



CONSTRUCTION DOCUMENT SUBMISSION

**PROJECT MANUAL – Book 1 of 2
(Divisions 1 through 14)**

FOR

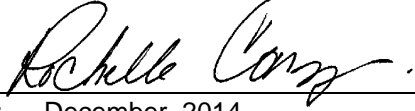
ALL WORK

FOR

**EXPAND/CONSTRUCT
OUTPATIENT MENTAL HEALTH CLINIC
BUILDING 111 ADDITION
VETERANS AFFAIRS MEDICAL CENTER
ST CLOUD, MINNESOTA**

**VA St. Cloud Project No. 656-341
Foss Project No. 1327**

I hereby certify that this drawing, specification or report was prepared by me or under my direct supervision and that I am a duly registered Architect under the laws of the State of Minnesota.



Dated: December, 2014

Regt. No. 46294

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Dated: December, 2014

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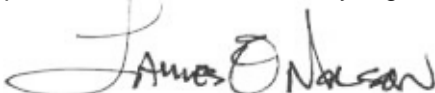
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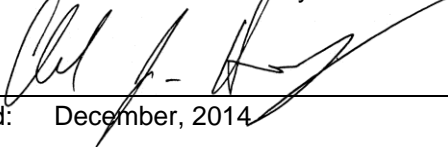
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Dated: December, 2014

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PROJECT MANUAL FOR

ALL WORK FOR

EXPAND/CONSTRUCT
OUTPATIENT MENTAL HEALTH CLINIC
BUILDING 111 ADDITION
VETERANS AFFAIRS MEDICAL CENTER
ST CLOUD, MINNESOTA

VA St. Cloud Project No. 656-341
Foss Project No. 1327

Foss Architecture & Interiors, 810 First Avenue North, Fargo ND 58102

**DEPARTMENT OF VETERANS AFFAIRS
 VHA MASTER SPECIFICATIONS**

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GENERAL REQUIREMENTS**

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

1.1 SAFETY REQUIREMENTS

Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

1.2 GENERAL INTENTION

- A. This project will add approximately 13,500 square feet by adding a second floor to building 111. This project will mitigate Minnesota Market utilization gaps for select Ambulatory Mental Health programs, including mental health clinic, psychology, and aftercare/screening/outreach programs. Due to the addition of a second floor to building 111, a temporary contractor provided building with build-out of approximately 13,500 square feet will be required during construction.

Contractor shall furnish all labor, materials, tools and equipment required to expand/construct an outpatient mental health clinic. The contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for Expand/Construct Outpatient Mental Health Clinic as required by drawings and specifications.

1. The Project involves providing a contractor provided temporary building for affected staff, removing the existing attic space and constructing a second floor of Building 111 to improve outpatient mental health services. Temporary building/office work (Section 13 34 41) shall be completed, with VA moved into these quarters, prior to start of expansion work on Building 111.
 2. Work includes general construction not all inclusive to: abatement, demolition, removal or relocation of existing structures, relocation of existing utilities, alterations, grading, drainage, site utilities, curbs, walks, pavement, storm water management systems, architectural, structural, mechanical and electrical work.
 3. The existing Building 111 will be vacated during construction of this project. Adjacent buildings will remain occupied by the VA throughout construction of this project. Adjacent buildings will remain occupied by the VA throughout construction. Work in occupied areas may need to be accomplished outside of normal working hours, 8:30 a.m. - 4:30 p.m., if noise, dust and other hazards cannot be mitigated. Coordination with other construction projects may be required during the course of construction.
- B. Visits to the site by Bidders may be made only by appointment with the Contracting Officer Representative (COR).
- C. Offices of Foss Architecture and Interiors, as Architect-Engineers, will render certain technical services during construction. Such

services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer Representative (COR) or his duly authorized representative.

- D. Before placement and installation of work, subject to tests by Testing Laboratory, retained by Contractor, the Contractor shall notify the COR not less than three (3) working days in advance and shall coordinate with testing lab personnel to be present at the site in time for proper taking of samples and testing of specimens and field inspection.
- E. All employees of general contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and restricted from unauthorized access.
- F. Prior to commencing work, general contractor shall provide proof that the project supervisor having an OSHA 30 certified "competent person" (CP) (29 CFR 1926.20(b)(2)) will maintain a presence at the work site whenever the general or subcontractors are present.
- G. Training:
 - 1. **The Contractor's project supervisor is required to attend GEMS and Safety training provided by VA St. Cloud. Training must be attended prior to being designated as a job supervisor on any VA St. Cloud construction project.**
 - 2. **Beginning July 31, 2005, all employees of general contractor or subcontractors shall have the at minimum the 10-hour OSHA certified Construction Safety course and other relevant competency training, as determined by VA CP with input from the Infection Control Risk Assessment (ICRA) team.**
 - 3. **Submit training records of all such employees for approval before the start of work.**
 - 4. **Notice to proceed will be issued not less than 2 weeks after receipt of bonds; time extensions will not be granted because of the need for training.**

H. Identification Badge:

All contractor employees working on this project will be required to obtain and wear while on VA property, a VA picture identification badge. The badge will only be issued to those employees having the appropriate OSHA Construction Safety Cards. The badges must be requested 2 weeks in advance of working on site and will be issued free of charge by the VA. **All ID badges must be returned upon contract completion. There will be a \$200 charge for each ID badge not returned at the end of the contract.**

I. Project Acceptance (Substantial Completion):

1. **The acceptance of a project for substantial completion is to include the following:**

- a. **The completion of all items to meet the criteria of the contract drawings and specifications to the satisfaction of the Contracting Officer (CO). Items for correction may be considered to be punch list items, as determined by the COR, if the COR finds them to be minor in correction. Value for the corrections will be held by the VA, as determined by the COR, until all corrections are completed to the satisfaction of the COR.**
- b. **The VA will not accept a project, or phase of a project as determined by contract documents, as substantially complete until a complete passing test and balance report of the HVAC system has been submitted and accepted as complete and passing by the COR. It is recommended that the HVAC system be completed with sufficient time to make corrections to submit a passing report. A time extension to the contract will not be considered for corrections to the HVAC system that are determined by the COR to be installation or design errors if within the contract.**

1.3 SCOPE/BASE BID ITEM(S)

- A. Refer to 1.2 General Intention for a description of the scope/base bid items.
- B. DEDUCT ALTERNATES, The list of alternates is provided below:

NOTE: Alternates if accepted, will be accepted in the numerical order of their listing below. (Example: To consider Alternate No. 5, deduct alternates No. 1 through No. 4 would have to be accepted first.)

1. **ALTERNATE NO.1**: (Base Bid less Alternate No. 1- deduct 0 calendar days from the contract completion time)

Delete window blinds on all new windows.

State the amount to be deducted from Base Bid, to delete all vertical window blinds from the project, as indicated on the drawings, and as specified Section 12 24 00 VERTICAL WINDOW BLINDS herein.

2. **ALTERNATE NO.2**: (Base Bid less Alternate Nos. 1 and 2; deduct 0 calendar days from the contract completion time)

Delete Carpet Tile, and Substitute Broadloom carpet:

State the amount to be deducted from Base Bid, to provide broadloom Carpet type C-1a in lieu of type C-1 carpet tile, as shown on the drawings, and as herein specified in SECTION 09 68 00 CARPETING. Note: Ground Floor carpet is not affected by this Alternate.

3. **ALTERNATE NO.3**: (Base Bid less Alternate Nos. 1, 2 and 3; deduct 10 calendar days from the contract completion time)

Ground Floor Carpet Deletion:

State the amount to be deducted from Base Bid, to delete the replacement of all indicated ground floor carpeting. In lieu of replacement, existing carpeting shall remain, and shall be protected with 1/8" Masonite board protection.

4. **ALTERNATE NO. 4**: (Base Bid less Alternate Nos. 1, 2, 3 and 4; deduct 0 calendar days from the contract completion time)

Deduct Case Work and Lockers:

State the amount to be deducted from Base Bid to delete casework indicated on Sheet AS102C, in Rooms 111, partial 108, 112 & 130. Delete lockers in Rooms 108 and 128.

5. **ALTERNATE NO. 5**: (Base Bid less Alternate Nos. 1,2,3,4 and 5; deduct 5 calendar days from the contract completion time)

Plumbing Rough-in - Office/Counsel Rooms- 1st Floor:

State the amount to be deducted from Base Bid to delete plumbing rough-in for hand sinks, in 1st floor office/counsel rooms, as indicated on the plumbing drawings, and as herein specified.

6. **ALTERNATE NO. 6**: (Base Bid less Alternate Nos. 1,2,3,4,5 and 6; deduct 3 calendar days from the contract completion time)
Heat Exchanger Redundancy:
State the amount to be deducted from Base Bid, to provide a single skid domestic water heater exchanger, in lieu of dual skid heat exchangers, including all controls valves, stands, and associated piping as indicated on the mechanical drawings, and as specified herein.
7. **ALTERNATE NO. 7**: (Base Bid less Alternate Nos.1,2,3,4,5,6 and 7; deduct 14 calendar days from the contract completion time)
Ground Floor Exam Rooms (existing) Modifications:
State the amount to be deducted from Base Bid, to delete all work necessary as indicated on the drawings, and as required to change existing ground floor exam rooms, into Office Counsel Rooms (affects Rms. 34,35,36,37,51,45,55,56, & 57) Base bid indicates work necessary to modify these rooms. This work would be deleted under this alternate. Under this deduct, the only work then done to these exam rooms is to change out the sink faucet with a new low flow fixture.
8. **ALTERNATE NO. 8**:
(Base Bid less Alt. Nos.1,2,3,4,5,6,7 and 8; deduct 2 calendar days from the contract completion time)
1st Floor Reception Desk/Clerk Station (modular furniture):
State the amount to be deducted from Base Bid, to delete the modular reception desk/clerk Station and Kiosks from the project, as indicated on the drawings, and as herein specified: SECTION 12 59 00 MODULAR FURNITURE, at First floor Reception/Clerk Station Desk. If this alternate is accepted, the VA would then provide the modular furniture.
9. **ALTERNATE NO.9**: (Base Bid less Alternates No. 1,2,3,4,5,6,7,8 and 9; deduct 0 calendar days from the contract completion time)
Alternative Roof Framing and detailing:
State the amount to be deducted from Base Bid, to provide alternative roof framing system as detailed on Sheet AS A502, in lieu of the roof detailing as shown on Sheet AS 501, and affects roof framing, sheathing, roof insulation, etc. as specified herein.
10. **ALTERNATE NO.10**: (Base Bid less Alt. Nos. 1,2,3,4,5,6,7,8,9 and 10; deduct 0 calendar days from the contract completion time)

Lawns- Substitute Seeding in lieu of Sod:

State the amount to be deducted from Base Bid, to provide seeding of all disturbed areas, in lieu of Sod, as specified SECTION 32 90 00 PLANTINGS, and as indicated on Civil Drawings.

11. **ALTERNATE NO. 11:** (Base Bid less Alt. Nos.1,2,3,4,5,6,7,8,9,10 and 11; deduct 0 calendar days from the contract completion time)

Delete changing Controls to DDC- Ground Floor:

State the amount to be deducted from Base Bid, to delete changing the Ground Floor Controls on the project from pneumatic to DDC. If this alternate is accepted, the controls on the existing project shall remain pneumatic, with the existing air compressor relocated as shown on the drawings.

12. **ALTERNATE NO. 12:**

(Base Bid less Alt. Nos.1,2,3,4,5,6,7,8,9,10,11 and 12; deduct 0 calendar days from the contract completion time)

Delete all remaining casework and tack boards in LPN Workroom 108:

State the amount to be deducted from Base Bid, to delete the remainder of casework and tack boards in Rm 108 as herein specified. If this alternate is accepted, the VA would then provide the modular furniture required for this area.

13. **ALTERNATE NO. 13:**

(Base Bid less Alt. Nos.1,2,3,4,5,6,7,8,9,10,11,12 and 13; deduct 3 calendar days from the contract completion time)

Maintain Existing Snowmelt System (in B111 crawlspace):

State the amount to be deducted from Base Bid, to delete the moving/relocation of the existing snowmelt system. If this alternate is accepted, the existing snowmelt system would remain as is.

14. **ALTERNATE NO. 14:**

(Base Bid less Alt. Nos.1,2,3,4,5,6,7,8,9,10,11,12,13 and 14; deduct 0 calendar days from the contract completion time)

Prefinished Steel Gutters in lieu of Copper Gutters:

State the amount to be deducted from Base Bid, to delete the copper gutters, downspouts, and to replace with prefinished steel gutters and downspouts, as herein specified (See Section 076000, Sheet metal).

15. **ALTERNATE NO. 15:**

(Base Bid less Alt. Nos.1,2,3,4,5,6,7,8,9,10,11,12,13,14 and 15;
deduct 5 calendar days from the contract completion time)

Group Office Spaces:

State the amount to be deducted from Base Bid, to change groups of individual offices, and turn into larger work areas, (group office space) This would not affect Corridors C1-10 or C1-11. This deduct would group the following rooms into groups:

- a. Group 1: Rooms 135, 136, 137
- b. Group 2: Rooms 138 and 139
- c. Group 3: Rooms 140, 142 and 144
- d. Group 4: Rooms 141, 143 and 145
- e. Group 5: Rooms 146, 148 and 150
- f. Group 6: Rooms 147,149,151 and 152

16. **ALTERNATE NO.16:** Base Bid less Alt.Nos.1,2,3,4,5,6,7,8,9,10,11, 12,13,14,15 and 16; deduct 5 calendar days from the contract completion time)

Electrical- Delete replacement of Ground Floor light fixtures:

State the amount to be deleted from Base Bid, to delete the replacement of all Ground Floor light fixtures with new LED style fixtures. Existing fixtures shall be removed, salvaged and reused as necessary for above ceiling work.

17. **ALTERNATE NO. 17:**

(Base Bid less Alt. No. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16 and 17;
deduct 10 calendar days from the contract completion time)

Undesignated Space (shell Space):

State the amount to be deleted from Base bid, and accepted Alternate No. 15, (grouped spaces) to combine the following into one space.

"Undesignated Room 190" as shown on 111-AS102D. Spaces and rooms affected are:

- a. Groups 2,3,4,5 and 6 (previous Alt. 15)
- b. Corridors C1-10 and C1-11
- c. Toilet 153
- d. Office 155
- e. Wheelchair 156

(Group 1, under this alternate is to be turned back to Base bid configuration of individual Rooms 135, 136, and 137. Chase 154 and

the duct chase south of Rm. 156 shall remain as configured in base bid.)

Alternate NO. 17 requires the following clarifications and additions:

Room 190 is to have minimal finishes as shown on 111-AS901. In addition to the finishes listed on this drawing, the GWB walls shall be finished to a Level 2.

Install electrical outlets on the interior perimeter walls and wire to circuits as shown on 111-ES302. Surface-mount lighting to be installed as shown on 111-ES700.

No fin tube heaters as shown on 111-AS102D are required. The mechanical contractor shall provide and install an Air Terminal Unit TU-2-23 for Storage Room 190. This unit shall be 1500 CFM maximum and 1000 CFM minimum with 60,000 BTU's of heat. The unit shall be located off the 20"x20" supply air duct located in Room 190 with a 12" with a 12" diameter inlet duct connection, provide 30 inches minimum of 10" diameter straight duct prior to connecting to the terminal unit. Balance damper on return air duct to 1500 CFM. Pipe the hot water reheat coil in this unit to the hot water heating mains with 1" HWH and 1" HWHR, 4.0 GPM. All valves, dampers and accessories for TU-2-23 shall match the requirements in the base bid documents. The Controls contractor shall provide and install a thermostat for TU-2-23 and provide all programming and sequencing as stated in base bid for VAV unit control. Thermostat shall be centrally located in the room on an interior wall.

Install fire protection header as shown on 111-FPS4. Provide ordinary hazard sprinkler head coverage in lieu of light hazard as shown on sheet 111-FPS4. Install 8 smoke detectors in the open space 190 for proper coverage based on NFPA 72 guidelines.

Sheet 111-GI102; Detail 2; Extend the smoke partition wall west across wall/door 108A & south across wall/door C1-11. Stop at the 1-hour fire wall near the mid-point of the south wall in Storage Room 157.

Sheet 111-AS801; Door Schedule: Door C1-11 shall be rated 20 minutes; Hardware group shall change to HW Set #20 on door schedule. Door 108A shall be rated 20 minutes, Door Type change to Type "E" (not "D") on door schedule. Hardware group HW set #3 shall add one set seals 188S ZER (section 087100).

18. **ALTERNATE NO. 18:**

(Base Bid less Alt. No. 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17 and 18; deduct 0 calendar days from the contract completion time)

Deduct Nurse Call:

State the amount to be deleted from Base Bid to delete at ground floor Rooms 29 and 30; Staff Restrooms 132 and 143.

19. **ALTERNATE NO. 19:**

(Base Bid less Alt. No. 1,2,3,4,5,6,7,8,9,10,11,12,14,15,16,17,18 and 19; deduct 0 calendar days from the contract completion time)

Delete Sealed Concrete:

State the amount to be deducted from Base Bid, to delete the requirement to apply Liquid Densifier/Sealer as herein specified (See Section 03 30 53 Cast-in-Place Concrete, Paragraph 3.9 Surface Treatments) and where indicated on drawing sheet 111-AS901.

20. **ALTERNATE NO. 20:**

(Base Bid less Alt. Nos.

1,2,3,4,5,6,7,8,9,10,11,12,14,15,16,17,18,19 and 20; deduct 0 calendar days from the contract completion time)

Delete Signage:

State the amount to be deducted from Base Bid, to delete the Signage (Room number, Directional signs, Identification signs) as herein specified (See Section 10 14 00, Signage) and where indicated on the drawing sheets 111-AS107, 111-AS108, 111-AS109.

21. **ALTERNATE NO. 21:**

(Base Bid less Alt. No.

1,2,3,4,5,6,7,8,9,10,11,12,14,15,16,17,18,19,20 and 21; deduct 0 calendar days from the contract completion time)

Eliminate Fire/Smoke Damper Position Monitoring:

State the amount to be deducted from Base Bid, to delete position monitoring on Fire/Smoke Dampers, as shown by Detail 5 on drawing 111-HS18.

22. **ALTERNATE NO. 22:**

(Base Bid less Alt. No.

1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21 and 22; deduct 0 calendar days from the contract completion time)

Change Pipe Insulation from Cellular Glass Closed Cell to Mineral Fiberglass:

State the amount to be deducted from Base Bid, to change the chilled water piping inside the building from cellular glass closed cell to mineral fiberglass, as herein specified (See Section 23 07 11, HVAC and Boiler Plant Insulation.) All chilled water piping exterior to the building shall remain polyisocyanurate closed cell rigid pipe insulation as specified.

1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. AFTER AWARD OF CONTRACT, Contractor is to provide his/her own drawings and specifications as downloaded from WWW.FBO.gov

1.5 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. All contractor and subcontractor employees working on this project are subject to background investigation. VA has the right to refuse to badge any employee that does not pass the background investigation. It is expected that the contractor will have the employee scheduled for the issuance of a badge well in advance of starting work. Due to the badge process, the employee will not be able come to the VA, receive badge, and conduct work on same day. There will be a \$200 fine for badges issued and not returned upon completion of project. New security requirements will require that individuals working on any systems that are networked will have to have a PIV badge with logical clearance. This will require a more extensive background check that will require more time to process.

Contractor and subcontractor employees that will work on the VA property shall submit the following information to the Contracting Officer's Representative (COR) when requesting a badge.

Initial Badge Submission Requirements:

First, middle and last name (Legal name, as shown on picture ID)

DOB

SSN

Height

Eye Color

Hair Color

Name of Firm or Company

VA project name

Name of COR

3. Before starting work the General Contractor shall give two weeks' notice to the COR so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.

4. For working outside the 8:00 a.m. - 4:30 p.m. regular hours as defined in the contract, The General Contractor shall give 3 days' notice to the Contracting Officer Representative (COR) so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
5. No photography of VA premises is allowed without written permission of the Contracting Officer Representative (COR).
6. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer Representative (COR).

C. Guards: NOT USED

D. Key Control:

1. Door hardware installed in construction doors is to be self-closing and storage function lock, able to receive a BEST 7 pin core and only operable with a key. The VA will install the construction core and issue keys to the contractor's personnel. All construction fences are to be locked with a VA lock in series so VA engineering and police personnel have emergency access at all times. Construction fences are to be kept locked at all times to prevent access by patients and VA unauthorized staff. Contractor is to provide means of egress from the site that keeps the site secure from the exterior. Keys to necessary construction areas can be checked out with the approval of the COR. The contractor is to give a minimum of 1 week notice for security approval for areas that need to be entered for construction purposes.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.
3. VA construction core keys will be issued to the contractor as deemed necessary by the COR. All keys must be returned when no longer needed or upon completion of the contract. **There will be a \$25**

charge for each key not returned at the end of the contract. Should VA security be compromised as a result of failure to return a key(s), there will be an additional charge to the contractor of \$25 for each door re-cored.

E. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer Representative (COR) upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer Representative (COR).
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer Representative (COR) and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.

- b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

F. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. General Contractor and its employees shall park in designated areas only.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer Representative (COR). The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer Representative (COR) and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer Representative (COR), the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer Representative (COR), use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer Representative (COR). When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the

Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(FAR 52.236-10)

- D. Working space and space available for storing materials shall be as shown on the drawings.
- E. Workmen are subject to rules of Health Care System applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Health Care System as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. The Contractor shall notify the COR prior to the use of equipment and tools that transmit vibrations and noises that can be either felt or heard outside of the work site.

COR approval to use such equipment and tools shall be obtained in advance not less than 48 hours prior to the use of such tools, in order to allow advance coordination with health care staff.

- 1. Do not store materials and equipment in other than assigned areas.
- 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Health Care System areas required to remain in operation.
- 3. Where access by Health Care System personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements and will be coordinated with the COR.

G. Phasing:

The Medical Center must maintain its operation 24 hours a day 7 days a week. Therefore, any interruption in service must be scheduled, in advance, and coordinated with the COR to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be

employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks.

To insure such executions, Contractor shall furnish the COR with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. All phasing dates shall be arranged to insure accomplishment of this work in successive phases, as detailed in the construction drawings, and phasing plans.

- H. Building No. 111 will be vacated by Government in accordance with above phasing beginning immediately after date of receipt of Notice to Proceed and turned over to Contractor and when the Contractor has completed the temporary wood building, allowing the VA to move to temporary locations.
- I. Buildings Nos. 28 and 9 will be occupied by Health Care System personnel during performance of work; but the immediate areas of alterations will be vacated. Occupied areas of buildings shall remain fully operational at all times.
 - 1. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Health Care System operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting, etc. to facilitate patient and staff access. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period. Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Health Care System operations will continue during the construction period.

2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed

J. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet) minimum height, around the construction area indicated on the drawings or as required confining all construction activities. Provide gates as required for access with necessary hardware, including hasps and padlocks. Contractor must provide hardware on gate to provide exit ability of contractor's staff and not allow access to patients at the facility. VA engineering staff must have the ability to access this gate at any time. Provide gates as required for access with necessary hardware, including hasps and padlocks. Note: VA will provide padlocks, keyed to construction core. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Removal of the construction fence shall be coordinated in advance with the COR.

K. When a building and/or construction site is turned over to Contractor, Contractor shall accept entire responsibility including upkeep and maintenance therefore:

1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.

2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

L. Utilities Services: Maintain existing utility services for Health Care System at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone),

they shall be cut and capped at suitable places where shown; or, in absence of such indication, in the drawings, prior to any cutting or capping, the Contractor shall coordinate cutting and capping with the COR. The Contractor shall also coordinate all such actions with the Utility companies involved.

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of the COR. No "HOT TAPPING" of any utility service other than storm or sanitary utilities is allowed unless under extreme circumstances. If these circumstances are determined appropriate and approved by the COR, all work must follow Facilities Management Memorandum 23 "Hot Tapping Procedures"

All services under work shall be isolated and all energy released before work begins. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS for additional requirements.

2. Contractor shall submit a request to interrupt any such services to the COR, in writing, not less than 48 hours, in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Health Care System. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
5. In case of a contract construction emergency, service will be interrupted on approval of the COR. Such approval will be confirmed in writing as soon as practical.

6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

M. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged at the main, branch or panel they originate from. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.

N. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:

1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times with approval.

2. The Contractor shall submit proposed methods and scheduling of required cutting, altering and removal of existing roads, walks and entrances, to the COR , not less than 7 work days in advance of any such work. Plans for such work, must be approved in advance, by the COR.

O. Coordinate the work for this contract with other construction operations the Contractor shall inform the COR of all such coordination in advance. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

1.7 ALTERATIONS

A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report,

signed by both, to the Contracting Officer Representative (COR). This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of buildings.
 2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and the COR.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of the COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and the COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.

D. Protection: Provide the following protective measures:

1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 DISPOSAL AND RETENTION

A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:

1. Reserved items which are to remain property of the Government are noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by the COR.
2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.
3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.
4. PCB Transformers and Capacitors: The Contractor shall be responsible for disposal of the Polychlorinated Biphenyl (PCB) transformers and

capacitors. The transformers and capacitors shall be taken out of service and handled in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of PCB transformers and capacitors for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the Contracting Officer Representative (COR) who will annotate the contract file and transmit the Manifest to the Health Care System.

a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:

40 CFR 261.....Identification and Listing of Hazardous Waste

40 CFR 262.....Standards Applicable to Generators of Hazardous Waste

40 CFR 263.....Standards Applicable to Transporters of Hazardous Waste

40 CFR 761.....PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions

49 CFR 172.....Hazardous Material tables and Hazardous Material Communications Regulations

49 CFR 173.....Shippers - General Requirements for Shipments and Packaging

49 CFR 173.....Subpart A General

49 CFR 173.....Subpart B Preparation of Hazardous Material for Transportation

49 CFR 173.....Subpart J Other Regulated Material; Definitions and Preparation

TSCA.....Compliance Program Policy Nos. 6-PCB-6 and 6-
PCB-7

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound. Any grass that is damaged during construction will have the pre-existing grade restored, be sodded and maintained until the sod is firmly rooted as determined by the COR. Sod will be watered by contractor and may not exceed 6 inches while the contractor is responsible.

- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer Representative (COR) may have the necessary work performed and charge the cost to the Contractor.

(FAR 52.236-9)

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements. At a minimum, the contractor is to comply with all EPA regulations for protection from storm water pollution that would be caused by construction and

implement all required safeties to maintain compliance. Also, all wash downs for concrete trucks is to be conducted off site. No containment areas are allowed on site.

D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) and/or Storm Water pollution Prevention Plan (SWPPP) permit is required for this project. The Contractor is considered an "operator" under the permit and has extensive responsibility for compliance with permit requirements. VA will provide permit application upon request. The contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:

- Designating areas for equipment maintenance and repair;
- Providing waste receptacles at convenient locations and provide regular collection of wastes;
- Locating equipment wash down areas on site, and provide appropriate control of wash-waters; concrete truck wash down is not allowed on site.
- Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
- Providing adequately maintained sanitary facilities.

1.10 RESTORATION

A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as shown in the drawings or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without written approval of the Contracting Officer (CO). Existing work to be altered or extended and that is found to be defective in any way, shall

be reported to the COR before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 PHYSICAL DATA

A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by:

- Independent Testing Technologies, Project 14-237, Report of Geotechnical Explorations for, Building B111, Outpatient Mental Health Clinic, ST. Cloud VA Medical Center, VA Project 656-341, St. Cloud Minnesota. -

B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are shown diagrammatically on drawings.

- C. A copy of the soil report is included in the project specifications and shall be considered part of the contract documents.
- D. Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Bidders are expected to examine site of work and logs of borings; and, after investigation, decide for themselves character of materials and make their bids accordingly. Upon proper application to Department of Veterans Affairs, bidders will be permitted to make subsurface explorations of their own at site.

1.12 PROFESSIONAL SURVEYING SERVICES

A registered professional land surveyor or registered civil engineer whose services are retained and paid for by the Contractor shall perform services specified herein and in other specification sections. The Contractor shall certify that the land surveyor or civil engineer is not one who is a regular employee of the Contractor, and that the land surveyor or civil engineer has no financial interest in this contract.

1.13 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer Representative (COR). The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer Representative (COR) until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer Representative (COR) may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. Establish and plainly mark center lines for each building and corner of column lines and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, roads, parking lots, are in accordance with lines and elevations shown on contract drawings.
- C. Following completion of general mass excavation and before any other permanent work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of work. Survey shall include, but not be limited to, location of lines and grades of footings, exterior walls, center lines of columns in both directions, major utilities and elevations of floor slabs:
1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COR before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.
- D. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the COR before any major items of concrete work are placed. In addition, Contractor shall also furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following work is complete in every respect as required by contract drawings.
1. Lines of each building and/or addition.
 2. Elevations of bottoms of footings and tops of floors of each building and/or addition.
 3. Lines and elevations of sewers and of all outside distribution systems.
 4. Lines of elevations of all swales and interment areas.

5. Lines and elevations of roads, streets and parking lots.

- E. Whenever changes from contract drawings are made in line or grading requiring certificates, record such changes on a reproducible drawing bearing the registered land surveyor or registered civil engineer seal, and forward these drawings upon completion of work to the COR.
- F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.14 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the COR's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings in AutoCad release 13 to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A, B, & C shall also apply to all submitted and revised shop drawings.

1.15 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Health Care System property and, when authorized by the COR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed and restoration performed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.

- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.16 NOT USED

1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to written approval and compliance with the following provisions:
 - 1. Permission to use each unit or system must be given by the CO/Contracting Officer in writing. Any such equipment shall be installed and maintained in accordance with the written agreement and following provisions.
 - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Installation of temporary electrical equipment or devices shall be in accordance with NFPA 70, National Electrical Code, (2014 Edition), Article 590, *Temporary Installations*. Voltage supplied to each item of equipment shall be verified to be correct and it that motors shall not be overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
 - 3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be reduced to contract specs, or in the absence of contract specifications, adjusted to "at or below" manufacturer's specs for typical installations.
 - 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.

5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.

a. The MERV Rating for filtration shall be such to satisfy LEED IEQc3.2 requirements. MERV 13 rated filters are required prior to occupancy.

6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.

B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.

C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

D. Any damage to the equipment or excessive wear due to prolonged use will be repaired replaced by the contractor at the contractor's expense.

1.18 TEMPORARY USE OF EXISTING ELEVATORS

A. Use of existing elevator for handling building materials and Contractor's personnel will be permitted subject to the following provisions.

1. Contractor shall make advance arrangements with the COR for use of elevators. The COR will ascertain the elevators are in proper condition. Contractor may use the elevator in Building #3 for daily use for special nonrecurring time intervals, once permission is granted by the COR. Personnel for operating the elevators will not be provided by the Department of Veterans Affairs.

2. Contractor covers and provides maximum protection of the following elevator components:

a. Entrance Jams, heads, soffits and threshold plates.

- b. Entrance columns, canopy, return panels, and inside surfaces of the car enclosure walls.
 - c. Finish flooring in the cab.
3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by actions of foreign matter, such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced with new hoisting ropes, at the Contractor's expense.
 4. If brake lining of elevators is excessively worn or damaged, during temporary use, they shall be removed and replaced with new brake lining at Contractor's expense.
 5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts at the Contractor's expense, if recommended by elevator inspector after elevator is released by Contractor.
 6. Place elevator in condition equal, less normal wear that existing at time it was placed in service of the Contractor, as approved by Contracting Officer.

1.19 TEMPORARY USE OF NEW ELEVATORS

- A. The Contractor and his personnel shall be permitted use of new elevator(s) subject to the following provisions:
 1. Contractor shall make arrangements with the COR for use of elevator(s). Contractor may obtain elevator(s) for exclusive use.
 2. Prior to the use of elevator(s), the Contractor shall have the elevator(s) inspected and accepted by an ASME accredited, certified elevator safety inspector. The acceptance report shall be submitted to the COR.
 3. Submit to the COR the schedule and procedures for maintaining equipment. Indicate the day or days of the week and total hours required for maintenance. A report shall be submitted to the COR monthly indicating the type of maintenance conducted, hours used, and any repairs made to the elevator(s).

4. The Contractor shall be responsible for enforcing the maintenance procedures as per VA and manufacturers recommendations and requirements.
5. During temporary use of elevator(s) all repairs, equipment replacement and cost of maintenance shall be the responsibility of the Contractor.
6. Personnel for operating elevator(s) shall not be provided by the Department of Veterans Affairs.
7. Contractor shall cover and provide maximum protection of the entire elevator(s) installation.
8. The Contractor shall arrange for the elevator company to perform operation of the elevator(s) so that an ASME accredited, certified elevator safety inspector can evaluate the equipment. The Contractor shall be responsible for any costs of the elevator company.
9. All elevator(s) parts worn or damaged during temporary use shall be removed and replaced with new parts at the contractor's expense. This shall be determined by an ASME accredited certified elevator safety inspector after temporary use and before acceptance by the Government. Submit report to the COR for approval.
10. Elevator shall be tested as required by the testing section of the elevator(s) specifications before acceptance by the Department of Veterans Affairs. The Contractor shall be responsible for all cost associated with testing and inspection.

1.20 TEMPORARY TOILETS

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Health Care System. Contractor shall keep such places clean at all times, and be responsible for any damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

1.21 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as

specified in the contract. The Contractor shall carefully conserve any utilities furnished.

- B. The Contractor, at Contractor's expense and in a workmanlike manner, in compliance with code and as satisfactory to the Contracting Officer Representative (COR), shall install and maintain all necessary temporary connections and distribution lines. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia and repair restore the infrastructure as required.
- C. Contractor shall furnish and install meters at Contractor's expense and furnish the Health Care System a monthly record of the Contractor's usage of all furnished utilities including, but not limited to electricity, water, and steam as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open flame devices, such as salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. A heat exchanger type system, with contained flame and exhaust to be outside of building and ducted to the interior shall be allowed with pre-approval. Maintain minimum temperatures as specified for various materials:
 - 1. Obtain heat by connecting to Health Care System heating distribution system.
 - a. Steam is available at no cost to Contractor. Steam will only be allowed for use once the building addition/expansion is fully enclosed and insulated to an R value of the permanent design for all envelope features.
 - b. Electric Resistance heat is not allowed.
 - 2. If the contractor elects not to connect to the nearest available steam supply, gas/fuel heaters will be allowed with a submitted plan that is approved by the COR and facility Safety Officer.

- a. Gas/fuel heaters must be an indirect heat unit with a heat exchanger. The unit must utilize a fresh air intake and exhaust outdoors.
 - b. All gas/fuel is to be supplied by the contractor at contractor's expense.
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the Health Care System electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices and electrical welding devices. Electricity for all other uses must be metered, but is available at no cost to the Contractor.
- F. Water (for Construction and Testing): Furnish temporary water service.
1. Obtain water by connecting to the Health Care System water distribution system. Provide reduced pressure backflow preventer at each connection as per code. Water must be metered and is available at no cost to the Contractor.
 2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COR's discretion) of use of water from Health Care System's system.
 3. Water from the potable water system may not be used for irrigation. Irrigation water is available near the site.
- G. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished and paid by the Contractor at Contractor's expense.
- H. Steam: Furnish steam system for testing required in various sections of specifications.

1. Obtain steam for testing by connection to the Health Care System steam distribution system. Steam is available at no cost to the contractor.
2. Maintain connections, piping, fittings, and fixtures, and conserve steam use, so none is wasted. Failure to stop leakage or other waste will be cause for revocation (at COR's discretion) of use of steam from the Health Care System's system.

1.22 NEW TELEPHONE EQUIPMENT

The contractor shall coordinate with the work of installation of telephone equipment by others. This work shall be completed before the building is turned over to VA.

1.23 TESTS

- A. As per specification section 23 05 93 the contractor shall provide a written testing and commissioning plan complete with component level, equipment level, sub-system level and system level breakdowns. The plan will provide a schedule and a written sequence of what will be tested, how and what the expected outcome will be. This document will be submitted for approval prior to commencing work. The contractor shall document the results of the approved plan and submit for approval with the as built documentation.
- B. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- C. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer Representative (COR). Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air,

steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.

- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonable period of time during which operating and environmental conditions remain reasonably constant and are typical of the design conditions.
- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.24 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system

being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Training for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until training for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. The Contractor shall coordinate and schedule all training in advance with the COR, and training shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications.

1.25 GOVERNMENT-FURNISHED PROPERTY

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the Schedule or drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Health Care System.
- C. Contractor shall be prepared to receive this equipment from Government and store or place such equipment not less than 90 days before Completion Date of project.
- D. Notify Contracting Officer Representative (COR) in writing, 60 days in advance, of date on which Contractor will be prepared to receive

equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.

2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.

F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.

G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.26 RELOCATED EQUIPMENT AND ITEMS

A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.

B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.

C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, at the main whenever

such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".

- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing equipment, required to be relocated.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.27 HISTORIC PRESERVATION:

- A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of, or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the COR verbally, and then with a written follow-up. The Contractor shall cease work at the point of discovery in order to protect the find from damage, pending direction from the Contracting Officer as to how to proceed.

1.28 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the COR.
- B. Maintain sign and remove it when directed by the COR.

1.29 SAFETY SIGN

- A. Provide a Safety Sign where directed by COR.
- B. Maintain sign and remove it when directed by the COR.

1.30 PHOTOGRAPHIC DOCUMENTATION

- A. During the construction period through completion, provide photographic documentation (300 - 400 pictures) of construction progress and at

selected milestones including electronic indexing, navigation, storage and remote access to the documentation, as per these specifications. The commercial photographer or the subcontractor used for this work shall meet the following qualifications:

1. Demonstrable minimum experience of three (3) years in operation providing documentation and advanced indexing/navigation systems including a representative portfolio of construction projects of similar type, size, duration and complexity as the Project.
2. Demonstrable ability to service projects throughout North America, which shall be demonstrated by a representative portfolio of active projects of similar type, size, duration and complexity as the Project.
3. All persons photographing shall be accompanied by the COR.

B. Photographic documentation elements:

1. Each digital image shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) capable of producing 200x250mm (8 x 10 inch) prints with a minimum of 2272 x 1704 pixels and 400x500mm (16 x 20 inch) prints with a minimum 2592 x 1944 pixels.
2. Indexing and navigation system shall utilize actual AUTOCAD construction drawings, making such drawings interactive on an on-line interface. For all documentation referenced herein, indexing and navigation must be organized by both time (date-stamped) and location throughout the project and photographer shall take pictures in the presence of the COR.
3. Documentation shall combine indexing and navigation system with inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
 - a. Photo documentation is required for the following LEED credits:
SSp1: Provide date-stamped photos showing the measures taken,

including any corrective action, to effectively implement the ESC plan. Include at least 3 photos from at least 3 inspections equally spaced over the site work period. Inspections must occur monthly, at a minimum IEQc3.1 - Provide photos documenting methods employed to protect absorptive materials from moisture damage during construction and pre-occupancy. Photos should highlight materials stored or installed on-site and should include date and time stamp. Photos of all noted moisture protection methods on at least 2 different time periods must be included.

4. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings. If site work or pad preparation is extensive, this documentation may be required immediately before construction and at several pre-determined intervals before building work commences.
5. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days ("Progressions"). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.
6. As-built condition of pre-foundation utilities and site utilities shall be documented prior to pouring footers, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building(s) envelope(s) and utility runs in the immediate vicinity of the building(s) envelope(s). This may also include utilities enclosed in slab-on-deck in multi-story buildings. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive site utility plans.

7. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
8. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the COR in order to capture pre-determined focal points, such as waterproofing, window flashing, radiused steel work, architectural or Exterior Insulation and Finish Systems (EIFS) detailing. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive elevations or elevation details.
9. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the COR. Overlapping photographic techniques shall be used to insure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
 - a. Digital photos with views of all interior spaces, in addition to the exterior will be submitted to LEED online, as part of the certification requirements.
10. Miscellaneous events that occur during any Contractor site visit, or events captured by the Department of Veterans Affairs independently, shall be dated, labeled and inserted into a Section in the navigation structure entitled "Slideshows," allowing this information to be stored in the same "place" as the formal scope.
11. Customizable project-specific digital photographic documentation of other details or milestones. Indexing and navigation accomplished through interactive architectural plans.
12. Monthly (29 max) exterior progressions (360 degrees around the project) and slideshows (all elevations and building envelope). The

slideshows allow for the inclusion of Department of Veterans Affairs pictures, aerial photographs, and timely images which do not fit into any regular monthly photograph.

13. Weekly (21 Max) Site Progressions - Photographic documentation capturing the project at different stages of construction. These progressions shall capture underground utilities, excavation, grading, backfill, landscaping and road construction throughout the duration of the project.
 14. Regular (8 max) interior progressions of all walls of the entire project to begin at time of substantial framed or as directed by the COR through to completion.
 15. Detailed Exact-Built of all Slabs for all project slab pours just prior to placing concrete or as directed by the COR.
 16. Detailed Interior exact built overlapping photos of the entire building to include documentation of all mechanical, electrical and plumbing systems in every wall and ceiling, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by the COR.
 17. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by the COR prior to occupancy.
 18. In event a greater or lesser number of images than specified above are required by the COR, adjustment in contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.
- D. Coordination of photo shoots is accomplished through the COR. Contractor shall also attend construction team meetings as necessary. Contractor's operations team shall provide regular updates regarding the status of the documentation, including photo shoots concluded, the

availability of new Progressions or Exact-Builts viewable on-line and anticipated future shoot dates.

- E. Contractor shall provide all on-line domain/web hosting, security measures, and redundant server back-up of the documentation.
- F. Contractor shall provide technical support related to using the system or service.
- G. Upon completion of the project, final copies of the documentation (the "Permanent Record") with the indexing and navigation system embedded (and active) shall be provided in an electronic media format, typically a DVD or external hard-drive. Permanent Record shall have Building Information Modeling (BIM) interface capabilities. On-line access terminates upon delivery of the Permanent Record.

1.31 FINAL ELEVATION DIGITAL IMAGES

- A. A minimum of four (4) images of each elevation shall be taken with a minimum 6 MP camera, by a professional photographer with different settings to allow the COR to select the image to be printed. All images are provided to the RE on a CD.
- B. Photographs shall be taken upon completion, including landscaping. They shall be taken on a clear sunny day to obtain sufficient detail to show depth and to provide clear, sharp pictures. Pictures shall be 400 mm x 500 mm (16 by 20 inches), printed on regular weight paper, matte finish archival grade photographic paper and produced by a RA4 process from the digital image with a minimum 300 PPI. Identifying data shall be carried on label affixed to back of photograph without damage to photograph and shall be similar to that provided for final construction photographs.
- C. Furnish six (6) 400 mm x 500 mm (16 by 20 inch) color prints of the following buildings constructed under this project (elevations as selected by the RE from the images taken above). Photographs shall be artistically composed showing full front elevations. All images shall become property of the Government. Each of the selected six prints shall be placed in a frame with a minimum of 2 inches of appropriate matting as a border. Provide a selection of a minimum of 3 different frames from which the SRE will select one style to frame all six

prints. Photographs with frames shall be delivered to the COR in boxes suitable for shipping.

1. Building No. 111.

1.32 REBATE DOCUMENTATION

- A. As the VA is involved in rebate programs for installed materials, the contractor is to provide information to the COR including invoices, information sheets, etc. as required for the government to successfully receive rebates.

- - - E N D - - -

SECTION 01 32 16.15
PROJECT SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COTR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COTR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer has the right to approve or disapprove the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall

have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COTR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date

constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- D. Within 30 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.
- E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.
- F. The Complete Project Schedule shall contain approximately 35 work activities/events.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.

- d. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, floor, or building, to another area, floor, or building, for at least five trades who are performing major work under this contract.
 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the COTR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
 5. The schedule shall be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.
- Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COTR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable

completion date of each phase regardless of the COTR's approval of the Project Schedule.

- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.
- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COTR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COTR three work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.

5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**
- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor

should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
 - 1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
 - 2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
 - 3. Reschedule the work in conformance with the specification requirements.
- B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COTR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO THE SCHEDULE

- A. Within 30 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:
 - 1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
 - 2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
 - 3. The schedule does not represent the actual prosecution and progress of the project.

4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.
- B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.
- C. Contracting Officer's approval for the revised project schedule and all relevant data is contingent upon compliance with all other paragraphs of this section and any other previous agreements by the Contracting Officer or the VA representative.
- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COTR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer-produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts

and advise the Contractor in writing of the Contracting Officer's decision.

- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

- - - E N D - - -

RECYCLED CONTENT CERTIFICATION
FORM - 01 3310

RECYCLED CONTENT CERTIFICATION FORM

PROJECT: 	SUBCONTRACTOR/INSTALLER: ADDRESS: CITY, STATE, ZIP: TELEPHONE: FAX: E-MAIL:
PROJECT NO.;	

CONTRACTOR: ADDRESS: CITY, STATE, ZIP: TELEPHONE: FAX: E-MAIL:	PRODUCT MANUFACTURER: ADDRESS: CITY, STATE, ZIP: TELEPHONE: FAX: E-MAIL:
--	--

Item No.	Product Category	Spec. Section No.	Quantity Bid	Unit of Measure	Material Cost (no labor)	Weight (lbs)	% Virgin Content	% Post-consumer	% Post-industrial	Total %
							As a percent of total weight			
										100
										100
										100
										100
										100
										100
										100
										100
										100
										100
										100

 Name (Printed) Title Date Signature

Product Category is the base material that comprises the greatest percentage of the product by either weight or volume, such as steel, plastic, aluminum, wood, etc.

This form is to be completed by a Corporate Officer of the Product Manufacturer for the Contractor. The Contractor must return the certification, completed for each product with recycled content as required by specific Specification Sections. Attach additional sheets/backup as necessary.

SECTION 01 33 23
SUBMITTAL PROCEDURES

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer Representative (COR), that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
 - D. **All LEED Forms, Product Data, cut sheets, or MSDS information required for LEED Submittals shall be submitted in digital PDF format for review by A/E and LEED Consultant.**
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals (including any laboratory samples to be tested) will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.

- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer Representative (COR) and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer Representative (COR) assumes no responsibility for checking quantities or exact numbers included in such submittals.
- A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
- B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.

1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
- C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.
1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
 2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
 3. Samples and laboratory tests shall be sent directly to an approved commercial testing laboratory.
 4. Contractor shall forward a copy of transmittal letter to Resident Engineer simultaneously with submission to a commercial testing laboratory
 5. Laboratory test reports shall be sent directly to COR for appropriate action.
 6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
 7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be

marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.

- E. Approved samples will be kept on file by the COR at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
- F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 2. Reproducible shall be full size.
 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

Architect-Engineer: Foss Architecture & Interiors,
810 1st Ave. North
Fargo, North Dakota 58102

1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Contracting Officer Representative (COR).

1-12. Samples (except laboratory samples) for approval shall be sent to Architect-Engineer, in care of:

Contracting Officer Representative (COR) ,

VA Medical Center

4801 Veterans Drive

St. Cloud, Minnesota 56303-2099

1-13 PROJECT MANAGEMENT AND COORDINATION - ENVIRONMENTAL

- A. Contractor's Environmental Manager: Designate an on-site party responsible for overseeing the environmental goals for the project and implementing procedures for environmental protection.
1. Qualifications: Minimum 5 years construction experience on projects of similar size and scope; minimum 3 years experience with environmental procedures similar to those of this project; familiarity with Environmental Management Systems (EMSs) such as ISO 14001; familiarity with environmental regulations applicable to construction operations.
 2. Responsibilities: Responsibilities shall include:
 - a. Compliance with applicable Federal, State, and local environmental regulations, including maintaining required documentation.
 - b. Implementation of the Waste Management Plan.
 - c. Implementation of the IAQ Management Plan.
 - d. Implementation of the Environmental Protection Plan.
 - e. Training for Contractor personnel in accordance with their position requirements.
 - f. Monitoring and documentation of environmental procedures.

1-14 CERTIFICATIONS:

- A. Definition: Certifications are manufacturer's testimonials prepared by him or by an independent testing agency which certify conformance with specified requirements.
- B. Content: Identify product by reference to Specification Section, and by reference to applicable Drawings. Clearly mark each copy to identify pertinent model, if more than one certification is required.
- C. Submit certification for all wood products provided by a Forest Stewardship Council (FSC) accredited certifier.
- D. Provide final certification of well-managed forest of origin to

provide final documentation of FSC-certified sustainably harvested status. Acceptable wood "certified sustainably harvested" certifications shall include:

1. Wood suppliers' certificate issued by one of the FSC-accredited certifying agencies;
 2. Letter from one of a certifying agency corroborating that the products on the wood supplier's invoice originate from FSC-certified well-managed forests.
 3. Suppliers' invoice detailing the quantities of certified wood products for project;
- E. Environmental Product Certifications: include manufacturer certification indicating product contains maximum recycled content possible without being detrimental to product performance.
- F. Include certification indicating cleaning materials comply with requirements of these Specifications.
- G. Material/Product Compliance Tables, and Adhesives and Sealants Compliance Tables: Furnish executed Compliance Tables as required by each Section.

1-15 RECYCLED CONTENT CERTIFICATION FORM:

- A. Complete and submit Section 01 3310 Recycled Content Certification Form for all materials and products for which recycled content is specified. Make additional copies of the Form as required to ensure each material and product being tracked for recycled content is listed on the form.
1. Include the LEED Material Cost Calculator.
- B. Recycled Content Certification Forms shall be furnished to the Architect prior to ordering the material or product being tracked for recycled content. Failure to provide Recycled Content Certification Forms will be considered grounds for Architect's rejection of the material or product. Removal of rejected materials/products, and replacing them with approved, shall be the responsibility of the Contractor and at his expense.
- C. Furnish product data indicating the source of recycled content data for material/product for which recycled content is specified.
- D. Alternative forms listing recycled content may be furnished in lieu of Section 01 3310 provided the following information is indicated on each form: a description of the material, the manufacturer of the material or product, the material/product cost, the pre-consumer anchor post consumer recycled content, and the source of the recycled content data. Forms are subject to review and approval by the Architect,
- E. Forms rejected by the Architect shall be revised and re-submitted.

1-16 REGIONAL MATERIALS DATA:

- A. For each material and product for which regional materials were specified, furnish the following items below, along with Shop Drawings and Product Data for these materials and products:
1. Percentage of product, by weight, that meets both extraction and manufacturing distance criteria;

2. Distance between the project site and the extraction/harvest/recovery site;
3. Distance between project site and final manufacturing location.
4. Product name for each tracked material;
5. Material manufacturer name;
6. Total product cost for each tracked material.

- - - E N D - - -



LEED for New Construction v2009

Construct MHC Bldg 111 Addition 11/11/2014

Registered Project Checklist

12 13 1 Sustainable Sites Possible Points: 26

Y	N	?			
Y			Prereq 1	Construction Activity Pollution Prevention	
1			Credit 1	Site Selection	1
	5		Credit 2	Development Density and Community Connectivity	5
	1		Credit 3	Brownfield Redevelopment	1
6			Credit 4.1	Alternative Transportation—Public Transportation Access	6
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
	3		Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
	1		Credit 5.1	Site Development—Protect or Restore Habitat	1
	1		Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
	1		Credit 7.1	Heat Island Effect—Non-roof	1
	1		Credit 7.2	Heat Island Effect—Roof	1
		1	Credit 8	Light Pollution Reduction	1

6 4 Water Efficiency Possible Points: 10

Y	N	?			
			Prereq 1	Water Use Reduction—20% Reduction	
	2	2	Credit 1	Water Efficient Landscaping	2 to 4
	2		Credit 2	Innovative Wastewater Technologies	2
	2	2	Credit 3	Water Use Reduction	2 to 4

9 21 5 Energy and Atmosphere Possible Points: 35

Y	N	?			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
6	12	1	Credit 1	Optimize Energy Performance	1 to 19
	7		Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
	2		Credit 4	Enhanced Refrigerant Management	2
1	2		Credit 5	Measurement and Verification	3
		2	Credit 6	Green Power	2

6 4 4 Materials and Resources Possible Points: 14

Y	N	?			
			Prereq 1	Storage and Collection of Recyclables	
1	2		Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
1			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
		1	Credit 2	Construction Waste Management	1 to 2
	2		Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	N	?			
1		1	Credit 4	Recycled Content	1 to 2
1		1	Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

11 4 1 Indoor Environmental Quality Possible Points: 15

Y	N	?			
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
1			Credit 1	Outdoor Air Delivery Monitoring	1
	2		Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
		1	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
	1		Credit 8.1	Daylight and Views—Daylight	1
	1		Credit 8.2	Daylight and Views—Views	1

6 Innovation and Design Process Possible Points: 6

Y	N	?			
1			Credit 1.1	Innovation in Design: Educational Signage	1
1			Credit 1.2	Innovation in Design: Green Cleaning	1
1			Credit 1.3	Innovation in Design: Exemp Perf. EAc6 OR PBT Reducton	1
1			Credit 1.4	Innovation in Design: Low Mercury Lighting OR IPD credit	1
1			Credit 1.5	Innovation in Design: Exemp Performance MRC7	1
1			Credit 2	LEED Accredited Professional	1

2 1 1 Regional Priority Credits Possible Points: 4

Y	N	?			
1			Credit 1.1	Regional Priority: SSc6.1	1
1			Credit 1.2	Regional Priority: SSc6.2	1
		1	Credit 1.3	Regional Priority: MRC2 75%	1
		1	Credit 1.4	Regional Priority: MRC5.2, WEc1, EQc8.1	1

46 49 16 Total Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

SECTION 01 35 16
LEED SUBMITTAL FORMS

PART 1 - GENERAL:

1.1 PURPOSE:

- A. These forms are for the Contractor's use in submitting documentation to be used to determine whether particular credits have been achieved. The cooperation of subcontractors, suppliers and manufacturers is required.
- B. These forms apply to the following LEED Credits:
 - 1. **Mrc2 - Construction Waste Management**
 - 2. **Mrc4 - Recycled Content.**
 - 3. **Mrc5 - Regional Materials.**
 - 4. **Mrc7 - Certified Wood.**
 - 5. **lEQc Credit 4.1 - Low-Emitting Materials: Adhesives and Sealants.**
 - 6. **lEQc Credit 4.2 - Low-Emitting Materials: Paints & Coatings.**
 - 7. **lEQc Credit 4.3 - Low-Emitting Materials: Flooring Systems**
 - 8. **lEQc Credit 4.4 - Low Emitting Materials: Composite Wood and Agrifiber products**
 - 9. **lEQc Credit 5 - Indoor Chemical and Pollutant Source Control**

1.2 FORMS:

- A. 01 3516.01 - LEED Material Cost Summary Form: Certification by Contractor.
- B. 01 3516.02 - LEED Wood-Containing Product List: Certification by Contractor. **Project Requires FSC Content of 95% or higher for project total.** In order to achieve an Innovation and Design Credit for Exemplary Performance. This includes all new wood, and wood products (lumber, plywood, wood veneer, etc.) permanently installed on the project.
- C. 01 3516.03 - LEED Metal-Containing Product List: Certification by Contractor.
- D. 01 3516.04 - LEED New Product Content Form: Including separate reporting of wood, steel, rapidly renewable, and recycled content; data certification by manufacturer of product; cost and quantity certification by Contractor.
- E. 01 3516.05 - LEED New Product Source Form: Data certification by manufacturer of product; cost and quantity certification by Contractor.
- F. 01 3516.07 LEED Prohibited Content Installer Certification: Certification by each installer working on project regardless of product type.

SECTION 01 35 16
LEED SUBMITTAL FORMS

1.3 PROCEDURES:

- A. All LEED submittal forms are to be submitted by Contractor; certifications are to be made by indicated party.
 - 1. **All LEED forms, Product Data, cut sheets, or MSDS required for LEED Submittals shall be provided in Digital PDF format for review by Architect and LEED Consultant.**
- B. Where a LEED Submittal is called for, fill out and submit the appropriate form.
 - 1. Fill out one form for each different brand name product and each different manufacturer of a lot of commodity products.
 - 2. Where required attachments are specified, attach the documentation to the back of the form.
- C. Each form must be signed by the entity capable of certifying the information.
 - 1. Certification signatures must be made by an officer of the company.
 - 2. For products, certification must be made by the manufacturer not the supplier.
 - 3. For custom fabricated products, certification by the fabricator is acceptable.
- D. Submit the completed forms in accordance with the requirements of Section 01 3323 - Administrative Requirements, as information submittals.
 - 1. Give each form a unique submittal number.
 - 2. Do not combine LEED forms with product data or shop drawing submittals.

END OF SECTION

**SECTION 01 3516.01
LEED MATERIAL COST SUMMARY FORM**

LEED SUBMITTAL FORM

A. Identification:

- 1. Project Name: _____
- 2. Project No.: _____
- 3. Architect: _____

B. This form applies to the following LEED Credits:

- 1. MR Credits 4.1 - Recycled Content
- 2. MR Credits 5.1 - Regional Materials
- 3. MR Credit 7 - Certified Wood

C. Procedure:

- 1. Because the above listed credits require computations based on the material costs for the project, the Contractor is required to submit the following cost breakdown, in addition to any cost breakdown specified elsewhere.
- 2. Costs are to be material costs excluding labor, overhead, and profit, but including delivery, storage, and handling charges. Revise cost summary whenever materials actually installed change due to contract modifications or Contractor preference.

CERTIFICATION:

- \$ _____ Total Cost of All Materials
- \$ _____ Total Cost of Plumbing, HVAC, Electrical and Communications
- \$ _____ Total Cost of Architectural Equipment - Divisions 11 Thru 14
- \$ _____ Total Cost of Wood and Wood-Based Materials, including temporary construction items that will neither be incorporated into the work nor returned to their supplier for re-use.

CERTIFIED BY: (Contractor)

- A. Print Name: _____
- B. Signature: _____
- C. Title: _____ (officer of company), Date: _____

END OF SECTION

**SECTION 01 3516.02
LEED WOOD-CONTAINING PRODUCT LIST**

LEED SUBMITTAL FORM

- A. Identification:
1. Project Name: _____
 2. Project No.: _____
 3. Architect: _____

B. This form applies to LEED MRC 7 (certified wood).

C. This project requires FSC Content of 95% or higher for project total.

WOOD-CONTAINING PRODUCTS

A. Wood-containing products are those made of solid wood, wood chip, or wood fiber, or containing components made of solid wood, wood chip or wood fiber.

B. Rationale: Because the computation for this credit is based on the total material costs for all wood and wood-based products on the project, the Contractor is required to submit the following itemization of wood and wood-based products, including materials used during construction but not incorporated into the finished work.

C. Procedure: For each wood-containing product provided for this project, submit "LEED Material Content Form". At minimum, submit for the following products. Initial those for which the material content form is attached.

- D. Permanent Wood-Containing Product List:
- _____ Wood framing, furring, and supports
 - _____ Sheathing
 - _____ Blocking, curbing and nailers
 - _____ Cabinets and casework
 - _____ Doors including composite construction
 - _____ Wood shelving

- E. Temporary Wood-Containing Product List:
- _____ Concrete formwork and formwork supports

CERTIFICATION

_____ All other wood-containing products used on this project are shown on the attached list.

_____ I certify that there are no other wood-containing products used on this project that exceed 1 percent of total material cost.

_____ I certify that there are no other temporary facilities or construction using wood-containing products that exceed 1 percent of the total material cost.

CERTIFIED BY: (Contractor)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company), Date: _____

END OF SECTION

**SECTION 01 3516.03
LEED METAL-CONTAINING PRODUCT LIST**

LEED SUBMITTAL FORM:

- A. Identification:
1. Project Name: _____
 2. Project No.: _____
 3. Architect: _____
- B. This form applies to LEED Credits MR 4.1 and 4.2 (recycled content).

STEEL-CONTAINING PRODUCTS:

- A. Rationale: Although all steel contains reused steel, steel products often cannot be traced to a certain mill lot and, even when they can, the mill's certificate usually does not indicate the proportion of new to reused steel.
- B. Procedure: Determine recycled steel content by estimating the proportion of reused steel based on trade association surveys of mill practices multiplied by the quantity of steel by weight in the product.
1. Referenced Mill Practices Survey: See the current edition of Steel Recycling Institute "Steel Takes LEED with Recycled Content," at http://www.recycle-steel.org/PDFs/leed/Steel%20Takes%20LEED_June06.pdf.
 2. If the mill source cannot be identified, the product will be considered to have the lowest reused steel content reported in referenced mill practices survey.
 3. For each steel-containing product provided for this project, submit "LEED New Product Content Form". At minimum, submit for the following products. Initial those for which the material content form is attached.
- C. Steel-Containing Product List:
- _____ Concrete reinforcement (bars, mats, wire, mesh), anchor plates
 - _____ Structural steel framing members, plates
 - _____ Bar joists and girders
 - _____ Steel decking
 - _____ Light gauge steel framing and trusses
 - _____ Steel stairs and ladders
 - _____ Steel handrails and railings
 - _____ Miscellaneous formed steel fabrications
 - _____ Steel wall and roof panels
 - _____ Steel sheet metal flashing and trim
 - _____ Steel doors and frames
 - _____ Non-load-bearing steel framing (studs, ceiling framing, shaftwall)
 - _____ Suspended ceiling grid
 - _____ Steel wall louvers and vents

CERTIFICATION:

_____ All other steel- and cast iron-containing products used on this project are shown on the attached list.

_____ I certify that there are no other steel-containing products used on this project that exceed 1 percent of total material cost less material cost attributed to mechanical and electrical.

CERTIFIED BY: (Contractor)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company)
4. Date: _____

END OF SECTION

**SECTION 01 3516.04
LEED MATERIAL CONTENT FORM**

LEED SUBMITTAL FORM

- A. Identification:
1. Project Name: _____
 2. Project No.: _____
 3. Architect: _____
 4. Product Name: _____ (brand name, model number, etc.)
 5. Manufacturer: _____ www. _____
 - a. Contact: _____ Tel.: _____
 6. Supplier/Sub.: _____ www. _____
 - a. Contact: _____ Tel.: _____
 7. Applicable Specification Section Number(s) _____
- B. This form applies to LEED Credits MRc 4.1 (recycled content), MRc 6 (rapidly renewable content), and MRc 7 (certified wood).

PRODUCT CERTIFICATION

- A. FSC-Certified Solid Wood, Wood Chip, and Wood Fiber Content: _____ percent by weight.
_____ Product is FSC-trademarked.
_____ FSC Chain-of-Custody certificate number is _____
FSC: Forest Stewardship Council Chain-of-Custody number or physical trademark; computation of less than 100 percent certified content in accordance with FSC policy.
- I. NOTE: Project requires FSC Content of 95% or high for project total.**
- B. Steel Content: _____ percent by weight.
_____ Steel Mill Source is: _____
_____ Mill letter describing mill process and typical re-used steel content is attached.
- C. Other Content: (Percentages by weight may not add up to more than 100 percent.)
1. Pre-Consumer/Post-Industrial Recycled Content: _____ percent by weight.
 2. Post-Consumer Recycled Content: _____ percent by weight.
 3. Description of Recycled Content: _____
 4. Definition: Recycled content is defined in accordance with FTC regulations, found in 16 CFR 260.7(e); see www.ftc.gov/Thcp/gmrule/guldes80427.htm.
- D. Total Weight: _____ per _____, (unit).
- E. CERTIFIED BY: (Manufacturer)
1. Print Name: _____
 2. Signature: _____
 3. Title: _____ (officer of company), Date: _____

COST CERTIFICATION

- A. Unit Cost: \$ _____ per _____ (same unit as above); No. of Units Installed: _____
- B. OR (enter cost either above or below, not both)
- C. Total Installed Material Cost of This Product: \$ _____
- D. CERTIFIED BY: (Contractor)
1. Print Name: _____
 2. Signature: _____
 3. Title: _____ (officer of company), Date: _____

END OF SECTION`

**SECTION 01 3516.05
LEED NEW PRODUCT SOURCE FORM**

LEED SUBMITTAL FORM:

- A. Identification:
1. Project Name: _____
 2. Project No.: _____
 3. Architect: _____
 4. Product Name: _____ (brand name, model number, etc.)
 5. Manufacturer: _____ www. _____
 - a. Contact: _____ tel: _____
 6. Supplier/Sub: _____ www. _____
 - a. Contact: _____ tel: _____
 7. Applicable Specification Section Number(s) _____

B. This form applies to LEED MR Credits 5.1 for new products only; see separate form for reused products.

PRODUCT CERTIFICATION:

A. The following percentages of this product were processed in the locations indicated. (Indicate NIA in first column if process is not applicable.)

Percent	Harvest, Extraction, Recovery, or Manufacturing Process	City/County, State, Country	Distance From Project
_____ %	Raw Material _____:	_____	_____
_____ %	Raw Material _____	_____	_____
_____ %	Raw Material _____	_____	_____
_____ %	Manufactured at: (primary)	_____	_____
_____ %	Manufactured at: (primary)	_____	_____
_____ %	Manufactured at: (secondary)	_____	_____
_____ %	Manufactured at: (secondary)	_____	_____
_____ %	Manufactured at: (final)	_____	_____
_____ %	Manufactured at: (final)	_____	_____

B. CERTIFIED BY: (Manufacturer)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company), Date: _

COST CERTIFICATION

A. Unit Cost: \$ _____ per _____, (unit); No. of Units Installed: _____

B. OR (enter cost either above or below, not both)

C. Total Installed Material Cast: \$ _____

D. CERTIFIED BY: (Contractor)

1. Print Name: _____
2. Signature: _____
3. Title: _____ (officer of company), Date: _

END OF SECTION

**SECTION 01 3516.07
LEED PROHIBITED CONTENT INSTALLER CERTIFICATION**

LEED SUBMITTAL FORM:

- A. Identification:
1. Project Name: _____
 2. Project No.: _____
 3. Architect: _____
- B. This form applies to the following LEED credits: Credit 1E0 4.1; VOC content of field-installed adhesives and sealants.
- C. Procedure:
1. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, each installer of work on this project is required to certify that his/their use of these particular materials complies with the contract documents and to provide documentation showing that the products used do not contain the prohibited content.
 - 2, Volatile organic compounds (VOCs) are defined by the U.S. EPA and state and local regulations applicable to this project. See Contract Documents for minimum criteria.

PRODUCT CERTIFICATION:

- A. _____ Adhesives: I Certify that the installation work of my firm on this project has not required the use of any adhesives,
- B. OR (certify either the above or the below, not both)
- C. _____ Adhesives: I certify that my firm has NOT installed any adhesive with VOC content exceeding that specified in Section 01 6000 on this project; product data and MSDS sheets for all adhesives used, whether specified or not, are attached.
- D. _____ Joint Sealants: I certify that the installation work of my firm on this project has not required the use of any gunnable or pourable joint sealants.
- E. OR (certify either the above or the below, not both)
- F. _____ Joint Sealants: I certify that my firm has NOT installed any joint sealant with VOC content exceeding that specified in Section 07 9000 on this project; product data and MSDS sheets for all joint sealants used, whether specified or not, are attached.
- G. CERTIFIED BY; (Installer/Manufacturer/Supplier Firm)
1. Firm Name: _____
 2. Print Name: _____
 3. Signature: _____
 4. Title: _____ (officer of company), Date: _____

END OF SECTION

**SECTION 01 35 26
SAFETY REQUIREMENTS**

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**SECTION 01 35 26
SAFETY REQUIREMENTS**

1.1 APPLICABLE PUBLICATIONS:

A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health
 Planning

A10.34-2012.....Protection of the Public on or Adjacent to
 Construction Sites

A10.38-2013.....Basic Elements of an Employer's Program to
 Provide a Safe and Healthful Work Environment
 American National Standard Construction and
 Demolition Operations

- C. American Society for Testing and Materials (ASTM):
 E84-2013.....Surface Burning Characteristics of Building
 Materials
- D. The Facilities Guidelines Institute (FGI):
 FGI Guidelines-2010Guidelines for Design and Construction of
 Healthcare Facilities
- E. National Fire Protection Association (NFPA):
 10-2013.....Standard for Portable Fire Extinguishers
 30-2012.....Flammable and Combustible Liquids Code
 51B-2014.....Standard for Fire Prevention During Welding,
 Cutting and Other Hot Work
 70-2014.....National Electrical Code
 70B-2013.....Recommended Practice for Electrical Equipment
 Maintenance
 70E-2012Standard for Electrical Safety in the Workplace
 99-2012.....Health Care Facilities Code
 241-2013.....Standard for Safeguarding Construction,
 Alteration, and Demolition Operations
- F. The Joint Commission (TJC)
 TJC ManualComprehensive Accreditation and Certification
 Manual
- G. U.S. Nuclear Regulatory Commission
 10 CFR 20Standards for Protection Against Radiation
- H. U.S. Occupational Safety and Health Administration (OSHA):
 29 CFR 1904Reporting and Recording Injuries & Illnesses
 29 CFR 1910Safety and Health Regulations for General
 Industry
 29 CFR 1926Safety and Health Regulations for Construction
 Industry
 CPL 2-0.124.....Multi-Employer Citation Policy
- I. VHA Directive 2005-007

1.2 DEFINITIONS:

- A. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

- B. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- C. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- D. 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.
- E. 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 (any time lost after day of injury/illness onset);
 - 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.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Facility Safety Officer thru the Contracting Officer's Representative (COR).

1.4 ACCIDENT PREVENTION PLAN (APP) :

A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). 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.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
 - 2) Plan approver (company/corporate officers authorized to obligate the company);
 - 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).
 - b. **BACKGROUND INFORMATION.** List the following:
 - 1) Contractor;

- 2) Contract number;
 - 3) Project name;
 - 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).
- c. STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.
- d. RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:
- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;
 - 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
 - 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;
 - 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
 - 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
 - 6) Lines of authority;
 - 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;
- e. SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:
- 1) Identification of subcontractors and suppliers (if known);
 - 2) Safety responsibilities of subcontractors and suppliers.
- f. TRAINING.**
- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.

- 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.
- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)
- 5) The Contractor's project supervisor is required to attend GEMS and Safety training provided by VA St. Cloud. Training must be attended prior to being designated as a job supervisor on any VA St. Cloud construction project.
- 6) Submit training records of all such employees for approval before the start of work.

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

h. ACCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all OSHA Recordable Incidents. The APP shall include accident/incident investigation procedure & identify person(s) responsible to provide the following to the COR:

- 1) Exposure data (man-hours worked);
- 2) Accident investigations, reports, and logs.

i. PLANS (PROGRAMS, PROCEDURES) REQUIRED. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks in site-specific compliance and accident

prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;
- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);
- 8) Night operations and lighting;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 21) Radiation Safety Program;
- 22) Abrasive blasting;
- 23) Heat/Cold Stress Monitoring;
- 24) Crystalline Silica Monitoring (Assessment);
- 25) Demolition plan (to include engineering survey);
- 26) Formwork and shoring erection and removal;
- 27) PreCast Concrete.

- C. Submit the APP to the COR or Government Designated Authority for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 a minimum of 14 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.
- D. Once accepted by the COR 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 Representative (COR), until the matter has been rectified.

- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the COR. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer Representative (COR) within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS) :

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the COR and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
 1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).

- a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the COR for review for compliance with contract requirements in accordance with Section 01 33 23, SUBMITTAL PROCEDURES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
 4. 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.
 5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the COR.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. 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, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.

- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) AND "COMPETENT PERSON" (CP):

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b) (2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, Scaffolds, and Trenches/Excavations).
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in

accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.
- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, scaffolds, and trenches/excavations shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Submit training records associated with the above training requirements to the COR for review for compliance with contract requirements in accordance with Section 01 33 23, SUBMITTAL PROCEDURES 14 calendar days prior to the date of the preconstruction conference for acceptance.
- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the

Resident Engineer that individuals have undergone contractor's safety briefing.

- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to the COR.
- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 2. The COR will be notified immediately prior to start of the inspection and invited to accompany the inspection.
 3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
 4. A report of the inspection findings with status of abatement will be provided to the COR within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. Notify the COR as soon as practical, but no more than four hours after any accident meeting the definition of OSHA Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$5,000, or any weight handling equipment accident. Within notification 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 COR or Government Designated Authority determine whether a government investigation will be conducted.

- B. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162, and provide the report to the COR within 5 calendar days of the accident. The COR will provide copies of any required or special forms.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the COR monthly.
- D. A summation of all OSHA recordable accidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the COR monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the COR as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE) :

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE includes:
 - 1. Hard Hats - unless written authorization is given by the COR in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.
 - 2. Safety glasses - unless written authorization is given by the COR, appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
 - 3. Appropriate Safety Shoes - based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the COR.

4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the COR before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the COR. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project is: **Class III**, however, work outside the primary project scope area may vary. The required infection control precautions with each class are as follows:
 1. Class I requirements:
 - a. During Construction Work:
 - 1) Notify the COR.
 - 2) Execute work by methods to minimize raising dust from construction operations.
 - 3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.
 - b. Upon Completion:
 - 1) Clean work area upon completion of task
 - 2) Notify the COR.
 2. Class II requirements:

- a. During Construction Work:
 - 1) Notify the COR.
 - 2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool mounted dust collectors where possible.
 - 3) Water mist work surfaces to control dust while cutting.
 - 4) Seal unused doors with duct tape.
 - 5) Block off and seal air vents.
 - 6) Remove or isolate HVAC system in areas where work is being performed.
 - b. Upon Completion:
 - 1) Wipe work surfaces with cleaner/disinfectant.
 - 2) Contain construction waste before transport in tightly covered containers.
 - 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
 - 4) Upon completion, restore HVAC system where work was performed
 - 5) Notify the COR.
3. Class III requirements:
- a. During Construction Work:
 - 1) Obtain permit from the COR.
 - 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
 - 3) Complete all critical barriers with sheetrock, or temporarily with plastic to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
 - 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
 - 5) Contain construction waste before transport in tightly covered containers.

- 6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the COR and thoroughly cleaned by the VA Environmental Services Department.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Vacuum work area with HEPA filtered vacuums.
- 4) Wet mop area with cleaner/disinfectant.
- 5) Upon completion, restore HVAC system where work was performed.
- 6) Return permit to the COR.

4. Class IV requirements:

a. During Construction Work:

- 1) Obtain permit from the COR.
- 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers with sheetrock, or temporary barriers with plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
- 5) Seal holes, pipes, conduits, and punctures.
- 6) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
- 7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the COR with thorough cleaning by the VA Environmental Services Dept.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.
- 8) Return permit to the COR.

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
 - b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing

f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

D. Products and Materials:

1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes for temporary construction, less than one shift.
2. Barrier Doors: Self Closing, One-hour (minimum) Two-hour (if replacing a 2 hour building separation) solid core wood in steel frame, painted
3. Dust proof drywall rated to existing building separation.
4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
7. Disinfectant: Hospital-approved disinfectant or equivalent product
8. Portable Ceiling Access Module

E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.

F. A dust control program will be establish and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to COR and Facility CSC for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start

of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.

- H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center. **All ductwork determined to be contaminated during construction shall be cleaned by the contractor at the contractor's expense.**
 2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
 3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
 4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
 5. The contractor shall not haul debris through patient-care areas without prior approval of the COR and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
 6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
 7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.

1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin

screening test is without evidence of active (infectious) pulmonary TB.

3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to the COR for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. Temporary Construction Partitions:
 1. Install and maintain temporary construction partitions to provide smoke-tight separations between, construction areas, the areas that are described in phasing requirements, and adjoining areas. Construct partitions of gypsum board on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
 2. Install one-hour (minimum), two-hour (if replacing a 2 hour building separation) fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.

3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with the COR.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to the COR.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Standpipes: Install and extend standpipes up with each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.
- SPEC WRITER NOTE: Modify to suit design.
Coordinate with phasing.
- K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with the COR. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Resident Engineer.
- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with the COR.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with the COR at least 8 hours in

advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to the COR.
- P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. If required, submit documentation to the COR that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J - General Environmental Controls, 29 CFR Part 1910 Subpart S - Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.
- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.
- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Chief of Facilities Management with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA specific to energized work activities will be developed, reviewed, and accepted prior to the start of that work.

1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
 2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical testing instruments or equipment appropriate for the environment in which they will be used.
 3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the COR.
- D.** Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity has been accepted by the COR and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E.** Ground-fault circuit interrupters. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites shall have approved ground-fault circuit interrupters for personnel protection. "Assured Equipment Grounding Conductor Program" only is not allowed.

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.

3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.
4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
 1. The Competent Person's name and signature;
 2. Dates of initial and last inspections.
- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P.

- B. All excavations and trenches 5 feet in depth or greater shall require a written trenching and excavation permit (NOTE - some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall be completed and provided to the COR prior to commencing work for the day. At the end of the day, the permit shall be closed out and provided to the COR. The permit shall be maintained onsite and include the following:
1. Determination of soil classification
 2. Indication that utilities have been located and identified. If utilities could not be located after all reasonable attempt, then excavating operations will proceed cautiously.
 3. Indication of selected excavation protective system.
 4. Indication that the spoil pile will be stored at least 2 feet from the edge of the excavation and safe access provided within 25 feet of the workers.
 5. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere.
- C. If not using an engineered protective system such as a trench box, shielding, shoring, or other Professional Engineer designed system and using a sloping or benching system, soil classification cannot be Solid Rock or Type A. All soil will be classified as Type B or Type C and sloped or benched in accordance with Appendix B of 29 CFR 1926.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date of November 10, 2014.
- C. A detailed lift permit shall be submitted 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing. The lift will not be allowed without approval of this document.
- D. Crane operators shall not carry loads
1. over the general public or VAMC personnel
 2. over any occupied building unless
 - a. the top two floors are vacated

- b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1910.146 except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].
- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the COR.

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with and Obtain permits from the COR at least 8 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

1.23 LADDERS

- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
- B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
- C. Manufacturer safety labels shall be in place on ladders
- D. Step Ladders shall not be used in the closed position
- E. Top steps or cap of step ladders shall not be used as a step
- F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.
 - 1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.

2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.

G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.

B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. See 21.F for covering and labeling requirements. Skylights located in floors or roofs are considered floor or roof hole/openings.

C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.

1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.

2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.

3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.

4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.

5. Workers are prohibited from standing/walking on skylights.

- - - E N D - - -

SECTION 01 42 10
REFERENCES (LEED)

PART 1 - GENERAL

1.1 SUMMARY:

A. This Section includes:

1. Environmental reference standards cited in the Contract Documents.

1.2 DEFINITIONS:

A. Definitions pertaining to sustainable development: As defined in ASTM E2114 and as specified herein.

B. Biobased Materials: Fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000. Minimum biobased content shall be as defined by the US Department of Agriculture

1. Biobased content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight.

C. Chain-of-Custody: Process whereby a product or material is maintained under the physical possession or control during its entire life cycle.

D. Deconstruction: Disassembly of buildings to recover materials.

E. DfE (Design for the Environment): A technique that includes elements of resource conservation and pollution prevention as applied in various product sectors. A technique that incorporates approaches which are part of product (or assembly) concept, need and design. Considerations involve material selection, material and energy efficiency, reuse, maintainability and design for disassembly and recyclability. Refer to ISO Guide 64 for additional clarification.

F. Environmentally preferable products: Products and services that have a lesser or reduced effect on the environment in comparison to conventional products and services. Refer to EPA's Final Guidance on Environmentally Preferable Purchasing for more information <<http://www.epa.gov/epp/guidance/finalguidancetoc.htm>>.

G. Non-Renewable Resource: A resource that exists in a fixed amount in various places in the earth's crust and that cannot be replenished on a human time scale. Non-renewable resources have the potential for renewal only by geological, physical, and chemical processes taking place over hundreds of millions to billions of years. Examples include: iron ore, coal, and oil.

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REFERENCES (LEED)

- H. Perpetual Resource: A resource that is virtually inexhaustible on a human time scale. Examples include solar energy, tidal energy, and wind energy.
- I. Recycled Content Materials: Products that contain preconsumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent with Federal Trade Commission (FTC) Guide for the Use of Environmental Marketing Claims.
- J. Renewable Resource: A resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grasslands, and fertile soil.

1.3 QUALITY ASSURANCE:

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.4 ABBREVIATIONS AND ACRONYMS:

- A. Industry and Non-Profit Associations:
 - AF&PA (American Forest & Paper Association): 1111 19th Street, NW Suite 800; Washington, DC 20036; 202-463-2712; www.aboufsfi.org
 - AGC (Associated General Contractors of America): (703) 548-3118; www.agc.org
 - ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.); 1791 Tullie Circle, N.E., Atlanta, GA 30329; 404-636-8400; www.ashrae.org
 - ASLA (American Society of Landscape Architects): 636 Eye Street, NW; Washington, DC 20001-3736; 202-898-2444;

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REFERENCES (LEED)

ASTM International (American Society for Testing and Materials International): 100 Barr Harbor Drive, PO Box C700; West Conshohocken, Pennsylvania, 19428-2959; 610-832-9585; www.astm.org

CFPC (Certified Forest Products Council): 721 NW 9th Avenue, Suite 300; Portland, OR 97209; 503 -224-2205; www.certifiedwood.org

CIMA (Cellulose Insulation Manufacturers Association); (888) 881-2462; www.cellulose.org

CRI (Carpet & Rug Institute): (800) 882-8846; www.carpet-rug.com

FSC (Forest Stewardship Council): 1155 30th Street NW Suite 300; Washington D.C. 20007; 202 342 0413; www.fscus.org

GS (Green Seal): 1001 Connecticut Avenue, NW; Suite 827; Washington, DC 20036-5525; (202) 872-6400; green seal@green seal.org

Habitat for Humanity: (800) HABITAT.

IESNA (Illuminating Engineering Society of North America): (212) 248-5000; www.iesna.org

IGMA (Insulating Glass Manufacturers Alliance): (613) 233-1510; www.igmaonline.org

ISO (International Organization of Standardization): www.iso.ch/iso/en/ISOOnline.frontpage

NAAQS (National Ambient Air Quality Standards): www.epa.gov/airs/criteria.html

NAHB (National Association of Home Builders): 800-898-2842; www.nahbrc.org

NAIMA (North American Insulation Manufacturers Association): (703) 684-0084; www.naima.org

NEBB (National Environmental Balancing Bureau): (301) 977-3698; www.nebb.org

NFRC (National Fenestration Rating Council): (301) 589-6372; www.nfrc.org

NSF International (National Sanitation Foundation International): (800) 673-6275 or (734) 769-8010; www.nsf.org

USGBC (US Green Building Council): 1015 18th Street, NW, Suite 805; Washington, DC 20036; (202) 82-USGBC or 828-7422; www.usgbc.org

WDMA (Window & Door Manufacturers Association): (800) 223-2301 or (847) 299-5200; www.wdma.com

B. Federal Agencies:

CE (Army Corps of Engineers): www.usace.army.mil

CPC (Consumer Product Safety Commission): (800) 638-2772; www.cpsc.gov

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REFERENCES (LEED)

- EPA (Environmental Protection Agency): (202) 272-0167; www.epa.gov
- DOD (Department of Defense): www.dod.gov
- DOE (Department of Energy): www.doe.gov
- FDA (Food and Drug Administration): (888) 463-6332; www.fda.gov
- FTC (Federal Trade Commission): www.ftc.gov
- GSA (General Services Administration): (202) 708-5082; www.gsa.gov
- HUD (Department of Housing and Urban Development): (202) 708-1112;
www.hud.gov
- LBL (Lawrence Berkeley National Laboratory): (510) 486-5605;
www.lbl.gov
- NIST (National Institute of Standards and Technology): (301) 975-6478; www.nist.gov
- OSHA (Occupational Safety & Health Administration): (800) 321-6742; www.osha.gov
- USDA (Department of Agriculture): (202) 720-2791; www.usda.gov
- C. State and Local Agencies:
- Austin Green Builder Program: City of Austin; P.O. Box 1088, Austin, TX 78701 (512) 974-2000, 512-505-3700;
<http://www.ci.austin.tx.us/greenbuilder/>
- CAL-MAX (California Materials Exchange) Program sponsored by the California Integrated Waste Management Board (916) 255-2369.
- CPUC (California Public Utilities Commission): (415) 703-2782;
www.cpuc.ca.gov
- Michigan Department of Environmental Quality; 517-373-1322.
- Texas Commission on Environmental Quality (formerly Texas Natural Resources Conservation Commission): TCEQ, Contact Name, Building Letter, 12100 Park 35 Circle, Austin, TX 78753; 512/239-1000;
<http://163.234.20.106/>

1.5 REFERENCED STANDARDS:

- A. American Forest and Paper Association:
Sustainable Forestry Initiative
- B. American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE):
ASHRAE/IES 90.1: Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings.
- C. American Society for Testing and Materials International (ASTM):
B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
C1199 Standard Test Method for Measuring the Steady-State Thermal Transmittance of Fenestration Systems Using Hot Box Methods

SECTION 01 42 10
REFERENCES (LEED)

C1227 Standard Specification for Precast Concrete septic Tanks
C1240 Standard Specification for Use of Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar, and Grout
C1386 Standard Specification for Precast Autoclaved AERATED Concrete (PAAC) Wall Construction Units
C1452 Standard Specification for Reinforced Autoclaved Aerated Concrete Elements
C1483 Standard Specification for Exterior Solar Radiation Control Coatings on Buildings
C593 Standard Specification for Fly Ash and Other Pozzolans for Use With Lime
C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
C739 Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation
C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
D1067 Standard Test Methods for Acidity or Alkalinity of Water
D1435 Standard Practice for Outdoor Weathering of Plastics
D1972 Standard Practice for Generic Marking of Plastic Products
D2369 Standard Test Method for Volatile Content of Coatings
D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
D4552 Standard Practice for Classifying Hot-Mix Recycling Agents
D4840 Standard Guide for Sampling Chain-of-Custody Procedures
D4887 Standard Test Method for Preparation of Viscosity Blends for Hot Recycled Bituminous Materials
D5033 Standard Guide for Development of ASTM Standards Relating to Recycling and Use of Recycled Plastics
D5106 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
D5157 Standard Guide for Statistical Evaluation of Indoor Air Quality Models
D5268 Standard Specification for Topsoil Used for Landscaping Purposes

SECTION 01 42 10
REFERENCES (LEED)

D5359 Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber

D5435 Standard Test Method for Diagnostic Soil Test for Plant Growth and Food Chain Protection

D5463 Standard Guide for Use of Test Kits to Measure Inorganic Constituents in Water

D5505 Standard Practice for Classifying Emulsified Recycling Agents

D5509 Standard Practice for Exposing Plastics to a Simulated Compost Environment

D5512 Standard Practice for Exposing Plastics to a Simulated Compost Environment Using an Externally Heated Reactor

D5603 Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Particulate Rubber

D5663 Standard Guide for Validating Recycled Content in Packaging Paper and Paperboard

D5759 Standard Guide for Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses

D5792 Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives

D5834 Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard)

D5851 Standard Guide for Planning and Implementing a Water Monitoring Program

D5852 Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method

D5879 Standard Practice for Surface Site Characterization for On-Site septic Systems

D5921 Standard Practice for Subsurface Site Characterization of Test Pits for On-Site septic Systems

D5925 Standard Practice for Preliminary Sizing and Delineation of Soil Absorption Field Areas for On-Site septic Systems

D596 Standard Guide for Reporting Results of Analysis of Water

D6002 Standard Guide for Assessing the Compostability of Environmentally Degradable Plastics

D6006 Standard Guide for Assessing Biodegradability of Hydraulic Fluid

D6007 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber

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REFERENCES (LEED)

D6046 Standard Classification of Hydraulic Fluids for Environmental Impact

D6081 Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation

D6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes

D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber

D6112 Standard Test Methods for Compressive and Flexural creep and Creep-Rupture of Plastic Lumber and Shapes

D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes

D6145 Standard Guide for Monitoring Sediment in Watersheds

D6146 Standard Guide for Monitoring Aqueous Nutrients in Watersheds

D6155 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures

D6245 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation

D6261 Standard Specification for Extruded and Compression Molded Basic Shapes Made from Thermoplastic Polyester (TPES)

D6262 Standard Specification for Extruded, Compression Molded, and Injection Molded Basic Shapes of Poly(aryl ether ketone) (PAEK)

D6270 Standard Practice for Use of Scrap Tires in Civil Engineering Applications

D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers

D6330 Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions

D6345 Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air

D6400 Standard Specification for Compostable Plastics

D6435 Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes

D6629 Standard Guide for Selection of Methods for Estimating Soil Loss by erosion

D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards

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REFERENCES (LEED)

D6670 Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products

D6712 Standard Specification for Ultra-High-Molecular-Weight Polyethylene (UHMW-PE) Solid Plastic Shapes

E1021 Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells

E1023 Standard Guide for Assessing the Hazards of a Material to Aquatic Organisms and Their Uses

E1038 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls

E1039 Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation

E1040 Standard Specification for Physical Characteristics of Nonconcentrator Terrestrial Photovoltaic Reference Cells

E1042 Standard Classification for Acoustically Absorptive Materials Applied by Trowel or Spray

E1056 Standard Practice for Installation and Service of Solar Domestic Water Heating Systems for One- and Two-Family Dwellings

E1160 Standard Guide for On-Site Inspection and Verification of Operation of Solar Domestic Hot Water Systems

E1171 Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments

E1266 Standard Practice for Processing Mixtures of Lime, Fly Ash, and Heavy Metal Wastes in Structural Fills and Other Construction Applications

E1328 Standard Terminology Relating to Photovoltaic Solar Energy Conversion

E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Under Defined Test Conditions Using a Large Chamber

E1362 Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells

E1374 Standard Guide for Open Office Acoustics and Applicable ASTM Standards

E1376 Standard Test Method for Measuring the Interzone Attenuation of Sound Reflected by Wall Finishes and Furniture Panels

E1423 Standard Practice for Determining the Steady State Thermal Transmittance of Fenestration Systems

SECTION 01 42 10
REFERENCES (LEED)

E1433 Standard Guide for Selection of Standards on Environmental Acoustics

E1462 Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules

E1596 Standard Test Methods for Solar Radiation Weathering of Photovoltaic Modules

E1597 Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments

E1609 Standard Guide for Development and Implementation of a Pollution Prevention Program

E1678 Standard Test Method for Measuring Smoke Toxicity for Use in Fire Hazard Analysis

E1686 Standard Guide for Selection of Environmental Noise Measurements and Criteria

E1780 Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source

E1799 Standard Practice for Visual Inspections of Photovoltaic Modules

E1802 Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules

E1830 Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules

E1861 Standard Guide for Use of Coal Combustion By-Products in Structural Fills

E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

E1923 Standard Guide for Sampling Terrestrial and Wetlands Vegetation

E1963 Standard Guide for Conducting Terrestrial Plant Toxicity Tests

E1971 Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings

E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces

E1983 Standard Guide for Assessment of Wetland Functions

E1991 Standard Guide for Environmental Life Cycle Assessment of Building Materials/Products

E2047 Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays

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REFERENCES (LEED)

- E2114 Standard Terminology for Sustainability Relative to the Performance of Buildings
- E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
- E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
- E683 Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings
- E772 Standard Terminology Relating to Solar Energy Conversion
- E781 Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
- E782 Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
- E823 Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
- E850 Standard Practice for Use of Inorganic Process Wastes as Structural Fill
- E861 Standard Practice for Evaluating Thermal Insulation Materials for Use in Solar Collectors
- E881 Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
- E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
- E904 Standard Practice for Generating All-Day Thermal Performance Data for Solar Collectors
- E948 Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
- F1732 Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer and Drain Pipe Containing Recycled PVC Material
- D. Bat Conservation International:
Bat Approved Bat Houses
- E. Center for Resource Solutions
Green-e program
- F. EPA:
Comprehensive Procurement Guidelines
Energy Star
Environmentally Preferable Purchasing Program Final Guidance

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REFERENCES (LEED)

- Heat Island Initiative
- National Performance Track
- Product Stewardship Program
- G. Green Seal:
 - GC-03 Anti-Corrosive Paints
 - GC-12 Occupancy Sensors
 - GC-13 Split-Ductless Air-Source Heat Pumps
 - GS-05 Compact Fluorescent Lamps
 - GS-11 Paints
 - GS-13 Windows
 - GS-14 Window Films
 - GS-31 Electric Chillers
 - GS-32 Photovoltaic Modules
 - GS-36 Commercial Adhesives
 - GS-37 Industrial & Institutional Cleaners
- H. National Institute of Building Sciences:
 - Whole Building Design Guide
- I. Federal Trade Commission:
 - Guide for the Use of Environmental Marketing Claims
- J. Forest Stewardship Council:
 - Chain-Of-Custody
 - Forest Management
- K. International Organization of Standardization:
 - ISO Guide 64; Guide for Inclusion of Environmental Aspects in Product Standards
 - ISO 14004 Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques
- L. National Association of Home Builders:
 - Advanced Framing Techniques: Optimum Value Engineering
- M. National Institute of Standards and Technology:
 - BEES (Building for Environmental and Economic Sustainability)
 - Lifecycle Decision Support Tool
- N. US Department of Agriculture:
 - Biobased Products - Definitions and Descriptions
- US Green Building Council:
 - LEED™ v2.0/v2.1 rating program

PART 2 - PRODUCTS:

Not used.

SECTION 01 42 10
REFERENCES (LEED)

PART 3 - EXECUTION:

Not used

END OF SECTION

**SECTION 01 42 19
REFERENCE STANDARDS**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

AA Aluminum Association Inc.
<http://www.aluminum.org>

AABC Associated Air Balance Council
<http://www.aabchg.com>

AAMA American Architectural Manufacturer's Association
<http://www.aamanet.org>

AAN American Nursery and Landscape Association
<http://www.anla.org>

AASHTO American Association of State Highway and Transportation Officials
<http://www.aashto.org>

AATCC American Association of Textile Chemists and Colorists
<http://www.aatcc.org>

ACGIH American Conference of Governmental Industrial Hygienists
<http://www.acgih.org>

ACI American Concrete Institute
<http://www.aci-int.net>

ACPA American Concrete Pipe Association
<http://www.concrete-pipe.org>

ACPPA American Concrete Pressure Pipe Association
<http://www.acppa.org>

ADC Air Diffusion Council
<http://flexibleduct.org>

AGA American Gas Association
<http://www.aga.org>

AGC Associated General Contractors of America
<http://www.agc.org>

AGMA American Gear Manufacturers Association, Inc.
<http://www.agma.org>

AHAM Association of Home Appliance Manufacturers
<http://www.aham.org>

AISC American Institute of Steel Construction
<http://www.aisc.org>

AISI American Iron and Steel Institute
<http://www.steel.org>

AITC American Institute of Timber Construction
<http://www.aitc-glulam.org>

AMCA Air Movement and Control Association, Inc.
<http://www.amca.org>

ANLA American Nursery & Landscape Association
<http://www.anla.org>

ANSI American National Standards Institute, Inc.
<http://www.ansi.org>

APA The Engineered Wood Association
<http://www.apawood.org>

ARI Air-Conditioning and Refrigeration Institute
<http://www.ari.org>

ASAE American Society of Agricultural Engineers
<http://www.asae.org>

ASCE American Society of Civil Engineers
<http://www.asce.org>

ASHRAE American Society of Heating, Refrigerating, and
Air-Conditioning Engineers
<http://www.ashrae.org>

ASME American Society of Mechanical Engineers
<http://www.asme.org>

ASSE American Society of Sanitary Engineering
<http://www.asse-plumbing.org>

ASTM American Society for Testing and Materials
<http://www.astm.org>

AWI Architectural Woodwork Institute
<http://www.awinet.org>

AWS American Welding Society
<http://www.aws.org>

AWWA American Water Works Association
<http://www.awwa.org>

BHMA Builders Hardware Manufacturers Association
<http://www.buildershardware.com>

BIA Brick Institute of America
<http://www.bia.org>

CAGI Compressed Air and Gas Institute
<http://www.cagi.org>

CGA Compressed Gas Association, Inc.
<http://www.cganet.com>

CI The Chlorine Institute, Inc.
<http://www.chlorineinstitute.org>

CISCA Ceilings and Interior Systems Construction Association
<http://www.cisca.org>

CISPI Cast Iron Soil Pipe Institute
<http://www.cispi.org>

CLFMI Chain Link Fence Manufacturers Institute
<http://www.chainlinkinfo.org>

CPMB Concrete Plant Manufacturers Bureau
<http://www.cpmb.org>

CRA California Redwood Association
<http://www.calredwood.org>

CRSI Concrete Reinforcing Steel Institute
<http://www.crsi.org>

CTI Cooling Technology Institute
<http://www.cti.org>

DHI Door and Hardware Institute
<http://www.dhi.org>

EGSA Electrical Generating Systems Association
<http://www.egsa.org>

EEI Edison Electric Institute
<http://www.eei.org>

EPA Environmental Protection Agency
<http://www.epa.gov>

ETL ETL Testing Laboratories, Inc.
<http://www.etl.com>

FAA Federal Aviation Administration
<http://www.faa.gov>

FCC Federal Communications Commission
<http://www.fcc.gov>

FPS The Forest Products Society
<http://www.forestprod.org>

GANA Glass Association of North America
<http://www.cssinfo.com/info/gana.html/>

FM Factory Mutual Insurance
<http://www.fmglobal.com>

GA Gypsum Association
<http://www.gypsum.org>

GSA General Services Administration
<http://www.gsa.gov>

HI Hydraulic Institute
<http://www.pumps.org>

HPVA Hardwood Plywood & Veneer Association
<http://www.hpva.org>

ICBO International Conference of Building Officials
<http://www.icbo.org>

ICEA Insulated Cable Engineers Association Inc.
<http://www.icea.net>

\ICAC Institute of Clean Air Companies
<http://www.icac.com>

IEEE Institute of Electrical and Electronics Engineers
<http://www.ieee.org>

IMSA International Municipal Signal Association
<http://www.imsasafety.org>

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
<http://www.mbma.com>

MSS Manufacturers Standardization Society of the Valve and Fittings Industry Inc.
<http://www.mss-hq.com>

NAAMM National Association of Architectural Metal Manufacturers
<http://www.naamm.org>

NAPHCC Plumbing-Heating-Cooling Contractors Association
<http://www.phccweb.org.org>

NBS National Bureau of Standards
 See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
<http://www.nationboard.org>

NEC National Electric Code
 See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<http://www.nema.org>

NFPA National Fire Protection Association
<http://www.nfpa.org>

NHLA National Hardwood Lumber Association
<http://www.natlhardwood.org>

NIH National Institute of Health
<http://www.nih.gov>

NIST National Institute of Standards and Technology
<http://www.nist.gov>

NLMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
 18928 Premiere Court
 Gaithersburg, MD 20879
 (301) 670-0604

NSF National Sanitation Foundation
<http://www.nsf.org>

NWWDA Window and Door Manufacturers Association
<http://www.nwwda.org>

OSHA Occupational Safety and Health Administration
Department of Labor
<http://www.osha.gov>

PCA Portland Cement Association
<http://www.portcement.org>

PCI Precast Prestressed Concrete Institute
<http://www.pci.org>

PPI The Plastic Pipe Institute
<http://www.plasticpipe.org>

PEI Porcelain Enamel Institute, Inc.
<http://www.porcelainenamel.com>

PTI Post-Tensioning Institute
<http://www.post-tensioning.org>

RFCI The Resilient Floor Covering Institute
<http://www.rfci.com>

RIS Redwood Inspection Service
See - CRA

RMA Rubber Manufacturers Association, Inc.
<http://www.rma.org>

SCMA Southern Cypress Manufacturers Association
<http://www.cypressinfo.org>

SDI Steel Door Institute
<http://www.steeldoor.org>

IGMA Insulating Glass Manufacturers Alliance
<http://www.igmaonline.org>

SJI Steel Joist Institute
<http://www.steeljoist.org>

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
<http://www.smacna.org>

SSPC The Society for Protective Coatings
<http://www.sspc.org>

STI Steel Tank Institute
<http://www.steeltank.com>

SWI Steel Window Institute
<http://www.steelwindows.com>

TCA Tile Council of America, Inc.
<http://www.tileusa.com>

TEMA Tubular Exchange Manufacturers Association
<http://www.tema.org>

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200
Madison, WI 53719
(608) 833-5900

UBC The Uniform Building Code
See ICBO

UL Underwriters' Laboratories Incorporated
<http://www.ul.com>

ULC Underwriters' Laboratories of Canada
<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau
6980 SW Varns Road, P.O. Box 23145
Portland, OR 97223
(503) 639-0651

WRCLA Western Red Cedar Lumber Association
P.O. Box 120786
New Brighton, MN 55112
(612) 633-4334

WWPA Western Wood Products Association
<http://www.wwpa.org>

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SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL**1.1 DESCRIPTION:**

- A. This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by General Contractor.

1.2 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
- T27-11.....Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
- T96-02 (R2006).....Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- T99-10.....Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
- T104-99 (R2007).....Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- T180-10.....Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
- T191-02 (R2006).....Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method
- C. American Society for Testing and Materials (ASTM):
- A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A370-12.....Standard Test Methods and Definitions for Mechanical Testing of Steel Products
- A416/A416M-10.....Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

A490-12.....Standard Specification for Heat Treated Steel
Structural Bolts, 150 ksi Minimum Tensile
Strength

C31/C31M-10.....Standard Practice for Making and Curing
Concrete Test Specimens in the Field

C33/C33M-11a.....Standard Specification for Concrete Aggregates

C39/C39M-12.....Standard Test Method for Compressive Strength
of Cylindrical Concrete Specimens

C109/C109M-11b.....Standard Test Method for Compressive Strength
of Hydraulic Cement Mortars

C136-06.....Standard Test Method for Sieve Analysis of Fine
and Coarse Aggregates

C138/C138M-10b.....Standard Test Method for Density (Unit Weight),
Yield, and Air Content (Gravimetric) of Concrete

C140-12.....Standard Test Methods for Sampling and Testing
Concrete Masonry Units and Related Units

C143/C143M-10a.....Standard Test Method for Slump of Hydraulic
Cement Concrete

C172/C172M-10.....Standard Practice for Sampling Freshly Mixed
Concrete

C173/C173M-10b.....Standard Test Method for Air Content of freshly
Mixed Concrete by the Volumetric Method

C780-11.....Standard Test Method for Pre-construction and
Construction Evaluation of Mortars for Plain
and Reinforced Unit Masonry

C1019-11.....Standard Test Method for Sampling and Testing
Grout

C1064/C1064M-11.....Standard Test Method for Temperature of Freshly
Mixed Portland Cement Concrete

C1077-11c.....Standard Practice for Agencies Testing Concrete
and Concrete Aggregates for Use in Construction
and Criteria for Testing Agency Evaluation

C1314-11a.....Standard Test Method for Compressive Strength
of Masonry Prisms

D422-63(2007).....Standard Test Method for Particle-Size Analysis
of Soils

D698-07e1.....Standard Test Methods for Laboratory Compaction
Characteristics of Soil Using Standard Effort

- D1140-00 (2006)Standard Test Methods for Amount of Material in
Soils Finer than No. 200 Sieve
- D1143/D1143M-07e1.....Standard Test Methods for Deep Foundations
Under Static Axial Compressive Load
- D1556-07.....Standard Test Method for Density and Unit
Weight of Soil in Place by the Sand-Cone Method
- D2166-06.....Standard Test Method for Unconfined Compressive
Strength of Cohesive Soil
- D2167-08).....Standard Test Method for Density and Unit Weight
of Soil in Place by the Rubber Balloon Method
- D2216-10.....Standard Test Methods for Laboratory
Determination of Water (Moisture) Content of
Soil and Rock by Mass
- D3666-11.....Standard Specification for Minimum Requirements
for Agencies Testing and Inspecting Road and
Paving Materials
- D3740-11.....Standard Practice for Minimum Requirements for
Agencies Engaged in Testing and/or Inspection
of Soil and Rock as used in Engineering Design
and Construction
- D6938-10.....Standard Test Method for In-Place Density and
Water Content of Soil and Soil-Aggregate by
Nuclear Methods (Shallow Depth)
- E94-04 (2010).....Standard Guide for Radiographic Examination
- E164-08.....Standard Practice for Contact Ultrasonic
Testing of Weldments
- E329-11c.....Standard Specification for Agencies Engaged in
Construction Inspection, Testing, or Special
Inspection
- E543-09.....Standard Specification for Agencies Performing
Non-Destructive Testing
- E1155-96 (R2008).....Determining FF Floor Flatness and FL Floor
Levelness Numbers
- E. American Welding Society (AWS):
- D1.D1.1M-10.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

- A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be

required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."

- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by . When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Contracting Officer Representative(COR) to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Contracting Officer Representative(COR), Contractor, unless other arrangements are agreed to in writing by the Contracting Officer Representative(COR). Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Contracting Officer Representative(COR) immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

- A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:
 - 1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Contracting Officer Representative(COR) regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Contracting Officer Representative(COR) extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide part time observation of fill placement and compaction and field density testing in building areas and provide part time observation of fill placement and compaction and field density testing in pavement areas to verify that earthwork compaction obtained is in accordance with contract documents.
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D698 Method A 2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Contracting Officer Representative (COR) before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185 m² (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Contracting Officer Representative (COR). In each

compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

- C. Fill and Backfill Material Gradation: One test per 10 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM C136/.
- D. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- E. Testing Materials: Test suitability of on-site and off-site borrow as directed by Contracting Officer Representative (COR).

3.2 LANDSCAPING:

- A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
 - 1. Test for organic material by using ASTM D2974.
 - 2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
- B. Submit laboratory test report of topsoil to Contracting Officer Representative (COR).

3.3 ASPHALT CONCRETE PAVING:

- A. Aggregate Base Course:
 - 1. Determine maximum density and optimum moisture content for aggregate base material in accordance with ASTM D1557, Method D 2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with ASTM D1556.
 - 2. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.
- B. Asphalt Concrete:
 - 1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
 - 2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.

3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.4 SITE WORK CONCRETE:

- A. Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.5 CONCRETE:

- A. Batch Plant Inspection and Materials Testing:
 1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Contracting Officer Representative (COR) and perform periodic inspections thereafter as determined by Contracting Officer Representative (COR).
 2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Contracting Officer Representative (COR).
 3. Sample and test mix ingredients as necessary to insure compliance with specifications.
 4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
 5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.
- B. Field Inspection and Materials Testing:
 1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
 2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.

3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m³ (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. Label each cylinder with an identification number. Contracting Officer Representative (COR) may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day's pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m³ (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m³ (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum

wind velocity; record maximum temperature of surface of hardened concrete.

11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
 12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
 13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
 16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
 18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
 - b. Perform all floortolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
 - c. Provide the Contractor and the Contracting Officer Representative (COR) with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
 19. Other inspections:
 - a. Grouting under base plates.
 - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Contracting Officer Representative (COR). Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Contracting Officer Representative (COR). In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in MPa (psi).
 - e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic foot).
 - f. Weather conditions during placing.
 - g. Temperature of concrete in each test cylinder when test cylinder was molded.
 - h. Maximum and minimum ambient temperature during placing.
 - i. Ambient temperature when concrete sample in test cylinder was taken.
 - j. Date delivered to laboratory and date tested.

3.6 REINFORCEMENT:

- A. Review mill test reports furnished by Contractor.
- B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.

3.7 PRESTRESSED CONCRETE:

- A. Inspection at Plant: Forms, placement and concrete cover of reinforcing steel and tendons, placement and finishing of concrete, and tensioning of tendons.
- B. Concrete Testing: Test concrete including materials for concrete required in Article, CONCRETE of this section, except make two test

cylinders for each day's production of each strength of concrete produced.

- C. Test tendons for conformance with ASTM A416 and furnish report to Contracting Officer Representative (COR).
- D. Inspect members to insure that specification requirements for curing and finishes have been met.

3.8 ARCHITECTURAL PRECAST CONCRETE:

- A. Inspection at Plant: Forms, placement of reinforcing steel, concrete cover, and placement and finishing of concrete.
- B. Concrete Testing: Test concrete including materials for concrete as required in Article CONCRETE of this section, except make two test cylinders for each day's production of each strength of concrete produced.
- C. Inspect members to insure specification requirements for curing and finishes have been met.

3.9 MASONRY:

- A. Mortar Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C780.
 - b. Obtain samples during or immediately after discharge from batch mixer.
 - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
 - d. Test one sample at 7 days and 2 samples at 28 days.
 - 2. Two tests during first week of operation; one test per week after initial test until masonry completion.
- B. Grout Tests:
 - 1. Laboratory compressive strength test:
 - a. Comply with ASTM C1019.
 - b. Test one sample at 7 days and 2 samples at 28 days.
 - c. Perform test for each 230 m² (2500 square feet) of masonry.
- C. Masonry Unit Tests:
 - 1. Laboratory Compressive Strength Test:
 - a. Comply with ASTM C140.
 - b. Test 3 samples for each 460 m² (5000 square feet) of wall area.
- D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 460 m² (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

3.10 STRUCTURAL STEEL:

- A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.
- B. Prefabrication Inspection:
 - 1. Fabricator Qualifications: A qualified fabricator who participates in the AISC Certification program and is designated an AISC Certified Plant, Category **STD** at time of bid.
 - a. In lieu of AISC Certification program, fabricator shall furnish AWS welding operator certifications and hire an independent testing agency to inspect fabrication of structural steel. Inspection reports shall be furnished to Architect.
- C. Fabrication and Erection:
 - 1. Erector Qualifications: A qualified installer who participates in the AISC Certification program and is designated an AISC Certified Erector, Category **CSE** at time of bid.

Or
 - 2. Erection of steel in this Section shall be performed by a Specialty Contractor of experienced steel erectors having a minimum of 6 years experience and having certified welders on the erection crew.
 - 3. Comply with applicable provisions of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 4. Welding procedures, welders, welding operator and tackers shall be qualified in accordance with "AWS" Reference Specification
 - 5. Weld Inspection:
 - a. Inspection of field welds will be conducted by testing laboratory and shall be in accordance with Section 6, "AWS" Reference Specification as follows:
 - b. Visual inspection of 50 percent of all field welds.
 - c. Inspection of high-strength bolted connections will be conducted by testing laboratory with a properly calibrated torque wrench. Check a minimum of two bolts in each connection. Paid by Erector.
 - d. Erection Contractor shall provide necessary scaffolding, lifts, or temporary platforms required by testing laboratory in order to perform their work. Such scaffolding, lifts or platforms shall be acceptable to the testing laboratory. Pass only.

- e. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.
- 6. Bolt Inspection:
 - a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 Bolts. connection when one or more are rejected.
- D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Contracting Officer Representative (COR).

3.11 STEEL DECKING:

- A. Provide field inspection of welds of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.
- B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."
- C. Submit inspection reports, certification, and instances of noncompliance to Contracting Officer Representative (COR).

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SECTION 01 50 10
CONSTRUCTION IAQ MANAGEMENT PLAN

PART 1 - GENERAL:

1.01 RELATED REQUIREMENTS:

- A. Section 01 3323 - Submittal Procedures.
- B. Section 01 4529 - Testing Laboratory Services
- C. Section 01 5719 - Temporary Facilities and Controls.
- D. Section 01 7419 - Construction Waste Management and Disposal.
- E. Section 01 9100 - Commissioning.
- F. Division 23 - HVAC. Division 26 - Electrical.

1.02 REFERENCE STANDARDS:

- A. SMACNA IAQ Guidelines for Occupied Buildings Under Construction.
- B. ANSI/ASHRAE 52.2-1999 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
- C. US Environmental Protection Agency "Compendium of Methods for the Determination of Air Pollutants in Indoor Air".

1.03 SUBMITTALS:

- A. Furnish product data for all temporary HVAC filtration media indicating manufacturer name, product/model name/number, MERV rating, and installed location of media during construction.

PART 2 - PRODUCTS:

Not used.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION:

- A. During construction the Contractor shall implement the following Indoor Air Quality (IAQ) Management Plan as follows:
- B. IAQ Management Plan shall meet or exceed the Control Measures of the SMACNA IAQ Guidelines for Occupied Buildings Under Construction, Chapter 3.
- C. Contractor shall appoint IAQ Manager who shall have the responsibility to identify IAQ problems and their mitigation.
- D. HVAC Protection:
 - 1. Provide temporary heating and ventilating equipment of sufficient size and capacity to maintain minimum temperature and humidity as specified other Sections. See Section 01 50 00 Temporary Facilities and Controls for additional information.

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CONSTRUCTION IAQ MANAGEMENT PLAN

2. Protect all permanent HVAC equipment from dust and odors. Seal all duct and equipment openings with plastic.
 3. The permanent HVAC system shall not be used until all Work, including cleaning, has been completed. Mechanical equipment rooms shall not be used for construction storage.
 4. **Document protection measures with photographs, showing actual provided measures used to keep materials clean and dry during construction period.**
 - a. **Provide photos documenting methods employed to protect absorptive materials from moisture damage during construction and pre-occupancy. Photos should highlight materials stored or installed on-site and should include date and time stamp. Photos of all noted moisture protection methods on at least 2 different time periods must be included.**
- E. Source Control:
1. Vehicles, gasoline or diesel-powered equipment and tools, and other sources of exhaust and combustion fumes considered hazardous to human health shall not be located near ventilation air intakes or other areas where fumes may contaminate the building,
- F. Pathway interruption:
1. Isolate areas of work from completed areas to prevent contamination of clean or occupied spaces.
- G. When the outside air temperature is such that heating is not required to maintain specified minimum temperatures, ventilate using 100% outside air, conditioned to minimum temperature requirements, to exhaust contaminated air directly to the outside during installation of VOC-emitting materials. These materials include, *but are not limited to* sealants, adhesives, paints and other coatings, composite wood products, agrifiber products and carpeting.
- H. Depressurize the work area allowing the air pressure differential between construction and clean areas to contain dust and odors. Provide temporary barriers in accordance with Section 01 50 00 between construction area(s) and clean area(s).
- I. Housekeeping:
1. Develop a cleaning program designed to control contaminants

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CONSTRUCTION IAQ MANAGEMENT PLAN

in building spaces during construction and prior to occupancy, Furnish a copy of the cleaning program to the Architect.

2. Protect porous materials from exposure to moisture, and store porous materials in a clean area prior to installation.
3. Vacuum cleaners shall have high efficiency particulate filters.
4. Wetting agents may be used for dust control provided these wetting agents do not adversely affect other materials, products or equipment, and they do not contribute to excessive humidity.

J. Scheduling:

1. Coordinate construction activities to minimize or eliminate disruption of operations in the occupied portions of the building.
2. Coordinate and sequence construction activities throughout the duration of the Work to minimize the effect on indoor air quality.
3. Perform activities with high pollution potential during periods that will allow time for high-polluting materials and products to air out.

3.02 PRE-OCCUPANCY:

A. Develop and implement an Indoor Air Quality (IAQ) Management Plan for the pre-occupancy phase.

B. Filtration media: Replace filters with MERV 13 at completion of Flush out and prior to occupancy, to meet both IEQc3.2 and IEQc5.

1. OPTION 1 – Flush-Out

- a. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush out by supplying a total air volume of 14,000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees F and relative humidity no higher than 60%.

OR

- b. If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery

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CONSTRUCTION IAQ MANAGEMENT PLAN**

of a minimum of 3,500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm/sq. ft. of outside air or the design minimum outside air rate determined in EQ Prerequisite 1, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu. ft./sq. ft. of outside air has been delivered to the space.

OR

2. OPTION 2 – Air Testing

- a. Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air and as additionally detailed in the Reference Guide.
- b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded.

Contaminant	Maximum Concentration
Formaldehyde	50 parts per billion
Particulates (PM10)	50 micrograms per cubic meter
Total Volatile Organic Compounds	500 micrograms per cubic meter (TVOC)
* 4-Phenylcyclohexene (4-PCH)	6.5 micrograms per cubic meter
Carbon Monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor levels

** This test is only required if carpets and fabrics with styrene butadiene rubber (SBR) latex backing material are installed as part of the base building systems.*

- c. For each sampling point where the maximum concentration limits are exceeded conduct additional flush out with

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- outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved.
- d. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test.
 - e. The air sample testing shall be conducted as follows:
 - 1) All measurements shall be conducted prior to occupancy, but during normal occupied hours, and with the building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
 - 2) The building shall have all interior finishes installed, including but not limited to millwork, doors, paint, carpet and acoustic tiles. Non-fixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
 - 3) The number of sampling locations will vary depending upon the size of the building and number of ventilation systems. For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and greatest presumed source strength.
 - 4) Air samples shall be collected between 3 feet and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum 4-hour period.

3.03 POTENTIAL TECHNOLOGIES AND STRATEGIES:

- A. Prior to occupancy, perform a building flush-out or test the air contaminant levels in the building. The flush-out is often used where occupancy is not required immediately upon substantial completion of construction. IAQ testing can minimize schedule impacts but may be more costly. Coordinate with Indoor

SECTION 01 50 10
CONSTRUCTION IAQ MANAGEMENT PLAN

Environmental Quality Credits 3.1 and 5 to determine the appropriate specifications and schedules for filtration media.

END OF SECTION

1

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractors.

1.2 RELATED REQUIREMENTS

- A. Section 31 2000 - Earthwork
- B. Section 32 9000 - Planting

1.3 REFERENCE STANDARDS

- A. ASTM D4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2007.
- B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2009).
- C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2011.
- D. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 2008.
- E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2012.
- F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2002 (Reapproved 2009).
- G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; current edition.
- H. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; Federal Highway Administration; 1995.
- I. USDA TR-55 - Urban Hydrology for Small Watersheds; USDA Natural Resources Conservation Service; 1986.

1.4 PERMITTING REQUIREMENTS

- A. Construction General Permit (CGP)
 - 1. The Construction General Permit authorizes the discharge of storm water associated with construction activity and small construction activity as defined under the National Pollutant Discharge Elimination System (NPDES)/ State Disposal System (SDS) program.

- a. Construction activity includes clearing, grading, excavation, that disturbs land of equal to or greater than five (5) acres and includes the disturbance of less than five (5) acres of total land area that is a part of a larger common plan of development or sale if the larger common plan will ultimately disturb five (5) acres or more.
 - b. Small construction activity includes clearing, grading, excavation, that disturbs land of equal to or greater than one (1) acre, and includes the disturbance of less than one (1) acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb equal to or greater than one and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility.
2. To obtain coverage under the general permit, the General Contractor must submit the following:
 - a. Notice of Intent (NOI).
 - b. Contractor shall complete an online permit application and provide the \$400 (verify) permit fee.
 - c. Storm Water Pollution Prevention Plan (SWPPP).
- B. Notice of Intent (NOI)
1. The General Contractor shall complete the NOI form for construction activity, a minimum of seven (7) days prior to land disturbing activities.
 - a. NOI form can be found on the Minnesota Pollution Control Agency website: <http://www.pca.state.mn.us/>.
 - b. Contractor is responsible for the day to day supervision of construction activities and is responsible for compliance with the permit conditions.
- C. Storm Water Pollution Prevention Plan (SWPPP)
1. A SWPPP has been developed for this project and is included in the project plans. Contractor shall be responsible for reviewing, implementing, and amending as needed.

1.5 TERMINATION OF COVERAGE

- A. Notice of Termination (NOT)
1. Contractor(s) wishing to terminate coverage under the CGP must submit a Notice of Termination (NOT) to the MPCA.
 2. Contractor(s) must submit a NOT within 30 days after one or more of the following conditions have been met:

- a. Final Stabilization has been achieved on all portions of the site for which the contractor is responsible.
- b. Another Owner/Contractor has assumed control over all areas of the site that have not been finally stabilized.

1.6 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Also comply with all more stringent requirements of State of MN Erosion and Sedimentation Control Manual.
- C. Best Management Practices Standard: Federal Highway Administration Best Management Practices for Erosion and Sediment Control.
- D. Runoff Calculation Standard for Urban Areas: USDA NRCS TR-55, Urban Hydrology for Small Watersheds.
- E. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
 1. Contractor will obtain permits and pay for securities required by authority having jurisdiction.
 2. Owner will withhold payment to equivalent to all fines resulting from non-compliance with applicable regulations.
- F. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- G. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 10 years.
- H. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
 1. Control movement of sediment and soil from temporary stockpiles of soil.
 2. Prevent development of ruts due to equipment and vehicular traffic.
 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.

- I. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
 - 1. Prevent windblown soil from leaving the project site.
 - 2. Prevent tracking of mud onto public roads outside site.
 - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
 - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
 - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- K. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
 - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- L. Open Water: Prevent standing water that could become stagnant.
- M. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
- N. Coordination: All Contractors are responsible to coordinate work and environmental impacts with the General Contractor. Concerns must be addressed and incorporated into the SWPPP prior to construction. General Contractor is responsible to uphold and manage the SWPPP.
- O. Fines: Fines incurred due to non-compliance by contractors shall be levied to the responsible contractor.

1.7 SUBMITTALS

- A. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

1. Provide a summary, sample log, checklist, inspection report, or similar document that demonstrates periodic inspection of the implemented measures. This documentation to include:
 - a. Sample dates
 - b. Inspection frequency (at least monthly, year round)
2. Provide date stamped photos showing the measures taken, including any corrective action, to effectively implement ESC plan. At least 3 photos from at least 3 inspections equally spaced over the sitework period. Inspections to occur monthly at a minimum.

- C. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- B. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
 2. Permittivity: 0.05 sec^{-1} , minimum, when tested in accordance with ASTM D4491.
 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355 after 500 hours exposure.
 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632.
 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632.
 6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.

7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
8. Manufacturers:
 - a. BP Amoco, Amoco Fabrics and Fibers: www.geotextile.com.
 - b. TenCate: www.tencate.com.
 - c. Propex Geosynthetics: www.geotextile.com
- C. Silt Fence Posts: One of the following, minimum 5 feet long:
 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
 2. Softwood, 4 by 4 inches in cross section.
 3. Hardwood, 2 by 2 inches in cross section.
- D. Inlet Protection: method and/or product used for inlet protection shall be determined by the Contractor and approved by the Engineer prior to installation.
- E. Mulch: Hydraulically applied mulch, meeting the requirements of MnDOT 3884.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.3 SCOPE OF PREVENTIVE MEASURES

- A. Erosion Prevention Practices:
 1. General Contractor must plan for and implement appropriate construction phasing, vegetative buffer strips, horizontal slope grading and other construction practices that minimize erosion, so that the inspection and maintenance requirements are complied with.
 2. All exposed soil areas with a continuous positive slope within 200 lineal feet of a surface water, must have temporary erosion protection or permanent cover for the exposed soil areas year round. This includes constructed storm water management pond side slopes and any exposed soil areas with a positive slope to a storm water conveyance system, such as a curb and gutter system, storm sewer inlet, temporary or permanent drainage ditch or other natural or man made systems that discharge to a surface water. See the guidelines below:

- a. Slopes steeper than 3:1: Establish temporary or permanent cover within 7 days.
 - b. Slopes 10:1 to 3:1: Establish temporary or permanent cover within 14 days.
 - c. Flatter than 10:1: Establish temporary or permanent cover within 21 days.
3. The normal wetted perimeter of any temporary or permanent drainage ditch that drains water from a construction site, or diverts water around a site, must be stabilized within 200 lineal feet from the property edge, or from the point of discharge to any surface water. Stabilization must be completed within 24 hours of connecting to a surface water.
 4. Pipe outlets must be provided with temporary or permanent energy dissipation within 24 hours of connection to a surface water.
- B. Sediment Control Practices
1. Sediment control practices must minimize sediment from entering surface waters, including curb and gutter systems and storm sewer inlets.
 - a. Temporary or permanent drainage ditches and sediment basins that are designed as part of a treatment system require sediment control practices only as appropriate for site conditions.
 - b. If the down gradient treatment system is overloaded, additional up gradient sediment control practices must be installed to eliminate the overloading, and the SWPPP must be amended to identify these additional practices.
 - c. In order to maintain sheet flow and minimize rill and/or gullies, there shall be no unbroken slope length of greater than 75 feet for slopes with a grade of 3:1 or steeper.
 2. Sediment control practices must be established on all down gradient perimeters before any up gradient land disturbing activities begin. These practices shall remain in place until final stabilization has been established.
 - a. Linear Sediment Barriers: Made of silt fences.
 - 1) Provide linear sediment barriers:
 - (a) Along downhill perimeter edge of disturbed areas, including soil stockpiles.
 - (b) Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
 - (c) Along the toe of cut slopes and fill slopes.

- (d) Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
 - (e) Across the entrances to culverts that receive runoff from disturbed areas.
 - 2) Space sediment barriers with the following maximum slope length upslope from barrier:
 - (a) Slope of Less Than 2 Percent: 100 feet.
 - (b) Slope Between 2 and 5 Percent: 75 feet.
 - (c) Slope Between 5 and 10 Percent: 50 feet.
 - (d) Slope Between 10 and 20 Percent: 25 feet.
 - (e) Slope Over 20 Percent: 15 feet.
- 3. The timing of the installation of sediment control practices may be adjusted to accommodate short-term activities such as clearing or grubbing, or passage of vehicles. Any short-term activity must be completed as quickly as possible and the sediment control practices must be installed immediately after the activity is completed. However, sediment control practices must be installed before the next precipitation event even if the activity is not complete.
- 4. All storm drain inlets must be protected by appropriate BMP's during construction until all sources with potential for discharging to the inlet have been stabilized.
- 5. Temporary soil stockpiles must have silt fence or other effective sediment controls, and cannot be placed in surface waters, including storm water conveyances such as curb and gutter systems, or conduits and ditches.
- 6. Vehicle tracking of sediment from the construction site must be minimized by BMP's such as rock construction pads, concrete or steel wash racks, or equivalent systems. Street sweeping must be used if such BMP's are not adequate to prevent sediment from being tracked onto the street.
 - a. Construction Entrances: Traffic-bearing aggregate surface.
 - 1) Width: 20 feet, minimum.
 - 2) Length: 50 feet, minimum.
 - 3) Provide at each construction entrance from public right-of-way.

- 4) Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
 7. The General Contractor must install all temporary sedimentation basins if outlined in the plan documents.
- C. Dewatering and Basin Draining
1. Dewatering or basin draining (e.g., pumped discharges, trench/ditch cuts for drainage) related to the construction activity that may have turbid or sediment laden discharge water must be discharged to a temporary or permanent sedimentation basin on the project site whenever possible. If the water cannot be discharged to a sedimentation basin prior to entering the surface water, it must be treated with the appropriate BMP's, such that the discharge does not adversely affect the receiving water or downstream landowners. The General Contractor must ensure that discharge points are adequately protected from erosion and scour. The discharge must be dispersed over natural rock riprap, sand bags, plastic sheeting or other accepted energy dissipation measures. Adequate sedimentation control measures are required for discharge water that contains suspended solids.
 2. All water from dewatering or basin draining activities must be discharged in a manner that does not cause nuisance conditions, erosion in receiving channels or on downslope properties, or inundations in wetlands causing significant adverse impact to the wetland.
- D. Pollution Prevention Management Measures
1. Contractors shall implement the following pollution prevention management measures on the site:
 - a. Solid Waste: Collected sediment, asphalt and concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other wastes must be disposed of properly and must comply with governing state regulations.
 - b. Hazardous Materials: Oil, gasoline, paint and any hazardous substances must be properly stored, including secondary containment, to prevent spills, leaks or other discharge. Restricted access to storage areas must be provided to prevent vandalism. Storage and disposal of hazardous waste must be in compliance with governing state health department regulations.
 - c. External washing of trucks and other construction vehicles must be limited to a defined area of the site. Runoff must be

contained and waste properly disposed of. No engine degreasing is allowed on site.

E. Final Stabilization

1. The General Contractor is responsible for final stabilization of the site.
2. The General Contractor must submit a Notice of Termination within 30 days after final stabilization has been completed, or another Contractor has assumed control over all areas of the site that have not undergone final stabilization.
3. Final Stabilization can be accomplished once the following items have been completed:
 - a. All soil disturbing activities at the site have been completed and all soils have been stabilized by a uniform perennial vegetative cover with a density of 70 percent over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions have been established.
 - b. All drainage ditches, constructed to drain water from the site after construction is complete, must be stabilized to preclude erosion.
 - c. All temporary synthetic, and structural erosion prevention and sediment control BMP's must be removed.
 - d. The General Contractor must clean out all sediment from conveyances and from temporary sedimentation basins that are to be used as permanent water quality management basins.
 - e. Sediment must be stabilized to prevent it from being washed back into the basin, conveyances or drainageways discharging off-site or to surface waters. The cleanout of permanent basins must be sufficient to return the basin to design capacity.

F. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

3.4 INSTALLATION

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.
2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D4873.

2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.
 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
 5. Install with top of fabric at nominal height and embedment as specified.
 6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
 7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
 8. Fasten fabric to wood posts using one of the following:
 - a. Four 3/4 inch diameter, 1 inch long, 14 gage nails.
 - b. Five 17-gage staples with 3/4 inch wide crown and 1/2 inch legs.
 9. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
 10. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Mulching:
1. All temporary and permanently seeded areas shall be mulched with hydraulic mulch per MnDOT 2575.
- D. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
 2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding

is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.

3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.5 INSPECTIONS & MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. All inspections and maintenance conducted during construction must be recorded in writing and these records must be retained with the SWPPP. Records of each inspection and maintenance activity shall include:
 1. Date and time of inspection.
 2. Name of person(s) conducting inspections.
 3. Finding of inspections, including recommendations for corrective actions.
 4. Corrective actions taken (including dates, times, and party completing maintenance activities.
 5. Date and amount of rainfall events greater than 1/2 inch (0.5 inches) in 24 hours.
 6. Documentation of changes made to the SWPPP.
- C. All erosion prevention and sediment control Best Management Practices (BMP's) must be inspected to ensure integrity and effectiveness. All non functional BMP's must be repaired, replaced, or supplemented with functional BMP's. The General Contractor must investigate and comply with the following inspection and maintenance requirements:
 1. Silt Fences:
 - a. Promptly replace fabric that deteriorates unless need for fence has passed.
 - b. Remove silt deposits that exceed one-third of the height of the fence.
 - c. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

2. Surface Waters:
 - a. Surface waters, including drainage ditches and conveyance systems, must be inspected for evidence of sediment being deposited by erosion.
 - b. The General Contractor must remove all deltas and sediment deposited in surface waters, including drainage ways, catch basins and other drainage systems and restabilize the areas where sediment removal results in exposed soil. Removal and stabilization must take place within seven (7) days of discovery unless precluded by legal, regulatory, or physical access constraints.
 - c. The General Contractor shall use all reasonable efforts to obtain access. If precluded, removal and stabilization must take place within seven (7) calendar days of obtaining access.
 - d. The General Contractor is responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work.
3. Construction Exit Locations:
 - a. Construction site vehicle exits must be inspected for evidence of off-site sediment migration onto paved surfaces.
 - b. Tracked sediment must be removed from all off-site paved surfaces within 24 hours of discovery.
4. Temporary and Permanent Best Management Practices (BMP's):
 - a. The General Contractor is responsible for the operation and maintenance of all permanent water quality management BMP's, as well as all erosion prevention and sediment control BMP's, for the duration of the project; or until another Contractor has resumed control over all areas of the site that have not been finally stabilized; or the site has undergone final stabilization.
5. Migrated Sediment Off-Site:
 - a. If sediment escapes the construction site, off-site accumulations of sediment must be removed in a manner and at a frequency sufficient to minimize off-site impacts.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

3.6 RECORD RETENTION

- A. The SWPPP, including all certificates, reports, and records must be made available to the federal, state and local officials within 72 hours upon request for the duration of the permit and for three (3) years following the Notice of Termination.

3.7 PROTECTION OF OTHER RESOURCES:

- A. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of Minnesota e Air Pollution Statue, Rule, or Regulation and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- B. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Resident Engineer. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive

impact noise on the property shall not exceed the following dB limitations:

<u>Time Duration of Impact Noise</u>	<u>Sound Level in dB</u>
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS,	80	PNEUMATIC TOOLS	80
STATIONARY			
PUMPS	75		
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

b. Use shields or other physical barriers to restrict noise transmission.

c. Provide soundproof housings or enclosures for noise-producing machinery.

d. Use efficient silencers on equipment air intakes.

e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.

f. Line hoppers and storage bins with sound deadening material.

g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.

3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being

- performed above 58 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.
- C. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- D. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

- - - E N D - - -

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL:

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry, and asphalt and **bituminous**).
 - 3. Clean dimensional wood and palette wood.
 - 4. NOTE: LEED does not allow/include soil trees, vegetation etc., in waste diversion calculations. **See attached LEED online form.**
 - 5. Engineered wood products (plywood deck, particle board and I-joists, etc.).
 - 6. Metal products (eg, Metal roof framing, steel, wire, beverage containers, copper, etc.).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials - (Asphalt shingles) Omann Bros. Albertville, MN shingle recycler.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.
 - 11. Gypsum board.
 - 12. Insulation.
 - 13. Paint.
 - 14. Fluorescent lamps.

1.2 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction/ Demolition waste includes products of the following:
 - 1. Excess or unusable construction materials.
 - 2. Packaging used for construction products.
 - 3. Poor planning and/or layout.
 - 4. Construction error.
 - 5. Over ordering.
 - 6. Weather damage.
 - 7. Contamination.
 - 8. Mishandling.
 - 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of **75** percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling and return. Such areas are to

be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.

- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.

- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SUBMITTAL PROCEDURES, furnish the following:
- B. Prepare and submit to the Contracting Officer Representative (COR) a written demolition debris management plan. The plan shall include, but not be limited to, the following information:

1. Procedures to be used for debris management.
2. Techniques to be used to minimize waste generation.
3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.7 RECORDS

- A. Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED NC v2009 Reference Guide and LEED MRc2 Template.

PART 2 - PRODUCTS:**2.1 MATERIALS**

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION:**3.1 COLLECTION**

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.
- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates

removed, transportation costs, weight tickets, manifests, invoices.
Include the net total costs or savings for each salvaged or recycled
material.

- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices. Include the net total costs for each disposal.

- - - E N D - - -

SECTION 01 91 00**GENERAL COMMISSIONING REQUIREMENTS****PART 1 - GENERAL****1.1 COMMISSIONING DESCRIPTION**

- A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.
- B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.
- C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.
- D. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:

1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.
 2. Verify and document proper integrated performance of equipment and systems.
 3. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
 4. Document the successful achievement of the commissioning objectives listed above.
- E. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 CONTRACTUAL RELATIONSHIPS

- A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the Resident Engineer as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.
- B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA Resident Engineer and the Contractor. It is the practice of the VA to require that communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the Resident Engineer and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the Resident Engineer.
- C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.

D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and Resident Engineer. Thus, the procedures outlined in this specification must be executed within the following limitations:

1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
2. Commissioning Issues identified by the Commissioning Agent will be delivered to the Resident Engineer and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
3. In the event that any Commissioning Issues and suggested resolutions are deemed by the Resident Engineer to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Resident Engineer will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Resident Engineer of any issues that they deem to constitute a potential contract change prior to acting on these issues.
5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or Resident Engineer, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.3 RELATED WORK

- A. Section 01 00 00 GENERAL REQUIREMENTS.
- B. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.

C. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.

D. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.

1.4 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.

B. The commissioning activities have been developed to support the United States Green Building Council's (USGBC) LEED™ rating program and to support delivery of project performance in accordance with the VA requirements developed for the project to support the following credits:

1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" and the prerequisite of "Fundamental Building Systems Commissioning."

1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers
BOD	Basis of Design
BSC	Building Systems Commissioning
CCTV	Closed Circuit Television
CD	Construction Documents
CMMS	Computerized Maintenance Management System
CO	Contracting Officer (VA)
COR	Contracting Officer's Representative (see also VA-RE)
COBie	Construction Operations Building Information Exchange
CPC	Construction Phase Commissioning
Cx	Commissioning
CxA	Commissioning Agent
CxM	Commissioning Manager
CxR	Commissioning Representative

List of Acronyms	
Acronym	Meaning
DPC	Design Phase Commissioning
FPT	Functional Performance Test
GBI-GG	Green Building Initiative - Green Globes
HVAC	Heating, Ventilation, and Air Conditioning
LEED	Leadership in Energy and Environmental Design
NC	Department of Veterans Affairs National Cemetery
NCA	Department of Veterans Affairs National Cemetery Administration
NEBB	National Environmental Balancing Bureau
O&M	Operations & Maintenance
OPR	Owner's Project Requirements
PFC	Pre-Functional Checklist
PFT	Pre-Functional Test
SD	Schematic Design
SO	Site Observation
TAB	Test Adjust and Balance
VA	Department of Veterans Affairs
VAMC	VA Medical Center
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer
USGBC	United States Green Building Council

1.6 DEFINITIONS

Acceptance Phase Commissioning: Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

Accuracy: The capability of an instrument to indicate the true value of a measured quantity.

Back Check: A back check is a verification that an agreed upon solution to a design comment has been adequately addressed in a subsequent design review

Basis of Design (BOD): The Engineer's Basis of Design is comprised of two components: the Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.

Benchmarks: Benchmarks are the comparison of a building's energy usage to other similar buildings and to the building itself.. For example, ENERGY STAR Portfolio Manager is a frequently used and nationally recognized building energy benchmarking tool.

Building Information Modeling (BIM): Building Information Modeling is a parametric database which allows a building to be designed and constructed virtually in 3D, and provides reports both in 2D views and as schedules. This electronic information can be extracted and reused for pre-populating facility management CMMS systems. Building Systems Commissioning (BSC): NEBB acronym used to designate its commissioning program.

Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

CCTV: Closed circuit Television. Normally used for security surveillance and alarm detections as part of a special electrical security system.

COBie: Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the Computer Maintenance Management Systems (CMMS) used to operate facilities. See the Whole Building Design Guide website for further information (<http://www.wbdg.org/resources/cobie.php>)

Commissionability: Defines a design component or construction process that has the necessary elements that will allow a system or component to be effectively measured, tested, operated and commissioned

Commissioning Agent (CxA): The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means

the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

Commissioning Checklists: Lists of data or inspections to be verified to ensure proper system or component installation, operation, and function. Verification checklists are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements (OPR) is being achieved.

Commissioning Design Review: The commissioning design review is a collaborative review of the design professionals design documents for items pertaining to the following: owner's project requirements; basis of design; operability and maintainability (O&M) including documentation; functionality; training; energy efficiency, control systems' sequence of operations including building automation system features; commissioning specifications and the ability to functionally test the systems.

Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components. (See also - Commissioning Observation).

Commissioning Manager (CxM): A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.

Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

Commissioning Plan: A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.

Commissioning Process: A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems, components, and assemblies are

planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.

Commissioning Report: The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.

Commissioning Representative (CxR): An individual appointed by a sub-contractor to manage the commissioning process on behalf of the sub-contractor.

Commissioning Specifications: The contract documents that detail the objective, scope and implementation of the commissioning process as developed in the Commissioning Plan.

Commissioning Team: Individual team members whose coordinated actions are responsible for implementing the Commissioning Process.

Construction Phase Commissioning: All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Contract Documents (CD): Contract documents include design and construction contracts, price agreements and procedure agreements. Contract Documents also include all final and complete drawings, specifications and all applicable contract modifications or supplements.

Construction Phase Commissioning (CPC): All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Coordination Drawings: Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

Data Logging: The monitoring and recording of temperature, flow, current, status, pressure, etc. of equipment using stand-alone data recorders.

Deferred System Test: Tests that cannot be completed at the end of the acceptance phase due to ambient conditions, schedule issues or other conditions preventing testing during the normal acceptance testing period.

Deficiency: See "Commissioning Issue".

Design Criteria: A listing of the VA Design Criteria outlining the project design requirements, including its source. These are used during the design process to show the design elements meet the OPR.

Design Intent: The overall term that includes the OPR and the BOD. It is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. The design intent documents are utilized to provide a written record of these ideas, concepts and criteria.

Design Narrative: A written description of the proposed design solutions that satisfy the requirements of the OPR.

Design Phase Commissioning (DPC): All commissioning tasks executed during the design phase of the project.

Environmental Systems: Systems that use a combination of mechanical equipment, airflow, water flow and electrical energy to provide heating, ventilating, air conditioning, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

Executive Summary: A section of the Commissioning report that reviews the general outcome of the project. It also includes any unresolved issues, recommendations for the resolution of unresolved issues and all deferred testing requirements.

Functionality: This defines a design component or construction process which will allow a system or component to operate or be constructed in a manner that will produce the required outcome of the OPR.

Functional Test Procedure (FTP): A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Industry Accepted Best Practice: A design component or construction process that has achieved industry consensus for quality performance and functionality. Refer to the current edition of the NEBB Design Phase Commissioning Handbook for examples.

Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

Issues Log: A formal and ongoing record of problems or concerns - and their resolution - that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

Lessons Learned Workshop: A workshop conducted to discuss and document project successes and identify opportunities for improvements for future projects.

Maintainability: A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment. Maintainability also includes components that have readily obtainable repair parts or service.

Manual Test: Testing using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the 'observation').

Owner's Project Requirements (OPR): A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Peer Review: A formal in-depth review separate from the commissioning review processes. The level of effort and intensity is much greater than a typical commissioning facilitation or extended commissioning review. The

VA usually hires an independent third-party (called the IDIQ A/E) to conduct peer reviews.

Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

Pre-Design Phase Commissioning: Commissioning tasks performed prior to the commencement of design activities that includes project programming and the development of the commissioning process for the project

Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing.

Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.

Procedure or Protocol: A defined approach that outlines the execution of a sequence of work or operations. Procedures are used to produce repeatable and defined results.

Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

Resolution: This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

Site Observation Reports (SO): Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

Special System Inspections: Inspections required by a local code authority prior to occupancy and are not normally a part of the commissioning process.

Static Tests: Tests or inspections that validate a specified static condition such as pressure testing. Static tests may be specification or code initiated.

Start Up Tests: Tests that validate the component or system is ready for automatic operation in accordance with the manufactures requirements.

Systems Manual: A system-focused composite document that includes all information required for the owners operators to operate the systems.

Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Testing: The use of specialized and calibrated instruments to measure parameters such as: temperature, pressure, vapor flow, air flow, fluid flow, rotational speed, electrical characteristics, velocity, and other data in order to determine performance, operation, or function.

Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as "Testing, Adjusting, and Balancing" and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

Thermal Scans: Thermographic pictures taken with an Infrared Thermographic Camera. Thermographic pictures show the relative temperatures of objects and surfaces and are used to identify leaks, thermal bridging, thermal intrusion, electrical overload conditions, moisture containment, and insulation failure.

Training Plan: A written document that details, in outline form the expectations of the operator training. Training agendas should include instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

Trending: Monitoring over a period of time with the building automation system.

Unresolved Commissioning Issue: Any Commissioning Issue that, at the time that the Final Report or the Amended Final Report is issued that has not been either resolved by the construction team or accepted by the VA.

Validation: The process by which work is verified as complete and operating correctly:

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).
3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying warranty issues and enforcing warranty provisions of the construction contract.

Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

Whole Building Commissioning: Commissioning of building systems such as Building Envelope, HVAC, Electrical, Special Electrical (Fire Alarm, Security & Communications), Plumbing and Fire Protection as described in this specification.

1.7 SYSTEMS TO BE COMMISSIONED

- A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these

systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.

B. The following systems will be commissioned as part of this project:

Systems To Be Commissioned	
System	Description
HVAC System	
Chillers	Pre-functional and Functional Verification. Includes associated piping components, operation, controls, etc.
Pumps	Pre-functional and Functional Verification. Includes associated piping components, operation, controls, etc.
VFD's	Pre-functional and Functional Verification
Air Handling Units	Pre-functional and Functional Verification. Includes associated ductwork components, piping, valves, operation, controls, etc.
Terminal Devices	Pre-functional and Functional Verification. Includes associated ductwork components, piping, valves, operation, controls, etc.
Unit Heaters	Pre-functional and Functional Verification. Includes associated piping components, operation, controls, etc.
Heat Exchangers	Pre-functional and Functional Verification. Includes associated piping components, operation, controls, etc.
Exhaust Fans	Pre-functional and Functional Verification. Includes associated ductwork components, operation, controls, etc.
Fire/Smoke Dampers	Pre-functional and Functional Verification
Building Automation Controls System	Functional Verification
Fire Protection	
Fire Alarm Integration	Functional Verification
Electrical System	
Lighting Controls	Functional Verification of all daylighting, scheduled lighting, or occupancy sensors.
Testing and Balancing	
TAB Verification	CxA shall perform a random 10% verification alongside the TAB Contractor.

1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.
- B. Members Appointed by Contractor:
 - 1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
 - 2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
- C. Members Appointed by VA:
 - 1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The VA will engage the CxA under a separate contract.
 - 2. User: Representatives of the facility user and operation and maintenance personnel.
 - 3. A/E: Representative of the Architect and engineering design professionals.

1.9 VA'S COMMISSIONING RESPONSIBILITIES

- A. Appoint an individual, company or firm to act as the Commissioning Agent.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
 - 1. Coordination meetings.

2. Training in operation and maintenance of systems, subsystems, and equipment.
 3. Testing meetings.
 4. Witness and assist in Systems Functional Performance Testing.
 5. Demonstration of operation of systems, subsystems, and equipment.
- C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

- A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.
- B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.
- C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
 1. Participate in commissioning coordination meetings.
 2. Conduct operation and maintenance training sessions in accordance with approved training plans.
 3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
 4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
 5. Review and comment on commissioning documentation.

6. Participate in meetings to coordinate Systems Functional Performance Testing.
7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
8. Provide information to the Commissioning Agent for developing commissioning plan.
9. Participate in training sessions for VA's operation and maintenance personnel.
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures to conduct Systems Functional Performance Testing of installed systems.

1.11 COMMISSIONING AGENT'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Prepare the commissioning plan. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.
- C. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.
- D. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.
- E. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.

- F. Coordinate Systems Functional Performance Testing schedule with the Contractor.
- G. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.
- H. Witness and document Systems Functional Performance Testing.
- I. Compile test data, inspection reports, and certificates and include them in the commissioning report.
- J. Prepare commissioning Field Observation Reports.
- K. Prepare the Final Commissioning Report.
- L. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

1.12 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
 - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
 - 2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 - 3. Identification of systems and equipment to be commissioned.
 - 4. Schedule of Commissioning Coordination meetings.
 - 5. Identification of items that must be completed before the next operation can proceed.
 - 6. Description of responsibilities of commissioning team members.
 - 7. Description of observations to be made.

8. Description of requirements for operation and maintenance training.
9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
12. Preliminary Systems Functional Performance Test procedures.

B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested system.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Observations and Issues.
8. Issue number, if any, generated as the result of test.

C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed

and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.

- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- E. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.
1. Creating an Commissioning Issues Log Entry:
- a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
 - b. Assign a descriptive title for the issue.
 - c. Identify date and time of the issue.
 - d.
 - e. Identify system, subsystem, and equipment to which the issue applies.
 - f. Identify location of system, subsystem, and equipment.

- g. Include information that may be helpful in diagnosing or evaluating the issue.
 - h. Note recommended corrective action.
 - i. Identify commissioning team member responsible for corrective action.
 - j. Identify person that identified the issue.
2. Documenting Issue Resolution:
- a. Log date correction is completed or the issue is resolved.
 - b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
 - c. Identify changes to the Contract Documents that may require action.
 - d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
 - e. Identify person(s) who corrected or resolved the issue.
 - f. Identify person(s) verifying the issue resolution.
- F. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of the Contract Documents. The commissioning report will include, but is not limited to, the following:
- 1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution.

2. Commissioning plan.
 3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
 4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
 5. Commissioning Issues Log.
 6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.
- G. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems, subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:
1. Documentation of deferred and off season test(s) results.
 2. Completed Systems Functional Performance Test Procedures for off season test(s).
 3. Documentation that unresolved system performance issues have been resolved.
 4. Updated Commissioning Issues Log, including status of unresolved issues.
 5. Identification of potential Warranty Claims to be corrected by the Contractor.

1.13 SUBMITTALS

- A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:
1. The Commissioning Team: A list of commissioning team members by organization.

2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on Systems Performance Testing, including information on testing sample size (where authorized by the VA).
 3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.
 4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
 5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
 6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.

- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.
- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA Resident Engineer with copies to the Contractor and Architect.
- G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.
- H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.
- I. Data for Commissioning:
1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
 2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

1.14 COMMISSIONING PROCESS

- A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.
- B. Within 30 days of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CxM) to manage and lead the commissioning effort on behalf of the Contractor. The Commissioning Manager shall be the single point of contact and communications for all commissioning related services by the Contractor.
- C. Within 30 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

1.15 QUALITY ASSURANCE

- A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.
- B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.16 COORDINATION

- A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.
- C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.
- D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.
- E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.
- F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS**2.1 TEST EQUIPMENT**

- A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.
- B. Data logging equipment and software required to test equipment shall be provided by the Contractor.
- C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION**3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES**

A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Commissioning Roles & Responsibilities							
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	N/A	N/A	N/A	N/A	N/A	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	N/A	N/A	N/A	N/A	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
OPR and BOD	Maintain OPR on behalf of Owner	R	L	R	R	O	
	Maintain BOD/DID on behalf of Owner	R	A	L	R	O	
Document Reviews	TAB Plan Review	R	N/A	N/A	N/A	N/A	
	Submittal and Shop Drawing Review	R	N/A	R	R	N/A	
	Review Contractor Equipment Startup Checklists	N/A	N/A	N/A	N/A	N/A	
	Review Change Orders, ASI, and RFI	N/A	N/A	N/A	N/A	N/A	
Site Observations	Witness Factory Testing	N/A	N/A	N/A	N/A	N/A	
	Construction Observation Site Visits	N/A	N/A	N/A	N/A	N/A	
Functional Test Protocols	Final Pre-Functional Checklists	L	A	R	R	O	
	Final Functional Performance Test Protocols	L	A	R	R	O	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Status Reports	L	A	R	R	O	

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Commissioning Roles & Responsibilities							
Reports and Logs	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Commissioning Roles & Responsibilities							
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	N/A	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	N/A	N/A	N/A	N/A	N/A	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	N/A	N/A	N/A	N/A	N/A	

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional	
Commissioning Roles & Responsibilities								
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes	
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O		
Schedules	Prepare Functional Test Schedule	L	A	R	R	O		
OPR and BOD	Maintain OPR on behalf of Owner	R	L	R	R	O		
	Maintain BOD/DID on behalf of Owner	R	A	L	R	O		
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O		
	Pre-Functional Checklist Verification	L	A	R	R	O		
	Review Operations & Maintenance Manuals	N/A	N/A	N/A	N/A	N/A		
	Training Plan Review	R	N/A	N/A	N/A	N/A		
	Warranty Review	N/A	N/A	N/A	N/A	N/A		
	Review TAB Report	R	N/A	R	N/A	N/A		
Site Observations	Construction Observation Site Visits	N/A	N/A	N/A	N/A	N/A		
	Witness Selected Equipment Startup	N/A	N/A	N/A	N/A	N/A		
Functional Test Protocols	TAB Verification	R	N/A	N/A	P	N/A		
	Systems Functional Performance Testing	L	A	P	P	P		
	Retesting	L	A	P	P	P		

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Systems Training	N/A	N/A	N/A	N/A	N/A	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	
	Final Commissioning Report	L	A	R	R	R	
	Prepare Systems Manuals	N/A	N/A	N/A	N/A	N/A	

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	N/A	N/A	N/A	N/A	N/A	

Warranty Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	N/A	N/A	N/A	N/A	N/A	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	N/A	N/A		N/A	N/A	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	N/A	N/A		N/A	N/A	

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.

1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.

a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.

b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.

2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.

a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

b. The full startup plan shall at a minimum consist of the following items:

1) The Pre-Functional Checklists.

2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by

each procedure and a signature block added by hand at the end.

3) The manufacturer's normally used field checkout sheets.

- c. The Commissioning Contractor will submit the full startup plan to the VA for review. Final approval will be by the VA.
- d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.

3. Sensor and Actuator Calibration

- a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.
- b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

4. Execution of Equipment Startup

- a. Four(4) weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.
- b. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.
- c. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

- A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached

sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.

- B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.
- C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

3.4 DDC SYSTEM TRENDING FOR COMMISSIONING

- A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.
- B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers - Critical, Priority, and Maintenance.
 - 1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display. The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.
 - 2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from

the operator or maintenance personnel within a normal work shift, and not immediate action.

3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.
- C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.
- D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the Resident Engineer and Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor shall provide, but not limited to, the following trend requirements and trend submissions:
1. Pre-testing, Testing, and Post-testing - Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the Resident Engineer. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Resident Engineer, prior to the execution of Systems Functional Performance Testing.

2. Dynamic plotting - The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.
4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Freeze Stat Level 2	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 3	DI	COV	24 hours	3 days	P	True	1 min
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
UVC Emitter Alarm	DI	COV	24 hours	3 days	P	True	10 min
CO2 Alarm	DI	COV	24 hours	3 days	P	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AO	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Return Fan S/S	DO	COV	24 hours	3 days	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

Terminal Unit (VAV, CAV, etc.) Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Air Flow	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Local Setpoint	AI	15 Min	12 hours	3 days	M	±10°F from SP	60 min
Space Humidity	AI	15 Min	12 hours	3 days	P	> 60% RH	5 min
Unoccupied Override	DI	COV	12 hours	3 days	M	N/A	12 Hours
Refrigerator Alarm	DI	COV	12 hours	3 days	C	N/A	10 min
Damper Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		

Unit Heater Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Space Temperature	AI	15 Minutes	12 hours	3 days	P	±5°F from SP	10 min
Heating Valve Position	AO	15 Minutes	12 hours	3 days	N/A		
Unit Heater ON/OFF	DO	COV	12 hours	3 days	M	Status <> Command	30 min

Steam and Condensate Pumps Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Steam Flow (LB/HR)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Pump Run Hours	AI	15 Minutes	12 hours	3 days	N/A		
Water Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Electric Meter (KW/H)	AI	15 Minutes	12 hours	3 days	N/A		
Irrigation Meter (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
Chilled Water Flow (TONS)	AI	15 Minutes	12 hours	3 days	N/A		
Condensate Flow (GPM)	AI	15 Minutes	12 hours	3 days	N/A		
High Water Level Alarm	DI	COV	12 hours	3 days	C	True	5 Min
Condensate Pump Start/Stop	DO	COV	12 hours	3 days	P	Status <> Command	10 min

Domestic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Domestic HW Setpoint WH-1	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Setpoint WH-2	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	C	> 135 °F	10 Min
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	P	±5°F from SP	10 Min
Dom. Circ. Pump #1 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #2 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Dom. Circ. Pump #2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Domestic HW Start/Stop	DO	COV	12 Hours	3 days	N/A		

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
System HWS Temperature	AI	15 min	12 hours	3 days	C	±5°F from SP	10 Min
System HWR Temperature	AI	15 min	12 hours	3 days	M	±15°F from SP	300 Min
HX-1 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-1 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-2 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-3 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
HX-3 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-4 Entering Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
HX-4 Leaving Temperature	AI	15 min	12 hours	3 days	P	±5°F from SP	10 Min
System #1 Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System #1 Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min
System #2 Flow (GPM)	AI	15 min	12 hours	3 days	N/A		
System #2 Differential Pressure	AI	15 min	12 hours	3 days	P	±10% from SP	8 Min
HW Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 3 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 4 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
HW Pump 1 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 2 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 3 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 4 VFD Speed	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #1 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station #2 1/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		

Hydronic Hot Water Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Steam Station #2 2/3 Control Valve Position	AO	15 Min	12 Hours	3 days	N/A		
Steam Station Bypass Valve Position	AO	15 Min	12 Hours	3 days	N/A		
HW Pump 1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 3 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HW Pump 4 Start/Stop	DO	COV	12 Hours	3 days	N/A		
HWR #1 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #2 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #3 Valve	DO	COV	12 Hours	3 days	N/A		
HWR #4 Valve	DO	COV	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Chiller 1 Entering Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Leaving Temperature	AI	15 Minutes	12 Hours	3 days	P	±5°F from SP	10 Min
Chiller 1 Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Percent Load	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 KW Consumption	AI	15 Minutes	12 Hours	3 days	N/A		
Chiller 1 Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Decoupler Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Differential Pressure	AI	15 Minutes	12 Hours	3 days	P	±5% from SP	10 Min
Secondary Loop Flow	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Supply Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Return Temperature	AI	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Tonnage	AI	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Primary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Secondary Loop Pump 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Secondary Loop Pump 2 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Status	DI	COV	12 Hours	3 days	C	Status <> Command	30 min
Chiller 1 Evaporator Iso-Valve	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Evaporator Flow Switch	DI	COV	12 Hours	3 days	N/A		
Chiller 1 Unit Alarm	DI	COV	12 Hours	3 days	C	True	10 Min
Refrigerant Detector	DI	COV	12 Hours	3 days	C	True	10 Min
Refrigerant Exhaust Fan Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Emergency Shutdown	DI	COV	12 Hours	3 days	P	True	1 Min

Chilled Water System Trending and Alarms							
Point	Type	Trend Interval	Operational Trend Duration	Testing Trend Duration	Alarm Type	Alarm Range	Alarm Delay
Primary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Pump 1 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Secondary Loop Pump 2 VFD Speed	AO	15 Minutes	12 Hours	3 days	N/A		
Primary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Primary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 1 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Secondary Pump 2 Start / Stop	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Enable	DO	COV	12 Hours	3 days	N/A		
Chiller 1 Iso-Valve Command	DO	COV	12 Hours	3 days	N/A		
Refrigerant Exhaust Fan Start / Stop	DO	COV	12 Hours	3 days	N/A		

E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified

after submission shall be recorded and resubmitted to the Resident Engineer and Commissioning Agent.

1. Point-to-Point checkout documentation;
2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
3. A sensor calibration table listing the referencing the location of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

SYSTEM		
Sensor	Calibration Frequency	O&M Calibration Procedure Reference
Discharge air temperature	Once a year	Volume I Section D.3.aa
Discharge static pressure	Every 6 months	Volume II Section A.1.c

1. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

AIR HANDLING UNIT AHU-1				
Control Reference	Proportional Constant	Integral Constant	Derivative Constant	Interval
Heating Valve Output	1000	20	10	2 sec.

3.5 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

- A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.

- B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.
- C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.
- D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms

developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
 2. Equipment location and ID number
 3. Date
 4. Project name
 5. Participating parties
 6. A copy of the specific sequence of operations or other specified parameters being verified
 7. Formulas used in any calculations
 8. Instructions for setting up the test.
 9. Special cautions, alarm limits, etc.
 10. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
 11. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.
- E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.
1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
 2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be

- erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
 4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
 5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.
- F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.
- G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the

Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

- H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.
- J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.
- K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.6 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

- A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose.

Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.

1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.
4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
 - a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor's response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
 - b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the

Contractor shall reschedule the test and the test shall be repeated.

5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
 - a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor's response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
 - b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
 - c. The Commissioning Agent will document the resolution process.
 - d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.
- C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:

1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
 2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
 3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
 4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
 5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.7 DEFERRED TESTING

- A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen

Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.

- B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent. Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

----- END -----

SECTION 02 30 00
SUBSURFACE INVESTIGATION

PART 1 - GENERAL:

1.01 INVESTIGATION:

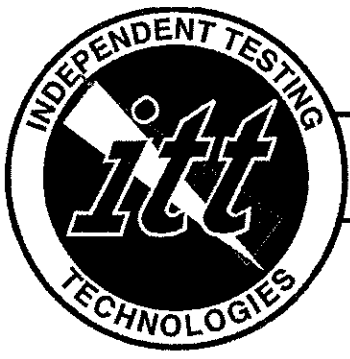
- A. Soil and subsurface investigations were conducted at Project site resulting in a report issued by Independent Testing Technologies, dated 8-15-2014.

1.02 INTERPRETATION:

- A. Report is not intended as guarantee by Owner and Architect as accurate or indicative of all soil conditions on Project site.
- B. Report was obtained by Architect for use in design only and is not part of Contract Documents.
- C. Report and log of borings is available for Contractor's information but is not warranty of subsurface conditions.
- D. For additional investigation, Contractor should visit site and acquaint himself with site conditions.
- E. Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

1.03 See Enclosed Report attached to specification.

END OF SECTION



Independent Testing Technologies, Inc.

AUGUST 15, 2014

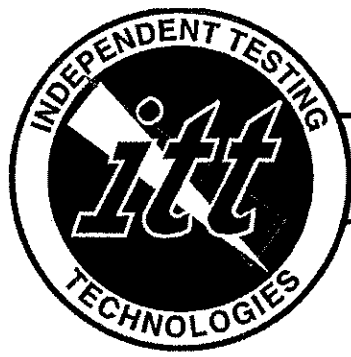
**PROJECT 14-237
REPORT OF GEOTECHNICAL EXPLORATIONS**

For

**BUILDING 111
OUTPATIENT MENTAL HEALTH CLINIC
ST. CLOUD VA MEDICAL CENTER
VA PROJECT #656-341
ST. CLOUD, MINNESOTA**

Prepared For:

FOSS ARCHITECTS



Independent Testing Technologies, Inc.

August 15, 2014

Ms. Rochelle Conzemius, AIA
Foss Architecture
801 1st Avenue North
Fargo, ND 58102

RE: 14-237 *Revised* Report of Geotechnical Exploration
Building 111 Outpatient Mental Health Clinic
St. Cloud VA Medical Center Project 656-341
St. Cloud, Minnesota

Dear Ms. Conzemius:

Independent Testing Technologies, Inc. is pleased to submit the results of our subsurface investigation program for this project in St. Cloud, Minnesota. This *revised* report represents our work for this project as authorized by you and includes updated project information provided by you last week. . It includes our recommendations regarding earthwork, fill and compaction, building suitability, foundation design and floor slab support. An electronic copy is provided.

The soils on this site are fairly well suited for the proposed building and site improvements. The majority of the soils encountered were silty sand (SM) and poorly graded sand with silt (SP-SM) fill overlying native clean, poorly graded sands (SP) and poorly graded sands with silt (SP-SM). Some minor silts (ML) and silty clayey sands (SC-SM) were encountered deep in two of the borings. Groundwater was observed at depths of 16.0 to 19.0 feet during drilling and should not have an impact on construction. Soil samples obtained during our investigation will be stored at our office for thirty days after the date of this report. After that time, they will be disposed of unless you advise otherwise.

Ms. Conzemius, it has been our pleasure to work with you on this project. Please contact Patrick Johnson if you have any questions regarding this report. Please contact Daryl Dhein if you would like a proposal for the materials testing services that will be needed during the construction phase.

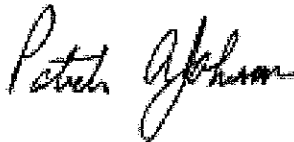
Sincerely,

Patrick A. Johnson, P.E.
MN Registration #22037

Kevin T. Reller
Vice President

CERTIFICATION

I hereby certify that this report was prepared
by me or under my direct supervision and that I am a
duly Registered Engineer under the laws
of the State of Minnesota.



Patrick A. Johnson

Date: August 15, 2014 Registration No.: 22037

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**GEOTECHNICAL EXPLORATIONS
ST. CLOUD VA BUILDING 111
OUTPATIENT MENTAL HEALTH CLINIC
ST. CLOUD, MINNESOTA
PROJECT 14-237**

A. Introduction

This report is being prepared for use by our client on this specific project. We intend to present this report and our findings in the same logical manner that led us to arrive at our recommendations. This report is based on some general assumptions regarding the anticipated construction based on experience with similar projects. These assumptions and the entire report should be reviewed immediately upon receipt.

Purpose:

The purpose of our investigation was to evaluate the existing soil and water conditions on this site and provide a report of our findings and recommendations regarding design and construction of the proposed improvements. The project consists of the construction of two additions to the north wing of Building 111, an additional floor added to that building and construction of temporary structures for administrative office functions on pier footings on the east side of the St. Cloud VA Medical Center campus in St. Cloud, Minnesota.

The additions to building 111 will be two-story and three-story, steel framed, and masonry structures with crawl space on standard, cast-in-place spread footings. The temporary office spaces will be modular trailers placed on pier foundation. Several infiltration basins are also planned for storm water runoff treatment. In accordance with your written authorization, we have conducted a subsurface exploration program for the proposed project.

Scope of Services:

Our authorized scope of services included the following:

1. To investigate the subsurface soil and water conditions encountered at seven (7) split-spoon soil boring locations. The split spoon borings were planned to be twenty five (25) feet deep in the building areas and ten (10) deep in the BMP areas.

2. To provide a report of our findings including the results of our subsurface investigation and recommendations regarding earthwork, fill and compaction, building suitability, foundation design, allowable soil bearing capacity, floor slab support, wall backfill, lateral earth pressures, estimated soil infiltration rates and suitability for infiltration.

General Site Conditions:

The project site is located to the north of Building 111 and east of Building 9 on the east side of the St. Cloud VA Medical Center campus. The site is open yard areas with concrete walkways. The site is relatively flat with slopes of 2 to 4%. There are numerous buried utilities in the area including sanitary sewers, storm sewer, water mains, steam lines, water services, primary electric, sprinklers, communications and lighting.

Available Subsurface Information:

According to the Geologic Map of Minnesota, Quaternary Geology, prepared by Howard C. Hobbs and Joseph E. Goebel (1982, Minnesota Geological Survey), this site lies within an outwash unit not associated with a particular moraine. It is associated with the Des Moines glaciation of Pleistocene, Late Wisconsinan age. The drift is derived from parent material in North Dakota and Manitoba.

According to the Soil Survey of Stearns County prepared by the Soil Conservation Service, the site lies within the Hubbard-Dickman Soil Association. These consist of nearly level to sloping, excessively drained and well drained, coarse textured and moderately coarse textured soils formed in a sandy or loamy mantle and underlying outwash under savanna vegetation. Most of the individual soils mapped on this site are sandy and have slight limitations for development of commercial building sites.

B. Exploration Program

Seven (7) split-spoon soil borings were conducted on this project. The borings were advanced to depths of 10 to 25 feet using a 3 ¼ inch hollow stem auger with drilling fluid. Samples were obtained every 2 ½ feet for the first 10 feet and every 5 feet thereafter using a 2-inch O.D. split spoon sampler in accordance with the American Society for Testing and Materials (ASTM D1586). Standard penetration values (N-values) were obtained at each sample interval by driving the sampler into the soil using a 140-pound hammer falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler 12 inches is known as the standard penetration resistance or N-value. Where the sampler can not be driven at least 6 inches by 50 blows of the hammer, the total number of blows as well as the distance driven is reported on the boring logs.

Groundwater levels were noted during drilling. The holes were sealed with a mixture of bentonite grout and the auger cuttings. Some settlement of the bore holes may be expected. The borings were conducted with truck mounted CME-55 drill rig. The surface elevations were based on an assumed elevation of 100.0 for the floor slab of building 111.

Exploration Results:

The borings were all conducted in grassy yard areas. All of the borings, except boring B-6, encountered silty sand (SM) topsoil to depths of 6 inches to 30 inches. Boring B-6 encountered silty sand (SM) fill from the surface to a depth of 4.0 feet, followed by poorly graded sand with silt (SP-SM) fill to 7.5 feet.

Below the topsoil, borings B-1 and B-2 encountered poorly graded sand with silt (SP-SM) fill to depths of 3.5 to 4.0 feet. Below the fill, boring B-1 encountered native, poorly graded sand (SP) to 16.0 feet, poorly graded sand with silt (SP-SM) to 19.0 feet, silty clayey sand (SC-SM) to 23.0 feet and then poorly graded sand (SP) to termination at 25.0 feet. Below the fill, boring B-2 encountered native, poorly graded sands (SP) to 15.0 feet, followed by poorly graded sands with silt (SP-SM) to termination at 25.0 feet. Below the topsoil, boring B-3 encountered native, poorly graded sand (SP) with gravel to termination at 25.0 feet. Below the topsoil, boring B-4 encountered native, poorly graded sand (SP) with gravel to 20.0 feet, followed by grey silt (ML) to 21.0 feet and then poorly graded sand (SP) to termination at 25.0 feet.

Below the topsoil, boring B-5 encountered native, poorly graded sand (SP) with gravel to termination at 10.0 feet. Below the fill, boring B-6 encountered native, poorly graded sand (SP)

with gravel to termination at 10.0 feet. Below the topsoil, boring B-7 encountered native, poorly graded sand with silt (SP-SM) to 4.0 feet and then poorly graded sand (SP) with gravel to termination at 10.0 feet.

Penetration Test Results:

The standard penetration blow counts in the sand (SM, SP-SM) fill ranged from 2 to 17, which are very low to moderate, indicating that they are in a very loose to dense condition. The standard penetration blow counts in the native sandy outwash soils underlying the fill ranged from 9 to 68, which are moderate to high, indicating that they are in a dense to very dense condition. The blow counts generally became higher with depth, which is typical in normally consolidated, native granular soils. Refusal of the spoon or auger did not occur in any of the borings.

Water Level Observations:

Observations of the subsurface water conditions were made during drilling operations. Groundwater was encountered at depths of 16.0 to 19.0 feet during drilling.

Although the water levels were observed over a very short period of time, it is our opinion that the water levels measured are an accurate representation of the true water levels on this site at the time of our exploration due to the permeability of the soils at that level. It should be noted that fluctuations in the level of the groundwater can occur due to variations in rainfall, temperature, spring thaw and other factors not evident at the time of our investigation. Mottled soils were not observed. Mottled native soils are a historical indication of a temporarily or seasonally saturated soil condition. Grey soils were observed. Grey native soils are an indication of a permanently saturated soil condition.

C. Engineering Review

Discussion:

Based on our findings, the site appears to be well suited for the proposed building and site improvements. Some surficial fill was encountered. It was likely placed during the original building

construction and site grading. It is our opinion that more fill material than what was observed in our borings could be expected, since the site has already been disturbed during prior construction activities. There are a number of utilities running through the area of the proposed construction. We recommend all of the existing fill soils in the building areas be completely removed and replaced with properly compacted structural fill. Most of the fill appears to be suitable for re-use.

The new building additions will be two-story and three-story, steel framed and masonry wall structures with crawl spaces on standard cast-in-place concrete spread footings. The footings will bear at approximately 6 feet below finished grade. The temporary building will be one-story, modular trailers supported on piers bearing at approximately 6 feet below grade.

Excluding the sand (SM, SP-SM) fill and topsoil, the native soils on this site appear suitable for support of the proposed building. Groundwater should not have an impact on project design or construction.

D. Recommendations

The following recommendations are based on our understanding of the proposed project. If our understanding of the project is not accurate, or if changes are made to the project scope, please inform us so that our recommendations can be amended, if necessary. We have included recommendations regarding earthwork and construction that may help in cost estimates and aid in design. We should be allowed to review the proposed construction plans to provide further detailed recommendations, if necessary. Without the opportunity to review the final construction plans, the recommendations made in this report may no longer be valid.

Site Grading:

We recommend that the existing topsoil material be removed from the building areas. We estimate that this will require an excavation of approximately 6 to 30 inches across the site. In addition, we recommend any existing fill be removed from the proposed building areas. The fill that we encountered in our borings appeared to be suitable for re-use as structural fill. However, we recommend that the existing fill be removed and replaced.

After topsoil removal and removal of any fill, we recommend the exposed native sandy soils or

suitable fill material in the building areas be compacted with three passes of a heavy vibratory compactor to remove any inconsistencies in the density of the soils and to provide uniform compaction of the native soils prior to placing any new fill.

We recommend the bottom of the excavation be observed by a soils engineer or a qualified technician to verify that native, competent material has been reached. We recommend the excavation be oversized one foot for every foot of fill required to reach planned grade (1:1 oversizing at 45 degrees from vertical). Soils can change dramatically over short horizontal distances; therefore these depths should be used as a guide. After removal of the topsoil and any unsuitable soils, we recommend clean, mineral fill, meeting the requirements of structural fill, be placed and compacted to bring the building and pavement areas to grade.

Structural Fill:

The on-site soils consisting of poorly graded sand (SP) and poorly graded sands with silt (SP-SM) are considered excellent material for use as structural fill. These soils are relatively easy to work with and are easily compacted with normal vibratory compaction equipment. The existing silty sand (SM) soils are considered fair material for use as structural fill. These soils can be somewhat difficult to work with if they become wet prior to compaction.

We recommend that any imported fill consist of mineral soils meeting the following requirements. No organic soils, roots, stumps, logs, brush, etc. should be used as structural fill below any foundation or pavement section. We recommend that all fill material be free of soft, wet, or frozen soils, highly expansive soils, rubble, debris and rocks in excess of 6 inches in diameter. The fill should be as uniform as possible both in composition and moisture content.

We recommend all fill be compacted to the minimum relative density levels shown in the table below:

Location	Recommended Compaction Level (percent of Std. Proctor ASTM D698)
Below Foundations, Exterior Wall Footings, Interior Column Pads	100 %
Below Interior Floor Slabs and Non Load Bearing Wall Footings	98%
Below Pavements, deeper than 3 feet from finished subgrade	95%
Below Pavements within 3 feet of finished subgrade	100%
Below Exterior Sidewalks and Slabs and Exterior Wall Backfill	95%
Landscape Areas	90%

All fill should be compacted at a moisture content within plus or minus 2% of the optimum moisture as determined by a standard proctor. We recommend compaction tests be taken on any fill in the building and pavement areas at a rate of one test per vertical foot per 2,500 square foot area, with a minimum of two tests per fill area.

Foundations:

The N-values recorded in the penetration borings indicate that the existing native soils on this site are in a dense to very dense condition capable of supporting the proposed structure. All footings should be placed on native, poorly graded sands or compacted fill.

We recommend all exterior footings in heated building areas be placed at a minimum depth of 42 inches below proposed final grade to provide protection from frost damage. Interior footings in heated areas can be placed at any convenient depth as long as they are on firm, native soils or properly compacted fill. In unheated areas, we recommend the footings be placed 60 inches deep due to increased frost penetration depths. If the crawl space under the temporary structures is not insulated and heated, we recommend the foundations bear on native soil at least 60 inches below proposed exterior finished grounds surface.

Any footings placed on native soils or on properly compacted fill should be proportioned for a

maximum net allowable soil bearing pressure of 3500 psf. We recommend compaction tests be taken on any fill below the footings at a rate of one test per 50 linear feet for wall footings and one test per column footing. Compaction tests need not be taken on the native, undisturbed sand below the footings. We recommend compaction tests be taken immediately prior to pouring the footings.

The recommended bearing pressure is a net value and represents the actual loads that may be transmitted to the soil independent of overburden pressures. We estimate total settlement to be less than 1/2 inch with differential settlement about half of this if the recommendations in this report are followed.

Floor Slab

We recommend a minimum of 6 inches of clean, free draining washed sand with less than 5% passing a No. 200 sieve be placed beneath the floor slabs. This will provide a capillary break and a uniform level subgrade for the floor slabs. We recommend floor slabs be designed using a modulus of subgrade reaction of 300 pounds per cubic inch.

We recommend a vapor moisture barrier consisting of minimum 6-mil polyethylene sheeting. A vapor barrier should be placed under all concrete floors on ground that are likely to receive an impermeable floor finish or be used for any purpose where the passage of water vapor through the floor is undesirable. Floor coverings such as linoleum, vinyl tile, carpeting, wood, and synthetic surfacing effectively seal the moisture within the slab where it eventually may loosen, buckle, or blister the floor covering.

In order to lessen the moisture post-construction, we recommend using a low water-cement ratio concrete, less than .45. We recommend allowing the slab a 2-month drying period and testing the slab moisture condition before installing any floor covering.

Wall Backfill

We recommend below grade walls be backfilled with the on-site sandy soils (SP, SP-SM, SM). We recommend all wall backfill be compacted to the minimum densities specified above. We recommend below grade walls be designed using a coefficient of active pressure (K_a) of 0.3, an at-rest coefficient (K_o) of 0.5, and a passive coefficient (K_p) of 3.0. We recommend restrained below grade walls be designed using a dry bulk density of 120 pcf for the on site soils.

Excavation Safety

The borings encountered native clean, dry, poorly graded sands above the water table. Based on the results of the boring and visual examination of the soils, it is apparent the sand soils in the anticipated excavation will be granular Type C soils in accordance with OSHA regulations. According to OSHA, Type C soils can be excavated to a depth of 20 feet or less at maximum allowable slope of 1.5:1. However, excavations below the water table in these soils will not be stable under any circumstances and will require adequate shoring and dewatering. Workers should not be allowed in excavations below water on this site without adequately designed shoring or cofferdam.

For excavations less than 20 feet deep and above water, benching and sloping shall be similar as that shown in Appendix B-1.3 of the OSHA regulations. An excavation shoring, benching or sloping system for excavations deeper than 20 feet must be designed by a registered professional engineer.

Please keep in mind that 29 CFR 1926.651 (k) (1) regulations require daily inspections of the sloping and benching and adjacent areas by a competent person for any evidence of a situation that could result in a possible cave-in or hazardous condition. Our authorized scope of work does not include those inspections.

We recommend that excavations slope at a 1.5:1 (horizontal: vertical) ratio from the bottom of the excavation to the surface. Stockpiled material should be kept at least 2 feet from the edge of the excavation. This is the minimum required by OSHA. We recommend all construction

vehicles be kept at least 5 feet from the edge of the excavation. An escape ladder should be provided at all times while workers are in the excavation. All excavations must meet OSHA standards (29 CFR1926).

Stormwater Pond:

The native sand soils on this site are suitable for infiltration treatment. According to the *Minnesota Stormwater Manual, November 2005*, prepared by the Minnesota Pollution Control Agency, it is our opinion that the native sands consisting of poorly graded sand (SP) and poorly graded sand with silt (SP-SM) below the topsoil fill material are in Hydrologic Group "A." We estimate the native sand soils would have an infiltration rate of approximately 1.0 to 1.5 inches per hour. The pond bottom should be at least three feet above the water level for infiltration basins.

For the most part, the existing fill materials on the site are sandy. However, being that it is fill that was placed indiscriminately, it is prudent to assume the fill material may have more restrictive infiltration rates. We recommend the sandy fill soils be assigned an assumed infiltration rate of approximately 0.3 inches per hour.

F. Closing

Our work was performed for geotechnical purposes only and not to document the presence or extent of any contamination on the site. We can note that our crew did not detect any obvious contamination by sight or smell during drilling operations. However, human senses are limited in terms of contamination detection and, therefore, the lack of detection through human sensing does not preclude the possibility of the presence of contamination of the site.

This report represents the result of our subsurface investigation and is based on information gathered at specific locations. Subsurface conditions can change a great deal over short horizontal distances. Also, the actual interface between strata will likely be a gradual transition rather than an abrupt change as represented on the boring logs.

Geotechnical engineering is based extensively on opinion. Therefore, the data contained in this report should be used as a guide, and we recommend that construction monitoring be performed by a qualified geotechnical engineer or technician. Any changes in the subsurface conditions from those found during this geotechnical investigation should be brought to the attention of a soils engineer.

c:b14237-rpt

APPENDIX 1

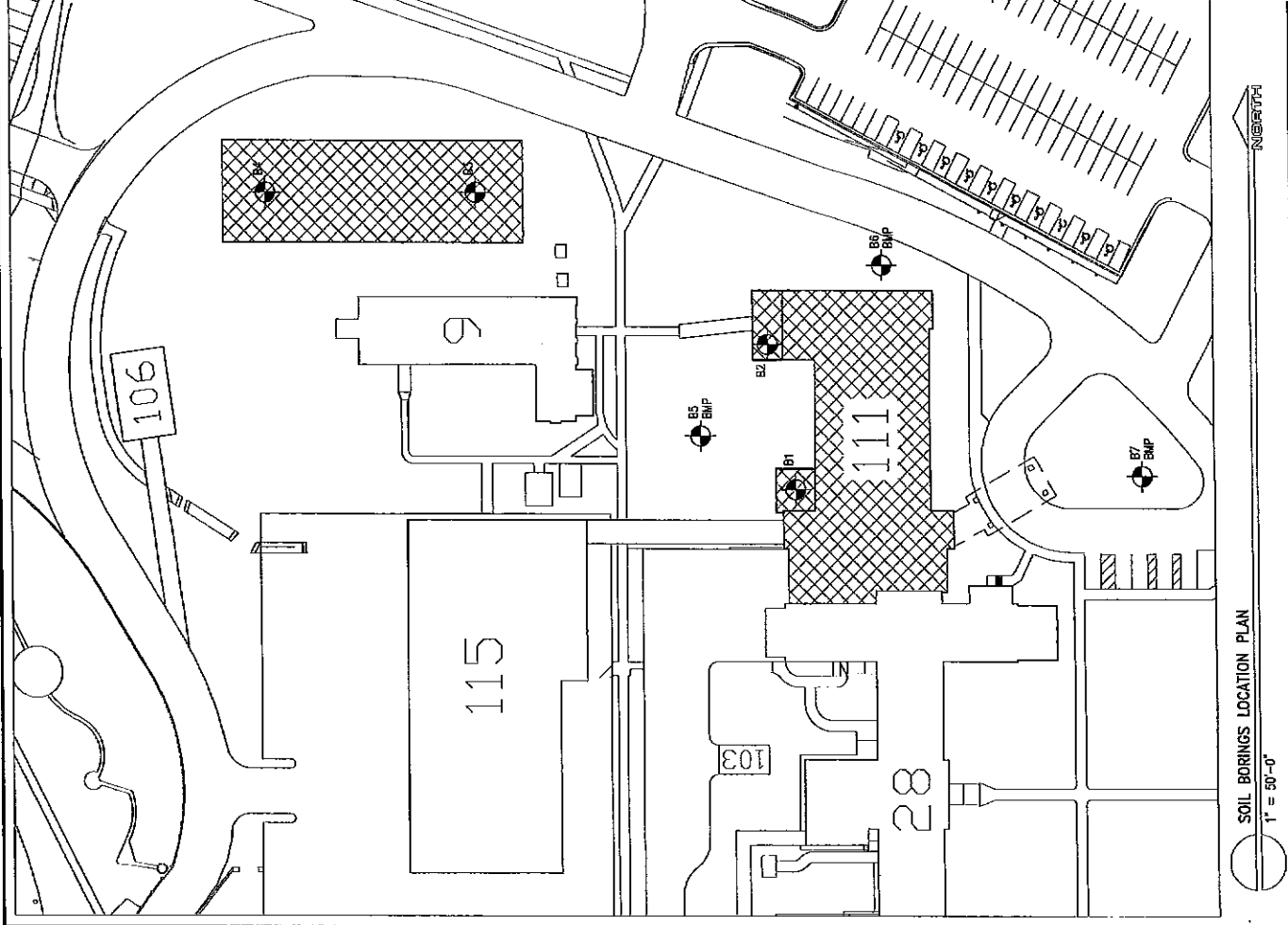
BORING LOCATION PLAN

DEPARTMENT OF
FOSS ARCHITECTURE & INTERIORS
A PROFESSIONAL CORPORATION
THIS REPORT WAS PREPARED BY ME OR UNDER MY
DIRECT SUPERVISION AND I AM A DULY LICENSED
ENGINEER UNDER THE LAWS OF THE STATE OF

REGISTRATION NUMBER:
PROJECT NO. 1227
SCALE:
DATE: 07/18/2011
DRAWN: msk

**SOIL BORINGS
LOCATION PLAN**

KEY PLAN
SHEET:



APPENDIX 2
BORING LOGS

PROJECT: 14-237 FOSS ARCHITECTS
 BLDG 111 OUTPATIENT MENTAL HEALTH
 VA PROJ 656-341
 ST. CLOUD, MINNESOTA

DATE: 8/4/14 BORING #: B-1
 START TIME: 10:40 END TIME: 11:30

METHOD: 3 1/4" I.D. Hollow Stem Auger
 CREW: RB / MM
 ELEVATION: 100.6

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes
9"	SM	SILTY SAND, fine grained, black, TOPSOIL					
3.5	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ a trace of GRAVEL, brown. POSS. FILL	1	17		4.6	
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown.	2	17		2.6	
10.0			3	20		2.7	
			4	26		3.5	
15.0			5	18		4.4	
16.0							
19.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to coarse grained, w/ a little GRAVEL, brown.			V		Water encountered at 17.0 feet during drilling.
20.0	SC-SM	SILTY CLAYEY SAND, fine to medium grained, w/ GRAVEL, grey. w/ layers of grey silt and silty clay	6	68		8.0	
23.0							
25.0	SP	POORLY GRADED SAND, medium to coarse grained, w/ GRAVEL, grey.	7	48		8.0	
		Boring complete to 25 feet. Water was encountered at 17.0 feet during drilling. No water present to cave-in at 9.0 feet after completion.					

PROJECT: 14-237 FOSS ARCHITECTS
BLDG 111 OUTPATIENT MENTAL HEALTH
VA PROJ 656-341
ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-2
START TIME: 11:35 **END TIME:** 12:48

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM

LOCATION: See Boring Location Plan

ELEVATION: 99.9 **Page 1 of 1**

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes	
6"	SM	SILTY SAND, fine grained, black, TOPSOIL						
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ a trace of GRAVEL, brown. FILL	1	3		6.6		
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown.	2	9		4.0		
10.0			3	20		10.4		
			4	34		3.7		
15.0			5	14		11.3		
20.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ GRAVEL, brown.	6	46	V	12.0	Water encountered at 16.0 feet during drilling.	
25.0			7	51		8.2		
		Boring complete to 25 feet. Water was encountered at 16.0 feet during drilling. No water present to cave-in at 6.0 feet after completion.						

PROJECT: 14-237 FOSS ARCHITECTS
 BLDG 111 OUTPATIENT MENTAL HEALTH
 VA PROJ 656-341
 ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-3
START TIME: 12:51 **END TIME:** 1:34
METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM
ELEVATION: 102.2

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes	
10"	SM	SILTY SAND, fine grained, black, TOPSOIL						
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a trace of GRAVEL, brown.	1	19		2.8		
			2	19		3.7		
			3	20		3.3		
10.0			4	17		5.1		
				fine to coarse grained, w/ a little GRAVEL at 12.5 feet				
15.0			5	25		3.2		
20.0			6	16		V		21.1
25.0			7	24		13.2		
		Boring complete to 25 feet. Water was encountered at 19.0 feet during drilling. No water present to cave-in at 4.0 feet after completion.						

PROJECT: 14-237 FOSS ARCHITECTS
BLDG 111 OUTPATIENT MENTAL HEALTH
VA PROJ 656-341
ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-4
START TIME: 1:37 **END TIME:** 2:18
METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM
ELEVATION: 100.7

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes
30"	SM	SILTY SAND, fine grained, black, TOPSOIL	1	8		3.3	
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown. fine to coarse grained, w/ a little GRAVEL at 10 feet	2	13		2.7	No sample recovery Water encountered at 18.0 feet during drilling.
			3	17		3.3	
10.0			4	19		5.2	
15.0			5	41			
			6	13	V	22.2	
20.0							
21.0	ML	SILT, grey.					
25.0	SP	POORLY GRADED SAND, medium to coarse grained, w/ GRAVEL, grey, water bearing.	7	9		12.0	
		Boring complete to 25 feet. Water was encountered at 18.0 feet during drilling. No water present to cave-in at 4.0 feet after completion.					

PROJECT: 14-237 FOSS ARCHITECTS
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 ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-5
START TIME: 10:20 **END TIME:** 10:38
METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM
ELEVATION: 102.6

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes
10"	SM	SILTY SAND, fine grained, black, TOPSOIL					
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown.	1	22		4.0	
			2	22		2.5	
		fine to medium grained, w/ a trace GRAVEL at 6.5 feet	3	18		3.2	
10.0			4	20		3.1	
		Boring complete to 10.0 feet. Water was not encountered during drilling. No water present to cave-in at 3.5 feet after completion.					

PROJECT: 14-237 FOSS ARCHITECTS
 BLDG 111 OUTPATIENT MENTAL HEALTH
 VA PROJ 656-341
 ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-6
START TIME: 9:59 **END TIME:** 10:14
METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM
ELEVATION: 102.2

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes
4.0	SM	SILTY SAND, fine grained, w/ a trace of GRAVEL, dark brown. FILL	1	2		7.4	
5.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ a trace of GRAVEL, brown. FILL	2	13		9.2	
7.5			3	24			No sample Recovery
10.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown.	4	14		4.6	
Boring complete to 10.0 feet. Water was not encountered during drilling. No water present to cave-in at 7.0 feet after completion.							

PROJECT: 14-237 FOSS ARCHITECTS
BLDG 111 OUTPATIENT MENTAL HEALTH
VA PROJ 656-341
ST. CLOUD, MINNESOTA

DATE: 8/4/14 **BORING #:** B-7
START TIME: 9:27 **END TIME:** 9:47
METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: RB / MM
ELEVATION: 102.3

LOCATION: See Boring Location Plan

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	Water Table	W _n	Notes
24"	SM	SILTY SAND, fine grained, dark brown, TOPSOIL.					
4.0	SP-SM	POORLY GRADED SAND w/ SILT, fine to medium grained, w/ a trace of GRAVEL, brown.	1	9		4.3	
5.0	SP	POORLY GRADED SAND, fine to medium grained, w/ a little GRAVEL, brown.	2	20		2.6	
			3	24		2.5	
10.0			4	38		2.1	
		Boring complete to 10.0 feet. Water was not encountered during drilling. No water present to cave-in at 4.5 feet after completion.					

Unified Soil Classification (USC) System (from ASTM D 2487)

Major Divisions		Group Symbol	Typical Names
Course-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	Gravels 50% or more of course fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW Well-graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GP Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM Silty gravels, gravel-sand-silt mixtures
		Gravels with Fines	GC Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of course fraction passes the 4.75 mm (No. 4) sieve	Clean Sands	SW Well-graded sands and gravelly sands, little or no fines
		Clean Sands	SP Poorly graded sands and gravelly sands, little or no fines
		Sands with Fines	SM Silty sands, sand-silt mixtures
		Sands with Fines	SC Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	Silts and Clays Liquid Limit 50% or less	ML Inorganic silts, very fine sands, rock four, silty or clayey fine sands	
		CL Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays	
		OL Organic silts and organic silty clays of low plasticity	
	Silts and Clays Liquid Limit greater than 50%	MH Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH Inorganic clays or high plasticity, fat clays	
		OH Organic clays of medium to high plasticity	
Highly Organic Soils		PT Peat, muck, and other highly organic soils	

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic

Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL:

1.1 DESCRIPTION:

- A. This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK:

- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 11, EARTH MOVING
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- G. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works.

Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

1.5 PROJECT CONDITIONS:

- A. Occupancy: The Owner will occupy portions of the building immediately adjacent to areas of selective demolition. Conduct work in a manner that will minimize need for disruption of Owner's normal operations. Provide a minimum of 72 hours advance notice to Architect of demolition activities that will affect Owner's normal operations.
- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures demolished. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within the structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.
- C. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, flame cutting will not be allowed. Maintain portable fire suppression devices during torch cutting. When using gas torches to removed fire escapes, brackets, anchors, unused fixtures, or other exterior embedded metal structures or reinforcements from masonry and mortar, caution shall be exercised in localizing torching to not allow expansion resulting from crumbling or disintegration of mortar or masonry. Any damaged masonry or mortar from gas cutting shall be replaced at the expense of the Contractor.
- D. Provide equipment for the transport of removed materials. Removal of debris shall be as specified, but shall be in compliance with governing authorities. Framing member, etc., shall be removed and lowered by hoists, derricks, or other safe, suitable methods.

1.6 PERMITS AND LICENSES:

- A. The contractor shall notify the proper agencies and obtain and pay for all licenses, permits, fees, etc. as required for the start and completion of the Work.
 - 1. Contractor shall not handle hazardous waste such as asbestos or PCB's as part of this Contract. He shall immediately notify the Owner if suspected materials are encountered.

PART 2 - PRODUCTS:

2.1 MATERIALS:

- A. Except for items indicated on Drawings to be turned over to Owner or relocated, maintain possession of materials being demolished and remove from site. Take precautions not to damage items indicated for relocation or to be turned over to Owner. The Owner retains all salvage rights. Contractor to review prior to demolition.

2.2 FLOWABLE FILL MIXTURE: (USED TO FILL ABANDONED SEWER LINES)

- A. Mix design shall produce a consistency that will result in a flowable product at the time of placement which does not require manual means to move it into place.
- B. Flowable fill shall have a minimum strength of 3.0 MPa (450 psi) according to ASTM C39 at 28 days after placement.
- C. Flowable fill shall have minimal subsidence and bleed water shrinkage. Evaporation of bleed water shall not result in shrinkage of more than 10.4 mm per m (1/8 inch per foot) of flowable fill depth (for mixes containing high fly ash content). Measurement of a Final Bleeding shall be as measured in Section 10 of ASTM C 940 "Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory.
- D. Flowable fill shall have a unit weight of 1900 - 2300 kg/m³ (115 - 145 lbs/Cu.ft.) measured at the point of placement after a 60 minute ready-mix truck ride. In the absence of strength data the cementitious content shall be a maximum of 90 kg/m³ (150 lbs/cy).
- E. Flowable fill shall have an in-place yield of at least 98% of design yield for permanent type.
- F. Provide equipment as recommended by the Manufacturer and comply with manufacturer's recommendations for the addition of additives, whether at the production plant or prior to placement at the site.

PART 3 - EXECUTION:

3.1 EXAMINATION:

- A. Verify that utilities have been disconnected and capped, if applicable.
 - 1. Survey existing conditions and correlate with requirements indicated to determine the extent of selective demolition required.
 - 2. Fill sewer lines with flowable fill as herein specified, and where indicated on the site plans.
- B. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.
- C. Perform surveys as the work progresses to detect hazards, resulting from selective demolition.

3.2 PREPARATION:

- A. Protect existing items which are not indicated to be altered.
- B. Locate guard rails around open shafts. Post clearly visible warning signs.
- C. Demolition activities such as pneumatic hammering, sledging, drilling shall be scheduled with Owner prior to initiation of such activities.
- D. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and Authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing authorities.
- E. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and where required by authorities having jurisdiction.
 - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways where required by governing authorities or Owner. Maintain exit requirements.
 - 2. Protect existing site improvements, appurtenances and landscaping, scheduled to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior

surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

5. Protect walls, ceilings, floors, and other existing finish work that are to remain and are exposed during selective demolition operations.
- F. Erect and maintain dustproof and soundproof partitions as required to prevent spread of noise, dust, fumes and smoke to other parts of the building. On completion, remove partitions and repair damaged surfaces to match adjacent surfaces.
1. Construct dustproof partitions of not less than nominal 3 5/8" metal studs, ½" gypsum board, with joints taped on occupied side, and ½" fire retardant plywood sheathing on the demolition side. Install a layer of 4 mil poly into the construction of the partition, located in wall as directed by Architect.
 - a. Where wall is used to close off exterior openings, insulate and cover the exterior sheathing with double lap of 30 lb. felt. Seal perimeter.
 2. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
 3. Protect air handling equipment and seal off existing ductwork where necessary to prevent the spread of dust, fumes.
- G. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building portions or structural walls, roofs, etc.

3.3 POLLUTION CONTROLS:

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 1. Remove debris from elevated portions of building by chute, hoist or other device that will convey debris to grade level. Free falling debris to grade is not allowed.

- C. Clean adjacent structures and improvements of dust, dirt and debris caused by selective demolition operations. Return adjacent areas to condition existing prior to start of demolition.

3.4 CONTINUITY OF OPERATIONS:

- A. Provide protection for VAMC patients and staff in adjacent areas; normal operations of the Medical Center will proceed.
- B. Coordinate demolition activities with Owner to maintain uninterrupted operations.

3.5 MAINTENANCE OF SERVICES:

- A. It is critical that demolition of remodeling projects does not interrupt the building utilities services. Hospital operations, utility services, egress and ingress requirements must remain operational during the demolition. These services include plumbing, electrical, heating, ventilation, communication, and building access.

3.6 DEMOLITION:

- A. Demolish and remove existing construction only to the extent required by new construction, and as indicated and required. Use methods required to complete work within limitations of governing regulations. Demolish in an orderly and careful manner as required to accommodate new Work, including that required for connection to the new building. Protect existing foundations and supporting structural members.
 1. Proceed with demolition systematically, from higher to lower levels. Complete demolition work above each floor or tier prior to disturbing supporting members on lower levels.
 2. Neatly cut openings and holes plumb, square, and true to dimensions. Use ducting methods least likely to damage construction to remain/adjoining construction. To minimize disturbances of adjacent surfaces, use hand or small power tools designed for sawing and grinding and not hammering and chopping.
 3. Do not use torches until work area is cleared of flammable materials. Verify condition of duct and pipe interior shafts prior to cutting. Maintain portable fire suppression systems during cutting operations.
 4. Provide adequate ventilation when using cutting torches.
 5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 6. Spread out loads of demolition equipment and demolished materials, so as not to overload existing structure.

- B. Carry out demolition Work to cause as little inconvenience as possible to adjacent occupied portions of building.
- C. Repair all demolition performed in excess of that required, at no cost to the Owner.
- D. Burning of materials on site is not permitted.
- E. Remove demolished materials, tools and equipment from site upon completion of Work. Leave site in an acceptable condition. Transport and legally dispose of off-site.

3.7 SAW CUTTING:

- A. Work shall be performed by an experienced saw cutting contractor. Saw cutting shall be performed with water cooled saw units or dry cutting saw units. Saw cut openings in existing walls and floors where indicated.

3.8 CORE DRILLING:

- A. Core drilling shall be done by Contractor with proper sized drill or coring machine.

3.9 OVERHEAD DEMOLITION, DEMO NEAR DUCT AND PIPE CHASES, ETC.:

- A. Contractor shall take extreme care not to let demolished material drop down shafts or drop to floors below. Provide temporary closure of shafts if necessary.

3.10 EXISTING FLOORING AND BASE REMOVAL:

- A. Contractor shall remove existing flooring and base in as large of pieces as possible. Contractor shall take care in removing old vinyl base adhesive from existing walls to avoid excess damage. Remove existing adhesive used in adhering existing carpet to substrate. Removal of Vinyl Asbestos tile and sheet goods is to be provided by the Owner.

3.11 MASONRY VENEER REMOVAL:

- A. Demolition of existing Veneer:
 - 1. Remove indicated veneer. Coordinate removal efforts with Owner. Face brick shall be removed in an orderly careful fashion. Salvage architectural precast where reusing in new addition.
- B. Demolished brick shall be removed and dumped down chutes into trucks which shall haul brick to the landfill or approved dumping site. Remove and salvage existing frames, lintels, etc.
- C. Power chisel and remove header courses so that they are flush back to the face of the cmu backup. Take care not to damage items indicated from reinstallation.

- D. Protection of Backup: During the course of this work the cmu back-up walls will become exposed. Contractor shall temporarily protect exposed block to prevent the possibility of water damage during inclement weather. Provide poly or tarps and all means acceptable to the Owner or Architect to protect this wall from deterioration or water infiltration.
- E. Remove demolished materials, tools and equipment from site upon completion of Work. Leave site in an acceptable condition.

3.12 BUILDING DEMOLITION:

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be

handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

- E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

3.13 CLEAN-UP:

- A. On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Resident Engineer. Clean-up shall include off the Medical Center disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

3.14 APPLICATION OF FLOWABLE FILL:

- A. Secure tanks, pipes and other members to be filled with flowable fill. Protect exposed surfaces of flowable fill from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

- - - E N D - - -

**SECTION 03 30 53
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies cast-in-place structural concrete, such as footings, foundations, underpinning concrete, slabs on grade, topping slabs, and material and mixes for other concrete.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- D. Sump pit and sump system: Divisions 22/23. Mechanical.
- E. Drain Tile: Section 33 4613.

1.3 TOLERANCES:

- A. ACI 117.
- B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.4 REGULATORY REQUIREMENTS:

- A. ACI SP-66 ACI Detailing Manual
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
- B. Concrete Mix Design.
- C. Shop Drawings: Reinforcing steel: Complete shop drawings.
- D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.
- E. Include all required LEED Forms as listed in Division 1.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 117-10.....Specification for Tolerances for Concrete Construction, Materials and Commentary
 - 211.1-91 (R2009).....Standard Practice for Proportions for Normal, Heavyweight, and Mass Concrete
 - 301-10.....Specifications for Structural Concrete
 - 305.1-06.....Specification for Hot Weather Concreting

- 306.1-90 (R2002).....Standard Specification for Cold Weather
Concreting
- SP-66-04ACI Detailing Manual
- 318-11.....Building Code Requirements for Structural
Concrete and Commentary
- 347-04.....Guide to Formwork for Concrete
- C. American Society for Testing and Materials (ASTM):
- A185/A185M-07.....Standard Specification for Steel Welded Wire
Reinforcement, Plain, for Concrete
Reinforcement
- A615/A615M-09.....Standard Specification for Deformed and Plain
Carbon Steel Bars for Concrete Reinforcement
- A996/A996M-09.....Standard Specification for Rail Steel and Axle
Steel Deformed Bars for Concrete Reinforcement
- C33/C33M-11a.....Standard Specification for Concrete Aggregates
- C39/C39M-12.....Standard Test Method for Compressive Strength
of Cylindrical Concrete Specimens
- C94/C94M-12.....Standard Specification for Ready Mixed Concrete
- C143/C143M-10.....Standard Test Method for Slump of Hydraulic
Cement Concrete
- C150-11.....Standard Specification for Portland Cement
- C171-07.....Standard Specification for Sheet Material for
Curing Concrete
- C172-10.....Standard Practice for Sampling Freshly Mixed
Concrete
- C173-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method
- C192/C192M-07.....Standard Practice for Making and Curing
Concrete Test Specimens in the Laboratory
- C231-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method
- C260-10.....Standard Specification for Air-Entraining
Admixtures for Concrete
- C494/C494M-11.....Standard Specification for Chemical Admixtures
for Concrete
- C618-12.....Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in Concrete

D1751-04 (R2008)Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
D4397-10.....	Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
E1155-96 (2008).....	Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

- A. Wood, plywood, metal, or other materials, approved by COR, of grade or type suitable to obtain type of finish specified.
- B. Form Ties: Develop a minimum working strength of 3000 lbs, when fully assembled. Ties shall be adjustable in length to permit tightening of forms, and may have lugs, cones washers to act as spreader within the form. Once poured the contractor shall fill all tie hole voids, left by the form tie, with concrete grout. Wire ties are not permitted.
- C. STOOP FORM DECK:
 - 1. Metal Form Deck - Type 2: Single pan fluted units utilized as a permanent form for reinforced concrete slabs. Comply with the depth and gauge requirements as shown on the Contract Documents.
 - a. Finish: Galvanized G-60.
 - 2. Void Forms: Double faced, completely impregnated with paraffin and laminated with moisture resistant adhesive, size as required.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150, Type I or II. NOTE: Provide Hi-Early cement at underpinning concrete.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
 - 1. Fly Ash is not permitted in Floor slab or topping concrete.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 300 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.
- D. Fine Aggregate: ASTM C33.
- E. Mixing Water: Fresh, clean and potable.
- F. Air-Entraining Admixture: ASTM C260.

- G. Chemical Admixtures: ASTM C494.
- H. Vapor Barrier: Meeting ASTM E 1745-97 Class A-C;
1. Stego Wrap 15 mil vapor barrier, with seam tape by Stego Industries is specified with WR Meadow's Perminator, Vapor Block 15 by Raven Industries, BarrierBac 350 series (16 mil) or VaporGuard by Reef Industries also acceptable. All systems shall be provided with seam tape, and pipe boots.
 2. Install per the requirements of the manufacturers listed and ASTM E 1643-94.
 3. Ensure surface below vapor retarder is smooth, level and compacted, with no sharp projections. Join sections and seal penetrations with mastic tape. Ensure surfaces to receive the mastic tape are dry and clean. Repair holes in vapor retarder, with self-adhesive white sealant tape. Seal around piers, pipes, and other penetrations.
 4. At crawl space areas, extend vertically up the 4" foundation wall, terminate to the concrete with mastic tape, and nailed at 8" oc with plastic capped Simplex style nails, or washered tapcon fasteners.
- I. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.
- J. Welded Wire Fabric: ASTM A185.
- K. Structural Synthetic's Macro Fiber Reinforcement: topping slabs on hollowcore precast.
1. Complying with ASTM C 1116, minimum 2" length, aspect ratio 50 - 90; Minimum Re3 value of 34.8% at 5lbs./yd dosage according to ASTM C 1609, and minimum average residual strength of 170 psi at 3.7lbs/yd. dosage per ASTM C 1399. Minimum dosage rate of 4lbs. per cubic yard of concrete.
- L. Expansion Joint Filler: ASTM D1751.
- M. Sheet Materials for Curing Concrete: ASTM C171.
- N. Liquid Hardener and Dustproofer: Fluosilicate solution or magnesium fluosilicate or zinc fluosilicate. Magnesium and zinc may be used separately or in combination as recommended by manufacturer.
- O. Liquid Densifier/Sealer: 100 percent active colorless aqueous silicate solution.
- P. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied in accordance with manufacturer's recommendations. Grout shall show no settlement or vertical drying shrinkage at 3 days or thereafter

based on initial measurement made at time of placement, and produce a compressive strength of at least 18mpa (2500 psi) at 3 days and 35mpa (5000 psi) at 28 days.

- Q. Waterstops: (Corps of Engineers) COE CRD -C 513 rubber or CRD - 572 vinyl type Durajoint, type #4, 4" by W. R. Grace & Co. with Greenstreak, Vulco and Vinylex Corporation also acceptable. (See Drawings for locations.)
1. Provide Bentonite waterstop, such as Waterstop Rx by Voclay where practical.

2.3 CONCRETE MIXES:

- A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.
- B. Compressive strength at 28 days shall be not less than 3000 psi and 4000 psi, as indicated on Structural drawings.
- C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.
- D. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.
- E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength	Non-Air-Entrained		Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio
30 (4000) ^{1,3}	325 (550)	0.55	340 (570)	0.50
25 (3000) ^{1,3}	280 (470)	0.65	290 (490)	0.55

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c.
 2. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
 3. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.
- F. Air-entrainment is required for all exterior concrete and as required for Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS. Air content shall conform with the following table:

**TABLE I - TOTAL AIR CONTENT
FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)**

Nominal Maximum Size of Coarse Aggregate	Total Air Content Percentage by Volume
10 mm (3/8 in)	6 to 10
13 mm (1/2 in)	5 to 9
19 mm (3/4 in)	4 to 8
25 mm (1 in)	3 1/2 to 6 1/2
40 mm (1 1/2 in)	3 to 6

2.4 BATCHING & MIXING:

- A. Store, batch and mix materials as specified in ASTM C94.
1. Job-Mixed Concrete: not allowed.
 2. Ready-Mixed: Ready-mixed concrete comply with ASTM C94, except use of non-agitating equipment for transporting concrete to the site will not be permitted. With each load of concrete delivered to project, ready-mixed concrete producer shall furnish, in duplicate, certification as required by ASTM C94.
 3. Topping: Add quantity of fibermesh in accordance with manufacturer's recommendations.
- B. Water Cement Ratios: General ACI 301, Section 4.
1. Maximum for concrete exposed to freezing and thawing = .45.
 2. Maximum for all other conditions: Water-cement ratio shall be selected on the basis of strength and workability requirements, but minimum cement content should not be less than 470 lbs. per cubic yard.
 3. Note: Fly ash is not permitted in floor slab or topping concrete.

PART 3 - EXECUTION

3.1 FORMWORK:

- A. Installation conform to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
- B. Treating and Wetting: Treat or wet contact forms as follows:
1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.

2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with water just before placing concrete.
 3. Use sealer on reused plywood forms as specified for new material.
- C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.
- D. Construction Tolerances:
1. Contractor is responsible for setting and maintaining concrete formwork to assure erection of completed work within tolerances specified to accommodate installation or other rough and finish materials. Remedial work necessary for correcting excessive tolerances is the responsibility of the Contractor. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
 2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 REINFORCEMENT:

- A. Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 VAPOR BARRIER:

- A. Except where membrane waterproofing is required, place interior concrete slabs on a continuous vapor barrier.
- B. Place 100 mm (4 inches) of fine granular fill over the vapor barrier to at the crawl space areas.
- C. Lap joints 150 mm (6 inches) and seal with a compatible pressure-sensitive tape.
- D. Patch punctures and tears.

3.4 PLACING CONCRETE:

- A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of

forms, and from inside of mixing and conveying equipment. Obtain approval of COR before placing concrete. Provide screeds at required elevations for concrete slabs.

- B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
- C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.
- D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.
- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from COR.

3.5 PROTECTION AND CURING:

- A. Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by COR.

3.6 FORM REMOVAL:

- A. Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.7 SURFACE PREPARATION:

- A. Immediately after forms have been removed and work has been examined and approved by COR, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar

made with 1 part portland cement and 2 to 3 parts sand, fortified, with acrylic latex additive.

3.8 FINISHES:

A. Vertical and Overhead Surface Finishes:

1. Unfinished Areas: Vertical and overhead concrete surfaces exposed in unfinished areas, above suspended ceilings in manholes, and other unfinished areas exposed or concealed will not require additional finishing.
2. Interior and Exterior Exposed Areas (to be painted): Fins, burrs and similar projections on surface shall be knocked off flush by mechanical means approved by COR and rubbed lightly with a fine abrasive stone or hone. Use an ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.
3. Interior and Exterior Exposed Areas (finished): Finished areas, unless otherwise shown, shall be given a grout finish of uniform color and shall have a smooth finish treated as follows:
 - a. After concrete has hardened and laitance, fins and burrs have been removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone or stone.
 - b. Apply grout composed of 1 part portland cement and 1 part clean, fine sand (smaller than 600 micro-m (No. 30) sieve). Work grout into surface of concrete with cork floats or fiber brushes until all pits and honeycomb are filled.
 - c. After grout has hardened, but still plastic, remove surplus grout with a sponge rubber float and by rubbing with clean burlap.
 - d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish for any area in same day. Confine limits of finished areas to natural breaks in wall surface. Do not leave grout on concrete surface overnight.

B. Slab Finishes:

1. Float Finish: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of

same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.

2. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, and all monolithic concrete floor slabs exposed in finished work and for which no other finish is shown or specified shall be steel troweled. Final steel troweling to secure a smooth, dense surface shall be delayed as long as possible, generally when the surface can no longer be dented with finger. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure on trowel to compact cement paste and form a dense, smooth surface. Finished surface shall be free of trowel marks, uniform in texture and appearance.
3. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.
4. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade and Shored suspended slabs	Unshored suspended slabs
Specified overall value F _F 28/F _L 21	Specified overall value F _F 25
Minimum local value F _F 19/F _L 16	Minimum local value F _F 17

5. Section 01 45 29 TESTING AGENCY shall verify new slab or topping compliance.

3.9 SURFACE TREATMENTS:

- A. Surface treatments shall be mixed and applied in accordance with manufacturer's printed instructions.
- B. Liquid Densifier/Sealer: Use on all exposed concrete floors and concrete floors to receive carpeting.
- C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of all concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Aggregate shall be broadcast uniformly over concrete surface. Trowel concrete surface to smooth dense finish. After curing, rub the treated surface with abrasive brick and water sufficiently to slightly expose abrasive aggregate.

3.10 APPLIED TOPPING:

- A. Separate concrete topping with thickness and strength shown with only enough water to insure a stiff, workable, plastic mix.
- B. Continuously place applied topping until entire section is complete, struck off with straightedge, compact by rolling or tamping, float and steel trowel to a hard smooth finish.
- C. Porous backfill shall be placed as shown.

3.11 PRECAST CONCRETE ITEMS: (SPLASH BLOCKS)

- A. Precast concrete items, not specified elsewhere, shall be cast using 35 MPa (4000 psi-minimum) air-entrained concrete to shapes and dimensions shown. Finish surfaces to match corresponding adjacent concrete surfaces. Reinforce with steel as necessary for safe handling and erection.

- - - E N D - - -

SECTION 03 41 33
PRECAST STRUCTURAL PRETENSIONED CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies precast prestressed concrete construction including design not shown, fabrication, erection, and other related items including bearing pads and anchorage.
- B. Precast prestressed concrete includes hollow-core slabs.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Topping Concrete: Section 03 30 53, CAST-IN-PLACE CONCRETE.
- C. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
- D. Architectural Precast Concrete Panels: Section 03 45 00, PRECAST ARCHITECTURAL CONCRETE.
- E. Repair of abraded galvanized and painted surfaces: Section 09 91 00, PAINTING.

1.3 QUALITY ASSURANCE:

- A. Manufacturer Qualifications: Precast concrete manufacturing plant shall be certified by Prestressed Concrete Institute, Plant Certification Program, prior to start of production.
- B. Precast concrete work shall be performed by firms that have demonstrated capability, subject to approval, to produce and erect type of work specified.
- C. Precast concrete manufacturer shall have on staff or shall retain a qualified registered Professional Structural Engineer to certify precast concrete conforms in all aspects to requirements of ACI 318.
- D. Erector Qualifications: Regularly engaged for at least 5 years in erection of precast structural concrete similar to requirements of this project.
- E. Requirements of Regulatory Agencies: Local codes plus applicable specifications, standards and codes are a part of these specifications.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
- B. Shop Drawings:
 - 1. Erection Drawings:
 - a. Plans and/or elevations locating and defining material furnished by manufacturer.

- b. Sections and details showing connections, cast-in items and their relation to structure.
 - c. Description of all loose, cast-in and field hardware.
 - d. Field installed anchor location drawings.
 - e. Erection sequences and handling requirements.
 - f. Dead, live and other applicable loads used in design.
2. Production drawings:
- a. Elevation view of each member.
 - b. Sections and details to indicate quantities and position of reinforcing steel, anchors, inserts, and essential embedded hardware.
 - c. Lifting and erection inserts.
 - d. Dimensions and finishes.
 - e. Prestress for strand and concrete strengths.
 - f. Estimated cambers.
 - g. Method of transportation.
- C. Product Design Criteria:
1. Loadings for design:
- a. Initial handling and erection stresses.
 - b. Dead and live loads as specified on contract drawings.
 - c. Other loads specified for member where they are applicable.
 - d. Deflection of precast members shall be limited as follows:
 - 1) Vertical Live Load - $\text{Span}/360$
 - 2) Wind Load - $0.0025 \times \text{Floor to Floor Height}$
 - e. Design shall provide for thermal movements of completed structure.
2. Design calculations of products shall be performed by a registered Professional Engineer experienced in precast prestressed concrete design.
3. Design shall be in accordance with applicable codes, ACI 318 and the PCI Design Handbook.
4. Details for waterproof joints between precast members.
- D. Mix Designs: Submit proposed concrete mix designs and appropriate test data as specified in Part 2 of this section.
- E. Permissible Design Deviations:
- 1. Design connections according to the conceptual details shown in the contract documents.
 - 2. Design deviations will be permitted only after Contracting Officer Representative (COR)'s written approval of manufacturer's proposed design supported by complete design calculations and drawings.

3. Design deviations shall provide an installation equivalent to basic intent without incurring additional cost to the Government.

F. Test Reports: Concrete and other material.

G. Include all required LEED Forms as listed/referenced in Division 1.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Delivery and Handling:

- 1. Lift and support precast concrete members during manufacturing, stockpiling, transporting and erection operations only at lifting or supporting points, or both, as shown on contract and shop drawings, and with approved lifting devices. Lifting devices shall have a minimum safety factor of 4. Exterior lifting hardware shall have a minimum safety factor of 5.
- 2. Transportation, site handling, and erection shall be performed with acceptable equipment and methods, and by qualified personnel.

B. Storage:

- 1. Store all units off ground.
- 2. Place stored units so that identification marks are discernible.
- 3. Separate stacked members by battens across full width of each bearing point.
- 4. Stack so that lifting devices are accessible and undamaged.
- 5. Do not use upper members of stacked tier as storage area for shorter member or heavy equipment.

1.6 APPLICABLE PUBLICATIONS:

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

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

- A36/A36M-08.....Standard Specifications for Carbon Structural Steel
- A82-07.....Standard Specifications for Steel Wire, Plain, for Concrete Reinforcement
- A123/A123M-09.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A153/A153M-09.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A185-07.....Standard Specifications for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
- A307-10.....Standard Specifications for Carbon Steel Bolts and Studs

- A325-10.....Standard Specifications for Structural Bolts,
Steel, Heat Treated
- A416/A416M-10.....Standard Specifications for Steel Strand,
Uncoated Seven-Wire for Prestressed Concrete
- A615/A615M-09.....Standard Specifications for Deformed and Plain
Billet-Steel Bars for Concrete Reinforcement
- A767/A767M-09.....Standard Specifications for Zinc-Coated
(Galvanized) Steel Bars for Concrete
Reinforcement
- A775/A775M-03 (R2008)....Standard Specifications for Epoxy-Coated
Reinforcing Steel Bars
- C33-03.....Standard Specifications for Concrete Aggregates
- C88-05.....Standard Test Method for Soundness of Aggregates
by Use of Sodium Sulfate or Magnesium Sulfate
- C150-07.....Standard Specifications for Portland Cement
- C260-10.....Standard Specifications for Air-Entraining
Admixtures for Concrete
- C330-05.....Standard Specifications for Lightweight
Aggregates for Structural Concrete
- C494/C494M-10.....Standard Specification for Chemical Admixtures
for Concrete
- C. American Concrete Institute (ACI):
- 117-10.....Standard Specifications for Tolerances for
Concrete Construction and Materials
- 318-08.....Building Code Requirements for Structural
Concrete and Commentary
- D. Prestressed Concrete Institute (PCI):
- MNL-116-99.....Manual for Quality Control for Plants and
Production of Precast Concrete Products Fourth
Edition
- MNL-127-99.....Erector's Manual: Standards and Guidelines for
the Erection of Precast Concrete Products
- E. American Welding Society (AWS):
- D1.1/D1.1M-10.....Structural Welding Code - Steel
- D1.4-11.....Structural Welding Code - Reinforcing Steel
- 1.7 ENVIRONMENTAL CONDITIONS:**
- A. Cold Weather Requirements- Grouting Joints:
1. Cold weather conditions exist when temperature is 40 degrees F. or below.

2. Following general rules may be modified as approved by Architect to suit Project conditions.

AIR TEMP.

<u>(Degrees F.)</u>	<u>CONSTRUCTION REQUIREMENTS</u>
40 - 42	Heat mixing water or sand to product grout temperature between 40 degrees F. and 120 degrees F.
32 - 35	Heat mixing water and sand to produce grout temperature between 40 degrees F. and 120 degrees F.
25 - 15	Heat mixing water and sand to product grout temperature between 40 degrees F. and 120 degrees F. Utilize heat blankets and sources of heat on undersides of plank under construction.
15 and below	Heat mixing water and sand to produce mortar temperature between 40 degrees F. and 120 degrees F. Provide enclosure and auxiliary heat to maintain air temperature above 32 degrees F.

MEAN DAILY AIR

<u>TEMP. (Degrees F.)</u>	<u>PROTECTION REQUIREMENTS</u>
40 - 32	Protect from rain or snow for 24 hours.
32 - 25	Completely cover grouted joints for 24 hours.
25 - 15	Completely cover planks with insulating blankets or approved equal protection for 24 hours. Supplemental heat at underside is required.
15 and below	Maintain plank temperature above 32 degrees F. for 24 hours by enclosure and approved supplementary heat.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Portland Cement: ASTM C150, Type I or III.
- B. Aggregates: ASTM C33, Coarse and Fine.
- C. Air-entraining Admixture: ASTM C260.
- D. Chemical Admixtures: ASTM C494.
- E. Mixing Water: Fresh, clean, and potable.
- F. Reinforcing Steel: ASTM A615M, Grade 400 MPa (ASTM A615, Grade 60), deformed.
- G. Weldable Reinforcing Steel: ASTM A706M, Grade 400 MPa (ASTM A706 Grade 60).
- H. Anchor Bolts: ASTM A307, low-carbon steel bolts, regular hexagon nuts and carbon steel washers, galvanized.

- I. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon bolts, and hardened washers complying with ASTM A325, galvanized.
- J. Welded Wire Fabric: ASTM A185.
- K. Wire Reinforcement: ASTM A82.
- L. Prestressing Steel: ASTM A416, Grade 250K or 270K, uncoated, 7-wire, stress-relieved strand.
- M. Anchors and Inserts: ASTM A36 structural steel plates and shapes, ASTM A153 or ASTM A123 hot dipped galvanized finish.
- N. Keyway Grout:
 - 1. Sand-Cement Grout: Portland cement, ASTM C 150, Type 10 (hydraulic/hi-early) and clean, natural sand, ASTM C 144, or ASTM C 404. Mix at ratio of 1 part cement to 2 ½ to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content of grout less than 0.06 percent chloride ion by weight of cement when tested in accordance with ASTM C 1218/C 1218M. 3000 psi minimum at 7 days.
- O. Bearing Pads:
 - 1. Hardboard: AHA A135.4, Class 1, tempered hardboard strips, (Masonite or korolath) smooth on both sides, as recommended by precaster.
 - 2. Moving: Provide PTFE or elastomeric bearing pads as recommended by the Precast manufacturer.
- P. Caulking and Sealants: Specified under Section 07 92 00, JOINT SEALANTS.
- Q. Accessories: Provide clips, hangers, and other accessories required for installation of project units and for support of subsequent construction or finishes.
- R. Insulation: Provide 75mm (3") thick insulation plug at each cell end of hollow core at exterior wall conditions. Expanded polystyrene to meet ASTM-C578, Class A, Type 1, EPS insulation. Factory or field install.
- S. Concrete infill: Hardpack infill with 4000 psi concrete.
- T. Steel Headers: ASTM A36 Structural steel angles, and headers as manufactured by Precaster, and as indicated on structural drawings.

2.2 CONCRETE MIXES:

- A. Normal-Weight Concrete:
 - 1. Compressive Strength: 35 MPa (6000 psi) minimum at 28 days.
 - 2. Release Strength: 25 MPa (4500 psi) minimum at transfer of prestress.
- B. Do not use calcium chloride, chloride ions or other salts.

2.3 FABRICATION:

- A. Fabrication Procedures: PCI MNL-116.

- B. Fabrication Tolerances: PC MNL-116 and ACI 117 for reinforcing steel placement.
- C. Finishes:
1. Standard Underside: Resulting from casting against approved forms using good industry practice in cleaning of forms, design of concrete mix, placing and curing. Small surface holes caused by air bubbles, normal color variations, normal form joint marks, and minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or other defects will be permitted.
 2. Standard Top: Result of vibrating screed and additional hand finishing at projections. Normal color variations, minor indentations, minor chips and spalls will be permitted. No major imperfections, honeycomb, or defects will be permitted.
 3. Exposed Vertical Ends: Strands shall be recessed and the ends of member will receive sacked finish.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing, complying with CRSI recommendations. For exposed-to-view concrete surfaces, shear legs of supports are in contact with forms, provide supports with legs that are plastic protected or stainless steel protected.
- E. Openings: Primarily on thin sections, factory fabricate those openings 250 mm (10 inches) round or square or larger as shown on drawings. Locate and field drill or cut other openings where no contact is made with prestressing or reinforcing steel after precast prestressed products have been erected. Opening shall be approved by Contracting Officer Representative (COR) before drilling or cutting.
- F. Patching: Patching will be acceptable providing structural adequacy of product and appearance are not impaired.
- G. Defective Work: Precast concrete units which do not conform to specified requirements, including strength, tolerances, and finishes, shall be removed and replaced with precast concrete units that meet the requirements of this section. Contractor is also responsible for cost of corrections to other work affected by or resulting from corrections to precast concrete work.
- H. Fasteners: Cast in galvanized hardware such structural inserts, bolts and plates as required by drawings.

PART 3 - EXECUTION**3.1 ERECTION:**

- A. Site Access: Provide suitable access to building, proper drainage, and firm, level bearing for hauling and erection equipment to operate under their own power.
- B. Preparation:
 - 1. Provide true, level surfaces on field placed bearing walls and other field placed supporting members.
 - 2. Place and accurately align anchor bolts, plates or dowels in column footings, grade beams and other field placed support members.
 - 3. Shoring required for composite beams and slab shall have a minimum load factor of 1.5 times (dead load plus construction loads).
- C. Installation: Installation of precast prestressed concrete shall be performed by the fabricator's erection crew in accordance with PCI MNL-127. Lift members with suitable lifting devices at points provided by manufacturer. Temporary shoring and bracing, when necessary, shall comply with manufacturer's recommendations.
- D. Alignment: Align and level precast members as required by the approved shop drawings. Level out variations between adjacent members by jacking, loading, or any other feasible method as recommended by the manufacturer and acceptable to Contracting Officer Representative (COR). Individual pieces are considered plumb, level, and aligned if the error does not exceed 1:500 excluding structural deformation caused by loads.

3.2 FIELD WELDING:

- A. Field welding is to be done by qualified welders using equipment and materials compatible to base material in accordance with AWS D1.1 and AWS D1.4.
- B. Field coat with galvanized paint specified under Section 09 91 00, PAINTING all welded connections.

3.3 ATTACHMENTS:

- A. Do not use powder-actuated or air-driven fasteners or drill the precast units for surface attachment of accessory items unless otherwise accepted by the precast manufacturer.

3.4 GROUTING:

- A. Grouting of all hollow core slab joints with cement grout. All keyways shall be grouted full. Anchorages of structural steel supports and misc. metal items must be fully grouted during erection process.
- B. Perform grouting in an orderly manner as erection progresses in order that full capacity of connection and bearing can be developed at earliest possible time.

- C. After grouting the joints, any material that may have seeped through to the ceiling below must be removed before it hardens. In all areas where the hollow core slabs serve as the ceiling, all underside joints must be tooled to a smooth concave groove. Clean grout spillage that occurs during this operation.
- D. Provide forms and other acceptable methods to retain grout in place. Pack spaces solid with stiff grout materials, tamping until voids are completely filled. Place grout to finish smooth, plumb, and level with adjacent surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove from exposed surfaces.

3.5 INSPECTION AND ACCEPTANCE:

- A. Final inspection and acceptance of erected precast prestressed concrete shall be made by Contracting Officer Representative (COR) to verify conformance with drawings and specifications.

3.6 COORDINATION WITH TRADES AFTER ERECTION:

- A. The precast erector shall provide information to trades on the job through the Engineer on acceptable methods of attaching to underside of precast plank.
 - 1. Openings smaller than 10" by other trades and placement of anchorage devices shall be made only after in-field training of the contractor by the precast erector. Means and methods of cutting and anchoring shall be reviewed prior to precast erector leaving the site.
- B. All other contractors shall insure that their attachment devices do not shoot or drill into portions of precast panels in which prestressed steel is located. Inform the engineer immediately if this occurs.

- - - E N D - - -

SECTION 03 45 00
PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes the performance criteria, materials, production, and erection of architectural precast concrete cladding units. The work performed under this section includes all labor, material, equipment, related services, and supervision required for the manufacture and erection of the architectural precast concrete work shown on the contract drawings. The salvaging and reinstallation of existing architectural precast items (indicated) is provided by this Section also.

1.2 RELATED WORK

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete: Section 03 30 53, CAST-IN-PLACE CONCRETE.
- C. Precast pre-stressed structural building elements: Section 03 41 33, PRECAST STRUCTURAL PRETENSIONED CONCRETE.
- D. Mortar: Section 04 05 13, MASONRY MORTAR; Masonry Facing: Section 04 20 00, UNIT MASONRY.
- E. Cavity Wall Insulation: Section 04 20 00, UNIT MASONRY.
- F. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
- G. Repair of abraded galvanized and painted surfaces: Section 09 91 00, PAINTING.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm that complies with PCI MNL 117 and the following requirements and is experienced in producing units similar to those indicated for this Project and with a record of successful in-service performance:
 - 1. Assumes responsibility for engineering units to comply with performance requirements. A Comprehensive Engineering Analysis shall be performed by a qualified professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
 - 2. Participates in PCI's Plant Certification program at the time of bidding and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

3. Has sufficient production capacity to produce required units without delaying the work.
4. ACCEPTABLE MANUFACTURERS:
 - a. American Artstone, New Ulm, Minnesota
 - b. Gage Brothers precast, Sioux Falls, South Dakota
 - c. Amcon Precast, St. Cloud, MN
 - d. Bremix Precast units, St. Joseph, MN
 - e. Pacific Stone/Thunderstone LLC, Lincoln, NE
 - f. Molin Concrete Products and Concrete Inc.
 - g. Stoneworks, Elk River, MN.
- B. Erector Qualifications:
 1. A precast concrete erector Qualified by the Precast/Prestressed Concrete Institute (PCI) prior to beginning work at the project site. Submit a current Certificate of Compliance furnished by PCI designating qualification in Category A (Architectural Systems) for non-load-bearing members.
 2. An erector with a minimum of 8 years of experience who has completed architectural precast concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117.
- D. Sample Panels: After sample approval and before fabricating units, produce a minimum of two sample panels approximately 1.5 sq. m. (16 sq. ft.) in size for review by Contracting Officer Representative (COR) . Incorporate full scale details of architectural features, finishes, textures, and transitions in the sample panels. Approved sample panel may be used for mockup and range sample.
 1. Locate panels where indicated or, if not indicated, as directed by Contracting Officer Representative (COR) .
 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 3. After acceptance of repair technique, maintain one sample panel at the manufacturer's plant and one at the project site in an undisturbed condition as a standard for judging the completed work.

4. When back face of precast concrete unit is to be exposed, show samples of the workmanship, color, and texture of the backup concrete as well as the facing.
 5. Demolish and remove sample panels only when directed.
- E. Range Samples: After sample panel approval and before production of units, produce a minimum of three samples, approximately 1.5 sq. m. (16 sq. ft.) in size, representing anticipated range of color and texture on project's units. Following range sample acceptance by the Contracting Officer (COR), maintain samples at the manufacturer's plant as color and texture acceptability reference.

1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide units and connections capable of withstanding: the design criteria specified on the drawings, self weights and weights of materials supported or attached, for the conditions indicated.
1. Design Standards: Comply with ACI 318 (ACI 318M) and the design recommendations of PCI MNL 120, applicable to types of units indicated.
 2. Limit deflection of precast members as follows:
 - Vertical live load - $\text{Span} / 360$.
 - Wind load - Floor to floor height times 0.0025.
 3. Design for handling, transportation and erection stresses.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Retain quality control records and certificates of compliance for 5 years or period of warranty, whichever is greater.
- B. Design Mixes: For each concrete mix along with compressive strength and water-absorption tests.
- C. Shop (Erection) Drawings: Detail fabrication and installation of units.
1. Indicate member locations with distinctive marks that match marks placed on the panels. Provide plans, elevations, dimensions, corner details, shapes, cross sections and relationships to adjacent materials.
 2. Indicate aesthetic intent including joints, reveals, and extent and location of each surface finish.
 3. Indicate separate face and backup mix locations, and thicknesses. Indicate locations, extent and treatment of dry joints if two-stage casting is proposed.

4. Indicate welded connections by AWS standard symbols. Detail loose and cast-in hardware, and connections.
 5. Indicate locations, tolerances and details of anchorage devices to be embedded in or attached to structure or other construction.
 6. Indicate sequence of erection.
 7. Indicate locations and details of facing materials, anchors, and joint widths.
- D. Comprehensive Engineering Analysis: Provide calculations by the qualified professional engineer responsible for the product design. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate design criteria and loads. Indicate the location, type, magnitude and direction of all imposed loadings from the precast system to the building structural frame.
- E. Samples: Design reference samples for initial verification of design intent, approximately 300 by 300 by 50 mm (12 by 12 by 2 inches), representative of finishes, color, and textures of exposed surfaces of units.
- F. Samples for each facing unit required, showing the full range of color and texture expected. Supply sketch of each corner or special shape with dimensions. Supply sample showing color and texture of joint treatment.
- G. Welding Certificates: Copies of certificates for welding procedure specifications (WPS) and personnel.
- H. Qualification Data for fabricator and professional engineer: List of completed projects with project names and addresses, names and addresses of Contracting Officer Representative (COR) s and owners, and other information specified.
- I. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
1. Concrete strengths and mix designs.
- J. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements.
1. Concrete materials.
 2. Reinforcing materials and prestressing tendons.
 3. Admixtures.
 4. Bearing pads.
 5. Structural-steel shapes and hollow structural sections.
 6. Anchors.
- K. Include all required LEED Forms as listed/referenced in Division 1.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Product handling requirements of PCI MNL 117 shall be followed at the plant and project site.
- B. Deliver all units to the project site in such quantities and at such times to assure compliance with the agreed project schedule and proper setting sequence so as to limit unloading units temporarily on the ground.
- C. Lift and support units only at designated points shown on the Shop Drawings.
- D. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

1.7 WARRANTY

- A. Warranty of precast concrete work, including anchorage, joint treatment and related components to be free from defects in materials and workmanship, including cracking and spalling.
- B. After erection, completed work will be weathertight, subject to terms of Article "Warranty of Construction" FAR clause 52.246-21, except warranty period is extended to five years.

1.8 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A82-07.....Steel Wire, Plain, for Concrete Reinforcement
 - A108-07.....Steel Bar, Carbon and Alloy, Cold-Finished
 - A123/A123M-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - A153/A153M-09.....Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - A184/A184M-06.....Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
 - A276-10.....Stainless Steel Bars and Shapes
 - A490/A490M-10.....Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
 - A496-07.....Steel Wire, Deformed, for Concrete Reinforcement

- 563/A563M-07.....Carbon and Alloy Steel Nuts
- A615/A615M-09.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- A675/A675M-03 (R2009) .Steel Bars, Carbon, Hot-Wrought, Special Quality, Mechanical Properties
- A706/A706M-09.....Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
- A767/A767M-09.....Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- A775/A775M-07.....Epoxy-Coated Steel Reinforcing Bars
- A780-09.....Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- A884/A884M-06.....Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement
- A934/A934M-07.....Epoxy-Coated Prefabricated Steel Reinforcing Bars
- B227-10.....Hard-Drawn Copper-Clad Steel Wire
- B633-07.....Electrodeposited Coatings of Zinc on Iron and Steel
- C33-11.....Concrete Aggregates
- C40-04.....Organic Impurities in Fine Aggregate for Concrete
- C150-09.....Portland Cement
- C260-10.....Air-Entraining Admixtures for Concrete
- C494/C494M-10.....Chemical Admixtures for Concrete
- C881/C881M-10.....for Epoxy-Resin-Base Bonding Systems for Concrete
- C979-10.....Pigments for Integrally Colored Concrete
- C1107-08.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- C1240-10.....Silica Fume Used in Cementitious Mixtures
- D412-06.....Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- D2240-05 (R2010).....Test Method for Rubber Property—Durometer Hardness
- F436/F436M-10.....Hardened Steel Washers
- F593-02 (R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F844-07.....Washers, Steel, Plain (Flat), Unhardened for General Use
- C. American Concrete Institute (ACI):
- ACI 211.1-91 (R2009) ..Selecting Proportions for Normal, Heavyweight and Mass Concrete (Reapproved 2002)
- ACI 318-11.....Building Code Requirements for Structural Concrete
- D. American Association of State Highway and Transportation Officials

- AASHTO LFRD-2010.....LRFD Bridge Design Specifications, U.S., 3rd
Edition
- AASHTO M251-06.....Elastomeric Bearings
- E. Precast/Prestressed Concrete Institute (PCI):
- MNL-117-96.....Quality Control for Plants and Production of
Architectural Precast Concrete Products
- MNL-120-04.....Design Handbook - Precast and Prestressed Concrete
- MNL-124-08.....Design for Fire Resistance of Precast Prestressed
Concrete
- MNL-127-99.....Erector's Manual - Standards and Guidelines for
the Erection of Precast Concrete Products
- MNL-135-00.....Tolerance Manual for Precast and Prestressed
Concrete Construction
- TR-6-03.....Interim Guidelines for the Use of Self-
Consolidating Concrete
- F. Military Specifications (MIL. Spec):
- MIL-C882E-89.....Cloth, Duck, Cotton or Cotton-Polyester Blend
Synthetic Rubber, Impregnated, and Laminated, Oil
Resistant

PART 2 - PRODUCTS

2.1 MOLD MATERIALS

- A. Molds: Rigid, dimensionally stable, nonabsorptive material, warp and buckle free, that will provide continuous and true precast concrete surfaces within fabrication tolerances indicated; non-reactive with concrete and suitable for producing required finishes:
1. Mold-Release Agent: Commercially produced liquid-release agent that will not bond with, stain or adversely affect precast concrete surfaces and will not impair subsequent surface or joint treatments of precast concrete.

2.2 REINFORCING MATERIALS

- A. Reinforcing Steel: Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending. or
1. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.
- B. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I or III.
 - 1. For surfaces exposed to view in finished structure, use white, same type, brand, and mill source throughout the precast concrete production.
 - 2. Standard gray Portland cement may be used for non-exposed backup concrete.
- B. Supplementary Cementitious Materials for unexposed surfaces (backup concrete) only.
 - 1. Fly Ash Admixture: ASTM C618, Class C or F with maximum loss on ignition of 3 percent.
- C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C33, with coarse aggregates complying with Class 5S. Provide and stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for entire project.
 - 1. Face-Mix Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
 - a. Gradation: Uniformly graded To match design reference sample.
 - b. Hard durable quartz granite aggregate carefully graded from coarse to fine in proportions required to match approved samples.
 - 2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Contracting Officer Representative (COR) .
 - a. Test sand for color value in accordance with ASTM C40. Sand producing darker than specified color standard is unacceptable.
 - b. Aggregate used shall produce finished product matching existing.
- D. Unexposed Surface (Backup) Concrete Aggregates: ASTM C33.
- E. Admixtures: Admixtures containing calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture are not permitted.
 - 1. Coloring Admixture: ASTM C979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable and non-fading.
 - 2. Air Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
 - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 4. Retarding Admixture: ASTM C494/C494M, Type B.
 - 5. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.

6. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 7. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 8. Plasticizing Admixture for Flowable Concrete: ASTM C1017/C1017M.
- F. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.4 STEEL CONNECTION MATERIALS

- A. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706/A706M.
- B. Finish: For exterior steel items and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A123/A123M, after fabrication, or ASTM A153/A153M, as applicable
 1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with SSPC-Paint 20.

2.5 STAINLESS-STEEL CONNECTION MATERIALS

- A. Stainless-Steel Dowels: ASTM A666, Type 304, of grade suitable for application.

2.6 BEARING PADS AND OTHER ACCESSORIES

- A. Provide bearing pads for units as follows:
 1. Elastomeric Pads: AASHTO M251, plain, vulcanized, 100 percent polychloroprene (neoprene) elastomer, molded to size or cut from a molded sheet, 50 to 70 Shore A durometer according to ASTM D2240, minimum tensile strength 15.5 MPa (2250 psi) per ASTM D412.
 2. Random-Oriented, Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Surface hardness of 70 to 90 Shore A durometer according to ASTM D2240. Capable of supporting a compressive stress of 20.7 MPa (3000 psi) with no cracking, splitting or delaminating in the internal portions of the pad. Test one specimen for each 200 pads used in the project.
 3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer. Surface hardness of 80 to 100 Shore A durometer according to ASTM D2240. Conforming to Division II, Section 18.10.2 of AASHTO LFRD, or MIL-C-882E.
 4. Frictionless Pads: Tetrafluoroethylene (teflon), glass-fiber reinforced, bonded to stainless or mild-steel plates, of type required for in-service stress.

- B. Reglets: Stainless steel, ASTM A167, Type 302 felt or fiber filled or cover face opening of slots.
- C. Vents and Weeps: Polyvinyl chloride plastic tubing, 9.5 mm (3/8-inch) inside diameter.
- D. Accessories: Provide clips, hangers, plastic or steel shims, and other accessories required to install units.

2.7 GROUT MATERIALS

- A. Sand-Cement Grout: Portland Cement, ASTM C150, Type I, and clean, natural sand, ASTM C144, or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, Grade A for drypack and Grades B and C for flowable grout and of a consistency suitable for application within a 30-minute working time.
- C. Epoxy-resin grout: Two-component mineral-filled epoxy-resin: ASTM C881 of type, grade, and class to suit requirements.

2.8 FACING UNITS AND ACCESSORIES

- A. Refer to the related specification for facing units and facing accessories.
- B. Epoxy Anchor Hole Filler: ASTM C881, 100 percent solids, sand-filled non-shrinking, non-staining of type, class, and grade to suit application.

2.9 CONCRETE MIXES

- A. Prepare design mixes to match Contracting Officer Representative (COR) 's sample for each type of concrete required.
 - 1. Limit use of fly ash and granulated blast-furnace slag to 20 percent replacement of Portland cement by weight
- B. Design mixes shall be prepared by a qualified independent testing agency or by qualified precast plant personnel at fabricator's option.
- C. Limit water-soluble chloride ions to the maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested in accordance with ASTM C1218/C1218M.
- D. Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 34.5 MPa (5000 psi).

- 2. Maximum Water-Cementitious Materials Ratio: 0.45.
- 3. Release Strength at Transfer of Prestress: 24.1 MPa (3500 psi).
- E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
- G. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

2.10 MOLD FABRICATION

- A. Molds: Accurately construct and maintain molds, mortar tight, within fabrication tolerances and of sufficient strength to withstand pressures due to concrete-placement and vibration operations and temperature changes and for prestressing and detensioning operations.
 - 1. Form joints are not permitted on faces exposed to view in the finished work.
 - 2. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

2.11 FABRICATION

- A. Cast-in Anchors, Inserts, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

Weld headed studs and deformed bar anchors used for anchorage.
- B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing units to supporting and adjacent construction.
- C. Cast-in reglets, slots, holes, and other accessories in units as indicated.
- D. Cast-in openings larger than 250 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of Contracting Officer (COR) .
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.

1. Place reinforcing steel minimum concrete cover. of 38 mm (1-1/2 inches). Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
- F. Mix concrete according to PCI MNL 117 and requirements in this Section. After concrete batching, no additional water may be added.
 1. At the fabricator's option either of the following mix design/casting techniques may be used:
 - a. A single design mix throughout the entire thickness of panel.
 - b. Design mixes for facing and backup; using cement and aggregates for each type as indicated, for consecutive placement in the mold. Use cement and aggregate specified for facing mix, use cement and aggregate for backup mix complying with criteria specified as selected by the fabricator.
- G. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units. Comply with requirements in PCI MNL 117.
 1. Place backup concrete to ensure bond with face mix concrete.
 2. Place self-consolidating concrete without vibration in accordance with PCI TR-6.
- H. Identify pickup points of units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each unit on a surface that will not show in finished structure.
- I. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat
- J. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the Contracting Officer (COR) .

2.12 FABRICATION TOLERANCES

- A. Fabricate units straight and true to size and shape with exposed edges and corners precise and true so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.
- B. Fabricate architectural trim units such as sills, quoins, medallions, with tolerances meeting PCI MNL 135.

2.13 FINISHES

- A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight and sharp. Finish exposed-face surfaces of units to match existing architectural precast as follows:

1. Acid-Etched Finish: Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections and insulation from acid attack.
- B. Finish exposed top, bottom, end surfaces of units to match face-surface finish.
- C. Finish unexposed surfaces of units by float finish.

2.14 SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to Section 01 45 29, TESTING LABORATORY SERVICES and PCI MNL 117 requirements respectively. If using self-consolidating concrete also test and inspect according to PCI TR-6.
- B. Testing: If there is evidence that the concrete strength of precast concrete units may be deficient, Precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to PCI MNL 117:
 1. Test results will be made in writing on the same day that tests are performed, with copies to Contracting Officer Representative (COR) , Contractor, and precast concrete fabricator. Test reports will include the information required in Section TESTING LABORATORY SERVICES and the following:
 - a. Identification mark and type of precast concrete units represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- C. Defective or Damaged Work: Units that do not comply with acceptability requirements, including concrete strength, manufacturing tolerances, and color and texture range are unacceptable. Chipped, spalled or cored units may be repaired, if repaired units match the visual mock-up. The Contracting Officer Representative (COR) reserves the right to reject any unit if it does not match the accepted samples and visual mock-up. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Deliver anchorage devices that are embedded in or attached to the building structural frame or foundation before start of such work. Provide locations, setting diagrams, and templates for the proper installation of each anchorage device.
- B. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, true and level bearing surfaces, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Do not install units until supporting backup wall structure & surrounding face brick are ready to receive precast

3.2 ERECTION

- A. Erect level, plumb and square within the specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
 - 1. Install temporary steel or plastic spacing shims or bearing pads as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and use sand-cement grout to fill voids within recessed lifting devices flush with surface of adjacent precast concrete surfaces when recess is exposed.
 - 4. Unless otherwise shown provide for uniform joint widths of 3/8" to 1/2".
- B. Connect units in position by bolting, welding, grouting, or as otherwise indicated on approved Erection Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and/or grouting are completed.
- C. Stainless Steel Ties/Attachments: Upon approval of Contracting Officer Representative (COR) , precast pre-stressed products may be drilled or "shot" for fasteners Provided reinforcing or pre-stressing steel is not damaged or cut.
 - 1. Should spalling occur, repair according to this specification section.

- D. Venting and Weeps: Where precast concrete panels form the outer wythe of cavity wall construction, vent the cavity wall.
1. Use polyvinyl chloride plastic tubing to vent the cavity.
 2. Place plastic vent tubes "tilted down and out" in horizontal and vertical joints.
 3. Space vent tubes in accordance with shop drawings, but not less than two vents per panel or approximately 1220 mm (4 feet) on centers.
- E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13, MASONRY MORTARING
1. Clean surfaces forming beds and other joints for precast concrete panels of dust, dirt, and other foreign matter, and wet thoroughly to prevent suction before precast concrete, elements are set.
 2. Set precast element level and true to line with uniform joints filled completely with mortar.
Rake out joints 25 mm (1-inch) deep for pointing or sealants.
Joints required to have only sealant: Kept free of mortar for full depth.
 3. Keep exposed faces of precast concrete elements free of mortar.
 4. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.
 5. Where parging is shown, parge back of elements solid with mortar.
Apply parging without skips or holidays.
- F. Pointing: Wash and brush clean, leaving joints free from loose mortar, dust and other foreign material.
1. Carefully point with a slightly concave joint.
 2. Mortar for pointing as specified in Section 04 05 13, MASONRY MORTARING
- G. Sealing of Joints: Where shown and where required to make work watertight: clean, dry and seal joints between precast concrete elements and between precast elements and adjoining materials as specified in Section 07 92 00, JOINT SEALANTS.

3.3 ERECTION TOLERANCES

- A. Erect units level, plumb, square, true, and in alignment without exceeding the erection tolerances of PCI MNL 117, Appendix I.

3.4 REPAIRS

- A. Repairs will be permitted provided structural adequacy of units and appearance are not impaired.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent

line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 6 m (20 feet).

- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A780.
- D. Remove and replace damaged units when repairs do not meet requirements.

3.5 CLEANING

- A. Clean all surfaces of precast concrete to be exposed to view, as necessary, prior to shipping.
- B. Clean mortar, plaster, fireproofing, weld slag, and any other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

- - - E N D - - -

SECTION 04 05 13
MASONRY MORTAR

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies Portland-Lime mortar materials and mixes.

1.2 RELATED WORK

A. Mortar used in Section:

1. Section 03 45 00, ARCHITECTURAL PRECAST CONCRETE.
2. Section 04 20 00, UNIT MASONRY & GROUT.

1.3 TESTING LABORATORY-CONTRACTOR RETAINED

- A. Engage a commercial testing laboratory approved by Resident Engineer to perform tests specified below.
- B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Resident Engineer.

1.4 TESTS

- A. Test mortar and materials specified.
- B. Certified test reports.
- C. Identify materials by type, brand name and manufacturer or by origin.
- D. Do not use materials until laboratory test reports are approved by Resident Engineer.
- E. After tests have been made and materials approved, do not change without additional test and approval of Contracting Officer Representative (COR) .
- F. Testing:
 1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
 2. Mortar:
 - a. Test for compressive strength and water retention; ASTM C270.
 - b. Mortar compressive strengths 28 days as follows:
Type S: Minimum 12400 kPa (1800 psi) at 28 days.
Type N: Minimum 5170 kPa (750 psi) at 28 days.
 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.

4. Sand: Test for deleterious substances, organic impurities, soundness.

G. During progress of work, testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES, takes and tests samples as specified in that section.

1.5 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.

B. Certificates:

1. Indicating that following items meet specifications:

- a. Portland cement.
- b. Hydrated lime.
- c. Fine aggregate (sand).

C. Mortar mix:

1. Laboratory Test Reports:

- a. Mortar, each type.
- b. Admixtures.

2. Manufacturer's Literature and Data:

- a. Cement, each kind.
- b. Hydrated lime.
- c. Admixtures.

D. Include all required LEED Forms as listed/referenced in Division 1.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.

B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.

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

- C40-04.....Organic Impurities in Fine Aggregates for
Concrete
- C144-04.....Aggregate for Masonry Mortar
- C150-09.....Portland Cement
- C207-06.....Hydrated Lime for Masonry Purposes
- C270-10.....Mortar for Unit Masonry

C307-03 (R2008)	Tensile Strength of Chemical - Resistant Mortar, Grouts, and Monolithic Surfacing
C321-00 (R2005)	Bond Strength of Chemical-Resistant Mortars
C348-08	Flexural Strength of Hydraulic Cement Mortars
C780-10	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979-10	Pigments for Integrally Colored Concrete

PART 2 - PRODUCTS

2.1 HYDRATED LIME

- A. ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY MORTAR

- A. ASTM C144 and as follows:
 1. Light colored sand for mortar for laying face brick.
- B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

2.3 PORTLAND CEMENT

- A. ASTM C150, Type I.

2.4 LIQUID ACRYLIC RESIN

- A. A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.5 WATER

- A. Potable, free of substances that are detrimental to mortar, masonry,

2.6 COLOR ADMIXTURE

- A. Pigments: ASTM C979.
- B. Use mineral pigments only. Organic pigments are not acceptable.
- C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING

- A. Mix in a mechanically operated mortar mixer.
 1. Mix mortar for at least three minutes but not more than five minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.

- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.
- D. Mortar that has stiffened because of loss of water through evaporations:
 - 1. Re-tempered by adding water to restore to proper consistency and workability. Colored Mortar shall NOT be retempered.
 - 2. Discard mortar that has reached its initial set or has not been used within two hours.
- E. Pointing Mortar:
 - 1. Mix dry ingredients with enough water to produce a damp mixture of workable consistency which will retain its shape when formed into a ball.
 - 2. Allow mortar to stand in dampened condition for one to 1-1/2 hours.
 - 3. Add water to bring mortar to a workable consistency prior to application.

3.2 MORTAR USE LOCATION

- A. Use Type S mortar for CMU Masonry Backup walls, and interior CMU masonry containing vertical reinforcing bars
- B. For brick veneer over frame back up walls, use Type N portland cement-lime mortar or Type N masonry cement or mortar cement mortar.
- C. Use Type N mortar for other masonry work & where setting Architectural Precast, except as otherwise specified.

- - - E N D - - -

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies requirements for construction of masonry unit walls (cmu block and brick), masonry grout and masonry accessories.

1.2 RELATED WORK

- A. Mortars: Section 04 05 13, MASONRY MORTAR.
- B. Steel lintels and shelf angles: Section 05 50 00, METAL FABRICATIONS.
- C. Cavity insulation: Provided and installed by this Section 04 20 00 UNIT MASONRY.
- D. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.
- F. Architectural Precast items: Section 03 45 00.
- G. Air Barriers applied to exterior walls CMU Backup units:
Section 07 27 26, Fluid Applied Air Barriers.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Samples:
1. Face brick, sample panel, 200 mm by 400 mm (8 inches by 16 inches) showing full color range and texture of bricks, bond, and proposed mortar joints.
2. Concrete masonry units, when exposed in finish work.
3. Anchors, and ties, one each and joint reinforcing 1200 mm (48 inches) long.
- C. Shop Drawings:
1. Shop Drawings: Submit shop drawings for fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies as required for fabrication and placement of reinforcement for unit masonry work.
- D. Certificates:
1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
2. Indicating that the following items meet specification requirements:

- a. Face brick.
- b. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
- 3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.
- E. Manufacturer's Literature and Data:
 - 1. Anchors, ties, and reinforcement.
 - 2. Through Wall flashing, and accessories.
 - 3. Through Wall Flashing membrane, and adhesive, Termination bars.
 - 4. Cavity Wall Insulation
 - 5. Vapor Barrier Membrane.
- F. Laboratory Test Reports:
 - 1. Grout compressive strengths.

1.4 SAMPLE/MOCKUP PANEL

- A. Before starting masonry, lay up a sample panel in accordance with Masonry Standards Joint Committee (MSJC) and Brick Industry Association (BIA).
 - 1. Use masonry units from random cubes of units delivered on site.
 - 2. Include reinforcing, ties, and anchors.
- B. Use sample panels approved by COR for standard of workmanship of new masonry work.
- C. Use sample panel to test cleaning methods.
- D. Contractor shall provide a freestanding mock-up panel on a concrete foundation similar to the Project brick ledge detail. Window sill and head flashings shall also be required. The mock-up shall include waterproofing, damp proofing or vapor barrier materials, concrete block back-up, wall ties, vertical rebar, grouting, horizontal reinforcement, thru-wall flashing assemblies, weeps, insulation, and brick.
 - 1. The mock-up will be used to determine the workmanship standard for installation of all components and shall be constructed for review as a part of the Pre-Installation Meeting for masonry and thru-wall flashings. Mockup shall be constructed by field personnel used on this project.
- E. Size: minimum 6 ft. long x 6 ft. high.
- F. Note: Window opening shall be included in the mock-up to show through-wall flashing at the base of the wall, below the sill, and above the lintel, with end dams at each location. The window opening to be provided 24" x 24" and thru the exterior brick only, with no stone sill

below the window required, and no joint reinforcement at the exposed CMU area.

- G. After approved by Owner's Representative, use as standard for all Work.
- H. Removal: Do not move nor destroy panel until directed by Owner's Representative.

1.5 WARRANTY

- A. Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A951-06.....Steel Wire for Masonry Joint Reinforcement.
 - A615/A615M-09.....Deformed and Plain Billet-Steel Bars for
Concrete Reinforcement.
 - A675/A675M-03 (R2009)....Standard Specification for Steel Bars, Carbon,
Hot-Wrought, Special Quality, Mechanical
Properties C34-03 Structural Clay Load-Bearing
Wall Tile
 - C55-09.....Concrete Building Brick
 - C56-10.....Structural Clay Non-Load-Bearing Tile
 - C62-10.....Building Brick (Solid Masonry Units Made From
Clay or Shale)
 - C67-09.....Sampling and Testing Brick and Structural Clay
Tile
 - C90-11.....Load-Bearing Concrete Masonry Units
 - C216-10.....Facing Brick (Solid Masonry Units Made From
Clay or Shale)
 - C476-10.....Standard Specification for Grout for Masonry
 - C612-10.....Mineral Fiber Block and Board Thermal
Insulation
 - C744-11.....Prefaced Concrete and Calcium Silicate Masonry
Units
 - D1056-07.....Flexible Cellular Materials - Sponge or
Expanded Rubber
 - D2000-08.....Rubber Products in Automotive Applications

D2240-05 (R2010).....Rubber Property - Durometer Hardness
 D3574-08.....Flexible Cellular Materials-Slab, Bonded, and
 Molded Urethane Foams

F1667-11.....Fasteners: Nails, Spikes and Staples

C. Masonry Industry Council:

Hot and Cold Weather Masonry Construction Manual-98 (R2000).

D. American Welding Society (AWS):

D1.4-11 Structural Welding Code - Reinforcing Steel.

E. Federal Specifications (FS):

FF-S-107C-00.....Screws, Tapping and Drive

F. Brick Industry Association - Technical Notes on Brick Construction
 (BIA):

11-2001.....Guide Specifications for Brick Masonry, Part I

11A-1988.....Guide Specifications for Brick Masonry, Part II

11B-1988.....Guide Specifications for Brick Masonry, Part
 III Execution

11C-1998.....Guide Specification for Brick Masonry
 Engineered Brick Masonry, Part IV

11D-1988.....Guide Specifications for Brick Masonry
 Engineered Brick Masonry, Part IV continued

G. Masonry Standards Joint Committee; Specifications for Masonry

Structures TMS 602-08/ACI 530.1-08/ASCE 6-08 (2008 MSJC Book Version
 TMS-0402-08).

1.7 FIELD TESTING:

- A. Provide one field test of 3 prisms of each block size to be used. This test shall be made at the start of masonry construction and 1 additional test of 3 prisms of each block for each 5000 SF of wall constructed. The prisms shall be built on the job by the masons using the same materials and methods used for the construction of the building walls. After 6 days they shall be transported to the laboratory in a manner that will not disturb the mortar bond. Prisms will be tested at 28 days and shall reach 1500 psi based upon the net area of the block or brick.
- B. Each prism shall consist of 2 concrete blocks, 8 x 16 x wall width laid in stack bond using a 3/8" thick mortar bed on the face shells. Use specified mortar.
- C. Masonry Inspection by Testing Agency shall take place on site as follows:

1. When prisms are taken.
2. At the start of laying of units.
3. After the placement of reinforcing steel.
4. Inspection of grouting operations

1.8 PRECONSTRUCTION CONFERENCE:

- A. Present: General Contractor, Masonry Superintendent for the project, Masonry Office Project Manager, Owner and Owner's Representative, Material Suppliers, Owner's testing lab,
- B. Discuss: Expectations for cavity wall insulation, through-wall flashings, mortar droppings, reglet and sealant installation. Also discussed will be mortar and grout testing requirements, ordering of specified materials and sequencing of construction, etc.
- C. Schedule a minimum of 2 weeks prior to the masonry work.
 1. Preinstallation conference to occur on the same day as the preconstruction meeting.
 2. Occur on the same day as the mortar preinstallation meeting.
- D. Agenda: construction schedule and sequence, mockup construction, product delivery and storage, material compatibility, site restrictions, coordination of testing and observation, and other project specific topics.

PART 2 - PRODUCTS

2.1 BRICK

- A. Face Brick:
 1. ASTM C216, Grade SW, Type FBS.
 2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
 3. Size: Modular
 4. Type: Match existing in size, color, and texture, believed to be:
 - a. Och's Brick and Tile Co., Custom mix of Harvard modular Face Brick No. 8765; blend believed to be 20% of No. 80, 10% of No. 70, 30% of No. 60; and 40% of No. 50.

2.2 CONCRETE MASONRY UNITS

- A. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
 1. Unit Weight: Normal weight.
 2. Fire rated units for fire rated partitions.
 3. Sizes: Modular.

4. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.

B. Concrete Brick: ASTM C55.

2.3 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615M, deformed bars, grade as shown.

B. Joint Reinforcement:

1. Form from wire complying with ASTM A951.
2. Hot Dip Galvanized after fabrication, with 1.5 oz. coating, meeting ASTM A 153, class B2 requirements.
3. Width of joint reinforcement 40 mm (0.16 inches) less than nominal width of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement at least 3000 mm (10 feet) in length.
6. Joint reinforcement in rolls is not acceptable.
7. Joint reinforcement that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
9. Ladder Design:
 - a. Longitudinal wires deformed 9 gauge (.016") diameter wire.
 - b. Cross wires: 9 gauge (.016") diameter wire.
 - c. Hot dip galvanize ladder reinforcement after manufacture.
10. Cavity Wall Ties:
 - a. Longitudinal wires 9 gauge (4 mm =0.16 inch) with U shape 5 mm 3/16" rectangular ties extending into other wythe as required by insulation depth, and spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 5 mm (3/16 inch) pintle tie projecting into other wythe 75 mm (3 inches min.)
 - b. Hot dip galvanize after fabrication.
 - c. Hohmann & Barnhard "Cavity Ladder Eye-270 Series, is acceptable, with Wirebond & Heckman Industries products also acceptable .

C. Individual ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to a rectangular shape not less than 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not permitted.
2. Adjustable Cavity Wall Ties:

- a. Adjustable wall ties may be used at Contractor's option.
 - b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
 - c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
 - d. Form one piece to a rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into the bed joint 50 mm (2 inches).
 - e. Form the other piece to a 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having a 75 mm (3 inch) long bent section for engaging the 105 mm (4-1/8 inch) wide piece to form adjustable connection.
- D. Individual Wall Ties:
- 1. Mesh wall ties formed of ASTM A82, W0.5, 2 mm, (16 gage) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch) mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
 - 2. Rectangular wire wall ties formed of W1.4, 3 mm, (9 gage) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.
- E. New brick to existing CMU backup ties and individual ties where added at openings:
- 1. Hohmann and Barnard's HB-213MS series, with Mighty Lok Pintle (flattened and serrated), hot dip galvanized finish. Provide complete with stainless steel Tapcon anchors, 1/4" diameter, 2 per tie. Predrill as required.
 - 2. Ultimate capacity of stainless steel, Tapcon anchor in hollow block:
 - a. Pull Out: 754 lbs, with 1-1/4" depth of embedment.
 - b. Shear: 1218 lbs, shear, in hollow block, with 1 1/4" depth of embedment.
- F. Corrugated Wall Tie: (interior use only)
- 1. Form from 1.5 mm (0.0598 inch) thick corrugated, galvanized steel 30 mm (1-1/4 inches) wide by lengths so as to extend at least 100 mm (4 inches) into joints of new masonry plus 38 mm (1-1/2 inch) turn-up.
 - 2. Provide 5 mm (3/16 inch) hole in turn-up for fastener attachment.
- G. Hot dip Galvanize all ties after fabrication, with 1.5 oz. coating, meeting ASTM A 153, class B2.

2.4 REBAR REINFORCING:

- A. Reinforcing Steel for Cores, Lintels and Bond Beams: ACI 301, Chapter 5; Deformed billet steel bars conforming to ASTM A 615-76a Grade 60.
- B. Reinforcing Steel Connectors: lapping and tying rebar per ACI 301; H&B's Barloc rebar connectors are allowed. Dowels into existing masonry: Drill and anchor dowels with Duro-Pair epoxy resin anchoring system.

Provide wire mesh screens, sized to accept rebar dowels indicated.
Minimum embedment 8" unless indicated otherwise on drawings.

2.5 PREFORMED COMPRESSIBLE JOINT FILLER:

- A. Thickness and depth to fill the joint as specified.
- B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
- C. Non-Combustible Type: ASTM C612, Class 5, 1800 degrees F.

2.6 CLEANERS:

- A. Masonry Cleaner:
 - 1. Detergent type cleaner selected for each type masonry used.
 - 2. Acid cleaners are not acceptable.
 - 3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.

2.7 CONCRETE GROUT: (Cores, lintels and Bond Beam fill)

- A. Meeting the requirements of ASTM C 476; but with 2,800 psi at 28 days, 1/2-inch maximum aggregate at Course Grout with a slump in 6-8" range.
 - 1. Fine Grout shall meet 2000 psi at 28 days, and shall contain 3/16" natural or manufactured sand with maximum slump of 11. Coarse grout to be used in most instances, unless the grout space is 2" or narrower; in those instances use fine grout.
- B. Provide anti-shrinkage admixture equivalent to *Sika Grout Aid*, to minimize shrinkage of grout.
 - 1. Maximum grout height is 48" lift.
- C. Testing of grouts for consistency and compressive strengths to occur at beginning of project, mid-point and near end of project. Submit to Owner and Architect the results of testing.
 - 1. Consistency of masonry grout may be measured with a slump cone (ASTM C 143), and slumps of 8-12 shall be provided.

2.8 THROUGH-WALL FLASHING:

- A. York's 3 oz. Multiflash 500 series (gold); a copper fiberglass laminated (non-asphalt) thru-wall flashing is specified, with equivalent by Sandell and Advanced Copper Sealtite 2000 also approved.
- B. Sealant at laps and flashing terminations: Provide polyether type sealant, such as York's UniverSeal US-100 (Bondaflex STP 25, DuraLink by ChemLink, Sonolastic 150 by BASF) for joints in flashing and where it terminates at sheathing.
 - 1. Also: Set horizontal portion of all thru wall flashing in bed of sealant, minimum bead of 3/8" diameter, held back 1-1/2" from face of brick.

2.9 THROUGH-WALL ACCESSORIES:

- A. Cell vent: H&B's Quadro-Vent, grey in color, size to match head joints; Heckman's Cell vent No. 85; Equivalent by Durowall or Advanced. Provide at exterior walls at tops of walls above soffits and at bottoms of walls to provide venting of the cavity. Spaced 24" oc.
1. Rope weeps/wicks. Rope wick shall be manufactured by Durowall or equal. Provide cell vents at locations indicated, with rope wick placed at all other locations. Verify with Architect. Length of rope wicks shall be a minimum of 36"
- B. Air Space Matt: (designed to prevent mortar from dropping to bottom of cavity space) 1" thick Cav Clear Matt by Archovations, 888-436-2620. Provide in 16" tall x 8ft long sheets. **Installed full height of air space.** Advanced Building Products' Mortairvent CW systems, as well as Keene Building Products "Cav-Air-Ator systems also acceptable.
- C. Termination bars/Anchors: 1" x 1/8" aluminum or stainless steel termination bar by York; fastened 6" oc with Powers Fasteners, Zamac nail-in anchor, 2" long; Seal top of termination bar with York recommended sealant, such as polyether sealant previously specified.
(in 2.8b above)
- D. Stainless Steel Drip: Provide 304 ss., 24 ga. minimum with formed drip, at thruwall flashing locations indicated on drawings.

2.10 ACCESSORIES:

- A. Control Joints: Preformed rubber polyvinylchloride material; of size(s) and profiles.
- B. Joint Filler: Closed-cell polyvinylchloride or polyethylene oversized 50% self expanding.
- C. Partition Top Anchor:
1. Non-exposed areas (above ceilings, etc.): Hohmann & Barnard's PTA-422 anchor, 12 ga. mil galvanized finish; Heckman's 420 series equivalent; Durowall's DA410 series top of wall anchor; spaced at 48" centers along lengths of wall.
2. Exposed areas: H & B's PTA 420 series with PTA Tube; Heckman's 419/421 series; installed in head joints at 48" oc. Review installation with Architect. Install along walls a minimum of 48" centers.

2.11 WALL REGLETS:

- A. Coordinate with Section 07 60 00-Sheetmetal. When installing, all joints shall be lapped 3" and sealed with Single component butyl sealant equivalent

to Sikaflex 1 A or NP-1 by Sonneborne. Masons to remove the clear plastic protective cover from metal prior to installing.

2.12 CAVITY WALL INSULATION: (cavity and face of wall)

- A. Extruded cellular polystyrene, ASTM C 578, Type IV, Minimum R-value of 5.4 per inch of material at 40 degrees F. per ASTM C518; Certifoam SE by Diversifoam Products, Foamular 250 by Owen's Corning, Styrofoam SM by Dow Chemical, with equivalent by Pactiv also approved.
- B. Filler at Insulation Joints: (for filling joints in cavity wall insulation & attachment to backup walls) Polytech - PT series by FAI International is specified with Polycell by W.R. Grace; Touch-n-Seal *Instant Sealant*, by Convenience Products also approved. Use container size appropriate for project scope. 1.4 - 1.6 density foamed isocyanurate insulation meeting ASTM E-84 requirements, with flamespread 15 or less, and smoke density 60 or less. Provide the product in low expansion, or double expansion formula as required by job conditions.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Protection:
 - 1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
 - 2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final landscaping or other site work is completed.
- B. Cold Weather Protection:
 - 1. Masonry may be laid in freezing weather when methods of protection are utilized.
 - 2. Comply with MSJC and "Hot and Cold Weather Masonry Construction Manual".

3.2 DEMOLITION: (Coordinate with Division 2)

- A. Protection of Backup: During the course of this work the back-up walls will become exposed. Contractor shall temporarily protect exposed block to prevent the possibility of water damage during inclement weather. Provide poly or tarps, and all means acceptable to the Owner or Architect to protect this wall from deterioration.
- B. Remove demolished materials, tools and equipment from site upon completion of Work. Leave site in an acceptable condition.

3.3 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:
- B. Maximum variation from plumb:
 - 1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
 - 2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
 - 3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- C. Maximum variation from level:
 - 1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
 - 2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- D. Maximum variation from linear building lines:
 - 1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
 - 2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
 - 1. Minus 6 mm (1/4 inch).
 - 2. Plus 13 mm (1/2 inch).
- F. Maximum variation in prepared opening dimensions:
 - 1. Accurate to minus 0 mm (0 inch).
 - 2. Plus 6 mm (1/4 inch).

3.4 INSTALLATION GENERAL

- A. Keep finish work free from mortar smears or spatters, and leave neat and clean.
- B. Anchor masonry as specified in Paragraph, ANCHORAGE.
- C. Wall Openings:
 - 1. Fill hollow metal frames, built into masonry walls and partitions, solid with mortar as laying of masonry progresses.
 - 2. If items are not available when walls are built, prepare openings for subsequent installation.
- D. Tooling Joints:
 - 1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
 - 2. Tool while mortar is soft enough to be compressed into joints and not raked out.
 - 3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.

4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E. Partition Height:

1. Extend partitions at least 100 mm (four inches) above suspended ceiling or to overhead construction where no ceiling occurs.
2. Extend following partitions to overhead construction.
 - a. Where noted smoke partitions, FHP (full height partition), and FP (fire partition) and smoke partitions (SP) on drawings.
 - b. Both walls at expansion joints.
 - c. Corridor walls.
 - d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
 - e. Walls at refrigerator space.
 - f. Reinforced masonry partitions
3. Extend finish masonry partitions at least four-inches above suspended ceiling and continue with concrete masonry units o overhead construction, tie to structure with "top of wall" anchors, spaced 32" oc. along length of wall.

F. Lintels:

1. Lintels are not required for openings less than 1000 mm (3 feet 4 inches) wide that have hollow metal frames.
2. Openings 1025 mm (3 feet 5 inches) wide to 1600 m (5 feet 4 inches) wide with no structural steel lintel or frames, require a lintel formed of concrete masonry lintel or bond beam units filled with grout per ASTM C476 and reinforced with 1 - #15m (1-#5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast lintels of 25 Mpa (3000 psi) concrete, of same thickness as partition, and with one Number 5 deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, may be used in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings over 1600 m (5 feet 4 inches) wide, brick masonry, and elevator openings unless shown otherwise.
5. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:

1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
 - a. Place masonry in accordance with lines and levels indicated on Drawings.
 - 1) Full head and bed joints shall be provided. Fill also all cores in brick masonry solid below thru wall flashing and at the tops of walls.
 2. Align head joints of alternate vertical courses.
 3. At sides of openings, balance head joints in each course on vertical center lines of openings.
 4. Use no piece shorter than 100 mm (4 inches) long.
 5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, and abutting masonry partitions.
 6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
 7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.
- H. Use not less than 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless shown otherwise.
- I. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.
- J. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.
- K. Structural Steel Encased in Masonry:
1. Where structural steel is encased in masonry and the voids between the steel and masonry are filled with mortar, provide a minimum 25 mm (1 inch) mortar free expansion space between the masonry and the steel by applying a box board material to the steel before the masonry is laid.
 2. Do not place spacing material where steel is bearing on masonry or masonry is bearing on steel.
- L. Chases:
1. Do not install chases in masonry walls and partitions exposed to view in finished work, including painted or coated finishes on masonry.

2. Masonry 100 mm (4 inch) nominal thick may have electrical conduits 25 mm (1 inch) or less in diameter when covered with soaps, or other finishes.
 3. Full recess chases after installation of conduit, with mortar and finish flush.
 4. When pipes or conduits, or both occur in hollow masonry unit partitions retain at least one web of the hollow masonry units.
- M. Wetting and Wetting Test:
1. Test and wet brick or clay tile in accordance with BIA 11B.
 2. Do not wet concrete masonry units or glazed structural facing tile before laying.
- N. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.
- O. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.
- P. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.
- Q. Allow not less than the following minimum time to elapse after completion of members before removing shores or forms, provided suitable curing conditions have been obtained during the curing period.
1. 10 days for girders and beams.
 2. 7 days for slabs.
 3. 7 days for reinforced masonry soffits.

3.5 ANCHORAGE

- A. Masonry Facing to Backup and Cavity Wall Ties:
1. Use individual cavity wall ties (tied to horizontal backup reinforcing) for new work.
 2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 400 mm (16") horizontally.
 3. At openings, provide individual ties spaced not more than (8 inches) apart vertically around perimeter of opening, and within 300 mm (4 inches) from edge of opening.
 4. Anchor new masonry facing to existing masonry with corrugated wall ties spaced at 400 mm (16 inch) maximum vertical intervals

horizontally. Predrill and Fasten individual ties to masonry with tapcon style anchors.

5. Use joint reinforcing for cavity wall ties spaced not more than 400 mm (16 inches) vertically.

B. Anchorage of Abutting Masonry:

1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with corrugated wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

C. Anchorage to Steel Beams or Columns:

1. Use adjustable beam anchors on each flange.
2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.6 REINFORCEMENT

A. Joint Reinforcement:

1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Brick veneer over frame backing walls does not require joint reinforcement.

4. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
 5. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required for anchorage of masonry to concrete structure.
 6. Joint reinforcement is required in every other course of stack bond CMU masonry.
 7. Wherever brick masonry is backed up with stacked bond masonry, joint reinforcement is required in every other course of CMU backup, and in corresponding joint of facing brick.
- B. Steel Reinforcing Bars:
1. Install in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for lintels and bond beam horizontal reinforcement. Install in wall cavities of reinforced masonry walls where shown.
 2. Use grade 60 bars if not specified otherwise.
 3. Bond Beams:
 - a. Form Bond beams of load-bearing concrete masonry units filled with ASTM C476 grout and reinforced with 2-#15m (#5) reinforcing steel unless shown otherwise. Do not cut reinforcement.
 - b. Brake bond beams only at expansion joints and at control joints, if shown.

3.7 BRICK EXPANSION AND CMU CONTROL JOINTS

- A. Provide brick expansion (BEJ) and CMU control (CJ) joints where shown on drawings.
- B. Keep joint free of mortar and other debris.
- C. Where joints occur in masonry walls.
 1. Install preformed compressible joint filler in brick wythe.
 2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
 3. Install filler, backer rod, and sealant on exposed faces.
- D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys/control joints are used to create a continuous vertical joint.

- E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
- F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.8 BUILDING EXPANSION JOINTS

- A. Keep joint free of mortar. Remove mortar and other debris.
- B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.
- C. Where joints are on exposed faces, provide depth for backer rod and sealant as specified in Section 07 92 00, JOINT SEALANTS, unless shown otherwise.

3.9 ISOLATION SEAL

- A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation between walls or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.
- B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.
- C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.

3.10 BRICKWORK

- A. Lay clay brick in accordance with BIA Technical Note 11 series.
- B. Laying:
 - 1. Lay brick in common bond, with clipped header coursing matching the bond of existing building.
 - 2. Maintain bond pattern throughout.
 - 3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
 - 4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
 - 5. Lay exposed brickwork joints symmetrical about center lines of openings.
 - 6. Do not structural bond multi wythe brick walls unless shown.
 - 7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
 - 8. Lay brick for sills with wash and drip.

9. Build solid brickwork as required for anchorage of items.

C. Joints:

1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (eight inches) vertically, unless shown otherwise.
2. Rake joints for pointing with colored mortar when colored mortar is not full depth.

D. Weep Vents and Weep Holes:

1. Install weeps at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in the wall.
2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
3. Install sand or pea gravel in cavity approximately 75 mm (3 inches) high between weep holes.

E. Cavity Type Exterior Walls:

1. Keep air space clean of mortar accumulations and debris.
 - a. Install cavity air space matt, full height of the new cavity.
2. Lay the interior wythe of the masonry wall full height where Vapor retarder membrane is required on cavity face. Coordinate to install vapor barrier prior to laying outer wythe.
3. Insulated Cavity Type Exterior Walls:
 - a. Install the insulation against the cavity face of inner masonry wythe.
 - b. Place insulation between rows of ties or joint reinforcing or bond to masonry surface with a bonding agent as recommended by the manufacturer of the insulation. Foam all joints in the insulation, using foamed sealant as a mortar when installed. Fill horizontal and vertical joints.
 - c. Lay the outer masonry wythe up with an air space between insulation and masonry units.

3.11 MASONRY CAVITY WALL INSULATION

- A. Cut, or order precut, and mount insulation on exterior faces of inner wythes of masonry cavity walls and brick faced concrete walls. Lay units in joint filler/adhesive used for bonding. Install insulation in long lengths, staggering vertical joints minimum 24", and lay horizontally between ties (spaced at 16" oc).

- B. Bond polystyrene board to backup wall surfaces with Joint filler/adhesive in accordance with recommendations of insulation manufacturer.

3.12 CONCRETE MASONRY UNITS

A. Kind and Users:

1. Provide special concrete masonry shapes as required, including lintel and bond beam units, sash units, and corner units . Use solid concrete masonry units, where full units cannot be used, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout the cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not use brick jambs in exposed finish work.
5. Use concrete building brick only as filler in backup material where not exposed.
6. Masonry assemblies shall meet the required fire resistance in fire rated partitions of type and construction that will provide fire rating as shown.
 - a. Set units according to applicable requirements specified for concrete masonry units.
7. Where lead lined concrete masonry unit partitions terminate below the underside of overhead floor or roof deck, fill the remaining open space between the top of the partition and the underside of the overhead floor or roof deck, with standard concrete masonry units of same thickness as the lead lined units.

B. Laying:

1. Lay concrete masonry units with 10 mm (3/8 inch) joints, with a bond overlap of not less than 1/4 of the unit length, except where stack bond is required.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill such voids with mortar or grout.

7. Provide a 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so that cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings not less than 50 mm (2 inches) by 75 mm (3 inches).
10. Do not wedge the masonry against the steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes shown.
12. Steel reinforcement, at time of placement, free of loose flaky rust, mud, oil, or other coatings that will destroy or reduce bond.
13. Steel reinforcement in place before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place by centering clips, caging devices, tie wire, or other approved methods, vertically at spacings noted.
16. Support vertical bars near each end and at intermediate intervals not exceeding 192 bar diameters.
17. Reinforcement shall be fully encased by grout or concrete.
18. Splice reinforcement or attach reinforcement to dowels by placing in contact and secured or by placing the reinforcement within 1/5 of the required bar splice length.
19. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
20. Grout cells of concrete masonry units, containing the reinforcing bars, solid as specified under grouting.
21. Cavity and joint horizontal reinforcement may be placed as the masonry work progresses.

3.13 AIR BARRIER

- A. Coordinate with Section 07 2726, for sequencing of installation. Tool joints on the face of backup walls flush. Fill all voids to provide smooth surface for application of vapor retarder. This Section 04 2000, is responsible for providing all work necessary to put CMU backup walls into acceptable condition for receiving the Air Barrier membrane.

3.14 GROUTING

- A. Preparation:

1. Clean grout space of mortar droppings before placing grout.
2. Close cleanouts.
3. Install vertical solid masonry dams across grout space for full height of wall at intervals of not more than 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
4. Verify reinforcing bars are in cells of units or between wythes as shown.

B. Placing:

1. Place grout by hand bucket, concrete hopper, or grout pump.
2. Consolidate each lift of grout after free water has disappeared but before plasticity is lost.
3. Do not slush with mortar or use mortar with grout.
4. Interruptions:
 - a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inch) below top of last masonry course.
 - b. Grout from dam to dam on high lift method.
 - c. A longitudinal run of masonry may be stopped off only by raking back one-half a masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:

1. Double wythe masonry constructed grouted in lifts not to exceed 300 mm (12 inches) or less than 50 mm (2 inches) wide.
2. Consolidate by puddling with a grout stick during and immediately after placing.
3. Grout the cores of concrete masonry units containing the reinforcing bars solid as the masonry work progresses.

D. Low Lift Method:

1. Construct masonry to a height of 1.5 m (5 ft) maximum before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method: Not used.

or separation from the masonry units.

3.15 PLACING REINFORCEMENT

- A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on the Contract

Drawings or final shop drawings, or bars with reduced cross-section due to excessive rusting or other causes.

- B. Position reinforcement accurately at the spacing indicated. Support and secure vertical bars against displacement. Horizontal reinforcement may be placed as the masonry work progresses. Where vertical bars are shown in close proximity, provide a clear distance between bars of not less than the nominal bar diameter or 25 mm (1 inch), whichever is greater.
- C. Splice reinforcement bars where shown; do not splice at other places unless accepted by the Contracting Officer Representative (COR). Provide lapped splices, unless otherwise indicated. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.
- D. Provide not less than minimum lap as indicated on shop drawings, or if not indicated, as required by governing code.
- E. Embed metal ties in mortar joints as work progresses, with a minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.
- F. Embed prefabricated horizontal joint reinforcement as the work progresses, with a minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement not less than 150 mm (6 inches) at ends. Use prefabricated "L" and "T" sections to provide continuity at corners and intersections. Cut and bend joint reinforcement as recommended by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- G. Anchoring: Anchor reinforced masonry work to supporting structure as indicated.
- H. Anchor reinforced masonry walls to non-reinforced masonry where they intersect.

3.16 CLEANING AND REPAIR

- A. General:
 - 1. Clean exposed masonry surfaces on completion.
 - 2. Protect adjoining construction materials and landscaping during cleaning operations.
 - 3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
 - 4. Remove mortar droppings and other foreign substances from wall surfaces.
- B. Brickwork:

1. First wet surfaces with clean water, then wash down with a solution of soapless detergent. Do not use muriatic acid.
 2. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
 3. Free clean surfaces of traces of detergent, foreign streaks, or stains of any nature.
- C. Concrete Masonry Units:
1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
 2. Allow mud to dry before brushing.
- D. Experimenting with the cleaning, until satisfactory results are achieved is the responsibility of the Contractor! If products used do not clean to satisfactory results, Contractor shall provide alternate cleaners until satisfactory results are achieved.

3.17 THROUGH-WALL FLASHINGS

- A. Place through-wall flashings in accordance with manufacturer's recommendations.
- B. Installation:
1. Prepare masonry surfaces smooth and free from projections that could puncture flashings. Fill voids of existing masonry backup for smooth substrate to receive through-wall flashings.
 2. Extend through wall flashings through veneer masonry unit as shown, and extend vertically 8 to 12" inches and bed into mortar joint of concrete block or seal back-up, using termination bar.
 3. Terminate to CMU backup with termination bar, anchoring 6" o.c., and continuously seal with recommended poly-ether sealant, manufactured by or for the thruwall flashing manufacturer (such as polyether type sealant- (York's UniverSeal US-100 Bondaflex STP 25, DuraLink by ChemLink, Sonolastic 150 by BASF).
 4. Form end dams on lintels & sills of openings. Extend flashing the length of the lintel and sill, and extend a minimum of 4" beyond the ends of lintel or sill, and form end dams.
 - a. Typically, thru wall flashings shall extend a ¼" out from the exterior face of masonry with a ¼" drip edge. At sills flashing, cut flush with masonry face, but be sure to lay the horizontal on the brick in bed of sealant.
 5. Coat masonry backup wall with mastic for the entire vertical leg of the flashing from the bottom of the flashing to slightly beyond the

- top edge of the flashing. Fully embed through wall flashing membrane in mastic with lower edge extending as shown on the drawings.
6. At exposed through wall flashing locations, set the horizontal leg of the membrane in a thin 1" wide band of sealant/ mastic, placed ½" or more back from the masonry face. Where through wall flashing is covered by Wall reglet and counterflashing (roof-to-wall locations), the band of mastic at the horizontal leg is not required.
 7. All seams, overlaps shall be lapped a minimum of 6" and all surfaces of the lap shall be coated with mastic.
 8. Where brick ties penetrate the through wall flashing, install ties and seal with mastic.
 9. End dams shall be folded a minimum of 2" high, or one brick height, at all through wall flashing location terminations, including heads and window sills. Coat the fold with mastic. Inside and outside corners, fold membrane and use a minimal number of pieces. Provide a small additional piece of membrane at the corner setting in and covered with mastic. Coat all folds, cuts and corners with mastic.
 10. Seal termination bars, through wall flashing top edge (where cut), lap edges, fasteners, and additional corner pieces, dowel holes piercing membrane and brick ties with mastic or tube sealant.
 11. At window openings, provide sill drip tray(s) onto backup wall.
 12. Where through wall flashing is left exposed, trim to ¼" beyond the face of the outer wythe of the veneer, after work is completed.
 13. Where flashing is concealed by sheetmetal reglet and counterflashing, (roof to wall locations) leave membrane length for trimming during the sheet metal installation. Secure membrane length against wind and weather damage, without piercing membrane area to be left in final detail.
- C. Through Wall Flashing Locations: Typical locations are shown by details on drawings. Provide at the base of all walls, on grade, and where walls meet roofs/wall reglets, over windows, doors, wall openings, etc. Flashings required at all similar conditions (including bottom of cavities behind precast face members and where horizontal surfaces intersect vertical wall cavities and at all lintels above exterior wall openings).
- D. Extend flashings the full lengths of lintels and shelf angles, a minimum of 4" beyond ends of lintels (approx. 12" beyond jamb of opening) and form enddams.

3.18 WALL REGLETS

- A. Coordinate with Section 07 60 00 Sheetmetal. When installing, all joints shall be lapped 3" and sealed with Single component sealant. Masons to remove the clear plastic protective cover from metal prior to installing.

3.19 BUILT-IN WORK

- A. As Work progresses, build in items supplied by other trades.
- B. Build in items plumb and true.
- C. Bed anchors of hollow metal frames in mortar joints. Fill frame voids solid with mortar. Fill masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build in organic materials which will be subjected to rot or deterioration.

3.20 CUTTING AND FITTING

- A. Cut and fit masonry for chases, pipes, conduit, sleeves, and grounds. Cooperate fully with other sections of Work to ensure correct size, shape and location.
- B. Obtain Architect's or Contracting Officer's review prior to cutting or fitting any area which is not indicated on Drawings, or which might impair appearance or strength of masonry Work.
- C. Fill with mortar all spaces around stacks, piping and ductwork, etc. which pass through partitions. Do not fill around piping where expansion must be accommodated. Allow space for pipe insulation at wall chases. Fill all spaces around structural anchorages with grout.

3.21 EXTERIOR CAVITY WALL CONSTRUCTION (Sequence of Construction of New Cavity Walls)

- A. The block backup wall shall be laid first including joint reinforcement. Once the backup wall is laid full height, and the spray applied air retarder (Section 07 2726) is installed, then the rigid insulation installation shall take place. After rigid insulation installation is completed, contact COR for insulation inspection. Once this has been accomplished, the face brick can be installed.
- B. Brick and block of exterior cavity walls shall not be laid together as this prevents close inspection of rigid insulation and does not allow for the air retarder installation. After air retarder, any additional face mounted brick ties must be mounted prior to insulation installation. Example: Ties at perimeters of windows, etc.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies structural steel shown and classified by Section 2, Code of Standard Practice for Steel Buildings and Bridges.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Painting: Section 09 91 00, PAINTING.
- C. Steel Joist: Section 05 21 00, STEEL JOIST FRAMING.
- D. Steel Decking: Section 05 31 00, STEEL DECKING.

1.3 QUALITY ASSURANCE:

- A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category **Std** fabrication plant.
- B. Before authorizing the commencement of steel erection, the controlling contractor shall ensure that the steel erector is provided with the written notification required by 29 CFR 1926.752. Provide copy of this notification to the Resident Engineer.

1.4 TOLERANCES:

Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by AISC 303, Sections 6 and 7, Code of Standard Practice for Buildings and Bridges, except as follows:

- A. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch).

1.5 DESIGN:

- A. Connections: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with the details shown on the Drawings, supplementing where necessary. The details shown on the Drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the Contracting Officer

Representative (COR) of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the COR. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

1.6 REGULATORY REQUIREMENTS:

- A. AISC 360: Specification for Structural Steel Buildings
- B. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.

1.7 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
- B. Shop and Erection Drawings: Complete
- C. Certificates:
 - 1. Structural steel.
 - 2. Steel for all connections.
 - 3. Welding materials.
 - 4. Shop coat primer paint.
- D. Test Reports:
 - 1. Welders' qualifying tests.
- E. Design Calculations and Drawings:
 - 1. Connection calculations, if required.
- F. Record Surveys.
- G. Include all required LEED Forms as listed/referenced in Division 1.

1.8 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Institute of Steel Construction (AISC):
 - 1. AISC 360-10 Specification for Structural Steel Buildings
 - 2. AISC 303-10 Code of Standard Practice for Steel Buildings and Bridges
- C. American National Standards Institute (ANSI):
 - B18.22.1-65 (R2008).....Plain Washers
 - B18.22M-81 (R2000).....Metric Plain Washers
- D. American Society for Testing and Materials (ASTM):
 - A6/A6M-11.....Standard Specification for General Requirements
for Rolled Structural Steel Bars, Plates,
Shapes, and Sheet Piling

- A36/A36M-08.....Standard Specification for Carbon Structural Steel
- A53/A53M-10.....Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
- A123/A123M-09.....Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A242/A242M-04 (R2009)....Standard Specification for High-Strength Low-Alloy Structural Steel
- A283/A283M-03 (R2007)....Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
- A307-10.....Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A490-12.....Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength
- A500/A500M-10a.....Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A501-07.....Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- A572/A572M-07.....Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- A992/A992M-11.....Standard Specification for Structural Steel Shapes
- E. American Welding Society (AWS):
- D1.1/D1.1M-10.....Structural Welding Code-Steel
- F. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
- Specification for Structural Joints Using ASTM A325 or A490 Bolts
- G. Military Specifications (Mil. Spec.):
- MIL-P-21035.....Paint, High Zinc Dust Content, Galvanizing, Repair
- H. Occupational Safety and Health Administration (OSHA):
- 29 CFR Part 1926-2001...Safety Standards for Steel Erection

PART 2 - PRODUCTS**2.1 LEED MATERIAL REQUIREMENTS**

A. Steel:

1. MRc4 Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option.

2. Regional Content MRc5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.

2.2 MATERIALS:

A. Structural Steel: ASTM A36.

B. Structural Tubing: ASTM A500, Grade B.

C. Steel Pipe: ASTM A53, Grade B.

D. Bolts, Nuts and Washers:

1. High-strength bolts, including nuts and washers: ASTM A325 and A490.

2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.

3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.

E. Zinc Coating: ASTM A123.

F. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.

PART 3 - EXECUTION**3.1 CONNECTIONS (SHOP AND FIELD):**

A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.

B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than 70% of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

3.2 FABRICATION:

Fabrication in accordance with Chapter M, AISC 360.

3.3 SHOP PAINTING:

A. General: Shop paint steel with primer in accordance with AISC 303, Section 6.

- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
 - 2. Surfaces which will be encased in concrete.
 - 3. Surfaces which will receive sprayed on fireproofing.
 - 4. Top flange of members which will have shear connector studs applied.
- D. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

3.4 ERECTION:

- A. General: Erection in accordance with AISC 303, Section 7B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with AISC 303, Section 7.

3.5 FIELD PAINTING:

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.
- B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

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SECTION 05 21 00
STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies open web steel joists, cross bracing and accessories.

1.2 RELATED WORK:

- A. Structural Steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
 - 1. Joists bearing plates are by Section 05 12 00.
- B. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

- A. Design all elements with the latest published version of applicable Codes.

1.4 TOLERANCES:

- A. Deviation from a straight line between ends of any installed joist shall not exceed 10 mm in 3 m (3/8 inch in 10 feet).

1.5 REGULATORY REQUIREMENTS:

- A. STEEL JOIST INSTITUTE: Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders, (Latest Edition).

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 - 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Shop and Erection Drawings: Complete.
 - 1. Fabrication drawings including details and schedules for the fabrication and assembly of each joist.
 - 2. Erection drawings showing the size and location of each joist, bridging, cross bracing, bearing details, connections, welds, bolts and bearing plates.
- C. Certificates: STEEL JOIST INSTITUTE compliance.
- D. Design Calculations: If requested by the Contracting Officer Representative (COR), submit complete calculations covering the design of all members and connections. Calculations must be specifically applicable to the joists supplied.

1.7 QUALITY ASSURANCE:

- A. Provide documentation that the joist manufacturer is a member of the Steel Joist Institute and has satisfactorily completed work of a similar scope and nature.

1.8 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Institute of Steel Construction (AISC):
1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (Latest Edition).
 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition).
- C. American Society for Testing and Materials (ASTM):
- A307-07.....Carbon Steel Bolts and Studs, 400 MPa (60,000 psi) Tensile Strength
- A325-09.....Structural Bolts, Steel, Heat Treated, 800/700 MPa (120/105 ksi) Minimum Tensile Strength
- A490-08.....Heat-Treated Steel Structural Bolts, 1000 MPa (150 ksi) Minimum Tensile Strengths
- D. American Welding Society (AWS):
- D1.1-08.....Structural Welding Code - Steel
- E. SSPC: The Society for Protective Coatings:
- Steel Structures Painting Manual, Volumes 1 and 2
- F. Steel Joist Institute (STEEL JOIST INSTITUTE):
- Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders (Latest Edition)
- G. U.S. Army Corps of Engineers:
- CRD-C-621.....Specification for Non-Shrink Grout

PART 2 - PRODUCTS**2.1 LEED MATERIAL REQUIREMENTS**

- A. Steel:
1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option
 2. **Regional Content MRC5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.**

2.2 OPEN WEB STEEL JOISTS:

- A. K-Series conforming to STEEL JOIST INSTITUTE standard specifications.

2.3 ACCESSORIES - FITTINGS:

- A. Accessories and fittings, angle cross bracing including end supports and bridging, in accordance with standard STEEL JOIST INSTITUTE specification under which joists were designed.
- B. Unfinished Threaded Fasteners: ASTM A307, Grade A, regular hexagon type, low carbon steel.
- C. High-strength bolts, including nuts and washers: ASTM A325 or A490 heavy hexagon structural bolts.

2.4 BEDDING MORTAR:

- A. For joist ends bearing on concrete or masonry, provide bedding mortar as follows:
 - 1. Non-metallic, shrinkage-resistant mortar; premixed, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C-621.

PART 3 - EXECUTION**3.1 FABRICATION:**

- A. Fabrication and assembly in accordance with applicable standard STEEL JOIST INSTITUTE specification:
 - 1. Make chord splices with full penetration welds capable of developing the ultimate strength in tension of the parent material. Make no allowance for the strength of back-up bars or other material incidental to welding.
 - 2. Provide shop-welded connection plates at panel points to receive supplemental framing.
 - 3. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.
 - 4. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable STEEL JOIST INSTITUTE specifications.
 - 5. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with STEEL JOIST INSTITUTE specifications. Provide bridging anchors for ends of bridging lines terminating at walls or beams. Provide bridging adequate to resist the loads indicated on the Contract Documents.
 - 6. End Anchorage: Provide end anchorages, to secure joists to adjacent construction, complying with STEEL JOIST INSTITUTE specifications,

unless otherwise indicated. Design all end anchorages to resist a minimum net uplift of 1.6 kPa (35 pounds per square foot) of supported area.

- a. Embed Plates in masonry are provided by Section 05 12 00 and installed by Section 04 20 00. Division 05 21 00 to Coordinate the location of the embeds.
7. Header Units: Provide header units to support all joists at openings in floor or roof system not framed with steel shapes.
8. Provide supplemental steel support framing for metal deck where normal deck bearing is precluded by other framing members and minor openings.

3.2 SHOP PAINTING:

- A. Shop painting in accordance with applicable STEEL JOIST INSTITUTE standard specification.
- B. Shop paint joists and accessories with a rust-inhibiting primer paint. For joists which will be finish painted, limit paint to a primer which is compatible with specified finish paint. In high humidity areas, shop paint joists with a zinc-rich primer to receive top coats per the paint system manufacturer's recommendations.

3.3 ERECTION:

- A. Installation of joists in accordance with applicable STEEL JOIST INSTITUTE standard specification.
- B. Handle joists in a manner to avoid damaging of joists. Remove damaged joists from site, except when field repair is approved and such repairs are satisfactorily made in accordance with manufacturer's recommendations.
- C. Accurately set joists and end anchorage in accordance with the applicable STEEL JOIST INSTITUTE standard specification. Secure joists resting on masonry or concrete bearing surfaces by welding or bolting to the steel bearing plates as indicated on the Contract Documents. Secure bridging and anchoring in place prior to application of any construction loads. Distribute any temporary loads so that carrying capacity of any joist is not exceeded. Loads shall not be applied to bridging where joist lengths are 12 m (40 feet) and longer. Where joist lengths are 12 m (40 feet) and longer, install a center row of bolted diagonal bridging to provide lateral stability before slackening of hoisting lines.

3.4 TOUCH UP - FIELD PAINTING:

- A. Clean abraded, corroded, and field welded areas and touch up with same type of paint used in shop painting.
- B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

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**SECTION 05 31 00
STEEL DECKING**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies material and services required for installation of steel decking as shown and specified.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Finish Painting: Section 09 91 00, PAINTING.
- C. Cee joist Framing: Section 05 40 00 COLD FORMED ROOF FRAMING.
- D. Steel Joists: Section 05 21 00 STEEL JOISTS.
- E. Provide Acoustic insulation inserts to Section 07 5423 TPO ROOFING, who will be installing the inserts during roof installation.

1.3 DESIGN REQUIREMENTS:

- A. Design steel decking in accordance with AISI publication, "Specification for the Design of Cold-formed Steel Structural Members" except as otherwise shown or specified.
- B. Design all elements with the latest published version of applicable codes.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 - 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.
- D. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
- A36/A36M-08.....Standard Specification for Carbon Structural Steel
- A653/A653M-11.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- C423-09a.....Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
- 360-10.....Specification for Structural Steel Buildings.
- D. American Iron and Steel Institute (AISI):
- S100-07.....North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition with Supplement 2.aisc
- E. American Welding Society (AWS):
- D1.3-08.....Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement
 2. Factory Mutual Research Approval Guide (2002)
- G. Military Specifications (Mil. Spec.)
- MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS**2.1 LEED MATERIAL REQUIREMENTS****A. Steel:**

1. **Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option.**
2. **Regional Content MRc5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.**

2.2 MATERIALS:

- A. Steel Decking (Galvanized): ASTM A653, Structural Quality
- B. Galvanizing: ASTM A653, G60.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- D. Miscellaneous Steel Shapes: ASTM A36. Shop prime.
- E. Welding Electrode: E60XX minimum.
- F. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 - 2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
 - 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
 - 4. Ridge, Hip and Valley Metal: Provide 1.3 mm (18 gauge), minimum 200 mm (8 inch) wide ridge and valley plates where roof slope exceeds 40 mm per meter (1/2 inch per foot).
 - 5. Seat Angles for Deck: Provide where a beam does not frame into a column.

2.3 REQUIREMENTS:

- A. Provide steel decking of the type, depth, gauge, and section properties as shown.
- B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gage requirements as shown on the Contract Documents.
 - 1. Wide Rib (Type B) deck. Finish: Galvanized G-60.

2. Acoustic Deck - Wide rib Type BA or BIA, finish Galvanized G-60.
 - a. Provide acoustic insulation inserts material to SECTION 07 5323 EPDM ROOFING. Insulation inserts will be installed by Roofers.
- C. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans, except for interstitial levels.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- F. Screw Fastening Deck Units:
 1. Secure units to supporting members with screw fasteners. Fasteners located 6" o.c. at end laps, and at 12" oc at all intermediate supports. Side laps shall be fastened at centers of deck spans (48" span at 24" centers; 60" span, at 30" centers).
 2. Fastener Enhancement (Corners, Roof Edge):
 - a. Secure units to supporting members with screw fasteners, locating one fastener at each rib (6" spacing) into the supports (joist flanges) or equal. This enhanced spacing to occur at corners and outside perimeter of roof. Extend this enhancement out a minimum of 2 joist spaces on deck running perpendicular to wall (or a minimum of 8'-0") from edge, and out a minimum of 6'-0" where

deck runs parallel with the wall. Fasten sidelaps 18" oc. at these perimeter/corner enhancement areas. Take care where standing when fastening sidelaps.

3. Screws: The allowable load value per screw used to determine maximum fastener spacing for either self drilling or standard metal type is based upon a minimum size of #12, with minimum support thickness of 0.06". #12 TEK self tapping or Drilling screws with no. 4 hardness by Buildex.
4. Attach split or partial panels to the structure in every valley. In addition, secure deck to each supporting member in ribs where side laps occur. Power driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
5. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 2.8kPa (60 psf) at eave overhang and 1.4 kPa (30 psf) for other roof areas.
6. Note: Welding of deck to Steel Joists is allowed. Weld in same pattern as previously indicated. Use screws for stitching side laps. The use of welding washers is recommended.

G. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.
2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the Structural Drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the Structural Drawings are to be located, cut and reinforced by the trade requiring the opening.
4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Contracting Officer

Representative (COR). Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.

6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

- a. Reinforcement Subframing for opening supports: Section 05 50 00
MISC. METALS

3.2 WELDING:

- A. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.3.

3.3 FIELD REPAIR:

- A. Areas scarred during erection.
- B. Welds to be thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint. Touch-up paint for shop painted units of same type used for shop painting.

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SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:
1. Heavy Gauge load-bearing steel stud walls (interior bearing walls at roof framing, and parapet walls between shingled roof and EPDM Roof).
 2. Heavy gauge Cee Joist Roof Framing.

1.2 RELATED WORK:

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Open web steel joists: Section 05 21 00, STEEL JOIST FRAMING.
- C. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- D. Eave rafter tails, and gable end ladder framing, and Plywood Sheathing: Section 06 10 00 ROUGH CARPENTRY.
- E. Metal Roof Deck at Base Bid: Section 05 31 00.
- F. Roof Deck (direct to joists) at Alternative Roof Framing: Section 06 10 00 ROUGH CARPENTRY.

1.3 DESIGN REQUIREMENTS:

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the minimum physical and structural properties indicated.
1. Design Loads: As indicated.
 2. Design framing systems to withstand design loads without deflections greater than the following:
 - a. Interior Load-Bearing & Parapet Walls: Lateral deflection of 1/360 of the wall height.
 - b. Roof Framing: Vertical deflection of 1/360 of the span.
 3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).

4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
5. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
6. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.
- D. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Iron and Steel Institute (AISI):
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)
- C. American Society of Testing and Materials (ASTM):
A36/A36M-08.....Standard Specifications for Carbon Structural Steel
A123/A123M-09.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M-09.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A307-10.....Standard Specifications for Carbon Steel Bolts and Studs

A653/A653M-10.....Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

E488-96 (R2003).....Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements

E1190-95 (R2007).....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):

D1.3/D1.3M-08.....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Sheet Steel for joists, studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G90, with a yield of 340 MPa (50 ksi) minimum.

1. Recycled content in Cold rolled Steel used in studs: Minimum **6** percent post-consumer recycled content, or minimum **30** percent pre-

2. Regional Content MRC5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.

B. Galvanizing Repair Paint: MIL-P-21035B.

C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 ACCEPTABLE FRAMING MANUFACTURERS:

A. Clark-Dietrich Building Systems products are specified, MBA Building Supplies, Custom Studs Inc., Lakeville, Minnesota; Telling Industries, Mentor Ohio, and Marino-Ware also acceptable metal framing product manufacturers.

2.3 WALL FRAMING:

- A. Steel Studs: Equivalent to Clark-Deitrich's CSJ Series, 50 KSI, standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness: 1.52 mm (0.0598 inch) (conforms to 16 gage)
 - 2. Flange Width: Stud, Framing: (1-5/8 inches) minimum
 - 3. Web: Punched
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness: Matching steel studs.
 - 2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

2.4 ROOF RAFTER/JOIST FRAMING (CEE JOISTS)

- A. Steel Joists: Equivalent to Clark-Deitrich's CSW Series 50 KSI, standard C-shaped steel joists, unpunched, of web depths indicated, with lipped flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness:
 - 1.52 mm (0.0598 inch) 16 gage-50ksi, (Base Bid)
 - 2. Flange Width: 2" flange width.
 - 3. Roof Framing System (Alternate No. 1): Provide 33 KSI - 16ga. framing at Roof framing alternate. See Alternates Description and alternative framing details.
- B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness: Matching steel joists.
 - 2. Flange Width: 51 mm (2-inches) minimum.

2.5 FRAMING ACCESSORIES:

- A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Gusset plates.

5. Deflection track and vertical slide clips.
 6. Stud kickers and girts.
 7. Joist hangers and end closures.
 8. Reinforcement plates.
- C. INSULATION: Provide mineral wool or fiberglass insulation filler at all double jamb or double header members which will be inaccessible to the insulating contractor.

2.5 ANCHORS, CLIPS AND FASTENERS:

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 REQUIREMENTS:

- A. Welding in accordance with AWS D1.3.
- B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 FABRICATION:

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.
- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 ERECTION:

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. Securely anchor tracks to supports as shown.
- C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.
- E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- G. Install headers in all openings that are larger than the stud spacing in that wall.
- H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- I. Studs in one piece for their entire length, splices will not be permitted.
- J. Provide a load distribution member at top track where joist is not located directly over bearing stud.
- K. Provide joist bridging and web stiffeners at reaction points where shown.
- L. Provide end blocking where joist ends are not restrained from rotation.
- M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 ROOF FRAMING:

- A. The contractor shall submit fabrication and erection drawings for approval.
- B. All framing/joists members shall be accurately cut to length, angle and be true to line to assure tight joints for finished truss.
- C. All Framing members and connector plates shall be properly placed in special jigs and the members tightly clamped in place, remaining in that position until the connector plates have been welded and fastened joining the heavy gauge framing.
- D. Spacings - Base Bid: Space roof framing at 32"oc where 1 ½" metal roof deck is used.
 - 1. At the alternate roof framing system (Alt. No. 1), where gypsum fire barrier/plywood sheathing system is directly applied to joists, space the roof framing at 24"oc maximum.
- E. Provide bridging at roof framing per structural drawings/notes. Coordinate with Divisions 22/23 mechanical and 26, Electrical as headers for roof penetrations shall be provided. See drawings for locations. All connections at roof framing shall be screwed or welded.
- F. Provide cross ventilation holes in the framing at the alternative roof framing.

3.4 TOLERANCES:

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.
- C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.
- D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.5 FIELD REPAIR:

- A. Touch-up damaged galvanizing with galvanizing repair paint.

- - - E N D - - -

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
 - 1. Metal Support for Wall and Ceiling Mounted Items
 - 2. Frames
 - 3. Slab support angles
 - 4. Elevator pit ladder and Hoist Beam
 - 5. Loose Lintels
 - 6. Shelf Angles, or support angles at window sills.
 - 7. Railings
 - 8. Security Fence with gate (wire mesh stair closure)

1.2 RELATED WORK

- A. Metal Stairs: Section 05 51 00, METAL STAIRS.
- B. Prime and Finish Painting: Section 09 91 00, PAINTING.
- C. Corner Guards: Section 10 26 00, WALL AND DOOR PROTECTION.
- D. Wall backing/blocking: Metal backing is by Section 06 10 00.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 - 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Manufacturer's Literature and Data:
 - 1. Provide literature and data on all premanufactured items.
- C. Shop Drawings:
 - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
 - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
 - 3. Provide templates and rough-in measurements as required.
- D. Manufacturer's Certificates:
 - 1. Hot dip galvanized finish as specified.
 - 2. Live load designs as specified.
- E. Design Calculations for specified live loads including dead loads.

- F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 LEED SUBMITTALS:

- A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

1. Recycled Content:

- a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
- b. Section 01 3310, Recycled certification Form: submit a fully executed form, for all products with specified recycled content.

2. Local/Regional Materials:

- a. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
- b. Indicate location of extraction, harvesting, and recovery; indicate distance between extraction, harvesting, and recovery and the project site.

1.5 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
 B18.6.1-97.....Wood Screws
 B18.2.2-87 (R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
 A36/A36M-08.....Structural Steel
 A47-99 (R2009).....Malleable Iron Castings

- A48-03 (R2008).....Gray Iron Castings
- A53-10.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless
- A123-09.....Zinc (Hot-Dip Galvanized) Coatings on Iron and
Steel Products
- A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel
Steel Plate, Sheet and Strip
- A269-10.....Seamless and Welded Austenitic Stainless Steel
Tubing for General Service
- A307-10.....Carbon Steel Bolts and Studs, 60,000 PSI
Tensile Strength
- A312/A312M-09.....Seamless, Welded, and Heavily Cold Worked
Austenitic Stainless Steel Pipes
- A391/A391M-07.....Grade 80 Alloy Steel Chain
- A653/A653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-
Iron Alloy Coated (Galvannealed) by the Hot-Dip
Process
- A786/A786M-09.....Rolled Steel Floor Plate
- B456-03 (R2009).....Electrodeposited Coatings of Copper Plus Nickel
Plus Chromium and Nickel Plus Chromium
- B632-08.....Aluminum-Alloy Rolled Tread Plate
- C1107-08.....Packaged Dry, Hydraulic-Cement Grout
(Nonshrink)
- F436-10.....Hardened Steel Washers
- F468-10.....Nonferrous Bolts, Hex Cap Screws, and Studs for
General Use
- F593-02 (R2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-11.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
- D1.1-10.....Structural Welding Code Steel
- D1.2-08.....Structural Welding Code Aluminum
- D1.3-08.....Structural Welding Code Sheet Steel
- E. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:
- SP 1-04.....No. 1, Solvent Cleaning
- SP 2-04.....No. 2, Hand Tool Cleaning
- SP 3-04.....No. 3, Power Tool Cleaning

PART 2 - PRODUCTS**2.1 DESIGN CRITERIA**

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.
- B. Ladders and Rungs: 120 kg (250 pounds) at any point.
- C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

2.2 LEED MATERIAL REQUIREMENTS

- A. Steel:
 - 1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option
 - 2. **Regional Content MRC5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.**
- B. Aluminum:
 - 1. Recycled Content: Provide products with an average recycled content of steel products, so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

2.3 MATERIALS

- A. Steel Shapes, Beams, bars, plates: ASTM A36.
- B. Steel Channel: ASTM 572, Grade 50
- C. Steel Pipe: ASTM A53.
 - 1. Galvanized for exterior locations.
 - 2. Type S, Grade A unless specified otherwise.
 - 3. NPS (inside diameter) as shown.
- D. Shop primer for ferrous metal: Fast curing, lead and chromate free, universal modified - alkyd primer complying with performance requirements in FS TT-P-664, compatible with finish paint systems indicated. Glidden 5205, Rustoleum 1573, Hentzen 4080 or 97779AIA-2 or Tnemec 10-99R or Diamond Vogel's PN-5517, are acceptable. Provide in dry mil thickness 2 mil minimum - 3.5 mil maximum.
- E. Grout: ASTM C1107, pourable type.
- F. Wall Brackets- Handrail: Equal to No. 378 (hidden fastening) by Julius Blum & Co.,
Inc. (Cast Metal).

2.4 HARDWARE

- A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:

- a. ASME B18.2.2.
- b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
- c. ASTM F468 for nonferrous bolts.

2. Washers: ASTM F436, type to suit material and anchorage.

2.5 FABRICATION GENERAL

A. Material

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, or bolting.
2. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
3. Holes, for bolts: Accurately punched or drilled and burrs removed.
4. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
5. Use bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:
 - a. Fabricate items to design shown.
 - b. Furnish members in longest lengths commercially available within the limits shown and specified.
 - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
 - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
 - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
 - f. Prepare members for the installation and fitting of hardware.
 - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
 - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
 - a. Weld in accordance with AWS.
 - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.

- c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
 - d. Finish welded joints to match finish of adjacent surface.
3. Joining:
- a. Miter or butt members at corners.
 - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
 - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes and miters.
 - b. Fit removable members to be easily removed.
 - c. Design and construct field connections in the most practical place for appearance and ease of installation.
 - d. Fit pieces together as required.
 - e. Fabricate connections for ease of assembly and disassembly without use of special tools.
 - f. Joints firm when assembled.
 - g. Conceal joining, fitting and welding on exposed work as far as practical.
 - h. Do not show rivets and screws prominently on the exposed face.
 - i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common
- F. Finish:
- 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
 - 2. Steel and Iron: NAAMM AMP 504.
 - a. Hot dip galvanized finish: Galvanize to a minimum of 1.25 oz. per s.f. per ASTM A386.

- b. Surfaces exposed in the finished work:
 - 1) Finish smooth rough surfaces and remove projections.
 - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
- c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Prime Items not specified to have other coatings.
 - b) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
 - c) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
 - d) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
 - 2) Nonferrous metals: Comply with MAAMM-500 series.
- G. Protection:
 - 1. Slab bearing angles: coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
 - 2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.6 SUPPORTS

- A. General:
 - 1. Fabricate ASTM A36 structural steel shapes as shown.
 - 2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
 - 3. Field connections may be welded or bolted.
- B. For Wall Mounted Items:
 - 1. For items supported by metal stud partitions.
 - 2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
 - 3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
 - 4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
 - 5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.

6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

C. Elevator Hoist Beam:

1. Construct assembly top of elevator shaft as shown and design to support not less than a 4000lb. working load at any point.
2. Fabricate supports as shown, complete with embed plates.
3. Fabricate structural steel shapes unless shown otherwise.

2.7 LOOSE LINTELS

- A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.
- B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.
- C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.
 1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
 2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).
- E. Provide bearing plates for lintels where shown.
- F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.
- G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.
- H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.
- I. Elevator Entrance Masonry Opening lintels:
 1. Fabricate lintel from wide flange with plate, and provide a minimum of 200 mm (8inch) bearing each end.
 2. Cut the plate short at bearing, so that only the beam is bearing at each side of opening.

2.8 BEARING ANGLES

- A. Fabricate from steel angles of size shown.
- B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.

C. Provide in hot dip galvanized finish.

2.9 LADDERS (SEE SECTION 055100 FOR SHIPS LADDERS)

A. Steel Ladders:

1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
5. Galvanize elevator pit ladders after fabrication, ASTM A123, G-90.

B. Ladder Rungs:

1. Fabricate from 25 mm (one inch) diameter steel bars, or No. 8 Deformed rebar.
2. Galvanized after fabrication, ASTM A123, G-90 rungs for access to pits.

2.10 RAILINGS (WALL HANDRAILINGS)

A. In addition to the dead load design railing assembly to support live load specified.

B. Fabrication General:

1. Provide continuous welded joints, dressed smooth and flush.
2. Standard flush fittings, designed to be welded, may be used.
3. Exposed threads will not be approved.
4. Form handrail brackets to size and design shown.

C. Handrails:

1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:

1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.

4. Form handrail brackets from malleable iron, or use specified brackets.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
 - a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
 - b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
 - c. Continuously weld brackets to post.
 - d. Provide slotted bolt holes in rail bracket.
 - e. Weld bolt heads flush with top of rail.
 - f. Weld flanged fitting to post where posts are installed in sleeves.

2.11 SECURITY FENCE with GATE: (Wire Mesh Partition - stair closure)

- A. MANUFACTURERS: Acorn Iron products are specified Superior Wire and Iron Products, Inc. and Iron Works; Blue Island Wire & Iron Works; Indiana Wire Products, Inc.; Kentucky Metal Products Co.; The Lakeside Wire and Iron Co.; Logan Co.; Miller Wire Works, Inc.; PAA Industries, Inc.; The G-S Company Wire and Iron Works; and Western Wire & Iron Works, Inc. also acceptable.
- B. STANDARD DUTY TYPE: All wire, standard duty 130 series, w/vertical 1 1/4"x5/8" or "C" section frames with std. horizontal channels, 10 ga. Steel wire, 1 1/2" diamond mesh, with standard mortise cylinder lock with recessed knob inside. Reinforce posts adjacent to doors and corner posts with flats, channels, cees, tubes, etc. See drawings (AS401) for location and height.
- C. COLOR: Electrostatic finish, picked from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Items set into concrete or masonry.
 1. Provide temporary bracing for such items until concrete or masonry is set.
 2. Place in accordance with setting drawings and instructions.

3. Build strap anchors, into masonry as work progresses.
- C. Field weld in accordance with AWS.
 1. Design and finish as specified for shop welding.
 2. Use continuous weld unless specified otherwise.
- D. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- E. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- F. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. Unless shown otherwise.
 4. Secure steel plate or hat channels to studs as detailed.
- B. Supports for Wall Mounted items:
 1. Locate center of support at anchorage point of supported item.
 2. Locate support at top and bottom of wall hung cabinets.
 3. Locate support at top of floor cabinets and shelving installed against walls.
 4. Locate supports where required for items shown.

3.3 STEEL LINTELS

- A. Use lintel sizes and combinations shown or specified.
- B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.
- C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.4 SLAB BEARING ANGLES

- A. Anchor angles with 12 mm (1/2 inch) expansion anchor bolts at 16" oc, unless shown otherwise.

- B. Provide expansion space at end of members.

3.5 LADDERS

- A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.
- B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.
 1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
 2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.
 3. Space rungs approximately 300 mm (12 inches) on centers.

3.6 RAILINGS

- A. Steel Posts:
 1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
 2. Install sleeves in concrete formwork.
 3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
 4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
 5. Secure sliding flanged fittings to posts at base with set screws.
 6. Secure fixed flanged fittings to concrete with expansion bolts.
 7. Secure posts to steel with welds.
- B. Anchor to Walls:
 1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
 - a. Anchor steel plate to concrete or solid masonry with exp. Bolts.
 - b. Anchor steel plate to hollow masonry with toggle bolts.
 2. Anchor flanged fitting with toggle bolt to steel support in frame walls.
- C. Handrails:
 1. Anchor brackets for metal handrails as detailed.
 2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.

3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to be installed in supporting frame wall and to hollow masonry unless shown otherwise.

3.7 STEEL COMPONENTS FOR MILLWORK ITEMS

- A. Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.8 CLEAN AND ADJUSTING

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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**SECTION 05 51 00
METAL STAIRS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies steel stairs with railings.
- B. Types:
 - 1. Closed riser stairs with concrete filled treads, including landing support, decking platforms, with finished railing system.
 - 2. Ships Ladder and railings.

1.2 RELATED WORK

- A. Concrete fill for treads and platforms: Section 03 30 53, CAST-IN-PLACE CONCRETE.
- B. Wall handrails and railings for other than steel stairs: Section 05 50 00, METAL FABRICATIONS.
- C. Requirements for shop painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 - 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.

1.4 APPLICATION PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
- B. American Society for Testing and Materials (ASTM):
 - A36/A36M-08.....Structural Steel
 - A47-99 (R2009).....Ferritic Malleable Iron Castings
 - A48-03 (R2008).....Gray Iron Castings
 - A53-10.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated
Welded and Seamless
 - A307-10.....Carbon Steel Bolts and Studs, 60000 psi Tensile
Strength
 - A653/653M-10.....Steel Sheet, Zinc Coated (Galvanized) or Zinc
Alloy Coated (Galvannealed) by the Hot-Dip
Process
 - A563-07.....Carbon and Alloy Steel Nuts
 - A1008-10.....Steel, Sheet, Cold-Rolled, Carbon, Structural,
High-Strength, Low-Alloy

- A786/A786M-09.....Rolled Steel Floor Plates
- A1011-10.....Steel, Sheet and Strip, Strip, Hot-Rolled
Carbon, Structural, High-Strength, Low-Alloy

C. American Welding Society (AWS):

- D1.1-10.....Structural Welding Code-Steel
- D1.3-08.....Structural Welding Code-Sheet Steel

D. The National Association of Architectural Metal Manufactures (NAAMM) Manuals:

- Metal Bar Gratings (ANSI/NAAMM MBG 531-09)
- AMP521-01.....Pipe Railing Manual, Including Round Tube

E. American Iron and Steel Institute (AISI):

- 2001.....Design of Cold-Formed Steel Structural Members

1.5 LEED SUBMITTALS:

A. Product data. Unless otherwise indicated, submit the following for each type of product provided under work of this Section:

1. Recycled Content:

- a. Indicate recycled content; indicate percentage of pre-consumer and post-consumer recycled content per unit of product.
- b. Section 01 3323, Recycled certification Form: submit a fully executed form, for all products with specified recycled content.

PART 2 - PRODUCTS

2.1 LEED MATERIAL REQUIREMENTS

A. Steel:

- 1. Recycled Content: Minimum 10 percent post-consumer recycled content, or minimum 40 percent pre-consumer recycled content at contractor's option

2. Regional Content MRc5: 10-20% material by cost is extracted harvested, manufactured, within 500 mile radius.

2.2 DESIGN CRITERIA

- A. Design stairs to support a live load of 500 kg/m² (100 pounds per square foot).
- B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.
- C. Design Grating treads in accordance with NAAMM Metal Bar Grating Manual.

- D. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point.

2.3 MATERIALS

- A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.
- B. Steel Grating: Metal bar type grating NAAMM BG.
- C. Sheet Steel: ASTM A1008.
- D. Structural Steel: ASTM A36.
- E. Steel Floor Plate: ASTM 786.
- F. Steel Decking: Form from zinc coated steel conforming to ASTM A446, with properties conforming to AISI Specification for the Design of Cold-Formed Steel Structural Members.
- G. Steel Plate: ASTM A1011.

2.4 FABRICATION GENERAL

- A. Fasteners:
 1. Conceal bolts and screws wherever possible.
 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
- B. Welding:
 1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
 2. Where possible, locate welds on unexposed side.
 3. Grind exposed welds smooth and true to contour of welded member.
 4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Fit face stringer to newel post by tenoning into newel post, or by notching and fitting face stringer to side of newel where shown.
- F. Shop Prime Painting: Prepare surface and apply primer as specified for

2.5 RAILINGS

- A. Fabricate railings, including handrails, from steel pipe with flush.
 1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
 2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.
- B. Return ends of handrail to wall and close free end.
- C. Provide standard terminal castings where fastened to newel.

- D. Space intermediate posts not over six feet on center between end post
- E. Fabricate handrail brackets from cast malleable iron.
- F. Provide standard terminal fittings at ends of post and rails.

2.6 CLOSED RISER STAIRS

- A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.
- B. Fabricate pans for treads and platforms, and risers from sheet steel. Fabricate pans for platforms from steel decking where shown.
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.

2.7 SHIPS LADDER:

- A. Custom fabricated, 500 lb. minimum capacity; Designed to meet OSHA/ANSI A14.3 standards, and IBC requirements, with galvanized 1/4" checkerplate treads or grating treads with checkerplate nosings. Finish/material: Hot dip galvanized treads with primed steel stringers and railings.
- B. In lieu of shop fabricated units, pre-manufactured SL Series steel units by ACL Industries, or mill finished aluminum units by Precision Ladder LLC are acceptable.

PART 3 - EXECUTION

3.1 STAIR, SHIPS LADDER INSTALLATION

- A. Provide hangers and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.
- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill any gap between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.
- F. Install landing support steel and deck plumb, level and true to line.

3.2 RAILING INSTALLATION

- A. Install standard terminal fittings at ends of posts and rails.
- B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
- C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).

- D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

3.3 FIELD PRIME PAINTING

- A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
- B. Touch-up abraded areas with same primer paint used for shop priming.
- C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Section specifies wood blocking, framing, sheathing, roof furring, nailers, sub-flooring, rough hardware, and light wood construction.
- B. Note: Wall Backing - No wood backing is allowed on this project. See this section 06 10 00 for metal backing to be used.

1.2 RELATED WORK:

- A. Woodwork, casework, millwork: Section 06 4000, FINISH CARPENTRY.
- B. Heavy gauge metal studs for parapet framing, and roof joists/Rafters: Section 05 40 00 Cold Formed Metal Framing.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
 - 1. Include all required LEED Forms as listed/referenced in Division 1.
- B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.
- C. Environmental Documentation: Submit manufacturer's environmental documentation.
 - 1. Forest Stewardship Council (FSC) Lumber, Plywood used in rough carpentry: Chain of custody certificate.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.
- D. Locate stacks on well drained areas, supported at least 150 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):

- National Design Specification for Wood Construction
 NDS-05.....Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
 A190.1-07.....Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
 B18.6.1-97.....Wood Screws
- E. American Plywood Association (APA):
 E30-07.....Engineered Wood Construction Guide
- F. American Society for Testing And Materials (ASTM):
 A47-99 (R2009).....Ferritic Malleable Iron Castings
 A48-03 (R2008).....Gray Iron Castings
 A653/A653M-10.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-
 Iron Alloy Coated (Galvannealed) by the Hot Dip
 Process
 D143-09.....Small Clear Specimens of Timber, Method of
 Testing
 D1760-01.....Pressure Treatment of Timber Products
- G. Federal Specifications (Fed. Spec.):
 MM-L-736C.....Lumber; Hardwood
- H. Commercial Item Description (CID):
- I. Military Specification (Mil. Spec.):
 MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated
- J. U.S. Department of Commerce Product Standard (PS)
 PS 1-95.....Construction and Industrial Plywood
 PS 20-05.....American Softwood Lumber Standard
- K. LEED v2009, MRC7Certified Wood**
IEQc4.4Low Emitting Materials, Composite Woods
and Agrifiber

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Unless otherwise specified, each piece of lumber bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced. FSC certified Lumber is required on this project. Chain of Custody is required.
1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.

2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
 3. All lumber, plywood, wood materials provided by this Section shall be FSC certified.
- B. Structural Members: Species and grade as listed in the AFPA, National Design Specification for Wood Construction having design stresses as shown.
- C. Lumber Other Than Structural:
1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee & FSC certified.
 2. Framing lumber: DFL or SPF, with Minimum extreme fiber stress in bending of 1100.
 3. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.
- D. Sizes:
1. Conforming to Prod. Std., PS20.
 2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.
- E. Moisture Content:
1. At time of delivery and maintained at the site.
 2. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
 3. Lumber over 50 mm (2 inches) thick: 25 percent or less.
- F. Fire Retardant Treatment: (F.T.)
1. Treatment shall comply with formulation FR-1 of the current edition of AWPA standard P17, for Interior treatment giving a flame spread rating of 25 or less per ASTM E84. Hoover's PyroGuard, and Arch Wood Protection's Dricon treatment are approved.
 2. The fire retardant formulations must be free of halogens, sulfates, chlorides and ammonium phosphate.
 3. All lumber and plywood shall be seasoned "KDAT" standards after fire treatment.
- G. Preservative Treatment:
1. Do not treat Heart Redwood and Western Red Cedar.

2. Treat wood members and plywood exposed to weather or in contact with masonry or concrete.
3. Treat other members specified as preservative treated (PT).
4. ACQ or AC2 Preservative treatment, by the pressure method complying with ASTM D176. CCA pressure treatment of wood is not permitted.

2.2 PLYWOOD

- A. Comply with Prod. Std., PS 1.
- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type.
 1. Provide FSC certified Plywood.
- C. Sheathing:
 1. APA rated Exposure 1 or Exterior; panel grade CD or better.
 2. Wall Sheathing: (Knee Walls at roof framing, parapets at flat roof perimeter, etc.)
 - a. Minimum 12 mm (15/32 inch) thick with supports 600 mm (24 inches) on center unless specified otherwise.
 - b. Minimum 1200 mm (48 inches) wide at corners without corner bracing of framing.
 - c. Minimum 4 plies required for sheathing.
 3. Roof sheathing: (Base Bid)
 - a. Minimum 12 mm (15/32 inch) thick with span rating for supports 600mm(24 inches) on center unless specified otherwise. Minimum 5 plies required for roof sheathing.
 - b. Provide Fire treated where indicated.

2.3 "NON COMBUSTIBLE" ROOF SHEATHING SYSTEM: (Alternate Roof system - See Alternate Descriptions)

- A. The non-combustible roof sheathing system consists of a field applied system of 5/8" Type 'X' fiberglass faced gypsum roof board directly to the 2x nailers, with a layer of 1/2" APA Rated "Sheathing" plywood overlay sheathing applied over the top. This system shall meet the UL Roof Construction NM528 per the latest edition of Roofing Materials and Systems Directory by UL.
- B. Gypsum Roof Board: 1/2" Dens Deck by Georgia Pacific is acceptable, in 4x8 and 4x4 sizes. Roof board contains water resistant silicone treated gypsum core, fiberglass facers, fire and rot resistant meeting

ASTM E84 rating of flamespread, and Smoke Developed of "0" with inorganic fiberglass facers.

1. Securock by USG and GlassRoc by Certainteed, & National Gypsum's Dexcell are also acceptable.

C. Plywood Sheathing overlay: 1/2" square edged, APA rated "Sheathing" board, (CD-exterior rated) no less than a 4 ply product.

1. Provide FT treated where indicated.

2.5 ROUGH HARDWARE AND ADHESIVES:

A. Anchor Bolts:

1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.

2. Extend at least 200 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).

B. Miscellaneous Bolts: Expansion Bolts: C1D, A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Use 13 mm (1/2 inch) bolt unless shown otherwise.

Toggle Bolts: Fed Spec FF-B-588. Provide type as required for hollow masonry or framed walls.

C. Washers:

1. ASTM F844.

2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.

D. Screws:

1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.

2. Wood to Steel: ASTM C954, or ASTM C1002.

E. Nails:

1. Size and type best suited for purpose unless noted otherwise. Use aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.

2. ASTM F1667:

a. Common: Type I, Style 10.

F. Clip Angles or Reinforcing Angles:

1. Fabricate clip angles, or bearing angles from 16 ga. G-60 galvanized steel, custom fabricated as indicated. Anchor to walls and blocking as indicated. Punched or drilled for fasteners.

G. Adhesives:

1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.

2. For structural laminated Wood: ASTM D2559.

2.6 MISC ACCESSORIES and WOOD COMPONENTS:

- A. Tapered Wood Siding: (Used at parapet wall Details) Cedar, B grade or rustic, plain beveled lap siding 3/4" x width as required.
- B. Rough 2X Facia Boards: (Spec Note: Covered by prefinished metal facia.) 2x Select structural SPF or DFL wood. Section 06 1000, shall prime with 1 coat good grade alkyd oil primer, all sides and edges, prior to installation.
- C. Vent Fabric: Cobra Ridge vent, cut to 6" widths, and installed at air void paths at parapet's facia exhaust. See details.

2.7 WOOD FRAMING AT EAVES, GABLE ENDS - BASE BID: (2x4, 2x6) Size as indicated, MSR (machine stress rated lumber, minimum 1200fb, **Fire Treated**, Southern Yellow Pine or Doug Fir, FSC certified.

- A. Sister eave rafter tails to sides of Heavy gauge framing with self drilling winged TEKS, and 3/8" diameter carriage or machine bolts spaced at 6" centers, staggered across face of rafter tail.
- B. Fasten ladder framing at gable ends to sides of steel rafter with 3/8" Carriage bolts at 8" oc staggered. Clip the Wood framing to the gable end track at each gable end rafter extension.

2.8 WALL BACKING/BLOCKING:

- A. Metal Blocking/Backing: ASTM C645; Galvanized 18 ga. G-60 finish; cee wall track material, notched for attachments to steel studs. Provide in 6" and 8" widths. Fasten with self drilling lo-profile head screws. Notch for lengths/runs over one stud space.
- B. Wood blocking/ backing is not allowed on this project.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

- A. Conform to applicable requirements of the following:
 - 1. AFPA National Design Specification for Wood Construction for timber connectors.
 - 2. AFPA WCD-number 1, Manual for House Framing for nailing and framing unless specified otherwise.
 - 3. APA for installation of plywood or structural use panels.
- B. Fasteners:
 - 1. Nails.

- a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA Manual for House Framing where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
 - b. Use special nails with framing connectors.
 - c. For sheathing and subflooring, select length of nails sufficient to extend 25 mm (1 inch) into supports.
 - d. Use eight penny or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
 - e. Use 16 penny or larger nails for nailing through 50 mm (2 inch) thick lumber.
 - f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
 - g. Nailing Schedule; Using Common Nails:
 - 1) Joist bearing on sill or girder, toe nail three-8d or framing anchor.
 - 2) Bridging to joist, toe nail each end two-8d.
 - 3) Ledger strip to beam or girder three-16d under each joint.
 - 4) Sheathing:
 - a) Plywood or structural use panel to each stud or joist face nail 8d, at supported edges 150 mm (6 inches) on center and at intermediate supports 250 mm (10 inches) on center. When gluing plywood to joint framing increase nail spacing to 300 mm (12 inches) at supported edges and 500 mm (20 inches) o.c. at intermediate supports.
 - 5) Built-up corner studs 16d at 600 mm (24 inches) (24 inches) on center.
 - 6) Doubled top plates, face nails 16d at 400 mm (16 inches) on center.
 - 7) Top plates, laps, and intersections, face nail two-16d.
2. Bolts:
- a. Fit bolt heads and nuts bearing on wood with washers.
 - b. Countersink bolt heads flush with the surface of nailers.
 - c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
 - d. Use toggle bolts to hollow masonry or sheet metal.

- e. Use bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 600 mm (24 inch) intervals between end bolts. Use clips to beam flanges.
- 3. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.
 - a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
 - b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.
- 4. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.
- 5. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.
- 6. Screws to Join Wood:
 - a. Where shown or option to nails.
 - b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
 - c. Spaced same as nails.
- 7. Installation of Connectors:
 - a. Conform to applicable requirements of the NFPA National Design Specification for Wood Construction.
 - b. Fit wood to connectors and drill holes for fasteners so wood is not split.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
 - 1. Space anchor bolts 1200 mm (4 feet) on centers between ends and within 150 mm (6 inches) of end. Stagger bolts from side to side on plates over 175 mm (7 inches) in width.
 - 2. Use shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
 - 3. Closely fit, and set to required lines.
- D. Cut notch, or bore in accordance with NFPA Manual for House-Framing for passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- E. Blocking, Nailers, and Furring:
 - 1. Install furring, blocking, nailers, and grounds where shown.
 - 2. Use longest lengths practicable.
 - 3. Use fire retardant treated wood blocking where shown at openings and where shown or specified.

4. Layers of Blocking or Plates:
 - a. Stagger end joints between upper and lower pieces.
 - b. Nail at ends and not over 600 mm (24 inches) between ends.
 - c. Stagger nails from side to side of wood member over 125 mm (5 inch in width).

3.2 F.T. (fire treated)WOOD NAILERS OVER INSULATION: (BASE BID)

- A. Space at 24" oc over installed rigid roof insulation (Section 07 2200). 2x 4 wood nailer shall be fastened thru nailer, roof insulation, and shall penetrate the metal roof deck minimum of 1 1/2". Fasten nailers at 12" oc and stagger fasteners from one side of 2x4 to the other. Coordinate layout insulation placement with Section 07 22 00. 2x4 furring shall cover ends of insulation during layout.
 1. At the very bottoms of hips where small space is prohibitive to installing nailers, cut double layer 3/4" plywood and install solid.
 2. Provide venting voids as indicated on details esp. at valleys, etc., to allow venting to be continuous from roof edge to ridge.
 3. Final layout of furring shall be submitted by Contractor in shop drawing format and be reviewed by the Architect.
- B. Nailer Fasteners: OMG's or Atlas, #12 or #14 Roof Fastener, epoxy coated, with drill point capable for going thru wood nailer, rigid roof insulation and drilling or piercing the metal roof deck.
- C. Valley, Ridge, and Hip Blocking:
 1. Size for depth of cut on rafters.
 2. Straight and true intersections of roof planes.
 3. Secure hip and valley blocking wall plates by using Screws indicated above.
 4. Provide solid in blocking layers indicated.
- D. Frame openings in roof with solid blocking, headers and trimmer blocking.
- E. Rough Bucks:
 1. Install rough wood bucks at opening in masonry or concrete where wood frames or trim occur.
 2. Brace and maintain bucks plumb and true until masonry has been built around them or concrete cast in place.
 3. Cut rough bucks from 50 mm (2 inch) thick stock, of same width as partitions in which they occur and of width shown in exterior walls.
 4. Extend bucks full height of openings and across head of openings; fasten securely with anchors specified.

F. Sheathing Fastening Schedule; Using fasteners as indicated:

1. Sheathing:

- a. Where fastening plywood to heavy gauge metal wall or roof framing use epoxy coated/corrosion resistant fasteners with self drilling point. Screw 6" o.c. at each end support and 8" o.c. at intermediate supports. Space sheathing per manufacturer's recommendations.
- b. Where fastening to 2x nailers, use galvanized, deformed shank (spiral shank) nail.

2. Non-Combustible Sheathing System: (Alternate #1)

- a. Where fastening non-combustible deck to heavy gauge metal framing use corrosion resistant fasteners with self drilling point. Temporarily fasten the gypsum roof board to the joists with a minimum of 4 screws per 4'x4" sheet and 6 screws at 4'x8' sheet. Overlay the gypsum with plywood sheathing and fasten 6" o.c. at each end support and 8" o.c. at intermediate supports. Install and space gypsum roof board and plywood sheathing per manufacturer's recommendations.
- b. Where fastening non-combustible deck to 2x wood nailer framing use corrosion resistant nails or fasteners with a self-drilling point. Temporarily fasten the gypsum roof board to the nailers/framing with a minimum of 4 fasteners per 4'x4" sheet and 6 fasteners at 4'x8' sheet. Overlay the gypsum with plywood sheathing and fasten 6" o.c. at each end support and 8" o.c. at intermediate supports with a minimum 8d galvanized common or box nail, or galvanized with deformed shank. Install and space gypsum roof board and plywood sheathing per manufacturer's notes.

3. Coordinate with Section 07 3113, Asphalt shingles, as the ice/water membrane and building paper shall be applied as soon as possible after roof is sheathed.

G. Sheathing:

1. Use FSC Certified plywood panels for sheathing.
2. Lay panels with joints staggered, with edge and ends 3 mm (1/8 inch) apart and nailed over bearings as specified.
3. Set nails not less than 9 mm (3/8 inch) from edges.
4. Install 50 mm by 100 mm (2 inch by 4 inch) blocking spiked between nailers, unless detailed otherwise.

H. Non-combustible Roof Gypsum Sheathing:

1. Install per the requirements of the manufacturer.
2. Lay gypsum panels with joints staggered (between plywood and gypsum a minimum offset of 24" both directions. Stagger joints in the plywood layer a minimum of 24". Space the gypsum and plywood with edge and ends 3 mm (1/8-inch) apart, fastened over bearings as specified.
3. Install plywood overlay with long dimension perpendicular to framing. Install as previously specified.

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SECTION 06 40 00
FINISH CARPENTRY & CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies finish carpentry and casework as described herein, and as shown on the drawings.
- B. Items specified, includes, but not limited to:
 - 1. LPN Workroom Casework
 - 2. Storage Room Shelving.
 - 3. Medication Room Casework.
 - 4. Meeting/Breakroom Casework.
 - 5. Countertops, work tops.
 - 6. Cast Polymer Fabrications, such as window sills.

1.2 RELATED WORK

- A. Metal Wall backing, Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- B. Wood doors: (prefinished) Section 08 14 00, WOOD DOORS.
- C. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.
- E. Modular or Pre-manufactured Furniture(reception/control area): Section 12 59 00.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SUBMITTAL PROCEDURES.
 - 1. Indicate materials and wood species, component profiles, fastening, jointing details, finishes, accessories and items furnished by others but installed in woodwork.
 - 2. Indicate cutout locations, plumbing fixtures, mechanical and electrical devices, and other items occurring in the wood/casework.
 - 3. Indicate grain for solid lumber and veneer.
 - 4. Scale:
 - 1. Plans, elevations, etc.: 1/4" to 1'-0" or larger.
 - 2. Detail Sections: 3" = 1'-0" or full size.
 - 5. Product data: Submit for hardware and accessories.
 - 6. Field Measurements: Provide field measurements on the shop drawings. Where field measurements cannot be made without delaying project, coordinate measurements among trades to ensure proper fit of wood/casework.

B. Samples:

1. High Pressure Decorative laminate finished plywood or particleboard, 150 mm by 300 mm (six by twelve inches).
2. Melamine finished particleboard.
3. Cast Plastic (12" square sample).
4. Drawer construction sample.

C. Certificates:

1. Indicating of materials meet the requirements specified.
2. Indicating moisture content of materials meet the requirements specified.

D. Environmental Documentation: Submit manufacturer's environmental documentation.

1. Forest Stewardship Council (FSC) Lumber, Plywood and Particleboard used in cabinet construction: Chain of custody certificate.

E. Manufacturer's literature and data:

1. Finish hardware
2. Sinks with fittings
3. Electrical components

F. Include all required LEED Forms as listed/referenced in Division 1.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.
- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Resident Engineer. Store at a minimum temperature of 21°C (70°F) for not less than 10 days before installation.
- C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Testing and Materials (ASTM):
 - A36/A36M-08.....Structural Steel
 - A53-12.....Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
 - A167-99 (R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip

- B26/B26M-09.....Aluminum-Alloy Sand Castings
- B221-08.....Aluminum and Aluminum-Alloy Extruded Bars,
Rods, Wire, Profiles, and Tubes
- E84-10.....Surface Burning Characteristics of Building
Materials
- C. American Hardboard Association (AHA):
A135.4-04.....Basic Hardboard
- D. Builders Hardware Manufacturers Association (BHMA):
A156.9-03.....Cabinet Hardware
A156.11-10.....Cabinet Locks
A156.16-08.....Auxiliary Hardware
- E. Hardwood Plywood and Veneer Association (HPVA):
HP1-09.....Hardwood and Decorative Plywood
- F. National Particleboard Association (NPA):
A208.1-09.....Wood Particleboard
- G. American Wood-Preservers' Association (AWPA):
AWPA C1-03.....All Timber Products - Preservative Treatment by
Pressure Processes
- H. Architectural Woodwork Institute (AWI):
AWI-09.....Architectural Woodwork Quality Standards and
Quality Certification Program
- I. National Electrical Manufacturers Association (NEMA):
LD 3-05.....High-Pressure Decorative Laminates
- J. U.S. Department of Commerce, Product Standard (PS):
PS20-10.....American Softwood Lumber Standard
- K. Military Specification (Mil. Spec):
MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated
- L. Federal Specifications (Fed. Spec.):
A-A-1922A.....Shield Expansion
A-A-1936.....Contact Adhesive
FF-N-836D.....Nut, Square, Hexagon Cap, Slotted, Castle
FF-S-111D(1).....Screw, Wood
MM-L-736(C).....Lumber, Hardwood
- M. LEED v2008, MRc7Certified Wood
IEQc4.4Low Emitting Materials, Composite Woods
and Agrifiber**

1.6 QUALITY ASSURANCES:

- A. The "AWS Architectural Woodwork Standards", 2009, 1st edition, published jointly by Architectural Woodwork Institute and AWMAC of Canada, applies to and is part of this Section, and any reference to Premium, Custom or Economy grades is as defined therein.
- B. Manufacturer's Competence: Woodwork shall be manufactured by well established and experienced firm, acceptable to the Owner and Architect, with satisfactory record of similar size and quality installations.
 - 1. Perform work in accordance with AWS "Premium" Quality Standards.

PART 2 - PRODUCTS**2.1 BIO-BASED MATERIAL**

- A. Bio-based Materials: For products designated by the USDA's Bio-Preferred program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specification section. For more information regarding the product categories covered by the Bio-Preferred program, visit <http://www.bio-preferred.gov>

2.2 LUMBER

- A. Grading and Marking:
 - 1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
 - a. All lumber shall be FSC certified, and to have chain of custody.
 - 2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 - 3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Sizes:
 - 1. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which product is produced.
 - 2. Millwork, standing and running trim, and rails: Actual size as shown or specified.

- C. Hardwood: MM-L-736, species as specified for each item.
- D. Softwood: PS-20, exposed to view appearance grades:
 - 1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
 - 2. Use Prime for painted or opaque finish.

2.3 PLYWOOD

- A. Softwood Plywood:
 - 1. Prod. Std. & FSC Certificate
 - 2. Grading and Marking:
 - a. Each sheet of plywood shall bear the mark of a recognized association or independent inspection agency that maintains continuing control over the quality of the plywood.
 - b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
 - 3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.
 - 4. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.
 - 5. Shelving Plywood:
 - a. Interior Type, any species group.
 - b. Veneer Grade: A-B or B-C.
 - 6. Other: As specified for item.
- B. Hardwood Plywood:
 - 1. HPVA: HP.1 & FSC Certificate.
 - 2. Species of face veneer shall be as shown or as specified in connection with each particular item.
 - 3. Inside of Building:
 - a. Use Type II (interior) A grade veneer for transparent finish.
 - b. Use Type II (interior) Sound Grade veneer for paint finish.
 - 4. Use plain sliced red oak unless specified otherwise.

2.4 PARTICLEBOARD

- A. NPA A208.1 & FSC Certificate
- B. Plastic Laminate Particleboard Cores:
 - 1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.

2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.

C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

2.5 HIGH-PRESSURE DECORATIVE LAMINATES (P. LAM)

A. NEMA LD-3.

B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having P.Lam. finish. General Purpose, Type HGL.

C. Cabinet Interiors including Shelving: Both of following options to comply with NEMA, CLS as a minimum.

1. P.Laminate clad plywood or particle board.

2. Resin impregnated decorative paper thermally fused to particle board.

D. Backing sheet on bottom of plastic laminate covered wood tops: Backer, Type HGP.

E. Post Forming Fabrication, Decorative Surfaces: Post forming, Type HGP.

2.6 ADHESIVE

A. For P. Laminate: Fed. Spec. A-A-1936.

B. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

C. All Field applied adhesives must meet VOC content requirements of MRC4.1. All Laminate adhesives must also meet requirements of MRC4.4-NAUF, regardless if they're field or shop applied.

2.7 CABINET WORK:

A. Construction: Flush overlay.

1. Cabinetwork to be flush overlay design and shall be manufactured to meet Premium requirements of AWI. All surfaces to be finished with plastic laminate. Balance the exterior surface laminates with .020" white high pressure interior cabinet liner. Cases shall be edged with plastic laminated edging.

2. Drawer and doors shall be edged with plastic laminate edging **or** with 3mm PVC edge.

a. PVC edge color to match laminate plastic.

3. Provide glazed cabinet doors where indicated, glaze with 1/8" tempered glass with removable glass stops. Glass to meet ASTM C-1048 requirements.

4. Exposed surfaces shall be Plastic laminate and shall conform to the requirements of the National Electric Manufacturer's Association (NEMA) Publication Number LD-1-1971 and NEMA LD-3 - 1985.

- B. Core Materials: All core materials shall be a blended bio-fiber composition (Primeboard) with non-formaldehyde adhesives. Board shall exceed performance requirements for ANSI AS208.1 M3 standards. Further the board shall contribute to LEED Certification in categories:
1. Indoor Air Quality: LEED EQ credit 4, Low-Emitting materials.
 2. Rapidly Renewable Resource: LEED MR credit 6, Rapidly Renewable Material
 3. Recycled Material Content - LEED MR Credit 4, Recycled Content.
 - a. Casework manufacturer shall provide documentation and certification of use. No formaldehyde, no exceptions.
- C. MR Moisture Resistant Particleboard: Average 47-pound density particleboard, ANSI A 208.1 1-1999, M-; FSC certified.
1. Provide at all countertops and at cabinet bases where sinks occur.
- D. No exposed edges or surfaces of particle board will be permitted. All exposed surfaces and edges must be painted or sealed. This includes cuts made in field.
- E. AWS's definitions of Semi-exposed and exposed surfaces per Section 10 Casework, of AWS Standards, govern unless noted otherwise.
- F. Exposed Surfaces: Plastic laminate; color and texture in Section 09 06 00 SCHEDULE FOR FINISHES.
- G. Semi-Exposed Surfaces: Color: White
1. Cabinet liner shall be used as the balancing sheet of the exterior laminate with Thermally fused melamine used elsewhere at the interior of the cabinets.
 2. The following melamine products approved:
 - a. Panolam by Domtar
 - b. MDL by Melamine Decorative Laminate Inc.

2.8 CONSTRUCTION: (Plastic Laminate)

- A. Structural Cabinet Body: Cabinet backs shall be minimum 1/2" thick and inset from the rear of body and fully bound (dadoed) four sides. Provide 3/4" thick stiffeners fastened to back/body. Base units, except sink base units, provided with full sub-top.
- B. Structural Drawer Body: *1/2" drawer sides, backs and subfronts. Drawer body shall be doweled or dovetailed and provided with 3/4" applied front. Bottom shall be 1/2" typical bottom, recessed fully bound (dadoed) and joint glued all four sides. Provide underbody stiffeners on all drawers.
1. *Note: At paper drawers, or drawers over 32" width, provide 3/4" drawer sides, backs and subfronts.

- C. Structural Cabinet Support: Cabinet sub-base shall be of a separate and continuous ladder type platform design leveled and floor mounted prior to cabinet body placement. Material shall be exterior grade plywood. No cabinet sides-to-floor will be allowed. Provide 4" height unless otherwise noted.
- D. Countertops, Vanities: Plastic laminate self-edged with top set formed backsplash. Provide sidesplash as indicated on Drawings. Core for countertops shall be minimum of 1-1/8", and core for backsplash not less than 3/4" thick. Core for countertops may be 45 lb. nominal particleboard, M-3 grade, meeting previous specifications, with MR grade (moisture resistant) at sink tops to be provided.
- E. All countertops provided with balancing sheet .020" thick. Splicing of countertops shall be by using KV #516 joint tightners, Bolt and plate connections will not be allowed.
- F. Countertop edges shall be self edged with laminate and shall be square edged.
- G. Make cutouts for sinks, service fixtures, and equipment to be mounted in countertops. Seal exposed particleboard with a clear synthetic resin sealer or clear, deep penetration oil and resin sealer recommended by the plastic laminate manufacturer, with the following tentatively approved:
1. Ben Moore's Sanding sealer, No. 23
 2. Sherwin Williams vinyl sealer No. T 67F3
 3. Speedhide 6-10 alkyd sanding sealer by PPG
- H. Note: P.laminate for countertops shall be .050" thick, conforming to NEMA LD 3, abrasion resistant laminate (matching Nevamar's ARP, Wilsonart's High Wear or equivalent) with manufacturer and color noted on elevations and details and as specified in the Color Schedule.
1. Note: Post formed countertops shall be manufactured using .042" post-forming grade laminate.
- I. Provide Wilsonart's High Wear laminate tops at kitchen areas, dietary grille, general store.
- J. P. Laminate Backing Sheet: NEMA LD3; BKV min. 0.028" thick.
- K. Cabinet Liner: NEMA LD3, Std DLS, Min. 0.020" thick, equal to low pressure melamine; solid color and matching edge banding where exposed.
- 2.9 CAST POLYMER FABRICATIONS:** (window sills)
- A. Cast polymer, 1/2" sheet. Where indicated provide with thickened edge. Dupont Corian Products are acceptable.
1. Cast polymer to meet the following requirements:

- a. FM approval, Flame spread less than 25. Flammability Class 1
firerating
 - b. Rockwell hardness (M scale) minimum of 55 per ASTM D785.
 - c. Impact Strength (IZOD) minimum of 22 ft. lbs./inch per ASTM D256.
- B. All cast polymer fabrications shall be Greenguard Certified, or they shall conform to the following emission criteria:
- | | |
|----------------------|---------------------------|
| Individual VOC's: | ≤0.1 TLV |
| Formaldehyde: | ≤0.05 ppm |
| 4-phenylcuclohexene: | ≤0.0065 mg/m ³ |
| Total VOC's: | ≤ 0.5 mg/m ³ |
| Total Aldehydes: | ≤0.1 ppm |
- C. Color: See Section 09 0600 Color Schedule.

2.10 HARDWARE:

- A. General: Unless identified otherwise Provide mill standard cabinet hardware.
- B. Hinges: AWS Compliant, Class 1. Provide satin chrome 5 knuckle hinge (Similar to Stanley's 1592HT) with hospital tips.
- C. Catches:
 - 1. Magnetic Type. Provide one per door except at doors exceeding 36" in height; provide 2 at these doors.
- D. Pulls:
 - 1. Wire Pulls: Stanley #4484. US26D, Satin Chrome finish.
- E. Drawer Guides/Slides:
 - 1. (24" or less): Blum 430M, full extension, 100lb rating, roller bearings, epoxy coated/finished.
 - 2. File Drawer Guides: Accuride 4034; rail mounted, full extension, 150 lb. rating; 75000 cycle tested; clear zinc finish.
 - 3. (42" or less) Wide Drawer Guides and Lateral File Drawers: Accuride 3640A; rail mounted, full extension, 200 lb. rating; 75000 cycle tested; clear zinc finish.
 - 4. NOTE: Drawer guide products by Waterloo, KV, Blum, Grass etc are acceptable also.
- F. Grommets:
 - 1. Hard PVC type designed for countertops by Doug Mockett. Verify colors.
 - 2. Vents: Doug Mockett's GT Series, rectangular grilles, standard painted finish. Perimeter aluminum frame with mesh/1. Frame and Mesh same finish.

G. Shelf Standards and Brackets at Cabinets:

1. Note: 1/4"± holes at 32mm spacing with KV 346 Series (or equal) shelf supports approved.

H. Shelf Standards and Brackets: (Heavy Duty- double slotted) (STORAGE ROOM ONLY)

1. KV 185 with 85 standards (anachrome only)

I. File Follower: Knappe and Voight, or equivalent CompX File frame system by Timberline. File drawers to be provided with Pendaflex suspension racks or equal; letter and legal size.

J. Locks and Keying:

1. Best 1EE (with ring package) or 5L series cabinet locks are specified. Set to accept removable 7 pin core housing, & keying, which are provided by Owner.

2. Inactive door Lock:

- a. Inactive wall cabinet or base cabinet door: provide surface bolts, top and bottom of door, similar to Stanley's CD4060, 4" satin nickel surface bolt/strike.

K. Support Brackets:

1. Brackets by AM Hardware, 888-647-0200 (www.aandmhardware.com) are specified; 1/8" steel, finished in textured powder coat- black, grey, white or almond; sizes as required by countertop/vanity size.

L. Self Labeling Strips: Provide where indicated, C-line durable clear plastic strips with peel and stick adhesive on back, 4" x 7/8", 10 strips per box (local office supply).

2.11 SEALANT:

- A. Silicone sealant, synthetic rubber base; FS TT-S-1543, Class A; crystal clear color.

PART 3 - EXECUTION**3.1 ENVIRONMENTAL REQUIREMENTS**

- A. Maintain work areas and storage areas to a minimum temperature of 21°C (70°F) for not less than 10 days before and during installation of interior millwork.
- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

- A. General:

1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
 2. Secure trim with fine finishing nails, screws, or glue as required.
 3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
 4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.
 5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
 6. Plumb and level items unless shown otherwise.
 7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.
 8. Exterior Work: Joints shall be close fitted, metered, tongue and grooved, rebated, or lapped to exclude water and made up in thick white lead paste in oil.
- B. Work of this Section is classified "**Premium**" Grade according to AWI Quality Standards, Section 1700. These exacting standards apply to field installation and will be used as guides for acceptance or rejection of Work.
- C. Employ only the highest quality craftsmen and methods to perform installation Work.

3.3 COORDINATION:

- A. Coordinate with other trades as required to insure proper clearances, field dimensions, backing and blocking, etc.
- B. Coordinate locations of all electrical outlets, or connection in close proximity to millwork installations. Work in close coordination with Division 26 Electrical Contractor.
- C. Coordinate the locations of all backing and blocking with Section 06 1000, and Drywall contractor.

3.4 INSTALLATION:

- A. Coordinate blocking installation and placement with Section 06 10 00 CARPENTRY. Scribe and closely fit to adjacent construction. Shim as necessary with concealed shims. Make cutouts as required for mechanical and electrical items.
- B. Do not install unfinished items until back priming by Section 09 9100, PAINTING, is completed.

- C. **Install millwork free from hammer or tool marks, open joints, slivers, or other defects detrimental to appearance or performance. Install in as long of lengths as possible, with minimum number of joints.** Leave surfaces clean and true with exposed wood sanded parallel with grain, free of discernible marks and ready for final finish. Set millwork plumb, level, square and true. Scribe to floors and walls as required. Cope returns, and Miter corners, countersink nails, drill holes in millwork.
- D. Install work after building's humidity is at an acceptable level.
- E. Ensure that mechanical and electrical items affecting this section are properly placed, complete, prior to commencement of installation.
- F. Cabinets: Install without distortion so that doors and drawers fit openings properly and area accurately aligned. Install separate base frame and level in prior to mounting base cabinets.
- G. Provide on-site sealing of all cutouts in wood/casework.
- H. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.
 - 1. Complete installation of hardware and accessory items as indicated.
 - 2. Maintain veneer sequence matching of cabinets.
- I. Tops: Securely anchor to base units and other support systems. Provide sink cutouts as required.
- J. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly and correctly.
- K. Install sealant in joints between Work of this Section and other surfaces where indicated on Drawings or otherwise required to give finished appearance.

3.5 PROTECTION:

- A. Protect all woodwork from defacement or damage until final completion of project.
- B. Clean installed woodwork by providing initial wipe down of casework.

- - - E N D - - -

**SECTION 06 4006
ADHESIVES AND SEALANTS COMPLIANCE TABLE**

INSTRUCTIONS :

Submit form for each sealant, sealant primer, and adhesive product, including aerosol adhesives, used by **Sections 06 1000 and 06 4000 only**

Attach all submissions to original of this form.

Any non-compliant items must be explained in an accompanying attachment.

Form must be certified by responsible representative of Contractor or Sub-Contractor.

Project Information	
Name:	
Address:	

Contractor/Subcontractor Information	Product Information
Name:	Manufacturer:
Address:	Product Name;
	Product Type:
Telephone:	

Product Type	Actual VOC Data (g/L less water)	Maximum VOC limits in g/L less water
Architectural Sealant		250
Architectural Sealant Primer - porous		775
Architectural Sealant Primer - non-porous		250
Drywall and Panel Adhesive		50
Structural Wood Member Adhesive		140
Multipurpose Adhesive		70
Contact Adhesive		80
Top and Trim Adhesive		250
General Purpose Mist Adhesive		65% VOC by weight
General Purpose Web Spray Adhesive		55% VOC by weight
Special Purpose Aerosol Adhesive		70% VOC by weight

I certify information presented on, and attached to, this compliance table is true, complete and accurate.

Signed: _____

Title: _____

Date: _____

End of Section