

MS0114

PROJECT NO: FTEV 12-1164 A&B

DATE: 16 September 2016

DEPARTMENT OF THE AIR FORCE  
SPECIAL OPERATIONS COMMAND  
1 SPECIAL OPERATIONS WING

**ADAL Child Development Center Bldg. &  
Repair Child Development Center  
Building 90353**

HURLBURT FIELD, FLORIDA

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## SECTION 01 00 00: GENERAL REQUIREMENTS

### PART 1 GENERAL

#### 1.01 INTENT:

- A. The intent of this project is to provide the Government with a fully complete and useable building meeting all the requirements for its intended use, constructed to high standards and the requirements of the Contract Documents. A fully complete and useable building is defined as one that is constructed to meet the aesthetic, functional and structural properties required by the drawings, specifications, amendments issued prior to receipt of bids/proposals, and modifications issued after award of the contract. All work shall be constructed to meet or exceed industry or government standards, whichever is more stringent. All construction shall be executed in a professional manner resulting in a finished product of highest quality. All materials, equipment, and other products used in the construction shall be new or approved recyclable materials from an approved source. All new work shall be maintained in a clean condition, and shall be installed plumb, square, true to line and grade, and shall conform to the stated dimensions, notes, schedules, etc. The work shall be properly secured, consistent in quality, fit and finish, and installation, etc.

#### 1.02 APPLICABILITY:

- A. This section of the specification is applicable to all sections that follow.

#### 1.03 INTERPRETATION OF CONTRACT DOCUMENTS:

- A. Prospective bidders desiring further information, interpretation or clarification of the contract documents shall forward a written request to the Contracting Officer. **The Contracting Officer is the sole authority for interpretation of intent of work and for approval of quality of materials and workmanship. Failure to request the above shall not be the basis for a change order. DO NOT ASSUME THAT YOUR INTERPRETATION IS CORRECT.**

#### 1.04 CONFLICTS, DISCREPANCIES OR AMBIGUITIES:

- A. Prior to submittal of a bid or proposal by the prime/general contractor, it is expected that each subcontractor, equipment and/or material supplier, and others associated with the project, shall have carefully examined as necessary, the drawings, specifications, and all addenda issued prior to the date of submission of the bid or proposal. Any and all conflicts, discrepancies or ambiguous language reasonably ascertainable from an inspection of the above and the project site that will affect the cost, quality, fit, finish, labor specified or required, equipment and/or materials specified or required, etc., necessary to **fully complete the project and make it operational for its intended use, must immediately be brought to the attention of the prime/general contractor. The prime/general contractor must immediately notify the Contracting Officer in writing prior to submitting a bid or proposal and request written clarification of the conflict and/or discrepancy.**
- B. Conflicts, discrepancies and ambiguous language that are inconsistent with the intent as stated above include but are not limited to:
1. Ambiguous notes or statements or drawings or details.
  2. Conflicting information on the drawings and/or in the specifications.
  3. Errors or inconsistencies in schedules.
  4. Dimensional errors.
  5. Incomplete notes or dimensions or schedules.
  6. Extraneous notes, dimensions or schedules that conflict with the drawings or specifications.
- C. **Conflicts, discrepancies or ambiguities brought to the attention of the Contracting Officer AFTER award of contract WILL NOT be considered as a basis for a change in the work.**
- D. The intent of the above paragraphs is to increase the involvement of all persons associated with the project, particularly during the bid or proposal phase. Increased involvement during this phase will enhance the accuracy of the bid or proposal and reduce the potential for issuance of change orders during the construction phase.

#### 1.05 DEFINITIONS:

- A. **“Contract Documents”**: Contract Documents consist of the Contract, drawings and specifications, all addenda issued prior to submission of the bid/proposal and all modifications and/or other directives issued after the award/execution of the contract. The intent of the Contract Documents is to provide the Contractor with all items of work necessary for the proper execution and completion of the project. The items listed are complementary, what is required by one shall be as binding as if required by all. In the event of a conflict between the drawings and the specifications, the specifications shall take precedence over the drawings, **unless** otherwise noted on the drawings. The Contractor shall perform all work consistent with and reasonably inferable from the Contract Documents as necessary to produce the intended results.
- B. **“Government”**: The government is the United States of America. The government is the owner of the project.
- C. **“Prime Contractor”**: The Prime/General Contractor is the person or entity who is qualified, bonded and insured, and who is responsible for preparing the bid/proposal and submitting it to the government. If the bid/proposal is accepted, the prime contractor will enter into a contract with the government to construct the work in accordance with the Contract Documents. The term “contractor” is used throughout the contract documents, and is synonymous with Prime/General Contractor, and means the contractor or the contractor’s authorized representative.
- D. **“Subcontractor”**: A Subcontractor is a person or entity who prepares and submits a bid/proposal for a portion of the work to the contractor for his use in preparing his bid/proposal. During the construction phase, the subcontractor has a direct contract with the contractor to perform a portion of the work.
- E. **“Material/Equipment Suppliers”**: Material/equipment suppliers are person(s) or entities who prepare and submit a bid/proposal to the contractor for his use in preparing his bid/proposal. During the construction phase, the material equipment supplier has a direct contract with the contractor to provide certain materials or equipment to be incorporated into the work.
- F. **“Project”**: The project is the total construction of the work to be performed under the contract documents and may be the whole or part and which may include construction by the government.
- G. **“Work”**: The term work means the providing of construction services required by the contract documents, and includes all labor, materials, equipment and other incidentals necessary to fulfill the contractor’s obligations. The work constitutes the whole project.
- H. **“Changes in the Work”**: Changes in the work may be accomplished after award of contract without invalidating the contract. Changes in the work shall be based upon a mutual agreement between the contractor and the government. Changes in the work shall be performed under applicable provisions of the contract documents unless otherwise provided for in the change. The time to complete the additional work shall also be a part of the agreement.

#### 1.06 COORDINATION:

- A. **The prime contractor is responsible for the overall coordination of the project during the bid and or the proposal phase and the construction phase.**
  1. Coordinate **bid and or the proposal phase** to assure that all materials, labor, equipment, etc., to be used in the construction of the project and necessary for the completion of the prime contractor’s bid/proposal, as defined in 1.01 above, are included in the bids of the respective suppliers and/or subcontractors work, i.e., civil, architectural, plumbing, HVAC, or electrical.
  2. Coordinate **construction phase** to assure efficient and orderly progression of the work. Coordination shall include, but is not limited to, periodic meetings between the contractor and subcontractors to coordinate the work of each trade one with the other, installation of one part of the work that is dependent on the installation of other components either before or after it’s own installation, the materials and equipment needed to properly complete the work and ordering of those materials and equipment, preparation of schedules, layouts and phasing of the work as required to meet the government’s stated needs, installation of and removal of temporary facilities, preparation and delivery of submittals including shop drawings, manufacturer’s product data, etc., scheduling of construction activities in the sequence required to obtain the best results, installation of different components within the allotted space to assure maximum accessibility for required maintenance or repair, periodic inspections of the work to assure compliance with the Contract Documents, visual inspections of the work to assure compliance with aesthetic requirements, maintenance and completion of all contract closeout documents including the

coordination of supporting closeout documents by all subcontractors, maintenance and completion of Construction Data Worksheet, verification of new utility connections to each item of existing and new equipment, verify measurements of existing and new work prior to installation of various components, proper storage of materials at the site particularly items requiring specific environmental conditions, protection of completed new work to minimize damage by other trades, cleaning, correction of punch list items of work after the final inspection, correction of warranty items during the warranty period, etc.

3. The prime contractor, each subcontractor, each equipment or material supplier and others who may be affiliated with the project are individually responsible for field verification of existing and new conditions that will affect their work, including the work of associated trades. Do not order, fabricate or install new items without field verification. Any discrepancy between the actual field dimension(s) and the size shown on the drawings, specifications, shop drawings, manufacturer's product data, etc. must immediately be brought to the attention of the prime contractor, project inspector and Contracting Officer. The prime contractor shall request written direction from the Contracting Officer.
  4. Prior to performing any Site work or work below grade, the Contractor must obtain a completed and signed copy of AF FORM 103, Base Civil Engineering Work Clearance Request.
  5. Prior to bringing any lasers on Hurlburt Field, the contractor shall notify the Bio Environmental office 881-1822 and the Safety Office 884-2610.
- B. Individual sections of this specification are taken from the Base Master Specification. Therefore, not all products (materials, equipment, etc.) specified may be required to complete the construction of this project. In accordance with 1.05 above, the contractor, each subcontractor, equipment and/or material supplier, and others associated with the project, must carefully examine the drawings to determine which products are required to fully complete the work. See paragraph 1.04 Discrepancies.

#### **1.07 CONSTRUCTION DATA WORKSHEET**

- A. The contractor must complete the checklist attached at the end of this section.
1. Section 1.a. General Data Required: The government will complete Category Code and Facility number.
  2. Section 1.b. Systems in Building: All.

#### **1.08 METHODS:**

- A. The site shall be prepared, maintained, and operated by the contractor throughout the Work. Such preparation, maintenance, and operation include but are not limited to:
1. Preparation: Prevent damage to all existing construction, existing equipment and furnishings, existing utilities and paved areas, and new items such as recently installed materials and equipment, new stored materials, trees/shrubs/landscape features identified to remain at the site, and privately owned vehicles in and around the work site. The contractor responsible for the damage will be held liable for the repair or replacement of the damaged item as directed by the Contracting Officer.
  2. Safety and Security: Occupied and unoccupied facilities must be maintained in a safe manner to prevent the possibility of injury to the occupants and workmen. Upon completion of the days work, the contractor is responsible for securing the facility to prevent unlawful entry to the facility. If the interior of the facility or any equipment or furnishings are damaged due to the contractor's failure to properly secure the facility, the prime contractor and/or the subcontractor responsible for securing the facility will be held liable for the repair of the facility and replacement of the damaged equipment or furnishings as directed by the Contracting Officer.
  3. Maintenance: Maintain the site in a neat and orderly manner to include daily trash/debris removal, stacking of material, control of surface drainage, mowing, and road sweeping.
  4. Operation: Follow Occupational Safety and Health Administration requirements, US Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, base law enforcement and base fire marshal requirements.
  5. Trailers used for storage and/or temporary field offices shall be clean and well maintained and display only the name of the contractor or subcontractor.

#### **1.09 CONSTRUCTION:**

- A. All work will be of professional quality. Intent of construction includes but is not limited to the following:
1. Utility connections shall be clean and complete. Contractor must request a utility outage from the Contracting Officer no less than 3 working days prior to a scheduled outage for a single facility, and 14 days for outages affecting multiple facilities.
  2. Backfilling and compaction will be performed so settling shall not occur.

3. All disturbed areas and all new graded areas shall be graded smooth and sodded. Seeding will be permitted only if indicated on the drawings and/or approved by the Contracting Officer. Also, see other applicable sections(s) of the specification.
4. Construction shall be built to minimum industry tolerances unless otherwise noted and shall be square, true to line and grade, plumb and straight. Construct to the dimensions and elevations given on the drawings.
5. Finishes shall be consistent in color and texture, and shall cover all exposed surfaces, including obscure surfaces.
6. All work shall be constructed and/or installed in strict accordance with the manufacturer's written instructions, copies of which must be included with submittal documents.
7. **Road/pavement cuts are not permitted** unless approved by the Contracting Officer. If approved, road/pavement cuts must be submitted to the 1 Special Operations Civil Engineering Squadron, Programs Flight (1 SOCES/CEP) in writing, two weeks prior to the scheduled road/pavement cut.
8. Under no circumstances will a utility outage or road cut be permitted without the required notification unless the Base Civil Engineer deems it an emergency.
9. Any contractor that connects to a Hurlburt Field fire hydrant for water usage must use an approved backflow preventer and provide proof to the 1 SOCES/CEAN (ASSETT Management Flight) through the Contracting Officer that they are using a certified backflow prevention device. The certificate must be current to within 12 months of the date of connection and through the duration of water usage. Certification must be by a Certified Backflow Tester certified by the State.
10. Temporary electric power, natural gas and water used by the contractor during construction shall be provided by the government at no cost to the contractor. The contractor shall provide temporary meters for each utility. Each temporary meter shall be read by the contractor monthly on the last working day of the month and submitted to the Hurlburt Field Energy Manager on that same day. At the completion of the project and acceptance by the government, the contractor shall remove the temporary meters and make the final connections to the utility.

#### 1.10 CONSTRUCTION STANDARDS:

- A. This project shall be constructed to conform to the latest edition of the following standards.
  1. ASTM: American Society for Testing and Materials
  2. ACI: American Concrete Institute
  3. International Code Council
    - a. International Building Code
    - b. International Fuel Gas Code
    - c. International Mechanical Code
    - d. International Plumbing Code
    - e. NFPA: National Fire Protection Association.
    - f. NEC: National Electric Code
    - g. Unified Facilities Criteria (UFC) UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings.
    - h. Unified Facilities Criteria (UFC) UFC 3-600-01, Fire Protection Engineering for Facilities.
    - i. Americans with Disabilities Act
    - j. ASCE 7-98
    - k. 1 Special Operations Civil Engineer Squadron Design & Construction Standards. (Copy in 1 SOCES Engineering Flight office)
    - l. Unified Facilities Criteria (UFC) UFC 3-210-10, Low Impact Development.
- B. The contractor is required to comply with all aspects of the Federal Aviation Regulation (FAR), Part 77, **Objects Affecting Navigable Airspace**, for all work associated with this contract. This includes, but is not limited to, the use of any and all equipment used to construct the facility and the facility itself. The contractor is required to obtain **all necessary permits including FAA form 7460-1 (latest edition) and provide all necessary notices** associated with this requirement. All work within the following areas must be coordinated in writing with the Contracting Officer 21 days in advance of commencement of the work:
  1. LATERAL CLEARANCE AREA: A line 1000 feet from and parallel to the centerline of the runway.
  2. TAXIWAY SETBACK: A line 200 feet from and parallel to the centerline of any taxiway.
  3. APRON SETBACK: A line 125 feet from and parallel to the edge of the aircraft-parking apron.
  4. CLEAR ZONE: A line 1500 feet from and parallel to the centerline of the runway beginning at the runway threshold and continuing for a distance of 3000 feet north and south of the ends of the runway.
- C. A copy of FAR Part 77, and permit applications may be obtained from:  
ARP Division ASO-600



Federal Aviation Administration  
 P. O. Box 20636  
 Atlanta, Georgia 30320  
 Phone 404-3056700

#### 1.11 SUBSTITUTIONS:

- A. Throughout these specifications and/or on the drawings one or more "**Trade Names**" for a product may be listed. When this occurs, all parties agree that the phrases: "**or equal,**" "**or approved equal,**" and "**or equal as approved,**" follow each "**Trade Name**" listed. The contractor may submit substitute products, meeting the identified salient characteristics (physical and functional), to the Contracting Officer for review and approval. The term "Trade Names" includes Acceptable Manufacturers listed under PART 2 PRODUCTS of the specifications.
- B. Approval Required:
  - 1. The Contract is based on the standards of quality established in the Contract Documents.
  - 2. All products proposed for use, including those specified by required attributes and performance shall require approval by the Contracting Officer before being incorporated into the work.
  - 3. **Do not substitute materials, equipment, or methods unless such substitution has been specifically reviewed and approved for this Contract by the Contracting Officer.**
  - 4. Refer to section 01 60 00 for substitution submittal requirements.
- C. **Do not assume that materials, equipment or methods submitted, as a substitution, will be approved as equal. The Contracting Officer is the sole interpreter of the Contract Documents.**

#### 1.12 ASBESTOS:

- A. See section 01 56 00, Environmental Protection

#### 1.13 LEAD BASED PAINT

- A. See section 01 56 00, Environmental Protection

#### 1.14 HAZARDOUS MATERIALS AND WASTE

- A. See section 01 56 00, Environmental Protection

#### 1.15 CONTRACT PROGRESS REPORT

- A. Contractor progress reports shall be made in a timely manner and in accordance with the contract documents.
- B. Contractor shall use the Contract Progress Report form at the end of this section. As indicated on the form, all listed items of work may not be applicable to this project. Contractor shall submit completed form to include only those items of work applicable to this project.
- C. Item 73, "Close-Out Documents" has been assigned a value of 3%:
  - 1. This amount will be withheld from final payment until such time as all project record documents; "As-Built" drawings, operation & maintenance manuals & data, spare parts & maintenance products, warranties, maintenance service, etc., have been turned over to the government. The withholding of payment is not a penalty but is being done to assure compliance with specification Section 01 70 00 CONTRACT CLOSEOUT.
  - 2. **The government will not provide a final inspection or accept Beneficial Occupancy of the building until all the above documents have been turned over to the government.** The contractor and subcontractors are advised to prepare these documents as the work progresses and not wait until the end of the project.

#### 1.16 CONTRACT PROGRESS SCHEDULE

- A. The contractor must provide a copy of the Contract Progress Schedule for review by the Contracting Officer and the Construction Manager no later than 5 calendar days after the issuance of the Notice to Proceed. If disapproved, the contractor shall resubmit the revised Contract Progress Schedule within 2 days of the date of the disapproval. The Contract Progress Schedule must be approved within 10 days of the date of the disapproval. **No construction work shall start without an approved Contract Progress Schedule.**
- B. The Contract Progress Schedule must be based on the data in the Contract Progress Report attached to the

end of the section.

- C. In order to satisfy the contract requirements that work commence within 10 days of Notice to Proceed, the contractor may commence the submittal process in accordance with Section 01 33 00.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

# CONSTRUCTION DATA WORKSHEET

## 1. GENERAL DATA REQUIRED:

### A. PROJECT INFORMATION:

Project No.: \_\_\_\_\_ Contract No.: \_\_\_\_\_, Completion Date: \_\_\_\_\_  
 Category Code: \_\_\_\_\_, Facility No.: \_\_\_\_\_, Total Cost: \_\_\_\_\_  
 Liquidated Damages \_\_\_\_\_, Number of Floors: \_\_\_\_\_  
 General Description: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

### B. SYSTEMS IN BUILDING:

Category Code	Unit of Nomenclature	Measure	Amount	Cost	Description (If Required)
880-211	Closed Head Auto Sprinkler	HD/SF	___/___	_____	_____
880-217	AFFF PA Sprink Sys	HD/SF	___/___	_____	_____
880-221	Auto Fire Detection System (Include Pull Stations)	SF/EA	___/___	_____	_____
880-232	Foam Fire System	EA	_____	_____	_____
872-841	Security Alarm System	EA	_____	_____	_____
811-147	Electric Emergency Power Generator	KW	_____	_____	_____
	Storage Tank for Heating Or Generator Fuel (Type Fuel)	GA	_____	_____	_____
	Storage Tank for Heating	GA	_____	_____	_____
821-115	Heating Plt 750/3500 MB	MB	_____	_____	_____
821-116	Heating Plt over 3500 MB	MB	_____	_____	_____
	Storage Tank for Heating	GA	_____	_____	_____
890-125	A/C Plt less 5 TN	TN	_____	_____	_____
890-121	A/C Plt 5 to 25 TN	TN	_____	_____	_____
826-122	A/C Plt 25 to 100 TN	TN	_____	_____	_____
826-123	A/C Plt Over 100 TN	TN	_____	_____	_____
890-126	A/C Window Units	SF/TN	___/___	_____	_____
824-464	Gas Mains	LF	_____	_____	_____
844-368	Water Supply, Non-Potable	KG	_____	_____	_____
852-261	Veh. Parking (Ops)	SY	_____	_____	_____
852-262	Veh. Parking (Non-Org)	SY	_____	_____	_____
132-133	Pad, Equip	SY	_____	_____	_____
132-134	Ant. Spt Stru	EA	_____	_____	_____
890-272	EMCS Field Equip	EA	_____	_____	_____
812-223	Prim Dist Line OH	LF	_____	_____	_____
	Transformers	KV	_____	_____	_____
812-224	Sec Dist Line OH	LF	_____	_____	_____
812-225	Prim Dist Line UG	LF	_____	_____	_____
812-226	Sec Dist Line UG	LF	_____	_____	_____
812-926	Exterior Lighting (Street or Parking area Lights)	EA	_____	_____	_____
812-928	Traffic Lights	EA	_____	_____	_____
831-157	Industrial Waste Fuel Spill Collection (Oil/Fuel)	KG	_____	_____	_____
831-169	Sewage Septic Tank (Facility # it supports)	KG	_____	_____	_____
832-266	Sanitary Sewer Main	LF	_____	_____	_____
832-267	Sanitary Sewage Pump Station	SF	_____	_____	_____
842-245	Water Dist Mains	LF	_____	_____	_____
843-314	Fire Protection Water Main	LF	_____	_____	_____
843-315	Fire Hydrants	EA	_____	_____	_____
851-143	Curbs & Gutters (Transition between Road & Parking lot)	SY	_____	_____	_____

**C. RELATED FACILITIES:**

<u>Category Code</u>	<u>Nomenclature</u>	<u>UM</u>	<u>Amount</u>	<u>Cost</u>	<u>Description (If Reqd.)</u>
851-145	Driveway	SY	_____	_____	_____
147	Road	SY	_____	_____	_____
871-183	Storm Drain Disposal	LF	_____	_____	_____
872-245	Fence, Boundary	LF	_____	_____	_____
872-247	Fence, Security	LF	_____	_____	_____
872-248	Fence, Interior	LF	_____	_____	_____
852-289	Sidewalk	SY	_____	_____	_____
890-269	Cathodic Protection Sys	EA	_____	_____	_____
890-181	Utility Line Duct-Elec	LF	_____	_____	_____
890-181	Utility Line Duct-Comm	LF	_____	_____	_____
890-158	Load and Unload Platform	EA	_____	_____	_____
832-255	Industrial Waste Main	LF	_____	_____	_____

This checklist includes only the basic general construction category codes. More detailed category code listing information is available through the Real Property office, 884-6167.

<b>CONTRACT PROGRESS REPORT</b>				
CONTRACTOR			ADDRESS	
REPORT NO.	PERIOD COVERED FROM                      TO		PROJECT NO. / TITLE	
CONTRACT AMOUNT \$			CONTRACT NO.	COMPLETION DATE
NOTE: ALL ITEMS LISTED MAY NOT BE APPLICABLE TO THIS PROJECT. CONTRACTOR SHALL SUBMIT COMPLETED FORM TO INCLUDE ONLY THOSE ITEMS THAT ARE APPLICABLE TO THIS PROJECT.				
LINE NO.	WORK ELEMENTS	% OF TOTAL JOB	% COMPLETED THIS PERIOD	% COMPLETE CUMULATIVE
1	MOBILIZATION			
2	DEMOLITION - ARCHITECTURAL			
3	ASBESTOS / LEAD ABATEMENT			
4	SITE PREPARATION			
5	SITE UTILITIES			
6	SITE IRRIGATION SYSTEM			
7	SITE FINISH GRADING			
8	SITE LANDSCAPING			
9	ASPHALT PAVING / BASE			
10	CONCRETE CURB / GUTTER			
11	CONCRETE BUILDING SLAB / VAPOR BARRIER			
12	CONCRETE WALKS / LANDINGS			
13	CONCRETE FOOTINGS			
14	CONCRETE BEAMS / COLUMNS			
15	MASONRY FOUNDATIONS			
16	MASONRY SCREENWALLS			
17	MASONRY VENEER			
18	STRUCTURAL STEEL			
19	MISCELLANEOUS METALS / HANDRAILS / GRATES			
20	WOOD AND PLASTICS			
21	WALL INSULATION			
22	ROOF INSULATION			
23	EIFS			
24	WINDOWS			
25	EXTERIOR DOORS			
26	STOREFRONT			
27	OVERHEAD COILING DOORS			
28	INTERIOR DOORS			
29	HARDWARE			
30	EXTERIOR METAL STUDWALLS / SHEATHING			
31	INTERIOR METAL STUDWALLS / SHEATHING			
32	PAINTING			
33	WALL COVERING			
34	TOILET ACCESSORIES			
35	TOILET PARTITIONS / URINAL SCREEN			
36	SIGNAGE			
37	RAISED ACCESS FLOOR			

LINE NO.	WORK ELEMENTS	% OF TOTAL	% THIS PERIOD	% CUMULATIVE
38	PRE-ENGINEERED METAL BUILDING (PEMB)			
39	PEMB ROOF / FASCIA			
41	ELEVATORS / CONVEYING SYSTEMS			
42	DEMOLITION - MECHANICAL / PLUMBING			
43	NEW WATER / SEWER / NATURAL GAS SERVICE			
44	PLUMBING ROUGH-IN UNDER SLAB			
45	HVAC ROUGH-IN UNDER SLAB			
46	PLUMBING ROUGH-IN ABOVE SLAB			
47	PLUMBING FIXTURE / TRIM-OUT			
48	COMPRESSED AIR SYSTEM			
49	PIPE AND DUCT INSULATION			
50	DUCTWORK			
51	HYDRONIC PIPING			
52	FIRE SUPPRESSION			
53	HVAC EQUIPMENT			
54	GRILLES / DIFFUSERS/ TRIM-OUT			
55	CONTROLS			
56	TEST AND BALANCE			
57	DEMOLITION - ELECTRICAL			
58	ELECTRIC SERVICE TEMPORARY			
59	TRANSFORMER			
60	PRIMARY OVERHEAD ELECTRIC SERVICE			
61	PRIMARY UNDERGROUND ELECTRIC SERVICE			
62	SECONDARY OH ELECTRIC SERVICE			
63	SECONDARY UG ELECTRIC SERVICE			
64	ELECTRIC ROUGH-IN			
65	COMM / LAN ROUGH-IN			
66	FIRE DETECTION ROUGH-IN			
67	FIRE DETECTION EQUIPMENT / TRIM-OUT			
68	COMM / LAN TRIM-OUT			
69	ELECTRIC FIXTURES / TRIM-OUT			
70	EXTERIOR LIGHTING			
71	BONDING			
72	DEMOBILIZATION			
73	CLOSE-OUT DOCUMENTS	3%		
TOTAL				
SCHEDULED AMOUNT THIS BILLING				
TOTAL BID AMOUNT:		SCHEDULED:	ACTUAL:	
INSPECTOR SIGNATURE: _____ CONCUR NOT CONCUR (CIRCLE)				
<b>PROGRESS OR COMPLETION CERTIFICATE</b>				
I HEREBY CERTIFY THAT THE CONTRACTOR HAS SATISFACTORILY COMPLETED THE INDICATED PERCENTAGE OF THE CONTRACT SPECIFICATIONS				
<b>SUBMITTED BY OR FOR</b>				
CONTRACTOR:		BASE CIVIL ENGINEER:		
TYPE OR PRINT NAME AND TITLE		SIGNATURE		DATE
<b>REVIEWED BY OR FOR CONTRACTING OFFICER</b>				
TYPE OR PRINT NAME AND TITLE		SIGNATURE		DATE



**SECTION 01 09 00****REFERENCE STANDARDS****PART 1 - GENERAL****1.01 SECTION INCLUDES**

- A. Applicability of Reference Standards.
- B. Provision of Reference Standards at site.
- C. Source and acronyms used for Reference Standards in Contract Documents.

**1.02 APPLICABILITY OF REFERENCE STANDARDS**

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The publications listed in the various specification sections form a part of the specification to the extent referenced. The publications are referred to in the text by basic designation only.
- C. Use the latest standard, except when a specific date is specified.
- D. Disregard payment provisions contained in any portion of the referenced specifications and standards.
- E. If the specified reference standard(s) conflicts with the Contract Documents, request clarification from the Contracting Officer before proceeding.

**1.03 PROVISION OF REFERENCE STANDARDS AT SITE**

- A. When required by individual specifications sections, obtain a copy of the standard. Maintain a copy at the jobsite during submittals, planning, and progress of the specific work until completion.

**1.04 ABBREVIATIONS & NAMES**

- A. Where acronyms or abbreviations are used in the specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, and authority having jurisdiction or other entity applicable. Refer to "Encyclopedia of Associations" published by Gale Research Co., available in most libraries.

**1.05 SOURCE FOR REFERENCE STANDARDS**

AAMA	American Architectural Manufacturers Association 1827 Walden Office Square, Suite 550 Schaumburg, IL 60173-4268
AASHTO	American Association of State Highway and Transportation Officials 444 N. Capital St., NW, Suite 249 Washington, DC 20001
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219
ACPA	American Concrete Pipe Association 8300 Boone Blvd., #400 Vienna, VA 22182
AWPA	American Wood Protection Association P.O. Box 361784 Birmingham, AL 35236-1784
AF&PA	American Forest and Paper Association



111 Nineteenth Street, NW, Suite 800  
Washington, DC 20036

- AISI American Iron and Steel Institute  
25 Massachusetts Avenue, NW Suite 800  
Washington, DC 20001
- AISC American Institute of Steel Construction  
One East Wacker Drive, Suite 700  
Chicago, IL 60601-1802
- AITC American Institute of Timber Construction  
7012 S. Revere Parkway Suite 140  
Centennial, CO 80112
- ALSC American Lumber Standard Committee  
P.O. Box 210  
Germantown, MD 20875-0210
- ANSI American National Standards Institute  
11 West 42nd St.  
New York, NY 10036
- APA/EWA APA – The Engineered Wood Association  
Order From:  
<http://www.apawood.org>
- ASCE American Society of Civil Engineers  
1801 Alexander Bell Drive  
Reston, VA 20191-4400
- ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers  
1791 Tullie Circle, N. E  
Atlanta, GA 30329
- ASNT American Society for Non-destructive Testing  
4153 Arlingate Plaza  
Columbus, OH 43228-0518
- ASTM American Society for Testing and Materials  
1916 Race Street  
Philadelphia, PA 19103
- AWI Architectural Woodwork Institute  
46179 Westlake Drive, Suite 120  
Potomac Falls, VA 20165-5874
- AWPA American Wood Protection Association  
P.O. Box 361784  
Birmingham, AL 35236-1784
- AWS American Welding Society  
P.O. Box 351040  
Miami, FL 33135
- AWWA American Water Works Association  
6666 West Quincy  
Denver, CO 80235
- BHMA Builders Hardware Manufacturers Association

355 Lexington Avenue, 15th Floor  
New York, NY 10017

- CFR Code of Federal Regulations  
Order from:  
Superintendent of Documents  
Government Printing Office  
Washington, DC 20402-9371
- CISCA Ceilings and Interior Systems Construction Association  
405 Illinois Avenue, 2B  
St. Charles, IL 60174
- CRI The Carpet and Rug Institute  
P.O. Box 2048  
Dalton, GA 30722-2048
- CRSI Concrete Reinforcing Steel Institute  
933 No. Plum Grove Rd.  
Schaumburg, IL 60173-4758
- CS United States Department of Commerce Standard  
Order from:  
National Technical Information Service  
5285 Port Royal Rd.  
Springfield, VA 22161
- DHI Door and Hardware Institute  
14150 Newbrook Dr.  
Chantilly, VA 20151
- EIMA EIFS Industry Members Association  
2600 N.W. Lake Rd.  
Camas, WA 98607-8542
- FAA Federal Aviation Administration  
Department of Transportation  
Order from:  
Superintendent of Documents  
Government Printing Office  
Washington, DC 20402-9371  
For documents offered at no cost, order from:  
Dept. of Transportation  
ATTN: M443.2  
400 Seventh St., SW  
Washington, DC 20590
- FDOT Florida Department of Transportation  
Order from:  
<http://www.dot.state.fl.us/mapsandpublications/>
- FM FM Global  
270 Central Avenue  
P.O. Box 7500  
Johnston, RI 02919-4923
- FS Federal Specifications  
Order from:  
Standardization Documents Order Desk

Bldg 4, Section D  
700 Robbins Ave.  
Philadelphia, PA 19111-5094

FSC Forest Stewardship Council  
212 Third Avenue North, Suite 504  
Minneapolis, MN 55401

FTM-STD Federal Test Method Standards  
Order from:  
Standardization Documents Order Desk  
Bldg 4, Section D  
700 Robbins Ave.  
Philadelphia, PA 19111-5094

GA Gypsum Association  
6525 Belcrest Road, Suite 480  
Hyattsville, MD 20782

GC Green Seal  
1001 Connecticut Avenue, NW  
Suite 827  
Washington, DC 20036-5525

MS Military Specifications (MILSPEC)  
Standardization Documents Order Desk  
Bldg 4, Section D  
700 Robbins Ave.  
Philadelphia, PA 19111-5094

MSS Manufacturers' Standardization Society of the Valve and Fittings Industry  
127 Park St., NE  
Vienna, VA 22180

NAAMM National Association of Architectural Metal Manufacturers  
800 Roosevelt Rd, Bldg. C, Suite 312  
Glen Ellyn, IL 60137

NBS National Bureau of Standards  
(U. S. Department of Commerce)  
Gaithersburg, MD 20234

NEMA National Fire Protection Association  
1 Batterymarch Park  
Quincy, MA 02169-7471

NFPA American Wood Protection Association  
P.O. Box 361784  
Birmingham, AL 35236-1784

NIOSH National Institute for Occupational Safety and Health  
(Centers for Disease Control and Prevention)  
Order From:  
<http://www.cdc.gov/niosh/docs/203-154/method-cas1.html>

OSHA Occupational Safety and Health Administration  
(U.S. Department of Labor)  
Order from:  
Superintendent of Documents  
Government Printing Office

Washington, DC 20402-9371

- SCAQMD South Coast Air Quality Management District  
21865 Copley Drive  
Diamond Bar, CA 91765
- SCS Scientific Certification Systems  
2000 Powell Street, Suite 600  
Emeryville, CA 94608
- SDI Steel Deck Institute  
P.O. Box 25  
Fox River Grove, IL 60021
- SJI Steel Joist Institute  
234 W. Cheves Street  
Florence, SC 29501
- SMACNA Sheet Metal and Air Conditioning Contractors' National Association  
4201 Lafayette Center Drive  
Chantilly, VA 20151-1219
- SPIB Southern Pine Inspection Bureau  
P.O. Box 10915  
Pensacola, FL 32524-0915
- SSMA The Steel Stud Manufacturers Association  
35 East Wacker Drive, Suite 850  
Chicago, IL 60601-2106
- SSPC The Society for Protective Coatings  
40 24<sup>th</sup> Street  
6<sup>th</sup> Floor  
Pittsburgh, PA 15222
- TCNA Tile Council of North America  
100 Clemson Research Blvd.  
Anderson, SC 29625
- UL Underwriters Laboratories, Inc.  
2600 N.W. Lake Rd.  
Camas, WA 98607-8542

**PART 2 - PRODUCTS: NOT USED.**

**PART 3 - EXECUTION: NOT USED.**

**END OF SECTION**

## SECTION 01 10 00:SUMMARY OF WORK

### PART 1 GENERAL

#### 1.01 WORK INCLUDED:

- A. The contractor shall furnish all labor, materials, tools, supervision and equipment and perform all operations necessary to accomplish all work complete in place, as shown on the drawings, specified herein, or as needed to construct FTEV 12-1164 A, ADAL Child Development Center Bldg. 90353 and FTEV 12-1164 B, Repair Child Development Bldg. 90353.

#### 1.02 JOB DESCRIPTION:

- A. The work to be performed for the FTEV 12-1164 A ADAL and FTEV 12-1164 B Repair portions of this project includes, but is not necessarily limited to, the following principal features:

##### FTEV 12-1164 A

1. Addition of 1,789 SF to the existing facility for expansion of commercial grade kitchen and additional administrative offices.
2. Provision of site adjustments including site utility modifications, landscaping, AT/FP barricades to the parking area and dumpster relocation.

##### FTEV 12-1164 B

1. Renovation of the existing kitchen and laundry spaces as well as renovations to the entrance lobby and surrounding administrative spaces, including toilet rooms.
2. Replacement and upgrade of all mechanical equipment (pumps, boilers, air handling units) for the building.
3. Replacement of casework and suspended acoustic tile ceiling systems in Classrooms 13, 14, and 15.
4. Replacement of the mechanical system, including ducts and terminal units, in Classrooms 13, 14, and 15.
5. Provision of toilet partition privacy screens in child bathroom areas of Building 90357 (CDC Annex).

#### 1.03 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of site to allow Owner visitation and inspection.
- B. The contractor and subcontractors are permitted to use existing utilities available at the site. Use is subject to approval by the Contracting Officer. The 1 Special Operations Civil Engineering Squadron must approve all connections. Connection to existing water mains must utilize a backflow preventer, certified within the 12 months prior to use on base.

#### 1.04 DISPOSAL

- A. All scrap materials and debris shall be disposed of in an on- site dumpster. When full, it shall be emptied at a legally approved dumpsite off- base. It shall be the responsibility of the contractor to provide the dumpster and for the selection of the dumpsite. Provide Contracting Officer with name(s) of waste disposal company and approved dumpsite.

#### 1.05 STORAGE AREA

- A. Contractor lay-down/materials storage site shall be as shown on the drawings or as approved by the Contracting Officer.
- B. A minimum of a 6 foot high temporary visual barrier shall surround the area.
- C. The area must be maintained in a reasonably clean manner. All empty boxes, paper and trash must be deposited in the on-site construction dumpster.

#### 1.06 SAFETY

- A. The pertinent sections of the following publications are applicable to all work on this project.
  1. U.S. Army Corps of Engineers: EM 385-1-1, Safety and Health Requirements Manual.
  2. Air Force Instruction (AFI) 91-202.
  3. AFOSH Standard 48.139. See Specification Section 01 00 00 General Requirements paragraph 1.06.A.5.

**1.07 HAUL ROUTE AND LITTER**

- A. The Contractor shall utilize only the designated haul route for the project for access to and from the site as shown on the Drawings.

**1.08 USE OF BARGE AREA**

- A. Use of the barge off loading area is not allowed except as approved, in writing, by the Contracting Officer. Contractor must request usage of the barge site, in writing, to the Contracting Officer a minimum of 30 days prior to expected deliveries. Contractor must also submit a schedule of all deliveries. Under no circumstances should the contractor assume such requests will be approved. Contractor should plan to have materials delivered by other means.
- B. If usage of the barge site is approved, the contractor must meet the following requirements:
  1. Crane boom height cannot exceed eighty (80) feet from mean water elevation.
  2. Crane boom must have a red flag and an operational blinking obstruction light.
  3. Contractor will be responsible for surrounding water quality per the State of Florida Regulations. Prior to delivery of any barge/crane or tug, contractor must install full-depth turbidity barriers both east and west of the site to extend beyond limits of off loading operations.
  4. Off loading operations will be during daylight hours only. Operations will not start before 0700 (7:00 AM) and boom must be lowered to deck height by 1700 hours (5:00 PM) each day.
  5. Contractor is required to provide the name and number of a responsible party, and contact information of the tug/crane operator at site to **both** of the following:
    - a. The Contracting Officer.
    - b. Hurlburt Tower: Hurlburt Tower – 884-4795. (If tower cannot be contacted notify the Airfield Manager – 884-4491.
  6. Upon notification of inclement weather, off loading operations must cease and the boom lowered to deck height. Do not raise boom until cleared by the Hurlburt Tower. All barges and equipment must be secured. Upon notification of Hurcon conditions, the contractor must remove all barges, cranes, tugs, and associated equipment from the site. The government will not be responsible for any delays or costs associated to weather.
  7. If notified to do so by the Contracting Officer or Hurlburt Tower, operations must cease and the boom lowered to deck height. Under no circumstances should the boom be raised until cleared by the notifying authority. The government will not be responsible for any associated delays or costs.
- C. If these requirements cannot be met, the contractor is prohibited from using the barge site. Failure to adhere to these requirements during operations will result in immediate revocation of site use at no expense to the government. Site must be maintained per specifications and contractor will be responsible for any and all clean-up after operations.

**PART 2 PRODUCTS (Not Used)****PART 3 EXECUTION****3.01 INSPECTION**

- A. The contractor shall accomplish work in an orderly progression of steps to satisfy the performance requirements of this specification.

**3.02 HOURS OF WORK**

- A. The normal hours of a workday shall be between 7:00 A.M. and 4:00 P.M., Monday through Friday, except holidays and observed holidays. The contractor may elect, at his option, to work hours other than normal duty hours if approved by the Contracting Officer. All work time, other than normal working days, shall be requested in writing, 3 days in advance.

**3.03 PHOTOGRAPHS**

- A. The contractor will take before and after photographs of the work. "Before" photos will be submitted before the start of work. "After" photos will be submitted before the acceptance of the work. A minimum of 24 photos of each will be required. Photos must show exterior and interior areas of the building that are to receive the new work. The intent is to show the amount of change. Photos may be submitted by the Air Force for design and construction awards. All photos taken shall be in digital format and submitted on CD. Submit one copy of before and after photos.

**3.04 QUALITY CONTROL**

- A. The contractor shall establish and maintain quality control to assure compliance with Contract Documents, and maintain records of his quality control for materials, equipment and construction operations.

**3.05 CONSTRUCTION LAYOUT & VERIFICATION:**

- A. The contractor shall employ a Florida Registered Land Surveyor to layout the building and other site features in accordance with the drawings. Potential problems that will affect the site geometry shall immediately be brought to the attention of the Contracting Officer.
- B. Horizontal and Vertical Control shall conform to Hurlburt Field Datum: Horizontal NAD-83; Vertical NAVD-88.
- C. Upon completion of the project and prior to the submission of the "As-Built" drawings (See Section 01 70 00 Contract Closeout), the contractor shall employ a Florida Registered Land Surveyor to perform the following Horizontal Control by use of Global Positioning Satellite (GPS) to sub-meter accuracy, and Vertical Control using the above datum.:
  - 1. Location of building corners.
  - 2. Buried water mains, sanitary and/or storm water sewers including all valves, cleanouts, horizontal turns, etc.
  - 3. Elevations at top of manhole(s), lift stations, storm water structures or similar above ground structures.
  - 4. Invert elevations of all manholes and stub-outs intended for future connections to the system.

**3.06 WARRANTY INSPECTION**

- A. A warranty inspection will be held thirty (30) days prior to the expiration of the contractor's one-year warranty. The inspection will be held at the project site. Those in attendance shall include the contractor, the Contracting Officer, the project inspector, and the occupant. The purpose of this inspection will be to identify current or re-occurring problems associated with the project and past warranty calls and corrective action taken to remedy them. The contractor shall contact the Contracting Officer to determine the date of the inspection. The Contracting Officer shall contact the appropriate government agencies and confirm the date the inspection is to take place.
- B. A list of problems identified at the inspection will be provided to all those in attendance. All problems must be corrected to the satisfaction of the government prior to the expiration of the warranty

**END OF SECTION**









**SECTION 01 33 00:****SUBMITTALS****PART I GENERAL****1.01 WORK INCLUDED:**

- A. Throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and Government standards, or description of required attributes and performance.
- B. Make all submittals required by the Contract Documents in a timely manner to allow construction of the building within the allotted performance time.
  - 1. Long lead items such as pre-engineered metal building systems, electrical and mechanical systems, special equipment, etc. must be submitted within 15 days of Notice to Proceed.
  - 2. All submittals must be made within 45 days of Notice to Proceed.
  - 3. **Late submittals that result in delayed delivery of materials and equipment, which will affect the completion and acceptance of the building by the government, will not be a justification for a time extension.**
  - 4. Revise, submit and/or resubmit (submittals) as necessary to establish compliance with the specified requirements.

**1.02 QUALITY ASSURANCE:**

- A. Coordination of Submittals: Prior to each submittal, carefully review and coordinate all aspects of each item being submitted and verify that each item and the submittal for it conforms in all respects with the requirements of the Contract Documents. **By affixing his signature to each submittal, the contractor certifies that this coordination and verification has been performed.**
- B. Certificates of Compliance:
  - 1. Certify that all materials used in the work comply with all specified provisions thereof. Certification shall not be construed as relieving the contractor from furnishing satisfactory materials if, after tests are performed on selected samples' the material is found to not meet specific requirements.
  - 2. Show on each certification the name and location of the work, name and address of contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. An officer of the manufacturing or fabrication company shall sign certificates.
  - 3. In addition to the above information, all laboratory test reports submitted with Certificates of Compliance shall show the date or dates of testing, the specified requirements for which testing was performed, and results of the test or tests.

**PART 2 PRODUCTS****2.01 SHOP DRAWINGS AND COORDINATION DRAWINGS:**

- A. Shop Drawings: Make all shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.

**2.02 MANUFACTURER'S LITERATURE:**

- A. Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly indicate which portion of the contents is being submitted for review.

**PART 3 EXECUTION****3.01 IDENTIFICATION OF SUBMITTALS:**

- A. General: Consecutively number all submittals.
- B. Internal Identifications: On at least the first page of each copy of each submittal and elsewhere as required for positive identification, clearly indicate the submittal number in which the item was included.
- C. **Indicate FTEV Number, Project Title and Contract Number**

### 3.02 COORDINATION OF SUBMITTALS:

- A. **General:** Prior to submittal for approval, use all means necessary to fully coordinate all material including, but not necessarily limited to:
  1. Determine and verify all interface conditions, catalog numbers and similar data.
  2. Coordinate with other trades as required.
  3. Clearly indicate all deviations from requirements of the Contract Documents.
  
- B. **Grouping of submittals:** Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals will be rejected as not complying with the provisions of the Contract Documents and the contractor shall be strictly liable for all delays so occasioned.
  
- C. **Interior Finish Materials/Colors/Samples:** All interior finish materials/colors/samples, including but not limited to, flooring, base, paint/stain, wall coverings, acoustic ceiling/suspension system, acoustical treatment, window treatment, laminated plastic for base/wall cabinets/countertops, interior signage, etc., shall be submitted as a group (**one submittal**) to allow the government to review/approve/disapprove and select/coordinate the interior finish materials/colors prior to being incorporated into the work. Upon receipt of the government's approved selections, the contractor shall provide the government with actual samples of each item for the record, minimum size 4"x4", except laminate plastic chips shall be manufacturer's standard size.
  
- D. **Exterior Finish Materials/Colors/Samples:** All exterior finish materials/colors/samples, including but not limited to, brick, concrete masonry, exterior insulation finish system, stucco, paint/stain, roofing/flashing, exterior signage, pavers, windows, doors, etc., shall be submitted as a group (one submittal) to allow the government to review/approve/disapprove and /select/coordinate the exterior finish materials/colors prior to being incorporated into the work. Upon receipt of the government's approved selections, the contractor shall provide the government with actual samples of each item for the record, minimum size 4"x4".

### 3.03 SUBMITTAL APPROVAL:

- A. **General:** Approval by the Contracting Officer shall not be construed as a complete check, but only that the general method of construction and detailing is satisfactory. **Review and approval by government shall not relieve the contractor from responsibility for errors that may exist, or from liability for failure to comply with the intent of the Contract Documents.**
  
- B. **Revisions After Approval:** When a submittal has been approved, a re-submittal by the contractor for the purpose of substitution of materials or equipment, will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary.
  
- C. **Unnecessary Submissions:** When the contractor elects to provide the materials, equipment, etc., that was used as the basis for the design and is the exact: Manufacture's name, catalog number, size, and finish as shown in the drawings or specified herein, no submittal is required. The contractor however shall submit a letter to the Contracting Officer stating that he will use the specified product. All field-testing associated with the material or equipment, etc. must be performed and submitted to the Contracting Officer for approval.

### 3.04 SCHEDULE OF MATERIAL SUBMITTALS.

- A. Assign numbers to these items to be submitted, beginning with the number 1 and continuing through the last submittal. Items that are disapproved and require resubmittal shall be numbered with the original submittal number followed by R1 if the first resubmittal of the item, R2 if the second resubmittal, and so on, until final approval is given.

**END OF SECTION**

## **SECTION 01 41 00: TESTING LABORATORY SERVICES**

### **PART 1 GENERAL**

#### **1.01 REFERENCES:**

- A. ASTM D3740 – Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction.
- B. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Special Inspection, or Testing Materials Used in Construction.

#### **1.02 SELECTION AND PAYMENT:**

- A. Contractor shall employ and pay for services of an independent testing laboratory to perform specified inspection and testing. One laboratory shall perform all tests for project.
- B. The Government will employ and pay for services of an independent testing laboratory to perform inspection and testing deemed to be in the best interest of the Government. The contractor will be responsible for the cost of all inspections, testing and replacement of Work not meeting the Contract Documents.
- C. Employment of testing laboratory shall in no way relieve contractor of obligation to perform Work in accordance with requirements of Contract Documents.

#### **1.03 QUALITY ASSURANCE:**

- A. Comply with requirements of ASTM E329 and ASTM D3740.
- B. Laboratory: Licensed and authorized to operate in State of Florida.
- C. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards (NBS) or accepted values of natural physical constants.
- D. Certification: Current Certification by Construction Materials Council, Inc.

#### **1.04 CONTRACTOR SUBMITTALS:**

- A. Prior to start of Work, submit testing laboratory name, address and telephone number, and the name or names of the Professional Engineer(s), currently registered in the state of Florida, who will be certifying the reports or tests and a responsible officer of the company
- B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards (NBS) during most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

#### **1.05 LABORATORY RESPONSIBILITIES:**

- A. Provide qualified personnel at site.
- B. Perform specified inspection, sampling, making cylinders, etc., and testing of all products in accordance with Contract Documents.
- C. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- D. Provide certified copies of the reports or tests as per 1.06 below. The Professional Engineer shall affix his name and date to all reports or tests before affixing his impression seal over both.

#### **1.06 LABORATORY REPORTS:**

- A. **After each inspection and test and prior to providing copies to the contractor, the Testing Laboratory shall promptly forward one (1) copy of each laboratory report directly to the Contracting Officer for record purposes. Mail to Contracting Officer, 1 SOCONS, 350 Tully St., Hurlburt Field, FL 32544.**

- B. Contractor shall submit four (4) copies of each laboratory report as per Section 01 33 00 to the Contracting Officer for review and approval.
- C. Include:
  1. Date issued.
  2. Project title and number.
  3. Name of inspector.
  4. Date and time of sampling or inspection.
  5. Identification of product and specifications section.
  6. Location in the project.
  7. Type of inspection or test.
  8. Date of test.
  9. Results of test.
  10. Conformance with Contract Documents.
- D. When requested by Contracting Officer, provide interpretation of test results.

**1.07 LIMITS ON TESTING LABORATORY AUTHORITY:**

- A. Laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.
- B. Laboratory may not approve or accept any portion of the Work.
- C. Laboratory may not assume any duties of the contractor.
- D. Laboratory has no authority to stop the Work.

**1.08 CONTRACTOR RESPONSIBILITIES:**

- A. Notify laboratory of the location of the construction site and samples of materials proposed to be used, which require testing.
- B. Provide laboratory all proposed mix designs.
- C. Cooperate with laboratory personnel and provide access to the Work, to manufacturer's literature and other pertinent data.
- D. Provide incidental labor and facilities to provide access to Work to be tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- E. Notify laboratory a minimum of 24 hours prior to expected time for operations requiring inspection, sampling, and testing services.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

## SECTION 01 56 00 ENVIRONMENTAL PROTECTION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. The environmental protection required for this contract.

#### 1.02. REFERENCES

- A. 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.
1. **CODE OF FEDERAL REGULATIONS (CFR)**
    - 29 CFR 1910.1200, Hazard Communication Standard
    - 40 CFR 110, Discharge of Oil
    - 40 CFR 112, Oil Pollution Prevention
    - 40 CFR 122, EPA administered permit programs
    - 40 CFR 125, National Pollutant Discharge Elimination System (NPDES)
    - 40 CFR 260-271, Resource Conservation and Recovery Act (RCRA)
    - 40 CFR 260-279, Hazardous Waste and Used Oil Management
    - 40 CFR 300, National Oil and Hazardous Substances Pollution Contingency Plan
    - 40 CFR 355, Emergency Planning and Notification
    - 40 CFR 403, General Pretreatment Regulations for Existing and New Sources of Pollution
    - 49 CFR 171-172, General Information, Regulations and Definitions, and Hazardous Waste
  2. **ENVIRONMENTAL PROTECTION AGENCY (EPA)**
    - EPA PL 96-510, Comprehensive Environmental Response Compensation & Liability Act
  3. **FLORIDA ADMINISTRATION CODE (FAC)**
    - FAC 62-25, Regulation of Stormwater Discharge
    - FAC 62-150, Hazardous Substance Release Notification
    - FAC 62-210, Stationary Sources – General Requirements
    - FAC 62-212, Stationary Sources – Preconstruction Review
    - FAC 62-621.300(2), Discharge of Groundwater From Any Non-Contaminated Site
    - FAC 62-330, Environmental Resource Permitting in Northwest Florida
    - FAC 62-555, Permitting, Construction, Operation, and Maintenance of Public Water Systems
    - FAC 62-604, Collection Systems and Transmission Facilities
    - FAC 62-730, Hazardous Waste
    - FAC 62-762, Aboveground Storage Tank Systems
    - FAC 62-770, Petroleum Contamination Site Cleanup Criteria
  4. **HURLBURT FIELD INSTRUCTIONS AND DIRECTIVES**
    - Hurlburt Field Directive for Mercury and Fluorescent Lamps
    - Hurlburt Field Ozone Depleting Management Plan
    - Hurlburt Field Spill Prevention Control and Countermeasure (SPCC) Plan
    - Hurlburt Field Installation Restoration Program (IRP) Management Action Plan
    - Hurlburt Field Hazardous Waste Management Plan
    - Hurlburt Field Asbestos Management and Operations Plan
    - Hurlburt Field Lead Based Paint and Lead Hazard Plan
    - Hurlburt Field Landscape Development Plan
    - Hurlburt Field Environmental Policy
  5. **AIR FORCE INSTRUCTIONS AND DIRECTIVES**
    - AFI 23-204 Organizational Fuel Tanks
    - AFI 32-7001 Environmental Management
    - AFI 32-7042 Waste Management
    - AFI 32-7044 Storage Tank Compliance
    - AFI 32-7064 Natural Resources
    - AFI 32-7086 Hazardous Materials Management

#### 1.03 QUALITY ASSURANCE

- A. Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record on daily reports any problems in complying with laws, regulations, permit requirements, ordinances, and corrective action taken. The Contractor shall immediately inform the Contracting Officer of any environmental problem.

#### 1.04 CONTRACTOR COMPLIANCE

- A. Permits: The contractor shall ensure that all required environmental permits are in their possession prior to start of construction and/or installing or operating any new or modified equipment or processes or disturbing or clearing any land area.
- B. The contractor shall be responsible for operating within permit limits and abiding by all permit conditions. 1 SOCES/CEIE shall be notified immediately of any exceedances of permit limits or violation of permit conditions. The contractor shall immediately notify 1 SOCES/CEIE of any unforeseen environmental conditions, which may conflict with approved permits. Any certifications required by permits shall be the responsibility of the contractor. Copies of all permits and certifications shall be submitted to the contracting office for 1 SOCES/CEIE in electronic format (.dwg, pdf, or .doc).
- C. All certifications, notices and documentation required by environmental permits shall be the responsibility of the contractor, but must be coordinated through the contracting office and 1 SOCES/CEIE prior to submittal to regulatory agencies.
1. Sanitary Sewer Permit: The government will provide a copy of the permit to the contractor prior to start of construction. After construction, the line will not be put into use until the permit clearance has been applied for and obtained. All necessary paperwork (Certification of Completion Form, as-builts, etc.) will be submitted to the contracting office for 1 SOCES/CEIE. The regulatory agency has 30 days to review. Work is not considered complete until the permit clearance has been applied for and obtained.
  2. Potable Water Permit: The government will provide a copy of the permit to the contractor prior to start of construction. After construction, the line will not be put into use until the permit clearance has been applied for and obtained. For phased projects a permit clearance can be obtained for each phase by submitting a certification of completion package for each phase as a partial completion on the entire permitted project. All necessary paperwork (Certification of Completion Form, as-builts, bacteriologicals, pressure test results, etc) will be submitted to the contracting office for 1 SOCES/CEIE. The regulatory agency has 30 days to review. Work is not considered complete until the permit clearance has been applied for and obtained.
  3. Irrigation Permit: The government will provide a copy of the permit to the contractor prior to start of construction. After construction, the system will not be put into use until the permit clearance has been applied for and obtained. All necessary paperwork (Certification of Completion Form, as-builts, etc) will be submitted to the contracting office for 1 SOCES/CEIE. The regulatory agency has 30 days to review. Work is not considered complete until the permit clearance has been applied for and obtained.
  4. Wetland Permit: The government will provide a copy of the permit application to the contractor prior to start of construction. Prior to start of any construction in a wetland, a Joint Application for Environmental Resource Permit must be completed by the contractor. Completion of the application package to include site plan, and signed/sealed drawings must be submitted to the 1 SOCES/CEIE for coordination. The application must note all best management practices (BMP's) such as silt screens and must show locations.. The regulatory agency has 30 days to request additional information. All necessary paperwork (Certification of Completion Form, as-builts, etc) will be submitted to the contracting office for 1 SOCES/CEAN. The regulatory agency has 30 days to review. Work is not considered complete until the permit clearance has been applied for and obtained.
  5. Generic Stormwater Permit for Stormwater Discharge from Large and Small Construction Activities, F.A.C. 62-621; and Environmental Resource Permit F.A.C. 62-330 if applicable :
    - a. Prior to start of Construction:
      1. Prior to start of any site work the contractor shall submit to the contracting office for 1 SOCES/CEIE in electronic format; 1 copy of the Notice of Intent (NOI) Form 62-621.300(4)(b); proof of fee payment; 1 copy of the signed Stormwater Pollution Prevention Plan (SWPPP) and map; 1 copy of the letter from the regulatory agency issuing the permit for the project;
      2. If F.A.C. 62-330 is applicable, in electronic format: 1 copy of application package signed and sealed with Form 62-330.060(1) or 10-2 General Permit certification record; ; 1 copy of the drainage delineation, 1 copy of the supporting engineering calculations, 1 copy of the geotechnical report (where applicable), 1 copy of the survey (where applicable), 1 copy regulatory agency letter issuing permit number; 1 copy of the proof of submittal to regulatory agency of the Construction Commencement Notice Form 62-330.350(1) at least 48 hours prior to start of construction.



- b. During Construction::
    1. The contractor shall provide to the contracting office for 1 SOCES/CEIE at the end of each month, in electronic format, signed weekly and storm event inspection reports; and the Notice of Termination (NOT) Form 62-621.300(6) within 14 days of final stabilization of the site. Copies of the reports must also be kept on-site.
    2. If F.A.C. 62-330 is applicable: 1 copy of Form 62-330.310(1) As-Built Certification by the Engineer of record within 30 days after completion of construction.
6. Copies of all required forms and guidance can be found at <http://www.dep.state.fl.us/>.

## **PART 2 PRODUCTS (NOT USED)**

## **PART 3 EXECUTION**

### **3.01 SUBMITTALS**

- A. The Contractor shall submit an Environmental Protection Plan within 15 days after receipt of the notice to proceed. Approval of the Contractor's plan will not relieve the Contractor of responsibility for adequate and continuing control of pollutants and other environmental protection measures. The contractor shall obtain approval by the Contracting Officer prior to the start of construction, modification, or demolition for all project facilities and/or equipment. The plan shall include, but shall not be limited to, the following:
  1. Legal Requirements: A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits. Whenever there is a conflict between Federal, State, or local laws, regulations, and permit requirements, the more restrictive provisions shall apply.
  2. Environmental Protection Procedures: Procedures to be implemented to provide the required environmental protection, to comply with the applicable laws and regulations, and to correct pollution due to accident, natural causes, or failure to follow the procedures of the environmental protection plan.
  3. Drawings: Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials shall be included.
  4. Solid Waste Management Plan: See paragraph titled Solid Waste.
  5. Emergency Response and Spill Prevention Plan: See paragraph titled Emergency Response and Spill Prevention.
  6. Hazard Material List: See paragraph titled Hazardous Materials.
  7. Storm Water Pollution Prevention Plan: See paragraph titled Water Resources.
  8. Hazard Waste Management and Disposal Plan: See paragraph titled Hazardous Waste.
  9. Summary of Solid Waste Generated: See paragraph titled Solid Waste Implementation.

### **3.02 NATURAL RESOURCES**

- A. ENVIRONMENTAL RESOURCES: The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine activities to areas defined by the drawings and specifications except where tree replacement is required. Environmental protections shall be as stated in the following subparagraphs:
  1. The contractor shall confine all activities to areas defined by the drawings and specifications. In areas indicated on the drawing or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission. Trees, shrubs and other vegetation not identified for removal shall be protected against removal, injury, defacing and scarring-no ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times.
  2. The Contractor shall not park vehicles or equipment within the drip line of trees. Prior to trimming or removal of trees, contractor shall coordinate with 1 SOCES/CEIE. All verified merchantable timber that is removed shall be limbed and stacked butt to butt in an out of the way location. Trees that are damaged or removed shall be replaced according to guidance found in the Hurlburt Field 2009 Landscape Development Plan

3. Prior to any construction, the Contractor shall mark the areas not to be disturbed under this contract. Isolated areas within the general work area, which are to be saved and protected, shall also be marked or fenced. The Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.
  4. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Side and back slopes shall be protected as soon as practicable upon completion of rough grading. Earthwork brought to final grade shall be finished as indicated.
  5. The Contractor shall construct or install temporary and permanent erosion and sedimentation control features as indicated on the drawings. Erosion control measures on drawings shall be augmented if necessary to ensure effectiveness. Berms, dikes, drains, sedimentation basins, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.
  6. The Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only when approved. Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.
  7. The Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed and that egg deposits from plant pests are not present; the Contractor shall consult with the USDA jurisdictional office for additional cleaning requirements.
- B. Protection of Fish and Wildlife Resources: All species of wildlife are protected on Hurlburt Field, Florida. Feeding, possessing, capturing, and attempting to capture, kill or otherwise harass wildlife is prohibited.
- C. Black Bear and American Alligator: Black bear and American alligator sightings are common on Hurlburt Field. It is against the law to feed, possess, capture or attempt to capture, kill or otherwise harass these species. Feeding, possession, or harassment of an alligator is a second-degree misdemeanor. If a bear is sighted or if an alligator is found to be in an enclosed area, posing immediate threat or is affecting traffic, contact the 1 SOCES/CEIE (884-4651) as soon as possible. Construction sites must be cleared of any food or drink items at the end of each workday. Any items that could attract wildlife must be carried off the base or placed in a dumpster. Ensure all dumpster doors and lids are securely closed at the end of the day to deter bears or other wildlife from entering and feeding.

### 3.03 CULTURAL RESOURCES

- A. Historical, Archaeological, and Cultural Resources: Existing historical, archaeological, and cultural resources within the Contractor's work area will be so designated by the Contracting Officer if any has been identified. The Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out. The Contractor shall provide and install protection measures for these resources and be responsible for their preservation during the life of the contract. Protection measures will be provided by 1 SOCES/CEIE after consultation with the State Historic Preservation Officer on a case-by-case basis.
- B. Artifacts Discovered During Construction: If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, the Contractor shall immediately stop work and notify the Contracting Officer and 1 SOCES/CEIE.

### 3.04 WATER RESOURCES

- A. The Contractor shall keep construction activities under surveillance, management, and control implementing "good house-keeping" practices to avoid pollution of surface and ground waters.

The contractor shall ensure that all employees and subcontractors are aware that dumping of any substance to ground, storm systems, wetlands or water bodies is prohibited, unless express written approval is provided from the contracting office and 1 SOCES/CEIE. All spills of hazardous materials, hazardous waste, petroleum, toxic substances, wastewaters, or materials that generate an oxygen demand in water bodies must be properly cleaned up immediately. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination. Monitoring of water areas affected by construction shall be the Contractor's responsibility.

- B. Wetlands: Monitoring of wetland and water resources affected by construction activities shall be the responsibility of the Contractor and performed in accordance with the Clean Water Act and all Federal and State rules, laws, and standards. During construction, best management practices (BMP's) will be required to maintain soil erosion measures and a minimum distance of 15 feet and average of 25 feet from jurisdictional wetlands and water areas that could be adversely affected by construction activities. Contractor shall ensure that all erosion control products are free of invasive species. Contractor should plan for all events which will cause extreme conditions that may result in failure of BMP's. All fines and penalties assessed for wetlands violations affected by construction activities shall be the responsibility of the contractor.
- C. Stormwater: The contractor shall use proper control and management techniques to ensure stormwater criteria are met in accordance with Federal, State, and local stormwater regulations. The contractor must comply with the Hurlburt Field Stormwater Management Plan.
- D. Where erodible soils or other erodible materials are present, no matter the total size of the affected area, erosion control measures must be installed/implemented prior to start of construction and in accordance with the Florida Stormwater, Erosion, and Sedimentation Control Inspector's Manual available at [www.dep.state.fl.us/](http://www.dep.state.fl.us/). This applies to construction areas, storage areas, and laydown areas. Erosion control measures must remain in place and be properly maintained until the site is properly stabilized. .
- E. In some cases where severe erosion results in waters becoming turbid despite control measures, regular turbidity monitoring and documentation shall be necessary. Any such documentation shall be forwarded to the contracting office for 1 SOCES/CEIE review..
- F. Stream Crossings shall allow movement of materials or equipment without violating water pollution control standards of the Federal, State or local government.
- G. Landscaping: All new landscaping will be watered in accordance with the current stage of the Hurlburt Field Water Conservation Policy. All irrigation work will need to be coordinated with 1 SOCES/CEIE & 1SOCES/CEC. The use of potable water for irrigation systems is prohibited. New plantings should follow guidance outlined in the Hurlburt Field Landscape Development Plan.
- H. Contractor is not authorized sewage holding tanks on base and must procure a portable toilet service contract. The contract must include the correct removal of sewage and maintenance of the portable toilet.
- I. Projects that construct facilities with a footprint greater than 5,000 gross square feet, or expand the footprint of existing facilities by more than 5,000 gross square feet must maintain or restore to the maximum extent technically feasible the project predevelopment hydrology per section 438 of the Energy Independence and Security Act (EISA).
- J. Dewatering: The requirements stated in Ch. 62-621.300(2), F.A.C. must be met before the commencement of any discharge of produced groundwater from a non-contaminated site activity to surface waters of the state (e.g. wetlands, stormwater systems). Any reportable documents associated with the compliance of this regulation shall be sent to the contracting office for 1 SOCES/CEIE review prior to the submittal to the Florida Department of Environmental Protection (FDEP). For dewatering operations that discharge to groundwaters of the state, a site-specific exemption letter must be obtained from the FDEP. In order for the contractor to obtain this exemption letter, a letter must be submitted stating the scope of the operation, estimated amount of water to be discharged during the operation, as well as best management practices that will be used during the dewatering operation to ensure no produced groundwater will be discharged to

surface waters of the state. This letter shall be sent to the contracting office for 1 SOCES/CEIE review prior to the submittal to the FDEP.

### 3.05 AFFIRMATIVE PROCUREMENT

- A. Per Executive Order 13101, the Environmental Protection Agency (EPA) requires that all government purchases of designated items shall contain at least the minimal amount of post-consumer and/or total recovered materials. EPA-designated items fall into the following categories:

- Bio-based Products
- Construction Products
- Landscape Products
- Miscellaneous Products
- Non-Paper Office Products
- Paper and Paper Products
- Park and Recreation Products
- Transportation Products
- Vehicular Products

Specific requirements can be found at the EPA's website: <http://www.epa.gov/cpg/products.htm>. Also, see section 01 54 00: Green Procurement.

### 3.06 AIR RESOURCES

- A. Equipment operation and activities or processes performed by the Contractor in accomplishing the specified construction shall be in accordance with the State rules and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained. The Contractor shall monitor all air areas affected by the construction activities. Monitoring results will be periodically reviewed by 1 SOCES/CEIE to ensure compliance.
- B. Ozone Depleting Substances: The contractor shall adhere to Air Force and HFLD policies regarding halons and chlorofluorocarbons (CFCs). The contractor shall not introduce any Class I Ozone Depleting Substances (ODS) to Hurlburt Field during the course of this contract. The contractor shall be responsible for the recovery and recycling of all Class II ODS, including any necessary sampling marking, labeling, and disposal. The contractor may access the Hurlburt Field ODS Management Plan for guidance. However, the contractor shall remain ultimately responsible for any ODS work related to these tasks. Any work performed on equipment containing ODS used as refrigerants shall only be done by EPA certified technicians. Certification cards shall be on their person at all times. Intentional venting of ODS is strictly prohibited. Any work performed on equipment containing ODS used as refrigerants should only be done by EPA-certified technicians. Certification cards should be on their person at all times.
- C. Particulates: Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials, shall be controlled at all times, including weekends, holidays and hours when work is not in progress. The Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. All reasonable precautions shall be taken during earthmoving and grading activities to control small particulate matter from becoming airborne. Water or other dust suppressants shall be used as necessary on unpaved surfaces, open stockpiles and conveyor systems to reduce emissions of dust. All reasonable precautions shall be taken to prevent the deposition of "drag-out" dirt on paved surfaces, and all drag dirt shall be removed from paved roadways at the end of each shift. The Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs by employing BMP's.
- D. Employ the following BMP's to minimize air pollutants:
1. Limit the entry/exit of vehicles to the site to minimize track-in and track-out of aggregate and construction materials.
  2. Apply water or other dust suppressants to unpaved roads..
  3. Keep stock piles and open containers covered when not in use.
  4. Landscape or vegetate as soon as practical.
  5. Use water-based paints and low VOC surface coatings as per section 09 90 00.

### 3.07 SOLID WASTE

- A. The contractor shall make every attempt to reduce the generation of solid and hazardous waste to the maximum extent possible. The contractor shall utilize the Base Recycling Center (884-

7577) for any office paper, cardboard, plastic, or metal wastes related to a project whenever possible. All wastes, whether recycled or landfilled, shall be weighed prior to disposal. Detailed disposition, to include; manifests, weight tickets, receipts, and invoices, information shall be reported by the fifth day of each quarter to 1 SOCES/CEIE. Solid wastes (excluding clearing debris) shall be placed in containers and emptied, recycled or land-filled, on a regular schedule. Containers used for solid waste shall be kept covered and closed at all times and shall be leak-proof. Solid waste, including refuse and construction and demolition debris, shall not be stored within 200 feet of jurisdictional wetlands or water bodies in accordance with FDEP regulation 62-701.300. Design for pads that will house solid waste dumpsters must reflect the 200 feet set-back from jurisdictional wetlands, water bodies and any stormwater conveyance structure. Segregation measures shall be employed so that no hazardous or toxic waste is co-mingled with solid waste. The Contractor shall transport solid waste (items not utilized by Base Recycling Center) off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. Vehicles used in transporting refuse shall be covered and enclosed to prevent spillage. Expense and cleanup of any spills on or off base are always the responsibility of the contractor.

- B. Solid Waste Management Plan: The Solid Waste Management Plan, refer to paragraph titled Submittals, shall include, but not limited to, the following:
1. Description and estimated quantities of the proposed job-site waste to be generated.
  2. Landfill Options: The name of the landfill(s) where trash will be disposed of, applicable landfill tipping fee(s), and the projected cost of disposing of all project waste in the landfill(s).
  3. Waste Diversion: A list of the waste materials from the project that will be separated for reuse, salvage, or recycling, associated weights and estimated cost savings shall be reported to 1 SOCES/CEIE by the 5<sup>th</sup> day of each quarter.
  4. Handling Procedures: A description of the means by which any waste materials identified in item 3 above will be stored and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
  5. Transportation: A description of the means of transportation of the waste and recycled materials (whether materials will be site-separated and self-hauled to designated center, or whether mixed materials will be collected by a waste hauler and removed from the site). Request manufacturers to use the minimum packaging required for protection and identification of project products, and to use packaging materials with recycled content where economically feasible in accordance with FAR, Executive Order 13101, and the Hurlburt Field Affirmative Procurement Plan.
  6. Submit cost information on the Solid Waste Management Plan for **Solid Waste Disposal, Recycling, Cost savings for wastes diverted from the landfill** to the Contracting Officer by 5<sup>th</sup> day of each quarter.
- C. Solid Waste Management Plan Implementation
1. The Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting results of the Solid Management Plan for the project.
  2. The Contractor shall distribute copies of the Solid Management Plan to key personnel and submit the plan to the Contracting Officer as part of the Environmental Protection Plan (see Submittals section).
  3. The Contractor shall provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties.
  4. The Contractor shall lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
  5. The Contractor shall **submit with each Application for Progress Payment, a Summary of Solid Waste Generated** by the project to 1 SOCES/CEIE. Failure to submit this information shall render the Application for Payment incomplete and shall delay Progress Payment. The Summary shall be submitted on a form acceptable to the Owner and shall contain the following information:
    - a. The amount (in tons) of material land-filled from the project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include manifests, weight tickets, receipt, and invoices.
    - b. For **each** material recycled, reused or salvaged from the project, the amount (in tons), the date removed from the job-site, the receiving party, the transportation cost, the amount of any money paid or received for the recycled or salvaged material, and the net

total cost or savings of salvage or recycling each material. Attach manifests, weight tickets, receipts, and invoices.

- c. Any serviceable or salvageable items not accepted by DRMO or Base Supply will become the property of the Contractor and will be properly handled, transported, and disposed of off-base by the Contractor in conformance with the Solid Management Plan and with all applicable federal, state, and local regulations.

### **3.08 HAZARDOUS WASTE (Includes Special and Universal Waste)**

- A. The contractor shall be considered the primary co-generator for all hazardous wastes generated throughout the duration of the contract. All hazardous waste management activities shall be coordinated and approved by 1 SOCES/CEIE.
- B. The contractor's key personnel must attend the Hurlburt Field Hazardous Waste Awareness briefing prior to starting work on base. For reservations, contact Randy Trent at (850) 884-7923 or email [randy.trent@hurlburt.af.mil](mailto:randy.trent@hurlburt.af.mil).
- C. The contractor is responsible for the management and disposal of all hazardous wastes he/she generates on base. All cost for labor, equipment, materials, transportation, and other services required to comply with federal, state and local laws governing hazardous/special waste management and disposal are the responsibility of the contractor.
- D. The contractor shall characterize their waste streams using specific and technical knowledge, MSDS,s and/or sampling and analysis. This responsibility also includes preparation of waste profile sheets, manifests (regulated and non regulated) packaging, marking and labeling of wastes containers.
- E. The contractor shall manage all hazardous waste, special waste, and universal waste IAW the HFLD Hazardous Waste Management Plan. The contractor shall ensure that all employees, including their subs, comply with the rules and procedures outlined in the Hurlburt Field Hazardous Waste Management Plan.
- F. The contractor shall be familiar with and have immediate access to the following publications and regulations:
  - 1. Environmental Protection Agency (EPA): Title 40 Code of Federal Regulations, Parts 260-279
  - 2. Department of Transportation (DOT): Title 49 Code of Federal Regulations, Parts 171-177
  - 3. Hurlburt Field Hazardous Waste Management Plan
- G. If transportation of Hazardous Wastes is required, the contractor shall possess or ensure the transportation company used for transportation of hazardous waste has a valid state and federal EPA identification number and all DOT requirements are met.
- H. The contractor shall prepare profiles and manifests for all waste transported off base for disposal. A designated representative from 1 SOCES/CEIE, Environmental Element, must approve and sign the hazardous waste/non-hazardous waste manifest. Contractor shall ensure the signed manifest is returned to 1 SOCES/CEAN within 45 days from the time it's received at the disposal facility.
- I. The Hurlburt Field Hazardous Waste Storage Facility may accept contractor's hazardous, special and universal waste (that was generated on base) depending on type of waste, quantities generated and provisions of the contract. 1 SOCES/CEIE must approve acceptance of the waste before it's generated.

### **3.09 HAZARDOUS MATERIALS**

- A. For the purposes of the document, Hazardous Materials (HM) are defined as any product material, chemical or substance listed in 49 CFR 172.101 (revised) and 40 CFR 302-304 (revised). Specifically, a HM is any substance or material, in any quantity or form that has the potential to harm human health or the environment or displays specific characteristics (reactive, corrosive, ignitable, and toxic).

- B. Absolutely no HM shall be brought onto Hurlburt Field until that material is coordinated with Base Hazardous Material Program Manager per AFI 32-7086, Hazardous Materials Management . This requirement shall apply for all HM that the contractor intends to bring onto government property for any/all processes or applications. The contractor shall submit a complete hazardous material inventory list including manufacturer specific (Material) Safety Data Sheets (preferred electronic copy), part number/trade name, container size, estimated usage quantities, and any other supporting documentation for each HM used prior to contract start or introduction of that material to Hurlburt Field. The HM inventory shall include the contract number, performance period, and a contractor point of contact for HM matters. Upon completion the Contractor shall provide actual usage quantities in writing to the HM Project Manager. All excess material and empty containers are the responsibility of the contractor and shall be removed accordingly at the end of the contract. Should contractor HM requirements change during the performance period, the Contractor shall immediately notify the HM Program Manager of such changes in writing.
- C. Storage of Hazardous Materials: All HM shall be stored at Hurlburt Field with approval and coordination from 1 SOCES/CEIE, the base Fire Department (1 SOCES/CEF), and Wing Safety. The contractor shall observe HM storage practices in accordance with regulations, policies, plans and procedures employed by the base. HM storage shall be in a manner that limits exposure to rainfall and prevents releases to the environment.
- D. All contractor personnel shall immediately report to the Contracting Officer and 1 SOCES/CEIE any hazardous materials, substances (including suspect asbestos containing materials), chemicals, or contaminated areas encountered. Further, the contractor personnel shall immediately cease work in the area unless the work is of an emergency nature and the risk of exposure can be mitigated by the use of personal protective equipment (PPE) or clothing. The government will determine the best means of sampling and corrective action and will notify the contractor accordingly.
- E. The contractor shall not use, store, or handle any Class I ODS during the course of this contract.
- F. All hazardous materials and waste resulting from construction projects (including renovation/repair and demolition) shall be managed in accordance with local, state, federal and Hurlburt Field rules and regulations.

### 3.10 TOXIC WASTE

- A. Asbestos: All asbestos work must be accomplished in accordance with federal, state, and local laws and the Hurlburt Field Asbestos Management Plan. See Section 02 82 16.00 20.
1. Notice of Asbestos Renovation or Demolition, DEP Form 62-257.900(1) must be submitted to Florida Department of Environmental Protection at least 10 working days prior to any demolition and/or renovation regardless of whether asbestos is present or not. A copy of this notification and all asbestos surveys conducted must be provided to 1 SOCES/CEIE prior to performing any work. Upon completion of any asbestos abatement, the contractor will provide copies of all disposal waste manifests to 1 SOCES/CEIE, Toxic Substance Program Manager.
  2. A copy of all submittals must be provided to 1 SOCES/CEIE with adequate time built in for review.
  3. The use of materials, products or equipment containing asbestos **will not** be allowed in the construction of this project. See sample list below.
  4. Prior to the commencement of construction, the prime contractor, each subcontractor and material/equipment supplier shall provide the Contracting Officer and 1 SOCES/CEIE with a Notarized statement that to the best of their knowledge, no asbestos will be used in the construction of this project. Additionally, the contractor must have available the most current *Material Data Safety Sheet* proving the materials contain no asbestos.
  5. Sample list of Asbestos Containing Materials (ACM):  
Note: The following list does not include every product/material that may contain asbestos. It is intended as a general guide to show which types of material may contain asbestos.
- |                      |                            |                                 |
|----------------------|----------------------------|---------------------------------|
| • Cement pipes       | • Cement wallboard         | • Cement siding                 |
| • Asphalt floor tile | • Vinyl floor tile         | • Vinyl sheet flooring          |
| • Flooring backing   | • Construction mastics     | • Acoustical plaster            |
| • Decorative plaster | • Textured paints/coatings | • Ceiling tiles & lay-in-panels |
| • Spray-applied      | • Blown-in insulation      | • Fireproofing materials        |

- insulation
- Taping compounds (thermal)
- Laboratory hoods
- Fire curtains
- HVAC duct insulation
- Ductwork flexible fabric
- Heating and electrical
- Spackling compounds
- Roofing felt
- Fire doors
- Wallboard
- Electrical wiring insulation
- Packing materials (for wall/floor penetrations)
- Laboratory gloves
- Elevator equipment panels
- Boiler insulation
- Cooling towers
- Electrical panel partitions
- Chalkboards
- Base flashing
- Caulking/putties
- Joint compounds
- High temperature gaskets
- Fire blankets & table tops
- Elevator brake shoes
- Breeching insulation
- Pipe insulation (corrugated connections air cell, block, etc.)
- Electrical cloth ducts
- Roofing shingles
- Thermal paper products
- Adhesives
- Vinyl wall coverings

Caution needs to be taken to ensure materials purchased do not contain one or more % asbestos by volume.

- B. Lighting Ballast: When fluorescent and mercury vapor fixtures are removed, the ballast must be examined for PCB labeling. Ballast is presumed to contain PCBs unless they are clearly labeled "NO PCBs". Suspected ballast must be removed and disposed IAW Hurlburt Field directives.
- C. Lead Based Paint: No paint containing lead shall be used during the course of this contract. The Occupational Health and Safety Act (OSHA) Lead Construction Standard, 29 CFR 1926.62 is in effect whenever materials are disturbed that contain any amount of lead. This will require contractors disturbing lead-based paint to institute medical surveillance, training, engineering controls, worker protection measures and employee monitoring until monitoring results per the lead paint standard demonstrate that employee exposure is below the action level and permissible exposure limit. The contractor on site must maintain all documentation regarding lead exposure by either historical data or project data. **This data shall also be made available to 1 SOCES/CEIE upon completion of the project.**
1. Prior to the commencement of construction, the prime contractor, each subcontractor and material/equipment supplier shall provide to the Contracting Officer and 1 SOCES/CEIE with a Notarized statement that to the best of their knowledge, no lead based paint will be used in the construction of this project. Additionally, the contractor must have available the most current *Material Data Safety Sheet* proving that the paint does not have any lead content. If lead based paint has been identified, copies of surveys must be forwarded to 1 SOCES/CEIE, Toxic Substance Program Manager.
  2. The contractor shall be responsible for collection and disposal of all lead paint chips and lead paint-contaminated materials, and for accumulation of these chips/materials on site. The contractor shall test the paint materials, provide containers for proper disposal, and transport any resulting hazardous waste to an appropriate hazardous waste accumulation area should it test positive as hazardous waste. All necessary accumulation, disposal activities and documentation shall be coordinated with the 1 SOCES/CEIE flight.
  3. A copy of contractor's exposure assessment data shall be provided to 1 SOCES/CEIE.
  4. Copies of all lead paint-related documentation generated from this project, including lead testing, air monitoring and hazardous waste manifests, shall be provided by the Contractor to the Contracting Officer. A copy shall be forwarded to the contracting office for 1 SOCES/CEIE within 10 working days of task completion.
  5. **On Military Family Housing Projects**, there shall be in-depth coordination with the 1SOCES/CEAN flight to allow for resident notification and necessary arrangements. **The contractor is strongly encouraged to coordinate closely with 1SOCES/CEIE for any required guidance on this critical issue.**
  6. Contractors performing renovation, repair and painting projects that disturb lead-based paint in homes, child care facilities, and schools built before 1978, must be certified and must follow specific work practices to prevent lead contamination (40 CFR Part 745). Upon completion of any lead base paint abatement, the contractor will provide copies of all disposal waste manifests to the contracting office for 1 SOCES/CEIE, Toxic Substance Program Manager.



### 3.11 SPILL PREVENTION:

- A. The contractor is required to familiarize their employees with spill procedures, fire suppression systems and Material Safety Data Sheets for all materials used and/or stored at the project site. In the event of an oil, fuel or chemical spill, the contractor shall immediately notify the Hurlburt Field Fire Department by calling 911. The contractor shall also notify the Contracting Officer (CO) and provide a detailed, written spill report to the contracting office for 1 SOCES/CEIE within 24 hours describing the events of the release. Costs incurred from contractor related spills are the responsibility of the contractor. The contractor shall reimburse any government cost associated with spill response and clean-up.
- B. The contractor shall provide and maintain spill containment equipment, sufficient in both type and quantity, at all sites involving the storage, use or handling of hazardous waste and hazardous materials. The type of spill equipment and quantity required will be identified in the contractor's site specific contingency plan. Equipment and materials must be adequate to contain any release and secondary containment must be in use as required.
- C. If the contractor is required to stockpile contaminated soil for testing prior to disposal, the CO will inform the contractor of the stockpile location after consultation with 1 SOCES/CEIE.
- D. Contractor vehicle and heavy equipment maintenance (including oil changing, lubrication, and vehicle washing) is not authorized on base.
- E. **All fuel, oil, and chemical spills that occur on Hurlburt Field (regardless of amount) must be immediately reported to the base Fire Department by calling 911.**

### 3.12 LABORATORY REQUIREMENTS

- A. The contractor shall as required use a laboratory capable of performing all analysis required to determine Resource Conservation and Recovery Act (RCRA) characteristics such as, but not limited to, Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP volatile and semi-volatile organic, flashpoint, reactivity, and pH. The laboratory shall also be capable of performing any analysis required to determine the applicability of the used oil criteria detailed in 40 CFR, Part 279. The contractor shall ensure that all analytical work is performed IAW the methods and procedures, including QA/QC requirements, detailed in EPA SW-8467. The analytical laboratory shall be capable of providing accurate, complete data within eight (8) working days. Field analysis and portable instrumentation shall not be used to fulfill laboratory requirements. The contractor shall retain all data on file for a minimum of three years and keep it readily available for inspection by any authorized agency, including 1 SOCES/CEIE Asset Management Flight. Chain-of-custody documents shall be included with these records. At the end of the contract, all of these data files may be transferred to 1 SOCES/CEIE.

### 3.13 POST CONSTRUCTION CLEANUP

- A. The Contractor shall clean up all areas affected by construction and restore them back to their original condition to include landscaping, planting of trees, grass, and shrubs damaged by construction; and raking and disposal of debris such as roof shingles, paper, nails, glass, sheet metal, bricks, and waste concrete. Backfilled areas shall be compacted properly and replanted with grass.

### 3.14 INSTALLATION RESTORATION PROGRAM (IRP)

- A. Contractors and Project Managers (PM) planning projects on Hurlburt Field should be aware of the potential to encounter soil/groundwater contamination throughout many areas of the base. The following guidance has been developed to assist in the planning, designing and construction of projects in possibly contaminated areas (IRP sites). The first set of guidance is the most stringent and involves projects planned in an area that has known contamination and regulatory Land Use Controls. The second set of guidance applies to projects planned near a known IRP site with suspected contamination. The last set of guidance is general and applies to any areas of the base where contamination has not been confirmed. It is imperative that planners, designers and contractors involve 1 SOCES/CEIE early and often in the planning, designing, and construction process to minimize the impact that contaminated soils/groundwater may have on their project.

- B. Projects located on a site with known soil and/or groundwater contamination with land use controls:
  - 1. There are land use controls on this area imposed by an environmental regulatory agency designed to protect public health.
  - 2. Project Manager should investigate and plan to ensure all monitor wells/cleanup systems are avoided.
  - 3. Project Manager should submit detailed work plans to 1 SOCES/CEIE early in planning stages so 1 SOCES/CEIE can obtain concurrence from the regulatory agencies on project details.
  - 4. Project Manager should educate workers on potential to encounter contamination and also should ensure workers are adequately protected with personal protective equipment.
  - 5. If unusual soil or groundwater color/odor is encountered during subsurface work, contact 1 SOCES/CEIE.
- C. Projects located near a site with known or suspected soil and/or groundwater contamination without land use controls:
  - 1. If unusual soil or groundwater color/odor is encountered during subsurface work, contact 1 SOCES/CEIE.
  - 2. Project Manager should investigate and plan to ensure all monitor wells/cleanup systems are avoided.
  - 3. Project Manager should educate workers on potential to encounter contamination and also should ensure workers are adequately protected with personal protective equipment.
- D. Sites without land use controls and not in close proximity to known contamination or IRP site:
  - 1. If unusual soil or groundwater color/odor is encountered during subsurface work, contact 1 SOCES/CEIE.
  - 2. Project Manager should educate workers on potential to encounter contamination and also should ensure workers are adequately protected with personal protective equipment.
- E. **Be aware that the regulatory agency can halt the project for long periods of time due to the discovery of contamination. 1 SOCES/CEIE is committed to expediting projects with IRP compliance related issues.**

### 3.15 STORAGE TANKS

- A. 1 SOCES/CEAN must approve the use of fuel storage tanks on base, and the contractor must ensure adequate spill containment (spill kits) for any tanks approved for use on Hurlburt Field. The contractor must have written spill procedures for tanks and heavy equipment that they use on base. Temporary gasoline storage is **NOT** permitted on base.
- B. POL/Storage Tanks: Storage tanks and POL can be a source of contamination if not managed appropriately. Contractor personnel obtaining fuels from Storage Tanks agree to follow all 62-762 FAC and the following list of Air Force Technical Order's to ensure compliance: 37-1-1, 37A-1-101, 42B-1-1, 42B-1-1S-2, 42B-1-16, 42B-1-22, 42B-1-23, and 42C-1-12.
- C. Contractor must contact 1SOCES/CEIE for a copy of Hurlburt Field's Integrated Contingency Plan (ICP), if storage tank use is approved. A number of Federal and State agencies have regulations pertaining to pollution prevention and emergency response requirements of oil and hazardous storage and transfer facilities. The Hurlburt Field ICP has been developed to address the issues of spill prevention, discharge containment / cleanup, and emergency response actions.

**END OF SECTION**

**SECTION 01 58 00 PROJECT IDENTIFICATION SIGN****PART 1 GENERAL****1.01 SECTION INCLUDES:**

- A. Project Identification Sign.

**1.02 QUALITY ASSURANCE:**

- A. Design sign and structure in accordance with drawing shown on page 2 of this specification.
- B. Use experienced professional sign painter.
- C. Finishes shall be adequate to withstand weathering, fading, and chipping, for duration of construction.

**PART 2 PRODUCTS****2.01 SIGN MATERIALS:**

- A. Structure and Framing: New, pressure-treated 4 x 4 x 12' support posts.
- B. Sign Surfaces: Exterior grade plywood, A-C, 1/2" thick, 4'-0" x 8'-0".
- C. Paint and Primers: Exterior professional quality, high-gloss alkyd enamel.
- D. Lettering: Exterior quality paint as per above, or pre-cut vinyl self-adhesive products, in accordance with attached drawing.

**PART 3 EXECUTION****3.01 INSTALLATION:**

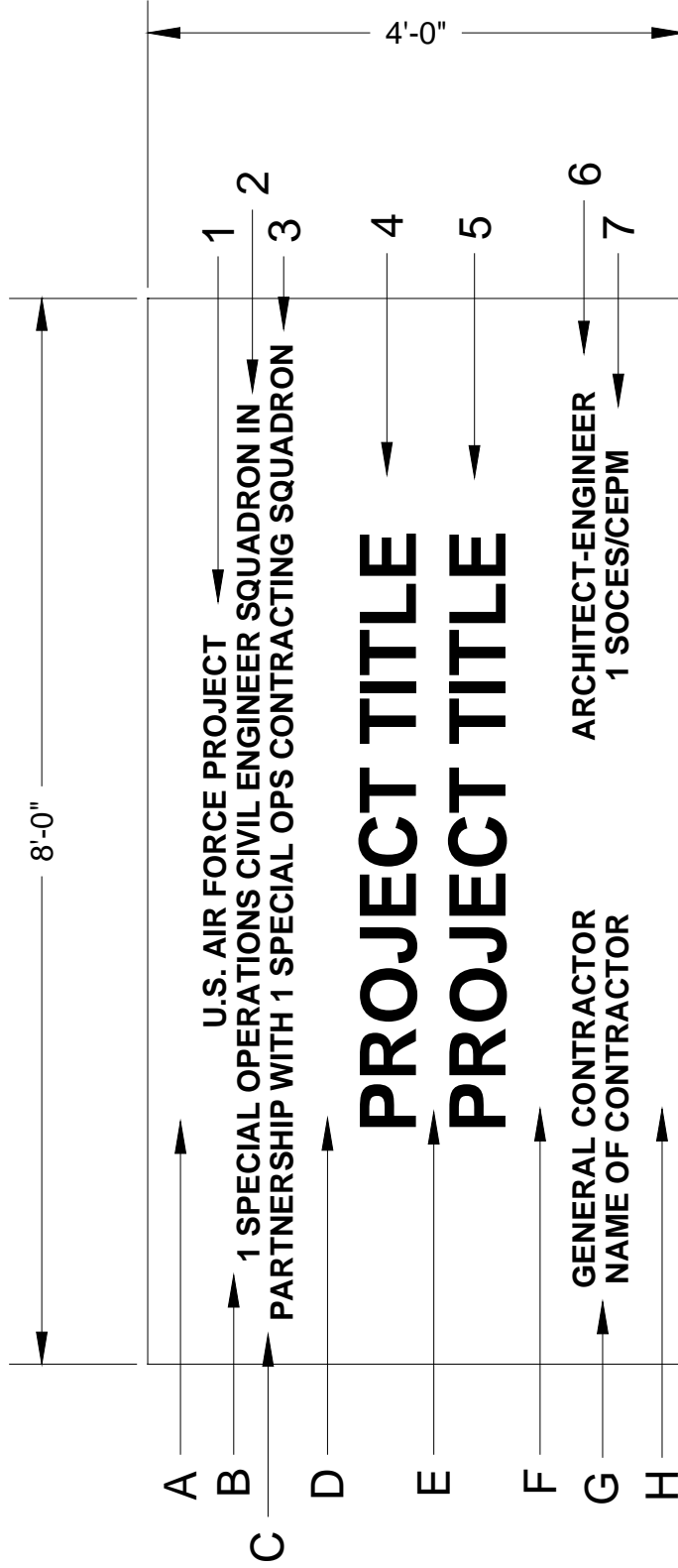
- A. Install project identification sign within 15 days after Notice to Proceed.
  - 1. Install at a location of high public visibility adjacent to main entrance to site.
  - 2. Erect sign surface plumb and level. Anchor securely.
  - 3. Paint exposed surfaces of sign, supports, and framing.

**3.02 MAINTENANCE:**

- A. Maintain sign and supports clean.
- B. Repair deterioration and damage.

**3.03 REMOVAL:**

- A. Remove signs, framing, supports, and foundations at completion of project and restore the area.



1. USE 1/2" GRADE A-C EXTERIOR PLYWOOD
2. PAINT WITH EXTERIOR GLOSS ENAMEL:
  - a. 1 COAT PRIMER
  - b. 2 COATS COLOR #20122, FED. STANDARD 595B
  - c. WHITE LETTERS
3. MOUNT SECURELY ON PRESSURE TREATED 4x4s, WITH BOTTOM 4' FROM GRADE
4. REMOVE SIGN AFTER COMPLETION OF CONSTRUCTION

SPACE	HEIGHT	LINE	LETTER HEIGHT	STROKE
A	5"	1	2"	3/16"
B	1"	2	2"	3/16"
C	1"	3	2"	3/16"
D	6"	4	5"	1/2"
E	3"	5	5"	1/2"
F	6"	6	2"	3/16"
G	1"	7	2"	3/16"
H	5"			

END OF SECTION

**SECTION 01 60 00****MATERIAL AND EQUIPMENT****PART 1 GENERAL****1.01 PRODUCTS**

- A. Products means new material, machinery, components, equipment, fixtures and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work. Products may also include existing materials or components required for reuse.
- B. Do not use materials and equipment removed from existing premises except as specifically permitted by the Contract Documents and approved by the Contracting Officer.
- C. Provide interchangeable components of the same manufacturer for similar components.

**1.02 TRANSPORTATION AND HANDLING:**

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.

**1.03 STORAGE AND PROTECTION:**

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weathertight, climate controlled enclosures.
- B. For exterior storage of fabricated products, place on sloped supports above ground.
- C. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- D. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- E. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement or damage.
- F. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

**1.04 PRODUCT OPTIONS:**

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers with a Provision for substitutions: Submit a request for substitution for any manufacturer not named.

**1.05 SUBSTITUTIONS:**

- A. Substitutions will be considered under provisions of Section 01 00 00.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- C. A request constitutes a representation that the contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.

3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Government.
  4. Waives claims for additional costs or time extension which may subsequently become apparent.
  5. Will reimburse Government for redesign services associated with the request.
- D. **Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request, or when acceptance will require revision to the Contract Documents.**
- E. Substitution Submittal Procedure:
1. Submit four (4) copies of request for substitution for consideration. Limit each request to one proposed substitution.
  2. Submit shop Drawings, product data, and certified test results attesting to the proposed product equivalence.
  3. Submit one (1) copy of the material specification, product data, and a physical sample of each finish material (carpet, rubber/vinyl base, wall covering, vinyl composition tile, ceramic tile, acoustical ceiling, etc.) of the specified material for which a substitution is proposed. This information will be used to compare the proposed substitution to the specified material to assure compliance with the contract requirements.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**SECTION 01 65 00****STARTING OF SYSTEMS****PART I GENERAL****1.01 STARTING SYSTEMS**

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify project inspector 7 days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions, which may cause damage.
- D. Verify that tests, meter readings and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of responsible manufacturer's representative if required by manufacturer or contractors' personnel in accordance with manufacturers' instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with applicable Section of Specifications that equipment or system has been properly installed in accordance with manufacturer's installation instructions and is functioning correctly.

**1.02 DEMONSTRATION AND INSTRUCTIONS**

- A. Demonstrate operation and maintenance of products to Government personnel 7 days prior to date of final inspection.
- B. Utilize operation and maintenance manuals as basis for demonstration. Review contents of manual with government personnel in detail to explain all aspects of operation and maintenance.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment designated location.
- D. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

**1.03 TESTING, ADJUSTING AND BALANCING**

- A. Contractor will appoint, employ and pay for services of an independent firm to perform testing, adjusting and balancing.
- B. Reports will be submitted by the independent firm to the Contracting Officer indicating observations and results of tests and indicating compliance or non-compliance with specified requirements and with the requirements of the Contract Documents.

**PART 2 PRODUCTS (NOT USED)****PART 3 EXECUTION (NOT USED)****END OF SECTION**

**SECTION 01 70 00****CONTRACT CLOSEOUT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Closeout procedures.
- B. Final cleaning.
- C. Adjusting.
- D. Project record documents.
- E. Operation and maintenance data.
- F. Spare parts and maintenance products.
- G. Warranties.
- H. Maintenance service.

**1.02 CLOSEOUT PROCEDURES**

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for final inspection.
- B. Upon completion of final inspection, correct punch list items to the satisfaction of the government, and submit all closeout documents, the Government shall take beneficial occupancy of building (BOD). **All warranties will start when government takes BOD.**
- C. Provide closeout submittals to Government as required by contract documents. Complete and submit attached closeout checklist.

**1.03 FINAL CLEANING**

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum and remove any stains from carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- D. Replace filters of operating equipment.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

**1.04 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

**1.05 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.



2. Specifications.
  3. Addenda.
  4. Change Orders and other modifications to the Contract.
  5. Reviewed Shop Drawings, Product Data, and Samples.
  6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction. Do not put extraneous marks or other information on these documents. Maintain documents in good, clean condition free from tears or damage.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
1. Manufacturer's name and product model and number.
  2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each construction change on the respective drawing sheet or sheets to record actual construction including:
1. Addenda issued prior to receipt of bid or proposal.
  2. Change orders issued during the construction phase.
  3. Measured depths of foundations in relation to finish floor datum.
  4. Measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.
  5. Measured locations of external and internal utilities, and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  6. Field changes of dimension and detail.
  7. Details not on original Contract drawings.
  8. Field changes related to materials.
- G. Prior to final inspection the contractor shall:
1. Submit original record documents to Contracting Officer. Contractor is advised to have a reproduced copy of the original record documents made for their records.
  2. Obtain Disc copies of the contract drawings in current version of AUTOCAD used by 1SOCES/CEP. Verify with the project inspector. Correct drawing files (sheets) to reflect all as-built conditions based on the changes made as per item F. above. Add the words "AS BUILT" to the revision block of each sheet title block, the date the drawings were changed and the initials of the person making the change.
  3. Submit one set of prints of the corrected contract drawing files to allow Base Civil engineer to verify accuracy of the corrected drawings against the record documents.
  4. Upon review and approval of the corrected contract drawing files, provide disc copies to the government for their records.
  5. Completed Construction Data Worksheet. See Section 01 00 00, paragraph 1.07
  6. Project Closeout Check List. See end of section.
  7. **See Section 01 00 00, paragraph 1.15.C referencing 3% payment retention until receipt and approval of Closeout Documents.**
  8. **See Section 01 10 00, paragraph 3.05. referencing location of buildings, etc. to be submitted with As-Built documents.**
- H. Upon acceptance of the building, project record documents and the "As Built" drawings by the Contracting Officer and the Base Civil Engineer, final payment will be made to the contractor

## 1.06 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8-1/2 x 11 inch text pages, three ring binders with durable plastic covers and digital electronic copy. General contractor shall assemble all O & M data required on project and submit as a single submittal.
- B. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Operating instructions.
    - e. Maintenance instructions for equipment and systems.
    - f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  - 3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of manufacturer's warranties.
- E. Submit 1 draft copy of completed volumes 5 days prior to final inspection. This copy will be reviewed and returned after final inspection, with comments. Revise content of all document sets as required prior to final submission.
- F. Submit two sets of revised final volumes, within 10 days after final inspection.
- G. DIGITAL COPY: Contents of digital copy shall match those described for printed materials. Organize the digital copy, per Volume, with a Table of Contents (digital file folder structure) for Parts 1-3. Designated sections in file folders and subfolders shall be arranged by system and subdivided by specification section and information required. For example:
  - A. Part 3 – Project Documents
    - 1. HVAC System
      - a. Section 23 36 00 Air Terminal Units
        - i. Shop drawings
        - ii. Reports
        - iii. Certifications
        - iv. Warrantiiies

### **1.07 SPARE PARTS AND MAINTENANCE PRODUCTS**

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

### **1.08 CONTRACTOR/SUBCONTRACTOR WARRANTIES**

- A. Provide triplicate notarized copies.

- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.
- C. Submit prior to final Application for Payment.
- D. All warranties shall be submitted within 10 days from BOD with warranty start dates printed on warranties.

**1.09 MAINTENANCE SERVICE**

- A. Furnish service and maintenance of components where indicated in specification sections during the warranty period.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Government

**PART 2 PRODUCTS (NOT USED);**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**

**PROJECT CLOSEOUT CHECK LIST**

**PROJECT # AND TITLE:** \_\_\_\_\_

**CONTRACTOR:** \_\_\_\_\_

**CONTRACTOR** (mark n/a next to those items that are not applicable for this project)

\_\_\_\_\_ TEST AND BALANCE REPORT SUBMITTED, APPROVED AND INCLUDED IN THE O&M MANUALS. REPORT SHALL BE SUBMITTED PRIOR TO FINAL INSPECTION.

\_\_\_\_\_ HAVE O&M MANUALS BEEN SUBMITTED AND APPROVED. MANUALS ARE TO BE ASSEMBLED BY THE GENERAL CONTRACTOR AND SUBMITTED UNDER A SINGLE COVER PER SECTION 01700. (SEE ATTACHED LIST). MANUALS SHALL BE SUBMITTED PRIOR TO FINAL INSPECTION.

\_\_\_\_\_ PUNCH LIST COMPLETED.

\_\_\_\_\_ HAS MECHANICAL AND ELECTRICAL IDENTIFICATION BEEN COMPLETED.

\_\_\_\_\_ HAS COMPLETED CONSTRUCTION DATA WORKSHEET.

\_\_\_\_\_ HAVE THE RECORD DOCUMENTS AND AS-BUILT DRAWINGS BEEN SUBMITTED AND APPROVED PER SECTION 01700.

\_\_\_\_\_ HAS THE DDC PROGRAMMING FOR THE HOST COMPUTER BEEN DOWN LOADED TO THE CONTROLS SHOP.

\_\_\_\_\_ HAS FINAL CLEANING BEEN COMPLETED.

\_\_\_\_\_ HAVE SPARE PARTS BEEN TURNED OVER TO THE GOVERNMENT. (SEE ATTACHED LIST)

\_\_\_\_\_ HAVE WARRANTIES BEEN SUBMITTED AND APPROVED. (SEE ATTACHED LIST)

\_\_\_\_\_ HAVE DIGITAL RECORD DRAWINGS BEEN SUBMITTED (SECTION 02811 LANDSCAPE IRRIGATION AND 15330 FIRE SUPPRESSION)

\_\_\_\_\_ HAS ALL REQUIRED TRAINING BEEN ACCOMPLISHED. (SEE ATTACHED LIST)

\_\_\_\_\_ HAS ALL REQUIRED TESTING BEEN ACCOMPLISHED. (SEE ATTACHED LIST).

\_\_\_\_\_ HAVE ITEMS TO BE TURNED OVER TO GOVERNMENT BEEN TURNED OVER.

\_\_\_\_\_ HAVE REPLACEMENT TREES BEEN PLANTED IN AUTHORIZED LOCATION

\_\_\_\_\_ IS CONSTRUCTION SITE STABLE, NO EROSION

\_\_\_\_\_ HAS ALL CONTRACTOR HAZMAT BEEN REMOVED FROM PROJECT SITE

\_\_\_\_\_ HAS CONTRACTOR SUBMITTED THE TOTAL HAZARDOUS MATERIALS USED DURING CONTRACT

\_\_\_\_\_ HAS CONTRACTOR PROVIDED WITNESSED AND NOTARIZED STATEMENT THAT PROJECT WAS CONSTRUCTED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS INCLUDING ALL CHANGES MADE DURING THE CONSTRUCTION PHASE.

\_\_\_\_\_ WARRANTY FORM

**PROJECT # AND TITLE:** \_\_\_\_\_  
**CONTRACTOR:** \_\_\_\_\_

**INSPECTORS**

- \_\_\_\_\_ HAVE THE ABOVE ITEMS BEEN COMPLETED BY THE CONTRACTOR.
- \_\_\_\_\_ HAS 100% COMPLETION LETTER AND BLUE BOOKS BEEN SENT TO CONTRACTING.
- \_\_\_\_\_ HAS FINAL PAYMENT BEEN APPROVED.
- \_\_\_\_\_ HAS WARRANTY DATE BEEN ESTABLISHED. DATE:\_\_\_\_\_
- \_\_\_\_\_ HAVE RECORD DRAWINGS AND ORIGINALS BEEN TURNED OVER TO DRAFTING FOR DOING AS-BUILTS AND FILING.
- \_\_\_\_\_ HAVE O&M MANUALS BEEN TURNED OVER THE SHOPS.
- \_\_\_\_\_ HAS 1354 BEEN COMPLETED AND TURNED OVER TO REAL PROPERTY ALONG WITH INSPECTORS AND ENGINEERS FOLDERS. \*\*
- \_\_\_\_\_ HAS CONTRACTOR'S WRITTEN, WITNESSED AND NOTARIZED STATEMENT RE COMPLETION OF THE PROJECT BEEN TURNED OVER TO THE GOVERNMENT.  
SEE SECTION 01 00 00 GENERAL REQUIREMENTS, PARAGRAPH 1.15.
- \_\_\_\_\_ HAS PERFORMANCE EVALUATIONS BEEN RECEIVED, COMPLETED AND RETURNED.
- \_\_\_\_\_ HAVE ASBESTOS RECORDS BEEN RECEIVED FROM CONTRACTOR AND TURNED OVER TO CEV.
- \_\_\_\_\_ HAVE ENVIRONMENTAL PERMIT CERTIFICATIONS ISSUED FOR POTABLE WATER, SANITARY SEWER, OR STORMWATER BEEN CLOSED OUT.

\*\* 1354 SHOULD BE COMPLETED PRIOR TO TURNING IN O&M MANUALS, AS-BUILTS DRAWINGS AND BLUE BOOKS.

**PROJECT # AND TITLE:** \_\_\_\_\_  
**CONTRACTOR:** \_\_\_\_\_

### **SPARE PARTS**

_____	Section 09 51 13 ceiling tile	_____	Section 09 65 00 flooring base
_____	Section 12 21 13 blinds	_____	Section 21 13 13 fire sup. heads
_____	Section 23 54 00 filters	_____	Section 23 73 00 filters
_____	Section 26 24 16 keys	_____	Section 26 28 26 keys
_____	Section 26 52 00 lamps	_____	Section 28 16 00 intrusion detection
_____	Section 23 81 23 computer room air conditioning units		

### **O&M MANUALS**

_____	Section 32 84 00 irrigation sys	_____	Section 09 30 00 ceramic tile
_____	Section 09 68 00 carpet	_____	Section 10 44 00 fire extinguishers
_____	Section 22 13 43 lift stations	_____	Section 21 13 18 high expansion foam system
_____	Section 21 13 13 fire suppr.	_____	Section 22 10 00 plumbing piping
_____	Section 22 11 19 plumbing spec.	_____	Section 22 40 00 plumbing fixtures
_____	Section 22 30 00 pluming eq.	_____	Section 23 21 16 hydronic spec.
_____	Section 23 21 23 pumps	_____	Section 23 52 34 boilers
_____	Section 23 54 00 furn. & a/c	_____	Section 23 55 00 unit heaters
_____	Section 23 64 00 chillers	_____	Section 23 73 00 air handlers
_____	Section 23 34 23 ventilators	_____	Section 23 36 00 terminal units
_____	Section 23 09 23 controls	_____	Section 26 12 00 transformers
_____	Section 26 28 26 transfer switch	_____	Section 26 24 27 bypass switch
_____	Section 26 51 00 interior lights	_____	Section 26 56 00 site lighting
_____	Section 26 33 00 emer. power	_____	Section 26 32 13 generators
_____	Section 28 31 00 fire alarm	_____	Section 28 13 00 intrusion detection
_____	Section 23 81 23 computer room air conditioning units		
_____	Section 23 72 00 enthalpy and desiccant wheel systems		

### **WARRANTIES**

_____	Section 31 31 16 termite control	_____	Section 07 42 13 metal roofing
_____	Section 07 90 00 joint sealers	_____	Section 07 52 00 bituminous roofing
_____	Section 08 14 16 wood doors	_____	Section 13 34 19 metal bldg. roofing
_____	Section 13 34 19 metal bldgs	_____	Section 22 40 00 water cooler
_____	Section 22 30 00 water heater	_____	Section 23 52 34 boiler
_____	Section 23 54 00 compressor	_____	Section 23 55 00 unit heater
_____	Section 23 64 00 chiller	_____	Section 23 36 00 terminal units
_____	Section 26 55 50 ballfield lighting	_____	Section 26 33 00 emer. power supply
_____	Section 26 32 13 generator		
_____	Section 23 81 23 computer room air conditioning units		
_____	Section 21 13 18 high expansion foam system		

### **TRAINING**

_____	Section 23 52 34 boilers	_____	Section 23 64 00 chillers
_____	Section 23 09 23 controls	_____	Section 26 32 13 generators
_____	Section 28 31 00 alarm system		
_____	Section 23 81 23 computer room air conditioning units		
_____	Section 21 13 18 high expansion foam system		

PROJECT # AND TITLE: \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

**TESTING**

_____	Section 31 23 23 backfill	_____	Section 31 23 16 trenching
_____	Section 32 12 16 paving	_____	Section 32 84 00 irrigation sys
_____	Section 03 30 00 concrete	_____	Section 04 05 03 mortar
_____	Section 22 13 43 lift stations	_____	Section 21 13 13 fire suppression
_____	Section 22 10 00 plumbing piping	_____	Section 22 15 00 compressed air
_____	Section 23 21 13 hydronic piping	_____	Section 23 52 34 boilers
_____	Section 23 64 00 chillers	_____	Section 23 81 26 heat pumps
_____	Section 23 81 26 OA Units	_____	Section 23 31 00 ductwork
_____	Section 23 09 23 controls	_____	Section 26 05 13 med-voltage cable
_____	Section 26 27 26 wiring devices	_____	Section 26 05 26 grounding
_____	Section 26 32 13 generators	_____	Section 28 31 00 alarm system
_____	Section 28 16 00 detection sys	_____	Section 27 00 00 LAN systems
_____	Section 23 81 23 computer room air conditioning units		
_____	Section 23 72 00 enthalpy and desiccant wheel systems		

**P R O J E C T   W A R R A N T Y   F O R M**

**BUILDING NUMBER & STREET ADDRESS:** \_\_\_\_\_

**PROJECT NUMBER & TITLE:** \_\_\_\_\_

**CONTRACT NUMBER:** \_\_\_\_\_

**PROJECT MANAGER & PHONE NO:** \_\_\_\_\_

**CONTRACT SPECIALIST & PHONE NO.** \_\_\_\_\_

**DATE OF GOVERNMENT ACCEPTANCE:** \_\_\_\_\_

**GENERAL ONE YEAR WARRANTY EXPIRATION DATE:** \_\_\_\_\_

**ONE YEAR WARRANTY INPSECTION DATE (30 days prior to expiration)** \_\_\_\_\_

**BRIEF DESCRIPTION OF WORK:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**PRIME KTR, PHONE NO. & FAX NO.** \_\_\_\_\_

**HVAC SUBKTR, PHONE & FAX NO.** \_\_\_\_\_

**PLUMBING SUBKTR, PHONE & FAX NOS.** \_\_\_\_\_

**ELECTRICAL SUBKTR. PHONE & FAX NO'S** \_\_\_\_\_

**E X T E N D E D   W A R R A N T I E S**

<b><u>SPEC.</u></b>	<b><u>ITEM &amp; WARRANTY -</u></b>	<b><u>RESPONSIBLE PARTY (IES)</u></b>
31 31 16	Termite Treatment, 5 yrs,	Prime ktr & installer
32 84 00	Irrigation System, 2 yr,	Prime ktr & subktr
04 20 00	Masonry, 2 yr,	Prime ktr & subktr
07 42 13	Preformed Metal Roofing, general, 2 yr	Prime ktr & subktr
	Panel finish, 20 year,	Manufacturer
	Leaking, 20 yr,	Manufacturer
07 52 00	Modified Bitumen Roofing, 10 yr,	Manufacturer
07 62 00	Sheet Metal Flashing & Trim, finish 20 yr,	Manufacturer
08 33 23	Overhead Rolling Doors, one year plus warranty,	Manufacturer
13 34 19	Pre-Engineered Building Systems, general, 2 yr,	Prime ktr & installer
	Siding finish, 5 yr,	Manufacturer
	Panel finish, 20 yr,	Manufacturer
	Leaking, 20 yr,	Manufacturer
22 40 00	Plumbing, water cooler compressor, 5 yr,	Manufacturer
22 30 00	Plumbing, water heater tank, 6 yr,	Manufacturer
22 15 00	Compressed Air Systems, air compressor, 5 yr,	Manufacturer
23 52 34	Finned Water Tube Boilers, boiler heat exchanger, 5 yr,	Manufacturer



**EXTENDED WARRANTIES, continued.**

<b><u>SPEC.</u></b>	<b><u>ITEM &amp; WARRANTY -</u></b>	<b><u>RESPONSIBLE PARTY (IES)</u></b>
23 54 00	Forced Air Furnaces & Split System Air Conditioning, 5 yr compressor, 10 yr heat exchanger,	Manufacturer
23 55 00	Fuel Fired Unit Heaters, unit heat exchanger, 5 yr,	Manufacturer
23 64 00	Air Cooled Water Chillers, 5 yr,	Manufacturer
26 55 50	Ballfield Lighting, 5 yr,	Manufacturer
26 33 00	Emergency Power Supply, 5 yr,	Manufacturer

**GENERAL INFORMATION**

**SPEC ITEM DESCRIPTION; MANUFACTURER, SPEC #, STYLE, TYPE, COLOR, ETC.**

04 20 00	Brick, _____
04 20 00	Concrete Masonry _____
04 20 00	Glass Masonry _____
06 41 00	Custom Casework _____
07 24 00	EIFS _____
07 42 13	Prefrmd. Roofing & Access. _____
07 52 00	Modif'd Bitumen Memb. Roofing _____
08 13 14	Steel Doors & Frames _____
08 14 16	Wood Doors _____
08 41 13	Alum. Entry & Storefront _____
08 51 13	Alum. Windows, Oper. & Fixed _____
08 71 00	Door H'dware Latchsets _____
	Locksets _____
	Closers _____
	Exit Devices _____
09 30 00	Cer. Tile Floor & Wall _____
09 51 13	Susp. Acoust. Ceiling _____
09 65 00	Resilient Floor _____
09 68 00	Carpet _____
09 90 00	Painting _____
10 21 14	Plas. Lam. Toil. Part's _____
10 26 00	Bumper, Corner & Wall Prot. _____
10 14 00	Interior Signage _____
10 28 00	Toil. & Bath Access. _____
12 21 13	Mini & Vert. Blinds _____
13 34 19	Pre-Engr. Bldg. Systems _____
26 12 00	Distribution Transfmers. _____
26 24 16	Panelboards _____
26 24 17	Load Centers _____

**GENERAL INFORMATION, continued.**

**SPEC      ITEM DESCRIPTION; MANUFACTURER, SPEC #, STYLE, TYPE, COLOR, ETC.**

<b>26 28 26</b>	<b>Transfer Switch</b> _____
<b>26 28 27</b>	<b>By-pass Isolation Switch</b> _____
<b>26 51 00</b>	<b>Interior Luminaires</b> _____
<b>26 56 00</b>	<b>Site Lighting</b> _____
<b>26 32 13</b>	<b>Pkg. Engine Generator Syst.</b> _____
<b>28 31 00</b>	<b>Fire Detect. &amp; Alarm Syst.</b> _____
<b>28 16 00</b>	<b>Intrusion Detect. Syst.</b> _____

**I N S T R U C T I O N S**

1. The prime contractor shall complete this form and provide it with the close out documentation.
2. Extended warranties; Provide name, phone and fax number for the responsible party (ies).
3. General Information; Provide name, phone and fax number, and pertinent information indicated for each item listed.
4. It may not be required to use all of the items listed under Extended Warranties and General Information, in the construction of this project. Should this occur, simply line through the item to indicate it was not used on this project.

\_\_\_\_\_  
Prime Contractor (See note below)

\_\_\_\_\_  
Date

\_\_\_\_\_  
Mailing Address

\_\_\_\_\_  
City, State and Zip Code

\_\_\_\_\_  
Phone Number

\_\_\_\_\_  
Fax Number

\_\_\_\_\_  
E-mail Address

If prime contractor is a corporation, affix the corporate seal below and provide signature of responsible party who can legally obligate the corporation.

## **SECTION 01 81 13: GREEN PROCUREMENT**

### **PART 1 GENERAL**

#### **1.01 GREEN PROCUREMENT & POLLUTION PREVENTION**

- A. Green Procurement is a mandatory component of the Air Force pollution prevention program. The AF Installation Pollution Prevention Program Guide includes this goal for Green Procurement: "100% of all products purchased each year in each of U.S. EPA's 'Guideline Item' categories shall contain recycled materials meeting U.S. EPA's Guideline Criteria."
- B. Currently, reporting of green procurement purchases is limited to contracts having a total value greater than \$100,000.00, which includes the purchase of any amount of U.S. EPA-designated items.
- C. This document contains guidelines for implementing the RCRA, EO, DOD, and Air Force requirements

#### **1.02 AUTHORITY & REFERENCES:**

- A. The Resource Conservation and Recovery Act (RCRA), section 6002 (42 U.S.C. 6962)
- B. Executive Order (EO) 13101, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition.
- C. Title 40, Code of Federal Regulations (CFR), Part 247, Comprehensive Procurement Guideline for Products containing Recovered Material.
- D. Federal Acquisition Regulations (FAR)

#### **1.03 REGULATORY BACKGROUND**

- A. Section 6002 of RCRA requires federal agencies to give preference in the acquisition process to products and practices that conserve and protect natural resources and the environment. EO 13101 requires federal agencies to expand waste prevention and recycling programs, implement affirmative procurement programs for the United States Environmental Protection Agency (EPA) -designated items, and procure other environmentally preferable products and services. The stated purpose of the Green Procurement Program is to stimulate the market for recovered materials. As a result of EO 13101, the EPA issued the Comprehensive Procurement Guidelines (CPG's) that have established the mandatory procurement by federal agencies of 36 items produced with recovered materials. The EPA has also issued Recovered Material Advisor Notices (RMANs) to accompany the CPGs and provide detailed information on the designated items.
- B. Please direct all questions regarding the plan to the Contracting Officer for forwarding to the 1 SOCES/CEAN Environmental Flight, 8844651.

#### **1.04 DOD AND AIR FORCE REQUIREMENTS**

- A. Green Procurement programs are required of all Air Force (USAF) installations. Department of Defense (DOD) Instruction 4715.4, Pollution Prevention, calls for program establishment in accordance with RCRA and EO 12873. Green Procurement is also addressed in Air Force Instruction (AFI) 32-7080, Pollution Prevention Program, and the 24 July 1995 Air Force Pollution Prevention Strategy. The Strategy sets program goals, and the AFI provides program guidance.

#### **1.05 SUBMITTALS**

- A. Submit under provisions of Sections 01 00 00, 01 33 00 and 01 60 00.
- B. Each contractor as defined in paragraph 1.08 Definitions must complete the form attached at the end of this section, indicating which products containing recycled or recovered products are going to be incorporated in the construction of this project. In accordance with paragraph 1.09 Exemptions, provide which exemption is applicable to each listed product.
- C. Product Data: Submit manufacturer's material specifications, installation instructions, physical characteristics,

- D. Manufacturer's Certificate: Certify that products meet or exceed the specified requirements.
- E. Sample: Submit sample for record.

#### **1.06 RECYCLED OR RECOVERED PRODUCTS**

- A. Those construction materials identified on the Form at the end of this section.

#### **1.07 QUALITY ASSURANCE**

- A. Manufacturer: Companies specializing in the manufacture of products that comply with the requirements of this section with a minimum of three (3) years documented experience.

#### **1.08 DEFINITIONS:**

- A. GREEN PROCUREMENT: The purchase of environmentally preferable products manufactured from recycled and reclaimed materials.
- B. ACQUISITION: The acquiring by contract with appropriated funds for supplies or services (including construction) by and for the use of the Federal Government through purchase or lease, whether the supplies or services are already in existence or must be created, developed, demonstrated, and evaluated. Acquisition begins at the point when agency needs are established and includes the description of requirements to satisfy agency needs, solicitation and selection of sources, award of contracts, contract financing, contract performance, contract administration, and those technical and management functions directly related to the process of fulfilling agency needs by contract.
- C. CONTRACTOR (S): The prime contractor, subcontractors, material suppliers, and equipment suppliers who provide the products that will be used in the construction of this project.
- D. ENVIRONMENTALLY PREFERABLE: Products or services having a lesser or reduced effect on human health and the environment when compared to competing products or services, serving the same purpose. This comparison may consider raw materials acquisition, production, manufacturing, packing, distribution, reuse, operation, maintenance, or product or service disposal. (EO 13101)
- E. EPA DESIGNATED ITEM: An item that is or can be made with recovered material; that is listed by the Environmental Protection Agency (EPA) in a procurement guideline (40CFR, part 427); and for which EPA has advised purchasing recommendations in a related Recovered materials Advisory Notice (RMAN). (FAR 23.402)
- F. EXECUTIVE AGENCY OR AGENCY: An executive agency as defined in 5 U.S.C. 105. For the purpose of this order, military departments, as defined in 5 U.S.C. 102 are covered under the auspices of the Department of Defense.
- G. FORM: The Affirmative Procurement Reporting Form found at the end of this section.
- H. POLLUTION PREVENTION: Source reduction as defined in the Pollution Prevention Act of 1990 (42 U.S.C. 13102), and other practices that reduce or eliminate the creation of pollutants through (a) increased efficiency in the use of raw materials, energy, water, or other resources; or (b) protection of natural resources by conservation.
- I. PRODUCT: Materials and equipment that will be used in the construction of this project.
- J. POST CONSUMER MATERIAL: A material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. "Postconsumer material" is a part of the broader category of "recovered material".
- K. PROCUREMENT: The purchase and providing of products to be used in the construction of this project.
- L. RECOVERED MATERIALS: Waste materials and by-products which have been recovered or diverted from solid waste, but such term does not include those materials and by-products generated from, and commonly reused within, an original manufacturing process. (EO 13101, 42 U.S.C. 6903 (19) and FAR 23.402)

- M. RECYCLABILITY: The ability of a product or material to be recovered from or otherwise diverted from the solid waste stream for the purpose of recycling. (EO 13101)
- N. RECYCLING: The series of activities, including collection, separation, and processing by which products or other materials are recovered from the solid waste stream for use in form of raw materials in the manufacture of new products other than fuel for producing heat or power by combustion. (EO 13101)
- O. RECYCLED MATERIAL: A material utilized in place of raw or virgin material in product manufacturing consisting of materials derived from postconsumer waste, industrial scrap, material derived from agricultural wastes, and other items, all of which can be used in new product manufacturer. (EPA Guidelines & OFPP Policy Letter 92-4)
- P. RECYCLED PRODUCT: A recycled product is one made completely or partially from waste materials or by-products recovered or diverted from the solid waste stream.
- Q. SOLID WASTE: Garbage, refuse, sludges and other discarded materials including those from industrial, commercial, and agricultural operations, and from community activities. This excludes solids or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flow, etc. (EPA Guidelines)
- R. SPECIFICATION (S): A clear and accurate description of the technical requirements for materials, products, or services including the minimum requirement for materials' quality and construction and any equipment necessary for an acceptable product. In general, specifications are in the form of written descriptions, drawings, prints, commercial designations, industry standards, and other descriptive references.
- S. UNREASONABLE PRICE: If the cost of the recycled content product exceeds the cost of a non-recycled item, the Air Force considers the cost to be unreasonable. (Air Force Affirmative Procurement Plan)
- T. VERIFICATION: Procedures used by procuring agencies to confirm both vendor estimates and certifications of the percentages of recovered materials contained in the products supplied to them or to be used in the performance of a contract. (EPA Guidelines)
- U. WASTE PREVENTION: Any change in the design, manufacturing, purchase, or use of materials or products (including packaging) to reduce their amount or toxicity before they are discarded. Waste prevention also refers to the reuse of products or materials.
- V. WASTE REDUCTION: Preventing or decreasing the amount of waste being generated through waste prevention, recycling, or purchasing recycled and environmentally preferable products.

#### 1.09 EXEMPTIONS

- A. U.S. EPA recommends minimum content levels for those items listed at paragraph 1.10. The minimum content levels are indicated in the Form. These levels are **mandatory** for Air Force procurements **unless one of the following exemptions applies**. RCRA provides the following exemptions from the requirement to purchase EPA-designated items:
  1. The product is not available from a sufficient number of sources to maintain a satisfactory level of competition (i.e., available from two or more sources).
  2. The product is not available within a reasonable period of time.
  3. The product does not meet the performance standards in applicable specifications or fails to meet reasonable performance standards of the procuring agency.
  4. The product is not available at a reasonable price. For Air Force purposes, "unreasonable price" is defined as follows: If the price of the recycled-content product exceeds the cost of a non-recycled item, then the price is considered unreasonable.
- B. Each contractor is responsible for completion of the Form with respect to his or her work and products being provided. Each contractor shall provide written documentation to support his/her decision not to acquire items meeting the minimum content levels. This documentation shall be forwarded to the Contracting Officer for review and approval. In the event the documentation fails to support the contractor's findings, the Contracting Officer shall return the documentation to the contractor citing the reason(s) for disapproval. The contractor shall resubmit and address the deficiencies.

### 1.10 U.S. EPA-DESIGNATED ITEMS

- A. The 54 U.S. EPA-designated items are listed below. **Not all of these items and the products listed under each item may be required in the construction of this project. Please refer to the drawings and specifications.** The executed Form shall be used to demonstrate compliance with the stated procurement requirements.
1. PAPER PRODUCTS
    - Item 1: All paper and paper products, excluding building and construction paper grades.
  2. VEHICULAR PRODUCTS
    - Item 2: Lubricating oils containing re-refined oil, including engine lubricating oils, hydraulic fluids, and gear oils, but excluding marine and aviation oils.
    - Item 3: Tires, excluding airplane tires.
    - Item 4: Reclaimed engine coolants, excluding coolants used in non-vehicular applications
  3. CONSTRUCTION PRODUCTS
    - Item 5: Building insulation products.
    - Item 6: Structural fiberboard products for applications other than building insulation.
    - Item 7: Laminated paperboard products for applications other than building insulation.
    - Item 8: Cement and concrete, including products such as pipe and block, containing fly ash.
    - Item 9: Cement and concrete, including concrete products such as pipe and block, containing ground-granulated blast furnace (GGBF) slag.
    - Item 10: Carpet made of polyester fiber for use in low- and medium-wear applications.
    - Item 11: Floor tiles containing recovered rubber or plastic.
    - Item 12: Patio blocks containing recovered rubber or plastic.
    - Item 25: Shower and restroom dividers/partitions containing recovered steel or plastic.
    - Item 26: Reprocessed and consolidated latex paint for specific uses.
    - Item 37: Carpet cushion
    - Item 38: Flowable fill.
    - Item 39: Railroad grade crossing surfaces.
  4. TRANSPORTATION PRODUCTS
    - Item 13: Traffic barricades used in controlling or restricting vehicular traffic.
    - Item 14: Traffic cones used in controlling or restricting vehicular traffic.
    - Item 27: Parking stops.
    - Item 28: Channelizers used as temporary traffic control devices.
    - Item 29: Delineators used as temporary traffic control devices.
    - Item 30: Flexible delineators used as temporary traffic control devices.
  5. PARK AND RECREATION PRODUCTS
    - Item 15: Playground surfaces containing recovered rubber or plastic.
    - Item 16: Running tracks containing recovered rubber or plastic.
    - Item 31: Plastic fencing.
    - Item 40: Park benches and picnic tables.
    - Item 41: Playground equipment.
  6. LANDSCAPING PRODUCTS
    - Item 17: Hydraulic mulch products containing recovered paper or recovered wood.
    - Item 18: Compost made from yard trimmings, leaves, and/or grass clippings.
    - Item 32: Garden and soaker hoses containing recovered rubber or plastic.
    - Item 33: Lawn and garden edging containing recovered rubber or plastic.
    - Item 42: Food waste compost.
    - Item 43: Plastic lumber landscaping timbers and posts.
  7. NON-PAPER OFFICE PRODUCTS
    - Item 19: Office recycling containers.
    - Item 20: Office waste receptacles.
    - Item 16: Plastic desktop accessories.
    - Item 22: Toner cartridges.
    - Item 23: Binders.
    - Item 24: Plastic trash bags.
    - Item 34: Printer ribbons (re-inked ribbons or re-inking equipment/service for ribbons).
    - Item 35: Plastic envelopes.
    - Item 44: Solid plastic binders.
    - Item 45: Plastic clipboards.

- Item 46: Plastic file folders.
- Item 47: Plastic clip portfolios.
- Item 48: Plastic presentation folders.

#### 8. MISCELLANEOUS PRODUCTS

- Item 36: Pallets
- Item 49: Sorbents.
- Item 50: Industrial drums.
- Item 51: Awards and plaques.
- Item 52: Mats
- Item 53: Signage, including supports and posts.
- Item 54: Manual grade strapping.

#### 1.11 APPLICABILITY

- A. These procedures apply to all contractors employed in the construction of this project.
- B. Please direct all questions regarding the plan to the Contracting Officer for forwarding to the 1 SOCES/CEAN Environmental Flight, 884-4651.

#### 1.12 INTENT

- A. The intent of this section is to increase the awareness of all contractors as to the availability of products manufactured from or that contain recycled materials, thereby increasing the use of these products in the construction of this project.
- B. The various sections of the specifications contain references to products to be used in the construction of this project. The listed product **may or may not** be manufactured from or contain recycled materials. **Therefore all contractor(s), subcontractors, equipment suppliers and material suppliers are responsible for compliance with this specification and those items/products listed on the Form. Recycled products shall be used wherever possible subject to the exemptions as per paragraph 1.09.**
- C. Substitution of recycled materials or recycled products for specified products are subject to the provisions of paragraph 1.05 Submittals (above) and Section 01 00 00, paragraph 1.11.

## PART 2 PRODUCTS

### 2.01 PARTIAL LIST OF PRODUCT SOURCES AND INFORMATION

- A. GENERAL DATA:
  1. GreenSpec Binder, Environmental Building News, [www.ebuild.com](http://www.ebuild.com)
  2. Certified Forest Products Council, [www.certifiedwood.org/](http://www.certifiedwood.org/)
  3. Wiley Series in Sustainable Design, [www.wiley.com/](http://www.wiley.com/)
  4. The Carpet and Rug Institute, [www.carpet-rug.com/](http://www.carpet-rug.com/)
  5. Information, McGraw-Hill, [dialogue@mcgraw-hill.com](mailto:dialogue@mcgraw-hill.com)
  6. Florida Directory of Recycled Product Vendors, [www.2.dep.state.fl.us/waste/programs/rbac/downloads/rbac\\_dir.pd](http://www.2.dep.state.fl.us/waste/programs/rbac/downloads/rbac_dir.pd)
  7. Oikos Green Building Source, News, searchable products data base, library, [www.oikos.com](http://www.oikos.com)
  8. Green Design Network, News, publications, databases, [www.greendesign.net](http://www.greendesign.net)
  9. Green Works Recycled Content7 Product Guide, detailed vendors directory, [www.metrokc.gov/greenworks/recycontent.htm](http://www.metrokc.gov/greenworks/recycontent.htm)>
- B. DIVISION 03 00 00, CONCRETE
  1. GranCem, granulated blast-furnace slag, [www.grancem.com/](http://www.grancem.com/)
  2. Syndesis, cement-based, pre-cast product workable with wood tools, [www.syndesisinc.com/](http://www.syndesisinc.com/)
- C. DIVISION 04 00 00, MASONRY
  1. Heble Building Systems, autoclaved aerated concrete blocks, [www.heble.com/](http://www.heble.com/)
  2. Ytong Florida Ltd., autoclaved aerated concrete blocks, [www.ytong-usa.com/](http://www.ytong-usa.com/)
- D. DIVISION 06 00 00, WOOD, PLASTICS, AND COMPOSITES
  1. Avonite, solid surfacing, [www.avonite.com/](http://www.avonite.com/)
  2. Chemical Specialties, wood treatment, [www.treatedwood.com/](http://www.treatedwood.com/)

3. Homasote Company, structural fiberboard, [www.homasote.com/](http://www.homasote.com/)
  4. Isoboard, fiberboard composed of straw fibers and non-toxic resins, [www.isoboard.com/](http://www.isoboard.com/)
  5. TrusJoist Mac Millan, engineered wood products, [www.homasote.com/](http://www.homasote.com/)
- E. DIVISION 07 00 00, Thermal & Moisture Protection
1. Duro-Last Roofing, recycled PVC walkway pads, 1-800-2480280
  2. Johns Manville, Insulation products, [www.jm.com/](http://www.jm.com/)
  3. Majestic Skylines, rubber-based slate-look roofing for steep roofs, [www.majesticskylines.com/](http://www.majesticskylines.com/)
  4. Owens-Corning, insulation products, [www.owenscorning.com/](http://www.owenscorning.com/)
- F. DIVISION 08 00 00, OPENINGS
1. Marvin Window & Door, windows, some meeting "Energy Star Label", [www.marvin.com/](http://www.marvin.com/)
  2. Pella, energy efficient windows, [www.pella.com/](http://www.pella.com/)
- G. DIVISION 09 00 00, FINISHES
1. Armstrong World Industries, Inc.-Flooring Systems, [www.armstrong-floors.com/](http://www.armstrong-floors.com/)
  2. Armstrong World Industries, Inc.-Ceiling Systems, [www.ceilings.com/](http://www.ceilings.com/)
  3. Benjamin Moore & Co., VOC free acrylic interior latex paint, [www.benjaminmoore.com/](http://www.benjaminmoore.com/)
  4. CanFibre Group Ltd., all-green medium-density fiberboard, [www.canfibre.com](http://www.canfibre.com)
  5. Chemrex Inc., low-e interior paint, [www.chemrex.com/](http://www.chemrex.com/)
  6. Collins & Aikman Floor coverings, carpet with 100% post-consumer backing, [www.powerbond.com/](http://www.powerbond.com/)
  7. DesignTex, Inc., polyester panel fabric made from 100% PET fiber, [www.dtex.com/](http://www.dtex.com/)
  8. Dodge-Regupol, Inc., 100% recycled rubber-flooring, [www.regupol.com/](http://www.regupol.com/)
  9. Eco-sensitive modular tile, vinyl tile with 100% recycled carpet-backing, [www.powerbond.com/](http://www.powerbond.com/)
  10. Environmental Stone Products, stone manufactured from 100% recycled glass, [www.environmentalstone.com/](http://www.environmentalstone.com/)
  11. Glidden: residential interior latex paints 100% free of VOC, [www.icipaintstores.com/](http://www.icipaintstores.com/)
  12. Homasote Inc., sound barrier, [www.homasote.com/](http://www.homasote.com/)
  13. Isoboard Enterprises, Inc. panel made from wheat straw and non-toxic resins, 1-503-2427345
  14. Marley-Flexco Co., flooring made from 95% recycled truck and bus tires, [www.marleyflexco.com/](http://www.marleyflexco.com/)
  15. The Mat Factory, Inc., interlocking roll-up tiles made from 100% postconsumer tire rubber and PVC plastic from electric cable covers, 1-949-6453122
  16. Permafirm Pad Co., carpet pads made from almost 100% recycled content, 1-800-3446977
  17. Sherwin Williams, VOC compliant paints and enamels, [www.sherwin.com/](http://www.sherwin.com/)
  18. SierraPine Limited, formaldehyde-free particleboard and medium density fiberboard containing recycled/recovered wood fiber, [www.sierrapine.com/](http://www.sierrapine.com/)
  19. Summitville Tiles, impervious porcelain tiles using feldspar tailings, [www.summitville.com/](http://www.summitville.com/)
  20. Tectum, natural-fiber acoustical ceiling and wall panels, [www.tectum.com/](http://www.tectum.com/)
  21. Tiles with natural fibers, tiles made of a bio-alloy material and natural fibers, [www.maderatile.com](http://www.maderatile.com)
  22. USG Interiors, Inc., synthetic gypsum board, [www.usg.com/](http://www.usg.com/)
  23. Decorative Architectural Tiles, floor, counter & wall tile made from 100 % postconsumer glass, 1-808-8857812
  24. Forbo, linoleum-flooring utilizing renewable resources, [www.forbo.com/](http://www.forbo.com/)
- H. DIVISION 10 00 00, SPECIALTIES
1. The Access Store, modular ramping system made from 100% recycled rubber, [www.accessstoe.com/](http://www.accessstoe.com/)
  2. BP Solar, photovoltaic modules and systems, [www.bp.com/bpsolar/index](http://www.bp.com/bpsolar/index)
  3. Mecho Shade Systems, interior shade cloths, [www.mechoshade.com/](http://www.mechoshade.com/)
  4. R Control, structural insulated panel (SIP), [www.mechoshade.com/](http://www.mechoshade.com/)
- I. DIVISION 12 00 00, FURNISHINGS
1. Guilford of Maine, fabric from 100% recycled materials, [www.terratex.com/](http://www.terratex.com/)
  2. Phenix Biocomposites, tabletops made from soy based products free of petrochemicals, 1-800-3248187
  3. Safe Solutions, LLC, furniture manufactured from waste wood, 1-970-2473333
- J. DIVISION 14 00 00, CONVEYING EQUIPMENT
1. Montgomery KONE, AC girlies elevators, [www.montgomery-kone.com/](http://www.montgomery-kone.com/)
- K. DIVISION 26 00 00, ELECTRICAL
1. Advance Transformer Company, linear reactor ballast, [www.advancetransformer.com/](http://www.advancetransformer.com/)



2. Artemide Inc., energy efficient cold-cathode lighting, [www.artemide.com/](http://www.artemide.com/)
3. Edison Price Lighting, track mounted metal-halide PAR 30 &38 lamps, 1-212-5216995
4. Leviton Manufacturing Corporation, Inc., occupancy sensors, [www.leviton.com/](http://www.leviton.com/)
5. Phillips Lighting, energy efficient compact fluorescent lamps, [www.phillips.com/lighting](http://www.phillips.com/lighting)
6. Osram Sylvania, mercury-free lamps and energy efficient fluorescent lamps, [www.osramsylvania.com/](http://www.osramsylvania.com/)
7. Sensor Switch, lighting control occupancy sensors, [www.sensorswitch.com/](http://www.sensorswitch.com/)
8. Venture Lighting, pulse-start high performance lamp and ballast system, [www.venturelighting.com/](http://www.venturelighting.com/)

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install materials and systems in accordance with manufacturer's written instructions and approved submittals. Install materials and systems in proper relation to adjacent construction and with uniform appearance.
- B. Coordinate with work of other sections.
- C. Restore damaged finishes and test for proper function.
- D. Clean and protect work from damage.

**END OF SECTION**

**GREEN PROCUREMENT REPORTING FORM  
(PER EXECUTIVE ORDER 13101)**

PROJECT NUMBER: \_\_\_\_\_  
 BLDG NUMBER: \_\_\_\_\_  
 PROJECT MANAGER \_\_\_\_\_  
 PROJECT INSPECTOR: \_\_\_\_\_  
 CONTRACTOR: \_\_\_\_\_

This form is to be completed by the Contractor and submitted through 1 SOCONS to 1 SOCEC. It is the responsibility of the 1 Special Operations Civil Engineering Squadron construction inspector to submit this data to 1 SOSCES/CEAN who in-turn reports it to AFSOC MAJCOM IAW E.O. 13101, Federal Acquisition, Recycling, and Waste Prevention.

RECYCLED OR RECOVERED PRODUCT	% REQUIRED (MINIMUM)	% AVAIL (ACTUAL)	QUANTITY USED/UI	EXEMPTED 1,2,3,4
-ROCK WOOL INSUL	75%			
-FIBERGLASS INSUL	20-25%			
-LOOSE FILL/SPRAY ON INSUL	75%			
-PERLITE COMP BOARD INSUL	23%			
-PLASTIC RIGID FOAM INSUL	9%			
-GLASS FIBER REINF FOAM INSUL	6%			
-PHENOLIC RIGID FOAM INSUL	5%			
-STRUCTURAL FIBER BD	80-100%			
-LAMINATED PAPER BD	100%			
-CEMENT/CONCRETE (FLYASH)	SEE SPEC			
-CARPET (PET)	25-100%			
-PATIO BLOCKS/RUBBER	90-100%			
-PATIO BLOCKS/PLASTIC	90-100%			
-FLOOR TILES/RUBBER	90-100%			
-FLOOR TILES/PLASTIC	90-100%			
-TRAFFIC CONES	50-100%			
-TRAFFIC BARRICADES	80-100%			
-PLAYGROUND SURFACES	90-100%			
-RUNNING TRACKS	90-100%			
-COMPOST	100%			
-WOOD-BASED HYDRAULIC MULCH	100%			
-PAPER-BASED HYDRAULIC MULCH	100%			
REPROCESSED LATEX PAINT WHITE, OFF-WHITE & PASTEL COLORS	20%			
REPROCESSED LATEX PAINT GREY, BROWN, EARTH TONES & OTHER DARK COLORS	50-99%			
CONSOLIDATED LATEX PAINT	100%			
PLASTIC/RUBBER PARKING STOPS	100%			
CONCRETE CONTAINING COAL FLY ASH PARKING STOPS	20-40%			
CONCRETE CONTAINING GGBF PARKING STOPS	25-70%			
PLASTIC SHOWER & RESTROOM DIVIDERS/PARTITIONS	20-100%			

CERTIFICATION

I hereby certify the Statement of Work/Specifications for the requisition/procurement of all materials listed on this form comply with EPA standards for recycled/recovered materials content.

\_\_\_\_\_  
Contractor

\_\_\_\_\_  
Inspector

\_\_\_\_\_  
Environmental Flight

The following exemptions may apply to the non-procurement of recycled/recovered content materials:

- 1) The product does not meet appropriate performance standards
- 2) The product is not available within a reasonable time frame
- 3) The product is not available competitively (from two or more sources)
- 4) The product is only available at an unreasonable price (compared with a comparable non-recycled content product.)

**SECTION 02 41 19:****SELECTIVE STRUCTURE DEMOLITION****PART 1 GENERAL****1.01 SUMMARY**

- A. Provide all demolition as required by the Contract Documents.
  - 1. Demolish interior and exterior portions of structures including but not limited to, walls, partitions, windows, doors, roofing, paving/curb/guttering, site furniture, shrubs, trees, interior finishes, etc., and associated components.
  - 2. Demolish plumbing, mechanical, and electrical equipment and associated components
  - 3. Demolished materials shall become the property of the Contractor unless otherwise noted on the Drawings or in the Specifications.
  - 4. Remove and dispose of demolished materials at a legally approved dumpsite off base.
  - 5. Notify Contracting Officer prior to shut-off of existing utilities. Cap off utilities that are to remain in use.
  - 6. Where fasteners, bolts, piping, wiring, ductwork and/or equipment that is/are to be removed are attached to or pass through walls, floors, ceilings or roofs, the Contractor shall patch all holes or openings under 1(one) square foot in size to match adjacent construction. Patch holes or openings in fire rated walls as required to maintain fire rating.
  - 7. **Existing fire suppression systems, fire detection systems, and intrusion systems must remain active** unless approved by the Contracting Officer and the responsible agency (Fire Department/Security Forces). Required deactivation of systems, or portions thereof, during demolition/construction must be requested and approved 72 hours in advance. Contractor will be responsible for protection of premises during periods of deactivation. If necessary, provide temporary protection or services.

**1.02 SUBMITTALS**

- A. Submit for approval selective demolition schedule, including schedule and methods for capping and continuing utility service, and clearing & grubbing schedule.

**1.03 QUALITY ASSURANCE**

- A. Comply with governing codes and regulations. Use experienced workmen.

**1.04 PROJECT CONDITIONS**

- A. Government personnel will not occupy areas of Work during demolition.

**PART 2 PRODUCTS (Not Used)****PART 3 EXECUTION****3.01 DEMOLITION**

- A. Do not damage building elements and improvements indicated to remain. Items of salvage value and not included on schedule of salvage items to be returned to Government may be removed from structure. Storage or sale of items at Project site is prohibited.
- B. Do not close or obstruct streets, walks, drives or other occupied or used spaces or facilities without the written permission of the Contracting Officer and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Contracting Officer and authorities having jurisdiction. If necessary, provide temporary utilities
- C. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly. Complete closure of Air Force roads will not be authorized.

**END OF SECTION**

## **SECTION 03 10 00            CONCRETE FORMING AND ACCESSORIES**

### **PART 1    GENERAL**

#### **1.01    SECTION INCLUDES**

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

#### **1.02    PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION**

- A. See applicable section of the specifications.

#### **1.03    REFERENCES**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials.
- B. ACI 301 - Specification for Structural Concrete for Buildings.
- C. ACI 318 - Building Code Requirements for Reinforced Concrete.
- D. ACI 347 - Recommended Practice For Concrete Formwork.
- E. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

#### **1.04    DESIGN REQUIREMENTS**

- A. Design, engineer and construct formwork, shoring and bracing in accordance with ACI 318 to conform to the design and all applicable building code requirements to achieve concrete shape, line and dimension as indicated on the construction documents.

#### **1.05    SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.

#### **1.06    SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
    - c. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.
    - c. Certified wood products.

#### **1.07    QUALITY ASSURANCE**

- A. Perform Work in accordance with ACI 318.
- B. Maintain one copy of each document on site.

#### **1.08    QUALIFICATIONS**

- A. Design formwork under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.

### **1.09 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for design, fabrication, erection and removal of formwork.

### **1.10 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

### **1.11 COORDINATION**

- A. Coordinate this section with other sections of work, which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement, request instructions from the Contracting Officer before proceeding.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site
  3. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines

### **2.02 WOOD FORM MATERIALS**

- A. Softwood Plywood: APA/EWA PS1, C Grade.

### **2.03 FORMWORK ACCESSORIES**

- A. Form Ties: Snap-off type, galvanized metal, adjustable length, 1 inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent: Colorless mineral oil, which will not stain concrete, or absorb moisture.
- C. Corners: Chamfered type, 3/4 inch x 3/4 inch size.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

### **3.02 EARTH FORMS**

- A. Earth forms are not permitted.

### **3.03 ERECTION - FORMWORK**

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 318.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.

- E. Obtain approval before framing openings in structural members, which are not indicated on Drawings.
- F. Provide chamfer strips on exposed external corners of concrete edge.

### **3.04 APPLICATION - FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes, which are effected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

### **3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for items to be embedded in or passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate work of other Sections in forming and placing openings, slots, reglets, recesses. chases, sleeves, bolts. anchors, and other inserts.
- D. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.

### **3.06 FORM CLEANING**

- A. Clean and remove foreign matter within forms as erection proceeds.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
- D. During cold weather, remove ice from within forms. Do not use de-icing salts or water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

### **3.07 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI 301 and ACI 117.

### **3.08 FIELD QUALITY CONTROL**

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.
- B. Do not reuse wood formwork more than 2 times for concrete surfaces to be exposed to view. Do not patch formwork.

### **3.09 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

**END OF SECTION**

**SECTION 03 20 00****CONCRETE REINFORCEMENT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Reinforcing steel bars, wire fabric and accessories for cast in place concrete.

**1.02 REFERENCES**

- A. ACI 301 - Specifications for Structural Concrete.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ANSI/ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- D. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- E. CRSI - Manual of Standard Practice.
- F. CRSI - Placing Reinforcing Bars.
- G. ACI SP-66 – ACI Detailing Manual.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices and anchor bolt layout.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with CRSI Manual of Standard Practice.
- B. Prepare shop drawings in accordance with ACI SP-66.
- C. Maintain one copy of each document on site.
- D. Submit certified copies of mill test report of reinforcement materials analysis.

**1.06 COORDINATION**

- A. Coordinate with placement of formwork, formed openings and other Work.

**PART 2 PRODUCTS**



**2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

**2.02 REINFORCEMENT**

- A. Reinforcing Steel:
  - 1. ASTM A615, 60-ksi yield grade
  - 2. Deformed billet steel bars.
- B. Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets; plain finish: (Sidewalk Reinforcement)
- C. Slab on Grade Reinforcement shall be:
  - 1. #3 rebar at 12" o/c each way.

**2.03 ACCESSORY MATERIALS**

- A. Tie Wire: Minimum 16 gauge annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture. Brick or CMU may not be used for support except as permitted by references in paragraph 1.02 above.

**2.04 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with ACI 318.

**PART 3 EXECUTION****3.01 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Conform to ACI 318 for concrete cover over reinforcement.

**3.02 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 41 00.

**END OF SECTION**

**SECTION 03 30 00****CAST-IN-PLACE CONCRETE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Slabs on grade, slabs on grade including integral footings, foundations, beams, columns, and elevated floor and roof slabs.
- B. Equipment pads and thrust blocks.
- C. Control, expansion and contraction joint devices.

**1.02 REFERENCES**

- A. ACI 301 - Specifications for Structural Concrete.
- B. ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete
- C. ACI 305R - Hot Weather Concreting.
- D. ACI 306R - Standard Specification for Cold Weather Concreting.
- E. ACI 308R - Standard Specification for Curing Concrete.
- F. ACI 318 - Building Code Requirements for Structural Concrete.
- G. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- H. ASTM C33 - Standard Specification for Concrete Aggregates.
- I. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- J. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
- K. ASTM C150 - Standard Specification for Portland Cement.
- L. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.
- M. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- N. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- O. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
- P. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
- Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- R. ASTM C685 - Standard Specification for Concrete Made By Volumetric Batching and Continuous Mixing.
- S. ASTM D994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
- T. ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill under Concrete Slabs.

- U. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- V. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
- W. ASTM D6690 - Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

### **1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on joint devices, sealants, attachment accessories and admixtures.
- C. Concrete mix design.
- D. Submit manufacturer's installation instructions.
- E. Provide 12-inch long sample of expansion joint and control joint.

### **1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

### **1.05 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual locations of embedded utilities and components, which are concealed from view.

### **1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with ACI 301.
- B. Maintain one copy of each document on site.
- C. Acquire cement and aggregate from same source for all work.
- D. Conform to ACI 305R when concreting during hot weather.
- E. Conform to ACI 306R when concreting during cold weather.

### **1.07 COORDINATION**

- A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

## **PART 2 PRODUCTS**

### **2.01 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type I - Normal or Type III - High Early Strength Portland type.
- B. Fine and Coarse Aggregates: ASTM C33. Course aggregate shall be washed and shall consist of crushed stone. Particle shape of coarse shall be generally cubicle in shape.

- C. Water: ACI 318; potable, Clean and not detrimental to concrete with no chloride ions.

## 2.02 ADMIXTURES

- A. Air Entrainment: ASTM C260.
- B. Chemical: ASTM C494, Type D - Water Reducing and Retarding or Type E - Water Reducing and Accelerating Admixture.
- C. Fly Ash: ASTM C618. Type C or Type F (Loss on ignition for type F shall not exceed 6%). **If an approved pozzolanic material is used, the weight of flyash used shall not exceed 10% determined by dividing the weight of flyash by the weight of Portland cement.**
- D. Use of all admixtures must be approved by the Contracting Officer. **The use of 'plastisizers' is prohibited unless approved by the Contracting Officer.**

## 2.03 ACCESSORIES

- A. Bonding Agent: Polymer resin emulsion or two component modified epoxy resin.
- B. Vapor Barrier: ASTM E1745, Class "B" reinforced, multi-ply vapor retarder (Water vapor resistance 0.3 perms, Tensile strength 30.0 lbf/in, Puncture resistance 1700 grams). Install in strict compliance with manufacturer's written instructions including filed taping of seams and installation of pipe boots penetrating through the slab.
- C. Non-shrink Grout: ASTM C1107: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

## 2.04 JOINT TYPES, DEVICES AND FILLER MATERIALS (Identify Type on Structural Drawings)

- A. Isolation Joint (IJ): Asphalt impregnated glass fiber filler Type A: ASTM D994, minimum 1/2" inch thick or as indicated on drawings.
- B. Exterior Construction Joint (ECJ): Integral galvanized steel, formed to tongue and groove profile, with removable top strip exposing sealant trough, and ribbed steel spikes with tongue to fit top screed edge.
- C. Exterior Tooled Contraction Joint (ETC): Tool formed joint located between isolation joints.
- C. Interior Transverse Construction Joint (ITC): Integral galvanized steel, formed to tongue and groove profile, with ribbed steel spikes with tongue to fit top screed edge with removable cap for sealant pocket.
- D. Interior Longitudinal Contraction Joint (ILC): Joint that is saw cut into the surface of the concrete as soon as the concrete has hardened sufficiently to prevent aggregates from becoming dislodged by the cutting process (usually 4-12 hours after the concrete hardens) and completed before drying shrinkage causes cracking. Initial cut shall be 1/3 the thickness of the slab. After concrete has cured, joints shall be re-cut to 1/2" width x 1/2" depth. Provide foam backer rod and fill joint with sealant flush with top of slab.
- E. All joint material shall match the thickness of the slab.
- F. Sealant:
  1. ASTM D6690: Hot applied synthetic rubber compound.
  2. Cold applied two-part liquid neoprene.

## 2.05 CONCRETE MIX

- A. Select proportions for normal weight concrete in accordance with ACI 301. Mix concrete in accordance with ACI 304R. Deliver concrete in accordance with ASTM C94.
- B. Use accelerating admixtures in cold weather ONLY when approved by Contracting Officer. Use of admixtures will not relax cold weather placement requirements.
- C. Accelerating admixtures shall not contain more than 0.1% calcium chloride.
- D. Use set retarding admixtures during hot weather only when approved by Contracting Officer.

- E. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify site conditions.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

#### **3.02 PREPARATION**

- A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions. Remove laitance, coatings, and unsound materials.

#### **3.03 SCHEDULE - JOINT CONTROL**

- A. Floor Slab Perimeter and Exterior/Interior Isolation Joints: Joint filler Type A set 1/8 inch below floor slab elevation.
- B. Exterior/Interior Construction Joints: Set joints to line and grade.
- C. Contraction Joints: Saw-cut joints to dimensions shown on the drawings.
- D. See 2.04. above.

#### **3.04 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 318.
- B. Notify Contracting Officer minimum 24 hours prior to commencement of operations.
- C. Ensure reinforcement, inserts, embedded parts, formed joint fillers and joint devices are not disturbed during concrete placement.
- D. Install vapor barrier under interior slabs on grade. Lap joints minimum 8 inches and seal watertight by taping edges and ends.
- E. Repair vapor barrier damaged during placement of concrete reinforcing. Repair with vapor barrier material; lap over damaged areas minimum 8 inches and seal watertight.
- F. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.
- G. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- H. Install joint device anchors. Maintain correct position to allow joint cover flush with floor finish.
- I. Deposit concrete at final position. Prevent segregation of mix.
- J. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- K. Place concrete continuously between predetermined expansion, control, and construction joints.
- L. Do not interrupt successive placements; do not permit cold joints to occur.
- M. Saw cut joints within 12 hours of placing using 3/16-inch thick blade. Depth of cut shall not be less than one-third (1/3) the thickness of the slab.
- N. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/4 inch in 10 feet.

**3.05 CONCRETE TYPES AND FINISHING**

- A. Finish concrete floor surfaces in accordance with ACI 301.
- B. Monolithic Foundation and Slab-on-Grade: 6" thick, 3,000 psi 28 day concrete, formed to line and grade. Steel trowel finishes surface of slab. Vertical surfaces shall be repaired/patched and finished no later than one day after form removal. Wet and rub surface with a carborundum brick or other approved abrasive, producing a satisfactory finish, smooth and uniform in color and texture. Seal all joints with an approved joint sealer.
- C. Beams, Columns, Elevated Floor and Roof Slabs Exposed to View: 4,000 psi 28 day concrete. Patch/repair surfaces after form removal, wet and rub surface with a carborundum brick or other approved abrasive after patching/repair, producing a satisfactory finish, smooth and uniform in color and texture.
- D. Exposed Exterior Sidewalks, Aprons, Landings, Steps: 4" thick, 3,000 psi 28 day concrete, air entrained, and non-slip broom finish.
- E. Below Grade Footings, Single-Story Structures: 3,000 psi 28 day concrete, form finish.
- F. Below Grade Footings, Multi-Story Structures: 4,000 psi 28 day concrete, form finish.

**3.06 CURING AND PROTECTION**

- A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Cure concrete floor surfaces to requirements of Section 03 39 00.

**3.07 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01 41 00.
- B. Provide free access to work and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to testing firm for review and approval prior to commencement of work.
- D. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.
- E. Three concrete test cylinders will be taken for every 40 or less cubic yards of each class of concrete placed. Perform one compression test each at 7 days and 28 days, and one spare to be tested when directed by Contracting Officer.
- F. One slump test will be taken for each set of test cylinders taken. Slump shall be within 3"-5" range except monolithic foundation and slab-on-grade shall be within 2"-4" range.

**3.08 PATCHING**

- A. Allow Contracting Officer to inspect concrete surfaces immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Contracting Officer upon discovery.
- C. Patch imperfections as directed in accordance with ACI 301.

**3.09 DEFECTIVE CONCRETE**

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements. Concrete not conforming to specified strength in 28 days will be considered defective.

- B. Defective concrete will be **removed and replaced**. Removal will be to the nearest construction joint in all directions. Repair of defective concrete will be permitted only upon approval from the Contracting Officer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Contracting Officer for each individual area.

**END OF SECTION**

## **SECTION 03 35 00: CONCRETE FINISHING**

### **PART 1 GENERAL**

#### **1.01 REFERENCES**

- A. South Coast Air Quality Management District:
  1. SCAQMD Rule 1113 - Architectural Coatings.

#### **1.02 SECTION INCLUDES**

- A. Surface treatment with concrete hardener-sealer coating.

#### **1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Manufacturer's Data and Installation Instructions: Indicate criteria for preparation and application.

#### **1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each flooring system.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products under provisions of Section 01 60 00.
- B. Deliver materials in manufacturer's packaging including application instructions.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

#### **2.02 ACCEPTABLE MANUFACTURERS: HARDENERS AND SEALERS**

- A. Hardener & Sealers: "Crystaloid" liquid hardener as manufactured by Concrete Service Materials Co., "Sealco 800" by Cormix Construction Chemicals, "Clear Bond" by Guardian Chemical Co., "Sonosil" by Sonneborn Building Products.
- B. Substitutions: Under provisions of Section 01 00 00.



**PART 3 EXECUTION****3.01 CLEANING AND EXAMINATION**

- A. Upon completion of the interior of the building, including but not limited to, painting, acoustical ceilings, electrical, etc., the contractor shall thoroughly clean the concrete floor slab using materials recommended by the manufacturer of the hardener and sealer. Upon completion of the cleaning, verify that floor surfaces are acceptable to receive the work of this Section.

**3.02 FLOOR SURFACE TREATMENT**

- A. Apply hardener and sealer (number of coats as required by manufacturer to be qualified as a "heavy-duty" coating) in accordance with manufacturer's written instructions on interior floor surfaces.

**END OF SECTION**

**SECTION 03 39 00****CONCRETE CURING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Initial and final curing of horizontal and vertical concrete surfaces.

**1.02 REFERENCES**

- A. ACI 301 - Specifications for Structural Concrete.
- B. ACI 302.1 – Guide for Concrete Floor and Slab Construction.
- C. ACI 308.1 - Standard Specification for Curing Concrete.
- D. ACI 318 – Building Code Requirements for Structural Concrete
- E. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete.
- F. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- G. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on curing compounds, product characteristics, compatibility and limitations.
- C. Manufacturer's Installation Instructions: Indicate criteria for preparation and application.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with ACI 301.
- B. Maintain one copy of document on site.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products under provisions of Section 01 60 00.
- B. Deliver curing materials in manufacturer's packaging including application instructions.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Membrane Curing Compound Type A: ASTM C309, white pigmented Type 2, Class B, free of paraffin.
- B. Absorptive Mats Type B: ASTM C171.

- C. Waterproof Paper Type C: ASTM C171, treated to prevent separation during handling and placing, standard color.
- D. Polyethylene Film Type D: ACTM C171, 6 mil. thick, clear.
- E. Water: Potable and not detrimental to concrete.

## **2.02 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are ready to be cured.

### **3.02 EXECUTION - HORIZONTAL SURFACES**

- A. Cure floor surfaces in accordance with ACI 308.
- B. Membrane Curing Compound at Exterior Exposed Concrete Only: Apply curing compound in accordance with manufacturer's instructions in 2 coats with second coat at right angles to first.
- C. **All Floor Slabs shall be cured with Polyethylene Film** (Optional for other horizontal surfaces): Spread polyethylene film over floor slab areas, lapping edges and sides and sealing with pressure sensitive tape; maintain in place for 7 days. Other wet-cure methods may be used if approved by the Contracting Officer.

### **3.03 PROTECTION OF FINISHED WORK**

- A. Do not permit traffic over unprotected floor surface.

**END OF SECTION**

## SECTION 04 05 03: MASONRY MORTARING AND GROUTING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Mortar for masonry.

#### 1.02 REFERENCES

- A. American Concrete Institute:
  - 1. ACI 530 - Building Code Requirements for Masonry Structures.
  - 2. ACI 530.1 - Specifications for Masonry Structures.
- B. ASTM C91 – Standard Specification for Masonry Cement.
- C. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- E. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
- F. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- G. International Building Code (Latest Edition), Chapter 21 Masonry.

#### 1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

#### 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Provide design mix, Proportion method (by volume), required environmental conditions, and Forrer admixture limitations. Base volume on cubic foot measurements. See table 2103.7(1) 2000 International Building Code. The use of the Forrer admixture requires a reduction in the volume of water. Include volume of water required in gallons. **Do not use hydrated lime or lime putty in the design mix.**
- C. Submit premix mortar manufacturer's certificate indicating conformance to ASTM C270 and installation instructions under provisions of Section 01 33 00.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and protect products at site under provisions of Section 01 60 00. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

#### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Cold Weather Requirements: International Building Code, Chapter 21, Cold Weather Construction.
- B. Hot Weather Requirements: International Building Code, Chapter 21, Hot Weather Construction.

**1.07 MIX TESTS**

- A. Test mortar in accordance with Section 01 41 00 and in accordance with ASTM C780.
- B. Test mortar mix for compressive strength, consistency and slump. Provide 4 copies of test results to Contracting Officer for review and approval prior to commencement of work. Mix design for all masonry units exposed to the weather, standard CMU and face brick **must include** Forrer Dry Block II or Forrer Dry Brick Admixture, in the proportions recommended by the manufacturer for the type of mortar specified. See 2.04 Mortar Mixes below. The use of Forrer Dry Block II or Dry Brick is not required in mix design for masonry units not exposed to the weather.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

**2.02 MATERIALS:**

- A. Masonry Cement: ASTM C91, Type M or Type S.
- B. Mortar Aggregate: ASTM C144, standard masonry type.
- C. Premix Mortar: ASTM C387, Type S, white cement, for glass unit masonry.
- D. Admixtures: Forrer Dry Block or Dry Brick Admixture.

**2.03 MORTAR MIXES**

- A. Mortar for Non-load Bearing Walls and Partitions and Glass Unit Masonry: ASTM C270, Type S utilizing the Proportion Method to achieve 1800 psi strength.
- B. Mortar for load Bearing Walls and Partitions: ASTM C270, Type M, utilizing the Proportion Method to achieve 2500 psi strength.

**2.04 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270. Mortar shall be mixed between 3-5 minutes in a mechanical batch mixer with the required amount of water to provide the required consistency. Hand mixing is not permitted. See 1.03.B above.
- B. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. Mortars that have become stiffened may be re-tempered by adding the minimum amount of water to achieve the required consistency.
- D. Use mortar within 2-1/2 hours after mixing. Discard mortar beyond 2-1/2 hours.

**2.05 TEST PANEL:**

- A. Provide 4' x 4' test panel to illustrate laying of masonry units including width and tooling of mortar joints. Do not lay any masonry units until the Inspector has approved the test panel. The approved test panel shall be the standard of quality for the project.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Request inspection of spaces to be grouted.

**3.02 INSTALLATION**

- A. Install mortar to requirements of the specific masonry Section.

**3.03 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed in accordance with ASTM C780 and under provisions of Section 01 41 00.
- B. Provide free access to work and cooperate with appointed firm.
- C. Submit proposed mix design of each type of mortar to testing firm for review and approval prior to commencement of work.
- D. Tests of mortar, aggregates and admixtures may be performed to ensure conformance with specified requirements.
- E. Three undisturbed samples of molded mortar test cylinders will be taken as follows:
  - 1. For every 1000 s.f. of gross wall area or fraction thereof.

**END OF SECTION**

**SECTION 04 20 00****UNIT MASONRY****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete masonry units.
- B. Brick masonry units.
- C. Glass masonry units.
- D. Reinforcement, anchorage, and accessories.
- E. Parged masonry surfaces.
- F. Reinforcement, anchorage, and accessories.

**1.02 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION**

- A. See applicable sections of the Specifications and the Drawings.

**1.03 REFERENCES**

- A. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- B. ASTM C55 - Standard Specification for Concrete Brick.
- C. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- D. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- E. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
- G. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
- H. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
- I. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
- J. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- K. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
- L. ASTM D1056 – Standard Specification for Flexible Cellular Materials – Sponge or Expanded Rubber
- M. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
- N. ACI 530 - Building Code Requirements for Masonry Structures.
- O. ACI 530.1 - Specifications For Masonry Structures.
- P. International Building Code (Latest Edition), Chapter 21 Masonry.

**1.04 SUBMITTALS**

- A. Submit one sample of each masonry unit to be used in the construction to illustrate type, texture, range, etc. under provisions of Section 01 33 00.

- B. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements.
- C. Submit product data and manufacturer's written installation instructions of all products used in the construction under provisions of Section 01 33 00.
- D. Submit copy of UL Design for fire-rated wall assemblies.
- E. Substitutions: Under provisions of Section 01 00 00.

#### **1.05 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

#### **1.06 QUALIFICATIONS**

- A. Installer / Subcontractor: Company specializing in performing the work of this Section with minimum 3 years documented experience.
- B. Manufacturer: Company specializing in the successful manufacture of many different styles and colors of masonry units as specified in this Section with minimum of 3 years documented experience.

#### **1.07 MOCK-UP**

- A. Prior to start of work, provide 4' x 4' mock-up of each type of exposed masonry unit except glass masonry units. Provide 16" x 16" mock-up of glass units. Mock-up shall be constructed from approved CM units. When accepted, mock-up will demonstrate the minimum standard for the work. Mock-up may not remain as part of the work. **Do not start masonry work until mock up has been approved.**

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store and handle products at site on pallets to prevent the inclusion of foreign materials and damage to the products by weather, water or breakage. Products shall be delivered and stored in original plastic packages until ready for use. Damaged packages will be rejected. Products must be kept dry. Delivery, storage and handling shall also be in accordance with provisions of Section 01 60 00.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Cold Weather Requirements: International Building Code, Chapter 21, Cold Weather Construction.
- B. Hot Weather Requirements: International Building Code, Chapter 21, Hot Weather Construction.

#### **1.10 WARRANTY**

- A. The prime contractor and masonry subcontractor shall warrant the materials and installation for two years from the date of acceptance by the Contracting Officer. Warranty shall include cleaning of efflorescence from the Brick and Concrete Masonry Units, and repair of damaged BM / CMU due to efflorescence. Pre-sealer and water repellent sealer shall be re-applied after repair or cleaning of the Brick / CMU.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.



- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

## 2.02 CONCRETE MASONRY UNITS

- A. Hollow Load Bearing Block Units: ASTM C90, Grade N, Type II - Non-Moisture Controlled, normal weight.
- B. Solid Load Bearing Block Units: ASTM C90, Grade N, Type II - Non-Moisture Controlled, normal weight.
- C. Hollow Non-Load Bearing Block Units: ASTM C90, Type II - Non-Moisture Controlled, normal weight.
- D. Fire Rated Concrete Masonry Units: CM units produced in accordance with the Standard for Concrete Masonry Units, UL-618, are classified without further fire tests. Other CM Units are classified on the basis of fire tests conducted in accordance with the Standard for Fire Tests of Building Construction and Materials, UL-263. Supplier shall provide the appropriate Underwriters Laboratories Certificate indicating the correct classification, in hours, for the unit to be incorporated into the construction. Construction of fire-rated wall assemblies shall be in strict accordance with the Underwriters Laboratories Inc. UL Design (Number) listed on the drawing. A copy of the UL design is available from the Base Civil Engineer's office, Engineering Flight.
- E. Concrete Brick Units: ASTM C55, of same Grade, Type, and weight as block units.)
- F. Shape & Size: Nominal modular size of 8-inch x 8 inch x 16 inch, 4-inch x 8-inch x 16-inch and as indicated on the Drawings. Provide special units for 90 degree corners, bond beams, lintels, and bullnosed corners where indicated on the Drawings.
  1. Back-up Wythe, interior partitions to receive additional finish, and below grade: Plain/standard CMU.
  2. Exposed to view, above grade: Split Face, Split Face/Split Ribbed or Smooth or plain as indicated on the drawings.
- G. Substitutions: Under provisions of Section 01 00 00.

## 2.03 BRICK MASONRY UNITS

- A. Face Brick: ASTM C216, Type FBX, Grade MW; color as selected.
- B. Common Brick: ASTM C62, Grade MW; solid units.
- C. Size & Shape: Nominal modular size of 4 inches x 2-2/3 inches x 8 inches. Provide special units for 90-degree corners, lintels, and bull-nosed corners as indicated on drawings.
  1. Back-up Wythe, interior partitions to receive additional finish, and below grade: Common brick.
  2. Exposed to view, above grade: Face Brick color and texture as per 2.03.G below.
  3. Color shall match similar units used on base and must be approved by the Contracting Officer or his representative.
- D. Special Brick Shape: Shaped to profile indicated, surface texture on face, sides or ends as indicated on the drawings.
- E. Size and Shape of Giant Brick Units: As indicated on the drawings. Provide special units for 90-degree corners, lintels, and bull-nosed corners as indicated on drawings.
- F. Modular Brick Units: All brick units must be produced at one time for color/shade consistency. Acceptable Manufacturer:
  1. Cunningham Brick Company, Lexington KY, Winestone Rockface
  2. Cunningham Brick Company, Lexington KY, Winestone
- G. Substitutions: Under provisions of Section 01 00 00.

## 2.04 GLASS MASONRY UNITS:

- A. Hollow Glass Units: Permanently sealed hollow units by heat fusing joint with joint key and factory coating at units edges to assist mortar bond. Provide special corner units, curved units, end units etc., as required

and indicated on the drawings. Nominal size 8 inches x 8 inches x 4 inches. Color and pattern as indicated on the drawings.

- B. Solid Glass Units: Factory coated edges to assist mortar bond. Provide special corner units, curved units, end units etc., as required and indicated on the drawings. Nominal size 8 inches x 8 inches x 3 inches. Color and pattern as indicated on the drawings.
- C. Acceptable Manufacturers:
  1. Pittsburgh Corning Inc., 800 Presque Isle Road, Pittsburgh, PA 15239, phone 1-800-9925769
  2. Weck, Glashaus Inc., 450 Congress Parkway Suite "E", Crystal Lake, IL, phone 1-815-356-8440
- D. Substitutions: Under provisions of Section 01 00 00.

## 2.05 GROUT

- A. Fine Grout: Ready mixed concrete fill at small spaces of CM units shall be 3000 psi concrete without coarse aggregate. Use at spaces at least 0.75" wide horizontally but less than 3". Spaces smaller than 0.75" shall be filled with mortar. Slump shall be between 8"-10", about 8" for units with low water absorption and about 10 "for units with high water absorption. Limit fly ash to 15% of the weight of cement.
- B. Coarse Grout: Ready mixed concrete fill at cell(s) of CM units shall be 3000 psi concrete with pea gravel aggregate or smaller depending on job conditions. Use at spaces greater than 3 " wide horizontally. Slump shall be between 8"-10", about 8" for units with low water absorption and about 10 " for units with high water absorption. Limit fly ash to 15% of the weight of cement.

## 2.06 REINFORCEMENT AND ANCHORAGE

- A. Joint Reinforcement: Truss type hot-dip galvanized after fabrication, high tensile cold-drawn steel conforming to ASTM A82; manufactured by Dur-o- Wall or equal.
- B. Reinforcing Steel: ASTM A615, 60-ksi-yield grade; deformed billet steel bars sized and located as shown on the Drawings.

## 2.07 ACCESSORIES

- A. Through-Wall Flashing Assembly:
  1. 5 ounce copper-fabric type; full sheet copper, asphalt coated both sides, laminated under pressure between two layers (one each side) of treated glass fabric.
  2. Termination bar, 1" x 1/8" stainless steel bar with pre-punched holes, top of bar 16" above weeps (at foundation or steel angle lintel). Secure bar to each stud wall with stainless steel self-tapping screws. Apply sealant to screw heads.
  3. Steel Lintel Drip Edge: 26 gauge stainless steel, width to equal horizontal leg of lintel with 3/4" vertical leg up and down. Place on top of lintel and install copper-fabric flashing on top of drip edge.
- B. Preformed Control Joints: Polyvinylchloride material, regular, wide flange or "tee" design as required. Provide with corner and tee accessories, cement fused joints. Must meet ASTM D-2240.
- C. Preformed Joint Filler: Neoprene filler strip used at veneer control joints. Must meet ASTM D-1056, Class RE41 or 2A1.
- D. Veneer Wall Ties, Studwall Backup: 3/4" x 5" x 12 gauge hot galvanized steel screwed to studs with hot galvanized 3/16" wire ties. (Dur-O-Wal #D/A 207 & D/A 703 or 750 trapezoid wire ties or equal)
- E. Building Paper: No. 15 or 30 asphalt saturated felt as indicated on the drawings.
- F. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
- G. Veneer Wall Ties, Masonry Backup: Rectangular adjustable wall ties, hot dipped galvanized 3/16" wire, double pintel and double eye rod, at 16" o.c. vertically and 24" o.c. horizontally. Maximum vertical adjustment 1.25". (Dur-O-Eye D/A 3700 or approved equal)

- H. Horizontal Joint Reinforcement, Single Wythe: Hot dipped galvanized deformed bars, 3/16" side rods with #9 truss rod bracing, @ 16" o.c. vertically. Stagger with corrugated metal ties.
- I. Horizontal Joint Reinforcement, Glass Masonry Units: Hot dipped galvanized deformed bars, 9 gauge side rods @ 1.625-1.75" o.c. to suite GMU, @ 16" o.c. 9 gauge ladder type bracing @ 8" o.c.
- J. Horizontal Joint Reinforcement, Double Wythe: Hot dipped galvanized deformed bars, 3/16" side rods with 3/16" truss rod bracing, hot dipped galvanized 3/16" welded double eye rod at and double pintel @ 16" o.c. vertically.
- K. Expansion strips, Glass Masonry Units: Dense glass fiber 7/16 inch x 4-inch nominal size.
- L. Panel Anchors, Glass Masonry Units: Steel strips, 20 gauge x 1-3/4 inch wide, punched with three rows of elongated holes, pattern staggered, hot dip galvanized after fabrication to 1.25 ounce per square foot.
- M. Perimeter channel, Glass Masonry Units: Extruded aluminum, channel profile, size as required to fit GM unit, one piece per length installed (no joints/splices), anodized to match color as indicated on the drawings.
- N. Glass Masonry Units Grid System: Extruded anodized aluminum grid block system to accept Glass Masonry Units. Manufacturer, Innovative Building Products Inc., phone 1-800-923-2263.
- O. Z Bar Wall Ties: 0.25" thickness x length required @ 16" o.c., galvanized steel wire with moisture drip.
- P. Weep Holes-Wicks: Cotton rope, 0.375" diameter x 7" in length at 16" o.c. horizontally at veneer applications. On single wythe walls, install weep holes in center of each cell of CM units.
- Q. Rigid Steel Partition Anchors: 0.25" thick x 1.25" (w) x length required @ 16" o.c. vertically.
- R. Dovetail Anchors and Slots: Dovetail slot with dovetail anchors (corrugated ties, triangular wire-ties, and stone anchors) as required to secure masonry to structure.
- S. Mortar Net: High density polyethylene or nylon strands woven into a minimum 90% open mesh, installed on top of through-wall flashing at the inside of the cavity. Thickness of materials shall match the depth of the cavity. Material must not react with common building materials (PVC, polystyrene, polyethylene, copper, lead, asphalt, etc. **Must be a minimum of 16" above the top of the flashing and designed to last the life of the building.**
- T. Cleaning Solution: Non-acidic, as recommend by masonry manufacturer for masonry to be painted, not harmful to masonry work or adjacent material.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing condition.

### 3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors and accessories supplied in this section and other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing

### 3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one unit and on mortar joint to equal 8 inches. Joints shall be struck flush and tooled concave.

### 3.04 PLACING AND BONDING

- A. Lay solid masonry units in **full bed** of mortar, with full head joints uniformly jointed with other work.
- B. Lay first course of hollow masonry units with **full mortar** bedding. Lay subsequent units with face shell bedding on head and bed joints.
- C. Buttering corners of joint or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar as work progresses.
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Protect all CMU, the air space on veneer construction, and the air space in cavity wall construction, from water intrusion during construction by covering with plastic sheeting. **CMU must be kept dry at all times.**
- I. Glass Masonry Units: Install in strict accordance with manufacturer's written instructions.
- J. **It is extremely important that the air space between the back of the unit and sheathing be kept free of mortar to allow for drainage of water and free air circulation. The contractor must use moveable wood strips or other methods approved by the Contracting Officer, to prevent mortar accumulation within the air space.**

### 3.05 WEEPS AND MORTAR NET

- A. Install weep hole-wicks as per 2.06.P. horizontally above through-wall flashing at first course above grade and above shelf angles to allow for drainage and air circulation. Extend wick to the full depth of the air space and under mortar net. Weeps at cored units shall be installed at the center of each cell to allow drainage of water and air circulation within the masonry unit. Leave approximately 1" of rope extending beyond the exterior face of the wall. Upon completion of all masonry work and prior to sealing the masonry, carefully remove wick from the wall
- B. Install mortar net above flashing and shelf angles as per manufacturer's written instructions and paragraph 2.07.

### 3.06 REINFORCEMENT AND ANCHORAGES

- A. Install horizontal joint reinforcement 16 inches o.c. vertically.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- E. Reinforce stack bonded unit joint corners and intersections with steel partition anchors 16 inches o.c. alternating courses with horizontal reinforcement.
- F. Install vertical wall reinforcement in accordance with the drawings.

### 3.07 LINTELS

- A. Install lintels as scheduled on Drawings.

- B. Install reinforced unit masonry lintels over openings where precast concrete lintels are not scheduled.
- C. Use single piece reinforcing bars only.
- D. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- E. Place and consolidate grout fill without displacing reinforcing. Rod grout to insure full and complete filling of each cell, free of voids.
- F. Allow masonry lintel to attain specified strength before removing temporary supports.
- G. Maintain minimum 8 inch bearing on each side of opening.

### 3.08 GROUTED COMPONENTS

- A. Reinforce bond beam as indicated on the drawings. If not indicated on the drawings, provide a minimum of 2, No. 5 bars, and 1 inch from bottom web.
- B. Lap rebar splices a minimum 24".
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing. Rod grout to insure full and complete filling of each cell, free of voids.
- E. At bearing locations, fill masonry cells with grout for a minimum 16 inches either side of opening.
- F. Maximum height of CMU wall(s) prior to grouting cells is 4'-8". Grout cells in accordance with the drawings. After grout has been placed, continue CMU walls in 4'-8" increments until wall reaches full height.

### 3.09 CONTROL JOINTS (Brick and CMU only)

- A. Do not continue horizontal joint reinforcement through control joints. Provide corrugated metal ties at 8" o/c (vertically) at each portion of wall at each side of control joint.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner-joints in accordance with manufacturer's instructions.
- C. In lieu of preformed control joints, contractor may field construct control joints by providing 1/2" clear space free of mortar between ends of masonry units. Provide backer rod and sealant.
- D. Provide control joints:
  1. Location and size of control joint as indicated on the drawings. If not shown on the drawings, see E. below.
  2. Where masonry meets dissimilar construction materials and remains in the same plane.
  3. Where control or expansion joints occur in the structure.
- E. Maximum control joint spacing measured horizontally:
  1. 20-feet in either direction for walls up to 10 feet high.
  2. 28-feet in either direction for walls 10 feet plus-14 feet in height.
  3. 36-feet in either direction for walls 14 feet plus-18 feet in height.
  4. Placement of the above shall be as directed by the Contracting Officer or his designated Civil Engineering representative.

### 3.10 BUILT-IN WORK

- A. As work progresses, build in metal door and glazed frames, anchor bolts, plates and other items furnished by other Sections.
- B. Build in items plumb and level.

- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.

### **3.11 TOLERANCES**

- A. Maximum Variation From Unit to Adjacent Unit: 1/32 inch.
- B. Maximum Variation From Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. Maximum Variation From Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation From Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

### **3.12 CUTTING AND FITTING**

- A. Cut and fit for pipes, conduit, cleaves and other items as may be required.
- B. Obtain Contracting Officer for approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### **3.13 CLEANING**

- A. Cleaning shall be in strict accordance with each manufacturer's written instructions. Using cleaning solution recommended by manufacturer. Provide two copies of each to Contracting Officer prior to commencement of cleaning. If the manufacturer's instructions conflict with the following procedure, notify Contracting Officer immediately.
- B. Remove excess mortar and mortar smears.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

### **3.14 PROTECTION OF FINISHED WORK**

- A. Protect finished installation without damaging completed work; provide protective boards at exposed external corners, which may be damaged by construction activities.

### **3.15 FINISH**

- A. See section **09 90 00 PAINTING**.

**END OF SECTION**

**SECTION 05 12 00****STRUCTURAL STEEL FRAMING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Structural steel framing members, and support members.
- B. Base plates, and miscellaneous steel including 12 Ga. shells and 18 Ga. Studs.
- C. Grouting under base plates.

**1.02 REFERENCES**

- A. ASTM A36 - Standard Specification for Carbon Structural Steel.
- B. ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- D. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
- E. ASTM A449 - Standard Specification for Quenched and Tempered Steel Bolts and Studs.
- F. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
- G. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- H. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
- I. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
- J. ASTM A992 - Standard Specification for Structural Steel Shapes.
- K. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- L. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- M. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- N. AWS D1.1 - Structural Welding Code - Steel.
- O. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges.
- P. AISC 341 - Seismic Provisions for Structural Steel Buildings
- Q. AISC 360 - Specification for Structural Steel Buildings.
- R. SSPC - Steel Structures Painting Manual.
- S. GC-03 (Green Seal) Anti-Corrosive Paints

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, fasteners and handrails.
  2. Connections.
  3. Indicate welded connections with AWS A2.0 welding symbols. Indicate net weld lengths.
  4. Shear Stud Connectors
- C. Mill Test Reports: Submit under provisions of Section 01 41 00 Testing Laboratory Services, indicating structural strength, destructive and non-destructive test analysis.
- D. Welders' Certificates: Submit under provisions of Section 01 41 00 Testing Laboratory Services, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.

#### **1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
  2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

#### **1.05 QUALITY ASSURANCE**

- A. Fabricate structural steel members in accordance with AISC specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. Perform Work in accordance with AISC - Specification for Architectural Exposed Structural Steel.
- C. Maintain one copy of each document on site. Submit three copies to the Contracting Officer.

#### **1.06 QUALIFICATIONS**

- A. Fabricator: Company specializing in performing the work of this Section with minimum 5 years experience.
- B. Erector: Company specializing in performing the work of this section with minimum 5 years experience.
- C. Design connections not detailed on the Drawings shall be prepared under the direct supervision of a Professional Structural Engineer experienced in design of this work and currently licensed in the State of Florida. Shop drawing submittals shall be signed/sealed by the same Professional Structural Engineer.
- D. Welders and Welding Procedures: AWS D1.1 qualified within previous 12 months.

#### **1.07 FIELD MEASUREMENTS**

- A. Verify that field measurements are as shown on Drawings prior to preparation of the shop drawings.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.



2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

C. Indoor Environmental Quality Characteristics:

1. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03

## **2.02 MATERIALS**

- A. Structural Steel Members: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B or ASTM A501.
- C. Structural W-Shapes: ASTM A992, Grade 50
- D. Pipe: ASTM A63, Grade B.
- E. Bolts, Nuts, and Washers: ASTM A325.
- F. Anchor Bolts: ASTM A307.
- G. Shear Connectors: ASTM A108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.
- H. Welding Materials: AWS D1.1; type required for materials being welded.
- I. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, and water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.
- J. Shop and Touch-Up Primer: SSPC Paint IS, Type I, red oxide.
- K. Exterior Exposure: See Section 09 90 00 for primer and surface prep.

## **2.03 FABRICATION**

- A. Continuously seal joined members by continuous welds.

## **2.04 FINISH**

- A. Prepare structural component surfaces in accordance with SSPC.
- B. Shop prime structural steel members. Do not prime surfaces that will be field welded or in contact with concrete.

## **2.05 SOURCE QUALITY CONTROL AND TESTS**

- A. Testing and analysis of components will be performed under provisions of Section 01 41 00.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

## **3.02 ERECTION**

- A. Allow for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on shop drawings.
- C. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic and welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

- D. Do not field cut or alter structural members without approval of the Contracting Officer.
- E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
- F. Grout under base plates.

### **3.03 ERECTION TOLERANCES**

- A. Maximum Variation From Plumb: 1/8 inch.
- B. Maximum Offset From True Alignment: 1/4 inch.

### **3.04 FIELD QUALITY CONTROL**

- A. Field inspection will be performed under provisions of Section 01 41 00.
- B. Shear Connectors: In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:
  - 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
  - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connector already tested, according to requirements in AWS D1.1.

**END OF SECTION**

## SECTION 05 21 00: STEEL JOIST FRAMING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  1. Open web steel joists, with bridging, attached seats and anchors.

#### 1.02 REFERENCE STANDARDS

- A. AISC 341 - Seismic Provisions for Structural Steel Buildings.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- F. ASTM A992 – Standard Specification for Structural Steel Shapes
- G. ASTM F2329 - Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners.
- H. AWS D1.1 - Structural Welding Code - Steel.
- I. SJI K-1.1 - Standard Specifications for Open Web Steel Joists, K-series. (“Specifications”)
- J. SJI LH/DLH-1.1 - Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series.
- K. SJI JG-1.1 - Standard Specification for Joist Girders.
- L. SSPC - Steel Structures Painting Manual.

#### 1.03 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Shop Drawings:
  1. Indicate standard designations, configuration, sizes, spacing, locations of joists, joist leg extensions.
  2. Joist coding, bridging, connections, attachments.
  3. Cambers.
  4. Connection details.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- D. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within previous 12 months.

#### 1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.

2. Indoor Air Quality Certificates:
  - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

### **1.05 QUALITY ASSURANCE**

- A. Perform Work in accordance with the following:
  1. SJI K-1.1, SJI LH/DLH-1.1, and SJI JG-1.1, including headers and other supplementary framing.
  2. AISC 341 Seismic Provisions for Structural Steel Buildings.
- B. Perform Work in accordance with SJI – Steel Joist Institute’s “Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joists Girders” that are applicable to the types of joists indicated.
- C. Welding: Quality procedures and personnel according to AWS D1.1 “Structural Welding Code – Steel”
- D. Maintain one copy of each document on site. Submit three copies to the Contracting Officer.

### **1.06 QUALIFICATIONS**

- A. Fabricator: Company specializing in performing Work of this section with minimum 5 years experience.
- B. Erector: Company specializing in performing Work of this section with minimum 5 years experience.
- C. Design connections not detailed on drawings under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Florida.

### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store and handle joists as recommended in SJI’s “Specifications”

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturer List:
  1. Butler Manufacturing Co.
  2. New Columbia Joist Co.
  3. Vulcraft Steel Joist
  4. Section 01 60 00 - Product Requirements: Requirements for substitutions for other manufacturers and products.

### **2.02 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

### **2.03 MATERIALS**

- A. Open Web Joists Members: Comply with SJI’s “Specifications” for web and steel-angle chord members.

- B. Bolts: ASTM A325; carbon-steel, plain-uncoated, heavy hex bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
- C. Structural Steel For Supplementary Framing and Joist Leg Extensions: ASTM A36 / ASTM A992
- D. Welding Materials: AWS D1.1; type required for materials being welded.
- E. Shop Primer: SSPC Paint 15, Type 1, red oxide.
- F. Touch-Up Primer: Match shop primer.

#### **2.04 FABRICATION**

- A. Furnish bottom and top chord extensions as indicated on drawings.
- B. Fabricate to achieve end bearing of:
  1. 2-1/2 inches on steel.
  2. 4 inches on masonry.
- C. Frame special sized openings in joist web framing as detailed.

#### **2.05 FINISHES**

- A. Prepare joist component surfaces in accordance with SSPC.
- B. Shop prime joists and supplementary framing members. Do not prime surfaces that will be field welded.
- C. Leave joists and supplementary framing members unprimed.
- D. Galvanizing: ASTM A123/A123M; hot dip galvanize after fabrication.
- E. Galvanizing for Bolts, Connectors, and Anchors:
  1. Hot-Dipped Galvanizing:
    - a. Bolts, Nuts, and Washers: ASTM F2329.
    - b. Connectors and Anchors: ASTM A153/A153M.
  2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

#### **2.06 SOURCE QUALITY CONTROL**

- A. Section 01 41 00 - Quality Requirements: Testing, inspection and analysis requirements.
- B. Furnish shop testing and analysis of steel sections.
- C. When fabricator is approved by authority having jurisdiction, submit certificate of compliance indicating Work performed at fabricator's facility conforms to Contract Documents.
  1. Specified shop tests are not required for Work performed by approved fabricator.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify bearing plates are set to required location and elevation.
- C. Verify bearing surfaces are ready to receive joists.

#### **3.02 ERECTION**

- A. Erect and bear joists on supports.
- B. Allow for erection loads. Install sufficient temporary bracing to maintain framing safe, plumb, and in alignment.

- C. Coordinate placement of anchors in concrete or masonry construction for securing bearing plates or angles.
- D. After joist alignment and installation of framing, field weld joist seat to bearing plates or angles.
- E. Position and field weld joist chord extensions and wall attachments as detailed.
- F. Frame floor and roof openings greater than 18 inches with supplementary framing.
- G. Do not permit erection of decking until joists are braced, bridged, and secured or until completion of erection and installation of permanent bridging and bracing.
- H. Do not field cut or alter structural members without approval of the Contracting Officer.
- I. After erection, prime all welds, abrasions, and surfaces not shop primed.

**3.03 TOLERANCES**

- A. Section 01 41 00 - Quality Requirements: Tolerances.

**3.04 FIELD QUALITY CONTROL**

- A. Section 01 41 00 - Quality Requirements: Requirements for inspecting, testing.
- B. Section 01 70 00 - Execution and Closeout Requirements: Requirements for testing, adjusting, and balancing.
- C. Field inspect members, connections, welds, and tightening of high strength bolts in slip-critical connections.

**END OF SECTION**

## **SECTION 05 31 13: STEEL DECKING**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section Includes:
  - 1. Steel roof deck and accessories.
  - 2. Steel composite floor deck and accessories including formed steel deck end forms to contain wet concrete.

#### **1.02 REFERENCES**

- A. American Society of Civil Engineers: ASCE 3 - Standard Practice for the Construction and Inspection of Composite Slabs.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
- C. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- E. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.
- F. AWS D1.1 - Structural Welding Code - Steel.
- G. SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.
- H. SSPC: The Society for Protective Coatings:
  - 1. SSPC Paint 15 - Steel Joist Shop Paint.
  - 2. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

#### **1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal Procedures: Submittal requirements.
- B. Shop Drawings: Indicate deck plan, support locations, Projections, openings and reinforcement, pertinent details, and accessories.
- C. Product Data: For each deck type, submit deck profile characteristics and dimensions, structural properties, finishes and accessories.
- D. Product Certificates.
- E. Field quality-control test and inspection reports.
- F. Research/Evaluation Reports: for steel decks.
- G. Manufacturer's Installation Instructions: Submit manufacturer's installation instructions.
- H. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- I. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within previous 12 months.

#### **1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

### 1.05 QUALITY ASSURANCE

- A. Perform Work in accordance with ASCE 3 for composite decks. Perform Work in accordance with SDI standard for roof decks.
- B. SDI Specifications: SDI 29 - Design Manual for Composite Decks, Form Decks and Roof Decks.
- C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code – Sheet Steel."
- D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance Ratings; Indicated by design designations of applicable testing and inspecting agency.
  - 2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.
- E. Maintain one copy of each document on site. Submit three copies to the Contracting Officer.

### 1.06 QUALIFICATIONS

- A. Installer: Company specializing in performing Work of this section with minimum 5 years experience.
- B. Design deck layout, spans, fastening, and joints under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Florida.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation and other damage during deliver, storage and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

## PART 2 PRODUCTS

### 2.01 MATERIALS

- A. Manufacturers:
  - 1. Butler Manufacturing Co.
  - 2. ASC Profiles, Inc.
  - 3. Canam Steel Corp.; The Canam Manac Group.
  - 4. Consolidated Systems, Inc.
  - 5. DACS, Inc.
  - 6. D-Mack Industries Inc.
  - 7. Epic Metals Corporation.
  - 8. Marlyn Steel Decks, Inc.



9. New Millennium Building Systems, LLC.
10. Nucor corp.; Vulcraft Division.
11. Roof Deck, Inc.
12. United Steel Deck, Inc.
13. Valley Joist; Division EBSCO Industries, Inc.
14. Verco Manufacturing Co.
15. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

- B. Metal Deck: Sheet steel, configured as follows:
1. ASTM A653/A653M, Grade 33 Structural Quality; with G90 galvanized coating.
  2. See plans for deck profile and thickness.
  3. Side Joints: lapped.
  4. Flute Sides: plain vertical face.
- C. Composite Metal Deck: Sheet steel, configured as follows:
1. ASTM A653/A653M, Grade 33 Structural Quality; with G90 galvanized coating.
  2. See plans for deck profile and thickness.
  3. Side Joints: lapped.
  4. Flute Sides: diagonally ribbed for improved concrete bond.
- D. Welding Materials: AWS D1.1.
- E. Shop Primer: SSPC Paint 15, Type 1, red oxide.
- F. Touch-Up Primer: Match shop primer.

## 2.02 ACCESSORIES

- A. Flute Closures: Closed cell foam rubber; match thickness and profiled to fit tight to deck.
- B. Fasteners: Stainless or Galvanized hardened steel, self tapping. Size and spacing of fasteners indicated on plan.
- C. Related Deck Accessories: Metal closure strips, wet concrete stops, cover plates, cant strips, galvanized; of profile and size to match steel deck.

## 2.03 SUSTAINABILITY CHARACTERISTICS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
- C. Indoor Environmental Quality Characteristics:
1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.

### 3.02 INSTALLATION

- A. Erect metal deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, requirements in this Section and as indicated.
- B. Bear deck on masonry or concrete support surfaces with 1-1/2 inch minimum bearing. Align and level.

- C. Bear deck on steel supports with 1-1/2 inch minimum bearing. Align and level.
- D. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck and support of other work.
- E. Weld in accordance with AWS D1.1.
- F. Mechanically fasten male/female side laps as indicated on the plans.
- G. Roof sump pans and sump plates: install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
  - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- H. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.
  - 1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.
- I. Pour Stops and Girder Fillers; Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.
- J. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.
- K. Weld stud shear connectors through steel deck to structural members below.
- L. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up prime paint.

### **3.03 FIELD QUALITY CONTROL**

- A. Welding: Inspect welds in accordance with AWS D1.1.
- B. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- C. Testing agency will report inspection results promptly and in writing to the Contracting Officer.
- D. Remove and Replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

**END OF SECTION**

**SECTION 05 40 00****COLD-FORMED METAL FRAMING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Formed metal stud framing at exterior and interior locations.
- B. Framing accessories.

**1.02 REFERENCES**

- A. AISI General - Standard for Cold-Formed Steel Framing - General Provisions.
- B. ASTM A525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- C. ANSI/ASTM A591 - Steel Sheet, Cold-Rolled, Structural Quality, Electrolytic Zinc-Coated.
- D. ASTM C 754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Wallboard, Backing Board, or Water-Resistant Backing Board.
- E. FS TT-P-645 - Primer, Paint, Zinc-Chromate, Alkyd Type.
- F. AISI NAS - North American Specification for Design of Cold-Formed Steel Structural Members.
- G. SSMA – Product Technical Information.
- H. GC-03 – (Green Seal) Anti-Corrosive Paints

**1.03 SYSTEM DESCRIPTION**

- A. Metal stud framing system for exterior load bearing and non-load bearing walls and infill of existing exterior walls
- B. Metal stud framing system for interior load bearing and non-load bearing walls.
- C. Roof truss system.

**1.04 SUBMITTALS**

- A. Submit shop drawings of prefabricated and panelized work for all exterior and interior load bearing and non-load bearing walls, including but not limited to, component details, stud layout, framed openings, headers and jambs, anchorage to structure and track, type and location of fasteners, and accessories or items required of other related work.
- B. Describe method of field construction of all exterior and interior load bearing and non-load bearing walls including but not limited to, component details, stud layout, framed openings, headers and jambs, anchorage to structure and track, type and location of fasteners, and accessories or items required of other related work.
- C. Submit shop drawings of roof truss system: show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- D. For all roof truss framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Product data describing standard framing member materials and finish, product criteria, load charts, limitations, steel sheet, expansion anchors, power-actuated anchors, mechanical fasteners, vertical deflection clips, horizontal drift deflection clips, miscellaneous structural clips and accessories, manufacturer's installation instructions, etc. under provisions of Section 01 33 00.

**1.05 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.

- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

### **1.06 QUALITY ASSURANCE**

- A. Perform work in accordance with AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
- B. Install all anchoring devise in accordance with manufacturer's written instructions.
- C. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- D. For Roof Trusses, Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- E. Maintain one copy of each document on site.

### **1.07 SEQUENCING AND SCHEDULING**

- A. Coordinate work required under this section with other work.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS, METAL STUDS, TRACKS AND JOISTS**

- A. Dale/Incor, Dietrich, Marino, Unimast.
- B. Substitutions: Under provisions of Section 01 00 00.

### **2.02 ACCEPTABLE MANUFACTURERS, ANCHORAGE DEVICES**

- A. Conventional steel anchor bolts with washers/nuts, embedded in the concrete.
- B. Mushroom head spike by Powers Fastening, Inc.
- C. Dome head powder driven pins by Hilti Anchoring & Powder Actuate Systems.
- D. Type, size and spacing of anchoring devices are shown on the drawings.
- E. Substitutions: Under provisions of Section 01 00 00.

### **2.03 STUD FRAMING MATERIALS**

- A. See Drawings for location. Gage and weight are minimum acceptable. Larger sizes may be used where required to meet design loads.
- B. Exterior Stud walls (Load Bearing)

1. 8" x 16 gage, CEE 1-5/8" flange, galvanized studs, 16" o. c. Physical Properties; Wt/ft.= 2.313#, Area= .6623 in<sup>2</sup>; I= 5.6294 in<sup>4</sup>; S= .1.3470 in<sup>3</sup>; R = 2.9154 in.
  2. 6" x 16 gage, CEE 1-5/8" flange, galvanized studs, 16" o. c. Physical Properties; Wt/ft.= 1.919#, Area= .5487 in<sup>2</sup>; I= 2.8033 in<sup>4</sup>; S= .08872 in<sup>3</sup>; R = 2.2602 in.
- C. Interior Stud walls (Load Bearing), 3-5/8" x 16 gage, CEE 1-5/8" flange, galvanized, studs, 16" o.c. Physical Properties; Wt/ft.= 1.452#, Area= .4138 in<sup>2</sup>, I= .8549 in<sup>4</sup>, S= .4388 in<sup>3</sup>, R= 1.4373 in.
- D. Interior Stud walls (Fire-rated), 3-5/8" x 20 gage, DWS 1-1/4" flange, galvanized, studs, 16" o.c. Physical Properties; Wt/ft.= .611#, Area= .180 in<sup>2</sup>, I= .342 in<sup>4</sup>, S= .171 in<sup>3</sup>, R= 1.595 in.
- E. Interior Stud walls (Drywall)
1. 3-5/8" x 22 gage, DWS 1-1/4" flange, galvanized, studs, 24" o.c. Physical Properties; Wt/ft.= .415#, Area= .122 in<sup>2</sup>, I= .216 in<sup>4</sup>, S= .105 in<sup>3</sup>, R= 1.601 in.
  2. 1-5/8" x 22 gage, DWS 1-1/4" flange, galvanized, studs, 24" o.c. Physical Properties; Wt/ft.= .293#, Area= .086 in<sup>2</sup>, I= .034 in<sup>4</sup>, S= .035 in<sup>3</sup>, R= .746 in.
- F. Runners: Of same material and finish as studs, bent leg retainer notched to receive studs.
- G. Furring and Bracing Members: Of same material and finish as studs, thickness to suit purpose.
- H. Fasteners: Self-drilling, self-tapping screws as recommended by manufacturer.
- I. Metal Backing: 20 gage galvanized steel for reinforcement.
- J. Anchorage Devices:
1. Powder actuated pins at interior walls.
  2. Anchor bolts, mushroom head spikes or dome head powder actuated pins at exterior walls. See 2.02. above.
- K. Primer: FS TT-P-645, for touch-up of galvanized surfaces.

### 2.03 ROOF TRUSS FRAMING MEMBERS

- A. ASTM A 653 steel, G90 galvanized. Provide manufacturer's standard chord and web member profiles with mechanical properties as required by structural design calculations. Shop fabrication required.
1. Design trusses in accordance with AISI RG-9518.
  2. Determine mechanical properties by testing in accordance with ASTM A 370.
  3. Configure web members as required by structural design calculations.
- B. Framing Accessories: ASTM A 653 steel, Class 1, 50 ksi minimum yield strength, 65 ksi minimum tensile strength, G90 hot-dipped galvanized coating, except as otherwise noted.
1. Stamp manufacturer's name on each accessory item.
  2. Provide screws with accessories designated for screw attachment.
- C. Roof Ties: Fabricate for screw or weld attachment of truss to structural frame. Size and thickness as required by structural design calculations.
- D. Bridging and Cross Bridging: Requirements vary according to manufacturer. Fabricate members for specific truss depth and spacing with connection to each truss flange and to each truss web. Provide bridging sized to truss depth and spacing and connections as required by structural design calculations.
- E. Cold Rolled Channel: Width and thickness as required by structural design calculations.
- F. Flat Strap: Width and thickness as required by structural design calculations. Rigid attachment to stud flange.
- G. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. Size as required by structural design calculations.
- H. Web Stiffeners: Channel shaped stiffener. Screw attachment to truss or stud webs. Provide size and thickness as required by structural design calculations.

- I. Fasteners: Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size and size as required by structural design calculations.

## **2.05 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance..
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.
- C. Indoor Environmental Quality Characteristics:
  - 1. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

## **PART 3 FABRICATION**

### **3.01 FABRICATION**

- A. Fabricate cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  - 1. Fabricate framing assemblies using jigs or templates.
  - 2. Cut framing members by sawing or shearing; do not torch cut.
  - 3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
    - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
  - 4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- D. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
  - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

## **PART 4 EXECUTION**

### **4.01 EXAMINATION**

- A. Verify that conditions are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

### **4.02 ERECTION**

- A. Align and secure bottom runners (tracks) with approved anchoring devices.
- B. Install studs vertically at spacing indicated above. Connect studs to runners using fastener method recommended by stud manufacturer.
- C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.

- D. Install top runner and brace to pre-engineered metal building system and cross-brace to adjacent stud wall for rigid installation.
- E. Splicing of studs is not permissible.
- F. Construct corners using minimum three studs.
- G. Double studs at wall openings, door and window jambs, and not more than 2 inches each side of openings.
- H. Coordinate erection of studs with requirements of door and window frame openings, supports and attachments.
- I. Align stud web openings.
- J. Coordinate installation of bucks, anchors, and blocking with electrical and mechanical work to be placed in or behind stud framing.
- K. Blocking: Secure steel channels to studs.
- L. Refer to Drawings for indication of partitions to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs.
- M. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.
- N. Truss Framing Installation:
  - 1. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
  - 2. Erect trusses without damaging framing members or connections.
  - 3. Align webs of bottom chords and load-bearing supports to transfer loads to structure. Anchor trusses securely at all bearing points.
  - 4. Install continuous bridging and permanently brace trusses as indicated on the shop drawings and designed according to LGSEA's Technical Note 551e, "Design Guide for Permanent Bracing of Cold-Formed Steel Trusses."
  - 5. Install trusses at spacing as shown on drawings.
  - 6. Do not remove, cut, or otherwise alter truss members or connections.
  - 7. Install accessories as required by structural design calculations. Provide appropriate fasteners in all predrilled holes backed by another framing member.

#### **4.03 TOLERANCES**

- A. Maximum Variation From True Position (plumb, level, and true to line): 1/8 inch.
- E. Maximum Variation of any Member from Plane: 1/4 inch.
- F. Member Spacing: Not more than 1/8 inch plus or minus from spacing indicated.

**END OF SECTION**

**SECTION 06 41 00: ARCHITECTURAL WOOD CASEWORK****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Plastic laminate clad cabinet units.
- B. Countertops.
- C. Cabinet hardware.

**1.02 REFERENCES**

- A. American National Standards Institute:
  - 1. ANSI A156.9 - Cabinet Hardware
- B. Architectural Woodwork Institute:
  - 1. AWI – AWS Architectural Woodwork Standards
- C. National Electrical Manufacturers Association:
  - 1. NEMA LD 3 - High Pressure Decorative Laminates.
- D. Green Seal:
  - 1. GS-11 - Product Specific Environmental Requirements.
  - 2. GS-36 - Aerosol Adhesives.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

**1.03 QUALITY ASSURANCE**

- A. Perform work to "Custom Quality" in accordance with Quality Standards of Architectural Woodwork Institute (AWI).
- B. A single firm shall do all work in this section.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
    - d. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
    - b. Certify each composite wood product contains no added urea-formaldehyde resins.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.
    - d. Certified wood products.

**1.05 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.



- B. Product Data: Submit 4 copies of manufacturer's technical product data and installation instructions indicating materials, hardware and finishes used in fabrication of cabinets.
- C. Shop Drawings: Submit 4 copies of shop drawings indicating location and size of each type of cabinet and countertop, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to countertop and to walls.
- D. Samples for plastic laminate selection: Submit manufacturer's full color and pattern range.
- E. Samples for verification: Submit one 8 x 10 inch sample of each type, pattern, and color previously selected.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A. Store materials for interior woodwork indoors in air-conditioned spaces maintained within design temperature and humidity range.
- B. Protect units from moisture damage.

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

- A. During and after installation of work in this section, maintain the same temperature and humidity in building spaces as will occur after occupancy.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
  3. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.
  3. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
  4. Interior Composite Wood Products: Contain no added urea-formaldehyde resins.

#### **2.02 BASIC MATERIALS**

- A. Softwood Plywood: Grade A-C veneer interior grade with lumber core; type of glue recommended for application; and the following:
  1. Species of Veneer: Pine or as approved by the contracting Officer.
- B. Hardwood Lumber: AWI grade II Custom Grade; maximum moisture content of 5-10 percent; and the following:
  1. Species of Wood: Basswood or Yellow Poplar or as approved by Contracting Officer.
  2. Cut or Slicing of Wood: Plain sawn.
- C. Plastic Laminate: NEMA LD-3, of thickness, type and grade indicated.
  1. General Purpose Horizontal and High usage Exposure: NEMA Standard, GP50.
  2. General Purpose Vertical and Medium Usage Exposure: NEMA Standard, GP28.
  3. Post-Forming, Horizontal, Formed Radius Edges: NEMA Standard, PF42.

#### **2.03 WALL AND BASE CABINET CONSTRUCTION**

- A. Construction Style:
  1. Reveal Overlay on Face Frame Style: Provide base, wall and full height units (if any) with drawer fronts, doors and fixed panels (if any) overlaying and concealing frames and sides of cabinet bodies.

- B. Cabinet Construction:
  1. Laminate Clad Cabinets: Softwood Plywood core material with high-pressure plastic laminate facings conforming to 2.01.C.
  2. Joinery: All joints for casework construction are doweled and glued. Cabinet sides, bottoms and tops are rabbeted to accept the back panel.
- C. Component Construction:
  1. Doors: 3/4" thick plywood with GP28 on exposed face and edges.
  2. Drawer Fronts: 3/4" thick plywood with GP28 on exposed face and edges.
  3. Exposed End Panels: 3/4" plywood with GP28 on exposed face and edges.
  4. Exposed Side Panels and Stretchers: 3/4" thick plywood with GP28 on exposed face and edges.
  5. Back Panels: 1/4" plywood.
  6. Countertop: 3/4" thick plywood with GP50 on top and edges.
  7. Splash: 3/4" thick plywood with GP28 on top and edges
  8. Toe Kicks: 3/4" thick plywood with GP28 on exposed face
  9. Drawer Boxes: 3/4" thick hardwood sides, sub-front and back with 3/8" plywood bottoms. Joints are dovetail construction. The drawer sides and ends are dadoed to accept drawer bottom, which is glued in place.
  10. Exterior Finish: All visible exposed surfaces covered with GP28.
  11. Interior Finish: Factory clear finish as standard with cabinet fabricator. Submit type of finish and description of preparation and application of materials.
  12. Edging: All edges of doors, drawer fronts and cabinet cases are edged with GP28 to match panels.
  13. Semi-exposed Shelving (Within casework): 3/4" thick plywood panels with plastic laminate at front edge to match cabinet body color. (See 10.)
  14. Exposed Shelving: 3/4" thick plywood with GP28 on both faces and all edges to match.

## 2.04 HARDWARE

- A. Shelf Standards and Rests: Formed steel channels and rests, cut for fitted rests spaced at 1 inch centers; satin finish.
- B. Shelf Brackets: Formed steel brackets for attachment with lugs; satin finish.
- C. Drawer and Door Pulls: Aluminum "U" shaped pull, satin finish, 4 inches wide.
- D. Sliding Door Pulls: Oval shaped, aluminum with satin finish.
- E. Cabinet Locks: Keyed cylinder, two keys per lock, satin finish.
- F. Catches: Magnetic.
- G. Drawer Slides: Side-mounted wrap around guides, epoxy-coated steel with ball bearing/nylon rollers, self-closing. Load rated for 100 lbs.
- H. Hinges: Fully concealed, spring loaded, self-closing and fully adjustable, chrome steel finished. Provide "snap-on" feature and allow for door movement through minimum of 165 degrees.
- I. Sliding Door Track Assemblies: Galv. steel construction, ball bearing carriers fitted within tracks, multiple pendant suspension attachments for door.

## PART 3 EXECUTION

### 3.01 INSPECTION

- A. Verify adequacy of backing and support framing.

### 3.02 INSTALLATION

- A. Set and secure casework in-place rigid, plumb and level.
- B. Use purpose designed fixture attachments at concealed locations for wall-mounted components.
- C. Use threaded steel concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

- D. Carefully scribe casework against other building materials, leaving gaps of 1/32" inch max. Don't use additional overlay material for this purpose.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorage.
- F. Counter-sink anchorage devices at exposed locations used to wall mount components and conceal with solid plugs to match surrounding finish material. Finish flush with surrounding surfaces.
- G. Complete hardware installation.

### **3.03 ADJUSTING AND CLEANING**

- A. Adjust doors drawers, hardware, fixtures and other moving or operating parts to function smoothly and correctly.
- B. Clean casework, counters, shelves, hardware, fittings and fixtures.

**END OF SECTION**

## SECTION 06 61 16 SOLID SURFACING FABRICATIONS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

A. Solid surface countertops on interior casework fabrications.

#### 1.02 RELATED WORK

A. General sustainable design documentation requirements: 01 81 13 "Green Procurement".

B. Casework Fabrications: Section 06 41 00 "Architectural Wood Casework"

C. Countertop Sinks: Section 22 40 00 "Plumbing Fixtures"

#### 1.03 Applicable Publications

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

##### B. ASTM INTERNATIONAL (ASTM)

ASTM D2583	(2013a) Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D570	(1998; E 2010; R 2010) Standard Test Method for Water Absorption of Plastics
ASTM D638	(2014) Standard Test Method for Tensile Properties of Plastics
ASTM D696	(2008; E 2013) Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer
ASTM E84	(2015b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM G21	(2015) Determining Resistance of Synthetic Polymeric Materials to Fungi

#### 1.04 SYSTEM DESCRIPTION

A. Work under this section includes solid polymer (solid surfacing) fabrication as shown on the drawings and as described in this specification.

- B. In most instances, installation of solid polymer fabricated components and assemblies will require strong, correctly located structural support provided by other trades. To provide a stable, sound, secure installation, close coordination is required between the solid polymer fabricator/installer and other trades to ensure that necessary structural wall support, cabinet counter top structural support, proper clearances, and other supporting components are provided for the installation of wall panels, countertops, shelving, and all other solid polymer fabrications to the degree and extent recommended by the solid polymer manufacturer.
- C. Appropriate staging areas for solid polymer fabrications. Allow variation in component size and location of openings of plus or minus 3 mm 1/8 inch.

## **1.05 SUBMITTALS**

- A. Submit In Accordance
- B. SD-02 Shop Drawings
  - 1. Detail Drawings
  - 2. Installation
- C. SD-03 Product Data
  - 1. Solid Polymer Material
  - 2. Qualifications Fabrications
  - 3. Certification
- D. Samples
  - 1. Material
- E. Test Reports
  - 1. Solid Polymer Material SD-07
  - 2. Certificates
  - 3. Fabrications Qualifications
- F. Operation and Maintenance Data
  - Cleanup.

## **1.06 QUALITY ASSURANCE**

- A. Qualifications: To ensure warranty coverage, solid polymer fabricators shall be certified to fabricate by the solid polymer material manufacturer being utilized. Mark all fabrications with the fabricator's certification label affixed in an inconspicuous location. Fabricators shall have a minimum of 5 years of experience working with solid polymer materials. Submit solid polymer manufacturer's certification attesting to fabricator qualification approval.

B. Mock-ups: Submit Detail Drawings indicating locations, dimensions, component sizes, fabrication and joint details, attachment provisions, installation details, and coordination requirements with adjacent work.

C. Sustainable Design Certification: Product shall be third party certified by Greenguard Indoor Air Quality Certified, SCS Scientific Certification Systems Indoor Advantage or equal. Certification shall be performed annually and shall be current.

### 1.07 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to project site until areas are ready for installation. Deliver components and materials to the site undamaged, in containers clearly marked and labeled with manufacturer's name. Materials shall be stored indoors and adequate precautions taken to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation, for duration of project.

### 1.08 WARRANTY

A. Provide manufacturer's warranty of ten years against defects in materials, excluding damages caused by physical or chemical abuse or excessive heat. Warranty shall provide for material and labor for replacement or repair of defective material for a period of ten years after component installation.

## PART 2 PRODUCTS

### 2.01 MATERIAL

A. Provide solid polymer material that is a homogeneous filled solid polymer; not coated, laminated or of a composite construction; meeting IAPMO Z124.3 and IAPMO Z124.6 requirements. Material shall have minimum physical and performance properties specified. Superficial damage to a depth of 0.01 inch shall be repairable by sanding or polishing. Material thickness shall be as indicated on the drawings. In no case shall material be less than 1/4 inch in thickness. Submit a minimum 4 by 4 inch sample of each color and pattern for approval. Samples shall indicate full range of color and pattern variation. Approved samples shall be retained as a standard for this work. Submit test report results from an independent testing laboratory attesting that the submitted solid polymer material meets or exceeds each of the specified performance requirements.

B. Cast, 100 Percent Acrylic Polymer Solid Surfacing Material: Cast, 100 percent acrylic solid polymer material shall be composed of acrylic polymer, mineral fillers, and pigments and shall meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4000 psi (max.)	ASTM D638
Hardness	55-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05

High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	
1/2 inch sheet	140 inches, 1/2 lb ball, no failure	
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.1% max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	30 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

C. Acrylic-modified Polymer Solid Surfacing Material: Cast, solid polymer material shall be composed of a formulation containing acrylic and polyester polymers, mineral fillers, and pigments. Acrylic polymer content shall be not less than 5 percent and not more than 10 percent in order to meet the following minimum performance requirements:

PROPERTY	REQUIREMENT (min. or max.)	TEST PROCEDURE
Tensile Strength	4100 psi (max.)	ASTM D638
Hardness	50-Barcol Impressor (min.)	ASTM D2583
Thermal Expansion	.000023 in/in/F (max.)	ASTM D696
Boiling Water Surface Resistance	No Change	ANSI/NEMA LD 3-3.05
High Temperature Resistance	No Change	ANSI/NEMA LD 3-3.06
Impact Resistance (Ball drop)		ANSI/NEMA LD 3-303
1/4 inch sheet	36 inches, 1/2 lb ball, no failure	

1/2 inch sheet	140 inches, 1/2 lb ball, no failure	
3/4 inch sheet	200 inches, 1/2 lb ball, no failure	
Mold & Mildew Growth	No growth	ASTM G21
Bacteria Growth	No growth	ASTM G21
Liquid Absorption (Weight in 24 hrs.)	0.6% max.	ASTM D570
Flammability		ASTM E84
Flame Spread	25 max.	
Smoke Developed	100 max.	
Sanitation	"Food Contact" approval	NSF/ANSI 51

D. Material Patterns and Colors: Patterns and colors for all solid polymer components and fabrications shall be those indicated on the project drawings and color schedule Section 09 06 90. Pattern and color shall occur, and shall be consistent in appearance, throughout the entire depth (thickness) of the solid polymer material.

E. Surface Finish: Exposed finished surfaces and edges shall receive a uniform appearance. Exposed surface finish shall be matte; gloss rating of 5-20.

## 2.02 ACCESSORY PRODUCTS

- A. Accessory products, as specified below, shall be manufactured by the solid polymer manufacturer or shall be products approved by the solid polymer manufacturer for use with the solid polymer materials being specified.
- B. Seam Adhesive: Seam adhesive shall be a two-part adhesive kit to create permanent, inconspicuous, non-porous, hard seams and joints by chemical bond between solid polymer materials and components to create a monolithic appearance of the fabrication. Adhesive shall be approved by the solid polymer manufacturer. Adhesive shall be color-matched to the surfaces being bonded where solid-colored, solid polymer materials are being bonded together. The seam adhesive shall be clear or color matched where particulate patterned, solid polymer materials are being bonded together.
- C. Silicone Sealant: Sealant shall be a mildew-resistant, FDA and OSHA Nationally Recognized Testing Laboratory (NRTL) listed silicone sealant or caulk in a clear formulation. The silicone sealant shall be approved for use by the solid polymer manufacturer. Use sealant to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures.



## D. Mounting Hardware

Provide mounting hardware, including sink/bowl clips, inserts and fasteners for attachment of undermount sinks and lavatories.

### 2.03 FABRICATIONS

- A. Components shall be factory or shop fabricated to sizes and shapes indicated, to the greatest extent practical, in accordance with approved Shop Drawings and manufacturer's requirements. Provide factory cutouts for sinks, lavatories, and plumbing fixtures where indicated on the drawings. Contours and radii shall be routed to template, with edges smooth. Defective and inaccurate work will be rejected. Submit product data indicating product description, fabrication information, and compliance with specified performance requirements for solid polymer, joint adhesive, sealants, and heat reflective tape. Both the manufacturer of materials and the fabricator shall submit a detailed description of operations and processes in place that support efficient use of natural resources, energy efficiency, emissions of ozone depleting chemicals, management of water and operational waste, indoor environmental quality, and other production techniques supporting sustainable design and products.
- B. Joints and Seams: Form joints and seams between solid polymer components using manufacturer's approved seam adhesive. Joints shall be inconspicuous in appearance and without voids to create a monolithic appearance.
- C. Edge Finishing: Rout and finish component edges to a smooth, uniform appearance and finish. Edge shapes and treatments, including any inserts, shall be as detailed on the drawings. Rout all cutouts, then sand all edges smooth. Repair or reject defective or inaccurate work.
- D. Counter and Vanity Top Splashes: Fabricate backsplashes and end splashes from 1/2 inch thick solid surfacing material to be 4 inches high. Backsplashes and end splashes shall be provided [for all counter tops and vanity tops. Backsplashes shall be shop fabricated and be loose, to be field attached.
- E. End Splashes: End splashes shall be provided loose for installation at the jobsite after horizontal surfaces to which they are to be attached have been installed.
- F. Window Stools: Fabricate window stools from 1/2 inch thick solid surfacing, solid polymer material. Dimensions, edge shape, and other details shall be as indicated on the drawings.
- G. Counter and Vanity Tops: Fabricate all solid surfacing, solid polymer counter top and vanity top components from 1/2 inch thick material. Edge details, dimensions, locations, and quantities shall be as indicated on the Drawings. Counter tops shall be complete with 4 inch high loose, 90 degree transition at all locations. Attach 2 inch wide reinforcing strip of polymer material under each horizontal counter top seam. Submit a minimum 1 foot wide by 6 inch deep, full size sample for each type of counter top shown on the project drawings. The sample shall include the edge profile and backsplash as detailed on the project drawings. Solid polymer material shall be of a pattern and color as indicated on

the drawings. Sample shall include at least one seam. Approved sample shall be retained as standard for this work.

- H. Counter Top With Sink: Stainless Steel or Vitreous China Sink. Countertops with sinks shall include cutouts to template as furnished by the sink manufacturer. Manufacturer's standard sink mounting hardware for vitreous china installation shall be provided. Seam between sink and counter top shall be sealed with silicone sealant. Sink, faucet, and plumbing requirements shall be in accordance with Section 22 40 00 "PLUMBING FIXTURES".

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Components: Install all components and fabricated units plumb, level, and rigid. Make field joints between solid polymer components using solid polymer manufacturer's approved seam adhesives, to provide a monolithic appearance with joints inconspicuous in the finished work. Attach metal or vitreous china sinks and lavatory bowls to counter tops using solid polymer manufacturer's recommended clear silicone sealant and mounting hardware. Solid polymer sinks and bowls shall be installed using a color-matched seam adhesive. Plumbing connections to sinks and lavatories shall be made in accordance with Section 22 00 00 PLUMBING, GENERAL PURPOSE.
- B. Loose Counter Top Splashes: Mount loose splashes in the locations noted on the drawings. Loose splashes shall be adhered to the counter top with a color matched silicone sealant when the solid polymer components are solid colors. Use a clear silicone sealant to provide adhesion of particulate patterned solid polymer splashes to counter tops.
- C. Silicone Sealant: Use a clear, silicone sealant or caulk to seal all expansion joints between solid polymer components and all joints between solid polymer components and other adjacent surfaces such as walls, floors, ceiling, and plumbing fixtures. Sealant bead shall be smooth and uniform in appearance and shall be the minimum size necessary to bridge any gaps between the solid surfacing material and the adjacent surface. Bead shall be continuous and run the entire length of the joint being sealed.

### **3.02 CLEAN-UP**

- A. Components shall be cleaned after installation and covered to protect against damage during completion of the remaining project items. Submit a minimum of six copies of maintenance data indicating manufacturer's care, repair and cleaning instructions. Maintenance video shall be provided, if available. Maintenance kit for matte finishes shall be submitted.

End of Section 06 61 16

## **07 14 00 FLUID-APPLIED WATERPROOFING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Fluid-Applied waterproofing applied to face of masonry construction.

#### **1.02 RELATED WORK**

- A. General sustainable design documentation requirements: 01 81 13 "Green Procurement".
  
- B. Masonry Walls: Section 04 20 00

#### **1.03 APPLICABLE PUBLICATIONS**

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

- B. ASTM INTERNATIONAL (ASTM)
  - ASTM C33/C33M (2016) Standard Specification for Concrete Aggregates
  
  - ASTM C836/C836M (2015) High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course

#### **1.04 SUBMITTALS**

- A. Submit in accordance
  
- B. Product Data:
  - 1. Fluid-applied membrane.
  - 2. Primer Elastomeric sheet.
  - 3. Submit material description and physical properties, application.
  - 4. Details, and recommendations regarding shelf life, application.
  - 5. Procedures, and precautions on flammability and toxicity.

#### **1.05 PREWATERPROOFING CONFERENCE**

- A. Prior to starting application of waterproofing system, arrange and attend a pre waterproofing conference to ensure a clear understanding of drawings and specifications. Give the Contracting Officer 7 days' advance written notice of the time and place of meeting. Ensure that the mechanical and electrical subcontractor, flashing and sheet metal subcontractor, and other trades that may perform other types of work on or over the membrane after installation, attend this conference.

## **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver waterproofing materials in manufacturer's original, unopened containers, with labels intact and legible. Containers of materials covered by a referenced specification number shall bear the specification number, type, and class of the contents. Deliver materials in sufficient quantity to continue work without interruption. Store and protect materials in accordance with manufacturer's instructions, and use within their indicated shelf life. When hazardous materials are involved, adhere to special precautions of the manufacturer, unless precautions conflict with local, state, and federal regulations. Promptly remove from the site materials or incomplete work adversely affected by exposure to moisture or freezing. Store materials on pallets and cover from top to bottom with canvas tarpaulins.

## **1.07 ENVIRONMENTAL CONDITIONS**

- A. Apply materials when ambient temperature is 4 degrees C 40 degrees F or above for a period of 24 hours prior to the application and when there is no ice, frost, surface moisture, or visible dampness on the substrate surface. Apply materials when air temperature is expected to remain above 4 degrees C 40 degrees F during the cure period recommended by the manufacturer. Moisture test for substrate is specified under paragraph entitled "Moisture Test." Work may be performed within heated enclosures, provided the surface temperature of the substrate is maintained at a minimum of 4 degrees C 40 degrees F for 24 hours prior to the application of the waterproofing, and remains above that temperature during the cure period recommended by the manufacturer.

## **1.08 WARRANTY**

- A. Provide revisions or amendment to standard membrane manufacturer warranty to comply with the specified requirements. Minimum manufacturer warranty shall have no dollar limit, cover full system water-tightness, and shall have a minimum duration of 20 years.

## **PART 2 PRODUCTS**

### **2.01 FLUID-APPLIED MEMBRANE**

- A. Membrane: ASTM C836/C836M.

### **2.02 MEMBRANE PRIMER**

- A. As recommended by the fluid-applied membrane manufacturer unless specifically prohibited by the manufacturer of the fluid-applied membrane.

### **2.03 SEALANT**

- A. As recommended by the fluid-applied membrane manufacturer

### **2.04 SEALANT PRIMER**

- A. As recommended by the fluid-applied membrane manufacturer

### **2.05 BACKING MATERIAL**

- A. Premolded, closed-cell, polyethylene, or polyurethane foam rod having a diameter 25 percent larger than joint width before being compressed into joint. Provide bond breaker of polyethylene film or other suitable material between backing material and sealant.

## **2.06 JOINT FILLER**

- A. As specified in Section 03 30 00 CAST-IN-PLACE CONCRETE.

## **2.07 BOND BREAKER**

- A. As recommended by the fluid-applied membrane manufacturer. Bond breaker shall not interfere with the curing process or other performance properties of the fluid-applied membrane.

## **2.08 ELASTOMERIC SHEET**

- A. Preformed; as recommended by the fluid-applied membrane manufacturer. Bond strength between the fluid-applied membrane and the preformed elastomeric sheet shall be a minimum of 7 kPa one psi when tested in accordance with ASTM C836/C836M.

## **2.09 ELASTOMERIC SHEET ADHESIVE**

- A. As recommended by the elastomeric manufacturer.

# **PART 3 EXECUTION**

## **3.01 PREPARATION**

- A. Coordinate work with that of other trades to ensure that components to be incorporated into the waterproofing system are available when needed. Inspect and approve surfaces immediately before application of waterproofing materials. Remove laitance, loose aggregate, sharp projections, grease, oil, dirt, curing compounds, and other contaminants which could adversely affect the complete bonding of the fluid-applied membrane to the concrete surface.
- B. Flashings: Make penetrations through sleeves in concrete slab watertight before application of waterproofing. After flashing is completed, cover elastomeric sheet with fluid-applied waterproofing during waterproofing application.
- C. Drains: Make drain flanges flush with surface of structural slab. Apply a full elastomeric sheet around the drain, with edges fully adhered to drain flange and to structural slab. Do not adhere elastomeric sheet over joint between drain and concrete slab. Do not plug drainage or weep holes. Cover elastomeric sheet with fluid-applied waterproofing during waterproofing application. Lap elastomeric sheet a minimum of 100 mm 4 inches onto concrete slab.
- D. Penetrations and Projections: Flash penetrations and projections through structural slab with an elastomeric sheet adhered to the concrete slab and the penetration. Leave elastomeric sheet unadhered for 25 mm one inch over joint between penetration and concrete slab. Adhere elastomeric sheet a minimum of 100 mm 4 inches onto horizontal deck.

- E. Walls and Vertical Surfaces: Flash wall intersections which are not of monolithic pour or constructed with reinforced concrete joints with an elastomeric sheet adhered to both vertical wall surfaces and concrete slab. Flash intersections which are monolithically poured or constructed with reinforced concrete joints with either an elastomeric sheet or a vertical grade of fluid-applied waterproofing adhered to vertical wall surfaces and concrete slab. Leave sheet unadhered for a distance of 25 mm one inch from the corner on both vertical and horizontal surfaces.
  
- F. Cracks and Joints: Prepare visible cracks and joints in substrate to receive fluid-applied waterproofing membrane by placing a bond breaker and an elastomeric slip sheet between membrane and substrate. Cracks that show movement shall receive a 50 mm 2-inch bond breaker followed by an elastomeric sheet adhered to the deck. Nonmoving cracks shall be double coated with fluid-applied waterproofing.
  
- G. Priming: Prime surfaces to receive fluid-applied waterproofing membrane. Apply primer as required by membrane manufacturer's printed instruction

### **3.02 SPECIAL PRECAUTIONS**

Protect waterproofing materials during transport and application. Do not dilute primers and other materials, unless specifically recommended by materials manufacturer. Keep containers closed except when removing contents. Do not mix remains of unlike materials. Thoroughly remove residual materials before using application equipment for mixing and transporting materials. Do not permit equipment on the project site that has residue of materials used on previous projects. Use cleaners only for cleaning, not for thinning primers or membrane materials. Ensure that workers and others who walk on cured membrane wear clean, soft-soled shoes to avoid damaging the waterproofing materials.

### **3.03 APPLICATION**

Over primed surfaces, provide a uniform, wet, monolithic coating of fluid-applied membrane, 1.5 mm 60 mils thick, plus or minus 0.125 mm 5 mils by following manufacturer's printed instructions. Apply material by trowel, squeegee, roller, brush, spray apparatus, or other method recommended by membrane manufacturer. Check wet film thickness as specified in paragraph entitled "Film Thickness" and adjust application rate as necessary to provide a uniform coating of the thickness specified. Where possible, mark off surface to be coated in equal units to facilitate proper coverage. At expansion joints, control joints, prepared cracks, flashing, and terminations, carry membrane over preformed elastomeric sheet in a uniform 1.5 mm 60 mil thick, plus or minus 0.125 mm 5 mils, wet thickness to provide a monolithic coating. If membrane cures before next application, wipe previously applied membrane with a solvent to remove dirt and dust that could inhibit adhesion of overlapping membrane coat. Use solvent recommended by the membrane manufacturer, as approved.

### **3.04 FIELD QUALITY CONTROL**

- A. Moisture Test: Prior to application of fluid-applied waterproofing, measure moisture content of substrate with a moisture meter in the presence of the Contracting Officer. An acceptable device is the Delmhorst Moisture Meter, Model BD7/2E/CS, Type 21 E. Similar meters by other manufacturers, which are suitable for the purpose, may be used as approved by the Contracting Officer. Do not begin application until meter reading indicates "dry" range.
- B. Film Thickness: Measure wet film thickness every 10 square meters 100 square feet during application by placing flat metal plates on the substrate or using a mil-thickness gage especially manufactured for the purpose.

-- End of Section --

**SECTION 07 21 13:****BOARD INSULATION****PART 1 GENERAL****1.01 REFERENCES**

- A. 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.
  - 1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
    - a. ASTM D 41: Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
    - b. ASTM D 312: Standard Specification for Asphalt Used in Roofing
    - c. ASTM D 4586: Standard Specification for Asphalt Roof Cement, Asbestos-Free
    - d. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials
    - e. ASTM C1289: Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - 2. UNDERWRITERS LABORATORIES INC. (UL)
    - a. UL BMD: (1995) Building Materials Directory

**1.02 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.03 SUBMITTALS**

- A. Submit the following in accordance with section entitled "Submittal Procedures."
  - 1. Manufacturer's Catalog Data
    - a. Fasteners
    - b. Insulation
  - 2. Drawings
    - a. Tapered roof insulation system: Show a complete description of the procedures for the installation of each phase of the system indicating the type of materials, thicknesses, identity codes, sequence of laying insulation, location of ridges and valleys, special methods for cutting and fitting of insulation, and special precautions. The drawings shall be based on field measurements.
  - 3. Instructions
    - a. Nails and fasteners
    - b. Roof insulation, including field of roof and perimeter attachment requirements.
  - 4. Statements
    - a. Installer qualifications
      - 1) Requirement: Submit certificate from the insulation manufacturer attesting that the installer has the proper qualifications for installing tapered roof insulation systems.
  - 5. Test Reports
    - a. Flame spread and smoke developed ratings: Submit in accordance with ASTM E 84.

**1.04 QUALITY ASSURANCE**

- A. Insulation on Decks: Roof insulation shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E 84. Insulation bearing the UL label and listed in the UL BMD as meeting the flame spread and smoke developed ratings will be accepted in lieu of copies of test reports.

**1.05 DELIVERY, STORAGE, AND HANDLING**



- A. Delivery: Deliver materials to site in manufacturer's unopened and undamaged standard commercial containers bearing the following legible information:
  1. Name of manufacturer;
  2. Brand designation;
  3. Specification number, type, and class, as applicable, where materials are covered by a referenced specification; and
  4. Asphalt's flashpoint (FP), equiviscous temperature (EVT), and finished blowing temperature (FBT).
  5. Deliver materials in sufficient quantity to allow continuity of the work.
- B. Storage and Handling: Store and handle materials in a manner to protect from damage, exposure to open flame or other ignition sources, and from wetting, condensation or moisture absorption. Mark and remove damaged, crushed, or wet materials from the project site. Store in an enclosed building or trailer that provides a dry, adequately ventilated environment. Store felt rolls on ends. For the 24 hours immediately before application of felts, store felts in an area maintained at a temperature no lower than 50 degrees F. Replace damaged material with new material.

#### 1.06 ENVIRONMENTAL CONDITIONS

- A. Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F or when there is ice, frost, or moisture visible on the roof deck.

#### 1.07 PROTECTION OF PROPERTY

- A. Provide protection as specified.
  1. Flame-Heated Equipment: Locate and use flame-heated equipment so as not to endanger the structure or other materials on the site or adjacent property. Do not place flame-heated equipment on the roof. Provide and maintain a fire extinguisher near each item of flame-heated equipment.
  2. Protective Coverings: Install protective coverings at paving and building walls adjacent to hoist and kettles prior to starting the work. Lap protective coverings at least 6 inches, secure them against wind, and vent them to prevent collection of moisture on the covered surfaces. Keep protective coverings in place for the duration of the work with asphalt products.
  3. Special Protection: Provide special protection approved by the insulation manufacturer, or avoid heavy traffic on completed work when ambient temperature is above 80 degrees F.
  4. Dripping of Bitumen: Seal joints in and at edges of deck as necessary to prevent dripping of asphalt into building or down exterior walls.

## PART 2 PRODUCTS

### 2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

### 2.02 INSULATION

- A. Insulation Types: Roof insulation shall be the following materials and compatible with attachment methods for the specified insulation and roof membrane:
  1. Polyisocyanurate Board: ASTM C1289 (Felt-faced) Type II, Class 1, Grade 2 or (Foil-faced) Type I, Class 1, except minimum compressive strength shall be 20 pounds per square inch (psi).
  2. Composite Boards: ASTM C1289 (Polyisocyanurate-perlite), Type III.
- B. Insulation Thickness:
  1. Air-conditioned buildings. As necessary to provide a thermal resistance (R value) of 30 or more for average thickness of tapered system. Thickness shall be based on the "R" value for aged insulation.
  2. Non-airconditioned buildings. As necessary to provide a thermal resistance (R value) of 12 or more for average thickness of tapered system. Thickness shall be based on the "R" value for aged insulation.
- C. Tapered Roof Insulation: One layer of the tapered roof insulation assembly shall be factory tapered to a slope of not less than 1/4 inch per foot. Provide starter and filler blocks as required providing the total

thickness of insulation necessary to meet the specified slope and thermal conductance. Mitered joints shall be factory fabricated and shall consist of two diagonally cut boards or one board shaped to provide the required slopes. Identify each piece of tapered insulation board by color or other identity coding system, allowing the identification of different sizes of tapered insulation board required to complete the roof insulation system.

- D. Cants and Tapered Edge Strips: Provide preformed cants and tapered edge strips of the same material as the roof insulation; or, when roof insulation material is unavailable, provide pressure-preservative treated wood, wood fiberboard, or rigid Perlite board cants and edge strips as recommended by the roofing manufacturer, unless otherwise indicated. Face of cant strips shall have incline of 45 degrees and vertical height of 4 inches. Taper edge strips at a rate of 3/4 to 1 1/2 inch per foot down to approximately 1/8 inch thick.

### 2.03 BITUMENS

- A. Asphalt Primer: ASTM D41.
- B. Asphalt: ASTM D312, Type III or IV.
- C. Asphalt Roof Cement: ASTM D4586, Type I for horizontal surfaces, Type II for vertical and sloped surfaces.

### 2.04 FASTENERS

- A. Flush-driven through flat round or hexagonal steel or plastic plates. Steel plates shall be zinc-coated, flat round not less than 1-3/8 inch diameter or hexagonal not less than 28 gage. Plastic plates shall be high-density, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fastener head shall recess fully into the plastic plate after it is driven. Plates shall be formed to prevent dishing. Do not use bell-or cup-shaped plates. Minimum withdrawal resistance of fasteners from deck shall be 40 pounds (lbs) each.

### 2.05 WOOD NAILERS AND BLOCKING

- A. Pressure-preservative-treated.

## PART 3 EXECUTION

### 3.01 EXAMINATION AND PREPARATION

- A. Surface Inspection: Surfaces shall be clean, smooth, and dry. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work. The Contractor shall inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:
  - 1. In the presence of the Contracting Officer perform the following surface-dryness test on concrete substrates:
    - a. Foaming: When poured on the deck, one pint of asphalt when heated in the range of 350 to 400 degrees F, shall not foam upon contact
    - b. Strippability: After asphalt used in the foaming test application has cooled to ambient temperatures, test coating for adherence. Should a portion of the sample be readily stripped clean from surface, do not consider surface to be dry and do not start application. Should rain occur during application, stop work and do not resume until surface has been tested by method above and found dry.
- B. Surface Preparation: Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:
  - 1. Install wood nailers the same thickness as insulation at eaves, edges, curbs, walls, and roof openings for securing cant strips, gravel stops, and flashing flanges.

### 3.02 INSULATION INSTALLATION

- A. Apply insulation in two layers with staggered joints when total required thickness of insulation exceeds 1/2 inch. Lay insulation so that continuous longitudinal joints are perpendicular to direction of felts for the built-up roofing and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface.

1. Installation Using Asphalt: Firmly embed each layer in solid asphalt mopping; mop only sufficient area to provide complete embedment of one board at a time. Provide 20 to 35 lbs of asphalt per 100 square feet of roof deck for each layer of insulation. Apply asphalt when temperature is within plus or minus 25 degrees F of EVT. Do not heat asphalt above asphalt's FBT or 525 degrees F, whichever is less, for longer than 4 consecutive hours. Use thermometers to check temperatures during heating and application.
2. Installation Using Only Mechanical Fasteners; Secure total thickness of insulation with penetrating type fasteners.
3. Special Precautions for Installation of Foam Insulation
  - a. Polyisocyanurate Insulation: Where Polyisocyanurate foam board insulation is provided, install 3/4 inch thick expanded Perlite board insulation over top surface of foam board insulation. Stagger joints of insulation with respect to foam board insulation below.
4. Cant Strips: Where indicated, provide cant strips at intersections of roof with walls, parapets, and curbs extending above roof. Wood cant strips shall bear on and be anchored to wood blocking. Fit cant strips flush against vertical surfaces. Where possible, nail cant strips to adjoining surfaces. Where cant strips are installed against non-nailable materials, install in heavy mopping of asphalt or set in a heavy coating of asphalt roof cement.
5. Tapered Edge Strips: Where indicated, provide edge strips in the right angle formed by junction of roof and wood nailing strips that extend above level of roof. Install edge strips flush against vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, install in heavy mopping of asphalt or set in heavy coating of asphalt roof cement.

### **3.03 PROTECTION**

- A. Protection of Applied Insulation: Completely cover each day's installation of insulation with the finished roofing specified on same day. Do not permit phased construction. Protect open ends of each day's work with temporary water cutoffs, and remove when work is resumed. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Do not permit storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, as necessary, to distribute weight to conform to a 20-psf live load limit.
- B. Damaged Work and Materials: Restore work and materials that become damaged during construction to original condition or replace with new materials.

**END OF SECTION**

**SECTION 07 21 16:****BLANKET INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Batt insulation and vapor barrier in exterior wall and ceiling construction.
- B. Batt insulation for filling perimeter window and door shim spaces, crevices in exterior wall and roof.
- C. Batt or roll insulation (un-faced) for sound control at interior wall and ceiling spaces.

**1.02 REFERENCES**

- A. ASTM C665 – Standard Specification Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- B. ASTM E-84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM C991 – Standard Specification for Fibrous Glass Insulation for Metal Buildings
- D. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Materials of this Section shall provide continuity of thermal barrier and vapor barrier at building enclosure elements.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.05 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on product characteristics, performance criteria, limitations, tested "R" values, and other pertinent data.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

**1.06 COORDINATION**

- A. Coordinate work with other trades. Take care to prevent damage to other work.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

**2.02 ACCEPTABLE MANUFACTURERS - INSULATION MATERIALS**

- A. Batt and Roll Insulation:
  1. Celotex, Certain Teed, Manville Building Products Group, Owens-Corning Fiberglass, Schuller.
- B. Metal Building Roof & Wall Insulation:
  1. Energy Miser by Insulation Corporation of America, Simple Saver by Thermal Design, Suspend-R by Schuller.
- C. Substitutions: Under provisions of Section 01 00 00.

**2.03 MATERIALS**

- A. Batt and Roll Insulation: Unfaced, preformed glass fiber bat/roll used for sound control, ASTM C665, Type 1.
- B. Metal Building Wall Insulation: Combination roll/batt installation (ASTM C991, Type I) with highly reflective white, heavy-duty reinforced, facing/vapor barrier. Facing/vapor barrier perm rating shall be not more than 0.025 grains per hour per square foot based on ASTM E96, procedure B. Special applications that require that the facing not function as a vapor barrier shall be perforated with 3/16" minimum diameter holes spaced no greater than 4" on center in each direction. UL flame spread classification of 25 or less and smoke density of index of 50 or less based on ASTM E84. An insulation system specifically designed for application between the wall girts of a pre-engineered metal building. System provides for full width and thickness of insulation between girts without voids, gaps or sags. **(Standard metal building roof insulation does not qualify for this application)**
- C. Metal Building Roof Insulation: Combination roll/batt installation (ASTM C991, Type I) with highly reflective white, heavy-duty reinforced, facing/vapor barrier. Facing/vapor barrier perm rating shall be not more than 0.025 grains per hour per square foot based on ASTM E96, procedure B. UL flame spread classification of 25 or less and smoke density of index of 50 or less based on ASTM E-84. An insulation system specifically designed for application between or below the roof purlins of a pre-engineered metal building. System provides for full width and thickness of insulation between or below purlins, without voids, gaps or sags. **(Standard metal building roof insulation does not qualify for this application)**
- D. Tape: Polyester self-adhering type or as required by insulation manufacturer, 2 inch wide.

**2.04 THERMAL REQUIREMENTS**

- A. Overall thermal resistance (insulation only):
  1. Interior Walls: R-13 (3.5"-4" wall thickness), Sound-Control @ Offices see Room Finish Schedule.
  2. Exterior Stud Walls: R-19 (6" wall thickness), Admin/Office Facilities
  3. Exterior Walls: R-19, Pre-Engineered Metal Buildings (PEMB).
  4. Roof: R-30, Pre-Engineered Metal Buildings (PEMB).
  5. Ceilings Under Vented Attic Spaces: R-38.

**2.05 SOUND CONTROL**

- A. Sound control @ interior studwalls, see drawings Room Finish Schedule. Fiction-fit & un-faced fiberglass batt or roll insulation, full thickness of studwall.
- B. Sound control @ ceiling of rooms, see drawings Room Finish Schedule. Un-faced fiberglass batt or roll insulation, 12" thick.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

**3.02 INSTALLATION**

- A. Exterior Walls: Install in accordance with insulation manufacturer's instructions without gaps or voids.
- B. Interior Walls: Install in accordance with insulation manufacturer's instructions without gaps or voids.
- C. Exterior Wall PEMB: Install horizontally between the girts in accordance with manufacturer's instructions without gaps or voids. Facing/vapor barrier shall be installed over the face of the girts before or after

installation of insulation. (If installed after insulation, secure insulation to girts in a manner acceptable to the Construction Inspector) Secure facing to girts with metal straps @ 4 feet o/c maximum spacing. Screw straps to face of girts.

- D. Roof PEMB: Install horizontally between the purlins in accordance with manufacturer's instructions without gaps or voids. Facing/vapor barrier shall be installed over the face of the girts before installation of insulation. Secure facing to girts with metal straps @ 4 feet o/c maximum spacing. Screw straps to face of girts.
- E. Vented Attic Spaces: Install batt or roll insulation between framing members prior to installation of gypsum board ceiling. Vapor barrier to warm side of building.
- F. Trim insulation neatly to fit spaces. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.
- G. Install with factory applied membrane facing warm side of building spaces. Lap ends and sides flanges of membrane over framing members.
- H. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.

**END OF SECTION**

**SECTION 07 52 19 SELF-ADHERING MODIFIED BITUMINOUS MEMBRANE ROOFING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Self-sealing, self-healing, fully adhered air and vapor barrier.

**1.02 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate detail at openings and base of wall. Provide product data for membrane, mastic and surface conditioner.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with manufacturer's recommendations.
- B. Verify compatibility with sealants to be used.

**1.05 QUALIFICATIONS**

- A. Fabricator and Installer: Company specializing in flashing work with three years experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
- B. Material shall be delivered in original, unopened containers with the product information clearly visible.
- C. Materials shall be stored such that the material shall remain dry and temperatures shall not exceed 100 degrees.
- D. Do not double stack pallets of cartons.

**1.07 COORDINATION**

- A. Coordinate work under provisions of Section 01 00 00.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

**2.02 MATERIALS**

- A. Manufacturer's standard composite flashing product consisting of a pliable and highly adhesive rubberized asphalt compound, minimum 26 mils thick, bonded completely and integrally to a high-density, cross-laminated polyethylene film, minimum 4 mils thick, to produce an overall thickness of minimum 30 mils.
- B. Surface Conditioner/Primer: Provide manufacturer's standard product or product recommended by manufacturer for bonding membrane flashing to concrete or masonry.
- C. Termination mastic: Provide manufacturer's standard rubberized asphalt-based mastic for sealing membrane terminations and punctures.
- D. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Perm-A-Barrier Wall Flashing; Grace: W.R. Grace & Co.
  - 2. Polyguard 300; Polyguard Products, Inc.
  - 3. Miradri 400VB; Mirafi Moisture Protection Products.
- E. Substitutions: Under provisions of Section 01 00 00.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine conditions, with installer present, for compliance with requirements for installation tolerances and other specific conditions.

#### **3.02 PREPARATION**

- A. Remove all deleterious materials from surfaces to receive adhered membrane vapor barrier and flashing.
- B. After precipitation, allow a minimum of 24 hours drying time before installation.

#### **3.03 INSTALLATION**

- A. Apply surface conditioner by spray, brush or roller at rate recommended by manufacturer. Allow conditioner to dry completely before installation of membrane. Let dry until conditioner cannot be rubbed off. If conditioned areas are not covered that day, recondition area.
- B. Precut pieces of membrane to largest easily handled lengths for each location.
- C. Remove release paper and position carefully before placing against the surface.
- D. When properly positioned, place the membrane against the substrate using a hand roller. Fully adhere flashing to substrate to prevent water from migrating under the flashing.
- E. Overlap adjacent pieces of membrane two inches and roll all overlaps with a steel hand roller.
- F. Trim bottom edge of flashing pieces 1/2 inch back from the exposed face of building.
- G. At heads, sills and other horizontal terminations of membrane, turn up ends a minimum of two inches, cut and make careful folds to form a pan and seal with mastic.
- H. Apply a bead or trowel coat of mastic along top edges, seams, cuts and penetrations.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspection will involve surveillance of work during installation to verify compliance with specified requirements.

#### **3.05 CLEANUP**

- A. Upon completion of work, remove all trash, shipping cartons, construction debris, etc. and dispose of off-site.
- B. Clean all membrane flashing and make minor repairs to damaged surfaces.



**END OF SECTION**

## SECTION 07 54 23 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

#### 1.02 RELATED WORK

- A. General sustainable design documentation requirements: 01 81 13 "Green Procurement".
- B. Roof Insulation: Section 07 21 13 "Board Insulation".
- C. Sheet metal components and wind uplift requirement for roof-edge design: Section 07 62 00 "Sheet Metal Flashing and Trim"

#### 1.03 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):  
ANSI/SPRI ES-1-03 Wind Design Stand for Edge Systems Used with Low Slope Roofing Systems.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):  
ASCE/SEI-7-10 Minimum Design Loads for Buildings and Other Structures.
- D. ASTM International (ASTM):  
D6878-01 Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.  
E108-10 Standard Test Methods for Fire Tests of Roof Coverings

#### 1.04 PERFORMANCE REQUIREMENTS

- A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

#### 1.05 QUALITY CONTROL

- A. Installer Qualifications:
  1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
  2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.
- B. Inspector Qualifications:  
Inspection of work by third-party technical inspector or technical representative of manufacturer experience in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and

approved by the manufacturer to issue warranty certifications. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
  2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.
- C. Product/Material Requirements:
1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.
- D. Roofing system design standard requirements
1. Recommendations of ANSI/SPRI ES-1 for roof edge design.
  2. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressures indicated on the drawings. Provide wind load calculations and submit signed and sealed engineering calculations and substantiating data to validate wind resistance of any non-rated roof system. Base wind uplift calculations design wind speeds indicated on the drawings in accordance with ASCE7. Submit engineering calculations validating the wind resistance of roof system.
- E. Pre-Roofing Meeting:
1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attending by the Roofing Inspector, Material Manufacturer's Technical Representative, Roofing Applicator, Contractor, and Contracting Officer.
  2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
  3. Inspect roof deck at this time to:
    - a. Verify that work of other trades which penetrates roof deck is completed.
    - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
    - c. Examine samples and installation instructions of manufacturer.

## 1.06 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, "Shop Drawings, Product Data, Samples".
- B. Product Data:
  1. Adhesive materials.
  2. Membrane sheet roofing and flashing membrane.
  3. Roofing cement.
  4. Fastening requirements.
  5. Application instructions.
  6. Engineering calculations, signed/sealed.
- C. Shop Drawings: Include plans, sections, details, and attachments.

1. Base flashing and terminations.
- D. Warranty: As specified.
- E. Documentation of supervisors' and inspectors' qualifications.
- F. Field reports of roofing inspector.
- G. Contract Close-out Submittals:
  1. Maintenance Manuals.
  2. Warranty signed by installer and manufacturer.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to single ply membrane roofing for storage, handling and installation.

#### **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Environmental Controls: Refer to Section 01 56 00, "Environmental Protection"
- C. Protection of interior spaces: Refer to Section 01 00 00, "General Requirements".

#### **1.09 WARRANTY**

Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to 10 years.

### **PART 2 PRODUCTS**

#### **2.01 TPO MEMBRANE ROOFING**

- A. TPO Sheet: ASTM D6878, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick, no backing.
  1. Color: White.

#### **2.02 ACCESSORIES**

- A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.
- B. Bonding Adhesive: Manufacturer's standard, water based.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.
- E. Miscellaneous Accessories: Provide sealers, preformed flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

**2.03 ADHESIVE AND SEALANT MATERIALS:**

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
  - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine substrates and conditions with roofing Installer and roofing Inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
- B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

**3.02 PREPARATION**

- A. Complete roof deck construction prior to commencing roofing work:
  - 1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
  - 2. Complete deck and insulation installation to provide designed drainage to working roof drains.
  - 3. Document installation of related materials to be concealed prior to installing roofing work.
- B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.
- C. Sweep decks to broom clean condition. Remove all dust, dirt, or debris.
- D. Remove projections that might damage materials.

**3.03 TEMPORARY PROTECTION**

- A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
- B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
- C. Provide for removal of water or drainage of water away from the work.
- D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

**3.04 INSTALLATION, GENERAL**

- A. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.
- B. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.
- C. Installation Conditions:
  - 1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
  - 2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
  - 3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered on installed:
    - a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
    - b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

### 3.05 INSTALLATION OF TPO ROOFING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with TPO.
- B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. Commence installation at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas. Allow for relaxing before proceeding.
  - 1. Lap edges and ends of sheets 50 mm (two inches) or more as recommended by the manufacturer.
  - 2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434.
  - 3. Check seams to ensure continuous adhesion and correct defects.
  - 4. Finish edges of laps with a continuous beveled bead of sealant to sheet edges to provide smooth transition.
  - 5. Finish seams as the membrane is being installed (same day).
  - 6. Anchor perimeter to deck or wall as specified.
- F. Repair areas of welded seams where samples have been take or marginal welds, bond voids, or skips occur.
- G. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (four inches) beyond cut.
- H. Adhered System:
  - 1. Apply adhesive in quantities required by roof membrane manufacturer.
  - 2. Fold sheet back on itself after rolling out and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.

3. After adhesive has set according to adhesive manufacturers application instruction, roll the membrane into the adhesive in a manner that minimizes voids and wrinkles.
4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

### **3.06 INSTALLATION OF FLASHING**

- A. Install flashing as the membrane is being installed. If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.
- B. Flashing Roof Drains:
  1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
    - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal frame.
    - b. Do not allow the roof cement to come in contact with the TPO roof membrane.
    - c. Adhere the TPO roof membrane to the metal flashing with the membrane manufacturer's recommended adhesive.
  2. Turn down the metal drain flashing and TPO roof membrane into the drain body and install clamping ring and strainer.
- C. Installing TPO Base Flashing and Pipe Flashing:
  1. Install TPO flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (four inches) on roof membrane.
    - a. Adhere flashing to pipe, wall or curb with adhesive.
    - b. Form inside and outside corners of TPO flashing membrane in accordance with NRCA manual. Form pipe flashing in accordance with NRCA manual use pipe boot.
    - c. Lap ends not less than 100 mm (four inches).
    - d. Heat weld flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
  2. Anchor top of flashing to walls or curbs with fasteners spaced not over 200 mm (eight inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.
  3. Apply sealant to top edge of flashing.
- D. Repairs to membrane and flashings:
  1. Remove sections of TPO sheet roofing or flashing that is creased, wrinkled, or fishmouthed.
  2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (four inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing. Finish edge of lap with sealant as specified.

### **3.07 FIELD QUALITY CONTROL**

- A. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of 5 full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports.
  1. Examine and probe seams in the membrane and flashing in the presence of Resident Engineer and Membrane Manufacturer's Inspector.
  2. Probe edge of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal welds, voids, skips, and fishmouths.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
  1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

- C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
  - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

### **3.08 PROTECTING AND CLEANING**

- A. Protect membrane roofing system from damage and wear during remained of construction period.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.
- C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

**END OF SECTION**



## SECTION 07 61 00 PREFORMED ROOFING, WALL SIDING AND ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Preformed, prefinished "Galvalume" roofing and aluminum roofing, wall siding and associated integral flashings, trim and underlayment. The completed roof installation shall meet UL 90 Uplift as a minimum.
- B. Prefinished "Galvalume" and aluminum counterflashings.
- C. Prefinished "Galvalume" and aluminum gutters and downspouts.
- D. Preformed, prefinished "Galvalume" and Aluminum Fascia Panels.
- E. Light-gauge galvanized steel, sloped retrofit roof structure over existing roof structure.

#### 1.02 REFERENCES

- A. AISC - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.
- B. ASTM A36 - Structural Steel.
- C. ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.
- D. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.
- E. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- F. ASTM A386 - Zinc-coating (Hot-Dip) on Assembled Steel Products.
- G. ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- H. ASTM A490 - Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.
- I. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- J. ASTM A501 - Hot Formed Welded and Seamless Carbon Steel Structural Tubing.
- K. ASTM A525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
- L. ASTM A529 - Structural Steel with 42,000 psi (290 MPa) Minimum Yield Point.
- M. ASTM A572 - High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality.
- N. ASTM A792 - Steel Sheet, Aluminum-Zinc Coated "Galvalume".
- O. AWS A2.0 - Standard Welding Symbols.
- P. AWS D1.1 - Structural Welding Code.
- Q. FS HH-I-558 - Insulation, Blocks, Boards, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe Fitting Covering, Thermal (Mineral Fiber, Industrial Type).
- R. SSPC - Steel Structures Painting Council.
- S. ASTM E1592 – Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure.
- T. ASCE 7-98 – Minimum Design Loads for Buildings and Other Structures.

- U. AISC-MB Certification
- V. ASTM E 1637 – Aluminum Panel Systems
- W. CRRC Cool Roof Rating Council – [www.coolroof.org](http://www.coolroof.org)
- X. USGBC LEED V3.0 – [www.usgbc.org/leed](http://www.usgbc.org/leed)
- Y. ASTM E1980 - 11 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
- Z. ASTM E903-96 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- AA. ASTM E408 - 71(2008) Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- BB. ASTM E1918 - 06 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
- CC. ASTM C1371 - 04a(2010)e1 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emisometers

### 1.03 SYSTEM DESCRIPTION

- A. Soffit System: Preformed and factory prefinished galvanized steel or aluminum sheet, perforated soffit panels of manufacturers standard profile, with required framing/anchorage assembly, insulation, and accessory components. (Manufacturer's standard perforated metal siding is not acceptable.)
- B. Wall Siding System: Preformed and factory prefinished "Galvalume" steel sheet panels or aluminum panels of manufacturers standard profile, with required framing/anchorage assembly, insulation, and accessory components.
- C. Roof and Fascia System: Preformed and factory prefinished "Galvalume" steel sheet or aluminum sheet, standing seam roof/fascia panels, metal gutters with exposed downspouts as shown on the drawings, low profile screened venting ridge or low profile non-venting ridge, insulation and thermal blocking between roof sheets and structural elements, and accessory components. **Roof and fascia panels that are field formed at the construction site are not acceptable unless the manufacturer of the rolling machine provides a warranty meeting the requirements of 1.13.B below.**
- D. Roof Slope: 3 inches in 12 inches, unless shown otherwise.
- E. Thermal Insulation, see Section 07 21 13 & 07 21 16.

### 1.04 DESIGN REQUIREMENTS

- A. Roof system, wall system, etc., shall be designed to withstand dead loads and design loads due to pressure and suction (uplift) of wind, 140 mph, in accordance with ASCE 7-98, and the above references.
- B. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.
  1. Load Calculations: Submit load calculations for the following verifying that the system supplied meets the design loads indicated. Coordinate calculations with the manufacturer's test results.
    - a. Wind load uplift design pressure at roof locations specified.
    - b. Clip spacing and allowable load per clip calculations.
    - c. The fastening of clips to structure or intermediate support spacing.
    - d. Intermediate support spacing and fastening to structure when required.
    - e. Allowable panel span at anchorage spacing indicated.
    - f. Safety factor used in determining loading.

- C. Exterior roof system and wall system shall withstand imposed loads with maximum allowable deflection of span: 1/180.
- D. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140. Provide drainage to exterior for water entering or condensation occurring within roof system.
- E. Assembly to permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 100 degrees F.
- F. Size and fabricate roof system and wall system free of distortion or defects detrimental to appearance or performance.
- G. Cool Roof requirements: Metal roof systems shall be designed to meet or exceed the minimum requirements:
  - 1. Solar Reflectance three year aged value per CRRC: 32
  - 2. Thermal Emittance three year aged value per CRRC: 90
  - 3. Solar Reflective index (SRI) per USGBC LEED V3.0 Credit
    - a. Low slope roof equal or greater than 2:12 roof pitch: SRI = 78
    - b. Steep slope roof greater than 2:12 roof pitch: SRI = 29.

### 1.05 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Roofing and Siding:
  - a. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, all flashing conditions, terminations, installation details, component dimensions, trim shapes, and manufacturer's written installation instructions. **The roofing manufacturer must prepare the shop drawings.**
  - b. Product Data: Provide manufacturer's data on metal types, finishes, characteristics, roof and siding panel certification and other information as may be requested by the Contracting Officer.
  - c. Submit one sample 12" x 12" size illustrating metal finishes color.
  - d. Manufacturer's Installation Instructions: Indicate preparation requirements, assembly sequence, etc.
  - e. CRRC Rated Product ID and certificate.
- C. Coordination Drawings: Roof plans, drawn to scale, based on input from installers of the items involved.
- D. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of meeting performance requirements.
- E. Product test reports.
- F. Field quality-control reports.
- G. Maintenance data.
- H. Warranties: Samples of warranties specified.

### 1.06 QUALITY ASSURANCE

- A. Provide preformed roof, fascia and siding panel systems, which have been pretested and certified by the manufacturer to provide resistance to air and water infiltration and structural deflection and failure in accordance with paragraph 1.04 Design Requirements.
- B. Prior to issuance of the warranties, the roofing manufacturer's representative shall inspect the installation and provide the Contracting Officer a written report as to the quality of the installation. All work identified as being not acceptable to the manufacturer's representative, shall be corrected. Upon completion of the corrected work and acceptance by the manufacturer's representative, the representative shall provide the Contracting Officer a written report indicating that all defective work has been corrected and that the warranties will be issued. The written report shall be attached to the roof system warranty.

### 1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.
- B. Installer: Subcontractor specializing in erection of pre-engineered metal building systems with a minimum of three years documented experience and approved by the metal building manufacturer.
- C. Design Work under direct supervision of a Professional Structural Engineer experienced in design of this work. Structural design drawings and documents shall be signed, sealed and dated by a Professional Structural Engineer currently licensed in the State of Florida.

#### **1.08 STORAGE BUILDINGS IN THE MUNITIONS STORAGE AREA:**

- A. Storage buildings in the Munitions Storage Area to receive new roofing and siding shall comply with this specification with the following exceptions:
  - a. Roof, wall and fascia colors shall be selected from the manufacturer's standard range of colors. The color shall be "Light Tan".
  - b. Overhangs are not required.
  - c. Provide manufacturer's standard gutters, rake trim, downspouts, etc. Provide pre-cast concrete splash blocks at each downspout.
  - d. Roof Slope: Existing.

#### **1.09 WARRANTIES**

- A. General Warranty Kynar Finish (Roof, Fascia and Wall Siding): Submit three copies of manufacturer's written warranty providing twenty (20) year guarantee that exterior pre-finished color coated surfaces of wall siding, fascia, or roof panels will not chip, crack, craze, blister, or peel, and without chalking in excess of 8 (ASTM D659) and without fading (color change) in excess of 5 NBS units for the same time period. Include coverage for weather-tightness of building enclosure after installation. Warranty shall commence on the date of acceptance by the Contracting Officer.

#### **1.10 ROOF SYSTEM PERFORMANCE WARRANTY**

- A. Submit two copies of the manufacturer's written warranty providing twenty (20) year guarantee, commencing on the date of acceptance by the Government, that the entire roofing system including but not limited to sub-framing, roof panels, fascia panels, flashings, gutters and downspouts, curb, etc. will not leak for the same time period. Manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period. The warranty shall be issued directly to the Government.
- B. Roof and fascia panels that are rolled and formed at the construction site must be warranted for a period of twenty years as per the above paragraph. The manufacturer of the rolling machine must provide the Roof System Warranty. In lieu of the warranty provided by the rolling machine manufacturer, the warranty may be provided by an independent entity that routinely provides warranties of this type. The form of the warranty must be acceptable to the government.
- C. Special Warranty on Panel Finishes: Manufacturer's warranty in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Finish Warranty Period: 20 years from date of Government acceptance of the work. The warranty shall be issued directly to the Government.

#### **1.11 PRIME CONTRACTOR / INSTALLER WARRANTY**

- A. Submit two copies of written warranty providing two (2) year guarantee against defects in the installation, workmanship and materials, leaking (see paragraph 1.12 & 1.13) and further guarantee the installation to be in accordance with manufacturer's instructions. Warranty shall commence on the date of acceptance by the Contracting Officer.

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS: WALL SIDING SYSTEM**

- A. Sheet Steel Stock: ASTM A792 Galvalume AZ55 coating, factory pre-finished.

- B. Pre-finished wall panels, corner trim, sill flashing, etc., **within one-half mile of Santa Rosa Sound** shall be 0.040 aluminum, factory pre-finished. Verify location of building with Base Civil Engineer.
- C. Joint Seal Gaskets: Manufacturer's standard type.
- D. Fasteners: Manufacturer's standard type, stainless steel, finishes to match adjacent surfaces when exposed to the exterior/weather. Fasteners not exposed to the exterior/weather shall be manufacturer's standard type, galvanized to ASTM A386 2.0 oz/sf finish.
- E. Bituminous Paint asphaltic type.
- F. Sealant: One or two-part high performance urethane type, non-staining, elastomeric, skinning.

## 2.02 MATERIALS: FASCIA AND ROOF SYSTEM

- A. Sheet Steel Stock: ASTM A792 Galvalume AZ55 coating, factory pre-finished.
- B. Pre-finished roofing panels, flashings, fascia panels, soffit panels, ridge caps, etc., **within one-half mile of Santa Rosa Sound** shall be 0.040 aluminum, factory pre-finished. Verify location of building with Base Civil Engineer.
- C. Joint Seal Gaskets: Manufacturer's standard type.
- D. Fasteners: Manufacturer's standard type, stainless steel, finishes to match adjacent surfaces when exposed to the exterior/weather. Fasteners not exposed to the exterior/weather may be manufacturer's standard type, galvanized to ASTM A386 2.0 oz/sf finish.
- E. Clips: Clips shall be heavy duty stainless steel, and able to accommodate simultaneous horizontal and vertical movement due to thermal and wind loading.
- F. Underlayment: ASTM D226, asphalt saturated felt as indicated on the drawings, or if not indicated on the drawings, a minimum of # 15; or spray applied waterproof membrane as indicated on the drawings..
- G. Bituminous Paint asphaltic type.
- H. Sealant: Manufacturer's standard gun grade, one or two part high performance urethane type, non-staining elastomeric, skinning; or silicone sealant as indicated on the drawings.
- I. Equipment Curbs. Factory pre-formed one piece curbs, welded construction, with integral water deflecting cricket, minimum 3" attachment flanges, minimum 8" high curbs and built-in rib configurations designed to fit the specific panel to which they will mount. . Curbs must be fabricated from galvalume coated steel sheet compatible with the roof panels. They must provide a watertight seal.

## 2.03 FABRICATION

- A. FASCIA, WALL SIDING AND ROOF SYSTEMS, STEEL
  1. Fascia: Same panel as standing seam roofing below. Roof seams and fascia seams shall be in alignment. (Gable end wall panels same as fascia.)
  2. Standing Seam Roofing: Structural architectural panel, steel minimum 24 gage metal thickness; mechanically seamed to adjacent panels and roof clips, manufacturer's standard profile not to exceed 18" center to center of seams, lapped edges fitted with continuous gaskets. Roofing shall be continuous lengths from eave edge to ridge. (Trapezoidal structural standing seam panels are not acceptable)
  3. Soffit Panels: Minimum 26 gage metal thickness, manufacturer's standard soffit panel profile, perforated for ventilation. (Perforated wall siding is not acceptable.)
  4. Wall Siding Panels/Girts: Minimum 26 gauge metal thickness, manufacturer's standard profile. **Flush girts required at buildings to receive pre-formed metal wall siding and/or liner panels.**
  5. Purlins, Eave Struts and other Miscellaneous Structural Shapes: Rolled formed structural shape to receive siding, standing seam roofing sheet.
  6. Internal and external Corners: Same material thickness and finish as adjacent material, profile brake formed with hemmed edges, factory mitered to required angles.
  7. Expansion Joints: Same material and finish as adjacent material, manufacturer's standard brake formed type, of profile to suit system.

8. CRRC Rated Product ID and certificate.
- B. FASCIA, WALL SIDING AND ROOF SYSTEMS, ALUMINUM
    1. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
    2. Thickness: Minimum 0.040 inch.
    3. Surface: Smooth with raised intermediate ribs for added stiffness.
    4. Exposed Coil-Coated Finish:
      - a. 3-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Minimum total dry film nominal thickness of 2.0 mils.
    5. Concealed Finish: White or light-colored acrylic or polyester backer finish.
  - C. Miscellaneous Flashings, Valley Flashings, Closure Pieces, In-fills, Vents, Stacks, Caps, and Special Trim Shapes.
    1. Same material and finish as adjacent material, profile to suit system or formed as detailed. Gauges of metals shall be as recommended by SMACNA for the specific application, and/or manufacturer's written recommendations.
  - D. Fasteners: To maintain load requirements, and weathertight installation, same finish as cladding, non-corrosive type. (See above)
  - E. Ridge Vent: Same material and finish as adjacent material, manufacturer's standard low profile to suit roof system, complete with insect screen.
  - F. Ridge Cap: Same material and finish as adjacent material, manufacturer's standard low profile to suit roof system.
  - G. Gutters & downspouts:
    1. Exposed gutters and downspouts on Storage Buildings in Munitions Storage Area. See 1.11. above.
      - a. Fabricate gutters of same material and finish as roofing metal.
      - b. Form gutters to profile and size indicated, or as required to safely collect and remove water. Size of gutter based on 3.5" per hour rainfall intensity, 60-minute duration, 10-year frequency.
      - c. Exposed downspouts shall be constructed from the same materials as roofing metal. Terminate downspouts at pre-cast concrete splash blocks. Number and size of downspouts shall be adequate to dispose of roof runoff without overflowing the gutter.
      - d. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion and provide expansion at joints.
      - e. Fabricate downspout support straps of same material and finish as roofing metal.
    2. Exposed gutters and downspouts. (Not required on one-story buildings except as noted on the drawings).
      1. Fabricate gutters of same material and finish as roofing metal.
      2. Form gutters to profile and size indicated, or as required to safely collect and remove water. Size of gutter based on 3.5" per hour rainfall intensity, 60-minute duration, 10-year frequency.
      3. Construct concealed downspouts from 6" minimum diameter PVC. Number of downspouts shall be adequate to dispose of roof runoff without overflowing gutter. Attach flanged PVC fittings, etc. to the bottom of the gutter and connect to the downspout(s). Route concealed downspouts to exterior enclosure. See drawings for location of concealed downspouts. Terminate downspouts at pre-cast concrete splash blocks.
      4. Form sections in maximum possible lengths. Hem exposed edges. Allow for expansion and provide expansion at joints.
      5. Line interior of built-in gutters with elastomeric roofing membrane.
  - H. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
    1. Thickness: Minimum 0.040 inch.
    2. Surface: Smooth with raised intermediate ribs for added stiffness.
    3. Exposed Coil-Coated Finish: 3-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not

- less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Minimum total dry film nominal thickness of 2.0 mils.
4. Concealed Finish: White or light-colored acrylic or polyester backer finish.
- I. Panel Sealants:
    1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch wide and 1/8 inch thick.
    2. Joint Sealant: ASTM C 920; as recommended in writing by metal roof panel manufacturer.
    3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
- 2.04 UNDERLAYMENT MATERIALS**
- A. Felts: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.
  - B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.
- 2.05 MISCELLANEOUS MATERIALS**
- A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
    1. Profile: Vertical-rib, snap-joint or rolled joint, as indicated on Drawings.
    2. Material: Aluminum sheet, 0.040 inch thick.
    3. Exterior Finish: 3-coat fluoropolymer.
      - a. Color: As selected by Contracting Officer from manufacturer's full range.
      - b. Clips: Stainless Steel floating to accommodate thermal movement.
      - c. Joint Type: As standard with manufacturer. Rolled joint type.
    4. Panel Coverage: 12 -18 inches
    5. Panel Length: One piece with no joints except at ridges.
- 2.06 ACCESSORIES**
- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for
    - a. complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
      1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
      2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
      3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- 2.07 FABRICATION**
- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
  - B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
  - C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

## 2.08 FINISHES

- A. Wall Siding Components and Accessories:
  1. Provide factory finished full-strength 70% "Kynar 500" coating baked on for 15 minutes at 450 degree F (232 degree C), 30% reflective gloss (ASTM D523), over minimum 0.3 mil baked on epoxy primer at exterior (weather) side. Total dry film thickness of 1.0 minimum.
- B. Roof and Fascia Roof Components and Accessories:
  1. Factory finished full-strength 70% "Kynar 500" coating baked on for 15 minutes at 450 degree F (232 degree C), 30% reflective gloss (ASTM D523), over minimum 0.3 mil baked on epoxy primer. Total dry film thickness of 1.0 minimum.

## 2.09 COLORS: (See 1.11 for exception)

- A. The following colors shall be applied to the various components to be incorporated into the project. Items to be field finished shall conform to colors indicated or to the actual color of the prefinished item(s) supplied by the manufacturer.
  1. Roof panels, fascia, gutters, soffits, low profile ridge vents, or low profile ridge cap, flashings, vents, equipment, trim and miscellaneous shapes in the plane of the roof; color "Medium Bronze".
  2. Exterior personnel doors and door frames; "Dark Bronze" at Main Entry, match wall siding at other doors.
  3. Exterior windows and frames; "Dark Bronze".
  4. Louvers and louver frames; "Match Color of Wall".
  5. Wall siding/components/accessories shall be selected from the manufacturer's standard colors, and shall match as close as possible, Devoe 2M54E, "Tortoise Shell". If a custom color is indicated on the drawings, supplier shall provide in his proposal, the cost difference if any, between the "standard" color and the "custom" color.
- B. Interior Surfaces of Wall Siding, Fascia, Roof Components and Accessories: Pre-coated enamel steel, modified silicone finish, color white.
- C. Vinyl Vapor Barrier at Exposed Interior Face of Insulation: White. (See Section 07213)

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify site conditions, including but not limited to, all dimensions, field conditions that may affect the installation, etc., prior to commencement of work. Commencement of work will be interpreted that contractor has verified all field conditions and is responsible for all corrective work that may be required.

### 3.02 ERECTION, ROOFING, FASCIA, AND WALL SYSTEM

- A. Install in accordance with manufacturer's instructions and as indicated on the drawings.
- B. Exercise care when cutting prefinished material to minimize damage to the prefinished surface and ensure cuttings does not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.
- D. Locate end laps over supports. End laps shall be the minimum recommended by the manufacturer but in no event less than 2". Place sidelaps over bearing.
- E. Provide expansion joints where required or indicated.
- F. Use concealed fasteners at roof panels except as may be required at eave. Use exposed fasteners at siding.
- G. Install insulation and vinyl vapor barrier in accordance with manufacturer's instructions utilizing framing members for attachment.



- H. Install sealant and gaskets to prevent weather penetration.
- I. System: Free of rattles, noise due to thermal movement and wind whistles.
- J. Existing plumbing vents exhaust fans and ductwork, flues, stacks, roof mounted exhaust fans/curbs and other items that penetrate or on top of the existing roof must be extended up to and through the new roof. Provide new curbs, support framing, flashings, electrical, etc. as needed to complete the installation. Notify Contracting Officer immediately of inoperative equipment.

### **3.03 ERECTION, GUTTER AND DOWNSPOUT**

- A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.
- B. Apply bituminous paint on surfaces in contact with cementitious materials.
- C. Slope gutters minimum 1/16 inch/ft.
- D. Terminate downspouts at pre-formed concrete splash blocks.

### **3.04 INSTALLATION, ACCESSORIES**

- A. Seal wall and roof accessories watertight and weather tight with sealant.

### **3.05 TOLERANCES**

- A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
- B. Fascia and Roofing: 1/8 from true position.

### **3.06 CLEANING**

- A. The exterior walls, doors, windows, etc., shall be cleaned of dirt, stains and other foreign matter. Scratches or other defects, considered minor by the Contracting Officer, shall be repaired to the satisfaction of the Contracting Officer. Major defects shall be replaced with new material to match that of the defective item.
- B. The interior of the building shall be swept broom clean and left in such a condition as to allow the government ready access to the building and capable of completing their portion of the work.

### **3.07 UNDERLAYMENT INSTALLATION**

- A. Felt Underlayment: Apply in shingle fashion to shed water, and with lapped joints of not less than 2 inches.
- B. Apply slip sheet over underlayment before installing metal roof panels.
- C. Install flashings to cover underlayment.

### **3.08 METAL ROOF PANEL INSTALLATION**

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
  1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Snap or Rolled Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

### **3.09 ACCESSORY INSTALLATION**

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
  2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where

possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

**3.10 CLEANING**

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

**END OF SECTION**

**SECTION 07 62 00 SHEET METAL FLASHING AND TRIM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Coping, parapet, cap, sill, lintel, shingle edge, and other flashing.
- B. Counterflashings over bituminous, base flashing.
- C. Counterflashings for roof hatches, skylights.
- D. Counterflashings at roof mounted equipment and vent stacks.

**1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION**

- A. See applicable sections of the Specifications and the Drawings.

**1.03 REFERENCES**

- A. ASTM A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
- B. ASTM A792 - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot Dip Process, ("Galvalume")
- C. ASTM B32 - Standard Specification for Solder Metal.
- D. ASTM A123 – Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
- E. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- F. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
- G. ASTM D4586 - Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- H. FS A-A 51145D - Flux, Soldering, Non-Electronic, Paste and Liquid.
- I. SMACNA - Architectural Sheet Metal Manual.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.05 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
- C. Submit one sample 12" x 12" size illustrating metal finish color.

**1.06 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA standard details and requirements.
- B. Maintain one copy of the document at the site.

#### 1.07 QUALIFICATIONS

- A. Fabricator and Installer: Company specializing in sheet metal flashing work with three years experience.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
- B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials, which may cause discoloration or staining.

#### 1.09 COORDINATION

- A. Coordinate work under provisions of Section 01 00 00.

#### 1.10 GENERAL WARRANTY:

- A. Submit two copies of the manufacturer's written warranty providing twenty (20) year guarantee that finish will not chip, crack, craze, blister, or peel and without chalking in excess of 8 (ASTM D4214) and without fading (color change) in excess of 5 NBS units for the same time period. Include coverage for weather-tightness of building enclosure after installation. Warranty shall commence on the date of acceptance by the Contracting Officer.

## PART 2 PRODUCTS

### 2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

### 2.02 MATERIALS

- A. Sheet Steel Stock: ASTM A792 Galvalume AZ55 coating, factory pre-finished.
- B. Pre-finished flashings, trim, etc., **within one-half mile of Santa Rosa Sound** shall be 0.032 aluminum, factory pre-finished. Verify location of building with Base Civil Engineer.
- C. Fasteners and Clips: Manufacturer's standard type, galvanized to ASTM A123 2.0 oz/sq finish. Finish to match adjacent surfaces.
- D. Underlayment: ASTM D226, asphalt saturated felt as indicated on the drawings, or if not indicated on the drawings, a minimum of # 15.
- E. Bituminous Paint: Asphaltic Type.
- F. Sealant: Manufacturer's standard gun grade, one or two-part high performance urethane type, non-staining, elastomeric, skinning.
- G. Slip Sheet: Rosin sized building paper.
- H. Primer: Zinc Chromate type.
- I. Protective Backing Paint: Asphaltic Type.
- J. Plastic Cement: ASTM D4586, Type I.

- K. Reglets: Surface Mounted or recessed type, as indicated on the drawings, galvanized steel.
- L. Gutter and Downspout Anchorage Devices: Fabricate downspout support straps of same material and finish as roofing material. Follow SMACNA requirements.
- M. Gutter Supports: Brackets or Straps as indicated on the drawings. Follow SMACNA requirements.
- N. Solder: ASTM B32.
- O. Flux: FS A-A-51145D.
- P. Equipment Curbs. Factory pre-formed, and pre-finished, one piece curbs, welded construction, with integral water deflecting cricket, minimum 3" attachment flanges, minimum 8" high curbs **and built-in rib configurations designed to fit the specific panel to which they will mount**. Curbs must be fabricated from galvalume coated steel sheet compatible with the roof panels. They must provide a watertight seal. Field fabricated curbs will not be accepted.

### 2.03 COMPONENTS

- A. Gutters: Rectangular profile as indicated on the drawings.
  - 1. Downspouts: Rectangular profile as indicated on the drawings.
  - 2. Accessories: Profiled to suit gutters and Downspouts.
  - 3. Splash Pads: Precast concrete type, 12' x 24" size, placed at end of each downspout.

### 2.04 FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Fabricate cleats of same material as sheet, minimum 2" wide x 22 gauge (minimum), interlockable with sheet.
- C. Form pieces in longest possible lengths.
- D. Hem exposed edges on underside 1/2".
- E. Fabricate corners from one piece with minimum 18-inch long legs, seam or solder for rigidity, seal with sealant.
- F. Fabricate vertical faces with bottom edge formed outward 1/2 inch and hemmed to form drip.
- G. Fabricate flashing to allow toe to extend 2 inches over, roofing surface. Return and brake edges.
- H. Back paint concealed metal surfaces and dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

### 2.05 FINISHES

- A. Factory finished full-strength 70% "Kynar 500" coating baked on for 15 minutes at 450 degree F (232 degree C), 30% reflective gloss (ASTM D523), over minimum 0.3 mil baked on epoxy primer. Total dry film thickness of 1.0 minimum.
- B. Provide coating which has been field tested under normal range of weathering conditions for minimum of 20 years without significant peel, blister, flake, chip, crack or check in finish, and without chalking in excess of 8 (ASTM D4214), and without fading in excess of 5 NBS units.
- C. Back paint concealed metal surfaces and dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

### 2.06 COLORS:

- A. The following colors shall be applied to the various components to be incorporated into the project

1. Roof panels, fascia, gutters, soffits, low profile ridge vents, or low profile ridge cap, flashings, vents, trim and miscellaneous shapes in the plane of the roof; color "Medium Bronze".
2. Plumbing stacks, vents, or other similar products that are not available in a factory finish as specified in 2.06.A.1 above, shall be field painted. Conform to colors indicated or to the actual color of the prefinished item(s) supplied by the manufacturer. Field finished items shall receive a prime coat plus two finish coats of exterior oil paint conforming to Military Specification, MIL-P-52324, Class 2. Paint shall be as recommend by the manufacturer for the specific material to receive the finish.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located. Verify roofing termination and base flashing are in place, sealed, and secure.

#### **3.02 PREPARATION**

- A. Install starter and edge strips, and cleats before starting installation.
- B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

#### **3.03 INSTALLATION**

- A. Conform to drawing details and/or details included in the SMACNA manual.
- B. Insert flashing into reglets to form tight fit. Secure in place with lead wedges. Pack remaining spaces with lead wool. Seal flashing into reglets with sealant.
- C. Secure flashing in place using concealed fasteners. Use exposed fasteners only where permitted.
- D. Apply plastic cement compound between metal flashing and felt flashing.
- E. Fit flashing tight in place. Make corners square surfaces true and straight in planes, and lines accurate to profiles.
- F. Seal metal joints watertight.
- G. Secure gutters and downspouts in place using fasteners.
- H. Slope gutters 1/16" inch per foot minimum.
- I. Set splash pads under downspouts.
- J. Perform flood testing and note any area that is not watertight. Repair and retest until no leaks are visible.
- K. Existing plumbing vents, exhaust fans and ductwork, flues, stacks, roof mounted exhaust fans/curbs and other items that penetrate or on top of the existing roof must be extended up to and through the new roof. Provide new curbs, support framing, flashings, electrical, etc. as needed to complete the installation. Notify Contracting Officer immediately of inoperative equipment.

#### **3.04 FIELD QUALITY CONTROL**

- A. Inspection will involve surveillance of work during installation to verify compliance with specified requirements.

#### **3.05 CLEANUP**

- A. Upon completion of work, remove all trash, shipping cartons. Construction debris, etc. and dispose of off-site.
- B. Clean all flashing and make minor repairs to damaged surfaces.

**END OF SECTION**

## **SECTION 07 84 00: FIRESTOPPING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Through - penetration firestopping in fire rated construction.
- B. Construction-gap firestopping at connections of the same or different materials in fire rated construction.
- C. Construction-gap firestopping occurring within fire rated walls
- D. Construction-gap firestopping occurring at the top of fire rated walls.
- E. Through-penetration smoke-stopping in smoke partitions.
- F. Construction-gap smoke-stopping in smoke partitions.

#### **1.02 REFERENCES**

- A. UNDERWRITERS LABORATORIES
  - 1. U.L. Fire Resistant Directory
    - a. Volume #1; Hourly ratings for beams, floors, roofs, walls & partitions.
    - b. Volume #2: Hourly ratings for joint systems & through penetration firestop systems.
    - c. Roofing Materials & Systems.
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS STANDARDS:
  - 1. ASTM E814: Standard Test Method for Fire Tests of Penetration Firestop Systems
  - 2. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
  - 3. ASTM E119: Standard Test Methods for Fire Tests of Buildings Construction and Materials
- C. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

#### **1.03 DEFINITIONS**

- A. Assembly: Particular arrangement of materials specific to given type of construction described or detailed in referenced documents.
- B. Barriers: Time rated firewalls, smoke barrier walls, time rated ceiling/floor assemblies and structural floors.
- C. Firestopping: Methods and materials applied in penetrations and unprotected openings to limit spread of heat, fire, gasses and smoke.
- D. Penetration: Opening or foreign material passing through or into barrier or structural floor such that full thickness of rated materials is not obtained.
- E. Construction Gaps: Gaps between adjacent sections of walls, exterior walls, at wall tops between top of wall and ceiling, and structural floors or roof decks; and gaps between adjacent sections of structural floors.
- F. System: Specific products and applications classified and numbered by Underwriters Laboratories, Inc. to close specific barrier penetrations
- G. Sleeve: Metal fabrication or pipe section extending through thickness of barrier and used to permanently guard penetration. Sleeves are described as part of penetrating system in other sections.

#### **1.04 SYSTEM DESCRIPTION**

- A. Design Requirements
  - 1. Fire-rated construction: Maintain barrier and structural floor fire resistance ratings including resistance to cold smoke at all penetrations, connections with other surfaces or types of construction, at separations required to permit building movement and sound or vibration absorption, and at other construction gaps.



2. Smoke barrier construction: Maintain barrier and structural floor resistance to cold smoke at all penetrations, connections with other surfaces and types of construction and at all separations required to permit building movement and sound or vibration absorption, and at other construction gaps.

### **1.05 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

### **1.06 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data on product characteristics, performance and limitation criteria.
- C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- D. Manufacturer's Certificate: Certify that products and systems meet or exceed specified requirements.
- E. Shop Drawings: Indicate dimensions, description of materials and finishes, general construction, specific modifications, component connection anchorage methods, hardware and installation procedures, plus the following specific requirements.
  1. Details of each proposed assembly identifying intended products and applicable UL System number, or UL classified devices.
  2. Manufacturer or manufacturers representative shall provide qualified engineering judgements and drawings relating to nonstandard applications as needed.

### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum five years documented experience.
- B. Applicator: Company specializing in performing the work of this Section with minimum three years documented experience and approved by manufacturer.

## **PART 2 - PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

### **2.02 MANUFACTURES**

- A. Hilti Construction Chemicals, Inc.
- B. IPC Corp.
- C. Tremco
- D. United States Gypsum Co.
- E. 3M Inc.
- F. Other manufacturers and products listed in the UL Fire Resistance

### **2.03 MATERIALS**

- A. Systems, devices and materials listed in the UL Fire Resistance Directory under categories XHBN, XHDG, and XHEZ may be used, providing it conforms to the construction type, penetrant type, annular space requirements and the fire rating involved in each separate instance, and that the system be symmetrical for wall applications.

### **2.04 ACCESSORIES**

- A. Fill, void or cavity materials: As classified under category XHHW in the UL Fire Resistance Directory.
- B. Forming materials: As classified under category XHKU in the UL Fire Resistance Directory.
- C. Other materials as may be listed in the UL Fire Resistance Directory for a specific application. Submit request to the Contracting Officer along with supporting data including applicable UL design. Proceed upon approval of the Contracting Officer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verification of conditions: Examine area and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
  - 1. Verify barrier penetrations are properly sized and in suitable condition for application of materials.
  - 2. Do not proceed until unsatisfactory conditions have been corrected.

### **3.02 PREPARATION**

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter that may affect bond of firestopping material.
- B. Remove incompatible materials that affect bond.

### **3.03 APPLICATION**

- A. Apply/Install penetration seal materials in accordance with printed instructions of the UL Fire Resistance Directory and in accordance with manufacturer's instructions.

### **3.04 CLEANING**

- A. Clean up spills of liquid components.
- B. Neatly cut and trim materials as required.
- C. Remove equipment, materials, and debris, leaving area and other work in undamaged, clean condition.

**END OF SECTION**

**SECTION 07 90 00****JOINT PROTECTION****PART 1 GENERAL****1.01 SECTION INCLUDES:**

- A. Preparing sealant substrate surfaces.
- B. Sealant and backing.

**1.02 REFERENCES:**

- A. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- B. ASTM C1193 – Standard Guide for Use of Joint Sealants.
- C. FS A-A-272B –Caulking Compounds.
- D. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Regional products.

**1.04 SUBMITTALS:**

- A. Submit product data under provisions of Section 01 33 00.
- B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations and color availability.
- C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

**1.05 QUALITY ASSURANCE:**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with a minimum of three years experience.

**1.06 ENVIRONMENTAL REQUIREMENTS:**

- A. Do not install solvent curing sealants in enclosed building spaces.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

**1.07 SEQUENCING AND SCHEDULING:**

- A. Coordinate the work of this Section with all related work referenced by other applicable sections and the drawings.

**1.08 WARRANTY:**

- A. Provide three-year warranty.

- B. Warranty: Include coverage of installed sealants and accessories which fail to achieve air tight and air tight seal, exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  - 1. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

### **2.02 SEALANTS:**

- A. Acrylic Sealant: ASTM C920, Type II, Class A, color as selected.
- B. Butyl Sealant: FS A-A-272B, color as selected.
- C. Polysulphide Sealant: ASTM C920, Type II, non-sag, class A, color as selected.

### **2.03 ACCESSORIES:**

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer, compatible with joint forming materials.
- C. Joint Backing: ASTM D1056, round, closed cell polyethylene foam rod, oversized 30-50 percent larger than joint width.
- D. Bond Braker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION:**

- A. Verify that surfaces are ready to receive work and field measurements are as shown on the Drawings and recommended by the manufacturer.
- B. Beginning of installation means installer accepts existing surfaces.

### **3.02 PREPARATION:**

- A. Clean joints in accordance with manufacturer's instructions.
- B. Remove loose materials and foreign matter which might impair adhesion of sealant.
- C. Verify that joint backing and release tapes are compatible with sealant.
- D. Perform preparation in accordance with ASTM C1193 for latex base sealants.
- E. Protect elements surrounding the work of this Section from damage or disfiguration.

### **3.03 INSTALLATION:**

- A. Install sealant in accordance with manufacturer's instructions.
- B. Measure joint dimensions and size materials to achieve required width/depth ratios.

- C. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- G. Tool joints concave.

**3.04 CLEANING AND REPAIRING:**

- A. Clean adjacent soiled surfaces.
- B. Repair or replace defaced or disfigured finishes caused by work of this Section.

**3.05 PROTECTION OF FINISHED WORK:**

- A. Protect finished installation.
- B. Protect sealants until cured.

**3.06 SCHEDULE:**

<u>LOCATION</u>	<u>TYPE</u>	<u>COLOR*</u>
A. Exterior Door/Window Frames/Walls	Polysulphide	To be selected.
B. Interior Door/Window Frames/Walls	Acrylic, Solvent Cure	To be selected.
C. Under Thresholds	Butyl	To be selected.
D. Exterior Insulation Finish System	As recommended by EIFS manufacturer	To be selected.

\*By Contracting Officer

**END OF SECTION**

## **SECTION 08 13 14: STANDARD STEEL DOORS AND FRAMES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Non-rated, thermally insulated, steel doors and frames.
- B. Rated, thermally insulated steel doors and frames.

#### **1.02 REFERENCES**

- A. ANSI/SDI- A205.8 – SDI – 100 – Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) the Hot-Dip Process.
- C. Door and Hardware Institute (DHI) - The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- D. ICC/ANSI A117.1 Accessible and Useable Buildings and Facilities.

#### **1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

#### **1.04 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and locations for glazing, louvers, and finish.
- C. Product Data: Indicate door configurations, location of cutouts for hardware reinforcement.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

#### **1.05 QUALITY ASSURANCE**

- A. Conform to requirements of ANSI/SDI-A250.8 and ICC/ANSI A117.1.

#### **1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products in accordance with Section 01 60 00.

#### **1.08 COORDINATION**

- A. Coordinate the work with door opening construction, doorframe and door hardware installation.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

### **2.02 ACCEPTABLE DOOR MANUFACTURERS**

- A. Amweld, Ceco, Curries, Fenestra, Steelcraft.
- B. Substitutions: Under provisions of Section 01 00 00.

### **2.03 MATERIALS**

- A. Exterior Doors: SDI-100 Grade III, Model 1, 16 gage, galvanized. Exterior doors at conditioned spaces shall be filled with polyurethane insulation.
- B. Exterior Door Frames: SDI-100, Grade III, 16 gage, galvanized with welded corners.
- C. Interior Doors: SDI-100 Grade I, Model 1, 20 gage.
- D. Interior Door Frames: SDI-100, Grade I, 18 gage, knockdown frames.
- E. Door Accessories: Door jamb anchors, floor anchors, door silencers, etc., as required to fully complete the work.
- F. Removable Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.
- G. Sealant: Sealant and backer rod as specified.

### **2.04 FABRICATION**

- A. Astragals for Double Doors: Steel T shaped, specifically for double doors.
- B. Fabricate doors with hardware reinforcement welded in place.
- C. Close top and bottom edge of exterior doors with inverted steel channel flush end closure. Seal joints watertight.

### **2.05 FINISH**

- A. Steel Sheet: Galvanized to ASTM A653 G60.
- B. Primer: Baked.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that opening sizes and tolerances are acceptable.

### **3.02 INSTALLATION**

- A. Install doors and frames in accordance with ANSI/SDI A250.8 and DHI.
- B. Coordinate installation of fixed glass and louvers.
- C. Upon completion of concrete masonry units, seal perimeter of frame where it abuts CMU with sealant. Use backer rod if required.

### **3.03 ERECTION TOLERANCES**

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

**3.04 ADJUSTING**

- A. Adjust door for smooth and balanced door movement.

**END OF SECTION**



**SECTION 08 14 16: FLUSH WOOD DOORS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Wood doors and panels, fire rated and non-rated.

**1.02 REFERENCES**

- A. ANSI/WDMA I.S.1A – Architectural Wood Flush Doors
- B. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- C. AWI - Architectural Woodwork Quality Standards.
- D. NFPA 80 – Standard for Fire Doors and Other Opening Protectives.
- E. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

**1.03 ACOUSTIC PERFORMANCE**

- A. Acoustic Rating for Door and Frame Assembly: ASTM E90, minimum STC 31. See Door Schedule on drawings for doors that are acoustical rated.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of AWI Quality Standard Section 1300 and 1400 Custom Grade.
- B. Fire Door and Panel Construction: Conform to NFPA 252.
- C. Installed Doors and Panels: Conform to NFPA 80 for fire rated class indicated on drawings.

**1.05 REGULATORY REQUIREMENTS**

- A. Conform to applicable codes for fire rated doors and panels.

**1.06 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
    - d. Certify lumber is harvested from Forest Stewardship Council Certified well managed forest.
  - 2. Indoor Air Quality Certificates:
    - a. Certify each composite wood product contains no added urea-formaldehyde resins.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.
    - d. Certified wood products.

**1.07 SUBMITTALS**

- A. Submit shop drawings and product data under provisions of Section 01 33 00.
- B. Indicate door elevations, internal blocking for hardware attachment, and cutouts for glazing and/or louvers.
- C. Submit samples under provisions of Section 01 33 00.

- D. Submit one sample 6 x 6 inches in size illustrating door construction.
- E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.
- F. Submit manufacturer's certificate under provisions of Section 01 33 00 that doors meet or exceed specified acoustic and/or fire rated requirements.

#### **1.08 DELIVERY, STORAGE, AND PROTECTION**

- A. Protect products under provisions of Section 01 60 00.
- B. Protect doors with resilient packaging sealed with heat shrunk plastic. Break seal on site to permit ventilation.
- C. Package, deliver, and store doors in accordance with AWI or ANSI/WDMA requirements.

#### **1.09 WARRANTY**

- A. Provide life of installation warranty.
- B. Warranty: Warranty shall be in addition to, and not a limitation of, other rights the Government may have under the Contract Documents.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
  3. Certified Wood Materials: Furnish wood materials certified in accordance with FSC Guidelines.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Composite Wood Products: Contain no added urea-formaldehyde resins.

#### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Algoma Hardwoods, Inc., Mohawk Flush Doors, Inc., Weyerhaeuser Company.
- B. Substitutions: Under provisions of Section 01 00 00.

#### **2.03 DOOR AND PANEL TYPES**

- A. Flush Interior Doors: 1-3/4 inches thick; solid core construction, wood veneer faces, acoustical and/or fire rated as indicated.
- B. Panels: To match door construction; face veneer to end match, acoustical and/or fire rated as indicated on the drawings.

#### **2.04 DOOR AND PANEL CONSTRUCTION (AWI QUALITY STANDARD)**

- A. Solid, Non-Rated Core: AWI Section 1300, PC-Particleboard.
- B. Solid, Fire Rated Core: AWI Section 1300, Type FD 1-1/2. See Door Schedule on drawings for fire-rated doors/frames.
- C. Solid, Special Function Core: AWI Section 1300, Type SR - Sound Retardant (Acoustical). See Door Schedule on drawings for acoustical-rated doors/frames.

#### **2.05 DOOR AND PANEL CONSTRUCTION (ANSI/WDMA - I.S.1A STANDARD)**

- A. Solid, Non-Rated Core: ANSI/WDMA I.S.1A; solid particleboard mat formed wood flake or mat-formed wood chip core.

- B. Solid, Special Function Core: ANSI/ WDMA I.S.1A; labeled fire performance as indicated on the drawings and/or sound resistant (acoustical) type.

## **2.06 FLUSH DOOR AND PANEL FACING**

- A. Facing Quality: AWI custom grade.
- B. Flush Interior Door Veneer: Birch species wood, rotary sliced with random matched grain, for transparent finish.

## **2.07 ADHESIVES**

- A. Interior Doors: AWI or ANSI/ WDMA, Type II.

## **2.08 ACCESSORIES**

- A. Glass Stops: Wood type for non-fire rated doors; rolled metal type designed to conform to UL requirements for fire rated doors.

## **2.09 FABRICATION**

- A. Fabricate non-rated doors in accordance with AWI Quality Standards or ANSI/ WDMA I.S.1A requirements.
- B. Fabricate fire rated doors in accordance with AWI Quality Standards or ANSI/ WDMA I.S.1A and to UL requirements. Attach fire-rating label to door edge.
- C. Provide flush doors with 1/2-inch thick edge strips of wood species to match face veneer.
- D. Pre-machine doors for finish hardware.
- E. Provide "Z" or "T" shaped metal astragal in one piece to UL requirements for double fire doors to rating required.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions.
- B. Machine cut relief for hinges and closers and coring for handsets and cylinders.
- C. Trim door width by cutting equally on both jamb edges. Trim fire door width from lock edge only, to a maximum of 3/16 inch.
- D. Trim door height by cutting equally on top and bottom edges to a maximum of 3/4 inch. Trim fire door height at bottom edge only, to a maximum of one inch.
- E. Drill pilot hole for screw and boltholes. Use threaded through bolts for half surface hinges.
- F. Prepare doors to receive finish hardware in accordance with AWI or ANSI/ WDMA requirements.
- G. Conform to AWI or ANSI/ WDMA requirements for fit tolerances.
- H. Coordinate installation of glass and glazing.
- I. Install door louvers.

### **3.02 INSTALLATION TOLERANCES**

- A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

### **3.03 ADJUSTING AND CLEANING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**

**SECTION 08 41 13: ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aluminum doors and frames.
- B. Vision glass and insulated metal infill panels.
- C. Door hardware.
- D. Integral air and vapor barrier.
- E. Perimeter sealant.

**1.02 REFERENCES**

- A. AAMA CW-DG-1 Aluminum Curtain Wall Design Guide Manual.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site.
- C. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls, and Doors Using Dynamic Pressure.
- D. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.
- E. AAMA SFM-1 - Aluminum Storefront and Entrance Manual.
- F. ICC/ANSI A117.1 – Accessible and Useable Buildings and Facilities.
- G. ASTM A36 – Standard Specification for Carbon Structural Steel.
- H. ASTM A123 – Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- I. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- K. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rod, Wires, Profiles, and Tube.
- L. ASTM C1048 – Standard Specification for Heat Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
- M. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers
- N. ASTM D2287 – Standard Specification for Nonrigid Vinyl Chloride Poymer and Copolymer Molding and Extrusion Compounds
- O. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- P. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- Q. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- R. Green Seal:
  - 1. GC-03 - Anti-Corrosive Paints.

- S. SSPC: The Society for Protective Coatings:
  1. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).
  2. SSPC Paint 25 - Red Iron Oxide, Zinc Oxide, Raw Linseed Oil, and Alkyd Primer.
  3. Steel Structures Painting Manual

### 1.03 SYSTEM DESCRIPTION

- A. Aluminum entrances and storefront system includes shop fabricated, factory pre-finished, tubular aluminum sections with supplementary internal support framing as required, swinging door(s), vision glass, insulated metal panel infill, related flashings, anchorage and attachment devices.

### 1.04 PERFORMANCE REQUIREMENTS

- A. Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall as calculated in accordance with ASCE 7-98, and in accordance with ANSI/ASTM E330.
- B. **Storefront Systems used in the Explosive Ordnance Disposal Area (EOD) shall be designed to a minimum of 50-psf-wind load.**
- C. Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.
- D. System to accommodate, without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- E. Limit air leakage through assembly to 0.06-cfm/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- F. Vapor Seal with Interior Atmospheric Pressure of 1 inch (25 mm) sp, 72 degrees F, 40 Percent RH: No failure.
- G. Water Leakage: None, when measured in accordance with ASTM E331 with a test pressure difference of 2.86-lbf/sq ft.
- H. Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- I. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F over a 12hour period without causing detrimental affect to system components.
- J. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

### 1.05 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

### 1.06 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, location of anchoring devices as required to meet all superimposed loads, affected related work and expansion and contraction joint location and details.
- C. Product Data: Provide component dimensions; describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.
- D. Submit one sample 6 inches x 6 inches in size illustrating pre-finished aluminum surface, glass units, infill panels, glazing materials.
- E. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

#### **1.07 QUALITY ASSURANCE**

- A. Perform Work in accordance with AAMA SFM-1.
- B. Conform to requirements of ICC/ANSI A117.1.

#### **1.08 QUALIFICATIONS**

- A. Manufacturer and Installer: Company specializing in manufacturing or installing aluminum glazing systems with minimum three years documented experience.

#### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00.
- B. Handle work of this section in accordance with AAMA – CW-10.
- C. Protect pre-finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings, which bond when, exposed to sunlight or weather.

#### **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install sealant when ambient temperature is less than 40 degrees F during and 48 hours after installation.

#### **1.11 FIELD MEASUREMENTS**

- A. Verify that field measurements are as indicated on shop drawings

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

#### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Amaralite Architectural Products, Inc., CMI-Cronstoms, Inc., Kawneer Company, Inc., PPG Industries, Inc., Tubelite Architectural Products Division
- B. Substitutions in accordance with Section 01 00 00.

#### **2.03 MATERIALS**

- A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper.

- B. Sheet Aluminum: ASTM B209.
- C. Sheet Steel: ASTM A653, galvanized in accordance with ASTM A123.
- D. Steel Sections: ASTM A36, shaped to suit mullion sections.
- E. Anchors, Fasteners, Supports, etc.: Compatible with aluminum; aluminum; non-magnetic stainless steel, or other non-corrosive, non-corrodible material.
- F. Touch-Up Primer for Galvanized Steel Surfaces: SSPC 20, zinc rich type.

#### **2.04 COMPONENTS**

- A. Aluminum Door/Storefront Frames: 1.75 inch x 4.5 inch nominal dimension extruded tube or channel with either mechanical or welded joints; flush glazing stops; drainage holes; internal weep drainage system, anodized finish.
- B. Aluminum Stile and Rail Doors: 1.75 inches nominal thickness extruded tube with mechanical or welded joints; medium width stile and rail with intermediate mullion; beveled glazing stops; factory glazed; anodized finish.
- C. Infill Panel: Internally reinforced, glazing edge sealed permitting internal air movement to glazing space, outside air barrier line
  - 1. Outer Face: 0.032-inch thick aluminum.
  - 2. Core: Rigid polyurethane insulation core with R-value of 8.
  - 3. Inner Face: 0.032-inch aluminum.
  - 4. Outer and inner faces, anodized finish.
- D. Flashings: 0.032 inch thick aluminum finish to match mullion sections where exposed.

#### **2.05 GLASS AND GLAZING MATERIALS**

- A. Glass and Glazing Materials: As described below:
  - 1. Glass in Exterior Lights: 1" nominal thickness, sealed insulating glass units, factory assembled of multiple panes (thickness of individual glass panes 0.25"), separated by and sealed to spacers forming air-tight, dehydrated air spaces; exterior panes bronze-tint fully tempered and inside pane laminated clear float glass, quality q3, conforming to ASTM C 1048, kind HS, type I, light transmittance 0.45-0.47; shading coefficient 0.56-0.58; winter "U" value 0.49, summer "U" value 0.56-0.58.
  - 2. Glass in Interior Lights: 0.25" nominal thickness, fully tempered float glass, quality q3, conforming to ASTM C 1048, kind HS, type I, clear.

#### **2.06 SEALANT MATERIALS**

- A. Sealant and Backing Materials: One or two part high performance sealant system, as recommended by glazing manufacturer.

#### **2.07 HARDWARE (As Standard with the Door Manufacturer and Rated for Handicap Accessibility)**

- A. Weather Stripping:
  - 1. At fixed stops: Replaceable, compression type molded gaskets of neoprene or EPDM rubber complying with ASTM C864 or polyvinyl chloride complying with ASTM D 2287.
  - 2. At other edges: Replaceable woven polypropylene, wool, or nylon pile with aluminum or nylon fabric backing.
  - 3. At door bottom: Adjustable molded EPDM or vinyl sweep continuously contacting threshold, concealed mounting.
- B. Threshold: Extruded aluminum, one piece per door opening, ribbed non-slip surface, 4"(W) x 0.5"(H).
- C. Hinges: Center pivots or ball-bearing hinges.
- D. Push/Pull: Manufacturer's standard.
- E. Panic Device: Push-pad type with rim exit device.
- F. Closer: Surface mounted, head rail or frame mount.

- G. Removable Cores: Removable cores shall be compatible/interchangeable with Best cores. The supplier shall provide temporary construction cores, which will be returned upon completion/acceptance of the project. The Government will provide the permanent cores and keying.
- H. Door silencers: Provide neoprene bumpers.

## **2.08 FABRICATION**

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement for door hardware.
- F. Reinforce framing members for imposed loads.

## **2.09 FINISHES**

- A. Finish coatings to conform to AAMA 611.
- B. Exposed Aluminum Surfaces: Class I anodized finish, dark bronze color, minimum 0.7 mil thickness, AA-M12C22A42/44, electrolytically deposited color
- C. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 2.0-oz/sq ft.
- D. Apply two coats of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

### **3.02 INSTALLATION**

- A. Install wall system in accordance with manufacturer's instructions and AAMA – CW-DG-1 Aluminum Curtain Wall Design Guide.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work as required.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install all flashings and associated work.
- G. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Install swinging door(s).



- J. Set thresholds in bed of mastic and secure.
- K. Install hardware using templates provided.
- L. Install glass and infill panels as required, in accordance with manufacturer's recommendations to achieve performance criteria and provide weathertight conditions.
- M. Install perimeter sealant to method required to achieve performance criteria, backing materials, and installation criteria in accordance with manufacturer's recommendations.

### **3.03 TOLERANCES**

- A. Maximum Variation from Plumb: 1/16 inches per 3'-0", non-cumulative or 1/16 inches per 10'-0", whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

### **3.04 ADJUSTING**

- A. Adjust work as per manufacturer's recommendations.
- B. Adjust operating hardware and door(s) for smooth operation.

### **3.05 CLEANING**

- A. Remove protective material from pre-finished aluminum surfaces.
- B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by method acceptable to sealant manufacturer.

### **3.06 PROTECTION OF FINISHED WORK**

- A. Protect finished Work until final inspection and acceptance by the Contracting Officer.

**END OF SECTION**

**SECTION 08 71 00****DOOR HARDWARE****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Hardware for doors.

**1.02 REFERENCES**

- A. BHMA - Builders' Hardware Manufacturers Association.
- B. DHI - Door and Hardware Institute.
- C. NAAMM - National Association of Architectural Metal Manufacturers.
- D. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
- E. SDI - Steel Door Institute.

**1.03 COORDINATION**

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

**1.04 QUALITY ASSURANCE**

- A. Manufacturers: Companies specializing in manufacturing door hardware with minimum three years experience.
- B. Hardware Supplier: Company specializing in supplying commercial door hardware with 3 years documented experience, approved by manufacturer.
- C. Hardware Supplier Personnel: Employ an Architectural Hardware Consultant (AHC) to assist in the work of this Section.

**1.05 CERTIFICATIONS**

- A. Architectural Hardware Consultant shall inspect complete installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions, and as specified herein.

**1.06 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.07 SUBMITTALS**

- A. Submit schedule, shop drawings, manufacturer's parts list, templates, and product data under provisions of Section 01 33 00.
- B. Indicate locations and mounting heights of each type of hardware.
- C. Provide product data on specified hardware.

- D. Submit samples under provisions of Section 01 33 00. Samples: May be incorporated into the work or returned to supplier.

### **1.08 OPERATIONS AND MAINTENANCE DATE**

- A. Submit operation and maintenance data. Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products in accordance with Section 01 60 00.
- B. Lock manufacturer shall deliver keys directly to the Contracting Officer, properly tagged as to location and arranged in sets.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

### **2.02 ACCEPTABLE SUPPLIERS**

- A. Locksets/Latchsets:
  1. Best, Schlage and Arrow.
  2. Provide correct lockset or latchset as required to suite individual door use or as indicated on the door and hardware schedule.
  3. Provide locksets at all offices, mechanical rooms, storage rooms, equipment closets and similar rooms as indicated on the door and hardware schedule.
  4. Provide latchsets at interior doors not receiving locksets and as indicated on the door and hardware schedule.
  5. Provide latchset at all fire-rated doors as indicated on the door or hardware schedule.
  6. Grade 1, Series 4000, heavy-duty cylindrical lockset or latchset with removable core. (See J. below)
  7. Locksets at aluminum entrances (storefront) must be supplied by the door manufacturer and as indicated on the door and hardware schedule.
- B. Deadbolts:
  1. Best, Schlage and Arrow.
  2. Provide deadbolts at exterior doors not scheduled to receive panic device and as indicated on the door and hardware schedule.
  3. Tubular lock with removable core, 1' throw with concealed hardened steel roller with inside turning knob.
  4. Deadbolts at aluminum entrance supplied by door manufacturer.
- C. Weather-stripping & Threshold:
  1. National Guard, Pemko, Zero.
  2. Provide thresholds at all exterior doors and other opening as indicated on the door and hardware schedule.
  3. Thresholds shall be ADA accessible, dark bronze anodized aluminum.
  4. Thresholds at aluminum entrances supplied by door manufacturer.
  5. Provide weather-stripping at all exterior doors and as indicated on the door and hardware schedule.
  6. Provide acoustical and/or lightproof weather-stripping as indicated on the door and hardware schedule.
  7. Weather-stripping at aluminum entrances supplied by door manufacturer.
- D. Hinges:
  1. Bommer, Hager, Stanley.

2. Provide minimum 3 hinges per door opening unless otherwise called for on the door and hardware schedule. Size of hinges must be sized to accommodate door thickness, weight, width, type, backset, clearance, and frequency based on building occupancy and use, and as indicated on the door and hardware schedule.
  3. Full mortise steel at interior doors.
  4. Full mortise stainless steel at exterior doors with non-removable pins.
  5. Hinges at aluminum entrances supplied by the door manufacturer.
- E. Closers:
1. Corbin, Dorma, and LCN.
  2. Provide closers at all exterior doors, toilet room doors, and fire-rated doors. Provide closers at other openings as indicated on the door and hardware schedule.
  3. ADA accessible at principal entry door openings and interior door openings equipped with closers. Metal covers.
  4. Closers at aluminum entrances supplied by the door manufacturer.
- F. Surface Bolts:
1. Glynn-Johnson, Hager, Ives, Stanley.
  2. Provide bolts at all inactive leaf of pairs of doors other than entry doors. Provide bolts at other openings as indicated on the door and hardware schedule.
  3. 8" in length, mount at top and bottom of inactive door leaf. Provide bottom strike or modify threshold to accept bolt.
  4. Bolts at aluminum entrances supplied by the door manufacturer.
- G. Push-Pad Panic Devices:
1. Adams-Rite, Dor-O-matic, Von Duprin and Yale.
  2. Provide ADA accessible panic devices at principal exterior personnel ingress/egress openings. Provide panic devices at other door openings as indicated on the door and hardware schedule.
  3. Panic devices at aluminum entrances supplied by door manufacturer.
- H. Pushbutton Access Control:
1. Provide access control at doors indicated on the door and hardware schedule.
  2. Simplex Model 1000 series or equal at doors other than those listed above.
  3. Simplex Model L1000 series or equal for ADA accessible door openings.
  4. Simplex Model LP1000 series or equal at exterior doors for ADA accessible doors. Must be used with a rim mounted exit device.
  5. Exit device at aluminum entrances, equipped with access control device, supplied by door manufacturer.
- I. Wall and Floor Mounted Stops and Holders:
1. Baldwin hardware, H.B. Ives, Triangle Brass manufacturing.
  2. Provide floor and/or door knob/wall mounted type at exterior doors and other doors as indicated on the door and hardware schedule.
  3. Provide door knob/wall type at interior doors or as indicated on the door schedule.
  4. Stops and holders at aluminum entrances supplied by door manufacturer.
- J. Removable Cores: Removeable cores shall be compatible and interchangeable with Best 6-pin cores. The contractor shall provide temporary construction cores, which will be returned to the contractor, upon completion and acceptance of the project by the government. The government will provide the permanent cores and keying to the government system.
- K. Finishes:
1. Locksets, latchsets, deadbolts, surface bolts, etc, US26D at interior doors, US32D at exterior doors.
  2. Thresholds, dark bronze anodized aluminum.
  3. Closers, dark bronze finish.
  4. Miscellaneous items, depending on availability of specified item, match as close a possible other finishes used on the door and other hardware.
  5. Finish of hardware used on aluminum entrances and storefronts shall be dark bronze.
- L. Fasteners:
1. Fasteners, anchors, and similar devices shall be provided by the manufacturer or as recommended by the manufacturer. Finish to match finish of item being installed.

- M. Fire-Rated Doors:
  - 1. Provide hardware of types and quality listed above and complying with NFPA 80.

### **2.03 SUBSTITUTIONS**

- A. Under provisions of Section 01 00 00.

### **2.04 HARDWARE SCHEDULE**

- A. See drawings for Hardware Schedule.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Beginning of installation means acceptance of existing conditions.

### **3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and requirements of SDI, NAAMM, BHMA, and DHI.
- B. Use the templates provided by hardware item manufacturer.
- C. Coordinate installation of hardware with other trades.
- D. Align hardware to be plumb and level, free of warp and twist, flush with adjacent surfaces, etc. Maintain dimensional tolerances as recommended by the manufacturer.
- E. Adjust operable hardware for smooth operation free from binding, rubbing or scraping.

### **3.03 CLEANING**

- A. Remove protective material from hardware surfaces. Wash down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Remove dirt from crevices, etc. Wipe surfaces clean and dry.

**END OF SECTION**

## SECTION 09 21 16: GYPSUM BOARD ASSEMBLIES

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Gypsum board.
- B. Taped and sanded joint treatment.

#### 1.02 REFERENCES

- A. ASTM C1396 – Standard Specification for Gypsum Wallboard.
- B. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- C. ASTM A1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High Strength, Low Alloy, High Strength Low Alloy with Improved Formability, and Ultra High Strength.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
- F. ASTM C1002 – Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- G. GA-214 – Recommended Levels of Gypsum Board Finish
- H. GA-216 - Application and Finishing of Gypsum Panel Products.
- I. Gypsum Construction Handbook, published by United States Gypsum Board Co.
- J. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

#### 1.03 QUALITY ASSURANCE

- A. Applicator: Company specializing in gypsum board systems work with 3 years documented experience, and approved by manufacturer.

#### 1.04 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

#### 1.05 SUBMITTALS

- A. Submit product data, including but not limited to, manufacturer's installation instructions, metal accessories, gypsum board, joint tape, screws, texturing material, drywall compound, etc., under provisions of Section 01 33 00.

- B. Submit one sample of gypsum board panels, 2'x2', illustrating textured finish.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products in accordance with Section 01 60 00.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  2. Interior Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.

#### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Domtar, Georgia-Pacific, Gold Bond, Temple-Inland, U.S. Gypsum Co.
- B. Substitutions: Under provisions of Section 01 00 00.

#### **2.03 GYPSUM BOARD MATERIALS**

- A. Type "X" Fire Rated Gypsum Board: ASTM C1396; fire resistive type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.
- B. Moisture Resistant and Type "X" Fire Resistant Gypsum Board: ASTM C1396; 5/8-inch thick, maximum permissible length; ends square cut, tapered edges.
- C. Gypsum Sheathing Board: ASTM C1396; moisture resistant and fire resistant type; 1/2 inch thick, maximum permissible length; ends square cut, book tongue and grooved edges; water repellent paper faces.
- D. Fasteners: Self-drilling, self-tapping, corrosive-resistant screws as recommended by the gypsum board manufacturer.

#### **2.04 ACCESSORIES**

- A. Corner Beads, Edge Trim, Control Joints, Casing Beads, and Accessories: Metal.
- B. Joint Materials: ASTM C475; GA 216; reinforcing tape, joint compound, adhesive, water, and fasteners.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on drawings.
- B. Beginning of installation means acceptance of existing surfaces.

#### **3.02 GYPSUM BOARD INSTALLATION**

- A. Install gypsum board in accordance with GA 214, GA 216, Gypsum Construction Handbook, and in accordance with manufacturer's written instructions. Butt all joints loosely with maximum joint of 1/8". Maximum joint at outlet box, switch box and other similar devices, 3/8".
- B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.

- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing. Applies regardless of fire rating of wall.
- D. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
- E. Use screws when fastening gypsum board to metal furring or framing.
- F. Double Layer Applications: Use fire rated gypsum-backing board for first layer of fire rated partitions. Tape and mud joints. Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
- G. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

### **3.03 CONTROL JOINTS**

- A. Provide control joints at each side of door and window openings from the header to the top of the wall. Attach control joint to double studs spaced 0.5" apart.
- B. Provide control joints:
  - 1. Where partitions or ceilings of dissimilar construction meet and remain in the same plane.
  - 2. Wings of "L", "U", & "T" shaped ceiling areas are joined.
  - 3. Where control or expansion joints occur in the base wall construction and/or structure.
- C. Maximum control joint spacing:
  - 1. Partitions, 30 feet maximum in either direction.
  - 2. Interior Ceilings with perimeter relief, 50 feet maximum in either direction.
  - 3. Interior Ceilings without perimeter relief, 30 feet maximum in either direction.
  - 4. Exterior Ceilings, 30 feet maximum in either direction.

### **3.04 JOINT MATERIALS/FINISH**

- A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive final finish coat. All walls will be textured with a minimum 'orange peel' texture unless otherwise noted. Provide 12" x 12" sample of texture coat on 5/8" gypsum board for review, approval and record. The approved sample will serve as the standard of quality the contractor must achieve with the actual final finish. Minimum finish will be Level 3 for textured walls and Level 5 for untextured walls.
- B. Walls with indentations, visible joint lines, ripples, surface defects, etc. will not be accepted.
- C. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- D. Erect in accordance with manufacturer's instructions.

### **3.05 TOLERANCES**

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

**END OF SECTION**



**SECTION 09 22 16****NON-STRUCTURAL METAL FRAMING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Formed metal stud framing at exterior and interior locations.
- B. Framing accessories.

**1.02 REFERENCES**

- A. ASTM A653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM A879 – Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
- C. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- D. FS TT-P-645 - Primer, Paint, Zinc-Chromate, Alkyd Type.
- E. GA 216 – Application and Finishing of Gypsum Panel Products.
- F. Green Seal:
  - 1. GC-03 - Anti-Corrosive Paints.

**1.03 SYSTEM DESCRIPTION**

- A. Metal stud framing system for exterior load bearing and non-load bearing walls and infill of existing exterior walls
- B. Metal stud framing system for interior load bearing and non-load bearing walls.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.05 SUBMITTALS**

- A. Submit shop drawings of prefabricated and panelized work for all exterior and interior load bearing and non-load bearing walls, including but not limited to, component details, stud layout, framed openings, headers and jambs, anchorage to structure and track, type and location of fasteners, and accessories or items required of other related work.
- B. Describe method of field construction of all exterior and interior load bearing and non-load bearing walls including but not limited to, component details, stud layout, framed openings, headers and jambs, anchorage to structure and track, type and location of fasteners, and accessories or items required of other related work.
- C. Product data describing standard framing member materials and finish, product criteria, load charts, limitations, manufacturer's installation instructions, etc. under provisions of Section 01 33 00.

D. Substitutions: Under provisions of Section 01 00 00.

### 1.06 QUALITY ASSURANCE

A. Perform work in accordance with GA 216.

B. Install all anchoring device in accordance with manufacturer's written instructions.

### 1.07 SEQUENCING AND SCHEDULING

A. Coordinate work required under this section with other work.

## PART 2 PRODUCTS

### 2.01 SUSTAINABILITY CHARACTERISTICS

A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.

B. Materials and Resources Characteristics:

1. Recycled Content Materials: Furnish materials with maximum available recycled content.
2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

C. Indoor Environmental Quality Characteristics:

1. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

### 2.02 ACCEPTABLE MANUFACTURERS, METAL STUDS, TRACKS AND JOISTS

A. Dale/Incor, Dietrich, Marino, Unimast.

B. Substitutions: Under provisions of Section 01 00 00.

### 2.03 ACCEPTABLE MANUFACTURERS, ANCHORAGE DEVICES

A. Conventional steel anchor bolts with washers/nuts, embedded in the concrete.

B. Mushroom head spike by Powers Fastening, Inc.

C. Dome head powder driven pins by Hilti Anchoring & Powder Actuate Systems.

D. Type, size and spacing of anchoring devices are shown on the drawings.

E. Substitutions: Under provisions of Section 01 00 00.

### 2.04 STUD FRAMING MATERIALS (See Drawings for location. Gage and weight are minimum acceptable)

A. Exterior Stud walls (Load Bearing), 8" x 16 gage, CEE 1-5/8" flange, galvanized studs, 16" o. c. Physical Properties; Wt/ft.= 2.313#, Area= .6623 in<sup>2</sup>; I= 5.6294 in<sup>4</sup>; S= .13470 in<sup>3</sup>; R= 2.9154 in.

B. Exterior Stud walls (Load Bearing), 6" x 16 gage, CEE 1-5/8" flange, galvanized studs, 16" o. c. Physical Properties; Wt/ft.= 1.919#, Area= .5487 in<sup>2</sup>; I= 2.8033 in<sup>4</sup>; S= .08872 in<sup>3</sup>; R= 2.2602 in.

C. Interior Stud walls (Load Bearing), 3-5/8" x 16 gage, CEE 1-5/8" flange, galvanized, studs, 16" o.c. Physical Properties; Wt/ft.= 1.452#, Area= .4138 in<sup>2</sup>, I= .8549 in<sup>4</sup>, S= .4388 in<sup>3</sup>, R= 1.4373 in.

D. Interior Stud walls (Fire-rated), 3-5/8" x 20 gage, DWS 1-1/4" flange, galvanized, studs, 16" o.c. Physical Properties; Wt/ft.= .611#, Area= .180 in<sup>2</sup>, I= .342 in<sup>4</sup>, S= .171 in<sup>3</sup>, R= 1.595 in.

E. Interior Stud walls (Drywall), 3-5/8" x 22 gage, DWS 1-1/4" flange, galvanized, studs, 24" o.c. Physical Properties; Wt/ft.= .415#, Area= .122 in<sup>2</sup>, I= .216 in<sup>4</sup>, S= .105 in<sup>3</sup>, R= 1.601 in.

F. Interior Stud walls (Drywall), 1-5/8" x 22 gage, DWS 1-1/4" flange, galvanized, studs, 24" o.c. Physical Properties; Wt/ft.= .293#, Area= .086 in<sup>2</sup>, I= .034 in<sup>4</sup>, S= .035 in<sup>3</sup>, R= .746 in.

1. Physical Properties about major axis.  
in = inches

in2 = inches squared

in3 = inches cubed

in4 = inches fourd

- G. Runners: Of same material and finish as studs, bent leg retainer notched to receive studs.
- H. Furring and Bracing Members: Of same material and finish as studs, thickness to suit purpose.
- I. Fasteners: Self-drilling, self-tapping screws as recommended by manufacturer.
- J. Metal Backing: 20 gage galvanized steel for reinforcement.
- K. Anchorage Devices:
  1. Powder actuated pins at interior walls.
  2. Anchor bolts, mushroom head spikes or dome head powder actuated pins at exterior walls. See 2.03. above.
- L. Primer: FS TT-P-645, for touch-up of galvanized surfaces.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that conditions are ready to receive work.
- B. Beginning of installation means installer accepts existing conditions.

### **3.02 ERECTION**

- A. Align and secure bottom runners (tracks) with approved anchoring devices.
- B. Install studs vertically at spacing indicated above. Connect studs to runners using fastener method recommended by stud manufacturer.
- C. Fit runners under and above openings; secure intermediate studs at spacing of wall studs.
- D. Install top runner and brace to pre-engineered metal building system and cross-brace to adjacent stud wall for rigid installation.
- E. Splicing of studs is not permissible.
- F. Construct corners using minimum three studs.
- G. Double studs at wall openings, door and window jambs, and not more than 2 inches each side of openings.
- H. Coordinate erection of studs with requirements of door and window frame openings, supports and attachments.
- I. Align stud web openings.
- J. Coordinate installation of bucks, anchors, and blocking with electrical and mechanical work to be placed in or behind stud framing.
- K. Blocking: Secure steel channels to studs.
- L. Refer to Drawings for indication of partitions to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs.
- M. Coordinate placement of insulation in multiple stud spaces made inaccessible after stud framing erection.

### **3.03 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch.

B. Maximum Variation of any Member from Plane: 1/4 inch.

**END OF SECTION**

## **SECTION 09 24 23 CEMENT STUCCO**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Three coat cementitious stucco system applied to metal lath.

#### **1.02 RELATED WORK**

- A. General sustainable design documentation requirements: 01 81 13 "Green Procurement"
- B. Sheet applied vapor barrier: Section 07 52 19 "Self-Adhering Modified Bituminous Membrane Roofing".
- C. Gypsum Sheathing Board: Section 09 21 16 "Gypsum Board Assemblies".

#### **1.03 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- B. ASTM INTERNATIONAL (ASTM)

ASTM A1064/A1064M	(2016a) Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C1032	(2014) Standard Specification for Woven Wire Plaster Base
ASTM C1063	(2016a) Standard Practice for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
ASTM C150/C150M	(2016) Standard Specification for Portland Cement
ASTM C206	(2014) Standard Specification for Finishing Hydrated Lime
ASTM C847	(2014a) Standard Specification for Metal Lath
ASTM C897	(2015) Aggregate for Job-Mixed Portland Cement-Based Plasters
ASTM C926	(2016a) Application of Portland Cement-Based Plaster
ASTM C933	(2014) Welded Wire Lath
ASTM D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

#### **1.04 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, "Shop Drawings, Product

Data, Samples”.

B. Product Data:

1. Adhesive Materials.
2. Membrane sheet roofing and flashing membrane.
3. Roofing cement.
4. Fastening requirements.
5. Application instructions.
6. Engineering calculations, signed/sealed.

C. Shop Drawings: Include plans, sections, details, and attachments.

1. Base Flashing and terminations.

D. Warranty: As specified.

E. Documentation of supervisors' and inspectors' qualifications.

F. Field reports of roofing

**1.05 QUALITY ASSURANCE**

- A. Colored Stucco Finish Coat Sample Panel: Submit, if required, a SAMPLE PANEL as follows: One 12- inch square stucco panel showing finish texture and color and exposed reinforcement at the edges, one 12- inch square of reinforcement, and a 12-inch length of each accessory proposed, prior to proceeding with stucco work. \

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver packaged materials to the site in the original packages and containers with labels intact and seals unbroken. Keep cementitious materials dry and stored off the ground, under cover and away from damp surfaces until ready to be used. Aggregate shall be covered to prevent the absorption or loss of moisture.

**1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Do not apply stucco when the ambient temperature is 4 degrees C 40 degrees F or lower, or when drop in temperature below 4 degrees C 40 degrees F is expected within 48 hours after application.

**PART 2 PRODUCTS**

**2.01 PORTLAND CEMENT**

- A. Portland cement shall conform to ASTM C150/C150M, white portland cement, Type I.

**2.02 COLORED STUCCO FINISH COAT**

- A. Colored stucco finish coat shall be a mill mixed product using white portland cement and requiring only the addition of and mixing with water for application. Color shall be in accordance with Section 09 90 00

PAINTING AND COATING. Submit samples including both a fabricated portion of unit of work and color samples.

**2.03 LIME**

- A. Lime shall conform to ASTM C206, Type S.

**2.04 SAND**

- A. Sand aggregate for job-mixed base coat and job-mixed finish coat stucco shall conform to ASTM C897.

**2.05 ACCESSORIES**

- A. Accessories shall be roll formed galvanized steel, or rigid polyvinyl chloride (PVC), except that cornerite and striplath shall be formed from steel sheets with manufacturer's standard galvanized coating. Vinyl members shall be in accordance with ASTM D1784. Welded wire corner reinforcements shall be zinc coated, galvanized 1.4 mm 17 gauge steel wire conforming to ASTM A1064/A1064M.

**2.06 STEEL FRAMING**

- A. Steel framing shall be as shown and shall be manufacturers standard products with shop applied protective coating.

**2.07 METAL LATH**

- A. Metal lath shall conform to ASTM C847, types and weights in accordance with the various spacing shown in ASTM C841. Lath for vertical application on steel and wood framing supports shall be expanded metal or welded or woven wire and shall have paper backing with a minimum vapor permeance of 287.2 ng per Pa per second per square meter 5 perms. Woven wire lath shall be a maximum 38 x 38 mm 1-1/2 x 1-1/2 inch mesh wire of not less than 1.37 mm 0.0540 inch nominal diameter and shall conform to ASTM C1032. Welded wire lath shall conform to ASTM C933, with openings not to exceed 50 x 50 mm 2x2 inches. Expanded metal or wire lath shall be fabricated in a manner to provide not less than 6 mm 1/4-inch keying between wire and paper backing and keying shall be obtained by a uniform series of slots in a perforated face paper woven between the wires.

**2.08 WATER**

- A. Provide clean, fresh, potable water, free from amounts of oils, acids, alkalis and organic matter that would be injurious to the stucco.

**PART 3 EXECUTION**

**3.01 FRAMING**

- A. Framing shall be installed as indicated.

**3.02 CONTROL JOINTS**

- A. Control joints shall be located as indicated on the drawings. Prefabricated control joint members shall be installed prior to the application of the

stucco. Control joints shall be cleared of all stucco within the control area after stucco application and prior to final stucco set.

### **3.03 LATH**

- A. Install lath in accordance with ASTM C841 or ASTM C1063 except as otherwise specified. Metal and wire lath shall be applied straight, without buckles and with joints staggered. End laps of metal lath shall be not less than 1 inch. When paper-backed lath is used, the paper shall be split from the lath at all lap areas to provide a paper to paper and lath to lath lap. Horizontal joints shall be shiplapped. Lath shall be interrupted at all control joints. Submit drawings showing details of construction for reinforcement, furring, and grounds; including manufacturer's installation instructions for stucco materials, and locations where each mix and coating thickness will be used.
- B. Apply metal lath over vertical open steel backing frame construction only after sheathing and air barrier has been applied to the area to receive the stucco. Fasten lath every 8 inches vertically and every 16 inches horizontally; and where sheets of lath are lapped. Drive fasteners to hold both lapped edges securely in place.

### **3.04 PROPORTIONS AND MIXING**

- A. Proportions and mixing for job-mixed base coat and finish coat shall conform to the applicable requirements of ASTM C926. Mixing of mill-mixed finish coat shall be in accordance with the manufacturer's directions. Submit detailed description of the proposed job-mix proportions for base and finish coats; including identification of thickness of coats.

### **3.05 STUCCO APPLICATION**

- A. Stucco shall be applied in three coats to a thickness of not less than 1 inch as measured from the back plane of metal reinforcement, exclusive of ribs or dimples or from the face of solid backing or support, with or without metal reinforcement, to the finished stucco surface, including moderate texture variations. Stucco application shall conform to the applicable requirements of ASTM C926 and the following:
- B. Workmanship: Items or features of the work in connection with or adjoining the stucco shall be in place, plumb, straight, and true prior to beginning the stucco work. Metal and wire lath, where required, shall be in place and positioned to provide a good key at back of lath. Where lath is applied over copper, the copper shall be given a heavy coat of bituminous paint. Masonry surfaces to receive stucco shall be evenly dampened immediately prior to application of stucco. Each stucco coat shall be applied continuously in one general direction, without allowing mortar to dry at edges. Where it is impossible to work the full dimension of a wall surface in a continuous operation, jointing shall be made at a break, opening, or other natural division of the surface. Edges to be joined shall be dampened slightly to produce a smooth confluence. Exterior corners of stucco shall be slightly rounded. Stucco on soffit surfaces shall be pitched forward to form a drip.
- C. Scratch Coat: Apply scratch coat not less than 3/8-inch-thick under sufficient pressure to form good keys and to completely embed the reinforcement. Before the scratch coat has set, it shall be lightly



scratched in one direction and vertical surfaces shall be scratched in the horizontal direction only. The scratch coat shall be fog cured for a minimum of 72 hours.

- D. Brown Coat: Evenly dampen the scratch coat to obtain uniform suction before the brown coat is applied. There shall be no visible water on the surface when the brown coat is applied. The brown coat shall be applied to the scratch coat with sufficient pressure to force the stucco into the scratches and shall be brought to a plumb, true, even plane with rod or straightedge. When set sufficiently, the brown coat shall be uniformly floated with a dry float to promote densification of the coat and to provide a surface receptive to bonding of the finish coat. Brown coat shall be fog cured for a minimum of 72 hours.
- E. Finish Coat: Dampen surfaces of the brown coat not more than 1 hour before the finish coat is to be applied to a uniform wetness with no free-standing water on the surface. The finish coat shall match existing finish and shall conform to the approved sample. Fog cure the finish coat for a minimum of 48 hours. Take care to prevent staining.
- F. Surface Tolerance: When a 3/8-foot straightedge is placed at any location on the finished surface of the stucco, excluding rough-textured finish, the surface shall not vary more than 3 mm 1/8 inch from the straightedge.

### **3.06 CURING AND PROTECTION**

- A. Perform fog curing by applying a fine mist of water to the stucco. Exercise care during fog curing to avoid erosion damage of the stucco surfaces. Do not use a solid stream of water. Fog not less than three times daily. Protect the stucco from the direct rays of the sun during severe drying conditions using canvas, cloth or other approved sheet material.

### **3.07 PATCHING AND POINTING**

- A. Replace or patch loose, cracked, damaged or defective work as directed. Patching shall match existing work in texture and color and shall be finished flush.

-- End of Section --

**SECTION 09 51 13****ACOUSTICAL PANEL CEILINGS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Suspended metal grid-ceiling system and perimeter trim.
- B. Acoustical panels.

**1.02 REFERENCES**

- A. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- C. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- D. Green Seal:
  - 1. GS-11 - Product Specific Environmental Requirements.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacture of ceiling suspension system and/or ceiling panels with 5 years minimum experience.
- B. Installer: Company with 3 years minimum documented experience, and approved by the manufacturer.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.05 SUBMITTALS**

- A. Submit and indicate on shop drawings, grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to system, and product data including manufacturer's installation instructions, under provisions of Section 01 33 00.
- B. Submit samples under provisions of Section 01 33 00. One 6" x 6" sample of ceiling tile and one 12"-24" sample of ceiling grid, hanger wire, wall trim.

**1.06 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain uniform temperature of minimum 60 degrees F, and humidity of 20 to 40 percent prior to installation. Storage time of materials at the job site shall be as short as possible. Excess humidity during storage can cause possible warp, sag, or poor fit after installation.

**1.07 SEQUENCING/SCHEDULING**

- A. Do not install acoustical ceilings until building is enclosed, sufficient heat is provided, dust-generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Schedule installation of acoustic units after interior wet work is dry.

#### **1.08 EXTRA STOCK**

- A. Provide 2 cartons of extra panels upon completion and Government acceptance of work.

#### **1.09 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver, store, protect and handle products in accordance with Section 01 60 00.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.

#### **2.02 ACCEPTABLE MANUFACTURERS - SUSPENSION SYSTEM**

- A. Chicago Metallic Corporation, National Rolling Mill, Inc., Donn.
- B. Substitutions: Under provisions of Section 01 00 00.

#### **2.03 ACCEPTABLE MANUFACTURERS - CEILING PANELS**

- A. Armstrong, Celotex, United States Gypsum.
- B. Substitutions: Under provisions of Section 01 00 00.

#### **2.04 SUSPENSION SYSTEM – CEILING PANEL COMPONENTS**

- A. See Room Finish and Color Schedule. Provide products that are equal to and match as close as possible the salient characteristics of the products specified. Match as close as possible, includes but is not limited to, type of suspension system, color, ceiling panel size, thickness, surface texture, acoustical properties, etc.

### **PART 3 EXECUTION**

#### **3.01 INSPECTION**

- A. Verify that existing conditions are ready to receive work.
- B. Verify that layout of hangers will not interfere with other work.
- C. Beginning of installation means acceptance of existing conditions.

#### **3.02 INSTALLATION**

- A. Install system in accordance with ASTM C636 and manufacturer's installation instructions, including #8 galvanized steel hanger wire to rigidly secure the suspension system to the structure above, including integral mechanical and electrical components with a maximum deflection not to exceed 1/360.
- B. Acoustical materials are interior finish products and are designed to be installed in spaces where the building is enclosed and the HVAC system(s) are functioning and will be in continuous operation after the acoustical materials are installed. Environmental conditions shall be as near as possible to those specified for the intended occupancy.

- C. Install after major above ceiling work is complete. Coordinate the location of hangers with other work.
- D. Supply and install hangers, clips, etc. for attachment to the building structural system.
- E. Hang system independent of walls, columns, ducts, pipes and conduit.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Locate suspension system in room according to reflected ceiling plan.
- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner or support components independently.
- I. Do not eccentrically load system, or produce rotation of runners.
- J. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners. Provide edge moldings at junctions with other interruptions.
- K. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
- L. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border neatly against abutting surfaces.
- M. Install acoustic units level, in uniform plane, and free from twist, warp and dents.
- N. Lay sound control insulation, 24" x 48" x 6" batts, on top of ceiling panels maintaining tight fit to adjacent insulation batts. See drawings, Room Finish Schedule for location of sound control insulation.

### **3.03 TOLERANCES**

- A. Variation from Flat and Level Surface: 1/8 inch in 10 ft.
- B. Variation from Plumb of Grid Members Caused by Eccentric Loads: Two degrees maximum.

**END OF SECTION**

**SECTION 09 65 00****RESILIENT FLOORING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Resilient base.
- B. Vinyl composition tile.
- C. Rubber tile.

**1.02 REFERENCES**

- A. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile.
- C. ASTM F1861 - Standard Specification for Resilient Wall Base.
- D. Scientific Certification Systems:
  - 1. SCS EC10.2 - Environmental Certification Program Indoor Air Quality Performance.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1113 - Architectural Coatings.
  - 2. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
    - b. Certify volatile organic compound content for each flooring system.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.04 SUBMITTALS**

- A. Submit manufacturer's installation instructions and product data under provisions of Section 01 33 00.
- B. Submit manufacturer's standard samples, including pre-molded exterior corners, illustrating range of colors, for Contracting Officer selection.

**1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- B. Maintain ambient temperature required by adhesive manufacturer 3 days prior to, during, and 24 hours after installation of materials.

**1.06 EXTRA MATERIALS**

- A. Provide 20 linear feet of base.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products in accordance with Section 01 60 00.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  2. Interior Hard Surface Flooring: FloorScore Certified for VOC content in accordance with SCS EC10.2.
  3. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

### **2.02 ACCEPTABLE MANUFACTURERS - RUBBER BASE**

- A. Burke, Flexco, Mercer, R.C. Musson, Roppe.

### **2.03 ACCEPTABLE MANUFACTURER'S - RUBBER TILE**

- A. Azrock, Burke, Flexco, Mercer, R.C. Musson, Roppe.

### **2.04 ACCEPTABLE MANUFACTURER'S - VINYL BASE**

- A. Azrock, Flexco, Johnsonite, Mercer, Roppe.

### **2.05 ACCEPTABLE MANUFACTURER'S - VINYL COMPOSITION TILE**

- A. Azrock, Armstrong, Kentile.

### **2.06 SUBSTITUTIONS**

- A. Under provisions of Section 01 00 00.

### **2.07 BASE-FLOORING MATERIALS**

- A. See Room Finish and Color Schedule. Provide products that are equal to and match as close as possible the salient characteristics of the products specified. Match as close as possible, includes but is not limited to, type of base and tile, color, size, thickness, surface texture, etc.

### **2.08 ACCESSORIES**

- A. Adhesives: Waterproof; types recommended by the respective base/vinyl manufacturer.
- B. Sub-Floor Filler: As recommended by the floor tile manufacturer.
- C. Base Accessories: Pre-molded end stops and external corners, of same material, size, and color as base.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft, and are ready to receive work. Beginning of installation means acceptance of existing substrate and site conditions.
- B. Verify concrete floors are dry to maximum moisture content of 7 percent, and exhibit negative alkalinity, carbonization, or dusting.

### **3.02 PREPARATION**

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Apply, trowel and float filler to smooth, flat, hard surface.

- C. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to surfaces as recommended by manufacturer.

### **3.03 INSTALLATION - BASE MATERIAL**

- A. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
- B. Miter internal corners. At external corners, use pre-molded units. At exposed ends use pre-molded units.
- C. Install base on solid backing. Bond tight to wall and floor surfaces.
- D. Scribe and fit to door frames and other interruptions.

### **3.04 INSTALLATION - TILE MATERIAL**

- A. Install in accordance with manufacturer's recommendations.
- B. Mix tile from container to ensure shade variations are consistent.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.
- E. Install tile to square grid pattern with all joints aligned. Alternate pattern grain to produce basket weave pattern on vinyl composition tile. Joints shall be parallel to building lines, with minimum 1/2 tile width at room perimeter.

### **3.05 PROTECTION AND CLEANING**

- A. Prohibit traffic in the area for 48 hours after installation. Remove excess adhesive from floor, base, and wall surfaces without damage. Clean in accordance with manufacturer's instructions.

**END OF SECTION**

**SECTION 09 68 00****CARPETING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Carpeting glue down method
- B. Base finish
- C. Carpet
- D. Accessories

**1.02 REFERENCES**

- A. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. Carpet and Rug Institute:
  - 1. CRI Green Label Plus Testing Program.
- D. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
    - b. Certify volatile organic compound content for each flooring system.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.04 SUBMITTALS**

- A. Submit shop drawings and product data under provisions of Section 01 33 00.
- B. Indicate seaming plan, method of joining seams, and direction of carpet.
- C. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns, colors available, and method of installation.
- D. Submit samples under provisions of Section 01 33 00.
- E. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

**1.05 MAINTENANCE DATA**

- A. Include maintenance procedures, recommend maintenance materials, and suggested schedule for cleaning and shampooing.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in carpet with three years minimum experience.



- B. Installer: Company with 5 years minimum documented experience or approved by manufacturer.

### **1.07 REGULATORY REQUIREMENTS**

- A. Conform to code for carpet flammability requirements in accordance with ASTM E84.
- B. Conform to ASTM E648.

### **1.08 ENVIRONMENTAL REQUIREMENTS**

- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.
- B. Maintain minimum 70 degrees F (21 degrees C) ambient temperature three days' prior to, during, and 24 hours after installation of materials.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  2. Interior Carpet: Maximum volatile organic compound content in accordance with CRI Green Label Plus Testing Program.

### **2.02 CARPET**

- A. See Room Finish and Color Schedule. Provide products that are equal to and match as close as possible the salient characteristics of the products specified. Match as close as possible, includes but is not limited to, type of carpet, backing, pile height, color and pattern, surface texture, total weight, fiber weight, fiber, etc.
- B. Substitutions: Under provisions of Section 01 00 00.

### **2.03 ACCESSORIES**

- A. Sub-Floor Filler: White premix latex or type recommended by carpet manufacturer.
- B. Primes and Adhesives: Waterproof of types recommended by carpet manufacturer.
  1. Releasable carpet adhesive for carpet tiles.
- C. Edge Strips: Rubber type, color to be selected.
- D. Base Gripper: A one-piece gripper edging strip, wood or metal type, finish and color to be selected.
- E. Base: Rubber or vinyl type, 4 inches by 1/8 inch, colors to be selected.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrate surfaces are smooth and flat with maximum variation of 1/8 inch in 10 ft and are ready to receive work.
- B. Verify concrete floors are dry and exhibit negative alkalinity, carbonization, or dusting.
- C. Beginning of the installation means acceptance of existing substrate and site conditions.

**3.02 PREPARATION**

- A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to leave smooth, flat, hard surface.
- C. Prohibit traffic until filler is cured.
- D. Vacuum floor surface.

**3.03 INSTALLATION**

- A. Apply carpet and adhesive in accordance with manufacturer's instructions.
- B. Lay out rolls of carpet.
- C. Verify carpet match before cutting. All carpet shall be from the same dye lot.
- D. Double cut carpet, to allow intended seam and pattern match. Make cuts straight, true, and unfrayed.
- E. Locate seams in area of least traffic.
- F. Fit seams straight, not crowded or peaked, free of gaps.
- G. Lay carpet on floors with run of pile in same direction as anticipated traffic.
- H. Do not change run of pile in any room where carpet is continuous through a wall opening into another room. Locate change of color or pattern between rooms under door centerline.
- I. Cut and fit carpet around interruptions.
- J. Fit carpets tight to intersections with vertical surfaces without gaps.
- K. Use Releasable Adhesive for Carpet Tile.

**3.04 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean and vacuum carpet surfaces.

**3.05 PROTECTION**

- A. Prohibit traffic from carpet areas for 24 hours after installation.

**END OF SECTION**

**SECTION 09 90 00****PAINTING AND COATING****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Surface preparation
- B. Surface finish schedule

**1.02 REFERENCES**

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. ASTM D1653 – Standard Test Methods for Water Vapor Transmission of Organic Coating Films
- C. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials
- D. Green Seal:
  - 1. GC-03 - Anti-Corrosive Paints.
  - 2. GS-11 - Product Specific Environmental Requirements.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1113 - Architectural Coatings.

**1.03 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing quality paint and finish products with three years experience.
- B. Applicator: Company specializing in commercial painting and finishing with three years experience approved by product manufacturer.

**1.05 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

**1.06 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior paint and coating.
    - b. Certify volatile organic compound content for each flooring system.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.07 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00. Paint and primers used shall be the highest quality, top-of-the-line, professional coatings manufactured by each respective paint manufacturer.
- B. Provide product data on all finishing products.
- C. Submit samples under provisions of Section 01 33 00.

- D. Submit one sample 12" x 12" in size illustrating range of colors and textures available for each surface finishing product scheduled, for selection.
- E. Submit manufacturer's preparation and application recommendations for each type of material to be painted under provisions of Section 01 33 00.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.
- E. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in well ventilated area, unless required otherwise by manufacturer's instructions.
- F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

#### **1.09 ENVIRONMENTAL REQUIREMENTS**

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 Degrees C) for interiors, 50 Degrees F (10 degrees C) for exterior, unless required otherwise by manufacturer's instructions.

### **PART 2 PRODUCTS**

#### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  1. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
  2. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.
  3. Interior Clear Wood Finishes, Floor Coatings, Stains, Primers, and Shellacs: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
  4. Interior Concrete, Wood, Bamboo, and Cork Floor Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113, including sealers and stains.

#### **2.02 ACCEPTABLE MANUFACTURERS (PRIMER AND PAINT)**

- A. Devoe, Glidden, Benjamin Moore, Pittsburgh, Sherwin-Williams.
  1. Paint and primers used shall be the highest quality, top-of-the-line, professional coatings manufactured by each respective paint manufacturer.
- B. Substitutions: Under provisions of Section 01 00 00.

### **2.03 CLEANER, PRE-SEALERS & WATER REPELLANT SEALER FOR ARCHITECTURAL EXPOSED CONCRETE & INTEGRALLY COLORED DECORATIVE CONCRETE MASONRY UNITS**

- A. CMU Pre-Sealer: Pre-sealer used on all concrete and CMU surfaces to fill capillaries and large pores prior to the application of the water repellant sealer. Pre-sealer must be manufactured by and compatible with the water repellant sealer. Submit test data to substantiate conformance to ASTM D1653, and E96.
- B. Water Repellant Sealer: Water based, VOC compliant, deep penetrating clear silane and/or siloxane blend to protect horizontal and vertical surfaces. Manufacturer must have a minimum of 5 years experience in the manufacturer of masonry sealer.
- C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent material.

### **2.04 MATERIALS**

- A. Coatings: Ready mixed. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogenous coating.
- B. Coatings: Good flow and brushing properties capable of drying or curing free of streaks or sags.
- C. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

### **2.05 FINISHES**

- A. Refer to Room Finish and Color Schedule on drawings for colors.
- B. All surfaces exposed to view shall be painted in accordance with the schedule at the end of this Section.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces or finishing.
- B. Verify that substrate surfaces are smooth and flat and ready to receive paint. Correct minor defects and clean surfaces which affect work of this Section.
- C. Shellac and seal marks which may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- F. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow masonry to dry as per paint manufacturer's recommendations.
- G. Architectural Exposed Concrete Scheduled to Receive Pre-Sealer and Water Repellant Sealer: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Uncoated Steel and Iron Surfaces: Remove grease, scale, dirt, and rust. Where heavy coatings of scale are evident, remove by wire brushing or sandblasting clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- I. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. (Prime metal items including shop primed items.)

- J. Mill Finish Aluminum: Clean as per paint manufacturer's recommendations.
- K. Metal Doors Scheduled for Painting: Seal all surfaces, including top and bottom edges with primer.
- L. Existing painted walls to receive new paint shall be repaired to "like new" condition prior to start of painting. "Like new" means to remove all nails or other devices used for attaching objects to the wall, fill holes, sand and make ready to receive prime and finish coats.
- M. Beginning of painting means acceptance of surface and site conditions.

### **3.02 PROTECTION**

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

### **3.03 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.
- H. Prime back surfaces of interior and exterior woodwork with primer paint.
- I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish with gloss varnish reduced 25 percent with mineral spirits.

### **3.04 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Refer to Mechanical and Electrical sections for schedule of color-coding and identification banding of equipment, ductwork, piping, and conduit.
- B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars, and supports, except where items are prefinished.
- D. Replace identification markings on mechanical or electrical equipment when painted accidentally.
- E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- F. Paint exposed conduits and electrical equipment occurring in finished areas.
- G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

- H. Color code equipment, piping, conduit, and exposed ductwork in accordance with color schedule. Color band and identify with flow arrows and names.
- I. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.

### 3.05 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material, which may constitute a fire hazard and place in closed metal containers and remove daily from site.

### 3.06 SCHEDULE - EXTERIOR SURFACES

(Includes, but is not limited to, the following and all conduits, disconnect switches, louvers, condensing units, roof vents, exhaust fans, masonry, etc. visible when viewing the exterior of the building.)

#### A. Steel

##### 1. Organic Zinc Rich Urethane Primer (Primer)

1. Generic Type: Organic Zinc Rich Urethane Primer
2. Solids By Volume: 63%
3. Zinc Content: 83% by weight.
4. Test Criteria:

Test Criteria	Test Duration	Proposed Product Test Results
ASTM B 117 Salt Spray (Fog)	50,000 hours (Scribed Panel)	Rust @ Scribe: Plane Rust: Blisters:
ASTM G 85 Prohesion	15,000 Hours	Rust @ Scribe: Plane Rust: Blisters:
ASTM D 4585 Humidity	4,000 hours	Rusting: Blistering:
ASTM 4541 Adhesion	Average of Three Tests	Report PSI Adhesion
ASTM G8 Cathodic Disbondment	30 Days Exposure	
Immersion Service (Potable Water)	7 years – No Failure	

##### 2. Epoxy Intermediate Coat

1. Generic Type: Polyamide Epoxy
2. Solids By Volume: 56%.
3. Test Criteria:

Test Criteria	Test Duration	Proposed Product Test Results
ASTM B 117 Salt Spray (Fog)	10,900 hours (Scribed Panel)	Rust @ Scribe: Plane Rust: Blisters:
ASTM G 85 Prohesion	15,000 Hours	Rust @ Scribe: Plane Rust: Blisters:
ASTM D 4585 Humidity	4,000 hours	Rusting: Blistering:
ASTM D 4060	CS-17 Wheel	Report mg Loss / Average of three

Abrasion	1,000 Gram Load 1,000 Cycles	tests
ASTM 4541 Adhesion	Average of Three Tests	Report PSI
ASTM G8 Cathodic Disbondment	30 Days Exposure	
Immersion Service (Potable Water)	7 years – No Failure	

### 3. 8.04 Exterior Finish Coat

1. Generic Type: Fluoropolymer Polyurethane
2. Solids By Volume: 60%.
3. Test Criteria:

Test Criteria	Test Duration	Proposed Product Test Results
ASTM B 117 Salt Spray (Fog)	10,000 hours (Scribed Panel)	Rust @ Scribe: Plane Rust: Blisters:
ASTM D 4585 Humidity	3,000 hours	Rusting: Blistering:
ASTM D 4060 Abrasion	CS-17 Wheel 1,000 Gram Load 1,000 Cycles	Report mg Loss / Average of three tests
ASTM 4541 Adhesion	Average of Three Tests	Report PSI
ASTM D 4587 QUV Exposure Cycle 4: 8 hours UV – 4 hours condensation	16,000 hours	Gloss Retention:
ASTM D 4587 QUV Exposure Cycle 4: 8 hours UV – 4 hours condensation	25,000 hours	Gloss Retention: Color Change: DED FMCII
ASTM D 4141 (EMMAQUA) Exterior Exposure	1,260MJ/m2 Exposure	Gloss Retention: Color Change:
ASTM D 4141 (EMMAQUA) Exterior Exposure	3,500MJ/m2 Exposure	Gloss Retention: Color Change:
ASTM D 522 Flexibility	Method A Conical Mandrel	Cracking: % Elongation:
ASTM 2794 Impact	Average of Three Trials	Direct Impact:
ASTM D 503`1 Weatherometer	5,500 hours	% Gloss Retention: Color Change: DED
AAMA 2604-98	5 Years Exposure	Report: Color Retention: Gloss Retention: Chalking: Erosion:

#### B. Steel - Galvanized

1. Two coats Acrylic Latex, semi-gloss.

#### C. Aluminum Mill Finish



1. Prime coat as per paint manufacturer's recommendation.
2. Two coats Acrylic Latex, semi-gloss.

D. Architectural Exposed Concrete

1. Upon completion of the cleaning, allow the concrete to dry as recommended by the manufacturer of the sealer system. Verify that the surface is cleaned and ready to receive the pre-sealer. The area to receive the sealer must be cleaned, etc. to the satisfaction of the installer and sealer system manufacturer and allowed to dry. If not acceptable to the sealer manufacturer's representative, the area must be re-cleaned, etc. Paint system manufacturer shall certify that the surface is acceptable to receive the sealer prior to the application of the finish coats. Correction of any surface irregularities or imperfections will then be the responsibility of the contractor applying the pre-sealer and finish coats. Installation shall be in strict accordance with the manufacturer's written instructions.
2. Upon completion of and curing of the pre-sealer, install sufficient number of coats of the sealer as per the manufacturer's written instructions. Installation shall be in strict accordance with the written instructions.

E. Concrete Masonry Units

1. Upon completion of the cleaning, allow the masonry to dry as recommended by the manufacturer of the paint system. Verify that the surface is cleaned and ready to receive the primer-sealer. The area to receive the primer-sealer must be cleaned, etc. to the satisfaction of the installer and paint system manufacturer and allowed to dry. If not acceptable to the paint manufacturer's representative, the area must be re-cleaned, etc. Paint system manufacturer shall certify that the surface is acceptable to receive the primer-sealer prior to the application of the finish coats. Correction of any surface irregularities or imperfections will be the responsibility of the contractor applying the primer sealer and the finish coats. Installation shall be in strict accordance with the manufacturer's written instructions.
2. Upon completion of and curing of the primer-sealer, paint a minimum two coats Acrylic Latex (flat) and additional coats as directed by the manufacturer's written instructions. Installation shall be in strict accordance with the written instructions.

F. Existing Painted CMU or EIFS Surfaces:

1. Prepare surface and prime as per paint manufacturer recommendations.
2. Paint two coats Acrylic Latex, or as recommended by manufacturer, flat, on CMU surfaces.
3. Paint two coats 100% Acrylic, or as recommended by manufacturer, flat, on EIFS surfaces.

G. Factory Finished Items:

1. Prepare surface as per paint manufacturer recommendations and paint two coats Acrylic Latex, semi-gloss or flat.

H. Miscellaneous Surfaces:

1. One coat primer as recommended by the paint manufacturer.
2. Two coats Acrylic Latex, semi-gloss or flat.

### 3.07 SCHEDULE - INTERIOR SURFACES

A. Steel - Unprimed

1. One coat Latex primer.
2. Two coats Latex Enamel, satin or eggshell.

B. Steel - Shop Primed

1. Touch-up with original primer or as recommended by the paint manufacturer.
2. Two coats Latex Enamel, satin or eggshell.

C. Steel - Galvanized

1. Two coats Latex Enamel, satin or eggshell.

D. Aluminum Mill Finish

1. One coat as recommended by the paint manufacturer.
2. Two coats Latex Enamel, satin.

E. Plaster, Gypsum Board

1. One coat Latex wall primer.
2. Two coats Latex Enamel, eggshell.

- F. Plywood, Wood (Painted)
  - 1. One coat Latex Primer.
  - 2. Two coats Latex Enamel, satin or eggshell.
- G. Plywood, Wood (Clear or Stained)
  - 1. One coat alkyd based, non-masking, penetrating stain.
  - 2. Two coats clear acrylic polyurethane, low luster.
- H. Miscellaneous Surfaces
  - 1. One coat primer as recommended by the paint manufacturer.
  - 2. Two coats Latex Enamel, satin or eggshell.
- I. Factory Finished Items
  - 1. Prepare surface and paint two coats Latex Enamel, satin or eggshell.
- J. Existing Painted Surfaces:
  - 1. Prepare surface as per paint manufacturer recommendations.
  - 2. Prime as required and paint two coats Acrylic Latex, flat or Latex Enamel, satin or eggshell.

### **3.08 SCHEDULE**

- A. As per Room Finish and Color Schedule.

**END OF SECTION**

**SECTION 09 96 00****HIGH PERFORMANCE COATINGS****PART 1 GENERAL****1.01 SECTION INCLUDES:**

- A. Provide a high performance coating system consisting of a two-component epoxy primer and a proprietary component, aliphatic, moisture-cure urethane for protecting interior concrete floors. Product shall comply with SCAQMD VOC for low VOC

**1.02 REFERENCES:**

- A. ETL 96-5. ([www.wbdg.org/ccb/AF/AFETL/etl\\_96\\_5.pdf](http://www.wbdg.org/ccb/AF/AFETL/etl_96_5.pdf))
- B. ASTM F1869 - 10 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- C. ASTM F2170 - 09 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- D. ASTM D2369-03 Standard Test Method for Volatile Content of Coatings
- E. ASTM D3960 - 05 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- F. ASTM D2370 - 98(2010) Standard Test Method for Tensile Properties of Organic Coatings
- G. ASTM D4060 - 10 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser

**1.03 Performance Requirements**

- A. Provide manufacturer's technical data bulletin for specific material, cured coatings and a complete list of chemical resistant properties based on 7-day spot testing on concrete, to include Jet Fuel (JP-4), Xylene, Brake Fluid, Skydrol® 500B and Skydrol® LD4 with no adverse effects. Product must be specifically recommended for aircraft hangers.

**1.04 Submittals**

- A. Product Data: Submit manufacturer's product data, including physical properties, chemical resistance, surface preparation, slip resistance textured coatings, cleaning, coloring, surface painting, etc., and written application and storage instructions.
- B. Submit list of a minimum of five projects similar in nature, which have been installed by applicator during the last five years, identified with project name, location, name of owner's representative, their phone number and date of application. The applicator must be approved by the manufacturer of the floor product.

**1.05 Warranties:**

- A. Manufacturer and applicator shall provide minimum 2 year warranty starting on the date of beneficial occupancy by the government.

**1.06 Quality Assurance:**

- A. Applicator Qualifications:
  - 1. A minimum of three years' experience in the application of coatings or re-surfacing of new or previously coated concrete floors.
  - 2. A minimum of ten projects and/or 250,000 square feet successful applications.
- B. Pre-Application Meeting: A pre-application meeting shall be held 2 weeks before the start of work. Require attendance of parties directly affecting work of this section, including the Prime Contractor, Applicator, Manufacturer's Representative and the government representative. Review the existing or new floor, required surface preparation, application, cleaning, protection and coordination with other work.

**1.07 Delivery, Storage and Handling:**

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying the manufacturer and product name.

- B. Materials shall be stored in strict compliance with manufacturer's written instructions. See 1.03.A.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS:**

- A. BASF, Duraguard, Silikal, Tennant.
- B. Miscellaneous: See 1.03.A.
  - 1. Traction Grit: To improve traction in slip hazard areas, use (60 mesh) – white aluminum oxide or as recommended by the manufacturer.
  - 2. Cleaners and Related Products.
- C. Substitutions: Under provisions of Section 01 00 00.

## **PART 3 - EXECUTION**

### **3.01 INSPECTION**

- A. Examine concrete surface to receive floor coating system. Notify the Contracting Officer if surface is not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.
- B. Allow new concrete substrate to cure a minimum of 30 days.
- C. Floor temperature and materials should be between 65°F (18°C) and 90°F (32°C). Humidity must be less than 80%. DO NOT coat unless floor temperature is more than five degrees over the dew point.
- D. Concrete must be dry before application of floor coating material. Concrete moisture testing must occur. Calcium chloride testing or in-situ relative humidity testing is recommended. Readings must be below 3 pounds per 1,000 square feet (1.5 kg per 150m<sup>2</sup>) over a 24-hour period on the calcium chloride test or below 75% relative internal concrete humidity.
- E. Beginning of flooring application means acceptance of surface and existing site conditions.

### **3.02 PREPARATION**

- A. Prepare surface in accordance with manufacturer's written instructions.
- B. Remove coating or membrane for existing concrete with one of the following methods:
  - 1. Shotblast.
  - 2. Diamond Grind.
  - 3. Scarify.
  - 4. Vacuum or sweep concrete surface.
- C. Apply pre-coat cleaner recommended by the manufacturer. Ensure solution reacts with the concrete in a general and equal fashion over all areas.
- D. Do not use un-buffered muriatic acid to condition the concrete.

### **3.03 APPLICATION (Per manufacturers written instructions)**

- A. Apply floor coating system in accordance with manufacturer's instructions.
  - 1. Assemble squeegees and rollers; clean rollers to remove residual lint.
  - 2. Primer Coat (thin mil systems <10 mils, <254 microns): See manufacturers product bulletin for specific application instructions). Allow primer to cure 8 hours at 75°F (24°C) and 50% relative humidity.
  - 3. Mix components together per manufacturers recommendations.
  - 4. Mix only enough material which can be applied within 20 minutes.
- B. Optional Build Coat (system application >10 mils, >254 microns): Use 100% solids epoxy when appropriate (see manufacturers product bulletin for specific application instructions).
  - 1. Mix components together.

2. Mix only enough material which can be applied within 25 minutes.
3. Apply Build Coat after the prime coat has set and within 24 hours.
4. Build Coat to cure 16 hours at 75°F (24°C) and 50% relative humidity.
5. Apply VOC-Compliant, Gloss Urethane Topcoat.
  1. NOTE: Epoxy must be thoroughly sanded and cleaned prior to application of Eco-HPS 100.
  2. Open and mix only enough material which can be applied in a 2-hour period.
  3. Apply Eco-HPS 100 at the rate of 500 ft<sup>2</sup>/gal. (12.3 m<sup>2</sup>/L).
  4. Allow coating to dry 24 hours at 75°F (24°C) and 50% relative humidity.

#### **3.04 PROTECTION**

- A. Close job site to traffic for a period of 24 hours after coating application

**END OF SECTION**

**SECTION 10 14 00****SIGNAGE****PART 1 GENERAL****1.01 REFERENCES**

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

ANSI Z97.1 Safety Glazing Materials Used in Buildings

**1.02 GENERAL**

- A. Interior signage shall be of the sizes and types shown on the drawings, shall conform to the requirements specified herein, and shall be provided at the locations indicated. Signs shall be complete with lettering, and related components for a complete installation. Signs shall be the standard product of a manufacturer regularly engaged in the manufacture of such products and shall essentially duplicate signs that have been in satisfactory use at least 2 years prior to bid opening.

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.04 SUBMITTALS**

- A. The following shall be submitted in accordance with Section 01 33 00 SUBMITTALS:
1. Product Data: Manufacturer's descriptive data, catalogs cuts, installation and cleaning instructions.
  2. Samples: One sample of each of the following sign types showing typical quality and workmanship. The samples may be installed in the work, provided each sample is identified and location recorded.
    - a. Door sign.
    - b. Wall sign
- B. Two samples of manufacturer's standard color chips for each material requiring color verification.

**1.05 DELIVERY AND STORAGE**

- A. Materials shall be delivered to the jobsite in manufacturer's original packaging and stored in a clean, dry area.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

**2.02 COLORS**

- A. Colors shall be as scheduled.

**2.03 ACRYLIC SHEET**

- A. Acrylic sheet for panels and components shall conform to ANSI Z97.1.

**2.04 PLAQUE SIGNS**

- A. Plaque signs shall be a modular type signage system. Signs shall be fabricated of acrylic plastic conforming to ANSI Z97.1.
  - 1. Standard Modular Plaque Signs: Plaque signs shall consist of matte finish acrylic plastic, thickness and size as shown. Corners of signs shall be squared.
  - 2. Type of Mounting For Plaque Signs: Surface mounted signs shall be provided with 1/16 inch thick vinyl foam tape.

**2.05 GRAPHICS**

- A. Graphics Application: Signage graphics shall conform to the following:
  - 1. Message shall be applied to panel using the silkscreen process. Silk-screened images shall be executed with photo screens prepared from original art. No hand cut screens will be accepted. Original art shall be defined as artwork that is a first generation reproduction of the specified art. Edges and corners shall be clean.
  - 2. Fabricate signs to accept changeable inserts for room number and room name to accommodate future changes.
- B. Messages: See drawings and schedule for message content, Typeface: Helvetica regular as indicated.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Signs shall be installed in accordance with approved manufacturer's instructions at locations shown on the drawings. Signs shall be installed plumb and true at mounting heights indicated, and by method shown or specified. Signs on doors or other surfaces shall not be installed until finishes on such surfaces have been installed.
  - 1. Anchorage: Anchorage shall be in accordance with approved manufacturer's instructions.
  - 2. Protection and Cleaning: The work shall be protected against damage during construction. Sign surfaces shall be cleaned in accordance with the manufacturer's approved instructions.

**END OF SECTION**

## SECTION 10 21 14 TOILET COMPARTMENTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Floor mounted, head rail braced toilet partitions.
- B. Floor braced urinal screens.
- C. Shower cubicles.
- D. Attachment hardware.

#### 1.02 REFERENCES

- A. ANSI A117.1 – Accessible and Useable Buildings and Facilities.
- B. ASTM A167 – Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- C. Green Seal:
  - 1. GS-36 - Aerosol Adhesives.
- D. NEMA LD-3 - High Pressure Decorative Laminates.
- E. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

#### 1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

#### 1.04 SUBMITTALS

- A. Submit shop drawings indicating partition layout and dimensions, panel and door sizes, door swings, elevations, anchorage and mounting details, and finishes.
- B. Submit product data under provisions of Section 01 33 00.
- C. Submit one sample 3 x 6 inches in size illustrating selected panel colors and patterns.
- D. Provide a sample of each type of hardware.
- E. Submit manufacturer's installation instructions.

#### 1.05 REGULATORY REQUIREMENTS

- A. Conform to ANSI A117.1 and ADA code for provisions for the physically handicapped.

#### 1.06 FIELD MEASUREMENTS

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

### PART 2 PRODUCTS



**2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  - 2. Interior Aerosol Adhesives: Maximum volatile organic compound content in accordance with GS-36.

**2.02 ACCEPTABLE MANUFACTURERS** (When in compliance with requirements)

- A. All American Metal Corp.; American Sanitary Partition Corp.; Ampco Products; Bobrick Toilet Compartments; Flush-Metal Partition Co.; Global Steel Products; Sanymetal; Robart Partitions.
- B. Substitutions: Under provisions of Section 01 00 00.

**2.03 MATERIALS**

- A. Solid Phenolic Core panel material with laminating facing on both sides fused to substrate during panel manufacture, machine and finish smooth.
- B. Plastic Laminate: NEMA LD-3 General Purpose type 0.062 inch thick.
- C. Adhesive: Contact type.
- D. Head rail: 1 x 1-5/8 inch, anti-grip, and clear anodized extruded aluminum; with cast socket type wall brackets.

**2.04 ACCESSORIES**

- A. Pilaster Shoe: ASTM A167, Type 304 stainless steel, 3 inch height with adjustable screw jack.
- B. Attachments, Screws, and Bolts: Stainless steel, theft proof type, heavy duty extruded aluminum brackets.
- C. Through Bolts and Nuts: Stainless steel with tamperproof heads.
- D. Steel Plate Reinforcement: Carbon steel, prepared for fasteners, 1/8 inch thick.

**2.05 HARDWARE**

- A. Hinges: Non-ferrous cast pivot hinges, gravity type, adjustable for door close positioning, nylon bearings.
- B. Latch and Keeper: Thumb turn door latch, door strike and keeper with rubber bumper.
- C. Coat Hook: Cast alloy hook with rubber bumper tip.

**2.06 FABRICATION**

- A. Fabricate partitions by applying single sheet plastic laminate finish to faces and edges of core material using adhesive and pressure bonding. Seal edges of cut-outs. Bevel corners and edges.
- B. Reinforce pilaster and panels with steel plate reinforcement sandwiched within core at attachment points. Router cut openings as required.
- C. Thickness of Partition Panels and Doors: One inch.
- D. Thickness of Pilasters: 1-1/4 inch.

**2.07 FINISHES**

- A. Plastic Laminate: Finish color and pattern as indicated on the drawings. If not indicated on the drawings, selection shall be made by the Contracting Officer's designated Civil Engineering representative from the manufacturer's standard color palette.
- B. Stainless Steel Surfaces: No. 4 finish.
- C. Exposed Steel Surfaces: Polished chrome plated.
- D. Aluminum: Clear anodized.
- E. Non-ferrous Surfaces: Polished chrome plated.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify field measurements are as shown on shop drawings.
- B. Verify correct location of built-in framing, blocking, anchorage, bracing, and plumbing fixtures.
- C. Beginning of installation means installer accepts existing conditions.

#### **3.02 ERECTION**

- A. Erect in accordance with manufacturer's instructions.
- B. Install partition components secure, plumb and level.
- C. Attach panel brackets securely to walls and floors using appropriate anchor devices.
- D. Attach panels and pilasters to brackets with through bolts and nuts. Locate head rail joints at pilaster centerline.
- E. Anchor urinal screen panels to walls with two panel brackets and to vertical pilaster upright consisting of tubular stock with end sockets anchored to floor and ceiling.
- F. Provide 1/2-inch space between wall surface and panels or pilasters.
- G. Provide for adjustment of floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.
- H. Equip each toilet stall door with top and bottom hinges, and door latch.
- I. Install door strike keeper on each pilaster in alignment with door latch.
- J. Equip each toilet stall door panel with one coat hook and bumper.

#### **3.03 ERECTION TOLERANCES**

- A. Maximum Variation From Plumb or Level: 1/8 inch.
- B. Maximum Misplacement From Intended Position: 1/8 inch.

#### **3.04 ADJUSTING**

- A. Adjust and align door hardware to uniform clearance, not to exceed 3/16 inch, at vertical edges of doors.
- B. Adjust door hinges so that free movement is attained and will locate in-swinging doors in partial open position when unlatched. Return out-swinging doors to closed position.

#### **3.05 CLEANING**

- A. Remove protective coverings.
- B. Clean surfaces and hardware.

**3.06 PROTECTION OF FINISHED WORK**

- A. Protect finished installation.
- B. Field touch-up of finished surfaces will not be permitted. Replace damaged components.

**END OF SECTION**

**SECTION 10 26 00****WALL PROTECTION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Provide and install wall bumper and corner guards.
- B. Provide and install corridor wainscot wall covering protection

**1.02 REFERENCES**

- A. ASTM D 2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics.
- B. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
- D. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
- E. ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.
- G. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

**1.03 DESCRIPTION**

- A Bumper and Corner Guards shall conform to the layouts shown. Color as indicated on the drawings.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.05 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings shall show details of construction, reinforcing, mountings, and anchoring.
- C. Submit manufacturer's product literature and installation instructions for each type of wall and corner guard and installation accessory required. Include methods of installation for each type of installation for each type of substrate.
- D. Submit written data on physical characteristics, durability, resistance to fading and flame resistance characteristics.
- E. Samples:
  - 1. 12" long samples of each type of wall and corner guard required.
  - 2. 12 inch by 12-inch sample wall protection material, including 6-inch long sample of vertical trim, inside and outside corners and wainscot trim.

- F. Test Results: Submit certified test reports evidencing compliance with requirements for the following:
  1. Flame Spread: Not more than 25.
  2. Smoke developed: Not more than 450.
  3. Test Method: NFPA 255.
- G. Shop drawings showing locations, extent, and installation details of wall and corner guards, and other protection systems. Show methods of attachment to adjoining construction.

#### **1.06 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has previously installed wall surface protection systems similar in material, design, and extent to the systems indicated for this Project.
- B. Manufacturer Qualifications: Firm experienced in manufacturing wall surface protection system components that are similar to those required for this Project and that have a record of successful in-service performance.
- C. Fire Performance Characteristics: Provide wall surface protection system components that are identical to those tested in accordance with ASTM E 84 for the fire performance characteristics indicated below. Identify wall surface protection system components with appropriate markings from the testing and inspection organization.
  1. Flame Spread: 25 or less.
  2. Smoke Developed: 450 or less.
- D. Impact Strength: Provide wall surface protection system components with a minimum impact resistance of 25.4 ft. x lb/sq. ft. when tested in accordance with ASTM D 256 (Izod impact, ft. x lb/in. notch).
- E. Single Source Responsibility: Obtain each color, grade, finish, and type of wall surface protection system component from a single source with resources to provided products of consistent quality in appearance and physical properties without delaying progress of the Work.
- F. Design Criteria: The drawings indicate the location size, profile and dimensional requirements of wall surface protection system components required and are based on the specific types and models indicated. Wall surface protection system components by other manufacturers may be considered provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Contracting Officer. The burden of proof of equality is on the Contractor.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original factory wrappings and containers, clearly labeled with identification of manufacturer, brand name, quality or grade, and fire hazard classification.
- B. Store wall surface protection materials in original undamaged packages and containers inside a well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.
  1. Maintain room temperature within the storage area at not less than 70 deg F during the period plastic materials are stored. Keep sheet material out of direct sunlight to avoid surface distortion.
  2. Store rigid plastic corner guard covers in a vertical position, and rigid plastic wall guard and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attain the minimum room temperature of 70 deg F.

#### **1.08 MAINTENANCE**

- A. Maintenance Instructions: Provide the manufacturer's instructions for maintenance of installed work. Include recommended methods and frequency for maintaining optimum condition under anticipated traffic and use conditions. Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- B. Replacement Materials: After completion of work, deliver not less than 5 percent of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as materials installed. Package replacement materials with protective covering, identified with appropriate labels.

## **PART 2 - PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

## 2.02 BUMPER AND CORNER GUARDS

- A. BUMPER GUARDS: Provide bumper guards in dimensions, mounting and profiles shown on drawings.
  1. Provide continuous aluminum retainers of 6063-T5 aluminum alloy. Rail covers shall be extruded rigid polyvinyl chloride, minimum thickness of .078".
  2. Rail covers shall be self extinguishing per ASTM D 635, meet flame spread requirement of 25 per ASTM E 84, and achieve a non-flaming smoke density rating of 400 per ASTM E 662
  3. Provide high impact molded returns and corners.
  4. Provide aluminum wall brackets furnished complete with toggle bolts.
- B. CORNER GUARDS: Provide corner guards in dimensions, mounting and profile details as indicated on drawings. Provide material in 90-degree corners, with mounting holes 8" on center and formed edges.
  1. Provide corner guards with aluminum retainer secured to wall with appropriate mounting devices, covered with high impact vinyl/acrylic extrusion, locked in place, to absorb heavy impact without damage to guard, retainer or adjacent wall.
  2. Mounting: Surface mounted, ceiling height.
  3. Corner radius: 1/4"
  4. High Impact Vinyl/Acrylic Alloy: Minimum .110" thick, Class A Fire rating, chemical and stain resistant.

## 2.03 WAINSCOT WALL COVERING

- A. Provide semi-rigid vinyl/acrylic wall covering, .022" thickness. Provide 4' x 8' sheet sizes in color specified. Provide standard joint and corner trim components, including wainscot molding. Provide water-based primers and adhesives as recommended by the manufacturer.

## 2.04 FABRICATION

- A. General: Fabricate wall protection systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of components.
- B. Preassemble components in the shop to the greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- C. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of evidence of wrinkling, chipping, uneven coloration, dents, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.
- D. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors for inter-connection of members to other construction.
- E. Provide inserts and other anchorage devices for connecting components to concrete or masonry. Fabricate anchoring devices to be capable of withstanding imposed loads. Coordinate anchoring devices with the supporting structure.

## 2.05 FINISHES

- A. General: Comply with NAAMM "Metal Finishes Manual" for recommendations relative to application and designations of finishes.
- B. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.
- C. Aluminum Mill Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Examine areas and conditions in which wall surface protection components and wall protection systems will be installed.
- B. Do not proceed with installations until unsatisfactory conditions have been corrected.
- C. Bumper and Corner Guards shall be installed straight and plumb with all horizontal lines level and rigidly anchored to the supporting construction. Where indicated, anchorage to the walls shall be toggle bolting.
  - 1. Complete all finishing operations, including painting, before beginning installation of wall surface protection system materials. Drilling and cutting for installation of anchors shall be at locations that will be concealed in the finished work.
- D. Do not use material with chips, cracks, voids, stains or other defects, which might be visible in the finished work.
- E. Install material and assemblies to comply with drawings and final shop drawings in strict compliance with manufacturer's printed instructions. Adjust accessories for proper system alignment.

### **3.02 CLEANING**

- A. Bumper and corner guards shall be cleaned and protected from damage until acceptance.

### **3.03 QUALITY CONTROL**

- A. The Contractor shall establish and maintain quality control for operations under this section to assure compliance with contract requirements and shall maintain records of his quality control for all materials, equipment and construction operations, including, but not limited to the following:
- B. Preparatory inspection: (To be conducted prior to commencing work).
  - 1. Review shop drawing and material requirements.
  - 2. Submit shop drawings, samples or material certification as required.
- C. Initial inspection: (To be conducted after a representative sample of the work is complete).
  - 1. Check installation to assure proper anchorages, alignment and operation.
  - 2. Check finish to assure color is approved.
  - 3. Check for damages or defects and that corrective action is taken.
- D. Follow-up inspection: (To be conducted daily to assure compliance with results of initial inspection).
  - 1. Check all items mentioned in preparatory and initial inspections.

**END OF SECTION**

## SECTION 10 28 00 TOILET AND BATH ACCESSORIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Toilet and shower, washroom accessories.
- B. Attachment hardware.

#### 1.02 REFERENCES

- A. ANSI A117.1 – Accessible and Useable Buildings and Facilities.
- B. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A1008 – Standard Specification for Steel, Sheet, Cold-Rolled , Carbon, Structural, High-Strength Low Alloy, High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- D. ASTM B456 – Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- E. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- F. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- G. Green Seal:
  - 1. GC-03 - Anti-Corrosive Paints.
  - 2. GS-11 - Product Specific Environmental Requirements.
- H. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 - Adhesive and Sealant Applications.

#### 1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
  - 2. Indoor Air Quality Certificates:
    - a. Certify volatile organic compound content for each interior adhesive and sealant and related primer.
    - b. Certify volatile organic compound content for each interior paint and coating.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

#### 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Provide product data on accessories describing size, finish, details of function, attachment methods.
- C. Submit manufacturer's installation instructions under provisions of Section 01 33 00.



**1.05 KEYING**

- A. Supply three keys for each accessory to Owner.
- B. Master key all accessories.

**1.06 REGULATORY REQUIREMENTS**

- A. Installation of all accessories, including height above finished floor, relationship of accessory to other items, etc., shall conform to ANSI A117.1.

**1.07 SEQUENCING AND SCHEDULING**

- A. Coordinate the work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.
- C. Indoor Environmental Quality Characteristics:
  - 1. Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  - 2. Interior Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with GS-11.
  - 3. Interior Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with GC-03.

**2.02 TOILET ROOM ACCESSORIES**

- A. Provide toilet room accessories for each toilet room in accordance with paragraph "3.04 SCHEDULE OF TOILET ACCESSORIES".

**2.03 ACCEPTABLE MANUFACTURERS**

- A. American Specialties, Inc.; Bobrick Washroom Equipment, Inc.; Bradley Washroom Accessories; General Accessory Mfg. Co.; McKinney/Parker; World Hand Dryers.
- B. Substitutions: Under provisions of Section 01 00 00.

**2.04 MATERIALS**

- A. Stainless Steel Sheet: ASTM A167, Type 304.
- B. Tubing: ASTM A269, stainless steel.
- C. Fasteners, Screws, and Bolts: Hot dip galvanized, tamperproof, and security type.
- D. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

**2.05 FABRICATION**

- A. Weld and grind smooth joints of fabricated components.
- B. Form exposed surfaces from single sheet of stock, free of joints.
- C. Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- D. Back paint components where contact is made with building finishes to prevent electrolysis.

- E. Shop assemble components and package complete with anchors and fittings.
- F. Provide steel anchor plates, concealed solid wood blocking, adapters, and anchor components for installation.

## **2.06 FACTORY FINISHING**

- A. Chrome/Nickel Plating: ASTM B456, polished finish.
- B. Stainless Steel: No. 4 satin luster finish.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that site conditions are ready to receive work and dimensions are as indicated on the drawings, in accordance with ADA accessibility requirements and/or instructed by the manufacturer.
- B. Beginning of installation means acceptance of existing conditions and substrate.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- B. Provide templates and rough-in measurements as required.
- C. Verify exact location of accessories for installation.
- D. Verify that all concealed blocking, anchors, etc. are in place prior to finishes being installed.

### **3.03 INSTALLATION**

- A. Install fixtures, accessories and items in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Upon completion of the installation, the contractor shall remove all protective wrappings, etc., and clean each piece thoroughly.

### **3.04 SCHEDULE OF TOILET ACCESSORIES**

- A. TOILET TISSUE DISPENSER (ONE PER TOILET): 20 gauge steel body with brushed stainless steel cover; 1, 9.375" x 4" roll on 3" core; double-prong key lock; hinged front cover; indicator slot; ABS plastic tear-off bars on sides.
- B. RECESSED ELECTRIC HAND / HAIR DRYER (ONE PER THREE LAVATORIES, TWO PER FOUR TO SIX LAVATORIES): Electric hand/hair dryer; automatic hands-off operation; chrome-plated heavy die-cast zinc cover with tamper-resistant screws; non-corrosive plated interior components; minimum 1/10 H.P. shaded brush less motor, 120 volt, 17 amp, 2000watt; 10 year limited warranty.
- C. MIRROR (ONE PER LAVATORY): 24"(W) X 36"(H) X 22 gauge, satin finish, roll-formed stainless steel channel mirror edge; 20 gauge galvanized steel back separated from mirror with poly fill; 1/4" float glass mirror, electro-copper backed, meeting Fed. Spec. DD-M-00411b with tape protected edges.
- D. GRAB BARS (ONE set per handicap toilet): 1.5" O.D. stainless steel, non-slip finish, concealed mounting; 1, 42" straight bar with center support at side of toilet and 1, 36" straight bar behind toilet.

**END OF SECTION**

**SECTION 10 44 00****FIRE PROTECTION SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Cabinets.

**1.02 REFERENCES**

- A. NFPA 10 – Standard for Portable Fire Extinguishers.
- B. UL 711 - Rating and Fire Testing of Fire Extinguishers.
- C. UL 299 - Dry Chemical Fire Extinguishers.

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.04 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide extinguisher operational features, color and finish, anchorage details and cabinet/extinguisher dimensions.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**1.05 QUALITY ASSURANCE**

- A. Provide units conforming to UL 711.

**1.06 REGULATORY REQUIREMENTS**

- A. Conform to NFPA 10 for requirements for extinguishers.

**1.07 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:

1. Recycled Content Materials: Furnish materials with maximum available recycled content.
2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

## **2.02 ACCEPTABLE MANUFACTURERS**

- A. J.L. Industries; Larsen's Manufacturing Co.; Potter-Roemer; Watrous.
- B. Substitutions: Under provisions of Section 01 00 00.

## **2.03 EXTINGUISHERS**

- A. Dry Chemical Type: UL 299, Cast steel tank, with pressure gage;
  1. Class 4A-60BC with rechargeable metal heads.
  2. Class 2A-10BC for use at dormitory or similar units with rechargeable metal heads.

## **2.04 EXTINGUISHER CABINETS**

- A. Metal: Formed sheet steel, white epoxy finish primer; 18 gage thick base metal, size to accommodate extinguisher.
- B. Configuration: Semi-recessed type, sized to accommodate accessories.
- C. Extinguisher cabinets recessed within fire-rated walls or partitions shall be fire-rated to match that of the wall or partition.
- D. Trim Type: Rolled edge construction, 2.5" return trim projection.
- E. Door:
  1. 18 gage thick reinforced for flatness and rigidity; flush pull to meet ADA code and projection requirements, full glass, non-locking with friction catch or rolling ball latch.
  2. Fire extinguishers used at exterior applications shall use doors, hinges, etc. of stainless steel and be equipped with locks.
- F. Door Glazing:
  1. Glass, clear, 1/4 inch thick tempered.
  2. Fire extinguishers used at exterior applications shall use break-away-acrylic-panel.
- G. Cabinet Mounting Hardware: Appropriate to cabinet and as recommended by manufacturer.

## **2.05 FINISHES**

- A. Extinguisher: Steel, baked enamel to standard red color.
- B. Cabinet Interior, Exterior Trim and Door: White baked enamel finish.

## **2.06 EXTERIOR CABINETS**

- A. Surface mounted injection molded ABS plastic with brass lock, removable or breakable cover, and labels. Sized to accommodate required fire extinguisher.

## **2.07 FABRICATION**

- A. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- B. Pre-drill for anchors.
- C. Hinge doors for 180 degree opening with continuous piano hinge. Provide nylon roller type catch.
- D. Weld, fill, and grind components smooth.
- E. Glaze doors with resilient channel gasket glazing.

## **2.08 BRACKETS**

- A. Fire extinguishers in mechanical rooms or similar spaces shall be bracket mounted.

## **PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify location of extinguishers in accordance with drawings.
- B. Verify rough openings for cabinet are correctly sized and located.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, height above finish floor to conform to ADA code.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.
- E. Mounting height shall be 4'-0" to top of cabinets or extinguisher.

**3.03 CLEANING**

- A. Clean glass, interior and exterior of cabinet and extinguisher.

**END OF SECTION**

## SECTION 11 40 00:

## FOODSERVICE EQUIPMENT

### PART 1 GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.
- B. Drawings and specifications are to be considered as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Architect in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions; verify all dimensions and existing conditions.
- C. Plans and specifications are based upon products or systems of first named manufacturer. Any modifications and /or substitutions, other than the first named, that require changes in plumbing, mechanical, or electrical shall be coordinated and paid for by the foodservice equipment contractor.

#### 1.02 SCOPE

- A. All foodservice equipment for this project shall be purchased in accordance with Architect's documents and bidding procedures. Final utility connections to all equipment shall be part of the work under the appropriate divisions of the contract, and not as part of the Foodservice Equipment Contract.

#### 1.03 BIDDING REQUIREMENTS AND INFORMATION

- A. The Foodservice Equipment Contractor (FSEC) must be an established firm which has foodservice equipment as its principal business and has been established for at least five (5) years prior to bid date. Supplier must have experience in contract work and show a willingness to coordinate field problems and follow up service during warranty period.

Pre-approved foodservice equipment contractors include:

- Birmingham Restaurant Supply, Inc. (BRESKO) 205.252.0076 / 800.344.2455
- Dixie Store Fixtures & Sales Co. 205.322.2442 / 800.323.4943
- Hawk Foodservice Equipment & Supplies 334.271.1150 / 800.467.1150
- Mobile Fixture 706.507.2300 / 855.507.2300
- H & R Restaurant Supply 205.409.0097 / 888.364.4080

- B. FSEC to make all arrangements for storage of equipment and have a representative at the job to receive all equipment. Deliver all equipment of this section to its location on site with all transportation charges prepaid. Install as called for below under **INSTALLATION AND CONDITIONS AT SITE.**
- C. Any deviation in construction details shall be described in the equipment schedule, or detailed drawings.
- D. Intent and Interpretation of Specifications: It is the intention of these specification to produce a foodservice facility to meet the needs of the Owner. Among the primary

requirements are sanitation, ready accessibility for cleaning, low cost maintenance and operation, strength and ruggedness. Any construction detail or evasion of any of the specification requirements shall be cause for rejection. Bidders are particularly cautioned regarding the finishing welds. These specifications require equipment of the highest class in material, finish and workmanship.

#### **1.04 DRAWINGS**

- A. Drawings furnished constitute a part of these specifications and show locations of equipment and general arrangement of mechanical and electrical services. Necessary deviation from the illustrated arrangements to meet structural conditions shall be considered a part of the work of this section.
- B. The drawings are for the assistance and guidance of the Contractor. Exact locations are to be governed by the building configuration.
- C. Should there be a conflict between the drawings and the specifications, the Contractor is responsible to notify the Owner, Architect, or Consultant immediately of such discrepancies.

#### **1.05 RELATED SECTIONS**

- A. All electrical (Division 26), gas, water and waste (Division 22) services to rough-in points at fixture locations and final connections to fixtures, except where specified otherwise for specific items shall be provided by respective contractors. All ductwork above finished ceiling shall be provided and installed by mechanical contractor (Division 23). FSEC shall provide all required information for coordination of required services.
- B. Faucets, valves and traps, electric starters and switches, light receptacles and other trim and fittings which are not an integral part of the equipment or are not herein specified will be furnished and installed by others.
- C. Certain items of equipment shown on the drawings but specifically excluded from this contract, will be furnished and installed by others.

#### **1.06 BRANDS AND NAMES**

- A. Where equipment is specified by name of manufacturer and model number, it is intended that the designated name and number represents a standard of quality and is not intended to restrict competition in any way. The Architect reserves the right to accept or reject each proposed substitution and such decision shall be final and binding upon all parties. All proposed equipment substitutions shall be submitted at least ten (10) days prior to date of the bid to the Architect and all substitutions must acquire pre-bid approval. It is furthermore the intention of these specifications to produce a set of Foodservice Equipment to meet the needs of the Owner. Among the primary requirements are sanitation, ready accessibility for cleaning, low cost maintenance and operation, strength and ruggedness. Any construction detail or evasion of any of the specification requirements shall be cause for rejection. Plans and specifications are based upon products or systems of the first named manufacturer. Any modifications and/or substitutions, other than the first named, that require changes in plumbing, mechanical, or electrical shall be coordinated and paid for by the F.S.E.C. Refer to Division 1 Section "Substitutions."

- B. Acceptance of proposed substitution is entirely at the discretion of Owner and/or their Representative, and subject to the following qualifications:
1. Equal in quality of material used, in structural strength and in details of construction.
  2. Equal in performance, mechanically and productivity.
  3. Equal in finish, or in characteristics permitting specified finish to be applied.
  4. Availability of replacement parts and maintenance service.
- C. The bid price for each proposed substitute shall include all money required to incorporate the substitute into the project. Later requests for additional monies for substitutes will not be considered.
- D. Bidders recommending substitutions are cautioned to examine plumbing, mechanical and electrical plans and conditions at the building site to determine if such substitution will require changes in plumbing, mechanical and electrical connections already planned or installed. If the proposed substitutions require such changes, the bidder shall include the cost of same in their bid and call it to the attention of the Architect by including a descriptive notation in the request for approval. Any changes in plumbing, mechanical and electrical after acceptance of bid, due to substituted equipment, shall be the responsibility of the FSEC including any additional cost as a result of the substitution.
- E. Engage a firm experienced in manufacturing foodservice equipment similar to that indicated for this Project and with a record of successful in-service performance. It is required that all "Fabricated Special" items of equipment such as foodservice units, tables, sinks, counter tops, etc., described in the following specifications other than by name and catalog numbers, be manufactured by a Foodservice Equipment Fabricator who has the manufacturing plant, personnel and engineering facility to properly design, detail and manufacture high quality foodservice equipment. The manufacturer shall be subject to the approval of the Architect and owner. All work in the above category shall be manufactured by one manufacturer and shall be of standard unit assembly and of uniform design and finish. The manufacturer of this equipment must be able to show that they have, for the past seven years, been engaged in the manufacture of and distribution of equipment as required under the contract as their principle product.
- F. Obtain equipment of like families through one source from a single manufacturer.
- G. Pre-approved alternate manufacturers are as listed below -
- Air curtain - Burner, Curtron
  - Custom fabrication - LTI, Atlanta Custom Fabrication, Savannah Stainless
  - Drying rack - Piper Products, Inc., Nexel
  - Exhaust hood and utility wall- Avtec, Gaylord
  - Fill faucets, pre-rinse, hose reel - T & S, Krowne
  - Rack, can - Eagle, Kelmax, Advance Tabco
  - Range - Southbend, Garland, Montague
  - Storage shelving - Nexel, Cambro, Eagle/Metal Masters
  - Tilt skillet - Market Forge, Groen, Blodgett
  - Walk-in cooler/freezer - Thermo Kool, Kolpak, American Panel, Bally
  - Walk-in refrigeration - RDT Refrigeration, Kolpak, American Panel
  - Work tables - Eagle/Metal Masters, Duke, or custom fabricator



### **1.07 STANDARDS OF QUALITY**

- A. The Architect will be sole judge of the acceptability and conformity of equipment to specifications.
- B. Fabricated equipment shall be provided by a National Sanitation Foundation (NSF) approved fabricator. Manufacturer shall be subject to approval by the Architect and/or owner.

### **1.08 CONFORMANCE TO CODES AND STANDARDS**

- A. All work and materials shall comply with applicable provisions of the following and as specified.
  - 1. National Sanitation Foundation Standards (NSF).
  - 2. All state and local codes.
  - 3. Underwriters Laboratories, Inc. (UL).
  - 4. National Electric Manufacturer's Association
  - 5. United States Department of Agriculture (USDA).
  - 6. American Society of Mechanical Engineers (ASME) and carry A.S.M.E. stamp.
  - 7. National Fire Protection Agency (NFPA).
  - 8. American Gas Association (AGA)Source Quality Control: Give notice 15 days prior to 90% completion of fabricated equipment so that they may be inspected prior to delivery. Failure to comply may result in rejection at the job site.
- B. Whenever the drawings and specifications require larger sizes or higher standards than are required by the regulations, the drawings and specifications shall govern.
- C. Whenever the drawings and specifications require something which will violate the regulations, the regulations shall govern.
- D. NO EXTRA CHARGE will be paid for furnishing items required by the regulations, but not specified or shown on the drawings.
- E. Rulings and interpretations of the enforcing agencies shall be considered a part of the regulations.
- F. All work shall be in accordance with the governing health, building, safety and fire protection codes and regulations.

### **1.09 MANUFACTURER'S INSTRUCTIONS**

Manufacturer's directions shall be used in this contract covering points not shown or noted in the drawings or specifications.

### **1.010 MANUFACTURER'S LITERATURE**

- A. Within 30 days after notice to proceed, and prior to equipment purchase, submit one (1) bound set and PDF files on CD of manufacturer's specification and data sheets, describing articles and equipment, as specified, for approval. Illustrations may be multiple copied and need not be manufacturer's original literature sheets. Each

submittal must include manufacturer's literature for each item and a type written specification sheet showing item number, quantity to be furnished, manufacturer's name, model number and list optional finishes and accessories to be supplied. In addition, show electrical characteristics and/or BTU rating and indicate if electrical cord and plug will be furnished. Material shall be assembled in order by item number as specified herein and brochure shall be complete and include all items. FSEC shall provide five (5) bound sets of approved documents to GC for distribution to Architect, Engineers and Owner.

- B. Bound submittal shall be complete, accounting for each specified "buy-out" item. Loose sheets or "piece-meal" submittal shall not be acceptable. If a manufacturer's catalog sheet is not obtainable, for a specific item, insert a typed written sheet describing the item giving all of the required information.

#### **1.011 ROUGH-IN DRAWINGS**

- A. Prepare and submit, within 30 days after notice to proceed, submit one(1) bound set (rolled, not folded) and PDF files on CD of drawings showing all utility rough-ins for kitchen equipment items including items listed as "Future, Existing-Reset, and/or Owner Furnished" (min. scale of 1/4"=1'-0"). Drawings to indicate size and location of all utilities, floor depressions, raised bases and wall openings for equipment. Services will be roughed-in to suit the drawings and FSEC shall be responsible for conforming to these conditions with his equipment and connections thereto. In the event rough-in has been accomplished before award of contract, the FSEC shall thoroughly check existing facility and furnish all equipment to suit building conditions. FSEC shall provide five (5) bound sets of approved documents.
- B. Manufacturer's directions shall be followed in all cases where the manufacturers of articles used in this contract furnish directions or prints covering points not shown on the drawings or specifications.
- C. FSEC shall furnish assistance to various trades in location of sleeves, conduits, and pipes through which the utility lines are to be drawn. FSEC shall also furnish assistance to various trades in the location and dimensions of wall openings relative to the foodservice equipment. FSEC shall make at least one field inspection to check the location of sleeves, conduits, pipes, and wall openings affecting the foodservice equipment relative to the connections. The field inspection shall be made before the finished floors are laid in order to make any necessary relocations of the utility sleeves, conduits, and pipes. General Contractor shall notify FSEC in sufficient time to inspect same and shall notify the Architect 24 hours prior to the inspection.
- D. In addition to the rough-in drawings, the FSEC shall submit to the Architect for approval a Foodservice Equipment Schedule which will indicate in reasonable detail the pertinent mechanical information required to make the hook-up, i.e., the maximum utility demands, the quantity, exact size and connection characteristic of all valves, faucets, etc.
- E. Reproductions of original contract drawings are not acceptable for use as submittal.

#### **1.012 SUBMITTAL OF SHOP DRAWINGS**

- A. FSEC to prepare and submit, within 30 days after notice to proceed, submit one (1)

bound set (rolled, not folded) and PDF files on CD for custom fabricated items showing dimensioned plans and elevations (min. 3/4"=1'-0" scale) and vertical cross sections (min. 1 1/2"=1'-0" scale) . Show all materials, gauges, and methods of construction, including relation to adjoining and related work when cutting or close fitting is required. Show all reinforcements, wall plates and backing, anchorage and other work required for complete installation of all fixtures. Drawings to show item number and exact quantity required below each detail as well as in the title block. Title block to be located to allow review of this information when folded to 8 1/2" x 11". Omissions and discrepancies on approved drawings shall not relieve the FSEC of providing items as specified and shown on contract drawings. FSEC shall provide five (5) bound sets of approved documents.

B. FSEC will put into fabrication only those items for which they have received approval.

### **1.013 SUB-CONTRACTORS**

A. If FSEC contemplates subletting any of the work herein specified, he shall submit to the Architect the names and addresses of such subcontractors, together with a detailed breakdown of the work which he contemplates subletting.

B. If the Architect agrees to the subletting of any part of this work, no change of such sub-contractor shall be made after award of the contract.

### **1.014 ACCESS TO SHOPS**

FSEC shall accord to Owner, or an authorized representative, access to shops where all equipment is to be fabricated for inspection of materials and general construction of work as it proceeds before completion and shipment.

### **1.015 FIELD MEASUREMENTS**

Measurements required to size and place foodservice equipment are not to be taken from drawings but shall be taken from the actual structure, therefore, giving due consideration to any architectural, structural or mechanical discrepancies that may occur during construction of building. Field dimensions shall be taken at the earliest opportunity so as not to delay deliveries. Notify foodservice consultant of appointed date and time. **FSEC shall be responsible for proper fit of all equipment furnished under this section of the contract, including table & counter corners to follow wall angles. Gaps over 1/4" wide are not acceptable.**

### **1.016 MAINTENANCE DATA AND OPERATING INSTRUCTIONS**

At the conclusion of the project and prior to the final inspection, provide two (2) bound manuals and PDF files on CD containing dimensional prints, data sheets, operating and maintenance instructions containing complete description, parts list, wiring diagrams, operating data and other information pertaining to the proper operation and maintenance of the various items of all equipment having motors or other moving parts. Include names, addresses and telephone numbers of authorized service agencies for all items. When available, provide factory authorized training video tapes to be retained in the foodservice operation manager's office. Assemble information in alphabetical order in a 3 ring binder of sufficient size.

### **1.017 GUARANTEES AND WARRANTIES**

A. New equipment furnished for this foodservice facility shall be guaranteed for a period of

one year, beginning on the date of final acceptance of the work of this section. Guarantee shall protect against defective material and workmanship.

- B. In addition to the above, all self-contained refrigeration equipment shall include installation, start-up, and carry a 1 year parts and labor service warrantee. Include an additional minimum four (4) year warranty extension covering compressor/motor assemblies.
- C. Upon receipt of notice of failure of any part, during the guarantee period, the affected part or parts shall be replaced promptly at no cost to the Owner.
- D. In the event that replacement of an entire item is required, Owner shall have the option of full use of the defective equipment until a replacement has been delivered and completely installed.
- E. All repairs and replacements shall be made at a time and during hours satisfactory to the Owner.

#### **1.018 PERMITS AND REGULATIONS**

FSEC shall procure and pay for all permits and licenses necessary for execution of work and shall supply any and all certificates of compliance required by state and local regulatory agencies.

#### **1.019 CHANGES IN WORK**

The Owner reserves the right to require the Contractor to make reasonable modification in the routing of work and relocation of equipment. This specifically refers to conditions where interference occurs or where most desirable accessibility can be obtained or whose materials cannot be installed because of structural or mechanical conditions encountered.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. All materials, equipment, etc., shall be new and of kinds specified, and shall be undamaged condition when turned over to Owner. All workmanship shall be of the best quality by craftsmen skilled in their respective trades.
- B. Material and equipment in place shall present a smooth and neat finished installation without rough spots, sharp edges, dirt-catching crevices and shall be easily cleanable.
- C. Metal:
  - 1. Stainless steel: All new, first grade, material; U.S. Standard Gauges as specified or shown; ASTM A-526, 18-8, Type 304, 2B finish on totally concealed surfaces; all exposed surfaces given a finish equal to #4. Where manufacturing process and welding disturb original finish it shall be carefully ground, polished and restored to match balance of surface.
  - 2. Galvanized Steel: All new, commercial quality, zinc coated carbon steel; U.S. Standard Gauges as specified or shown, ASTM A-526. Use in largest sheets possible with as few joints as necessary. Paint with NSF approved hammertone

gray enamel unless otherwise specified.

3. Steel Pipe: All new, commercial quality, galvanized; rust resistant coating on threads.

## **2.02 WELDING**

- A. Stainless steel welds using stainless steel electrodes, shall be free of pits, flaws discoloration, and peeked to remove flux and impurities. Grind welds smooth and polish to original finish of metal with grain uniform to grain of original sheet. Where grinding or polishing has destroyed grain, restore and blend to omit all traces of welding.
- B. Acetylene welding or silver solder not acceptable.
- C. Shop seams and corners in stainless steel tops shall be welded, ground smooth and polished.

## **2.03 ELECTRICAL SPECIFICATION**

- A. FSEC to supply for each motor driven appliance or electrically heated unit a suitable control switch or starter of proper type in accordance with National Electrical Code. All switches and controls are to be listed or recognized by Underwriter's Laboratories, Inc. controls that are mounted on vertical surfaces or fabricated fixtures set into recessed die-stamped stainless steel cups or otherwise indented to prevent damage.
- B. All internal wiring for fabricated equipment items, including all electrical devices built into or forming an integral part of these items, to be furnished and installed by equipment contractor. All receptacles are to be grounding type listed by UL and approved for use by NEC.
- C. All cord connected items must be furnished with cord sets not exceeding 6 feet in length. All cord sets are to contain an equipment grounding conductor and be furnished with caps or plugs listed or recognized by UL.
- D. Each motor shall have over-current phase protection in each ungrounded conductor. Protection may be in motor starter or integral with equipment.
- E. Provide and install all electrical devices, including hood lights unless otherwise specified. Provide all internal wiring of electrical apparatus built into or forming an integral part of fabricated equipment, complete to a J-box or breaker panel, ready for final connection.
- F. Provide cord and plug for all mobile and portable equipment operating on 120 volt and 208 volt single phase power supply, unless specified, or indicated otherwise. Cord to be rubber covered, three wire of proper current capacity; furnish appropriate length. Plug to be 90 degree, three prong, grounding type of proper NEMA configuration. (Verify for matching receptacle)
- G. Provide and install all florescent fixtures and lamps where specified or shown in the drawings. Light switches (unless a part of the fixture) shall be furnished and installed per the electrical work of the contract.

## **2.04 ACCESSORIES**

Except where otherwise noted, manufacturer's catalog number specified is to include all accessories which are, at the time of this proposal, furnished as standard equipment with item specified.

## **2.05 FAUCETS, VALVES AND FITTINGS**

- A. Faucets furnished as part of Foodservice Equipment Contract.
- B. Deck Mounted Faucets: Provide similar and equal to T & S model number B-1142 (8" centers) mixing faucet with 12" swivel gooseneck spout and non-splash aerator, unless specified otherwise. Splash Mounted Faucets: Provide similar and equal to T & S model number B-0231 (8" centers) mixing faucet with 12" swing spout and non-splash aerator, unless specified otherwise. Mounting of faucets to fixtures by plumbing contractor. All faucets shall be polished chromium plated.
- C. All other fittings, such as stops on gas, hot and cold water services, traps, valves, fittings, etc., furnished and installed by plumbing contractor.
- D. Provide all built-in water systems, such as water chillers (faucet and ice plate, etc.), completely interconnected and insulated within the fixture ready for final connection.

## **2.06 FABRICATION**

- A. Metal Work - All work shall be stainless steel except where work is completely concealed unless otherwise specified. Fabricate entirely concealed work from galvanized sheet steel in U.S. gauge or brass fastenings. After cleaning weld area, a coating or cold zinc spray or compound for this purpose shall be applied. Finish exposed fastenings to match adjacent surfaces, flush, and buffed smooth. Roll and polish lines and arises of extruded sections. Make finished work free of tool and construction marks, dents, and other imperfections; polish and dress exposed surfaces to original finish after completion of fabricated work.
- B. Stainless Steel: Heliarc-type welded. Grind exposed area to finish matching adjacent surface. Raw edges shall be deburred and made smooth. All joints welded; soldered joints not permitted.
- C. Pipe Stands and Frames: For open base tables; fabricate of 1 5/8" O.D. 16 gauge steel tubing, including cross bracing. Weld and finish joints between legs and braces. Flattened ends on tube stretchers not permitted.
- D. Table Tops: 14 gauge stainless steel unless otherwise shown, with shop seams and corners welded. Reinforce working tops of fixtures on underside with framework of 1 1/2" angle or 14 gauge hat section full perimeter on open pipe frames with a 4" channel at each pair of legs. Conceal any galvanized framework from view. Weld leg sockets to this channel; stud weld channel to top. Provide one channel runner lengthwise for tops up to 30" wide, two runners for tops over 30" wide. Reinforce tops to eliminate any noticeable deflection. Unless otherwise shown, turn down metal tops 1/2" at 90 degree, 1/2" back at a 15 degree angle, and a 3/4" hold back from framing. Tops with fountain edge shall turn up 1/2" at 30 degrees, then down 2" with 1/2" turn back at 15 degrees.

- E. Provide tops with backsplash and endsplash as specified. Flange top edge back 2" at a 45 degree angle and 3/4" down on rear where adjacent to walls; close splash ends and attach to walls. Seal space between wall and backsplash with a vermin proof angle and sealant in a neat and professional manner.
- F. Make free corners of tops spherical.
- G. Counter Bodies and Enclosed Bases: On cabinet bodies; enclose ends and sides as required. Exposed bodies and aprons of 18 gauge stainless steel. Unexposed bodies and aprons 16 gauge galvanized angles. Reinforce bases at tops with framework of 1 1/2" x 1 1/2" x 1/8" galvanized angles; miter corners and welded. Provide channels to reinforce shelves and to support tops. Welded joints; butt joints not acceptable. Make outside corners of enclosed bases, cabinet bodies and corners against walls and other fixtures square. When fixtures fit against or between walls, set bodies 1" from wall line; extend tops back to wall line to permit adjustment to wall irregularities. Provide a matching flush fitting vertical trim strip at each end of body; extend to wall. Fabricate fixtures to set on 6" legs or bases as specified with bases set in sealant. Entire perimeter of base to form a vermin proof seal. Applying sealant after base is set will not be accepted.
1. Doors: Double cased stainless steel unless otherwise noted. Weld, grind smooth and polish corners of outer pans. Fill inner pan tightly into outer pan with sound deadening material such as manufacturer's standard semi-rigid glass fiber board used for core. Tack weld pans together with seams solder filled. Finish doors approximately 3/4" thick.
- H. Shelving:
1. Removable interior Shelves: 16 gauge stainless steel, unless otherwise specified. Provide ends and back with 1 1/2" high turnup against fixture body. Turn down front edge 1 1/2" and back 1/2" at 15 degree. Install on stainless steel adjustable shelf supports with pilaster welded to fixture walls.
  2. Non-Removable Interior Shelves: 16 gauge stainless steel, unless otherwise specified. Provide ends and back with 1 1/2" high turnup against fixture body. Turn down front edge 1 1/2" and back 1/2" at 15 degree. Bottom shelf shall turn under 90 degree with sheet metal closure to base to prevent sagging and vermin collection.
  3. Undershelves: On open base tables; 16 gauge stainless steel, unless otherwise specified. Turn down 1 1/2" and back 1/2" at 15 degrees. Locate 10" from floor; weld corners to legs. Turn back and ends up 2" at 90 degrees.
  4. Elevated Shelves: 16 gauge stainless steel, unless otherwise specified. Turn down 1 1/2" and back 1/2" at 15 degrees. Where adjacent to wall or other fixtures, turn back and/or ends up 2" at 90 degrees. Make corners spherical.
- I. Sink and Drainboards: Fabricated of 14 gauge stainless steel, unless otherwise specified.
1. Provide working edges with a raised rolled edge; from work surface, maximum 3" turn up and finish top edge with 1 1/2" diameter roll; 5/8" radius corners, both vertical and horizontal, one piece construction. Drainboards to be integral with sinks.
  2. Determine depth of sink bowl from top of bowl.
  3. Provide sinks with minimum 10" high backsplash and endsplash as applicable; flange top edge back 2" at 45 degree angle; attach and seal to walls as required.

4. Run grain of sink splash within same fixture in same direction.
5. Provide cut-outs as required for water supply and waste outlets.
6. Fabricate sink bowls individually with four sides and bottom; weld together; cap front, bottom and completely up the back; make vermin proof by welding a 14 gauge by 2" wide flush stainless steel trim band around joint. Each sink cross braked to center of drain. Manufactured sink bowl acceptable alternate.
7. Round corners, including bottom.
8. Unless specified otherwise, fit bottom of each sink bowl containing center drain connection with a rough chrome plated 1 ½" lever type action waste valve with satin finish stainless steel lever. Include a 14 gauge stainless steel lever support bracket and weld to underside of sink. Mount waste valve, make watertight, and leave bottom with a 1 ½" male thread.

## **2.07 REFRIGERATION EQUIPMENT**

- A. All refrigeration systems (piping, hangers, compressors, evaporators, installation, etc.) shall comply with Division 1570 and be factory installed by a properly licensed heating and air conditioning contractor. Contractor must have three (3) years experience with projects of this size. Upon completion of testing, manufacturer shall provide to Architect a written certificate of acceptance showing all standards of quality have been met and complete system is operating properly.
- B. Provide start-up and one year service and maintenance contract in addition to regular one year guarantee for self-contained refrigeration systems.
- C. Refrigeration system shall be pre-packaged, pre-engineered, factory assembled, air cooled, remote refrigeration system. Verify location of system. Provide weather-proof housing.
- D. System to be complete with all refrigeration equipment and accessories required to make a complete refrigeration system that will maintain temperatures indicated. System to be provided with low ambient controls consisting of all required condenser fan controls, thermostat time clocks and crank case heaters. Refrigerator and freezer condensing units and coils shall be as called for in the itemized specifications and as shown on the plan.
- E. Refrigeration units shall be provided with single stage compressors with air-cooled condensers operating at such speed within recommended range of suction and discharge pressures for walk-in coolers and freezers and with required BTU specifications. Each compressor unit shall be equipped with a compressor, large pump down capacity receiver with two shut off valves, liquid line drier, sight glass, suction and discharge vibration eliminator, high-low pressure control, crankcase heater and flood back head pressure control for low ambient - all factory assembled. Provide all new units of same manufacture, factory assembled, to operate with Refrigerant R-22 for cooler and R-404 for freezer, 100 degrees F., ambient air, capacities selected on 16 hour running time basis.
- F. Hook-up: Room thermostat and liquid line solenoid valves (for pump down cycle operation) and refrigerant lines (insulated as required) to be provided by FSEC. All electrical interconnection and control wiring between blowers and compressors to be



provided by electrical contractor. FSEC to provide manufacturer's literature and data to electrical contractor in coordinating this work.

- G. System to be pressure tested (both high and low side) with dry nitrogen at 300 psi. After evacuating the system and charging with refrigerant, test piping with a halide torch and prove tight under actual operating conditions.
- H. Refrigerant Piping and Accessories: FSEC to extend refrigerant lines from condensing units to evaporator until completely hooked up and made ready for operation. System shall be complete and sized to conform to current ACRMA standards. Refrigerant, drain, and condensate water piping shall be Type "L" hard drawn copper ACR refrigerant tubing with long radius wrought copper solder joint fittings. Provide wall sleeves, hangers, and escutcheons as specified for typical piping. Make up joints with high temperature silver-solder (SIL-FOR or equal) suitable for 300 psi working pressure. Pass dry nitrogen gas through pipe while joints are soldered. All refrigerant suction lines shall be insulated with UL fire and smoke rated nominal 3/4" thick flexible foamed plastic, closed cell pipe insulation equal to Rubatex R-180-FS. Insulation shall have a "k" factor of not more than 0.26 at 70 degree F mean temperature and a water vapor transmission rate of 0.1 per-inch or less. Slip onto pipe prior to erection and seal butt joints with #373 adhesive. Insulate sweat fittings with miter-cut pieces of insulation the same size as on adjacent piping. Insulate screwed fittings with sleeved fitting covers fabricated from miter-cut pieces of insulation according to the manufacturer's sleeving size recommendations, overlap and seal to the adjacent pipe insulation. Paint all insulation with two coats of Rubatex 374 white finish. Condensate drain lines same as refrigerant suction lines except 3/4" thickness.
- I. Sleeves: FSEC to provide drawings showing locations and sizes of all necessary sleeves for refrigeration lines, drain lines, etc. Actual penetrations through building walls and floors to be provided by General Contractor.
- J. Freezer drain lines to be wrapped in electric heater cable to prevent freezing of condensate in drain lines. All drain lines to exit compartments as shown on plan. Secure approval of drain line routing from Architect prior to installation. Freezer equipped with electric defrost unit complete with timer, built-in thermostat to return systems to freezing cycle and delay start of circulating fan until heat in coil has been removed. Timer to stop defrost cycle in case of thermostat failure. Extend drains from coils in copper tubing, through walls to drip over and into floor drain.
- K. Control Panel: Package shall have factory mounted and pre-wired control panel complete with interlocked main fused disconnect, compressor circuit breakers, contractors and time clocks wired for single point electrical connection. Electrical contractor shall provide and install main power lines to panel and use wire harness wiring for control and defrost heater between the defrost clock and the refrigeration fixtures, all in accordance with the wiring diagram and local codes. The temperature for each unit shall be controlled by means of a thermostat wired to actuate a solenoid valve in the liquid line, with the compressor operation controlled by the low pressure cut-out switch. Thermostat and low pressure controls shall be adjusted to maintain the room temperatures as specified.

- L. Service Contract to Cover Guarantees: Emergency refrigeration service, shall be placed with a reliable local refrigeration company maintaining 24-hour service for the life of guarantees and warranties.
- M. Pipe Rack: Compressors shall be furnished with manufacturer's standard factory assembled rack, unless otherwise specified. Rigidly mount compressor unit motors on unit or cast base so as to effect quiet operation.
- N. Provide electrical phase protector.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION AND CONDITIONS AT JOB SITE**

- A. Install all items of equipment as recommended by manufacturer. An item, which because of its unwieldy size or which cannot be delivered in one piece because of physical conditions at site, or which may be damaged or caused damage during delivery and placement, may be delivered in sections but the sections must be of such size as to hold field joints to a minimum and must have been pre-fitted at the factory. Carefully join at the site and weld seamless (after placement) with the same type of weld and welding material used in the fabrication. Welds shall be flat and homogeneous and shall be ground to original finish of metal.
- B. Installation: Place all equipment, assemble, and make a complete unit in the required location, properly leveled, fitted and secured in place, ready for all plumbing, electrical and mechanical connections to be made by other sub-contractors. Traps, line valves, sink trim and fittings are not included except where so stated: but any switches, valves or other accessories which are at the date of this specification regularly included whether or not they are specifically listed herein are to be provided.
- C. FSEC shall erect equipment at site in full compliance with current rules and regulations of City, County and State. If, because of jurisdictional trade agreements or other conditions, any work specified, performed under this contract must be done by others, FSEC shall sub-let such work to those who are qualified to do such work or make other arrangements at his own expense as approved by Architect.
- D. If it becomes necessary to schedule construction so that all partitions be erected prior to delivery of foodservice equipment, bidders are cautioned that all equipment must be fabricated so that it can be handled through finished door openings.
- E. Owner and/or General Contractor to furnish necessary flues and/or vents of proper capacity to operate fixtures specified.
- F. FSEC to furnish trim of same material as body of fixtures where necessary to create sanitary condition and finished appearance.
- G. FSEC to remove all debris made by his workers daily and remove same from premises. Equipment to be cleaned prior to final inspection so as to be free from dirt and dust at time of Owner's acceptance.

- H. FSEC to provide competent project manager for erection and placing of equipment and to coordinate with other contractors in regard to connections at time of installation. FSEC to deliver to other contractors all plumbing and electrical parts that are furnished loose as part of equipment, and coordinate with other trades as to proper installation, if so requested.
- I. Carefully examine conditions at building as soon as possible and report to Architect any work performed by others or any condition at site which prevents FSEC from proper execution of work or which will cause unreasonable delay or an unsatisfactory condition upon completion.
- J. Measurements shown on drawings accompanying these specifications are approximate and are for estimating purposes only. At the time of checking measurements. FSEC is to carefully examine spaces and existing conditions and report to Architect any work performed by others which prevents them from proper execution of their work as required under the contract and obtain Architect's final decision and instructions before proceeding.
- K. Coordinate details and scheduling work at site with other work to avoid unnecessary interference or damage. Work to be done by competent workers and in a thorough, substantial and neat manner in complete accordance with plans and specifications.
- L. Enough competent workers and supervision shall be employed on the job to complete without delay. Properly protect equipment from soiling and damage until inspected and accepted or until FSEC is released from responsibility by Architect. Provide any openings or holes in equipment as needed for connections not included in this section.
- M. All equipment with backsplashes for passing through walls is to be placed tight to wall and sealed to wall with silicone sealant approved by NSF, as required to prevent entry of vermin and insects. **Gaps over 1/4" wide will not be accepted.**
- N. FSEC shall take necessary precautions to adequately protect foodservice equipment from damage caused by other trades during installation process. Before final inspection, FSEC shall remove all protective covering and coatings from work and thoroughly clean all parts of his equipment and service them, leaving all items free from defect, adjusted and lubricated according to the recommendations of manufacturer. **CAUTION:** Equipment with scratches, dents, discoloration, or any other obvious damage will not be accepted.
- O. All work and materials to be in full accordance with the latest rules of U.S. Public Health Service, National Board of Fire Underwriters, and local or State ordinances, regulations of State Fire Marshall and Underwriter's Laboratory.
- P. Provide a full compliment of light bulbs with equipment.

### **3.02 TESTING**

- A. After all connections to equipment have been completed, conduct the final test or tests of equipment in the presence of the Architect or authorized representative for a period of one (1) hour minimum. Adjust and lubricate as required. Each piece of equipment with a heating device shall be tested for temperature control and/or thermostat functions;

thermostats shall be re-calibrated as needed.

- B. Provide a training program by a Serve Safe certified culinary chef to consist of one (1) day at startup, showing all equipment and how it works with demonstrations. Provide the same training as follow up in two (2) one (1) day programs within 90 days of start of school. Trainer shall monitor employees and demonstrate how to properly use equipment with live cooking. Service provided shall include abbreviated classes in Serve Safe and HACCP, and the proper method for receiving and storing product. Training to consist of a total of three (3) days.
- C. Contractor shall issue a letter, signed by all sub-contractors involved and co-signed by Owner's representative stating that staff have been satisfactorily instructed in the use of the equipment.

**PART 4 EQUIPMENT**

**NOTE -**

- 1. General contractor will be responsible for providing all equipment in this schedule (either through their own efforts or by foodservice equipment contractor (FSEC) acting as a sub-contractor).
- 2. All equipment identified in this schedule is to be separately identified in the bid according to the project number and to the funding source as indicated. Bid should include provision of equipment, if applicable, cleaning, storage, servicing, and reinstallation or hook-up to utilities as required. Provision for rough-in, parts, jacks, or other utilities to connect equipment should be included in the appropriate division for building cost and should not be part of equipment bid.
- 3. All relocated equipment shall be stored, cleaned, relocated and/or reinstalled and re-connected to utilities as required. Contractor shall be responsible for documenting condition (including operation/functionality) of said equipment prior to removal and insure it is returned in same or better condition as at removal.

**Logistical Classification (LC) -**

- Class A - FTEV 12-1164 A
- Class B - FTEV 12-1164 B
- Class C - By Owner
- Class D - By End User
- Class E - Existing equipment to be relocated

**Item Qty LC Description**

1	1	A/C	AIR CURTAIN Mars Air # HV248-1UA-TS 120 V 1 ph direct connection 9.0 amps high velocity, unheated, 1 HP motor, Titanium Silver powder coated cabinet. USDA & FDA compliant Accessories: Universal plunger/roller switch, model 99-014
2	1	A/C	WALK-IN COOLER/FREEZER Master-Bilt 120 V 1 ph direct connection 10 amps 23'-1" x 13'-6" (11'-0 1/2" wide sections) x 9'-6" H. N.S.F. construction. Provide digital thermometers, light switches and alarm system at each entry door.

Freezer shall be equipped with a two-way heated pressure relief vent.

Finishes - Interior walls and ceiling shall be white aluminum. Unexposed exterior walls shall be .032 stucco natural aluminum, exposed exterior walls shall be stucco stainless with 36" high aluminum treadplate.

Panels - each panel shall be completely filled with rigid foamed-in-place urethane. Overall thickness shall be 4". Panels must be easily replaceable. Assembly of walk-in shall be by cam-action locking devices with access ports to interior. All joints shall be sealed with PVC bubble gasketing, foamed-in-place (not glued or stapled).

Floor panels - Sub-floor shall be smooth aluminum with foamed-in-place insulation, fabricated similar to other panels. All edges and corners to be covered in accordance with NSF standard 7. All joints shall be sealed with PVC bubble gasket to be foamed-in-place (not glued or stapled). Floor shall be reinforced by the integral inclusion of heavy gauge expanded steel foamed-in-place in direct contact with the underside of sub-floor. Support steel shall not be taped or glued, but held in place by polyurethane foam insulation. Foam shall adhere directly to the underside of sub-floor in such a manner as to form a unitized panel. Each compartment floor to be covered with 100% recycled vinyl flooring, 1/4" thick as furnished and installed by Master-Bilt. Flooring shall be turned up at walls a minimum of 9" incorporating a minimum 1/4" radius and secured to walk-in wall panels with an aluminum finishing trim secured to wall panels every 8". Material to comply with fire performance characteristics as determined by ASTM test methods and have a coefficient of friction (slip resistance) that meets or exceeds OSHA and ADA requirements. Seams to be heat welded per manufacturer's recommendations.

Doors - Each section shall be fitted with one 36" x 78" swing type entrance door. Doors shall be flush type, finished in and out to match the walls in which located. Door and door handles shall be UL Listed and equipped with magnetic gasket, Posi-Seal door closure and handle with provisions for lock and safety release, 1/8" diamond tread kickplate (36" high, interior and exterior) on doors. Door jamb shall be of steel reinforced with FRP frame. An isolated, low wattage heater strip covered by magnetically attracting stainless steel for freezer door (5 watts per foot). Stainless steel threshold with non-skid striping at each door section.

Lighting - each door section shall have rigid conduit between switch and outlet box. Concealed wiring shall be standard on each entrance door section. Provide four (4) 48" LED (2 tube) type vapor proof lights (as required to meet lighting code of 10 foot candles). Bulbs to be provided by successful bidder. All connections to be air and water tight.

Accessories:           Door locks  
                              Peep windows, 14" x 14"  
                              Matching closure trim  
                              One (2) panel auto-closing cool curtains at each  
                              entry door, "Arctic Seal Swinging Door." Standard  
                              mounting. PVC material, USDA and FDA  
                              compliance

Walk-in shall be complete with all the above specified equipment including refrigerant and all additional refrigeration equipment and accessories required to make a complete system including refrigerant line runs, refrigerant charging and leak checking. A complete cycle test shall be performed on each system as part of final testing.

- 3A 1 A/C FREEZER COMPRESSOR  
 Master-Bilt # MHLZ0121C 208-230 V 3 ph direct connection 3.0 HP.  
 R-404A Low temp -10F., 9972 Btuh system capacity with mounted timer, hermetic compressor. Sized for 100F temperature at condenser. MCA: 21, MOP: 30, RLA: 12, LRA: 85. Sized for 100° F temperature at condenser. 38" L x 27" W x 18" H. Base: M2@ 260#.  
 Accessories: Stainless steel weather housing  
 Reverse defrost  
 Four (4) year extended compressor warranty
- 3B 1 A/C FREEZER EVAPORATOR  
 Master-Bilt # E1LZ0120B 208-230 V 1 ph direct connection amps: 1.4 fan and 13.0 defrost. R-404A Low temp -10F., 12000 Btuh Includes pre-assemble kit and master controller, reverse cycle. 64" L x 15" W x 16" H.
- 3C 1 A/C COOLER COMPRESSOR  
 Master-Bilt # MHHZ0171C 208-230 V 3 ph direct connection 1 ½ HP  
 R-404A Hermetic condenser with hood and low ambient kit, Medium tem 35F., 12420 Btuh system capacity with mounted timer. Sized for 100° F temperature at condenser. MCA: 14, MOP: 20, RLA: 7, LRA: 51. 38" L x 27" W x 18" H. 38" L x 27" W x 18" H. Base: M2 @ 360#.  
 Accessories: Stainless steel weather housing  
 Four (4) year extended compressor warranty
- 3D 1 A/C COOLER EVAPORATOR  
 Master-Bilt # E1HZ0130A 120 V 1 ph direct connection 1.8 amps.  
 R-404A Medium tem 35F., 13400 Btuh capacity. 46" L x 15" W x 16" H. Includes preassemble kit and solenoid/temp control.  
 Each evaporator shall be provided with a 3/4" (minimum) copper drain line which shall pitch for complete drainage of all condensation. Drain lines shall extend through sleeves through the walk-in walls to hub drain as shown on sheet A9.3. Drain lines shall have a "P" trap outside the walk-in, just above finished floor. All portions of the drain line within the walk-in freezer shall be completely wrapped in electric heater cable (as supplied by FSEC and installed by electrical contractor) and shall be fully insulated to prevent any freezing of condensation within drain line.

The refrigeration systems shall be completely installed as indicated on drawings with the electrical contractor to connect all condensing units, evaporators, components as specified and make all interconnecting wiring between evaporators and/or condensing unit and controls. Each

unit shall be charged and adjusted and after the initial start-up and adjustment, the installing contractor shall furnish a one year refrigeration service policy on a local level including all labor, materials, refrigerant and mileage.

- |    |     |       |   |
|----|-----|-------|---|
| 4  | LOT | A/D   | <p>WALK-IN SHELVING</p> <p>Metro "Super Erecta Pro" 74" stationary posts with four (4) shelves per section. Shelf frames and posts to be steel with epoxy finish. Reinforced nylon adjustable feet. Polypropylene open grid shelf mats. S-hooks allowed at inner corners only. Size and arrangement as per plan.</p>                                      |
| 5A | 2   | A/C   | <p>HAND SINK</p> <p>Advance Tabco # 7-PS-62 Wall model, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 series stainless steel, splash mounted gooseneck faucet, knee valve, basket drain, wall bracket, NSF Note: if located within 12" of work surface, provide side splash to that side.</p> <p>Accessories: Welded side splash, 7-PS-16</p> |
| 5B | 1   | B/C   | <p>HAND SINK</p> <p>Advance Tabco # 7-PS-62 Wall model, 14" wide x 10" front-to-back x 5" deep bowl, 20 gauge 304 series stainless steel, splash mounted gooseneck faucet, knee valve, basket drain, wall bracket, NSF Note: if located within 12" of work surface, provide side splash to that side.</p> <p>Accessories: Welded side splash, 7-PS-16</p> |
| 6  | 1   | A/D   | <p>SPACER TABLE</p> <p>Advance Tabco # FMS-363 36" X 18" 16 gauge 304 series stainless steel top with 1-1/2" rear upturn, adjustable 18 gauge stainless steel undershelf, stainless steel legs with adjustable stainless steel bullet feet, NSF</p> <p>Accessories: Shorten to 18" wide, TA-61<br/>Type "304" stainless steel legs, TA-95</p>             |
| 7  | 1   | A/D/E | <p>COMBINATION OVEN</p> <p>Relocate existing Henny Penny <b>Electrician/plumber to make all final connections.</b> 120 V 1 ph cord and plug connection 12.5 amps; 123,000 Btu.</p>  |
| 8  | 1   | A/D/E | <p>CONVECTION OVEN</p> <p>Relocate existing Blodgett <b>Electrician/plumber to make all final connections.</b> 120 V 1 ph cord and plug connection 8.0 amps; 45,000 Btu.</p>  |
| 9  | 1   | A/D   | <p>TILT SKILLET</p> <p>Vulcan # VG40 120 V 1 ph cord and plug connection 9.0 amps; 120,000 Btu. Gas, 40-gallon capacity, 46" wide open base, manual tilt, 9" deep stainless steel pan with gallon markings, pouring lip &amp; removable strainer, spring assist cover with drip edge, pan holder, thermostatic control,</p>                               |

includes faucet bracket, electric ignition, 12" stainless steel legs.

**Electrician/plumber to make all final connections.**

Accessories: Double pantry faucet with washdown hose, DBCTTS  
WASHDOWN  
2" draw-off valve, BPDOV-3  
Draw-off strainer, STRAINR-BPD  
Casters, CASTERS BP  
Dormont "Posi-set" wheel placement system

- 10 1 A/D 2-EYE RANGE  
Vulcan # V2B18B 66,000 Btu. Heavy duty range, gas, 18", (2) 33,000  
BTU open burners, cast iron grates, storage base with cabinet doors,  
stainless steel front, front top ledge, sides, base, burner box & stub back,  
6" adjustable legs, BTU, CSA, NSF. **Electrician/plumber to make all  
final connections.**  
Accessories: Casters, CASTERS RR4  
Dormont "Posi-set" wheel placement system

- 11 1 A/C EXHAUST HOOD  
Captive-Aire # 6030ND-2-PSP-F 120 V 1 ph direct connection 10.0  
amps. Two (2) sections, end to end, wall mounted; each having a 14"  
front plenum; hood # 1 shall have a 12" utility cabinet for electrical and  
fire suppression system.  
Hood 1: 60" x 8'-0" one (1) each 10" x 15" exhaust riser- 1600 total CFM  
@ -0.566" S.P., two (2) each 12" x 28" supply risers - 1504 total CFM @  
0.183" S.P. as measured at duct collars.  
Hood 2: 60" x 7'-0" one (1) each 10" x 13" exhaust riser- 1400 total CFM  
@ -0.537" S.P., two (2) each 12" x 24" supply risers - 1204 total CFM @  
0.183" S.P. as measured at duct collars.  
Hood fan and light switches to be located on utility wall riser, item 12.  
Exhaust hood and all components to be NSF Listed and build in  
accordance with NFPA Standard 96 and must comply with 2006 IMC,  
Section 507.2.1.1 Operations. Fire suppression system to be Ansul  
R102 appliance coverage and inter-connected with fire enunciation panel.  
Suppression system installer to perform pre-installation system review  
and testing (no exception) prior to State Inspection. System shall be  
installed by a factory trained and certified installer. FSEC shall install N  
gas emergency shut-off valve as supplied with system. **Note-conduit  
between remote pull station and hood connection to be within  
structural wall, no exception.**  
Exhaust fan 1: Captive-Aire # DU180HFA 208 V 3 ph direct connection  
5.9 FLA  
Make-up air fan: Captive-Aire # A2-D.250-G15 208 V 3 ph direct  
connection 3.4 FLA with N gas fired heater.  
Fan accessories: Grease box, AC interlock relay, motorized backdraft  
damper, low fire start, inlet pressure gauge, manifold pressure gauge,  
commercial smoke detector/alarm interlock, vented regulator ½" vent,  
extended power drop, and roof curb.  
**Fans supplied by FSEC, installed by General Contractor.**



**Electrician to make all final connections. Duct work above hood supplied and installed by General Contractor.**

Accessories: Closure panels to ceiling  
Captrate Solo filters  
UL Listed, pre-wired LED lights

- 12 1 A/C UTILITY WALL  
Captive-Aire 16'-0" overall length  
Electrical: 120/208 V 3 ph: total connected load -18.9 amps 6.8 kw; service size - 120/208 - 100 amps. Direct connection.  
Gas: 1-1/4" looped system; connected load - 354 MBH; system capacity - 960 MBH  
Water: 3/4" hot and cold water  
System shall include hot and cold water, 120/208 service main breaker with shunt trip and reset handle, emergency kill switch, hood fan and light switch with weatherproof cover, status indicator lights, duplex receptacle with weatherproof cover, electrical load center with individual circuit breakers, System shall have two vertical risers, one on each end. The horizontal distribution raceway between risers shall be separated into electrical and plumbing compartments and each shall be completely enclosed and water tight with removable access panels. The risers and raceway shall be construction of 16 ga type 304 stainless steel. The system shall be completely pre-wired and pre-plumbed with one (1) final connection point for each incoming service. **Electrician/plumber to make all final connections.**  
Accessories: Hoses and quick disconnects to complete connection to equipment
- 13 1 A/D WORK TABLE  
Advance Tabco # SS-306 Per outlet: 120 V 1 ph direct connection 20.0 amps. 36" x 72" flat top, adjustable undershelf, stainless steel frame & shelf, 14 gauge 304 series stainless steel top. **Electrician to connect table mounted outlets to power source.**  
Accessories: One (1) 20" x 20" x 5" utensil drawer, SHD-2020  
Mid-mounted pot rack, SCT-72/228  
Two (2) duplex outlets, TA-62  
Type "304" stainless steel legs  
Two (2) flanged feet, TA-19
- 14 1 A/C FLOOR TROUGH  
Advance Tabco # FTG-1836 18"W, 36"L, 4"D, 14 gauge 304 series stainless steel, includes stainless steel subway grating constructed from 3/16" x 1" bars, removable stainless steel strainer basket, 4" O.D. waste pipe, pitched towards waste.
- 15 1 A/C FILL FAUCET  
Fisher # 57657 8" deck mount, with 10" swing spout, lever handles, stainless steel, NSF. Mount on work table (item # 20) as per plan and elevations.

- 16 1 A/D/E REACH-IN FREEZER  
Relocate existing Traulsen # RLT132WUT-HHS 120 V 1 ph cord and plug connection 9.4 amps.
- 17 1 A/D/E REACH-IN REFRIGERATOR  
Relocate existing Traulsen # RHT132WUT-HHS 120 V 1 ph cord and plug connection 7.0 amps.
- 18 1 A/D WORK TABLE  
Advance Tabco # KSS-305 30" x 60" top, with 5" splash at rear, adjustable undershelf, stainless steel frame & shelf, 14 gauge 304 series stainless steel top, stainless steel bullet feet. Secure to wall with Z-clips.  
Accessories: End splash, TA-31  
Splash mounted overshelf, PT-12S-60/TA-227  
One (1) 20" x 20" x 5" utensil drawer, SHD-2020  
Type 304 stainless steel legs, TA-95
- 19 1 A/C/E PREP TABLE W/ SINKS  
Relocate existing Universal Stainless 30' x 12'-0" unit with two (2) compartment sink, rear splash, full length S/S undershelf, partial over shelf and foot valve for fill faucet. Secure to wall with Z-clips.
- 20 1 A/C WORK TABLE W/ SINK  
Advance Tabco # SS-306 Per outlet: 120 V 1 ph direct connection 20.0 amps. 36" x 72" flat top, adjustable undershelf, stainless steel frame & shelf, 14 gauge 304 series stainless steel top, stainless steel bullet feet. Mount fill faucet (item # 15) as per plan and elevations. **Electrician to connect table mounted outlets to power source.**  
Accessories: Cut out for plumbing, TA-48  
20" x 20" x 8" sink, TA-11C  
Lever drain, K-5  
Bracket for lever drain, K-4  
One (1) 20" x 20" x 5" utensil drawer, SHD-2020  
Two (2) duplex outlets, TA-62  
Type 304 stainless steel legs, TA-95  
Plumbing chase, UCF-1
- 21 2 A/D/E HEATED HOLDING CABINET  
Relocate existing Metro # C539-HDS-U 120 V 1 ph cord and plug connection 16.7 amps.
- 22 1 A/D/E HEATED HOLDING CABINET  
Relocate existing Metro 120 V 1 ph cord and plug connection 16.7 amps.
- 23 SPARE NUMBER
- 24A 1 A/D/E PAN RACK

Relocate existing equipment.

24B 1 B/D/E PAN RACK  
Relocate existing equipment.

25 1 B/D/E CAN RACK  
Relocate existing equipment.

26 1 B/D CAN RACK  
Channel # CSR-156 First In, First out model, 82"H, stationary, inclined angle can slides, front loading, holds (156) #10 cans, front edge turned up, welded aluminum construction, NSF.

27 LOT B/D DRY STORAGE SHELVING  
Metro "Super Erecta Pro" 86" stationary posts with five (5) shelves per section. Shelf frames and posts to be steel with epoxy finish. Reinforced nylon adjustable feet. Polypropylene open grid shelf mats. S-hooks allowed at inner corners only. Size and arrangement as per plan.

28 SPARE NUMBER

29 LOT B/C WALL GRID SHELVING  
Metro "Metroseal 3" epoxy coated corrosion-resistant finish with Microban® antimicrobial protection, includes all hardware for installation, as per elevation. Provide 1" clear between posts.  
2 Wall track # SW56K3  
1 Wall track # SW40K3  
4 Upright # SWU30K3  
8 Shelf support, single # SWS14K3  
3 Wall grid # WG2448K3  
4 Wall shelf # 1448NK3  
10 Small hook, 3 1/2" # HK23C  
2 Wire basket, 17 3/8"x 7 1/2" x 5" # H210K3  
2 Wire basket, 17 3/8"x 7 1/2" x 10" # H212K3

30 1 B/C/E 3 COMPARTMENT SINK  
Relocate existing equipment.

31 1 B/C/E CLEAN DISHTABLE  
Existing to remain.

32 1 B/C/E DOOR TYPE DISHWASHER  
Existing to remain. Hobart # AM15-2 208/240 V 3 ph direct connection 24.9 amps, booster - 208/240 V 3 ph direct connection 55.9 amps.

33 1 B/C/E CONDENSATE HOOD  
Existing to remain, new duct and exhaust fan by mechanical.

34 1 B/C/E DISPOSER

Existing to remain. Salvajor 208 V 3 ph direct connection 6.2 amps.

- 35 1 B/C/E SOILED DISHTABLE W/ PRE-RINSE  
Existing to remain.
- 36A 2 A/D DRYING RACK  
Metro # PR48VX3 26"W x 50"L x 68"H, 4-tier, includes: (2) drop-ins & (1) cutting board/tray drying rack, (1) removable polymer shelf mat, built in Microban® antimicrobial product protection and casters.
- 36B 1 B/D DRYING RACK  
Metro # PR48VX3 26"W x 50"L x 68"H, 4-tier, includes: (2) drop-ins & (1) cutting board/tray drying rack, (1) removable polymer shelf mat, built in Microban® antimicrobial product protection and casters.
- 37 LOT B/D/E PORTABLE CART  
Relocate existing equipment.
- 38 1 B/D/E DISH STORAGE RACK  
Relocate existing equipment.
- 39 1 B/C MOP CLOSET  
Advance Tabco # 9-OPC-84 25"W x 22-5/8"D x 84"H, mop sink base (bowl 16" x 20" x 12"), left hinged door, (2) mop holders, (1) fixed intermediate shelf, side louver ventilation, stainless steel construction  
Accessories: Service Sink Faucet, 6-1/2" spout, with hose thread & pail hook, vacuum breaker spout, wall braced, chrome-plated brass
- 40 1 B/D/E ICE MAKER W/ STORAGE BIN  
Relocate existing Hoshizaki # KM-201MAH with water filter system. 120 V 1 ph cord and plug connection 6.1 amps.
- 41 1 B/D EQUIPMENT STAND  
Advance Tabco # ES-303 36"W x 30"D x 24" working height, 14 gauge 304 series stainless steel top with 1" upturn on rear & both sides, front edge with no-drip v-edge, 18 gauge adjustable stainless steel undershelf, stainless steel legs with adjustable stainless steel bullet feet, NSF  
Accessories: 16 gauge 304 series S/S leg upgrade, TA-95

**END OF SECTION**

**SECTION 12 20 00****WINDOW TREATMENTS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Horizontal slat mini-blinds.
- B. Operating hardware.
- C. Vertical hardware

**1.02 SYSTEM DESCRIPTION**

- A. Horizontal metal slat mini-blinds installed at all window openings, manual control of raising and lowering by cord; blade angle adjustable by control wand.
- B. Vertical PVC slates installed at window openings, manual control of sliding slates from side to side by operating cord or metal chain and manual control of slate orientation by rotation control wand to limit the amount of light coming through.

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.04 SUBMITTALS**

- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Submit shop drawings indicating opening sizes, mini-blind size(s), installation of blind at window opening, method of attachment, clearances, and operation.
- C. Submit product data under provisions of Section 01 33 00.
- D. Submit product data indicating physical and dimensional characteristics, and operating features.
- E. Submit samples under provisions of Section 01 33 00.
- F. Submit one sample not less than 1 inch x 12 inch long illustrating slat materials and finish, color, cord, wand type and color.
- G. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with three years experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Deliver blinds wrapped and crated in a manner to prevent damage to components or marring of surfaces.

- C. Store and protect products under provisions of Section 01 60 00.
- D. Store in a clean, dry area, lay flat and blocked off ground to prevent sagging, twisting, or warping.

### **1.07 COORDINATION**

- A. Coordinate installation of blinds to assure compliance with manufacturer's installation instructions.
- B. Provide concealed solid wood blocking within the studwall for attachment of headrail bracket/supports for new construction.
- C. Provide adequate bracing and appropriate hardware to accommodate existing conditions for secure installation.

## **PART 2 PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 – Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles (800 km) of Project site.

### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Hunter Douglas
- B. Kirsch
- C. Levolor
- D. Graber
- E. Fashion Tech/Louverdrape
- F. Substitutions: Under provisions of Section 01 00 00.

### **2.03 MATERIALS**

- A. Louver Slate: One inch wide; 0.006 inch (min) thick spring tempered prefinished aluminum horizontal slats, with manufacturing burro removed; radiused slat corners.
- B. Slat Support: Woven polypropylene, ladder configuration.
- C. Head Rail Housing: Prefinished, formed steel box, 1 inch x 1.5 inch (nominal), internally fitted with hardware, pulleys and bearings for blind operation.
- D. Cord: Braided polypropylene, continuous loop, free end.
- E. Control Wand: Extruded hollow plastic, round shape, removable type, length of window opening height less 12 inches.
- F. Head Support Bracket: Overhead head rail housing attachment provided for installation.
- G. Accessory Hardware: Type recommended by blind manufacturer.

### **2.04 FACTORY FINISHING**

- A. Blind Slat and Head Rail Housing: Color to be neutral color, (recommend matching color of wall if wall color is a light neutral color). Do not use bright, intense, or colors that are set to match items that could be changed out before a 20 year cycle, e.g. chair fabric, accent color on walls.
- B. Cord and Control Wand: Color as standard with manufacturer and compatible with color of blind.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that surfaces and opening are ready to receive the work.
- B. Do not commence fabrication until field measurements are confirmed.
- C. Ensure structural supports are correctly placed.
- D. Beginning of installation means installer accepts existing surfaces and substrates.

**3.02 MINI-BLIND SIZING**

- A. Bottom of Headrail shall be level with and 1 inch above finished window head; overall width of blind equal finished window opening (jamb-jamb), if the blind can not be inset in the window opening then the width will be the opening plus 2 inches; overall height of blind equal finished window opening (head to sill) plus 1 inch

**3.03 VERTICAL BLIND SIZING**

- A. Inset into the window opening, with the head rail (valance) fitting up to the top of the opening and the width of the opening. The length will be 1/4" from the bottom of the opening. If the blind can not be inset, locate the headrail (valance) bottom level with the top of the opening, the width to extend 3" past each side of the opening and the length to be 2" longer than the opening (or 1.4" from the window sill if a sill exists).

**3.04 INSTALLATION**

- A. Install blinds in accordance with manufacturer's instructions and using manufacture's installation brackets and hardware.
- B. Center blind on window opening; bottom of headrail 1 inch above finished window head.
- C. Secure in place with flush countersunk fasteners.
- D. Contractor shall field verify all the dimensions of all windows to receive blinds.

**3.05 TOLERANCES**

- A. Maximum Offset From Level: 1/8 inch.

**3.06 ADJUSTING**

- A. Adjust work as necessary to meet above conditions and manufacturer's installation instructions.
- B. Adjust blinds for smooth operation.

**3.07 CLEANING**

- A. Clean blinds in accordance with manufacture's instructions, or if none provided, clean with soft cloth to remove all dust, dirt, etc. Take extra care to prevent damaging finish.

**END OF SECTION**

**SECTION 21 13 00: WET AND DRY PIPE SPRINKLER SYSTEMS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Design and install wet and/or dry-pipe sprinkler system as indicated on drawings.
- B. Fire sprinkler piping.
- C. Fire department connection.

**1.02 REFERENCES**

- A. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.4 - Grey Iron Threaded Fittings.
- D. ASME B16.5 - Steel Pipe Flanges and Flanged Fittings.
- E. ASME B16.9 - Factory-Made Wrought Steel Buttweld Fittings.
- F. ASME B16.11 - Forged Steel Fittings, Socket Welded and Threaded.
- G. ASME B16.25 - Buttwelding Ends for Pipe, Valves, Flanges and Fittings.
- H. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- K. ASTM A795 – Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and seamless Steel Pipe for Fire Protection Use.
- L. ASTM F438 – Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- M. ASTM F439 – Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- N. ASTM F442/F442M – Standard Specification for Chlorinated Poly (Vinyl Chlorinated) (CPVC) Plastic Pipe (SDR-PR)
- O. NEMA 250 - Enclosures for Electrical Equipment (1000 Volt Maximum).
- P. NFPA 13 - Installation of Sprinkler Systems.
- Q. NFPA 1963 – Standard for Fire Hose Connections
- R. UFC 3-600-01 – Design: Fire Protection Engineering for Facilities.
- S. UL 405 - Fire Department Connection Devices

**1.03 SYSTEM DESCRIPTION**

- A. System to provide coverage for entire building.
- B. Interface system with building fire and smoke alarm system. Coordinate with alarm system contractor.



- C. Provide system to NFPA 13, UFC 3-600-01, and as required in this section. Where conflicts exist the most stringent shall apply.
- D. Provide dry pipe system in areas subject to freezing.
- E. Provide fire department connection.

#### **1.04 QUALITY ASSURANCE**

- A. Design and installation to conform to NFPA 13 (latest edition) and UFC 3-600-01.
- B. Equipment and Components: All materials used shall be UL Listed and Factory Mutual approved, and bear UL or FM label or marking.
- C. Specialist Firm: Company specializing in sprinkler systems with three years experience.
- D. Design by or under the supervision of a certified sprinkler designer.

#### **1.05 REGULATORY REQUIREMENTS**

- A. Hydraulic Calculations, Product Data, and Shop Drawings: Bear stamp of approval of certified sprinkler designer.

#### **1.06 SUBMITTALS**

- A. Submit shop drawings, calculations, layout, and product data.
- B. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, components and accessories.
- C. Submit shop drawings, product data, installation instructions and hydraulic calculations sealed by a certified sprinkler designer.
- D. Contractor shall prepare shop drawings in AutoCAD format and submit paper copies for approval. Upon completion of the project the contractor shall submit a digital copy of the as-built shop drawings. The base shall provide standard border sheet and drawing sheets in digital format as required for the preparation of the shop drawings. Title block is to be filled out the same as the contract drawings and numbered FP-1.
- E. Submit certification of all individuals involved in preparation of shop drawings and calculations. Individuals must currently be certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level - III certification in Automatic Sprinkler System program.
- F. Submittals shall be made under provisions of Section 01 33 00.
- G. The submittals, training, and zoning for the sprinkler system shall be prepared and provided by in-house personnel employed by the Fire Sprinkler Contractor.
- H. The submittals shall be approved by the Hurlburt Fire Department prior to the purchase of materials or any installation of work is begun.

#### **1.07 OPERATION AND MAINTENANCE DATA**

- A. Submit manufacturer's operation and maintenance data.
- B. Include written maintenance data on components of system, servicing requirements, and record drawings.

#### **1.08 EXTRA STOCK**

- A. Provide extra sprinkler heads under provisions of NFPA 13.
- B. Provide suitable wrenches for each head type.
- C. Provide metal storage cabinet and located in the mechanical room.

## PART 2 PRODUCTS

### 2.01 PIPING MATERIALS

- A. Buried Piping: Cast iron within 5' of building.
- B. Above Ground Inside Building Piping:
  - 1. Steel Pipe: ASTM A53/A53M, Grade B or ASTM A795, Schedule 40, black. All pipe and fittings for a dry pipe sprinkler system shall be Schedule 40, galvanized. No Schedule 10 pipe shall be acceptable in any system.
    - a. Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
    - b. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings; ASME B16.6, threaded fittings
    - c. Malleable Iron Fittings: ASME B16.3, threaded fittings.
    - d. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers.
  - 2. CPVC Pipe: ASTM F442/F442M, SDR 13.5, UL listed for wet pipe systems, carrying a rated working pressure of 175 psi @ 150 Degrees F
    - a. Fittings: ASTM F438 schedule 40 or ASTM F439 schedule 80, CPVC.
    - b. Joints: ASTM F493, solvent weld.

### 2.02 GATE VALVES

- A. Up to and Including 2 Inches: Bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge or disc, solder or threaded ends.
- B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, solid wedge, flanged or grooved ends.

### 2.03 CHECK VALVES

- A. Up to and including 2 Inches: Bronze swing disc, solder or screwed ends.
- B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.
- C. Iron body; bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

### 2.04 DRAIN VALVES

- A. Bronze compression stop with nipple and cap or hose thread.
- B. Brass ball valve with cap and chain, 3/4 inch hose thread.

### 2.05 PIPING SPECIALTIES

- A. Wet Pipe Riser Valve: Check type valve, main drain connection, and inlet and outlet gauge connections. Ductile iron body, brass seat and rubber-faced clapper assembly hinged to a removable access cover.
- B. Fire Department Connection: Standard wall type; ductile iron; chrome plated finish, double clapper type; thread size to suit fire department hardware; two way threaded dust cap and chain of same material and finish, 3/4 inch (19 mm) automatic drip connected to drain; marked "Sprinkler - Fire Department Connection".
- C. Water flow switch: Vane type with adjustable delay and two single pole double throw switches (for wet systems only). Provide type as permitted by NFPA 13 for dry systems.
- D. Dry Pipe Valve: U.L. listed latching differential type with associated trim package for system operation, maintenance, and testing. Provide protection against accumulation of water above the clapper by an automatic draining device.
- E. Air Compressor: Automatically maintained pressure system capable of restoring normal air pressure in the system within 30 minutes. Provide domestically manufactured assembly. Air compressor shall be single stage for motors below 1-1/2 hp and two stage for 1-1/2 hp and above, capable of producing air at 150 psi. Sixty gallon tanks and larger shall be ASME stamped. Pumps shall be cast iron with metal belt guard, intake air filter, pressure switch control, tank gauge, check valve, tank drain, pressure relief valve

and outlet valve. Motor speed shall not exceed 1200 rpm. Magnetic starters and overloads shall be provided for all three phase motors.

- F. Gate Valve and Indicator Post: Gate valves for underground installation shall be of inside screw type with counter-clockwise rotation to open. Indicating valves shall be gate valves with approved indicator post of length to permit the top of the post to be located 35" above finished grade. Gate valves and indicator posts shall be UL or FM listed. Provide BEST paddle lock with removable 6-pin core at each indicator post. Indicator post will be painted with one coat chromate primer and two coats alkyd enamel – dark bronze.
- G. Double Check Valve Assemblies: ASSE 1015, AWWA C510-89; stainless steel body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with test cocks and two OS&Y shutoff valves. Approved for use in fire protection systems and approved for installation in the vertical position. All backflow preventors 2 inches and smaller shall be installed with unions for easy removal and maintenance. All backflow preventors shall access ports for each check valve, no dual access type services ports shall be allowed. The riser shall be configured with a test header to allow forward flow testing of backflow preventors at full system demand. Assembly shall include an isolation valve and exterior wall mounted header with multiple test ports sufficient to accommodate full system demand gpm.

## **2.06 SPRINKLER HEADS**

- A. Suspended Ceiling Type: Standard pendant type with chrome plated finish, with matching escutcheon.
- B. Exposed Area Type: Standard upright type with chrome plated finish.
- C. Sidewall Type: Chrome plated finish with matching escutcheon.
- D. Fusible Link: Temperature rated for specific area hazard.

## **2.07 SPRINKLER GUARDS**

- A. Sprinkler guards shall be provided in areas where the heads are subject to mechanical damage, including mechanical.

## **2.08 YARD-TYPE FIRE-DEPARTMENT CONNECTION**

- A. Standard: UL 405.
- B. Type: Exposed, freestanding.
- C. Pressure Rating: 15 psig minimum.
- D. Body Material: Corrosion-resistant metal.
- E. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
- F. Caps: Brass, lugged type, with gasket and chain.
- G. Escutcheon Plate: Round, brass, floor type.
- H. Outlet: Bottom, with pipe threads.
- I. Number of Inlets: Two.
- J. Sleeve: Brass.
- K. Sleeve Height: 18 inches (460 mm).
- L. Escutcheon Plate Marking: Similar to AUTO SPKR.
- M. Finish Including Sleeve: Rough brass or bronze.
- N. Outlet Size: NPS 4 (DN 100).

- O. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to spill to outside building.
- P. Provide valve box at the base of the yard-type FDC to house the check valve and ball drip.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Coordinate work of this Section with other affected work and reflected ceiling plan.
- B. Ream pipe and tube ends to full inside diameter. Remove burrs.
- C. Remove scale and foreign material, inside and out, before assembly.
- D. CPVC piping shall be packaged immediately after its manufacture to prevent damage and shall be stored indoors after production until shipped. Piping shall be protected from damage and sun light on site.

#### **3.02 INSTALLATION - PIPING**

- A. Install buried shut-off valves in valve box. Provide post indicator (PIV), if indicated. PIV shall be installed so that the top of the post is 36 inches above grade. PIV's shall be protected by bollards when installed 5 feet or less from paved areas. Bollards shall be arranged so that they do not hinder operation of the valve.
- B. Install vertical type double check valve assembly in sprinkler system riser. Provide tamper switches for each valve and connect to the alarm panel. FDC shall be installed between 36 inches and 48 inches above grade.
- C. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
- D. Place pipe runs to minimize obstruction to other work.
- E. Place piping in concealed spaces above finished ceilings. In open areas or areas without suspended ceilings, install piping as close as possible to structure above to allow maximum clearance below piping.
- F. Center heads in one direction only in ceiling tile with location in other direction variable, dependent upon spacing and coordination with ceiling elements.
- G. Slope piping and arrange systems to drain at main drain. Where the capacity of trapped sections of piping is less than 5 gallons, an auxiliary drain consisting of not less than a ½" valve shall be provided. Where the capacity of trapped sections of piping is more than 5 gallons, an auxiliary drain consisting of two 2" valves and a 2" by 12" condensate nipple (drum drip) shall be provided. Auxiliary drains shall be terminated outside the building. Install valves in an accessible location or provide access panel.
- H. Route piping in orderly manner, plumb, and parallel to building structure.
- I. Exposed Areas: Paint piping with one coat zinc chromate primer and two coats alkyd enamel to match wall/ceiling color. Provide stencils or pipe markers in accordance with Section 23 05 53.
- J. Mechanical Rooms and Concealed areas: Paint piping with one coat zinc chromate primer and two coats red Alkyd enamel.
- K. Connect water flow switch and other signaling devices to alarm panel.
- L. Inspector's test station shall be installed in the riser room downstream of the flow switch.
- M. Locate outlet of inspectors test outside building 2'-0" above grade with splash block.
- N. Piping for inspectors test or auxiliary drains shall **not** be exposed in finished areas. Install piping concealed in wall or construct furred out space to conceal piping. Provide access door where needed for

access to valves.

- O. CPVC piping shall only be installed when and where indicated on the project drawings. Installation shall be in accordance with manufactures installation instructions, NFPA 13 and its listing.
- P. Provide sleeve at all wall and floor slab pipe penetrations.
- Q. All piping joints under building slabs and foundations shall be installed with thrust blocks and joint restraints.
- R. The Contractor shall notify the Hurlburt Fire Department prior to taking an existing sprinkler system out of service for modification or repair. The Contractor shall perform a function test on the flow switch before taking the system down. The Contractor (not the Fire Department) shall valve off the system, drain the system, perform the repair/modifications, and then put the system back in operation. The Contractor shall perform a function test on the flow switch then notify the Contracting Officer after system is ready for inspection and operation.
- S. When performing repairs or modifications on a fire sprinkler system with a fire pump, the Contractor shall shut down the fire pump first, and then shut the jockey pumps down second. After work is complete, the Contractor shall put the jockey pump back in service before the fire pump is put back in service.
- T. All fire suppression valves that are put into service shall be monitored by factory supplied switch in the normal operational position. If the valve is to be closed under normal system operation, then the valve shall be monitored in the closed position. If the valve is to be open under normal system operation then the valve shall be monitored by factory supplied switch in the open position. Valves that are monitored open under normal system operation will not be accepted as closed valves.
- U. All fire systems shall have a posted sequence of operation. The Contractor shall provide and post a laminated sequence of operation near the fire riser.
- V. Fire sprinkler systems that protect facilities with multiple floors shall have a flow switch at each floor control valve. This flow switch shall provide a signal to the fire alarm control panel to indicate which part of the building has flow to the sprinkler heads.

### **3.03 CLEANING**

- A. Flush entire piping system of foreign matter.

### **3.04 SYSTEM ACCEPTANCE**

- A. System acceptance shall be in accordance with NFPA 13.
- B. Test shall be witnessed by Government contract inspector.
- C. Test control sequence for operation.
- D. At time of the systems acceptance the contractor shall fill out the Contractor's Material and Test Certificate and submit for final approval.
- E. Backflow preventer assemblies shall be tested in accordance with the International Plumbing Code at the time of installation. Use attached inspection form and submit for approval.

**END OF SECTION**

## Backflow Prevention Device Inspection and Maintenance Form

<b>Device</b>	Make: _____	Model: _____	Serial #: _____	Size: _____	
	Date Installed: _____	Test Date: _____	Device Location: _____		
	<input type="checkbox"/> New	<u>Orientation</u>	<u>Use</u>	<u>Protection</u>	
	<input type="checkbox"/> Existing	<input type="checkbox"/> Vertical Up	<input type="checkbox"/> Domestic	<input type="checkbox"/> Containment	
Previous Device Serial #: _____	<input type="checkbox"/> Vertical Down	<input type="checkbox"/> Fire	<input type="checkbox"/> Isolation		
	<input type="checkbox"/> Horizontal	<input type="checkbox"/> Irrigation			
<b>Testing &amp; Maintenance</b>	<input type="checkbox"/> Initial Test	<input type="checkbox"/> Passed	Line Pressure: _____		
	<input type="checkbox"/> Annual Test	<input type="checkbox"/> Failed			
	<b>REDUCED PRESSURE BACKFLOW ASSEMBLY</b>				
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Relief Valve</b>
	<input type="checkbox"/> Leaked	<input type="checkbox"/> Leaked	<input type="checkbox"/> Failed to Open		
	<input type="checkbox"/> Closed Tight	<input type="checkbox"/> Closed Tight	Opened At _____		
	Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	<input type="checkbox"/> Closed Tight		
	Shut Off Valve No. 2	<input type="checkbox"/> Leaked			
	<b>DOUBLE CHECK VALVE</b>			<b>PRESSURE VACUUM BREAKER</b>	
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Air Inlet Valve</b>
With Flow	Against Flow	With Flow	Against Flow	Opened At _____	
<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Failed to Open	
<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Leaked	
Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	Pressure Differential Across Check Valve _____			
Comments: _____					
<b>Test Kit</b>	Test Kit Make: _____	Model: _____	Serial No. _____	Last Calibration Date: _____	
<b>Tester</b>	Name of Certified Tester: _____	Tester Certification Number: _____	Expiration Date: _____		
<b>PASS</b> <input type="checkbox"/> <b>FAIL</b> <input type="checkbox"/>					
I Hereby certify I have tested the device in accordance with FAC Rule 62-555.330(6) and FAC Rule 62-555.360(2).					
Tester's Signature: _____			Date: _____		

**SECTION 22 05 03: PIPES AND TUBES FOR PLUMBING PIPING AND EQUIPMENT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe and pipe fittings.
- B. Valves.
- C. Sanitary sewer piping system.
- D. Domestic water piping system.
- E. Natural gas piping system.
- F. Meters

**1.02 REFERENCES**

- A. ANSI B31.1 - Power Piping.
- B. ASME B16.3 - Malleable Iron Threaded Fittings.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
- F. ASTM A53/A53M - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- G. ASTM A74 - Cast Iron Soil Pipe and Fittings.
- H. ASTM A234/A234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperatures Service.
- I. ASTM B32 - Solder Metal.
- J. ASTM B42- Seamless Copper Pipe, Standard Sizes.
- K. ASTM B88 - Seamless Copper Water Tube.
- L. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- M. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- N. ASTM D2241 – Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
- O. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- P. ASTM D2564 - Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- Q. ASTM D2665 - Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
- R. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
- S. ASTM D3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- T. ASTM D3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- U. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

- V. AWWA C111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- W. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service
- X. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- Y. AWWA C700 - Cold Water Meters - Displacement Type, Bronze Main Case
- Z. AWWA C651 - Disinfecting Water Mains.
- AA. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water Distribution.
- AB. CISPI 301 – Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- AC. NFPA 54 - National Fuel Gas Code.

### **1.03 SUBMITTALS**

- A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Submittal shall indicate where the different piping materials are to be used. Indicate valve data and ratings.
- B. Submit Backflow preventer inspection report and results disinfection samples.
- C. Submittals shall be made under provisions of Section 01 33 00.

### **1.04 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of piping and valves.

### **1.05 OPERATION AND MAINTENANCE DATA**

- A. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views for water meters, gas meters and regulators.

### **1.06 QUALITY ASSURANCE**

- A. Valves: Manufacturer's name and pressure rating marked on valve body.

### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing the work of this section.

### **1.08 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with the International Plumbing Code.
- B. Conform to applicable code for installation of backflow prevention devices.

### **1.09 DELIVERY, STORAGE, AND HANDLING**

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

### **1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install underground piping when bedding is wet or frozen.

## **PART 2 PRODUCTS**



**2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A74 service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: ASTM C564, neoprene gasket system.
- C. PVC Pipe: ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

**2.02 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: ASTM A74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: ASTM C564, neoprene gasket system.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
- C. PVC Pipe: ASTM D2665.
  - 1. Fittings: PVC.
  - 2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

**2.03 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Copper Tubing: ASTM B42, hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B32, solder, Grade 95TA.
- B. Copper Tubing: ASTM B42, annealed.
  - 1. Fittings: ASME B16.26, cast bronze.
  - 2. Joints: Flared.

**2.04 WATER PIPING, ABOVE GRADE**

- A. Copper Tubing: ASTM B88, Type L, hard drawn.
  - 1. Fittings: ASME B16.18, cast bronze, or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, solder, Grade 95TA.

**2.05 NATURAL GAS PIPING, ABOVE GRADE**

- A. Steel Pipe: ASTM A53, Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, forged steel welding type.
  - 2. Joints: NFPA 54, threaded or welded to ANSI B31.1.

**2.06 FLANGES, UNIONS, AND COUPLINGS**

- A. Pipe Size 2 Inches and Under:
  - 1. Ferrous pipe: 150 psig malleable iron threaded unions.
  - 2. Copper tube and pipe: 150 psig bronze unions with soldered joints.
- B. Pipe Size Over 2 Inches:
  - 1. Ferrous pipe: 150 psig forged steel slip-on flanges; 1/16 inch thick preformed neoprene gaskets.
  - 2. Copper tube and pipe: 150 psig slip-on bronze flanges; 1/16 inch thick preformed neoprene gaskets.
- C. Grooved and Shouldered Pipe End Couplings:
  - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
  - 2. Sealing gasket: "C" shape composition sealing gasket.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.07 GATE VALVES**

- A. Up to and including 2 Inches: Bronze body, bronze trim, non-rising stem, handwheel, inside screw, single wedge or disc, solder or threaded ends.
- B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, single wedge, flanged or grooved ends.

**2.08 GATE VALVES, BURIED**

- A. Up to 3 inches: brass or bronze body, non-rising stem, inside screw, single wedge or disc, with control rod, extension box and valve key. Provide post indicator, where shown on drawings.
- B. 3 inches and over: AWWA C500, Iron body, bronze trim, non-rising stem with square nut, single wedge, control rod, extension box and valve key. Provide post indicator where shown on drawings.

**2.09 BALL VALVES**

- A. Up to and including 2 Inches: Bronze one piece body, stainless steel ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- B. Over 2 Inches: Cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle or gear drive handwheel for sizes 10 inches and over, flanged.

**2.10 PLUG VALVES**

- A. Up to and including 2 Inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
- B. Over 2 Inches: Cast iron body and plug, non-lubricated, Teflon packing, flanged ends.

**2.11 BUTTERFLY VALVES**

- A. Bronze body, stainless steel disc, resilient replaceable seat, threaded ends, extended neck, infinite position lever handle with memory stop.
- B. Cast or ductile iron body, chrome plated ductile iron disc, resilient replaceable EPDM seat, wafer or lug ends, extended neck, infinite position lever handle with memory stop.

**2.12 SWING CHECK VALVES**

- A. Up to and including 2 Inches: Bronze swing disc, solder or screwed ends.
- B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

**2.13 SPRING LOADED CHECK VALVES**

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer, or flanged ends.

**2.14 RELIEF VALVES**

- A. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

**2.15 STRAINERS**

- A. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

**2.16 WATER METERS**

- A. Meters shall conform to American Water Works Association (AWWA) C700 and meet the following criteria:
  - 1. Positive displacement, oscillating piston, or oscillating disc type.

2. Magnetic drive with magnetic shielding.
3. Straight reading sealed register graduated in gallons.
4. All bronze split case.
5. Integral strainer.
6. Threaded ends.
7. With pulse switch initiator.
8. Water meter shall be located in the mechanical room. If conditions require an alternate location, the location shall be approved prior to installation by the Contracting Officer

- B. Water meters must be capable of accurately measuring and handling water at pressure, temperatures, and flow rates encountered. The pulse initiator will provide the maximum number of pulses, up to 500 per minute, obtainable from the manufacturer; and not less than 1 pulse per 100 gallons.
- C. Water meters shall be capable of providing pulse or digital signals for remote readout. Water meters shall be compatible with the existing wireless Sensus FlexNet Advanced Metering Infrastructure (FlexNet) system to include the existing FlexNet tower gateway base station, regional network interface system components and set to the approved system operating frequency provided by base personnel. Contractor shall be responsible for programming the meter and ensuring it is communicating with the FlexNet system.

## 2.17 SERVICE GAS METER AND REGULATOR

- A. Gas meter shall be to mil spec MIL-M-18294, style B, without resettable counter. Gas meters must be capable of providing pulse or digital signals for remote readout. Gas meters shall be compatible with the existing wireless Sensus FlexNet Advanced Metering Infrastructure (FlexNet) system to include the existing FlexNet tower gateway base station, regional network interface system components and set to the approved system operating frequency provided by base personnel. Contractor shall be responsible for programming the meter and ensuring it is communicating with the FlexNet system. Pulse switch initiators will provide the maximum number of pulses per 2.83 cubic meters (100 cubic feet). Meters will be calibrated and have local readout capability in volumetric units of 100 cubic feet. Meter shall be pipe mounted and shall be suitable for gas pressure, temperature, and flow rate.

Meters are to be direct reading without having to apply a multiplication factor.

- B. The contractor shall provide and install a gas meter by-pass harness to ensure continuous gas flow from the utility riser to the building natural gas distribution piping when the meter is removed for future maintenance and calibration Installation shall comply with all applicable federal, state and local codes and standards.
- C. Regulator shall be sized for pressure, temperature and flow rate as required by local gas vendor. Body of pressure regulators shall be steel.
- D. Meter, by-pass harness, and regulator shall conform to the requirements of Okaloosa Gas District, the local gas vendor.
- E. Prepare piping connections to equipment with flanges or unions.

## 2.18 MARKING TAPE:

- A. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with type of service in large letters.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

**3.03 BEDDING**

- A. Excavate pipe trench for work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Form and place concrete for pipe thrust restraints at any change of pipe direction on pressure pipe. Place concrete to permit full access to pipe and pipe accessories. Provide thrust restraint bearing on subsoil.
- C. Place bedding material at trench bottom, level fill materials in one continuous layer not exceeding 8 inches compacted depth; compact to 95 percent.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact to 95 percent.
- E. Maintain optimum moisture content of bedding material to attain required compaction density.

**3.04 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than 30 in of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of primer to welding.
- K. Provide support for utility meters in accordance with requirements of utility companies.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Paint exposed piping (insulated and uninsulated) and supports to match wall/ceiling color.
- M. Install bell and spigot pipe with bell end upstream.
- N. Install valves with stems upright or horizontal, not inverted.
- O. Maintain separation of water main from sewer piping in accordance with State of Florida code.
- P. Provide 6" dirt leg in gas piping system at all low points equipment connections and at meter.
- Q. Paint exterior water piping to match the color of the building. Paint interior water piping exposed in mechanical rooms or in concealed areas blue. Paint exposed interior water piping to match color of adjacent surfaces. Label per Section 23 05 53.
- R. Paint exterior natural gas piping to match the color of the building. Paint interior natural gas piping exposed in mechanical rooms or in concealed areas yellow. Paint exposed interior natural gas piping to match color of adjacent surfaces. Label per Section 23 05 53.

- S. Install marking tape continuous over top of non-metallic pipe buried 12 inches below finish grade, above pipe line. Also install tracer wire on top of pipe.
- T. Install access fittings to permit disinfection of water system.
- U. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.
- V. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1/8 inch in 10 feet.
- W. Test all underground piping prior to backfilling trench.
- X. Installation of PVC pipe is prohibited in return air plenums. Coordinate with HVAC systems.

### **3.05 INSTALLATION - VALVES AND HYDRANTS**

- A. Set valves on solid bearing.
- B. Center and plumb valve box over valve. Set box cover flush with finished grade.

### **3.06 APPLICATION**

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install ball or butterfly valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Provide plug valves in Natural gas systems for shut-off service.

### **3.07 ERECTION TOLERANCES**

- A. Establish invert elevations, slopes for drainage to 1/8 inch per foot (one percent) minimum. Maintain gradients.
- B. Slope water piping and arrange to drain at low points.

### **3.08 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

- I. For any water line replacement/installation requiring water samples, the samples shall be collected by a qualified individual. A qualified individual is a Water and Wastewater Contract Lab samples specialist, State licensed water operator, or State licensed water distribution operator.

### **3.09 SERVICE CONNECTIONS**

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with reduced pressure backflow preventer.
  1. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.
  2. Unless approved otherwise, all connections to existing water mains shall be done using wet tapping methods.
- C. Provide new gas service complete with gas meter and regulators.

### **3.10 TESTING**

- A. Test water distribution systems and drainage systems as required by the International Plumbing Code and AWWA 600. All tests are to be witnessed by the contract inspector. If piping systems do not pass the tests, contractor shall make corrections and repeat tests at no additional cost to the government. Repeat until piping systems pass the tests.
- B. Test gas piping systems as required by the International Gas Code. All tests are to be witnessed by the contract inspector. If piping systems do not pass the tests, contractor shall make corrections and repeat tests at no additional cost to the government. Repeat until piping systems pass the tests.

**END OF SECTION**

**SECTION 22 07 00: PLUMBING INSULATION****PART 1 GENERAL****1.01 SECTION INCLUDES:**

- A. Plumbing piping insulation, jackets and accessories.
- B. Plumbing equipment insulation, jackets and accessories.

**1.02 REFERENCES**

- A. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- F. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- G. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
- H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- I. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
- K. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- L. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- M. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- N. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- O. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- P. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- Q. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- R. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- S. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120.
- T. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

U. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials.

### **1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittal: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

### **1.04 QUALITY ASSURANCE**

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Maintain one copy of each document on site.

### **1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum three years experience.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 - Material and Equipment: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

### **1.07 FIELD MEASUREMENTS**

- A. Verify field measurements prior to fabrication.

## **PART 2 PRODUCTS**

### **2.01 PIPE INSULATION**

- A. TYPE P-1: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
  - 1. Thermal Conductivity: 0.23 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 850 degrees F.
  - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied reinforced foil kraft with self-sealing adhesive joints.
  - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- B. TYPE P-2: ASTM C547, molded glass fiber pipe insulation. Conform to ASTM C795 for application on Austenitic stainless steel.
  - 1. Thermal Conductivity: 0.23 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 850 degrees F.



- C. TYPE P-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket. Conform to ASTM C795 for application on Austenitic stainless steel.
  - 1. Thermal Conductivity: 0.27 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 650 degrees F.
  - 3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
  - 4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE P-4: ASTM C612; semi-rigid, fibrous glass board noncombustible. Conform to ASTM C795 for application on Austenitic stainless steel.
  - 1. Thermal Conductivity: 0.27 at 75 degrees F.
  - 2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE P-5: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
  - 1. Thermal Conductivity: 0.27 at 75 degrees F.
  - 2. Operating Temperature Range: Range: Minus 70 to 180 degrees F.
- F. TYPE P-6: ASTM C534, Type I, flexible, closed cell elastomeric insulation, tubular.
  - 1. Thermal Conductivity: 0.30 at 75 degrees F.
  - 2. Maximum Service Temperature: 300 degrees F.
  - 3. Operating Temperature Range: Range: Minus 58 to 300 degrees F.
- G. TYPE P-7: ASTM C534, Type I, flexible, nonhalogen, closed cell elastomeric insulation, tubular.
  - 1. Thermal Conductivity: 0.27 at 75 degrees F.
  - 2. Maximum Service Temperature: 250 degrees F.
  - 3. Operating Temperature Range: Range: Minus 58 to 250 degrees F.
- H. TYPE P-8: ASTM C547, Type I or II, mineral fiber preformed pipe insulation, noncombustible.
  - 1. Thermal Conductivity: 0.23 at 75 degrees F.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Canvas Jacket: UL listed, 6 oz/sq yd, plain weave cotton fabric treated with fire retardant lagging adhesive.
- I. TYPE P-90: ASTM C578, Type XIII, extruded polystyrene insulation, formed into shapes for use as pipe insulation.
  - 1. Thermal Conductivity: 180 day aged value of 0.259 at 75 degrees F.
  - 2. Operating Temperature Range: Range: Minus 297 to 165 degrees F.
  - 3. Vapor Barrier Jacket: ASTM C1136, Type I, factory applied film of 6 milsthickness and water vapor permeance of 0.02 perms.
- J. TYPE P-10: ASTM C533; Type I, hydrous calcium silicate pipe insulation, rigid molded white; asbestos free.
  - 1. Thermal Conductivity: 0.45 at 200 degrees F.
  - 2. Operating Temperature Range: 140 to 1200 degrees F.

## 2.02 PIPE INSULATION JACKETS

- A. Vapor Retarder Jacket:
  - 1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
  - 2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
- B. PVC Plastic Pipe Jacket:
  - 1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
  - 2. Thickness: 15 mil.
  - 3. Connections: Brush on welding adhesive.
- C. ABS Plastic Pipe Jacket:
  - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
- D. Aluminum Pipe Jacket:
  - 1. ASTM B209.
  - 2. Thickness: 0.016 inch thick sheet.

3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: 1/2 inch wide; 0.015 inch thick aluminum.

### 2.03 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: Wood insulation saddle, hard maple. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self adhesive closure. Thickness to match pipe insulation.
- F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- G. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- H. Insulating Cement: ASTM C195; hydraulic setting on mineral wool.
- I. Adhesives: Compatible with insulation.

### 2.04 EQUIPMENT INSULATION

- A. TYPE E-1: ASTM C553; glass fiber, flexible or semi-rigid, noncombustible.
  1. Thermal Conductivity: 0.24 at 75 degrees F.
  2. Operating Temperature Range: 0 to 450 degrees F.
  3. Density: 1.5 pound per cubic foot.
- B. TYPE E-2: ASTM C612; glass fiber, rigid board, noncombustible with factory applied aluminum foil jacket.
  1. Thermal Conductivity: 0.24 at 75 degrees F.
  2. Operating Temperature Range: 0 to 450 degrees F.
  3. Density: 3.0 pound per cubic foot.
  4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- C. TYPE E-3: ASTM C612; semi-rigid, fibrous glass board noncombustible, end grain adhered to jacket.
  1. Thermal Conductivity: 0.27 at 75 degrees F.
  2. Operating Temperature Range: 0 to 650 degrees F.
  3. Vapor Barrier Jacket: ASTM C1136, Type II, factory applied reinforced foil kraft with self-sealing adhesive joints.
  4. Jacket Temperature Limit: minus 20 to 150 degrees F.
- D. TYPE E-4: ASTM C612; semi-rigid, fibrous glass board noncombustible.
  1. Thermal Conductivity: 0.27 at 75 degrees F.
  2. Operating Temperature Range: 0 to 650 degrees F.
- E. TYPE E-5: ASTM C533; Type II, hydrous calcium silicate block insulation, asbestos free.
  1. Thermal Conductivity: 0.45 at 200 degrees F.
  2. Operating Temperature Range: 140 to 1200 degrees F.
- F. TYPE E-6: ASTM C534, Type II, flexible, closed cell elastomeric insulation, sheet.
  1. Thermal Conductivity: 0.27 at 75 degrees F.
  2. Operating Temperature Range: Range: Minus 70 to 220 degrees F.

### 2.05 EQUIPMENT INSULATION JACKETS

- A. PVC Plastic Equipment Jacket:
  1. Product Description: ASTM D1785, sheet material, off-white color.
  2. Minimum Service Temperature: -40 degrees F.

3. Maximum Service Temperature: 150 degrees F.
4. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.
5. Thickness: 15 mil.
6. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape.

B. Aluminum Equipment Jacket:

1. ASTM B209.
2. Thickness: 0.016 inch thick sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Vapor Retarder Jacket:

1. ASTM C921, white Kraft paper with glass fiber yarn, bonded to aluminized film.
2. Water Vapor Permeance: ASTM E96/E96M; 0.02 perms.

D. Field Applied Glass Fiber Fabric Jacket System:

1. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
2. Glass Fiber Fabric:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Blanket: 1.0 lb/cu ft density.
  - c. Weave: 5 x 5.
3. Indoor Vapor Retarder Finish:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Vinyl emulsion type acrylic, compatible with insulation, white color.

## 2.06 EQUIPMENT INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.
- B. Covering Adhesive Mastic: Compatible with insulation.
- C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- D. Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement: ASTM C449/C449M.
- E. Adhesives: Compatible with insulation.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify piping and equipment has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

### 3.02 INSTALLATION - PIPING SYSTEMS

- A. Piping Exposed to View in Finished Spaces: Locate insulation and cover seams in least visible locations.
- B. Continue insulation through penetrations of building assemblies or portions of assemblies having fire resistance rating of one hour or less. Provide intumescent firestopping when continuing insulation through assembly. Finish at supports, protrusions, and interruptions. Refer to Section 07 84 00 for penetrations of assemblies with fire resistance rating greater than one hour.
- C. Piping Systems Conveying Fluids Below Ambient Temperature:
  1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
  2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
  3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.

- D. Glass Fiber Board Insulation:
1. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
  2. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
  3. Cover wire mesh or bands with cement to a thickness to remove surface irregularities.
- E. Extruded Polystyrene Insulation:
1. Wrap elbows and fitting with vapor retarder tape.
  2. Seal butt joints with vapor retarder tape.
- F. Hot Piping Systems less than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
  3. Do not insulate unions and flanges at equipment, but bevel and seal ends of insulation at such locations.
- G. Hot Piping Systems greater than 140 degrees F:
1. Furnish factory-applied or field-applied standard jackets. Secure with outward clinch expanding staples or pressure sensitive adhesive system on standard factory-applied jacket and butt strips or both.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
  3. Insulate flanges and unions at equipment.
- H. Inserts and Shields:
1. Piping 1-1/2 inches Diameter and Smaller: Install galvanized steel shield between pipe hanger and insulation.
  2. Piping 2 inches Diameter and Larger: Install insert between support shield and piping and under finish jacket.
    - a. Insert Configuration: Minimum 6 inches long, of thickness and contour matching adjoining insulation; may be factory fabricated.
    - b. Insert Material: Compression resistant insulating material suitable for planned temperature range and service.
  3. Piping Supported by Roller Type Pipe Hangers: Install galvanized steel shield between roller and inserts.
- I. Insulation Terminating Points:
1. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
  2. Chilled Water Coil Branch Piping: Insulate chilled water piping and associated components up to coil connection.
  3. Condensate Piping: Insulate entire piping system and components to prevent condensation.
- J. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
  2. Miter joints at elbows.
  3. Seal seams and butt joints with manufacturer's recommended adhesive.
  4. When application requires multiple layers, apply with joints staggered.
  5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- K. High Temperature Pipe Insulation:
1. Install in multiple layers to meet thickness scheduled.
  2. Attach each layer with bands. Secure first layer with bands before installing next layer.
  3. Stagger joints between layers.
  4. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

- L. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers, ABS jacket and fitting covers, or aluminum jacket.
- M. Piping Exterior to Building: Provide vapor retarder jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor retarder cement. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water or on bottom side of horizontal piping.
- N. Buried Piping: Insulate only where insulation manufacturer recommends insulation product may be installed in trench, tunnel or direct buried. Install factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with 1 mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with polyester film.
- O. Heat Traced Piping Interior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer.
- P. Heat Traced Piping Exterior to Building: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size insulation large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located at 3 or 9 o'clock position on side of horizontal piping with overlap facing down to shed water.
- Q. Prepare pipe insulation for finish painting. Refer to Section 09 90 00.

### **3.03 INSTALLATION - EQUIPMENT**

- A. Factory Insulated Equipment: Do not insulate.
- B. Exposed Equipment: Locate insulation and cover seams in least visible locations.
- C. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- D. Equipment Containing Fluids Below Ambient Temperature:
  1. Insulate entire equipment surfaces.
  2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
  3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
  4. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Containing Fluids 140 degrees F Or Less:
  1. Do not insulate flanges and unions, but bevel and seal ends of insulation.
  2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
  3. Finish insulation at supports, protrusions, and interruptions.
- F. Equipment Containing Fluids Over 140 degrees F:
  1. Insulate flanges and unions with removable sections and jackets.
  2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
  3. Finish insulation at supports, protrusions, and interruptions.
- G. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers or aluminum jacket.
- H. Equipment Located Exterior to Building: Install vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal equipment.
- I. Nameplates and ASME Stamps: Bevel and seal insulation around; do not cover with insulation.

- J. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.
- K. Prepare equipment insulation for finish painting. Refer to Section 09 90 00.

### 3.04 SCHEDULES

- A. Water Supply Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Domestic Hot Water Supply and Recirculation	P-1	1-1/4 inches and smaller	0.5
		1-1/2 inches and larger	1.0
Domestic Hot Water Supply and Recirculation systems with domestic water temperature maintenance cable	P-1	1 inch and smaller	1.0
		1-1/4 inches to 2 inches	1.5
		2-1/2 inches and larger	2.0
Domestic Cold Water	P-1 or P-5	1-1/4 inches and smaller	0.5
		1-1/2 inches and larger	1.0
Deionized Water	P-1 or P-5	All sizes	1.0

- B. Drainage Services Piping Insulation Schedule:

PIPING SYSTEM	INSULATION TYPE	PIPE SIZE	INSULATION THICKNESS inches
Storm Piping (horizontal above ground within building)	P-1 or P-5	All sizes	1.0
Storm Piping (horizontal and vertical above ground within building when PVC pipe is used)	P-1 or P-5	All sizes	1.0
Sanitary Sewer Piping (horizontal and vertical above ground within building when PVC piping is used)	P-1 or P-5	All sizes	1.0

- C. Equipment Insulation Schedule:

EQUIPMENT	INSULATION TYPE	INSULATION THICKNESS inches
Roof Drain Bodies	E-2 or E-6	1.0
Domestic Hot Water Storage Tanks	E-1 or E-2	1.5
Domestic Water Storage Tanks	E-1, E-2, or E-6	1.0
Domestic Water Booster Pump Bodies	E-6	0.5
Water Softeners and Tanks	E-1, E-2, or E-6	1.0

**END OF SECTION**

**SECTION 22 11 19:****PLUMBING SPECIALTIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Floor drains.
- B. Cleanouts.
- C. Hose bibs.
- D. Backflow preventers.
- E. Water hammer arrestors.

**1.02 REFERENCES**

- A. ANSI/ASSE 1013 - Backflow Preventers, Reduced Pressure Principle.
- B. ANSI/ASSE 1011 - Wall Hydrants, Anti-Backflow Types.
- C. ANSI A112.21.1 - Floor Drains.
- D. ANSI A112.26.1 - Water Hammer Arrestors.
- E. PDI WH-201 Water Hammer Arresters.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- D. Submittals shall be made under provisions of Section 01 33 00.

**1.04 PROJECT RECORD DOCUMENTS**

- A. Record actual locations of equipment, cleanouts and backflow preventers.

**1.05 OPERATION AND MAINTENANCE DATA**

- A. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS****2.01 FLOOR DRAINS**

- A. ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, trap prime, and 8 inch round, adjustable nickel-bronze strainer.
- B. Mechanical rooms: ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and minimum 8" round, adjustable nickel-bronze strainer with extended anti-splash rim.

**2.02 CLEANOUTS**

- A. Exterior Surfaced Areas: Round cast nickel bronze access frame and non-skid cover.
- B. Interior Finished Floor Areas: Lacquered cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, and adjustable nickel-bronze strainer, round with serrated cover in service areas and round with depressed cover to accept floor finish in finished floor areas.



- C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- D. Interior Unfinished Accessible Areas: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

### **2.03 HOSE BIBS**

- A. ANSI/ASSE 1011; anti-siphon hose bibb with chrome plated wall plate, hose thread spout, handwheel, and integral vacuum breaker. Exterior hose bibb shall be provided with a rough brass recessed wall box.

### **2.04 BACKFLOW PREVENTERS**

- A. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

### **2.05 WATER HAMMER ARRESTORS**

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -33 to 180 degrees F and maximum 150 psig working pressure.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Coordinate cutting and forming of floor construction to receive drains to required invert elevations.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Pipe relief from backflow preventer to nearest drain by means of an approved air gap. Install backflow preventers in an accessible location (i.e. not greater than 5' above floor and 12" clear space around backflow preventer, unless otherwise noted).
- E. Install water hammer arrestors in an accessible location, complete with isolation valve on hot and cold water supply piping. Water hammer arrestors are to be installed between the last two fixtures on each branch line.
- F. Provide access doors to all water hammer arrestors that are not accessible.
- G. Provide deep seal "p" trap for all floor drains.
- H. Backflow preventer assemblies shall be tested in accordance with the International Plumbing Code at the time of installation. Use attached inspection form and submit for approval.

**END OF SECTION**

## Backflow Prevention Device Inspection and Maintenance Form

<b>Device</b>	Make: _____	Model: _____	Serial #: _____	Size: _____	
	Date Installed: _____	Test Date: _____	Device Location: _____		
	<input type="checkbox"/> New	<u>Orientation</u>	<u>Use</u>	<u>Protection</u>	
	<input type="checkbox"/> Existing	<input type="checkbox"/> Vertical Up	<input type="checkbox"/> Domestic	<input type="checkbox"/> Containment	
Previous Device Serial #: _____	<input type="checkbox"/> Vertical Down	<input type="checkbox"/> Fire	<input type="checkbox"/> Isolation		
	<input type="checkbox"/> Horizontal	<input type="checkbox"/> Irrigation			
<b>Testing &amp; Maintenance</b>	<input type="checkbox"/> Initial Test	<input type="checkbox"/> Passed	Line Pressure: _____		
	<input type="checkbox"/> Annual Test	<input type="checkbox"/> Failed			
	<b>REDUCED PRESSURE BACKFLOW ASSEMBLY</b>				
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Relief Valve</b>
	<input type="checkbox"/> Leaked	<input type="checkbox"/> Leaked	<input type="checkbox"/> Failed to Open		
	<input type="checkbox"/> Closed Tight	<input type="checkbox"/> Closed Tight	Opened At _____		
	Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	<input type="checkbox"/> Closed Tight		
	Shut Off Valve No. 2	<input type="checkbox"/> Leaked			
	<b>DOUBLE CHECK VALVE</b>			<b>PRESSURE VACUUM BREAKER</b>	
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Air Inlet Valve</b>
With Flow	Against Flow	With Flow	Against Flow	Opened At _____	
<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Failed to Open	
<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Leaked	
Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	Pressure Differential Across Check Valve _____			
Comments: _____					
<b>Test Kit</b>	Test Kit Make: _____	Model: _____	Serial No. _____	Last Calibration Date: _____	
<b>Tester</b>	Name of Certified Tester: _____	Tester Certification Number: _____	Expiration Date: _____		
<b>PASS</b> <input type="checkbox"/> <b>FAIL</b> <input type="checkbox"/>					
I Hereby certify I have tested the device in accordance with FAC Rule 62-555.330(6) and FAC Rule 62-555.360(2).					
Tester's Signature: _____			Date: _____		

**SECTION 22 40 00:****PLUMBING FIXTURES****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Showers.
- G. Electric water coolers.
- H. Eyewash fountains.
- I. Emergency showers.

**1.02 REFERENCES**

- A. ANSI A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- B. ANSI Z358.1 - Emergency Eye Wash and Shower Equipment.
- C. ARI 1010 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.
- D. ASME A112.18.1 - Plumbing Fixture Fittings.
- E. ASME A112.19.2 - Vitreous China Plumbing Fixtures.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use).

**1.03 QUALITY ASSURANCE**

- A. Fixtures: By same manufacturer for each product specified throughout.
- B. Trim: By same manufacturer for each product specified throughout.

**1.04 SUBMITTALS**

- A. Submit product data.
- B. Include fixtures, sizes, utility sizes, trim, and finishes.
- C. Submittals shall be made under provisions of Section 01 33 00.

**1.05 SUSTAINABLE DESIGN SUBMITTALS**

- A. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Water Efficiency Certificates:
    - a. Certify plumbing fixture flow rates.

**1.06 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data.
- B. Include fixture trim exploded view and replacement parts lists.

**1.07 WARRANTY**

- A. Provide five year manufacturer's warranty.

- B. Warranty: Include coverage of electric water cooler compressor.

## **PART 2 PRODUCTS**

### **2.01 WATER CLOSET**

- A. Bowl: ASME A112.19.2; floor mounted, siphon jet, vitreous china closet bowl, with elongated rim, 1-1/2 inch spud, china bolt caps. Low water consumption type (1.6 GPF).
- B. Flush Valve: ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker. Low water consumption type (1.28 GPF). Provide with trap primers where indicated.
- C. Seat: Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

### **2.02 URINAL**

- A. Urinal: ASME A112.19.2; vitreous china, wall hung washout urinal with shields, integral trap, removable stainless steel strainer, 3/4 inch top spud, steel supporting hanger. Low water consumption type (0.125 GPF). Provide with trap primers where indicated.
- B. Flush Valve: ASME A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, integral screwdriver stop. Low water consumption type (1.0 GPF).
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

### **2.03 WALL-HUNG LAVATORY**

- A. Basin: ASME A112.19.2; vitreous china wall-hung lavatory 19 x 17 inch minimum, with 4 inch high back, drillings on 4 inch centers, rectangular basin with splash lip, front overflow, and soap depression.
- B. Trim: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator, long single lever handle, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon. Water shall be provided with a quarter turn ball valve. Valve shall be sweat or screwed.
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.
- D. Maximum Water Flow: 0.5 Gallons per minute for private fixtures and 0.25 gallons per cycle for metering fixtures in public spaces.

### **2.04 COUNTERTOP LAVATORY**

- A. Lavatory: ASME A112.19.2; vitreous china self-rimming countertop lavatory, 19 x 17 inches with drillings on 4 inch centers, front overflow, soap depression, seal of putty, caulking, or concealed vinyl gasket.
- B. Trim: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator, long single lever handle, chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon. Water shall be provided with a quarter turn ball valve. Valve shall be sweat or screwed.
- C. Maximum Water Flow: 0.5 Gallons per minute for private fixtures and 0.25 gallons per cycle for metering fixtures in public spaces.

### **2.05 SINK**

- A. Bowl: ASME A112.19.3; double compartment 32 x 21 x 8-1/8 inch outside dimensions 20 gage, Type 304 stainless steel, self-rimming with undercoating, 3-1/2 inch crumb cups, and stainless steel drain, ledgeback drilled for trim.
- B. Trim: ASME A112.18.1; chrome plated brass supply with 7-1/4" tubular swing spout, water economy aerator, indexed lever handles; chrome plated 17 gage brass P-trap with cleanout plug and arm with escutcheon. Water shall be provided with a quarter turn ball valve. Valve shall be sweat or screwed.
- C. Maximum Water Flow: 1.2 Gallons per minute.

**2.06 SHOWER**

- A. Built-in tile, 36 x 36 x 75 inch high, with stone texture receptor, soap dish, removable chrome plated strainer, tailpieces. Provide cabinet and all accessories as required to be handicap accessible.
- B. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, and shower head assembly to meet handicap requirements.
- C. Maximum Water Flow: 1.6 Gallons per minute.

**2.07 ELECTRIC WATER COOLER**

- A. Fountain: ARI 1010; surface, high-low, handicapped mounted electric water cooler with stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, mounting bracket, refrigerated with integral air cooled condenser; capacity of 8 gal/hr of 50 degree F water with inlet at 80 degree F and room temperature of 90 degree F. Outdoor cooler shall be all stainless steel and freeze-proof.
- B. Trim: Water shall be provided with a quarter turn ball valve. Valve shall be sweat or screwed.

**2.08 SERVICE SINK**

- A. Bowl: 24 x 24 x 10 inch high white molded stone, floor mounted, with one inch wide shoulders, stainless steel strainer.
- B. Trim: ASME A112.18.1; exposed wall type supply with lever handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges; 5 feet of 1/2 inch diameter plain end reinforced rubber hose, hose clamp, mop hanger.

**2.09 EMERGENCY EYE WASH**

- A. ANSI Z358.1; free standing, self cleaning, non-clogging eye wash with quick opening, full-flow valves, stainless steel eye wash receptor, twin eye wash heads, stainless steel dust cover, copper alloy control valve and fittings.

**2.10 EMERGENCY SHOWER**

- A. ANSI Z358.1; free standing, self cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

**PART 3 EXECUTION****3.01 INSPECTION**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

**3.02 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops reducers, and escutcheons.
- C. Install components level and plumb
- D. Install and secure fixtures in place with wall supports, wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.
- F. Provide flush water closets and urinals with reclaimed water where available.
- G. Mount fixtures to the following heights above finished floor:

Water Closet:

Standard	15	inches to top of bowl rim
Handicapped	18	inches to top of seat

Urinal:

Standard	22	inches to top of bowl rim
Handicapped	19	inches to top of bowl rim

Lavatory:

Standard	31	inches to top of basin rim
Handicapped	34	inches to top of basin rim, 29" clear knee space.

Drinking Fountain:

Handicapped	34-36	inches to bubbler, 27" clear knee space.
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Water Closet Flush Valves:

Standard	11	inches min. above bowl rim
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Shower Heads:

Adult (male)	69.5	inches to bottom of head
Adult (female)	64.5	inches to bottom of head

Emergency Eye Wash:

Standard	38	inches to receptor rim
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Emergency Shower:

Standard	84	inches to bottom of head
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- H. Provide manufactured covers for the exposed supply lines and drains at handicapped lavatories to meet ADA requirements. Pipe insulation is not acceptable.

**3.03 ADJUSTING AND CLEANING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. At completion clean plumbing fixtures and equipment.
- C. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

**END OF SECTION**

**SECTION 23 05 00: COMMON WORK RESULTS FOR HVAC****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Basic Mechanical Requirements specifically applicable to Division 21, 22, and 23 Sections, in addition to Division 1 - General Requirements.

**1.02 WORK SEQUENCE**

- A. During the construction period coordinate mechanical schedule and operations with Prime contractor.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to applicable Building Code for the state of Florida.
- B. Fire Protection: Conform to NFPA.
- C. Plumbing: Conform to International Plumbing Code.
- D. The contractor shall perform all demolition, installation, inspection and maintenance of air conditioning equipment in accordance with the latest Environmental Protection Agency guidance, specifically Title IV of the Clean Air Act, Amendments Section 608.
- E. All personnel servicing air conditioning equipment shall be certified in refrigerant recovery and recycling by a State of Florida authorized organization.
- F. All equipment used in servicing air conditioning equipment shall be certified for refrigerant recovery and recycling by a State of Florida authorized organization.
- G. Any servicing of air conditioning equipment must recover, and if possible, recycle all refrigerant. The only alternate to this is to recover and dispose of the refrigerant in accordance with the latest and most restrictive guidance from the Environmental Protection Agency or the Florida Department of Environmental Regulation.

**1.04 PROJECT/SITE CONDITIONS**

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Submit for approval before proceeding.
- C. Where existing equipment (i.e. air handlers, chillers, water heaters, etc.) is to remain, the contractor shall verify condition of that equipment prior to beginning work. If equipment does not work properly, contractor shall notify government for that item to be fixed or problem to be noted prior to beginning work. If contractor does not notify government of any problems it is assumed that all existing equipment to remain is in perfect working order and will be returned in that condition. Contractor is responsible for protection of existing equipment to remain, and any operation of equipment required while under construction.
- D. When existing air handling equipment is to remain in service during construction the Contractor shall place temporary construction filters at all return air grilles. These filters shall be removed when construction is complete. The Contractor shall replace the filters at the unit for all existing and new air handlers after construction is complete.
- E. Project drawings are diagrammatic and do not show all required turns, elbows, transitions, etc. that may be required due to existing conditions or work done by other trades. It is the contractors responsibility to provide all such turns, elbows, transitions, etc. and coordinate with other trades as required to provide a complete and operational system. This shall be done at no additional cost to the government.
- F. All mechanical equipment shall be provided with concrete housekeeping pads.
- G. All pumps shall be anchored in place.

- H. On all air handling and exhaust systems, the Contractor shall provide approved fixed ladder/platform for maintenance and repair of new equipment installed.

**1.05 GAS SERVICE**

- A. Where gas services are required it is the contractor's responsibility to coordinate with local gas utility (Okaloosa County Gas District). Any charges associate with gas services are the responsibility of the contractor.

**1.06 WARRANTY**

- A. All warranties shall begin on the day the government takes beneficial occupancy of the project unless system is placed in operation in several phases at government's request. When system is completed the contractor shall submit letter requesting acceptance of that system. Warranty for that system shall begin on the date it is accepted by the government.

**1.07 OPERATION AND MAINTENANCE MANUALS**

- A. Provide operation and maintenance manuals and other info as required to be included in project O & M Manuals per Section 01 70 00 of this specification. Manuals shall contain written instructions for each system, shop drawings, as-builts, schematic drawings, catalog cuts (submittal information), manufacturer's instructions, warranties, and test and balance report as applicable for every section in this division.
- B. Manuals shall be available for review at the time of the final inspection.

**1.08 TEST AND BALANCE/COMMISSIONING**

- A. The Mechanical Contractor shall provide the services of a third party, independent firm for Test and Balance and Commissioning.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION (NOT USED)**

**END OF SECTION**



**SECTION 23 05 01: MECHANICAL DEMOLITION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Removal of designated mechanical items.
- B. Removal of designated construction.
- C. Disposal of materials. Storage of removed materials.

**1.02 SUBMITTALS FOR REVIEW**

- A. Submit work plan for outages and temporary services to areas that remain occupied (see paragraph 3.01E).

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to all applicable codes for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Do not close or obstruct egress width to any building or site exit.
- C. Do not disable or disrupt building fire or life safety systems without approval by base fire department.
- D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

**1.04 PROJECT CONDITIONS**

- A. Conduct demolition to minimize interference with any adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Contracting Officer. Do not resume operations until directed.

**PART 2 PRODUCTS (NOT USED)****PART 3 EXECUTION****3.01 PREPARATION**

- A. Erect and maintain weatherproof closures for exterior openings.
- B. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.
- C. Protect existing materials and finishes which are not to be demolished.
- D. Prevent movement of structure; provide bracing and shoring.
- E. Maintain existing mechanical and plumbing systems to any occupied areas of the building. Where disruption of systems feeding these areas can not be avoided, contractor shall minimize disruption to the greatest extent possible. Contractor shall submit for approval a work plan that shows how he intends to minimize disruption and the duration of any anticipated disruption. Contractor shall notify occupants 48 hours prior to any disruption of services. Work may be required to be done over a weekend. Where duration of disruption exceeds 2 days (unless noted otherwise) the contractor shall provide temporary services.
- F. Where ductwork systems or air handling equipment is to remain in place during demolition and construction, provide temporary closures of metal or taped polyethylene over openings to prevent construction dust from entering. Contractor will be required to clean ductwork, air handlers and coils where this has not been accomplished.

- G. Confirm with Contracting Officer's Representative about disposition of any systems to be retained by the Government.

### **3.02 DEMOLITION**

- A. Demolish in an orderly and careful manner. Protect existing supporting structural members and building components to remain.
- B. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- C. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- D. Where piping, wiring, ductwork and/or equipment are being removed passes through walls, floors, ceilings or roofs, patch holes to match adjacent finishes. Patch holes in fire rated walls as required to maintain fire rating.
- E. Where exposed mechanical items are being removed, finish surfaces behind item to match adjacent surfaces.
- F. Where removal of mechanical items require demolition of existing building components to remain, make repairs to match construction that was removed.
- G. Remove all controls and electrical associated with the removal of mechanical items unless they are shown to remain or required for installation of new equipment. Removal shall be back to any existing panels or devices that remain in operation.
- H. Remove all hangers, supports, and anchors associated with mechanical items being removed. Patch surfaces to match adjacent finishes.

**END OF SECTION**

**SECTION 23 05 19:****GAGES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pressure gages and Pressure gage taps.
- B. Thermometers and thermometer wells.
- C. Static pressure gages.
- D. Filter gages.

**1.02 REFERENCES**

- A. ASME B40.1 – Pressure Gauges and Gauge Attachments.
- A. ASTM E1 - Standard Specification for ASTM Thermometers.
- B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers.
- C. UL 393 - Indicating Pressure Gauges for Fire-Protection Service.
- D. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service.

**1.03 SUBMITTALS**

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Product Data: Provide manufacturers data which indicates use, operating range, total range, accuracy, and location for manufactured components.

**1.04 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install instruments when areas are under construction, except for required rough-in, taps, supports and test plugs.

**PART 2 PRODUCTS****2.01 PRESSURE GAGES**

- A. Gage: ASME B40.1, UL 393, UL 404 with bourdon tube, rotary brass movement, brass socket, front recalibration adjustment, black scale on white background.
  - 1. Case: Steel.
  - 2. Bourdon Tube: Brass.
  - 3. Dial Size: minimum 3-1/2 inch diameter.
  - 4. Mid-Scale Accuracy: One percent.
  - 5. Scale: Both psi and kPa.
- B. All gages shall be liquid filled on mechanical systems.

**2.02 PRESSURE GAGE TAPPINGS**

- A. Needle Valve: Brass or Steel, 1/4 inch NPT for minimum 300 psi.
- B. Ball Valve: Brass, 1/8 inch NTP for 250 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.
- D. Siphon: Steel, Schedule 40 or Brass, 1/4 inch NPT angle or straight pattern.

**2.03 STEM TYPE THERMOMETERS**

- A. Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
  1. Size: 7 inch scale.
  2. Window: Clear glass.
  3. Stem: Brass, 3/4 inch NPT, 3 1/2 inch long.
  4. Accuracy: ASTM E77, 2 percent.
  5. Calibration: Both degrees F and degrees C.

**2.04 THERMOMETER SUPPORTS**

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

**2.05 TEST PLUGS**

- A. Test Plug: 1/4 inch NPT or 1/2 inch NPT brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with:
  - a. Neoprene core for temperatures up to 200 degrees F.
  - b. Nordel core for temperatures up to 350 degrees F.
  - c. Viton core for temperatures up to 400 degrees F.

**2.06 STATIC PRESSURE GAGES**

- A. Dial Gages: 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- B. Inclined Manometer: Plastic with red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.
- C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install one pressure gage per pump, with taps before strainers and on suction and discharge of pump; pipe to gage.
- C. Install extensions on all gages, gage tappings, valves, thermometers, and test plug as required to allow access without cutting back or removing insulation.
- D. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. Install siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.
- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches (64 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- F. Install thermometers in air duct systems on flanges.
- G. In hydronic systems install test plug adjacent to controls system thermostats, transmitters, or sensors. Coordinate with controls contractor.
- H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.

- I. Install static pressure gages to measure across filters and filter banks, (inlet to outlet). On multiple banks, provide manifold and single gage.
- J. Provide instruments with scale ranges selected according to service with largest appropriate scale. Select scale ranges where the operating points are about mid scale.
- K. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- L. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

**END OF SECTION**

## SECTION 23 05 29: HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Pipe, duct, and equipment hangers, supports, and associated anchors.
- B. Equipment bases, supports, and curbs.
- C. Sleeves, seals, and chases.
- D. Flashing and sealing equipment and pipe stacks.

#### 1.02 REFERENCES

- A. NFPA 13 - Standard for the Installation of Sprinkler Systems.

#### 1.03 QUALITY ASSURANCE

- A. Supports for Sprinkler Piping: In conformance with NFPA 13.
- B. Supports for Ductwork: In conformance with SMACNA HVAC Duct Construction Standards-Metal and Flexible.
- C. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- D. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

### PART 2 PRODUCTS

#### 2.01 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Carbon steel, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 6 Inches and Over: Carbon steel, adjustable, clevis.
- C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- E. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
- F. Vertical Support: Steel riser clamp.
- G. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.
- H. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- I. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation in 180 degree segments, minimum 12 inches long at pipe support.
- J. Shield for Insulated Piping 2-1/2 Inches and Larger (Except Cold Water Piping): Pipe covering protective saddles.
- K. Shields for Insulated Cold Water Piping 2-1/2 Inches and Larger: Hard block non-conducting saddles in 90 degree segments, 12 inch minimum length, block thickness same as insulation thickness.
- L. Shields for Vertical Copper Pipe Risers: Sheet lead.

**2.02 HANGER RODS**

- A. Steel Hanger Rods: Threaded both ends, threaded one end, or continuous threaded.

**2.03 INSERTS**

- A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

**2.04 FLASHING**

- A. Metal Flashing: 26 gage galvanized steel.
- B. Lead Flashing: 5 lb/sq ft sheet lead for waterproofing; one lb/sq ft sheet lead for soundproofing.
- C. Flexible Flashing: 47 mil thick sheet butyl; compatible with roofing.
- D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

**2.05 SLEEVES**

- A. Sleeves for Pipes through Non-fire Rated Floors: Form with 18 gage galvanized steel.
- B. Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gage galvanized steel.
- C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, UL listed.
- D. Sleeves for Round Ductwork: Form with galvanized steel.
- E. Sleeves for Rectangular Ductwork: Form with galvanized steel.
- F. Stuffing or Fire Stopping Insulation: Glass fiber type, non-combustible.
- G. Calk: Acrylic sealant.
- H. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

**2.06 FABRICATION**

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Design hangers without disengagement of supported pipe.
- C. Provide copper plated hangers and supports for copper piping.

**2.07 CHASES**

- A. PVC chases/conduit run underground or under slabs for the purpose of running refrigerant piping or other mechanical services shall have wall thickness equal to schedule 40 unless otherwise indicated.

**2.08 DUCT HANGERS AND SUPPORTS**

- A. Hangers: Galvanized steel band iron or rolled angle and 3/8" (9 mm) rods.
- B. Wall supports: Galvanized steel band iron or fabricated angle bracket.

**2.09 EQUIPMENT CURBS**

- A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, 1-1/2 inch thick insulation, factory installed wood nailer. Color to match color of roofing panels on metal roofs.

**PART 3 - EXECUTION**

**3.01 INSERTS**

- A. Provide inserts for placement in concrete formwork.
- B. Provide inserts for suspended hangers from reinforced concrete slabs and side of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

**3.02 PIPE HANGERS AND SUPPORTS**

- A. Support horizontal piping as follows:

<u>PIPE SIZE</u>	<u>MAX. HANGER SPACING</u>	<u>HANGER DIAMETER</u>
1/2 to 1-1/4 inch	6'-6"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"
PVC (All Sizes)	6'-0"	3/8"
C.I Bell & Spigot (or No-Hub)	5'-0" and at Joints	

- B. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- F. Support vertical piping independently of connected horizontal piping.
- G. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- H. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

**3.03 EQUIPMENT BASES AND SUPPORTS**

- A. Provide housekeeping pads of concrete, minimum 3-1/2 inches thick and extending 6 inches beyond all floor supported equipment unless detailed otherwise on drawings.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

**3.04 FLASHING**

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Seal floor, shower, mop sink and other drains watertight to adjacent materials.
- C. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flexible sheet flash and counterflash with sheet metal; seal watertight.

**3.05 SLEEVES**



- A. Install sleeves at all wall, ceiling, and floor piping and ductwork penetrations. Sleeves shall extend a minimum of 1 inch beyond building element on both sides. Size sleeve to allow minimum of 1 inch void between sleeve and building element.
- B. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- C. Extend sleeves through floors one inch above finished floor level. Calk sleeves full depth and provide floor plate.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with stuffing or fire stopping insulation and calk seal air tight. Install chrome plated steel escutcheon covers where penetration is located in occupied spaces or below finished ceilings. Install penetration firestopping to comply with manufacturers written installation instructions.

### **3.06 CHASES**

- A. Install chases water tight. Caulk both ends of the sleeve with plastic waterproof cement which will dry to a firm but pliable mass, or provide a segmented elastomeric seal.

### **3.07 DUCT HANGERS AND SUPPORTS**

- A. Duct up to 30" wide - 1" x 16 gauge at 10' spacing.
- B. Horizontal duct on wall supports up to 18" wide - 1-1/2" x 16 gauge or 1" x 1/8" at 8' spacing.

### **3.08 ROOF CURBS**

- A. Provide curbs for mechanical roof installations 14 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

### **3.09 FIRE STOPPING**

- A. At penetrations through fire rated walls, ceilings, or floors, install fire stopping materials to achieve fire ratings of adjacent construction.

### **3.10 FINISH**

- A. Prime coat steel hangers and supports. Paint exposed steel hangers and supports to match color of walls and/or ceilings. Hangers and supports located in crawl spaces, pipe shafts, and above suspended ceiling spaces are not considered exposed.

**END OF SECTION**

## SECTION 23 05 53: IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Identification of mechanical products installed under Division 23 00 00.

#### 1.02 REFERENCES

- A. ASME A13.1 - Scheme for the Identification of Piping Systems.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Color: Unless specified otherwise, conform to ASME A13.1.
- B. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- C. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- D. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- E. Stencils: With clean cut symbols and letters of following size:

<u>OUTSIDE DIAMETER OF INSULATION OR PIPE</u>	<u>LENGTH OF COLOR FIELD</u>	<u>SIZE OF LETTERS</u>
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"
2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
Over 10"	32"	3-1/2"
Ductwork and Equipment	-----	2-1/2"

- F. Stencil Paint: Semi-gloss enamel.
- G. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- H. Plastic Tape Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- I. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6 inch wide by 4 mil thick, manufactured for direct burial service.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

#### 3.02 INSTALLATION

- A. Identification markers/markings shall be applied after application of insulation and/or final painting.
- B. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
- C. Plastic or Metal Tags: Install with corrosive-resistant chain.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.

- E. Plastic Tape Markers: Install complete around pipe in accordance with manufacturer's instructions.
- F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
- G. Equipment: Identify air handling units, pumps, condensers, exhaust fans, VAV boxes, chillers, tanks, water treatment devices and any other equipment with plastic nameplates or stencil painting. Small devices, such as in-line pumps, may be identified with plastic or metal tags. Equipment shall be identified as they are shown and scheduled on drawings(i.e. AHU-1, CWP-1, CH-1).
- H. Controls: Identify control panels, thermostats, switches, disconnects and other major control components outside panels with plastic nameplates. Controls should be identified to indicate the piece of equipment they control and/or purpose of control component.
- I. Piping/Piping Insulation: Identify piping, concealed or exposed, with plastic pipe markers, plastic tape markers, or stenciled painting. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction. See applicable sections for pipe painting requirements on applicable services.
- J. Ductwork/Ductwork Insulation: Identify ductwork with stenciled painting or plastic tape markers. Identify as to type of air (supply, return or exhaust), piece of equipment serving ductwork, and flow direction. Locate identification on main trunk lines and branch lines at air handling equipment, at each side of a structure or enclosure penetration, at each obstruction and at a spacing of not more than 20 feet. See Section on ductwork for ductwork painting requirements.
- K. Valves shall be identified with a metal tag that has the valve identification number and a designation as "NORMALLY OPEN" or "NORMALLY CLOSED" or "THROTTLING."

**END OF SECTION**

## SECTION 23 05 93: TESTING, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.
- C. Measurement of final operating condition of HVAC systems.
- D. Sound measurement of equipment operating conditions.
- E. Vibration measurement of equipment operating conditions.

#### 1.02 REFERENCES

- A. AABC MN-1 - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems.
- B. ASHRAE 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning and Refrigeration Systems.
- C. NEBB - Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- D. TABB - International Standards for Environmental Systems Balance.

#### 1.03 SUBMITTALS

- A. Submit name of adjusting and balancing agency for approval within 21 days after award of Contract.
- B. Submit test and balance reports prior to the final inspection. Include full size drawing (24" x 36") with test report indicating the location of all items tested as required.
- C. Prior to commencing work, submit draft reports indicating adjusting, balancing, and equipment data required.
- D. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Contracting Officer and for inclusion in operating and maintenance manuals.
- E. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- F. Include detailed procedures, agenda, sample report forms, and copy of AABC National Project Performance Guaranty prior to commencing system balance.
- G. Submittals shall be made under provisions of Section 01 33 00.
- H. **Upon approval of the test and balance report, submit copy of the report in digital (MS Word or Excel) format.**

#### 1.04 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing:
  - 1. HVAC Pumps.
  - 2. Boilers.
  - 3. Forced Air Furnaces.
  - 4. Chillers.
  - 5. Air Cooled Refrigerant Condensers.
  - 6. Packaged Heating/Cooling Units.
  - 7. Packaged Terminal Air Conditioning Units.
  - 8. Unit Air Conditioners.
  - 9. Computer Room Air Conditioning Units.

10. Air Coils.
11. Terminal Heat Transfer Units.
12. Unit Ventilators.
13. Fan Coil Units.
14. Air Handling Units.
15. Fans.
16. Air Terminal Units.
17. Air Inlets and Outlets.
18. Heat Exchangers.

### 1.05 REPORT FORMS

- A. Submit reports on AABC National Standards for Total System Balance or NEBB forms.
- B. Forms shall include the following information:
  1. Title Page:
    - a. Company name (Test and balance contractor)
    - b. Company address
    - c. Company telephone number
    - d. Project name
    - e. Project location
    - f. Project Contractor (General contractor and Mechanical sub-contractor)
  2. Instrument List:
    - a. Instrument
    - b. Manufacturer
    - c. Model
    - d. Serial number
    - e. Range
    - f. Calibration date
  3. Air Moving Equipment:
    - a. Location
    - b. Manufacturer
    - c. Model
    - d. Air flow, specified and actual
    - e. Return air flow, specified and actual
    - f. Outside air flow, specified and actual
    - g. Total static pressure (total external), specified and actual
    - h. Inlet pressure
    - i. Discharge pressure
    - j. Fan RPM
  4. Exhaust Fan Data:
    - a. Location
    - b. Manufacturer
    - c. Model
    - d. Air flow, specified and actual
    - e. Total static pressure (total external), specified and actual
    - f. Inlet pressure
    - g. Discharge pressure
    - h. Fan RPM
  5. Return Air/Outside Air Data:
    - a. Identification/location
    - b. Design air flow
    - c. Actual air flow
    - d. Design return air flow
    - e. Actual return air flow
    - f. Design outside air flow
    - g. Actual outside air flow
    - h. Return air temperature
    - i. Outside air temperature
    - j. Required mixed air temperature
    - k. Actual mixed air temperature
    - l. Design outside/return air ratio
    - m. Actual outside/return air ratio

6. Electric Motors:
  - a. Manufacturer
  - b. HP/BHP
  - c. Phase, voltage, amperage; nameplate, actual, no load.
  - d. RPM
  - e. Service factor
  - f. Starter size, rating, heater elements
7. V-Belt Drive:
  - a. Identification/location
  - b. Required driven RPM
  - c. Driven sheave, diameter and RPM
  - d. Belt, size and quantity
  - e. Motor sheave, diameter and RPM
  - f. Center to center distance, maximum, minimum, and actual
8. Duct Traverse:
  - a. System zone/branch
  - b. Duct size
  - c. Area
  - d. Design velocity
  - e. Design air flow
  - f. Test velocity
  - g. Test air flow
  - h. Duct static pressure
  - i. Air temperature
  - j. Air correction factor
9. Air Monitoring Station Data:
  - a. Identification/location
  - b. System
  - c. Size
  - d. Area
  - e. Design velocity
  - f. Design air flow
  - g. Test velocity
  - h. Test air flow
10. Air Distribution Test Sheet:
  - a. Air terminal number
  - b. Room number/location
  - c. Terminal type
  - d. Terminal size
  - e. Area factor
  - f. Design velocity
  - g. Design air flow
  - h. Test (final) velocity
  - i. Test (final) air flow
  - j. Percent of design air flow
11. Terminal Unit Data:
  - a. Manufacturer
  - b. Type, constant, variable, single, dual duct
  - c. Identification/number
  - d. Location
  - e. Model
  - f. Size
  - g. Minimum static pressure
  - h. Minimum design air flow
  - i. Maximum design air flow
  - j. Maximum actual air flow
  - k. Inlet static pressure
12. Pump Data:
  - a. Identification/number
  - b. Manufacturer
  - c. Size/model
  - d. Impeller

- e. Service
  - f. Design flow rate, pressure drop, BHP
  - g. Actual flow rate, pressure drop, BHP
  - h. Discharge pressure
  - i. Suction pressure
  - j. Total operating head pressure
  - k. Shut off, discharge and suction pressures
  - l. Shut off, total head pressure
13. Air Cooled Chillers:
- a. Identification/number
  - b. Manufacturer
  - c. Capacity
  - d. Model
  - e. Evaporator entering water temperature, design and actual
  - f. Evaporator leaving water temperature, design and actual
  - g. Evaporator pressure drop, design and actual
  - h. Evaporator water flow rate, design and actual
  - i. Condenser entering water temperature, design and actual
  - j. Condenser leaving water temperature, design and actual
  - k. Condenser pressure drop, design and actual
  - l. Condenser water flow rate, design and actual
14. Cooling Coil Data:
- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Air flow, design and actual
  - f. Entering air DB temperature, design and actual
  - g. Entering air WB temperature, design and actual
  - h. Leaving air DB temperature, design and actual
  - i. Leaving air WB temperature, design and actual
  - j. Water flow, design and actual
  - k. Water pressure drop, design and actual
  - l. Entering water temperature, design and actual
  - m. Leaving water temperature, design and actual
  - n. Air pressure drop, design and actual
15. Heating Coil Data:
- a. Identification/number
  - b. Location
  - c. Service
  - d. Manufacturer
  - e. Air flow, design and actual
  - f. Water flow, design and actual
  - g. Water pressure drop, design and actual
  - h. Entering water temperature, design and actual
  - i. Leaving water temperature, design and actual
  - j. Entering air temperature, design and actual
  - k. Leaving air temperature, design and actual
  - l. Air pressure drop, design and actual
16. Flow Measuring Station:
- a. Identification/station
  - b. Location
  - c. Size
  - d. Manufacturer
  - e. Model
  - f. Design flow rate
  - g. Design pressure drop
  - h. Actual/final pressure drop
  - i. Actual/final flow rate
  - j. Station calibrated setting
17. Duct Leak Test:
- a. Description of ductwork under test

- b. Duct design operating pressure
  - c. Duct design test static pressure
  - d. Duct capacity, air flow
  - e. Maximum allowable leakage duct capacity times leak factor
  - f. Test apparatus
    - 1) Blower
    - 2) Orifice, tube size
    - 3) Orifice size
    - 4) Calibrated
  - g. Test static pressure
  - h. Test orifice differential pressure
  - i. Leakage
18. Combustion Test:
- a. Manufacturer
  - b. Model number
  - c. Serial number
  - d. Firing rate
  - e. Overfire draft
  - f. Gas meter timing dial size
  - g. Gas meter time per revolution
  - h. Gas pressure at meter outlet
  - i. Gas flow rate
  - j. Heat input
  - k. Burner manifold gas pressure
  - l. Percent carbon monoxide (CO)
  - m. Percent carbon dioxide (CO<sub>2</sub>)
  - n. Percent oxygen (O<sub>2</sub>)
  - o. Percent excess air
  - p. Flue gas temperature at outlet
  - q. Ambient temperature
  - r. Net stack temperature
  - s. Percent stack loss
  - t. Percent combustion efficiency
  - u. Heat output
19. Air Cooled Condenser:
- a. Identification/number
  - b. Location
  - c. Manufacturer
  - d. Model number
  - e. Serial number
  - f. Entering DB air temperature, design and actual
  - g. Leaving DB air temperature, design and actual
  - h. Number of compressors
20. Electric Heater:
- a. Manufacturer
  - b. Identification/number
  - c. Location
  - d. Model number
  - e. Design kW
  - f. Number of stages
  - g. Phase, voltage, amperage
  - h. Test voltage (each phase)
  - i. Test amperage (each phase)
  - j. Air flow, specified and actual
  - k. Temperature rise, specified and actual
21. Unit Ventilator and Fan Coil Data:
- a. Manufacturer
  - b. Identification/number
  - c. Location
  - d. Model number
  - e. Size
  - f. Air flow, design and actual



- g. Water flow, design and actual
- h. Water pressure drop, design and actual
- i. Entering water temperature, design and actual
- j. Leaving water temperature, design and actual
- k. Entering air temperature, design and actual
- l. Leaving air temperature, design and actual

#### **1.06 PROJECT RECORD DOCUMENTS**

- A. Submit record documents.
- B. Accurately record actual locations of balancing valves and rough setting.

#### **1.07 QUALITY ASSURANCE**

- A. Agency shall be company specializing in the adjusting and balancing of systems specified in this Section with minimum three years documented experience and certified by AABC MN-1. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor. All documentation shall be signed by a registered Professional Engineer.
- B. Total system balance shall be performed in accordance with AABC MN-1 or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

#### **1.08 SEQUENCING AND SCHEDULING**

- A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.
- B. No modifications shall be performed on any factory supplied systems without written approval of the Government. The Contractor shall notify the Contracting Officer if system modification is required above standard procedure and practice.

### **PART 2 PRODUCTS (NOT USED)**

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Before commencing work, verify that systems are complete and operable. Ensure the following:
  - 1. Equipment is operable and in a safe and normal condition.
  - 2. Temperature control systems are installed complete and operable.
  - 3. Proper thermal overload protection is in place for electrical equipment.
  - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  - 5. Duct systems are clean of debris.
  - 6. Correct fan rotation.
  - 7. Fire and volume dampers are in place and open.
  - 8. Coil fins have been cleaned and combed.
  - 9. Access doors are closed and duct end caps are in place.
  - 10. Air outlets are installed and connected.
  - 11. Duct system leakage has been minimized.
  - 12. Hydronic systems have been flushed, filled, and vented.
  - 13. Correct pump rotation.
  - 14. Proper strainer baskets are clean and in place.
  - 15. Service and balance valves are open.
- B. Report any defects or deficiencies noted during performance of services to Contracting Officer.
- C. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
- D. If, for design reasons, system cannot be properly balanced, report as soon as observed.
- E. Beginning of work means acceptance of existing conditions.

#### **3.02 PREPARATION**

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Base Civil Engineering (BCE) to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### **3.03 INSTALLATION TOLERANCES**

- A. Adjust air handling systems to plus or minus 5 percent for supply systems and plus or minus 10 percent for return and exhaust systems from figures indicated.
- B. Adjust hydronic systems to plus or minus 10 percent of design conditions indicated.

### **3.04 ADJUSTING**

- A. Recorded data shall represent actually measured, or observed condition.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- F. Check and adjust systems approximately six months after final acceptance and submit report.

### **3.05 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure.
- M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm

connections properly made and confirm proper operation for automatic variable air volume temperature control.

### **3.06 WATER SYSTEM PROCEDURE**

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

### **3.07 COMMISSIONING**

- A. The commissioning procedures shall be performed as required.

**END OF SECTION**

**SECTION 23 07 00:****HVAC INSULATION****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Ductwork insulation.
- B. Insulation jackets.
- C. Equipment insulation.
- D. Covering.
- E. Breeching insulation.
- F. Piping insulation.
- G. Jackets and accessories.

**1.02 REFERENCES**

- A. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- D. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- E. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- F. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- G. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
- H. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
- I. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- J. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- K. ASTM C1290 – Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
- L. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- M. ASTM E2231 - Specimen Preparation and Mounting of Pipe and Duct Insulation Materials to Assess Surface Burning Characteristics.
- N. NFPA 255 - Surface Burning Characteristics of Building Materials.

**1.03 QUALITY ASSURANCE**

- A. Applicator: Company specializing in insulation application with three years minimum experience.
- B. Insulation, Coverings, and Linings: UL listed; maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.

**1.04 SUBMITTALS**

- A. Submit product data.
- B. Include product description, list of materials and thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.
- D. Submittals shall be made under provisions of Section 01 33 00.

**1.05 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesive and insulation.

**PART 2 PRODUCTS****2.01 DUCTWORK INSULATION**

- A. Type A: Flexible glass fiber; ASTM C1290; commercial grade; 'k' value of 0.29 at 75 degrees F; 1.5 lb/cu ft minimum density; 0.002 inch foil scrim facing. Insulation shall be made of at least 20% post consumer glass cullet.
- B. Type B: Rigid glass fiber; ASTM C612, Class 1; 'k' value of 0.24 at 75 degrees F; 0.002 inch foil scrim facing. Insulation shall be made of at least 20% post consumer glass cullet.
- C. Type C: Flexible glass fiber; ASTM C553; 'k' value of 0.24 at 75 degrees F; 1.5 lb/cu ft minimum density; coated air side for maximum 4,000 ft/min (20.3 m/sec) air velocity. Insulation shall be made of at least 20% post consumer glass cullet.
- D. Adhesives: Waterproof fire-retardant type.
- E. Indoor Jacket: 6 oz/sq yd canvas.
- F. All exterior ductwork shall be factory double wall ductwork and shall be sealed watertight. All exterior ductwork shall be finished to match the adjacent building components.
- G. Lagging Adhesive: Fire resistive to NFPA 255.
- H. Impale Anchors: Galvanized steel, 12 gage. Secure with epoxy adhesive as recommend by manufacture.
- I. Joint Tape: Glass fiber cloth, open mesh.
- J. Tie Wire: Annealed steel, 16 gage.
- K. All ductwork insulation systems shall meet or exceed ASHRAE 90.1 requirements in addition to the requirements of this section.

**2.02 EQUIPMENT INSULATION**

- A. When factory insulation of HVAC equipment is available or is offered as an option, all HVAC equipment shall be provided with pre-insulated with factory insulation.
- B. Type A: Flexible mineral fiber blanket; ASTM C553; 'k' value of 0.24 at 75 degrees F; 2.0 lb/cu ft density.
- C. Type B: Rigid mineral fiber board; ASTM C612; 'k' value of 0.24 at 75 degrees F; 6.0 lb/cu ft density.
- D. Type C: Cellular glass; ASTM C552; 'k' value of 0.35 at 75 degrees F; 8.0 lb/cu ft density.
- E. Type D: Calcium silicate; ASTM C533; asbestos free; 'k' value of 0.40 at 250 degrees F; 14 lb/cu ft density.

**2.03 EQUIPMENT INSULATION ACCESSORIES**

- A. Bedding Compounds: Non-shrinking, permanently flexible, compatible with insulation. All bedding compounds shall contain zero VOC's.

- B. Vapor Barrier Coating: Non-flammable, fire resistant, polymeric resin, compatible with insulation. All vapor barrier coatings shall contain zero VOC's
- C. Insulating Cement: ASTM C195, hydraulic setting mineral wool. All insulating cement shall contain zero VOC's.
- D. Wire Mesh: Corrosive resistant metal; hexagonal pattern.

#### **2.04 PIPING INSULATION**

- A. Type A: Glass fiber insulation; ASTM C547, Type I; 'k' value of 0.24 at 75 degrees F; noncombustible. Insulation shall be made of at least 20% post consumer glass cullet.
- B. Type B: Cellular glass; ASTM C552, Type II, Class 2; maximum water vapor transmission rating of 0.1 perms; 'k' value of 0.40 at 75 degrees F.
- C. Type C: Cellular foam; ASTM C534, Type I; tubular form, flexible, plastic; 'k' value of 0.28 at 75 degrees F. All cellular foam piping insulation shall be provided with a metal jacket.

#### **2.05 PIPE INSULATION JACKETS**

- A. Interior Applications:
  1. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
  2. PVC Jackets: One piece, premolded type.
  3. Canvas Jackets: UL listed treated cotton fabric, 6 oz/sq yd.
- B. Exterior Applications:
  1. Aluminum Jackets: ASTM B209; 0.020 inch thick; smooth finish.
  2. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; smooth finish.

#### **2.06 PIPE INSULATION ACCESSORIES**

- A. Insulation Bands: 3/4 inch wide; 0.015 inch thick galvanized steel.
- B. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- C. Insulating Cement: ASTM C195; hydraulic setting mineral wool. All insulating cement shall contain zero Volatile Organic Compounds (VOC's).
- D. Finishing Cement: ASTM C449/C449M. All finishing cement shall contain zero VOC's.
- E. Fibrous Glass Cloth: Untreated; 9 oz/sq yd weight.
- F. Adhesives: Compatible with insulation and containing zero VOC's..

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Install materials after ductwork /piping has been tested and approved.
- B. Clean surfaces for adhesives.

#### **3.02 DUCTWORK INSULATION INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.
- C. Exterior Insulation (Type A or Type B) Application:
  1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  2. Secure insulation without vapor barrier with staples, tape, or wires.
  3. Install without sag on underside of ductwork. Use mechanical fasteners where necessary to prevent sagging. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop

and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

- D. Liner (Type C) Application:
  1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Seal and smooth joints. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.
- E. Continue insulation with vapor barrier through penetrations.
- F. Exposed insulation or ductwork: Where ductwork or insulation is exposed in mechanical rooms or in finished spaces, paint jacketing to match color of interior finish as approved by architect. Use paint suitable for substrate and in accordance with manufactures instructions.
- G. Where externally insulated ductwork connects to internally insulated ductwork or internally insulated pieces of equipment ensure there is a thermal break to prevent condensation on internally insulated items.

### **3.03 EQUIPMENT INSULATION INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Do not insulate factory insulated equipment.
- C. Apply insulation as close as possible to equipment by grooving, scoring, and beveling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires , or bands.
- D. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.
- E. Cover insulation with metal mesh and finish with heavy coat of insulating cement.
- F. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.
- G. When equipment with insulation requires periodical opening for maintenance, repair, or cleaning, install insulation in such a manner that it can be easily removed and replaced without damage.
- H. Select insulation types best suited for the equipment which it is to be installed, as recommended by insulation manufacturer. Insulation shall have a neat appearance and provide protection against heat loss or gain and condensation. Provide vapor barriers at all equipment below ambient temperature. Insulation shall be a minimum 2" thick.
- I. Equipment shall be provided from the manufacture with insulation which has documentation that the equipment will not condensate.

### **3.04 PIPING INSULATION INSTALLATION**

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. On insulated piping without vapor barrier and piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation at such locations.

- F. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.
- G. Neatly finish insulation at supports, protrusions, and interruptions.
- H. Install preformed insulation, of the same type and thickness, and aluminum jackets, where aluminum jackets are required, at elbows, tees, valves, etc.
- I. Jackets:
1. Indoor, Concealed Applications: Insulated pipes conveying fluids above ambient temperature shall have standard jackets, with or without vapor barrier, factory applied or field applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used. Excluding Type C insulation.
  2. Indoor, Concealed Applications: Insulated dual-temperature pipes or pipes conveying fluids below ambient temperature shall have vapor barrier jackets, factory applied or field applied. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe, and finish with glass cloth and vapor barrier adhesive. Excluding Type C insulation.
  3. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with canvas jacket; size for finish painting. Do not use PVC jackets. Include on all types of insulation.
  4. Exterior Applications: Provide vapor barrier jackets. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Include on all types of insulation.
  5. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film. Excluding Type C insulation.
- J. Finish Painting: Finish exterior of pipe jackets on all indoor exposed piping to match color of surface located behind pipes. Finish exterior of pipe jackets on all exterior piping to match color of surfaces behind piping.

### 3.05 SCHEDULES:

#### A. Ductwork

LOCATION	TYPE	THICKNESS (INCH)
Ductwork Exposed in Mech Rooms or other finished areas	B	2" (unless noted otherwise)
Ductwork not Exposed (above ceilings)	A	2" (unless noted otherwise)
Air Transfer Ducts	C	2" (unless noted otherwise)

#### B. Equipment

EQUIPMENT
Domestic Hot Water Storage Tanks
Domestic Cold Water Storage Tanks
Domestic Cold Water Pressure Tanks
Heat Exchangers/Converters
Air Separators
Hot Thermal Storage Tanks
Boiler Feed Water Storage Tanks
Steam Condensate Receivers
Condensate Tanks
Stacks to Roof
Chiller Cold Surfaces (Not Factory Insulated)
Cold Thermal Storage Tanks
Chilled Water Pump Bodies
Expansion Tanks



## C. Piping

PIPING	TYPE	PIPE SIZE, INCH	THICKNESS, INCH
Domestic Hot Water	A	ALL	1"
Tempered Domestic Water	A	ALL	1"
Domestic Cold Water	A	ALL	1"
Roof Drains	A	ALL	1"
Chilled Drinking Water	C	ALL	1"
Heating Water Supply and Return	A	1/2" - 1-1/4"	1"
	A	1-1/2" - 2"	1-1/2"
	A	2-1/2" - 3"	2"
	A	4" - 6"	2-1/2"
Low Pressure Steam Piping	A	1/2" - 1-1/4"	1"
	A	1-1/2" - 2"	1-1/2"
	A	2-1/2" - 3"	2"
	A	4" - 6"	2-1/2"
Low Pressure Steam Condensate	A	1/2" - 1-1/4"	1"
	A	1-1/2" - 2"	1-1/2"
	A	2-1/2" - 3"	2"
	A	4" - 6"	2-1/2"
Boiler Feed Water	A	1/2" - 1-1/4"	1"
	A	1-1/2" - 2"	1-1/2"
	A	2-1/2" - 3"	2"
	A	4" - 6"	2-1/2"
Chilled Water	B	ALL	2"
Condenser Water	A	ALL	1"
Cold Condensate Drains	C	ALL	1"
Refrigerant Suction	C	ALL	1"
Refrigerant Hot Gas	C	ALL	1"

**END OF SECTION**

## SECTION 23 09 23: DIRECT DIGITAL CONTROL SYSTEM FOR HVAC

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Direct Digital Control (DDC) Systems for HVAC Systems.
- B. Software.

#### 1.02 REFERENCES

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

- A. AIR-MOVEMENT AND CONTROL ASSN, INC (AMCA)  
AMCA 500 - Test Methods for Louvers, Dampers and Shutters
- B. AMERICAN NATIONAL STANDARDS INSTITUTE, INC (ANSI)  
ANSI B40.1 -Gauges-Pressure Indicating Dial Type-Elastic Element
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - 1. ASTM A 269 -Seamless and Welded Austenitic Stainless Steel Tubing for General Service
  - 2. ASTM B 88 - Seamless Copper Water Tube
  - 3. ASTM D 635 Rate of Burning and/or Extent of Time of Burning of Self-Supporting Plastics in a Horizontal Position
  - 3. ASTM D 1693 - Environmental Stress-Cracking of Ethylene Plastics
- D. FEDERAL COMMUNICATIONS COMMISSION (FCC)  
FCC Part 15 - (Vol II) Radio Frequency Devices
- E. FEDERAL SPECIFICATIONS (FS)  
FS GG-T-321 - (Rev D; Am 2) Thermometers, Self-Indicating Liquid-in-Glass for Machinery and Piping Systems
- F. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC (IEEE)  
IEEE No. 587 - Guide for Surge Voltage in Low Voltage AC Power Circuits
- G. NATIONAL ELECTRICAL MANUFACTURERS ASSN (NEMA)  
NEMA 250 - Enclosures for Electrical Equipment Incl Rev 1 (1000 Volts Maximum)
- H. UNDERWRITERS LABORATORIES, INC (UL)
  - 1. UL 94 - Test for Flammability of Plastic Materials for Parts in Devices and Appliances
  - 2. UL 916 - Energy Management Equipment

#### 1.03 GENERAL REQUIREMENTS

- A. Standard Products: Material and equipment shall be standard products of a manufacturer regularly engaged in the manufacturing of such products, which are of a similar material, design and workmanship. The standard products shall have been in a satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year use shall include applications of equipment and materials under similar circumstances and of similar size. The 2 years experience must be satisfactorily completed by a product which has been sold or is offered for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation, for not less than 6000 hours exclusive of the manufacturer's factory tests, can be shown. The equipment items shall be supported by a service organization. The Contractor shall submit a certified list of qualified permanent service organizations and qualifications. These service organizations shall be reasonably convenient to the equipment on a regular and emergency basis during the warranty period of the contract.
- B. Identical Items: Items of the same classification as specified in PART 2 - PRODUCTS shall be identical, including equipment, assemblies, parts, and components.
- C. Nameplates, Lens Caps, and Tags: Nameplates and lens caps bearing legends as shown and tags bearing device unique identifiers as shown shall have engraved or stamped characters. Nameplates

shall be mechanically attached to HVAC control panel interior doors. A plastic or metal tag shall be mechanically attached directly to each field-mounted device or attached by a metal chain or wire. Each air flow measurement station shall have a tag showing flow rate range for signal output range, duct size, and identifier as shown.

- D. Verification of Dimensions: The Contractor shall become familiar with all details of the work, shall verify all dimensions in the field, and shall advise the Contracting Officer of any discrepancy before performing any work.
- E. Drawings: Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The Contractor shall carefully investigate the mechanical, electrical, and finish conditions that could affect the work to be performed, shall arrange such work accordingly, and shall furnish all work necessary to meet such conditions.
- F. Power-Line Surge Protection: All equipment connected to ac circuits shall be protected from power-line surges. Equipment protection shall meet the requirements of IEEE No. 587. Fuses shall not be used for surge protection.
- G. System Support: The contractor shall provide 1 year of system support for all hardware in the control system at no additional cost to the building owner. System support shall include trouble-shooting, calibration, hardware replacement and other required services to maintain fully functioning, calibrated HVAC control systems. The system support service shall be available 5 days per week between 9 am and 4 pm. During the 1 year system support period, the contractor shall maintain a duplicate set of HVAC control drawings. At the owner's option, control problems will be solved by verbal instruction or on-site correction by the contractor. The number of system support calls and site visits shall be unlimited during the 1 year support period.

#### 1.04 SUBMITTALS

- A. Submit shop drawings and product data.
- B. Detail Drawings
  1. Detail drawings shall be submitted. Detail drawings shall include: a drawing index; a list of symbols; a series of drawings for each HVAC control system using abbreviations, symbols, nomenclature and identifiers as shown on the contract drawings; valve schedules; damper schedules; and a compressed-air station schematic on 34-inch by 22-inch sheets. Detail drawings shall also include: equipment data, product specific catalog cuts, and an ASME air-storage tank certificate. All detail drawings shall be delivered together as a complete submittal. Valve and damper schedules may be submitted in advance but shall be included in the complete submittal.
  2. Each control-system element on a drawing shall have a unique identifier as shown.
  3. Each series of drawings for an HVAC control system shall include a schematic as shown, a ladder diagram as shown, an equipment schedule as shown, a wiring diagram, a list of equipment with manufacturer and model number, a control-panel arrangement drawing, and an HVAC control-system sequence of operation.
  4. The wiring diagram shall show the interconnection of conductors and cables to HVAC control-panel terminal blocks and to the identified terminals of starters and packaged equipment, with all necessary jumpers and ground connections. The wiring diagram shall show the labels of all conductors. All sources of power required for HVAC control systems and for packaged-equipment control systems shall be identified back to the panel board circuit breaker number, HVAC system control panel, magnetic starter, or packaged control equipment circuit. Each power supply and transformer not integral to a controller, starter, or packaged equipment shall be shown. The connected volt-ampere load and the power supply volt-ampere rating shall be shown.
  5. The HVAC control-panel arrangement drawing shall show nameplate legends, fabrication details, and enclosure operating temperature-rise calculations. Fabrication details shall include interior door front and rear views, back panel layout and terminal block layout.
  6. The sequence of operation for each HVAC control system shall be in the language and format shown on the drawings. No operational deviations from specified sequences will be permitted without prior written approval of the Contracting Officer. The sequence of operation shall refer to each device by its unique identifier.
  7. The valve schedule shall include each valve's unique identifier, size, flow coefficient (Cv), pressure drop at specified flow rate, spring range, positive-positioner range, and actuator size, supported by close-off pressure data, dimensions, operation rate, and access and clearance requirements data.
  8. The damper schedule shall contain each damper's and each actuator's identifier, nominal and actual

sizes, orientation of axis and frame, direction of blade rotation, spring ranges, operation rate, positive-positioner ranges, locations of actuators and damper end switches, arrangement of sections in multi-section dampers, and methods of connecting dampers, actuators, and linkages. The damper schedule shall include the maximum expected velocity through the damper at the intended location and the maximum leakage rate at the operating static-pressure differential. The damper schedule shall contain actuator selection data supported by calculations of the torque required to move and seal the dampers, access and clearance requirements.

9. The equipment data shall be in booklet form, and indexed to the unique identifiers, and shall consist of data sheets that document compliance with the specification and a copy of each HVAC control system bill of materials. Catalog cuts shall be in booklet form indexed by device type. Where multiple components are shown on a catalog cut, the application specific component shall be marked.

#### C. Test Reports

1. The Contractor shall submit 4 copies of the site testing procedures. The site testing procedures shall identify each item to be tested and shall clearly describe each test. The test procedures shall include a list of the test equipment to be used for site testing, manufacturer and model number, and the date of calibration and accuracy of calibration within 6 months of the test date.
2. The Contractor shall submit 4 copies of the site testing data. Original copies of all data produced during site testing, including results of each test procedure, shall be turned over to the Government after Government approval of the site tests.
3. The Contractor shall furnish 4 copies of the performance verification test plans and procedures. The test plan and procedures for the performance verification test shall be indexed and submitted in booklet form 60 days before the Contractor's scheduled test dates.
4. The Contractor shall furnish 4 copies of the performance verification test report after completion of a successful test. Documentation of test results for the entire HVAC control system shall be submitted complete, in booklet form and indexed, within 30 days after each test.

#### D. Training Data

1. The Contractor shall furnish a training course in the maintenance and operation of the HVAC control systems specified 60 days prior to the start of training. The training shall be oriented to the specific systems being installed under this contract. One training manual shall be furnished for each trainee, plus two additional copies delivered for archival storage at the project site. The manuals shall include the agenda, the defined objectives for each lesson, and a detailed description of the subject matter for each lesson. Two copies of audiovisual materials shall be delivered to the Government for archival storage at the project site, either as a part of the printed training manuals or on the same media as that to be used during the training session.

#### E. Operation and Maintenance Manuals

1. The Contractor shall furnish 4 complete copies of operation manuals for each HVAC control system, in booklet form and indexed, outlining the step-by-step procedures required for each HVAC control system's startup, operation, and shutdown. The manuals shall include all detail drawings, equipment data, each controller's configuration check sheet and manufacturer supplied operation manuals for all equipment.
2. The Contractor shall furnish 4 complete copies of maintenance manuals, indexed in booklet form listing maintenance procedures. The maintenance instructions shall include a maintenance check list for each HVAC control system. Maintenance manuals shall include spare parts data and recommended maintenance tool kits for all control devices. Maintenance instructions shall include recommended repair methods, either field repair, factory repair, or whole-item replacement.
3. If operation and maintenance manuals are provided in a common volume, they shall be clearly differentiated and separately indexed.

#### F. Operating Instructions

1. Commissioning Procedures shall be provided for each HVAC control system, and for each type of terminal-unit control system. The procedures shall reflect the language and format shown. The commissioning procedures shall refer to the devices by their unique identifiers as shown. The commissioning procedures shall include step-by-step configuration procedures for each controller. The configuration procedures shall be product specific and shall include a configuration check sheet showing all configuration parameters, dip switch settings, initial recommended P, I and D constants.
2. The Contractor shall provide 4 copies of Commissioning Procedures, in booklet form and indexed, for each type of control device provided, such as controllers, pilot positioners, adjustable relays, and transmitters. Commissioning procedures shall include general instructions on how to set control parameters, including: setpoints; proportional, integral, and derivative mode constants; contact

output settings for the specific devices provided. Commissioning procedures shall be specific to each HVAC system, shall detail the steps involved, and shall refer to the procedures in the booklet for specific devices. Commissioning procedures shall be submitted 60 days prior to system commissioning.

#### G. Records

1. The Contractor shall furnish 4 copies of the calibration, adjustment and commissioning report which shall include controller setpoints and proportional, integral and derivative-mode constant settings, calibration data for all instruments and controls, and all the data resulting from adjusting the control-system devices and commissioning HVAC control system.
2. The Contractor shall furnish 4 copies of a list of service organizations qualified to service the HVAC control system. The list shall include the service organization name and telephone number.

### 1.05 DELIVERY AND STORAGE

- A. Products shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, and other contaminants, within the storage-condition limits published by the equipment manufacturer. Dampers shall be stored so that seal integrity, blade alignment and frame alignment are maintained.

### 1.06 INTEGRATION OF EQUIPMENT PROVIDED BY OTHERS

- A. Where products provided by others are required to interface to the DDC system the Equipment provider shall be responsible for providing a Bacnet MSTP interface. The Equipment provider is responsible for providing a product that will properly interface with all specified points exposed and a table of points and point names to the DDC contractor. The Equipment provider may provide a demo unit to the DDC contractor for testing. The DDC contractor shall then test the interface and provide the Equipment provider with feedback that it works, works with deficiencies, or does not work. It is the Equipment provider's responsibility to provide a working system. It is the DDC contractor's responsibility to make every effort to help verify compatibility and work with the Equipment provider to accomplish a certification that it will work. Field installation of the Equipment provider's interfaces will not be acceptable unless this is approved by all parties before Equipment delivery.

## PART 2 PRODUCTS

**2.01 GENERAL EQUIPMENT REQUIREMENTS:** The contractor shall provide a Schneider Electric I/A Network 8000 Direct Digital Control System as specified below "or equal". Any "or equal" control system shall seamlessly integrate with the facilities existing Schneider Electric I/A Network 8000 Direct Digital Control System and base UMCS host system. The control system shall be installed so that it can be monitored, adjusted and programmed from the host system, down to every device. When submitting an "or equal" control system the contractor shall demonstrate that they have successfully integrated with Schneider Electric controls as specified by providing past project and client information where this was done. They will also provide an additional week of classroom training on the operation and maintenance of the control system. The training shall include all materials, instruction, travel, and per diem for 5 individuals.

- A. **Schneider Electric I/A Network 8000 Direct Digital Control System:** Schneider Electric I/A Network 8000 Direct Digital Control System, hereinafter referred to as I/A DDC, shall consist of a G3 Building Controller with Web page engineering and graphics, Microzone II, MNL or MNB for air handling units, Microzone II, MNL or MNB for the boiler and chiller, and Variable Air Volume Box Controllers for variable air volume terminals. The system shall be set up for connection to the Base's dedicated area network, VLAN 466, this system as specified is the ONLY system that has undergone the stringent CTO/RTO process. The system shall be complete with all sensors, wiring, software, and hardware to form a functional HVAC automation system. Sensors, sensor wiring, gauges, thermometers and other accessories which are not part of the packaged I/A Network 8000 system shall be as specified hereinafter. Training shall be provided in accordance with paragraph 3.06 TRAINING. Control system submittals shall be made in accordance with paragraph 1.04 SUBMITTALS. In addition to the hardware and software required at the building, the contractor shall also provide the following software development for the existing I/A Network 8000 Host System located in the Energy Management Control System (EMCS) section of Base Civil Engineering.

1. **Graphical Building Representation:** A graphical building representation with room names and room numbers shall be created for the Web based System. The software shall allow logical routing from the room to the boiler and/or chiller through all intermediate items of equipment. At each level, the user shall be able to route to the previous display, the next logical equipment item, or the main building plan. User interface shall be web based for use with roller mouse or digitizer for this

operation. All building related attributes such as room setpoints, occupied schedules, etc. shall be displayed real-time and accessible from the graphic screen for modification.

2. Graphical System Schematics: A graphical system schematic for each air handling unit, chiller, pump, boiler, and variable air volume terminal shall be supplied with all sensed parameters displayed. In addition to the sensed parameters, system schematics including water coils shall display the chilled water or hot water supply temperature as measured at the chiller or boiler respectively. All system related attributes such as equipment control setpoints, throttling ranges, operating schedules, etc. shall be displayed real-time and accessible from the graphic screen for modification.
3. System Support: The contractor shall provide 1 year system support for all hardware and software in the control system at no additional cost to the building owner. The system support service shall be available 5 days per week between 9 am and 4 pm. During the 1 year system support period, the contractor shall maintain a duplicate set of building software on his support computer. At the owner's option, software problems will be solved by verbal instruction, or on site correction by the contractor. The number of system support calls shall be unlimited during the 1 year period.

#### B. Electrical and Electronic Devices

1. All electrical, electronic, and electro-pneumatic devices not located within an HVAC control panel shall have an enclosure NEMA 1 in accordance with NEMA 250 unless otherwise shown.
2. Standard Signals: The output of all analog transmitters and the analog input and output of all single-loop controllers and function modules shall be 4-to-20 mA dc signals. The signal shall originate from current-sourcing devices and shall be received by current-sinking devices.

#### C. Ambient Temperature Limits

1. Actuators and positive positioners, and transmitters shall operate within temperature limit ratings of plus 35 to 150 degrees F. All panel-mounted instruments shall operate within limit ratings of 35 to 120 degrees F and 10 percent to 95 percent relative humidity, noncondensing. All devices installed outdoors shall operate within limit ratings of minus 35 to 150 degrees F.

## 2.02 MATERIALS

### A. Tubing

1. Copper: Copper tubing shall conform to ASTM B 88 and shall have sweat fittings and valves. Plastic tubing shall have barbed fittings and valves. Plastic tubing shall have the burning characteristics of linear low-density polyethylene tubing, shall be self-extinguishing when tested in accordance with ASTM D 635, shall have UL 94 V-2 flammability classification, and shall withstand stress cracking when tested in accordance with ASTM D 1693. Plastic-tubing bundles shall be provided with mylar barrier and flame-retardant polyethylene jacket.
2. Stainless Steel: Stainless steel tubing shall conform to ASTM A 269, and shall have stainless steel compression fittings.

### B. Wiring

1. Terminal Blocks: Terminal blocks shall be insulated, modular, feed-through, clamp style with recessed captive screw-type clamping mechanism, shall be suitable for rail mounting, and shall have end plates and partition plates for separation or shall have enclosed sides.
2. Control Wiring for 24-Volt Circuits: Control wiring for 24-volt circuits shall be 18 AWG minimum and shall be rated for 300-volt service.
3. Wiring for 120-Volt Circuits: Wiring for 120-volt circuits shall be 14 AWG minimum and shall be rated for 600-volt service.
4. Analog Signal Wiring Circuits: Analog signal wiring circuits within control panels shall not be less than 20 AWG and shall be rated for 300-volt service.
5. Instrumentation Cable: Instrumentation cable shall be 18 AWG, stranded copper, single or multiple-twisted, minimum 2-inch lay of twist, 100% shielded pairs, and shall have a 300-volt insulation. Each pair shall have a 20-AWG tinned-copper drain wire and individual overall pair insulation. Cables shall have an overall aluminum-polyester or tinned-copper cable-shield tape, overall 20-AWG tinned-copper cable drain wire, and overall cable insulation.
6. Non-conducting Wiring: Non-conducting wiring duct in control panels shall have slotted sides, snap-on duct covers, fittings for connecting ducts, mounting clips for securing ducts, and wire-retaining clips.

## 2.03 ACTUATORS

- A. General Requirements: Actuators shall fail to their spring-return positions as shown on signal or power failure and shall have a visible position indicator. Actuators shall open or close the devices to which they are applied within 60 seconds after a full scale input signal change. Electric or electronic actuators

operating in parallel or in sequence shall have an auxiliary actuator driver. Actuators shall be electronic.

1. Damper Actuators: Damper actuators shall be rated for at least 125 percent of the motive power necessary to operate against the pressure shown. The actuator stroke shall be limited by an adjustable stop in the direction of power stroke. The actuators shall be provided with mounting and connecting hardware.
2. Valve Actuators: Valve actuators shall be rated for at least 125 percent of the motive power necessary to operate the valves over their full range of operation against the total and differential pressures shown.

## 2.04 AUTOMATIC CONTROL VALVES

- A. Valve Assembly: Valves shall have stainless-steel stems and stuffing boxes with extended necks to clear the piping insulation. Valve bodies shall be designed for not less than 125 psig working pressure or 150 percent of the system operating pressure, whichever is greater. Valve leakage rating shall be .01 percent of rated Cv.
- B. Butterfly-Valve Assembly: Butterfly valves shall be threaded lug type suitable for dead-end service, and for modulation to the fully-closed position, with carbon-steel bodies and non-corrosive discs, stainless steel shafts supported by bearings, and EPDM seats suitable for temperatures from minus 20 degrees to plus 250 degrees F. Valves shall have a manual means of operation independent of the actuator.
- C. Two-Way Valves: Two-way modulating valves shall have equal-percentage characteristics.
- D. Three-Way Valves: Three-way valves shall provide linear flow control with constant total flow throughout full plug travel.
- E. Duct-Coil and Terminal-Unit-Coil Valves: Control valves with flare-type ends shall be provided for duct or terminal-unit coils. Flare nuts shall be furnished for each flare-type end valve.
- F. Valves for Chilled-Water, Condenser-Water, and Glycol Service:
  1. Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for valves from 2 inches to 3 inches inclusive shall be of brass, bronze or iron. Bodies for 2-inch valves shall have threaded ends. Bodies for valves from 2-1/2 inches to 3 inches shall have flanged-end connections. Valve Cv shall be 100 percent to 110 percent of the Cv shown. Internal valve trim shall be brass or bronze except that valve stems may be type 316 stainless steel.
  2. Valves 4 inches and larger shall be butterfly valves.
- G. Valves for Hot-Water Service Below 250 Degrees F:
  1. Bodies for valves 1-1/2 inches and smaller shall be brass or bronze, with threaded or union ends. Bodies for 2-inch valves shall have threaded ends. Bodies for valves 2-1/2 inches to 3 inches shall have flanged-end connections. Valve Cv shall be 100 percent to 110 percent of the Cv shown.
  2. Internal trim (including seats, seat rings, modulating plugs, and springs) of valves controlling water hotter than 210 degrees F shall be Type 316 stainless steel.
  3. Internal trim for valves controlling water 210 degrees F or less shall be brass or bronze.
  4. Nonmetallic parts of hot-water control valves shall be suitable for a minimum continuous operating temperature of 250 degrees F or 50 degrees F above the system design temperature, whichever is higher.
  5. Valves 4 inches and larger shall be butterfly valves.

## 2.05 DAMPERS

- A. Damper Assembly
  1. A single damper section shall have blades no longer than 48 inches and shall be no higher than 72 inches. Maximum damper blade width shall be 8 inches. Larger sizes shall be made from a combination of sections. Dampers shall be steel, or other materials where shown. Flat blades shall be made rigid by folding the edges. All blade-operating linkages shall be within the frame so that blade-connecting devices within the same damper section will not be located directly in the air stream. Damper axles shall be 0.5-inch (minimum) plated steel rods supported in the damper frame by stainless steel or bronze bearings. Blades mounted vertically shall be supported by thrust bearings. Pressure drop through dampers shall not exceed 0.04 inch water gauge at 1,000 fpm in the wide-open position. Frames shall not be less than 2 inches in width. Dampers shall be tested in accordance with AMCA 500.
  2. Operating links external to dampers (such as crankarms, connecting rods, and line shafting for

transmitting motion from damper actuators to dampers) shall withstand a load equal to at least twice the maximum required damper-operating force. Rod lengths shall be adjustable. Links shall be brass, bronze, zinc-coated steel, or stainless steel. Working parts of joints and clevises shall be brass, bronze, or stainless steel.

3. Adjustments of crankarms shall control the open and closed positions of dampers.
  4. Modulating dampers shall be opposed-blade type and two-position dampers shall be parallel-blade type.
- B. Outside-Air, Return-Air, and Relief-Air Dampers: The dampers shall be as shown. Blades shall have interlocking edges and shall be provided with compressible seals at points of contact. The channel frames of the dampers shall be provided with jamb seals to minimize air leakage. Dampers shall not leak in excess of 20 cfm per square foot at 4 inches water gauge static pressure when closed. Seals shall be suitable for an operating temperature range of minus 40 degrees F to 200 degrees F. Dampers shall be rated at not less than 2000 fpm air velocity.
- C. Mechanical and Electrical Space Ventilation Dampers: The dampers shall be as shown. Dampers shall not leak in excess of 80 cfm per square foot at 4 inches water gauge static pressure when closed. Dampers shall be rated at not less than 1500 fpm air velocity.
- D. Damper End Switches: Each end switch shall be a hermetically-sealed switch with a trip lever and over-travel mechanism. The switch enclosure shall be suitable for mounting on the duct exterior and shall permit setting the position of the trip lever that actuates the switch. The trip lever shall be aligned with the damper blade.

## 2.06 SMOKE DETECTORS

- A. FIRE DETECTING DEVICES: Fire detecting devices shall comply with the applicable requirements of NFPA 72E, NFPA 90A, UL 268, and UL 521. The detectors shall be provided as indicated. Detector base shall be detachable and have screw terminals for making connections. No solder connections will be allowed. Detectors shall be connected into alarm initiating circuits. Installed devices shall conform to the classification of the area. All fire detecting devices and or detector bases with the exception of flame detectors shall be addressable and shall be dynamically supervised and uniquely identified in the control panel.
1. Smoke Detectors: Detectors shall be designed for detection of abnormal smoke densities. Smoke detectors shall be photoelectric type. Detectors shall contain a visible indicator LED that shows when the unit is in alarm condition. Detectors shall not be adversely affected by vibration or pressure. Detectors shall be the plug-in type in which the detector base contains terminals for making all wiring connections. Smoke detectors shall be addressable and remotely adjustable from the control panel.
    - a. Duct Detectors: Duct-mounted photoelectric smoke detectors shall be furnished and installed where indicated. Units shall consist of a Photoelectric Detectors, mounted in a special housing fitted with duct sampling tubes. Sampling tubes shall run the full width of the duct. The duct detector package shall conform to the requirements of NFPA 90A and shall be UL listed for use in air-handling systems. The control functions, operation, reset, and bypass shall be controlled from the fire alarm control panel. All LED'S to indicate the operation and alarm condition and the test and reset buttons shall be visible and accessible with the unit installed and the cover in place. Detector mounted above 6 feet and those mounted below 6 feet shall be readily accessible. Detectors shall have auxiliary contacts to provide control, interlock, and shutdown functions by the fire alarm control panel. Duct detector shall be addressable and controlled by the fire alarm control panel. The detectors shall be supplied by the fire alarm vendor to ensure complete system compatibility.

## 2.07 INSTRUMENTATION

- A. Measurements: Transmitters shall be calibrated to provide the following measurements, over the indicated ranges, for an output of 4 to 20 mAdc:
1. Conditioned space temperature, from 50 to 85 degrees F.
  2. Duct temperature, from 40 to 140 degrees F except that return-air temperature for economizer operation shall be minus 30 to plus 130 degrees F.
  3. Chilled-water temperature, from 30 to 100 degrees F.
  4. Heating hot-water temperature, from 100 to 250 degrees F.
  5. Outside-air temperature, from minus 30 to 130 degrees F.
  6. Relative humidity, 0 to 100 percent for high-limit applications; from 20 to 80 percent for space applications.
  7. Differential pressure for VAV supply-duct static pressure from 0 to 2.0 inches water gauge.



- B. Temperature Instruments
1. Resistance Temperature Detectors (RTD): Each RTD shall be platinum with a tolerance of plus or minus 0.1 percent at 32 degrees F, and shall be encapsulated in epoxy, series 300 stainless steel, anodized aluminum, or copper. Each RTD shall be furnished with an RTD transmitter as specified, integrally-mounted unless otherwise shown.
    - a. Continuous-Averaging RTD: Continuous-averaging RTDs shall have a tolerance of plus or minus 1.0 degree F at the reference temperature, and shall be of sufficient length to ensure that the resistance represents an average over the cross-section in which it is installed. The sensing element shall have a bendable copper sheath. Each averaging RTD shall be furnished with an RTD transmitter as specified, to match the resistance range of the averaging RTD.
    - b. RTD Transmitter: The RTD transmitter shall be selected to match the resistance range of the RTD. The transmitter shall be a 2-wire, loop-powered device. The transmitter shall produce a linear 4-to-20 mA<sub>dc</sub> output corresponding to the required temperature measurement. The output error shall not exceed 0.1 percent of the calibrated measurement. The transmitter shall include offset and span adjustments.
- C. Relative-Humidity Instruments: Relative-humidity sensing element shall use non-saturating sensing elements capable of withstanding a saturated condition without permanently affecting calibration or sustaining damage. Sensing elements shall have an accuracy of plus or minus 5 percent of full scale within the range of 20 to 80 percent relative humidity. A 2-wire, loop-powered transmitter located at the sensing elements shall be provided to convert the sensing elements output to a linear 4-to-20 mA<sub>dc</sub> output corresponding to the required humidity measurement. The transmitter shall be a 2-wire, loop-powered device. The output error shall not exceed 0.1 percent of calibrated measurement. The transmitter shall include offset and span adjustments.
- D. Pressure Instruments: The instrument shall be a pressure transmitter with an integral sensing element. The instrument over pressure rating shall be 25 psig. The sensing elements accuracy shall be plus or minus 2 percent of full scale. Transmitter accuracy shall be plus or minus 0.25 percent of the calibrated measurement. The transmitter shall be a 2-wire, loop-powered device. The transmitter shall produce a linear 4-to-20 mA<sub>dc</sub> output corresponding to the required pressure measurement. Each transmitter shall have offset and span adjustments.
- E. Thermowells: Thermowells shall be Series 300 stainless steel with threaded brass plug and chain, 2-inch lagging neck and extension-type well, and inside diameter and insertion length as required for the application.
- F. Sunshields: Sunshields for outside-air temperature sensing elements shall prevent the sun from directly striking the temperature sensing elements. The sunshields shall be provided with adequate ventilation so that the sensing element responds to the ambient temperature of the surroundings. The top of each sunshield shall have a galvanized-metal rainshield projecting over the face of the sunshield. The sunshields shall be painted white or shall be unpainted aluminum.
- G. Water Flow Meters: Flow meter type shall be magnetic type unless drawings allow turbine or ultrasonic types. All flow meters shall output a 4-20 ma signal. All meters shall have a flow range of 3 to 30 FPS. Magnetic flow meters shall have an accuracy of 0.2% at 1.64 FPS velocity and have SCADA ready outputs. Ultrasonic and turbine type meters shall have a +/- 2% accuracy.
- H. Meters: Utility meters shall be provided with BACnet interface and a NIPR drop.

## 2.08 THERMOSTATS

- A. Ranges: Thermostat ranges shall be selected so that the setpoint is adjustable without tools between plus or minus 10 degrees F of the setpoint shown.
- B. Space Low Limit Thermostats: Contacts shall be single-pole double-throw (SPDT), hermetically sealed, and wired to identified terminals. Maximum differential shall be 2 degrees F unless otherwise specified. Thermostat covers shall be made of locking metal or heavy-duty plastic, and shall be capable of being locked by an allen-head wrench or a special tool. Thermostats shall have manual switches as required by the application.
- C. Low-Temperature-Protection Thermostats: Low-temperature-protection thermostats shall be manual reset, low-temperature safety thermostats, with NO and NC contacts and a 20-foot element which shall

respond to the coldest 18-inch segment.

- D. Standard Unit Heater and Exhaust Fan Thermostats: Thermostat contacts shall be SPDT and wired to identified terminals. Thermostat housing shall be a NEMA 4X waterproof enclosure which will tolerate continuous spraying with water, high humidity, and airborne contaminants. Temperature scale and adjusting knob shall be mounted on the face of the thermostat such that setpoint adjustment can be made without tools. Adjusting knob penetration shall be sealed with a lubricated O-ring or other positive sealing method to maintain the integrity of the enclosure. Temperature range of thermostats shall be 40 to 100 degrees F. Temperature differential shall be not greater than 3 degrees F. Contact rating shall be sufficient to switch the connected load.

## 2.09 PRESSURE SWITCHES AND SOLENOID VALVES

- A. Pressure Switches: Each switch shall have an adjustable setpoint with visible setpoint scale. Range shall be as shown. Differential adjustment shall span 20 to 40 percent of the range of the device.
- B. Differential-Pressure Switches: Each switch shall be an adjustable diaphragm-operated device with 2 SPDT contacts, with taps for sensing lines to be connected to duct pressure fittings designed to sense air pressure. These fittings shall be of the angled-tip type with tips pointing into the air stream. Range shall be 0.5 to 6.0 inches water gauge. Differential shall be a maximum of 0.15 inch water gauge at the low end of the range and 0.35 inch water gauge at the high end of the range.

## 2.10 INDICATING DEVICES

- A. Thermometers
1. Ductwork Insertion and Piping Systems: Thermometers for insertion in ductwork and piping systems shall have brass, malleable iron, or aluminum alloy case and frame, clear protective face, permanently stabilized glass tube with indicating-fluid column, white face, black numbers, and a 9-inch scale.
  2. Thermometers for piping systems shall have rigid stems with straight, angular, or inclined pattern, and shall conform to FS GG-T-321.
  3. Thermometer Stems: All thermometer stems shall have expansion heads as required to prevent breakage at extreme temperatures. On rigid-stem thermometers, the space between bulb and stem shall be filled with a heat-transfer medium.
  4. Air-Duct Thermometers: Air-duct thermometers shall have perforated stem guards and 45-degree adjustable duct flanges with locking mechanism.
  5. Averaging Thermometers: Averaging thermometers shall have 3-1/2 inch (nominal) dial, with black legend on white background, and pointer traveling through a 270-degree arc.
  6. Accuracy: Thermometers shall have an accuracy of plus or minus 1 percent of scale range. Thermometers shall have the following ranges:
    - a. Mixed-air temperature: 0 to 100 degrees F in 1-degree F graduations.
    - b. Return-air temperature: 0 to 100 degrees F in 1-degree F graduations.
    - c. Cooling-coil-discharge temperature: 0 to 100 degrees F in 1-degree F graduations.
    - d. Heating-coil-discharge temperature: 30 to 180 degrees F in 2-degree F graduations.
    - e. Hydronic-heating systems below 220 degrees F: 40 to 240 degrees F in 2-degree graduations.
- B. Pressure Gauges: Gauges shall have black legend on white, background, and shall have a pointer traveling through a 270-degree arc. Accuracy shall be plus or minus 3 percent of scale range. Gauges shall meet ANSI B40.1.
1. Hydronic-System Applications: Gauges for hydronic-system applications shall be 4-1/2 inch (nominal) size and have ranges and graduations as shown below.
    - a. Pump Suction - 30 psi range, 1 psi graduations, 5 psi figure interval.
    - b. Pump Discharge - 60 psi range, 2 psi graduations, 10 psi figure interval.
    - c. Coil Supply - 60 psi range, 2 psi graduations, 10 psi figure interval.
    - d. Coil Return - 30 psi range, 1 psi graduations, 5 psi figure interval.
    - e. Chiller Inlet and Outlet - 60 psi range, 2 psi graduations, 10 psi figure interval.
    - f. Boiler Inlet and Outlet - 60 psi range, 2 psi graduations, 10 psi figure interval.
  2. Low Differential Pressure Gauges: Gauges for low differential-pressure measurements shall be 4-1/2 inch (nominal) size with two sets of pressure taps, and shall have a diaphragm-actuated pointer, white dial with black figures, and pointer zero adjustment. Gauges shall have ranges and graduations as shown. Accuracy shall be plus or minus 2 percent of scale range.

## 2.11 CONTROL DEVICES AND ACCESSORIES

- A. Relays: Relays shall be 2-pole, double-throw (2PDT) with a 10-ampere resistive rating at 120 Vac, and

shall have an enclosed 120-Vac coil with 11-pin blade connectors, and a matching rail-mounted socket. Power consumption shall not be greater than 3 watts.

- B. Time-Delay Relays: Time delay relays shall be 2PDT with 8-pin connectors, dust cover, and a matching rail-mounted socket. Adjustable timing range shall be 0 to 5 minutes. Power consumption shall not be greater than 3 watts.
- C. Regulated Power Supplies: Each power supply shall provide a 24-Vdc linear supply at not less than 2 amperes, with regulation to 0.05 percent of output voltage. Each power supply shall have a fused input, and shall be protected from voltage surges and power-line transients. The power supply output shall be protected against overvoltage and short circuits. Power supply loading shall not be greater than 1.2 amperes.

## 2.12 PILOT LIGHTS AND MANUAL SWITCHES

- A. Pilot Lights, Illuminated Switches, and Non-illuminated Switches: Pilot lights, illuminated switches, and non-illuminated switches shall be rectangular devices arranged in a horizontal matrix as shown. Switch action shall be as shown. Device illumination shall be by light-emitting diode lamp or by neon lamp.
- B. Manual Timed Override Switches: Manual timed override switches shall be spring-wound mechanical type, with timer range as specified on the drawings. Switches shall be furnished with a faceplate with time intervals permanently etched or engraved in the faceplate at the time of manufacture. Timer knob shall have a pointer to indicate setting position. Switches shall be suitable for mounting in a standard 2" x 4" outlet box. Contacts shall be rated for 20 amp resistive load at 125 volts. Switches shall be UL listed.

## 2.13 HVAC SYSTEM CONTROL PANELS

- A. Panel Assembly: The panel shall be fabricated as shown, and the devices shall be mounted as shown. Each panel shall be fabricated as a bottom-entry connection point for control-system electric power, control-system main air source, control-system wiring, pneumatic tubing, interconnection of control systems, interconnection of starters and external shutdown devices, and energy monitoring and control systems (EMCS) interface. Each panel shall have an operating temperature rise of not greater than 20 degrees F above an ambient temperature of 100 degrees F.
- B. Panel Electrical Requirements: Each control panel shall be powered by nominal 120 volts ac terminating at the panel on terminal blocks. Instrument cases shall be grounded. Interior panel, interior door, and exterior panel enclosure shall be grounded.
- C. Enclosure: The enclosure for each panel shall be a NEMA 12 single-door wall-mounted box conforming to NEMA 250, with continuous hinged and gasketed exterior door with print pocket and key lock, continuous hinged interior door, interior back panel, and ventilation louvers in back surface as shown. Inside finish shall be white enamel, and outside finish shall be gray primer over phosphatized surfaces.
- D. Mounting and Labeling: Controllers, pilot lights and switches, shall be mounted on the interior door as shown. Power conditioner, fuses and duplex outlet shall be mounted on the interior of the cabinet as shown. All other components housed in the panel shall be mounted on the interior back panel surface of the enclosure, behind the door on rails as shown. Controllers and gauges shall be identified by a plastic or metal nameplate that is mechanically attached to the panel. The nameplate shall have the inscription as shown. Lettering shall be cut or stamped into the nameplate to a depth of not less than 1/64 inch, and shall show a contrasting color, produced by filling with enamel or lacquer or by the use of a laminated material. Painting of lettering directly on the surface of the interior door or panel is not permitted.
- E. Wiring and Tubing
  1. Wiring Interconnections: Wiring shall be installed in wiring ducts in such a way that devices can be added or replaced without disturbing wiring that is not affected by the change. Wiring to single-loop controllers shall have a 4-inch wiring loop in the horizontal wiring duct at each wiring connection. There shall be no wiring splices within the control panel. All interconnections required for power or signals shall be made on device terminals or panel terminal blocks, with not more than 2 wires connected to a terminal.
  2. Terminal Blocks: Terminal blocks shall be arranged in groups as shown. Instrument signal grounds at the same ground reference level shall end at a grounding terminal for connection to a common ground point. Wiring-shield grounds at the same reference level shall end at a grounding terminal for connection to a common ground point. Grounding terminal blocks shall be identified by reference level.

3. Wiring Identification: All wiring connected to controller shall be identified by function and polarity, i.e., process variable, input, remote setpoint input and output.

F. EMCS Terminal Blocks: Terminal blocks shall be provided for connections to EMCS as shown. Analog signals shall require only the removal of jumpers to interface to EMCS.

## 2.14 ELECTRONIC VARIABLE AIR VOLUME (VAV) TERMINAL UNIT CONTROLS

A. VAV Terminal Units:

B. Terminal-Unit Controls

1. Vav Box Controller: Controls for pressure-independent boxes shall consist of a velocity- sensing device in the primary air entering the box, a room temperature sensing element, a damper actuator, a duct temperature sensor, and an adjustable microprocessor-based VAV box controller. Each controller shall operate a damper for cooling and, if required, a duct coil valve for heating. Actuators shall open and close the device to which it is applied within 6 minutes. The controller shall be compatible with the existing Schneider Electric I/A Network 8000 EMCS system. The controller shall be capable of reading cfm, duct temperature, room temperature, cooling setpoint, and damper position. Terminal unit controls shall have the requirements of UL 916 and FCC Part 15.

2. Communication-and-Programming Device: One hand-held communication-and-programming device with instruction manuals shall be provided. The communication-and-programming device shall connect to the VAV box controller directly or to a jack at the room temperature sensing element location. The communication-and-programming device shall be used to read and set minimum velocity, maximum velocity, cooling setpoint, and space temperature.

## PART 3 EXECUTION

**3.01 GENERAL INSTALLATION CRITERIA:** The HVAC control system shall be completely installed and ready for operation, as specified and shown. Dielectric isolation shall be provided where dissimilar metals are used for connection and support. Penetrations through and mounting holes in the building exterior shall be made watertight. The HVAC control-system installation shall provide clearance for control-system maintenance by maintaining access space between coils, access space to mixed-air plenums, and other access space required to calibrate, remove, repair, or replace control-system devices. The control-system installation shall not interfere with the clearance requirements for mechanical and electrical system maintenance.

A. Device-Mounting Criteria: Devices mounted in or on piping or ductwork, on building surfaces, in mechanical/electrical spaces, or in occupied space ceilings shall be installed in accordance with manufacturers' recommendations and as shown. Control devices to be installed in piping and ductwork shall be provided with all required gaskets, flanges, thermal compounds, insulation, piping, fittings, and manual valves for shutoff, equalization, purging, and calibration. Strap-on temperature sensing elements shall not be used except as specified.

B. Wiring Criteria: Wiring external to control panels, including low-voltage wiring, shall be installed in metallic raceways. Wiring shall be installed without splices between control devices and HVAC control panels. Instrumentation grounding shall be installed as necessary to prevent ground loops, noise, and surges from adversely affecting operation of the system. Cables and conductors wires shall be tagged at both ends, with the identifier shown on the shop drawings, in accordance with the requirements shown in the electrical division of this specification. Other electrical work shall be as specified in applicable sections of the electrical division of this specification

C. Controller Output Loop Impedance Limitation: Controller output loops shall be constructed so that total circuit impedance connected to the analog output of a single-loop controller shall not exceed 600 ohms.

## 3.02 CONTROL-SYSTEM INSTALLATION

A. Damper Actuators

1. Actuators shall not be mounted in the air stream.
2. Multiple actuators operating a common damper shall be connected to a common drive shaft.
3. Actuators shall be installed so that their action shall seal the damper to the extent required to maintain leakage at or below the specified rate and shall move the blades smoothly.

B. Room-Instrument Mounting: Room instruments shall be mounted so that their sensing elements are 5

feet above the finished floor unless otherwise shown.

- C. Low-Temperature-Protection Thermostats: For each 20 square feet of coil-face area, or fraction thereof, a thermostat shall be provided to sense the temperature at the location shown. The thermostat sensing element shall be installed in a serpentine pattern.
- D. Averaging-Temperature Sensing Elements: Sensing elements shall have a total-element minimum length equal to one linear foot per square foot of duct cross-sectional area.
- E. Duct Static-Pressure Sensing Elements and Transmitters: The duct static-pressure sensing element and transmitter sensing point shall be located approximately two-thirds of the distance from the supply fan to the end of the duct with the greatest pressure drop.
- F. Indication Devices Installed in Piping and Liquid Systems: Gauges in piping systems subject to pulsation shall have snubbers. Thermometers and temperature sensing elements installed in liquid systems shall be installed in thermowells.
- G. Tubing
  - 1. Control System Installation: The control system shall be installed so that pneumatic lines are not exposed to outside-air temperatures. All tubes and tube bundles exposed to view shall be installed neatly in lines parallel to the lines of the building. Tubing in mechanical/electrical spaces shall be routed so that the lines are easily traceable.
  - 2. Pneumatic Lines: In mechanical/electrical spaces, pneumatic lines shall be plastic tubing or copper tubing. Horizontal and vertical runs of plastic tubes or soft copper tubes shall be installed in raceways dedicated to tubing. The dedicated raceways shall be supported every 6 feet for horizontal runs and every 8 feet for vertical runs. Tubing not installed in raceways shall be hard-drawn copper tubing with sweat fittings and valves, supported every 6 feet for horizontal runs and every 8 feet for vertical runs.
  - 3. Connection to Liquid Lines: Tubing for connection of sensing elements and transmitters to liquid lines shall be copper with brass compression fittings.
  - 4. Connection to Ductwork: Tubing for connection of sensing elements and transmitters to ductwork shall be plastic tubing.
  - 5. External Tubing: Tubing external to mechanical/electrical spaces, when run in plenum ceilings, shall be soft copper with sweat fittings, supported every 8 feet. Tubing not in plenum spaces shall be soft copper with sweat fittings supported every 8 feet or shall be plastic tubing in raceways dedicated to tubing.

### 3.03 CONTROL SEQUENCES OF OPERATION

- A. General Requirements: These requirements shall apply to all primary HVAC systems unless modified herein. The sequences describe the actions of the control system for one direction of change in the HVAC process analog variable, such as temperature, humidity or pressure. The reverse sequence shall occur when the direction of change is reversed.
  - 1. HVAC System Sequences of Operation: HVAC system sequences of operation shall be as shown on the drawings and as specified herein.

### 3.04 COMMISSIONING PROCEDURES

- A. General Procedure
  - 1. Evaluations: The Contractor shall make the observations, adjustments, calibrations, measurements, and tests of the control systems, tune the controllers, set the clock schedule, and make any necessary control-system corrections to ensure that the systems function as described in the Sequence of Operation. The Contractor shall permanently record, on system equipment schedule, the final setting of controller proportional, integral and derivative constant settings, setpoint, manual reset setting, maximum and minimum controller output, and ratio and bias settings, in units and terminology specific to the controller.
  - 2. Item Check: An item-by-item check of the Sequence of Operation requirement shall be performed using Steps 1 through 4 in the specified Control System Commissioning Procedures. Steps 1, 2, and 3 shall be performed with the HVAC system shut down; Step 4 shall be performed after the HVAC systems have been started. Signals used to change the mode of operation shall originate from the actual HVAC control device intended for the purpose, such as the time clock. External input signals to the HVAC control panel (such as EMCS, starter auxiliary contacts, and external systems) may be simulated in Steps 1, 2, and 3. With each operational-mode change signal, observe that the proper pilot lights and HVAC-panel output-relay contacts function. Check all terminals assigned to

EMCS and observe that the proper signals are available.

3. Weather-Dependent Test Procedures: Weather-dependent test procedures that cannot be performed by simulation shall be performed in the appropriate climatic season. When simulation is used, the Contractor shall verify the actual results in the appropriate season.
4. Configuration: The Contractor shall configure each controller for its specified service.
5. Two-Point Accuracy Check: A two-point accuracy check of the calibration of each HVAC control-system sensing element and transmitter shall be performed by comparing the HVAC control-panel readout to the actual value of the variable measured at the sensing element and transmitter or air-flow measurement station location. Digital indicating test instruments shall be used, such as digital thermometers, motor-driven psychrometers, and tachometers. The test instruments shall be at least twice as accurate as the specified sensing element-to-controller readout accuracy. The calibration of the test instruments shall be traceable to NBS standards. The first check point shall be with the HVAC system in the shutdown condition, and the second check point shall be with the HVAC system in an operational condition. Calibration checks shall verify that the sensing element-to-controller readout accuracies at two points are within the specified product accuracy tolerances. If not, recalibrate or replace the inaccurate device and repeat the calibration check.
6. Insertion, Immersion Temperature Sensing Element: Insertion-temperature and immersion-temperature sensing element and transmitter-to-controller readout calibration accuracy shall be checked at one physical location along the axis of the sensing element.
7. Averaging-Temperature: Averaging-temperature-sensing element and transmitter-to-controller readout calibration accuracy shall be checked every 2 feet along the axis of the sensing element in the proximity of the sensing element, for a maximum of 10 readings. These readings shall then be averaged.

### **3.05 TESTING, COMMISSIONING, AND COORDINATION WITH HVAC BALANCING**

- A. Site Testing: The Contractor shall provide all personnel, equipment, instrumentation, and supplies necessary to perform all site testing, calibration, adjusting and commissioning. Wiring shall be tested for continuity and for ground, open, and short circuits. Tubing systems shall be tested for leaks. HVAC control panels shall be pretested off-site as a functioning assembly ready for field connections, calibration, adjustment, and commissioning of the operational HVAC control system. The Contractor shall obtain written Government approval of the specific site-testing procedures prior to any test. Written notification of any planned site-testing, commissioning or tuning shall be given to the Government at least 14 calendar days prior to any test.
- B. Control System Calibration, Adjustments, and Commissioning:
  1. Calibrate all instrumentation and controls and verify the specified accuracy using test equipment with calibration traceable to NIST standards.
  2. Mechanical control devices shall be adjusted to operate as specified.
  3. Control system commissioning shall be performed for each HVAC system.
- C. Performance Verification Test: The Contractor shall demonstrate compliance of the HVAC control system with the contract documents. Using test plans and procedures previously approved by the Government, the Contractor shall demonstrate all physical and functional requirements of the project. The performance verification test procedures shall explain, step-by-step, the actions and expected results that will demonstrate that the control systems perform in accordance with the sequences of operation. The performance verification test shall not be started until after receipt by the Contractor of written permission by the Government, based on the Contractor's written certification of successful completion of Contractor site testing as specified.
- D. Coordination with HVAC System Balancing: The Contractor shall tune the controllers after all air-system and hydronic-system balancing has been completed, minimum damper positions set and a report has been issued. Commissioning, except for tuning of controllers, shall be performed simultaneous with HVAC system balancing. The control subcontractor shall be responsible for placing all systems and subsystems in the correct mode during the performance of HVAC testing and balancing.
- E. Posted Instructions: Instructions on 8-1/2 by 11 inch sheets and half-size plastic laminated drawings for each system showing the final installed conditions shall be placed in each HVAC control panel. The posted instructions shall include the control sequence, control schematic, ladder diagram, wiring diagram, valve schedules, damper schedules, panel arrangement drawings, commissioning procedures, controller configuration check sheet with final configuration record, preventive maintenance instructions and single-loop controller operators manual. Additionally, half-size drawings showing the mechanical floor plan duct distribution and VAV box location shall be posted in each mechanical room.

**3.06 TRAINING**

- A. Training-Course Requirements: A training course shall be conducted for 6 operating staff members designated by the Contracting Officer. The training period, for a total of 32 hours of normal working time, shall be conducted within 30 days after successful completion of the performance verification test. The Contractor shall be responsible for furnishing all audiovisual equipment and 6 sets of all other training materials and supplies. A training day is defined as 8 hours of classroom instruction, including two 15-minute breaks and excluding lunchtime, Monday through Friday, during the daytime shift in effect at the training facility. The Contractor shall submit an outline for the course, with a proposed time schedule. Approval of the planned training schedule shall be obtained from the Government at least 30 days prior to the start of the training.
  
- B. Training-Course Content: For guidance in planning the required instruction, the Contractor should assume that attendees will have a high school education or equivalent, and are familiar with HVAC systems. The training course shall cover all of the material contained in the Operating and Maintenance Instructions, the layout and location of each HVAC control panel, the layout of one of each type of unitary equipment and the locations of each, the location of each system-control device external to the panels, preventive maintenance, troubleshooting, diagnostics, calibration, adjustment, commissioning, tuning, and repair procedures. Typical systems and similar systems may be treated as a group, with instruction on the physical layout of one such system. The results of the performance verification test and the calibration, adjustment and commissioning report shall be presented as benchmarks of HVAC control-system performance by which to measure operation and maintenance effectiveness.

**3.07 QUALITY CONTROL**

- A. The Contractor shall establish and maintain quality control for operations under this section to assure compliance with contract requirements and maintain records of his quality control for materials, equipment, and construction operations.

**END OF SECTION**

**SECTION 23 21 13:****HYDRONIC PIPING****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Pipe and pipe fittings.
- B. Valves.
- C. Heating water piping system.
- D. Chilled water piping system.

**1.02 REFERENCES**

- A. ASME - Boiler and Pressure Vessel Code.
- B. ASME Sec 9 - Welding and Brazing Qualifications.
- C. ASME B16.3 - Malleable Iron Threaded Fittings Class 150 and 300.
- D. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
- E. ASME B16.22 – Standard for Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- F. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- G. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- H. ASME B31.9 - Building Services Piping.
- I. ASTM A 47/A 47M – Standard Specification for Ferritic Malleable Iron Castings
- J. ASTM A 53/A 53M - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
- K. ASTM A183 – Standard Specification for Carbon Steel Track Bolts and Nuts
- L. ASTM A 234/A 234M - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures.
- M. ASTM A536 – Standard Specification for Ductile Iron Castings
- N. ASTM B 32 - Solder Metal.
- O. ASTM B 88 - Seamless Copper Water Tube.
- P. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
- Q. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable
- R. ASTM D 1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
- S. ASTM D 2235 - Solvent Cement for Acrylonitrile-Butadiene- Styrene (ABS) Plastic Pipe and Fittings.
- T. ASTM D 2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
- U. ASTM D 2310 - Machine-Made Reinforced Thermosetting Resin Pipe.
- V. ASTM D 2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
- W. ASTM D 2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.



- X. ASTM D 2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
- Y. ASTM D 2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
- Z. ASTM D 2683 - Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.
- AA. ASTM D 2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.
- AB. ASTM D 2855 - Making Solvent-Cemented Joints with PVC Pipe and Fittings.
- AC. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- AD. AWS A5.8 - Brazing Filler Metal.
- AE. AWS D1.1 - Structural Welding Code.
- AF. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- AG. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- AH. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- AI. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.

### **1.03 REGULATORY REQUIREMENTS**

- A. Conform to ASME B31.9.

### **1.04 QUALITY ASSURANCE**

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME SEC 9.
- C. Welders Certification: In accordance with ASME SEC 9.

### **1.05 SUBMITTALS**

- A. Submit product data.
- B. Include data on pipe materials, pipe fittings, valves, and accessories.
- C. Include welders certification of compliance with ASME SEC 9.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store valves in shipping containers with labeling in place.

## **PART 2 PRODUCTS**

### **2.01 HEATING WATER PIPING, BURIED**

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black with AWWA C105 polyethylene jacket, or double layer, half-lapped 10 mil polyethylene tape.
  1. Fittings: ASTM A 234/A 234M, forged steel welding type with double layer, half-lapped 10 mil polyethylene tape.
  2. Joints: AWS D1.1, welded.
  3. Polyurethane insulation with high density polyethylene jacket and heat shrink sleeves.

### **2.02 HEATING WATER PIPING, ABOVE GROUND**

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black.
  1. Grooved Mechanical Joints and Fittings: Joints and fittings shall be designed for not less than 175 psi

service. Welded fittings are not acceptable. Malleable iron conforming to ATM A 47/A 47M, Grade 32510. Ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket – flush type, fill entire cavity. Nuts and bolts – heat treated, ASTM A 183, cadmium plated or zinc electroplate. Factory pre-formed insulation shall be provided for these fittings.

2. Non-Grooved Pipe Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type fittings. Joints: Screwed, or AWS D1.1, welded.

B. Copper tubing: ASTM B 88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast, brass, or ASME B16.22, solder wrought copper.
2. Joints: Solder, lead free, ASTM B 32, 95-5 tin-antimony, or tin and silver, with melting range of 430 to 535 degrees F.

## 2.03 CHILLED WATER PIPING, BURIED

- A. Plastic PVC carrier pipe, fittings, and cement: ASTM D 1785 pipe, ASTM D 2466 socket type fittings, and ASTM D 2564 solvent cement shall be supplied by the same manufacturer. Pipe, fittings, flanges, and couplings shall have solvent cement socket end connections, except piping beyond 5 feet out of buildings shall have O-ring connections. Plastic PVC piping shall be suitable for working pressure of 125 psig at 75 degrees F.
- B. Flanged connections: Provide flat face flanged connections between plastic piping and metal piping. Plastic flanges shall be suitable for connecting to ASME Class 150 flanges.
- C. O-rings connections: Provide between straight sections of pipe beyond 5 feet from exterior of building.
- D. Insulation: Factory installed, rigid, 90-95% closed cell polyurethane, foamed in place, with minimum 1.5 inch annular space between pipe jacket completely filled. Foam to comply with ASTM C 591. Insulation conductivity (K) equals 0.14 (Btu-in/hr/sq. ft/degree F) per inch thickness at 50 degrees F. Jacketing material shall be high density polyethylene per ASTM D 1248 with a minimum thickness of 0.060 inches. Field joints shall be insulated with polyurethane as specified above and sealed water tight using fusion welded or heat shrink joint covers. Insulation and jacketing to be factory installed on the carrier pipe.

## 2.04 CHILLED WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40, black.
  1. Grooved Mechanical Joints and Fittings: Joints and fittings shall be designed for not less than 175 psi service. Welded fittings are not acceptable. Malleable iron conforming to ATM A 47/A 47M, Grade 32510. Ductile iron conforming to ASTM A 536, Grade 65-45-12. Gasket – flush type, fill entire cavity. Nuts and bolts – heat treated, ASTM A 183, cadmium plated or zinc electroplate. Factory pre-formed insulation shall be provided for these fittings.
  2. Non Grooved Pipe Fittings: ASME B16.3, malleable iron or ASTM A 234/A 234M, forged steel welding type. Joints: Screwed for pipe 2 inch and under; AWS D1.1 welded for pipe over 2 inch.
- B. Copper tubing: ASTM B 88, Type L, hard drawn.
  1. Fittings: ASME B16.18, cast, brass, or ASME B16.22, solder wrought copper.
  2. Joints: Solder, lead free, ASTM B 32, 95-5 tin-antimony, or tin and silver, with melting range of 430 to 535 degrees F.

## 2.05 EQUIPMENT DRAINS AND OVERFLOWS

- A. Steel Pipe: ASTM A 53/A 53M, Schedule 40 galvanized.
  1. Fittings: Galvanized cast iron, or ASME B16.3 malleable iron.
  2. Joints: Screwed, or grooved mechanical couplings.
- B. PVC Pipe: ASTM D 1785, Schedule 40, or ASTM D 2241, SDR 21 or 26.
  1. Fittings: ASTM D 2466 or D 2467, PVC.
  2. Joints: ASTM D 2855, solvent weld.
- C. ABS Pipe: ASTM D 2680 or ASTM D 2751.
  1. Fittings: ASTM D 2751.
  2. Joints: ASTM D 2235, solvent weld.

## 2.06 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions

for copper pipe, soldered joints.

- B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping.
- C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; C-shape elastomer composition sealing gasket for operating temperature range from -30 degrees F to 230 degrees F; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## **2.07 GATE VALVES**

- A. Up to 2 Inches: Bronze body, bronze trim, rising stem, hand wheel, inside screw, single wedge or disc, solder or threaded ends.
- B. Over 2 Inches: Iron body, bronze trim rising stem, hand wheel, OS&Y, single wedge, flanged or grooved ends.

## **2.08 GLOBE VALVES**

- A. Up to 2 Inches: Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable composition disc, solder or screwed ends, with backseating capacity.
- B. Over 2 Inches: Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

## **2.09 BALL VALVES**

- A. Up to 2 inches: Bronze one piece body, stainless steel ball, teflon seats and stuffing box ring, lever handle, solder or threaded ends.
- B. Over 2 Inches: Cast steel body, chrome plated steel ball teflon seat and stuffing box seals, lever handle, flanged.

## **2.10 PLUG COCKS**

- A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends, with one wrench operator for every ten plug cocks.
- B. Over 2 Inches: Cast iron body and plug, pressure lubricated, teflon packing, flanged ends, with wrench operator with set screw.

## **2.11 BUTTERFLY VALVES**

- A. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F, wafer or lug ends, extended neck, 10 position lever handle.

## **2.12 SWING CHECK VALVES**

- A. Up to 2 Inches: Bronze 45 degree swing disc, solder or screwed ends.
- B. Over 2 inches: Iron body, bronze trim, 45 degree swing disc, renewable disc and seat, flanged ends.

## **2.13 SPRING LOADED CHECK VALVES**

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

## **2.14 RELIEF VALVES**

- A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

# **PART 3 EXECUTION**

## **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. After completion, fill, clean, and chemically treat systems. See Section 23 25 00.

### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations. Wherever possible install valves in readily accessible locations not more than 2 feet above ceilings or 6 feet above floor in mechanical spaces.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Provide clearance for installation of insulation, and access to valves and fittings.
- F. Provide access panels where valves and fittings are not exposed.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain bottom of pipe level.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Prepare pipe, fittings, supports, and accessories for finish painting.
- J. Install valves with stems upright or horizontal, not inverted. Install valves so they can be accessed from the floor wherever possible or in an easily accessible location.
- K. Install metallic tape buried continuously along the full length of any buried nonmetallic piping, 12 inches below surface. The tape shall have a metallic center of aluminum foil, coated on both sides with polyethylene.
- L. Paint exterior hot water piping to match the color of the building. Paint exposed interior hot water piping to match color of adjacent surfaces. To be applied after insulation installation. Label per Section 23 05 53.
- M. Paint exterior chilled water piping to match the color of the building. Paint exposed interior chilled water piping to match color of adjacent surfaces. To be applied after insulation installation. Label per Section 23 05 53.

### **3.03 APPLICATION**

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Install gate, ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install plug cocks for throttling service.
- E. Provide 3/4 inch gate drain valves with threaded hose connections at main shut-off valves, low points of piping, bases of vertical risers, and at equipment and at isolation valves so that equipment or sections of piping can be drained without draining complete system.

### **3.04 TESTING**

- A. When additions or modifications are made to an existing hydronic system the Contractor shall test the existing system before modifications are made. Test the existing system as detailed in paragraph B. The results of the test shall be witnessed by the Contracting Officer's Inspector and any deficiencies shall be

reported in writing to the Contracting Officer.

- B. Hydrostatically test all hydronic piping systems by applying a water pressure of not less than 100 psi or 1-1/2 times the operating pressure whichever is greater. The pressure shall be maintained for 4 hours, during which all joints shall be inspected for leaks. . All tests are to be witnessed by the contract inspector. If piping systems do not pass, contractor shall make corrections and repeat tests at no additional cost to the government. Repeat until piping systems pass the tests.

**END OF SECTION**

**SECTION 23 21 16: HYDRONIC PIPING SPECIALTIES****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Expansion tanks.
- B. Chilled water storage tanks
- C. Air vents.
- D. Air separators.
- E. Strainers.
- F. Pump suction fittings.
- G. Combination fittings.
- H. Flow indicators, controls, meters.
- I. Relief valves.
- J. Pressure reducing valves
- K. Flexible connectors
- L. Backflow preventer.
- M. Water Meters.

**1.02 REFERENCES**

- A. ASME Section VIII - Boilers and Pressure Vessels Code Pressure Vessels.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

**1.05 SUBMITTALS**

- A. Submit shop drawings and product data for manufactured products and assemblies required for this project.
- B. Shop Drawings: Indicate dimensions of tanks, materials of construction, tank lining methods, anchors, attachments, lifting points, taps, and drains.
- C. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description, and model.
- D. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

**1.06 QUALITY ASSURANCE**

- A. Conform to ASME Section VIII for construction of potable water storage tanks. Provide tanks registered with National Board of Boiler and Pressure Vessel Inspectors.

**PART 2 PRODUCTS****2.01 EXPANSION TANKS**

- A. Construction: Closed, welded steel, tested and stamped in accordance with Section 8D of ASME Code;

100 psi rating; cleaned, prime coated, and supplied with steel support saddles; with tapings for installation of accessories.

- B. Gage Glass Set: Brass compression stops, guard, and 3/4 inch glass, maximum 24 inches length, long enough to cover tank for 2 inches above bottom to 2 inches below top.
- C. Quick Connect Air Inlet: Automotive tire valve type, manual air vent, tank drain, and pressure relief valve.
- D. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check back flow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

## **2.02 DIAPHRAGM-TYPE COMPRESSION TANKS**

- A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible Diaphragm sealed into tank, and steel legs or saddles.
- B. Accessories: Pressure gage and air-charging fitting, tank drain; precharge to 12 psig.

## **2.03 CHILLED WATER STORAGE TANK**

- A. Tank: Welded steel, ASME labeled for working pressure of 125 psig, steel support saddles, taps for accessories, threaded connections, access manhole.
- B. Accessories: Tank drain, water inlet and outlet.
- C. Vertical or Horizontal storage tank per drawings, sized as indicated on drawings.
- D. Insulation: Factory furnished 3 inch glass fiber insulation with steel or aluminum jacket.

## **2.04 AIR VENTS**

- A. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

## **2.05 AIR SEPARATORS**

- A. In-line Air Separators: Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with Section 8D of ASME Code; for 125 psig operating pressure.

## **2.06 STRAINERS**

- A. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2-1/2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

## **2.07 PUMP SUCTION FITTINGS**

- A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psig working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable fine mesh strainer to fit over cylinder strainer, and permanent magnet located in flow stream and removable for cleaning.
- B. Accessories: Adjustable foot support, blowdown tapping in bottom, gage tapping in side.

## **2.08 COMBINATION PUMP DISCHARGE VALVES**

- A. Valves: Straight or angle pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psig operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

## **2.09 CALIBRATED BALANCING VALVES**

- A. Cast iron or bronze, globe style, balance valve with handwheel with vernier type ring setting and memory stop, readout valves equipped with integral check valves and gasketed caps.
- B. Calibrated, plug type balance valve with precision machined orifice, readout valves equipped with integral check valves and gasketed caps, calibrated nameplate and indicating pointer.

- C. Provide calibrated balancing charts or calculators to determine fluid flow rate for each valve. Submit copies of each in the O & M manual.

## **2.10 AUTOMATIC FLOW CONTROL VALVES**

- A. Ductile-iron body with pressure ports, stainless steel flow control cartridge. Cartridge shall have segmented ports through which water passes. Cartridge movement shall result in shearing action that will dislodge or shear any particle that tends to get stuck in port.
- B. Valves shall control flow to within plus/minus 5 percent of design. Flow curve shall be smooth over its entire nominal control range.

## **2.11 RELIEF VALVES**

- A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

## **2.12 PRESSURE REDUCING VALVES**

- A. Bronze or cast iron body, stainless or chrome steel valve spring, stem, and trim, phosphor bronze diaphragm, direct acting, threaded 2 inches and smaller, flanged 2 inches and larger.

## **2.13 FLEXIBLE CONNECTIONS**

- A. Steel Piping: Stainless steel inner hose and braided exterior sleeve.
- B. Copper Piping: Bronze inner hose and braided exterior sleeve.
- C. Construct spool pieces to exact size for insertion of flexible connection.

## **2.14 BACKFLOW PREVENTERS**

- A. Reduced Pressure Backflow Preventers: ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

## **2.15 WATER METERS**

- A. AWWA C700, positive displacement disc type suitable for fluid with bronze case and cast iron bottom cap, straight reading, hermetically sealed register, magnetic drive with low flow indicator, graduated in gallons.

# **PART 3 EXECUTION**

## **3.01 INSTALLATION AND APPLICATION**

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Support tanks inside building from building structure.
- C. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- D. Provide automatic air vents at system high points and as indicated. Install isolation valves at all automatic air vent.
- E. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
- F. Provide air separator on suction side of system circulation pump and connect to expansion tank.
- G. Provide valved drain and hose connection on strainer blow down connection.
- H. Provide pump suction fitting on suction side of base mounted centrifugal pumps. Remove temporary strainers after cleaning systems.



- I. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps.
- J. Support pump fittings with floor mounted pipe and flange supports.
- K. Provide relief valves on pressure tanks, low pressure side of reducing valves, heat exchangers, and expansion tanks.
- L. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity not to exceed rating of connected equipment.
- M. Pipe relief valve outlet to nearest floor drain.
- N. Pipe relief from backflow preventer to nearest drain by means of an approved air gap. Install backflow preventers in an accessible location (i.e. not greater than 5' above floor and 12" clear space around backflow preventer, unless otherwise noted).
- O. Install water meters on all make-up water connections. Meters shall have totalizer register.
- P. Backflow preventer assemblies shall be tested in accordance with the International Plumbing Code at the time of installation. Use attached inspection form and submit for approval.
- Q. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation.
- R. All make-up water connections shall be equipped with a reduced pressure type backflow preventor.

**END OF SECTION**

## Backflow Prevention Device Inspection and Maintenance Form

<b>Device</b>	Make: _____	Model: _____	Serial #: _____	Size: _____	
	Date Installed: _____	Test Date: _____	Device Location: _____		
	<input type="checkbox"/> New	<u>Orientation</u>	<u>Use</u>	<u>Protection</u>	
	<input type="checkbox"/> Existing	<input type="checkbox"/> Vertical Up	<input type="checkbox"/> Domestic	<input type="checkbox"/> Containment	
Previous Device Serial #: _____	<input type="checkbox"/> Vertical Down	<input type="checkbox"/> Fire	<input type="checkbox"/> Isolation		
	<input type="checkbox"/> Horizontal	<input type="checkbox"/> Irrigation			
<b>Testing &amp; Maintenance</b>	<input type="checkbox"/> Initial Test	<input type="checkbox"/> Passed	Line Pressure: _____		
	<input type="checkbox"/> Annual Test	<input type="checkbox"/> Failed			
	<b>REDUCED PRESSURE BACKFLOW ASSEMBLY</b>				
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Relief Valve</b>
	<input type="checkbox"/> Leaked	<input type="checkbox"/> Leaked	<input type="checkbox"/> Failed to Open		
	<input type="checkbox"/> Closed Tight	<input type="checkbox"/> Closed Tight	Opened At _____		
	Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	<input type="checkbox"/> Closed Tight		
	Shut Off Valve No. 2	<input type="checkbox"/> Leaked			
	<b>DOUBLE CHECK VALVE</b>			<b>PRESSURE VACUUM BREAKER</b>	
	<b>Check Valve No. 1</b>		<b>Check Valve No. 2</b>		<b>Air Inlet Valve</b>
With Flow	Against Flow	With Flow	Against Flow	Opened At _____	
<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Leaked	<input type="checkbox"/>	<input type="checkbox"/> Failed to Open	
<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Closed Tight	<input type="checkbox"/>	<input type="checkbox"/> Leaked	
Pressure Differential Across No. 1 Check _____	Pressure Differential Across No. 2 Check _____	Pressure Differential Across Check Valve _____			
Comments: _____					
<b>Test Kit</b>	Test Kit Make: _____	Model: _____	Serial No. _____	Last Calibration Date: _____	
<b>Tester</b>	Name of Certified Tester: _____	Tester Certification Number: _____	Expiration Date: _____		
<b>PASS</b> <input type="checkbox"/> <b>FAIL</b> <input type="checkbox"/>					
I Hereby certify I have tested the device in accordance with FAC Rule 62-555.330(6) and FAC Rule 62-555.360(2).					
Tester's Signature: _____			Date: _____		

**SECTION 23 21 23:****HYDRONIC PUMPS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Base mounted pumps.

**1.02 REFERENCES**

- A. UL 778 - Motor Operated Water Pumps.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer: Company specializing in manufacture, assembly and field performance of pumps with minimum three years experience.
- B. Alignment: Base mounted pumps shall be aligned by qualified millwright and alignment certified.

**1.04 SUBMITTALS**

- A. Submit product data.
- B. Submit certified pump curves' showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

**1.05 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data.
- B. Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

**PART 2 PRODUCTS****2.01 GENERAL CONSTRUCTION REQUIREMENTS**

- A. Balance: Rotating parts, statically and dynamically.
- B. Construction: To permit servicing without breaking piping or motor connections.
- C. Pump Motors: Operate at 1750 rpm unless specified otherwise. Motors shall be high efficiency type.
- D. Pump Connections: Flanged.

**2.02 BASE MOUNTED PUMPS**

- A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for maximum working pressure.
- B. Casing: Cast iron, with suction and discharge gage ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
- C. Impeller: Bronze, fully enclosed, keyed to shaft.
- D. Bearings: Grease lubricated ball bearings.
- E. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- F. Seal: Carbon rotating against a stationary ceramic seat. 225 degrees F maximum continuous operating temperature.
- H. Drive: Flexible coupling with coupling guard.
- I. Baseplate: Cast iron or fabricated steel with integral drain rim.

**2.03 CLOSE COUPLED IN-LINE PUMPS**

- A. Pumps shall be in-line type, closed coupled, single stage design, for installation in vertical or horizontal

position, capable of being serviced without disturbing piping connections.

- B. Pump volute shall be of Class 30 cast iron. The impeller shall be non-ferrous, enclosed type, dynamically balanced, keyed to the shaft and secured by a locking capscrew.
- C. The liquid cavity shall be sealed off at the motor shaft by an internally-flushed mechanical seal with ceramic seal seat and carbon seal ring, suitable for continuous operation at 225 degrees F. A non-ferrous shaft sleeve shall completely cover the wetted area under the seal.
- D. Pump shall be rated for minimum of 175 psi working pressure. Volute shall have gauge tappings at the top and bottom.
- E. Motor shall meet NEMA specifications and shall be of the size, voltage and enclosure called for on the plans. It shall have heavy duty grease lubricated ball bearings, completely adequate for the maximum load for which the motor is designed.
- F. Each pump shall be factory tested per Hydraulic Institute Standards. It shall then be thoroughly cleaned and painted with at least one coat of high grade machinery enamel prior to shipment.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install pumps in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
- C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- D. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
- E. Provide line sized shut-off valve and strainer on pump suction, and line sized soft seat check valve and balancing valve on pump discharge.
- F. Provide air cock and drain connection on horizontal pump casings.
- G. Provide drains for bases and seals, piped to and discharging into floor drains.
- H. Lubricate pumps before start-up.
- I. Install base mounted pumps on concrete base, with anchor bolts, set and level, and grout in place.
- J. Qualified millwright shall check, align, and certify base mounted pumps prior to start-up.
- K. Install name plates on pump indicating the GPM, head and impeller diameter.
- L. On constant flow systems the pump impeller shall not be trimmed. The balancing valve shall be used for setting the flow rate.

**END OF SECTION**

**SECTION 23 25 00: HVAC WATER TREATMENT****PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes:
  - 1. System cleaner.
  - 2. Closed system treatment (water).
  - 3. Condenser water system treatment.
  - 4. Open system treatment.
  - 5. Chemical feeder equipment including associated feeders, pumps, tanks, controls, meters, and valves.

**1.02 SUBMITTALS**

- A. Submit proposed cleaning and flushing procedures.
- B. Shop Drawings: Indicate system schematic, equipment locations, and controls schematics, electrical characteristics and connection requirements.
- C. Product Data: Submit chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Submit placement of equipment in systems, piping configuration, and connection requirements.
- E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
- F. Manufacturers Field Reports: Indicate start-up of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.
- G. Submit initial and final water analysis reports.

**1.03 CLOSEOUT SUBMITTALS**

- B. Project Record Documents: Record actual locations of equipment and piping, including sampling points and location of chemical injectors.
- C. Operation and Maintenance Data: Submit data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

**1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Florida standard for addition of non-potable chemicals to building systems and for discharge to public sewers.

**1.05 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience with water analysis laboratories and full time service personnel.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

**1.06 WARRANTY**

- A. Furnish one year manufacturer warranty for pumps, valves and water meters.

**PART 2 PRODUCTS****2.01 SYSTEM CLEANER**

- A. Product Description: Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.

- B. Biocide; chlorine release agents including sodium hypochlorite or calcium hypochlorite, or microbiocides including quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

## **2.02 CLOSED SYSTEM TREATMENT (WATER)**

- A. Furnish materials in accordance with State Florida standards.
- B. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
- C. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium tolyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulfites.

## **2.03 CONDENSER WATER SYSTEM TREATMENT (COOLING TOWERS)**

- A. Furnish materials in accordance with State of Florida standards.
- B. Sequestering agent to inhibit scaling; phosphonates, sodium polyphosphates, lignin derivatives, synthetic polymer polyelectrolytes, or organite phosphates.
- C. Acid to reduce alkalinity and pH.
- D. Corrosion inhibitor; zinc-phosphate, phosphonate-phosphate, phosphonate-molybdate and phosphonate-silicate, sodium tolyltriazole, or low molecular weight polymers.
- E. Biocide; chlorine release agents including sodium hypochlorite or calcium hypochlorite, or microbiocides including quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

## **2.04 OPEN SYSTEM TREATMENT - (EVAPORATIVE CONDENSERS, SMALL COOLING TOWERS)**

- A. Furnish materials in accordance with State of Florida standards.
- B. Sequestering agent to inhibit scaling and corrosion inhibitor; polyphosphate.
- C. Biocide; chlorine release agents including sodium hypochlorite or calcium hypochlorite, or microbiocides including quaternary ammonia compounds, tributyl tin oxide, methylene bis (thiocyanate), or isothiazolones.

## **2.05 BY-PASS (POT) FEEDER**

- A. Furnish materials in accordance with State of Florida standards.
- B. Two or five gallon size capacity with quick opening cap for working pressure of 175 psig.

## **2.06 DRIP FEEDER**

- A. Plastic reservoir with coil of capillary tubing with probe, weights, charging syringe, and clip.

## **2.07 SOLUTION METERING PUMP**

- A. Furnish materials in accordance with State of Florida standards.
- B. Positive displacement, diaphragm pump with adjustable flow rate, thermoplastic construction, continuous-duty fully enclosed electric motor and drive, and relief valve.

## **2.08 SOLUTION TANKS**

- A. Furnish materials in accordance with State of Florida standards.
- B. 50 gallon capacity, polyethylene, self-supporting, 5 gallon graduated markings; molded fiberglass cover with recess for mounting pump, agitator, and liquid level switch.

## **2.09 AGITATOR**

- A. Furnish materials in accordance with State of Florida standards.
- B. Totally enclosed electric motor, stainless steel clamp and motor mount, ½ inch diameter Type 316 stainless steel propeller.

**2.10 LIQUID LEVEL SWITCH**

- A. Furnish materials in accordance with State of Florida standards.
- B. Polypropylene housing with integrally mounted PVC air trap, receptacles for connection to metering pump, and low level alarm.

**2.11 CONDUCTIVITY CONTROLLER**

- A. Furnish materials in accordance with State of Florida standards.
- B. Packaged monitor controller with solid state circuiting, five percent accuracy, linear dial adjustment, built-in calibration switch, on-off switch and light, control function light, output to control circuit.

**2.12 WATER METER**

- A. Furnish materials in accordance with State of Florida standards.
- B. Displacement type cold-water meter with sealed, tamper-proof magnetic drive, impulse contact register.

**2.13 SOLENOID VALVES**

- A. Furnish materials in accordance with State of Florida standards.
- B. Forged brass body globe pattern, normally open or closed as required, general-purpose solenoid enclosure, and continuous duty coil.

**2.14 TIMERS**

- A. Furnish materials in accordance with State of Florida standards.
- B. Electronic timers, infinitely adjustable over full range, 150 second and five minute range, mounted together in cabinet with hands-off-automatic switches and status lights.

**2.15 TEST EQUIPMENT**

- A. Furnish white enamel test cabinet with local and fluorescent light, capable of accommodating 4 - 10 ml zeroing titration burettes and associated reagents.
- B. Furnish following test kits:
  1. Alkalinity titration test kit.
  2. Chloride titration test kit.
  3. Sulphite titration test kit.
  4. Total hardness titration test kit.
  5. Low phosphate test kit.
  6. Conductivity bridge, range 0 - 10,000 micro-ohms.
  7. Creosol red pH slide, complete with reagent.
  8. Portable electronic conductivity meter.
  9. High nitrite test kit.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. Operate, fill, start and vent systems prior to cleaning. Use water meter to record capacity in each system. Place terminal control valves in open position during cleaning.

**3.02 CLEANING**

- A. Concentration: As recommended by manufacturer.
- B. Hot Water Heating Systems:
  1. Apply heat while circulating, slowly raising temperature to 160 degrees F and maintain for 12 hours minimum.
  2. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.
  3. Circulate for 6 hours at design temperatures, then drain.
  4. Refill with clean water and repeat until system is clean and cleaner is removed.

- C. Chilled Water Systems:
  1. Circulate for 48 hours, then drain systems as quickly as possible.
  2. Refill with clean water, circulate for 24 hours, then drain.
  3. Refill with clean water and repeat until system is clean and cleaner is removed.
- D. Use neutralizer agents on recommendation of system cleaner supplier and acceptance of Engineer.
- E. Flush open systems with clean water for one hour minimum. Drain and completely refill.
- F. Remove, clean, and replace strainer screens.
- G. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.
- H. Complete system shall be cleaned/flushed to include new and existing hydronic piping.

### **3.03 CLOSED SYSTEM TREATMENT**

- A. Provide one bypass feeder on each system. Install isolating and drain valves and interconnecting piping. Install around balancing valve downstream of circulating pumps as indicated on Drawings.
- B. Sample and analyze water and chemically treat as recommended by manufacture. Submit analysis and treatment recommendation for approval.
- C. Introduce closed system treatment through bypass feeder as required by water analysis.
- D. Sample and submit analysis of water following treatment.

### **3.04 OPEN SYSTEM TREATMENT (EVAPORATIVE CONDENSERS) (SMALL COOLING TOWERS)**

- A. Provide two glass mesh feeder bags for each unit, suspended in sump, filled with sequestering agent.
- B. Provide drip feeder to feed sequestering agent into sump. Interlock solenoid valve on drip system with spray or circulating pump.
- C. Provide 1/2 inch bleed-off complete with globe valve piped to drain. Locate bleed-off above flood line. Provide solenoid valve wired to pump.
- D. Provide conductivity controller to sample sump water and operate bleed-off solenoid valve. Activate with pump. Pipe to drain.
- E. Sample and analyze water and chemically treat as recommended by manufacture. Submit analysis and treatment recommendation for approval.
- F. Sample and submit analysis of water following treatment.

### **3.05 CONDENSER WATER SYSTEMS (COOLING TOWERS)**

- A. Provide automatic condenser water control systems for inhibitor feed, blow-down, and biocide feeds.
  1. Provide meter activated inhibitor application.
  2. Provide conductivity activated blow-down.
  3. Provide meter fed biocide with blow-down locked out to ensure biocide retention time.
- B. Incorporate solid state integrated circuits and digital LED displays, in NEMA 250 Type 12 steel enclosure. Provide lockable door with gaskets.
- C. Base dissolved solids control on conductivity and include:
  1. LED digital readout display (micro-ohm/cm).
  2. Temperature compensated sensor probe adaptable to sample stream manifold.
  3. High, low, normal conductance indicator lights (LED).
  4. High or low conductance alarm light (flash or steady switch), trip points field adjustable. Furnish flash or steady switch with silence position.
  5. Illuminated legend indicating "ALARM" whenever alarm condition exists.
  6. Hand-off-automatic switch for solenoid bleed valve.
  7. Illuminated legend indicating "BLEED" when valve is operated.



8. Adjustable hysteresis or dead-band (internal).
- D. Base inhibitor feed control on make-up volume and include:
    1. Solid state counter (1-15 field selectable).
    2. Solid state timer (adjustable 1/4 to 5 minutes).
    3. Test switch.
    4. Hand-off-automatic switch for chemical pump.
    5. Illuminated legend indicating "FEED" when pump is activated.
    6. Solid state lockout timer (adjustable 1/4 to 3 hours) and indicator light. Lockout timer to deactivate pump and activate alarm circuits.
    7. Panel total (quantity of makeup), Electro-mechanical type.
  - E. Biocide programmer to include:
    1. 24-hour timer with 14 day skip feature.
    2. Precision solid state bleed lockout timer (0-9 hours) and biocide pump timer (0 - 2-1/4 hours), clock controlled.
    3. Solid state alternator to enable use of two different formulations.
    4. Digital display of time of day (24 hours).
    5. LED display of day of week (14 days).
    6. Fast and slow clock set controls (internal).
    7. Battery back-up so clock is not disturbed by power outages, quartz timekeeping accuracy.
    8. Hand-off-automatic switches for biocide pumps.
    9. Illuminated legend indicating "BIOCIDE A" or "BIOCIDE B" when pump is activated.
  - F. Provide water meter on system make-up, wired to control system.
  - G. Provide solution pumps to feed sequestering agent and corrosion inhibitor from solution tank into condenser water supply to tower. Provide agitator in accordance with treatment suppliers recommendations.
  - H. Provide conductivity controller to sample condenser water and operate solenoid bleed valve and piping to blow-down controller. Wire sampler to open when condenser water pump is operating.
  - I. Introduce biocide to tower by continuous feed with solution pump or solenoid valve on tank (chlorine).
  - J. Provide liquid level switch in each solution tank to de-activate solution pump and agitator, and signal mechanical alarm system.
  - K. Install 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.
- 3.06 DEMONSTRATION**
- A. Furnish two hour training course for operating personnel, instruction to include installation, care, maintenance, testing, and operation of water treatment systems. Arrange course at start up of systems.

**END OF SECTION**

**SECTION 23 31 00: HVAC DUCTS AND CASINGS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Ductwork.
- B. Casings.
- C. Kitchen hood ductwork.
- D. Duct cleaning.

**1.02 REFERENCES**

- A. ASHRAE - Handbook Fundamentals; Chapter 34 - Duct Design.
- B. ASHRAE - Handbook HVAC Systems and Equipment; Chapter 16 - Duct Construction.
- C. ASTM A90/A90M – Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- D. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- E. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated by the Hot-Dip Process.
- F. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- G. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- H. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- I. NFPA 96 - Standard for the Ventilation Control and Fire Protection of Commercial Cooling Operations.
- J. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.
- K. SMACNA – HVAC Air Duct Leakage Test Manual.
- L. UL 181 - Factory-Made Air Ducts and Connectors.

**1.03 SUBMITTALS**

- A. Submit results of duct leakage testing.

**1.04 DEFINITIONS**

- A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.

**1.05 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A and NFPA 90B and NFPA 96 standards.

**1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, G90 zinc coating in conformance with ASTM A90/A90M.

- C. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.
- D. Insulated Flexible Ducts: Polyester film supported by helical-wound spring steel wire; fiberglass insulation; aluminized vapor barrier film.
  - 1. Pressure Rating: 10 inches wg positive and 1 inches wg negative.
  - 2. Maximum Velocity: 4000 fpm.
  - 3. Temperature Range: 0 degrees F to 250 degrees F.
  - 4. Thermal Resistance: 6.0 square feet-hour-degree F per BTU.
- E. Stainless Steel Ducts: ASTM A167, Type 304.
- F. Fasteners: Rivets, bolts, or sheet metal screws.
- G. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape, or heavy mastic.
- H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

## 2.02 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. If not indicated otherwise, supply and return duct and ductwork downstream of VAV boxes shall be constructed to 1" pressure classification with a seal class C and a leakage classification of 24 for rectangular ducts and 12 for round ducts. Ductwork upstream of VAV boxes shall be constructed to 2" pressure classification, unless otherwise noted, with a seal class C and a leakage classification of 24 for rectangular ducts and 12 for round ducts. Ductwork indicated to be constructed to a pressure class of 3" shall be constructed with a seal class B and a leakage classification of 12 for rectangular ducts and 6 for round ducts. Ductwork indicated to be constructed to a pressure class of 4", 6" or 10" shall be constructed with a seal class A and a leakage classification of 6 for rectangular ducts and 3 for round ducts.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- F. Connect flexible ducts to metal ducts with liquid adhesive plus draw bands.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inches cemented slip joint, brazed or electric welded. Prime coat welded joints.
- I. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

## 2.03 SINGLE WALL SPIRAL ROUND DUCTS

- A. Product Description: UL 181, Class 1, round spiral lock seam duct constructed of galvanized steel.

- B. Construct duct with the following minimum gages:

<u>Diameter</u>	<u>Gauge</u>
3 inches to 14 inches	26
15 inches to 26 inches	24
28 inches to 36 inches	22
38 inches to 50 inches	20
52 inches to 84 inches	18

- C. Construct fittings with the following minimum gages:

<u>Diameter</u>	<u>Gauge</u>
3 inches to 14 inches	24
15 inches to 26 inches	22
28 inches to 36 inches	20
38 inches to 50 inches	20
52 inches to 60 inches	18
62 inches to 84 inches	16

#### 2.04 SINGLE WALL SPIRAL FLAT OVAL DUCTS

- A. Product Description: Machine made from round spiral lock seam duct constructed of galvanized steel; rated for 10 inches wg pressure.

- B. Joints: Either fully welded or bolted flange with gasket material in accordance with manufacturer's recommendations.

- C. Construct duct with the following minimum gauges:

<u>Major Axis Dimension</u>	<u>Gauge</u>
7 inches to 24 inches	24
25 inches to 48 inches	22
50 inches to 70 inches	20
72 inches to 82 inches	18
84 inches and larger	16

- D. Construct fittings with the following minimum gauges:

<u>Major Axis Dimension</u>	<u>Gauge</u>
7 inches to 36 inches	20
37 inches to 60 inches	18
62 inches and larger	16

#### 2.05 DOUBLE WALL SPIRAL INSULATED ROUND DUCTS

- A. Product Description: Machine made from round spiral lock seam duct with light reinforcing corrugations, galvanized steel outer wall, 1 inch thick glass fiber insulation (0.27 Btu/hr/ft<sup>2</sup>/°F), perforated galvanized steel inner wall; fittings manufactured with solid inner wall.

- B. Construct duct with the following minimum gages:

<u>Diameter</u>	<u>Gauge</u>
3 inches to 14 inches	26
15 inches to 26 inches	24
28 inches to 36 inches	22
38 inches to 50 inches	20
52 inches to 84 inches	18

- C. Construct fittings with the following minimum gages:

<u>Diameter</u>	<u>Gauge</u>
3 inches to 14 inches	24
15 inches to 26 inches	22
28 inches to 36 inches	20
38 inches to 50 inches	20
52 inches to 60 inches	18
62 inches to 84 inches	16

**2.06 DOUBLE WALL SPIRAL INSULATED FLAT OVAL DUCTS**

A. Product Description: Machine made from round spiral lock seam duct with light reinforcing corrugations, galvanized steel outer wall, 1 inch thick glass fiber insulation (0.27 Btu/hr/ft<sup>2</sup>/°F), perforated galvanized steel inner wall; fittings manufactured with solid inner wall.

B. Construct duct with the following minimum gauges:

<u>Major Axis Dimension</u>	<u>Gauge</u>
7 inches to 24 inches	24
25 inches to 48 inches	22
50 inches to 70 inches	20
72 inches to 82 inches	18
84 inches and larger	16

C. Construct fittings with the following minimum gauges:

<u>Major Axis Dimension</u>	<u>Gauge</u>
7 inches to 36 inches	20
37 inches to 60 inches	18
62 inches and larger	16

**2.07 DOUBLE WALL DUCT, EXTERIOR APPLICATIONS**

A. All ductwork located outside the building shall be factory doublewall ductwork and it shall be sealed watertight.

B. The double wall duct shall be 2" thick and internally insulated with a minimum of 2" thick, 1.75 pounds per cubic foot glass fiber insulation.

C. The ductwork shall be round, flat oval or rectangular as indicated on the drawings.

D. Ductwork interior and exterior wall shall be factory fabricated from aluminum in accordance with SMACNA HVAC duct construction standards. Ductwork shall be supported in accordance with SMACNA standards.

**2.08 CASINGS**

A. Fabricate casings in accordance with SMACNA HVAC Duct Construction Standards and construct for operating pressures indicated.

B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.

C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

D. Fabricate acoustic casings with reinforcing turned inward. Provide 16 gage back facing and 22 gage perforated front facing with 3/32 inch diameter holes on 5/32 inch centers. Construct panels 3 inches thick packed with 4.5 lb/cu ft minimum glass fiber media, on inverted channels of 16 gage.

**2.09 KITCHEN HOOD EXHAUST DUCTWORK**

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and NFPA 96.

B. Exposed Kitchen Hood Exhaust Ducts: Construct of stainless steel ASTM A167, type 304 using continuous external welded joints.

C. Concealed Kitchen Hood Exhaust Ducts: Construct of 16 gage carbon steel or 18 gage stainless steel ASTM A167, type 304 using continuous external welded joints.

**PART 3 EXECUTION****3.01 INSTALLATION**

A. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or

screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

- B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- C. Set plenum doors 6 to 12 inches above floor. Arrange door swings so that fan static pressure holds door in closed position.
- D. Connect terminal units directly or with one foot maximum length of flexible duct. Do not use flexible duct to change direction.
- E. Connect diffusers or troffer boots with 5 feet maximum length of flexible duct. Hold in place with strap or clamp.
- F. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel or painted galvanized steel for ductwork exposed to view and stainless steel or galvanized steel for ducts where concealed.
- G. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- H. All exposed spiral round or flat oval duct shall be double wall insulated duct.
- I. Exposed ductwork shall be painted to match ceiling, roof structure, or as otherwise specified.
- J. The ductwork shall have balance dampers where the branch ducts connect to main trunk.

### 3.02 DUCTWORK APPLICATION SCHEDULE

<u>AIR SYSTEM</u>	<u>MATERIAL</u>
Supply Air	Steel, Aluminum
Return and Relief	Steel, Aluminum
General Exhaust	Steel, Aluminum
Kitchen Hood Exhaust	Steel, Stainless Steel
Dishwasher Exhaust	Stainless Steel
Fume Hood Exhaust	Stainless Steel
Outside Air Intake	Steel
Combustion Air	Steel
Exterior Ductwork	Aluminum

### 3.03 ADJUSTING AND CLEANING

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.

### 3.04 TESTING

- A. A leakage test shall be made of ductwork in each pressure classification, to demonstrate adequacy of construction tightness. Each section shall incorporate at least: 5 transverse joints, typical seams, one elbow, one fire damper, one access door, and 2 typical branch connections. Leakage testing shall be performed in accordance with sections 3 and 5 of SMACNA HVAC Air Duct Leakage Test Manual. Leakage in each type ductwork shall not exceed leakage classes identified in paragraphs 2.02A and 2.03A above. Test shall be witnessed by the contract inspector and test results submitted for approval.

**END OF SECTION**

**SECTION 23 33 00:****AIR DUCT ACCESSORIES****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Volume control dampers.
- B. Fire dampers.
- C. Combination fire and smoke dampers.
- D. Backdraft dampers.
- E. Air turning devices.
- F. Flexible duct connections.
- G. Duct access doors.
- H. Duct test holes.

**1.02 REFERENCES**

- A. AMCA 500 – Test Methods for Louvers, Dampers and Shutters.
- B. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- C. NFPA 92A – Recommended Practice for Smoke-Control Systems.
- D. SMACNA - HVAC Duct Construction Standards.
- E. UL 33 - Heat Responsive Links for Fire-Protection Service.
- F. UL 555 - Fire Dampers and Ceiling Dampers.
- G. UL 555C – Safety for Ceiling Dampers.
- H. UL 555S – Safety for Smoke Dampers.

**1.03 QUALITY ASSURANCE**

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.

**PART 2 PRODUCTS****2.01 VOLUME CONTROL DAMPERS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
- B. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
- C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inches.
- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.



- F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
- H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
- I. Outside air damper leakage shall be a maximum of 3 CFM per square foot. Damper leakage shall be tested in accordance with AMCA 500.

## **2.02 FIRE DAMPERS**

- A. Fabricate in accordance with NFPA 90A, NFPA 92A, UL 555, UL555S, UL555C and as indicated.
- B. Fabricate ceiling firestop flaps of galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side, and one layer on bottom side for round flaps, with locking clip.
- C. Fabricate ceiling dampers of galvanized steel, 22 gage frame, stainless steel closure spring, and light weight, heat retardant non-asbestos fabric blanket closure.
- D. Fabricate curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for low pressure ducts up to 12 inches in height.
- E. Fabricate multiple blade fire dampers with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- F. Fusible links, UL 33, shall separate at 160 degrees F. Provide adjustable link straps for combination fire/balancing dampers.

## **2.03 BACKDRAFT DAMPERS**

- A. Gravity backdraft dampers, size 18/x/18 inches or smaller, furnished with air moving equipment, may be air moving equipment manufacturers standard construction.
- B. Fabricate multi-blade, parallel action gravity balanced backdraft dampers of 16 gage galvanized steel, or extruded aluminum, with blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

## **2.04 AIR TURNING DEVICES**

- A. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, and mounting straps.
- B. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

## **2.05 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
- B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per sq yd, approximately 6 inches wide, crimped into metal edging strip.

## **2.06 DUCT ACCESS DOORS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards and as indicated.
- B. Duct access doors shall be provided at all fire dampers and duct mounted mechanical equipment.
- C. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
- D. Access doors smaller than 12 inches square may be secured with sash locks.

- E. Provide two hinges and two sash locks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.
- F. Access doors with sheet metal screw fasteners are not acceptable.

### **2.07 DUCT TEST HOLES**

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions.
- B. Provide balancing dampers where indicated and at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Contractor shall provide and install as many balancing dampers as required for proper balancing of the air system regardless of whether they are shown on the drawings. All dampers shown on the drawings shall be provided. Use splitter dampers only where indicated.
- C. Provide balancing dampers on medium and high pressure systems where indicated.
- D. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.
- F. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- G. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- H. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, or as indicated.
- I. Provide duct test holes where indicated or required for testing and balancing purposes.

**END OF SECTION**

**SECTION 23 34 00:****HVAC FANS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Roof exhausters.
- B. Wall exhausters.
- C. Cabinet exhaust fans.
- D. Ceiling exhaust fans.

**1.02 REFERENCES**

- A. AMCA 99 - Standards Handbook.
- B. AMCA 204 - Balance Quality and Vibration Levels for Fans.
- C. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- D. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
- E. AMCA 301 - Method of Publishing Sound Ratings for Air Moving Devices.
- F. SMACNA - Low Pressure Duct Construction Standard.
- G. UL 705 - Power Ventilators.

**1.03 QUALITY ASSURANCE**

- A. Performance Ratings: Conform to AMCA 210.
- B. Sound Ratings: AMCA 301, tested to AMCA 300.
- C. Fabrication: Conform to AMCA 99.
- D. UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- E. Balance Quality: Conform to AMCA 204.

**1.04 SUBMITTALS**

- A. Submit shop drawings and product data.
- B. Provide fan curves with specified operating point clearly plotted.
- C. Submit sound power levels for both fan inlet and outlet at rated capacity.
- D. Submit manufacturer's installation instructions.
- E. Submittals shall be made under provisions of Section 01 33 00.

**1.05 OPERATION AND MAINTENANCE DATA:**

- A. Submit operation and maintenance data.
- B. Include instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.

**PART 2 PRODUCTS****2.01 ROOF EXHAUSTERS**

- A. Centrifugal or Axial Fan Unit: V-belt or direct driven, with galvanized steel prefinished in baked-on enamel housing; resilient mounted motor; 1/2 inch mesh, 16 gage aluminum bird screen; square base to suit roof curb with continuous curb gaskets; secured with cadmium plated bolts and screws.
- B. Roof Curb: 12 - 16 inch high with continuously welded seams, built-in cant strip, one inch insulation and curb bottom, and factory installed door nailer strip.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- D. Backdraft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **2.02 WALL EXHAUSTERS**

- A. Centrifugal or Axial Fan Unit: V-belt or direct driven, with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 16 gage aluminum bird screen; secured with cadmium plated bolts and screws.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Backdraft Damper: Gravity activated, aluminum multiple blade construction, felt edged with nylon bearings.
- D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **2.03 CABINET AND CEILING EXHAUST FANS**

- A. Centrifugal Fan Unit: V-belt or direct driven, with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- C. Grille: Molded white plastic or aluminum with baked white enamel finish.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with lag screws to roof curb.
- C. All exterior roof mounted or wall mounted supply or exhaust fan including any curbs or flashing shall be painted to match the adjacent surfaces.
- D. When an exhaust fan is mounted in a ceiling tile or in a suspended ceiling system the fan shall be supported independently from the ceiling tile or ceiling grid.

**END OF SECTION**

**SECTION 23 36 00:****AIR TERMINAL UNITS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Variable volume terminal units.
- B. Variable volume regulators.
- C. Integral sound attenuator.
- D. Integral heating coils.
- E. Integral damper motor operators.
- F. Integral controls.

**1.02 REFERENCES**

- A. ARI 880 – Air Terminals.
- B. ARI 885 – Estimating Occupied Space Sound Levels in the Application of Air Terminals and Air Outlets.
- C. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. UL 181 - Factory-Made Air Ducts and Connectors.

**1.03 SUBMITTALS**

- A. Submit shop drawings.
- B. Submit shop drawings indicating configuration, general assembly, and materials used in fabrication.
- C. Submit product data.
- D. Submit product data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings which indicate air flow, static pressure, and NC designation.
- E. Include schedules listing discharge and radiated sound power level for each of second through sixth octave bands at inlet static pressures of one to 4 inch wg.
- F. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

**1.04 QUALITY ASSURANCE**

- A. **Test and rate air terminal units performance for air pressure drop, flow performance, and acoustical performance in accordance with ARI 880 and ARI 885. Attach ARI seal to each terminal unit.**

**1.05 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data.
- B. Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts lists.
- C. Include directions for resetting constant volume regulators.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum eight years experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURED UNITS; VARIABLE AIR VOLUME (VAV)**

- A. VAV and dual duct terminal units shall be the type, size, and capacity shown and shall be mounted in the ceiling or wall cavity and shall be suitable for single duct system applications. Actuators and controls shall be as specified in Section 23 09 23, Direct Digital Control Systems. Unit enclosures shall be constructed of galvanized steel not lighter than 22 gauge or aluminum sheet not lighter than 18 gauge. Single or multiple discharge outlets shall be provided as required. Units with flow limiters are not acceptable. Unit air volume shall be factory preset and readily field adjustable without special tools. Reheat coils shall be provided as indicated. A flow chart shall be attached to each unit. Acoustic performance of the terminal units shall be based upon units tested according to ARI 880. Sound power level shall be as indicated. Discharge sound power shall be shown for minimum and 1-1/2 inches water gauge inlet static pressure. Lining shall be minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Variable volume, single duct, terminal units shall be provided with a calibrated air volume sensing device, air valve or damper, actuator, and accessory relays. Units shall control air volume to within plus or minus 5 percent of each air set point volume as determined by the thermostat with variations in inlet pressures from 3/4 inch to 6 inch water gauge. Internal resistance of units shall not exceed 0.4 inch water gauge at maximum flow range. External differential pressure taps separate from the control pressure taps shall be provided for air flow measurement with a 0 to 1 inch water gauge range. Unit volume controller shall be normally open upon loss of power. Unit shall be pressure independent.

**2.02 HEATING COILS**

- A. Hot Water Heating Coil: 1/2 inch copper tube mechanically expanded into aluminum plate fins, leak tested under water to 200 psig pressure, factory installed.
- B. Capacity: Refer to schedule on the contract drawings.

**2.03 WIRING**

- A. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.
- B. Factory mount transformer for control voltage on electric and electronic control units. Provide terminal strip in control box for field wiring of thermostat and power source.

**2.04 CONTROLS**

- A. Refer to Section 23 09 23, Direct Digital Control Systems.

**2.05 TESTS**

- A. Provide testing of units.
- B. Test run volume dampers and controls. Check sequence of operation and air flow limits at factory prior to shipment.
- C. Automatic flow controller shall be capable of maintaining air flow to within 5 percent of set point with inlet static pressure variations up to 4 inches.
- D. Maximum Casing Leakage: 2 percent of design air flow at rated inlet static pressure.
- E. Maximum Damper Leakage: 2 percent of design air flow at one inch.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide ceiling access doors where units are not easily accessible.
- C. Support units individually from structure. Do not support from adjacent ductwork.
- D. Where boxes are installed above suspended ceilings, the air terminal units shall be installed not more than 2' (to the bottom of the units) above the ceiling.

**3.02 ADJUSTING**

- A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 30 percent full flow. Set units with heating coils for minimum 30 percent full flow.

**END OF SECTION**

**SECTION 23 37 00:****AIR OUTLETS AND INLETS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Diffusers.
- B. Diffuser boots.
- C. Registers/grilles.
- D. Door grilles.
- E. Louvers.
- F. Roof hoods.

**1.02 REFERENCES**

- A. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
- B. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- C. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- D. SMACNA - HVAC Duct Construction Standard.

**1.03 QUALITY ASSURANCE**

- A. Test and rate performance of air outlets and inlets in accordance with ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

**1.04 REGULATORY REQUIREMENTS**

- A. Conform to NFPA 90A.

**1.05 SUBMITTALS**

- A. Submit product data.
- B. Provide product data for items required for this project.
- C. Submit manufacturer's installation instructions.
- D. Submittals shall be made under provisions of Section 01 33 00.

**PART 2 PRODUCTS****2.01 RECTANGULAR CEILING DIFFUSERS**

- A. Rectangular, stamped, multi-core type diffuser to discharge air in 360 degree pattern.
- B. Provide surface mount or inverted T-bar type frame. Face is to be 24"x24" when mounted in suspended ceilings.
- C. Fabricate of steel with baked enamel off-white finish.
- D. Provide radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

**2.02 CEILING SUPPLY REGISTERS/GRILLES**

- A. Streamlined and individually adjustable curved blades to discharge air along face of grille, 4-way deflection. To be install only where indicated.



- B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting and gasket.
- C. Fabricate of aluminum extrusions with factory baked enamel off-white finish.
- D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

### **2.03 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Fixed grilles of 1/2 x 1/2 x 1/2 inch louvers.
- B. Fabricate 1-1/4 inch margin frame with lay-in frame for suspended grid ceilings.
- C. Fabricate of aluminum with factory baked enamel off-white finish.
- D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.

### **2.04 WALL SUPPLY REGISTERS/GRILLES**

- A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting and gasket.
- C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel off-white finish.
- D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. In gymnasiums, blades shall be front pivoted, welded in place or securely fastened to be immobile.

### **2.05 WALL EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Streamlined blades, depth of which exceeds 3/4 inch spacing, with spring or other device to set blades, horizontal face.
- B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.
- C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel off-white finish.
- D. Where not individually connected to exhaust fans, provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. In gymnasiums, blades shall be front pivoted, welded in place, or securely fastened to be immobile.

### **2.06 DOOR GRILLES**

- A. V-shaped louvers of 20 gage steel, one inch deep on 1/2 inch centers.
- B. Provide 20 gage steel frame with auxiliary frame to give finished appearance on both sides of door, with factory finish. Color to be selected by government from standard manufacturer's colors (minimum 9 colors).

### **2.07 LOUVERS**

- A. Provide 6 inch deep, storm type louvers with blades on 45 degree slope, heavy channel frame, bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake. Provide insect screens on intake louvers.
- B. Fabricate of 12 gage extruded aluminum, welded assembly, with factory prime coat finish to facilitate field painting. Louvers are to be factory painted standard color to match adjacent surfaces as closely as possible, unless otherwise directed.

### **2.08 ROOF HOODS**

- A. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards.
- B. Fabricate of galvanized steel, minimum 16 gage base and 20 gage hood, or aluminum, minimum 16 gage

base and 18 gage hood; suitably reinforced; with removable hood; bird screen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory coated to match color of roof panels, unless otherwise directed. Provide insect screens on intake louvers.

- C. Mount unit on minimum 12 inch high curb base with insulation between duct and curb.
- D. Make hood outlet area minimum of twice throat area.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install items in accordance with manufacturers' instructions and as indicated on drawings.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.
- F. Where louvers and grilles are to be installed in existing openings, contractor shall verify dimensions prior to ordering.
- G. Install louvers and grilles plumb and level.
- H. Grilles installed in exterior soffits shall be painted to match the color of soffit.
- I. When diffusers or grilles are cut into a ceiling tile, the diffuser or grille shall be supported independently of the ceiling tile.

**END OF SECTION**

## **SECTION 23 64 10: PACKAGE AIR-COOLED WATER CHILLERS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. Section includes chiller package, charge of refrigerant and oil, controls and control connections, chilled water connections, condenser water connections, refrigerant connections, auxiliary water connections, starters.

#### **1.02 REFERENCES**

- A. Air-Conditioning and Refrigeration Institute:
  - 1. ARI 550/590 - Water Chilling Packages Using the Vapor Compression Cycle.
- B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:
  - 1. ASHRAE 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- C. American Society of Mechanical Engineers:
  - 1. ASME Section VIII - Boiler and Pressure Vessel Code - Pressure Vessels.
- D. National Electrical Manufacturers Association:
  - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

#### **1.03 DEFINITIONS**

- A. Coefficient of Performance (COP) - cooling: The ratio of the rate of heat removal to the rate of energy input, in consistent units, for a complete refrigerating system or some specific portion of that system under designated operating conditions.
- B. Integrated Part-Load Value (IPLV): A single-number figure of merit based on part-load EER, COP, or kW/ton expressing part-load efficiency for air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment.

#### **1.04 SUBMITTALS**

- A. Shop Drawings: Indicate components, assembly, dimensions, weights and loads, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.
- B. Product Data: Submit rated capacities, weights, specialties and accessories, electrical requirements, wiring diagrams, and control diagrams.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include startup instructions.
- D. Manufacturer's Field Reports: Submit start-up report for each unit. Indicate results of leak test and refrigerant pressure test.
- E. P-413 Baked Phenolic Coating (Heresite Coating) reports.

#### **1.05 CLOSEOUT SUBMITTALS**

- A. Section 01 70 00 – Contract Closeout
- B. Operation and Maintenance Data: Submit start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

#### **1.06 QUALITY ASSURANCE**

- A. Conform to ARI 550/590 code for testing and rating of scroll or screw water chillers.
- B. Performance Ratings: Coefficient of Performance (COP) and Integrated Part-Load Value (IPLV) not less than prescribed by ASHRAE 90.1.

#### **1.07 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience approved by manufacturer.

#### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. Section 01 60 00 – Material and Equipment.
- B. Accept chillers on site in factory packaging. Inspect for damage.
- C. Protect indoor chillers from weather by storing under roof.

#### **1.09 WARRANTY**

- A. Furnish five year manufacturer warranty to include coverage for complete assembly including materials labor and refrigerant.
- B. Equipment shall be tagged with a durable, oil and water resistant tag. Tag shall include the following information: equipment covered, Manufacturer, Model #, Serial #, warranty period, contract #, and warranty contact and phone #.

#### **1.10 MAINTENANCE SERVICE**

- A. Furnish service and maintenance of complete assembly for one year from Date of Beneficial Occupancy.

### **PART 2 PRODUCTS**

#### **2.01 PACKAGED WATER CHILLERS**

- A. Product Description: Factory assembled and tested, packaged, air cooled, liquid chillers consisting of scroll or screw compressors (type as indicated on drawings), compressor motor, condenser, evaporator, refrigeration accessories, instrument and control panel including gages and indicating lights, auxiliary components and accessories, and motor starters. Units shall operate using R-134a, R-410a refrigerant or as indicated on drawings.
- B. Capacity Criteria: The unit shall have a minimum Energy Efficiency Ratio (EER) of 10 and a minimum Integrated Part Load Value (IPLV) 13.8, or as indicated on the drawings, whichever is the most stringent, in accordance with ARI 550 for scroll and screw packages.

#### **2.02 HERMETIC COMPRESSORS**

- A. Scroll Compressors:
  1. Unit: Direct drive, hermetic, 3600 RPM, fixed compression, scroll motor-compressor with control panel.
  2. Features: Centrifugal oil pump, sump oil heater, oil level sight glass, oil charging valve, two point lubrication for each motor bearing, flooded lubrication for journal and thrust bearings, check valve on scroll discharge port, crank case heater.
  3. Motor: Suction-gas cooled, hermetically sealed, squirrel cage induction.

#### **2.03 SEMI-HERMETIC COMPRESSORS**

- A. Screw Compressors:
  1. Unit: Direct drive, semi-hermetic 3600 RPM, fixed compression, rotary screw compressor with control panel.
  2. Features: Differential refrigerant pressure oil pump, oil heater, oil separator and filter and oil charging valve.
  3. Motor: Suction gas-cooled, hermetically sealed, squirrel cage induction.
  4. Automatic Capacity Reduction: Continuously variable slide valve with infinitely variable control to 15 percent of full load.

#### **2.04 EVAPORATOR**

- A. Shell and tube type, seamless or welded steel construction with cast iron or fabricated steel, heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Furnish multiple refrigerant circuits on multiple compressor units.

- B. Design, test, and stamp refrigerant side for 225 psig working pressure and water side for 150 psig working pressure, in accordance with ASME Section VIII.
- C. Insulate with 0.75 inch minimum thick flexible closed-cell insulation with maximum K factor of 0.26.
- D. Furnish water drain connection and thermometer wells for temperature controller and low temperature cutout.

## 2.05 CONDENSER COILS, FANS AND MOTORS

- A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Furnish sub-cooling circuits as applicable. Air test under water to 425 psig, and vacuum dehydrate. Seal with holding charge of refrigerant. Condenser coil shall have baked on phenolic thermosetting resin coating.
- B. Coil Guard: Expanded metal or Louvered.
- C. Vertical direct or belt driven propeller type condenser fans with fan guard on discharge, equipped with roller or ball bearings with grease fittings extended to outside of casing.
- D. Weatherproof motors suitable for outdoor use, single phase permanent split capacitor or 3 phase, with permanent lubricated ball bearings and built-in current and thermal overload protection.

## 2.06 REFRIGERANT CIRCUIT

- A. Factory furnished and piped.
- B. Furnish for each refrigerant circuit:
  1. Liquid line solenoid valve.
  2. Filter dryer (replaceable core type).
  3. Liquid line sight glass and moisture indicator.
  4. Thermal expansion for maximum operating pressure.
  5. Charging valve.
  6. Insulated suction line.
  7. Discharge line check valve.
  8. Compressor discharge service valve.
  9. Pressure relief device.

## 2.07 CONTROLS

- A. Chiller shall be provided with a complete factory-mounted, prewired microprocessor based control system. Controls shall contain as a minimum a digital display, acceptable gauges, an on-auto-off switch, power wiring, and control wiring. Controls package shall provide operating controls, monitoring capabilities, programmable setpoints, safety controls and DDC interface. The Contractor shall properly coordinate the chiller control system with the temperature-control system specified. Temperature sensing elements shall be located as recommended by the manufacturer. Capacity reduction may be provided by cylinder unloading, by sequence operation of two or more, or by a combination of both methods. Provide chiller plant manager to communicate with DDC control system where required by drawings. Coordinate with controls sequence of operation.
- B. Chiller shall be provided with the following adjustable operating controls:
  1. Leaving chilled water temperature control.
  2. Adjustable timer or automated controls to prevent a compressor from short cycling.
  3. Automatic lead/lag controls for multi-compressor units.
  4. System capacity control to adjust the unit capacity in accordance with the system load and the programmable set points. Controls shall automatically re-cycle the chiller on power interruption.
  5. Startup and head pressure controls to allow system operation at all ambient temperatures down to 0 degrees F unless otherwise noted.
- C. During normal operations, the control system shall be capable of monitoring and displaying the following operating parameters. Access and operation of the display shall not require opening or removing any panels or doors.
  1. Entering and leaving chilled water temperatures.
  2. Self diagnostic.
  3. Operation status.
  4. Operating hours.

5. Number of starts.
  6. Compressor status.
  7. Refrigerant discharge and suction pressures.
  8. Oil pressures.
- D. The control system shall be capable of being reprogrammed directly at the unit. The programmable setpoints shall include the following.
1. Leaving chilled water temperature.
  2. Time clock/calendar date.
- E. Chiller shall be provided with the following safety controls which automatically shutdown the chiller and which require manual reset.
1. Low chilled water temperature protection.
  2. High condenser refrigerant discharge pressure protection.
  3. Low evaporator pressure protection.
  4. Chilled water flow detection.
  5. High motor winding temperature protection.
  6. Low oil flow protection if applicable.
  7. Motor current overload and phase loss protection.
- F. Chiller shall be provided with the following safety controls which automatically shutdown the chiller and which provide automatic reset.
1. Over/under voltage protection.
  2. Chilled water flow interlock.
  3. Phase reversal protection.
- G. The control system shall be capable of communicating all data to a remote integrated DDC processor through a single shielded cable. The data shall include as a minimum all system operating conditions, capacity controls, and safety shutdown conditions. The control system shall also be capable of receiving a remote unit start/stop.
- H. The chiller controls shall be provided with a BACnet or LON Gateway to allow communication with the Hurlburt Field Central HVAC monitoring system.

## 2.08 HEAT TAPE

- A. Heat tape shall be wrapped around the exterior, above ground pipe, pipe fittings and heat exchanger before insulation is installed. The heat tape sensor shall be installed against the coldest part of the pipe and heat exchanger and the tape patterns on the pipe and pipe fittings shall be as recommended by the cable manufacturer and as approved by the Contracting Officer. Heat tape shall consist of a metal sheathed mineral nickel-chromium resistance wire having an abrasion-resistant thermoplastic sheath external to the metal sheath. Resistance wire shall be capable of dissipating not less than 4 watts per linear foot. Tape shall be furnished in standard manufactured lengths and shall not be cut or shortened when installed. Tape shall closely follow surface to be heated and shall be free from overlaps, sharp kinks, or bends. Spacing shall be uniform to prevent formation of hot spots. Automatic heat control shall be accomplished by a thermostat which shall be installed in accordance with manufacturer's recommendations. Thermostat shall be set to maintain 34 degrees F. Heat tape shall be suitable for 120-volt single-phase service. Heat tape thermostats shall have a suitable range set to maintain 38 degrees F or shall be of the non-adjustable type designed to maintain 38 degrees F at the sensor. Each thermostat may control the load directly or may control the load through a separate magnetic contractor. A separate sensor and thermostat shall be provided for each type supply and return line.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install packaged outdoor chiller on concrete foundation minimum 6 inches thick and 6 inches wider than equipment base on each side.
- B. Install units on vibration isolation.
- C. Install the following piping accessories on evaporator chilled water piping connections.
1. On inlet:

- a. Thermometer well for temperature controller.
  - b. Thermometer.
  - c. Strainer.
  - d. Flow switch.
  - e. Flexible pipe connection.
  - f. Pressure gage.
  - g. Shut-off valve.
2. On outlet:
- a. Thermometer.
  - b. Flexible pipe connection.
  - c. Pressure gage.
  - d. Shut-off valve.
- D. Arrange piping for easy dismantling to permit tube cleaning.
- E. Install chiller accessories furnished loose for field mounting.
- F. Install electrical devices furnished loose for field mounting.
- G. Install control wiring between chiller control panel and field mounted control devices.
- H. Provide connection to electrical service.

### **3.02 FIELD QUALITY CONTROL**

- A. Furnish cooling season start-up, winter season shutdown service, for first year of operation. When initial start-up and testing takes place in winter and machines are to remain inoperative, repeat start-up and testing operation at beginning of first cooling season.

### **3.03 MANUFACTURER'S FIELD SERVICES**

- A. Furnish services of factory trained representative for minimum of one day to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, calibrate controls, and instruct Owner on operation and maintenance.
- B. Furnish initial charge of refrigerant and oil.

### **3.04 DEMONSTRATION AND TRAINING**

- A. Demonstrate system operations and verify specified performance. Demonstrate low ambient operation during winter testing for air-cooled condensers.

**END OF SECTION**

## SECTION 23 73 00: INDOOR CENTRAL-STATION AIR-HANDLING UNITS

### PART 1 GENERAL

#### 1.01 WORK INCLUDED:

- A. Packaged air handling units.

#### 1.02 REFERENCES:

- A. AMCA 99 - Standards Handbook.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- C. AMCA 300 – Reverberant Room Method for Sound Testing of **Fans**.
- D. AMCA 301 – Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- E. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- F. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- G. ANSI/UL 900 - Test Performance of Air Filter Units.
- H. ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
- I. ARI 430 - Standard for Central Station Air Handling Units.
- J. ARI Guideline D – Application and Installation of Central Station Air-Handling Units.
- K. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- L. NEMA MG1 – Motors and Generators.
- M. NEMA ICS1 – Standard for Industrial Control and Systems; General Requirements
- N. NEMA ICS2 – Standard for Controllers, Contactors, and Overload Relays Rated 600V.
- O. NEMA ICS6 – Enclosures.
- P. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- Q. ASHRAE 52 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

#### 1.03 QUALITY ASSURANCE:

- A. Fan Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301; tested to AMCA 300 and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99 and ARI 430.
- D. Filter Media: ANSI/UL 900 listed, Class I or Class II..
- E. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.
- F. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product.

#### 1.04 SUBMITTALS:

- A. Submit shop drawings and product.



- B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
- C. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gages and finishes of materials.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit sound power levels for both fan outlet and casing radiation at rated capacity.
- F. Submit product data of filter media, filter performance data, filter assembly, and filter frames.
- G. Submit UVC Emitter Ultraviolet disinfection data.
- H. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field installed wiring.
- I. Submit manufacturer's installation instructions.

#### **1.05 OPERATION AND MAINTENANCE DATA:**

- A. Submit operation and maintenance data.
- B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

#### **1.06 DELIVERY, STORAGE, AND HANDLING:**

- A. Deliver products to site under provisions of Section 01 60 00 in factory fabricated protective containers, with factory-installed shipping skids and lifting lugs.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

#### **1.07 ENVIRONMENTAL REQUIREMENTS:**

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

#### **1.08 EXTRA MATERIALS**

- A. Provide two of each filter.

## **PART 2 PRODUCTS**

### **2.01 GENERAL**

- A. Air Systems Equipment
  - 1. Fans: Fans shall be tested and rated according to AMCA 210. Fans may be connected to the motors either directly or indirectly with V-belt drive. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity. Motor sheaves shall be variable pitch for 15 hp and below and fixed pitch as defined by ARI Guideline D. Variable pitch sheaves shall be selected to drive the fan at a speed which will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. When fixed pitch sheaves are furnished, a replaceable sheave shall be provided when needed to achieve system air balance. Motors for V-belt drives shall be provided with adjustable rails or bases. Removable metal guards shall be provided for all exposed V-belt drives, and speed-test openings shall be provided at the center of all rotating shafts. Fans shall be provided with personnel screens or guards on both suction and supply ends, except that the screens need not be provided, unless otherwise indicated, where ducts are connected to the fan. Fan and motor assemblies shall be provided with vibration-isolation supports or mountings as indicated. Vibration-isolation units shall be standard products with published loading ratings. Each fan shall be selected to produce the capacity required at the fan static pressure indicated. Sound power level shall be as indicated. The sound power level values shall be obtained according to AMCA 300. Standard AMCA arrangement, rotation, and discharge shall be as indicated.

- a. Centrifugal Fans: Centrifugal fans shall be fully enclosed, single-width single-inlet, or double-width double-inlet, AMCA Pressure Class I, II, or III as required or indicated for the design system pressure. Impeller wheels shall be rigidly constructed, accurately balanced both statically and dynamically. Fan blades may be forward curved, backward-inclined or airfoil design in wheel sizes up to 30 inches. Fan blades for wheels over 30 inches in diameter shall be backward-inclined or airfoil design. Fan wheels over 36 inches in diameter shall have overhung pulleys and a bearing on each side of the wheel. Fan wheels 36 inches or less in diameter may have one or more extra long bearings between the fan wheel and the drive. Bearings shall be sleeve type, self-aligning and self-oiling with oil reservoirs, or precision self-aligning roller or ball-type with accessible grease fittings or permanently lubricated type. Grease fittings shall be connected to tubing and serviceable from a single accessible point. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA 9 and AFBMA 11. Fan shafts shall be steel, accurately finished, and shall be provided with key seats and keys for impeller hubs and fan pulleys. Each fan outlet shall be of ample proportions and shall be designed for the attachment of angles and bolts for attaching flexible connections. Motors, unless otherwise indicated, shall not exceed 1800 rpm and shall have drip proof enclosures. Motor starters shall be magnetic across-the-line type with general-purpose enclosure. Remote manual switch with pilot indicating light shall be provided where indicated. Fans and motors shall be internally vibration isolated from the rest of the air handling unit.
2. Coils: Coils shall be fin-and-tube type constructed of seamless copper tubes and aluminum or copper fins mechanically bonded or soldered to the tubes. Copper tube wall thickness shall be a minimum of 0.020 inches. Aluminum fins shall be 0.0075 inch minimum thickness. Copper fins shall be 0.0045 inch minimum thickness. Casing and tube support sheets shall be not lighter than 16 gauge galvanized steel, formed to provide structural strength. When required, multiple tube supports shall be provided to prevent tube sag. Each coil shall be tested at the factory under water at not less than 400 psi air pressure and shall be suitable for 200 psi working pressure. Coils shall be mounted for counterflow service. Coils shall be rated and certified according to ARI 410. Coils shall have a maximum of 8 fins per inch. Provide UVC germicidal lamps downstream of the cooling coil.
  - a. Water Coils: Water coils shall be installed with a pitch of not less than 1/8 inch per foot of the tube length toward the drain end. Headers shall be constructed of cast iron, welded steel or copper. Each coil shall be provided with a plugged vent and drain connection extending through the unit casing.
3. Air Filters: Air filters shall be listed according to requirements of UL 900.
  - a. Extended Surface Pleated Panel Filters: Filter thickness and efficiency shall be as shown on the drawings.. At minimum filters shall be 2 inch depth, sectional, disposable type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested according to ASHRAE 52. Initial resistance at 500 feet per minute shall not exceed 0.36 inches water gauge. Filters shall be UL Class 2. Media shall be nonwoven cotton and synthetic fiber mat. A wire support grid bonded to the media shall be attached to a moisture resistant fiberboard frame. All four edges of the filter media shall be bonded to the inside of the frame to prevent air bypass and increase rigidity.
  - b. Holding Frames: Frames shall be fabricated from not lighter than 16-gauge sheet steel with rust-inhibitor coating. Each holding frame shall be equipped with suitable filter holding devices. Holding frame seats shall be gasketed. All joints shall be airtight.
  - c. Filter Gauges: Filter gauges shall be dial type, diaphragm actuated draft and shall be provided for all filter stations, including those filters which are furnished as integral parts of factory fabricated air handling units. Gauges shall be at least 3-7/8 inches in diameter, shall have white dials with black figures, and graduations and shall have a minimum range of 1 inch beyond the specified final resistance for the filter bank on which each gauge is applied. Each gauge shall incorporate a screw operated zero adjustment and shall be furnished complete with two static pressure taps with integral compression fittings, two molded plastic vent valves, two 5 foot minimum lengths of 1/4 inch diameter vinyl tubing, and all hardware and accessories for gauge mounting.
4. UVC Germicidal Lamps: Provide high output UVC germicidal lamps specifically designed for use in HVAC Air Handling unit applications. Components shall include a housing, reflector, high efficiency electronic power source, emitter sockets and emitter tube. The output of the UVC Emitters shall be no less than 10  $\mu\text{W}/\text{cm}^2$  at one meter in a 400 fpm airstream at 45 degrees F as tested in accordance with the general provisions of IES Lighting Handbook, 1981 Applications Volume. Fixture shall be field mounted and shall have a warranty for a period of no less than one year.
  - a. UVC Emitter tube: Emitter tube shall be of high output, hot cathode, T5 (15mm) diameter, and medium bi-pin type. They shall produce 95% of their energy at 254 nm and be capable of producing the specified output at airflow velocities to 1000fpm at temperatures of 35 -170 degrees F. UVC emitters shall produce no ozone or secondary contamination.

**B. Air Handling Units**

1. **Factory-Fabricated Air Handling Units:** Units shall be single-zone draw-through type as indicated. Units shall include fans, coils, airtight insulated casing, prefilters, adjustable V-belt drives, belt guards for externally mounted motors, access sections where indicated, vibration-isolators, and appurtenances required for specified operation. Vibration isolators shall be as indicated. Each air handling unit shall have physical dimensions suitable to fit space allotted to the unit and shall have the capacity indicated. Air handling unit shall have published ratings based on tests performed according to ARI 430.
  - a. **Casings:** Casing sections shall be 2 inch double wall type constructed of a minimum 18 gauge galvanized steel, or 18-gauge steel outer casing protected with a corrosion resistant paint finish according to paragraph FACTORY PAINTING. Inner casing of double-wall units shall be minimum 20 gauge solid galvanized steel. Casing shall be designed and constructed with an integral structural steel frame such that exterior panels are non-load bearing. Exterior panels shall be individually removable. Removal shall not affect the structural integrity of the unit. Casings shall be provided with inspection doors, access sections, and access doors as indicated. Inspection and access doors shall be insulated, fully gasketed, double-wall type, of a minimum 18-gauge outer and 20-gauge inner panels. Doors shall be rigid and provided with heavy duty hinges and latches. Inspection doors shall be a minimum 12 inches wide by 12 inches high. Access doors shall be minimum 24 inches wide and shall be the full height of the unit casing or a minimum of 6 ft., whichever is less. Access Sections shall be according to paragraph AIR HANDLING UNITS. Drain pan shall be double-bottom type constructed of 16 gauge stainless steel, pitched to the drain connection. Drain pans shall be constructed water tight, treated to prevent corrosion, and designed for positive condensate drainage. When 2 or more cooling coils are used, with one stacked above the other, condensate from the upper coils shall not flow across the face of lower coils. Intermediate drain pans or condensate collection channels and downspouts shall be provided, as required to carry condensate to the unit drain pan out of the air stream and without moisture carryover. Each casing section handling conditioned air shall be insulated with 1-1/2 pound density fibrous glass material having a thermal conductivity not greater than 0.23 Btu/hr-sf-F. Factory applied fibrous glass insulation shall conform to ASTM C 1071 and shall meet the requirements of NFPA 90A. A latched and hinged inspection door, shall be provided in the fan and coil sections. Additional inspection doors, access doors and access sections shall be provided where indicated.
  - b. **Heating and Cooling Coils:** Coils shall be provided as specified in paragraph AIR SYSTEMS EQUIPMENT, for types indicated.
  - c. **Air Filters:** Air filters shall be as specified in paragraph AIR SYSTEMS EQUIPMENT for types and thickness indicated.
  - d. **Fans:** Fans shall be double-inlet, centrifugal type with each fan in a separate scroll. Fans and shafts shall be dynamically balanced prior to installation into air handling unit, then the entire fan assembly shall be statically and dynamically balanced at the factory after it has been installed in the air handling unit. Fans shall be mounted on steel shafts accurately ground and finished. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA 9 and AFBMA 11. Bearings shall be permanently lubricated or lubricated type with lubrication fittings readily accessible at the drive side of the unit. Bearings shall be supported by structural shapes, or die formed sheet structural members, or support plates securely attached to the unit casing. Bearings may not be fastened directly to the unit sheet metal casing. Fans and scrolls shall be furnished with coating indicated. Fans shall be driven by a unit-mounted or a floor-mounted motor connected to fans by V-belt drive complete with belt guard for externally mounted motors. Belt guards shall be the three sided enclosed type with solid or expanded metal face. Belt drives shall be designed for not less than a 1.3 service factor based on motor nameplate rating. Motor sheaves shall be variable pitch for 25 hp and below and fixed pitch above 25 hp as defined by ARI Guideline D. Where fixed sheaves are required, variable pitch sheaves may be used during air balance, but shall be replaced with an appropriate fixed sheave after air balance is completed. Variable pitch sheaves shall be selected to drive the fan at a speed that will produce the specified capacity when set at the approximate midpoint of the sheave adjustment. Motors for V-belt drives shall be provided with adjustable bases. Fan motors shall have splashproof enclosures. Motor starters shall be magnetic across-the-line type with general-purpose enclosure. Unit fan or fans shall be selected to produce the required capacity at the fan static pressure.
  - e. **Access Sections and Filter/Mixing Boxes:** Access sections shall be provided where indicated and shall be furnished with access doors as shown. Access sections and filter/mixing boxes shall be constructed in a manner identical to the remainder of the unit casing and shall be equipped with

- access doors. Mixing boxes shall be designed to minimize air stratification and to promote thorough mixing of the air streams.
- f. Dampers: Dampers shall be as specified in Section 23 09 23.
  - g. AHU's shall be provided with ultra violet lights in the air handling unit on the discharge side of the coiling coil and in the mixing box before the coils. The lights shall be wired and switched separately from the air handling unit. Label switch as the ultra violet light switch.
- C. Motors and Starters: NEMA MG 1, NEMA ICS 1, and NEMA ICS 2. Determine specific motor characteristics to ensure provision of correctly sized starters and overload heaters. Provide motors to operate at full capacity with a voltage variation of plus or minus 10 percent of the motor voltage rating. Motor size shall be sufficient for the duty to be performed and shall not exceed its full load nameplate current rating when driven equipment is operated at specified capacity under the most severe conditions likely to be encountered. When motor size provided differs from size indicated or specified, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, and branch circuit protection to accommodate equipment actually provided. Provide phase loss protection on all 3 phase motors. Provide general-purpose type starter enclosures in accordance with NEMA ICS 6.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION:**

- A. Install in accordance with manufacturer's instructions and in conformance with ARI Guideline D.
- B. Assemble high pressure units by bolting sections together. Isolate fan section with flexible duct connections.
- C. Install unit on vibration isolators if not internally isolated.
- D. Install emitters and fixtures downstream of the cooling coil at right angles to the coil fins in sufficient quantity and in such an arrangement so as to provide an equal distribution of UVC energy on the coil and in the drain pan. To maintain energy efficiency, the UVC produced shall be of the lowest possible reflected and shadowed losses. Provide interlock switch on the access to the UVC emitters to turn the light off when access is opened. Install provided Caution Labels on all accesses to the UVC emitters.

**END OF SECTION**

**SECTION 26 05 00: BASIC ELECTRICAL REQUIREMENTS****PART 1 GENERAL****1.01 REFERENCES:**

- A. NFPA 70, National Electrical Code (Current edition and updates)
- B. UFC 3-501-01, Electrical Engineering (Current edition and updates)
- C. UFC 3-520-01, Interior Electrical Systems (Current edition and updates)
- D. UFC 3-530-01 Design: Interior, Exterior Lighting and Controls (Current edition and updates)
- E. UFC 3-550-01, Exterior Electrical Power Distribution (Current edition and updates)
- F. UFC 3-560-01 Electrical Safety, O & M (Current edition and updates)
- G. UFC 3-535-01 Visual Air Navigation Facilities (Current edition and updates)

**1.02 SUBMITTALS:**

- A. Submit under provisions of Section 01 33 00.
- B. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- C. Mark dimensions and values in units to match those specified.

**1.03 REGULATORY REQUIREMENTS:**

- A. Electrical: Conform to NFPA 70.
- B. Obtain permits, and request inspections from authority having jurisdiction.

**1.04 PROJECT/SITE CONDITIONS:**

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Project Engineer before proceeding.
- C. Within 30 days of receipt of notice to proceed and prior to starting installation, the Contractor shall submit to the Contracting Officer for approval a complete set of shop drawings to include all material and equipment proposed for installation Sealed by a registered electrical engineer or by a registered professional engineer having at least four years of current experience in the design of electrical systems. The individual's name, signature, and professional engineer number shall be included on all final design documents. All electrical system designs must be reviewed and stamped by an electrical engineer.

**PART 2 (NOT USED)****PART 3 EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. New Underground Systems in Project shall conform to the following:
  - 1. Riser Pole (unless otherwise specified in drawings or specs.)
    - a. Shall have as a minimum; 15 kv Fused cutouts rated for the system, 9 kv arresters, and applicable rated mounting and support hardware.
  - 2. Conduit (unless otherwise specified in drawings or specs.)
    - a. Shall be 5 inch, PVC, schedule 40 or 5 inch red-colored High Density Polyethylene (HDPE. duct for underground installations.
    - b. Primary Feeders shall be encased in 3 in concrete minimum or 5 to 6 feet below finished grade if not encased in concrete.

3. Old / Replaced overhead system shall be removed in total and disposed of by the contractor. (unless otherwise specified in drawings or specs.)
  4. New transformers, primary sectionalizing enclosures, bypass switches, and associated hardware shall be mounted on a concrete base pad. (unless otherwise specified in drawings or specs.)
    - a. Concrete pad shall be 6-inch minimum free concrete surface area at all sides of transformer.
    - b. 6 inches minimum pad thickness, 4 inches may below grade
    - c. Concrete to be 3500 psi rated minimum strength
    - d. Provide opening in concrete slab for primary and secondary in accordance with manufacturer's recommendations.
  5. All areas disturbed by trenching / digging for system installation shall be returned to the original (or better) condition prior to beginning of project.
    - a. Under NO circumstances are RUNWAY, AIRCRAFT PARKING APRONS, and TAXIWAYS to be removed for installation of an underground system.
      1. These areas are to be DIRECTIONAL BORED UNDER and nonmetallic flexible raceway (HDPE) shall be installed for system installation.
    - b. The Contract Officer may approve otherwise and written authorization must be obtained prior to beginning project.
  6. Handholds or Pull boxes shall be placed at "ALL" underground circuit connections where a device is used for the connection.
    - a. Minimum of 18-inch square accessible, covered, opening.
    - b. Strength of handholes and their frames shall be vehicle load rated at all locations and conform to the requirements of IEEE C2.
    - c. Precast concrete handholes shall have the required strength established by ASTM C 478.
    - d. Frames covers shall be made of grey cast iron and a machine-finished seat shall be provided to ensure a matching joint between frame and cover. Cast iron shall comply with ASTM A 48, Class 30B, minimum.
    - e. Handhole shall be provided with sump hole.
    - f. Provide slack wrap of cable in handhole.
  7. Cable fault indicators shall be installed on all cables in primary junction cabinets and 3 and 4 way switches.
    - a. Cable fault indicators shall be automatically reset type which will return the indicator to "no fault" or non-tripped position with inrush current restraint – delayed trip..
    - b. Unit shall be either single phase or three phase with remote indicator mounting option to provide convenient mounting on the panel enclosure. Single phase unit shall be provided with a single current sensing core assembly and a single indicator. Three phase unit shall have three independent sensing cores and one indicator assembly that contains three flags.
    - c. Unit shall be voltage powered unit and completely sealed and submersible.
    - d. Trip Level: set (ampere) to as specified by contracting officer.
  8. Finish: All pad-mounted equipment shall be painted to meet ANSI standards for corrosion resistant coatings. Color of all equipment shall match Federal Standard 595B, color 20095. This coating shall be a factory finish. All pad-mounted equipment located South of U.S Highway 98 (Soundside) shall be Stainless Steel.
- B. Above Ground Systems in Project
1. New installed utility, light, and/or communication poles shall conform to the following: (unless otherwise specified in drawings or specs.)
    - a. Pole and Foundation must be certified to withstand a 120 mph wind load with a 1.3 gust factor as a complete assembly. Calculations shall be provided and certified by a registered Professional Engineer.
    - b. Poles will be placed no closer then 125 feet to an aircraft parking apron, runway, or taxiway.
    - c. The Contract Officer may approve otherwise and written authorization must be obtained prior to beginning project.
  2. All electrical devices shall be rated for outdoor/weather use NEMA-3.
  3. All primary connections to the system shall have fused cutouts, arresters, and applicable hardware rated for the system connection.
  4. All external mounted electrical cutout/switch boxes shall be rated NEMA-3, fused, total phase disconnects.
- C. Conductor and conductor sizes shall conform to the following:(unless otherwise specified in drawings or specs.)
1. Conductors shall be of copper or copper strand
  2. Rated for an ambient temperature of no less then 75 degrees C.
  3. Maintain the circuit loads with no more then a 2 percent voltage drop.

4. Rated to maintain a 1.5 designed circuit load as a minimum.
5. Conductor and insulation rated for the circuit voltage, with 600 VAC as the minimum standard.
6. Conductor used on load circuits of voltage 110 VAC or higher shall be of a minimum size no smaller than #12 AWG, copper.
7. Conductor used on Service Drops, transformer to building, of voltage 110 VAC or higher shall be of a minimum size no smaller than #000 AWG, copper.
8. Conductor used on all primary circuits, 12.4 KV and higher, shall be of a minimum size no smaller than #2 AWG, copper.

D. General Standards, minimums (unless otherwise specified in drawings or specs.)

1. Control Voltage: 120 VAC
2. Conduit: PVC (schedule 40), EMT, or HDPE.
3. Secondary system voltage: 208/120 VAC, 3 phase, 4 wire
4. Primary system voltage: 12470 VAC, 3 phase
5. Transformers: liquid cooled, DELTA - WYE connected
6. Building interior junction ("J") boxes: 4" metal utility with blank cover.

### 3.02 TRAINING

- A All training will be accomplished by the manufacturer of the equipment installed not by the Installing Company. The Contracting Officer will approve all training dates and times. All training will be done within 90 days of final acceptance of the project. Equipment manufacturer shall provide 1 day on site training for maintenance personnel and 5 days of technical training to the government at the manufacturing facility. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. The contractor shall furnish all literature, materials and training aids. Room and board costs shall be included for two government personnel. Factory training shall occur within 3 months of system acceptance. The training days will be Monday through Friday between 0700 and 1500.

**END OF SECTION**

**SECTION 26 05 19****BUILDING WIRE AND CABLE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Building wire and cable.
- B. Underground feeder and branch circuit cable.
- C. Wiring connectors and connections.

**1.02 REFERENCES**

- A. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Underwriters Laboratories, Inc.:
  - 1. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide for each cable assembly type.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.

**1.04 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. UFC 3-520-01 Interior Electrical Systems (Current Addition)

**1.05 PROJECT CONDITIONS:**

- A. Verify that field measurements are as shown on Drawings.
- B. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project Conditions.
- C. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

**PART 2 PRODUCTS****2.01 BUILDING WIRE AND CABLE**

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THHN/THWN rated at 75 degrees C.



- E. Minimum size: no less than Size #12 AWG on any load bearing circuit

## **2.02 UNDERGROUND FEEDER AND BRANCH CIRCUIT CABLE:**

- A. Description: ANSI/NFPA 70, Type UF.
- B. Conductor: Copper.
- C. Insulation Temperature Rating: 90 degrees C.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that mechanical work likely to damage wire and cable has been completed.

### **3.02 PREPARATION**

- A. Completely and thoroughly swab raceway before installing wire.

### **3.03 WIRING METHODS**

- A. Exterior Locations: Use only building wire Type THHN/THWN in conduit.
- B. Use wiring methods indicated on Drawings.

### **3.04 INSTALLATION**

- A. Install products in accordance with manufacturers' instructions.
- B. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- C. Pull all conductors into raceway at same time.
- D. Use suitable cable fittings and connectors.
- E. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- F. Clean conductor surfaces before installing lugs and connectors.
- G. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- H. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape un-insulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- I. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- J. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

### **3.05 INTERFACE WITH OTHER PRODUCTS**

- A. Identify each conductor with its circuit number or other designation indicated on Drawings.

### **3.06 FIELD QUALITY CONTROL:**

- A. Inspect wire and cable for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.

**END OF SECTION**

**SECTION 26 05 26:****GROUNDING AND BONDING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

**1.02 REFERENCES**

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
  - 2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 99 - Standard for Health Care Facilities.

**1.03 GROUNDING ELECTRODE SYSTEM**

- A. Rod electrode.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Grounding System Resistance: 25 ohms except as noted on the drawings.
- B. All grounding and bonding shall comply with NFPA 70, section 250.

**1.05 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide data for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground.
- D. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation and installation of exothermic connectors.

**1.06 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. AIR FORCE INSTRUCTION 32-1065 (Current Addition)

**PART 2 PRODUCTS****2.01 ROD ELECTRODE**

- A. Material: Copper.
- B. Diameter: 3/4 inch.
- C. Length: 20 feet.

**2.02 MECHANICAL CONNECTORS**

- A. Material: Bronze.

### **2.03 WIRE**

- A. Material: Stranded copper.
- B. Foundation Electrodes: 2 AWG.
- C. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that final backfill and compaction has been completed before driving rod electrodes.

### **3.02 INSTALLATION**

- A. Install Products in accordance with manufacturer's instructions.
- B. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- C. Unless otherwise indicated, ground rod shall be driven into ground until top of rod is approximately 1foot below finished grade.
- D. Install 2 AWG bare copper wire in foundation footing where indicated.
- E. Provide bonding to meet Regulatory Requirements.
- F. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- G. Bond all separately derived systems (SDS) including foundation reinforcement steel and building steel to main electrical ground. Communication, fire, video, etc., systems are considered SDS.

### **3.03 FIELD QUALITY CONTROL:**

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method. Provide full fall of potential graph and submit as test result. Resistance shall not exceed 25 Ohms.

**END OF SECTION**

**SECTION 26 05 29:****SUPPORTING DEVICES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Conduit and equipment supports.
- B. Anchors and fasteners.

**1.02 REFERENCES**

- A. ASTM International:
  - 1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
  - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- B. FM Global:
  - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
- D. Underwriters Laboratories Inc.:
  - 1. UL 263 - Fire Tests of Building Construction and Materials.
  - 2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 3. UL 1479 - Fire Tests of Through-Penetration Firestops.
  - 4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
  - 5. UL - Fire Resistance Directory.
- E. Intertek Testing Services (Warnock Hersey Listed):
  - 1. WH - Certification Listings.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

**PART 2 PRODUCTS****2.01 PRODUCT REQUIREMENTS**

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use expansion anchors
  - 2. Steel Structural Elements: Use beam clamps, spring steel clips.
  - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
  - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
  - 5. Solid Masonry Walls: Use expansion anchors.
  - 6. Sheet Metal: Use sheet metal screws.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.

- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- E. Obtain permission from Architect/Engineer before drilling or cutting structural members.
- F. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch (25 mm) off wall.

**END OF SECTION**

**SECTION 26 05 33:****CONDUIT****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquid tight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. High Density Polyethylene Nonmetallic Flexible Raceway (HDPE)
- G. Fittings and conduit bodies.

**1.02 REFERENCES**

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
- C. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- F. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- G. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
- H. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
- J. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
- K. NFPA 70 – National Electrical Code

**1.03 DESIGN REQUIREMENTS**

- A. Conduit Size: ANSI/NFPA 70.

**1.04 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid tight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, fittings, and conduit bodies, HDPE (Red Colored).

**1.05 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. UFC 3-520-01 Interior Electrical Systems (Current Addition)

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect, and handle products to site.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- D. Protect PVC conduit from sunlight.

**1.07 PROJECT CONDITIONS**

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system. Conceal all conduits within the construction unless noted otherwise.
- D. Underground conduit installations under existing aircraft aprons, ramps, taxiways, and runways will be installed by boring, unless written authorization is received from the contracting officer.

**PART 2 PRODUCTS****2.01 CONDUIT REQUIREMENTS**

- A. Minimum Size: 1/2 inch unless otherwise specified.
- B. Underground Installations:
  - 1. More than Five Feet from Foundation Wall: Use rigid galvanized steel conduit or thick wall nonmetallic conduit.
  - 2. Within Five Feet from Foundation Wall and in or Under Slab on Grade: Use thick wall nonmetallic conduit.
- C. Outdoor Locations, Above Grade: Use rigid galvanized steel.
- D. In Slab Above Grade:
  - 1. Use thick wall nonmetallic conduit.
- E. Wet and Damp Locations: Use rigid galvanized steel, electrical metallic tubing, thick wall nonmetallic conduit.
- F. Dry Locations:
  - 1. Concealed: Use rigid steel, intermediate metal conduit, electrical metallic tubing.
  - 2. Exposed: Use rigid steel, intermediate metal conduit, electrical metallic tubing.

**2.02 METAL CONDUIT**

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Electrical Metallic Tubing (EMT): ANSI C80.3.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1, aluminum fittings may be used with steel conduit.

**2.03 FLEXIBLE METAL CONDUIT**

- A. Description: Interlocked steel construction.
- B. Fittings: ANSI/NEMA FB 1.

**2.04 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: ANSI C80.3; galvanized tubing.



- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1, steel setscrew type.

### **2.05 NONMETALLIC CONDUIT**

- A. Description: NEMA TC 2; Schedule 40 PVC.
- B. Fittings and Conduit Bodies: NEMA TC 3.

### **2.06 HIGH DENSITY POLYETHYLENE (HDPE) RACEWAY**

- A. Description: Red Colored, NEMA TC 7; SDR 13.5.
- B. Fittings and Conduit Bodies: NEMA TC 6 and TC 8.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install conduit in accordance with NECA "Standard of Installation."
- B. Install nonmetallic conduit in accordance with manufacturer's instructions.
- C. Arrange supports to prevent misalignment during wiring installation.
- D. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- E. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.
- F. Fasten conduit supports to building structure and surfaces under provisions of Section 26 05 29.
- G. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
- H. Do not attach conduit to ceiling support wires.
- I. Arrange conduit to maintain headroom and present neat appearance.
- J. Route conduit parallel and perpendicular to walls.
- K. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- L. Route conduit in and under slab from point-to-point.
- M. Do not cross conduits in slab.
- N. Maintain adequate clearance between conduit and piping.
- O. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104 degrees F (40 degrees C).
- P. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.

- T. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2-inch (50 mm) size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 26 05 26.
- Z. Identify conduit under provisions of Section 26 05 53.
- AA. HDPE: Install HDPE by Directional boring, plowing, or open trench.

### **3.02 INTERFACE WITH OTHER PRODUCTS**

- A. Install conduit to preserve fire resistance rating of partitions and other elements.

**END OF SECTION**

**SECTION 26 05 34:****BOXES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pull and junction boxes.

**1.02 REFERENCES**

- A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NFPA 70 - National Electrical Code.

**1.03 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual locations and mounting heights of outlet, pull, and junction boxes.

**1.04 REGULATORY REQUIREMENTS**

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

**1.05 SUMMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide manufacturer's data on all boxes to be used.

**1.06 PROJECT CONDITIONS**

- A. Verify field measurements are as shown on Drawings.
- B. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose.

**PART 2 PRODUCTS****2.01 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
- B. Cast Boxes: NEMA FB 1, Type FD. Provide gasketed cover by box manufacturer.

**2.02 PULL AND JUNCTION BOXES:**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

**PART 3 EXECUTION****3.01 INSTALLATION:**

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- C. Support boxes independently of conduit that is connected to two rigid metal conduits both supported within 12 inches of box.
- D. Use cast outlet box in exterior locations exposed to the weather and wet locations.

**END OF SECTION**

**SECTION 26 05 53: ELECTRICAL IDENTIFICATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.

**1.02 REFERENCES**

- A. NFPA 70 - National Electrical Code.

**1.03 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.
- C. All Labeling shall comply with UFC 3-560-01 Electrical Safety, O&M(Current Addition)

**PART 2 PRODUCTS****2.01 NAMEPLATES AND LABELS**

- A. Nameplates: Engraved three-layer laminated plastic, white letters on black background.
- B. Locations: Each electrical distribution and control equipment enclosure.  
Example: PANEL A.
- C. Letter Size:
  - 1. Use 1/4-inch letters for identifying individual equipment and loads.
  - 2. Use 1/2-inch letters for identifying grouped equipment and loads.

**2.02 WIRE MARKERS**

- A. Description: Tape type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
- C. Legend:
  - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
  - 2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams and equipment manufacturer's shop drawings for control wiring.

**2.03 CONDUIT MARKERS**

- A. Description: Tape.
- B. Location: Furnish markers for each conduit longer than 6 feet.
- C. Spacing: 20 feet on center.
- D. Color:
  - 1. 208 Volt System: Gray.
  - 2. Telephone System: Blue.
  - 3. Low Voltage System: Black.

**2.04 UNDERGROUND WARNING TAPE**

- A. Description: 6-inch wide plastic tape, colored red with suitable warning legend describing buried electrical lines; Style No. 210 ELE as manufactured by Seton.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. Degrease and clean surfaces to receive nameplates and labels.

**3.02 APPLICATION**

- A. Install nameplate and labels parallel to equipment lines.
- B. Secure nameplate to equipment front using screws, rivets, or adhesive.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

**END OF SECTION**

**SECTION 26 24 16:****PANELBOARDS****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Lighting and appliance branch circuit panelboards.

**1.02 REFERENCES**

- A. Institute of Electrical and Electronics Engineers:
  1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
  3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
  5. NEMA PB 1 - Panelboards.
  6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.
- C. International Electrical Testing Association:
  1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. National Fire Protection Association:
  1. NFPA 70 - National Electrical Code.
- E. Underwriters Laboratories Inc.:
  1. UL 50 - Cabinets and Boxes
  2. UL 67 - Safety for Panelboards.
  3. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
  4. UL 1283 - Electromagnetic Interference Filters.
  5. UL 1449 - Transient Voltage Surge Suppressors.
  6. UL 1699 - Arc-Fault Circuit Interrupters.
- F. United Facilities Criteria:
  1. UFC 3-520-01 Interior Electrical Systems (Current Addition)

**1.03 SUBMITTALS**

- A. Submit shop drawings for equipment and component devices under provisions of Section 01 33 00.
- B. Include outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

**1.04 SPARE PARTS**

- A. Keys: Furnish 2 each to Owner.

**PART 2 PRODUCTS****2.01 BRANCH CIRCUIT PANELBOARDS:**

- A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB1; circuit breaker type.
- B. Enclosure: NEMA PB 1; Type 3R.
- C. Provide surface cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- D. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide copper ground bus in all panelboards.

- E. Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240-volt panelboards.
- F. Molded Case Circuit Breakers: NEMA AB 1; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles. Provide circuit breakers UL listed as Type SWD for lighting circuits. Provide UL Class A ground fault interrupter circuit breakers where scheduled.
- G. All panels to be provided with Main Breakers.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install panelboards plumb, in conformance with NEMA PB 1.1.
- B. Height: 4 ft.
- C. Provide filler plates for unused spaces in panelboards.
- D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

#### **3.02 FIELD QUALITY CONTROL**

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

**END OF SECTION**

**SECTION 26 27 26: WIRING DEVICES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Device plates.
- E. Occupancy Sensors

**1.02 REFERENCES**

- A. NEMA WD 1 - General Purpose Wiring Devices.
- B. NEMA WD 6 - Wiring Device Configurations.
- C. NFPA 70 – National Electrical Code

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

**1.04 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

**PART 2 PRODUCTS****2.01 WALL SWITCHES**

- A. Manufacturers: Bryant, Hubbell, and Leviton.
- B. Substitutions: Under provisions of Section 01 60 00.
- C. Description: NEMA WD 1, specification grade, general-duty, AC only general-use snap switch.
- D. Device Body: Ivory plastic with toggle handle.
- E. Voltage Rating: 120-277 volts, AC.
- F. Current Rating: 20 ampere.

**2.02 WALL DIMMERS**

- A. Manufacturers: Lutron, Prescolite, Hunt.
- B. Substitutions: Under provisions of Section 01 60 00.
- C. Description: NEMA WD 1, Type II semiconductor dimmer for incandescent lamps.
- D. Device Body: Ivory plastic with linear slide.
- E. Voltage: 120 volts.



F. Power Rating: 1000 Watts.

### **2.03 RECEPTACLES**

A. Manufacturers: Bryant, Hubbell, Leviton,

B. Substitutions: Under provisions of Section 01 60 00.

C. Description: NEMA WD 1; specification grade, general-duty general-use receptacle.

D. Device Body: Ivory plastic.

E. Configuration: NEMA WD 6; type as specified and indicated.

F. Convenience Receptacle: Type 5-20.

G. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

H. AFCI Outlets: Arc Flash Circuit Interrupter. All 20 amp receptacles that are not GFCI protected or stated otherwise.

### **2.04 WALL PLATES**

A. Cover Plate: Smooth stainless steel.

B. Weatherproof Cover Plate: Gasketed cast metal with hinged gasketed device cover.

### **2.05 OCCUPANCY SENSORS**

A. Manufacturers: Leviton or equivalent.

B. Substitutions: Under provisions of Section 01 60 00.

C. Description: Passive Infrared (PIR) sensor ceiling mounted or wall mounted. Auto On/Off, 15 seconds to 15 minutes delay Off time setting.

D. Device Body: Ivory plastic.

E. Voltage Rating: Low voltage, 120V, or 277 volts AC.

F. Current Rating: 20 ampere.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and will be completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

### **3.02 PREPARATION**

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean debris from outlet boxes.

### **3.03 INSTALLATION**

A. Install products in accordance with manufacturer's instructions.

B. Install devices plumb and level.

C. Install switches with OFF position down.

- D. Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.
- E. Do not share neutral conductor on load side of dimmers.
- F. Install receptacles with grounding pole on bottom.
- G. Connect wiring device-grounding terminal to branch circuit equipment grounding conductor.
- H. Install cover plates on switch, receptacle and blank outlets in finished areas.
- I. Connect wiring devices by wrapping conductor around screw terminal.
- J. Use jumbo size plates for outlets installed in masonry walls.
- K. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

### **3.04 INTERFACE WITH OTHER PRODUCTS**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33 to obtain mounting heights specified and indicated on Drawings.
- B. Install wall switch 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above finished floor.
- D. Install convenience receptacle 6 inches above backsplash of counter.
- E. Install dimmer 48 inches above finished floor.
- F. Install telephone jack 18 inches above finished floor.
- G. Install telephone jack for wall telephone 48 inches above finished floor.

### **3.05 FIELD QUALITY CONTROL**

- A. Inspect each wiring device for defects.
- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.
- F. Verify that each telephone jack is properly connected and circuit is operational.

### **3.06 ADJUSTING**

- A. Adjust devices and wall plates to be flush and level.

**END OF SECTION**

**SECTION 26 28 19:****DISCONNECT SWITCHES****PART 1 GENERAL****1.01 WORK INCLUDED**

- A. Disconnect switches.
- B. Fuses.
- C. Enclosures.

**1.02 REFERENCES**

- A. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- B. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

**1.03 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

**PART 2 PRODUCTS****2.01 DISCONNECT SWITCHES**

- A. Fusible Switch Assemblies: Heavy-duty, quick-make, quick-break, and load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: Designed to accommodate Class R fuses.
- B. Non-fusible Switch Assemblies: Heavy-duty, quick-make, quick-break, and load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- C. Enclosures: Type as indicated on Drawings.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install disconnect switches where indicated on Drawings.
- B. Install fuses in fusible disconnect switches.

**END OF SECTION**

## SECTION 26 35 33 SURGE SUPPRESSORS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Surge Protection Device

#### 1.02 STANDARDS AND REFERENCES

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
  - 2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
  - 3. IEEE C62.45 - Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA LS 1 - Low Voltage Surge Protection Devices.
- C. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 780 - Standard for the Installation of Lightning Protection Systems.
- D. Underwriters Laboratories Inc.:
  - 1. UL 1283 - Electromagnetic Interference Filters.
  - 2. UL 1449 - Transient Voltage Surge Suppressors.

#### 1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.

### PART 2 PRODUCTS

#### 2.01 SYSTEM DESCRIPTION

- A. The Surge Protection Device shall be constructed using multiple surge current diversion modules of metal oxide varistors (MOV) with each MOV individually fused. The modules shall be designed and constructed in a manner that ensures MOV surge current sharing. Use of gas tubes, silicon avalanche diodes or selenium cells are unacceptable unless documentation from a nationally recognized laboratory demonstrates current sharing of all dissimilar components at all surge current levels.

#### 2.02 ELECTRICAL REQUIREMENTS

- A. Nominal system operating voltage shall be:
  - 120/240 VAC, 1 Phase, 3Wire Plus Ground
  - 120/208 VAC, 3 Phase, 4 Wire Plus Ground, Wye.
  - 277/480 VAC, 3 Phase, 4 Wire Plus Ground, Wye or as shown on drawings
- B. Maximum continuous operating voltage (MCOV):  
The surge suppressor and all components in the suppression path (including all current diversion components) maximum continuous operating voltage shall be greater than 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS overvoltage (swell conditions).
- C. Operating Frequency: The operating frequency range of the system shall be at least 47 - 63 Hertz.

#### 2.03 FUSE AND THERMAL DISCONNECT

- 1. Surge Protection Device shall be internally fused to safely disconnect itself from the electrical system without damaging itself and rated to allow maximum specified surge current capacity. Surge Protection Device that utilize a single fuse to protect two or more suppression paths are not acceptable.
- 2. Fuse shall be capable of interrupting the AC power line short circuit fault current (KAIC). Short circuit rms current shall be at least 200KAIC or as shown on drawings.

3. Thermal disconnect device shall be installed on or near each MOV element that responds to excessive MOV heating by mechanically disconnecting the MOV from the power line.

#### 2.04 DESIGN REQUIREMENTS

- A. Protection Modes: The SPD shall provide protection as follows: All modes, L-N or L-L, L-G and N-G (Where applicable)

Note: L = Line, G = Ground, N = Neutral.

- B. UL 1449 Ratings: The maximum UL 1449 listed surge ratings for each and/or all of the specified protection modes shall not exceed the following in any mode of protection:

<u>Nominal System Voltage</u>	<u>Surge Voltage Rating</u>
120/240 or 120/208 volt	400 volts
277/480 volt	800 volts

- C. Noise Attenuation: The units shall be UL 1283 Listed as an electromagnetic interference filter. The filter shall provide insertion loss with a maximum of 60 dB from 100 KHz to 100 MHz per 50-Ohm Insertion Loss Methodology from MIL 220A.

#### 2.05 PERFORMANCE RATINGS

- A. Surge Current Capacity:

<u>Location</u>	<u>Surge Rating per Mode</u>	<u>Surge Rating Per Phase (L-N plus L-G)</u>
Main Distribution Panel	150 kA	300 kA
Branch Panels	80 kA	160 kA

#### 2.06 BASIS OF DESIGN

- A. Main panel unit Liebert Interceptor Series.  
B. Branch Panel units Liebert Accuvar ACV Series.

#### 2.07 ACCESSORIES

- A. Surge suppressor at main distribution panel shall have red and green status indicators, audible alarm, and transient counter.  
B. Surge suppressor at branch panels shall have red and green status indicators.

#### 2.08 TESTING

- A. Component Testing and Monitoring: Unit shall include an on-line circuit which tests and redundantly monitors individual components in all protection modes including neutral to ground (where applicable). Units that require external test sets or equipment are unacceptable.

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. The installing contractor shall install the parallel surge suppressor with short and straight conductors as practically possible. The contractor shall twist the surge suppressor input conductors together to reduce input conductor inductance. The contractor shall follow the surge suppressor manufacturer's recommended installation practices as found in the installation, operation and maintenance manual and comply with all applicable codes.

**END OF SECTION**

**SECTION 26 51 00: INTERIOR LUMINAIRES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Interior luminaires and accessories.
- B. Emergency lighting units.
- C. Exit signs.P
- D. Ballasts.
- E. Fluorescent lamp emergency power supply.
- F. Lamps.
- G. Luminaire accessories.

**1.02 REFERENCES**

- A. American National Standards Institute:
  - 1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
  - 2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
- B. National Fire Protection Association
  - 1. NFPA 70 – National Electrical Code
  - 2. NFPA 101 – Life Safety Code

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate dimensions and components for each luminary that is not a standard product of the manufacturer.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.04 PROJECT RECORD DOCUMENTS**

- A. Accurately record actual locations of each luminaire.

**1.05 OPERATION AND MAINTENANCE DATA**

- A. Maintenance Data: Include replacement parts list.

**1.06 QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

**1.07 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Conform to requirements of NFPA 101.
- C. Furnish products listed and classified by Underwriters Laboratories, Inc. or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and shown.

- D. Conform to the requirement of National Energy Policy Act (EPACT), 1992.
- E. ASHREA/IESNA Standard 90.1.
- F. UFC 3-530-01 Design: Interior and Exterior Lighting and Controls (Current Addition)

## **PART 2 PRODUCTS**

### **2.01 LUMINAIRES**

- A. Furnish products as specified in schedule on Drawings.
- B. Substitutions: Under provisions of Section 01 33 00.
- C. Install ballasts, lamps, and specified accessories at factory.

### **2.02 EXIT SIGNS**

- A. Manufacturers: As specified in schedule on Drawings or equal.
- B. Description: Universal LED exit unit with self testing.
- C. Housing: Extruded aluminum.
- D. Face: Open face white on red. Anodized satin aluminum stencil and color permanent fiberglass panels.
- E. Directional Arrows: Universal type for field adjustment.
- F. Mounting: Ceiling.
- G. Lamps: Manufacturers standard.
- H. Input Voltage: Per design.

### **2.03 BALLASTS**

- A. Fluorescent Ballast:
  1. Description: High power factor type electronic ballast with total line current harmonic distortion no greater than 20%.
  2. Provide ballast suitable for lamps specified.
  3. Voltage: 120 volts.
  4. Source Quality Control: Certify ballast design and construction by Certified Ballast Manufacturers, Inc.

### **2.04 FLUORESCENT LAMP**

- A. Lamp Ratings: as specified on drawings
- B. Fluorescent lamps shall meet and pass EPA Toxic Characteristic Leaching Procedure (TLCP) requirements, (without additive). (40 Code of Federal Regulations Appendix II to Part 261)

### **2.05 EMERGENCY POWER SUPPLY**

- A. Description: Emergency battery power supply suitable for installation in ballast compartment of fluorescent luminaire.
- B. Battery: Sealed lead calcium type, rated for 10-year life.
- C. Include TEST switch and AC ON indicator light, installed to be operable and visible from the outside of an assembled luminaire.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine substrate and supporting grids for luminaires.

- B. Examine each luminaire to determine suitability for lamps specified.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturers instructions.
- B. Install suspended luminaires using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- C. Locate recessed ceiling luminaire as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prohibit movement.
- E. Install recessed luminaires to permit removal from below.
- F. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.
- G. Install clips to secure recessed grid-supported luminaires in place.
- H. Install wall mounted luminaire at height as indicated on Drawings as scheduled.
- I. Install accessories furnished with each luminaire.
- J. Connect luminaires and exit signs to branch circuit outlets provided under Section 26 05 33 using flexible conduit.
- K. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Install specified lamps in each luminaire and exit signs.
- N. Install occupancy sensor lighting switches in all restrooms, small offices, and conference rooms.

### **3.03 FIELD QUALITY CONTROL**

- A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

### **3.04 CLEANING**

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosure.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

### **3.05 DEMONSTRATION**

- A. Provide systems demonstration.

### **3.06 SCHEDULE**

- A. See light fixture schedule on drawings.

### **3.07 TRAINING**

- A. All training will be accomplished by the manufacturer of the equipment installed not by the Installing Company. The Contracting Officer will approve all training dates and times. All training will be done within 90 days of final acceptance of the project. Equipment manufacturer shall provide 1 day on site training for maintenance personnel and 5 days of technical training to the government at the manufacturing facility. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. The contractor shall furnish all literature, materials and training aids. Room and



board costs shall be included for two government personnel. Factory training shall occur within 3 months of system acceptance. The training days will be Monday through Friday between 0700 and 1500.

**END OF SECTION**

**SECTION 26 56 00: EXTERIOR LIGHTING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exterior luminaires, poles and accessories.
- B. Recessed soffit lighting.

**1.02 REFERENCES**

- A. American National Standards Institute:
  - 1. ANSI C82.1 - American National Standard for Lamp Ballast-Line Frequency Fluorescent Lamp Ballast.
  - 2. ANSI C82.4 - American National Standard for Ballasts-for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type).
  - 3. ANSI O5.1 - Wood Poles, Specifications and Dimensions.

**1.03 SUBMITTALS**

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Indicate dimensions and components for each luminaire, which is not a standard product of the manufacturer. Provide signed, sealed and dated drawing by a currently registered professional engineer in the state of Florida certifying that the system meets or exceeds the required design conditions.
- C. Product Data: Provide dimensions, ratings, and performance data.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under "Regulatory Requirements".
- E. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

**1.04 OPERATION AND MAINTENANCE DATA**

- A. Maintenance Data: Include instructions for maintaining luminaires.

**1.05 REGULATORY REQUIREMENTS**

- A. Conform to requirements of NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.
- C. Conform to requirement of National Energy Policy Act (EPACT), 1992.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept products on site. Inspect for damage.
- B. Protect poles from finish damage by handling carefully.

**1.07 COORDINATION**

- A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

**1.08 DESIGN REQUIREMENTS**

- A. Exterior luminaires, poles, accessories and foundation systems shall be designed to meet ASCE 7-98 wind speed of 140 mph and for the height and drag factor recommended by AASHTO LTS-4.

**1.09 EXTRA MATERIALS**

- A. Provide two of each lamp type and wattage installed.

**PART 2 PRODUCTS**

**2.01 LUMINAIRES**

- A. Furnish products as specified in ELECTRICAL FIXTURE SCHEDULE on Electrical Lighting Plan.
- B. Area flood type luminaire, rectangular, 8 inch mounting arm.
- C. Material: Die-cast aluminum housing, dark bronze color, rectangular shape.
- D. Enclosure: Enclosed heavy-duty type. Provide gasketing between enclosure and frame and luminaire body.
- E. Photometric Control: Photocell shall be provided.
- F. Installation Conditions: Outdoor use only, enclosed and gasketed.
- G. Mounting: Provide pole mount.
- H. Ballast: Manufacturer's standard, matched to lamp characteristics, quad tap ballast.
- I. Lamp: High-pressure sodium lamp, wattage as indicated on FIXTURE SCHEDULE.
- J. Pole: Aluminum, round, tapered shaft, dark bronze color, diameter and height in feet as indicated on the drawings. See 1.08 DESIGN REQUIREMENTS.

**2.02 RECESSED SOFFIT LIGHTING**

- A. Furnish products as specified in ELECTRICAL FIXTURE SCHEDULE on Electrical Lighting Plan.
- B. Round type, 6"-9" diameter rough-in, pre-painted steel frame with galvanized junction box, pre-wired with medium base porcelain sockets.
- C. Ballast: Manufacturer's standard, matched to lamp characteristics.
- D. Lamp: 50W metal-halide lamp.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine excavation and concrete foundation for lighting poles.
- B. Examine each luminaire to determine suitability for lamps specified.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturers' instructions.
- B. Install lighting poles at locations indicated.
- C. Install poles plumb.
- D. Install lamps in each luminaire.
- E. Bond luminaires, metal accessories and metal poles to branch circuit equipment grounding conductor. Provide supplementary grounding electrode at each pole.
- F. All lighting poles shall have a handhole located next to the pole with all electrical connections inside. Strength of handholes and their frames shall be vehicle load rated at all locations and conform to the requirements of IEEE C2.

**3.03 FIELD QUALITY CONTROL**

- A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

**3.04 ADJUSTING**

- A. Aim and adjust luminaires to provide illumination levels and distribution as directed.

**3.05 CLEANING**

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosure.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

**END OF SECTION**

**SECTION 27 00 00:****TELEPHONE AND LAN SYSTEM****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. TELEPHONE WIRING SYSTEMS AS INDICATED ON THE DRAWINGS INCLUDES:
  - 1. Building Service Entrance Ducts; Telephone Backboard Entrance Conduits; Grounding; Telephone Backboards; Telephone Cables; Telephone Outlets; Cross-connect Blocks; Auxiliary Devices; Systems Furniture; Testing Requirements.
  - 2. Shall comply with the Electronic Industry and Telecommunication Industry Association Standards and all test results provided to 1 SOCS/SCX.
- B. LAN WIRING SYSTEM AS INDICATED ON THE DRAWINGS INCLUDES:
  - 1. Wiring Closets; Patch Panels; Conduits (Cable Distribution); LAN Outlets; Distribution Cabling; Distance Limitations; LAN Cable Specifications; LAN Cable Testing; Systems Furniture
- C. SIPRNet SYSTEM AS INDICATED ON THE DRAWINGS INCLUDES:
  - 1. General; SIPRNet Wiring Closets; SIPRNet Patch Panels; SIPRNet Conduits; SIPRNet LAN; Outlets; SIPRNet Distribution Cabling; NIPRNet To SIPRNet LAN Connection; SIPRNet LAN Cable Specifications; SIPRNet LAN Testing; Systems Furniture; SIPRNet – Qualifications for System Installer; SIPRNet Floor Plans; SIPRNet Conduit Pictures
- D. MISCELLANEOUS:
  - 1. Nameplates; Labels, Wire markers; Conduit markers; Stencils; Underground Warning Tape;
  - 2. Lockout Devices.

**1.02 RELATED SPECIFICATION SECTIONS:**

- A. Section 01000 – GENERAL REQUIREMENTS

**1.03 REFERENCES:**

- A. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- B. National Fire Protection Association:
  - 1. NFPA 70 - National Electrical Code.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- C. Telecommunications Industry Association/Electronic Industries Alliance:
  - 1. TIA-568-C.0-1 GENERIC TELECOMMUNICATIONS CABLING FOR CUSTOMER PREMISES
  - 2. TIA-568-C.1 COMMERCIAL BUILDING TELECOMMUNICATIONS CABLING STANDARD
  - 3. TIA-568-C.2 BALANCED TWISTED-PAIR TELECOMMUNICATIONS CABLING AND COMPONENTS STANDARDS
  - 4. TIA-568-C.3 OPTICAL FIBER CABLING COMPONENTS STANDARD
  - 5. TIA TIA-569 COMMERCIAL BUILDING STANDARD FOR TELECOMMUNICATIONS PATHWAYS AND SPACES
  - 6. TIA-607 GENERIC TELECOMMUNICATIONS BONDING AND GROUNDING (EARTHING) FOR CUSTOMER PREMISES
- D. Underwriters Laboratories, Inc.:
  - 1. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and their Accessories Installed in Air-Handling Spaces.
- E. Building Industry Consulting Service International, Inc.
  - 1. ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
  - 2. NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- F. American National Standards Institute:
  - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.

2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
3. ANSI C80.5 - Aluminum Rigid Conduit - (ARC).

G. National Electrical Manufacturers Association:

1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
4. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports.
6. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
8. NEMA FG 1 - Nonmetallic Cable Tray Systems.
9. NEMA VE 1 - Metal Cable Tray Systems.
10. NEMA VE 2 - Metal Cable Tray Installation Guidelines

H. ASTM International:

1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

I. AIR FORCE INSTRUCTION

1. AFSSI 7703 - COMMUNICATIONS SECURITY: PROTECTED DISTRIBUTION SYSTEMS (PDS)
2. AFSSI 7700 - Communications and Information: EMISSION SECURITY
3. AFSSI 7702 - EMISSION SECURITY COUNTERMEASURES REVIEWS
4. AFMAN 33-214 – Emission Security Assessments
5. AFSOCI 33-105 -

**1.04 SUBMITTALS:**

- A. Section 01 33 00: Submittals.
- B. Shop Drawings: See drawings for requirements.
- C. Product Data: Submit for all products to be installed in the construction, including but not limited to; Flexible metal conduit, Liquid-tight flexible metal conduit, Nonmetallic conduit, Flexible non-metallic conduit, Non-metallic tubing, Raceway fittings, Conduit bodies, Surface raceway, Wire way, Pull and junction boxes, Manholes, Handholes, Grounding Electrodes, JB Weld Grey, patch panels, cabinets, racks, termination blocks, copper wire, fiber optic cabling, building entrance terminals, cable connectors.
- D. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- E. As-built Drawings:
  1. NIPRNet/data and Telephone Provide as-built drawings showing the location of all outlets and cables to 1 SOCS/SCX, 515 Cody Ave, Hurlburt Field FL 32544. All outlets should be identified in as built drawings. Provide in VISIO format.
  2. SIPRNET - Contractor must provide a floor plan showing the exact location of all PDS conduits, cable trays, junction boxes, Crouse Hines FD-22 conduit Multi-Gang Cast Device boxes, lockable Single-Door Type 12 EMC Enclosures, Krone 50-pair 89D termination blocks, cabling, MDF and IDFs. Floor plans must show the size of the conduit, location of all mounting hardware (conduit hangers, straps, etc.) and the location of all joints (couplings, box connectors, etc.). Floor plans must be marked to show where the Open-Storage and Controlled Access Area boundaries. Floor plans will be labeled as "Protected Distribution System plan". Scale AutoCAD and/or Visio drawings shall be provided.

**1.05 QUALITY ASSURANCE:**

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.
- B. Provide combustible electrical equipment exposed within plenums with peak rate of heat release not greater than 100 kW, peak optical density not greater than 0.5, and average optical density

not greater than 0.15 when tested in accordance with UL 2043.

- C. Perform Work in accordance with 1SOCS/SCX.
  - 1. Entrance Wiring: By Contractor.
  - 2. Backbone Wiring: Complete from ITN identified by 1 SOCS to the Entrance facility using optical fiber backbone cables. Complete from first usable manhole identified by 1 SOCS to the entrance facility using copper cabling.
  - 3. Horizontal Wiring: Complete from telecommunications closet to each outlet using copper or optical fiber horizontal cables. All cables must be continuous from telecommunications room to customer service outlet without any splices.
- D. Provide grounding, surge protection and lightning protection of telecommunications system in accordance with latest version of Grounding, Bonding and Electrical Protection chapter of the NECA/BICSI 607-2011, TIA-607 , and NFPA 70.
- E. Maintain one copy of each document on site.

#### 1.06 QUALIFICATIONS:

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in installing products specified in this section with minimum three years documented experience, and with service facilities within 50 miles of the project.
- C. Testing Agency: Company [member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.
- D. Designer: Hold a BICSI RCDD credential

#### 1.07 DELIVERY, HANDLING, STORAGE & ENVIRONMENTAL:

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials & products on site in original factory packaging, labeled with manufacturer's Identification. Inspect for damage.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.
- E. Install labels or nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.
- F. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- G. Protect PVC conduit from sunlight.

## PART 2 PRODUCTS

- A. TELEPHONE TERMINATION BACKBOARDS: Material: 3/4" Plywood with 2 coats fire resistant insulating varnish.
- B. TELEPHONE TERMINATION CABINETS:
  - 1. Product Description: Surface type galvanized steel box with removable end walls & hinged front with concealed lock, size as required, gray baked enamel finish. Provide plywood backboard inside cabinet for mounting telephone termination devices.
- C. Data Network Cabinets
  - 1. Size and type determined by requirement. Lockable 7 ' tall metal cabinets with fully adjustable 19" metal rails, front and back doors (back door for free standing application), side panels, top panels, cooling equipment, cable management, power strips, grounding, shelves, and other accessories

required for the particular application. Must be mounted to floor or wall as required. Wall mounted units must have front and rear access to cables with piano hinges.

D. Voice CROSS-CONNECT

1. Product Description: TIA/EIA 568, wall-mounted 66M1-50-5C block assembly terminals mounted on 89B brackets adequate capacity for active and spare circuits

E. PATCH PANEL

1. Product Description: TIA/EIA 568,
  - a. rack-mounted 110 block assembly of terminals and accessory patch cords, with adequate capacity for active and spare circuits.
  - b. rack-mounted fiber optic patch panel with LC inserts for premise wiring and SC for backbone cables

F. OUTLET JACKS:

1. Conform to TIA/EIA 568 requirements for cable connectors for specific cable types.
2. The 2-inch x 4-inch wall plate cover will consist of four (4) ports, with Category 6, 8 conductor, RJ-45 jacks. Terminate in 568A configuration.

G. UNSHIELDED BACKBONE CABLE:

1. TIA/EIA 568, 100-ohm, unshielded twisted pair plenum rated noncombustible cable with 100, 50, or 25 pairs as required, 24 AWG copper conductor.
2. Terminate cable on 66M150-C5 blocks with standoff brackets.
3. Terminate LAN cable in 7-foot lockable cabinet on a 110-patch panel with vertical and horizontal wire management between patch panels.

H. SHIELDED BACKBONE CABLE:

1. TIA/EIA 568, 150-ohm shielded, twisted-pair plenum rated non-combustible cable with 2 pairs, 22 AWG copper conductor.
2. Terminate cable on 66M150-C5 blocks with standoff brackets.
3. Terminate LAN cable in 7-foot lockable cabinet on a 110-patch panel with vertical and horizontal wire management between patch panels.

I. OPTICAL FIBER BACKBONE CABLE: TIA/EIA 568, 8-125 um single mode optical fiber plenum rated noncombustible cable.

J. UNSHIELDED HORIZONTAL CABLE:

1. TIA/EIA 568, 100-ohm, unshielded twisted pair plenum rated Non-combustible cable with 4 pairs, 24 AWG copper conductor.
2. The 2-inch x 4-inch wall plate cover will consist of four (4) ports, with Category 6, rated, 8 conductor, RJ-45 jacks.
3. Terminate cable on 66M150-C5 blocks with standoff brackets.
4. Terminate LAN cable in 7-foot lockable cabinet on a 110-patch panel with vertical and horizontal wire management between patch panels.

K. SHIELDED HORIZONTAL CABLE:

1. TIA/EIA 568, 150-ohm shielded, twisted-pair plenum rated noncombustible cable with 2 pairs, 24 AWG copper conductor.
2. Terminate cable on 66M150-C5 blocks with standoff brackets.
3. Terminate LAN cable in 7-foot lockable cabinet on a 110-patch panel with vertical and horizontal wire management between patch panels.

L. OPTICAL FIBER HORIZONTAL CABLE: Product Description

1. 4 strand 62.5/125 um optical fiber plenum rated noncombustible cable.
2. Cable must not contain a metal carrier of any sort (i.e. shielding, copper carrier, etc.)
3. Terminated with LC connectors at customer premise and Comm room.



- M. NAMEPLATES: Laminated three-layer plastic with engraved black letters on white contrasting background color. 1/8 inch high letters for identifying individual equipment and loads; 1/4 inch high letters for identifying grouped equipment and loads.
- N. LABELS: Embossed adhesive tape, with 3/16 inch black letters on white background.
- O. WIRE MARKERS: Cloth tape, split sleeve, or tubing type wire markers.
- P. CONDUIT AND RACEWAY MARKERS: Labels fastened with adhesive.
1. Color:
    - a. Telephone System: Green lettering on white background.
    - b. NIPR System: Blue lettering on white background.
    - c. SIPR System: No Markings.
- Q. UNDERGROUND WARNING TAPE: Description: 4 inch wide plastic tape, detectable type, colored yellow with suitable warning legend describing buried electrical lines.
- R. WIRE:
1. Material: Stranded copper.
  2. Grounding Conductor: Copper conductor bare.
  3. Bonding Conductor: Copper conductor insulated.
- S. MECHANICAL CONNECTORS: Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.
- T. EXOTHERMIC CONNECTIONS: Must be manufactured by a company specializing in exothermic welding.
- U. METAL CONDUIT:
1. Rigid Steel Conduit: ANSI C80.1.
  2. Rigid Aluminum Conduit: ANSI C80.5.
  3. Intermediate Metal Conduit (IMC): Rigid steel.
  4. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit
- V. LIQUIDTIGHT FLEXIBLE METAL CONDUIT, FITTINGS: Interlocked steel construction with PVC jacket. Fittings: NEMA FB 1. Rick
- W. ELECTRICAL METALLIC TUBING (EMT), FITTINGS & CONDUIT BODIES: ANSI C80.3; galvanized tubing. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron, compression type.
- X. NONMETALLIC CONDUIT, FITTINGS & CONDUIT BODIES: NEMA TC 2; Schedule 80 PVC. Fittings and Conduit Bodies, NEMA TC 3.
- Y. NONMETALLIC TUBING, FITTINGS & CONDUIT BODIES: NEMA TC 2. Fittings and Conduit Bodies: NEMA TC 3.
- Z. SURFACE METAL RACEWAY:
1. Product Description: Sheet metal channel with fitted cover, suitable for use as surface metal raceway. Size as shown on the drawings.
  2. Finish: Gray enamel.
  3. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories; match finish on raceway.
- AA. SURFACE NONMETAL RACEWAY, FITTINGS, & ACCESSORIES: Plastic or Fiberglass channel with fitted cover, suitable for use as surface raceway. Size as shown on drawings or as required. Gray Finish. Furnish manufacturer's standard accessories, finish to match raceway.

- BB. WIREWAY: General purpose type wireway. Manufacturers standard knockouts. Size & length as indicated on Drawings. Hinged cover with full gaskets. Slip-in or flanged connectors. Lay-in type fittings with removable top; Rust inhibiting primer coating with gray enamel finish.
- CC. PULL, JUNCTION & OUTLET BOXES: (Follow AFSSI 7703 for SIPRNet applications.)
1. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  2. Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.
  3. Concrete Ceiling Boxes: Concrete type.
  4. Nonmetallic Outlet Boxes: NEMA OS 2.
  5. Cast Boxes: NEMA FB 1, Type FD, cast fer alloy]. Furnish gasketed cover by box manufacturer. Furnish threaded hubs.
  6. Surface Mounted Cast Metal Box: NEMA 250, Type [4] [4X] [6]; flat-flanged, surface mounted junction box:
    - a. Material: Galvanized cast iron] [Cast aluminum].
    - b. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
  7. Concrete composite] Handholes: Die-molded, glass-fiber [concrete composite] hand holes:
    - a. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
    - b. Concrete composite, weatherproof cover with nonskid finish.
- DD. CABLE TRAYS
1. NEMA VE 1, Class 20C ladder type tray.
    - a. Material: Aluminum.
    - b. Inside Width: 24 inches.
    - c. Inside Depth: 4 inches.
    - d. Straight Section Rung Spacing: 6 inches.
    - e. Inside Radius of Fittings: 12 inches.
    - f. Furnish manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.
    - g. Covers, as indicated on the drawings; flush, flanged, solid or ventilated.
- EE. WARNING SIGNS:
1. Engraved Nameplates: 1/2 inch black letters on yellow laminated plastic nameplate, engraved with: WARNING! DO NOT USE CABLE TRAY AS WALKWAY, LADDER, OR SUPPORT. USE ONLY AS MECHANICAL SUPPORT FOR CABLES AND TUBING!
- FF. Inner duct
1. 4" 3-Cell cloth inner duct for use in 4" or larger conduits. Place 3 packs in one 4" conduit run.
- GG. Lock Boxes
1. Have tamperproof hinges and hasps
  2. Constructed of 16 gauge or better metal
  3. Ability to secure wall plate within
- HH. JB Weld
1. opaque (not clear) colored epoxy
- II. Auxiliary Voice Backboard Devices
1. D-rings
  2. A-rings
  3. Mushroom spindles
- JJ. Cable organization
1. Tie wraps
  2. Cable Velcro Straps
- KK. Nylon pull ropes
1. ¼ inch thick strong waterproof polyester

**PART 3 EXECUTION****A. EXAMINATION:**

1. Section 01 30 00 - Administrative Requirements {01300 - Administrative Requirements}: Coordination and project conditions.
2. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

**B. EXISTING WORK:**

1. Remove exposed abandoned raceway[, including abandoned raceway above accessible ceiling finishes]. Cut raceway flush with walls and floors, and patch surfaces.
2. Remove concealed abandoned raceway to its source.
3. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
4. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
5. Extend existing raceway and box installations using materials and methods [compatible with existing electrical installations, or] as specified.
6. Clean and repair existing raceway and boxes to remain or to be reinstalled.
7. Install identification on existing [equipment to remain in accordance with this section.
8. Install identification on unmarked existing [equipment.
9. Replace lost nameplates, labels, markers.
10. Re-stencil existing equipment.

**C. D. FIELD QUALITY CONTROL:**

1. Visually inspect from each bus bar to main grounding electrode service location.
2. Test in accordance with references found in section 1.03 of this document.
3. When improper grounding is found, check entire project and correct. Perform retest.
4. Ground and bond raceway and boxes.
5. Fasten raceway and box supports to structure and finishes except in the case of SIPRNet. Follow AFSSI 7703 when fastening conduit and boxes used for SIPRNet.
6. Identify raceway and boxes.
7. Arrange raceway and boxes to maintain headroom and present neat appearance.

**D. GENERAL INSTALLATION - Grounding:**

1. Install in accordance with references found in section 1.03 of this document.
2. Install grounding and bonding conductors concealed from view.
3. Install grounding for each rack and equipment using #6 AWG THHN, rated for 90 degrees C, insulated, no smaller than 6 AWG copper stranded conductor to copper communication grounding bus bar located in COMM room. Install proper grounding lug on cable where connecting to racks and grounding bar.
4. Bond COMM room grounding system to building grounding electrode system at main electrical service entrance location with #6 AWG THHN, rated for 90 degrees C, insulated, copper stranded conductor.
5. Install routing for grounding conductor as short and direct as practical.
6. Install routing of bonding conductors with minimum number of bends and splices. Use sweeping bends.
7. Install bonding connections with listed bolts, crimp pressure connectors, clamps, or lugs.
8. Position busbars near associated equipment and insulate from supports.
9. Construct busbars of copper, 4 inches x 8 inches by 1/4 inch thick with pilot holes for ground lug.
10. Bond backbone cabling at each sheath opening.
11. Ground data cabinets, racks, cable trays, safes and mounting hardware located COMM room.
12. Label grounding conductors and grounding bus bars in accordance with references found in section 1.03 of this document..
13. Permanently attach equipment and grounding conductors prior to energizing equipment.
14. When improper grounding is found, check entire project and correct. Perform retest.
15. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 07 84 00.
16. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation specified in Section 07410.
17. Ground and bond pathways, cable shields, and equipment.

**E. General Installation – Fiber Optic Cable Horizontal**

1. Install in accordance with references found in section 1.03 of this document.
2. A minimum of 10 foot maintenance loop will remain at the equipment rack and at the last junction box, at a minimum. Neatly wire tie maintenance loops.
3. Installed and terminated using LC connectors

#### 4. Hot Splicing of cables will NOT BE ACCEPTED

#### F. General installation – Fiber Optic Cable Backbone

1. Installed using SC connectors and terminated in a patch panel uniformed to existing Fiber Optic Cable terminations.
2. Installations shall have a 10 meter/30 foot maintenance loop in each manhole and at the termination end.
3. Hot Splicing of cables will NOT BE ACCEPTED

#### G. General Installation – Copper Cable Horizontal

1. Install in accordance with references found in section 1.03 of this document.
2. A minimum of 10 foot maintenance loop will remain at the Telecommunications room and 3 feet loop at the last junction box. Neatly wire tie maintenance loops.
3. Install and terminate in RJ45 IAW 568A
4. Hot Splicing of cables will NOT BE ACCEPTED

#### H. General Installation – Copper Cable Backbone

1. Install in accordance with references found in section 1.03 of this document.
2. Installations shall have a 10 meter/30 foot maintenance loop in each manhole and at the termination end, when possible. Neatly wire tie maintenance loops.
3. Install and terminate in RJ45 IAW 568A
4. If splicing is required the contractor will make all cold splices and SCOW will make finale hot splice into existing cable.

#### I. General Installation – Boxes (Follow AFSSI 7703 for SIPRNet applications.)

1. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings
2. Adjust box location up to 4 feet prior to rough-in to accommodate intended purpose.
3. Orient boxes to accommodate wiring devices.
4. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
5. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.
6. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
7. Do not install flush mounting box back-to-back in walls; install with minimum 12 inches separation. Install with minimum 24 inches separation in acoustic rated walls.
8. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
9. Install stamped steel bridges to fasten flush mounting outlet box between studs.
10. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
11. Install adjustable steel channel fasteners for hung ceiling outlet box.
12. Do not fasten boxes to ceiling support wires or other piping systems.
13. Support boxes independently of conduit.
14. Install gang box where more than one device is mounted together. Do not use sectional box.
15. Install gang box with plaster ring for single device outlets.
16. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

#### J. General Installation- testing

1. Inspect and test optical fiber cables in accordance with references found in section 1.03 of this document., except Section 4. Perform inspections and tests listed in NETA ATS, Section 7.25.
2. Inspect and test copper cables and terminations in accordance with references found in section 1.03 of this document.
3. Install pathways in accordance with references found in section 1.03 of this document.
4. Install wire and cable in accordance with references found in section 1.03 of this document.
5. Install termination backboards and cabinets plumb, and attach securely to building wall or floor at each corner. Install cabinet trim plumb.
6. Install recessed cabinets flush with wall finishes, and stub 5 1" empty conduits to accessible location above ceiling at each location.
7. Install polyethylene pulling string in each empty telephone/data conduit over 10 feet in length or containing bends.

#### K. IDENTIFICATION – INSTALLATION

1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.

3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws, or adhesive.
5. Secure nameplate to inside surface of door on recessed panels in finished locations.
6. Install label parallel to equipment lines.
7. Install label for identification of individual control device stations.
8. Install labels for permanent adhesion and seal with clear lacquer.
9. Install wire marker for each conductor at pull boxes, outlet and junction boxes.
10. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
11. Install labels at data outlets identifying patch panel alpha and numerical port designation and indicated on as-built Drawings.
12. Install conduit & raceway marker for each conduit & raceway longer than 6 feet.
13. Marker Spacing: 20 feet on center.
14. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches below finished grade, directly above buried conduit, raceway, or cable.

L. INSTALLATION – RACEWAY (Follow AFSSI 7703 for SIPRNet Applications)

1. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
2. Arrange raceway supports to prevent misalignment during wiring installation.
3. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
4. Group related raceway; support using conduit rack. Construct rack using steel Uni-Strut channel Sections. Provide space on each for 25 percent additional raceways.
5. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary Supports
6. Do not attach raceway to ceiling support wires, ceiling grids, or other piping systems.
7. Construct Wireway supports from steel Uni-Strut channel sections.
8. Route exposed raceway parallel and perpendicular to walls.
9. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
10. Route conduit in and under slab from point-to-point.
11. Maintain clearance between raceway and piping for maintenance purposes.
12. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
13. Cut conduit square using saw or pipe cutter; de-burr cut ends.
14. Bring conduit to shoulder of fittings; fasten securely.
15. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.
16. Install conduit hubs or sealing locknuts to fasten conduit to sheet metal and cast boxes in damp And wet locations.
17. Install no more than two 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch.
18. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
19. Install fittings to accommodate expansion and deflection where raceway crosses control and expansion joints.
20. Install suitable pull string or cord in each empty raceway except sleeves and nipples.
21. Install suitable caps to protect installed conduit against entrance of dirt and moisture.
22. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.
23. Close ends and unused openings in Wire way.

M. Installation of Conduits for use in NIPRNet and Telephone Applications

1. Install conduits and stub out at cable rack in ceiling.
2. Utilize one 1" conduit for 2 telephone and 2 NIPRNet data cables. (If conduit will only contain 2 cables a 3/4" conduit may be used)
3. Conduit run will contain no more than two 90 degree bends

N. Installation of SIPRNet Conduits

1. Run in EMT conduit of at least 3/4" size. (Conduit fill rates must be considered)
2. Conduit will terminate in a GSA approved lock-box in accordance with AFMAN 33-221.

3. All conduit fittings and joints will be covered in opaque (not clear) colored epoxy (i.e. J.B. weld) to a distance of ½" away from the joint. Epoxy will be neatly applied over the entire joint.
  4. Junction boxes with pre-punched knockouts will not be used.
  5. Condulets (i.e. LBs, etc.) will not be used.
  6. Junction boxes must be large enough to allow a 1" bend radius for the fiber optics.
  7. Junction box covers will have epoxy applied around the entire perimeter of the cover.
  8. Apply epoxy to all screws, conduit fittings, and covers. Ensure screw slot is filled.
  9. Conduits will be mounted in plain view, a minimum of 1" from all other structures (non-SIPRNet conduits, Drop ceilings, Modular furniture, walls, etc.).
  10. If the carrier penetrates a wall, ceiling, or floor ensure the carrier is securely fastened to the wall, ceiling, or floor (no movement or "play" in the conduit). To ensure the carrier is securely fastened, permanent filler may be used to seal completely around the carrier. If the carrier is not securely fastened, then there needs to be a minimum of 2.5 centimeters (1 inch) clearance completely surrounding the PDS at the point of penetration. A filler (bat insulation for instance) that is easily removed and reinstalled without tools to facilitate lines route inspections may be used.
  11. Conduit will remain bare metal with no paint, wallpaper or any other markings.
- O. Installation of SIPRNet Conduits Within certified, approved, classified open secure storage areas (OSSA)
1. Conduits will be marked with 1-inch red tape at least every 1 ½ meters.
  2. Red tape will wrap completely around the conduit.
  3. Within these rooms, conduit may be installed above drop ceilings or below raised floors.
  4. Epoxy is not required on conduit installed within an OSSA.
  5. Conduits may not be installed within walls.
- P. Installation of Cable Trays intended for SIPRNet Within certified, approved, classified open secure storage areas (OSSA) and Controlled Access Areas (CAA)
1. Enclosed cable trays may be used.
  2. Cable trays must be constructed to allow 1-inch red tape marking at least every 1 ½ meters.
  3. Boxes where fiber optic cable terminate at the subscriber end must be permanently mounted to the facility structure
    - a. Boxes in OSSA do not need to be lockable
    - b. Boxes in CAA must be able to be locked with approved lock, have tamperproof hinges and hasps, and be constructed of 16 gauge or better metal.
- Q. Conduit between floors, within certified, approved, classified open-storage areas
1. The contractor must provide a scale floor plan showing the exact location of the conduit, size of the conduit, material the conduit is made from (i.e. EMT, rigid pipe)
  2. Conduit must be a minimum of 2-inches in diameter.
  3. must be marked with 1-inch wide red tape at least once every 1 ½ meters. Tape must go completely around the pipe.
  4. Conduit must be located in an area which is inspect able; building occupants must be able to inspect the entire surface of the conduit without need for special tools.
  5. Plexiglas maybe used when transitioning from one secure area to another.
- R. DRSN PDS
1. Main Distribution Frame (MDF) and Intermediate Distribution Frame (IDF) boxes require the use of lockable Single-Door Type 12 EMC Enclosures having minimum dimension greater than 24 x 24 x 8 inches.
  2. Grounding lugs are to be installed in each IDF box and terminated to a local building ground lug.
- S. INSTALLATION - METAL CABLE TRAY
1. Install metal cable tray in accordance with NEMA VE 2.
  2. Support trays and fasten to structure using steel Uni-Strut channel Sections. Install supports at each connection point, at end of each run, and at other points to maintain spacing between supports as recommended by manufacturer.
  3. Install expansion connectors where recommended by manufacturer.
  4. Install firestopping in accordance with Section 07 84 00 to sustain ratings when passing cable tray through fire-rated elements.
  5. Ground and bond metal cable tray in accordance with this section.
  6. Provide continuity between tray components.
  7. Use anti-oxidant compound to prepare aluminum contact surfaces before assembly.
  8. Install 2 #6 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.

9. Make connections to tray using mechanical, compression or exothermic connectors.
10. Install warning signs at 20 feet centers along cable tray, located to be visible.

T. Comm Installation for System Furniture

1. All systems furniture shall include punch out panels or open bottom panels for maintenance of wall jacks.
2. Provide two (3) 100-OHM Cat 6 UTP type premise cables for 2 for data and 1 for telephone to each person's workstation.
3. Provide Fiber optic cables as needed to complete customer requirements. Terminate cables at customer service area with LC connectors in appropriate outlet fixture.

U. ADJUSTING

1. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.
2. Adjust flush-mounting outlets to make front flush with finished wall material.
3. Install knockout closures in unused openings in boxes.

V. CLEANING

1. Section 01 70 00 - Execution and Closeout Requirements. Final cleaning.
2. Clean interior of boxes to remove dust, debris, and other material.
3. Clean exposed surfaces and restore finish.

**END OF SECTION**

## SECTION 27 51 16: PUBLIC ADDRESS AND MASS NOTIFICATION SYSTEMS

### PART 1 GENERAL

Note: This Section does not apply for MNS system that has the notification appliances circuit for the fire alarm system or ties into the Monaco transceiver for live voice or pre-recorded messages, new or existing. Refer to 28 31 00 for guidance.

#### 1.01 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. Factory Mutual System (FM) Publication
    - a. ACFM GLOBAL (FM)
    - b. FM P7825 Approval Guide
  2. International Electrochemical Commission (IEC)
    - a. IEC 60268, Part 16 The Objective Rating of Speech Intelligibility by Speech Transmission Index
    - b. IEC 60849 (Sound Systems for Emergency Purposes)
  3. National Fire Protection Association (NFPA)
    - a. NFPA 170 Fire Safety Symbols
    - b. NFPA 70 National Electrical Code
    - c. NFPA 72 National Fire Alarm Code
  4. Underwriters Laboratories (UL)
    - a. UL 1480 Standard for Safety Speakers for Fire Alarm, Emergency, and Commercial and Professional Use
    - b. UL 1638 Visual Signaling Appliances - Private Mode Emergency and General Utility Signaling
    - c. UL 1971 Signaling Devices for the Hearing Impaired
    - d. UL 2017 Standard for Safety for General-Purpose Signaling Devices and Systems
    - e. UL 464 Audible Signal Appliances
    - f. UL Fire Prot Dir Fire Protection Equipment Directory
  5. Unified Facility Criteria (UFC) 4-021-01, Design: O&M Mass Notification Systems
  6. National Institute of Certificate in Engineering Technologies (NICET)

#### 1.02 SUBMITTALS

- A. Submit shop drawings showing all system components under provisions of Section 01 33 00.
- B. Submit manufacturer's data on all components used in the system under provisions of Section 01 33 00 including availability of parts as per paragraph 2.02.
- C. Submit copies of current certificates and / or licenses as proof of meeting the Qualifications as per Para. 1.04. Certificates and/or licenses must remain current during the duration of the work and must not expire before the government accepts the work.
- D. The contractor shall not commence work prior to approval of SUBMITTALS by the 1 SOCES/CEOFC DDC/Alarm Maintenance Shop.
- E. Any contractor not meeting the above requirements will be prohibited from doing work on Hurlburt Field.

#### 1.03 DESCRIPTION OF WORK

- A. Scope: This work includes completion of design and providing a new, complete, mass notification system as described herein and on the contract drawings for Hurlburt AFB. The system shall include wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm notification appliances, and other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. Provide systems complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 72, IEC 60849, IEC 60268, Part 16, except as modified herein.



Provide all components required for interfacing with fire alarm system. See Section 28 31 00: Fire Detection and Alarm Systems.

#### **1.04 QUALIFICATIONS**

- A. The contractor shall have a minimum of three years documented experience in the installation of mass notification systems.
- B. The contractor must be approved by the manufacturer of the mass notification equipment.
- C. The qualifier for the contractor shall meet the requirements of NICET level III. The qualifier shall supervise the NICET level II personnel during the installation, inspection and testing of the fire alarm system.
- D. Mass notification technician personnel shall meet the requirements of NICET level II and also be state of Florida FASA Qualified as per the Florida statutes.
- E. The Contracting Officer shall reject any contractor who cannot show evidence of such qualifications.

#### **1.05 QUALITY ASSURANCE**

- A. Equipment and devices shall be compatible and operable with existing station fire alarm system and shall not impair reliability or operational functions of existing supervising station fire alarm system.
- B. Qualifications: The contractor shall have a minimum of three years documented experience in the installation of mass notification systems.
- C. The contractor must be approved by the manufacturer of the mass notification equipment.
- D. The qualifier for the contractor shall meet the requirements of NICET level III. The qualifier shall supervise the NICET level II personnel during the installation, inspection and testing of the fire alarm system.
- E. Mass notification technician personnel shall meet the requirements of NICET level II and also be state of Florida FASA Qualified as per the Florida statutes.
- F. The Contracting Officer shall reject any contractor who cannot show evidence of such qualifications.
- G. Manufacturer Qualifications: Components shall be of current design and shall be in regular and recurrent production at the time of installation. Provide design, materials, and devices for a protected premises fire alarm system, complete, conforming to NFPA 72, except as otherwise or additionally specified herein.
- H. Regulatory Requirements: Devices and equipment for fire alarm service shall be listed by UL Fire Prot Dir or approved by FM P7825.
  - 1. Mass Notification System: The equipment furnished shall be compatible and be UL listed, FM approved, or approved or listed by a nationally recognized testing laboratory for the intended use. All listings or approval by testing laboratories shall be from an existing ANSI or UL published standard.

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Protect equipment delivered and placed in storage from the weather, humidity, and temperature variation, dirt and dust, and other contaminants.

#### **1.07 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS**

- A. System and System Equipment: The Mass Notification System Operation and Maintenance Instructions shall include:
  - 1. "Manufacturer Data Package 5".
  - 2. Operating manual outlining step-by-step procedures required for system startup, operation, and shutdown. The manual shall include the manufacturer's name, model number, service manual, parts list, and complete description of equipment and their basic operating features.

3. Maintenance manual listing routine maintenance procedures, possible breakdowns and repairs, and troubleshooting guide. The manuals shall include conduit layout, equipment layout and simplified wiring, and control diagrams of the system as installed.
  4. The manuals shall include complete procedures for system revision and expansion, detailing both equipment and software requirements.
  5. Software delivered for this project shall be provided, on each type of CD/DVD media utilized.
  6. Printouts of configuration settings for all devices.
  7. Routine maintenance checklist. The routine maintenance checklist shall be arranged in a columnar format. The first column shall list all installed devices, the second column shall state the maintenance activity or state no maintenance required, the third column shall state the frequency of the maintenance activity, and the fourth column for additional comments or reference.
- B. Technical Data and Computer Software: Lesson plans, operating instructions, maintenance procedures, and training data, furnished in manual format, for the training courses. The operations training shall familiarize designated government personnel with proper operation of the installed system. The maintenance training course shall provide the designated government personnel adequate knowledge required to diagnose, repair, maintain, and expand functions inherent to the system.

### **1.08 SPARE PARTS AND TOOLS**

- A. Repair Service/Replacement Parts: Repair services and replacement parts for the system shall be available for a period of 10 years after the date of final acceptance of this work by the Contracting Officer. During guarantee period, the service technician shall be on-site within 24 hours after notification. All repairs shall be completed within 24 hours of arrival on-site.
- B. Interchangeable Parts: Spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Spare parts shall be delivered to the Contracting Officer at the time of the final acceptance testing.
- C. Special Tools: Software, connecting cables and proprietary equipment, necessary for the maintenance, testing, and reprogramming of the equipment shall be furnished to the Contracting Officer.

### **1.09 TECHNICAL DATA AND COMPUTER SOFTWARE**

- A. Technical data and computer software (meaning technical data that relates to computer software) that is specifically identified in this project, and may be defined/required in other specifications, shall be delivered, strictly in accordance with the CONTRACT CLAUSES. Data delivered shall be identified by reference to the particular specification paragraph against which it is furnished. Data to be submitted shall include complete system, equipment, and software descriptions. Descriptions shall show how the equipment will operate as a system to meet the performance requirements of this contract. The data package shall also include the following:
  1. Identification of programmable portions of system equipment and capabilities.
  2. Description of system revision and expansion capabilities and methods of implementation detailing both equipment and software requirements.
  3. Library of application software.
  4. Operation and maintenance manuals.

### **1.10 KEYS**

- A. Keys and locks for equipment shall be identical. Provide not less than six keys of each type required.

## **PART 2 PRODUCTS**

### **2.01 GENERAL PRODUCT REQUIREMENT**

- A. All mass notification equipment shall be listed for use under the applicable reference standards.

### **2.02 SYSTEM OPERATION**

- A. The Mass Notification System shall be a complete, mass notification system conforming to UL 2017. The system may be placed in the alert mode by local microphones or remotely from authorized locations/users.

### 2.03 MASS NOTIFICATION SYSTEM FUNCTIONS

- A. Notification Appliance Network: The notification appliance network consists of audio speakers located to provide intelligible instructions at areas as indicated on the drawings.
- B. Strobes: Strobes are also provided to alert hearing-impaired occupants.
- C. Voice Notification: An autonomous voice notification control unit is used to monitor and control the notification appliance network and provide consoles for local operation. Using a console, personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe notification appliances.

### 2.04 MASS NOTIFICATION CONTROL PANEL

- A. Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least four pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file. Provide all necessary components to interface with fire alarm and detection system.
- B. Cabinet: Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Mass Notification Control Panel" and shall not be less than one inch high. Provide prominent rigid plastic or metal identification plates for lamps, circuits, meters, fuses, and switches. The cabinet shall be provided in sturdy steel housing, complete with back box, hinged steel door with cylinder lock, and surface mounting provisions.
- C. Voice Notification System: The Voice Notification System shall comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements IEC 60849, IEC 60268, Part 16, except as specified herein. The system shall be a one-way multi-channel voice notification system incorporating user selectability of a minimum 8 distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Textual audible appliances shall produce a slow whoop tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers on appropriate floor, but not in stairs or elevator cabs. A live voice message shall override the automatic audible output through use of a microphone input at the control panel. When using the microphone, live messages shall be broadcast through speakers throughout the building. The system shall be capable of operating all speakers at the same time. The digitalized voice message shall consist of a non-volatile (EPROM) microprocessor based input to the amplifiers. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the slow whoop tone to take over all functions assigned to the failed unit. Class "A" Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC Circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level (600 ohms), 25, 70.7 or 100 volt output. The audio amplifier outputs shall be not greater than 100 watts RMS output. The strobe NAC Circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes. A hand held microphone shall be provided and, upon activation, shall take priority over any tone signal, recorded message or PA microphone operation in progress, while maintaining the strobe NAC Circuits activation. All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Form "C" contacts shall be provided for system alarm and trouble conditions. Circuits shall be provided for operation of auxiliary appliance during trouble conditions. During a Mass Notification event the panel shall not generate nor cause any trouble alarms to be generated with the Fire Alarm system. Mass Notification functions shall

take precedence over all other function performed by the Voice Notification System. Messages shall be as follows:

Priority	Type	*Pre-Tone	**Voice	Message Script (tones and messages repeat a minimum of three times)
1	Bomb Threat	Continuous	Male	May I have your attention please! A bomb threat has been reported in or around the building. Please follow the pre-plan and await further instructions.
2	Intruder	Continuous	Male	May I have your attention please! An intruder/hostile person has been sighted within or around the building. Please follow the pre-plan and await further instructions.
3	Alternate Exit	Continuous	Male	May I have your attention please! Please evacuate the building-using the designated alternate exists.
4	Fire	Code 3	Male	May I have your attention please! A fire emergency has been reported in the building. While this is being verified, please leave by the nearest exit and report to your designated assembly area.
5	Shelter in Place	Continuous	Male	May I have your attention please! Please shelter in place and wait further instruction.
6	Weather	None	Male	May I have your attention please! The National Weather Service has issued a severe weather warning for our area.
7	All Clear	None	Male	May I have your attention please! The building emergency has ended. An all clear has been given. Please resume normal activities.
8	Test	None	Male	May I have your attention please! This is a test of the mass notification system, this is only a test.

1. 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on) "May I have your attention, please? May I have your attention, please? A fire has been reported that may affect your floor. Please walk to the nearest exit and evacuate the building." (Provide a 2 second pause.) "May I have your attention please, (repeat the message)".
  2. 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on) "May I have your attention please? May I have your attention please? A fire emergency has been reported in the building. Please leave the building by the nearest exit or exit stairway. Do not use the elevators." (Provide a 2 second pause.) "May I have your attention please, (repeat the message)".
  3. 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on) "Alert! This is the Mass Notification System. There is an emergency situation. DO NOT evacuate the building! Stay in your current location! Stay tuned for further instructions (repeat message 2 times)".
  4. 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on) "Alert, this is the Mass Notification System. There is a chemical gas emergency. Turn off all HVAC equipment, seal all doors and windows with wet fabric, Don protective gear. DO NOT evacuate the building, Act now! Listen to the MNS system for further instructions (repeat message 2 times)".
  5. 1000 Hz tones (1 sec on, 1/2 second off, 1 second on, 1/2 second off, 1 second on) "Alert, this is the Mass Notification System. There is an explosive blast risk along the South wall of your building. Quietly move towards the north side of the building, and exit from the north stairs. Move away from the building heading north to the north parking area (repeat message 2 times)".
    - a. Auxiliary Input Module shall be designed to be an outboard expansion module to either expand the number of optional remote microphone stations, or allow a telephone interface.
- D. Memory: Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.
- E. Field Programmability: Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment.

## 2.05 NOTIFICATION APPLIANCES

- A. Mass Notification Speakers: Audible appliances shall conform to the applicable requirements of UL 464. Appliances shall be connected into notification appliance circuits. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances shall be painted white. Recessed audible appliances shall be installed with a grill that is painted white with a factory finish to match the surface to which it is mounted.
1. Speakers shall conform to the applicable requirements of UL 1480. Speakers shall have six different sound output levels and operate with audio line input levels of 100 Vac, 70 Vac, 7 Vac, and 25 Vac, by means of selectable tap settings. Tap settings shall include taps of 1/4, 1/2, 1, and 2 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400Hz to 4000Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard 4 inch square electrical boxes. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the Voice Notification System.
  2. Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gauge and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.
  3. Speakers located in SCIF areas shall be High Gain Buffer Amplifier Speakers in accordance with DCID 6/9, 7.2.
- B. Visual Notification Appliances: Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Americans with Disabilities Act (ADA). Mass Notification Appliances shall have clear high intensity optic lens and xenon flash tubes. The clear optic lens shall have the special wording "ALERT." The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 75 candelas based on the UL 1971 test. Strobe shall be ceiling-flush mounted. Where more than two appliances are located in the same room or corridor, provide synchronized operation.

## 2.06 WIRING

- A. Provide wiring materials under this section as specified in Division 16 with the additions and modifications specified herein.
- B. Alarm Wiring: The SLC wiring shall be copper cable in accordance with the manufacturer's requirements. Copper signaling line circuits and initiating device circuit field wiring shall be No. 16 AWG size conductors at a minimum. Notification appliance circuit conductors, that contain audible alarm devices, other than speakers, shall be solid copper No. 14 AWG size conductors at a minimum. Speaker circuits shall be copper No. 16 AWG size conductors at a minimum. Wire size shall be sufficient to prevent voltage drop problems. Circuits operating at 24 VDC shall not operate at less than 21.6 volts. Circuits operating at any other voltage shall not have a voltage drop exceeding 10 percent of nominal voltage. Power wiring, operating at 120 VAC minimum, shall be a minimum No. 12 AWG solid copper having similar insulation.

## 2.07 LOCAL OPERATING CONSOLES (LOC)

- A. Provide a LOC to allow emergency response forces and building occupants to access the mass notification system and originate messages in emergency situations from locations in the building other than the autonomous control unit. The LOC shall have eight message scripts as shown under paragraph 2.04 "Mass Notification Control Panel".

## PART 3 EXECUTION

### 3.01 INSTALLATION AND WIRING

- A. System components shall be securely fastened to their supports independently of the wiring. Runs of conduit, tubing, wire and cable shall be straight, neatly arranged, properly supported, and parallel or perpendicular to walls and partitions. Installation of all alarm wiring shall conform to NFPA 70. All wiring for the system shall be solid wires. Stranded wire is not acceptable. All wiring shall be installed in conduit. All wire connections, etc., shall be within a box as specified in NFPA 70. The sum of the cross-sectional areas of individual conductors shall not exceed 40 percent of the interior cross-sectional area of the conduit. Wiring for alarm zones shall be color-coded by zone with two colors remaining consistent

throughout the zone. No two zones using the same colors shall transit the same junction box. This does not negate the requirements for numbering wires. Numbers will originate at the control panel and be used throughout the circuit at all junctions and terminal devices. Wiring for audible visual circuits shall be color-coded red for positive and black for negative. All junction boxes and their covers will be painted red. Existing wiring in facilities being renovated shall not be reused.

### 3.02 DRAWINGS AND MANUALS

- A. Upon completion of the installation and prior to final inspection, the Contractor shall furnish two copies of "as-built" drawings. Drawings shall show equipment configuration, control panel equipment and subassembly locations, and the location of all connecting Wiring. Drawings shall include all wiring color codes and terminal numbers and termination points for all wires. In addition, the Contractor shall furnish two copies of a manual giving complete instructions for the operation, inspection, testing, and maintenance of the system including wiring diagrams. The drawings shall include a detailed wiring layout showing all junction boxes and all system wiring, including number of wires, with speaker and strobe circuits identified. The layout shall be done on the building floor plans and combined with fire detection and alarm system. See section 01 70 00 CONTRACT CLOSE OUT.

### 3.03 SPECIAL TOOLS

- A. All special tools or equipment necessary for the operation and maintenance of the equipment including testing shall be furnished. The items furnished will be new/ unused items with packaging and manuals.

### 3.04 REPAIR OF EXISTING WORK

- A. The work shall be carefully laid out in advance. Cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings or other surfaces as necessary for the proper installation, support, or anchorage of the conduit or other work shall be carefully done. Damage to buildings, piping or equipment shall be repaired and refinished by skilled mechanics of the trades involved.

### 3.05 TESTS

- A. After all equipment for this system has been installed and made operational, and at a time directed by the Contracting Office, the contractor shall conduct tests to demonstrate that the installation are per manufacturer's recommendation and shall verify correct operation of the mass notification system in accordance with the plans and specifications. All tests shall be combined with the fire alarm system. Testing of the system shall include all components of the installed system such as initiating devices, notification appliances, signaling line devices, interfaces and their respective circuits. In addition to the request letter, the Contractor shall submit a test plan/procedure to the Contracting Officer to indicate his proposed method to demonstrate compliance with the plans and specifications. The contractor will also certify in writing that the work accomplished meets all contractual requirements. The government will provide one retest. Subsequent testing will result in reimbursement of expenses to the Government. As-built drawings shall be furnished to the Contracting Officer two weeks prior to any initial inspections. Satisfactory operation of every device shall be demonstrated during the test:

### 3.06 TRAINING

- A. The manufacturer of the equipment shall provide qualified personnel to train the government personnel in the operation and maintenance of the equipment. The Contracting Officer will approve all training dates and times. All training will be done Monday through Friday between 0700 and 1500. The Contractor shall provide training on the operation and use of the system as required. The contractor shall furnish all literature, materials and training aids. Training will be conducted in the new facility. The Contractor will supply all training aids, schematics and literature.

### 3.07 QUALITY CONTROL

- A. The Contractor shall establish and maintain quality control for operations under the section to assure compliance with contract requirements, and maintain records of his quality control for all materials, equipment, and construction operations, including but not limited to the following:
  1. Preparatory Inspection: (To be conducted prior to commencing work.)
  2. Submittal of all materials and shop drawings necessary for accomplishment.
  3. Have in hand equipment and wiring layout-showing sequence of wiring.
  4. Qualifications of installing firm.
- B. Initial inspection: (To be conducted after a representative sample of the work is complete.)
  1. Check mounting heights, supports, accessibility of all items.

- C. Follow-Up Inspection: (to be conducted daily to assure compliance with results of initial inspection.)
  - 1. Determine that noted deficiencies are corrected.
  - 2. Make corrections for "as-built" mass notification system drawings.
  - 3. Determine that all installed equipment is functional and in accordance with the contract requirement.
  - 4. Operational test performed.
  - 5. Damages or defects corrected.
  
- D. A copy of these records and Contractor tests as well as records of corrective action taken, shall be furnished the Government as directed by the Contracting Officer.

**END OF SECTION**

## SECTION 28 31 00: FIRE DETECTION AND ALARM SYSTEMS

### PART 1 GENERAL

#### 1.01 APPLICABLE PUBLICATIONS

- A. 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.
  - 1. Factory Mutual System (FM) Publication
    - a) Approval Guide (Equipment, Materials, Services for Conservation of Property) 1989 with Quarterly Supplements.
  - 2. National Fire Protection Association (NFPA) Standards:
    - a) NFPA 70 National Electrical Code.
    - b) NFPA 72 National Fire Alarm Code.
    - c) NFPA90A Installation of Air Conditioning and Ventilating System.
  - 3. Underwriters Laboratories, Inc. (UL) Publications:
    - a) Fire Protection Equipment Directory (Jan 1989 with Quarterly Supplements).
    - b) UL 38 Manually Actuated Signaling Boxes for Use with Fire-Protective Signaling Systems
    - c) UL 228 Door Closers-Holders, with or without Integral Smoke Detector.
    - d) UL 268 Smoke Detectors for Fire Protective Signaling Systems.
      - (1) e) UL 268A Smoke Detectors for Duct Application
    - e) UL 464 Audible Signal Appliances.
    - f) UL 521 Heat Detectors for Fire Protective, Signaling Systems.
    - g) UL 864 Control Units for Fire-Protective Signaling Systems.
  - 4. Unified Facility Criteria (UFC) 3-600-01, Design: Fire Protection Engineering for Facilities
  - 5. Unified Facility Criteria (UFC) 4-021-01 Design and O&M: Mass Notification Systems (dated 9 April 08, change 1, January 2010)
- B. National Fire Protection Association:
  - 1. NFPA 72 - National Fire Alarm Code.
  - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

#### 1.02 SUBMITTALS

- A. Submit shop drawings showing all system components under provisions of Section 01 33 00. Plans and calculations must be prepared by a registered professional fire protection engineer or individual that has obtained National Institute for Certification in Engineering Technologies, Fire Alarm Systems Level IV. All fire alarm system designs must be reviewed and stamped by a registered professional fire protection engineer. If the MNS portion is used to notify occupants of fire condition than it to must adhere to this provision.
- B. Submit manufacturer's data on all components used in the system under provisions of Section 01 33 00.
- C. The authority having jurisdiction and the alarm shop 1 SOCES/CEOFA shall be notified prior to installation or alteration of equipment or wiring. Complete information regarding the system or system alterations, including specifications, type of system or service, shop drawings, input/output matrix, battery calculations, and notification appliance circuit voltage drop calculations shall be submitted for approval.
- D. Under no circumstances will installation begin prior to approval of SUBMITTALS.
- E. Submit Qualification of Installer per PART 2, Paragraph 2.05.

#### 1.03 SCOPE

- A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings. Only an addressable fire alarm system shall be accepted.
- B. Basic Performance:
  - 1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 6 (Class A) Signaling Line Circuits (SLC).
  - 2. Initiation Device Circuits (IDC) shall be wired Class A as part of an addressable device connected by the SLC Circuit.



3. Notification Appliance Circuits (NAC) shall be wired Class A as part of an addressable device connected by the SLC Circuit.
4. On Style 6 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

#### C. Basic System Functional Operation

1. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
  - a. The system alarm LED on the system display shall flash.
  - b. A local piezo electric signal in the control panel shall sound.
  - c. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
  - d. The fire alarm strobe horns shall sound or if MNS, the clear strobe shall flash and the fire message shall be announced through the fire/MNS speakers.
  - e. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
  - f. All system output programs assigned via control by event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.
  - g. An associated signal is sent VIA Monaco transceiver to the fire department.

#### 1.04 Operation

- A. Activation of any automatic fire detection device or manual station shall result in the continuous operation of all fire audio/visual devices in the building, shutdown of air-handling units below 2000CFM, and activation of the radio transceiver for transmission of a radio signal to central monitor location. The fire alarm system shall be wired *and* all associated conduits shall be Class A in accordance with NFPA 72 ch.6.4.2.2.2. All suppression system shall activate a separate zone for each water flow device on the transceiver for off normal conditions and water flow. Flow, tamper switches and Duct detectors shall not be on the same zone in the BTXM transceiver. Any alarm or trouble condition silenced at the panel shall not remove that condition from the radio transceiver inputs.

## PART 2 PRODUCTS

### 2.01 General Requirements

- A. Materials and equipment shall be new standard products of the manufacturer's latest design, and suitable to perform the function intended. Components of two or more models will not be combined to form a single control unit. This equipment shall be in service and supported by the manufacture for five years after the install date. Where two or more pieces of equipment must perform the same functions, the same manufacturer shall produce this equipment. The name of the manufacturer shall appear on all major components. Locks for all cabinets shall be keyed the same as the Monaco Radio Transceiver. (CORE NUMBER C415A). Fire alarm points shall be labeled by device type and location. There shall only be one central fire alarm panel located in any facility. Heat detectors and all associated conduit and wiring shall be removed from the facility when a fire sprinkler system is installed.

### 2.02 Quality Requirements

- A. All materials and equipment shall conform to the requirements of the UL, or the FMS for fire-alarm systems of the type indicated. The Contractor shall submit proof that the items furnished under this specification conform to these requirements. The UL label or seal, or listing in the UL Fire Protection Equipment Directory will be accepted as evidence that the items conform to UL requirements. The FMS label or seal, or listing in the Factory Mutual Approval Guide will be accepted as sufficient evidence that the items conform to the FMS requirements.

### 2.03 Shop Drawing and System Designer Qualifications

- A. Within 30 days after receipt of notice to proceed and prior to starting installation, the Contractor shall submit to the Contracting Officer for approval a complete set of shop drawings to include all material and equipment proposed for installation Sealed by a registered fire protection engineer, by a registered professional engineer having at least four years of current experience in the design of fire protection and detection systems, or by an engineering technologist qualified at NICET Level IV in fire systems. The

individual's name, signature, and professional engineer number or NICET certification number shall be included on all final design documents. All fire alarm system designs must be reviewed and stamped by a registered professional fire protection engineer. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, device addresses, candela ratings, speaker wattage taps settings, complete wiring point to point diagrams, and conduit layouts. Show annunciator layout, configurations, and terminations.

#### 2.04 Spare-Parts Data

- A. After submittal of the list of equipment, and no later than 2 months prior to contract scheduled completion, the Contractor shall furnish two copies of spare parts data for each different item of equipment listed. The data shall include a complete list of parts and supplies; a list of parts and supplies that are either normally furnished at no extra cost with the purchase of the equipment or specified below to be furnished as part of the contract and a list of additional items recommended by the manufacturer to assure efficient operation for a period of 120 days at the particular installation.

#### 2.05 Qualifications of Installer

- A. System Installer: Installation personnel shall be qualified or shall be supervised by persons who are qualified in the installation, inspection, and testing of fire alarm systems and shall be on-site at all times during system installation, modification or upgrade. Evidence of qualifications or certification shall be provided when requested by the authority having jurisdiction. Qualified personnel shall include, but not be limited to, one or more of the following:
1. Personnel who are factory trained and certified for fire alarm system installation of the specific type and brand of system being installed
  2. Personnel who are certified by a nationally recognized fire alarm certification organization acceptable to the authority having jurisdiction
  3. Personnel who are registered, licensed, or certified by a state or local authority.
- The Contracting Officer shall reject any proposed installer who cannot show evidence of such qualifications.

### PART 3 EXECUTION

#### 3.01 Pre-Construction Test

- A. Prior to starting any work on existing systems the contractor shall schedule through the contracting office a fire alarm system pre-test to establish the baseline for the alarm system. Any discrepancies identified shall be signed off by the contractor, 1 SOCES/CEOFA Alarm Shop, and contracting officer or his/her representative. Failure to conduct this test will hold the contractor solely responsible for all discrepancies during final inspection.

#### 3.02 Installation and Wiring

- A.
1. The FACP and control units shall be installed in a room directly accessible from the building exterior and shall be condition as office space.
  2. Runs of conduit, tubing, wire and cable shall be straight, neatly arranged, **properly supported**, red in color and parallel or perpendicular to walls and partitions. Installation of wiring shall conform to NFPA 70.  
NOTE: 300.11
  3. Wiring located within the cavity of a non-fire-rated floor-ceiling or roof-ceiling assembly shall not be secured to, or supported by, the ceiling assembly, including the ceiling support wires. An independent means of secure support shall be provided and shall be permitted to be attached to the assembly.
  4. All wiring shall be installed in conduit (minimum ¾" EMT). The sum of the cross-sectional areas of Individual conductors shall not exceed 40 percent of the interior cross-sectional area of the conduit.
  5. All wiring for the system shall be solid wires. The fire alarm system wiring shall not share the same conduit as other low voltage wiring, such as cameras, access control, etc.
  6. Wiring for audible visual circuits shall be color-coded red for positive and black for negative.
  7. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
  8. Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
  9. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system.

10. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for Initiating Device Circuits and signaling Line Circuits, and 14 AWG for Notification Appliance circuits.
  11. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as Fire Alarm; circuit breaker shall be protected from operation by unauthorized personnel by a circuit breaker guard. Fire Alarm Control Panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded. Label all wire termination with shrink wrap labels, clearly marked with the circuit information.
  12. All wire and cable shall be listed and/or approved by recognized testing agency for use with a protective signaling system. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet.
  13. System components shall be securely fastened to their supports independently of the wiring.
  14. Existing wiring in facilities being renovated shall not be reused and must be removed.
- B. Twist-on connectors (wire nuts) shall not be used. Connections shall be permitted to be made using a set-screw, pressure-type conductor connector, provided a means is used to prevent the set screw from bearing directly on the conductor.
  - C. Mount the BTXM radio transceiver panels at a height of 60 inches, measured from the Floor to the top of the panel.
  - D. All circuits shall be installed CLASS A, wiring and conduit shall comply with NFPA 72 CH. 6.4.2.2.2.
  - E. All modules shall have their address clearly and permanently labeled on the outside of the devices.
  - F. All address modules shall be integrated with the device.
  - G. Fire circuits shall not be run in the same raceway, cable or conduit as high voltage circuits (120vac).
  - H. Fire alarm circuits derived from the fire alarm panel shall not be terminated on the same device with 120VAC power unless it is a relay designed for the use.

### 3.03 Audible and Visual Alarm Devices

- A. Audible and Visual devices shall be furnished to indicate an alarm throughout the building. Devices shall be ceiling mounted unless waived in writing by the AHJ. All devices shall be supervised and operate on low voltage D.C. furnished by the control panel. All audible devices shall meet U 464.
- B. Where audible appliances are installed to provide signals for sleeping areas, they shall have a sound level of at least 15 dB above the average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds or a sound level of at least 75 dBA, whichever is greater, measured at the pillow level in the area required to be served by the system using the A-weighted scale (dBA).
- C. If any barrier, such as a door, curtain, or retractable partition, is located between the notification appliance and the pillow, the sound pressure level shall be measured with the barrier placed between the appliance and the pillow.
- D. Where permitted and if ceiling heights allows, and unless otherwise permitted all wall mounted appliances shall comply with 7.5.4 thru 7.5.4.4.8
- E. Install clear/white strobes for the building fire alarm system with a factory applied and none removable word "FIRE" **RED in color** to alert the occupants for complete evacuation.
- F. Signal for occupants to seek information or instructions shall be amber. Provide amber colored strobes with a factory applied and none removable word "ALERT" **RED in color** to alert the hearing impaired.
- G. Recessed appliances shall not be permitted.
- H. Monitoring Integrity of Emergency Voice/Alarm Communications Systems.

1. Speaker Amplifier and Tone-Generating Equipment. If speakers are used to produce audible fire alarm signals, the required trouble signal for NFPA 72, Ch 4.4.7.2.1.1 through 4.4.7.2.1.3 shall be in accordance with 4.4.3.5. When primary power is available, failure of any audio amplifier shall result in a trouble signal. When an alarm is present and primary power is not available (i.e., system is operating from the secondary power source), failure of any audio amplifier shall result in a trouble signal.
- I. All ceiling mounted devices shall be securely mounted in an approved box attached to the ceiling grid using a T bar and the ceiling tile shall have clips installed to prevent movement of tiles.
- J. Any system installed where the audible devices are used for fire evacuation shall comply with all the requirements of 3.03 A-I and shall be tested for system integrity as a fire alarm system.
- K. Devices shall not be mixed.
- L. Strobe and speakers shall be mounted in the manufacturers back box. If the manufacturer does not make a box then use the manufacturers recommended box.

### 3.04 Mass Notification Systems

- A. Mass Notification System Functions
  1. Notification Appliance Network: The notification appliance network consists of audio speakers located to provide intelligible instructions at areas as indicated on the drawings.
  2. Strobes: Strobes are also provided to alert hearing-impaired occupants. Provide amber colored strobes with a factory applied and none removable word "ALERT" **RED in color** to alert the hearing impaired. Install clear/white strobes for the building fire alarm system with a factory applied and none removable word FIRE" **RED in color** to alert the user.
  3. Voice Notification: An autonomous voice notification control unit is used to monitor and control the notification appliance network and provide consoles for local operation. Using a console, personnel in the building can initiate delivery of pre-recorded voice messages, provide live voice messages and instructions, and initiate visual strobe notification appliances.
  4. Mass notification systems that are integrated with the building fire alarm system shall be consider a component of the fire alarm system and therefore shall meet all requirements of "Installed Fire Alarm Systems" subject to the AHJ and inspected as life safety equipment.
  5. All power extenders, amplifiers, and control cabinets shall be protected in accordance with NFPA 72 Ch 4.4.5 (2007 Edition)
  6. All audio circuits shall be installed in accordance with UFC 4-021-01 chapter 4 (9 April 2008) Clear/white strobes activated by the fire alarm system shall not operate during those periods when the amber strobes are in operation, but otherwise shall operate continuously until the fire alarm system is reset. Switching off the fire alarm strobes shall not cause a trouble at the fire alarm panel.
  7. Interface with the FACP to override fire alarm audible and visual notification appliances. The FACP shall provide supervised circuit integrity of interconnecting wiring between the MNS and FACP.
  8. MNS shall temporarily override fire alarm audible messages and visual signals, and provide intelligible voice commands during simultaneous fire and terrorist events. All other features of the fire system, including the transmission of signals to the fire department, shall function properly. MNS messages shall take priority and continue to override fire alarm audible messages until the MNS message is either manually or automatically ended. If not manually ended, the MNS message will automatically end after 10 minutes.
  9. Provide a supervisory signal if the MNS is used to override fire alarm audible messages and visible signals during simultaneous fire and terrorist events. The supervisory signal shall be at the FACP and any remote fire alarm annunciators, and be transmitted to the fire department. The visual annunciation of the separate supervisory signal shall be distinctly labeled or otherwise clearly identified.
  10. Make general paging or other non-emergency messages available without the activation of strobes. A separate microphone must be provided for this purpose.
  11. Disable use of any microphones intended solely for general paging or other non-emergency messages upon loss of normal AC power.
  12. a. A Local Operating Console (LOC) shall be provided so that the travel distance to the nearest LOC will not be in excess of 61 m (200 ft) measured horizontally on the same floor. Have a single switch capable of shutting down all HVAC equipment in the facility in accordance with the requirements of UFC 4-010-01. The HVAC shutdown switch shall be supervised by the FACP

- and have a unique address for each LOC shutdown switch. The LOC shall be clearly marked on the cabinet with the address information. Label shall be engraved
- b. Where MNS is not installed the "AIR HANDLER SHUTDOWN" is still required and shall be placed next to any Fire Alarm Annunciator.
13. AC fail on the MNS system (any component) shall generate a separate trouble to the BTX-M and transmit to the fire department.
  14. No penetration will be made at the top of any control cabinet except as designed by the manufacture and cannot be altered.
  15. The Monaco BTX-M radio shall be capable of receiving Live voice commands and activating the 8 pre-recorded messages from the Monaco D-21 located at Fire Department control room.

### 3.05 Mass Notification Control Panel

- A. Provide a complete control panel fully enclosed in a lockable steel enclosure as specified herein. Operations required for testing or for normal care and maintenance of the systems shall be performed from the front of the enclosure. If more than a single unit is required at a location to form a complete control panel, the unit enclosures shall match exactly. Control unit shall provide power, supervision, control, and logic for the entire system, utilizing solid state, modular components, internally mounted and arranged for easy access. Control unit shall be suitable for operation on a 120 volt, 60 hertz, normal building power supply. Provide secure operator console for initiating recorded messages, strobes and displays; and for delivering live voice messages. Provide capacity for at least eight pre-recorded messages. Provide the ability to automatically repeat pre-recorded messages. Provide a secure microphone for delivering live messages. Provide adequate discrete outputs to initiate/synchronize strobes. Provide a complete set of self-diagnostics for controller and appliance network. Provide local diagnostic information display and local diagnostic information and system event log file. Provide all necessary components to interface with fire alarm and detection system.
- B. Cabinet: Install control panel components in cabinets large enough to accommodate all components and also to allow ample gutter space for interconnection of panels as well as field wiring. No external wires to pass through cabinet. The enclosure shall be identified by an engraved laminated phenolic resin nameplate. Lettering on the nameplate shall say "Mass Notification Control Panel" and shall not be less than one inch high. The cabinet shall be provided in sturdy steel housing, complete with back box, hinged steel door with cylinder lock keyed to C415A, and surface mounting provisions. Mount the fire/MNS panels at a height of no higher than 72 inches, measured from the floor to the TOP of the cabinet.
- C. Voice Notification System: The Voice Notification System shall comply with the requirements of NFPA 72 for Emergency Voice/Alarm Communications System requirements IEC 60849, IEC 60268, Part 16, except as specified herein. The system shall be a one-way multi-channel voice notification system incorporating user selectability of a minimum 8 distinct sounds for tone signaling, and the incorporation of a voice module for delivery of prerecorded messages. Textual audible appliances shall produce a slow whoop tone for three cycles followed by a voice message that is repeated until the control panel is reset or silenced. Automatic messages shall be broadcast through speakers on appropriate floor, but not in stairs or elevator cabs. A live voice message shall override the automatic audible output through use of a microphone input at the control panel or live voice transmitted from the fire department. When using the microphone, live messages shall be broadcast through speakers throughout the building. The system shall be capable of operating all speakers at the same time. The live voice from the ACU shall be priority 1; live voice from the fire department is priority 2; and the live voice from the LOC shall be priority 3. The digitalized voice message shall consist of a non-volatile (EPROM) microprocessor based input to the amplifiers. The microprocessor shall actively interrogate circuitry, field wiring, and digital coding necessary for the immediate and accurate rebroadcasting of the stored voice data into the appropriate amplifier input. Loss of operating power, supervisory power, or any other malfunction that could render the digitalized voice module inoperative shall automatically cause the slow whoop tone to take over all functions assigned to the failed unit. Class "A" Notification Appliance Circuits (NAC) shall be provided for the activation of strobe appliances. The activation of the NAC Circuits shall follow the operation of the speaker NAC circuits. Audio output shall be selectable for line level (600 ohms), 25, 70.7 or 100 volt output. The audio amplifier outputs shall be not greater than 100 watts RMS output. The strobe NAC Circuits shall provide at least 2 amps of 24 VDC power to operate strobes and have the ability to synchronize all strobes. A hand held microphone shall be provided and, upon activation, shall take priority over any tone signal, recorded message while maintaining the strobe NAC Circuits activation. All outputs and operational modules shall be fully supervised with on-board diagnostics and trouble reporting circuits. Form "C" contacts shall be provided for system alarm and trouble conditions. Circuits shall be provided for operation of auxiliary appliance during trouble conditions. During a Mass

Notification event the panel shall not generate nor cause any trouble signals to be generated at the Fire Alarm system but shall transmit a supervisory signal via the BTX-M transceiver to the fire department. Mass Notification functions shall take precedence over all other function performed by the Voice Notification System. PA systems and Background music are not authorized. Messages shall be as follows:

Priority	Type	*Pre-tone	**Voice	Message Script (tones and messages repeat a minimum of three times)
1	Bomb Threat	Continuous	Male	May I have your attention please! A bomb threat has been reported in or around the building. Please follow the pre-plan and await further instructions.
2	Intruder	Continuous	Male	May I have your attention please! An intruder/hostile person has been sighted within or around the building. Please follow the pre-plan and await further instructions.
3	Alternate Exit	Continuous	Male	May I have your attention please! Please evacuate the building – using the designated alternate exits.
4	Fire	Code 3	Male	May I have your attention please! A fire emergency has been reported in the building. While this is being verified, please leave by the nearest exit and report to your designated assembly area.
5	Shelter In Place	Continuous	Male	May I have your attention please! Please shelter in place, and await further instructions.
6	Weather	none	Male	May I have your attention please! The National Weather Service has issued a severe weather warning for our area.
7	All Clear	none	Male	May I have your attention please! The building emergency has ended. An all clear has been given. Please resume normal activities
8	Test	none	Male	May I have your attention please! This is a test of the mass notification system, this is only a test.

- D. Memory: Provide each control unit with non-volatile memory and logic for all functions. The use of long life batteries, capacitors, or other age-dependent devices shall not be considered as equal to non-volatile processors, PROMS, or EPROMS.
- E. Field Programmability: Provide control units and control panels that are fully field programmable for control, initiation, notification, supervisory, and trouble functions of both input and output. The system program configuration shall be menu driven. System changes shall be password protected and shall be accomplished using personal computer based equipment.

### 3.06 Notification Appliances

- A. Mass Notification Speakers: Audible appliances shall conform to the applicable requirements of UL 464. Appliances shall be connected into notification appliance circuits. Audible appliances shall generate a unique audible sound from other devices provided in the building and surrounding area. Surface mounted audible appliances shall be painted white. Recessed audible appliances shall be installed with a grill that is painted white with a factory finish to match the surface to which it is mounted.
- Provide appliances capable of satisfying all Uniform Federal Accessibility Standards (UFAS) and Americans with Disability Act Accessibility Guidelines (ADAAG) Speakers shall conform to the applicable requirements of UL 1480. Speakers shall have six different sound output levels and operate with audio line input levels of 100 Vac, 70 Vac, 7 Vac, and 25 Vac, by means of selectable tap settings. Tap settings shall include taps of 1/4, 1/2, 1, and 2 watt. Speakers shall incorporate a high efficiency speaker for maximum output at minimum power across a frequency range of 400Hz to 4000Hz, and shall have a sealed back construction. Speakers shall be capable of installation on standard 4 inch square electrical boxes. All inputs shall be polarized for compatibility with standard reverse polarity supervision of circuit wiring via the Voice Notification System.
  - Provide speaker mounting plates constructed of cold rolled steel having a minimum thickness of 16 gauges and equipped with mounting holes and other openings as needed for a complete installation. Fabrication marks and holes shall be ground and finished to provide a smooth and neat appearance for each plate. Each plate shall be primed and painted.
  - Provide speakers and installation methods compliant with Director of Central Intelligence Directive (DCID) 6/9 for areas classified as sensitive, compartmented information facilities (SCIF).

4. Verify intelligibility by measurement after installation. Ensure that a Common Intelligibility Scale (CIS) score greater than .8 is provided in each area where building occupants normally could be found. Areas of the building provided with hard wall and ceiling surfaces (such as metal or concrete) that are found to cause excessive sound reflections may be permitted to have a CIS score less than .8 if approved by the DOD installation, and if building occupants in these areas can determine that a voice signal is being broadcast and they must walk no more than 33 ft to find a location with a CIS score of at least .8. Areas of the building where occupants are not expected to be normally present are permitted to have a CIS score less than .8 if personnel can determine that a voice signal is being broadcast and they must walk no more than 50 ft to a location with a CIS score of at least .8. Measurements should be taken near the head level applicable for most personnel in the space under normal conditions ( e.g., standing, sitting, sleeping, as appropriate). Commercially available test instruments shall be used to measure intelligibility as specified by IEC 60849 and IEC 60268-16. The mean value of at least three readings shall be used to compute the intelligibility score at each test location. The installer is required to demonstrate these test result at commissioning.
  5. Strobe and speakers shall be mounted in the manufacturers back box. If the manufacturer does not make a box, then the user shall use a manufacturers recommended box, speakers shall be totally enclose so as not to allow dust or flyings to enter.
  6. Ensure speakers in the vicinity of the control panel and LOC will not create acoustical feedback or otherwise interfere with the ability to deliver live voice messages.
- B. Visual Notification Appliances: Visual notification appliances shall conform to the applicable requirements of UL 1971 and conform to the Americans with Disabilities Act (ADA). Mass Notification Appliances shall have clear high intensity optic lens and xenon flash tubes. The clear optic lens shall have the special wording "FIRE", the amber lens shall have the special wording "Alert" factory embossed on the device. The light pattern shall be disbursed so that it is visible above and below the strobe and from a 90 degree angle on both sides of the strobe. Strobe flash rate shall be 1 flash per second and a minimum of 75 candelas based on the UL 1971 test. Strobe shall be ceiling-flush mounted only. Where more than two appliances are located in the same room or corridor, provide synchronized operation.

### 3.07 Wiring.

- A.
1. The MNS control units shall be installed in a room directly accessible from the building exterior.
  2. Runs of conduit, tubing, wire and cable shall be straight, neatly arranged, **properly supported**, painted red and parallel or perpendicular to walls and partitions. Installation of wiring shall conform to NFPA 70. NOTE: 300.11
  3. Wiring located within the cavity of a non-fire-rated floor-ceiling or roof-ceiling assembly shall not be secured to, or supported by, the ceiling assembly, including the ceiling support wires. An independent means of secure support shall be provided and shall be permitted to be attached to the assembly.
  4. All wiring shall be installed in conduit (minimum ¾" EMT). The sum of the cross-sectional areas of Individual conductors shall not exceed 40 percent of the interior cross-sectional area of the conduit.
  5. All wiring for the system shall be solid wires. The fire alarm system wiring shall not share the same conduit as other low voltage wiring, such as cameras, access control, etc.
  6. Wiring for audible visual circuits shall be color-coded red for positive and black for negative.
  7. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.
  8. Conduits shall not enter the MNS Control Panel, or any other remotely mounted Control Panel equipment or back boxes, except where conduit entry is specified by the manufacturer.
  9. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the MNS system.
  10. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for Initiating Device Circuits and signaling Line Circuits, and 14 AWG for Notification Appliance circuits.
  11. The MNS Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as MNS, circuit breaker shall be protected from operation by unauthorized personnel by a circuit breaker guard. MNS Control Panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded. Label all wire termination with shrink wrap labels, clearly marked with the circuit information.
  12. All wire and cable shall be listed and/or approved by recognized testing agency for use with a protective signaling system. Wiring used for the multiplex communication circuit (SLC) shall be twisted and unshielded and support a minimum wiring distance of 12,500 feet.
  13. System components shall be securely fastened to their supports independently of the wiring.
  14. Existing wiring in facilities being renovated shall not be reused and must be removed.
- B. Twist-on connectors (wire nuts) shall not be used. Connections shall be permitted to be made using set

screw, pressure-type conductor connector, provided a means is used to prevent the set screw from bearing directly on the conductor.

- C Mount the MNS panels at a MAX height of 72 inches, measured from the floor to the top of the cabinet.
- D. All circuits shall be installed CLASS A, wiring and conduit shall comply with NFPA 72 CH. 6.4.2.2.2.
- E. All modules shall have their address, loop and power supply number clearly and permanently labeled on the outside of the devices.
- F. All address modules shall be integrated with the device.
- G. MNS circuits shall not be run in the same raceway, cable or conduit as high voltage circuits (120vac).
- H. MNS circuits derived from the MNS panel shall not be terminated on the same device with 120VAC power unless it is a relay designed for the use.

### 3.08 LCD Alphanumeric Display

- A. LCD Alphanumeric Display Annunciator: A minimum of at least one annunciator shall be installed.
  1. The alphanumeric display annunciator shall be a supervised, back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
  2. The LCD annunciator shall display all alarm and trouble (Note: must be able to disable trouble pizo of the annunciator) conditions in the system.
  3. Up to 32 LCD annunciators may be connected to a EIA 485 interface. LCD annunciators shall not reduce the annunciation or point capacity of the system. Each LCD shall include vital system wide functions such as, System Acknowledge, Silence and Reset.
  4. LCD display annunciators shall mimic the main control panel 80 character displays and shall not require special programming.
  5. The LCD annunciator shall have switches which may be programmed for System control such as, Global Acknowledge, Global Signal Silence and Global System Reset. These switch inputs shall be capable of being disabled permanently. Mount LCD annunciator at the main entrance to the facility.

### 3.09 Future Use

### 3.10 Drawings and Manuals

- A. Upon completion of the installation and prior to final inspection, the Contractor shall furnish two copies of "as-built" drawings. Drawings shall show equipment configuration, control panel equipment and subassembly locations, and the location of all connecting Wiring. Drawings shall include all wiring color codes and terminal numbers and termination points for all wires. In addition, the Contractor shall furnish two copies of a manual giving complete instructions for the operation, inspection, testing, and maintenance of the system including wiring diagrams. The drawings shall include a detailed wiring layout showing all junction boxes and all system wiring, including number of wires, with speaker and strobe circuits identified with speaker taps and candela ratings. Show module location and address. The layout shall be done on the building floor plans and combined with fire detection and alarm system. See section 01 70 00 CONTRACT CLOSE OUT.

### 3.11 Manual and Fire alarm Stations

- A. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel operation, they cannot be restored to normal use except by the use of a key.
- B. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
- C. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear in the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- D. The operable part of each manual fire alarm box shall be not less than 1.1 m (3½ ft) and not more than 1.37 m (4½ ft) above floor level.
- E. Manual fire alarm boxes shall be installed so that they are conspicuous, unobstructed, and accessible.
- F. Manual fire alarm boxes shall be located within 1.5 m (5 ft) of the exit doorway opening at each exit on



each floor and located on the side of the opening.

- G. Manual fire alarm boxes shall be mounted on both sides of grouped openings over 12.2m (40 ft) in width, and within 1.5 m (5 ft) of each side of the opening.
- H. Additional manual fire alarm boxes shall be provided so that the travel distance to the nearest fire alarm box will not be in excess of 61 m (200 ft) measured horizontally on the same floor.

### 3.12 Fire-Detecting Equipment

- A. Fire detecting equipment shall conform to NFPA 72 and shall be of the following types, as indicated on the drawings and as approved by the AHJ. All devices shall be addressable, no conventional devices allowed. Detector circuit design shall be suitable for the types and numbers of detectors, as approved, and shall limit detector circuit current not to exceed ratings of the detectors and associated relays. Smoke detectors shall not be installed or have protective cover removed until after the construction cleanup of all trades is complete and final. Furthermore, during renovation projects, existing detectors shall be removed and reinstalled or covered during construction.
- B. Location: Detecting equipment shall be installed as shown on the drawings. Should a conflict occur between the drawings and the NFPA codes, the NFPA codes shall take precedence. Fire alarm components will not be installed on building exteriors unless expressly required by NFPA codes and then must be weather proof. Pull stations shall have removable plastic covers without sounders and be sealed around their mounting surface. Heat detectors shall be placed to provide total (complete) coverage as required in NFPA 72.
- C. Photoelectric Type Smoke Detectors: Ceiling smoke detectors, which operate on the light scattering or the light obstruction principle, shall be furnished. In sleeping rooms, ceiling mounted smoke detectors shall be powered by DC circuits from the FACP, sound an audible alarm within the room only, does not activate or transmit signal to fire department and if removed from mount or disconnected, send a trouble signal with room location to the fire alarm panel to be transmitted to the fire department. AC powered detectors shall not be installed. Where combination heat smoke detectors are installed in sleeping areas, the smoke detector will operate as indicated above and the heat detector side shall announce a general alarm throughout the facility and transmit and alarm signal to the fire department. Smoke detectors shall not be located in a direct airflow or closer than 3 feet from an air supply diffuser or return air opening.
  1. The area of protection for smoke detection devices permitted by NFPA 72 must be reduced by 50% where destratification (ceiling) fans are used. UFC 3-600-01 5-43.1
- D. Duct-Mounted Smoke Detectors: Duct-mounted photoelectric smoke detectors shall be furnished and installed in accordance with NFPA 72 and NFPA 90A. Sampling tubes of sufficient length shall be provided so that the sampling tube can extend out of the opposite side of the duct for inspection. The sampling tubes must be secured to the duct on both sides of the duct regardless of size. A remote key/reset/test switch shall be furnished for duct detectors that are at a location that is not easily accessible for testing the installed duct detector. The detector housing shall be equipped with a transparent viewing port which shall permit viewing of detector head Alarm/Power-On indicator -at viewing angles up to 80 degrees off normal and inspection of cleanliness conditions inside the detector head mounting chamber. The detector shall be the plug-in type in which the detector base contains terminals for making all wiring connections. The detector indicator shall blink intermittently during standby conditions and shall glow red during alarm conditions. All LED's to indicate the operating and alarm condition and test and reset buttons or test part shall be visible, and accessible, with the unit installed and the cover in place. Detector operating voltage will be supplied from the DC circuits of the fire alarm panel.
  1. Air Handler Units (AHU) with a capacity below 2000CFM shall not have duct smoke detectors installed but shall be shut down from the fire alarm panel during an alarm activation. AHU's with a capacity between 2000 - 15,000 CFM shall have one duct detector installed in the supply air duct. AHU's with a capacity greater than 15,000 CFM will have two duct detectors installed, one in the supply air duct and one in the return air duct. Duct smoke detectors (2000 and larger) will shut down their respective AHU's upon activation will initiate a supervisory signal at the fire alarm panel. The fire alarm panel shall activate a separate zone for duct detectors on the Monaco Radio to send a supervisory signal to the fire department.
  2. A key switch shall be installed to bypass AIR Handler shutdown, for system testing, all other function shall not be impaired, the switch shall be supervised and send a signal via the Monaco transceiver to the fire department on a separate and distinct zone.
- E. Fixed-Temperature Heat Detectors: Only Addressable Fixed temperature heat detectors shall be

installed. The UL 521 test rating shall be 135 degrees F. or as shown. Heat detectors installed in attics and mechanical rooms shall be rated at 194 degrees F only. Heat detectors installed in exterior applications such as open storage units shall be all weather detectors.

### 3.13 System Components Addressable Devices

#### A. Addressable Devices General

1. Addressable devices shall use simple to install and maintain decade, decimal address switches. Devices shall be capable of being set to an address in a range of 001 to 159.
2. Addressable devices, which use a binary coded address setting method, such as a DIP switch, are not an allowable substitute.
3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.
4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash green under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady red illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
5. The fire alarm control panel shall provide detector sensitivity adjustment through field programming of the system. The panel on a time of day basis shall automatically adjust sensitivity.
6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
7. The detectors shall be ceiling mount and shall include a separate twist lock base with tamper proof feature. Bases shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 6 applications. (Applies only to sleeping quarters)
8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
11. Addressable devices shall store an internal identifying code that the control panel shall use to identify the type of device.
12. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
13. Addressable modules shall mount in a 4inch square (101.6 mm square), 21/ 8 inch (54 mm) deep electrical box.
14. All manual pull stations shall be mounted in the manufactures back box. If the manufacture does not make a box then use the manufactures recommended box.

#### B. Addressable Manual Fire Alarm Box (manual station)

1. Addressable manual fire alarm boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
3. Manual fire alarm boxes shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
4. All manual pull stations shall be mounted in the manufactures back box. If the manufacture does not make a box then use the manufactures recommended box.

#### C. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light scattering) principal to send data to the panel representing the analog level of smoke density.

#### D. Intelligent Laser Photo Smoke Detector

1. The intelligent laser photo smoke detector shall be a spot type detector that incorporates an extremely bright laser diode and an integral lens that focuses the light beam to a very small volume near a receiving photo sensor. The scattering of smoke particles shall activate the photo sensor.
2. The laser detector shall have conductive plastic so that dust accumulation is reduced significantly.
3. The intelligent laser photo detector shall have nine sensitivity levels and be sensitive to a minimum obscuration of 0.03 percent per foot.
4. The laser detector shall not require expensive conduit, special fittings or PVC pipe.
5. The intelligent laser photo detector shall support standard, relay, isolator and sounder detector bases.
6. The laser photo detector shall not require other cleaning requirements than those listed in NFPA 72. Replacement, refurbishment or specialized cleaning of the detector head shall not be required.
7. The laser photo detector shall include two bicolor LEDs that flash green in normal operation and turn on steady red in alarm.

#### E. Intelligent Ionization Smoke Detector

1. The detectors shall use the dual chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

#### F. Intelligent Multi Criteria Acclimating Detector

1. The intelligent multi criteria Acclimate detector shall be an addressable device that is designed to monitor a minimum of photoelectric and thermal technologies in a single sensing device. The design shall include the ability to adapt to its environment by utilizing a built-in microprocessor to determine its environment and choose the appropriate sensing settings. The detector design shall allow a wide sensitivity window, no less than 1 to 4% per foot obscuration. This detector shall utilize advanced electronics that react to slow smoldering fires and thermal properties all within a single sensing device.
2. The microprocessor design shall be capable of selecting the appropriate sensitivity levels based on the environment type it is in (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes (as walls are moved or as the occupancy changes).
3. The intelligent multi criteria detection device shall include the ability to combine the signal of the thermal sensor with the signal of the photoelectric signal in an effort to react hastily in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and false alarm condition by examining the characteristics of the thermal and smoke sensing chambers and comparing them to a database of actual fire and deceptive phenomena.

#### G. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) fix temp.

#### H. Future Use

#### I. Hostile Area Smoke Detector

1. The detector shall be designed to provide early warning smoke detection in environments where traditional smoke detectors are not practical.
2. The detector shall have a filter system to remove particles down to 25 microns.
3. This filter system shall remove unwanted airborne particles and water mist. This shall allow the detector to operate in environments where traditional smoke detectors would have nuisance alarms.
4. The filter system shall consist of 2 filters one of which is field replaceable.
5. The filter system shall have an intake fan to draw air and smoke through the filters into the sensing chamber.
6. The filter system shall be supervised so that if the filter is clogged or the fan fails the control panel reports trouble.
7. The filter system shall be powered from 24 VDC separate from the SLC communications.
8. The detector shall utilize a photoelectric sensing chamber.

J. Water-flow Indicator:

1. Water-flow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Water-flow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 to 45 seconds.
3. All water-flow switches shall come from a single manufacturer and series.
4. Water-flow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate water-flow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.
6. Water flow switches shall be wired to an addressable monitoring module, shall activate a non silenceable alarm at the FACP and transmit a signal from the BTXM on a dedicated Zone.

K. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be secured with a chain and lock.
3. Each valve supervisory switches shall be provided and connected as separate addressable points to the fire alarm system and shall report a separate and distinct supervisory alarm to the fire department (SPRINKLER TAMPER). Rope type tamper switches are not permitted.

L. Addressable Dry Contact Monitor Module Note: If approved by AHJ

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
2. The IDC zone shall be suitable for Class A operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
3. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2 3/4 inch (70 mm) x 1 1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

M. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. The IDC zone shall be wired for Class A operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

N. Addressable Control Module

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered polarized audio/visual notification appliances.
2. The control module NAC may be wired for Class A signal operation.
3. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised UL listed remote power supply.
4. The control module shall be suitable for pilot duty and rated for a minimum of 0.6 amps at 30 VDC.

O. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to same time on the same pair of wires.

### 3.14 Suppression Systems

A. Control Valve Supervisory Signal-Initiating Device.

1. Two separate and distinct signals shall be initiated: one indicating movement of the valve from its normal position (off-normal) and the other indicating restoration of the valve to its normal position. The off-normal signal shall be initiated during the first two revolutions of the wheel or during one-fifth of the travel distance of the valve control apparatus from its normal position. The off-normal signal shall not be restored at any valve position except normal.

Initiating device for supervising the position of a control valve shall not interfere with the operations of the valve, obstruct the view of its indicator, or prevent access for valve maintenance.

2. Control valve supervisor signals shall be sent to the fire station as a separate supervisor signal via the Monaco BTX-M radio transceiver.
3. Fire pumps are required to be monitored. Individual supervisory signals shall be provided for the following conditions:
  - a. Fire pump running signals are ALARMS
  - b. Fire pump loss of power of a phase
  - c. Fire pump phase reversal
  - d. Activation of a fire pump supervisory signal shall initiate a supervisory alarm at the system control panel and at the remote annunciators. Each set of contacts in the fire pump controller shall have address. All fire pump supervisory signals shall be transmitted to Fire Department VIA the BTX-M radio as a separate supervisory signal.

- B. **RELEASING SYSTEMS:** Testing personnel shall be qualified and experienced in the specific arrangement and operation of a suppression system(s) and a releasing function(s) and shall be cognizant of the hazards associated with inadvertent system discharge. Testing shall include verification that the releasing circuits and components energized or actuated by the fire alarm system are electrically supervised and operate as intended on alarm.
- C. A complete system discharge test including releasing of suppression agent activated from the overhead riser shall be required on all new systems and any system that is modified. Suppression systems and releasing components shall be returned to their functional operating condition upon completion of system testing.
- D. Outside water/Electric gongs shall not be required.

### 3.15 Kitchen Hood Suppression System

- A. Kitchen hood suppression system shall not be installed in a manner that a loss of power would generate an alarm however; a trouble signal would be required. A system test shall be required use air to simulate agent.
- B. All system regardless of size shall be connected to the fire alarm system.

### 3.16 Access Control

- A. Access control shall comply with Life Safety Code 101 para 7.2.1.5.2. Any device or system intended to actuate the locking or unlocking of exits shall be connected to the fire alarm system serving the protected premises. All exits connected in accordance with NFPA 72 ch 6.16.7.1 shall unlock upon receipt of any fire alarm signal by means of the fire alarm system serving the protected premises. Exception: Where otherwise required or permitted by the authority having jurisdiction or other codes. For all exits connected in accordance with NFPA 72 ch 6.16.7.1 and where batteries are used in accordance with NFPA 72 ch 4.4.1.5.1(1) as the secondary power supply, the batteries shall not be utilized to maintain these doors in the locked condition unless the fire alarm control unit is arranged with circuitry and sufficient secondary power to ensure the exits will unlock within 10 minutes of loss of primary power. If exit doors are unlocked by the fire alarm system, the unlocking function shall occur prior to or concurrent with activation of any public-mode notification appliances in the area(s) served by the normally locked exits. All doors that are required to be unlocked by the fire alarm system in accordance with NFPA 72 ch 6.16.7.1 through 6.16.7.5 shall remain unlocked until the fire alarm condition is manually reset.

### 3.17 CONTROL UNIT

- A. Control unit (Fire alarm panel) shall be addressable and be fully field programmable from the internal keyboard unless waived by the AHJ in writing. This shall include the addition of points, modification of points, and deletions. **ALL** system software required to perform uploads/downloads by base maintenance personnel shall be supplied. This includes the program for the facility system as well as the software and computer key that the laptop computer must use to perform these functions. Any connecting cables required to interface the laptop with the FACP shall be supplied. Installed as part of the system in each protected building and shall be approved for use with the fire detecting equipment, manual fire-alarm stations, and alarm-sounding devices. The unit shall operate with 24 volts DC derived from its internal AC rectifier/power supply. The control unit circuits shall be exclusively solid state. The control unit shall be housed in a substantial steel cabinet with lock and key C415A. The cabinet shall be painted inside and out. The control unit shall include light emitting diodes (LED's)(Lamps or neon tubes

not acceptable) to visually indicate the system condition, e.g., alarm and trouble by zone, system trouble conditions, primary and backup power supply status, etc. The control unit shall include a means to test all control unit functions. This includes a system test switch, zone disable, system reset, auxiliary disconnect and audible trouble silence switch, etc. The silence switch shall be provided with an audible resound feature. The unit shall supervise all alarm initiating circuits and all alarm sounding circuits. It shall also provide regulated and unregulated DC power for smoke detectors, which do not operate on zone voltage. With a point disabled the control unit shall repeat the alarm sequence when a second, third, etc., alarm is initiated on other zones. All LED's shall be plainly visible when the door on the control unit is closed. The control unit shall operate separate audible and visual signals when a ground fault is detected in any supervised circuit or device. It shall sound a distinct audible alarm and activate the notification appliance circuit throughout the building when any manual or automatic device on the system is activated. The fire alarm panel shall be equipped with at least one alarm, one supervisory and one trouble relay as integral components of the panel. Add on relays are not acceptable. Alarm relay and the trouble relay dry contacts shall be used solely to activate a radio transceiver, Monaco *BTXM*. Only low voltage (24) will be brought into the panel for auxiliary functions. The use of plug-on units and special devices not supplied by the manufacturer in conjunction with this feature is unacceptable. The control unit shall meet the requirements of UL 864 and shall be listed for NFPA 72.

- B. A separate supervisory module will be provided for sprinkler tampers and supervisory circuits.
- C. Main FACP or network node shall be a NOTIFIER Model NFS2640 or equal and shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.
- D. Water-flow Operation
  - An alarm from a water-flow detection device shall activate the appropriate alarm message on the main panel display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
- E. Operator Control
  - 1. Acknowledge Switch:
    - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition.
    - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
  - 2. Alarm Silence Switch:
    - a. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto silence timers.
- F. Alarm Activate (Drill) Switch:
  - 1. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
- G. System Reset Switch:
  - 1. Activation of the System Reset switch shall cause all electronically latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
- H. Future Use.
- I. System Capacity and General Operation
  - 1. The control panel or each network node shall provide, or be capable of expansion to 636 intelligent/addressable devices.

2. The control panel or each network node shall include Form C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC.
  3. It shall also include two Class A (NFPA Style Z) programmable Notification Appliance Circuits.
  4. The Notification Appliance Circuits shall be programmable to Synchronize with System Sensor, Gentex and Wheelock Notification Appliances.
  5. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
  6. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
  7. The system shall allow the programming of any input to activate any output or group of outputs. The system shall provide a minimum of 8 programmable form C contacts for triggering zones on the Monaco transceiver. Systems that have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes. The FACP shall support up to 20 logic equations, including "and," "or," and "not," or time delay equations to be used for advanced programming. Logic equations shall require the use of a PC with a software utility designed for programming. The system shall provide a minimum of 8 programmable form C contacts triggering zones on the Monaco Transceiver.
  8. The FACP or each network node shall provide the following features:
    - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
    - b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 5.
    - c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
    - d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be .5 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also support sensitive advanced detection laser detectors with an alarm level range of .03 percent per foot to 1.0 percent per foot. The system shall also include up to nine levels of Pre-alarm, selected by detector, to indicate impending alarms to maintenance personnel.
    - e. The ability to display or print system reports.
    - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
    - g. PAS pre-signal, meeting NFPA 72 6.8.1.3 requirements.
    - h. Periodic detector test, conducted automatically by the software.
    - i. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its pre-alarm level to just above normal peaks.
    - j. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
    - k. Walk test, with a check for two detectors set to same address.
    - l. Control by time for non-fire operations, with holiday schedules.
    - m. Day/night automatic adjustment of detector sensitivity.
    - n. Device blink control for sleeping areas.
  9. The FACP shall be capable of coding main panel node notification circuits in March Time (120 PPM), Temporal, and California Code. The panel shall also provide a coding option that will synchronize specific strobe lights designed to accept a specific "sync pulse." Notification Appliances shall meet the requirements specified in chapter 7 of NFPA 72.
- J. Remote LCD annunciator's will be required. Exact numbers and location will be determined by design and approved by the AHJ at least one annunciator will be installed. The location of an operated initiating device shall be annunciated by visible mean and at location accessible to first responders. Visible annunciation shall be by an alphanumeric display. The visible annunciation of the location of operated initiating devices shall not be canceled by the means used to deactivate alarm notification appliances.
- K. Protection of Fire Alarm System. Automatic smoke detection shall be provided at the location of each fire alarm control unit(s), notification appliance circuit power extenders, and supervising station transmitting equipment to provide notification of fire at that location.
- L. Audible Trouble Signal Silencing Means. The panel shall not utilize a key function to control unauthorized access to the panel.

- M. No penetration will be made at the top of any control cabinet except where provided by manufacture and shall not be altered.

### 3.18 TRANSCEIVERS

- A. Radio transceiver shall be provided for interface of the building fire alarm system and the existing Base central monitor receiver.
- B. The transceiver required is a Building Transceiver BTX-M with a minimum of one transceiver, one relay board and one audio board manufactured by Monaco Enterprises, Inc.
- C. Wiring used to interface the transceiver alarm and trouble Inputs with the fire alarm control panel shall be no greater in size than 18 AWG. Mount the radio at a height of 54 inches, measured from the floor.
- D. The frequency of operation for the transceiver shall be 163.5375 MHz.
- E. The minimum zone shall be as follows:
  - 1, Fire Alarm/trouble
  - 2, Sprinkler Flow
  - 3, Sprinkler Tamper
  - 4, MNS override of a fire alarm signal
  - 5, Duct Detector supervisory
- F. No penetration will be made at the top transceiver cabinet.
- G. 1SOCESICEOFA alarm shop will program the BTXM radio.

### 3.19 ANTENNA

- A. Antenna: Antenna Monaco Assembly Part No. 190-400-00. Antenna shall be installed in accordance with Hurlburt Field Specification 28 31 00 Part 3, section 3.19. Lightning arrestor kit shall be Monaco Assembly Part No. 190-007-01.
- B. Contractor shall provide a radio frequency (RF) power meter to test and verify that the standing wave ratio (SWR) is within the manufacturer's specifications.
- C. Future Use.
- D. Frequency: Antennas shall be designed to operate on the specified radio frequency of 163.5375 MHz.
- E. Environmental Requirements: All antenna assemblies shall be of corrosion-resistant materials and designed for reliable operation under adverse conditions including 100-mph winds, ice, snow, and rain. Antenna mast shall be  $\frac{3}{4}$  inch rigid aluminum and use a  $\frac{3}{4}$  coupling at the top for the PL 259 connector. Antenna structure to include brackets, lightning arrestor box and all conduits shall be painted in accordance with Hurlburt Field regulation to match the structure were attached.
- F. Antenna Cables: Coaxial cables shall be 50 ohm RG-8x with minimum 95% shield and shall include PL 259 and BNC type fittings or connectors as appropriate. Antenna cable for transmitter shall be RG-8x coaxial cable if length is under 200 feet, 9913 if over 200 feet. Utilize proper fittings PL259 and BNC. Cables in excess of 2 feet of the required length are not acceptable with a minimum 10 inches in the panel. The antenna cable shall be installed in  $\frac{3}{4}$  rigid aluminum conduit from radio to base of antenna with no cables exposed use a  $\frac{3}{4}$  coupling at the top of mast for the PL259.
- G. Grounding of Antenna Systems: Antenna masts and static discharge unit ground terminals shall be grounded in accordance with the requirements of NFPA 70, Article 810-21, AFI 32-1065 and the manufacturer's instructions, bonded to the facility lighting grid. Static discharge units and their enclosures shall be located inside the buildings as close as practical to the antenna lead-in point of entry. Ground rods shall be of copper-clad steel conforming to UL 4561 not less than  $\frac{5}{8}$  inch in diameter by ten feet in length. Ground rods shall not protrude above grade, ground wire from rod to equipment shall be protected in  $\frac{1}{2}$  EMT conduit. Ground rod shall be bonded to the building grounding system. Non-current-carrying metallic parts associated with mass notification equipment shall have maximum resistance to solid earth ground not to exceed the following values: Antennas/static discharge units 10 ohms; Radio alarm transceivers 10 ohms.



**3.20 Power Supply**

- A. Primary Power Supply: Primary power supply for ALL control units (this includes but not limited to FACP, MNS, BTXM transceiver and power supplies. Shall be on a dedicated 20-amp branch circuit and individually protected by surge protection devices part number EDCO Hsp121bt1r2 the circuit breaker shall be protected from operation by unauthorized personnel by a circuit breaker guard. At locations where the circuit breaker is out of sight of the fire alarm control panel, a disconnect switch shall be installed adjacent to the control panel and clearly marked "FIRE ALARM". The conductors feeding the control panel shall be #12 AWG. Stake-on terminal lugs are not acceptable for wire terminations. Id tag will be rigid plastic. Primary power supply wiring shall be installed in electrical metallic tubing in accordance with the applicable requirements of the NEC 70.
- B. Standby Power Supply: Standby power to insure operation of the fire alarm system in the event of primary power failure shall be provided by no more than two each maintenance free storage batteries.
- C. Power supply shall be provided with an automatic battery charger capable of a high/low charge rate.
- D. Battery shall have the capacity to operate the fire system for 24 hours and then be capable of sounding all general alarms for fifteen minutes for all fire alarm systems.
- E. Space for Future Use.
- F. The charging circuit for all systems shall be supervised to indicate a low battery condition and be rated to recharge fully discharged batteries in 24 hours.

**3.21 Fire Department Equipment**

- A. The Contractor shall furnish transceiver that will interface, and be fully compatible with the Government system installed at fire department. The existing system is a Monaco D21-M Radio Fire ALARM System.
- B. Contractor shall supply and install signage displaying the building number meeting base specification.

**3.22 Drawing and Manuals**

- A. Upon completion of the installation and prior to final inspection, the Contractor shall furnish two copies of "as-built" drawings on CD or DVD and shall be in CAD format. Drawings shall show equipment configuration, control panel equipment and subassembly locations, and the location of the transceiver and all connecting Wiring. Drawings shall include all wiring color codes and terminal numbers and termination points for all wires. They shall include a detailed wiring layout showing all junction boxes, all system wiring, including number of wires, with zones and alarm sounding circuits, initiating and alarm sounding devices identified by module number and strobes with candela rating. In addition, the Contractor shall furnish two copies of a manual giving complete instructions for the operation, inspection, testing, and maintenance of the system including wiring diagrams. The layout shall be done on the building floor plans. The final inspection cannot take place without the drawings.

**3.23 Special Tools**

- A. All special tools or equipment necessary for the operation and maintenance of the equipment including testing shall be furnished this includes but not limited to a laptop, software, cables and hardware keys (dongle) if required. The items furnished will be new/unused items with packaging and manuals.

**3.24 Repair of Existing Work**

- A. The work shall be carefully laid out in advance. Cutting, channeling, chasing, or drilling of floors, walls, partitions, ceilings or other surfaces as necessary for the proper installation, support, or anchorage of the conduit or other work shall be carefully done. Damage to buildings, piping or equipment shall be repaired and refinished by skilled mechanics of the trades involved.

**3.25 Tests**

- A. After all equipment for this system has been installed and made operational, and at a time directed by the Contracting Office, the contractor shall conduct tests to demonstrate that the installation and the system operation is in accordance with the plans and specifications. Testing of the system shall include remote annunciation of alarms and trouble conditions to the fire department. In addition to the request letter, the Contractor shall submit a test plan/procedure to the Contracting Officer to indicate his proposed method to demonstrate compliance with the plans and specifications. The contractor will also certify in writing that the work accomplished meets all contractual requirements. The government will provide one retest.

Subsequent testing will result in reimbursement of expenses to the Government. Satisfactory operation of each of the following devices shall be demonstrated during the test:

1. Each automatic detector.
  2. Each manual fire alarm station.
  3. Each transceiver, all functions.
  4. Each audible alarm device.
  5. Each visual alarm device.
  6. Supervision of each device such as; heat detectors, pull stations, smoke detectors, etc; and alarm zone circuits to include ground faults.
  7. Satisfactory operation after loss of primary power supply.
  8. Satisfactory operation of each device shut down circuit with correct zone correspondence. This shall not be simulated but shall actually be demonstrated by actual device/equipment shutdown.
  9. All control panel functions, alarm and trouble, audible and visual indicators, silence switches and their resound function and alarm resound features of the control unit.
  10. In each zone containing automatic smoke detectors, each detector will be put into the alarm mode and stay in that mode for 10 minutes after the last detector goes into alarm, to verify satisfactory operation of the detectors and the detector power supply module under alarm load. Smoke is expressly forbidden for this test.
  11. Supervision of DC power on each automatic detector circuit.
- B. Documentation Required. Every system shall include the following documentation, which shall be delivered to the contracting officer two weeks prior to any initial inspections the system:
1. An owner's manual and manufacturer's published instructions covering all system equipment. Provide all manuals, drawings, technical/programming manual on a DVD disk.
  2. Record drawings
  3. For software-based systems, provide programming software, database, dongle key and computer cable to connect to fire panel.

### 3.26 TRAINING

- A. Equipment installer shall provide 1 day on site training for maintenance personnel.
- B. 5 days of technical training to the government at the manufacturing facility. Training shall be accomplished by the manufacturer of the equipment within 90 days. Training shall allow for classroom instruction as well as individual hands on programming, troubleshooting and diagnostics exercises. The contractor shall furnish all literature, materials and training aids. Travel, Per Diem and hotel cost will be at the government's expense. Factory training shall occur within 3 months of system acceptance. The training days will be Monday through Friday between 0700 and 1600.
- C. Provide 2 days of training onsite for Hurlburt Fire Department.
- D. The Contracting Officer will approve all training dates and times.

### 3.27 Quality Control

- A. The Contractor shall establish and maintain quality control for operations under the section to assure compliance with contract requirements, and maintain records of his quality control for all materials, equipment, and construction operations, including but not limited to the following:
  1. Preparatory Inspection: (To be conducted prior to commencing work.)
  2. Submittal of all materials and shop drawings necessary for accomplishment.
  3. Have in hand equipment and wiring layout-showing sequence of wiring.
  4. Qualifications of installing firm.
- B. Initial inspection: (To be conducted after a representative sample of the work is complete.)
  1. Check mounting heights, supports, accessibility of all items.
  2. Check temperature ratings of detection against ceiling temperatures anticipated at detector locations.
  3. Check size of conduit, boxes, and wires for proper sizing in accordance with National Electrical Code and Contracts.
- C. Follow-Up Inspection: (to be conducted daily to assure compliance with results of initial inspection.)
  1. Determine that noted deficiencies are corrected.
  2. Make corrections for "as-built" fire alarm system drawings.
  3. Determine that all installed equipment is functional and in accordance with the contract requirement.

4. Operational test performed.
5. Damages or defects corrected.

A copy of these records and Contractor tests as well as records of corrective action taken, shall be furnished the government as directed by the contracting officer.

**3.28 Final Inspection**

- A. At the final inspection, a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

**END OF SECTION**

**SECTION 31 10 00:****SITE CLEARING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Remove surface debris.
- B. Clear site of plant life and grass.
- C. Remove trees and shrubs.
- D. Remove root system of trees and shrubs.
- E. Topsoil excavation.
- F. Site Grading

**1.02 REGULATORY REQUIREMENTS**

- A. Conform to applicable regulations and local ordinances for disposal of debris off Base.
- B. Coordinate clearing Work with utility companies.

**1.03 QUALITY ASSURANCE**

- A. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with particular requirements of the Project and methods needed to accomplish same.
- B. Use equipment adequate in size, capacity and numbers to accomplish the Work in a timely manner.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Fill Materials, See Section 31 23 23, Fill.
- B. Weed Killer: Provide a dry, free-flowing, dust free chemical compound, soluble in water, capable of inhibiting the growth of weeds and other undesirable vegetation and approved for use on base by governmental agencies having jurisdiction.
- C. Topsoil: Use stockpiled topsoil or provide topsoil consisting of friable, fertile soil of loamy character, containing an amount of organic material normal to the region. Topsoil shall be capable of sustaining healthy plant life and be reasonably free from subsoils, roots, heavy or stiff clay, stones larger than 2" in greatest dimension, weeds, sticks, brush and other deleterious material.

**PART 3 EXECUTION****3.01 PREPARATION**

- A. Verify that existing plant life designated to remain is tagged or identified.
- B. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to the timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

**3.02 PROTECTION**

- A. Protection of Person and Property.
  - 1. Barricade open holes and depressions occurring as part of this Work and post warning lights or safety flagging as required.
  - 2. Operate warning lights during the hours from dusk to dawn each day and as otherwise required.
  - 3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, washout, and other hazards caused by the Work of this Section.

- B. Locate, identify, and protect utilities that are to remain and protect from damage. If active utility lines are encountered that are not shown on the Drawings or otherwise made known to the Contractor, immediately notify the Contracting Officer and request instructions prior to proceeding with the Work.
- C. If existing utility services are interrupted as a result of Work under this Section, immediately restore service by repairing the damaged utility at no cost to the government.
- D. Protect trees, plant growth, and features designated to remain, as final landscaping.
- E. Protect benchmarks, permanent reference monuments and existing structures from damage or displacement. A Florida Registered Surveyor at no cost to the government shall replace damaged or destroyed benchmarks or permanent reference monuments. Damage to existing structures shall be repaired to the satisfaction of the Contracting Officer at no additional cost to the government.

### **3.03 CLEARING**

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees and shrubs within marked areas. Remove stumps and main root ball.

### **3.04 REMOVAL**

- A. Remove debris, rock, and extracted plant life from site and dispose of properly at an off base location.

### **3.05 TOPSOIL EXCAVATION**

- A. Excavate topsoil from areas to be further excavated and stockpile for later use, re-landscaping or finish grading.
- B. Excess topsoil, and subsoil, not being reused shall become the property of the Contractor and removed from the site.

### **3.06 SITE GRADING AND COMPACTION**

- A. Grading
  1. Uniformly grade those areas within the limits of construction including adjacent transition areas.
  2. Smooth the finished surface within specified tolerances with no irregular surface changes.
  3. Where a change of slope is indicated on the Drawings, construct a rolled transition section between the slopes, unless adjacent construction will not permit such a transition or if the transition defeats positive control of drainage.
  4. Grade areas adjacent to buildings to achieve positive drainage away from the buildings and to prevent ponding.
  5. Shape the surface areas to line, grade, and cross-section with finished surface not more than 0.05' above/below the required subgrade elevation.
- B. Compaction: See Section 31 23 23, Fill.

### **3.07 MAINTENANCE**

- A. Protect newly graded areas from traffic and erosion and keep free from trash weeds.
- B. Repair and reestablish grades in settled, eroded and rutted areas to the specified grades and tolerances.

**END OF SECTION**

**SECTION 31 23 16****EXCAVATION****PART 1 - GENERAL****1.01 SECTION INCLUDES:**

- A. Protection of existing utilities.
- B. Protection of existing buildings and structures.
- C. Excavation for building foundations.
- D. Excavation for slabs-on-grade and paving.
- E. Excavation for utilities to 5 feet outside of building line.
- F. Excavation, trenching, and backfilling requirements for installation, maintenance, repair, and replacement of storm sewer, sanitary sewer, and water distribution lines and appurtenances to the points of connection within 1.5 m (5 feet) of the buildings.

**1.02 REFERENCES:**

- A. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - ASTM D 422 Particle-Size Analysis of Soils
  - ASTM D 1556 Density and Unit Weight of Soil in Place by the Sand-Cone Method
  - ASTM D 1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort
  - ASTM D 698 Laboratory Compaction Characteristics of Soil Using Standard Method
  - ASTM D 2167 Density and Unit Weight of Soil in Place by the Rubber Balloon Method
  - ASTM D 2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  - ASTM D 6938 Standard Test Method for In-Place Density & Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

**1.03 DEFINITIONS**

- A. Degree of Compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 698.

**1.04 SUBMITTALS** The following shall be submitted in accordance with Section 01 33 00 - Submittals.

- A. Field Density Test Reports.
- B. Backfill Material Test Reports.

**1.05 COMPLETION OF WORK** Should the Contractor fail to complete the work as scheduled, the Contracting Officer may limit the work which has been started but not completed to any such amount as deemed reasonable. No extension of time will be granted to the Contractor for not being permitted to start on new streets, alleys or rights-of-way to construction for this reason.**PART 2 – PRODUCTS****2.01 MATERIALS**

- A. Satisfactory Materials shall consist of any material classified by ASTM D 2487 as GW, GP, and SW.

- B. **Unsatisfactory Materials:** Unsatisfactory materials shall be materials that do not comply with the requirements for satisfactory materials. Unsatisfactory materials include, but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 75 mm (3 inches), and materials classified in ASTM D 2487, as PT, OH, and OL. Unsatisfactory materials also include man-made fills, refuse, or backfills from previous construction.
- C. **Cohesionless and Cohesive Materials:**
1. Cohesionless materials shall include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.
  2. Cohesive materials include materials classified in ASTM D 2487 as GC, SC, CL, MH, and CH.
- D. **Unyielding Material:** Unyielding material shall consist of rock and gravelly soils with stones greater than 75 mm (3 inches) in any dimension or as defined by the pipe manufacturer, whichever is smaller.
- E. **Unstable Material** shall consist of materials too wet to properly support the utility pipe, conduit, or appurtenant structure.
- F. **Select Granular Material:** Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall contain not more than 10 percent by weight of material passing a 0.075 mm (No. 200) mesh sieve and no less than 95 percent by weight passing the 25 mm (1-inch) sieve. The maximum allowable aggregate size shall be 100 mm (1 inch per foot) of pipe diameter, or the maximum size recommended by the pipe manufacturer, whichever is smaller.
- G. **Initial Backfill Material** shall consist of select granular material or satisfactory materials free from rocks 2 mm (3/4 inch) or larger in any dimension or free from rocks of such size as recommended by the pipe manufacturer, whichever is smaller.
- H. **Plastic Marking Tape:** Plastic marking tape shall be acid and alkali-resistant polyethylene film, 152 mm (6 inches) wide with minimum thickness of 0.102 mm (0.004 inch). Tape shall have a minimum strength of 12.1 MPa (1750 psi) lengthwise and 10.3 MPa (1500 psi) crosswise. The tape shall be manufactured with integral wires, foil backing or other means to enable detection by metal detector when the tape is buried up to 3 feet deep. The tape shall be of a type specifically manufactured for marking and locating underground utilities. The metallic core of the tape shall be encased in a protective jacket or provided with other means to protect it from corrosion. Tape color shall be as specified in Table 1 and shall bear a continuous printed inscription describing the specific utility.

Table 1. Tape Color

Red:	Electric
Yellow:	Gas, Oil, Dangerous Materials
Orange:	Telephone, Telegraph, Television, Police, and Fire Communications
Blue:	Water Systems
Green:	Sewer Systems

## **PART 3 - EXECUTION**

### **3.01 PREPARATION**

- A. Verify the existence and location of underground utilities along the route of work. Omission from, or inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.
1. Identify required lines, levels, contours, and datum.
  2. Identify known underground, above ground and aerial utilities. Stake and flag locations.
  3. Protect above and below grade utilities which are to remain.
  4. Protect plants, shrubs, trees, lawns, and other features remaining as a portion of final landscaping.
  5. Protect benchmarks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

### 3.02 PROTECTION

- A. Existing Utilities:
  - 1. Protect existing known utilities from damage due to work required under the scope of this contract. Any damage to utilities will be repaired at the expense of the Contractor.
  - 2. Before beginning trenching operations, obtain an Air Force Form 103, Civil Engineering Work Clearance Permit for any underground or overhead utilities which may be on, or in close proximity to, the trenching areas.
- B. Existing Buildings and Structures:
  - 1. Guard against, and be responsible for, any movement, settlement, or collapse of adjacent buildings, sidewalks, structures, and underground and aboveground utilities. Repair damage done to the Base's property or any other property, on or off the premises, by reason of required work. Adequately brace walls during backfilling and compacting operations.
  - 2. Items to be Relocated: Exercise the greatest possible care when items are scheduled for relocation. Use only skilled labor in the appropriate crafts. Identify items to be relocated, store and protect as directed.
- C. Provide for surface drainage during the period of construction in a manner that protects trenches and adjacent areas. Take precautions and temporary measures, such as temporary seeding, to prevent damage from erosion of freshly graded areas. This applies to damage of newly graded areas within construction limits and damage to adjacent properties by eroded materials.

### 3.03 EXCAVATION

- A. General:
  - 1. Excavation shall be performed to the lines and grades indicated.
  - 2. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench equal to 1/2 the depth of the excavation, but in no instance closer than (2 feet).
  - 3. Excavated material not required or not satisfactory for backfill shall be removed from the site.
  - 4. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein, regardless of source, shall be removed to maintain the stability of the bottom and sides of the excavation. Continue to remove and dispose of water until utility lines, fittings, manholes, and other appurtenances are in place and sealed against the entrance of water. Water, earth, or any foreign materials shall not be allowed to enter the utility lines.
  - 5. Unauthorized overexcavation shall be backfilled in accordance with section 31 23 23, paragraphs 3.05 & 3.07 at no additional cost to the Government.
  - 6. Correct unauthorized excavation at no extra cost to Government.
  - 7. Remove unused excavated material from site in accordance with the following:
    - a. The contractor shall notify the Contracting Officer of the estimated or actual quantity of excess satisfactory soil, defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, and SP. The excess soil shall be removed and disposed of off base by the Contractor.
    - b. All unsatisfactory soil, as defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, shall be the Contractor's responsibility for disposal off base.
- B. Trench Excavation: The trench shall be excavated as recommended by the manufacturer of the pipe to be installed. Trench walls below the top of the pipe shall be sloped, or made vertical, and of such width as recommended in the manufacturer's installation manual. Where no manufacturer's installation manual is available, trench walls shall be made vertical. Trench walls more than five feet high shall be shored, cut back to a stable slope, or provided with equivalent means of protection for employees who may be exposed to moving ground or cave in. Trench walls which are cut back shall be excavated to at least the angle of repose of the soil. Special attention shall be given to slopes which may be adversely affected by weather or moisture content. The trench width below the top of pipe shall not exceed 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter and shall not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, redesign, stronger pipe, or special installation procedures shall be utilized by the Contractor. The cost of redesign, stronger pipe, or special installation procedures shall be borne by the Contractor without any additional cost to the Government.



1. **Bottom Preparation:** The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the pipe. Bell holes shall be excavated to the necessary size at each joint or coupling to eliminate point bearing. Stones of 1.5 inches or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, shall be removed to avoid point bearing.
2. **Removal of Unyielding Material:** Where unyielding material is encountered in the bottom of the trench, such material shall be removed a minimum of 4 inches below the required grade and replaced with suitable materials as provided in section 31 23 23, paragraphs 3.05 & 3.07.
3. **Removal of Unstable Material:** Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with Type "D" as provided in Section 31 23 23, paragraph 2.02.D. When removal of unstable material is required due to the fault or neglect of the contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Government.
4. **Jacking, Boring, and Tunneling:** Unless otherwise indicated, excavation shall be by open cut except that sections of a trench may be jacked, bored, or tunneled if, in the opinion of the Contracting Officer, the pipe, or duct can be safely and properly installed and backfill can be properly compacted in such sections.

- C. **Excavation for Appurtenances:** Excavation for manholes, catch-basins, inlets, or similar structures shall be sufficient to leave at least 12 inches clear between the outer structure surfaces and the face of the excavation or support members. Removal of unstable material shall be as specified above. When concrete or masonry is to be placed in an excavated area special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

**3.04 SPECIAL REQUIREMENTS:** Special requirements for both excavation and backfill relating to the specific utilities are as follows:

- A. **Water Lines:** Trenches shall be of a depth to provide a minimum cover of 3-1/2 feet from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.
- B. **Plastic Marking Tape:** Warning tapes shall be installed directly above the pipe, at the depth of 12-18 inches below finished grade unless otherwise shown.

**3.05 TESTING:** Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government.

- A. **Testing Facilities:** Tests shall be performed by an approved commercial testing laboratory or may be tested by facilities furnished by the Contractor. No work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. The first inspection shall be at the expense of the Government. Cost incurred for any subsequent inspection required because of failure of the first inspection will be charged to the Contractor.
- B. **Testing of Backfill Materials:** Characteristics of backfill materials shall be determined in accordance with particle size analysis of soils ASTM D 422 and moisture-density relations of soils ASTM D 1557. A minimum of one particle size analysis and one moisture-density relation test shall be performed on each different type of material used for bedding and backfill.
- C. **Field Density Tests:** Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. A minimum of one field density test per lift of backfill for every 500 feet of installation shall be performed. One moisture density relationship shall be determined for every 1500 cubic yards of material used. Field in-place density shall be determined in accordance with ASTM D 1556 or ASTM D 6938. When ASTM D 6938 is used, the calibration curves shall be checked and adjusted using the sand cone method as described in paragraph Calibration of the ASTM publication. ASTM D 6938 results in a wet unit weight of soil and when using this method, ASTM D 6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with the density calibration checks as described in ASTM D 6938. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job, on each different type of material encountered, at intervals as directed by the Contracting Officer. Copies of calibration curves,

results of calibration tests, and field and laboratory density tests shall be furnished to the Contracting Officer. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified at no additional cost to the Government.

- D. Displacement of Sewers: After other required tests have been performed and the trench backfill compacted to 2 feet above the top of the pipe, the pipe shall be inspected to determine whether significant displacement has occurred. This inspection shall be conducted in the presence of the Contracting Officer's representative. Pipe sizes larger than (36 inches) shall be entered and examined, while smaller diameter pipe shall be inspected by shining a light or laser between manholes or manhole locations, or by the use of television cameras passed through the pipe. If, in the judgment of the Contracting Officer, the interior of the pipe shows poor alignment or any other defects that would cause improper functioning of the system, the defects shall be remedied as directed at no additional cost to the Government.

**3.06 SETTLEMENT OCCURRING WITHIN THE GUARANTEE PERIOD:** Regardless of the type of compaction or settlement methods used, should settlement occur, refill, compact, and smooth off trenches until made to conform to the ground surface. Correct settlement under pavements and sidewalks as required.

**3.07 GRADING:** Grade to a finish ordinarily obtained from a blade grader, without abrupt changes in grade or holes that will hold water so that effective drainage is secured at all times. Maintain roadways in an acceptable condition at all times until final acceptance.

**3.08 FIELD QUALITY CONTROL**

- A. Field inspection will be performed under provisions of Section 01 41 00.
- B. Provide for visual inspection of bearing surfaces.

**3.09 SPECIAL PROVISIONS**

- A. Maximum length of open trench at any time shall not exceed 165 linear meters (500 linear feet) unless approved otherwise. When approved, the Contractor may upon request, conduct pipe laying activities at more than one separate location; with the restrictions on open trenches applying to each location.
- B. Move minor structures and restore temporary openings in fences to their original condition. Stockpile and reset, in original locations, any culverts, pipes, cables, or minor structures which are moved. Determine actual condition as to structures and miscellaneous obstacles to move for construction purposes. Removal and placement of these items shall be considered as part of the Contractor's obligation, and no additional payment shall be made.
- C. Make open cuts or excavations in sidewalks without additional compensation. Remove concrete from joint to joint wherever the trench crosses a sidewalk or sawcut for asphalt driveways, walkways, and jogging paths. After the pipe is in place and backfilled to the specified density the Contractor shall, at his own expense, replace or reconstruct sidewalks, walkways, and driveways with like materials and restore to the original condition in a manner satisfactory to the Contracting Officer. All installations under pavements and slabs will be accomplished by directional boring to a minimum of five feet beyond the pavement or slab edge. Asphalt settlement or concrete breakage over trenches shall be repaired as directed by the Contracting Officer.
- D. The Contractor shall maintain all the streets he/she is working on until acceptance of the work. Maintenance shall include grading the streets if they become bumpy or rough and the spraying of water on the streets to keep the dust down.
- E. Re-sod areas disturbed by grading or construction.
- F. Cleanup shall proceed directly behind backfilling to accommodate the return to normal conditions. The amount of work on which complete cleanup has not been accomplished shall be limited to 330 linear meters (1,000 linear feet) for the entire job should the Contractor fail to diligently pursue job cleanup.

**END OF SECTION**

MS0114

## **SECTION 31 23 16A EXCAVATION AND SUBGRADE PREPARATION FOR SIDEWALKS, CURBS AND GUTTERS**

### **PART 1 GENERAL**

#### **1.01 SUMMARY**

- A. This section includes excavation for curbs, gutters, sidewalks and minor quantities of new roadbeds.

#### **1.02 REFERENCES**

- A. Specific tests as noted herein: ASTM - American Society for Testing of Materials

#### **1.03 SUBMITTALS**

- A. The following shall be submitted in accordance with the section governing submittal format and requirements:
  - 1. SD-08 Statements: Earthwork: Procedure and location for disposal of unused satisfactory material.  
Proposed source of borrow material.

#### **1.04 DEFINITIONS**

- A. Satisfactory Materials: Satisfactory materials shall comprise any materials classified by, ASTM D 2487 as GW, GP, SW, GM, GC, SP, SM SC, ML, or CL.
- B. Unsatisfactory Materials: Unsatisfactory materials shall comprise any materials classified by ASTM D 2487 as Pt, OH, OL, CN or MN.
- C. Cohesionless and Cohesive Materials: Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136, ASTM D 422, and ASTM D 1140.
- D. Degree of Compaction: Degree of compaction required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557. This will be abbreviated below as a percent of laboratory maximum density.

#### **1.05 CLASSIFICATION OF EXCAVATION**

- A. No consideration will be given to the nature of the materials, and all excavation will be designated as unclassified excavation

#### **1.06 DISPOSAL OF EXCESS EXCAVATED MATERIALS**

- A. All excess fill material shall be disposed of off base at the contractor's expense.

### **PART 2 PRODUCTS (not used)**

### **PART 3 EXECUTION**

#### **3.01 STRIPPING OF TOPSOIL**

- A. Where indicated or directed, topsoil shall be stripped and shall be spread on areas already graded and prepared for topsoil, or when so specified topsoil shall be transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations.

#### **3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum as necessary for the work to be done. Removal and excavation of existing concrete or pavement less than 300 sq ft in affected area will not require technical survey of the area. Depths of excavation for these small orders can be measured by "eyeball" with a simple scale.

- B. Notify Contracting Officer in writing 7 days prior to commencement of work to remove and/or relocate utilities that are observed to interfere with the proposed excavation.

### 3.03 EXCAVATION

- A. Excavate subsoil required to accommodate curbs, gutters, paving, and sidewalks, as well as the required base aggregate course. Excavation depth shall be as necessary to accommodate the base aggregate and pavement specified in the task order. Where excavation depth is not specified; refer to subsection 3.05, "Depth of Excavation".
- B. For excavations over 1000 sq ft in surface area, grade top perimeter of excavation to prevent surface water from draining into excavation. For excavations less than 1000 sq ft, small hand formed "mounds" or sandbags around the perimeter will suffice. For work that will be completed in the same day and for which there is little danger of surface water run-off, special grading or sandbags is not required.
- C. Hand trim excavation. Remove loose matter, large rocks, roots or any other material that could interfere with the base aggregate layer.
- D. Notify Contracting Officer immediately if subsurface conditions are notably different than typical for the area in terms of water content, rock layers, unknown utilities, trash, or buried debris including potential archeological artifacts. Discontinue affected Work in area until notified to resume work.
- E. Correct unauthorized excavation at no extra cost to Government. Excavation deeper than authorized or specified shall be re-filled and thoroughly compacted in lifts no more than 3" deep. If excess surface water or organic material prevents compaction (as determined by the Contracting Officer), the contractor will provide select or aggregate fill as specified by the Contracting Officer and will complete infill by mechanical vibrator instead of by hand tamping.
- F. Remove excavated material from site. Proper disposition of excavated material is the responsibility of the contractor.
- G. Underpin adjacent structures, which may be damaged by excavation work, including utilities and pipe chases.
- H. Provide de-watering as necessary to ensure excavations are dry prior to compaction or addition of aggregates.
  - 1. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 3 feet of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least 1 foot below the working level.
  - 2. Operate dewatering system continuously until construction work below existing water levels is complete.
- I. For excavations near utilities, use of buried warning and identification tape shall be provided as appropriate for each line exposed during excavations. Use polyethylene plastic and metallic core or metallic-faced, acid- and alkali-resistant, polyethylene plastic warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 -inch-minimum width, color coded as specified below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, unaffected by moisture or soil. For all non-metallic piping use a detection wire wrapped around the pipe, in addition to the warning tape. Detection wire shall be, as a minimum, insulated single strand, solid copper with a minimum of 12 AWG.

#### Warning Tape Color Codes

Red	Electric
Yellow:	Gas, Oil; Dangerous Materials
Orange:	Telephone and Other Communications
Blue:	Water Systems

Green:	Sewer Systems
White:	Steam Systems
Gray:	Compressed Air

### **3.04 FIELD QUALITY CONTROL**

- A. Field inspection will be performed by 1SOCES/CEC inspectors.

### **3.05 DEPTH OF EXCAVATION**

- A. Unless specifically directed otherwise, standard excavation depth will conform to the following:
1. For repair/replacement of existing concrete sidewalks, curbs, gutters, and roadways: Use the remainder of the existing aggregate subgrade to serve as the basis for the new concrete. (No new excavation required). Where elevation changes require the disruption of the existing subgrade, excavate to an elevation depth at least equal to the pavement thickness plus 6" (when measured down, starting from the upper surface of the finish pavement). Remove all debris and remnants resulting from the demolition of the existing concrete.
  2. For new concrete sidewalks, curbs and gutters: Provide a minimum excavation depth equal to the pavement thickness plus 4 inches.
  3. For new roadways (Asphalt or Concrete): Provide excavation necessary to accommodate the pavement and base/subbase cross section specified. If design drawings are included, they shall take precedence over this specification and the task order unless specifically stated otherwise in writing from the Contracting Officer. Where no design drawings exist, contact the Contracting Officer to obtain standard subgrade requirements for the area and soil conditions under consideration.
  4. For asphalt sidewalks, curbs and gutters (repair/replacement or new work): Measure existing subgrade (where present). For subgrades less than 6" deep, excavate as necessary to allow for a final subgrade minimum depth of 6" after new material is combined and compacted with existing material. Subgrades greater than 6" depth may remain with no further excavation. Where no subgrade is present, excavate to depth of the pavement thickness plus 6 inches, when measured from the upper surface of the finished pavement.

### **3.06 SELECTION OF BORROW MATERIAL**

- A. Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation and shall be performed by the Contractor at no additional cost to the Government.

### **3.07 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS**

- A. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated in such manner as will afford adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavations of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

### **3.08 GRADING AREAS**

- A. When so provided and where indicated, work under contract will be divided into grading areas, within which satisfactory excavated material shall be placed in embankments, fills, and required backfills.

### **3.09 BACKFILL**

- A. Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials, in such a manner as to prevent wedging action or eccentric loading upon or against any structure. Ground surface on which backfill is to be placed shall be prepared as specified in paragraph PREPARATION OF GROUND SURFACE FOR EMBANKMENTS. Compaction requirements for backfill materials shall also conform to the applicable portions of paragraphs PREPARATION OF GROUND SURFACE FOR EMBANKMENTS, EMBANKMENTS, and SUBGRADE PREPARATION, below and other applicable sections. Compaction shall be accomplished by sheepfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the material being compacted.

### **3.10 PREPARATION OF GROUND SURFACE FOR EMBANKMENTS**

- A. Ground surface on which fill is to be placed shall be stripped of live, dead, or decayed vegetation, rubbish, debris, and other unsatisfactory material; plowed, disked, or otherwise broken up; pulverized; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the material being compacted. The prepared ground surface shall be scarified and moistened or aerated as required just prior to placement of embankment materials to assure adequate bond between embankment material and the prepared ground surface.

### 3.11 EMBANKMENTS

- A. Earth Embankments: Earth embankments shall be constructed from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. The material shall be placed in successive horizontal layers of loose material not more than 6 inches in depth. Each layer shall be spread uniformly on a soil surface that has been moistened or aerated as necessary and scarified or otherwise broken up in such a manner that the fill will bond with the surface on which it is placed. After spreading, each layer shall be plowed, disked, or otherwise broken up; moistened or aerated as necessary; thoroughly mixed; and compacted to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials. Compaction requirements for the upper portion of earth embankments forming subgrade for pavements shall be identical with those requirements specified in paragraph SUBGRADE PREPARATION. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the type of material being compacted.

### 3.12 SUBGRADE PREPARATION

- A. Construction Subgrade shall be shaped to line, grade, and cross section, and compacted as specified. This operation shall include plowing, disking, and any moistening or aerating required to obtain specified compaction. After rolling, the surface of the subgrade for roadways shall not show deviation greater than 5/8 inch when tested with a 10 foot straightedge applied both parallel and at right angles to the centerline of the area. The elevation of the finished subgrade shall not vary more than 0.05 foot from the established grade and cross section.
- B. Compaction: Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the type of material being compacted.
1. Subgrade for Pavements: Subgrade for pavements and shoulders shall be compacted to at least the percentage of laboratory maximum density in the following table for the specific depths below the surface of the pavement [or shoulders] shown.

Depth Below Pavement (or Shoulder) Surface - Inches		Percentage of Laboratory Maximum Density Required			
		<u>Fill</u>		<u>Cut</u>	
From	To	Cohesive materials	Cohesionless materials	Cohesive materials	Cohesionless materials
0"	5"	100	100	100	100
5"	11"	95	100	95	100
12"	16"	90	95	90	95
17"	20"	85	95	85	95

**Any depths over 20" will be specified in individual delivery orders.**

2. Subgrade for Shoulders: Subgrade for shoulders shall be compacted to at least 85 percent laboratory maximum density for the depth below the surface of shoulder shown in the table above.

### 3.13 SHOULDER CONSTRUCTION

- A. Shoulders shall be constructed of satisfactory excavated or borrow materials or as otherwise shown or specified herein. Shoulders shall be constructed as soon as possible after adjacent paving is complete,

but in the case of rigid pavements, shoulders shall not be constructed until permission of the Contracting Officer has been obtained. The entire shoulder area shall be compacted to at least the percentage of maximum density as specified in paragraph SUBGRADE PREPARATION above. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment well suited to the type of material being compacted. Shoulder construction shall be done in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. The completed shoulders shall be true to alignment and grade and shaped to drain in conformity with the cross section shown.

### 3.14 FINISHING

- A. The surface of all excavations, embankments, and subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for all graded areas shall be within 0.1 foot of the grades and elevations indicated except that the degree of finish for subgrades shall be specified in paragraph SUBGRADE PREPARATION above. Gutters and ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be turfed shall be finished to smoothness suitable for the application of turfing materials.

### 3.15 TESTING

- A. Testing shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory. Field in-place density shall be determined in accordance with ASTM D 1556 and/or ASTM D 2167, and/or ASTM D 6938. When ASTM D 6938 is used, the calibration curves shall be checked and adjusted using only the sand cone method as described in ASTM D 1556. ASTM D 6938 results in a wet unit weight of soil and when using this method ASTM D 6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall also be checked along with density calibration checks as described in ASTM D 6938, the calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and in intervals as directed by the Contracting Officer. ASTM D 2937, the Drive Cylinder Method shall be used only for soft, fine-grained, cohesive soils. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements, at no additional expense to the Government. Tests on recompacted areas shall be performed to determine conformance with specification requirements.
- B. Fill and Backfill Material Gradation: One test per 2,500 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C 136, ASTM D 422, or ASTM D 1140 as appropriate.
- C. In-Place Densities:
  - 1. One test per 1,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.
  - 2. One test per 1,000 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.
- D. Moisture Contents: In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of material being placed during stable weather conditions. During unstable weather, tests shall be made as dictated by local conditions and approved by the Contracting Officer.
- E. Optimum Moisture and Laboratory Maximum Density: Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 1,000 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.
- F. Tolerance Tests for Subgrades: Continuous checks on the degree of finish specified in paragraph SUBGRADE PREPARATION shall be made during construction of the subgrades.

### 3.16 SUBGRADE AND EMBANKMENT PROTECTION

- A. During construction, embankments and excavations shall be kept shaped and drained. Ditches and drains along subgrade shall be maintained in such a manner as to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition until ballast, subbase, base, or pavement is placed. The storage or stockpiling of materials on the finished subgrade will not be permitted. No subbase, base course, ballast, or pavement shall be laid until the subgrade has been checked and



approved, and in no case shall subbase, base, surfacing, pavement, or ballast be placed on a muddy, spongy, or frozen subgrade.

**END OF SECTION**

**SECTION 31 23 23:****FILL****PART 1 GENERAL****1.01 SECTION INCLUDES:**

- A. Building perimeter backfilling.
- B. Site filling and backfilling.
- C. Fill under slabs-on-grade and paving.
- D. Consolidation and compaction.
- E. Fill for over-excavation.
- F. Sheet vapor retardant and fill.

**1.02 REFERENCES:**

- A. ANSI/ASTM C136 - Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ANSI/ASTM D698 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lb/ft<sup>3</sup>)
- C. ANSI/ASTM D1556 - Test Method for Density of Soil in Place by the Sand-Cone Method.
- D. ANSI/ASTM D 6938 – Standard Test Method for In-Place Density & Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).
- E. State of Florida Department of Transportation (DOT), Standard Specifications for Road and Bridge Construction (SSRBC), most current edition.

**1.03 SUBMITTALS:**

- A. Submit under provisions of Section 01 33 00.
- B. Samples: Submit 10 lb. sample of each type of fill to testing laboratory, in airtight containers.

**PART 2 PRODUCTS****2.01 FILL MATERIALS:**

- A. Type A - Crushed Stone: Pit run or river washed natural stone; free of shale, clay, friable material, sand, debris; graded in accordance with ANSI/ASTM C136 within the following limits:

<b><u>Sieve Size</u></b>	<b><u>Percent Passing</u></b>
2 inches (50 mm)	100
One inch (25 mm)	95
3/4 inch (19 mm)	95 to 100
5/8 inch (16 mm)	75 to 100
3/8 inch (09 mm)	55 to 85
No. 4	35 to 60

- B. Type B - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter; graded in accordance with ANSI/ASTM C136, to the following:
  1. Minimum Size: 1/4 inch.
  2. Maximum Size: 5/8 inch.
- C. Type C - Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, or organic matter; graded in accordance with ANSI/ASTM C136, within the following limits:

<b><u>Sieve Size</u></b>	<b><u>Percent Passing</u></b>
No. 4	100
No. 14	10 to 100
No. 50	5 to 90

No. 100	4 to 30
No. 200	0

D. Type D - Structural Fill:

1. Earth for structural fill shall consist of material containing no more than 10 percent by weight finer than No. 200 US Standard Sieve and shall be inorganic (less than 3% organic material by dry unit weight) and conform to the following properties:
  - a. Liquid Limit = 30 maximum
  - b. Plasticity Index = 20 maximum
  - c. Dry Unit Weight = 100 pcf minimum
2. Gravel shall consist of crushed stone or gravel. Size and gradation shall be as specified herein below: Total Percent Passing Sieve (By Weight)

Sieve	1-1/2	1	3/4	1/2	3/8	#4	#8
Top	100	100	100	90-	40-	0-	0-
One-Third (Size #7)	100	70	10	5			
Bottom	100	95-	90-	25-	20-	0-	0-
Two-Thirds	100	100	60	55	10	5	

3. Material, which does not conform to the above classifications, may be used as Site Fill material, only outside building and pavement lines, provided Site Fill specifications are met.

- E. Subsoil: Reused or imported, free of gravel larger than 3-inch size, debris, and organic material.
- F. Concrete: Lean concrete with a compressive strength of 1,000 psi.

### PART 3 EXECUTION

#### 3.01 EXAMINATION:

- A. Verify fill materials to be reused are acceptable.
- B. Verify foundation perimeter drainage installation has been inspected.

#### 3.02 PREPARATION:

- A. Generally, compact subgrade to density requirements for subsequent backfill materials.
- B. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type A, B, C, or D fill and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Prior to placement of aggregate base course material at gravel or paved areas, compact subsoil to 98 percent of its maximum dry density in accordance with ANSI/ASTM D698.

#### 3.03 BACKFILLING:

- A. Backfill areas to contours and elevations with unfrozen materials.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.
- C. Granular Fill: Place and compact materials in continuous layers not exceeding 8 inches compacted depth.
- D. Soil Fill: Place and compact material in continuous layers not exceeding 8 inches compacted depth.
- E. Employ a placement method that does not disturb or damage utilities in trenches.
- F. Maintain optimum moisture content of backfill materials to attain required compaction density.
- G. Slope grade away from building a minimum of 6-inches in 10 feet unless noted otherwise.
- H. Make grade changes gradual. Blend slope into level areas.

- I. Remove surplus backfill materials from site.
- J. Trench Backfill: Trenches shall be backfilled to the grade shown. The trench may be backfilled to 2 feet above the top of pipe prior to performing the required pressure tests. The joints and couplings shall be left uncovered during the pressure test. The trench shall not be completely backfilled until all specified tests are performed.

### **3.04 TOLERANCES:**

- A. Top surface of backfilling must be plus or minus one inch from required elevations.

### **3.05 FIELD QUALITY CONTROL:**

- A. Field inspection and testing will be performed under provisions of Section 01 41 00.
- B. Tests and analysis of fill material will be performed in accordance with ANSI/ASTM D698 and with Section 01 41 00.
- C. Compaction testing will be performed in accordance with ANSI/ASTM D 1556, ANSI/ASTM D 6938, and ANSI/ASTM D698 and with Section 01 41 00.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to Government.
- E. Moisture & Density tests shall be in accordance with applicable sections of the Florida Dept. of Transportation Standard Specifications for the specific type of paving.

### **3.06 PROTECTION OF FINISHED WORK:**

- A. Re-compact fills subjected to vehicular traffic.

### **3.07 COMPACTION SCHEDULE:**

- A. Slab-On-Grade, Footings and Bottom of Trenches:
  1. Type D fill, 8 inches thick below bottom of floor slab/footing/trench, compacted to 100 percent.
  2. Cover with Type A fill, if called for on the drawings, 4 inches thick, compacted to 100 percent.
  3. Frequency of Tests:
    - a. Slab-On-Grade: One per 1000 square feet of slab area or fraction thereof for each lift.
    - b. Footings and Bottom of Trenches: One per 50 linear feet or fraction thereof.
- B. Exterior Side of Foundation Walls and Under Grass Areas:
  1. Subsoil or Type D fill, to 6" below finish grade, compacted to 95 percent.
  2. Remainder of 6" fill with topsoil, Compacted to 90 percent.
  3. Frequency of Tests:
    - a. Exterior Areas: One per 1000 square feet or fraction thereof.
- C. Fill Under Asphalt Paving (Base):
  1. Type A fill, minimum 6" inches thick below bottom of finish paving, compacted to 100 percent; or
  2. Minimum 6 inches thick lean concrete to minimum compressive strength of 1,000 psi.
  3. Frequency of Tests:
    - a. Base Course: One per 1000 square feet or fraction thereof.

**END OF SECTION**

## SECTION 31 31 16: TERMITE CONTROL

### PART I GENERAL

#### 1.01 SECTION INCLUDES

- A. Soil treatment for termite control below grade.

#### 1.02 REFERENCES

- A. EPA - Environmental Protection Agency - Federal Insecticide, Fungicide and Rodenticide Act.
- B. DoDI 4150.07 - Pest Management Program.
- C. AFI 32-1053 - Pest Management Program

#### 1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Provide product data of each pesticide to be used, manufacturers written installation instructions, MSDS, composition by percentage, dilution schedule, intended application rate and manufacturer's certification that pesticide meets or exceeds specified requirements.
- C. Submit applicator name, qualification, and current Florida license.
- D. After application, submit application data to include location of application, common name, EPA registration number, formulation, percent of active ingredient, source or NSN, quantity used, and application concentration with finished formulation %, diluent, rate, and method of application/equipment. Data will be provided to Pest Management for reporting to MAJCOM.
- E. Test Reports: Indicate regulatory agency approval reports when required.
- F. Provide sample copy of warranty meeting Section 1.09 requirements.

#### 1.04 PROJECT RECORD DOCUMENTS

- A. Accurately record moisture content of soil before application, date and rate of application, areas of application, diary of meter readings and corresponding soil coverage.

#### 1.05 MAINTENANCE DATA

- A. Indicate re-treatment schedule if required and other information pertinent to warranty.

#### 1.06 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this section with minimum 3 years documented experience, approved by manufacturer and licensed by the State of Florida. Submit copy of current Florida license.

#### 1.07 REGULATORY REQUIREMENTS

- A. Conform to applicable requirements for application in accordance with EPA and Florida Department of Environmental Regulation.

#### 1.08 SEQUENCING

- A. Apply toxicant immediately prior to installation of vapor barrier under slabs-on-grade.

#### 1.09 WARRANTY

- A. Provide **2 year written warranty** (inclusive with no annual renewal required) against subterranean and Formosan termite infestation and reinfestation of the building. Warranty shall **bind** both the contractor and termite contractor to promptly provide such treatment as may be necessary for the elimination and control of termite infestation, **and repair or replace all damage attributed to termites with no cost limitations**. Warranty shall be in a form acceptable to the Government.

### PART 2 PRODUCTS

**2.01 ARMED FORCES PEST MANAGEMENT BOARD APPROVED MATERIALS**

- A. Contact termiticide TERMIDOR 80 WG.
- B. Substitutions: Substitutions will not be considered for chemicals other than contact termiticides. Repellents will not be considered. Approval of deviations from Termidor 80 WG will not be at base level and will extend the normal approval/disapproval time. Contractor should plan accordingly. Substitutions must comply with specification section 01 00 00.

**2.02 MIX**

- A. Mix toxicant to manufacturer's instructions.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

**3.02 APPLICATION**

- A. Spray apply toxicant in accordance with manufacturer's instructions.
- B. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.
- C. Re-treat disturbed treated soil with same toxicant as original treatment.

**3.03 PROTECTION OF FINISHED WORK**

- A. Do not permit soil grading over treated work.

**3.04 LOCATION**

- A. Under slabs-on-grade and along perimeter of exterior and interior sides of foundation walls, grade beams and similar structures. Coordinate with final grading operations to prevent disturbance of toxicant barrier.

**END OF SECTION**

**SECTION 32 11 23****AGGREGATE BASE COURSES****PART 1 GENERAL****1.01 SUMMARY**

- A. This section includes specifications for the aggregate base course and sub base course.

**1.02 REFERENCES**

- A. Specific tests as provided herein:
  - 1. ASTM: American Society for Testing and Materials

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Materials Resources Certificates:
    - a. Certify source and origin for salvaged and reused products.
    - b. Certify recycled material content for recycled content products.
    - c. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Salvaged, refurbished, and reused products.
    - b. Products with recycled material content.
    - c. Regional products.

**1.04 SUBMITTALS**

- A. Submit the following information as listed for all base aggregate covering an area more than 200 sq ft of base material per site. New submittals for materials previously submitted and approved for work under this contract may not be required. No submittals are required for base aggregate used in single sites of less than 200 sq ft.
  - 1. Design Data
    - a. Gradation curve
  - 2. Statements
    - a. Source location and name
  - 3. Test Reports
    - a. Bearing ratio – **CBR**
    - b. Liquid limit
    - c. Plasticity index
    - d. Dry weight of slag
    - e. Percentage of wear
    - f. Moisture – Density Relations
  - 4. Field Test Reports
    - a. Gradation tests
    - b. Density tests

**PART 2 PRODUCTS****2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  - 1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  - 2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

**2.02 MATERIALS**

- A. Graded Aggregate Base: Material shall be graded aggregate. Other materials may not be used without the approval of the Contracting Officer. Obtain materials from approved sources. Preliminary approval of pits/sources shall not mean all material found in the deposit will be acceptable. Maximum dimensions of material particles shall not be greater than two-thirds the compacted thickness of the layer in which it is to be placed. Percentage of loss shall not exceed 40 per ASTM C-131. Gradation of the final composite mixture shall conform to the following size and shall be the basis of the gradation curve:

GRADATION OF AGGREGATES			
PERCENTAGE BY WEIGHT PASSING SQUARE-MESH SIEVE			
	1-1/2"	1"	3/4"
2-inch	100		
1-1/2-inch	70-100	100	
1-inch	45-80	60-100	100
1/2-inch	30-60	30-65	40-70
No. 4	20-50	20-50	20-50
No. 10	15-40	15-40	15-40
No. 40	5-25	5-25	5-25
No. 200	0-10	0-8	0-8

The above values are based on aggregates of uniform specific gravity. Percentages passing the various sieves may require appropriate correction when aggregates of varying specific gravities are used.

- B. Liquid limit and plasticity index: Liquid limit and plasticity index requirements as stated shall apply to the aggregate component blended to meet the required gradation and to the aggregate in the completed subbase or base course. The portion of the aggregate passing a No. 40 sieve shall either be nonplastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5, in accordance with ASTM D 4318.

### 2.03 SOURCE QUALITY CONTROL

- A. Prior to production and delivery of aggregates, take at least one initial sample in accordance with ASTM D 75. Collect each sample by taking three incremental samples at random from source material to make a composite sample of not less than 50 pounds. Repeat sampling procedure when source of material is changed or when deficiencies or variations from specified grading of materials are found in testing.
1. Testing of Samples:
    - a. Make gradation tests from each sample in accordance with ASTM C 136. Determine material passing the No. 200 sieve in accordance with ASTM C 117.
    - b. Make Laboratory Density Tests using ASTM D 1557, Method B, C, or D, for all material.
    - c. Minimum CBR value of 100.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify subgrade has been inspected to determine if gradients and elevations are correct and dry.

### 3.02 AGGREGATE PLACEMENT

- A. Spread aggregate base over prepared base to the total compacted thickness indicated on the plans.
- B. Place aggregate loose in equal layers and compact when total thickness exceeds 6 inches.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Compact each layer to at least 100 percent of the maximum laboratory density determined in accordance with ASTM D 1557. Compact material inaccessible to rolling equipment by mechanical tamping. Finish surface of the layer by blading and rolling. Blade, roll, and tamp until surface is smooth and free from waves and irregularities. Aerate material excessively moistened by rain during construction. Aerate using blade graders, harrows, or other equipment until the moisture content is that needed to obtain specified density. Place and compact earth at edges of course for at least one foot of the shoulder.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.



- F. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

### **3.03 TOLERANCES**

- A. Flatness: Perform smoothness test for areas in excess of 100 sq ft with a 10-foot straight edge applied parallel with and at right angles to centerline of the rolled area. Correct surface deviations in excess of 3/8 inch by loosening, adding or removing material, reshaping, watering, and compacting. When course is constructed in more than one layer, smoothness requirements apply only to the top layer.
- B. Variation from True Elevation: Within 1/2 inch. For sidewalks, new work must have elevation within 1/4 inch of adjoining existing pavement.

### **3.04 FIELD QUALITY CONTROL**

- A. Perform the following tests on new work in place
  1. Field Density Tests: ASTM D 1556 or ASTM D 6938. Take one field density test for each site that is greater than 200 sq ft. For jobs over 500 sq yds, take one field density test and one thickness test per 500 sq yds or fraction thereof.
  2. Thickness Test: Determine thickness of course from test holes not less than 3 inches in diameter. Obtain a thickness test for each site that is greater than 200 sq ft of course. For jobs over 500 sq yds, take one thickness test per 500 sq yds or fraction thereof. Where course deficiency is more than 1/2 inch, correct by scarifying, adding mixture of proper gradation, reblading, and recompacting. Where the measured thickness exceeds the indicated thickness by more than 1/2 inch, consider the measured thickness as the indicated or specified thickness plus 1/2 inch for determining the average. The average thickness shall be the average of the depth measurements and shall not underrun the thickness shown by more than 1/4 inch.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Government.

**END OF SECTION**

## SECTION 32 12 16 ASPHALTIC CONCRETE PAVING FOR ROADS AND PARKING LOTS

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. This section includes Asphaltic concrete paving, tack coat, and preservative seal for roads, parking lots, sidewalks, etc., but **excludes airfields**.

#### 1.02 REFERENCES

- A. Specific tests as provided herein:
1. AASHTO: American Association of State Highway Transportation Officials
  2. ASTM: American Society for Testing and Materials
  3. FDOT: Standard Specifications for Road and Bridge Construction (SSRBC)

**Note: References to “the Engineer” shall be read as “ the Contracting Officer”. SSRBC subsections referring to “Basis of Payment” do not apply.**

#### 1.03 SUSTAINABLE DESIGN SUBMITTALS

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
1. Sustainable Sites Certificates:
    - a. Certify paving materials solar reflectance index.
  2. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

#### 1.04 SUBMITTALS

- A. Submit asphalt job mix formula for review by the Contracting Officer prior to placement of asphaltic concrete under this contract. State of Florida Department of Transportation mix S-1 is considered an acceptable mix for roads. **Airfields are not included.** State of Florida Department of Transportation mix S-3 is considered an acceptable mix for parking lots.

#### 1.05 QUALITY ASSURANCE

- A. Bituminous-concrete mixtures shall be sampled and tested for quality control during construction of the bituminous-concrete courses as follows:

MATERIAL	REQUIREMENT	TEST METHOD	NUMBER OF TESTS
Uncompacted bituminous concrete mix	Sampling	ASTM D 979	One for each mixture or day of operation
Asphalt	Cement content	ASTM D 2172	
	Mechanical analysis	AASHTO T 30	
	Recovery of asphalt cement by Abson Method	ASTM D 1856	
	Penetration of recovered asphalt cement	ASTM D 5	
	Ductility of recovered asphalt cement	ASTM D 113	

Compacted bituminous-concrete	Bulk density	AASHTO T 166	Same as specified for uncompacted mix
Marshall samples	Marshall Stability and Flow Tests	ASTM D 5581	
<b>In-place pavement</b>	Density and thickness	As specified	Three specimens for each <u>1000 square yards</u> (or fraction thereof) of completed bituminous concrete course

## 1.06 REGULATORY REQUIREMENTS

- A. Conform to local (if any) and state requirements for paving work.

## 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Bituminous prime and tack coats shall be applied only when the ambient temperature in the shade is above 50 °F or when the temperature has not been below 35 °F for 12 hours immediately prior to application. Application may commence when the aggregate base course is dry or contains moisture not in excess of the amount that will permit uniform distribution and the required penetration.
- B. Bituminous-concrete courses shall be constructed only when the ambient temperature is above 40 ° F and the underlying base course is dry.

## 1.08 SPREADING EQUIPMENT

- A. Self-propelled electronically controlled type, unless other equipment is authorized by the Contracting Officer. Equip spreading equipment of the self-propelled electronically controlled type with hoppers, tamping or vibrating devices, distributing screws, electronically adjustable screeds, and equalizing devices. Capable of spreading hot bituminous mixtures without tearing, shoving, or gouging and producing a finished surface of specified grade and smoothness. Operate spreaders, when laying mixture, at variable speeds between 5 and 45 feet per minute. Design spreader with a quick and efficient steering device; a forward and reverse traveling speed; and automatic devices to adjust to grade and confine the edges of the mixture to true lines. The use of a spreader that leaves indented areas or other objectionable irregularities in the fresh laid mix during operations is prohibited.

## PART 2 PRODUCTS

### 2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design compliance.
- B. Sustainable Sites Characteristics:
1. Paving Surfaces: Minimum solar reflectance index (SRI) of 29, calculated in accordance with ASTM E1980.
    - a. Reflectance: Measured in accordance with ASTM E903, ASTM E1918, or ASTM C1549.
    - b. Emittance: Measured in accordance with ASTM E408 or ASTM C1371.
- C. Materials and Resources Characteristics:
1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

### 2.02 MATERIALS FOR BITUMINOUS CONCRETE

- A. Aggregate for Bituminous-Concrete: Coarse aggregate shall conform to ASTM D 692. Fine aggregate shall conform to ASTM D 1073. The sand equivalent value shall be not less than 30.
- B. Mineral Filler: Finely ground particles of limestone, hydrated lime or other mineral dust, free of foreign matter.
- C. Asphalt Cement: The asphalt cement shall meet the requirements of ASTM D 3381, table 2, viscosity grade AC-20.

- D. Bituminous Prime Coat: The bituminous prime coat shall be EPR-1 conforming to FDOT Specification Section 916-4.1.
- E. Bituminous Tack Coat: The bituminous tack coat shall be rapid-curing cut-back asphalt conforming to ASTM D 2028, designation RC-70.
- F. Job Mix Formulas: A job-mix formula for each bituminous-concrete mixture proposed for use in the work shall be submitted for approval prior to start of work.

### 2.03 PERFORMANCE REQUIREMENTS

- A. Bituminous-concrete mixtures shall meet the performance requirements described when sampled, and tested. Calculations shall be made for density and voids analyses.

#### PERFORMANCE REQUIREMENTS

TEST PROPERTY	S-1/S-3
Number of compaction blows, each end of specimen	45 to 55
Marshall stability, pounds	1500 minimum
Marshall flow, 1/100-inch units	8 minimum 14 maximum
Percent air void	3 minimum 5 maximum
Percent of voids in mineral aggregate (min)	14

### 2.04 SOURCE QUALITY CONTROL

- A. Provide mix design for asphalt under provisions of Section 01 41 00.
- B. Submit proposed mix design of each class of mix for review prior to commencement of work.

### 2.05 AGGREGATE GRADATION

- A. The submitted job mix shall be within the design range of the following table for base and surface courses:

#### Percentage By Weight Passing Square Mesh Sieves: Type S-1

1"	3/4	1/2	3/8	no. 4	no.10	no.16	no.40	no.80	no. 4	no.200
100	95-100	88-100	75-93	47-75	31-53		19-35	7-21	2-6	

#### Percentage By Weight Passing Square Mesh Sieves: Type S-3

1/2"	3/8"	no. 4	no. 10	no.16	no. 40	no. 80	no.100	no. 200
100	88-100	60-90	40-70		19-35	9-18		2-6

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify base conditions.
- B. Verify that compacted aggregate base course is dry and ready to support paving and imposed loads.
- C. Verify gradients and elevations of base are correct.

### 3.02 SUBBASE

- A. Section 32 11 23 - Aggregate Base Courses: Refer to section 32 11 23 for the basis of work under this subsection.

### 3.03 PREPARATION - TACK COAT

- A. Surface Preparation: Immediately before application of a bituminous prime coat to the aggregate base-course surface or other contact surface, loose material or other objectionable substances shall be removed.
- B. Priming the Base Course Surface: The prime coat shall be uniformly applied to the prepared base course surface. The rate of application shall be within the range of 0.15 and 0.40 gallon per square yard of surface. The temperature of the bituminous material at the time of application shall be within the range of 105 and 180 degrees F. Excess prime-coat material shall be squeegeed from the surface. Areas missed by the bituminous prime coat distributor shall be treated with prime coat material by means of hand sprayers. Following the application of prime coat material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours or longer as may be necessary. Blotting the prime coat with fine aggregate will not be permitted.
- C. Priming Other Contact Surfaces: Contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting the pavement shall be coated with a thin, uniform coating of bituminous tack-coat material prior to the bituminous-concrete mixture being placed against such structures. Following the application of the tack coat, the surface shall be allowed to dry until it is in a condition of tackiness to receive the bituminous-concrete mixture. Excess tack-coat material shall be squeegeed from the surface.

### 3.04 PLACING ASPHALT PAVEMENT - SINGLE COURSE

- A. The bituminous-concrete mixture shall be placed on the prepared surface, uniformly spread and struck off. Bituminous-concrete courses shall be placed in layers of approximately equal thickness except that no layer shall be more than 2-inches thick after compaction.
- B. Pavement Placing: Placing shall begin along the centerline of areas to be paved on a crowned section, at the high side of a section with a one-way slope and in the direction of the traffic flow. The mixture for each course shall be placed in strips not less than 10-feet wide. Progressive strip placement shall commence after rolling of the first strip. Rolling shall be extended to overlap the preceding strips. Placing the bituminous-concrete mixture shall be continuous.
- C. Hand Placing: In areas where the use of machine spreading is not practicable, the mixture shall be spread and finished by the use of heated hand tools. The mixture shall be dumped on approved dump boards and distributed into place from the dump boards in a uniformly loose layer of a thickness that will, when compacted, conform to required grade and thickness. The mixture shall be dumped no faster than it can be handled properly by the shovelers and rakers.
- D. Joints: Joints shall have the same texture, density, and smoothness as other sections of the course. Joints between old and new pavements, or between successive days' work, shall be made to ensure a continuous bond between the old and new sections of the pavement. Transverse joints in succeeding courses shall be offset at least 24 inches. The edge of the previously placed course shall be cut back to expose an even vertical surface over the full thickness of the course. Longitudinal joints in succeeding courses shall be offset at least 6 inches. When the edges of longitudinal joints are irregular or do not conform to the specifications, the edge shall be cut back to expose an even vertical surface over the full thickness of the course.
- E. Machine Spreading: The range of temperatures of the mixtures at the time of spreading shall be between 275 degrees F and 300 degrees F. Bituminous concrete having temperatures less than minimum spreading temperature when dumped into the spreader will be rejected. Adjust spreader and regulate speed so that the surface of the course is smooth and continuous without tears and pulling, and of such depth that, when compacted, the surface conforms with the cross section, grade, and contour indicated. Unless otherwise directed, begin the placing along the centerline of areas to be paved on a crowned section or on the high side of areas with a one-way slope. Place mixture in consecutive adjacent strips having a minimum width of 10 feet, except where the edge lanes require strips less than 10 feet to complete the area. Construct longitudinal joints and edges to true line markings. Establish lines parallel to the centerline of the area to be paved, and place string lines coinciding with the established lines for the spreading machine to follow. Provide the number and location of the lines needed to accomplish proper grade control. When specified grade and smoothness requirements can be met for initial lane construction by use of an approved long ski-type device and for subsequent lane construction by use of a short ski or shoe, in-place string lines for grade control may be omitted. Place mixture as nearly continuous as possible and adjust the speed of placing as needed to permit proper rolling. Follow the following table for minimum spreading temperatures:

- F. Minimum Spreading Temperatures: Minimum temperature of the asphaltic concrete mixture at the point of placement shall be 275 degrees F. Temperature to be taken within five (5) feet of spreader. Placement of mixtures less than specified will not be allowed and any pavement not meeting this requirement will be rejected.

### 3.05 COMPACTION

- A. General: Compaction shall commence as soon after placing as the bituminous-concrete mixture will bear the weight of the roller without undue displacement. During rolling, the wheels shall be kept moist with the minimum amount of water required to avoid picking up the bituminous-concrete mixture. In places not accessible to the rollers, the mixture shall be compacted with hot hand tampers.
- B. Rolling Procedure: Rolling shall commence longitudinally at the extreme sides of lanes and proceed toward the center of the pavement, except on superelevated curves. Rolling on superelevated curves shall commence on the low side and progress to the high side, overlapping on successive trips by at least one-half the width of the rear wheel of the roller. Alternate trips of the roller shall be of slightly different lengths. Rollers shall move at a slow but uniform speed with the drive roll or wheel nearest the paver. Speed of the rollers shall not exceed 3 miles per hour for steel-wheeled rollers or 5 miles per hour for pneumatic-tired rollers.
- C. Initial Rolling: The initial rolling shall immediately follow the rolling of the longitudinal joint and edges. Rollers shall be operated as close to the paver as possible without causing undue displacement. Preliminary tests of crown, grade and smoothness shall be made immediately after the initial rolling.
- D. Second Rolling: The second rolling shall follow the initial rolling as closely as possible, while the mixture is hot and in condition suitable for proper compaction. Rolling shall be continuous (at least 3 complete coverages) after the initial rolling until the mixture has been compacted. Causing undue displacement will not be permitted.
- E. Finish Rolling: Finish rolling shall be done while the mixture is warm enough for the removal of roller marks. Rolling shall continue until all roller marks are eliminated and the course has the specified density.
- F. Patching Deficient Areas: Bituminous-concrete mixtures that become mixed with foreign material or that are defective, such as low areas or "bird-baths," shall be removed, replaced with fresh bituminous-concrete mixture to obtain the required grade and smoothness for the finished surface, and compacted to the specified density. Pavement in deficient areas shall be removed to the full thickness of the bituminous-concrete course and so cut that the sides are perpendicular and parallel to the direction of traffic and the edges are vertical. Edges shall be sprayed with bituminous tack-coat material. Skin patching an area that has been rolled will not be permitted.
- G. Protection of Pavement: After final rolling, vehicular traffic shall not be permitted on the pavement until the pavement has cooled and hardened and in no case sooner than 6 hours.

### 3.06 TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 25-foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.

### 3.07 FIELD QUALITY CONTROL

- A. Field testing will be performed under provisions of Section 01 41 00.
- B. Take samples and perform tests as listed herein.
- C. Perform the following tests:
1. Density: For each 1000 tons of bituminous mixture placed, determine the representative laboratory density in accordance with ASTM D 5581. Samples for laboratory specimens shall be taken from trucks delivering mixture to the site; record in a manner approved by the Contracting Officer the project areas represented by the laboratory densities. From each representative area recorded, determine field density of pavement by densities of 4-inch diameter cores obtained from leveling, binder, and wearing courses; take three cores for each 1000 square yards or fraction thereof of course placed. Determine density of laboratory prepared specimens and cored samples in accordance with ASTM D 1188 or ASTM D 2726, as applicable. Separate pavement layers by sawing or other approved means. **Minimum Density shall be 96 % of the representative laboratory density.** Pavement with a density less than 96% will be rejected. No averaging of densities will be considered.

2. Thickness: Determine thickness of binder and wearing courses from samples taken for the field density tests. **The maximum allowable deficiency at any point shall not be more than 1/4-inch less than the thickness for the indicated course.** Average thickness of course or of combined courses shall be not less than the indicated thickness.
  3. Smoothness: Straightedge test the compacted surface of leveling, binder, and wearing courses as work progresses. Apply straightedge parallel with and at right angles to the centerline after final rolling. Unevenness of leveling and binder courses shall not vary more than 1/4-inch in 10 feet; variations in the wearing course shall not vary more than 1/8-inch in 10 feet.
  4. Finished Grades: Finish grades of each course placed shall not vary from the finish elevations, profiles, and cross sections indicated by more than 1/2 inch. Finished surface of the final wearing course shall be tested by running lines of levels at intervals of 25 feet longitudinally and transversely to determine elevations of completed pavement. Within 45 days after completion of final placement, perform a level survey at the specified grid spacing and plot the results on a plan drawn to the same scale as the drawings. Elevations not in conformance with the specified tolerance shall be noted on the plan in an approved manner. The Contracting Officer will inform the Contractor in writing of paved areas that fail to meet the final grades indicated within the specified tolerances. Skin patching for correcting low areas is prohibited.
  5. Finish Surface Texture of Wearing Course: Visually check final surface texture for uniformity and reasonable compactness and tightness. Final wearing course with a surface texture having undesirable irregularities such as segregation, cavities, pulls or tears, checking, excessive exposure of coarse aggregates, sand streaks, indentations, ripples, or lack of uniformity shall be removed and replaced with new materials.
- D. Correction of deficiencies: All deficiencies will be corrected by removal and replacement of the deficient pavement. Limits of replacement will be determined by additional testing as required to define the area of deficiency. All testing will be the responsibility of the contractor. All replacement will be full lane width with a minimum length equal to the lane width.

**END OF SECTION**

**SECTION 32 13 13****CONCRETE PAVING****PART 1 - GENERAL****1.01 SUMMARY**

- A. The work specified herein consists of the construction of Portland Cement Concrete Pavement. The work shall be performed in accordance with this specification and shall conform to the lines, grades, notes and typical sections shown in the plans. This section also includes reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.
- B. Portland Cement Concrete Pavement, as used herein, is a mixture of Portland Cement, aggregates, water and admixtures uniformly blended and placed to produce a pavement which meets all criteria as set forth in the plans and specifications.

**1.02 REFERENCES**

- A. Specific tests as specified herein:
  - 1. ACI                      American Concrete Institute
  - 2. ANSI                    American National Standards Institute
  - 3. ASTM                   American Society for Testing and Materials
  - 4. AWS                     American Welding Society

**1.03 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design submittals.
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  - 1. Sustainable Sites Certificates:
    - a. Certify paving materials solar reflectance index.
  - 2. Materials Resources Certificates:
    - a. Certify recycled material content for recycled content products.
    - b. Certify source for regional materials and distance from Project site.
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  - 1. Provide cost data for the following products:
    - a. Products with recycled material content.
    - b. Regional products.

**1.04 SUBMITTALS**

- A. Mix Designs (Contractor and Job)
  - 1. Contractor Furnished Mix Design: At least 30 days prior to the mixing and placing of any concrete, submit for approval concrete mix design with test reports which show the results of tests for the specified materials and results of the 7-day and 28-day flexural strength tests of the concrete. The mix design shall be based on aggregate gradation and specific gravity results determined by a laboratory within the past 6 months. If test results are not available, aggregates shall be sampled and tested.
  - 2. Mix Certification: At the expense of the Contractor and before concrete is placed at the job site, each concrete mix design shall be evaluated and certified by an approved engineering testing laboratory. The laboratory's certification shall include but not be limited to the following:
    - a. Confirmation of aggregate test data.
    - b. Evaluation of Mix Designs: Check calculations. Report the following: cement factor, pounds per yard; standard deviation used in design of mix; maximum water, gallons per bag of cement; percentage of fine aggregate to total aggregate by weight; volume of admixture; and yield for one cubic yard of concrete.
    - c. Statement that the selected cement-factor and proposed water-cement ratio for field production of concrete will or will not-provide the specified strength.
    - d. Statement of recommended approval or disapproval of mix design.
- B. Certified Test Reports: Before delivery of materials, submit three copies of certified test reports for the following listed materials:
  - 1. Aggregates
  - 2. Admixtures
  - 3. Materials for curing concrete



C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1. Steel Reinforcing

**1.05 DELIVERY AND STORAGE OF MATERIALS**

- A. Cement: Store cement immediately upon receipt. Store cement in bags in a suitable airtight and waterproof structure; floors shall be elevated above the ground a distance sufficient to prevent the absorption of moisture. Bags shall be stacked close together to reduce circulation of air but shall not be stacked against outside walls; the manner of storage shall permit easy access for inspection and identification of each shipment. Bulk cement shall be transferred to elevated airtight and weatherproof bins. At the time of use, all cement shall be free-flowing and free of lumps. Cement that has been in storage longer than 6 months shall not be used without approval of the Contracting Officer.
- B. Aggregates: Store aggregates in a manner to minimize segregation and prevent contamination of the aggregates. To preclude the inclusion of contaminants, the aggregates may be stored on areas covered with tightly laid wooden planks, sheet metal, or other hard and clean surface. Store aggregates of different sizes in separate piles. Stockpiles of coarse aggregates shall be formed by spreading the materials in thin, horizontal layers not exceeding 5 feet in depth. Stockpiling may be the single-core type, cast and spread type or truck-dumped type. Should the coarse aggregates become segregated, re-mix the stockpile to conform to the specified grading requirements.
- C. Admixtures: Store admixture in a manner that will not damage the containers and which will prevent evaporation. An air-entraining admixture which has been in storage for longer than 6 months or which has been subject to freezing shall not be used. All other types of admixtures which have been stored longer than 15 months shall not be used.

**1.06 GRADE AND SURFACE-SMOOTHNESS REQUIREMENTS**

- A. The finished surface of pavements shall conform to the elevations provided in the contract drawings. The following smoothness requirements are applicable:

**GRADE CONTROLS FOR AIRFIELD PAVEMENT  
OPERATING SURFACES**

Pavement Category	Longitudinal	Transverse
Runway	Max Grade 1.0%.	Max Grade 1.5% Min Grade 1.0%
Taxiway	Max Grade 1.5%.	Max Grade 1.5% Min Grade 1.0%
Apron	Max Grade 1.5% Min Grade 0.5%	Max Grade 1.5% Min Grade 0.5%
Other	Same as Apron	Same as Apron

Notes:

- (1) On runways, the maximum rate of longitudinal grade change is produced by vertical curves having 609 foot lengths for each percent of algebraic difference between two grades. A grade change is not allowed within the first 3000 feet from the runway end.
- (2) On runways, the transverse grade is to remain constant except at intersections where pavement surfaces must be warped.
- (3) On taxiways, the minimum distance between two points of intersection for a change in grade is 1500 feet. Changes in grade are done using vertical curves.

- B. Grade Control: Line and grade shown on contract drawings shall be established and maintained by the Contractor. Elevations of bench marks at the site of work will be determined, established, and maintained by the Government.

- C. Plan Grade: Finished surfaces shall conform to the grade and cross sections indicated on drawings. Deviations from the plan elevation will be permitted only where the proper functioning of drainage, appurtenant structures, or matching to existing pavement elevation is required.
- D. Surface Smoothness: Finished surfaces shall not deviate from the testing edge of a 12 foot straightedge more than tolerances shown for the respective pavement category below:

#### SURFACE SMOOTHNESS TOLERANCES

Pavement Category	Direction of Testing	Allowable Tolerance
Runway and Taxiway	Longitudinal	1/8 inch
	Transverse	1/4 inch
Calibration Stands and Compass Swing Bases	Longitudinal	1/4 inch
	Transverse	1/4 inch
All Other Airfield Areas	Longitudinal	1/4 inch
	Transverse	1/4 inch

- E. Edge Slump: Edge slump is the downward movement of the concrete along the pavement edge measured not more than 1.0 foot from the free edge. When a slip-form paver is used, 85 percent of the pavement, within a distance of one full slab length, shall have an edge slump less than 1/4 inch, and 100 percent of the pavement, within a distance of one full slab length, shall have an edge slump less than 3/8 inches. The use of paving equipment and/or procedures that fail to provide pavement edges within the above limitations shall not be allowed.

### 1.07 SURFACE EVALUATION TECHNIQUES

- A. The finished surface shall be evaluated for conformance with the plan grade and surface smoothness and edge slump by the contractor.
- B. Equipment: The contractor shall furnish and keep at the jobsite one 12 foot straightedge for each operating paver. The straightedge shall be used for testing the surface smoothness and/or edge slump of placed concrete. Wood shall not be used. The straightedge shall have a flat bottom and shall be adequately rigid to assure accuracy.
- C. Surface-Smoothness Determinations: When the concrete is hard enough to walk upon without damage to the surface, but not later than 24 hours after placement, the contractor shall test the pavement surface for smoothness. The testing will be observed by the Government. Testing shall be accomplished using a 12 foot straightedge which shall be placed to reveal surface irregularities. The entire area of the pavement shall be tested in both the longitudinal and transverse direction. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement and continuing across transverse joints.
- D. Edge Slump Determination: When the concrete will support walking without damage to the surface, the pavement shall be tested by the contractor with a 12 foot straightedge. The edge slump shall be determined at each free edge of each paving lane. The straightedge will be placed transverse to the direction of paving with the end of the straightedge at the free edge of the paving lane. Measurements will be made at increments of not more than one slab length.

### 1.08 SURFACE DEFICIENCIES AND CORRECTIONS

- A. High areas: High areas less than 1/4 inch may be reduced by grinding the hardened concrete. Grinding shall only be accomplished when the concrete can support the weight of the equipment without damage to the surface. High areas exceeding 1/4 inch must be corrected by removal and replacement. Cold planing of the deficiency will not be allowed unless approved by the Contracting Officer. Removal and replacement will be per paragraph 1.08.
- B. Low Areas: Areas exceeding the tolerance specified will be removed and replaced per paragraph 1.08.
- C. Excessive Edge Slump: Adding concrete to or otherwise manipulating the fresh concrete shall not be used as a method to correct edge slump. Edge slump shall be corrected by adjustment of the concrete mixture or the paving machine. Where edge slump exceeds the allowable, the placed concrete exceeding the limits of edge slump shall be removed and replaced per paragraph 1.08.

### 1.09 REMOVAL AND REPLACEMENT OF CONCRETE PAVEMENT

- A. Removal will be across the full width of the pavement lane or to the nearest planned longitudinal joint when multiple lanes are placed. Removal shall be to the nearest planned transverse joint which isolates the deficiency. Replaced sections will be tied to the adjacent sections as directed by the Contracting Officer.

## **PART 2 - PRODUCTS**

### **2.01 SUSTAINABILITY CHARACTERISTICS**

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design compliance.
- B. Sustainable Sites Characteristics:
  1. Paving Surfaces: Minimum solar reflectance index (SRI) of 29, calculated in accordance with ASTM E1980.
    - a. Reflectance: Measured in accordance with ASTM E903, ASTM E1918, or ASTM C1549.
    - b. Emittance: Measured in accordance with ASTM E408 or ASTM C1371.
- C. Materials and Resources Characteristics:
  1. Recycled Content Materials: Furnish materials with maximum available recycled content.
  2. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

### **2.02 PORTLAND CEMENT**

- A. Cement to be used or furnished under this specification shall be Portland cement, conforming with the requirements of ASTM C-150, Type I, II, or III, or Portland Pozzolan Cement, conforming with the requirements of ASTM C-595. Pozzolan materials shall not be used as a directly added ingredient in concrete in combination with Portland Pozzolan Cement.

### **2.03 WATER**

- A. Water for mixing and curing shall be fresh and clean. Turbidity of the water shall not exceed 2,000 parts per million.

### **2.04 AGGREGATES**

- A. Alkali Reactivity: Aggregate shall be free of substances that are deleteriously reactive with the alkalis in the cement in an amount sufficient to cause excessive expansion of the concrete. Acceptability of the aggregate shall be based upon satisfactory evidence furnished by the Contractor that the aggregate is free from such materials. Such evidence shall include service records of concrete of comparable properties under similar conditions of exposure and/or certified records of tests by an approved testing laboratory. Tests shall conform to Method of Test for Potential Reactivity of Aggregates (Chemical Method), ASTM C289. Aggregates shall be washed before use.
- B. Fine Aggregates: Fine aggregate is defined as clean granular material which passes an ASTM Number 4 Standard Sieve size and shall conform to ASTM C33, except as otherwise modified herein. Fine aggregates from different sources of supply shall not be mixed or stored in the same stock pile nor used alternately in the same concrete mix. Grading shall conform to ASTM C33. The maximum limitation of the fineness modulus of 3.1 specified in ASTM C 33 is not applicable and may be exceeded. The fineness modulus shall not be less than 2.3. Fine aggregate shall be natural sand(s) or a blend of mechanical (manufactured) sand and natural sand(s).
- C. Coarse Aggregates: Coarse aggregate is defined as that material retained on and above the Number 4 ASTM Standard Sieve size and shall conform to ASTM C33 except as otherwise modified herein. The grading requirements for coarse aggregates of ASTM C 33 do not apply and shall be as specified herein.
  1. The abrasion loss shall not exceed 40 percent for aggregates tested in accordance with ASTM C131.
  2. Deleterious Substances: Requirements of Table 3 as given in ASTM C 33 apply, except the deleterious substances in coarse aggregate shall not exceed the following percentage by weight when tested in accordance with the tests designated in ASTM C 33: Maximum percent by weight of total samples Clay lumps including friable particles 1.0 +/- 0.5.
  3. Coarse aggregate shall be washed and shall consist of crushed stone.
  4. Particle shape of the coarse aggregate shall be generally cubical in shape. Size should be 1.5" for pavement depths greater than 10 inches and 1" for depths less than 10 inches. The quantity of flat and elongated particles in any size group shall not exceed 0 percent, by weight, as determined by CRD-C-19. A flat particle is defined as one with a ratio of width to thickness greater than three. An elongated particle is one having a ratio of length to width greater than three.

5. The nominal maximum aggregate size shall be 1-1/2 inch, Class designation 4M as defined in ASTM C-33.
- D. Blending Sizes: Blending sizes are defined as intermediate size particles nominally passing the 3/8 inch sieve and retained above the ASTM Number 50 Standard Sieve size.
1. Blending sizes shall be washed clean materials of either natural deposits, manufactured products, or combinations thereof.
  2. Blending sizes shall meet the limits of deleterious substances and/or physical property requirements of ASTM C-33 based upon the aggregate sizes. Material which is of the coarse material size, by definition, shall meet coarse aggregate quality requirements. The material portion which meets the definition of the fine aggregate shall meet the quality requirements of the fine aggregate.
  3. The particles shall be generally cubical in shape without the presence of elongated or slivered materials.

## 2.05 ADMIXTURES

- A. Use of Admixtures must be approved by Contracting Officer.
1. Air-Entraining Admixtures: The air-entraining admixture shall conform to ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entraining admixture shall be in a solution of suitable viscosity for field use.
  2. Chemical Admixtures: ASTM C494, Type B - Retarding or Type A - Water Reducing. Submit for government approval, test reports from a laboratory approved by the Contracting Officer certifying that the proposed admixtures, when combined with the cement and aggregates to be used, will produce the specified concrete having the desired properties with respect to retardation, water content, slump and strength.
  3. Pozzolans: Pozzolanic materials to be used in concrete or furnished under this specification shall conform to the requirements of ASTM C618 for Class F or Class C. If an approved pozzolanic material is used, the weight of flyash in the mix shall not exceed 10 percent determined by dividing the weight of flyash by the weight of portland cement.

## 2.06 MATERIALS FOR CURING CONCRETE

- A. Waterproof Paper: Shall conform to ASTM C171, regular color.
- B. Polyethylene Sheeting shall not be used.
- C. Polyethylene-Coated Waterproof Paper Sheeting shall not be used.
- D. Polyethylene-Coated Burlap: Shall conform to ASTM C171.
- E. Liquid Membrane-Forming Compound: Shall conform to ASTM C309, white-pigmented Type 2, Class B, and be free of paraffin.
- F. Liquid Chemical Curing Compound: Shall be a compound which shall restrict the loss of moisture and properly cure the surface of the concrete. The chemical compounds shall be free of petroleum resins or waxes. The application of the chemical compounds shall be at the coverage recommended by the manufacturer, and the loss of moisture when determined in accordance with ASTM C156 shall not exceed 0.055 gram per square centimeter of surface. The abrasion loss if any shall not exceed 80 percent of that of the same concrete, untreated, when tested in accordance with ASTM C418 at age of 28 days.

## 2.07 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615, 40 ksi yield grade; plain and deformed billet steel bars.
- B. Reinforcing Steel Mat: ASTM A704, ASTM A615, 40 ksi.
- C. Stirrup Steel: ANSI/ASTM A82, plain finish.
- D. Welded Steel Wire Fabric: ASTM A185 Plain Type ASTM A497 Deformed Type; in flat sheets.
- E. Tie Wire: Minimum 16 gage annealed type.
- F. Chairs, Bolsters, bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.

- G. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.
- H. All reinforcement shall be free from loose, flaky rust, loose scale, oil, grease, mud, or other coatings that might reduce the bond with concrete. Removal of thin powdery rust and tight rust is not required; however, reinforcing steel which is rusted to the extent that it does not conform to the required dimensions or mechanical properties shall not be used.
- I. Dowels: Dowels shall be fabricated or cut to length at the shop or mill before delivery to the site. Dowels shall be free of loose, flaky rust and loose scale, and shall be clean and straight. Dowels may be sheared to length provided that the deformation from true shape caused by shearing does not exceed 0.04 inch on the diameter of the dowel and does not extend more than 0.04 inch from the end of the dowel. Dowels shall be plain steel bars conforming to ASTM A 615, grade 40 or 60; ASTM A 996, grade 50 or 60, or ASTM A996, grade 60, or shall be steel pipe conforming to ASTM A53, extra strong, as indicated. Split dowels shall be of the threaded type, of approved design. The external and internal threaded portion of the split dowels shall conform to the thread designation given in the tabulation below. When 3-piece split dowels are furnished, the minimum coupling length shall be as indicated below:

Dowel Diameter in Inches	Thread Designation	Minimum Coupling Length in Inches
$\frac{3}{4}$	7/8-9-UNC-2A-RH	2
1	1 1/8-7-UNC-2A-RH	2 1/2
1 1/4	1 3/8-6-UNC-2A-RH	3
1 1/2	1 3/4-5-UNC-2A-RH	3 3/4
2	2 1/2-4 1/2-UNC-2A-RH	4 3/4
3	3 1/4-4-UNC-2A-RH	6 3/4

- The minimum length of each external threaded portion of the split dowels shall not be less than the nominal diameter of the dowel. Split dowels, when assembled in place, shall be straight with length as specified, and shall have all external threads enclosed. End faces of couplings and of female portions of split dowels shall be squared to assure proper alignment of the dowel during installation.

- J. Fabrication:
- Fabricate concrete reinforcing in accordance with ACI 318.
  - Weld reinforcement in accordance with ANSI/AWS D12.1
  - Locate reinforcing splices not indicated on Drawings, at point of minimum stress.

## 2.08 FORMS

- A. General Requirements: Construct forms of metal, except that flexible or curved forms may be metal or wood on curves having a radius of 150 feet or less and for fillets. Forms shall be of the full depth of the concrete and of a strength, when staked, sufficient to resist the pressure of the concrete and the loads resulting from the finishing operations without springing, settling, or losing their shape. All forms shall be free of bulge and warp, and shall be cleaned thoroughly before being reused. Before placing the concrete, coat the contact surfaces of forms with a non-staining mineral oil.
- B. Side Forms: Place side forms only on underlying material that is at the proper grade. Set the side forms for full bearing on the foundation for the entire length and width and to the alignment of the edge of the finished pavement. Support the forms during the entire operation of placing, compaction, and finishing the pavement in such a manner that the forms will not deviate vertically more than 0.01 foot from the required grade and elevations indicated on the drawings. The maximum vertical deviation of the top of any side form, including joints, shall not exceed 0.01 foot from a 12-foot straightedge, nor shall the inside face vary more than 0.02 foot from a 12-foot straightedge. Stake sockets and interlocking devices shall be in such condition that they will prevent movement of the form.
- C. Metal Forms: Use metal forms free from irregularities, dents, and sags. The top face of the form shall not vary from the plane of the face by more than one-eighth inch in 10 feet, and the lateral variation shall be not greater than one-fourth inch in 10 feet.
- D. Wood Forms: Use wood forms made of plywood or well-seasoned lumber. Planks shall have a nominal thickness of not less than 2 inches and shall not vary on their edges more than one-eighth inch in 5 feet from the plane of the curve indicated on the drawings. The top face of the form shall not vary from the plane of the face by more than one-eighth inch in 10 feet.

**2.09 ACCESSORIES**

- A. Joint Filler: Shall be preformed materials conforming to ASTM D1751 or D1752.
- B. Epoxy Resin: All epoxy resin materials shall be two-component materials conforming to the requirements of ASTM, C181, class as appropriate for each application temperature to be encountered, except that in addition, the materials shall meet the following requirements:
  1. All materials shall have a 24-hour absorption not greater than 1 percent.
  2. The materials for bonding freshly mixed Portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete shall be Type II materials, grade as approved.
  3. The materials for use as patching materials for complete filling of spalls, wide cracks, and other voids; for use in embedding dowels and anchor bolts, and for use as a binder in preparing epoxy resin mortars and concretes, shall be Type III materials, and shall, in addition, meet these requirements: (a) the bond strength at 14 days (moist cure) shall be at least 1000 psi, and (b) the volatile content, cured system, shall not exceed 3 percent. Grade shall be as approved except that Grade 3 shall be used for embedding dowels in hardened concrete.

**2.10 CONCRETE MIX**

- A. Design concrete based on procedures derived from ACI 211.1, except as modified herein. Acceptance of concrete shall be based on requirements in paragraph, Field Sampling and Testing. Mix design shall take into consideration the coefficient of variation of the concrete batch plant and method of placement of the concrete. In the event such data is not available, a coefficient of variation of 10 percent and a probability of one test in ten falling below the specified strength shall be assumed in the design, except that the mix design during the progress of the work shall reflect actual concrete plant standard deviations and the mix design adjusted to assure concrete conforming to the specified requirements. The results of all trial batches, the standard deviation, estimated production rates, and number of daily tests shall be submitted with the mix design. Admixtures proposed for use in the mix will be permitted, provided they meet the requirements specified herein. The mix design shall be as specified herein under Submittals and conform to the following:
  1. Minimum Flexural Strength 28 Days (psi): 650.
  2. Maximum Aggregate Size (inches): 1 1/2".
  3. Maximum Water-Cement Ratio (by weight): 0.50.
  4. Range in Slump (Inches): 1-2. (0-1 for slipform pavers).
  5. Allowable air content: 6.0 +/- 1.5 percent by volume.
  6. The minimum cement factor is required for durable concrete with local aggregates but may be insufficient to obtain the specified strength; in that case, the Contractor shall increase the cement factor as necessary without additional compensation under the contract.

**PART 3 - EXECUTION****3.01 BASE PREPARATION**

- A. Before concrete is placed, the surface of the base shall be brought to finish grade and elevations as shown. The fine grading equipment shall be equipped with adjustable steel cutting devices capable of accurately producing the required surface. Fine grading of cement treated bases shall be completed prior to initial hardening of the base material.

**3.02 FORMING**

- A. Setting and Removing Forms Not Specified Otherwise: The forms shall be joined neatly and tightly, staked securely to line and grade, and braced firmly throughout. Where practicable, set forms at least 500 feet in advance of the point where concrete is being placed. Oil forms thoroughly before concrete is placed against them. Forms shall remain in place for at least 12 hours after concrete has been placed against them. After form removal and until the end of the curing period, the sides of the pavement shall be protected with moist earth or by other approved methods. Remove forms in a manner to preclude damaging the concrete.
- B. Planer: A planer mounted on rollers riding the forms or on previously constructed slabs, or a power grader operating between forms shall be provided for shaping the final surface of the underlying material. The power grader or power equipment used to pull the planer shall not produce ruts or indentations in the material. Before forms are set, final surface grading may be completed with automatic planer controlled for both direction and grade. Surface of base material shall not vary more than plus or minus 0.02 foot from the indicated elevations. When riding on previously constructed slabs, the planer shall be operated to prevent damage to surfaces or edges of the existing concrete.

- C. **Templates:** Provide a scratch template for checking the contour of the underlying material. Mount a template of rigid construction on wheels that are supported on side forms or on concrete in adjacent lanes. Provide on the template adjustable rods projecting downward to the surface of the material and at maximum one foot intervals. Adjust the rods to the required cross section at the bottom of the slab when the ends of the template are supported on the side forms or on concrete in the adjacent lanes. Check the Template frequently during use to assure that the rods are in the correct position.
- D. **Grade Between Forms:** Remove from the surface of the underlying material all foreign matter, waste concrete, cement, and debris. Finish the surface of the underlying material to the required section as shown on the drawings. Test the prepared surfaces with a template, after which maintain the surface in a smooth, compacted condition in conformity with the required section and established grade until concrete is placed. Wet the underlying material in advance of placing concrete to insure a firm, moist condition at the time concrete is placed. Do not permit equipment other than concrete delivery or paving equipment on the prepared underlying material located between forms. In cold weather protect the underlying material from frost when concrete is placed. The use of chemicals to eliminate frost in the underlying material shall not be permitted.

### **3.03 SLIP FORM CONSTRUCTION (Contractor's Option)**

- A. Use of a slip form paver is subject to specific approval by the Contracting Officer. The contractor shall provide a minimum of two references before consideration will be given by the government to allow the use of a slipform paver. The references must be for work accomplished in the past two years.
- B. The contracting officer will allow use of slipform paving only when the contractor can demonstrate that positive control of the edge slump and surface finish can be maintained. The contractor shall place a test strip using that concrete, manpower, equipment, and people that will be performing the work. If the test strip is approved, procedures used to accomplish the test strip shall become the standard for the work. When a successful placement of concrete can not be attained with the slipform paver, the contractor will use fixed forms.
- C. **Base Preparation:** Finish the base to the required section as shown. If the surface of the underlying material is to be used for grade and elevation control of the slip-form paver, the surface shall not vary more than plus or minus 0.02 foot from the elevations shown on the drawings. When the grade and elevation control of the slip form paver is established by a string line, the surface shall not vary more than plus or minus 0.04 foot. Remove from the surface of the underlying material, all foreign matter, waste concrete, cement, and debris. Wet the underlying material in advance of placing concrete to insure a firm, moist condition at the time concrete is placed. Do not permit equipment other than concrete delivery or paving equipment on the prepared underlying material. Fill and recompact all ruts, holes, or other indentations of the surface. Confirm the final grade immediately before concrete is placed.
- D. **Paving Equipment:** Slip-form paving equipment shall be a self-propelled, automatically controlled, full tracked, concrete paving, finishing machine, capable of spreading and shaping the plastic concrete to the specified cross-section in one pass, and consolidating concrete to the specified cross-section in one pass, and consolidating concrete mixtures as low as O-inch slump. The paver shall screed and finish the freshly-placed concrete in such a manner that a minimum of hand finishing is required. Paver shall be equipped with horizontal auger for pre-leveling plastic concrete to provide a uniform distribution for the slip form paver.
- E. **Slip-Form Construction:** Uniformly distribute concrete without delay into final position by a slip-form paver. For the full paving width, consolidate the concrete by internal vibration with transverse vibrating units or a series of longitudinal vibrating units. If a series of longitudinal vibrating units are used, they shall be spaced at intervals not to exceed 2-1/2 feet, measured center to center.
  - 1. **Internal Vibration:** The term "internal vibration" shall mean vibration by means of vibrating units located within the thickness of pavement section. The rate of vibration of each vibrating unit shall be not less than 8,000 vibrations per minute in the concrete, and the amplitude of vibration shall be sufficient to be perceptible on the surface of the concrete along the entire length of the vibrating unit and for a distance of at least one foot therefrom. The Contractor shall furnish a tachometer or suitable device for measuring and indicating the actual frequency of vibrations.
  - 2. **Equipment Support:** When concrete is being placed adjacent to an existing pavement and part of the equipment is supported on the existing pavement, provide protection to prevent damage to the previously constructed pavement, such as installing protective pads on crawler tracks or rubber-tire wheel and operating the equipment a sufficient distance from the pavement edge.

3. Alignment: No abrupt changes in longitudinal alignment of the pavement will be permitted. The horizontal deviation shall not exceed 0.10 foot from the established alignment of the pavement edge. Horizontal alignment shall be referenced to a taut string line or the surface of the underlying material.
- F. Widths Less Than A Traffic Lane: Concrete required to be placed in widths less than a traffic lane may be compacted and shaped by a powered mechanical compacting and shaping machine, except that a transverse tube (pipe) compactor shall be subject to approval of the Contracting Officer. Consolidation shall be supplemented with vibratory compactors. Where hand compaction is performed, construct a tamper of heavy plank with length that exceeds the width of the pavement by a minimum of one foot, shod with a heavy strip of metal for a tamping surface, and stiffened adequately to maintain the required shape during use. For concrete production in excess of 40 cubic yards per hour, and where all compaction is performed by hand methods, use at least two tampers.
  - G. Locations Inaccessible to Slip-Form Paving Equipment: Locations inaccessible to slip-form paving equipment shall be constructed as specified herein under "Conveying and Placing Concrete".

### 3.04 REINFORCEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position. Do not displace or damage vapor barrier. Accommodate placement of formed openings. Maintain concrete cover around reinforcing equal to at least 150% of the maximum aggregate size or 1 1/2 inches, whichever is greater.

### 3.05 PROPORTIONING AND MIXING CONCRETE

- A. Proportioning Concrete: Proportion concrete in accordance with the approved mix design. Except when failures of equipment or other unusual circumstances necessitate the temporary use of volumetric proportioning, all concrete shall be proportioned by weighing.
- B. Volumetric Proportioning: When volumetric proportioning is required, the weight proportions in the mix design shall be adjusted into equivalent volumetric proportions by weighing representative samples of the aggregates in the conditions in which they will be measured and in accordance with ASTM C 29. In determining the true volume of the fine aggregate, allowance shall be made for the bulking effect from the moisture contained therein.
- C. Concrete Equipment: In order to meet the plan and schedule of paving operations, select the number and sizes of units to accomplish the work. Maintain the concreting equipment in good condition. Assemble the equipment at a time sufficient to permit thorough inspection, calibration of weighing and measuring devices, adjustments of parts, and the making of any necessary repairs for satisfactory performance prior to the start of paving. Plant mixers, truck mixers, agitators, and non-agitating units shall conform to the applicable industry standards. On request by the Contracting Officer, the Contractor shall submit a detailed check list for the inspection of the equipment.
- D. Batching Facilities:
  1. Batching Plant: Shall include batcher, bins, weighing hoppers, pollution control collectors, and other weighing equipment. Support the structure for the bins and scales on firm foundation. Level and maintain the structure within the tolerances necessary for the proper operation of the weighing mechanism. Provide separate storage bins or compartments for fine aggregate and for each size of coarse aggregate with ample capacity and proper arrangement to preclude mixing of stored aggregates, under all working conditions. All weigh scales, remote weighing systems and balances for separate and cumulative aggregate weighing shall conform to manufacturer's standard tolerances for separate aggregate batches.
  2. Product Control: Design and arrange bins, discharge gates and conveyors to facilitate free flow and efficient control of materials entering the weigh hoppers. Construct weigh hoppers to provide for removing an overload of any one of the materials, also provide controls of the hopper so that as the aggregate approaches the level desired in the hopper, the rate of flow can be slowed and finally the flow shut off with precision, avoiding over-runs.
  3. Plant Inspection: Assemble the plant to facilitate inspection of all operations at all times, and provide ready adjustment to compensate for varying moisture content of aggregate and for changing proportions of materials. Provide test weights or other equipment for calibrating and checking the measuring devices. The Contractor shall make all necessary corrections to secure satisfactory performance. Arrange the batching plant so that the weighing beam or dial and the aggregate discharge gates are in full view of the operator. Install glass windows to provide a view of mixer charging and discharging, truck loading positions, and water and additive gages. Scales shall be accurate within 1/2 of one percent. Design plant for capability of delivering quantities of aggregates within a limit of accuracy of 2 percent of the desired



amount. Cement handled in bulk shall be transferred to separate weighing hopper capable of delivering quantities of bulk cement within a plus or minus tolerance of one percent. Provide canvas tremie or curtains attached to the discharge hopper to prevent loss of cement when discharging into batch trucks or mixers. Bulk cement elevators shall be handled by pneumatic or screw conveyors. Bucket cement elevators shall not be used unless approved by the Contracting Officer. Cement in standard packages (bags) need not be weighed, but fractional packages shall be weighed.

4. Mixer and Agitators: Attach to each mixer and agitator in a prominent place, a metal plate or plates showing clearly the use for which the equipment is designed, the capacity of the drum or container in terms of the volume of mixed concrete, and the manufacturer's recommended speed of rotation of the mixing drum or blades. Examine mixers and agitators daily for changes in condition due to accumulations of hardened concrete or mortar or to wear of blades. Do not use mixer or agitator if the slumps of individual samples of concrete, taken from time to time at approximately the one-quarter and the three-quarter points of the load, differ by more than one inch the equipment may be used when operation with a longer mixing time or with a smaller load will permit the slump requirements to be met.
  - a. Mixers: Provide batch type mixers, whether field-operated pavers, central mix plants, or truck mixers. The mixing equipment shall be capable of combining the aggregates, cement, and water within the specified time into a thoroughly mixed and uniform mass, and of discharging the mixture without segregation. The mixer shall have a rated capacity of at least 27 cubic feet of mixed concrete and shall not be charged with batches greater than the manufacturer's rated capacity. Construct and operate mixer so that water or any part of the mixture will not be lost while unit is in operation. Concrete uniformity shall conform to the criteria stated in Annex A1, ASTM C 94. Maintain concrete uniformity in rotating drum mixers by replacing pick-up and throw-over blades which are worn with new blades.
  - b. Stationary Mixers: When stationary mixers are approved for use, the central plant mixers shall be single-drum or multiple-drum type. Equip mixers with a device for measuring and indicating the quantity of water entering the batch. The device shall prevent leakage of water when the valves are closed, and be able to measure within a range of error of not more than one percent. Provide for each mixer a vertical tank for mixing water, equipped with a gauge glass, graduated scale for reading in terms of weight, and a suitable overflow for regulating the filling of the tanks. Install a device for automatically measuring and indicating the time of mixing and an interlocking mechanism to prevent discharge of concrete before expiration of the required mixing time. Provide an automatic counter for indicating the number of batches handled. Install a sensor to verify the flow of admixture to the mechanical dispenser.
  - c. Truck Mixers: Each tank mixer shall have a watertight drum suitably mounted and fitted with adequate blades capable of uniformly combining the mixture. Raise trailing dollies when not in use or when mixer load is being discharged. Provide a control switch for lowering or raising the booster axle to prevent lowering of the trailer after the load, or a partial load, has been discharged, unless a reset safety button is pushed. Provide a load adjustment control valve with a calibrated scale visible to the truck operator. Provide a revolution counter activator by the mixer drum. Provide truck mixers which will uniformly discharge low slump concrete. An inspection ladder shall be mounted on each mixer to permit ready inspection of the consistency of the concrete before discharging from drums.
  - d. Water Storage Tanks: Measuring tanks on truck mixers shall include outside taps and valves to facilitate checking the calibration of water tanks for providing water within one percent accuracy of the amount of water in the tank. Enclosed tanks operated by air pressure shall be visibly marked or labeled with the degree of accuracy for measuring the amount of water leaving the tank. Water meters if used shall be protected by pressure relief valves. Sight gages on tanks shall meet accuracy requirements of plus or minus one, or 2 percent of the total quantity of mixing water in a batch. At the job site the Contracting Officer may permit a small quantity of tempering water (not to exceed 2.5 gallons per cubic yard of concrete) to be added to the batch before discharging of the concrete provided the approved water-cement ratio is not exceeded. Locate water meters, gages, and other calibrated measuring devices on the pipe lines between the water tank and the mixer drum.
  - e. Agitators: Agitators shall be truck mixers operated at a speed of rotation designed by the manufacturer as agitating speed, or truck agitators. Agitators, when loaded to capacity, shall be capable of maintaining the mixed concrete in thoroughly mixed and uniform mass and of discharging the concrete at the specified slump.
5. Transportation Equipment: Vehicles used for transporting mixed concrete from a central mixing plant shall provide slow agitation of the concrete during transit, except that non-agitating equipment which will deliver the mixture in an unsegregated condition of uniform consistency may be used as specified herein. Concrete mixed and delivered in truck mixers is specified elsewhere.
  - a. Non-Agitating Equipment: When non-agitating equipment is used to transport concrete, discharge shall be completed within 45 minutes after introduction of the mixing water to the cement and aggregates, except that when conditions contribute to quick stiffening of the concrete, the allowable

- time shall be reduced. Deliver concrete to the site of work in a thoroughly mixed and uniform mass as determined in accordance with ASTM C 94, and discharged without segregation. Bodies of non-agitating equipment shall be metal, smooth, and watertight. If it rains or when the prevailing air temperature is 90 degrees F or higher, protect concrete being hauled with watertight covers. Slump limitation shall be as specified.
6. Spreaders: Dump concrete into an approved spreader when non-agitating equipment is used for transportation. The spreader shall be capable of distributing concrete uniformly over the entire width of the lane being paved. Concrete may be discharged by end dumping directly on the compacted grade in front of the paving machine provided the surface of the grade is not damaged by haul units.
- E. Measurement of Materials: The fine aggregate, each size of coarse aggregate, and the cement shall be weighed separately. Cement in standard packages (bags) need not be weighed, but bulk cement or fractional packages shall be weighed. The Contractor shall furnish the necessary equipment and shall establish accurate procedures for determining the quantities of free moisture in the aggregates, the true volume of the fine aggregate if volumetric proportioning is used, and the air content of the freshly mixed concrete if air-entrained concrete is used.
1. Chemical Admixtures: Measure the amount of chemical admixture by means of a device capable of ready adjustment to permit varying the quantity of admixture to be dispensed. Design and construct the device to accurately measure and dispense the required amount of admixture into the concrete mix. Keep different types of admixtures from intermixing prior to being mixed with other batch materials.
- F. Mixing and Agitating:
1. Mixing: Mix all concrete with machines, except in emergencies the mixing may be by hand as approved. Mixing shall begin within 30 minutes after the cement has been added to the aggregate or water to the cement and aggregates. The total elapsed time for batching, mixing, conveying, discharging, and placing the concrete in final position shall not exceed 1-1/2 hours for ambient temperatures below 90 degrees F, or 45 minutes for ambient temperatures above 90 degrees F, unless specified otherwise. Only concrete which conforms to the specified requirements and the approved mix design shall be discharged on the base. Once discharge has commenced, retempering the concrete with water will not be permitted. Excessive over-mixing which would require the addition of water to preserve the required consistency will not be permitted. The entire contents of the mixer shall be discharged before recharging. A discharge of separate aggregate at the end of the batch will be rejected and such material shall be removed from the site. Concrete shall be mixed by one of the following methods.
  2. Central Plant Mixing: The minimum mixing time for central plant mixing plants when stationary mixers are approved for use, shall be 80 seconds after all solid materials are in the mixer drum, and with all the mixing water introduced before one-fourth of the mixing time has elapsed. This mixing time may be reduced if mixer performance tests (ASTM C 94) indicate that satisfactory mixes can be achieved at a reduced mixing time. The rate of rotation of the mixer drum shall be the manufacturer's specified speed. When a stationary mixer is approved for use for partial mixing of the concrete (shrink-mixed), the mixing time in the stationary mixer shall be as specified herein.
  3. Truck Mixing: Mix and deliver concrete in a truck mixer. Charge the mixers with a ribbon-fed mixture of aggregates and cement, or in absence of facilities for ribbon feeding, charge the mixers with aggregates before the cement. Charge the truck mixer with a batch size equal to the rated capacity of the drum. When mixing is begun during or immediately after charging, a portion of the mixing water, not in excess of that required to produce the minimum acceptable slump, shall be added ahead of, or with, the other ingredients.
    - a. Mixing: After all ingredients, including water, are in the drum, initially mix the materials for not less than 70 nor more than 100 revolutions of the drum. Control mixing speed to not less than 8 rpm and not more than 18 rpm. After the initial mixing or after 30 to 75 revolutions of the drum, test the slump. If necessary add water only one time to produce the required slump; if additional water is added (from one to 2-1/2 gallons per cubic yard) continue the mixing for at least 5 to 10 more revolutions at drum speed of 16 to 18 rpm. Discharge of the concrete shall be completed within 11-1/2 hours or before the drum has revolved 300 revolutions, whichever comes first. Each batch of concrete delivered at the job site shall be accompanied by a time slip issued at the batching plant, bearing the time of departure there from and weight of aggregates, cement and water, and the signature of the weighmaster.
  4. Combination Central Plant and Truck Mixing (Shrink Mixing): Partially mix concrete in a central-plant mixer and complete the mixing in a truck mixer. In the central-plant mixer select a minimum mixing time required to intermingle the ingredients. In any event, do not exceed 45 seconds. Complete the mixing in a truck mixer as specified above under truck mixing.
  5. Agitating of Completely Mixed Concrete: Agitate completely mixed concrete from a central plant with an agitator or truck mixer operating at the speed of rotation designated by the manufacturer as agitating speed. Non-agitating equipment may be used when approved.

- G. Ready-Mixed Concrete: For the purpose of this specification, ready-mixed concrete is defined as Portland-cement concrete produced regularly by a commercial establishment and delivered to the purchaser in the plastic state. Ready-mixed concrete may be used provided the plant has sufficient capacity and transportation equipment to deliver the concrete at the scheduled rate. The interval between batches shall not exceed 30 minutes. The plant must meet the requirements specified herein for equipment, measurement of materials, mixing and agitation. The plant must have records which indicate an average plant coefficient of variation (ACI 214) of not greater than 15 percent. Ready-mixed concrete not specified otherwise shall be mixed and delivered by one of the methods specified in this section. Provide batch delivery tickets in accordance with ASTM C 94.

### 3.06 CONVEYING AND PLACING CONCRETE

- A. Conveying: Convey concrete from the mixer to grade as rapidly as practicable. Use side discharge conveyors, bridge roller conveyors, or other similar conveyor systems which will not cause segregation or loss of ingredients. Deposit concrete as nearly as practicable in its final position to avoid rehandling. At any point in conveying, the free vertical drop of the concrete from one conveyor to another shall not exceed 3 feet. For short distances, chuting is permitted from the transportation equipment. When trucks are permitted to operate on the Portland cement stabilized subgrade or base, concrete may be discharged in front of the paver. Clean conveying equipment before each run. Deposit concrete as soon as practicable after the forms have been oiled. Do not use concrete which has segregated in conveying or which was not protected from rainwater during a rain storm or rainy weather.
- B. Placing, General: Concrete placement will not be permitted when weather conditions prevent proper placement and consolidation. Maintain drainage ditches, gutters and side drains to drain the base during the construction of the pavement. In unreinforced pavement, place concrete in one continuous operation for the full depth and width of the section between transverse joints. If an emergency stop occurs within 7 feet of a previously placed expansion or contraction joint, remove the concrete back to the joint. If an emergency stop occurs more than 7 feet from a previously placed expansion or contraction joint and if the concrete is placed on a Portland cement stabilized base, install a plain butt type transverse joint. If concrete is not placed on a Portland cement stabilized base, install a keyed construction joint with approved tiebars.
1. Concrete Placement: Deposit concrete in its final location within 45 minutes from the time all ingredients are charged into the mixer and before initial set. Deposit in a manner that will require a minimum of rehandling. At the Contractor's option, concrete may be placed between stationary forms or constructed to the desired cross section using slip-form pavers. All work incidental to the handling and placing of concrete shall be done in a manner that will not damage the underlying surface. Dampen the underlying surface before placing concrete. Place concrete continuously at a uniform rate without unscheduled stops except for equipment failure or other emergencies. Care shall be exercised to avoid contamination of plastic concrete with foreign material on construction equipment or workman's footwear. Concrete spread by hand shall be done with shovels and not with rakes. Immediately fill with fresh concrete any holes left on removing any excess material or removing joint-forming devices. Thoroughly compact concrete adjacent to the forms and at joints.
- C. Vibration: Immediately after spreading concrete, consolidate with internal vibrating equipment concrete adjacent to forms and joints regardless of slab thickness, and concrete slabs 8 inches or more in thickness. Limit the duration of vibration to that necessary to produce consolidation of the concrete. Excessive vibration will not be permitted and generally vibrators shall not be operated in the concrete at one location for more than 15 seconds. At the option of the Contractor, vibrating equipment of a type approved by the Contracting Officer may be used to compact the concrete in unreinforced pavement slabs less than 8 inches thick.
1. Vibrating Equipment: Operate equipment, except hand-manipulated equipment, ahead of the front of the finishing machine. Select the number of vibrating units and power of each unit to properly consolidate the concrete. Mount the units on a frame that is capable of vertical movement and, when necessary, radial movement, as the vibrators may be operated at any desired depth within the slab or be completely withdrawn from the concrete. The clear distance between frame-mounted vibrating units that have spuds that extend into the slab at intervals across the paving lane shall not exceed 30 inches. The distance between the end of the vibrating tube and the side form shall not exceed 2 inches. For pavements less than 10 inches thick, the vibrators shall be operated parallel with or at a slight angle to the subbase. For thicker pavements, the vibrators shall be angled toward the vertical, with the vibrator tip preferably about 2 inches from the subbase, and the top of the vibrator a few inches below the pavement surface. The vibrators may be pneumatic, gas driven or the electric type, and shall be operated at frequencies within the concrete of not less than 8,000 vibrations per minute. The amplitude of vibration shall be such that noticeable vibrations occur at 1.5-foot radius when the vibrator is inserted in the concrete to the depth specified.

- D. **Placing Concrete in Cold Weather:** Except when authorized specifically by the Contracting Officer, concrete shall not be placed when the air temperature in the shade and away from artificial heat falls below 40 degrees F. or when the concrete without special protection is likely to be subject to freezing temperatures before the expiration of the specified curing period. When the concrete is likely to be subjected to freezing temperatures within 24 hours after it has been deposited, or when so directed, heat the concrete materials so that the temperature of the concrete when deposited is between 50 and 90 degrees F. Use methods of heating materials which will not cause deleterious effects to the concrete. Water for mixing shall not be heated above 165 degrees F.; however, if aggregates are not heated, the mixing water added to the aggregates may be heated to a maximum of 200 degrees F. prior to the addition of cement and provided the temperature of the concrete conforms to the above. For a period of 72 hours after placing, maintain the temperature of the concrete at 50 degrees F. or higher for a period of 72 hours, and at a temperature above freezing for the remainder of the curing period. Concrete damaged by freezing shall be removed and replaced at no additional cost to the Government. Additional recommended practices may be found in ACI 306.
- E. **Placing Concrete in Hot Weather:** Take extra care to reduce the temperature of the concrete being placed, and to prevent rapid drying of newly placed concrete. When the outdoor ambient temperature is more than 90 degrees F, the temperature of the concrete shall not exceed 95 degrees; and curing shall be started as soon as the surface of the fresh concrete is sufficiently hard to permit it without damage. Concrete placement temperatures shall be controlled by the Contractor at his expense and shall not be limited to: shading and cooling the aggregates; avoiding use of hot cement; cooling mixing water by additions of ice; insulating water supply lines and tanks; insulating mixer drums or cooling them with sprays or wet burlap coverings; working only at night; and addition of a retarder or water reducing retarder in the mix, if approved by the Contracting Officer. Reduce the temperature of side forms by aerating the forms with wet burlap or similar covering materials. Cool underlying material by sprinkling lightly with water. Additional recommended practices may be found in ACI 305.
- F. **Protection Against Rain:** All mixing and batching operations shall stop and the surface of the unhardened concrete shall be covered with protective covering. The length of pavement to be protected shall extend back to a point where the rain is not indenting the pavement surface. When slipform construction is used, install side forms in those areas of pavement where the edge cannot otherwise be protected to prevent edge erosion. After the rain ceases, install side forms as required to prevent excessive edge slump, and remove the protective covering without delay. Any water that remains on the pavement surface shall be removed. Areas of the surface where the texture has been damaged or exhibits a smooth sandy appearance shall be retextured and cured if possible. Areas that cannot be retextured must be removed and replaced per paragraph 1.08 of this section.

### **3.07 FINISHING CONCRETE**

- A. **General Requirements:** Start finishing operations immediately after placement of concrete. Use finishing machine, except that hand finishing may be used in emergencies and for concrete slabs in inaccessible locations or of such shapes that machine finishing is impracticable. The surface of the pavement on both sides of a joint shall be finished to the same grade. Finish formed joints from a transverse bridge securely supported. Provide hand finishing equipment for use at all times. Maintain finishing equipment and tools in a clean condition and free from hardened concrete or grout. When ambient conditions are such as to cause rapid loss of moisture from pavement surface, a uniform fog spray of water to restore the surface sheen may be applied during finishing operations. Avoid application of excessive amounts of water to the surface.
- B. **Side Form Finishing:** Strike off and screed the concrete to the required crown and cross-section by a power-driven transverse finishing machine. Transverse rotating tube or pipe shall not be permitted unless approved by the Contracting Officer. The elevation of the concrete shall be such that, when consolidated and finished, the surface of the pavement will be adequately consolidated and at the required grade. Equip the finishing machine with two screeds readily and accurately adjustable for changes in pavement crown and compensation for wear and other causes. It shall make as many trips over each area of pavement and at such intervals as necessary to give the proper compaction, retain the coarse aggregate near the finished surface, and produce a surface of uniform texture, true to grade and crown. Excessive operation over an area, which results in an excess of mortar and water being brought to the surface, will not be permitted.
1. **Equipment Operation:** Maintain the travel of machine on the forms without lifting, wobbling, or other variation of the machine which tend to affect the precision of concrete finish. Keep clean the tops of the forms by a device attached to the machine. During the first pass of the finishing machine, maintain a uniform ridge of concrete 4 inches deep, ahead of the front screed for its entire length.
  2. **Joint Finish:** Before the concrete is hardened, correct any edge slump of the pavement, exclusive of edge rounding, in excess of 0.02 foot. Finish the concrete surface on each side of the construction joints to the

same plane; correct all deviations before the newly placed concrete has hardened. Slip-form finishing is specified below.

- C. Hand Finishing: Strike-off and screed the surface of the concrete to elevations slightly above finish grade so that when the concrete is consolidated and finished, the surface of the pavement is at the indicated elevation. Vibrate the entire surface until the required compaction and reduction of surface voids is secured with a strike-off template.
- D. Longitudinal Floating: After the initial finishing, further smooth and consolidate the concrete by means of hand-operated longitudinal floats. Use floats that are not less than 12 feet long and 6 inches wide and stiffened to prevent flexing and warping.
- E. Slip-Form Finishing: After the concrete has been given a preliminary finish by means of finishing devices incorporated in the slip-form paving equipment, check the surface of fresh concrete with a straightedge device not less than 14 feet long. Remove high areas by the hand float method specified above. Finish the concrete surface on each side of the construction joints to the same plane. Correct all deviations before the newly placed concrete has hardened.
- F. Straightedge Finishing: After completion of the longitudinal floating, any excess water or laitance shall be removed from the surface of the pavement transversely with a 10-foot straightedge or, where the use of a straightedge is not practicable, with a long-handled wood float having a blade not less than 5 feet in length and 6 inches in width. Do not use a wooden float to float the entire surface of the pavement in lieu of, or supplementing, the use of the longitudinal float, except as follows: when strike-off and consolidation is done by hand or if the crown of the pavement will not permit the use of a longitudinal float, the surface shall be floated transversely by means of the wood float.
- G. Straightedge Testing: After the longitudinal floating has been completed and the excess water removed, but while the concrete is still plastic, test the slab surface with an accurate 10-foot straightedge swung from handles 3 feet longer than one-half the width of the slab. Hold the straightedge in successive positions to the centerline of the slab in contact with the surface of the concrete, and go over the whole slab area from one side of the slab to the other as necessary. Advance along the centerline of the slab in successive stages of not more than one-half the length of the straightedge. Fill all depressions immediately with freshly mixed concrete, strike-off, consolidate, and refinish. Cut down all high places and refinish. Straightedge testing and surface correction shall continue until the entire surface is within the tolerance specified.
- H. Texturing: Before the surface sheen has disappeared and before the concrete becomes nonplastic, the surface of the pavement shall be given a texture as specified below for Surface Finish.
- I. Surface Finish:
  - 1. Burlap Drag Finish: Before the concrete becomes non-plastic, finish the surface of the slab by dragging on the surface a strip of clean, wet burlap measuring from 3 to 10 feet long and 2 feet wider than the width of the pavement. Select the dimension of the burlap drag so that at least 3 feet of the material are in contact with the pavement. Drag the surface so as to produce a finished surface with a fine granular or sandy texture without leaving disfiguring marks.
- J. Edging: At the time the concrete has attained a degree of hardness suitable for edging, carefully finish all slab edges, including the edges at formed joints, with an edge having a maximum radius of one-eighth inch. Clean by removing all loose fragments and sloppy mortar from corners or edges of slabs which have crumbled and areas which lack sufficient mortar for proper finishing. Refill the voids solidly with a mixture of suitable proportions and consistency, and refinish. Remove all unnecessary tool marks and edge. All remaining edges shall be smooth and true to line. Select tools, methods, and workmanship to produce joints having edges of the same quality as other parts of the pavement as approved by the Contracting Officer. After removal of forms, repair all damaged and honeycombed areas with mortar composed of one part Portland cement to two parts sand.

### **3.08 CURING AND PROTECTION**

- A. Protect concrete from injurious action by the sun, rain, flowing water, frost, or mechanical injury and prevent concrete from drying out from the time the concrete is placed until expiration of the minimum curing periods specified below. At the completion of the finishing and at the time the concrete surface has hardened enough to prevent the surface being marred by the curing material, cure the concrete by one of the following methods: Use fresh water for curing; keep moist and at a temperature above 50 degrees F, all portions of the pavement for the full-curing periods specified below. Protect the pavement from damage during removal of form work or

from injury resulting from storage or transportation of materials and equipment during construction. Protect exposed vertical faces of concrete with curing compound or by other suitable means. During cold weather, use waterproof paper blankets specified below for initial curing.

**B. Moist Curing:**

1. **Mats:** Cover the entire surface of the pavement with two thicknesses of wet burlap weighing not less than 7 ounces per square yard (dry weight), cotton mats, or other similar material having a high absorptive quality. Thoroughly wet the material when applied and keep continuously wet during the time the material remains on the pavement. Use mats made of clean material, free from any substance which will have deleterious effect on the concrete. The minimum length of mats shall be the width of the pavement plus four times the thickness of the pavement. Place mats to completely cover the pavement surface and edges of the concrete with a slight overlap over adjacent mats. During application, avoid dragging the mats on the finished concrete or over mats already placed. Leave the mats in place not less than 8 hours, at that time remove the mats and continue curing by one of the other methods specified, or leave the mats in place for a total of 7 days and keep continuously wet.

**C. Liquid Membrane-Forming Compound Curing:** Apply the compound specified elsewhere in this Section on the concrete surface to restrict evaporation of the mixing water. Seal all joint openings at the top by inserting moistened paper or fiber rope or cover joints with strips of waterproof material prior to application of the curing compound in a manner to prevent the curing compound from entering the joint. Seven days after the application of the curing compound, the joints may be exposed and prepared to receive the joint sealant materials.

1. **Application of Curing Compound:** Immediately apply the compound after the surface loses its water sheen and has a dull appearance. Thoroughly agitate the curing compound by mechanical means during use and uniformly apply the compound in a two-coat continuous operation by power-spraying equipment. Apply two coats for a total coverage of 200 square feet per gallon of compound. If the compound lacks a uniform continuous, coherent film or exhibits checks, cracks, peels, or pinholes; apply an additional coat of compound to areas where the film is defective. Have readily available impervious sheet curing for use to protect the freshly placed concrete in the event conditions occur to prevent correct application of the compound at the proper time. Re-spray with two coats of curing compound the concrete surfaces subjected to heavy rainfall. Before application of the compound, prepare the surface as specified for "Protection Against Rain". Apply the two coats at the same method and rate required above.
2. **Protection of Treated Surfaces:** Protect concrete surfaces from all foot and vehicular traffic and all other sources of abrasion for not less than 172 hours. Maintain continuity of the applied liquid membrane-forming coating for the entire curing period and repair damage to the coating during the curing period.

**D. Special Requirements for High-Early-Strength Portland Cement Concrete:** The minimum periods of maintaining temperatures above freezing when concrete is placed in freezing weather shall be not less than one-quarter of those specified herein for Portland-cement concrete, but in no case less than 48 hours.

**E. Pavement Protection:** Keep pavement closed to vehicular traffic until the concrete is not less than 7 days old and has attained a minimum flexural strength of 450 pounds per square inch as determined by tests of the field cured test beams. At that time the pavement may be opened to limited traffic. Prevent damage to edges of slabs if subgrade planer, concrete finishing machine, or similar equipment is supported on previously constructed slabs. After the concrete has reached the specified 28 days flexural strength as verified by the laboratory-cured test beams, equipment with wheel loads capacity exceeding 5000 pounds may be used for transporting concrete or heavy equipment.

**F. Pavement Identification:** Indent in the surface of the unhardened concrete the contract number and date of construction. Locate markings at each end of a lane and at every 1000 feet of pavement or fraction thereof. Select letters and numbers a minimum height of 1-1/2 inches. Form width of indentations not less than 1/4 inch and depth not less than 1/8 inch with slightly beveled corners.

### **3.09 FIELD SAMPLING AND TESTING**

**A. Sampling:**

1. **Aggregates:** Sample at the source the fine and coarse aggregates prior to delivery of aggregates to the batch plant. During concrete placement, sample coarse aggregates for each 1000 tons and fine aggregates for each 500 tons. Use sampling methods in accordance with ASTM D 75. Identify each sample for conformance tests. When test results indicate that the fine aggregates consistently meet the specified gradation requirements, the rate of sampling may be reduced if approved.
2. **Concrete:** Obtain samples of plastic concrete in accordance with ASTM C 172. Quality Control samples may be taken at the concrete batch plant; however, samples for verification of concrete strength and

slump for submittal to the Government shall be taken at the job-site as the concrete is delivered in accordance with ASTM C 172. From each sample mold the required number of beams for each group of test specimens.

3. Sample Identification: Each sample shall be tagged for identification. The tag shall contain the following information:

Contract No. \_\_\_\_\_  
 Sample No. \_\_\_\_\_  
 Date of Sample \_\_\_\_\_  
 Sample \_\_\_\_\_  
 Source \_\_\_\_\_  
 Intended Use \_\_\_\_\_  
 For Testing \_\_\_\_\_

B. Testing:

1. Aggregate Testing: Without delay, perform gradation tests on each sample. Make all other aggregate tests, except durability tests, on initial source samples, and repeat tests including durability tests whenever there is a change of source. During progress of concrete placement, perform gradation tests for fine and coarse aggregates. Include sieve analysis for each fractional size and gradation analysis of the combined material representing the aggregate part of the concrete mix.
2. Cement Testing: Submit the identity of the cement manufacturer, the engineering and chemical qualities of the cement, and a manufacturer's statement which states that the cement complies with the intent and requirements of this specification. The contractor, or the supplier, is prohibited from changing cement sources during the progress of the work without submitting the same information which qualified the original source. The submittal shall be made at least 10 days before starting a mixture proportioning study. When the contractor changes sources of cement, strength testing shall be accomplished as if the work were just beginning.
3. Concrete Testing: Perform all tests with aggregates and cement to be used in the project. During the course of construction, if there is a deficiency in strength of the concrete produced, perform additional tests at the Contractor's expense and make adjustment in the mix, as required, to obtain the specified strength.
  - a. Concrete Slump: Test consistency of concrete slump in accordance with ASTM C 143. Determine consistency of concrete at the start of each day's concrete placement and for each group of beam test specimens.
  - b. Air Content: Determine air content at the start of concrete placement and for each group of beam test specimens. Record results with test specimens. Determine air content in accordance with ASTM C 173 or ASTM C 231.
  - c. Temperature Tests: Determine temperature of plastic concrete in-place during hot and cold weather periods, at frequent intervals, until uniform and acceptable temperature control is established as specified.
  - d. Yield Tests: Perform yield tests in accordance with ASTM C138, twice per day on concrete, and whenever materials or mix proportions are changed.
  - e. Surface Tests: After curing, test the surface of the pavement with a straightedge or device which will reveal any irregularities in the concrete surface. Correct the surface or any portion of the pavement in a longitudinal direction which shows irregularities greater than one-eighth inch in 10 feet, or in a transverse direction irregularities greater than 1/4 inch in 10 feet.
4. Test for Flexural Strength: During the progress of the work verify the flexural strength by testing beams made from concrete taken from the forms at intervals indicated herein. Mold and cure beams in accordance with ASTM C 31. Perform tests in accordance with ASTM C 78.
  - a. Airfield Pavements: Mold one group of six beams for each 1000 cubic yards or fraction thereof. Select one set of 2 beams taken at three locations: near the beginning, at midway, and near the end of concrete placement for a total of six beams for each group. An approved laboratory shall furnish all necessary labor facilities for molding, handling, and storing the beams at the site of the work and testing the beams. Perform tests at 7 days and 28 days.
  - b. All Other Pavements: Mold one set of four (4) beams for each 300 cubic yards or fraction thereof. An approved laboratory shall furnish all necessary facilities for molding, handling, and storing the beams at the site of the work and testing the beams. Perform tests at 7, 14, and 28 days.
5. Flexural Strength: Concrete shall meet the following requirements:
  - a. 7-day Tests: If the ratio of the 7 day strength to the specified 28-day strength is less than 65 percent or if the concrete strength does not meet other requirements of this specification, the Contractor shall make all necessary adjustments for conformations.

6. Control Charts: Provide control charts for concrete flexural strength in accordance with ACI 214, Appendix, except as otherwise modified herein. Post copies of charts at the job site. Submit weekly copies to Contracting Officer. The charts shall indicate the specified strength and the average strength determined by the mix design. Each control chart shall consist of the following plots:
  - a. Test Results: At the same location, plot each individual test strength (Airfield Pavement - the average result of three beams tested at 7 days and the average results of three beams tested at 28 days); the lowest acceptable value of individual beams tested at 28 days shall be 650 psi.
  - b. Moving Average for Strength: Moving average of five consecutive tests (ACI 214).
  - c. Moving Average for Range: The moving range is the difference between the highest and lowest of three test results: Points 1, 2 & 3; 2, 3 & 4; 3, 4 & 5; 4, 5 & 6; 5, 6 & 7; etc. Plot the moving average and compare the TABLE 1, the selected average strength. If the range of test results falls below the selected average range, the Contractor shall make necessary adjustments to the mix design to control the variation in the average strength results in order to assure that the specified strength is obtained.
7. Airfield Pavement samples for strength tests shall be taken at random from each group of beams molded. All beams shall be numbered consecutively, marked as 7-day and 28-day pairs, and identified as to each group sample.

**END OF SECTION**



**SECTION 32 17 23****PAVEMENT MARKINGS FOR ROADS AND PARKING LOTS****PART 1 - GENERAL****1.01 SUMMARY**

- A. This section includes the painting of pavement surfaces for roads, paths, and parking lots. Paint may include reflective beads as specified herein.

**1.02 REFERENCES**

- A. As specified herein:
  1. FED Federal Specifications and Standards
  2. MIL Military Specifications and Standards
  3. FDOT State of Florida Department of Transportation

**1.03 SUBMITTALS**

- A. Manufacturer's Certificates of Compliance: Submit for approval copies of manufacturer's certificates attesting that materials and equipment meet the requirements specified.
- B. Certified Test Reports: Submit for approval four certified copies of the reports of tests as required in referenced publications and Quality Control Section.

**1.04 DELIVERY AND STORAGE**

- A. Deliver paints and paint materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacturer, manufacturer's directions, and name of manufacturer. Provide storage facilities at the jobsite for maintaining materials at temperatures recommended by the manufacturer.

**1.05 WEATHER LIMITATIONS**

- A. Apply paint to clean, dry surfaces, and unless otherwise approved, only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Maintain paint temperature within these same limits. Do not apply paint when wind velocity exceeds 15 miles per hour.

**1.06 TRAFFIC CONTROLS**

- A. Place suitable warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. Provide materials conforming to the requirements specified herein.
  1. Paints for Roads: TT-P-1952C, color as indicated.
  2. Retro-reflective Media: Fed. Spec. TT-B-1325, Type I, Gradation A.
  3. FDOT Specifications

**2.02 EQUIPMENT**

- A. Machines, tools, and equipment used in the performance of the work shall be approved by the Contracting Officer and maintained in satisfactory operating condition.
- B. Paint Applicator: Provide self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. Provide machine having a speed during application not less than 5 m.p.h., and capable of applying the stripe widths indicated, at the paint coverage rate specified herein and of even uniform thickness with clear-cut edges. The equipment for applying the paint for airfield pavements will be a self-propelled or mobile-drawn pneumatic spraying machine with an arrangement of atomizing nozzles capable of applying a width line at any one time in multiples of 6 inches, from 6 inches to 36 inches. Provide paint applicator with paint reservoirs or tanks of sufficient capacity and suitable gages to apply paint in accordance with requirements specified. Equip tanks with suitable air-driven mechanical agitators. Equip spray mechanism with quick-action valves conveniently located, and

include necessary pressure regulators and gages in full view and reach of the operator. Install paint strainers in paint supply lines to insure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Provide pneumatic spray guns for hand application of paint in areas where the mobile paint applicator cannot be used.

- C. Reflective Media Dispenser: Attach dispenser for applying the retro-reflective media to the paint dispenser and operate automatically and simultaneously with the paint applicator through the same control mechanism. Use dispenser capable of adjustment and designed to provide uniform flow of reflective media over the full width of the stripe at the rate of coverage specified herein at all operating speeds of the paint applicator to which it is attached.

## **PART 3 - EXECUTION**

### **3.01 SURFACE PREPARATION**

- A. Allow pavement surfaces to cure for a period of not less than 21 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Completely remove surface laitance, existing paint markings, and other coatings adhering to the pavement by water blasting. Do not commence painting in any area until pavement surfaces are dry and clean and have been inspected and approved by the Contracting Officer.

### **3.02 APPLICATION**

- A. Rate of Application:
  1. Paint: Apply paint evenly to the pavement area to be coated at a rate of 105 (plus or minus 5) square feet per gallon.
  2. Retro-reflective Markings: Apply glass spheres uniformly to the wet paint on pavement requiring reflective paint at a rate of 5 (plus or minus 0.5) pounds of glass spheres per gallon of paint.
- B. Painting: Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement, or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.
- C. Retro-reflective Media: Follow application of reflective media immediately after application of paint. Accomplish drop-on application glass spheres to insure even distribution at the specified rate of coverage. Discontinue operations should there be malfunction of either paint applicator or reflective media dispenser immediately until deficiency is corrected.

### **3.03 FIELD TESTING AND INSPECTION**

- A. Sampling and Testing: As soon as the paint and retro-reflective materials are available for sampling, obtain by random selection from the sealed containers, one quart sample of each batch in the presence of the Contracting Officer. Accomplish adequate mixing prior to sampling to insure a uniform, representative sample. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Clearly identify samples by designated name, specification number, batch number, project contract number, intended use, and quantity involved. At the discretion of the Contracting Officer, samples provided may be tested by the Government for verification.
- B. Inspection:
  1. Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance.
  2. Surface preparations and application procedures will be examined by the Contracting Officer to determine conformance with the requirements specified. Approve each separate operation prior to initiation of subsequent operations.
  3. If the project inspector determines that the markings have not dried sufficiently in 90 minutes (during daylight operations) to prevent displacement, the work shall be discontinued until the cause of slow drying is determined and corrected.
  4. Areas found to be deficient in accordance with this specification by the contracting officer shall be cleaned and repainted at no additional cost to the government prior to completion of this portion of the contract.

**END OF SECTION**

**SECTION 32 92 23****SODDING****PART 1 GENERAL****1.01 DESCRIPTION OF WORK**

- A. Extent of landscape work generally includes:
  1. Weed Treatment
  2. Soil Preparation
  3. Sodding
  4. Reconditioning Existing Turf Areas
  5. Cleanup and Protection
  6. Maintenance
  
- B. Sub-grade Elevations: Excavation, filling and grading required to establish elevations shown on drawings are not specified in this section. Refer to Earthwork sections. Subcontractors shall coordinate with contractor on responsibility for earthwork.

**1.02 REFERENCES**

- A. General: Planting materials shall meet or exceed the Specifications of Federal, State and local laws requiring inspection for plant disease and insect control.
  
- B. Sod shall conform to the following document that is to be considered part of these Specifications: "Guideline Specifications to Sodding" American Sod Producers Association. (ASPA)

**1.03 QUALIFICATIONS**

- A. The contractor shall have not less than 3 years experience installing sod.

**1.04 SUSTAINABLE DESIGN SUBMITTALS**

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design submittals.
  
- B. Manufacturer's Certificate: Certify products meet or exceed specified sustainable design requirements.
  1. Materials Resources Certificates:
    - a. Certify source for regional materials and distance from Project site.
  
- C. Product Cost Data: Submit cost of products to verify compliance with Project sustainable design requirements. Exclude cost of labor and equipment to install products.
  1. Provide cost data for the following products:
    - a. Regional products.

**1.05 SUBMITTALS AND INSPECTIONS**

- A. Inspections: All necessary state, federal, and other inspection certificates shall accompany the invoice for each shipment or order for sod materials as approval at the site or elsewhere.
  
- B. Analysis and Standards: Pack standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agricultural Chemists, wherever applicable.
  
- C. Provide the following samples prior to installation:
  1. Herbicide: Label from container or supplier's brochure.
  2. Fill Sand: One-ounce sample of sand.
  3. Soil Amendments: Labels from all bags.
  4. Sod: Submit sod grower's certification of grass species. Identify source location.
  5. Soil Test: Contractor will have existing soil tested by an approved soil laboratory. Results of test shall be forwarded to the Contracting Officer in accordance with Section 01 41 00 of the specifications. The samples tested shall consist of a representative mixture from the site. Cost of the soil test and all additives at rates recommended by the laboratory shall be included in the base bid. Soil Test shall include these items and amendment rates of each needed for the specified sod: pH factor, Potassium, Phosphorus, Calcium, Magnesium, N-P-K, and a nematode count.

**1.06 JOB CONDITIONS**

- A. Basic Regulations: Sodding operations shall be conducted under favorable weather conditions during the seasons, which are normal for such work as determined by acceptable practice in the locality. Contractor is hereby notified of active utilities and caution shall be exercised to avoid interruption of services. Contractor is responsible for replacement of any existing buried utilities, irrigation lines, etc., if they are broken during the planting operations. Contractor shall obtain a digging permit and contact the appropriate utility to have their location marked. If not, any damage to utilities will be repaired at the contractor's expense. Contractor shall protect existing paved areas, curb/gutters, walks, etc. The contractor will repair any damage.
- B. When conditions detrimental to sod growth are encountered during soil preparation or planting, such as rubble fill, adverse drainage conditions, or obstructions, notify Contracting Officer and correct before planting.
- C. Sequence of Work: Sod after irrigation and final grades are established unless otherwise acceptable to Contracting Officer. Protect existing lawn areas and promptly repair damage to lawns resulting from operations.

### 1.07 WARRANTY & REPLACEMENT

- A. Contractor shall guarantee that at the end of 60 days following final building acceptance, all sod areas shall have established grass that is uniform in color and quality, and is reasonably free from visible imperfections. Any sod areas not in this condition will be replaced at no expense to the government. Inspection to determine the condition of the sod areas will be made by the Contracting Officer upon receiving such a request from contractor.
- B. Contractor shall not be held responsible for damages to sod areas due to government neglect, hurricanes, tornadoes, or for damage caused by theft or vandalism, other contractor's work on the site, application of fertilizers, and pesticides or other materials not applied by him. **The cost to repair damage caused by another contractor shall be paid for by the contractor responsible for the damage. This contractor shall immediately notify the prime contractor of the damage, etc.**
- C. Repair: When any portion of the surface becomes gullied or otherwise damaged due to drainage conditions, the affected portion shall be repaired to reestablish condition and grade of soil to as it was prior to injury as directed. Repair work required shall be performed without cost to the government. Repair shall be made within 10 days or as soon as weather conditions are satisfactory for planting.

## PART 2 PRODUCTS

### 2.01 SUSTAINABILITY CHARACTERISTICS

- A. Section 01 81 13 Green Procurement: Requirements for sustainable design compliance.
- B. Materials and Resources Characteristics:
  1. Regional Materials: Furnish materials extracted, processed, and manufactured within 500 miles of Project site.

### 2.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.
- B. Deliver sod on pallets after preparations for sodding have been completed and lay immediately. Protect sod from drying out. Use all means necessary to protect sod materials before, during and after installation and to protect the installed work and materials of all other trades.
- C. **Do not deliver more sod than can be laid in 24 hours. Sod not laid within 24 hours of delivery will be rejected.**

### 2.03 SOD

- A. Sod Schedules: Contractor shall furnish the sod required to accomplish the work and leave no bare areas.
  1. General lawn use at buildings: Argentine Bahia, Paspalum Notatum or Common Bermuda grass, Cynodon dactylon.
  2. Large areas, airfield. etc.: Common Bermuda grass, Cynodon dactylon.
  3. Playing fields; baseball, soccer, football, etc.: "Tifway" Bermuda, Cynodon dactylon.

4. General lawn use Soundside area: Floratam St. Augustine, *Stenotaphrum secundatum*.

- B. Provide strongly rooted sod of the type indicated on the drawings, ASPA approved field grown grade. All sod shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of two (2) years and machine cut and harvested to pad thickness of 3/4" to 1 1/4", excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted with maximum five percent (5%) deviation in either length, width, or pad thickness. Broken pads or pads with uneven ends will not be acceptable.
- C. Sod shall have root development, which will support its own weight, without tearing, when suspended vertically by its two upper corners.
- D. Sod shall be clear of non-specified grasses and weeds with not more than 3 weeds per pallet (500 SF).
- E. Contracting Officer reserves the right to inspect grass areas from time of installation to Final Acceptance. The time of inspection shall be after the grass has gone not mowed for a minimum of two weeks. Any evidence of non-specified grasses or weeds will be cause for rejection and replacement of the unacceptable lawn areas.

#### **2.04 SOIL AMENDMENT**

- A. Fill Sand: Clean yellow fill, No. 4 to 200 Sand, pH 5.5 - 6.5.
- B. Soil Amendment for All Sod (See 3.04 A for ratios):
  1. Gro-Tone Bed Mix.
  2. Black Kow Cow manure.

#### **2.05 MISCELLANEOUS LANDSCAPE MATERIALS**

- A. Water: Furnished by government or provided by the project irrigation system. Contractor shall provide hose and other watering equipment.
- B. Edging (if indicated on the drawings): Black Aluminum, 1/8" x 4" with stakes. Curve-Rite Aluminum Edging (800) 366-2878, Sure-Loc (800) 787-3562, PermaLoc (800) 356-9660 or approved equal.
- C. Mulch: Longleaf Pine Straw. Freshly baled, dry, and free of debris, leaves, insects, and briars.
- D. Wood Pegs: Softwood, sufficient size and length to ensure anchorage of sod on slopes.
- E. Herbicide (For Pre-Sod Treatment of Weeds, Etc.): Round-Up by Monsanto or approved equal.
- F. Herbicide (During Maintenance Period): Submit Label / Manufacturer's instructions.
- G. Fertilizer (for maintenance period): Gro-Tone Lawn Special 16-4-8 or approved equal. For winter applications use approved winterizer.

### **PART 3 EXECUTION**

#### **3.01 WEED TREATMENT**

- A. All site locations disturbed by site construction and to receive sod where weeds exist shall receive an initial treatment of post-emergent herbicide. Planting areas shall not be disturbed for fourteen (14) days following each application of herbicide. This treatment shall be repeated as required so that no weeds are present at the date of final inspection of the Project and at the conclusion of the 60-day maintenance period.
- B. Post-emergent weed treatment includes removal of weeds and other undesirable ground cover vegetation and shall be accomplished a minimum of fourteen (14) days prior to soil preparation for sodding operations.
- C. Care shall be taken not to affect existing trees or shrubs to be saved on the site. Also care will be taken not to affect plants on adjacent site.

#### **3.02 WEED TREATMENT PROCEDURE**

- A. Mow grass and/or existing weeds in designated areas to 3" height.
- B. Spray herbicide on a day that is not rainy or windy or below 65 degrees F.
- C. Do not disturb soil for 14 days.
- D. After 14 days, mechanically rake soil when the soil is not excessively hard or dry (water the soil if necessary).
- E. Remaining dead material shall be allowed to accumulate in place and shall be incorporated into the soil through the roto-tilling of the soil preparation work.

### **3.03 SOIL PREPARATION AND BED LAYOUT**

- A. Contractor shall report immediately upon his awareness, any site condition or situation of the contiguous landscape that would cause flooding, washing or concentration of excess surface water to the areas receiving planting or lawn.
- B. Prior to placement of any required fill sand, cultivate sub-grade to a minimum of four inches (4"). Remove stones over one-half inch diameter (1/2") and sticks, roots, rubbish and other extraneous debris of any dimension.
- C. Fill sand is to be placed to obtain uniform site grade and proper drainage. Compact to a minimum standard density of 80%.
- D. Prior to fine grading install Edging and Stakes per manufacturer's instructions. Layout of Edging is as indicated on the drawings. Straight runs are to be straight to within 1/2" and arcs are to be round to within 1/2" of plan dimensions. All Edging shall be truly square to other Edging or Sidewalks, etc. where shown.
- E. Irrigation work, if included, shall be completed after roto-tilling and compaction, but prior to fine grading.
- F. Fine Grading: The entire area shall be raked smooth after removing all rocks, roots and debris one-half inch (1/2") in diameter or larger. Make changes to grade gradual and blend slopes into level areas. The site shall be free from irregular surface changes and shall vary uniformly between fixed elevations.
- G. Fine grade grass areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grade. Limit fine grading to areas which can be planted immediately after grading.
- H. Allow for grass thickness in areas to be sodded and mulch thickness in shrub beds. Finish grade of soil shall be two inches (2") below top of pavement in all areas.

### **3.04 SOIL MIXTURE**

- A. Mix specified soil amendment (see Section 2.02 A) by roto-tilling to a depth of four (4) inches:
  1. Fifty (50) LBS of Bed Mix per One Thousand (1000) SF of Sod.
  2. One Hundred (100) LBS of Cow Manure per One Thousand (1000) SF of Sod.
- B. Before mixing, clean topsoil of roots, plants, sod, stones, lumps, existing irrigation materials, and other extraneous materials harmful or toxic to sod growth. (maximum acceptable lump size is 1/2".)
- C. Contractor may be required to mix all ingredients of the planting soil mix in the presence of the project inspector. All ingredients shall be thoroughly blended to provide a homogeneous mixture.

### **3.05 PREPARATION OF SOD AREAS**

- A. Bed preparation shall be done by hand within the drip-line of existing trees to protect the tree's roots.
- B. Planting beds with weed growth shall be treated as necessary to remove weeds and re-inspected. No beds shall be accepted with weeds or unspecified grass.

### **3.06 SODDING NEW LAWNS**

- A. Soil shall be prepared prior to sodding. See Sections 3.01 - 3.05.

- B. Lay sod within 24 hours from time of stripping. Do not plant dormant sod or if ground is frozen. Do not use any piece of sod less than .5 SF (one-half square foot). Do not harvest or transport sod when moisture content may adversely affect sod survival. Protect sod from sun, wind, and dehydration prior to installation. Do not tear, stretch, or drop sod during handling and installation.
- C. Prior to placement of sod, water soil thoroughly to obtain at least 6" (six) inches penetration into the soil below the sod. Do not lay sod on dry or frozen ground.
- D. Lay sod to form a solid mass with **tightly** fitted joints. Tightly butt ends and sides of sod strips; do not overlap. **Stagger** strips to offset joints in adjacent courses. Continuously rake soil in area of installation to assure a smooth finish grade. Tamp or roll lightly to ensure contact with sub-grade. **Work** sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass.
- E. Neatly and cleanly edge sod with a sharpened instrument so as not to fray edges of sod. Continuously re-sharpen during edging process.
- F. Sod indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
- G. On slopes of 3:1 and steeper, lay sod perpendicular to slope and secure every row with wooden pegs at a maximum of two (2) feet on center. Drive pegs flush with top of sod pad.
- H. Firmly press sod into contact with soil with roller weighing 100-150 pounds per lineal foot.
- I. Water sod thoroughly with a fine spray immediately after planting to obtain at least six inches (6") penetration into the soil below the sod.

### 3.07 RECONDITIONING EXISTING TURF AREAS

- A. Provide soil amendments, sod, fill sand and all other materials necessary to return turf to its original condition before the start of the contract.
- B. Recondition existing turf areas damaged by contractor's operations including storage for materials and equipment and movement of vehicles. Re-grade as required. Fill low spots and meet new finish grades. Cultivate bare and compacted areas thoroughly to provide a suitable soil for sod.
- C. Water newly reconditioned turf areas as required to establish turf. (60 Days Minimum).

### 3.08 MULCHING

- A. Dress Mulching: Within two days after planting not less than three inches (3") of mulch shall be placed on entire area of planting beds, and not less than four inches (4") over shrub and tree pits.
- B. Edge mulch with a round-point shovel where beds are next to turf or walkways so that mulch is pushed into soil and is kept in beds.

### 3.09 MAINTENANCE

- A. Begin maintenance immediately after planting and continue until sixty (60) days after final acceptance of the project, or longer as required to establish the turf.
- B. Maintain newly sodded lawn areas by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, re-grading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas. Immediately replace sod in areas showing deterioration.
- C. Apply herbicides and insecticides that will not inhibit growth but will prevent weed and insect damage to turf. Comply with State of Florida and manufacturer's requirements for application of herbicides and insecticides.
- D. After sod is rooted, apply Fertilizer at the rate of Ten (10) Lbs. per 1000 SF. If winter apply the approved winterizer at the medium rate listed on the bag.
- E. Watering Schedule: Watering schedule is to include the duration and frequency each irrigation zone will run per week; or, if there is no irrigation system the schedule of the watering truck or hand watering. This will be worked out jointly with the irrigation contractor and shall be programmed on to the controller after



review by BCE. Program shall be submitted to Contracting Officer as part of the final acceptance process.

### **3.10 CLEANUP AND PROTECTION**

- A. During landscape work, all pallets, sod pieces, debris, and sand on pavement, shall be removed daily.
- B. Any excess excavated subsoil or topsoil shall be removed from the site.
- C. After sodding operations are finished, all paved areas which may have become strewn with soil or other material shall be thoroughly cleaned by sweeping, and if necessary, power washing.
- D. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

### **3.11 INSPECTION AND ACCEPTANCE**

- A. The completed sod will be inspected at the time of the final inspection. Sod will also be inspected at the end of the 60-day maintenance period.
- B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until re-inspected and found to be acceptable. Remove rejected sod and materials promptly from the project site.

**END OF SECTION**

**SECTION 33 11 16: SITE WATER UTILITY DISTRIBUTION PIPING****PART 1 GENERAL****1.01 REFERENCES**

- A. ASME/ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes
- B. ASTM A 139 - Standard Specification for Electric Fusion (ARC) Welded Steel Pipe (NPS 4 & over)
- C. ASTM B 62 - Composition Bronze or Ounce Metal Castings
- D. ASTM C 94 - Ready-Mixed Concrete
- E. ASTM D 1785 - PolyVinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
- F. ASTM D 2241 - PolyVinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
- G. ASTM D 2466 - PolyVinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
- H. ASTM D 2564 - Solvent Cements for PolyVinyl Chloride (PVC) Plastic Piping Systems
- I. ASTM D 2774 - Standard Practice for Underground Installation of Thermoplastic Pressure Piping
- J. ASTM D 2855 - Practice for Making Solvent Cemented Joints with PVC Pipe & Fittings
- K. ASTM D 3139 - Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- L. ASTM D 3261 - Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
- M. ASTM F 714 - Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
- N. ASTM F 402 - Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
- O. ASTM F 477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- P. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- Q. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm), for Water and Other Liquids
- R. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- S. AWWA C153/A21.53 - Ductile-Iron Compact Fittings, 3 in. through 24 in. (76 mm through 610 mm) and 54 in. Through 64 in. (1,000 mm Through 1,600 mm), for Water Service
- T. AWWA C500 - Metal-Seated Gate Valves for Water Supply Service
- U. AWWA C502 - Dry-Barrel Fire Hydrants
- V. AWWA C503 - Wet-Barrel Fire Hydrants
- W. AWWA C509 - Resilient-Seated Gate Valves for Water and Sewerage Systems
- X. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances
- Y. AWWA C605 - Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
- Z. AWWA C651 - Disinfecting Water Mains

- AA. AWWA C800 - Underground Service Line Valves and Fittings
- BB. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution
- CC. AWWA C901 - Standard for Polyethylene Pressure Pipe and Tubing, ½ in. Through 3 in., for Water Service
- DD. AWWA M23 - PVC Pipe - Design and Installation
- EE. MIL-HDBK 1008C – Fire Protection for Facilities Engineering, Design, and Construction
- FF. UBPPA UNI-B-8 - Direct Tapping of Polyvinyl Chloride (PVC) Pressure Water Pipe
- GG. UL 246 - Hydrants for Fire-Protection Service
- HH. UL 262 - Gate Valves for Fire-Protection Service

### **1.02 WATER DISTRIBUTION MAINS**

- A. Provide water distribution mains indicated of AWWA C900 polyvinyl chloride (PVC) plastic pipe with detector wire. Provide water main accessories, gate valves as specified and where indicated.

### **1.03 WATER SERVICE LINES**

- A. Provide water service lines indicated from water distribution main to building service at a point approximately 5 feet from building or as otherwise indicated on drawings. Water service lines shall conform to Section 2.02A. Ductile iron pipe appurtenances and valves as specified for water mains may also be used for service lines. Provide PVC water service line appurtenances as specified and where indicated.

### **1.04 SUBMITTALS FOR REVIEW**

- A. Submit the following in accordance with Section 01 33 00, "Submittals."
  1. Water distribution main piping, fittings, joints, valves, and coupling
  2. Water service line piping, fittings, joints, valves, and coupling
  3. Hydrants
  4. Indicator posts
  5. Corporation stops
  6. Valve boxes
  7. Submit manufacturer's standard drawings or catalog cuts, except submit both drawings and cuts for push-on joints. Include information concerning gaskets with submittal for joints and couplings.
  8. Installation procedures for water piping
    - a. For fusible PVC used in HDD applications include:
      - (1) Manufacturer's recommended minimum bending radius.
      - (2) Manufacturer's recommended maximum safe pull force
      - (3) Fusion technician qualification indicating conformance with this specification.
  9. Pressure and leakage tests
  10. Disinfection/bacteriological tests

### **1.05 SUBMITTALS FOR PROJECT CLOSEOUT**

- A. Submit the following in accordance with Section 01 33 00, "Submittals."
  1. Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations.
  2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
  3. For fusible PVC used in HDD applications include the approved data logger service reports.

### **1.06 CERTIFICATES**

- A. Water distribution main piping, fittings, joints, valves, and coupling
- B. Water service line piping, fittings, joints, valves, and coupling
- C. Fire hydrants
- D. Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise and that production control tests have been performed at the intervals or frequency specified in the publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

**1.07 DELIVERY AND STORAGE**

- A. Deliver, store, protect and handle products to site under provisions of Section 01 60 00. Inspect materials delivered to site for damage. Unload and store with minimum handling. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves and hydrants free of dirt and debris.

**1.08 HANDLING**

- A. Handle pipes, fittings, valves, hydrants, and other accessories in a manner to ensure delivery to the trench in sound undamaged condition. Take special care to avoid injury to coatings and linings on pipe and fittings; make satisfactory repairs if coatings or linings are damaged. Carry, do not drag pipe to the trench. Store plastic piping, jointing materials and rubber gaskets that are not to be installed immediately, under cover out of direct sunlight.

**PART 2 PRODUCTS****2.01 WATER DISTRIBUTION MAIN MATERIALS****A. Piping Materials****1. Polyvinyl Chloride (PVC) Plastic Piping**

- a. Pipe and Fittings: Pipe, AWWA C900, shall be plain end or gasket bell end, Pressure Class 150 (DR 18) with cast-iron-pipe-equivalent OD. Fittings shall be gray iron or ductile iron, AWWA C110/A21.10 or AWWA C153/A21.53, and have cement-mortar lining, AWWA C104/A21.4, standard thickness.

Fittings with push-on joint ends shall conform to the same requirements as fittings with mechanical-joint ends, except that bell design shall be modified, as approved, for push-on joint suitable for use with PVC plastic pipe specified in this paragraph. Pipe color is to be blue or white.

- b. Joints and Jointing Material: Joints for pipe shall be push-on joints, ASTM D 3139. Joints between pipe and metal fittings, valves, and other accessories shall be compression-type joints/mechanical joints, ASTM D 3139 and AWWA A21.11. Provide each joint connection with an elastomeric gasket suitable for the bell or coupling with which it is to be used. Gaskets for push-on joints for pipe, ASTM F 477. Gaskets for compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA A21.11, for mechanical joints. Mechanically coupled joints using a sleeve-type mechanical coupling, as specified in paragraph entitled "Sleeve-Type Mechanical Couplings," may be used as an optional jointing method in lieu of push-on joints on plain-end PVC plastic pipe, subject to the limitations specified for mechanically coupled joints using a sleeve-type mechanical coupling and to the use of internal stiffeners as specified for compression-type joints in ASTM D 3139.

**2. Fusible Polyvinyl Chloride (PVC) Plastic Piping**

- a. Fusible polyvinylchloride pipe conforming to AWWA C900, plain end, minimum Pressure Class 150 (DR 18). Heavier wall pipe shall be provided if required to accommodate maximum calculated tensile force expected in pipe pull-back. Fused joints shall be in strict accordance with manufacturer's recommendations. Other joints and jointing material shall be as defined in 2.01.A.1.B "Joints and Jointing Material".

**3. High Density Polyethylene (HDPE) Plastic Pipe**

- a. ASTM F-714-Pipe Std.; ASTM D3261 – Fittings Std.; AWWA C-901; 3" – 8" SDR 11.0, 160 psi. HDPE inside diameter shall equal or exceed PVC inside diameter.

**B. Valves, Hydrants, and Other Water Main Accessories**

1. Gate Valves on Buried Piping: AWWA C500, AWWA C509, or UL 262. Unless otherwise specified, valves conforming to: (1) AWWA C500 shall be nonrising stem type with double-disc gates and mechanical-joint ends, (2) AWWA C509 shall be nonrising stem type with mechanical-joint ends, and (3) UL 262 shall be inside-screw type with operating nut, double-disc or split-wedge type gate, designed for a hydraulic working pressure of 150 psi, and shall have mechanical-joint ends. Materials for UL 262 valves shall conform to the reference standards specified in AWWA C500. Valves shall open by counterclockwise rotation of the valve stem. Stuffing boxes shall have O-ring stem seals. Stuffing boxes shall be bolted and constructed so as to permit easy removal of parts for repair. In lieu of mechanical-joint ends and push-on joint ends, valves may have special ends for connection to sleeve-type mechanical coupling. Valve ends and gaskets for connection to sleeve-type mechanical coupling shall conform to the applicable requirements specified for the coupling. Provide 6-inch size valves with gearing, AWWA C500. Valves shall be of one manufacturer.

**C. Fire Hydrants**

1. Hydrant: AWWA C502, UL 246, dry barrel type, inside dimension of 6 inches (153 mm) minimum, with minimum 5 inches (125 mm) diameter valve seat opening; minimum net water area of barrel not less than 190 percent of valve opening; 6 inch (153 mm) bell or mechanical joint inlet connection with accessories, gland bolts, and gaskets. Hydrant outlets shall have 0.90 discharge coefficients.
2. Hydrant Extensions: Fabricate in multiples of 6 inches (150 mm) with rod and coupling to increase barrel length.
3. Hose and Streamer Connection: Match sizes with utility company, two hose nozzles, and one pumper nozzle. Install a Hydra Storz connection with Cap (Hydra Shield Mfg. Co.) in place of the 4-1/2" steamer connection.
4. Finish: Primer and two coats of enamel in color to be selected by base.

**D. Casing (under roadways)**

1. Casing under all paved roads shall meet, at a minimum, the following:
  - a. Wall Thickness: (Steel Casing) All casings shall be 0.188", ASTM A139, Grade B.
  - b. Steel casing shall be coated inside and out with approved primer plus one coat of asphaltum paint on outside.
  - c. All casing as a minimum shall extend 3 feet beyond the edge of roadway surfaces, as indicated on the Drawings.

**E. Casing/Pipe Spacers**

1. The Contractor shall provide casing spacers for all piping routed through steel casing. The spacers shall be stainless steel construction with UHMW polymer runners and shall be in two (2) halves. The nuts and bolts used shall be stainless steel. A total of no less than two (2) spacers per joint of pipe shall also be used plus one (1) near the openings (ends) of the casing. The spacers shall be Model CCS by Cascade Water Works Manufacturing Co., or equal.
2. The Contractor shall provide casing end seals on all casings. The end seals shall wrap around the casing and carrier pipes after installation to provide a barrier to backfill debris and seepage. Stainless steel bands shall be used to secure the end seals. The casing end seals shall be Model CCES by Cascade Waterworks Mfg. Company, Advance Products and Systems or equal.

**2.02 WATER SERVICE LINE MATERIALS**

- A. Plastic Piping - Plastic pipe and fittings shall bear the seal of the National Sanitation Foundation for potable water service. Plastic pipe and fittings shall be supplied from the same manufacturer.
  1. Polyvinyl Chloride (PVC) Plastic Piping: ASTM D 1785, Schedule 40; or ASTM D 2241, with SDR as necessary to provide 150 psi minimum pressure rating. Fittings, ASTM D 2466. Pipe and fittings shall be of the same PVC plastic material and shall be one of the following pipe/fitting combinations, as marked on the pipe and fitting, respectively: [PVC 1120/PVC I; PVC 1220/PVC 12;] PVC 2120/PVC II; PVC 2116/PVC II. Solvent cement for jointing, ASTM D 2564.
- B. Insulating Joints - Joints between pipes of dissimilar metals shall have a rubber-gasketed or other suitable approved type of insulating joint or dielectric coupling, which will effectively prevent metal-to-metal contact between adjacent sections of piping.
- C. Corporation Stops - Ground key type; bronze, ASTM B 61 or ASTM B 62; and suitable for the working pressure of the system. . Threaded ends for inlet and outlet of corporation stops, AWWA C800.
- D. Curb Boxes - Provide a curb box for each curb or service stop. Curb boxes shall be of cast iron of a size suitable for the stop on which it is to be used. Provide a round head. Cast the word "WATER" on the lid. Each box shall have a heavy coat of bituminous paint.

**PART 3 EXECUTION****3.01 GENERAL REQUIREMENTS FOR INSTALLATION OF PIPELINES**

- A. These requirements shall apply to all pipeline installation except where specific exception is made in the "Special Requirements..." paragraphs.

**3.02 LOCATION OF WATER LINES**

- A. Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated. Do not lay water lines in the same trench with gas lines or electric wiring.

1. Water Piping Installation Parallel with Sewer Piping
  - a. Normal Conditions: Lay water piping at least 10 feet horizontally from a sewer or sewer manhole whenever possible. Measure the distance edge-to-edge.
  - b. Unusual Conditions: When local conditions prevent a horizontal separation of 10 feet, the water piping may be laid closer to a sewer or sewer manhole provided that:
    - (1) The bottom (invert) of the water piping shall be at least 18 inches above the top (crown) of the sewer piping.
    - (2) Where this vertical separation cannot be obtained, the sewer piping shall be constructed of AWWA-approved water pipe and pressure tested in place without leakage prior to backfilling.
    - (3) The sewer manhole shall be of watertight construction and tested in place.
2. Installation of Water Piping Crossing Sewer Piping
  - a. Normal Conditions: Water piping crossing above sewer piping shall be laid to provide a separation of at least 18 inches between the bottom of the water piping and the top of the sewer piping.
  - b. Unusual Conditions: When local conditions prevent a vertical separation described above, use the following construction:
    - (1) Sewer piping passing over or under water piping shall be constructed of AWWA-approved ductile iron water piping, pressure tested in place without leakage prior to backfilling.
    - (2) Water piping passing under sewer piping shall, in addition, be protected by providing a vertical separation of at least 18 inches between the bottom of the sewer piping and the top of the water piping; adequate structural support for the sewer piping to prevent excessive deflection of the joints and the settling on and breaking of the water piping; and that the length, minimum 20 feet, of the water piping be centered at the point of the crossing so that joints shall be equidistant and as far as possible from the sewer piping.
3. Sewer Piping or Sewer Manholes: No water piping shall pass through or come in contact with any part of a sewer manhole.

### **3.03 EARTHWORK**

- A. Perform earthwork operations in accordance with Specification Section 31 23 16.

### **3.04 PIPE LAYING AND JOINTING**

- A. Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Do not under any circumstances drop or dump pipe, fittings, valves, or any other water line material into trenches. Cut pipe accurately to length established at the site and work into place without springing or forcing. Replace by one of the proper length any pipe or fitting that does not allow sufficient space for proper installation of jointing material. Blocking or wedging between bells and spigots will not be permitted. Lay bell-and-spigot pipe with the bell end pointing in the direction of laying. Grade the pipeline in straight lines; avoid the formation of dips and low points. Support pipe at proper elevation and grade. Secure firm, uniform support. Wood support blocking will not be permitted. Lay pipe so that the full length of each section of pipe and each fitting will rest solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and supports where indicated and where necessary for fastening work into place. Make proper provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been properly made. At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads. Do not lay pipe when conditions of trench or weather prevent installation. Depth of cover over top of pipe shall not be less than 2 1/2 feet. Install access fittings to permit disinfection of water system.

### **3.05 CONNECTIONS TO EXISTING WATER LINES**

- A. Make connections to existing water lines after approval is obtained and with a minimum interruption of service on the existing line. Scheduling of any outage requires a minimum of one-week prior notice for the user of the facility. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped.

### **3.06 SPECIAL REQUIREMENTS FOR INSTALLATION OF WATER MAINS**

- A. Installation of PVC Plastic Water Main Pipe and Associated Fittings: Unless otherwise specified, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines"; with the requirements of AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, and setting of hydrants, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation."
  1. Jointing: Make push-on joints with the elastomeric gaskets specified for this type joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-

bevel pipe end to a bevel approximately the same as that on ductile-iron pipe used for the same type of joint. Use an approved lubricant recommended by the pipe manufacturer for push-on joints. Assemble push-on joints for pipe-to-pipe joint connections in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23, Chapter 7, "Installation," for pipe joint assembly. Make compression-type joints/mechanical joints with the gaskets, glands, bolts, nuts, and internal stiffeners previously specified for this type joint; assemble in accordance with the requirements of AWWA C605 for joining PVC pipe to fittings and accessories, with the applicable requirements of AWWA C600 for joint assembly, and with the recommendations of Appendix A to AWWA C111/A21.11. Cut off spigot end of pipe for compression-type joint/mechanical-joint connections and do not re-bevel. Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer using internal stiffeners as previously specified for compression-type joints.

2. Pipe Anchorage: Provide concrete thrust blocks. Thrust blocks shall be in accordance with the requirements of AWWA C605 for reaction or thrust blocking and plugging of dead ends, except that size and positioning of thrust blocks shall be as indicated. Use concrete, ASTM C 94, having a minimum compressive strength of 4,000 psi at 28 days.
3. Install a # 10 gage copper trace wire at top of and buried with PVC pipe to facilitate location with an electronic detector. Wrap around valve box and terminate 3-4" below grade. Do not wrap wire around pipe. Trace wire shall have bright blue insulation. Install magnetic detectable conductor 12 inches below finish grade. The magnetic detectable conductor shall also be bright blue.

#### B. Installation of fusible polyvinylchloride water main

1. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
2. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.
3. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.
4. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
  - a. HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
  - b. CARRIAGE – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
  - c. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.
  - d. DATA LOGGING DEVICE – An approved datalogging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.
5. Other equipment specifically required for the fusion process shall include the following:
  - a. Pipe rollers shall be used for support of pipe to either side of the machine.
  - b. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.
  - c. An infrared (IR) pyrometer for checking pipe and heat plate temperatures.
  - d. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
  - e. Facing blades specifically designed for cutting fusible polyvinylchloride pipe shall be used.

#### C. Installation of Valves and Hydrants

1. Installation of Valves: Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation in AWWA M23, Chapter 7, "Installation." Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.
2. Installation of Hydrants: Install hydrants in accordance with AWWA C600 for hydrant installation and as indicated. Make and assemble joints as specified for making and assembling the same type joints between pipe and fittings. Install hydrants with the 4 1/2 inch connections facing the adjacent paved surface. If there are two paved adjacent surfaces, contact the Contracting Officer for further instructions.

- D. Installation of Water Service Piping
1. Location - Connect service piping to the building service 5 feet from the building line unless otherwise specified or indicated.
  2. Service Line Connections to Water Mains - Connect service lines 2 inch size to the main with a rigid connection or a corporation stop and gooseneck and install a gate valve on service line below the frostline as indicated. All service line valves should included galvanized nipples (6" minimum) extending beyond valve box. Connect service lines to PVC plastic water mains in accordance with UBPPA UNI-B-8 and the recommendations of AWWA M23, Chapter 9, "Service Connections."
- E. Special Requirements for Installation of Water Service Piping
1. Installation of Plastic Piping - Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" and with the applicable requirements of ASTM D 2774 and ASTM D 2855, unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with ASTM F 402.
    - a. Jointing: Make solvent-cemented joints for PVC plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with ASTM D 2855. Make solvent-cemented joints for ABS plastic piping using the solvent cement previously specified for this material; assemble joints in accordance with the recommendations of the pipe manufacturer, as approved. Make plastic pipe joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.
    - b. Plastic Pipe Connections to Appurtenances: Connect plastic pipe service lines to galvanized nipples of corporation stops and gate valves in accordance with the recommendations of the plastic pipe manufacturer.
    - c. For connection to PVC service tubing, corporation stops shall be installed with galvanized nipple (minimum 6" long) on each end and coupling prior to transition to PVC.
- F. Disinfection - Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651 and as required by State permit. Prior to placing main in service contractor shall submit bacteriological results and pressure test results to the Government for the purpose of requesting State clearance. The Government will notify the contractor when the main has been approved and ready to be placed in service. Bacteriological samples shall be taken on two consecutive days at the connection to the existing system, the end point of the new addition, on each new line branching off main, and every 1,200 feet on straight runs of pipe. Contractor shall submit a drawing showing the sampling point locations and clearly indicate the chlorine residuals.
1. Prior to starting work, verify system is complete, flushed and clean.
  2. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
  3. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
  4. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
  5. Maintain disinfectant in system for 24 hours.
  6. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
  7. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
  8. Take samples no sooner than 24 hours after flushing, from locations indicated above, and analyze in accordance with AWWA C651.
  9. The total residual chlorine and total coliform analyses shall be completed, at the Contractor's expense, per the requirements of Florida Department of Environmental Protection (FDEP) rule 62-555.340(2). Analyses shall be performed by a laboratory of the Department of Health (DOH) or a laboratory certified by the DOH to perform bacteriological analyses of drinking water and shall be performed using an appropriate method referenced in subsection 62-550.550(1), F.A.C.

### 3.07 DIRECTIONAL DRILLING

- A, Where indicated on the drawings, the Contractor shall use directional drilling (trenchless excavation). The directional drilling shall be done using experienced personnel as well as properly sized equipment rated for both the size and length of pipe to be installed. The equipment shall incorporate the use of a radio detection-locating device. The locating device shall be capable of determining the position of the drill head plus or minus two (2) inches.
- B. The actual drilling process shall be one of displacement and compaction. The drill head shall cut its own hole and then compact the displaced material against the walls of the drilled hole. Bentonite shall be used to help hold the walls of the hole in place and ultimately fill the voids between the pipe and the walls of the hole.



- C. The pipe to be installed in all directional drilling shall be fusible polyvinyl chloride (PVC) plastic piping as detailed in Section 2.01.A.2 above, or high-density polyethylene, as detailed in Section 2.01.A.3 above. All piping shall be fitted with flanged fittings at both ends. The length shall be sufficient length to allow for at least a minimum of 5 feet below the bottom of the obstacle being drilled under.
- D. All normal precautions shall be utilized to protect any existing utilities within the drilling area.
- E. Coordinate with 1SOCES/CEAN when drilling under jurisdictional wetlands; a request for exemption from the Florida Department of Environmental Protection (FDEP) may be necessary.

### **3.08 FIELD QUALITY CONTROL**

- A. Field Tests and Inspections - The Government will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing, except that water and electric power needed for field tests. The Contractor shall produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.
- B. Testing Procedure - Test water mains and water service lines in accordance with the applicable specified standard, except for the special testing requirements given in paragraph entitled "Special Testing Requirements." Test PVC plastic water mains and water service lines made with PVC plastic water main pipe in accordance with the requirements of AWWA C605 for pressure and leakage tests. The amount of leakage on pipelines made of PVC plastic water main pipe shall not exceed the amounts given in AWWA 605, except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed. Test water service lines in accordance with applicable requirements of AWWA C605 for hydrostatic testing. No leakage will be allowed at plastic pipe joints.
- C. Special Testing Requirements - For pressure test, use a hydrostatic pressure 50 psi greater than the maximum working pressure of the system, except that for those portions of the system having pipe size larger than 2 inches in diameter, hydrostatic test pressure shall be not less than 200 psi. Hold this pressure for not less than 2 hours. Prior to the pressure test, fill that portion of the pipeline being tested with water for a soaking period of not less than 24 hours. For leakage test, use a hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

**END OF SECTION**

**SECTION 33 31 00 SANITARY UTILITY SEWERAGE PIPING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sanitary sewerage drainage piping, fittings, accessories, and bedding.
- B. Connection of building sanitary drainage system to municipal sewers.

**1.02 REFERENCES**

- A. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- B. ASTM C478 – Precast Reinforced Concrete Manhole Sections
- C. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
- D. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
- E. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils.
- F. ASTM D1556 - Test Methods for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.
- G. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 LB (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
- H. ASTM D1785 - Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80 and 120.
- I. ASTM D2321 - Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
- J. ASTM D3034 - Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
- K. ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

**1.03 DEFINITIONS**

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

**1.04 SUBMITTALS FOR REVIEW**

- A. Product Data: Provide data indicating pipe and pipe accessories.

**1.05 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for materials and installation of the work of this section.

**PART 2 PRODUCTS****2.01 PIPE MATERIALS**

- A. Plastic Pipe: ASTM D3034, SDR 35 max, Polyvinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end. Pipe color green or brown.
- B. Plastic Pipe: ASTM D1785, Schedule 40, Polyvinyl Chloride (PVC) material; bell and spigot style solvent sealed joint end. Pipe color green or brown.

**2.02 PIPE ACCESSORIES**

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, clean-outs, reducers, traps and other configurations required.
- B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewer Service" in large letters.

## 2.03 MANHOLES

- A. Manholes shall be pre-formed, pre-cast reinforced concrete. Locations of pipe, etc. shall be based on the drawings and invert elevations of the pipe.
- B. The depth of manholes will be measured from the top of the cover to the invert of the outlet pipe.
- C. Frames and covers shall be cast iron, ductile iron or reinforced concrete. Cast iron frames and covers shall be as indicated or shall be of type as suitable for the application, circular, without vent holes. The frames and covers shall have a combined weight of not less than 181.4 kg (400 pounds). Reinforced concrete frames and covers shall be as indicated or shall conform to ASTM C 478 or ASTM C 478M. The word "Sewer" shall be stamped or cast into covers so that it is plainly visible.
- D. A steel ladder shall be provided where the depth of a manhole exceeds 3.6 m (12 feet). The ladder shall not be less than 406.4 mm (16 inches) in width, with 19.1 mm (3/4 inch) diameter rungs spaced 304.8 mm (12 inches) apart. The two stringers shall be a minimum 9.5 mm (3/8 inch) thick and 50.8 mm (2 inch) wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123.
- E. Precast reinforced concrete manhole sections shall conform to ASTM C 478, except that Portland cement shall be as specified herein. Joints shall be cement mortar, an approved mastic, rubber gaskets, a combination of these types; or the use of external preformed rubber joint seals and extruded rolls of rubber with mastic adhesive on one side.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on drawings.
- B. Verify items provided by other sections of work are properly sized and located.
- C. Verify built-in items are in proper location, and ready for roughing into Work.
- D. Verify correct size of manhole excavation.

### 3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with [[fine] [coarse] aggregate.
- B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.
- C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

### 3.03 BEDDING

- A. Excavate pipe trench in accordance with Section 31 23 16 for work of this section. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Place bedding material at trench bottom, level materials in continuous layers not exceeding 8 inches compacted depth, compact to 95 percent.
- C. Maintain moisture content of bedding material at optimum or above to attain required compaction density.
- D. Bedding for pre-cast manhole bottoms shall be gravel, minimum size 1/2" to maximum size 1". Bedding material shall be a minimum of 6" thick and extend 1 foot beyond the diameter of the pre-cast bottom.

### 3.04 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM D2321 and manufacturer's instructions. Seal joints watertight. Joints and couplings should be left uncovered until after all tests are complete.
- B. Lay pipe to slope gradients noted on drawings with maximum variation from true slope of 1:1000.

- C. Install bedding at sides and over top of pipe to minimum compacted thickness of 12 inches; compacted to 95 percent.
- D. Refer to Section 31 23 16 for trenching requirements. Do not displace or damage pipe when compacting.
- E. Install trace wire and colored marker tape continuous over top of pipe buried 6 inches below finish grade, above pipeline.

### **3.05 INSTALLATION – MANHOLES**

- A. Excavation and Backfill:
  1. Excavate for manholes in accordance with Section 31 23 16 in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
  2. When groundwater is encountered, prevent accumulation of water in excavations. Place manholes in dry trench.
  3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.
- B. Place base pad, trowel top surface level.
- C. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- D. Backfill excavations for manholes in accordance with Section 31 23 23.
- E. Cut and fit for pipe.
- F. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour to form continuous drainage channel.
- G. Set cover frames and covers level without tipping, to correct elevations.
- H. Coordinate with other sections of work to provide correct size, shape, and location.
- I. Lift precast components at lifting points designated by manufacturer.
- J. When lowering manholes into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
- K. Set precast structures bearing firmly and fully on crushed stone bedding, compacted in accordance with provisions of Section 31 23 23.
- L. Assemble multi-section structures by lowering each section into excavation. Lower, set level, and firmly position base section before placing additional sections.
- M. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section.
- N. Joint sealing materials may be installed on site or at manufacturer's plant.
- O. Verify manholes installed satisfy required alignment and grade.
- P. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with mortar.
- Q. Cut pipe to finish flush with interior of structure.
- R. Shape inverts through manhole.

### **3.06 FRAME AND COVER INSTALLATION**

- A. Set frame and cover 2 inches above finished grade for manholes with covers located within unpaved areas to allow area to be graded away from cover beginning 1 inch below top surface of frame.

**3.07 FIELD QUALITY CONTROL**

- A. Request inspection prior to and immediately after placing bedding.
- B. Compaction testing will be performed in accordance with ASTM D1556.
- C. Moisture content testing will be performed in accordance with ASTM D1557.
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest at no cost to owner.
- E. Frequency of tests should be in accordance with ASTM D422, minimum of one per each type material, and ASTM D1557, minimum of one lift per 1000 feet (field density).
- F. Pressure Test: Not applicable for gravity pipe.
- G. Infiltration Test: Lines shall be tested for leakage by low pressure air testing, infiltration tests or exfiltration tests, as appropriate. Low pressure air testing for PVC pipe shall be as prescribed in ASTM F1417. Prior to infiltration or exfiltration tests the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 2 feet or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. When the Contracting Officer determines that infiltration cannot be properly tested, an exfiltration test shall be made by filling the line to be tested with water so that a head of at least 2 feet is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be re-established. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by either the infiltration test or exfiltration test shall not exceed 0.16 gallons per inch diameter per 100 feet of pipeline per hour. Manholes shall be tested for leakage by negative air pressure testing, infiltration testing, or exfiltration testing as appropriate. Negative air Pressure testing shall be as prescribed in ASTM C1244. Infiltration testing and exfiltration testing shall be as prescribed in ASTM C969. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correction, and retesting shall be made at no additional cost to the Government.
- H. Deflection Test: When flexible pipe is used, a deflection test shall be made on the entire length of the installed pipeline not less than 30 days after the completion of all work including the leakage test, backfill, and placement of any fill, grading, paving, concrete, or superimposed loads. Deflection shall be determined by use of a deflection device or by use of a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. The ball, cylinder, or circular sections shall have a diameter, or minor diameter as applicable, of 95.0 percent of the inside diameter of the pipe. A tolerance of plus 0.5 percent will be permitted. The ball, cylinder, or circular sections shall be of a homogeneous material throughout, shall have a density greater than 1.0 as related to water at 39.2 degrees F, and shall have a surface brinell hardness of not less than 150. It shall be center bored and through bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of 70,000 psi or more, with eyes at each end for attaching pulling cables. The eye shall be suitably backed with flange or heavy washer such that a pull exerted on the opposite end of the shaft shall produce compression throughout the remote end of the ball, cylinder or circular section. Circular sections shall be so spaced that the distance from the external faces of the front and back sections shall equal or exceed the diameter of the circular section. Failure of the ball, cylinder, or circular section to pass freely through a pipe run, either by being pulled through or by being flushed through with water, shall be cause for rejection of that run. When a deflection device is used for the test in lieu of the ball, cylinder, or circular sections described, such device shall be approved prior to use. The device shall be sensitive to 1.0 percent of the diameter of the pipe being measured and shall be accurate to 1.0 percent of the indicated dimension. Installed pipe showing deflections greater than 7.5 percent of the normal diameter of the pipe, shall be retested by a run from the opposite direction. If the retest also fails, the suspect pipe shall be replaced at no cost to the Government.

**3.08 PROTECTION OF FINISHED WORK**

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.

**3.09 RELATION TO WATER MAINS**

- A. Sewers crossing under water mains shall be laid to provide a minimum vertical distance of 18" between the invert of the upper pipe and the crown of the lower pipe. Where this minimum separation cannot be maintained, the crossing shall be arranged so that the sewer pipe joints and water main joints are equidistant from the point of crossing with no less than 10 feet between any two joints. Alternatively, the sewer main may be placed in a sleeve or encased in concrete to obtain the equivalent of the required 10-foot separation. Where there is no alternative to sewer pipes crossing over a water main, the criteria for minimum separation between lines and joints above are required.
- B. Sewers shall be laid at least 10 feet horizontally from existing or proposed water main. The distance shall be measured edge to edge.
- C. When it is impossible to obtain the proper horizontal and vertical separation as stipulated above, the sewer shall be constructed equal to water pipe, and shall be pressure tested to assure water tightness prior to backfill.

**END OF SECTION**

**SECTION 33 41 00****STORM UTILITY DRAINAGE PIPING****PART 1 - GENERAL**

**1.01 SECTION INCLUDES:** Requirements for storm drainage piping systems using concrete, clay, steel, ductile iron, aluminum, polyvinyl chloride (PVC), and polyethylene (PE) pipe.

**1.02 MEASUREMENT**

- A. Pipe Culverts and Storm Drains: The length of pipe installed will be measured along the centerlines of the pipe from end to end of pipe without deductions for diameter of manholes.
- B. Manholes and Inlets: The quantity of manholes and inlets will be measured as the total number of manholes and inlets of the various types of construction complete with frames and gratings or covers and, where indicated, with fixed side-rail ladders, constructed to the depths shown on the drawings and listed in the bid schedule. The depth of manholes and inlets will be measured from the top of grating or cover to invert of outlet pipe.
- C. Walls and headwalls will be measured as the number of walls and headwalls constructed in the completed work.
- D. Flared End Sections will be measured by the unit.
- E. Sheeting and Bracing: Payment will be made for sheeting and bracing ordered left in place based on the number of square meters (feet) of sheeting and bracing remaining below the surface of the ground.
- F. Rock Excavation: Not included.
- G. Backfill Replacing Unstable Material: The number of cubic meters (yards) of select granular material required to replace unstable material for foundations under pipes or drainage structures, which will constitute full compensation for this backfill material, including removal and disposal of unstable material and all excavating, hauling, placing, compacting, and all incidentals necessary to complete the construction of the foundation satisfactorily.

**1.03 REFERENCES**

- A. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
  - 1. AASHTO-01 Standard Specifications for Highway Bridges
  - 2. AASHTO M 167 Corrugated Steel Structural Plate, Zinc Coated, for Field Bolted Pipe
  - 3. AASHTO M 190 Bituminous Coated Corrugated Metal Culvert Pipe and Pipe Arches
  - 4. AASHTO M 198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets
  - 5. AASHTO M 219 Aluminum Alloy Structural Plate for Field Bolted Conduits
  - 6. AASHTO M 243 Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
  - 7. AASHTO M 294 Corrugated Polyethylene Pipe, 12 to 36-in. Diameter
- B. AMERICAN CONCRETE INSTITUTE (ACI)
  - 1. ACI 346 Cast-in-Place Nonreinforced Concrete Pipe
- C. AMERICAN RAILWAY ENGINEERING ASSOCIATION (AREA)
  - 1. AREA-01 Manual for Railway Engineering (Fixed Properties)
- D. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  - 1. ASTM A 48 Gray Iron Castings
  - 2. ASTM A 123 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - 3. ASTM A 536 Ductile Iron Castings
  - 4. ASTM A 716 Ductile Iron Culvert Pipe
  - 5. ASTM A 742 Steel Sheet, Metallic Coated and Polymer Precoated for Corrugated Steel Pipe
  - 6. ASTM A 760 Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
  - 7. ASTM A 762 Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains

8. ASTM A 798 Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications
9. ASTM A 807 Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications
10. ASTM A 849 Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
11. ASTM A 929 Standard Specification for Steel/Sheet, Metallic Coated by the Hot Dip Process for Corrugated Steel Pipe
12. ASTM B 26 Aluminum-Alloy Sand Castings
13. ASTM B 745 Corrugated Aluminum Pipe for Sewers and Drains
14. ASTM C 12 Installing Vitrified Clay Pipe Lines
15. ASTM C 14 Concrete Sewer, Storm Drain, and Culvert Pipe
16. ASTM C 32 Sewer and Manhole Brick (Made from Clay or Shale)
17. ASTM C 55 Concrete Building Brick
18. ASTM C 62 Building Brick (Solid Masonry Units Made from Clay or Shale)
19. ASTM C 76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
20. ASTM C 139 Concrete Masonry Units for Construction of Catch Basins and Manholes
21. ASTM C 231 Air Content of Freshly Mixed Concrete by the Pressure Method
22. ASTM C 270 Mortar for Unit Masonry
23. ASTM C 425 Compression Joints for Vitrified Clay Pipe and Fittings
24. ASTM C 443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
25. ASTM C 478 Precast Reinforced Concrete Manhole Sections
26. ASTM C 506 Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
27. ASTM C 507 Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe
28. ASTM C 655 Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
29. ASTM C 700 Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
30. ASTM C 877 External Sealing Bands for Noncircular Concrete Sewer, Storm Drain, and Culvert Pipe
31. ASTM D 1056 Flexible Cellular Materials - Sponge or Expanded Rubber
32. ASTM D 1171 Rubber Deterioration - Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens)
33. ASTM D 1443 Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
34. ASTM D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lb/cu.ft.)
35. ASTM D 1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
36. ASTM D 1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
37. ASTM D 1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
38. ASTM D 2167 Density and Unit Weight of Soil in Place by the Rubber Balloon Method
39. ASTM D 2321 Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
40. ASTM D 3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
41. ASTM D 3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
42. ASTM D 3350 Polyethylene Plastic Pipe and Fittings Materials
43. ASTM D 6938 Standard Test Method for In-Place Density & Water Content of Soil and Soil-Aggregate by Nuclear Methods
44. ASTM F 679 Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
45. ASTM F 714 Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
46. ASTM F 794 Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
47. ASTM F 894 Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
48. ASTM F 949 Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

#### E. FEDERAL SPECIFICATIONS (FS)



1. FS HH-G-156 (Rev D; Int Am 1) Gasket Material, General Purpose; Rubber Sheets, Strips, and Special Shapes
2. FS SS-S-210 (Rev A; Reinstatement Notice) Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints

F. FEDERAL TEST METHOD STANDARDS (FTM-STD)

1. FTM-STD 601 (Basic; Notice 7) Rubber: Sampling and Testing

**1.04 SUBMITTALS:** The following shall be submitted in accordance with Section 01 33 00 - Submittals.

- A. Pipe Placing Instructions: Printed copies of the manufacturer's recommendations for installation procedures of the material being placed, prior to installation.
- B. Certificates: Certified copies of test reports demonstrating conformance to applicable pipe specifications, before pipe is installed. Certification on the ability of frame and cover or gratings to carry the imposed live load.
- C. As-Built Drawings: Submit as part of the as-built drawings in accordance with Section 01 70 00, "Contract Closeout"
  1. Record actual locations of piping systems including all appurtenances and invert elevations.
  2. Use GPS (Latitudes and Longitudes, Degrees/Minutes/Seconds).

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Storage: Materials delivered to site shall be inspected for damage, unloaded, and stored with a minimum of handling. Materials shall not be stored directly on the ground. The inside of pipes and fittings shall be kept free of dirt and debris. Gasket materials and plastic materials shall be protected from exposure to the direct sunlight over extended periods.
- B. Handling: Materials shall be handled in such a manner as to ensure delivery to the trench in sound, undamaged condition. Pipe shall be carried to the trench, not dragged.

**PART 2 - PRODUCTS**

**2.01 PIPE FOR CULVERTS AND STORM DRAINS**

- A. Pipe for culverts and storm drains shall be of the sizes indicated and shall conform to the requirements specified.
- B. Concrete Pipe:
  1. Concrete Pipe shall conform to ASTM C 76, Class I.
  2. Reinforced Arch Culvert and Storm Drainpipe shall conform to ASTM C 506, Class A-II.
  3. Reinforced Elliptical Culvert and Storm Drainpipe shall conform to ASTM C 507.
    - a. Horizontal elliptical pipe shall be Class HE-A.
    - b. Vertical elliptical pipe shall be Class VE-II.
  4. Nonreinforced Pipe shall conform to ASTM C 14, Class 3.
- C. Corrugated Steel Pipe:
  1. Corrugated steel pipe shall conform to ASTM A 760, zinc coated of either:
    - a. Type I or II pipe with annular or helical corrugations.
    - b. Type IA or IIA pipe with helical corrugations fabricated with a smooth steel liner of Type C precoated sheet with a polymeric coating on both sides of not less than 0.25 mm (0.010-inch) thick conforming to ASTM A 742.
    - c. Type IR or IIR pipe with helical corrugations.
  2. Fully Bituminous Coated Corrugated Steel Pipe shall conform to AASHTO M 190 Type A and ASTM A 760 zinc coated pipe of either:
    - a. Type I or II pipe with annular or helical corrugations.
    - b. Type IA or IIA pipe with helical corrugations fabricated with a smooth steel liner of Type C precoated sheet with a polymeric coating on both sides of not less than 0.25 mm (0.010-inch)

- thick conforming to ASTM A 742. Bituminous coating shall only be applied to the outside surface of the shell and the inside surface of the liner.
- c. Type IR or IIR pipe with helical corrugations.
- D. PVC Pipe: The pipe stiffness shall be greater than or equal to 735/D for cohesionless material pipe trench backfills and greater than or equal to 1240/D for cohesive material pipe trench backfills or installation in an embankment or fill. D is the pipe diameter in inches.
    - 1. Type PSM PVC Pipe: Type PSM PVC Pipe shall conform to ASTM D 3034, cell class 13364-B with fittings cell class 13343-C by ASTM D 1784, Type PSM, SDR 23.5.
    - 2. Ribbed PVC Pipe shall conform to ASTM F 794 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, cell class 12454B Series 46.
    - 3. Smooth Wall PVC Pipe shall conform to ASTM F 679 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, cell class 12454B.
    - 4. Corrugated PVC Pipe shall conform to ASTM F 949 produced from PVC certified by the compounder as meeting the requirements of ASTM D 1784, cell class 12454B.
  - E. PE Pipe: The pipe stiffness shall be greater than or equal to 1170/D for cohesionless material pipe trench backfills and greater than or equal to 1990/D for cohesive material pipe trench backfills or installation in an embankment or fill. D is the pipe diameter in inches.
    - 1. Smooth Wall PE Pipe shall conform to ASTM F 714 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 335434C.
    - 2. Corrugated PE Pipe shall conform to AASHTO M 294 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 315412C or 334433C.
    - 3. Ribbed PE Pipe shall conform to ASTM F 894 produced from PE certified by the resin producer as meeting the requirements of ASTM D 3350, cell class 334433C, RSC 160.

## 2.02 DRAINAGE STRUCTURES

- A. Flared End Sections shall be of a standard design fabricated from zinc coated steel sheets meeting requirements of ASTM A 929.
- B. Precast Reinforced Concrete Box
  - 1. For highway loadings with 600 mm (2 feet) of cover or more or subjected to dead load only, ASTM C 789; for less than 600 mm (2 feet) of cover subjected to highway loading, ASTM C 850.

## 2.03 MISCELLANEOUS MATERIALS

- A. Concrete: Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for 221 Mpa (3000 psi) concrete under Section 03 30 00 - Cast-in-Place Concrete. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 37.5 mm (1-1/2 inches). Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall not be less than 25 mm (1 inch) thick for covers and not less than 40 mm (1-1/2 inches) thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 75 mm (3 inches) between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, or ASTM D 1752, or shall be resin-impregnated fiberboard conforming to the physical requirements of ASTM D 1752.
- B. Mortar for pipe joints, connections to other drainage structures, and brick or block construction shall conform to ASTM C 270, Type M, except the maximum placement time shall be 1 hour. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar. Water shall be clean and free of harmful acids, alkalis, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water. The inside of the joint shall be wiped clean and finished smooth. The mortar head on the outside shall be protected from air and sun with a proper covering until satisfactorily cured.
- C. Precast Concrete Segmental Blocks shall conform to ASTM C 139, not more than 200 mm (8 inches) thick, not less than 200 mm (8 inches) long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

- D. Brick shall conform to ASTM C 62, Grade SW; ASTM C 55, Grade S-I or S-II; or ASTM C 32, Grade MS. Mortar for jointing and plastering shall consist of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 10 mm (1/2 inch) of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.
- E. Precast Reinforced Concrete Manholes: Precast reinforced concrete manholes shall conform to ASTM C 478. Joints between precast concrete risers and tops shall be made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph JOINTS.
- F. Prefabricated Corrugated Metal Manholes shall be of the type and design recommended by the manufacturer. Manholes shall be complete with frames and cover, or frames and gratings.
- G. Frame and Cover or Gratings:
1. Frame and cover or gratings shall be cast gray iron, ASTM A 48, Class 35B; cast ductile iron, ASTM A 536, Grade 65-45-12; or cast aluminum, ASTM B 26, Alloy 356.0T6.
  2. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the plans.
- H. Joints:
1. Flexible Watertight Joints:
    - a. Materials: Flexible watertight joints shall be made with plastic or rubber-type gaskets for concrete pipe and with factory-fabricated resilient materials for clay pipe. The design of joints and the physical requirements for plastic gaskets shall conform to AASHTO M 198, and rubber-type gaskets shall conform to ASTM C 443. Factory-fabricated resilient joint materials shall conform to ASTM C 425. Gaskets shall have not more than one factory-fabricated splice, except that two factory-fabricated splices of the rubber-type gasket are permitted if the nominal diameter of the pipe being gasketed exceeds 1.35 m (54 inches).
    - b. Test Requirements: Watertight joints shall be tested and shall meet test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS. Gaskets or jointing materials shall not swell more than 100 percent by volume when immersed in accordance with Method 6211 of FTM-STD 601 in immersion medium No. 3 for 70 hours at 100 degrees C (212 degrees F.) Certified copies of test results shall be delivered to the Contracting Officer before gaskets or jointing materials are installed. Alternate types of watertight joint may be furnished if specifically approved.
  2. Preformed Plastic Sealing Compound shall conform to FS SS-S-210.
  3. External Sealing Bands shall conform to ASTM C 877.
  4. Flexible Watertight, Gasketed Joints:
    - a. Gaskets: When infiltration or exfiltration is a concern for pipe lines, the couplings may be required to have gaskets. The closed-cell expanded rubber gaskets shall be a continuous band approximately 178 mm (7 inches) wide and approximately 9.5 mm (3/8-inch) thick, meeting the requirements of ASTM D 1056, and shall have a quality retention rating of not less than 70 percent when tested for weather resistance by ozone chamber exposure, Method B of ASTM D 1171. Rubber O-ring gaskets shall be 20.6 mm (13/16 inch) inch in diameter for pipe diameters of 914 mm (36 inches) or smaller and 22.2 mm (7/8 inch) in diameter for larger pipe having 12.7 mm (1/2-inch) deep end corrugation. Rubber O-ring gaskets shall be 34.9 mm (1-3/8 inches) in diameter for pipe having 25 mm (1-inch) deep end corrugations. O-rings shall meet the requirements of AASHTO M 198 or ASTM C 443. Flexible plastic gaskets shall conform to requirements of AASHTO M 198, Type B.
    - b. Connecting Bands: Connecting bands shall be of the type, size and sheet thickness of band, and the size of angles, bolts, rods and lugs as indicated or where not indicated as specified in the applicable standards for specifications for the pipe. Exterior rivet heads in the longitudinal seam under the connecting band shall be countersunk or the rivets shall be omitted and the seam welded. Watertight joints shall be tested and shall meet the test requirements of paragraph HYDROSTATIC TEST ON WATERTIGHT JOINTS.

5. PVC or PE Plastic Pipes: Water tight joints shall be as recommended by the pipe manufacturer in accordance with the requirements of ASTM D 3212. Other joints shall be soil tight in accordance with AASHTO-01, Division II, Section 23.3.1.5.4.
6. Ductile Iron Pipe: Couplings and fittings shall be as recommended by the pipe manufacturer.

**2.04 STEEL LADDER:** A steel ladder shall be provided where the depth of the manhole exceeds 3.66 m (12 feet). These ladders will be not less than 406 mm (16 inches) in width, with 19 mm (3/4 inch) diameter rungs spaced 305 mm (12 inches) apart. The two stringers shall be a minimum 9.5 mm (3/8 inch) thick and 63.5 mm (2-1/2 inches) wide. Ladders and inserts shall be galvanized after fabrication in conformance with ASTM A 123.

**2.05 DOWNSPOUT BOOTS:** Boots used to connect exterior downspouts to the storm-drainage system shall be of gray cast iron conforming to ASTM A 48, Class 30B or 35B. Shape and size shall be as indicated.

### **2.06 HYDROSTATIC TEST ON WATERTIGHT JOINTS**

- A. Concrete, PVC and PE Pipe: A hydrostatic test shall be made on the watertight joint types as required. Only one sample joint of each type needs testing; however, if the sample joint fails because of faulty design or workmanship, an additional sample joint may be tested. During the test period, gaskets or other jointing material shall be protected from extreme temperatures which might adversely affect the performance of such materials. Performance requirements for joints in reinforced and nonreinforced concrete pipe shall conform to AASHTO M 198 or ASTM C 443. Test requirements for joints in clay pipe shall conform to ASTM C 425. Test requirements for joints in PVC and PE plastic pipe shall conform to ASTM D 3212.
- B. Corrugated Steel and Aluminum Pipe: A hydrostatic test shall be made on the watertight joint system or coupling band type proposed. The moment strength required of the joint is expressed as 15 percent of the calculated moment capacity of the pipe on a transverse section remote from the joint by the AASHTO-01 (Division 2, Section F23). The pipe will be supported for the hydrostatic test so that the joint is located at the point which develops 15 percent of the moment capacity of the pipe based on the allowable span in meters (feet) for the pipe flowing full or 54,233 Newton meters (40,000 foot-pounds), whichever is less. Performance requirements shall be met at an internal hydrostatic pressure of 69 kPa (10 psi) for a 10 minute period for both annular corrugated metal pipe and helical corrugated metal pipe with factory reformed ends.

## **PART 3 - EXECUTION**

### **3.01 EXCAVATION FOR PIPE CULVERTS, STORM DRAINS, AND DRAINAGE STRUCTURES**

- A. Excavation of trenches and for appurtenances and backfilling for culverts and storm drains shall be in accordance with the applicable portions of Section 31 23 16 - Excavation and the requirements specified below.
- B. Trenching: The width of trenches at any point below the top of the pipe shall be not greater than the outside diameter of the pipe plus 36 inches to permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Sheeting and bracing where required shall be placed within the trench width as specified. Care shall be taken not to overexcavate. Where trench widths are exceeded, redesign with a resultant increase in cost of stronger pipe or special installation procedures shall be necessary. Cost of this redesign and increased cost of pipe or installation shall be borne by the Contractor without additional cost to the Government.
- C. Removal of Unstable Material: Where wet or otherwise unstable soil incapable of properly supporting the pipe, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, such material shall be removed to the depth required and replaced to the proper grade with select granular material, compacted as provided in paragraph BACKFILLING. When removal of unstable material is due to the fault or neglect of the Contractor in his performance of shoring and sheeting, water removal, or other specified requirements, such removal and replacement shall be performed at no additional cost to the government.

### **3.02 BEDDING**

- A. The bedding surface for the pipe shall provide a firm foundation of uniform density throughout the entire length of the pipe. When no bedding class is specified or detailed on the drawings, concrete pipe shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular pipe or to the lower curved portion of pipe arch for the entire length of the pipe or pipe arch. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making the particular type of joint. Bedding for clay pipe shall be as specified by ASTM C 12. Bedding for corrugated metal pipe and pipe arch shall be in accordance with ASTM A 798. It is not required to shape the bedding to the pipe geometry. However, for pipe arches, it is recommended to either shape the bedding to the relatively flat bottom arc or fine grade the foundation to a shallow V-shape. Bedding for corrugated structural plate pipe shall meet requirements of ASTM A 807. Bedding for ductile iron culvert pipe shall meet requirements of ASTM A 716. Bedding for PVC and PE pipe shall meet the requirements of ASTM D 2321 for Class I II and III materials.

### 3.03 PLACING PIPE

- A. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipelines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Lifting lugs in vertically elongated metal pipe shall be placed in the same vertical plane as the major axis of the pipe. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipe in place shall be inspected before backfilling, and those pipes damaged during placement shall be removed and replaced.
1. Concrete, Clay, PVC, Ribbed PVC and Ductile Iron Pipe: Laying shall proceed upgrade with spigot ends of bell-and-spigot pipe and tongue ends of tongue-and-groove pipe pointing in the direction of the flow.
  2. Elliptical and Elliptical Reinforced Concrete Pipe: Placement shall be so that the manufacturer's reference lines designating the top of the pipe will be within 5 degrees of a vertical plane through the longitudinal axis of the pipe. In all backfilling operations, care shall be taken to prevent damage to or misalignment of the pipe.
  3. Corrugated PE Pipe: Laying shall be with the separate sections joined firmly on a bed shaped to line and grade and shall follow manufacturer's recommendations.
  4. Corrugated Metal Pipe and Pipe Arch: Laying shall be with the separate sections joined firmly together, with the outside laps of circumferential joints pointing upstream, and with longitudinal laps on the sides. Part paved pipe shall be installed so that the centerline of bituminous pavement in the pipe, indicated by suitable markings on the top at each end of the pipe sections, coincides with the specified alignment of pipe. Fully paved steel pipe or pipe arch shall have a painted or otherwise applied label inside the pipe or pipe arch indicating sheet thickness of pipe or pipe arch. Any unprotected metal in the joints shall be coated with bituminous material specified in AASHTO M 190 or AASHTO M 243. Interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs shall be used to facilitate moving pipe without damage to exterior or interior coatings. During installation, pipe or pipe arch shall be handled with care to preclude damage to the bituminous coating or paving. Prior to placing backfill, damaged areas of coupling bands and pipe shall be given a coating of bituminous material, specified in AASHTO M 190 or AASHTO M 243. Pipe on which bituminous coating has been damaged to such an extent that satisfactory field repairs cannot be made shall be removed and replaced. Vertical elongation, where indicated, shall be accomplished by factory elongation. Suitable markings or properly placed lifting lugs shall be provided to ensure placement of factory elongated pipe in a vertical plane.
  5. Structural-Plate Steel Pipe, Pipe Arches, and Arches: Structural plate structures shall be installed in accordance with ASTM A 807. Structural plate shall be assembled in accordance with instructions furnished by the manufacturer. Instructions shall show the position of each plate and the order of assembly. Bolts shall be tightened progressively and uniformly, starting at one end of the structure after all plates are in place. The operation shall be repeated to insure that all bolts are tightened to meet the torque requirements of 270 Newton meters (200 foot-pounds) plus or minus 68 Newton meters (50 foot-pounds). Any power wrenches used shall be checked by the use of hand torque wrenches or long-handled socket or structural wrenches for amount of torque produced. Power wrenches shall be checked and adjusted frequently as needed, according to type or condition, to insure proper adjustment to supply the required torque.

6. Structural-Plate Aluminum Pipe, Pipe Arches, and Arches: Structural plate shall be assembled in accordance with instructions furnished by the manufacturer. Instructions shall show the position of each plate and the order of assembly. Bolts shall be tightened progressively and uniformly, starting at one end of the structure after all plates are in place. The operation shall be repeated to ensure that all bolts are torqued to a minimum of 136 Newton meters (100 foot-pounds) on aluminum alloy bolts and a minimum of 203 Newton meters (150 foot-pounds) on galvanized steel bolts. Any power wrenches used shall be checked by the use of hand torque wrenches or long-handled socket or structural wrenches for the amount of torque produced. Power wrenches shall be checked and adjusted as frequently as needed, according to type or condition, to ensure that they are in proper adjustment to supply the required torque.
7. Multiple Culverts: Where multiple lines of pipe are installed, adjacent sides of pipe shall be at least half the nominal pipe diameter or 1 meter (3 feet) apart, whichever is less.
8. Jacking Pipe Through Fills: Methods of operation and installation for jacking pipe through fills shall conform to requirements specified in Vol. I, Chapter 8 of the AREA-01 Manual.

### 3.04 JOINTS

#### A. Concrete Pipe:

1. Cement-Mortar Bell-and-Spigot Joint: The first pipe shall be bedded to the established gradeline, with the bell end placed upstream. The interior surface of the bell shall be carefully cleaned with a wet brush and the lower portion of the bell filled with mortar to such depth as to bring inner surfaces of abutting pipes flush and even. The spigot end of each subsequent pipe shall be cleaned with a wet brush and uniformly matched into a bell so that sections are closely fitted. After each section is laid, the remainder of the joint shall be filled with mortar. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint shall be wrapped or bandaged with cheesecloth to hold mortar in place.
2. Cement-Mortar Oakum Joint for Bell-and-Spigot Pipe: A closely twisted gasket shall be made of jute or oakum of the diameter required to support the spigot end of the pipe at the proper grade and to make the joint concentric. Joint packing shall be in one piece of sufficient length to pass around the pipe and lap at the top. This gasket shall be thoroughly saturated with neat cement grout. The bell of the pipe shall be thoroughly cleaned with a wet brush, and the gasket shall be laid in the bell for the lower third of the circumference and covered with mortar. The spigot of the pipe shall be thoroughly cleaned with a wet brush, inserted in the bell, and carefully driven home. A small amount of mortar shall be inserted in the annular space for the upper two-thirds of the circumference. The gasket then shall be lapped at the top of the pipe and driven home in the annular space with a caulking tool. The remainder of the annular space then shall be filled completely with mortar and beveled at an angle of approximately 45 degrees with the outside of the bell. If mortar is not sufficiently stiff to prevent appreciable slump before setting, the outside of the joint thus made shall be wrapped with cheesecloth. Placing of this type of joint shall be kept at least five joints behind laying operations.
3. Cement-Mortar Diaper Joint for Bell-and Spigot Pipe: The pipe shall be centered so that the annular space is uniform. The annular space shall be caulked with jute or oakum. Before caulking, the inside of the bell and the outside of the spigot shall be cleaned.
  - a. Diaper Bands: Diaper bands shall consist of heavy cloth fabric to hold grout in place at joints and shall be cut in such lengths that they will extend one-eighth of the circumference of pipe above the spring line on one side of the pipe and up to the spring line on the other side of the pipe. Longitudinal edges of fabric bands shall be rolled and stitched around two pieces of wire. Width of fabric bands shall be such that after fabric has been securely stitched around both edges on wires, the wires will be uniformly spaced not less than 200 mm (8 inches) apart. Wires shall be cut into lengths to pass around pipe with sufficient extra length for the ends to be twisted at top of pipe to hold the band securely in place; bands shall be accurately centered around lower portion of joint.
  - b. Grout: Grout shall be poured between band and pipe from only the high side of band, until grout rises to the top of band at the spring line of pipe, or as nearly so as possible, on the opposite side of pipe, to ensure a thorough sealing of joint around the portion of pipe covered by the band. Silt, slush, water, or polluted mortar grout forced up on the lower side shall be carefully forced out by pouring and removed.
  - c. Remainder of Joint: The remaining unfilled upper portion of the joint shall then be filled with mortar and a bead formed around the outside of this upper portion of the joint with a sufficient amount of additional mortar. The diaper shall be left in place. Placing of this type of joint shall be

- kept at least five joints behind actual laying of pipe. No backfilling around joints shall be done until joints have been fully inspected and approved.
4. **Cement-Mortar Tongue-and-Groove Joint:** The first pipe shall be bedded carefully to the established gradeline with the groove upstream. A shallow excavation shall be made underneath the pipe at the joint and filled with mortar to provide a bed for the pipe. The grooved end of the first pipe shall be carefully cleaned with a wet brush, and a layer of soft mortar applied to the lower half of the groove. The tongue of the second pipe shall be cleaned carefully with a wet brush; while in horizontal position, a layer of soft mortar shall be applied to the upper half of the tongue. The tongue end of the second pipe then shall be inserted in the grooved end of the first pipe until mortar is squeezed out on interior and exterior surfaces. Sufficient mortar shall be used to fill the joint completely and to form a bead on the outside.
  5. **Cement-Mortar Diaper Joint for Tongue-and-Groove Pipe:** The joint shall be of the type described for cement-mortar tongue-and-groove joint in this paragraph, except that the shallow excavation directly beneath the joint shall not be filled with mortar until after a gauze or cheesecloth band dipped in cement mortar has been wrapped around the outside of the joint. The cement-mortar bead at the joint shall be at least 15 mm, (1/2-inch thick,) and the width of the diaper band shall be at least 200 mm (8 inches). The diaper shall be left in place. Placing of this type of joint shall be kept at least five joints behind the actual laying of the pipe. No backfilling around the joints shall be done until the joints have been fully inspected and approved.
  6. **Plastic Sealing Compound Joints for Tongue and Grooved Pipe:** Sealing compounds shall follow the recommendation of the particular manufacturer in regard to special installation requirements. Surfaces to receive lubricants, primers, or adhesives shall be dry and clean. Sealing compounds shall be affixed to the pipe not more than 3 hours prior to installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Sealing compounds shall be inspected before installation of the pipe, and any loose or improperly affixed sealing compound shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint with mastic-type sealant, a slight protrusion of the material is not visible along the entire inner and outer circumference of the joint when the joint is pulled up, the pipe shall be removed and the joint remade. After the joint is made, all inner protrusions will be cut off flush with the inner surface of the pipe. If nonmastic-type sealant material is used, the "Squeeze-Out" requirement above shall be waived.
  7. **Flexible Watertight Joints:** Gaskets and jointing materials shall be as recommended by the particular manufacturer in regard to use of lubricants, cements, adhesives, and other special installation requirements. Surfaces to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installing the pipe; any loose or improperly affixed gaskets and jointing materials shall be removed and replaced. The pipe shall be aligned with the previously installed pipe, and the joint pushed home. If, while the joint is being made the gasket becomes visibly dislocated the pipe shall be removed and the joint remade.
  8. **External Sealing Band Joint for Noncircular Pipe:** Surfaces to receive sealing bands shall be dry and clean. Bands shall be installed in accordance with manufacturer's recommendations.
- B. Corrugated Metal Pipe:**
1. **Field Joints:** Transverse field joints shall be of such design that the successive connection of pipe sections will form a continuous line free of appreciable irregularities in the flow line. In addition, the joints shall meet the general performance requirements described in ASTM A 798. Suitable transverse field joints which satisfy the requirements for one or more of the joint performance categories can be obtained with the following types of connecting bands furnished with suitable band-end fastening devices: corrugated bands, bands with projections, flat bands, and bands of special design that engage factory reformed ends of corrugated pipe. The space between the pipe and connecting bands shall be kept free from dirt and grit so that corrugations fit snugly. The connecting band, while being tightened, shall be tapped with a soft-head mallet of wood, rubber or plastic, to take up slack and ensure a tight joint. The annular space between abutting sections of part paved, and fully paved pipe and pipe arch, in sizes 750 mm (30 inches) or larger, shall be filled with a bituminous material after jointing. Field joints for each type of corrugated metal pipe shall maintain pipe alignment during construction and prevent infiltration of fill material during the life of the installations. The type, size, and sheet thickness of the band and the size of angles or lugs and bolts shall be as

indicated or where not indicated, shall be as specified in the applicable standards or specifications for the pipe.

2. Flexible Watertight, Gasketed Joints: Installation shall be as recommended by the gasket manufacturer for use of lubricants and cements and other special installation requirements. The gasket shall be placed over one end of a section of pipe for half the width of the gasket. The other half shall be doubled over the end of the same pipe. When the adjoining section of pipe is in place, the doubled-over half of the gasket shall then be rolled over the adjoining section. Any unevenness in overlap shall be corrected so that the gasket covers the end of pipe sections equally. Connecting bands shall then be centered over adjoining sections of pipe, and rods or bolts placed in position and nuts tightened.
3. Band Tightening: The band shall be tightened evenly, even tension being kept on the rods or bolts, and the gasket shall be closely observed to see that it is seating properly in the corrugations. Watertight joints shall remain uncovered for a period of time designated, and before being covered, tightness of the nuts shall be measured with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, the nut shall be retightened with a torque wrench and remain uncovered until a tight, permanent joint is assured.

### 3.05 DRAINAGE STRUCTURES

#### A. Manholes and Inlets:

1. Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete, precast concrete segmental blocks, prefabricated corrugated metal, or bituminous coated corrugated metal, complete with frames and covers or gratings and with fixed galvanized steel ladders where indicated. Pipe studs and junction chambers of prefabricated corrugated metal manholes shall be fully bituminous-coated and paved when the connecting branch lines are so treated.

#### B. Walls and Headwalls: Construction shall be as indicated on drawings.

- 3.06 STEEL LADDER:** Ladder shall be adequately anchored to the wall by means of steel inserts spaced not more than 1.83 m (6 feet) vertically, and shall be so installed as to provide at least 152 mm (6 inches) of space between the wall and the rungs. The wall along the line of the ladder shall be vertical for its entire length.

### 3.07 BACKFILLING

- A. Backfilling Pipe in Trenches: After the pipe has been properly bedded, selected material from excavation or borrow, at a moisture content that will facilitate compaction, shall be placed along both sides of pipe in layers not exceeding 150 mm (6 inches) in compacted depth. The backfill shall be brought up evenly on both sides of pipe for the full length of pipe. Care shall be taken to ensure thorough compaction of the fill under the haunches of the pipe. Each layer shall be thoroughly compacted with mechanical tampers or rammers. This method of filling and compacting shall continue until the fill has reached an elevation of at least 300 mm (12 inches) above the top of the pipe. The remainder of the trench shall be backfilled and compacted by spreading and rolling or compacted by mechanical rammers or tampers in layers not exceeding 6 inches. Tests for density will be made as necessary to ensure conformance to the compaction requirements specified elsewhere in this paragraph. Where it is necessary in the opinion of the Contracting Officer, any sheeting or portions of bracing used shall be left in place and the contract will be adjusted accordingly. Untreated sheeting shall not be left in place beneath structures or pavements.
- B. Backfilling Pipe in Fill Sections: For pipe placed in fill sections, backfill material and the placement and compaction procedures shall be as specified elsewhere in this paragraph. The fill material shall be uniformly spread in layers longitudinally on both sides of the pipe, not exceeding 150 mm (6 inches) in compacted depth, and shall be compacted by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 300 mm (12 inches) above the top of the pipe shall extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 4 m (12 feet), whichever is less. After the backfill has reached at least 300 mm (12 inches) above the top of the pipe, the remainder of the fill shall be placed and thoroughly compacted in layers not exceeding 200 mm (8 inches).
- C. Movement of Construction Machinery: In compacting by rolling or operating heavy equipment parallel with the pipe, displacement of or injury to the pipe shall be avoided. Movement of construction machinery



over a culvert or storm drain at any stage of construction shall be at the Contractor's risk. Any damaged pipe shall be repaired or replaced.

D. Compaction:

1. General: Cohesionless materials include gravels, gravel-sand mixtures, sands, and gravelly sands. Cohesive materials include clayey and silty gravels, gravel-silt mixtures, clayey and silty sands, sand-clay mixtures, clays, silts, and very fine sands. When results of compaction tests for moisture-density relations are recorded on graphs, cohesionless soils will show straight lines or reverse-shaped moisture-density curves, and cohesive soils will show normal moisture-density curves.
2. Minimum Density:
  - a. Backfill over and around the pipe and backfill around and adjacent to drainage structures shall be compacted at the approved moisture content to the following applicable minimum density (densities) which will be determined as specified in this paragraph.
  - b. Under airfield and heliport pavements, paved roads, streets, parking areas, and similar-use pavements including adjacent shoulder areas, the density shall be not less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material, up to the elevation where requirements for pavement subgrade materials and compaction shall control.
  - c. Under unpaved or turfed traffic areas, density shall not be less than 90 percent of maximum density for cohesive material and 95 percent of maximum density for cohesionless material.
  - d. Under nontraffic areas, density shall be not less than that of the surrounding material.

- E. Determination of Density: Testing shall be the responsibility of the Contractor and performed at no additional cost to the Government. Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. Tests shall be performed in sufficient number to ensure that specified density is being obtained. Laboratory tests for moisture-density relations shall be made in accordance with ASTM D 1557 except that mechanical tampers may be used provided the results are correlated with those obtained with the specified hand tamper. Field density tests shall be determined in accordance with ASTM D 2167 or ASTM D 6938. When ASTM D 6938 is used, the calibration curves shall be checked and adjusted, if necessary, using the sand cone method as described in paragraph Calibration of the referenced publications. ASTM D 6938 results in a wet unit weight of soil and when using this method ASTM D 6938 shall be used to determine the moisture content of the soil. The calibration curves furnished with the moisture gauges shall be checked along with density calibration checks as described in ASTM D 6938. Test results shall be furnished to the Contracting Officer. The calibration checks of both the density and moisture gauges shall be made at the beginning of a job on each different type of material encountered and at intervals as directed.

### 3.08 PIPELINE TESTING

- A. Lines shall be tested for leakage by exfiltration tests. Prior to testing for leakage the trench shall be backfilled up to at least the lower half of the pipe. If required, sufficient additional backfill shall be placed to prevent pipe movement during testing, leaving the joints uncovered to permit inspection. Visible leaks encountered shall be corrected regardless of leakage test results. When the water table is 600 mm (2 feet) or more above the top of the pipe at the upper end of the pipeline section to be tested, infiltration shall be measured using a suitable weir or other device acceptable to the Contracting Officer. An exfiltration test shall be made by filling the line to be tested with water so that a head of at least 600 mm (2 feet) is provided above both the water table and the top of the pipe at the upper end of the pipeline to be tested. The filled line shall be allowed to stand until the pipe has reached its maximum absorption, but not less than 4 hours. After absorption, the head shall be reestablished. The amount of water required to maintain this water level during a 2-hour test period shall be measured. Leakage as measured by the exfiltration test shall not exceed 0.98 liters per mm in diameter per kilometers (0.2 gallons per inch in diameter per 100 feet) of pipeline per hour. When leakage exceeds the maximum amount specified, satisfactory correction shall be made and retesting accomplished. Testing, correcting, and retesting shall be made at no additional cost to the Government.

**END OF SECTION**

## SECTION 33 71 73: ELECTRICAL UTILITY SERVICES

### PART 1 GENERAL

#### 1.01 WORK INCLUDED

- A. Install an underground service entrance from the pad mounted transformer to the service equipment located in the mechanical room.

#### 1.02 SYSTEM DESCRIPTION

- A. System Voltage: 120/208 volts, three phase, four wire, 60 Hertz.

#### 1.03 QUALITY ASSURANCE

- A. Install service entrance in accordance with the National Electrical Code and the project drawings.

#### 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.

### PART 2 PRODUCTS

#### 2.01 METERING EQUIPMENT

Electric Metering: NEMA/ANSI C12.10. Provide a socket-mounted electronic programmable outdoor watt-hour meter, surface mounted flush against the side of the low-voltage compartment of the transformer as indicated. Meter shall either be programmed at the factory or shall be programmed in the field. When field programming is performed, turn field programming device over to the Contracting Officer at completion of project. Meter shall be coordinated to system requirements.

1. Design: Provide meter designed for use on a 3-phase, 4-wire, 480Y/277 volt system with 3 current transformers. Electric meters shall be compatible with the existing wireless Sensus FlexNet Advanced Metering Infrastructure (FlexNet) system to include the existing FlexNet tower gateway base station, regional network interface system components and set to the approved system operating frequency provided by base personnel. Include necessary KYZ pulse initiation hardware for future connection to Energy Monitoring and Control System (EMCS).
2. Coordination: Provide meter coordinated with ratios of current transformers and transformer secondary voltage.
3. Class: 20; Form: 9S; Accuracy: +/- 1.0 percent; Finish: Class II
4. Cover: Polycarbonate and lockable to prevent tampering and unauthorized removal.
5. Kilowatt-hour Register: five digit electronic programmable type
6. Demand Register:
  - (a) Provide solid state
  - (b) Meter reading multiplier: Indicate multiplier on the meter face.
  - (c) Demand interval length: shall be programmed for 60 minutes with rolling demand up to six subintervals per interval.
7. Meter fusing: Provide a fuse block mounted in the secondary compartment containing one fuse per phase to protect the voltage input to the watt-hour meter. Size fuses as recommended by the meter manufacturer.
8. Socket: ANSI C12.7. Provide NEMA Type 3R, box-mounted socket having automatic circuit-closing bypass and having jaws compatible with requirements of the meter. Cover unused hub openings with blank hub plates. Paint box to match the pad-mounted transformer to which the box-mounted socket is attached.
9. Current transformers: IEEE C57.13. Provide butyl-molded window type current transformers with 600-volt insulation, 10 kV BIL and mount on the low-voltage bushings. Route current transformer leads in a location as remote as possible from the power transformer secondary cables to permit current measurements to be taken with hook-on-ammeters. Provide three current transformers per power transformer.

#### 2.02 3 Phase Transformer Rated 13 Terminal Meter Socket with Test Switch

Transformer rated 13 terminal aluminum meter socket pre-wired with a 10 pin test switch  
 Meter Socket: Brooks Meter Devices part # 652-3060B13-468 or approved equal.

Test Switch: Brooks Meter Devices part # 110-2344N or approved equal.

## DESIGN FEATURES

Aluminum

Ringless

2 piece cover

Industry standard Hub opening

Cover plate

Pre-wired with a 10 pin test switch.

1. Switch handle colors (left to right):

P1 – Black

P2 – Green

P3 – Red

Neutral

C1 – Black

CR – Black

C2 – Green

CR – Green

C3 - Red

CR – Red

2. Wiring for Form 9s meter socket (See figure 1).

P1 – Black

P2 – Green

P3 – Red

Neutral - White

C1 – Black with white stripe

CR1 – Black with white stripe

C2 – Green with white stripe

CR2 – Green with white stripe

C3 - Red with white stripe

CR 3– Red with white stripe

3. Wiring from transformer secondary to meter socket. (Installed by transformer manufacturer or contractor.)

Use #12 8-C 20-10 UVS meter cable 75C with the following colors:

Black

Red

Green

White

Black w/white stripe

White w/Black stripe

White w/Red stripe

White w/Green stripe

### Transformer connections

Voltage X1 to P1: Black

Voltage X2 to P2: Green

Voltage X3 to P3: Red

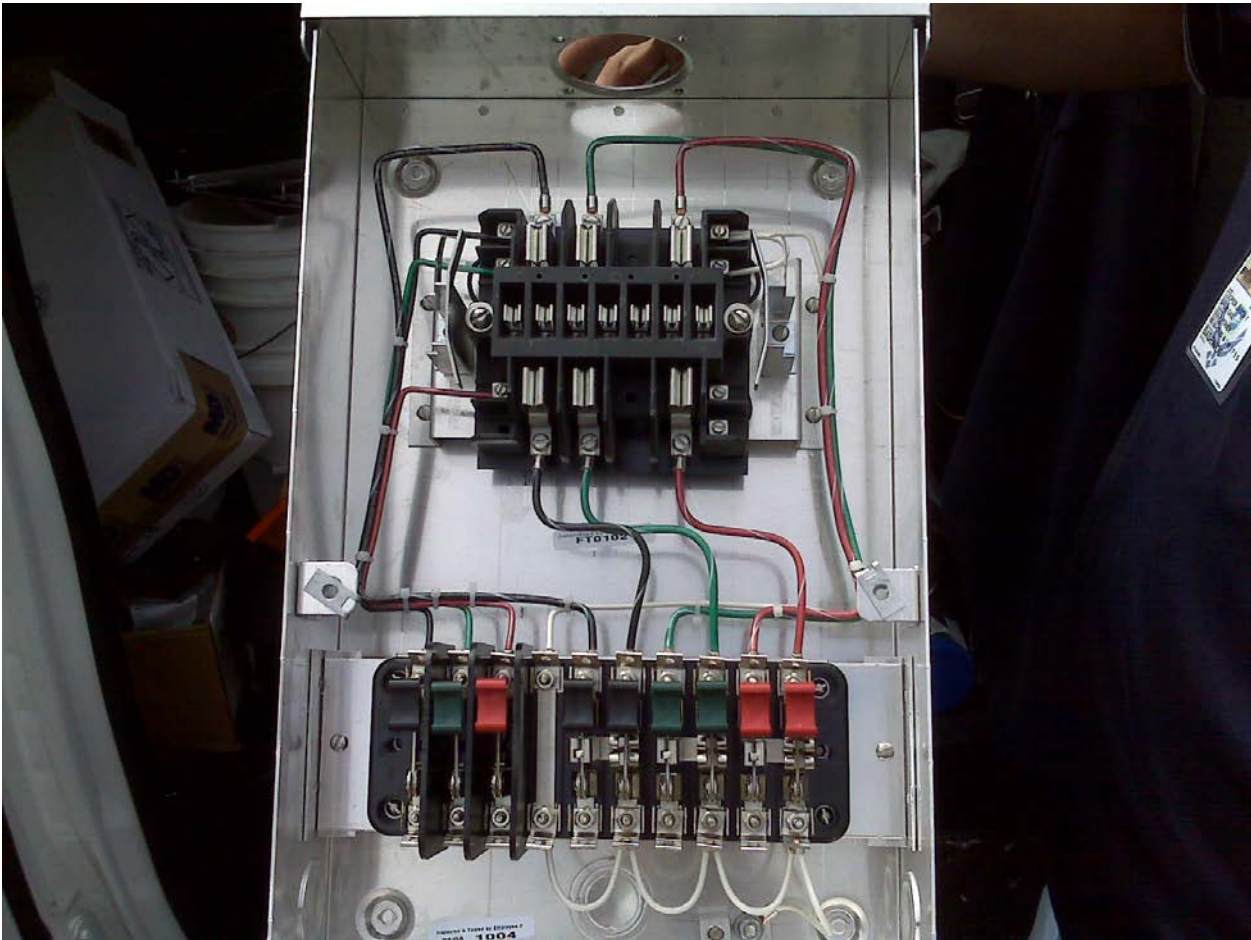
Voltage Xo to Neutral: White

Current 1 (X1) to C1: White with Black stripe

Current 2 (X1) to C2: White with green stripe

Current 3 (X1) to C3: White with red stripe

In the transformer, Current 1 (X2), Current 2 (X2), and Current 3 (X3) wired together and wired to Neutral in the meter socket using black with white stripe insulated conductor. In meter socket, test switch: Neutral, CR1, CR2, CR3, and ground lug are wired together using white insulated conductor.



**Figure 1: 13 Terminal Meter Socket prewired with Test Switch**

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Underground: Install service entrance conduits from the pad-mounted transformer to building service entrance equipment.

**END OF SECTION**

**APPENDIX**

**Subsurface Exploration and  
Geotechnical Engineering Evaluation**



**REPORT OF  
SUBSURFACE EXPLORATION AND  
GEOTECHNICAL ENGINEERING EVALUATION**

**BUILDING 90353 ADDITION**  
Hurlburt Field AFB, Okaloosa County, Florida

Prepared For:

**CALDWELL ASSOCIATES ARCHITECTS, INC.**  
116 North Tarragona Street  
Pensacola, Florida 32501

**NOVA Project Number: 8215080**

July 16, 2015

July 16, 2015

Mr. Bobby Kickliter, Sr. Draftsman  
**Caldwell Associates Architects, Inc.**  
116 North Tarragona Street  
Pensacola, Florida 32501

**Subject:** Report of Subsurface Exploration and Geotechnical Engineering Evaluation  
**Building 90353 Addition**  
Hurlburt Field AFB, Okaloosa County, Florida  
NOVA Project Number 8215081

Dear Mr. Kickliter:

**NOVA Engineering and Environmental, LLC (NOVA)** has completed the authorized subsurface exploration and geotechnical engineering evaluation for the proposed addition to Building 90353 at Hurlburt Field AFB in Okaloosa County, Florida. The work was performed in general accordance with NOVA Proposal Number 016-20150929 dated June 10, 2015 and in general accordance with industry standards.

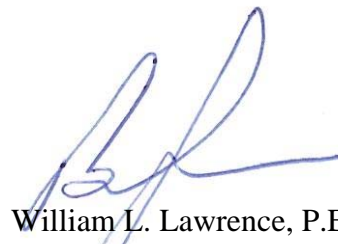
This report briefly discusses our understanding of the project at the time of the subsurface exploration, describes the geotechnical consulting services provided by NOVA, and presents our findings, conclusions and recommendations.

We appreciate your selection of NOVA and the opportunity to be of service on this project. If you have any questions, or if we may be of further assistance, please do not hesitate to contact us.

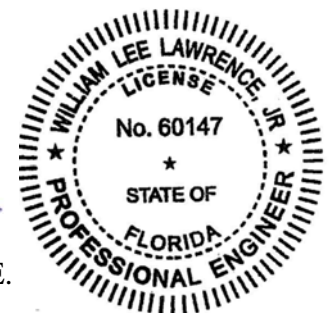
Sincerely,  
**NOVA ENGINEERING AND ENVIRONMENTAL, LLC**



Matthew Cullens  
Staff Professional



William L. Lawrence, P.E.  
Branch Manager  
Florida Registration No. 60147



Copies Submitted: via electronic mail service

Employee Owned – Client Driven

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## **EXECUTIVE SUMMARY**

A brief summary of pertinent findings, conclusions and recommendations are presented below. This information should not be utilized in design or construction without reading all of the recommendations presented in the text and Appendix of this report.

### **GENERAL**

- Our field exploration at the subject site included one (1) soil test boring (STB), drilled within the proposed building addition footprint, that was advanced to a depth of approximately 25 feet below existing grade. Drilling, testing and sampling operations were performed in general accordance with ASTM designations and other industry standards.
- Beneath a pavement section consisting of about 1½ inches of asphalt and 5 inches of sand-clay base, the test boring generally encountered loose to dense fine-grained sands (USCS classification of SP) to the maximum depth explored of about 25 feet below existing grade. Groundwater was encountered in the test boring at a depth of about 8 feet below existing grade at the time of our field exploration.

Subsurface conditions are described in greater detail on the attached Log of Boring Record.

### **SITE PREPARATION**

- We recommend stripping and grubbing the proposed construction area to remove the existing pavement section as well as surficial vegetation, root systems, and any other deleterious non-soil materials found to be present. Resulting or additional excavations should be backfilled with structural fill compacted to a minimum soil density of at least 95 percent of the maximum dry density as determined by the Modified Proctor test (ASTM D1557). Existing subsurface utilities servicing Building 90353 that are found to be present within the footprint of the proposed structure addition should be relocated or abandoned as appropriate.
- A geotechnical engineer should carefully evaluate all subgrades prior to foundation and slab-on-grade construction to confirm compliance with this report; evaluate geotechnical sections of the plans and specifications for the overall project; and provide additional recommendations that may be required.

### **FOUNDATION RECOMMENDATIONS**

- After the recommended site/subgrade preparation and fill placement, we recommend that the proposed structure addition be supported on a conventional shallow foundation system bearing upon naturally occurring soils and/or compacted structural fill. The building addition foundation may be designed for a maximum bearing pressure of **1,500 pounds per square foot (psf)**, and should be structurally isolated from the adjacent building.

# INTRODUCTION

## PROJECT INFORMATION

Our understanding of the proposed development is based on recent conversations and email exchanges with the client; review of supporting conceptual drawings provided by the client; review of aerial photography of the site via internet-based GIS software; and our experience with similar geotechnical conditions in the near vicinity to this project site.

NOVA understands the project will consist of the construction of a single-story, slab-on-grade building addition with a plan footprint on the order of 3,000 square feet. Foundation support for the proposed building addition is anticipated to be accomplished via conventional isolated shallow spread and continuous strip perimeter footings. We assume bearing loads will be on the order of 75 kips per column for concentrated column loads and 4 kips per lineal foot for wall loads. We assume that finish site grades will not change greater than +/- 2 feet from existing grades. If these assumptions are not accurate please advise us so that we may adjust our conclusions and recommendations as appropriate.

**Please note; this exploration is limited to the structural foundation support design aspects of the proposed addition to Building 90353 only; hence, additional information regarding overall site development is not relevant.**

## SCOPE OF WORK

**Caldwell Associates Architects, Inc.**, engaged NOVA to provide geotechnical engineering consulting services for the proposed Building 90353 Addition project. This report briefly discusses our understanding of the project, describes our exploratory procedures and presents our findings, conclusions, and recommendations.

The primary objective of this study was to provide a geotechnical exploration of the near surface soils within the area of the proposed construction and to assess these findings as they relate to geotechnical aspects of the planned site development. The authorized geotechnical engineering services included a site reconnaissance, one (1) soil test boring (STB) and sampling, engineering evaluation of the field data, and the preparation of this report. The boring location is shown on the attached Boring Location Plan. Our services were performed in general accordance with industry standards.

The assessment of site environmental conditions, including the presence of wetlands or detection of pollutants in the soil, rock or groundwater, laboratory testing of samples, or a site-specific seismic study was beyond the scope of this geotechnical study. If requested, NOVA can provide these services.

## **SITE DESCRIPTION**

### **GENERAL**

Building 90353 (Child Development Center) is located at 108 McMillan Street at Hurlburt Field AFB in Okaloosa County, Florida. At the time of our field exploration, the footprint of the proposed building addition primarily consisted of an asphalt paved parking lot. Surface waters were not observed on or adjacent to the project site at the time of our field exploration, and the site topography was observed to be relatively level in the area of the proposed construction.

### **GEOLOGY / HYDROLOGY**

#### **Site and Area Geology**

The site is located in the Okaloosa County, Florida area and according to the United States Geological Survey (USGS), is situated within the greater Gulf Coastal Plain region. The site is generally covered with Alluvium sediments of the Pleistocene/Holocene periods underlain by the Citronelle formation of the Pliocene/Pleistocene periods. The alluvial sediments typically consist of siliciclastics that are fine to coarse quartz sand containing clay lenses and gravel in places. Sands consists primarily of very fine to very coarse poorly sorted quartz grains; gravel is composed of quartz, quartzite, and chert pebbles. In areas of the Valley and Ridge province gravels are generally composed of angular to sub-rounded chert, quartz, and quartzite pebbles. Coastal deposits in the Okaloosa County area include fine to medium quartz sand with shell fragments and accessory heavy minerals along Gulf beaches and fine to medium quartz sand, silt, clay, peat, mud and ooze in the Mississippi Sound, Little Lagoon, bays, lakes, streams, and estuaries. The Citronelle formation consists primarily of varicolored/mottled lenticular beds of poorly sorted sand, clayey sand, clay, and clayey gravel. Limonite pebbles and lenses of limonite cemented sand occur locally in weathered Miocene exposures.

Surficial soils in the region are primarily siliciclastic sediments deposited in response to the renewed uplift and erosion in the Appalachian highlands to the north and sea-level fluctuations. The extent and type of deposit is influenced by numerous factors, including mineral composition of the parent rock and meteorological events.

#### **Groundwater**

Groundwater in the Gulf Coastal Plain typically occurs as an unconfined aquifer condition. Recharge is provided by the infiltration of rainfall and surface water through the soil overburden. More permeable zones in the soil matrix can affect groundwater conditions. The groundwater table is expected to be a subdued replica of the original surface topography. Based on a review of topographic maps and our visual site observations, we anticipate the groundwater flow at the site to be towards the south.

## **FIELD & LABORATORY PROCEDURES**

### **FIELD EXPLORATION**

The boring location was established in the field by NOVA personnel using the provided site plan, and by estimating distances and angles from existing site landmarks. Consequently, the referenced boring location should be considered approximate. If the client desires increased accuracy, NOVA recommends that the boring location and elevation be surveyed.

The Log of Boring Record in the Appendix presents the soil conditions encountered and shows the standard penetration test resistances or “N” values, which provide an indication of the relative densities of the materials encountered. This record represents our interpretation of the subsurface conditions based on the field exploration data, visual examination of the samples, and generally accepted geotechnical engineering practices. The stratification lines and depth designations represent approximate boundaries between various subsurface strata. Actual transitions between materials may be gradual. Also, subsurface conditions across the site may vary from those encountered in the test boring.

The groundwater level reported on the Log of Boring Record represents a measurement made at the completion of the boring. The boring was backfilled with soil cuttings at the completion of the field exploration for safety concerns. The approximate location of the boring is depicted on the Boring Location Plan in the Appendix. Please refer to the Log of Boring Record included in the Appendix for the subsurface conditions at the specific boring location.

### **LABORATORY TESTING**

Split-barrel samples were returned to our testing laboratory, where they were classified using visual/manual methods in accordance with the Unified Soil Classification System (USCS) and ASTM designations. The descriptions presented in the Log of Boring Record should be considered approximate.

Further laboratory testing was beyond the scope of this exploration.

## **SUBSURFACE CONDITIONS**

### **SOIL CONDITIONS**

The following paragraphs provide generalized descriptions of the subsurface profiles and soil conditions encountered by the boring conducted during this study. The Log of Boring Record in the Appendix should be reviewed to provide detailed descriptions of the conditions encountered at the boring location. Conditions may vary at other locations and times.

Beneath a pavement section consisting of about 1½ inches of asphalt and 5 inches of sand-clay base, the test boring generally encountered loose to dense fine-grained sands (USCS classification of SP) to the maximum depth explored of about 25 feet below existing grade.

Subsurface conditions are described in greater detail on the attached Log of Boring Record.

### **GROUNDWATER CONDITIONS**

Groundwater was encountered in the test boring at a depth of about 8 feet below existing grade at the time of our field exploration, which occurred during a period of normal to slightly above normal seasonal rainfall amounts. Groundwater levels vary with changes in season and rainfall, construction activity, surface water runoff and other site-specific factors. Groundwater levels in the Okaloosa County area are typically lowest in the late spring and the late fall and highest in the mid-summer with annual groundwater fluctuations by seasonal rainfall; consequently, the water table may vary at times

## **CONCLUSIONS AND RECOMMENDATIONS**

The following conclusions and recommendations are based on our understanding of the proposed construction, our site observations, our interpretation of the field data obtained during this exploration, our experience with similar projects, and generally accepted geotechnical engineering principles and practices.

Subsurface conditions in unexplored locations or at other times may vary from those encountered at the specific boring location. If such variations are noted during construction, or if project development plans are changed, we request the opportunity to review the changes and amend our recommendations, if deemed necessary.

### **SITE GRADING**

#### **Site Preparation**

Prior to proceeding with construction, the existing pavement section as well as all vegetation, root systems, and any other deleterious non-soil materials found to be present should be stripped from the proposed construction areas. NOVA suggests any existing utility locations should be reviewed to assess their impact on the proposed construction and relocated as appropriate. The soils exposed at the stripped grade elevation should be compacted utilizing non-vibratory compaction methods to a minimum soil density of at least 95 percent of the maximum dry density as determined by the Modified Proctor test method (ASTM D1557). Non-vibratory compaction methods will be required for this project due to the very close proximity of Building 90353.

A geotechnical engineer should carefully evaluate all subgrades prior to foundation and slab-on-grade construction to confirm compliance with this report; evaluate geotechnical sections of the plans and specifications for the overall project; and provide additional recommendations that may be required.

#### **Fill Placement**

Fill materials should be relatively clean sands, similar to the existing on-site soils, typically with less than 12 percent fines (material passing the No. 200 sieve), and free of non-soil materials and rock fragments larger than 3 inches in diameter. Based on visual examination, the existing soils encountered during this exploration appear suitable for reuse as structural fill. Fill materials that contain organic debris are not suitable for reuse as structural fill. Prior to construction, bulk samples of the proposed fill materials should be laboratory tested to confirm their suitability.

Fill should be placed in thin, horizontal loose lifts (maximum 12-inch) and compacted (utilizing non-vibratory ride-along rollers or portable equipment such as self-propelled plate tamps or jumping jacks) to a minimum soil density of at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557). Fill materials should have a target maximum dry density of 95 pcf or greater. If lighter weight fill materials are used, the NOVA geotechnical engineer should be consulted to assess the impact on design recommendations.

Soil moisture content should be maintained within 3 percent of the optimum moisture content. We recommend that the grading contractor have equipment on site during earthwork for both drying and wetting fill soils.

A NOVA soils technician, who can assess suitability of materials used, and uniformity and appropriateness of compaction efforts, should observe all filling and subgrade preparation. Field tests, using thin-wall tube, nuclear or sand cone testing methods (ASTM D2937, D6938, or D1556 respectively) should also be performed. One test per 2,000 square feet and each lift of fill are recommended, with test locations well distributed throughout the fill mass. When filling in small areas, at least one test per day per area should be required.

## **GROUNDWATER CONTROL**

Groundwater was encountered in the test boring at a depth of about 8 feet below existing grade at the time of our field exploration, which occurred during a period of normal to slightly above normal seasonal rainfall amounts. As previously noted, groundwater levels are subject to seasonal, climatic, and other variations and may be different at other times and locations. Groundwater is not expected to impact the planned near surface construction.

## **FOUNDATION RECOMMENDATIONS**

NOVA understands the project will consist of the construction of a single-story, slab-on-grade building addition with a plan footprint on the order of 3,000 square feet. Foundation support for the proposed building addition is anticipated to be accomplished via conventional isolated shallow spread and continuous strip perimeter footings. We assume bearing loads will be on the order of 75 kips per column for concentrated column loads and 4 kips per lineal foot for wall loads. We assume that finish site grades will not change greater than +/- 2 feet from existing grades. If these assumptions are not accurate please advise us so that we may adjust our conclusions and recommendations as appropriate.

After the recommended site and subgrade preparation and fill placement, we recommend a conventional shallow foundation system consisting of isolated spread footings and/or turn-down slab-on-grade construction be used to support the proposed structure addition. Foundations bearing on densified existing soils and/or compacted structural fill, as recommended in this report, may be designed for a maximum allowable bearing pressure of **1,500 pounds per square foot (psf)**, which reflects the relatively loose soil conditions encountered in the upper 6 feet of the soil horizon in the test boring and the fact that soil improvement utilizing a heavy weight vibratory roller will not be an option due to the very close proximity of Building 90353.

We recommend that the proposed building addition footprint be structurally isolated from the existing Building 90353, to minimize the potential for damage to both structures that would be caused by excessive differential settlements between the two structures. Flexible subsurface utility connections are also recommended, between structures.

We recommend minimum footing widths of 24 inches for ease of construction and to reduce the possibility of localized shear failures. Exterior footing bottoms should be at least 18 inches below finished surrounding exterior grades.

Settlements for spread foundations bearing on the aforementioned improved materials have been assessed using SPT values to estimate elastic modulus, published correlations and previous NOVA experience. Based on the assumed loading and strict adherence to the soil improvement recommendations stated in this report, we estimate total post-construction settlements will be less than 1 inch, with less than ½ the total settlement being differential between adjoining foundations.

Foundation excavations should be level and free of debris, ponded water, mud, loose, or water-softened soils. All foundation excavations should be evaluated by the geotechnical engineer prior to reinforcing steel placement to observe foundation subgrade preparation and assess bearing pressure capacity. Concrete should be placed as soon as is practical after the foundation is excavated and the subgrade evaluated. Foundation concrete should not be placed on saturated soil. If a foundation excavation remains open overnight, or if precipitation is imminent, a 3 to 4 inch thick "mud mat" of lean concrete should be placed in the bottom of the footing to protect the bearing soils until reinforcing steel and concrete can be placed.

## **SLAB-ON-GRADE**

The conditions exposed at subgrade levels will vary across the site and may include structural fill or densified in-situ soils. The slab-on-grade may be adequately supported on these subgrade conditions subject to the recommendations in this report. The slab-on-grade should be jointed around columns and along walls to reduce cracking due to differential movement. An underdrain system is not necessary beneath the slab, provided that the slab is at least 2 feet above the high groundwater level. An impermeable vapor barrier is recommended beneath finished spaces to reduce dampness.

Once grading is completed, the subgrade can be exposed to adverse construction activities and weather conditions during the period of sub-slab utility installation. The subgrade should be well drained to prevent the accumulation of water. If the exposed subgrade becomes unstable, excessively wet or exhibits excessive rutting or pumping, the geotechnical engineer should be consulted.

## **CONSTRUCTION OBSERVATIONS**

### **Shallow Foundations**

Foundation excavations should be level and free of debris, ponded water, mud, and loose, frozen or water-softened soils. All foundation excavations should be evaluated by the geotechnical engineer prior to reinforcing steel placement to observe foundation subgrade preparation and assess bearing pressure capacity. Due to variable site subsurface and construction conditions, some adjustments in isolated foundation bearing pressures, depth of foundations or undercutting and replacement with controlled structural fill may be necessary.



**APPENDIX A**  
**FIGURES & MAPS**



Scale: NTS

Date Drawn: 7/14/2015

Drawn By: MJC

Checked By: WLL



140-A Lurton Street  
 Pensacola, Florida 32505  
 850.607.7782 ♦ 850.249.6683

**SITE LOCATION MAP**

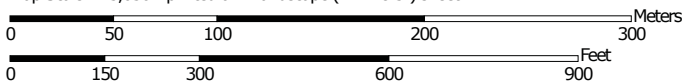
**Building 90353 Addition**  
 Hurlburt Field AFB, Okaloosa County, Florida  
 NOVA Project Number 8215081



Soil Map—Okaloosa County, Florida  
(Hurlburt Field Building Additions (90020, 90353))



Map Scale: 1:3,650 if printed on A landscape (11" x 8.5") sheet.




Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84




## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Okaloosa County, Florida  
Survey Area Data: Version 11, Sep 26, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 5, 2010—Oct 22, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Okaloosa County, Florida (FL091)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4	Chipley and Hurricane soils, 0 to 5 percent slopes	20.5	36.3%
6	Dorovan muck, frequently flooded	0.0	0.0%
27	Urban land	36.0	63.7%
<b>Totals for Area of Interest</b>		<b>56.5</b>	<b>100.0%</b>

**APPENDIX B**  
**SUBSURFACE DATA**





**LEGEND**  
**B-1 = 25' SPTB**

Scale: NTS

Date Drawn: 7/14/2015

Drawn By: MJC

Checked By: WLL








140-A Lurton Street  
Pensacola, Florida 32505  
850.607.7782 ♦ 850.249.6683

**BORING LOCATION PLAN**

**Building 90353 Addition**  
Hurlburt Field AFB, Okaloosa County, Florida  
NOVA Project Number 8215081



## SYMBOLS AND ABBREVIATIONS

<u>SYMBOL</u>	<u>DESCRIPTION</u>
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
% REC	Percent Core Recovery from Rock Core Drilling
RQD	Rock Quality Designation
	Stabilized Groundwater Level
	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

## UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW Well-graded gravels and gravel-sand mixtures, little or no fines GP Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM Silty gravels and gravel-sand-silt mixtures GC Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW** Well-graded sands and gravelly sands, little or no fines
			SP** Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM** Silty sands, sand-silt mixtures
			SC** Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less	ML Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays	
		OL Organic silts and organic silty clays of low plasticity	
	SILTS AND CLAYS Liquid limit greater than 50%	MH Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts	
		CH Inorganic clays or clays of high plasticity, fat clays	
		OH Organic clays of medium to high plasticity	
PT Peat, muck and other highly organic soils			

\*Based on the material passing the 3-inch (75 mm) sieve

\*\* Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

### RELATIVE DENSITY

(Sands and Gravels)

Very loose – Less than 4 Blow/Foot  
Loose – 4 to 10 Blows/Foot  
Medium Dense – 11 to 30 Blows/Foot  
Dense – 31 to 50 Blows/Foot  
Very Dense – More than 50 Blows/Foot

### CONSISTENCY

(Sils and Clays)

Very Soft – Less than 2 Blows/Foot  
Soft – 2 to 4 Blows/Foot  
Medium Stiff – 5 to 8 Blows/Foot  
Stiff – 9 to 15 Blows/Foot  
Very Stiff – 16 to 30 Blows/Foot  
Hard – More than 30 Blows/Foot

### RELATIVE HARDNESS

(Limestone)

Soft – 100 Blows for more than 2 Inches  
Hard – 100 Blows for less than 2 Inches

### MODIFIERS

**These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample**

Trace – 5% or less  
With Silt or With Clay – 6% to 11%  
Silty or Clayey – 12% to 30%  
Very Silty or Very Clayey – 31% to 50%

**These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample**

Trace – Less than 3%  
Few – 3% to 4%  
Some – 5% to 8%  
Many – Greater than 8%

**These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample**

Trace – 5% or less  
Few – 6% to 12%  
Some – 13% to 30%  
Many – 31% to 50%



**Project: Building 90353 Addition**  
**Project Location: Hurlburt Field AFB, Okaloosa Co., FL**  
**Project Number: 8215081**

**LOG OF BORING**  
**B-1**  
Page 1 of 1

Date(s) Drilled: **07/06/2015**  
Drilled By: **D. Hicks**  
Drill Rig Type: **Diedrich D50**  
Drilling Method: **SPTB**  
Hammer Data: Weight **140 lb.** Drop **30 in.**

Drill Bit Size/Type: **2-Inch Soil Bit**  
Sampling Method: **Split Spoon**  
Total Depth of Boring: **25 ft.**  
Boring Backfill: **Soil Cuttings**  
Groundwater Level: **8 ft.**

Logged by: **J. James**  
Checked by: **W. Lawrence**  
Approximate Surface Elevation: **Existing Grade**  
Vertical Datum: **Existing Grade**  
Location: **Per Boring Location Plan**

Elevation, feet MSL	Depth, feet	Sample Type	Sample Number	Sampling Resistance Blows/foot (N-value)	Consistency/Relative Density	USCS-AASHTO	Graphic Log	Material Description	TEST RESULTS			
									N-VALUE ●	PLASTICITY INDEX  —	NATURAL MOISTURE % ■	LIQUID LIMIT ▲
0	0		1	16	MEDIUM DENSE	SM SP		Asphalt (approx. 1.5")				
	1.5		2	7	LOOSE			Orange/tan fine-grained silty SAND (Base Course - approx. 5")				
	3		3	8	LOOSE			Tan fine-grained SAND				
	5		4	10	LOOSE	SP		Light tan/off-white fine-grained SAND				
	7		5	23	MEDIUM DENSE							
	10											
	15		6	23	MEDIUM DENSE	SP		Brown fine-grained SAND with slight organic stain				
	20		7	45	DENSE							
	25		8	31	DENSE							
	25							Boring Terminated at 25 ft.				

**REMARKS AND OTHER TESTS:**



**APPENDIX C**  
**ASFE Document**  
**Qualifications of Recommendations**

# Important Information About Your Geotechnical Engineering Report

*Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.*

*The following information is provided to help you manage your risks.*

## **Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects**

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. *No one except you* should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you –* should apply the report for any purpose or project except the one originally contemplated.

## **Read the Full Report**

Serious problems have occurred because those relying on a geotechnical engineering report did not read it at all. Do not rely on an executive summary. Do not read selected elements only.

## **A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors**

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, *do not rely on a geotechnical engineering report* that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## **Subsurface Conditions Can Change**

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

## **Most Geotechnical Findings Are Professional Opinions**

Site exploration identifies subsurface conditions *only* at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an *opinion* about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

### **A Report's Recommendations Are *Not* Final**

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

### **A Geotechnical Engineering Report Is Subject To Misinterpretation**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

### **Do Not Redraw the Engineer's Logs**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

### **Give Contractors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited;

encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

### **Read Responsibility Provisions Closely**

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce such risks, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations", many of the provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### **Geoenvironmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

### **Rely on Your Geotechnical Engineer for Additional Assistance**

Membership in ASFE exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

# **ASFE**

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## QUALIFICATIONS OF RECOMMENDATIONS

The findings, conclusions and recommendations presented in this report represent our professional opinions concerning subsurface conditions at the site. The opinions presented are relative to the dates of our site work and should not be relied on to represent conditions at later dates or at locations not explored. The opinions included herein are based on information provided to us, the data obtained at specific locations during the study, and our previous experience. If additional information becomes available which might impact our geotechnical opinions, it will be necessary for NOVA to review the information, re-assess the potential concerns, and re-evaluate our conclusions and recommendations.

Regardless of the thoroughness of a geotechnical exploration, there is the possibility that conditions between borings may differ from those encountered at specific boring locations, that conditions are not as anticipated by the designers and/or the contractors, or that either natural events or the construction process has altered the subsurface conditions. These variations are an inherent risk associated with subsurface conditions in this region and the approximate methods used to obtain the data. These variations may not be apparent until construction.

The professional opinions presented in this report are not final. Field observations and foundation installation monitoring by the geotechnical engineer, as well as soil density testing and other quality assurance functions associated with site earthwork and foundation construction, are an extension of this report. Therefore, NOVA should be retained by the owner to observe all earthwork and foundation construction to confirm that the conditions anticipated in this study actually exist, and to finalize or amend our conclusions and recommendations. NOVA is not responsible or liable for the conclusions and recommendations presented in this report if NOVA does not perform these observation and testing services.

This report is intended for the sole use of the **Caldwell Associates Architects, Inc.**, only. The scope of work performed during this study was developed for purposes specifically intended by the **Caldwell Associates Architects, Inc.**, only, and may not satisfy other users' requirements. Use of this report or the findings, conclusions or recommendations by others will be at the sole risk of the user. NOVA is not responsible or liable for the interpretation by others of the data in this report, nor their conclusions, recommendations or opinions.

Our professional services have been performed, our findings obtained, our conclusions derived and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices in the State of Florida. This warranty is in lieu of all other statements or warranties, either expressed or implied.