AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE	OF	PAGES
	1		147

2. AMENDMENT/MODIFICAITON NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO. (If applicble)
AMENDMENT NO. 0001	08/26/11		11-0127

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than Item 6)	CODE
Officer in Charge of Construction MCI-East 1005 Michael Road Camp Lejeune, NC 28547-2521	rmm	See Item 6	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code)	(X)	9A. AMENDMENT OF SOLICIATION NO.
	x	N40085-11-R-0127
		9B. DATED (SEE ITEM 11) 08/19/11
		10A. MODIFICATION OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 11)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[x] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers [ ] is extended, [x] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods:

(a)By completing items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment your desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPIRATION DATA (If required)

13. THIS ITEM ONLY APPLIES TO MODIFICATION OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

CHECK ONE	
	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

11-0127, Repair HQ's Building 421

The time and date for the receipt of proposals remains 1300, Friday,02 September 2011.

See Continuation Pages

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA (Signature of Contracting Officer)	16C. DATE SIGNED

1) Delete the following specifications:
   01 35 29
   01 78 00
   04 20 00
   08 11 13
   08 14 00
   08 41 00
   09 30 00
   09 65 00
   10 21 13
   23 07 00

2) Insert the attached revised specifications:
   01 35 29
   01 78 00
   04 20 00
   08 11 13
   08 14 00
   08 41 00
   09 30 00
   09 65 00
   10 21 13
   23 07 00

SECTION 01 35 29

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

06/11

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z359.1	(1992; R 1999) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components

ASME INTERNATIONAL (ASME)

ASME B30.3	(1996) Construction Tower Cranes
ASME B30.5	(2000) Mobile and Locomotive Cranes
ASME B30.8	(2000) Floating Cranes and Floating Derricks
ASME B30.22	(2000) Articulating Boom Cranes

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 10	(2010) Standard for Portable Fire Extinguishers
NFPA 241	(2000) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 51B	(2003) Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2011) National Electrical Code
NFPA 70E	(2004) Electrical Safety in the Workplace

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2008; Change 1-2010; Change 3-2010; Errata 1-2010) Safety and Health Requirements Manual

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards

29 CFR 1910.146	Permit-required Confined Spaces
29 CFR 1910.94	Ventilation
29 CFR 1915	Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
29 CFR 1919	Gear Certification
29 CFR 1926	Safety and Health Regulations for Construction
29 CFR 1926.500	Fall Protection

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP)

Activity Hazard Analysis (AHA)

Crane Critical Lift Plan

Crane Work Plan

Proof of qualifications for Crane Operators

SD-06 Test Reports

Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

Accident Reports

Monthly Exposure Reports

Regulatory Citations and Violations

Crane Reports

SD-07 Certificates

Confined Space Entry Permit

Certificate of Compliance (Crane)

Third Party Certification of Barge-Mounted Mobile Cranes

Submit one copy of each permit/certificate attached to each Daily Report.

1.3 DEFINITIONS

a. Associate Safety Professional (ASP). An individual who is currently certified by the Board of Certified Safety Professionals.

b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified as a CHST by the Board of Certified Safety Professionals.

c. Certified Industrial Hygienist (CIH). An individual who is currently certified as a CIH by the American Board of Industrial Hygiene.

d. Certified Safety Professional (CSP). An individual who is currently certified as a CSP by the Board of Certified Safety Professionals.

e. Certified Safety Trained Supervisor (STS). An individual who is currently certified as an STS by the Board of Certified Safety Professionals.

f. Competent Person for Fall Protection. A person who is cabable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.

g. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.

h. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

i. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

j. Multi-Employer Work Site (MEWS). A multi-employer work site, as defined by OSHA, is one in which many employers occupy the same site. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors.

k. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

l. Qualified Person for Fall Protection. A person with a recognized degree or professional certifictae, extensive knowledge, training and experience in the field of fall protection who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.

m. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

(1) Death, regardless of the time between the injury and death, or the length of the illness;

(2) Days away from work;

(3) Restricted work;

(4) Transfer to another job;

(5) Medical treatment beyond first aid;

(6) Loss of consciousness; or

(7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

n. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project.

o. Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).

p. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

q. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.4 CONTRACTOR SAFETY SELF-EVALUATION CHECKLIST

Contracting Officer will provide a "Contractor Safety Self-Evaluation checklist" to the Contractor at the pre-construction conference. The checklist will be completed monthly by the Contractor and submitted with each request for payment voucher. An acceptable score of 90 or greater is required. Failure to submit the completed safety self-evaluation checklist or achieve a score of at least 90, will result in a retention of up to 10 percent of the voucher.

1.5 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and the following laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.6 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employee uses illegal drugs or consumes alcohol during work hours. Ensure there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

1.7 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.7.1 Personnel Qualifications

Work performed under this contract shall meet Level 2.

1.7.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

Level 1:
Worked on similar projects.
10-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 2:
A minimum of 3 years safety work on similar project.
30-hour OSHA construction safety class or equivalent within last 3 years.
Competent person training as needed.

Level 3:
A minimum of 5 years safety work on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years.
Competent person training as needed.

Level 4:
A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and

clothing to include selection, use and maintenance.

Level 5:
An Associate Safety Professional (ASP), Certified Safety Trained Supervisor (STS) and/or Construction Health & Safety Technician (CHST).
A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

Level 6: A
Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH).
A minimum of 10 years safety work of a progressive nature with at least 5 years of experience on similar projects.
30-hour OSHA construction safety class or equivalent within the last 5 years.
An average of at least 24 hours of formal safety training each year for the past 5 years with training for competent person status for at least the following areas of competency: Excavation; Scaffolding; Fall protection; Hazardous energy; Confined space; Health hazard recognition, evaluation and control of chemical, physical and biological agents; Personal protective equipment and clothing to include selection, use and maintenance.

1.7.1.2 Certified Safety Professional (CSP) and/or Certified Industrial hygienist (CIH)

Provide a Certified Safety Professional (CSP) and/or Certified Industrial Hygienist (CIH) at the work site to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The CSP and/or CIH shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The CSP and/or CIH shall have no other duties than safety and occupational health management, inspections, and/or industrial hygiene.

1.7.1.3 Associate Safety professional (ASP), Certified Safety Trained Supervisor (STS) and/or Construction Health and Safety Technician (CHST).

Provide an Associate Safety Professional (ASP); Certified Safety Trained Supervisor (STS); and/or Construction Health & Safety Technician (CHST) at the work site to perform safety management, surveillance, inspections, and safety enforcement for the Contractor to meet the designated safety level in paragraph 1.6.1. The ASP, STS, and/or CHST shall be the safety and occupational health "competent person" as defined by USACE EM 385-1-1. The ASP, STS, and/or CHST shall be at the work site at all times whenever work or testing is being performed and shall conduct and document daily safety inspections. The ASP, STS, and/or CHST shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

1.7.1.4 Competent Person for Confined Space Entry

Provide a competent person meeting the requirements of EM 385-1-1 who is assigned in writing by the Designated Authority to assess confined spaces and who possesses demonstrated knowledge, skill and ability to:

a. Identify the structure, location, and designation of confined and permit-required confined spaces where work is done;

b. Calibrate and use testing equipment including but not limited to, oxygen indicators, combustible gas indicators, carbon monoxide indicators, and carbon dioxide indicators, and to interpret accurately the test results of that equipment;

c. Perform all required tests and inspections specified in 29 CFR 1910.146 and 29 CFR 1915 Subpart B;

d. Assess hazardous conditions including atmospheric hazards in confined space and adjacent spaces and specify the necessary protection and precautions to be taken;

e. Determine ventilation requirements for confined space entries and operations;

f. Assess hazards associated with hot work in confined and adjacent space and determine fire watch requirements; and,

g. Maintain records required.

When the work involves marine operations that handle combustible or hazardous materials, this qualified person shall be a NFPA certified marine chemist.

1.7.1.5 Competent Person for the Health Hazard Control and Respiratory Protection Program

Provide a competent person meeting the requirements of EM 385-1-1 who is:

a. Capable by education, specialized training and/or experience of anticipating, recognizing, and evaluating employee exposure to hazardous chemical, physical and biological agents in accordance with USACE EM 385-1-1, Section 6.

b. Capable of spe cifying necessary controls and protective actions to ensure worker health.

1.7.1.6 Crane Operators

Crane operators shall meet the requirements in USACE EM 385-1-1, Section 16 and Appendix G. In addition, for mobile cranes with Original Equipment Manufacturer (OEM) rated capacitates of 50,000 pounds or greater, crane operators shall be designated as qualified by a source that qualifies crane operators (i.e., union, a government agency, or an organization that tests and qualifies crane operators). Proof of current qualifications shall be provided.

1.7.2 Personnel Duties

1.7.2.1 Site Safety and Health Officer (SSHO)/Superintendent

a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily report.

b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.

c. Maintain applicable safety reference material on the job site.

d. Attend the pre-construction conference, pre-work meetings including preparatory inspection meeting, and periodic in-progress meetings.

e. Implement and enforce accepted APPS and AHAs.

f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.

g. Ensure sub-contractor compliance with safety and health requirements.

h. Ensure an approved "Special Permission Energized Electrical Work Permit" prior to starting any activity on energized electrical systems.

Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.7.2.2 Certified Safety Professional (CSP), Certified Industrial Hygienist (CIH), Associate Safety Professional (ASP), Certified Safety Trained Supervisor (STS), and/or Certified Construction Health & Safety Technician (CHST)

a. Perform safety and occupational health management, surveillance, inspections, and safety enforcement for the project.

b. Perform as the safety and occupational health "competent person" as defined by USACE EM 385-1-1.

c. Be on site whenever work or testing is being performed.

d. Conduct and document safety inspections.

e. Shall have no other duties other than safety and occupational health management, inspections, and enforcement on this contract.

If the CSP, CIH, ASP, STS, CHST is appointed as the SSHO all duties of that position shall also be performed.

1.7.3 Meetings

1.7.3.1 Preconstruction Conference

a. The Contractor will be informed, in writing, of the date of the preconstruction conference. The purpose of the preconstruction conference is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach mutual understanding relative to the administration of the overall project's Accident Prevention Plan (APP) before the initiation of work.

b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the preconstruction conference. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).

c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.

d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the preconstruction conference, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.

e. The functions of a Preconstruction conference may take place at the Post-Awqrd Kickoff meeting for Design Build Contracts.

1.7.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily report.

1.7.3.3 Work Phase Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

1.8 TRAINING

1.8.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be

kept on file at the project site.

1.8.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for all onsite employees.

1.8.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new phase, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.9 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". Where a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph 1.8.1. The APP shall be job-specific and shall address any unusual or unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the

public, and the environment.

Copies of the accepted plan will be maintained at the resident engineer's office and at the job site. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.9.1 EM 385-1-1 Contents

In addition to the requirements outlines in Appendix A of USACE EM 385-1-1, the following is required:

a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSs, CHSTs. The duties of each position shall be specified.

b. Qualifications of competent and of qualified persons. As a minimum, competent persons shall be designated and qualifications submitted for each of the following major areas: excavation; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.

c. Confined Space Entry Plan. Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

d. Health Hazard Control Program. The Contractor shall designate a competent and qualified person to establish and oversee a Health Hazard Control Program in accordance with USACE EM 385-1-1, Section 6. The program shall ensure that employees, on-site Government representatives, and others, are not adversely exposed to chemical, physical and biological agents and that necessary controls and protective actions are instituted to ensure health.

e. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of capacity of the crane or hoist (or lifts over 50 percent of the capacity of a barge mounted movile crane's hoists) at any radius of lift; lifts involving more thatn one crane or hoist; lifts of personnel; and lifts involving more than rigging or operation, sensitive equipment, or unusual safety risks. The plan shall be submitted 15 calendar day6s prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.c.18. and the following:

(1) For lifts of personnel, the plan shall demonstrate compliance with the requirements of 29 CFR 1926.500(g).

(2) For barge mounted mobile cranes, barge stability calculations identifying barge list and trim based on anticipated loading; and load charts based on calculated list and trim. Teh amount of list and trim shall be within the crane manufacturer's requirements.

f. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

g. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 1.8 m (6 feet). A qualified person for fall protection shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue self-rescue and evacuation procedures, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised every six months for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project. The Fall Protection Plan shall be included in the Accident Prevention Plan (APP)

h. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requiremetns for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.

i. Occupant Protection Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 02 83 19.00 10 Lead Based Paint Hazard Abatement, Target Housing & Child Occupied Facilities, 02 82 33.13 20 Removal/Control and Disposal of Lead Containig Paint.

j. Lead Compliance Plan. The safety and health aspects of lead work, prepared in accordance with Section 02 83 13.00 20 Lead in Construction.

k. Asbestos Hazard Abatement Plan. The safety and health aspects of asbestos work, prepared in accordance with Section 02 2 16.00, "Engineering Control of Asbestos Containing Materials"

l. Site Safety and Health Plan. The safety and health aspects prepared in accordance with this section.

m. PCB Plan. The safety and health aspects of Polychlorinated Biphenyls work, prepared in accordance with Sections 02 84 33, "Removal and Disposal of Polychlorinated Biphenyls (PCBs) and 02 61 23, "Removal and Disposal of PCB Contaminated Soils)".

n. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02 41 00.00 40, Demolition" and referenced sources. Include engineering survey as applicable.

o. Excavation Plan. The safety and health aspects prepared in accordance with Section 3100, Earthwork.

p. Crane Work Plan. The contractor shall provide a crane work plan to the Contracting Officer for acceptance. The crane work plan shall include the specific model of each crane and a drawing identifying their locations (exact), the dimensions, wheel sizes, number of wheels, wheel spacing, tire pressure(s), number of axles, axle spacing, minimum wheel load to be exerted during operatins and maximum outrigger load to be exerted during operations. The Contractor shall allow at least 10 working days for acceptance/non-acceptance of the crane work plan. No crane operations shall begin prior to written acceptance of the crane plan by the Government. ROICC shall be the government approving authority.

1.10 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each phase of work. At a minimum, define activity being performed, sequence of work, specific safety and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall protection methods used. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

The activity hazard analyses shall be developed using the project schedule as the basis for the activities performed. Any activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier or subcontractor and provided t othe prime contractor for submittal to the Contracting Offficer.

1.11 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

a. Map denoting the route to the nearest emergency care facility.

b. Emergency phone numbers.

c. Copy of the most up-to-date APP.

d. Current AHA(s).

e. OSHA 300A Form.

f. OSHA Safety and Health Protection-On-The-Job Poster.

g. Confined space entry permit.

h. Hot work permit.

i. A sign indicating the number of hours worked since last lost workday accident.

j. Safety and Health Warning Posters.

1.12 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.13 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.14 REPORTS

1.14.1 Accident Reports

a. For recordable injuries and illnesses, and property damage accidents resulting in at least $2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the Navy Contractor Significant Incident Report (CSIR) form or USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 1 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

b. For a weight handling equipment accident (including rigging gear accidents) the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the WHE Accident Report (Crane and Rigging Gear) form and provide the report to the Contracting Officer within 30 calendar days of the accident. Crane operations shall not proceed until cause is determined and corrective actions have been implemented to the satisfaction of the Contracting Officer. The Contracting Officer will provide a blank copy of the accident report form.

1.14.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than $2,000, or any weight handling equipment accident. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on site and Government investigation is conducted.

1.14.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.14.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

1.14.5 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

1.14.6 Certificate of Compliance

The Contractor shall provide a Certificate of Compliance for each crane entering an activity under this contract (see Contracting Officer for a blank certificate). Certificate shall state that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance shall comply with 29 CFR 1926 and USACE EM 385-1-1 section 16 and Appendix H. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. For cranes at DOD activities in foreign countries, the Contractor shall certify that the crane and rigging gear

conform to the appropriate host country safety standards. The Contractor shall also certify that all of its crane operators working on the DOD activity have been trained in the proper use of all safety devices (e.g., anti-two block devices). These certifications shall be posted on the crane.

1.14.7 Third Party Certification of Barge-Mounted Mobile Cranes

Barge-mounted mobile cranes shall be certified in accordance with 29 CFR 1919 by an OSHA accredited person.

1.15 HOT WORK

Prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, a written permit shall be requested from the Fire Division. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the hot work permit.

a. Oil painting materials (paint, brushes, empty paint cans, etc.), and all flammable liquids shall be removed from the facility at quitting time. All painting materials and flammable liquids shall be stored outside in a suitable metal locker or box and will require re-submittal with non-hazardous materials.

b. Accumulation of trays, paper, shavings, sawdust, boxes and other packing materials shall be removed from the facility at the close of each workday and such material disposed of in the proper containers located away from the facility.

c. The storage of combustible supplies shall be a safe distance from structures.

d. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.

e. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday. When possible, the main electric switch in the facility shall be deactivated.

f. When starting work in the facility, Contractors shall require their personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency phone number 911. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED IMMEDIATELY.

g. Obtain services from th FIRE DIVISION for "HOT WORK" within or around flammable materials (such as fuel systems, welding/cutting on fuel pipes) or confined spaces (such as sewer wet wells, manholes, vaults, etc.) that have the potential for flammable or explosive atmospheres.

PART 2 PRODUCTS

2.1 CONFINED SPACE SIGNAGE

The Contractor shall provide permanent signs integral to or securely attached to access covers for all required confined spaces. Signs wording: "DANGER--PERMIT-REQUIRED CONFINED SPACE - DO NOT ENTER -" in bold letters a minimum of 25 mm(one inch) in height and constructed to be clearly legible with all paint removed. The signal word "DANGER" shall be red and readable from 1.52 m(5 feet).

2.2 FALL PROTECTION ANCHORAGE

Fall protection anchorage, conforming to ANSI Z359.1, installed under the supervision of a qualified person in fall protection, shall be left in place for continued customer use and so identified by signage stating the capacity of the anchorage (strength and number of persons who may be tied-off to it at any one time).

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, Federal and/or State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard shall prevail.

3.1.1 Hazardous Material Use

Each hazardous material must receive approval prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material. Any work or storage involving hazardous chemicals or materials must be done in a manner that will not expose Government or Contractor employees to any unsafe or unhealthful conditions. Adequate protective measures must be taken to prevent Government or Contractor employees from being exposed to any hazardous condition that could result from the work or storage. The Prime Contractor shall keep a complete inventory of hazardous materials brought onto the work-site. Approval by the Contracting Officer of protective measures and storage area is required prior to the start of the work.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocynates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and

friable and non-friable asbestos. If additional material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 15 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 FALL HAZARD PROTECTION AND PREVENTION

The Contractor shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and escape procedures.

3.3.1 Training

The Contractor shall institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, the Contractor shall provide training for each employee who might be exposed to fall hazards. A competent person for fall protection shall provide the training. Training requirements shall be in accordance with USACE EM 385-1-1, section 21.A.16.

3.3.2 Fall Protection Equipment

The Contractor shall enforce use of the fall protection equipment designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is on a surface 1.8 m(6 feet) or more above lower levels. Fall protection systems such as guardrails, personnel fall arrest system, safety nets, etc., are required when working within 1.8m (6 feet) of any leading edge. In addition to the required fall protection systems, safety skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.I. and 05.J. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems may be required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, or travel. Fall protection must comply with 29 CFR 1926.500,

Subpart M and USACE EM 385-1-1.

3.3.2.1 Personal Fall Arrest Equipment

Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance and any swinging of the worker (pendulum-like motion) that can occur during a fall shall always be taken into consideration when attaching a person to a fall arrest system.

3.3.3 Fall Protection for Roofing Work

Fall protection controls shall be implemented based on the type of roof being constructed and work being performed. The roof area to be accessed shall be evaluated for its structural integrity including weight-bearing capabilities for the projected loading.

a. Low Sloped Roofs:

(1) For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets. A safety monitoring system is not adequate fall protection and is not authorized.

(2) For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.

b. Steep Roofs: Work on steep roofs requires a personal fall arrest system, guardrails with toe-boards, or safety nets. This requirement also includes residential or housing type construction.

3.3.4 Safety Nets

If safety nets are used as the selected fall protection system on the project, they shall be provided at unguarded workplaces, leading edge work or when working over water, machinery, dangerous operations and or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, fall arrest systems or restraint/positioning systems are impractical. Safety nets shall be tested immediately after installation with a drop test of 181.4 kg (400 pounds) dropped from the same elevation a person might fall, and every six months thereafter.

3.3.5 Existing Anchorage

Existing anchorages, to be used for attachment of personal fall arrest equipment, shall be certified (or re-certified) by a qualified person for fall protection in accordance with ANSI Z359.1. Exiting horizontal lifeline achorages shall be certified (or re-certified) by a registered

professional engineer with experience in designing horizontal lifeline systems.

3.3.6 Horizontal Lifelines

Horizontal lifelines shall be designed, installed, certified and used under the supervision of a qualified person for fall protection as part of a complete fall arrest system which maintains a safety factor of 2 (29 CFR 1926.500).

3.3.7 Guardrail Systems

Guardrails shall consist of top and mid-rails, post and toe boards. The top edge height of standard railing must be 42 inches plus or minus 3 inches above the walking/working level. When mid-rails are used, they must be installed at a height midway between the top edge of the guardrail system and the walking/working level. Posts shall be placed no more than 8 feet apart (29 CFR 1926.500 and USACE EM 385-1-1).

3.3.8 Rescue and Evacuation Procedures

When personal fall arrest systems are used, the contracator must ensure that the mishap victim can self-rescue or can be rescued promptly should a fall occur. A Rescue and Evacuation Plan shall be prepared by the contractor and include a detailed discussion of the following: methods of rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes to a medical facility. The Rescue and Evaluation Plan shall be included in the Activity Hazard Analysis (AHA) for the phase of work, in the Fall Protection and Prevention (FP&P) Plan, and the Accident Prevention Plan (APP).

3.4 PERSONAL PROTECTIVE EQUIPMENT

All personnel who enter a construction site area shall wear Personal Protective Equipment (PPE) at all times as outlined in the EM 385 1-1. In addition to the requirements of the EM 385 1-1, Safety Glasses (ANSI Z87.1) and High-Visibility Apparel (ANSI 107-2004 Performance Class II, Shirt or Vest) will be worn at all times on construction sites. Hearing protection is required in noise hazard areas or when performing noise hazard tasks. Mandatory PPE on all construction sites includes:

a. Hard Hats

b. Safety Glasses

c. High-Visibility Shirt or Vest

d. Safety-Toed Shoes or Boots

3.5 SCAFFOLDING

Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required.

Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.5.1 Stilts

The use of stilts for gaining additional height in construction, renovation, repair or maintenance work is prohibited.

3.6 EQUIPMENT

3.6.1 Material Handling Equipment

a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.

b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.6.2 Weight Handling Equipment

a. Cranes must be equipped with:

(1) Load indicating devices (LIDs) and a boom angle or radius indicator,

(2) or load moment indicating devices (LMIs).

(3) Anti-two block prevention devices.

(4) Boom hoist hydraulic relief valve, disconnect, or shutoff (stops hoist when boom reaches a predetermined high angle).

(5) Boom length indicator (for telescoping booms).

(6) Device to prevent uncontrolled lowering of a telescoping hydraulic boom.

(7) Device to prevent uncontrolled retraction of a telescoping hydraulic boom.

b. The Contractor shall notify the Contracting Officer 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated. Contractor's operator shall remain with the crane during the spot check.

c. The Contractor shall comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Erection shall be performed under the supervision of a designated person (as defined in ASME B30.5). All testing shall be performed in accordance with the manufacturer's recommended procedures.

d. The Contractor shall comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes, ASME B30.3 for construction tower cranes, and ASME B30.8 for floating cranes and floating derricks.

e. The presence of Government personnel does not relieve the Contractor of an obligation to comply with all applicable safety regulations. The Government will investigate all complaints of unsafe or unhealthful working conditions received in writing from contractor employees, federal civilian employees, or military personnel.

f. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. Christmas-tree lifting (multiple rigged materials) is not allowed.

g. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.

h. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and shall follow the requirements of USACE EM 385-1-1 section 11 and ASME B30.5 or ASME B30.22 as applicable.

i. Crane suspended personnel work platforms (baskets) shall not be used unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Personnel shall not be lifted with a line hoist or friction crane.

j. A fire extinguisher having a minimum rating of 10BC and a minimum nominal capacity of 5lb of extinguishing agent shall be available at all operator stations or crane cabs. Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, Standard for Portable Fire Extinguishers.

k. All employees shall be kept clear of loads about to be lifted and of suspended loads.

l. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.

m. The Contractor shall use cribbing when performing lifts on outriggers.

n. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.

o. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.

p. A substantial and durable rating chart containing legible letters and figures shall be provided with each crane and securely mounted onto the crane cab in a location allowing easy reading by the operator while seated in the control station.

q. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Contracting Officer personnel.

r. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Contracting Officer personnel.

s. The Contractor shall certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

3.6.3 Equipment and Mechanized Equipment

a. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment shall be on site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Such additional safety precautions or requirements shall be incorporated into the AHAs.

c. Equipment and mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operation by a competent person prior to being placed into use.

d. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

3.7 EXCAVATIONS

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect, and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly. The competent person shall perform soil classification in accordance with 29 CFR 1926.

3.7.1 Utility Locations

All underground utilities in the work area must be positively identified by a third party, independent, private utility locating company in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.7.2 Utility Location Verification

The Contractor must physically verify underground utility locations, including utility depth, by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within 2 feet of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 100 feet if parallel within 5 feet of the excavation.

3.7.3 Utilities Within and Under Concrete, Bituminous Asphalt and Other Impervious Surfaces

Utilities located within concrete slabs or pier decks, bridges, parking areas, and the like, are extremely difficult to identify. Whenever contract work involves chipping, saw cutting, or core drilling through concrete, bituminous asphalt or other impervious surfaces, the existing utility location must be coordinated with station utility departments in addition to location and depth verification by a third party, independent, private locating company. The third party, independent, private locating company shall locate utility depth by use of Ground Penetrating Radar (GPR), X-ray, bore scope, or ultrasound prior to the start of demolition and construction. Outages to isolate utility systems must be used in circumstances where utilities are unable to be positively identified. The use of historical drawings does not alleviate the contractor from meeting this requirement.

3.7.4 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on site for review. Job-made shoring or shielding shall have the registered professional engineer stamp, specifications, and tabulated data. Extreme care must be used when excavating near direct burial electric underground cables.

3.7.5 Trenching Machinery

Trenching machines with digging chain drives shall be operated only when the spotters/laborers are in plain view of the operator. Operator and spotters/laborers shall be provided training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Documentation of the training shall be kept on file at the project site.

3.8 ELECTRICAL

3.8.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified.

Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required by NFPA 70E. Insulating blankets, hearing protection, and switching suits may be required, depending on the specific job and as delineated in the Contractor's AHA.

3.8.2 Arc Flash Risk/Hazard Analysis

Contractor shall provide an Arc Flash Risk/Hazsrd Analysis in accordance with NFPA 70E for all locations where workers may be exposed to arc flash hazard (work on energized electrical equipment). The Arc Flash Risk/Hazard Analysis shall be sealed and signed by a qualified professional engineer.

3.8.3 Arc Flash Risk/Hazard Analysis Qualifications

Contractor shall engage the services of a qualified organization to provide Arc Flash Risk/Hazard Analysis of the electrial distribution system. Organization shall be independent of th aupplier, manufacturer, and installer of ht equipment. The organization shall be a first tier subcontractor. This work shall not be performed by a second tier subcontractor.

a. Submit name and qualificaitons of organization. Organization shall have been regularaly engaged in providing Arc Flash Risk/Hazard Analysis for a minimum of 5 years.

b. Submit name and qualifications of the professional engineer performing the analysis. Include a list of three comparable jobs performed by the engineer with specific names nad telephone numbers for reference.

3.8.4 Special Permission Energized Electrical Work Permit

All work on energized electrical systems, including high voltage, must have an approved "Special Permission Energized Electrical Work Permit." The results of a Arc Flash Risk/Hazard Analysis, per NFPA 70E, shall be included in the "Special Permission Energized Electrical Work Permit" request. Flame-resistant (FR) clothing and personel protective equipment (PPE) shall be rated for a minimum of 8 calories per square centimeter even if the flash hazard analysis indicates a lower value. A blank copy of the permit request is attached. An editable version may be obtained from the Contracting Officer.

3.8.5 Portable Extension Cords

Portable extension cords shall be sized in accordance with manufacturer ratings for the tool to be powered and protected from damage. All damaged extension cords shall be immediately removed from service. Portable

extension cords shall meet the requirements of NFPA 70.

3.9 WORK IN CONFINED SPACES

The Contractor shall comply with the requirements in Section 06.I of USACE EM 385-1-1 and OSHA 29 CFR 1910.146. Any potential for a hazard in the confined space requires a permit system to be used.

a. Entry Procedures. Prohibit entry into a confined space by personnel for any purpose, including hot work, until the qualified person has conducted appropriate tests to ensure the confined or enclosed space is safe for the work intended and that all potential hazards are controlled or eliminated and documented. (See Section 06.I.05 of USACE EM 385-1-1 for entry procedures.) All hazards pertaining to the space shall be reviewed with each employee during review of the AHA.

b. Forced air ventilation is required for all confined space entry operations and the minimum air exchange requirements must be maintained to ensure exposure to any hazardous atmosphere is kept below its' action level.

c. Ensure the use of rescue and retrieval devices in confined spaces greater than 1.5 m (5 feet) in depth. Conform to Sections 06.I.09, 06.I.10 and 06.I.11 of USACE EM 385-1-1.

d. Sewer wet wells require continuous atmosphere monitoring with audible alarm for toxic gas detection.

e. Include training information for employees who will be involved as entrants and attendants for the work. Conform to Section 06.I.06 of USACE EM 385-1-1.

f. Daily Entry Permit. Post the permit in a conspicuous place close to the confined space entrance.

3.10 CRYSTALLINE SILICA

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and USACE EM 385-1-1, Appendix C. The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.11 HOUSEKEEPING

3.11.1 Clean-Up

All debris in work areas shall be cleaned up daily or more frequently if necessary. Construction debris may be temporarily located in an approved location, however garbage accumulation must be removed each day.

3.11.2 Falling Object Protection

All areas must be barricaded to safeguard employees. When working overhead, barricade the area below to prevent entry by unauthorized employees. Construction warning tape and signs shall be posted so they are

clearly visible from all possible access points. When employees are working overhead all tools and equipment shall be secured so that they will not fall. When using guardrail as falling object protection, all openings shall be small enough to prevent passage of potential falling objects.

-- End of Section --

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SECTION 01 78 00

CLOSEOUT PROCEDURES

12/10

PART 1 GENERAL

1.1 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-10, Operation and Maintenance Data

Equipment/product warranty list

Submit Data Package 1 in accordance with Section 01 78 23, "Operation and Maintenance Data."

SD-11 Closeout Submittals

As-built drawings

GIS Deliverables

Record of materials

Maximo requirements

Complete Submittal Package - 1 copy

Equipment/product warranty tag

1.2 PROJECT RECORD DOCUMENTS

As-Built Drawings will be submitted as specified in 1.2.1 along with GIS Deliverables which will be created and submitted within specification in section 1.2.2.

1.2.1 As-Built Drawings

"FAC 5252.236-9310, Record Drawings." In addition to the requirements of FAC 5252.236-9310, the Contractor shall survey the horizontal and vertical location of all new utilities and structures to within 0.1 feet relative to the station datum. Drawing files shall be drawn according to, and in scale with NAD-1983-UTM-Zone-18N, GCS-North-America 1983, Datum: D-North-America-1983. All utilities shall be surveyed at each fitting and every 100 LF of run length and at each change of direction. All structures shall be surveyed at corners of buildings. Locations and elevations shall be recorded on the Record Drawings. Submit drawings with QC certification. Submit drawings in AutoCAD format versions 2000 or 2002.

1.3 SPECIFICATION FOR DIGITAL DATA - GIS DELIVERABLES

Objective: The primary objective of this section is to provide detailed specifications for the collection and creation of Geographic Information System (GIS) data to ensure that all GIS data delivered is compatible and will add value to Camp Lejeune's Installation Geospatial Information and Services (IGI&S) repository.

1.3.1 **Section 1** - Collection and Creation of Geospatial data

Prior to data collection and creation the contractor shall provide the Government Project Manager a Technical Approach Plan for approval which describes the contractor's plan to collect and create GIS Data as specified in this section.

The Technical Approach Plan will contain the following:

a. How features will be collected utilizing Global Positioning System (GPS) technology

b. Which features, as specified in Section 2, will be located, GPS and created

c. Source of attribute data

d. Steps taken to create file personal Geodatabase

e. What GIS data will be delivered

All questions regarding the Specification For Digital Data - GIS Deliverables shall be directed to MCB Camp Lejeune I&E, PWD GIS Section, via the Government Project Manager.

Specific Tasks are as follows:

a. Contractor is responsible for the collection and creation of geospatial data for newly constructed or replaced utilities and infrastructure features that fall within the realm of this specification.

b. Utilize GPS technology to locate and create GIS data and deliver only features that are relevant to this contract as specified in Section 2.

c. Follow instructions in Section 2 which defines the following:

(1) GIS feature requirements
(2) The manner in which the data will be collected in GPS
(3) The manner in which GIS data will be created
(4) Required Attribute data
(5) Other instructions pertaining to GIS data

Survey Grade and Sub-Foot GPS Geospatial Data Collection requirements:

a. GPS data shall be completed in accordance with the "Statewide Global Positioning System (GPS) Data Collection and Documentation Standards, Version 3" (or higher version if available at the time of this project) as prepared by the Statewide Mapping Advisory Committee and adopted by the North Carolina Geographic

Coordinating Council in May 2006. Copies of these standards can be found on the Internet at: www.ncgicc.org.

b. Only bench marks included in the North Carolina Geodetic Survey Base Station Network shall be used for mapping grade GPS data collection.

c. Mission planning is essential and contractor should utilize lowest possible PDOP values.

d. Geographic data shall be collected and created into the Universal Transverse Mercator (UTM) coordinate system.

(1) UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983.

e. Spatial accuracy requirements for Survey and Sub-Foot grade data collection are as follows:

Sub-Foot requirements

(1) All points shall be within + 12 inches
(2) 95 % accuracy rate for all points.

Survey Grade requirements

(1) All points shall be within + 1 centimeter
(2) 98 % accuracy rate for all points

f. Every effort shall be made to capture feature locations without using offsets.

(1) Offsets will be noted in final report and user_flag field for which each feature it applies, unless otherwise specified

1.3.1.1 Geospatial Data Standards

The IGI&S repository model is based on the Spatial Data Standards for Facilities, Infrastructure and Environment (SDSFIE) with modifications.

a. Copies of the SDSFIE may be obtained from the Solutions and Technology for the Advancement and Refinement of SDSFIE (STARS) Team Internet homepage at http://www.sdsfie.org/.

b. Due to on-going government modifications to Camp Lejeune's IGI&S repository the contract shall ensure the schema of the final product is in compliance and all data will been created and delivered utilizing Camp Lejeune's most current IGI&S repository schema.

(1) The contractor shall request an additional template prior to delivery to be used for the final delivery of data

(2) Final report will include date of last data request for IGI&S schema and geospatial data

Camp Lejeune's IGI&S repository's schema and geospatial data shall be obtained via the Government Project Manager before any data is collected or created. The Project Manager, upon request, shall furnish the contractor

with a Geospatial data request package. The contractor shall:

a. Request only GIS data that is pertinent to the contract

b. Request shall include the following information:

(1) Contract Number and Title
(2) Contractor's Name, Address, Phone Number, Email and Point of Contact
(3) Summary of Project
(4) Contract Specification
(5) Expected Delivery date and features

When developing a new feature class, the Contractor shall develop the initial structure consistent with the most current version of SDSFIE.

a. If further modifications to the database structure are required, the Contractor will consult with the Government Project Manager for direction and final approval.

b. All new feature data class shall be noted on the final report.

1.3.1.2 Collection of Geospatial data

a. Utility data, as identified in Section 2 will be collected utilizing Survey Grade GPS data collection methods.

b. Prior to GPS efforts, buried underground utilities shall be located in order to GPS accurate location.

c. Other infrastructure data, as identified in Section 2 shall be collected utilizing Sub-Foot GPS data collection methods.

d. GPS data and collection data files shall be included with every phase of delivery.

1.3.1.3 Creation of Geospatial Data

Data will be created in a File Personal Geodatabase using ArcGIS 9.3 or higher if a higher version is being used by the government at the time of this project.

Contractor shall verify the ArcGIS version, via the Government Project Manager, at the commencement of this contract.

Geodatabase Spatial Reference Properties shall include the following:

a. Coordinate System of UTM Zone 18N, the GRS 1980 spheroid and the North American Datum 1983

b. x,y domain precision of 1000

To ensure that all Geospatial data created can be loaded and add value to Camp Lejeune's IGI&S repository; data will be created in such a way that the delivered file personal geodatabase mirrors the IGI&S repository. This includes, but is not limited to the following:

a. Geospatial database table structure

b. Domain(s) configuration

(1) SDSFIE domains have been modified by Camp Lejeune for operational purposes, it is the contractor's responsibility to request and utilize associated domain structure to ensure deliverable will load into the geodatabase

c. Required attribute data as specified in Section 2 shall be obtained via contract specifications, plans and on as-built drawings

(1) Actual field data always supersedes drawings

d. The contractor may have to research and verifying existing as-built data in the Technical Records Section located at the Public Works Building, MCB Camp Lejeune

All data must be created using GIS topology rules for polygons, points and lines, such as, but not limited to the following examples:

a. Polygons, Polylines and points rules, please reference illustrating topology rules in ArcGIS at www.esri.com

b. Polygons must not have slivers

c. All utility or infrastructure system data, which is, but not limited to, transportation system and electrical, water, steam distribution, and wastewater collection etc., will be created using GIS spatially connectivity rules which specifies that vertex, edge and endpoints be snapped to features within the system.

(1) Features will be snapped to the appropriate item

(2) Data will be created to represent the real world, for example, direction of flow, i.e., water, sewer and transportation systems will be drawn and created in the direction of flow

(3) Utility systems will be created from source to sink, etc

(4) Abandoned In Place (AIP) utility lines will be located and updated in the current utility line feature data set and identified as AIP in the attribute table

(4) Demolished Lines are to be delivered in a feature data set, which appropriately reflects the utility

1.3.1.4 Creation of Geographic Data Documentation (METADATA)

For each digital file delivered containing geographic information the Contractor shall provide documentation consistent with the Federal Geographic Data Committee (FGDC) Content Standards for Digital Geospatial Metadata (CSDGM). Both 'Mandatory' and 'Mandatory-if- Applicable' fields shall be completed for each geographic data set.

Metadata generation tools included in the ArcGIS suite of software shall be used in the production of the required metadata in XML format. If neither of these tools is used, the Contractor must insure that the metadata is delivered in a format that can be easily translated to the XML format.

Copies of the FGDC metadata standard can be obtained on the Internet at http://www.fgdc.gov.

The documentation shall include, but not be limited to, the following:

a. The name and description of the data set/data layer

b. The source of the data and any related data quality information such as positional accuracy and time period of content

c. Descriptions of the receiver and other equipment used during collection and processing, base stations used for differential corrections, software used for performing differential corrections, estimated horizontal and vertical accuracies obtained, and conversion routines used to translate the data into final geographic data delivery format

d. Type of data layer (point, line, polygon, etc.)

e. Field names of all attribute data and a description of each field name

f. Definition of all codes used in the data fields

g. Ranges of numeric fields and the meaning of these numeric ranges

h. The creation date of the data layer and the name of the person or company who created it

i. A point of contact shall be provided to answer technical questions

Final report will also be required with the following supplement information:

a. Specific procedures and list of equipment, software and versions that was utilized for the GPS data collection and creation of geospatial data

b. Any offsets

c. Modifications to the geodatabase to include any new feature data class

d. Source that was utilized for all required attributes

e. Miscellaneous information that the contractor deems significant

f. A Technical Point of Contact

g. GPS data controller files

1.3.1.5 GIS Submittals

a. Reports will be submitted in the following formats and or versions. Contractor shall verify version(s) of software, via the Government Project Manager, at the commencement of this contract

(1) Microsoft Office 2003
(2) Adobe Portable Document Format (PDF)

(3) Spreadsheet files shall be provided in Microsoft Excel format

b. All GIS data will be provided in a ArcGIS file personal geodatabase as specified

c. Media for Geospatial Data Deliverables: Geographic data shall be delivered on a compact disk read-only memory (CD-ROM) -or- digital versatile disk read-only memory (DVD-ROM)

d. Map submittals shall accompany each geospatial deliverable

(1) Include ANSI C map for each project / area

Data should be labeled and attributed per specification

1.3.1.6 Ownership

All digital files, final hard-copy products, source data acquired for this project, and related materials, including that furnished by the Government, shall become the property of Marine Corps Base, Camp Lejeune and will not be issued, distributed, or published by the Contractor.

1.3.1.7 Geographic Data Review

a. The digital geographic maps, GPS collection files and related data, all working text and documents and file personal geodatabase shall be included for review in the draft and final contract submittals

b. The contract shall submit a preliminary review of data between 15-25 percent to ensure specifications are being met

c. The data will be analyzed for discrepancies in subject content, correct format in accordance with these specifications, and compatibility with Camp Lejeune's IGI&S repository schema

d. Failure for non-compliance of the specifications outlined in this document will result in non-acceptance of data deliverables

1.3.2 **Section 2** - Instructions to GPS and Attribute Requirements

Contract shall deliver all GIS data required in this section that applies to this contract

a. Attribute data requirements for Infrastructure: The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy and enter attribute data in compliance with the IGI&S repository

b. Structures: CLJN.structure_existing_area

GPS Structure and collect the following attributes:

(1) Subtype ID:
(2) Building ID:
(3) Structure Status
(4) Number of Levels
(5) Structure Use 2: Populate "Residential" if structure is a residential unit

(6) Material:
(7) Drawing Number
(8) Contract Number
(9) Date Acquired
(10) Source

c. Floor Outline: CLJN.building.floor_outline (Polyline) All new and renovated buildings will be required to have a "clean floor plan" for each floor level that will be delivered in GIS format. Each level will represent one feature and provide the following: walls, doors, windows, closet, crawlspace, head facility, stairwells, etc.

Create feature and update the following attributes:

(1) Building ID: Facility number
(2) Floor Name
(3) Subtype ID:
(4) Drawing Number
(5) Drawing Type
(6) Contract Number

d. Slabs: CLJN.slab_area

GPS and collect the following attributes:

(1) Structure ID: (Facility Number, if applicable)
(2) Feature Description:
(3) Structure Material
(4) Structure Condition
(5) Built Date
(6) Drawing Number
(7) Drawing Type
(8) Contract Number
(9) Data Source:

1.3.2.1 Attribute data requirements for Transportation

The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy.

a. Road Centerline: CLJN.road_centerline

GPS and collect the following attributes:

(1) Category:
(2) Road Name
(3) Paved: PAVED / UNPAVED
(4) Date Acquired:
(5) Surface Type:
(6) Drawing Number
(7) Contract Number
(8) Data Source:
(9) Use:
(10) Ramp:

b. Road Area: CLJN.road_area

GPS and collect the following attributes:

(1) Road Segment
(2) Paved
(3) Divided: yes / no
(4) Number of Lanes
(5) Installation Date
(6) Surface Type: Drawing Number
(7) Contract Number
(8) Data Source:
(9) Road_Name
(10) Ramp:

c. Curb line: CLJN.curb_line

GPS and collect the following attributes:

(1) Curb Material
(2) Description
(3) Drawing Number
(4) Contract Number
(5) Data Source:

d. Driveways: CLJN.vehicle_driveway_area

GPS and collect the following attributes:

(1) Driveway ID: Building that is associated with this feature
(2) Paved or Unpaved:
(3) Surface Material
(4) Installation Date
(5) Drawing Number
(6) Contract Number
(7) Data Source:

e. Parking Lots: CLJN.vehicle_parking_area

GPS and collect the following attributes:

(1) Parking ID: Building that is associated with this feature
(2) Paved or Unpaved
(3) Total Spaces
(4) Lighting:
(5) Drawing Number
(6) Contract Number
(7) Data Source:
(8) Surface_Type:
(9) Vehicle_Day:
(10) Park_use:
(11) Feature Name:
(12) Striping:
(13) Vehicle_Type:

f. Bridge: CLJN.road_bridge_area

GPS and collect the following attributes:

(1) Bridge ID: Facility Number
(2) Number of Lanes
(3) Bridge Material Type

(4) Bridge Type
(5) Capacity:
(6) Drawing Number
(7) Drawing Type
(8) Contract Number
(9) Data Source:
(10) Feature Name:

g. Pedestrian Sidewalks: CLJN.pedestrian_sidewalk_area

GPS and collect the following attributes:

(1) Material
(2) Use:
(3) Status
(4) Drawing Number
(5) Contract Number
(6) Data Source:

1.3.2.2 Attribute data requirements for Improvement

The following attributes shall be collected for each infrastructure data class: Collect GPS data for all features listed with Sub-Foot accuracy.

a. Fence: CLJN.fence_line

GPS and collect the following attributes:

(1) Material: CHAIN LINK, WOOD, etc
(2) Drawing Number
(3) Contract Number
(4) Data Source:
(5) Length:

b. Gates: CLJN.gate_line

GPS and collect the following attributes:

(1) Material:
(2) Feature Height
(3) Drawing Number
(4) Contract Number
(5) Data Source:
(6) Length:

c. Walls: CLJN.wall_line

GPS and collect the following attributes:

(1) Material:
(2) Feature Height
(3) Drawing Number
(4) Contract Number
(5) Data Source:
(6) Length:

d. Recreation Trails: CLJN.recreation_trail_centerline

GPS and collect the following attributes:

(1) Subtype:
(2) Trail Description:
(3) Paved:
(4) Date Acquired:
(5) Drawing Number
(6) Contract Number
(7) Data Source:
(8) trail_id:
(9) Trail_Name:

e. Playground: CLJN.playground_area

GPS and collect the following attributes:

(1) Pool ID: Facility Number
(2) Feature Description:
(3) Drawing Number
(4) Contract Number
(5) Data Source:

f. Swimming Pool: CLJN.swimming_pool_area

GPS and collect the following attributes:

(1) Swimming Pool ID:
(2) Feature Description:
(3) Drawing Number
(4) Contract Number
(5) Data Source:

g. Athletic Court: CLJN.athletic_court_area

GPS and collect the following attributes:

(1) Court ID:
(2) Court Type:
(3) Court Name
(4) Date Acquired
(5) Drawing Number
(6) Contract Number
(7) Court Desc:

h. Athletic Field: CLJN.athletic_field_area

GPS Structures and collect the following attributes:

(1) Field ID: Facility Number
(2) Field Description:
(3) Date Acquired:
(4) Field Type
(5) Contract Number
(6) Drawing Number
(7) Data Source:
(8) Field Name

1.3.2.3 Environmental Storage Tanks

The following attributes shall be collected for each infrastructure data

class: Collect GPS data for all features listed with survey grade accuracy.

a. Underground Storage Tanks: CLJN.underground_storage_tank_point

GPS and collect the following attributes:

(1) ENVUST-ID for Under Ground Storage Tank
(2) Hazsite_ID
(3) EH_Tank: Fuel Type
(4) Facility Number
(5) X Coordinates
(6) Y Coordinates
(7) Installation Date:
(8) Product_D:
(9) Narrative
(10) Serial Number
(11) Tank_Sys_D:
(12) Status:
(13) regulated:
(14) Volume
(15) Volume_U_D:

b. Aboveground Storage Tanks: CLJN.aboveground_storage_tank_site

GPS and collect the following attributes:

(1) ENVAST_ID for Above Ground Storage Tank
(2) Hazsite_ID
(3) EH_Tank:
(4) Facility Number
(5) X Coordinates
(6) Y Coordinates
(7) Product_D:
(8) Narrative
(9) Serial Number
(10) Tank_Sys_D:
(11) Status:
(12) Regulated:
(13) Volume
(14) Volume_U_D:

1.3.2.4 Other Features

a. Other Infrastructure Features:

All newly constructed features require GIS deliverables. If a particular utility is being installed and has been omitted from this specification, the feature shall be deliverable under these guidelines. At a minimum the following will be required:

(1) Subtype Id
(2) Facility ID
(3) Installation Date
(4) Type/Description
(5) Material
(6) Drawing Number
(7) Contract Number
(8) Data Source:

1.3.2.5 Utilities

Locate as specified in The Collections of Geospatial Data and Collect GPS data for each feature listed with survey grade accuracy and enter Domain data in compliance with the IGI&S database

Please note: All utility lines that can be currently located in MCB, Camp Lejeune GIS geodatabase that are to be demolished/removed within the specifications of this contract will be used to update the demolished line feature data set for that class. The existing spatial and non-spatial data will be copied into the demolished feature class. This information does not include Abandoned in Place (AIP) lines. Abandoned lines shall remain the in the existing data feature class and be attributed AIP.

1.3.2.6 Electrical Distribution

Please Note: MCB, Camp Lejeune's Complete Circuit ID list is available, please contract Government Project Manager for list which is provided by our Electrical Distribution shop in Public Works, MCB Camp Lejeune.

The following attributes shall be collected for each utility data class:

a. Collect GPS data for all features listed with survey grade accuracy.

b. Demolished Electrical Lines: CLJN.demolished_cable_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

(1) Date
(2) Drawing Number
(3) Drawing Type
(4) Contract Number
(5) Data Source:

c. Electrical Lines: CLJN.electrical_cable_line

Locate all Electrical Line data and collect the following attributes:

(1) Subtype Identifier:
(2) Disposition:
(3) Subtype:
(4) Date Acquired:
(5) Conduit Size
(6) Number of Phases
(7) Insulation Material
(8) Voltage
(9) Size of Units
(10) Substation ID
(11) Circuit ID:
(12) Contract Number
(13) Drawing Number
(14) Data Source:

d. Electrical Meter: CLJN.electrical_meter_point

Locate, GPS and collect the following attributes:

(1) Meter ID
(2) Voltage
(3) KW Rate
(4) Number of Phases
(5) Model Number
(6) Date Acquired
(7) Facility ID
(8) Substation ID
(9) Circuit ID:
(10) X Coordinates
(11) Y Coordinates
(12) Contract Number
(13) Drawing Number
(14) Data Source:

e. Electrical Transformer: CLJN.elect_transformr_bank_point

Locate, GPS and collect the following attributes:

(1) Subtype:
(2) Date Installed
(3) Primary Voltage
(4) Secondary Voltage
(5) Number of Transformers
(6) Total KVA
(7) Substation ID
(8) Circuit ID:
(9) KVA Information
(10) X Coordinates
(11) Y Coordinates
(12) Contract Number
(13) Drawing Number
(14) Data Source:

f. Electrical Poles: CLJN.utility_pole_tower_point

Locate, GPS and collect the following attributes:

(1) Pole No
(2) Date Acquired:
(3) Condition
(4) Type:
(5) Material
(6) Pole Height
(7) Units of Measure
(8) Circuit ID
(9) X Coordinates
(10) Y Coordinates
(11) Contract Number
(12) Drawing Number
(13) Data Source:

g. Exterior Lighting: CLJN. exterior_lighting_point

Locate, GPS and collect the following attributes:

(1) Light Type
(2) X Coordinates
(3) Y Coordinates
(4) Sensor:
(5) Watts
(6) Voltage
(7) Circuit ID
(8) Contract Number
(9) Drawing Number
(10) Date Acquired:
(11) Data Source:

h. Electrical Switch: CLJN.electrical_switch_point

Locate, GPS and collect the following attributes:

(1) Subtype ID:
(2) Switch ID:
(3) Disposition
(4) Installation Type:
(5) Switch Status:
(6) Voltage
(7) Circuit ID:
(8) X Coordinates
(9) Y Coordinates
(10) Contract Number
(11) Drawing Number
(12) Data Source:

i. Electrical Regulator: CLJN.electrical_regulator_point

Locate, GPS and collect the following attributes:

(1) Electrical Regulator ID:
(2) Disposition
(3) Regulator Type
(4) Regulator Use
(5) Primary Volts
(6) Secondary Volts
(7) Number of Taps
(8) KV Rate
(9) Fuse Type
(10) Manufacture
(11) Model Number
(12) Circuit ID:
(13) X Coordinates
(14) Y Coordinates
(15) Contract Number
(16) Drawing Number
(17) Data Source:

j. Electrical Manholes: CLJN.electrical_junction_point

Locate, GPS and collect the following attributes:

(1) Subtype ID:
(2) Type:
(3) Number of Cables
(4) Rim Elevation

(5) Units of Elevation
(6) Diameter
(7) Diameter Units
(8) X Coordinates
(9) Y Coordinates
(10) Sub Station ID
(11) Contract Number
(12) Drawing Number
(13) Data Source:

k. Electrical Generators: CLJN.electrical_generator_point

Locate, GPS and collect the following attributes:

(1) Generator ID
(2) Disposition
(3) KVA
(4) KW Rate
(5) Voltage
(6) Fuel Type
(7) Manufacture
(8) Model
(9) Serial Number
(10) Circuit ID:
(11) X Coordinates
(12) Y Coordinates
(13) Facility ID
(14) Contract Number
(15) Drawing Number
(16) Data Source:

1.3.2.7 Substation

a. Substation: CLJN.CLJN.electrical_substation_point

Locate, GPS and collect the following attributes:

(1) Disposition
(2) Capacity Rate
(3) Capacity Measure
(4) Voltage In
(5) Voltage Out
(6) Number of transformer
(7) Number of Spares
(8) Number of Circuits
(9) X Coordinates
(10) Y Coordinates
(11) Contract Number
(12) Drawing Number
(13) Data Source
(14) Date Acquired

1.3.2.8 Steam Distribution

The following attributes shall be collected for each utility data class: Collect GPS data for all features listed with survey grade accuracy.

a. Boiler: CLJN.heat_cool_boiler_site - If Required

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Disposition
(3) Type
(4) Capacity Heat
(5) Capacity Units
(6) Building ID: Facility Number where Boiler Resides
(7) X Coordinates
(8) Y Coordinates
(9) Contract Number
(10) Drawing Number
(11) Data Source

b. Fitting: CLJN.heat_cool_fitting_point

Georeference fitting data and collect the following attributes:

(1) Subtype ID:
(2) Date Acquired:
(3) Material
(4) Size
(5) Units
(6) Line Diameter
(7) Diameter in Units
(8) X Coordinates
(9) Y Coordinates
(10) Contract Number
(11) Drawing Number
(12) Data Source:

c. Valves: CLJN.heat_cool_valve_point

Locate, GPS and collect the following attributes:

(1) Data Acquired
(2) Size
(3) Size Units
(4) Elevation
(5) Elevation Units
(6) Project ID
(7) X Coordinates
(8) Y Coordinates
(9) Contract Number
(10) Drawing Number
(11) Data Source:

d. Manholes: CLJN.heat_cool_junction_point

Locate, GPS and collect the following attributes:

(1) Sub Type ID:
(2) Number of Valves
(3) Number of Pipes
(4) Width
(5) Length
(6) Diameter
(7) Units for Measurements
(8) Rim Elevations

(9) Ground Elevation
(10) Contract Number
(11) Drawing Number
(12) X Coordinates
(13) Y Coordinates
(14) Data Source:

e. Steam Line: CLJN.heat_cool_line

Locate, GPS and collect the following attributes:

(1) Subtype ID: Condensate, Steam
(2) Date Acquired:
(3) Disposition
(4) Use Underground, Overhead, Abandoned
(5) Material
(6) Size
(7) Length
(8) Size Units
(9) Ground Elevation
(10) Invert Elevation
(11) Units for Elevation
(12) Taped: Yes/No
(13) Building ID - If service line indicate Building
(14) Insulation Material
(15) Size of Insulation
(16) Size Units
(17) Contract Number
(18) Drawing Number
(19) Data Source:

f. Demolished Steam Line: CLJN.demolished_heat_cool_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

(1) Date
(2) Drawing Number
(3) Drawing Type
(4) Contract Number
(5) Data Source:

1.3.2.9 Storm Sewer

a. Storm Sewer Lines: CLJN.storm_sewer_line

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Use
(3) Type
(4) Material
(5) Size
(6) Diameters Units
(7) Elevation
(8) Elevation Units
(9) Contract Number
(10) Drawing Type

(11) Drawing Number

b. Storm Sewer Drainage Line: CLJN.storm_sewer_open drainage_line

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Disposition
(3) Contract Number
(4) Drawing Type
(5) Drawing Number

c. Manhole: CLJN.storm_sewer_junction_point

Locate, GPS and collect the following attributes:

(1) Subtype
(2) X Coordinate
(3) Y Coordinates
(4) Contract Number
(5) Drawing Type
(6) Drawing Number

d. Inlet: CLJN.storm_sewer_inlet_point -

Locate, GPS and collect the following attributes: Contract shall verify SWPPP GPS inlet and add to this feature.

(1) Subtype
(2) Date Acquired
(3) X Coordinates
(4) Y Coordinates
(5) Contract Number
(6) Drawing Type
(7) Drawing Number

e. Outfall: CLJN.storm_sewer_outfall_point

Locate, GPS and collect the following attributes:

(1) Subtype Domain
(2) Date Acquired:
(3) Basin ID - contractor shall utilized existing data and coordinate Basin_ID with data manager
(4) User_Flag
(5) X Coordinates
(6) Y Coordinates
(7) Contract Number
(8) Drawing Type
(9) Drawing Number

f. Ponds, Basins, & Treatment Measures: CLJN.storm_sewer_reservoir_areas

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Project ID:
(3) Permit ID: SW8 XXXXXX

(4) Size:
(5) Facility ID:
(6) Installation ID:
(7) Drawing Type:
(8) Drawing Number:

1.3.2.10 Wastewater Collection

The following attributes shall be collected for each utility data class: Collect GPS data for all features listed with survey grade accuracy.

a. Wastewater Lines: CLJN.wastewater_line

Locate, GPS and collect the following attributes:

(1) Pipe ID: by Manhole number
(2) Date Acquired
(3) Use
(4) Material
(5) Size of Diameter
(6) Units
(7) Invert Elevation 1
(8) Invert Elevation 2
(9) Elevation Units
(10) Slope
(11) Slope Units:
(12) Building ID: If building/facility service line indicate Building number that the line services
(13) Contract Number
(14) Drawing Number
(15) Data Source:
(16) Subtype:

b. Demolished Lines: CLJN.demolished_wastewater_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

(1) Date
(2) Drawing Number
(3) Drawing Type
(4) Contract Number
(5) Data Source:

c. Fitting: CLJN.wastewater_fitting_point

Georeference Fitting data and collect the following attributes:

(1) Subtype ID:
(2) Date Acquired:
(3) Type
(4) Material
(5) Size of Diameter
(6) Units
(7) User Flag: Named Area
(8) Contract Number
(9) Drawing Number
(10) X Coordinates

(11) Y Coordinates
(12) Data Source:

d. Valves: CLJN.wastewater_valve_point

Locate, GPS and collect the following attributes:

(1) Valves ID: Manhole Number associate with valve
(2) Date Acquired:
(3) Valve Style/Group:
(4) Valve Use
(5) Size in Diameter
(6) Valve Elevation
(7) Units of Elevation
(8) X Coordinates
(9) Y Coordinates
(10) Manhole ID
(11) Contract Number
(12) Drawing Number
(13) Data Source:

e. Manholes: CLJN.wastewater_junction_point

Locate, GPS and collect the following attributes:

(1) Subtype ID: Manhole
(2) Manhole ID: Each section of the base has a unique numbering system for manholes; please see Public Work, GIS office for details.
(3) Use:
(4) Type
(5) Material
(6) Number of Pipes in manhole
(7) Rim Elevation
(8) Invert Elevation
(9) Elevations Units
(10) Manhole Diameter
(11) Diameter Units
(12) X Coordinates
(13) Y Coordinates
(14) Date Acquired:
(15) Contract Number
(16) Drawing Number
(17) Data Source:

f. Vent: CLJN.wastewater_vent_point

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Valve Style/Type:
(3) Use:
(4) Size in Diameters
(5) Units in Diameters
(6) X Coordinates
(7) Y Coordinates
(8) Subtype ID: AIR
(9) Containment Type
(10) Contract Number

(11) Drawing Number
(12) Data Source:

g. Pump Stations: CLJN.wastewater_pump_point

Locate, GPS and collect the following attributes:

(1) Pump Station ID: Facility Number
(2) Date Acquired
(3) Use
(4) Type
(5) Cooling Method
(6) Rated Outflow Volume
(7) Flow Unit Measure Code
(8) X Coordinates
(9) Y Coordinates
(10) Number of Pumps
(11) Contract Number
(12) Drawing Number
(13) Data Source

h. Oil Water Separators: CLJN.wstewat_oil_wat_separatr_point

Locate, GPS and collect the following attributes:

(1) Oil Water Separator ID: Facility Number
(2) Date Acquired
(3) Type
(4) Separator Process
(5) Separator Volume
(6) Volume Units of Measure
(7) Grit Chamber:
(8) Flow Capacity
(9) Flow Units
(10) X Coordinates
(11) Y Coordinates
(12) Contract Number
(13) Drawing Number
(14) Data Source

i. Grease Trap: CLJN.wastewater_grease_trap_point

Locate, GPS and collect the following attributes:

(1) Trap Identification: Nearest Facility use Number
(2) Type of Trap
(3) Material
(4) Capacity Units
(5) Manhole
(6) Total Number of Laterals
(7) Flow Rate
(8) Flow Units
(9) Building ID: Facility Number on associated Building
(10) X Coordinates
(11) Y Coordinates
(12) Contract Number
(13) Drawing Number
(14) Data Source:

j. Septic Tank: CLJN.CLJN.wastewater_septic_tank_point

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Disposition
(3) Tank Capacity
(4) Contract Number
(5) Drawing Number
(6) Data Source:

1.3.2.11 Water Distribution

The following attributes shall be collected for each utility data class: Collect GPS data for all features listed with survey grade accuracy.

a. Water Lines: CLJN.water_line

Locate, GPS and collect the following attributes:

(1) Date Acquired
(2) Use of Line
(3) Disposition
(4) Material
(5) Size
(6) Size Units
(7) Pipe Length
(8) Unit for Length Dimension
(9) Taped
(10) Source
(11) All Invert Elevation information
(12) Units of Measures
(13) Contract Number
(14) Drawing Number
(15) Data Source
(16) Subtype

b. Demolished Line: CLJN.demolished_water_line

Existing attribute information will be copied into the demolished feature class: Please add the following attribute data once updated.

(1) Date
(2) Drawing Number
(3) Drawing Type
(4) Contract Number
(5) Data Source: Existing GIS Data

c. Water Meter: CLJN.water_meter_point

Locate, GPS and collect the following attributes:

(1) Meter ID
(2) Date Acquired:
(3) Type
(4) Installation Type
(5) Building ID: Facility Number - If attached to Building
(6) X Coordinates

(7) Y Coordinates
(8) Contract Number
(9) Drawing Number
(10) Data Source

d. Water Tank: CLJN.water_tank_point

Locate, GPS and collect the following attributes:

(1) Tank ID: Facility Number
(2) Date Acquired
(3) Disposition
(4) Tank Use
(5) Tank Status
(6) Tank Width
(7) Tank Length
(8) Tank Diameter
(9) Ground Elevation
(10) Tank Volume
(11) Unit of measure in Gallons
(12) Top Elevation
(13) Overflow Elevation
(14) Pressure High
(15) Pressure Low
(16) X Coordinates
(17) Y Coordinates
(18) Contract Number
(19) Drawing Number
(20) Data Source:

e. Water Valve: CLJN.water_valve_point

Locate, GPS and collect the following attributes:

(1) Date Acquired:
(2) Disposition
(3) Use: Valve
(4) Valve Status
(5) Size
(6) Size Units
(7) Valve Elevation
(8) Ground Elevation
(9) Size Unit
(10) Manhole ID
(11) X Coordinates
(12) Y Coordinates
(13) Contract Number
(14) Drawing Number
(15) Data Source
(16) subtype

f. Water Fitting: CLJN.water_fitting_point

Georeference and collect the following attributes:

(1) Date Acquired
(2) Disposition
(3) Type
(4) Material

(5) Size
(6) Size Units
(7) Contract Number
(8) Drawing Number
(9) Data Source

g. Water Well: CLJN.potable_water_well_point

Locate, GPS and collect the following attributes:

(1) Well ID: Facility Number
(2) Use: potable
(3) Well Status
(4) Station ID: Building Number
(5) Date Acquired:
(6) X Coordinates
(7) Y Coordinates
(8) Tank ID: Water Tank Facility Number
(9) Contract Number
(10) Drawing Number
(11) Data Source:

h. Water Manhole: CLJN.water_junction_point

Locate, GPS and collect the following attributes:

(1) Subtype
(2) Use
(3) Type
(4) Material
(5) Number Valves
(6) Number Pipes
(7) Installation Date
(8) Size Diameter
(9) Unit Diameter
(10) X Coordinates
(11) Y Coordinates
(12) Contract Number
(13) Drawing Number
(14) Data Source:

i. Fire Hydrant: CLJN.water_fire_connection_point

Locate, GPS and collect the following attributes:

(1) Hydrant ID: TBD by Fire Department
(2) Date Acquired:
(3) Disposition
(4) Valve Connector Type
(5) Valve Size:
(6) Inlet Diameter
(7) Units of measure
(8) X Coordinates
(9) Y Coordinates
(10) Contract Number
(11) Drawing Number
(12) Data Source:

j. NON Potable Water Well: CLJN.non-potable_water_well_point

Locate, GPS and collect the following attributes:

(1) Well ID: Facility Number
(2) Use:
(3) Well Status
(4) Station ID: Building Number
(5) Date Acquired:
(6) X Coordinates
(7) Y Coordinates
(8) Tank ID: Water Tank Facility Number
(9) Contract Number
(10) Drawing Number
(11) Data Source:

k. Other Utility Features:Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Geospatial data delivery does not replace as-built requirements

All newly constructed features require GIS deliverables.

(1) Facility ID
(2) Installation Date
(3) Type/Description
(4) Material
(5) Size
(6) Drawing Number
(7) Contract Number
(8) Data Source

1.3.2.12 Non-Compliance

Failure to follow the specification outlined in this document will result in non-acceptance of data deliverable.

Geospatial data delivery does not replace as-built requirements.

1.3.3 As-Built Record of Materials

Furnish a record of materials.

Where several manufacturers' brands, types, or classes of the item listed have been used in the project, designate specific areas where each item was used. Designations shall be keyed to the areas and spaces depicted on the contract drawing. Furnish the record of materials used in the following format:

MATERIALS DESIGNATION	SPECIFICATION	MANUFACTURER	MATERIALS USED (MANUFACTURER'S DESIGNATION)	WHERE USED
_____	_____	_____	_____	_____

1.3.4 Maximo Requirements

Submit maximo requirements as specified in Section 23 03 00 and 26 00 00.

1.4 EQUIPMENT/PRODUCT WARRANTIES

1.4.1 Equipment/Product Warranty List

Furnish to the Contracting Officer a bound and indexed notebook containing written warranties for equipment/products that have extended warranties (warranty periods exceeding the standard one-year warranty) furnished under the contract, and prepare a complete listing of such equipment/products. The equipment/products list shall state the specification section applicable to the equipment/product, duration of the warranty therefor, start date of the warranty, ending date of the warranty, and the point of contact for fulfillment of the warranty. The warranty period shall begin on the same date as project acceptance and shall continue for the full product warranty period. Execute the full list and deliver to the Contracting Officer prior to final acceptance of the facility.

1.4.2 Equipment Warranty Tags and Guarantor's Local Representative

Furnish with each warranty the name, address, and telephone number of the guarantor's representative nearest to the location where the equipment and appliances are installed. The guarantor's representative, upon request of the station representative, shall honor the warranty during the warranty period, and shall provide the services prescribed by the terms of the warranty. At the time of installation, tag each item of warranted equipment with a durable, oil- and water-resistant tag approved by the Contracting Officer. Attach tag with copper wire and spray with a clear silicone waterproof coating. Leave the date of acceptance and QC's signature blank until project is accepted for beneficial occupancy. Tag shall show the following information:

EQUIPMENT/PRODUCT WARRANTY TAG

Type of Equipment/Product _____
Warranty Period _____ From _____ To _____
Contract No. _____
Inspector's Signature _____ Date Accepted _____

Construction Contractor:
Name: _____
Address: _____
Telephone: _____

Warranty Contact: _____
Name: _____
Address: _____
Telephone: _____

STATION PERSONNEL TO PERFORM ONLY OPERATIONAL MAINTENANCE

1.5 COMPLETE SUBMITTAL PACKAGE

Contractor shall make electronic copies of all submittals, including the transmittal sheet, and provide a CD/DVD containing all submittals for project close out.

The CD/DVD shall be marked "Complete Submittal Package - Contract # N40085-11-B-0127."

1.6 MECHANICAL TESTING AND BALANCING

All contract requirements of Section 23 73 33, "HEATING, VENTILATING, AND COOLING SYSTEM," 23 09 23.13, "BACnet DIRECT DIGITAL CONTROL SYSTEMS FOR HVAC" shall be fully completed, including all testing, prior to contract completion date. In addition, all contract requirements of Section 23 05 93 "TESTING, ADJUSTING, AND BALANCING FOR HVAC" shall be fully completed, including testing and inspection, prior to contract completion date, except as noted otherwise in Section 23 05 93. The time required to complete all work and testing as prescribed by Sections 23 73 33, 23 09 23.13, and 23 0 5 93 is included in the allotted calendar days for completion.

1.7 CLEANUP

Leave premises "broom clean." Clean interior and exterior glass surfaces exposed to view; remove temporary labels, stains and foreign substances; polish transparent and glossy surfaces; vacuum carpeted and soft surfaces. Clean equipment and fixtures to a sanitary condition. Clean filters of operating equipment. Clean debris from roofs, gutters, downspouts and drainage systems. Sweep paved areas and rake clean landscaped areas. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

Not used.

-- End of Section --

SECTION 04 20 00

MASONRY
02/09

PART 1 GENERAL

1.1 REFERENCES

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

ACI INTERNATIONAL (ACI)

ACI 530/530.1	(2008) Building Code Requirements and Specification for Masonry Structures; Containing Building Code Requirements for Masonry Structures, Specification for Masonry Structures and Companion Commentaries

ASTM INTERNATIONAL (ASTM)

ASTM A 153/A 153M	(2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 615/A 615M	(2008b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A 641/A 641M	(2009a) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A 82/A 82M	(2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
ASTM B 370	(2009) Standard Specification for Copper Sheet and Strip for Building Construction
ASTM C 1019	(2008a) Standard Test Method for Sampling and Testing Grout
ASTM C 1072	(2006) Standard Test Method for Measurement of Masonry Flexural Bond Strength
ASTM C 129	(2006) Standard Specification for Nonloadbearing Concrete Masonry Units
ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar

ASTM C 150	(2007) Standard Specification for Portland Cement
ASTM C 207	(2006) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 216	(2007a) Facing Brick (Solid Masonry Units Made from Clay or Shale)
ASTM C 270	(2010) Standard Specification for Mortar for Unit Masonry
ASTM C 476	(2008) Standard Specification for Grout for Masonry
ASTM C 494/C 494M	(2008a) Standard Specification for Chemical Admixtures for Concrete
ASTM C 55	(2006e1) Concrete Brick
ASTM C 641	(2007) Staining Materials in Lightweight Concrete Aggregates
ASTM C 67	(2008) Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
ASTM C 780	(2008) Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM C 90	(2008) Loadbearing Concrete Masonry Units
ASTM C 91	(2005) Masonry Cement
ASTM C 94/C 94M	(2007) Standard Specification for Ready-Mixed Concrete
ASTM C 989	(2006) Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars

1.2 SYSTEM DESCRIPTION

1.2.1 Design Requirements

1.2.1.1 Unit Strength Method

Compute compressive strength of masonry system "Unit Strength Method," ACI 530/530.1. Submit calculations and certifications of unit and mortar strength.

1.2.1.2 Masonry Strength

Determine masonry strength in accordance with ACI 530/530.1; submit test reports on three prisms as specified in ACI 530/530.1. The cost of testing shall be paid by the Contractor.

1.2.2 Additional Requirements

a. Provide bracing and scaffolding necessary for masonry work. Design bracing to resist wind pressure as required by local code.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Clay or Shale Brick
Concrete Masonry Units (CMU)
Cement
Flashing

Manufacturer's descriptive data

Cold Weather Installation

Cold weather construction procedures.

SD-04 Samples

Clay or Shale Brick

Color samples of three stretcher units and one unit for each type of special shape. Units shall show the full range of color and texture.

Portable Panel

One panel of clay or shale brick, 2 by 2 feet, containing approximately 24 brick facings to establish range of color and texture.

SD-05 Design Data

Unit Strength Method

Calculations and certifications of masonry unit and mortar strength.

SD-06 Test Reports

Efflorescence Test
Masonry Cement

Test reports from an approved independent laboratory. Test reports on a previously tested material shall be certified as the same as that proposed for use in this project.

SD-07 Certificates

Clay or Shale Brick
Concrete Brick
Concrete Masonry Units (CMU)

Anchors, Ties, and Bar Positioners
Expansion-Joint Materials
Joint Reinforcement
Reinforcing Steel Bars and Rods
Masonry Cement
Admixtures for Masonry Mortar
Admixtures for Grout

Certificates of compliance stating that the materials meet the specified requirements.

SD-08 Manufacturer's Instructions

Masonry Cement

When masonry cement is used, submit the manufacturer's printed instructions on proportions of water and aggregates and on mixing to obtain the type of mortar required.

1.4 QUALITY ASSURANCE

1.4.1 Appearance

Manufacture bricks at one time and from the same batch. Blend all brick to produce a uniform appearance when installed. An observable "banding" or "layering" of colors or textures caused by improperly mixed brick is unacceptable.

1.4.2 Sample Masonry Panels

After material samples are approved and prior to starting masonry work, construct a portable panel of clay or shale brick and sample masonry panels for each type and color of masonry required. At least 48 hours prior to constructing the sample panel or panels, submit written notification to the Contracting Officer. Sample panels shall not be built in, or as part of the structure, but shall be located where directed.

1.4.2.1 Configuration

Panels shall be L-shaped or otherwise configured to represent all of the wall elements. Panels shall be of the size necessary to demonstrate the acceptable level of workmanship for each type of masonry represented on the project. The minimum size of a straight panel or a leg of an L-shaped panel shall be 8 feet long by 4 feet high.

1.4.2.2 Composition

Panels shall show full color range, texture, and bond pattern of the masonry work. The Contractor's method for mortar joint tooling; grouting of reinforced vertical cores, collar joints, bond beams, and lintels; positioning, securing, and lapping of reinforcing steel; positioning and lapping of joint reinforcement (including prefabricated corners); and cleaning of masonry work shall be demonstrated during the construction of the panels. Installation or application procedures for anchors, wall ties, CMU control joints, brick expansion joints, insulation, flashing, brick soldier, row lock courses and weep holes shall be shown in the sample panels. Panels that represent reinforced masonry shall contain a 2 by 2 foot opening placed at least 2 feet above the panel base and 2 feet away from all free edges, corners, and control joints. Required reinforcing

shall be provided around this opening as well as at wall corners and control joints.

1.4.2.3 Construction Method

Where anchored veneer walls are required, demonstrate and receive approval for the method of construction; i.e., either bring up the two wythes together or separately, with the insulation and appropriate ties placed within the specified tolerances across the cavity. Temporary provisions shall be demonstrated to preclude mortar or grout droppings in the cavity and to provide a clear open air space of the dimensions shown on the drawings. Where masonry is to be grouted, demonstrate and receive approval on the method that will be used to bring up the masonry wythes; support the reinforcing bars; and grout cells, bond beams, lintels, and collar joints using the requirements specified herein. If sealer is specified to be applied to the masonry units, sealer shall be applied to the sample panels. Panels shall be built on a properly designed concrete foundation.

1.4.2.4 Usage

The completed panels shall be used as the standard of workmanship for the type of masonry represented. Masonry work shall not commence until the sample panel for that type of masonry construction has been completed and approved. Panels shall be protected from the weather and construction operations until the masonry work has been completed and approved. After completion of the work, the sample panels, including all foundation concrete, shall become the property of the Contractor and shall be removed from the construction site.

1.5 DELIVERY, HANDLING, AND STORAGE

Materials shall be delivered, handled, stored, and protected to avoid chipping, breakage, and contact with soil or contaminating material. Store and prepare materials in already disturbed areas to minimize project site disturbance and size of project site.

1.5.1 Masonry Units

Cover and protect moisture-controlled concrete masonry units and cementitious materials from precipitation. Conform to all handling and storage requirements of ASTM C 90. Prefabricated lintels shall be marked on top sides to show either the lintel schedule number or the number and size of top and bottom bars.

1.5.2 Reinforcement, Anchors, and Ties

Steel reinforcing bars, coated anchors, ties, and joint reinforcement shall be stored above the ground. Steel reinforcing bars and uncoated ties shall be free of loose mill scale and rust.

1.5.3 Cementitious Materials, Sand and Aggregates

Cementitious and other packaged materials shall be delivered in unopened containers, plainly marked and labeled with manufacturers' names and brands. Cementitious material shall be stored in dry, weathertight enclosures or be completely covered. Cement shall be handled in a manner that will prevent the inclusion of foreign materials and damage by water or dampness. Sand and aggregates shall be stored in a manner to prevent contamination or segregation.

1.6 PROJECT/SITE CONDITIONS

Conform to ACI 530/530.1 for hot and cold weather masonry erection.

1.6.1 Hot Weather Installation

Take the following precautions if masonry is erected when the ambient air temperature is more than 99 degrees F in the shade and the relative humidity is less than 50 percent or the ambient air temperature exceeds 90 degrees F and the wind velocity is more than 8 mph. All masonry materials shall be shaded from direct sunlight; mortar beds shall be spread no more than 4 feet ahead of masonry; masonry units shall be set within one minute of spreading mortar; and after erection, masonry shall be protected from direct exposure to wind and sun for 48 hours.

1.6.2 Cold Weather Installation

Before erecting masonry when ambient temperature or mean daily air temperature falls below 40 degrees F or temperature of masonry units is below 40 degrees F, submit a written statement of proposed cold weather construction procedures for approval.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The source of materials which will affect the appearance of the finished work shall not be changed after the work has started except with Contracting Officer's approval.

2.2 CLAY OR SHALE BRICK

Color range and texture of clay or shale brick shall match the existing brick and shall conform to the approved sample. Brick shall be tested for efflorescence. Clay or shale brick units shall be delivered factory-blended to provide a uniform appearance and color range in the completed wall.

2.2.1 Solid Clay or Shale Brick

Solid clay or shale brick shall conform to ASTM C 216, Type FBS. Brick size shall be modular and the nominal size of the brick used shall be 3-5/8 inches thick, 2-1/4 inches high, and 8 inches long (nominal). Brick masonry shall match the existing brick masonry.

2.3 CONCRETE BRICK

Concrete brick shall conform to ASTM C 55, Grade N. Concrete brick may be used where necessary for filling out in concrete masonry unit construction.

2.4 CONCRETE MASONRY UNITS (CMU)

Cement shall have a low alkali content and be of one brand. Units shall be of modular dimensions and air, water, or steam cured. Exposed surfaces of units shall be smooth and of uniform texture.

a. Hollow Load-Bearing Units: ASTM C 90, made with lightweight aggregate. Provide load-bearing units for exterior walls, foundation

walls, load-bearing walls, and shear walls.

b. Hollow Non-Load-Bearing Units: ASTM C 129, made with lightweight aggregate. Load-bearing units may be provided in lieu of non-load-bearing units.

c. Solid Load-Bearing Units: ASTM C 90, lightweight units. Provide solid units for masonry bearing under structural framing members as indicated.

2.4.1 Aggregates

Lightweight aggregates and blends of lightweight and heavier aggregates in proportions used in producing the units, shall comply with the following requirements when tested for stain-producing iron compounds in accordance with ASTM C 641: by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light stain" classification. Use industrial waste by-products (air-cooled slag, cinders, or bottom ash), ground waste glass and concrete, granulated slag, and expanded slag in aggregates. Slag shall comply with ASTM C 989; Grade 80.

2.4.2 Kinds and Shapes

Units shall be modular in size and shall include closer, jamb, header, lintel, and bond beam units and special shapes and sizes to complete the work as indicated. Units used in exposed masonry surfaces in any one building shall have a uniform fine to medium texture and a uniform color.

2.5 MORTAR FOR STRUCTURAL MASONRY

ASTM C 270, Type S. Use Type I portland cement. Do not use admixtures containing chlorides. When structural reinforcement is incorporated, maximum air-content shall be 12 percent in cement-lime mortar and 18 percent in masonry cement mortar.

2.6 MASONRY MORTAR

Type S mortar shall conform to ASTM C 270. Mortar Type S shall conform to the proportion specification of ASTM C 270 except Type S cement-lime mortar proportions shall be 1 part cement, 1/2 part lime and 4-1/2 parts aggregate. Verification of masonry cement performance shall be based on ASTM C 780 and ASTM C 1072. Pointing mortar in showers and kitchens shall contain ammonium stearate, or aluminum tri-stearate, or calcium stearate in an amount equal to 3 percent by weight of cement used. Cement shall have a low alkali content and be of one brand. Aggregates shall be from one source.

2.6.1 Admixtures for Masonry Mortar

In cold weather, a non-chloride based accelerating admixture may be used subject to approval. Accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494/C 494M, Type C.

2.6.2 Hydrated Lime and Alternates

Hydrated lime shall conform to ASTM C 207, Type S.

2.6.3 Cement

Portland cement shall conform to ASTM C 150, Type I. Masonry cement shall conform to ASTM C 91, Type S. Containers shall bear complete instructions for proportioning and mixing to obtain the required types of mortar. Incorporate to the maximum extent, without conflicting with other requirements of this section, up to 40 percent fly ash, up to 70 percent slag, up to 10 percent cenospheres, and up to 10 percent silica fume.

2.6.4 Sand and Water

Sand shall conform to ASTM C 144. Water shall be clean, potable, and free from substances which could adversely affect the mortar.

2.7 GROUT AND READY-MIXED GROUT

Grout shall conform to ASTM C 476, fine. Cement used in grout shall have a low alkali content. Grout slump shall be between 8 and 10 inches. Minimum grout strength shall be 2000 psi in 28 days, as tested by ASTM C 1019. Grout shall be used subject to the limitations of Table III. Proportions shall not be changed and materials with different physical or chemical characteristics shall not be used in grout for the work unless additional evidence is furnished that the grout meets the specified requirements. Ready-Mixed grout shall conform to ASTM C 94/C 94M.

2.7.1 Admixtures for Grout

In cold weather, a non-chloride based accelerating admixture may be used subject to approval; accelerating admixture shall be non-corrosive, shall contain less than 0.2 percent chlorides, and shall conform to ASTM C 494/C 494M, Type C. In general, air-entrainment, anti-freeze or chloride admixtures shall not be used except as approved by the Contracting Officer.

2.7.2 Grout Barriers

Grout barriers for vertical cores shall consist of fine mesh wire, fiberglass, or expanded metal.

2.8 ANCHORS, TIES, AND BAR POSITIONERS

Anchors and ties shall be fabricated without drips or crimps and shall be zinc-coated in accordance with ASTM A 153/A 153M, Class B-2. Steel wire used for anchors and ties shall be fabricated from steel wire conforming to ASTM A 82/A 82M. Wire ties or anchors in exterior walls shall conform to ASTM A 641/A 641M. Joint reinforcement in interior walls, and in exterior or interior walls exposed to moist environment shall conform to ASTM A 641/A 641M; coordinate with paragraph JOINT REINFORCEMENT below. Anchors and ties shall be sized to provide a minimum of 5/8 inch mortar cover from either face.

2.8.1 Veneer Anchors

Provide screw on type veneer anchors, 1 1/4" wide x 6" long with 3 1/2 inches vertical adjustability, 14 gauge, hot-dipped galvanized after fabrication. Provide 3/16 inch diameter triangle ties, 4" x 4", hot-dipped galvanized after fabrication. Provide 40 mil dual barrier membrane tape x 3" wide consisting of 32 mils of pliable highly adhesive rubberized asphalt integrally bonded to an 8 mil, high density, cross-laminated polyethylene

film. The membrane tape shall be placed vertically over the exterior sheathing at each stud location. Veneer anchors and ties shall be placed at 16" o.c. vertically and 16" o.c. horizontally.

2.8.2 Bar Positioners

Bar positioners, used to prevent displacement of reinforcing bars during the course of construction, shall be factory fabricated from 9 gauge steel wire or equivalent, and coated with a hot-dip galvanized finish. Not more than one wire shall cross the cell.

2.9 JOINT REINFORCEMENT

Joint reinforcement shall be factory fabricated from steel wire conforming to ASTM A 82/A 82M, welded construction. Tack welding will not be acceptable in reinforcement used for wall ties. Wire shall have zinc coating conforming to ASTM A 153/A 153M, Class B-2. All wires shall be a minimum of 9 gauge. Reinforcement shall be ladder type design, having one longitudinal wire in the mortar bed of each face shell for hollow units and one wire for solid units. Joint reinforcement shall be placed a minimum of 5/8 inch cover from either face. The distance between crosswires shall not exceed 16 inches. Joint reinforcement for straight runs shall be furnished in flat sections not less than 10 feet long. Joint reinforcement shall be provided with factory formed corners and intersections. If approved for use, joint reinforcement may be furnished with adjustable wall tie features.

2.10 REINFORCING STEEL BARS AND RODS

Reinforcing steel bars and rods shall conform to ASTM A 615/A 615M, Grade 60.

2.11 EXPANSION-JOINT MATERIALS

Backer rod and sealant shall be adequate to accommodate joint compression equal to 50 percent of the width of the joint. The backer rod shall be compressible rod stock of polyethylene foam, polyurethane foam, butyl rubber foam, or other flexible, nonabsorptive material as recommended by the sealant manufacturer. Sealant shall conform to Section 07 92 00 JOINT SEALANTS, and shall be penetrating with a maximum volatile organic compound (VOC) content of 600 grams/liter.

2.12 THROUGH WALL FLASHING

Provide one of the following types except that the material shall be one which is not adversely affected by dampproofing material.

a. Copper or Stainless Steel Flashing: Copper, ASTM B 370, minimum 16 ounce weight; stainless steel, ASTM A 167, Type 301, 302, 304, or 316, 0.015 inch thick, No. 2D finish. Provide with factory-fabricated deformations that mechanically bond flashing against horizontal movement in all directions. Deformations shall consist of dimples, diagonal corrugations, or a combination of dimples and transverse corrugations. Flashing shall extend beyond the face of the wall 1/4 inch, and turn down at a 45 degree angle to form a drip. Where the flashing is not continuous, such as over and under openings in the wall and on each side of vertical expansion joints, the ends of the flashing should be extended beyond the jamb lines on both sides and turned up into the head of the head joint at least 1 inch at each end to form a dam.

PART 3 EXECUTION

3.1 PREPARATION

Prior to start of work, masonry inspector shall verify the applicable conditions as set forth in ACI 530/530.1, inspection. The Contracting Officer will serve as inspector or will select a masonry inspector.

3.1.1 Protection

Ice or snow formed on the masonry bed shall be thawed by the application of heat. Heat shall be applied carefully until the top surface of the masonry is dry to the touch. Sections of masonry deemed frozen and damaged shall be removed before continuing construction of those sections.

a. Air Temperature 40 to 32 Degrees F. Sand or mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F

b. Air Temperature 32 to 25 Degrees F. Sand and mixing water shall be heated to produce mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing.

c. Air Temperature 25 to 20 Degrees F. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Temperature of mortar on boards shall be maintained above freezing. Sources of heat shall be used on both sides of walls under construction. Windbreaks shall be employed when wind is in excess of 15 mph.

d. Air Temperature 20 Degrees F and below. Sand and mixing water shall be heated to provide mortar temperatures between 40 and 120 degrees F. Enclosure and auxiliary heat shall be provided to maintain air temperature above 32 degrees F. Temperature of units when laid shall not be less than 20 degrees F.

3.1.2 Completed Masonry and Masonry Not Being Worked On

a. Mean daily air temperature 40 to 32 degrees F. Masonry shall be protected from rain or snow for 24 hours by covering with weather-resistive membrane.

b. Mean daily air temperature 32 to 25 degrees F. Masonry shall be completely covered with weather-resistant membrane for 24 hours.

c. Mean Daily Air Temperature 25 to 20 degrees F. Masonry shall be completely covered with insulating blankets or equally protected for 24 hours.

d. Mean Daily Temperature 20 degrees F and Below. Masonry temperature shall be maintained above 32 degrees F for 24 hours by enclosure and supplementary heat, by electric heating blankets, infrared heat lamps, or other approved methods.

3.1.3 Stains

Protect exposed surfaces from mortar and other stains. When mortar joints are tooled, remove mortar from exposed surfaces with fiber brushes and wooden paddles. Protect base of walls from splash stains by covering

adjacent ground with sand, sawdust, or polyethylene.

3.1.4 Loads

Do not apply uniform loads for at least 12 hours or concentrated loads for at least 72 hours after masonry is constructed. Provide temporary bracing as required.

3.1.5 Surfaces

Surfaces on which masonry is to be placed shall be cleaned of laitance, dust, dirt, oil, organic matter, or other foreign materials and shall be slightly roughened to provide a surface texture with a depth of at least 1/8 inch. Sandblasting shall be used, if necessary, to remove laitance from pores and to expose the aggregate.

3.2 LAYING MASONRY UNITS

a. Coordinate masonry work with the work of other trades to accommodate built-in items and to avoid cutting and patching. Masonry units shall be laid in running bond pattern. Facing courses shall be level with back-up courses, unless the use of adjustable ties has been approved in which case the tolerances shall be plus or minus 1/2 inch. Each unit shall be adjusted to its final position while mortar is still soft and plastic.

b. Units that have been disturbed after the mortar has stiffened shall be removed, cleaned, and relaid with fresh mortar. Air spaces, cavities, chases, expansion joints, and spaces to be grouted shall be kept free from mortar and other debris. Units used in exposed masonry surfaces shall be selected from those having the least amount of chipped edges or other imperfections detracting from the appearance of the finished work. Vertical joints shall be kept plumb.

c. Units being laid and surfaces to receive units shall be free of water film and frost. Solid units shall be laid in a nonfurrowed full bed of mortar. Mortar for veneer wythes shall be beveled and sloped toward the center of the wythe from the cavity side. Units shall be shoved into place so that the vertical joints are tight. Vertical joints of brick and the vertical face shells of concrete masonry units, except where indicated at control, expansion, and isolation joints, shall be completely filled with mortar. Mortar will be permitted to protrude up to 1/2 inch into the space or cells to be grouted. Means shall be provided to prevent mortar from dropping into the space below.

3.2.1 Forms and Shores

Provide bracing and scaffolding as required. Design bracing to resist wind pressure as required by local codes. Forms and shores shall be sufficiently rigid to prevent deflections which may result in cracking or other damage to supported masonry and sufficiently tight to prevent leakage of mortar and grout. Supporting forms and shores shall not be removed in less than 10 days.

3.2.2 Reinforced Concrete Masonry Units Walls

Where vertical reinforcement occurs, fill cores solid with grout. Lay units in such a manner as to preserve the unobstructed vertical continuity of cores to be filled. Embed the adjacent webs in mortar to prevent

leakage of grout. Remove mortar fins protruding from joints before placing grout. Minimum clear dimensions of vertical cores shall be 2 by 3 inches. Position reinforcing accurately as indicated before placing grout. As masonry work progresses, secure vertical reinforcing in place at vertical intervals not to exceed 160 bar diameters. Use puddling rod or vibrator to consolidate the grout. Minimum clear distance between masonry and vertical reinforcement shall be not less than 1/2 inch. Unless indicated or specified otherwise, form splices by lapping bars not less than 40 bar diameters and wire tying them together.

3.2.3 Concrete Masonry Units

Units in piers, pilasters, columns, starting courses on footings, solid foundation walls, lintels, and beams, and where cells are to be filled with grout shall be full bedded in mortar under both face shells and webs. Other units shall be full bedded under both face shells. Head joints shall be filled solidly with mortar for a distance in from the face of the unit not less than the thickness of the face shell. Foundation walls below grade shall be grouted solid. Jamb units shall be of the shapes and sizes to conform with wall units. Solid units may be incorporated in the masonry work where necessary to fill out at corners, gable slopes, and elsewhere as approved. Double walls shall be stiffened at wall-mounted plumbing fixtures by use of strap anchors, two above each fixture and two below each fixture, located to avoid pipe runs, and extending from center to center of the double wall. Walls and partitions shall be adequately reinforced for support of wall-hung plumbing fixtures when chair carriers are not specified.

3.2.4 Clay or Shale Brick Units

Brick facing shall be laid with the better face exposed. Brick shall be laid in running bond with each course bonded at corners, unless otherwise indicated. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations may be used in sills, treads, soldier courses, except where deformations will be exposed to view.

3.2.4.1 Wetting of Units

Wetting of clay, shale brick, or hollow brick units having an initial rate of absorption of more than 1 gram per minute per square inch of bed surface shall be in conformance with ASTM C 67. The method of wetting shall ensure that each unit is nearly saturated but surface dry when laid. Test clay or shale brick daily on the job, prior to laying, as follows: Using a wax pencil, draw a circle the size of a quarter on five randomly selected bricks. Apply 20 drops of water with a medicine dropper to the surface within the circle on each brick. If the average time that the water is completely absorbed in the five bricks is less than 1-1/2 minutes, wet bricks represented by the five bricks tested.

3.2.4.2 Solid Units

Bed, head, and collar joints shall be completely filled with mortar.

3.2.4.3 Hollow Units

Hollow units shall be laid as specified for concrete masonry units.

3.2.4.4 Brick-Faced Walls

For brick-faced walls bond the two wythes in every sixth brick course with continuous horizontal joint reinforcement. Provide additional bonding ties spaced not more than 3 feet apart around the perimeter of and within 12 inches of all openings.

a. Collar Joints: Fill collar joints solid with mortar as each course of brick is laid. Do not disturb units in place.

b. Brick Sills: Lay brick on edge, slope, and project not less than 1/2 inch beyond the face of the wall to form a wash and drip. Fill all joints solidly with mortar and tool.

3.2.4.5 Cavity Walls

Provide a continuous cavity as indicated. Securely tie the two wythes together with horizontal joint reinforcement. Bevel mortar beds away from cavity to prevent projection into cavity when bricks are shoved in place. Keep cavities clear and clean of mortar droppings. At the bottom of cavity walls, in the course immediately above the through-wall flashing, temporarily omit one brick every 4 feet. With a hose and clean water, wash all mortar droppings and debris out of the cavity through the temporary openings at least twice each day masonry is laid, and more often when required to keep the cavities clean. Fill in the openings with bricks and mortar after the wall is complete and the cavity has been inspected and found clean. Provide weep holes of open head joints spaced 24 inches o.c. wherever the cavity is interrupted at base of wall and vertical obstructions (e.g. lintels).

3.2.4.6 Brick Veneer

Provide a continuous cavity as indicated. Install brick veneer after sheathing, masonry anchors, and flashing have been installed to the cold-formed steel framing system. Care shall be provided to avoid damaging the moisture barrier. Damaged moisture barrier and flashing shall be repaired or replaced before brick veneer is installed. Means shall be provided to keep cavities clean and clear of mortar droppings.

3.2.5 Tolerances

Masonry shall be laid plumb, true to line, with courses level. Bond pattern shall be kept plumb throughout. Corners shall be square unless noted otherwise. Except for walls constructed of prefaced concrete masonry units, masonry shall be laid within the following tolerances (plus or minus unless otherwise noted):

TABLE II

TOLERANCES

Variation from the plumb in the lines and surfaces of columns, walls and arises	
In adjacent masonry units	1/8 inch
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch

TOLERANCES

Variations from the plumb for external corners, expansion joints, and other conspicuous lines	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from the level for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	
In 20 feet	1/4 inch
In 40 feet or more	1/2 inch
Variation from level for bed joints and top surfaces of bearing walls	
In 10 feet	1/4 inch
In 40 feet or more	1/2 inch
Variations from horizontal lines	
In 10 feet	1/4 inch
In 20 feet	3/8 inch
In 40 feet or more	1/2 inch
Variations in cross sectional dimensions of columns and in thickness of walls	
Minus	1/4 inch
Plus	1/2 inch

3.2.6 Cutting and Fitting

Full units of the proper size shall be used wherever possible, in lieu of cut units. Cutting and fitting, including that required to accommodate the work of others, shall be done by masonry mechanics using power masonry saws. Concrete masonry units may be wet or dry cut. Wet cut units, before being placed in the work, shall be dried to the same surface-dry appearance as uncut units being laid in the wall. Cut edges shall be clean, true and sharp. Openings in the masonry shall be made carefully so that wall plates, cover plates or escutcheons required by the installation will completely conceal the openings and will have bottoms parallel with the masonry bed joints. Reinforced masonry lintels shall be provided above openings over 12 inches wide for pipes, ducts, cable trays, and other wall penetrations, unless steel sleeves are used.

3.2.7 Jointing

Joints shall be tooled when the mortar is thumbprint hard. Horizontal joints shall be tooled last. Joints shall be brushed to remove all loose and excess mortar. Mortar joints shall be finished as follows:

3.2.7.1 Flush Joints

Joints in concealed masonry surfaces and joints at electrical outlet boxes in wet areas shall be flush cut. Flush cut joints shall be made by cutting off the mortar flush with the face of the wall. Joints in unparged masonry walls below grade shall be pointed tight. Flush joints for architectural units, such as fluted units, shall completely fill both the head and bed joints.

3.2.7.2 Tooled Joints

Joints in exposed exterior and interior masonry surfaces shall be tooled slightly concave. Joints shall be tooled with a jointer slightly larger than the joint width so that complete contact is made along the edges of the unit. Tooling shall be performed so that the mortar is compressed and the joint surface is sealed. Jointer of sufficient length shall be used to obtain a straight and true mortar joint.

3.2.7.3 Door and Window Frame Joints

On the exposed interior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch. On the exterior side of exterior frames, joints between frames and abutting masonry walls shall be raked to a depth of 3/8 inch.

3.2.8 Joint Widths

Joint widths shall be as follows:

3.2.8.1 Concrete Masonry Units

Concrete masonry units shall have 3/8 inch joints, except for prefaced concrete masonry units.

3.2.8.2 Brick

Brick joint widths shall be the difference between the actual and nominal dimensions of the brick in either height or length. Brick expansion joint widths shall be as shown.

3.2.9 Embedded Items

Spaces around built-in items shall be filled with mortar. Openings around flush-mount electrical outlet boxes in wet locations shall be pointed with mortar. Anchors, ties, wall plugs, accessories, flashing, pipe sleeves and other items required to be built-in shall be embedded as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in the mortar. Cells receiving anchor bolts and cells of the first course below bearing plates shall be filled with grout.

3.2.10 Unfinished Work

Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. Loose mortar shall be removed and the exposed joints shall be thoroughly cleaned before laying new work.

3.2.11 Masonry Wall Intersections

Each course shall be masonry bonded at corners and elsewhere as shown. Masonry walls shall be anchored or tied together at corners and intersections with bond beam reinforcement and prefabricated corner or tee pieces of joint reinforcement as shown.

3.3 ANCHORED VENEER CONSTRUCTION

The inner and outer wythes shall be completely separated by a continuous airspace as shown on the drawings. Both the inner and the outer wythes shall be laid up together except when adjustable joint reinforcement assemblies are approved for use. When both wythes are not brought up together, through-wall flashings shall be protected from damage until they are fully enclosed in the wall. The airspace between the wythes shall be kept clear and free of mortar droppings by temporary wood strips laid on the wall ties and carefully lifted out before placing the next row of ties. A coarse gravel or drainage material shall be placed behind the weep holes in the cavity to a minimum depth of 4 inches of coarse aggregate or 10 inches of drainage material to keep mortar droppings from plugging the weep holes.

3.4 WEEP HOLES

Wherever through-wall flashing occurs, provide weep holes to drain flashing to exterior at acceptable locations as indicated on drawings. Weep holes shall be open head joints at 24 inches o.c. Weep holes shall be provided not more than 24 inches on centers in mortar joints of the exterior wythe above wall flashing, over foundations, bond beams, and any other horizontal interruptions of the cavity. Weep holes shall be perfectly horizontal or slightly canted downward to encourage water drainage outward and not inward. Weep holes shall be kept free of mortar and other obstructions.

3.5 MORTAR MIX

Mortar shall be mixed in a mechanically operated mortar mixer for at least 3 minutes, but not more than 5 minutes. Measurement of ingredients for mortar shall be by volume. Ingredients not in containers, such as sand, shall be accurately measured by the use of measuring boxes. Water shall be mixed with the dry ingredients in sufficient amount to provide a workable mixture which will adhere to the vertical surfaces of masonry units. Mortar that has stiffened because of loss of water through evaporation shall be retempered by adding water to restore the proper consistency and workability. Mortar that has reached its initial set or that has not been used within 2.5 hours after mixing shall be discarded.

3.6 REINFORCING STEEL

Reinforcement shall be cleaned of loose, flaky rust, scale, grease, mortar, grout, or other coating which might destroy or reduce its bond prior to placing grout. Bars with kinks or bends not shown on the drawings shall not be used. Reinforcement shall be placed prior to grouting. Unless otherwise indicated, vertical wall reinforcement shall extend to within 2 inches of tops of walls.

3.6.1 Positioning Bars

Vertical bars shall be accurately placed within the cells at the positions indicated on the drawings. A minimum clearance of 1/2 inch shall be

maintained between the bars and masonry units. Minimum clearance between parallel bars shall be one diameter of the reinforcement. Vertical reinforcing may be held in place using bar positioners located near the ends of each bar and at intermediate intervals of not more than 192 diameters of the reinforcement. Column and pilaster ties shall be wired in position around the vertical steel. Ties shall be in contact with the vertical reinforcement and shall not be placed in horizontal bed joints.

3.6.2 Splices

Bars shall be lapped a minimum of 48 diameters of the reinforcement. Welded or mechanical connections shall develop at least 125 percent of the specified yield strength of the reinforcement.

3.7 JOINT REINFORCEMENT INSTALLATION

Joint reinforcement shall be installed at 16 inches on center or as indicated. Reinforcement shall be lapped not less than 6 inches. Prefabricated sections shall be installed at corners and wall intersections. The longitudinal wires of joint reinforcement shall be placed to provide not less than 5/8 inch cover to either face of the unit.

3.8 PLACING GROUT

Cells containing reinforcing bars shall be filled with grout. Hollow masonry units in walls or partitions supporting plumbing, heating, or other mechanical fixtures, voids at door and window jambs, and other indicated spaces shall be filled solid with grout. Cells under lintel bearings on each side of openings shall be filled solid with grout for full height of openings. Walls below grade, lintels, and bond beams shall be filled solid with grout. Units other than open end units may require grouting each course to preclude voids in the units. Grout not in place within 1-1/2 hours after water is first added to the batch shall be discarded. Sufficient time shall be allowed between grout lifts to preclude displacement or cracking of face shells of masonry units. If blowouts, flowouts, misalignment, or cracking of face shells should occur during construction, the wall shall be torn down and rebuilt.

3.8.1 Vertical Grout Barriers for Fully Grouted Walls

Grout barriers shall be provided not more than 30 feet apart, or as required, to limit the horizontal flow of grout for each pour.

3.8.2 Horizontal Grout Barriers

Grout barriers shall be embedded in mortar below cells of hollow units receiving grout.

3.8.3 Grout Holes and Cleanouts

3.8.3.1 Grout Holes

Grouting holes shall be provided in slabs, spandrel beams, and other in-place overhead construction. Holes shall be located over vertical reinforcing bars or as required to facilitate grout fill in bond beams. Additional openings spaced not more than 16 inches on centers shall be provided where grouting of all hollow unit masonry is indicated. Openings shall not be less than 4 inches in diameter or 3 by 4 inches in horizontal dimensions. Upon completion of grouting operations, grouting holes shall

be plugged and finished to match surrounding surfaces.

3.8.3.2 Cleanouts for Hollow Unit Masonry Construction

Cleanout holes shall be provided at the bottom of every pour in cores containing vertical reinforcement when the height of the grout pour exceeds 5 feet. Where all cells are to be grouted, cleanout courses shall be constructed using bond beam units in an inverted position to permit cleaning of all cells. Cleanout holes shall be provided at a maximum spacing of 32 inches where all cells are to be filled with grout. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanouts shall not be less than 3 by 4 inch openings cut from one face shell. Manufacturer's standard cutout units may be used at the Contractor's option. Cleanout holes shall not be closed until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.8.3.3 Cleanouts for Solid Unit Masonry Construction

Cleanouts for construction of walls consisting of a grout filled cavity between solid masonry wythes shall be provided at the bottom of every pour by omitting every other masonry unit from one wythe. A new series of cleanouts shall be established if grouting operations are stopped for more than 4 hours. Cleanout holes shall not be plugged until masonry work, reinforcement, and final cleaning of the grout spaces have been completed and inspected. For walls which will be exposed to view, cleanout holes shall be closed in an approved manner to match surrounding masonry.

3.8.4 Grouting Equipment

3.8.4.1 Grout Pumps

Pumping through aluminum tubes will not be permitted. Pumps shall be operated to produce a continuous stream of grout without air pockets, segregation, or contamination. Upon completion of each day's pumping, waste materials and debris shall be removed from the equipment, and disposed of outside the masonry.

3.8.4.2 Vibrators

Internal vibrators shall maintain a speed of not less than 5,000 impulses per minute when submerged in the grout. At least one spare vibrator shall be maintained at the site at all times. Vibrators shall be applied at uniformly spaced points not further apart than the visible effectiveness of the machine. Duration of vibration shall be limited to time necessary to produce satisfactory consolidation without causing segregation.

3.8.5 Grout Placement

Masonry shall be laid to the top of a pour before placing grout. Grout shall not be placed in two-wythe solid unit masonry cavity until mortar joints have set for at least 3 days during hot weather and 5 days during cold damp weather. Grout shall not be placed in hollow unit masonry until mortar joints have set for at least 24 hours. Grout shall be placed using a hand bucket, concrete hopper, or grout pump to completely fill the grout spaces without segregation of the aggregates. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. The height

of grout pours and type of grout used shall be limited by the dimensions of grout spaces as indicated in Table III. Low-lift grout methods may be used on pours up to and including 5 feet in height. High-lift grout methods shall be used on pours exceeding 5 feet in height.

3.8.5.1 Low-Lift Method

Grout shall be placed at a rate that will not cause displacement of the masonry due to hydrostatic pressure of the grout. Mortar protruding more than 1/2 inch into the grout space shall be removed before beginning the grouting operation. Grout pours 12 inches or less in height shall be consolidated by mechanical vibration or by puddling. Grout pours over 12 inches in height shall be consolidated by mechanical vibration and reconsolidated by mechanical vibration after initial water loss and settlement has occurred. Vibrators shall not be inserted into lower pours that are in a semi-solidified state. Low-lift grout shall be used subject to the limitations of Table III.

3.8.5.2 High-Lift Method

Mortar droppings shall be cleaned from the bottom of the grout space and from reinforcing steel. Mortar protruding more than 1/4 inch into the grout space shall be removed by dislodging the projections with a rod or stick as the work progresses. Reinforcing, bolts, and embedded connections shall be rigidly held in position before grouting is started. CMU units shall not be pre-wetted. Grout, from the mixer to the point of deposit in the grout space shall be placed as rapidly as practical by pumping and placing methods which will prevent segregation of the mix and cause a minimum of grout splatter on reinforcing and masonry surfaces not being immediately encased in the grout lift. The individual lifts of grout shall be limited to 4 feet in height. The first lift of grout shall be placed to a uniform height within the pour section and vibrated thoroughly to fill all voids. This first vibration shall follow immediately behind the pouring of the grout using an approved mechanical vibrator. After a waiting period sufficient to permit the grout to become plastic, but before it has taken any set, the succeeding lift shall be poured and vibrated 12 to 18 inches into the preceding lift. If the placing of the succeeding lift is going to be delayed beyond the period of workability of the preceding, each lift shall be reconsolidated by reworking with a second vibrator as soon as the grout has taken its settlement shrinkage. The waiting, pouring, and reconsolidation steps shall be repeated until the top of the pour is reached. The top lift shall be reconsolidated after the required waiting period. The high-lift grouting of any section of wall between vertical grout barriers shall be completed to the top of a pour in one working day unless a new series of cleanout holes is established and the resulting horizontal construction joint cleaned. High-lift grout shall be used subject to the limitations in Table III.

TABLE III

POUR HEIGHT AND TYPE OF GROUT FOR VARIOUS GROUT SPACE DIMENSIONS

Maximum Grout Pour Height (feet) (4)	Grout Type	Grouting Procedure	Minimum Dimensions of the Total Clear Areas Within Grout Spaces and Cells (in.) (1,2) Multiwythe Masonry (3)	Hollow-unit Masonry
1	Fine	Low Lift	3/4	1-1/2 x 2
5	Fine	Low Lift	2	2 x 3
8	Fine	High Lift	2	2 x 3
12	Fine	High Lift	2-1/2	2-1/2 x 3
24	Fine	High Lift	3	3 x 3
1	Coarse	Low Lift	1-1/2	1-1/2 x 3
5	Coarse	Low Lift	2	2-1/2 x 3
8	Coarse	High Lift	2	3 x 3
12	Coarse	High Lift	2-1/2	3 x 3
24	Coarse	High Lift	3	3 x 4

Notes:

(1) The actual grout space or cell dimension shall be larger than the sum of the following items:

a) The required minimum dimensions of total clear areas given in the table above;

b) The width of any mortar projections within the space;

c) The horizontal projections of the diameters of the horizontal reinforcing bars within a cross section of the grout space or cell.

(2) The minimum dimensions of the total clear areas shall be made up of one or more open areas, with at least one area being 3/4 inch or greater in width.

(3) For grouting spaces between masonry wythes.

(4) Where only cells of hollow masonry units containing reinforcement are grouted, the maximum height of the pour shall not exceed the distance between horizontal bond beams.

3.9 BOND BEAMS

Bond beams shall be filled with grout and reinforced as indicated on the drawings. Grout barriers shall be installed under bond beam units to retain the grout as required. Reinforcement shall be continuous, including around corners, except through control joints or expansion joints, unless otherwise indicated on the drawings. Where splices are required for continuity, reinforcement shall be lapped 48 bar diameters. A minimum clearance of 1/2 inch shall be maintained between reinforcement and interior faces of units.

3.10 CONTROL JOINTS

Control joints shall be provided as indicated and shall be constructed by using special control-joint units or sash jamb units with control joint key in accordance with the details shown on the drawings. Sash jamb units

shall have a 3/4 by 3/4 inch groove near the center at end of each unit. The vertical mortar joint at control joint locations shall be continuous, including through all bond beams. This shall be accomplished by utilizing half blocks in alternating courses on each side of the joint. The control joint key shall be interrupted in courses containing continuous bond beam steel. In single wythe exterior masonry walls, the exterior control joints shall be raked to a depth of 3/4 inch; backer rod and sealant shall be installed in accordance with Section 07 92 00 JOINT SEALANTS. Exposed interior control joints shall be raked to a depth of 1/4 inch. Concealed control joints shall be flush cut.

3.11 JOINTS SHOWN ON THE DRAWINGS

a. Brick expansion joints

b. Concrete masonry veneer joints

c. will be located, detailed, and constructed as shown on the drawings. Keep joints free of mortar and other debris.

3.12 LINTELS

3.12.1 Masonry Lintels

Construct masonry lintels with lintel units filled solid with grout in all courses and reinforced with a minimum of two No. 4 bars in the bottom course unless otherwise indicated on the drawings. Lintel reinforcement shall extend beyond each side of masonry opening 40 bar diameters or 24 inches, whichever is greater. Reinforcing bars shall be supported in place prior to grouting and shall be located 1/2 inch above the bottom inside surface of the lintel unit.

3.12.2 Steel Lintels

Steel lintels shall have a minimum bearing length of 8 inches unless otherwise indicated on the drawings.

3.13 POINTING AND CLEANING

After mortar joints have attained their initial set, but prior to hardening, completely remove mortar and grout daubs or splashings from masonry-unit surfaces that will be exposed or painted. Before completion of the work, defects in joints of masonry to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Immediately after grout work is completed, scum and stains which have percolated through the masonry work shall be removed using a high pressure stream of water and a stiff bristled brush. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

3.13.1 Dry-Brushing

a. Exposed concrete masonry unit shall be dry-brushed at the end of each day's work and after any required pointing, using stiff-fiber bristled brushes

3.13.2 Clay or Shale Brick Surfaces

Exposed clay or shale brick masonry surfaces shall be cleaned as necessary to obtain surfaces free of stain, dirt, mortar and grout daubs, efflorescence, and discoloration or scum from cleaning operations. After cleaning, examine the sample panel of similar material for discoloration or stain as a result of cleaning. If the sample panel is discolored or stained, change the method of cleaning to ensure that the masonry surfaces in the structure will not be adversely affected. The exposed masonry surfaces shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphate and 1/2 cup laundry detergent to one gallon of water or cleaned with a proprietary masonry cleaning agent specifically recommended for the color and texture by the clay products manufacturer. The solution shall be applied with stiff fiber brushes, followed immediately by thorough rinsing with clean water. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations. Efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

3.14 PROTECTION

Protect facing materials against staining. Cover top of walls with nonstaining waterproof covering or membrane when work is not in progress. Covering of the top of the unfinished walls shall continue until the wall is waterproofed with a complete roof or parapet system. Covering shall extend a minimum of 2 feet down on each side of the wall and shall be held securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

3.15 TEST REPORTS

3.15.1 Efflorescence Test

Test brick, which will be exposed to weathering, for efflorescence. Schedule tests far enough in advance of starting masonry work to permit retesting if necessary. Sampling and testing shall conform to the applicable provisions of ASTM C 67. Units meeting the definition of "effloresced" will be subject to rejection.

-- End of Section --

SECTION 08 11 13

STEEL DOORS AND FRAMES

02/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 653/A 653M	(2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 879/A 879M	(2006) Standard Specification for Steel Sheet, zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
ASTM A 924/A 924M	(2009a) Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
ASTM C 578	(2009e1) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
ASTM C 591	(2009) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM D 2863	(2009) Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
ASTM E 1300	(2009a) Determining Load Resistance of Glass in Buildings
ASTM F 2248	(2009) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

ANSI/BHMA A156.115	(2006) Hardware Preparation in Steel Doors

and Steel Frames

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 105	(2010) Installation of Smoke Door Assemblies
NFPA 252	(2008) Standard Methods of Fire Tests of Door Assemblies
NFPA 80	(2010; TIA 10-2) Standard for Fire Doors and Other Opening Protectives

STEEL DOOR INSTITUTE (SDI/DOOR)

SDI/DOOR 111	(2009) Recommended Selection and Usage Guide for Standard Steel Doors, Frames and Accessories
SDI/DOOR 113	(2001; R 2006) Determining the Steady State Thermal Transmittance of Steel Door and Frame Assemblies
SDI/DOOR A250.11	(2001) Recommended Erection Instructions for Steel Frames
SDI/DOOR A250.6	(2003) Hardware on Steel Doors (Reinforcement - Application)
SDI/DOOR A250.8	(2003; R2008) Recommended Specifications for Standard Steel Doors and Frames

UNDERWRITERS LABORATORIES (UL)

UL 10C	(2009) UL Standard for Safety Positive Pressure Fire Tests of Door Assemblies

1.2 SUBMITTALS

The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Doors

Frames

Accessories

Show elevations, construction details, metal gages, hardware provisions, method of glazing, and installation details.

Schedule of doors

Schedule of frames

Submit door and frame locations.

SD-03 Product Data

Doors

Frames

Accessories

Submit manufacturer's descriptive literature for doors, frames, and accessories. Include data and details on door construction, panel (internal) reinforcement, insulation, and door edge construction.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors, frames, and accessories undamaged and with protective wrappings or packaging. Strap knock-down frames in bundles. Provide temporary steel spreaders securely fastened to the bottom of each welded frame. Store doors and frames on platforms under cover in clean, dry, ventilated, and accessible locations, with 1/4 inch airspace between doors. Remove damp or wet packaging immediately and wipe affected surfaces dry. Replace damaged materials with new.

PART 2 PRODUCTS

2.1 STANDARD STEEL DOORS

SDI/DOOR A250.8, except as specified otherwise. Prepare doors to receive door hardware as specified in Section 08 71 00. Undercut where indicated. Exterior doors shall have top edge closed flush and sealed to prevent water intrusion. Doors shall be 1-3/4 inch thick, unless otherwise indicated. Provide exterior glazing in accordance with ASTM F 2248 and ASTM E 1300.

2.1.1 Classification - Level, Performance, Model

2.1.1.1 Extra Heavy Duty Doors

SDI/DOOR A250.8, Level 3, physical performance Level A, Model 2 Seamless with core construction as required by the manufacturer, of size(s) and design(s) indicated. Where vertical stiffener cores are required, the space between the stiffeners shall be filled with mineral board insulation.
Exterior doors are to be insulated.

2.2 ACCESSORIES

2.2.1 Louvers

2.2.1.1 Interior Louvers

SDI/DOOR 111, Louvers shall be stationary sightproof type. Detachable moldings on room or non security side of door; on security side of door, moldings to be integral part of louver. Form louver frames of 20 gage steel and louver blades of a minimum 24 gage. Sightproof louvers to be inverted "V" blade design with minimum 55 percent net-free opening.

2.2.1.2 Exterior Louvers

Louvers shall be inverted "V" type with minimum of 55 percent net-free opening. Weld or tenon louver blades to continuous channel frame and weld

assembly to door to form watertight assembly. Form louvers of hot-dip galvanized steel of same gage as door facings. Louvers shall have steel-framed insect screens secured to room side and readily removable. Provide aluminum wire cloth, 18 by 18 or 18 by 16 inch mesh, for insect screens. Net-free louver area to be before screening.

2.2.2 Astragals

For pairs of exterior steel doors which will not have aluminum astragals or removable mullions, as specified in Section 08 71 00 DOOR HARDWARE provide overlapping steel astragals with the doors. For interior pairs of fire rated and smoke control doors, provide stainless steel astragals complying with NFPA 80 for fire rated assemblies and NFPA 105 for smoke control assemblies.

2.2.3 Moldings

Provide moldings around glass of interior and exterior doors and louvers of interior doors. Provide nonremovable moldings on outside of exterior doors and on corridor side of interior doors. Other moldings may be stationary or removable. Secure inside moldings to stationary moldings, or provide snap-on moldings. Muntins shall interlock at intersections and shall be fitted and welded to stationary moldings.

2.3 INSULATION CORES

Insulated cores shall be of type specified, and provide an apparent U-factor of .48 in accordance with SDI/DOOR 113 and shall conform to:

a. Rigid Cellular Polyisocyanurate Foam: ASTM C 591, Type I or II, foamed-in-place or in board form, with oxygen index of not less than 22 percent when tested in accordance with ASTM D 2863; or

b. Rigid Polystyrene Foam Board: ASTM C 578, Type I or II

2.4 STANDARD STEEL FRAMES

SDI/DOOR A250.8, Level 3, except as otherwise specified. Form frames to sizes and shapes indicated, with welded corners and knock-down field-assembled corners. Provide steel frames for doors, sidelights, and interior glazed panels, unless otherwise indicated.

2.4.1 Welded Frames

Continuously weld frame faces at corner joints. Mechanically interlock or continuously weld stops and rabbets. Grind welds smooth.

Weld frames in accordance with the recommended practice of the Structural Welding Code Sections 1 through 6, AWS D1.1/D1.1M and in accordance with the practice specified by the producer of the metal being welded.

2.4.2 Knock-Down Frames

Design corners for simple field assembly by concealed tenons, splice plates, or interlocking joints that produce square, rigid corners and a tight fit and maintain the alignment of adjoining members. Provide locknuts for bolted connections.

2.4.3 Mullions and Transom Bars

Mullions and transom bars shall be closed or tubular construction and be a member with heads and jambs butt-welded thereto or knock-down for field assembly. Bottom of door mullions shall have adjustable floor anchors and spreader connections.

2.4.4 Stops and Beads

Form stops and beads from 20 gage steel. Provide for glazed and other openings in standard steel frames. Secure beads to frames with oval-head, countersunk Phillips self-tapping sheet metal screws or concealed clips and fasteners. Space fasteners approximately 12 to 16 inch on center. Miter molded shapes at corners. Butt or miter square or rectangular beads at corners.

2.4.5 Cased Openings

Fabricate frames for cased openings of same material, gage, and assembly as specified for metal door frames, except omit door stops and preparation for hardware.

2.4.6 Anchors

Provide anchors to secure the frame to adjoining construction. Provide steel anchors, zinc-coated or painted with rust-inhibitive paint, not lighter than 18 gage.

2.4.6.1 Wall Anchors

Provide at least three anchors for each jamb. For frames which are more than 7.5 feet in height, provide one additional anchor for each jamb for each additional 2.5 feet or fraction thereof.

a. Masonry: Provide anchors of corrugated or perforated steel straps or 3/16 inch diameter steel wire, adjustable or T-shaped;

b. Stud partitions: Weld or otherwise securely fasten anchors to backs of frames. Design anchors to be fastened to closed steel studs with sheet metal screws, and to open steel studs by wiring or welding;

c. Completed openings: Secure frames to previously placed concrete or masonry with expansion bolts in accordance with SDI/DOOR 111.

2.4.6.2 Floor Anchors

Provide floor anchors drilled for 3/8 inch anchor bolts at bottom of each jamb member. Where floor fill occurs, terminate bottom of frames at the indicated finished floor levels and support by adjustable extension clips resting on and anchored to the structural slabs.

2.5 FIRE AND SMOKE DOORS AND FRAMES

NFPA 80 and NFPA 105 and this specification. The requirements of NFPA 80 and NFPA 105 shall take precedence over details indicated or specified.

2.5.1 Labels

Fire doors and frames shall bear the label of Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM), or Warnock Hersey International (WHI) attesting to the rating required. Testing shall be in accordance with NFPA 252 or UL 10C. Labels shall be metal with raised letters, and shall bear the name or file number of the door and frame manufacturer. Labels shall be permanently affixed at the factory to frames and to the hinge edge of the door. Door labels shall not be painted.

2.5.2 Oversized Doors

For fire doors and frames which exceed the size for which testing and labeling are available, furnish certificates stating that the doors and frames are identical in design, materials, and construction to a door which has been tested and meets the requirements for the class indicated.

2.5.3 Astragal on Fire and Smoke Doors

On pairs of labeled fire doors, conform to NFPA 80 and UL requirements. On smoke control doors, conform to NFPA 105.

2.6 WEATHERSTRIPPING

As specified in Section 08 71 00 DOOR HARDWARE.

2.7 HARDWARE PREPARATION

Provide minimum hardware reinforcing gages as specified in SDI/DOOR A250.6. Drill and tap doors and frames to receive finish hardware. Prepare doors and frames for hardware in accordance with the applicable requirements of SDI/DOOR A250.8 and SDI/DOOR A250.6. For additional requirements refer to ANSI/BHMA A156.115. Drill and tap for surface-applied hardware at the project site. Build additional reinforcing for surface-applied hardware into the door at the factory. Locate hardware in accordance with the requirements of SDI/DOOR A250.8, as applicable. Punch door frames, with the exception of frames that will have weatherstripping to receive a minimum of two rubber or vinyl door silencers on lock side of single doors and one silencer for each leaf at heads of double doors. Set lock strikes out to provide clearance for silencers.

2.8 FINISHES

2.8.1 Factory-Primed Finish

All surfaces of doors and frames shall be thoroughly cleaned, chemically treated and factory primed with a rust inhibiting coating as specified in SDI/DOOR A250.8. Where coating is removed by welding, apply touchup of factory primer.

2.8.2 Hot-Dip Zinc-Coated and Factory-Primed Finish

Fabricate exterior doors and frames and indicated interior doors and frames from hot dipped zinc coated steel, alloyed type, that complies with ASTM A 924/A 924Mand ASTM A 653/A 653M. The coating weight shall meet or exceed the minimum requirements for coatings having 0.4 ounces per square foot, total both sides, i.e., A40. Repair damaged zinc-coated surfaces by the application of zinc dust paint. Thoroughly clean and chemically treat to insure maximum paint adhesion. Factory prime as specified in

SDI/DOOR A250.8.

2.8.3 Electrolytic Zinc-Coated Anchors and Accessories

Provide electrolytically deposited zinc-coated steel in accordance with ASTM A 879/A 879M, Commercial Quality, Coating Class A. Phosphate treat and factory prime zinc-coated surfaces as specified in SDI/DOOR A250.8.

2.9 FABRICATION AND WORKMANSHIP

Finished doors and frames shall be strong and rigid, neat in appearance, and free from defects, waves, scratches, cuts, dents, ridges, holes, warp, and buckle. Molded members shall be clean cut, straight, and true, with joints coped or mitered, well formed, and in true alignment. Dress exposed welded and soldered joints smooth. Design door frame sections for use with the wall construction indicated. Corner joints shall be well formed and in true alignment. Conceal fastenings where practicable. Design frames in exposed masonry walls or partitions to allow sufficient space between the inside back of trim and masonry to receive calking compound.

2.9.1 Grouted Frames

For frames to be installed in exterior walls and to be filled with mortar or grout, fill the stops with strips of rigid insulation to keep the grout out of the stops and to facilitate installation of stop-applied head and jamb seals.

2.10 PROVISIONS FOR GLAZING

Materials are specified in Section 08 81 00, GLAZING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Frames

Set frames in accordance with SDI/DOOR A250.11. Plumb, align, and brace securely until permanent anchors are set. Anchor bottoms of frames with expansion bolts or powder-actuated fasteners. Build in or secure wall anchors to adjoining construction. Backfill frames with mortar. Coat inside of frames with corrosion-inhibiting bituminous material. For frames in exterior walls, ensure that stops are filled with rigid insulation before grout is placed.

3.1.2 Doors

Hang doors in accordance with clearances specified in SDI/DOOR A250.8. After erection and glazing, clean and adjust hardware.

3.1.3 Fire and Smoke Doors and Frames

Install fire doors and frames, including hardware, in accordance with NFPA 80. Install fire rated smoke doors and frames in accordance with NFPA 80 and NFPA 105.

3.2 PROTECTION

Protect doors and frames from damage. Repair damaged doors and frames

prior to completion and acceptance of the project or replace with new, as directed. Wire brush rusted frames until rust is removed. Clean thoroughly. Apply an all-over coat of rust-inhibitive paint of the same type used for shop coat.

3.3 CLEANING

Upon completion, clean exposed surfaces of doors and frames thoroughly. Remove mastic smears and other unsightly marks.

-- End of Section --

SECTION 08 14 00

WOOD DOORS
05/11

PART 1 GENERAL

1.1 REFERENCES

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

ARCHITECTURAL WOODWORK INSTITUTE (AWI)

AWI Qual Stds	(8th Edition) AWI Quality Standards

WINDOW AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

WDMA I.S. 1-A	(2007) Architectural Wood Flush Doors
WDMA I.S. 4	(2009) Water-Repellent Preservative Non-Pressure Treatment for Millwork

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

SD-02 Shop Drawings

Doors

Submit drawings or catalog data showing each type of door unit. Drawings and data shall indicate door type and construction, sizes, thickness, methods of assembly, door louvers, and glazing.

SD-03 Product Data

Doors

Accessories

Water-resistant sealer

Sample warranty

SD-04 Samples

Door finish colors

Submit a minimum of three color selection samples.

1.3 DELIVERY, STORAGE, AND HANDLING

Deliver doors to the site in an undamaged condition and protect against

damage and dampness. Stack doors flat under cover. Support on blocking, a minimum of 4 inch thick, located at each end and at the midpoint of the door. Store doors in a well-ventilated building so that they will not be exposed to excessive moisture, heat, dryness, direct sunlight, or extreme changes of temperature and humidity. Do not store in a building under construction until concrete, masonry work, and plaster are dry. Replace defective or damaged doors with new ones.

1.4 WARRANTY

Warrant doors free of defects as set forth in the door manufacturer's standard door warranty.

PART 2 PRODUCTS

2.1 DOORS

Provide doors of the types, sizes, and designs indicated.

2.1.1 Flush Doors

Conform to WDMA I.S. 1-A for flush doors. Hardwood stile edge bands of doors shall have a matching face veneer. Provide mill option for stile edge of doors scheduled to be painted. No visible finger joints will be accepted in stile edge bands.

2.1.1.1 Interior Flush Doors

Provide particleboard core, Type II flush doors conforming to WDMA I.S. 1-A with faces of good grade natural birch. Hardwood veneers shall be rotary cutbook matched.

2.2 ACCESSORIES

2.2.1 Door Louvers

Fabricate from wood and of sizes indicated. Provide louvers with a minimum of 35 percent free air. Equip louvers with sightproof inverted vee slat type. Mount louvers in the door with flush wood moldings.

2.2.2 Door Light Openings

Provide glazed openings with the manufacturer's standard wood moldings. Provide moldings for doors to receive natural finish of the same wood species and color as the wood face veneers.

2.2.3 Additional Hardware Reinforcement

Provide the minimum lock blocks to secure the specified hardware. The measurement of top, bottom, and intermediate rail blocks are a minimum 125 mm 5 inch by full core width. Comply with the manufacturer's labeling requirements for reinforcement blocking, but not mineral material similar to the core.

2.3 FABRICATION

2.3.1 Quality and Construction

Identify the standard on which the construction of the door was based,

identify the standard under which preservative treatment was made, and identify doors having a Type I glue bond.

2.3.2 Preservative Treatment

Treat doors scheduled for restrooms, janitor closets and other possible wet locations with a water-repellent preservative treatment and so marketed at the manufacturer's plant in accordance with WDMA I.S. 4.

2.3.3 Adhesives and Bonds

WDMA I.S. 1-A. Use Type I bond for exterior doors and Type II bond for interior doors. Provide a nonstaining adhesive on doors with a natural finish.

2.3.4 Finishes

2.3.4.1 Factory Finish

Provide doors finished at the factory by the door manufacturer as follows: AWI Qual Stds Section 1500, specification for System No. 4 Conversion varnish alkyd urea or System No. 5 Vinyl catalyzed. The coating is AWI Qual Stds premium, medium rubbed sheen, open grain effect. Use stain when required to produce the finish specified for color. Seal edges, cutouts, trim, and wood accessories, and apply two coats of finish compatible with the door face finish. Touch-up finishes that are scratched or marred, or where exposed fastener holes are filled, in accordance with the door manufacturer's instructions. Match color and sheen of factory finish using materials compatible for field application.

2.3.4.2 Color

Provide door finish colors as selected by the Contracting Officer from the color selection samples.

2.3.5 Water-Resistant Sealer

Provide manufacturer's standard water-resistant sealer compatible with the specified finishes.

PART 3 EXECUTION

3.1 INSTALLATION

Before installation, seal top and bottom edges of doors with the approved water-resistant sealer. Seal cuts made on the job immediately after cutting using approved water-resistant sealer. Fit, trim, and hang doors with a 1/16 inch minimum, 1/8 inch maximum clearance at sides and top, and a 3/16 inch minimum, 1/4 inch maximum clearance over thresholds. Provide 3/8 inch minimum, 7/16 inch maximum clearance at bottom where no threshold occurs. Bevel edges of doors at the rate of 1/8 inch in 2 inch. Door warp shall not exceed1/4 inch when measured in accordance with WDMA I.S. 1-A.

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SECTION 08 41 00

ALUMINUM ENTRANCES AND STOREFRONTS

01/07

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA)

AAMA WSG-1	(1995) Window Selection Guide
AAMA CW-10	(2004) Care and Handling of Architectural Aluminum from Shop to Site
AAMA 1503	(2009) Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
AAMA 2605	(2005) Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
AAMA SFM-1	Aluminum Storefront and Entrance Manual

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A117.1	Safety Standards for the Handicapped

ASTM INTERNATIONAL (ASTM)

ASTM A 36/A 36M	(2008) Standard Specification for Carbon Structural Steel
ASTM A 446	(1991) Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process for Stone Sewer and Drainage Pipe
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 221	(2008) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM E 1300	(2009a) Determining Load Resistance of Glass in Buildings

ASTM E 283	(2004) Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
ASTM E 330	(2002) Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 331	(2000; R 2009) Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
ASTM E 413	(2010) Rating Sound Insulation
ASTM E 90	(2009) Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
ASTM F 1642	(2004; R 2010) Standard Test Method for Glazing and Glazing Systems Subject to Airblast Loadings
ASTM F 2248	(2009) Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 15	(1991) Steel Joist Shop Paint
SSPC Paint 20	(1991) Zinc-Rich Primers (Type I - "Inorganic" and Type II - "Organic")

U.S. DEPARTMENT OF DEFENSE (DOD)

UFC 4-010-01	(2003; Change 1 2007) DoD Minimum Antiterrorism Standards for Buildings

1.2 SUMMARY

This section includes:

a. Aluminum doors and frames

b. Vision glass, glass and insulated metal infill panels

c. Integral air and vapor barrier

d. Perimeter sealant

1.3 SYSTEM DESCRIPTION

Aluminum entrances and storefront system includes tubular aluminum sections with supplementary internal support framing, shop fabricated, factory pre-finished, vision glass and insulated metal panel infill, related flashings, anchorage and attachment devices.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-02 Shop Drawings

ComponentsIndicate system dimensions, framed opening requirements and tolerances, affected related work and expansion and contraction joint location and details.

SD-03 Product Data

ComponentsProvide component dimensions, describe components within assembly,
anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

SD-04 Samples

Components

Submit two samples illustrating pre-finished aluminum surface, glass infill panels, and glazing materials.

SD-05 Design Data

Structural calculations for deflection;

- Design Analysis;

Submit design analysis with calculations showing that the design of each different size and type of aluminum framing and its anchorage to the structure meets the minimum antiterrorism standards required by UFC 4-010-01 "DoD Minimum Antiterrorism Standards for Buildings" and paragraph "Minimum Antiterrorism Performance" below. unless conformance is demonstrated by Standard Airblast Test results. Calculations verifying the structural performance of each framing member proposed for use, under the given loads, shall be prepared and signed by a registered Professional Engineer. The framing components and anchorage devices to the structure, as determined by the design analysis, shall be reflected in the shop drawings.

SD-06 Test Reports

Standard Airblast Test; G

For Minimum Antiterrorism framing members, in lieu of a Design Analysis, results of airblast testing, whether by arena test or shocktube, shall be included in a test report, providing information in accordance with ASTM F 1642, as prepared by the independent testing agency performing the test. The test results shall demonstrate the ability of each opening proposed for use to withstand the airblast loading parameters and achieve the hazard level rating specified in paragraph "Standard Airblast Test Method".

SD-07 Certificates

Components

Certify that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

Perform work in accordance with AAMA SFM-1 and AAMA WSG-1. Conform to requirements of ANSI A117.1.

1.5.1 Design Data Requirements

Submit calculations to substantiate compliance with deflection requirements and Minimum Antiterrorism Performance criteria. A registered Professional Engineer must provide calculations.

Submit design analysis with calculations showing that the design of each aluminum storefront unit and its anchorage to the structure meets the requirements of paragraph "Minimum Antiterrorism Performance Criteria". Calculations verifying the structural performance of each framed opening proposed for use, under the given loads, must be prepared and signed by a registered professional engineer. Reflect the framing components and anchorage devices to the structure, as determined by the design analysis, in the shop drawings.

1.6 QUALIFICATIONS

Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum five years documented experience.

1.7 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 with a wind lead of 130 mph and as measured in accordance with ASTM E 330. Provide Structural calculations for deflection to substantiate compliance with deflection requirements.

b. Uniform Load: A static air design of 40 psf shall be applied in the positive and negative direction in accordance with ASTM E 330. There shall be no deflection in excess of L/175 of the span of any framing member at design load. At structural test load equal to 1.5 times the specified design load, no glass breakage or permanent set in the framing members in excess of 0.2% of their clear spans shall occur.

c. 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.

d. Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at a static air pressure differential of 6.24 psf as measured in accordance with ASTM E 283.

e. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 12 lbf/sq ft.

f. 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.

g. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F 12 hour period without causing detrimental affect to system components.

h. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

i. Thermal Transmittance Test (U-value): When tested in accordance with AAMA 1503, the conductive thermal transmittance (U-value) shall not be more than 0.66 BTU/hr/sf/degrees F.

j. Condensation Resistance Test (CRF): When tested in accordance with AAMA 1503, the condensation resistance factor (CRF) shall not be less than 66 for the frame and 60 for the glass.

k. Sound Transmission Loss: When tested to ASTM E 90 and ASTM E 413, the Sound Transmission Class (STC) shall not be less than 34.

l. Blast Resistance: Aluminum framing system including storefront doors, glazing, anchors and connections, and hardware shall be able to meet the following requirements as designed by a Professional Engineer.

1. ASTM E 1300 "Standard Practice for Determining Load Resistance of Glass in Buildings".

2. ASTM F 2248 "Standard Practice for Specifying on Equivalent 3-second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass".

3. Glazing and Glazing Systems Subjected to Airblast Loadings: The test specimen shall be tested in accordance with ASTM F 1642. The test specimen shall receive a minimum "Low Hazard" rating per ASTM F 1642-04, a "Performance Condition 3b" per GSA and "Low Level of Protection" per UFC 4-010-01.

4. Department of Defense (DoD) Antiterrorism / Force Protection Construction Standards UFC 4-010-01 "United Facilities Criteria (UFC) DoD Minimum Antiterrorism Standards for Buildings" including change 1, dated 22 January 2007, Applicable Level of Protection, Low, Applicable Explosive Weight, II.

a. Frame Member Design:
Steel members may be designed using ultimate yield stresses and aluminum members may be designed based on a 0.2% offset yield strength. Equivalent static design loads for the window, and door members shall be 7 kilopascals (1 lb per square in) applied to the surface of the glazing and frame. Deformations shall not exceed 1/60 of the unsupported member lengths.

b. Glazing Frame Bite:
The glazing shall have a minimum frame bite of 9.5-mm

(3/8-in)for structurally glazed systems and 25-mm (1-in)for window systems that are not structurally glazed.

c. Connection Design:
Equivalent static design loads for connections of the window, or door frame to the surrounding walls or roof, hardware and associated connections, and glazing stop connections shall be 75 kilopascals (10.8 lbs per square inch)for glazing panels with a vision area less than or equal to 1.0 square meters (10.8 square feet) and 30 kilopascals (4.4 lbs per square inch) for glazing panels with a vision greater than 1.0 square meters (10.8 square feet) but less than or equal to 3.0 square meters (32 square feet). Loads shall be applied to the surface of the glazing and frame. Connections and hardware may be designed based on ultimate strength for steel and 0.2% offset yield strength for aluminum.

1.8 ALUMINUM ENTRANCE AND STOREFRONT PERFORMANCE

1.8.1 Minimum Antiterrorism Performance

Framing members shall meet the minimum antiterrorism performance criteria of UFC 4-010-01, as specified in the paragraphs below. Conformance to the performance requirements shall be validated by one of the following methods.

1.8.1.1 Computational Design Analysis Method

Framing members shall be designed to the criteria listed herein. Computational design analysis shall include calculations verifying the structural performance of each window proposed for use, under the given static equivalent loads.

Aluminum framing members shall restrict deflections of edges of glazing they support to L/160 under an equivalent 3-second duration loading of 50 pounds per square foot (psf), where L denotes the length of the glazing supported edge. (L is to be based on edge length of glazing in frame and not on the distance between anchors that fasten frame to the structure.)

The glazing frame bite for the aluminum frames shall be adequate to accept the width of structural silicone sealant or glazing tape as specified in paragraph "Provisions for Glazing" below.

Aluminum frames shall be anchored to the supporting structure with anchors designed to resist forces generated by a 3-second duration load of 100 pounds per square foot (psf) acting on the entire window unit.

1.8.1.2 Alternate Dynamic Design Analysis Method

As an alternative to the static equivalent load design approach described above, aluminum framing members, anchors, and glazing may be designed using a dynamic analysis to prove the framing system will provide performance equivalent to or better than the hazard rating associated with the applicable level of protection for the project.

1.8.1.3 Standard Airblast Test Method

As an alternative to either of the Computational Design Analysis Methods, each Minimum Antiterrorism aluminum framing system opening type shall be

tested for evaluation of hazards generated from airblast loading in accordance with ASTM F 1642 by an independent testing agency regularly engaged in blast testing. For proposed framing systems that are of the same type as the tested system but of different size, the test results may be accepted provided the proposed framing size is within the range from 25 percent smaller to 10 percent larger in area, than the tested framing system size. Proposed framing systems of a size outside this range shall require testing to evaluate their hazard rating. Testing my be by shocktube or arena test. The test shall be performed on the entire proposed framing system, which shall include, but not be limited to, the glazing, its framing system, operating devices, and all anchorage devices. Anchorage of the framing frame or subframe shall replicate the method of installation to be used for the project. The minimum airblast loading parameters for the test shall be as follows: Peak positive pressure of 40 kPa and positive phase impulse of 285 kPa-msec. The hazard rating for the proposed framing systems, as determined by the rating criteria of ASTM F 1642, shall not exceed the "Very Low Hazard" rating (i.e. the "No Break", "No Hazard", "Minimal Hazard" and "Very Low Hazard" ratings are acceptable. "Low Hazard" and "High Hazard" ratings are unacceptable). Results of framing systems previously tested by test protocols other than ASTM F 1642 may be accepted provided the required loading, hazard level rating, and size limitations stated herein are met.

1.9 PRE-INSTALLATION CONFERENCE

Convene two weeks prior to commencing work of this Section

1.10 DELIVERY, STORAGE, AND HANDLING

Handle work of this section in accordance with AAMA CW-10. Protect pre-finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.11 ENVIRONMENTAL REQUIREMENTS

Do not install sealants when ambient temperature is less than 40 degrees F during and 48 hours after installation.

1.12 FIELD MEASUREMENTS

Verify that field measurements are as indicated on shop drawings.

1.13 COORDINATION

Coordinate work under provisions of Section 01 11 00, "Summary of Work." Coordinate the work with installation of air and vapor barrier and components or materials.

1.14 WARRANTY

Provide three year warranty. Include coverage for complete system for failure to meet
specified requirements.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Extruded Aluminum

ASTM B 221; 6063 alloy, T-5 temper, and/or 6063 - T6 alloy and temper

2.1.2 Sheet Aluminum

ASTM B 209; alloy, temper.

2.1.3 Sheet Steel

ASTM A 446; galvanized.

2.1.4 Steel Sections

ASTM A 36/A 36M; shaped to suit mullion sections, and as required to meet blast resistance requirements.

2.1.5 Fasteners

Stainless steel.

2.1.6 Shop and Touch-Up Primer For Steel Components

SSPC Paint 15, Type 1, red oxide.

2.1.7 Touch-Up Primer For Galvanized Steel Surfaces

SSPC Paint 20, zinc rich type.

2.2 COMPONENTS

2.2.1 Frame

2 1/2" x 5" minimum nominal dimension; thermally broken with interior tubular section insulated from exterior; flush glazing stops; drainage holes; internal weep drainage system. Frame dimensions must be capable of meeting "Minimum Antiterrorism Performance."

2.2.2 Doors

1 3/4 inches thick minimum, 5 inch wide top rail, 5 inch wide vertical stiles, 6-1/2 inch wide bottom rail; beveled glazing stops.

2.2.3 Flashings

Aluminum to match mullion sections where exposed.

2.3 GLASS AND GLAZING MATERIALS

As specified in Section 08 81 00, "Glazing." Types as described below:

a. Glass in framing lites: Type 1-5/16 inch thick insulated.
   1. Exterior lite: 1/4" clear tempered and 1/4" clear as indicated.
   2. Interior lite: 1/4" laminated glass with a 0.030-inch PVB

interlayer.

b. Glass in door lites: Type 1-5/16 inch thick insulated.
1. Exterior lite: 1/4" clear tempered
2. Interior lite: 1/4" laminated glass with a 0.030-inch PVB interlayer.

2.4 SEALANT MATERIALS

As specified in Section 07 92 00, "Sealants"

2.5 HARDWARE

Doors 105A

2.5.1 Weatherstripping and Sill Sweep Strip

Manufacturer's standard type to suit application.

2.5.2 Threshold

Extruded aluminum, one piece per door opening, J32130, and meet the requirements for handicapped accessibility.

2.5.3 Hinges

Continuous Geared Hinges, ANSI 156.26, Grade 1.

2.5.4 Push/Pull

Back to back, Off-set pulls, 1 3/16" diameter, 10" center to center, Nylon, White, on each door.

2.5.5 Closer

C72021 with PT4G, and stop feature, on each door.

2.5.6 Security Lock

E0221.

2.6 FABRICATION

2.6.1 Components

Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

2.6.2 Joint and Corner Fitting

Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

2.6.3 Anchors

Prepare components to receive anchor devices. Fabricate anchors.

2.6.4 Fasteners

Arrange fasteners and attachments to conceal from view.

2.6.5 Door Hardware

Prepare components with internal reinforcement for door hardware and door operator hinge hardware.

2.6.6 Framing Members

Reinforce framing members for imposed loads.

2.7 FINISHES

2.7.1 Finish Coatings

Conform to AAMA 2605.

2.7.2 Exterior and Interior Exposed Aluminum Surfaces

AAMA 2605, high-performance finish with total dry film thickness of not less than 1.2 mils.

2.7.3 Concealed Steel Items

Primed with iron oxide paint.

2.7.4 Surfaces In Contact With Cementitious or Dissimilar Materials

Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Site Opening Conditions

Verify site opening conditions.

3.1.2 Dimensions, Tolerances, and Attachment Methods

Verify dimensions, tolerances, and method of attachment with other work.

3.1.3 Wall Openings

Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2 INSTALLATION

3.2.1 Wall System

Install wall system in accordance with manufacturer's instructions and AAMA CW-10, and with anchors which are required to meet blast resistance requirements.

3.2.2 Attachment and Alignment

Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities. Provide alignment attachments and shims to permanently fasten system to building structure. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work. Provide thermal isolation where components penetrate or disrupt building insulation. Install sill flashings. Coordinate attachment and seal of perimeter air and vapor barrier materials. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier. Install flashings and set thresholds in bed of mastic and secure.

3.2.3 Hardware

Install hardware using templates provided. Refer to Section 08 71 00, "Door Hardware" for installation requirements.

3.2.4 Glass

Install glass and infill panels in accordance with Section 08 81 00, "Glazing" to glazing method required to achieve performance criteria

3.2.5 Sealants

Install perimeter sealant to method required to achieve performance criteria. Type backing materials, and installation criteria in accordance with Section 07 92 00, "Sealants."

3.3 TOLERANCES

a. Maximum Variation From Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inches per 10 feet, whichever is less.

b. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

Adjust operating hardware for smooth operation.

3.5 CLEANING

Remove protective material from pre-finished aluminum surfaces. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dire from corners. Wipe surfaces clean. Remove excess sealant by method acceptable to sealant manufacturer.

3.6 PROTECTION OF FINISHED WORK

Protect finished work from damage.

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SECTION 09 30 00

CERAMIC TILE, QUARRY TILE, AND PAVER TILE
08/10

PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A118.10	(2003) Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installations

ASTM INTERNATIONAL (ASTM)

ASTM A 185/A 185M	(2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
ASTM C 1026	(1987; R 2002) Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling
ASTM C 1027	(2009) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
ASTM C 1028	(2007e1) Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
ASTM C 144	(2004) Standard Specification for Aggregate for Masonry Mortar
ASTM C 150/C 150M	(2009) Standard Specification for Portland Cement
ASTM C 206	(2003) Standard Specification for Finishing Hydrated Lime
ASTM C 207	(2006) Standard Specification for Hydrated Lime for Masonry Purposes
ASTM C 241/C 241M	(2009) Standard Specification for Abrasion Resistance of Stone Subjected to Foot Traffic
ASTM C 33/C 33M	(2008) Standard Specification for Concrete Aggregates

ASTM C 373	(1988; R 2006) Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products
ASTM C 482	(2002; R 2009) Bond Strength of Ceramic Tile to Portland Cement
ASTM C 501	(1984; R 2009) Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
ASTM C 648	(2004; R 2009) Breaking Strength of Ceramic Tile
ASTM C 847	(2009) Standard Specification for Metal Lath
ASTM D 226/D 226M	(2009) Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
ASTM D 4068	(2009) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane
ASTM D 968	(2005e1) Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM F 1679	(2004e1) Standard Test Method for Using a Variable Incidence Tribometer

MARBLE INSTITUTE OF AMERICA (MIA)

MIA Design Manual	(2003) Dimension Stone Design Manual

TILE COUNCIL OF NORTH AMERICA (TCNA)

TCA Hdbk	(2010) Handbook for Ceramic Tile Installation

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities

1.2 SYSTEM DESCRIPTION

1.2.1 General Requirements

Close space, in which tile is being set, to traffic and other work. Keep closed until tile is firmly set. Do not walk or work on newly tiled floors without using kneeling boards or equivalent protection of the tiled surface. Keep traffic off horizontal portland cement mortar installations for at least 72 hours. Keep all traffic off epoxy installed floors for at least 40 hours after grouting, and heavy traffic off for at least 7 days, unless otherwise specifically authorized by manufacturer. For materials like Tile, Accessories, and marble Thresholds submit Samples of sufficient

size to show color range, pattern, type and joints.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Tile
Setting-Bed
Mortar, Grout, and Adhesive
Reinforcing Wire Fabric

SD-04 Samples

Tile
Marble Thresholds
Grout

SD-06 Test Reports

TEST OF MEMBRANE WATERPROOFING

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the project site in manufacturer's original unopened containers with seals unbroken and labels and hallmarks intact. Protect materials from weather, and store them under cover in accordance with manufacturer's printed instructions.

1.5 ENVIRONMENTAL REQUIREMENTS

Do not perform ceramic tile work unless the substrate and ambient temperature is at least 50 degrees F and rising. Maintain temperature above 50 degrees F while the work is being performed and for at least 7 days after completion of the work. When temporary heaters are used, ventilate the area to the outside to avoid carbon dioxide damage to new tilework.

1.6 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a 1-year period.

1.7 EXTRA MATERIALS

Supply an extra two percent of each type tile used in clean and marked cartons.

PART 2 PRODUCTS

2.1 TILE

Conform to TCA Hdbk for standard grade tile. Provide grade sealed containers. Mark seals with the marks on the signed master grade certificate. Provide an impact resistant tile with a minimum floor breaking strength for wall tile of 90 pound and for floor tile of 250 pound in accordance with ASTM C 648. The manufacturer will provide a frost resistant rating for tile used in cold climate projects as determined by

ASTM C 1026. Provide a 0.50 maximum percent water absorption in accordance with ASTM C 373. Provide a minimum coefficient of friction of 0.60 wet and dry in accordance with ASTM C 1028. Identify floor tile as Class IV Plus-Extra Heavy Traffic, durability classification as rated by the manufacturer when tested in accordance with ASTM C 1027 for abrasion resistance as related to foot traffic.

2.1.1 Mosaic Tile

Furnish ceramic mosaic tile and trim shall be unglazed natural clay with cushion edges. Provide tile size 2 by 2 inch.

2.1.2 Porcelain Tile

Furnish an unglazed porcelain tile and trim with the color extending uniformly through the body of the tile. Provide a nominal size of 6 by 6 by 5/16 inch thick. Criteria for tile to meet or exceed is as follows: Abrasive wear in accordance with ASTM C 501 and bonding strength in accordance with ASTM C 482. Comply with 36 CFR 1191 for coefficient of friction for interior tiled floors.

2.2 SETTING-BED

Compose the setting-bed of the following materials:

2.2.1 Aggregate for Concrete Fill

Conform to ASTM C 33/C 33M for aggregate fill. Do not exceed one-half the thickness of concrete fill for maximum size of coarse aggregate.

2.2.2 Portland Cement

Conform to ASTM C 150/C 150M for cement, Type I, white for wall mortar and gray for other uses.

2.2.3 Sand

Conform to ASTM C 144 for sand.

2.2.4 Hydrated Lime

Conform to ASTM C 206 for hydrated lime, Type S or ASTM C 207, Type S.

2.2.5 Metal Lath

Conform to ASTM C 847 for flat expanded type metal lath, and weighing a minimum 2.5 pound/square yard.

2.2.6 Reinforcing Wire Fabric

Conform to ASTM A 185/A 185M for wire fabric. Provide 2 by 2 inch mesh, 16/16 wire or 1-1/2 by 2 inch mesh, 16/13 wire.

2.3 WATER

Provide potable water.

2.4 MORTAR, GROUT, AND ADHESIVE

2.4.1 Dry-Set Portland Cement Mortar

TCA Hdbk. Zero-volatile organic compound (VOC) content.

2.4.2 Latex-Portland Cement Mortar

TCA Hdbk. Zero-VOC content.

2.4.3 Ceramic Tile Grout

TCA Hdbk; petroleum-free and plastic-free sand portland cement grout dry-set grout, latex-portland cement grout or commercial portland cement grout. Maximum VOC content of 150 grams/liter.

2.4.4 Sealants

Comply with applicable regulations regarding toxic and hazardous materials and as specified.

2.4.5 Cementitious Backer Board

Provide cementitious backer units, for use as tile substrate, in accordance with TCA Hdbk. Furnish 1/2 inch thick cementitious backer units.

2.5 MARBLE THRESHOLDS

Provide marble thresholds of size required by drawings or conditions. Categorize marble Group A as classified by MIA Design Manual. Provide a fine sand-rubbed finish marble with gray in color as approved by the Contracting Officer. Provide minimum 12.0 marble abrasion when tested in accordance with ASTM C 241/C 241M.

2.6 PERMANENT PROTECTIVE BARRIER COATING

Provide a permanent protective barrier made from silica (glass) with the following characteristics:

a. Applied in liquid form at room temperature

b. Forms a permanent film.

c. Inorganic and not hurt by UV, Weather, most acids and other cleaning chemicals.

d. Used on concrete and painted concrete for additional wear, water proofing and anti-graffiti properties

e. A process designed to re-color grout and includes permanent protection.

Coating shall meet or exceed the following mechanical characteristics:

Test Results

Coefficient of Friction Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1028	Ceramic Tile- 4" Glazed (uncoated-dry)	0.84	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (coated-dry)	0.99	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (uncoated-wet)	0.42	Tile Council of America
ASTM C 1028	Ceramic Tile- 4" Glazed (coated-wet)	1.31	Tile Council of America

Result 15% higher coefficient of Friction dry and 68% higher wet

Visible Abrasion Resistance Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1027	Ceramic Tile- 4" Glazed	2100	Tile Council of America
ASTM C 1027	Ceramic Tile- 4" Glazed	6000	Tile Council of America

Result 65% increase in Visible Abrasion resistance

Moh's Scratch Hardness Tile and Grout

Test Method	Sample Type	Result	Test Facility
ASTM C 1027	Ceramic Tile- 4" Glazed (uncoated)	6	Tile Council of America
ASTM C 1027	Ceramic Tile- 4" Glazed (coated)	6	Tile Council of America

Result 0% diminished surface hardness

Coefficient of Friction Concrete

Test Method	Sample Type	Result	Test Facility
ASTM F 1679	Concrete Brushed Finish (uncoated-dry)	0.91	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed Finish	0.99	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed Finish	0.95	High Safety Consulting Services, Ltd.
ASTM F 1679	Concrete Brushed	0.96	High Safety Consulting

Result 0% diminished coefficient of Friction dry and wet

Visible Abrasion Resistance Concrete

Test Method	Sample Type	Result	Test Facility
ASTM D 968	Coated Panel	22.5 1/mil	Applied Technical Services
ASTM C 1027	Acrylic Paint	1 1/mil	Industry Standard
ASTM C 1027	Industrial Flooring Epoxy	12 1/mil	Industry Standard
ASTM C 1027	Aliphatic Urethane	18 1/mil	Industry Standard

Result 22.5 times more resistant to sand abrasion than conventional paint

2.6.1 Warranty

A. Manufacturer's Warranty: Manufacturer shall provide standard product warranty executed by authorized company official. Term of warranty shall be 3 years from Date of Substantial Completion.

B. Applicator's Warranty: Applicator shall warrant the coating installation against defects caused by faulty workmanship or materials for a period of 3 years from Date of Substantial Completion. The warranty will cover the surfaces treated and will bind the applicator to repair, at his expense, any and all failures of the treated surfaces which are not due to structural weaknesses or other causes beyond applicator's control such as fire, earthquake, tornado and hurricane. The warranty shall read as follows:

1. Warranty: The applicator warrants that, upon completion of the work, surfaces treated with a permanent protective barrier coating will be and will remain free from failure resulting from defective workmanship or materials for a period of 3 years from Date of Substantial Completion. In the event that failure occurs within the warranty period from such causes, the applicator shall, at his sole expense, repair, replace or otherwise correct such defective workmanship or materials. Applicator shall not be liable for consequential damages and applicator's liability shall be limited to repair, replacement or correcting of defective workmanship or materials. Applicator shall have no responsibility with respect to failure or other defects caused by structural failure or movement of the structure, or any other causes beyond Applicator's control.

2.7 MEMBRANE MATERIALS

Conform to ASTM D 226/D 226M, Type 1 for 15 pound waterproofing membrane, asphalt-saturated building felt. Conform to ASTM D 4068 4 mil for polyethylene film.

PART 3 EXECUTION

3.1 PREPARATORY WORK AND WORKMANSHIP

Inspect surface to receive tile in conformance to the requirements of TCA Hdbk for surface conditions for the type setting bed specified and for workmanship. Provide variations of tiled surfaces that fall within maximum values shown below:

TYPE	WALLS	FLOORS
Dry-Set Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Organic Adhesives	1/8 inch in 8 ft.	1/16 inch in 3 ft.
Latex Portland Cement Mortar	1/8 inch in 8 ft.	1/8 inch in 10 ft.
Epoxy	1/8 inch in 8 ft.	1/8 inch in 10 ft.

3.2 GENERAL INSTALLATION REQUIREMENTS

Do not start tile work until roughing in for mechanical and electrical work has been completed and tested, and built-in items requiring membrane waterproofing have been installed and tested. Do not start floor tile installation in spaces requiring wall tile until after wall tile has been installed. Apply tile in colors and patterns indicated in the area shown on the drawings. Install tile with the respective surfaces in true even planes to the elevations and grades shown. Provide special shapes as required for sills, jambs, recesses, offsets, external corners, and other conditions to provide a complete and neatly finished installation. Solidly back tile bases and coves with mortar.

3.3 INSTALLATION OF WALL TILE

Install wall tile in accordance with the TCA Hdbk, method W202 at concrete masonry walls, W244 at metal stud walls and B415.

3.3.1 Workable or Cured Mortar Bed

Install tile over workable mortar bed or a cured mortar bed at the option of the Contractor. Install a 4 mil polyethylene membrane, metal lath, and scratch coat. Conform to TCA Hdbk for workable mortar bed, materials, and installation of tile. Conform to TCA Hdbk for cured mortar bed and materials.

3.3.2 Dry-Set Mortar and Latex-Portland Cement Mortar

Use Dry-set or Latex-Portland Cement to install tile in accordance with TCA Hdbk. Use Latex Portland Cement when installing porcelain ceramic tile.

3.4 INSTALLATION OF FLOOR TILE

Install floor tile in toilets in accordance with TCA Hdbk method F122. Install floor tile in the acessible showers in accordance with TCA Hdbk method F122. Install floor tile in the non-acessible shower in accordance with TCA Hdbk method F121. Install shower receptors in accordance with TCA Hdbk method B415.

3.4.1 Workable or Cured Mortar Bed

Install floor tile over a workable mortar bed or a cured mortar bed at the option of the Contractor. Conform to TCA Hdbk for workable mortar bed materials and installation. Conform to TCA Hdbk for cured mortar bed materials and installation. Provide minimum 1/4 inch to maximum 3/8 inch joints in uniformed width.

3.4.2 Dry-Set and Latex-Portland Cement

Use dry-set or Latex-Portland cement mortar to install tile directly over properly cured, plane, clean concrete slabs in accordance with TCA Hdbk.

Use Latex Portland cement when installing porcelain ceramic tile.

3.4.3 Ceramic Tile Grout

Prepare and install ceramic tile grout in accordance with TCA Hdbk.

3.4.4 Waterproofing

Provide waterproof membrane as required by the Handbook for Ceramic Tile Installation and ANSI A118.10

3.4.5 Concrete Fill

Provide a 3500 psi concrete fill mix to dry as consistency as practicable. Compose concrete fill by volume of 1 part Portland cement to 3 parts fine aggregate to 4 parts coarse aggregate, and mix with water to as dry a consistency as practicable. Spread, tamp, and screed concrete fill to a true plane, and pitch to drains or levels as shown. Thoroughly damp concrete fill before applying setting-bed material. Reinforce concrete fill with one layer of reinforcement, with the uncut edges lapped the width of one mesh and the cut ends and edges lapped a minimum 2 inch. Tie laps together with 18 gauge wire every 10 inch along the finished edges and every 6 inch along the cut ends and edges. Provide reinforcement with support and secure in the centers of concrete fills. Provide a continuous mesh; except where expansion joints occur, cut mesh and discontinue across such joints. Provide reinforced concrete fill under the setting-bed where the distance between the under-floor surface and the finished tiles floor surface is a minimum 2 inch, and of the same thickness that the mortar setting-bed over the concrete fill with the thickness required in the specified TCA Hdbk method.

3.5 INSTALLATION OF MARBLE THRESHOLDS

Install thresholds where indicated, in a manner similar to that of the ceramic tile floor. Provide thresholds full width of the opening. Install head joints at ends not exceeding 1/4 inch in width and grouted full.

3.6 TEST OF MEMBRANE WATERPROOFING

Prior to concealment, plug the drain and cover membrane waterproofing on horizontal surfaces over finished spaces with 4 inches of ponded water for 24 hours to test watertightness. Make careful measurement of the water level at the beginning and end of the 24-hour period. If water level falls, drain the water, and thoroughly dry and inspect the waterproofing membrane. Make repairs or replacement, as directed, and repeat test. The test results shall be presented to the Contracting Officer before work is performed which conceals membrane waterproofing for each shower.

3.7 EXPANSION JOINTS

Form and seal joints as specified in Section 07 92 00 JOINT SEALANTS.

3.7.1 Walls

Provide expansion joints at control joints in backing material. Wherever backing material changes, install an expansion joint to separate the different materials.

3.7.2 Floors

Provide expansion joints over construction joints, control joints, and expansion joints in concrete slabs. Provide expansion joints where tile abuts restraining surfaces such as perimeter walls, curbs and columns and at intervals of 24 to 36 feet each way in large interior floor areas and 12 to 16 feet each way in large exterior areas or areas exposed to direct sunlight or moisture. Extend expansion joints through setting-beds and fill.

3.8 PERMANENT PROTECTIVE BARRIER COATING

A. Apply coatings by brush, roller, spray or other applicators according to coating manufacturer's written instructions. Use brushes or rollers only for exterior coating and where the use of other applicators is not practical.

B. Maintain uniformity of floor coating, and install continuously until reaching a point where the wet edge is at the edge of the application area

C. Transparent (Clear) Finish: Use single coat to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, or other surface imperfections.

3.8.1 Curing

Drying and Cure Time at 80° F

Dry to Touch	4-6 hours
Hard Dry (foot use)	8-10 hours
Full Cure	24 hours

3.8.2 Protection

A. Do not allow foot traffic for 12 hours.
B. Do not clean for 24 hours.

3.8.3 Cleaning

Tile and Grout- Neutral, rinse-less cleaning solution, agitate with soft bristle brush, extract, rinse extract, dry with floor fans.

3.9 CLEANING AND PROTECTING

Upon completion, thoroughly clean tile surfaces in accordance with manufacturer's approved cleaning instructions. Do not use acid for cleaning glazed tile. Clean floor tile with resinous grout or with factory mixed grout in accordance with printed instructions of the grout manufacturer. After the grout has set, provide a protective coat of a noncorrosive soap or other approved method of protection for tile wall surfaces. Cover tiled floor areas with building paper before foot traffic is permitted over the finished tile floors. Provide board walkways on tiled floors that are to be continuously used as passageways by workmen. Replace damaged or defective tiles.

3.10 WASTE MANAGEMENT

Separate waste, including metal and cardboard, in accordance with the Waste

Management Plan and recycle. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas. Close and seal tightly partly used sealant and adhesive containers and store in protected, well-ventilated, fire-safe area at moderate temperature. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in designated containers and areas and dispose of properly.

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SECTION 09 65 00

RESILIENT FLOORING
08/10

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM D 4078	(2002; R 2008) Water Emulsion Floor Polish
ASTM E 648	(2009a) Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
ASTM F 1066	(2004) Standard Specification for Vinyl Composition Floor Tile
ASTM F 1482	(2004; R 2009e1) Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
ASTM F 1861	(2008) Resilient Wall Base
ASTM F 1869	(2010) Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
ASTM F 2170	(2009) Determining Relative Humidity in Concrete Floor Slabs in situ Probes
ASTM F 710	(2008) Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

GREEN SEAL (GS)

GS-36	(2000) Commercial Adhesives

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD)

SCAQMD Rule 1168	(1989; R 2005) Adhesive and Sealant Applications

1.2 SYSTEM DESCRIPTION

1.2.1 Fire Resistance Requirements

Provide a minimum average critical radiant flux of 0.45 watts per square centimeter for flooring in corridors and exits when tested in accordance with ASTM E 648.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Resilient Flooring and Accessories
Adhesives
Vinyl Composition Tile

Wall Base

SD-04 Samples

Resilient Flooring and Accessories

SD-06 Test Reports

Moisture, Alkalinity and Bond Tests

SD-08 Manufacturer's Instructions

Surface Preparation
Installation

SD-10 Operation and Maintenance Data

Resilient Flooring and Accessories

SD-11 Closeout Submittals

Resilient Flooring and Accessories
Adhesives

1.4 DELIVERY, STORAGE, AND HANDLING

Deliver materials to the building site in original unopened containers bearing the manufacturer's name, style name, pattern color name and number, production run, project identification, and handling instructions. Store materials in a clean, dry, secure, and well-ventilated area free from strong contaminant sources and residues with ambient air temperature maintained above 68 degrees F and below 85 degrees F, stacked according to manufacturer's recommendations. Remove resilient flooring products from packaging to allow ventilation prior to installation. Protect materials from the direct flow of heat from hot-air registers, radiators and other heating fixtures and appliances. Observe ventilation and safety procedures specified in the MSDS. Do not store rubber surface products with materials that have a high capacity to adsorb volatile organic compound (VOC) emissions. Do not store exposed rubber surface materials in occupied spaces.

1.5 ENVIRONMENTAL REQUIREMENTS

Maintain areas to receive resilient flooring at a temperature above 68 degrees F and below 85 degrees F for 3 days before application, during application and 2 days after application, unless otherwise directed by the

flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 55 degrees F thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

1.6 SCHEDULING

Schedule resilient flooring application after the completion of other work which would damage the finished surface of the flooring.

1.7 WARRANTY

Provide manufacturer's standard performance guarantees or warranties that extend beyond a one year period.

PART 2 PRODUCTS

2.1 VINYL COMPOSITION TILE

Conform to ASTM F 1066 Class 2, (through pattern tile), Composition 1, asbestos-free, 12 inch square and 1/8 inch thick. Provide color and pattern uniformly distributed throughout the thickness of the tile.

2.2 WALL BASE

Conform to ASTM F 1861, Type TS (vulcanized thermoset rubber) Style A (straight - installed with carpet) and Style B (coved - installed with resilient flooring). Provide 4 inch high and a minimum 1/8 inch thick wall base. Provide job formed corners in matching height, shape, and color. Rubber shall contain a minimum of 90 percent post-consumer recycled material.

2.3 MOULDING

Provide tapered mouldings of rubber and types as recommended by flooring manufacturer for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 1/4 inch. Provide bevel change in level between 1/4 and 1/2 inch with a slope no greater than 1:2.

2.4 ADHESIVES

Provide adhesives for flooring, base and accessories as recommended by the manufacturer and comply with local indoor air quality standards. Interior adhesives shall meet the requirements of LEED low emitting materials credit. VOC content shall be less than the current VOC content limits of GS-36 and SCAQMD Rule 1168. Submit manufacturer's descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics. Provide Material Safety Data Sheets (MSDS) for all primers and adhesives to the Contracting Officer. Highlight VOC emissions.

2.5 SURFACE PREPARATION MATERIALS

Provide surface preparation materials, such as floor crack fillers as recommended by the flooring manufacturer for the subfloor conditions.

2.6 POLISH/FINISH

Provide polish finish as recommended by the manufacturer and conform to

ASTM D 4078 for polish.

2.7 CAULKING AND SEALANTS

Provide caulking and sealants in accordance with Section 07 92 00 JOINT SEALANTS.

2.8 MANUFACTURER'S COLOR, PATTERN AND TEXTURE

Provide color, pattern and texture for resilient flooring and accessories selected from manufacturer's standard colors. Color listed is not intended to limit the selection of equal colors from other manufacturers. Provide flooring in any one continuous area or replacement of damaged flooring in continuous area from same production run with same shade and pattern. Submit manufacturer's descriptive data and three samples of each indicated color and type of flooring, base, mouldings, and accessories sized a minimum 2-1/2 by 4 inch. Submit Data Package 1 in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 3 EXECUTION

3.1 EXAMINATION

Examine and verify that site conditions are in agreement with the design package. Report all conditions that will prevent a proper installation. Do not take any corrective action without written permission from the Government. Work will proceed only when conditions have been corrected and accepted by the installer. Submit manufacturer's printed installation instructions for all flooring materials and accessories, including preparation of substrate, seaming techniques, and recommended adhesives.

3.2 SURFACE PREPARATION

Provide a smooth, true, level plane for surface preparation of the flooring, except where indicated as sloped. Floor to be flat to within 3/16 inch in 10 feet. Prepare subfloor in accordance with flooring manufacturer's recommended instructions. Prepare the surfaces of lightweight concrete slabs (as defined by the flooring manufacturer) as recommended by the flooring manufacturer. Comply with ASTM F 710 for concrete subfloor preparation. Floor fills or toppings may be required as recommended by the flooring manufacturer. Install underlayments, when required by the flooring manufacturer, in accordance with manufacturer's recommended printed installation instructions. Comply with ASTM F 1482 for panel type underlayments. Before any work under this section is begun, correct all defects such as rough or scaling concrete, chalk and dust, cracks, low spots, high spots, and uneven surfaces. Repair all damaged portions of concrete slabs as recommended by the flooring manufacturer. Remove concrete curing and sealer compounds from the slabs, other than the type that does not adversely affect adhesion. Remove paint, varnish, oils, release agents, sealers, waxes, and adhesives, as required by the flooring product in accordance with manufacturer's printed installation instructions.

3.3 MOISTURE, ALKALINITY AND BOND TESTS

Determine the suitability of the concrete subfloor for receiving the resilient flooring with regard to moisture content and pH level by moisture and alkalinity tests. Conduct moisture testing in accordance with ASTM F 1869 or ASTM F 2170, unless otherwise recommended by the flooring manufacturer. Conduct alkalinity testing as recommended by the flooring

manufacturer. Determine the compatibility of the resilient flooring adhesives to the concrete floors by a bond test in accordance with the flooring manufacturer's recommendations. Submit copy of test reports for moisture and alkalinity content of concrete slab, and bond test stating date of test, person conducting the test, and the area tested.

3.4 PLACING VINYL COMPOSITION TILES

Install tile flooring and accessories in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's directions. Keep tile lines and joints square, symmetrical, tight, and even. Keep each floor in true, level plane, except where slope is indicated. Vary edge width as necessary to maintain full-size tiles in the field, no edge tile to be less than one-half the field tile size, except where irregular shaped rooms make it impossible. Cut flooring to fit around all permanent fixtures, built-in furniture and cabinets, pipes, and outlets. Cut, fit, and scribe edge tile to walls and partitions after field flooring has been applied.

3.5 PLACING MOULDING

Provide moulding where flooring termination is higher than the adjacent finished flooring and at transitions between different flooring materials. When required, locate moulding under door centerline. Moulding is not required at doorways where thresholds are provided. Secure moulding with adhesive as recommended by the manufacturer. Prepare and apply adhesives in accordance with manufacturer's printed directions.

3.6 PLACING WALL BASE

Install wall base in accordance with manufacturer's printed installation instructions. Prepare and apply adhesives in accordance with manufacturer's printed directions. Tighten base joints and make even with adjacent resilient flooring. Fill voids along the top edge of base at masonry walls with caulk. Roll entire vertical surface of base with hand roller, and press toe of base with a straight piece of wood to ensure proper alignment. Avoid excess adhesive in corners.

3.7 CLEANING

Immediately upon completion of installation of flooring in a room or an area, dry/clean the flooring and adjacent surfaces to remove all surplus adhesive. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions. No sooner than 5 days after installation, wash flooring with a nonalkaline cleaning solution, rinse thoroughly with clear cold water, and, except for rubber flooring and stair treads, risers and stringers, vinyl and other flooring not requiring polish finish by manufacturer, apply the number of coats of polish in accordance with manufacturer's written instructions. Clean and maintain all other flooring as recommended by the manufacturer.

3.8 WASTE MANAGEMENT

Separate offcuts and waste materials and reuse or recycle in accordance with the Waste Management Plan, keeping sheet materials larger than 2 square feet and tiles larger than 1/2 tiles separate for reuse. Identify manufacturer's policy for collection or return of construction scrap, unused material, demolition scrap, and/or packaging material. Place materials defined as hazardous or toxic waste in designated containers and

dispose of properly. Close and seal tightly partly used sealant and adhesive containers and store protected in a well ventilated fire-safe area at moderate temperature.

3.9 PROTECTION

From the time of installation until acceptance, protect flooring from damage as recommended by the flooring manufacturer. Remove and replace flooring which becomes damaged, loose, broken, or curled and wall base which is not tight to wall or securely adhered.

-- End of Section --

SECTION 10 21 13

TOILET COMPARTMENTS
01/07

PART 1 GENERAL

1.1 REFERENCES

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

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(2003; Reaffirmed 2009) Designation System for Aluminum Finishes

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2009) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 385/A 385M	(2009) Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
ASTM A 653/A 653M	(2009a) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM D 1972	(1997; R 2005) Standard Practice for Generic Marking of Plastic Products
ASTM D 6386	(2010) Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

INTERNATIONAL CODE COUNCIL (ICC)

ICC/ANSI A117.1	(2003; Errata 2007) Accessible and Usable Buildings and Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

CID A-A-60003	(Basic) Partitions, Toilet, Complete

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

36 CFR 1191	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and

1.2 SYSTEM DESCRIPTION

Provide a complete and usable toilet partition system, including toilet enclosures, system of panels, hardware, and support components. Furnish the partition system from a single manufacturer, with a standard product as shown in the most recent catalog data. Submit Fabrication Drawings for metal toilet partitions consisting of fabrication and assembly details to be performed in the factory. Submit manufacturer's Cleaning and Maintenance Instructions with Fabrication Drawings for review.

1.2.1 Plastic Identification

Verify that plastic products to be incorporated into the project are labeled in accordance with ASTM D 1972. Where products are not labeled, provide product data indicating polymeric information in the Operation and Maintenance Manual.

a. Type 1: Polyethylene Terephthalate (PET, PETE).

b. Type 2: High Density Polyethylene (HDPE).

c. Type 3: Vinyl (Polyvinyl Chloride or PVC).

d. Type 4: Low Density Polyethylene (LDPE).

e. Type 5: Polypropylene (PP).

f. Type 6: Polystyrene (PS).

g. Type 7: Other. Use of this code indicates that the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication Drawings
Installation Drawings

Drawings showing plans, elevations, details of construction, hardware, reinforcing, fittings, mountings, and anchorings for metal partitions. Installation drawings as specified.

SD-03 Product Data

Toilet Partition System
Cleaning and Maintenance Instructions
Colors And Finishes
Galvanized Steel Sheet
Sound Deadening Cores
Partition Panels and Doors
Anchoring Devices and Fasteners

Hardware and Fittings
Brackets
Door Hardware
Floor-Anchored Partitions
Overhead-Braced Partitions

Manufacturer's technical data and catalog cuts including installation and cleaning instructions.

Toilet Enclosures

SD-04 Samples

Colors and Finishes
Manufacturer's standard color charts and color samples.
Partition Panels

Three samples showing a finished edge on two adjacent sides and core construction, each not less than 12-inch square

Hardware and Fittings
Anchoring Devices and Fasteners

Three samples of each item. Approved hardware samples may be installed in the work if properly identified.

SD-07 Certificates

Certification

Documentation of product quality, as specified.

SD-10 Operation and Maintenance Data

Waste Management
Plastic Identification

When not labeled, identify types in Operation and Maintenance Manual.

1.4 REGULATORY REQUIREMENTS

Conform to ICC/ANSI A117.1 code for access for the handicapped operation of toilet compartment door and hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

Deliver materials in the manufacturer's original unopened packages with the brand, item identification, and project reference clearly marked. Store components in a dry location that is adequately ventilated; free from dust, water, other contaminants, and damage during delivery, storage, and construction.

1.6 WARRANTY

Provide Certification or warranties that metal toilet partitions will be free of defects in materials, fabrication, finish, and installation and will remain so for a period of not less than 15 years after completion.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Galvanized Steel Sheet

Provide galvanized steel sheet cold-rolled, stretcher-level, commercial quality material, conforming to ASTM A 653/A 653M. Conform surface preparation of material for painting to ASTM D 6386, Method A.

2.1.2 Sound-Deadening Cores

Provide sound deadening consisting of treated kraft paper honeycomb cores with a cell size of not more than 1 inch. Resin-material content shall weigh not less than 11 percent of the finished core weight. Expanded cores shall be faced on both sides with kraft paper.

2.1.3 Anchoring Devices and Fasteners

Provide steel anchoring devices and fasteners hot-dipped galvanized after fabrication, in conformance with ASTM A 385/A 385M and ASTM A 123/A 123M. Conceal all galvanized anchoring devices.

2.1.4 Brackets

Wall brackets shall be two-ear panel brackets, T-style, 1-inch stock. Provide stirrup style panel-to-pilaster brackets.

2.1.5 Hardware and Fittings

2.1.5.1 General Requirements

Conform hardware for the toilet partition system to CID A-A-60003 for the specified type and style of partitions. Provide hardware finish highly resistant to alkalis, urine, and other common toilet room acids. Comply latching devices and hinges for handicap compartments with 36 CFR 1191; provide stainless steel devices and hinges with door latches that operate without either tight grasping or twisting of the wrist of the operator.

a. Corrosion-resistant steel shall conform to ASTM A 167, Type 304.

2.1.5.2 Finishes

a. Corrosion-resistant steel shall have a No. 4 finish.

b. Exposed fasteners shall match the hardware and fittings.

2.1.6 Door Hardware

2.1.6.1 Hinges

Hinges shall be adjustable to hold in-swinging doors open at any angle up to 90 degrees and outswinging doors to 10 degrees. Provide self-lubricating hinges with the indicated swing. Hinges shall be the cutout-insert type and have the following type of return movement:

a. Gravity return movement

2.1.6.2 Latch and Pull

Latch and pull shall be a combination rubber-faced door strike and keeper equipped with emergency access.

2.1.6.3 Coat Hooks

Coat hooks shall be combination units with hooks and rubber tipped pins.

2.2 PARTITION PANELS AND DOORS

Provide partition panels and doors not less than 1 inch thick with face sheets not less than 0.0396 inch thick.

2.2.1 Toilet Enclosures

Conform toilet enclosures to CID A-A-60003, Type I, Style C, overhead braced. Furnish width, length, and height of toilet enclosures as shown. Provide a width of 1 inch. Finish surface of panels shall be solid polyethylene, Finish 5; water resistant; graffiti resistant; non-absorbent; 1/4 inch radius beveled edges. This item may contain post-consumer or post-industrial recycled content. Reinforce panels indicated to receive toilet paper holders or grab bars for mounting of the items required. Provide grab bars to withstand a bending stress, shear stress, shear force, and a tensile force induced by 250 lbf. Grab bars shall not rotate within their fittings.

2.3 FLOOR-ANCHORED PARTITIONS

Pilasters shall be not less than 1-1/4 inch thick with face sheets not less than 0.0635 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a steel bar not less than 1/2 by 7/8 inch welded to the reinforced face sheets and having not less than two 3/8 inch round anchorage devices for securing to the floor slab. Provide anchorage devices complete with threaded rods, expansion shields, lock washers, and leveling-adjustment nuts. Trim piece at the floor shall be 3 inch high and fabricated from not less than 0.030 inch thick corrosion-resistant steel.

2.4 OVERHEAD-BRACED PARTITIONS

Pilasters shall be not less than 1-1/4 inch thick with face sheets not less than 0.0393 inch thick. Provide anchoring device at the bottom of the pilaster consisting of a channel-shaped floor stirrup fabricated from not less than 0.0635 inch thick material and a leveling bolt. Secure the stirrup to the pilaster with not less than a 3/16 inch bolt and nut after the pilaster is leveled. Secure the stirrup to the floor with not less than two lead expansion shields and sheetmetal screws. Fabricate overhead brace from a continuous extruded aluminum tube not less than 1 inch wide by 1-1/2 inch high, 0.125-inch wall thickness. Finish shall be AA-C22A31 in accordance with AA DAF-45. Set and secure brace into the top of each pilaster. Fabricate 3 inch high trim piece at the floor from not less than 0.030 inch thick corrosion-resistant steel.

2.5 PILASTER SHOES

Provide shoes at pilasters to conceal floor-mounted anchorage. Pilaster shoes shall be stainless steel. Height shall be 3 inches.

2.6 HARDWARE

Hardware for the toilet partition system shall conform to CID A-A-60003 for the specified type and style of partitions. Hardware shall be pre-drilled by manufacturer. Hardware finish shall be highly resistant to alkalis, urine, and other common toilet room acids. Hardware shall include: chrome plated non ferrous cast pivot hinges, gravity type, adjustable for door close positioning; nylon bearings; black anodized aluminum door latch; door strike and keeper with rubber bumper; and cast alloy chrome plated coat hook and bumper. Latching devices and hinges for handicap compartments shall comply with 36 CFR 1191 and shall be stainless steel door latches that operate without either tight grasping or twisting of the wrist of the operator. Screws and bolts shall be stainless steel, tamper proof type. Wall mounting brackets shall be continuous, full height, stainless steel, in accordance with toilet compartment manufacturer's instructions. Floor-mounted anchorage shall consist of corrosion-resistant anchoring assemblies with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor.

2.7 COLORS AND FINISHES

2.7.1 Colors

Provide manufacturer's standard color charts for color of finishes for toilet partition system components.

2.7.2 Finishes No. 5

Provide solid plastic fabricated of polymer resins (polyethylene) formed under high pressure rendering a single component section not less than one inch thick. Colors shall extend throughout the panel thickness. Provide exposed finish surfaces: smooth, waterproof, non-absorbent, and resistant to staining and marking with pens, pencils, or other writing devices. Solid plastic partitions shall not show any sign of deterioration when immersed in the following chemicals and maintained at a temperature of 80 degrees F for a minimum of 30 days:

a.	Acetic Acid (80 percent)	Hydrochloric Acid (40 percent)
b.	Acetone	Hydrogen Peroxide (30 percent)
c.	Ammonia (liquid)	Isopropyl Alcohol
d.	Ammonia Phosphate	Lactic Acid (25 percent)
e.	Bleach (12 percent)	Lime Sulfur
f.	Borax	Nicotine
g.	Brine	Potassium Bromide
h.	Caustic Soda	Soaps
i.	Chlorine Water	Sodium Bicarbonate
j.	Citric Acid	Trisodium Phosphate
k.	Copper Chloride	Urea; Urine
l.	Core Oils	Vinegar

PART 3 EXECUTION

3.1 PREPARATION

Take field measurements prior to the preparation of drawing and fabrication to ensure proper fits. Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive work. Verify correct spacing of plumbing fixtures. Verify correct location of built in framing, anchorage, and bracing. Report in writing to Contracting

Officer prevailing conditions that will adversely affect satisfactory execution of the work of this section. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

Install partitions rigid, straight, plumb, and level, with the panels centered between the fixtures. Provide a panel clearance of not more than 1/2 inch and secure the panels to walls and pilasters with not less than two wall brackets attached near the top and bottom of the panel. Locate wall brackets so that holes for wall bolts occur in masonry or tile joints. Secure Panels to pilasters with brackets matching the wall brackets. Provide for adjustment due to minor floor variations. Locate head rail joints at pilaster center lines. Install adjacent components for consistency of line and plane. Equip each door with hinges, one door latch, and one coat hook and bumper. Align hardware to uniform clearance at vertical edges of doors.

a. Secure panels to hollow plastered walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Toggle bolts shall have a load-carrying strength of not less than 600 pounds per anchor.

b. Secure panels to ceramic tile on hollow plastered walls or hollow concrete-masonry walls with toggle bolts using not less than 1/4-20 screws of the length required for the wall thickness. Toggle bolts shall have a load-carrying strength of not less than 600 pounds per anchor.

c. Secure panels to solid masonry or concrete with lead or brass expansion shields designed for use with not less than 1/4-20 screws, with a shield length of not less than 1-1/2 inch. Expansion shields shall have a load-carrying strength of not less than 600 pounds per anchor.

d. Submit Installation Drawings for metal toilet partitions showing plans, elevations, details of construction, hardware, reinforcing and blocking, fittings, mountings and escutcheons. Indicate on drawings the type of partition, location, mounting height, cutouts, and reinforcement required for toilet-room accessories.

3.3 FLOOR-ANCHORED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Level tops of doors with tops of pilasters when doors are in a closed position. Expansion shields shall have a minimum 2-inch penetration into the concrete slab.

3.4 OVERHEAD-BRACED PARTITIONS

Secure pilasters to the floor with the anchorage device specified. Make all leveling devices readily accessible for leveling, plumbing, and tightening the installation. Secure overhead brace to the pilaster face with not less than two fasteners per face. Expansion shields shall have a minimum 2-inch penetration into the concrete slab. Make tops of doors parallel with the overhead brace when doors are in a closed position.

3.5 FINAL ADJUSTMENT

After completion of the installation, make final adjustments to the pilaster-leveling devices, door hardware, and other working parts of the partition assembly. Doors shall have a uniform vertical edge clearance of approximately 3/16 inch and shall rest open at approximately 30 degrees when unlatched.

3.6 CLEANING

Clean all surfaces of the work, and adjacent surfaces soiled as a result of the work, in an approved manner compliant with the manufacturer's recommended cleaning and protection from damage procedures until accepted. Remove all equipment, tools, surplus materials, and work debris from the site.

3.7 WASTE MANAGEMENT

Identify manufacturer's policy for collection or return of construction scrap, demolition scrap, unused material and packaging material. Institute demolition and construction waste separation and recycling to take advantage of manufacturer's programs. When such a service is not available, seek local recyclers to reclaim the materials.

-- End of Section --

SECTION 23 07 00

INSULATION OF MECHANICAL SYSTEMS

06/09

PART 1 GENERAL

1.1 REFERENCES

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

ASTM INTERNATIONAL (ASTM)

ASTM A 167	(1999) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
ASTM A 240/A 240M	(1996) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM B 209	(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM C 177	(1985; R 1997) Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
ASTM C 195	(1995) Mineral Fiber Thermal Insulating Cement
ASTM C 533	(1995) Calcium Silicate Block and Pipe Thermal Insulation
ASTM C 534	(1994) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
ASTM C 547	(1995) Mineral Fiber Preformed Pipe Insulation
ASTM C 552	(1991) Cellular Glass Thermal Insulation
ASTM C 553	(1992) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM C 591	(2009) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
ASTM C 592	(1980) Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

ASTM C 612	(1993) Mineral Fiber Block and Board Thermal Insulation
ASTM C 916	(1985; R 1990) Adhesives for Duct Thermal Insulation
ASTM C 1136	(1995) Flexible, Low permeance Vapor Retarders for Thermal Insulation
ASTM D 828	(1993) Tensile Breaking Strength of Paper and Paperboard
ASTM E 84	(2010b) Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E 96	(1997; Rev A) Water Vapor Transmission of Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS L-P-535	(Rev. E; Notice 2) Plastic Sheet (Sheeting): Plastic Strip: Poly (Vinyl Chloride) and Poly(Vinyl Chloride-Vinyl Acetate), Rigid

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-A-3316	(Rev. C; Am. 2) Adhesives, Fire-Resistant, Thermal Insulation
MIL-C-19565	(Rev. C; Am. 1) Coating Compounds, Thermal Insulation, Fire- and Water-Resistant, Vapor Barrier
MIL-C-20079	(Rev. H) Cloth, Glass: Tape, Textile Glass; and Thread, Glass and Wire-Reinforced Glass
MIL-A-24179	(Rev. A) (Valid Notice 1) Adhesive, Flexible Unicellular-Plastic Thermal Insulation

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 255	(2006) Standard Method of Test of Surface Burning Characteristics of Building Materials

UNDERWRITERS LABORATORIES (UL)

UL 723	(2008; Reprint Sep 2010) Test for Surface Burning Characteristics of Building Materials

1.2 SYSTEM DESCRIPTION

Provide new field-applied insulation for heating, ventilating, and cooling

(HVAC) air distribution systems and piping systems which are located within, on, under, and adjacent to buildings; and for plumbing piping systems.

1.2.1 Air Distribution System

Obtain Contracting Officer's written approval of systems under Section 23 05 93, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to air distribution systems.

1.2.2 Piping Systems

Obtain Contracting Officer's written approval of HVAC water distribution systems under Section 23 05 93, "Testing/Adjusting/Balancing: Small Heating/Ventilating/Cooling Systems" before applying field-applied insulation to HVAC water distribution systems. At the Contractor's option and with Contracting Officer's written approval, the piping systems may be insulated before systems are tested, adjusted, and balanced (TAB'd). Piping insulation shall terminate immediately adjacent to each flow control valve, automatic control valve, or device. For chilled water and chilled-hot water piping, the ends of pipe insulation and the space between ends of pipe insulation and piping shall be sealed with waterproof vapor barrier coating. After systems are TAB'd, the control valves and devices shall be insulated.

1.3 DEFINITIONS

1.3.1 Finished Spaces

Spaces used for habitation or occupancy where rough surfaces are plastered, panelled, or otherwise treated to provide a pleasing appearance.

1.3.2 Unfinished Spaces

Spaces used for storage or work areas where appearance is not a factor, such as unexcavated spaces and crawl space.

1.3.3 Concealed Spaces

Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

1.3.4 Exposed

Open to view. For example, pipe running through a room and not covered by other construction.

1.3.5 Fugitive Treatments

Treatment subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, and heat. Fugitive materials are entrapped materials that can cause deterioration, such as solvents and water vapor.

1.3.6 Outside

Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

1.3.7 Conditioned Space

An area, room or space normally occupied and being heated or cooled for human habitation by any equipment.

1.4 SUBMITTALS

Submit the following in accordance with Section 01 33 00, "Submittal Procedures."

SD-03 Product Data

Piping insulation

Piping insulation finishes

Heating, ventilating, and air conditioning systems insulation

Duct insulation finishes

Accessory materials

Adhesives, sealants, and coating compounds

1.5 QUALITY ASSURANCE

Every package or standard container of insulation, jackets, cements, adhesives, and coatings delivered to the project site shall have the manufacturer's stamp or label attached giving name of manufacturer, brand and description of material. Insulation packages and containers shall be asbestos-free.

1.6 FLAME-SPREAD AND SMOKE-DEVELOPED RATINGS
-

In accordance with NFPA 255, ASTM E 84 or UL 723, the materials on interior of the building shall have a flame-spread rating of not more than 25 and a smoke-developed rating of not more than 150 interior to the bulding.

1.6.1 Materials Tests

Test factory-applied materials as assembled. Field-applied materials may be tested individually. Use no fugitive or corrosive treatments to impart flame resistance. UL label or satisfactory certified test report from a testing laboratory will be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified. Flame-proofing treatments subject to deterioration due to effects of moisture or high humidity are not acceptable.

1.6.2 Materials Exempt From Fire-Resistant Rating

Nylon anchors.

PART 2 PRODUCTS

2.1 PIPING INSULATION

Piping systems, except buried pipe requiring insulation, types of insulation required, and insulation thickness shall be as listed in Tables I herein. Unless otherwise specified, insulate all fittings, flanges, and

valves, except valve stems, hand wheels, and operators. Provide factory premolded, precut, or field-fabricated insulation of the same thickness and conductivity as insulation on adjacent piping. Insulation exterior shall be factory cleanable, grease resistant, non-flaking and non-peeling. Pipe insulation shall conform to the referenced publications.

2.1.1 Flexible Unicellular Insulation

2.1.1.1 Recommended Adhesive

ASTM C 534. Provide adhesive as recommended by insulation manufacturer or conforming with MIL-A-24179, Type II, Class 1.

2.1.1.2 Polyolefin thermoplastic

Polyolefin thermoplastic meets ASTM C 534, except density.

2.1.1.3 Adhesive For Finishing Flexible Unicellular Insulation

MIL-A-3316, Class 1, Grade A.

2.1.1.4 Glass Cloth For Finishing Flexible Unicellular Insulation

MIL-C-20079, Type I, Class 1, 3, or 5.

2.1.2 Cellular Glass Insulation

ASTM C 552, Type II.

2.1.3 Cellular Phenolic Insulation

ASTM C 1136.

2.1.4 Mineral Fiber

ASTM C 547, Class I.

2.1.5 Calcium Silicate

ASTM C 533, Class I.

2.1.6 Piping Insulation Finishes

2.1.6.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket when field applied jacketing is not specified. All purpose jackets shall include integral vapor barrier as required by service. Provide jackets in exposed locations with a white surface suitable for field painting. Allow a maximum water vapor permeance of 0.05 perm in accordance with ASTM E 96, a puncture resistance of not less than 50 Beach units, and a minimum tensile strength of 35 pounds-force per inch of width in accordance with ASTM D 828.

2.1.6.2 Vapor-Barrier Material

ASTM C 1136. Resistant to flame, moisture penetration, and mold growth. Provide vapor-barrier material on pipe insulation as required in Table I.

2.1.6.3 Metal Jackets

a. Aluminum Jackets: ASTM B 209, Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated aluminum covers for insulation on fittings, valves and flanges.

b. Stainless Steel Jackets: ASTM A 167 or ASTM A 240/A 240M; Type 304, minimum thickness of 33 gage (0.010 inch), smooth surface with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide stainless steel bands, minimum width of 0.5 inch. Provide factory prefabricated stainless steel covers for insulation on fittings, valves, and flanges.

c. Piping, Fittings, Flanges, and Valves in Outside Locations: Finish elbows and curved piping with factory-fabricated metal covers. Finish tees, flanges, and valves with metal covers. Covers shall be same thickness and material as jackets on adjacent piping.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS INSULATION

Provide insulation on ducts ,plenums ,mixing boxes ,filter boxes ,casings and diffusers of Heating, Ventilating and Air Conditioning Systems (HVAC).)

2.2.1 Duct Insulation in Concealed Spaces

Blanket flexible mineral fiber insulation conforming to ASTM C 553, Type 1, Class B-3, .75 pound per cubic foot nominal, 3.0 inches thick, minimum installed R8. Provide flexible insulation in concealed spaces only.

2.2.2 Duct Insulation Not in Concealed Spaces

Mineral fiber in accordance with ASTM C 612, Class 2 (maximum surface temperature 400 degrees F), 6 pcf (pounds per cubic foot) average, 1.5 inch thick.

2.2.3 All Types of Ductwork Located Outside

Provide ASTM C 591, polyisocyanurate or polyurethane board insulation, minimum density of 1.7 pcf, 1.5 inch thick, and weatherproof finish.

2.2.4 Acoustically Lined Ducts

For ductwork indicated or specified in Section 23 73 33, "Ductwork and Ductwork Accessories," to be acoustically lined, provide external insulation as specified in paragraph entitled "Duct Insulation Not in Concealed Spaces."

2.2.5 Duct Insulation Finishes

2.2.5.1 All-Purpose Jacket

Provide a factory applied all-purpose jacket with or without integral vapor barrier as required by the service. In exposed locations, provide jackets

with a white surface suitable for field painting. All-purpose jacket shall have a maximum water vapor permeance of 0.05 perm per ASTM E 96; a puncture resistance of not less than 50 Beach units; and a tensile strength of not less than 35 pounds-force per inch of width in accordance with ASTM D 828.

2.2.5.2 Vapor-Barrier Material

ASTM C 1136, for duct in equipment room and exposed areas and Type I or II in remaining areas. Material shall be resistant to flame, moisture penetration, and shall not support mold growth. Provide vapor barrier on HVAC duct insulation, except insulation for heating only.

2.2.5.3 Metal Jackets

Provide metal jackets with moisture barrier lining for externally insulated ductwork located outside.

a. Aluminum Jackets: ASTM B 209, Alloy 3003 or 3004, Temper H14, 0.016- inch thick, smooth.

b. Stainless Steel Jackets: ASTM A 167, Type 304 , 0.010- inch thick, smooth.

2.3 BOILER STACKS AND BREECHING AND DIESEL ENGINE EXHAUST PIPING INSULATION

ASTM C 592 Class I or ASTM C 612 Class 3 or ASTM C 533, Type I. Insulation and minimum thickness shall comply with Table IV. Fill joints in the block insulation with mineral wool or equivalent insulation cement. For equipment operating at surface temperatures above 600 degrees F, apply block in double layer construction with staggered joints.

2.4 EQUIPMENT

Insulate all equipment and accessories as specified in Table II. In outside locations, provide insulation one inch thicker than specified. Increase the specified insulation thickness for equipment only where necessary to equal the thickness of angles or other structural members to make a smooth, exterior surface. Factory applied insulation shall meet the flame spread and smoke-developed rating of 25/50.

2.5 ADHESIVES, SEALANTS, AND COATING COMPOUNDS

2.5.1 Insulation and Vapor Barrier Adhesive

Provide ASTM C 916, Type I or Type II adhesive for securing insulation to metal surfaces and for vapor barrier lap only in building interior. Provide Type I when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will pass the edge-burning test is required. Provide Type II when an adhesive in which the vehicle is nonflammable in the liquid (wet) state and which will not pass the edge-burning test is required.

2.5.2 Lagging Adhesive

MIL-A-3316, Class 1, for bonding fibrous glass cloth to unfaced fibrous glass insulation; for bonding cotton brattice cloth to faced and unfaced fibrous glass insulation board; for sealing edges of and bounding fibrous glass tape to joints of fibrous glass board; or for bonding lagging cloth to thermal insulation, or Class 2, for attaching fibrous glass insulation

to metal surfaces.

2.5.3 Mineral Fiber Insulation Cement

ASTM C 195, thermal conductivity 0.85 maximum at 200 degrees F mean when tested in accordance with ASTM C 177.

2.5.4 Vapor Barrier Coating

MIL-C-19565, Type II, indoor only above surface temperature 60 degrees F, color white.

2.5.5 Weatherproof Coating

For outside applications provide a weatherproof coating recommended by the manufacturer of the insulation and jackets.

2.5.6 Flexible Unicellular Insulation Adhesive

MIL-A-24179, Type II, Class 1 or Type III.

2.6 ACCESSORY MATERIALS

2.6.1 Staples

ASTM A 167, Type 304 stainless steel outside-clinch type.

2.6.2 Insulation Bands

1/2 inch wide; 0.24 gage galvanized steel or 0.26 gage stainless steel or 0.24 gage aluminum.

2.6.3 Bands for Metal Jackets

3/8-inch minimum width; 0.26 gage stainless steel or 0.24 gage aluminum.

2.6.4 Anchor Pins

Provide anchor pins and speed washers recommended by insulation manufacturer.

2.6.5 Glass Cloth and Tape

MIL-C-20079, Type I, Class 1 or Class 3 cloth, and Type II, Class 1 or tape; 20 by 20 maximum size mesh. Tape shall be 4-inch wide rolls. Class 3 tape shall be 4.5 ounces per square yard. In lieu of glass cloth and tape, open weave glass membrane may be provided.

2.6.6 Wire

Soft annealed stainless steel, 0.047-inch nominal diameter.

2.6.7 PVC Pipe Fitting Cover

FS L-P-535, Composition A, Type II, Grade GU, factory premolded, one-piece.

PART 3 EXECUTION

3.1 PREPARATION

Do not insulate materials until system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and dried. Insulate return ducts, outside air intakes and supply ducts to the room outlets, flexible runouts, plenums, casings, mixing boxes, filter boxes, coils, fans, and the portion of air terminals not in the conditioned spaces. Ensure full range of motion of equipment actuators. Modify insulation to avoid obstruction with valve handles, safety reliefs, and other such items. Allow adequate space for pipe expansion. Install insulation with jackets drawn tight and cement down on longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems. Extend surface finishes to protect surfaces, ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Provide a moisture and vapor seal where insulation terminates against metal hangers, anchors and other projections through the insulation on surfaces for which a vapor seal is specified. Keep insulation dry during application of finish. Bevel and seal the edges of exposed insulation. Unless otherwise indicated, do not insulate the following:

a. Factory preinsulated flexible ductwork;

b. Vertical portion of interior roof drain pipelines, chrome plated pipes, and fire protection pipes;

c. Vibration isolating connections;

d. Adjacent insulation;

e. ASME stamps;

f. Fan name plates; and

g. Access plates in fan housings.

3.2 PIPING INSULATION

3.2.1 Mineral Fiber Pipe Insulation

Place sections of insulation around the pipe and joints tightly butted into place. The jacket laps shall be drawn tight and smooth. Secure jacket with fire resistant adhesive factory applied self sealing lap, or stainless steel outward clinching staples spaced not over 4 inches on centers and 1/2 inch minimum from edge of lap. Cover circumferential joints with butt strips, not less than 3 inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1 1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps. Apply staples to both edges of the butt strips. Patch damaged jacket material by wrapping a strip of jacket material around the pipe and cementing, stapling, and coating as specified for butt strips. Extend the patch not less than 1 1/2 inches past the break in both directions. At penetrations by pressure gages and thermometers, fill the voids with the vapor barrier coating for outside service. Seal with a brush coat of the same coating. Where penetrating roofs, insulate piping

to a point flush with the top of the flashing and seal with the vapor barrier coating. Butt tightly the exterior insulation to the top of the flashing and interior insulation. Extend the exterior metal jacket 2 inches down beyond the end of the insulation. Seal the flashing and counterflashing underneath with the vapor barrier coating.

3.2.2 Flexible Unicellular Insulation

Bond cuts, butt joints, ends, and longitudinal joints with adhesive, miter 90-degree turns and elbows, tees, and valve insulation. Where pipes penetrate fire walls, provide mineral fiber insulation inerts and sheet metal sleeves. Insulate flanges, unions, valves, and fittings in accordance with manufacturer's published instructions. Tape all butt joints with adhesive backed insulation tape. On elastomeric insulation (Rubatex, Armorflex) located outside provide weather covering as follows:

(1) Coat entire surface of insulation with MIL-A-3316

(2) While the adhesive is tacky, apply a layer of MIL-C-20079 glass cloth. Stretch tightly and overlap all joints by a minimum of 2-inches. Glass cloth at elbows and fittings shall be mitered.

(3) Apply a final coat of MIL-A-3316 adhesive.

3.2.3 Calcium Silicate Pipe Insulation

Secure insulation with stainless steel metal bands on 12-inch maximum centers. Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface.

3.2.4 Cellular Glass, Cellular Phenolic, and Polyisocyanurate

Secure outer most layer of insulation with metal bands 12-inch on center. If a factory installed all service jacket is used, the metal bands shall be applied to the outside of the all service jacket. If two or more layers are applied, the inner layers may be secured with fiber reinforced tape. For cold or chilled piping all joints both longitudinal and circumferential shall be sealed. Use the manufacturer's recommended cement or sealant. Apply all-purpose jacket, vapor barrier if required by Table I, and metal jacket if outside. Elbows shall be four piece miter if field fabricated. Pre-manufactured elbows can be held in place with metal bands. All elbows shall be finished as follows: Apply a skim coat of hydraulic setting cement directly to the insulation. When dry, apply a flooding coat of adhesive over the hydraulic setting cement. Press a layer of MIL-C-20079 glass cloth or tape into adhesive and seal laps and edges with adhesive. Coat cloth with adhesive cut at a ratio of one part water to five parts adhesive in color other than white for the purpose of visual inspection to ensure sizing of entire surface. Insulate flexible connection at pumps and other equipment with unicellular plastic insulation, unless otherwise indicated. Factory-fabricated removable and reusable insulated covers shall be provided for all valves, circuit setters, unions and flow control devices. The insulation cover shall be reusable without the need for special material or tools. Insulation shall be two piece molded cellular to fit the valve or device. Flexible unicellular insulation may be used in

lieu of molded cellular insulation.

3.2.5 Hangers and Anchors

Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide galvanized steel shields protection saddles. Band and secure insulation protection shields without damaging pipe insulation. Where shields are used on pipes 2 inches and larger, provide insulation inserts at points of hangers and supports. Insulation inserts shall be of calcium silicate, cellular glass (minimum 8 pcf), molded glass fiber (minimum 8 pcf), or other approved material of the same thickness as adjacent insulation. Inserts shall have sufficient compressive strength to adequately support the pipe without compressing the inserts to a thickness less than the adjacent insulation. Insulation inserts shall cover the bottom half of the pipe circumference 180 degrees and be not less in length than the protection shield. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation with vapor barrier coating, Type II or for exterior work, manufacturer's recommended weatherproof coating, as applicable. Where protection saddles are used, fill all voids with the same insulation material as used on the adjacent pipe. Where anchors are secured to chilled piping that is to be insulated, insulate the anchors the same as the piping for a distance not less than four times the insulation thickness to prevent condensation. Vapor seal insulation around anchors.

3.2.6 Sleeves and Wall Chases

Where penetrating interior walls, extend a metal jacket 2 inches out on either side of the wall and secure on each end with a band. Where penetrating floors, extend a metal jacket from a point below the back-up material to a point 10 inches above the floor with one band at the floor and one not more than one inch from end of metal jacket. Where penetrating exterior walls, extend the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall.

3.2.7 Flanges, Unions, Valves and Fittings for Hot Piping

Flanges, Unions, Valves, and Fittings Insulation (Except Flexible Unicellular) for Hot Piping: Factory fabricated removable and reusable insulation covers may be used. For inside domestic hot water, heating hot water, A/C condensate drains, high temperature hot water, steam and condensate return systems; exposed hot water piping and drains in handicap areas, place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. If nesting size insulation is used, overlap 2 inches or one pipe diameter, whichever is larger. Use insulating cement to fill voids. Elbows insulated using segments shall have not less than three segments per elbow. Place and joint the segments with manufacturer's recommended water-vapor resistant, fire retardant, and adhesive appropriate for the temperature limit of the service. Upon completion of installation of insulation, apply two coats lagging adhesive with glass tape embedded between coats. Overlap tape seams one inch. Extend adhesive onto adjoining insulation not less than two inches. The total dry film thickness shall be not less than 1/16 inch. Where unions are indicated not to be insulated, taper the insulation to the union at a 45 degree angle. Coat the insulation and all purpose jacket with two coats of lagging adhesive and with glass tape embedded between coats. The total dry film thickness shall

be not less than 1/16 inch. At the option of the Contractor, factory premolded one-piece PVC fitting covers may be provided in lieu of two coats of adhesive with tape embedded between coats. Factory premolded field-fabricated segment or blanket insert insulation shall be provided under the fitting covers. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling, taping with PVC vapor barrier tape, or with metal or plastic tacks made for securing PVC fitting covers. Do not provide PVC fitting covers where exposed to the weather. Provide PVC fitting covers only in ambient temperatures below 150 degrees F.

3.2.8 Piping Exposed to Weather

3.2.8.1 Metal Jackets

Install over the insulation. Metal jackets shall have side and end lap at least 2 inches wide with the cut edge of the side tap turned inside one inch to provide a smooth edge. Overlap the jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9-inch centers or with screws at not more than 5-inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by the insulation manufacturer for weatherproofing.

3.2.8.2 Flanges, Unions, Valves, Fittings, and Accessories

Insulate and finish as specified for the applicable service. Apply two coats of an emulsion type weatherproof mastic for hot service and vapor barrier mastic for cold service recommended by the insulation manufacturer. Embed glass tape in the first coat. Overlap tape not less than one inch and the adjoining metal jacket not less than 2 inches. Factory preformed metal jackets may be provided in lieu of the above for hot service.

3.3 DUCTS PLENUMS AND CASINGS (HVAC) INSULATION

3.3.1 Rigid Insulation

Secure rigid insulation by impaling over pins or anchors located not more than 3 inches from joint edges of boards, spaced not more than 12 inches on centers and secure with washers and clips. Spot weld anchor pins or attach with a waterproof adhesive especially designed for use on metal surfaces. Apply insulation with joints tightly butted. Neatly bevel insulation around name plates and access plates and doors. Each pin or anchor shall be capable of supporting a 20-pound load. Cut off protruding ends of pins, after clips are sealed with coating compound for inside work or manufacturer's recommended weatherproof coating for outside work, and reinforced with open weave glass membrane.

3.3.2 Flexible Blanket Insulation

Apply insulation with all joints tightly butted. Secure insulation to ductwork with adhesive in 6-inch wide strips on 12-inch centers. Staple laps of jacket with outward clinching staples. Sealing shall be in accordance with paragraph 3.3.3 below. For ductwork over 24 inches on horizontal duct runs, provide pins, washers and clips. Provide pins on sides of vertical ductwork being insulated. Space pins and clips on 18-inch centers and not more than 18 inches from duct corners. Carry insulation over standing seams and trapeze-type hangers. Install speed washers with pins and pin trimmed to washer. Sagging of flexible duct

insulation will not be permitted. Cut off protruding ends of pins after clips are secured and sealed with coating compound for inside work. For warm air ducts, overlap insulation not less than 2 inches at joints and secure the laps with outward clinch staples on 4-inch centers. In cold air ducts, vapor seal all joints and staple as specified.

3.3.3 Insulation Finishes and Joint Sealing

Fill all breaks, punctures, and voids with vapor barrier coating compound for inside work or manufacturer's recommended weatherproof coating for outside service. Vapor seal all joints by embedding a single layer of 3-inch wide open weave glass membrane, 20 by 20 mesh maximum size between two 1/16-inch wet film thickness coats of vapor barrier coating compound. Draw glass fabric smooth and tight with a 1 1/2-inch overlap. At jacket penetrations such as hangers, thermometers, and damper operating rods, fill voids in the insulation with vapor barrier coating. Brush a coat of vapor barrier coating where required on HVAC ducts. Provide vapor barrier jacket continuous across seams, reinforcing, and projections. Where height of projections is greater than insulation thickness, carry insulation and jacket over the projection. For joints for heating only systems, provide insulation with two coats of fire resistant adhesive with glass fabric mesh embedded between coats.

3.3.4 Metal Jackets for Outside Ductwork

Ensure metal-jacket side and end laps at least 2 inches wide, with the cut edge of the side lap turned under one inch to provide a smooth edge. Place horizontal laps to shed water. Seal vertical laps with insulation manufacturer's recommended weatherproof coating. Secure jackets in place with aluminum or stainless steel bands on 9-inch centers aluminum or stainless steel screws on 5-inch centers. Where ducts penetrate exterior walls, continue the increased thickness required for ductwork exposed to weather and the metal jackets through the sleeve to a point 2 inches beyond the interior surface of the wall. Where metal jacket abuts an uninsulated surface, seal joints with a weatherproof mastic recommended by the insulation manufacturer. For rectangular ducts, provide corner angles to exposed corners of the insulation. Apply two coats of weatherproof coating recommended by the insulation manufacturer to the entire surface with a layer of glass cloth embedded between coats. Ensure glass cloth overlaps not less than 2 inches at joints and adjoining surface. Each coat of weatherproof coating shall be 1/16-inch minimum thickness.

3.3.5 Access Plates and Doors

On acoustically lined ducts, plenums, and casings, provide insulation on access plates and doors. On externally insulated ducts, plenums, and casings, provide insulation-filled hollow steel panels and doors for access openings. Bevel insulation around access plates and doors.

3.4 EQUIPMENT INSULATION

3.4.1 General Procedures

Apply equipment insulation suitable for temperature and service in rigid block or semirigid board or flexible form to fit as closely as possible to equipment. Groove or score insulation where necessary to fit the contours of equipment. Stagger end joints where possible. Bevel the edges of the insulation for cylindrical surfaces to provide tight joints. Join sections of cellular glass insulation with bedding compound. After the cellular

glass insulation is in place on areas to be insulated, except where metal-encased, fill joints, seams, chipped edges, or depressions with bedding compound to form a smooth surface. Fill mineral fiber joints with insulating cement. Bevel insulation around name plates, ASME and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Protect exposed insulation corners with corner angles under wires and bands.

3.4.2 Cold Equipment (Except Pumps)

Secure insulation with 16-gage, galvanized steel or copper clad wire or with 3/4-inch wide 20-gage stainless steel bands spaced on 12-inch centers. Seal joints with joint sealer. Cover non-removable irregular surfaces such as corner angles with a smoothing coat of insulating cement. Provide removable heat exchanger head covers with a male-female shiplap type joint. Apply two coats of vapor barrier coating with a layer of glass cloth embedded between coats. The dry film thickness of the finish shall be 1/32-inch minimum.

3.4.3 Pumps

Insulate pumps used for hot service with 2-inch thick rigid mineral fiber insulation and pumps used for chilled water and brine service with 2-inch thick flexible unicellular sheets as follows: Insulate pumps by forming a box around the pump housing, drive shaft, and piping. Apply insulation to inside surfaces of 20-gage galvanized or stainless steel sheet-metal boxes having openings for drive shaft and pipes. Construct the box by forming the bottom and sides using joints which do not leave raw ends of insulation exposed. Band bottom and sides to form a rigid housing that does not rest on the pump. Between top cover and sides, fit joints tightly forming a female shiplap joint on the side pieces and a male joint on the top cover to make the top cover removable. Secure insulation to the box with adhesive. Allow clearance for draining and adjustment of pump shaft seal.

3.5 PAINTING AND IDENTIFICATION

Paint in accordance with Section 09 90 00, "Paints and Coatings." Piping identification shall be as specified in other sections.

3.6 REPLACEMENT OF EXISTING ASBESTOS INSULATION

Remove existing asbestos insulation in accordance with Section 02 82 16, "Removal and Disposal of Asbestos Materials". When existing asbestos insulation is to be replaced, provide new asbestos-free insulation. Label or stencil new insulation "Asbestos-Free" after final finishing and painting.

3.7 FIELD INSPECTION

Visually inspect to ensure that materials provided conform to specifications. Inspect installations progressively for compliance with requirements.

TABLE I

Piping Insulation Wall Thickness

Service	Material	Tube And Pipe Size (Inches) 1/4-1 1/4	1 1/2-3	3 1/2-5	6-& Larger	Vapor Barrier Required
Chilled Water & Dual Temperature & Refrigerant Suction Pipe	Cellular Glass	1.5 (2.0)	1.5 (2.0)	2.0 (2.5)	2.0 (2.5)	Yes
	Polyisocyanurate	1 (1)	1 (1.0)	1.5 (2.0)	1.5 (2.0)	Yes
	Flexible Unicellular	3/4 (1.5)	3/4 (1.5)	1.5 (2.0)	1.5 (2.0)	Yes
Domestic Cold Water, Drains and Horizontal Roof Drains	Polyisocyanurate	1	1	1	1	Yes
	Cellular Glass	1.5	1.5	1.5	1.5	Yes
	Cellular Phenolic	1	1	1	1	Yes
	Flexible Unicellular	3/4	1	1	1	Yes
Domestic Hot Water	Polyisocyanurate	1	1	1.5	1.5	No
	Calcium Silicate	1.5	1.5	1.5	1.5	No
	Mineral Fiber	1	1	1.5	1.5	No
	Cellular Glass	1.5	1.5	1.5	1.5	No
	Cellular Phenolic	1	1	1	1	No
	Flexible Unicellular	1	1	1.5	1.5	No

NOTE: Thickness in parenthesis are for:

(1) Cold piping - crawl spaces, mechanical rooms, and outside locations

(2) Hot Piping - outside locations, not including tunnels and crawl spaces.

(3) NP - Not permitted.

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TABLE II

Insulation For Equipment

Material	Spec	Type	Class	Vapor Barrier Required
Flexible Mineral Fiber,	ASTM C 553	I	B-3	Yes*/No
Rigid Mineral Fiber,	ASTM C 612		2	Yes*/No
or Cellular Glass	ASTM C 552	I		No

*Yes for chilled water and brine service and no for other services.

Equipment	Recommended Wall Thickness	Vapor Barrier Required
Systems		
Hot Water Storage Tanks	2"	No

*Exact insulation thickness may be determined by proposed condition of use.

-- End of Section --