

# **JAMES A HALEY VA HOSPITAL**

**Juliet Land Acquisition—Paving Design  
Project 673-502**

**ARCHITECTURAL SPECIFICATIONS  
REDUCED SCOPE  
100% SUBMITTAL**

July 8, 2016



DEPARTMENT OF VETERANS AFFAIRS  
 PROJECT SPECIFICATIONS PROJECT NO. 673-502

TABLE OF CONTENTS  
 Section 00 01 10

	DIVISION 00 - SPECIAL SECTIONS	Page
00 01 10	Table of Contents	
00 01 15	List of Drawing Sheets	
	DIVISION 01 - GENERAL REQUIREMENTS	
01 00 00	General Requirements	
01 32 16	Project Schedules (Greater than \$100,000)	
01 33 23	Shop Drawings, Product Data, and Samples	
01 42 19	Reference Standards	
01 45 29	Testing Laboratory Services	
01 57 19	Temporary Environmental Controls	
01 74 19	Construction Waste Management	
01 81 00	Commissioning	
	DIVISION 02 - EXISTING CONDITIONS	
02 21 00	Site Surveys	
02 41 00	Demolition	
02 65 00	Underground Storage Tank Removal	
	DIVISION 03 - CONCRETE	
03 30 53	Cast-in-Place Concrete (Short Form)	
03 45 00	Precast Architectural Concrete	
	DIVISION 04 - MASONRY	
	DIVISION 05 - METALS	
	DIVISION 06 - WOOD, PLASTICS AND COMPOSITES	
	DIVISION 07 - THERMAL AND MOISTURE PROTECTION	
	DIVISION 08 - DOORS AND WINDOWS	
	DIVISION 09 - FINISHES	
	DIVISION 10 - SPECIALTIES	
	DIVISION 11 - EQUIPMENT	
11 12 00	Parking Control Equipment	

	<b>DIVISION 12 - FURNISHINGS</b>	
	<b>DIVISION 13 - SPECIAL CONSTRUCTION</b>	
	<b>DIVISION 14- CONVEYING EQUIPEMENT</b>	
	<b>DIVISION 21- FIRE SUPPRESSION</b>	
	<b>DIVISION 22 - PLUMBING</b>	
	<b>DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)</b>	
	<b>DIVISION 25 - INTEGRATED AUTOMATION</b>	
	<b>DIVISION 26 - ELECTRICAL</b>	
26 05 11	Requirements for Electrical Installations	
26 05 33	Raceway and Boxes for Electrical Systems	
26 05 41	Underground Electrical Construction	
26 24 16	Panelboards	
26 27 26	Wiring Devices	
	<b>DIVISION 27 - COMMUNICATIONS</b>	
27 05 11	Requirements for Communications Installations	
27 05 33	Raceways and Boxes for Communications Systems	
	<b>DIVISION 28 - ELECTRONIC SAFETY AND SECURITY</b>	
28 05 11	Requirements for Electronic Safety and Security Installations	
28 05 33	Raceways and Boxes for Electronic Safety and Security	
	<b>DIVISION 31 - EARTHWORK</b>	
31 20 00	Earth Moving	
31 23 19	Dewatering	
31 32 00	Soil Stabilization System	
	<b>DIVISION 32 - EXTERIOR IMPROVEMENTS</b>	
32 31 13	Chain Link Fences and Gates	
32 31 53	Perimeter Security Fences and Gates	
	<b>DIVISION 33 - UTILITIES</b>	
33 40 00	Storm Drainage Utilities	

**SECTION 00 01 15**  
**LIST OF DRAWING SHEETS**

The drawings listed below accompanying this specification form a part of the contract.

<u>Drawing No.</u>	<u>Title</u>
<b>GENERAL</b>	
GI-001	COVER SHEET
GI-002	NOTES AND ABBREVIATIONS
<b>CIVIL</b>	
CS101	EXISTING CONDITIONS
CS102	DEMOLITION PLAN
CS103	SITE PLAN
CS104	GRADING AND DRAINAGE PLAN
CS105	STORMWATER POLLUTION PREVENTION
CS201	DETAILS
CS202	DETAILS
CS203	DETAILS
CS204	DETAILS
<b>ARCHITECTURAL</b>	
AS800	SITE PLAN FOR ELVATION REFERENCES
AS801	ORNAMENTAL FENCE MISC DETAILS
AS802	ORNAMENTAL FENCE MISC DETAILS
AS803	RAMP AND RAILING PLAN
AS804	FENCING ELEVATIONS
<b>STRUCTURAL</b>	
SS101	SITE STRUCTURAL
SS102	SITE STRUCTURES
<b>ARCHITECTURAL</b>	
ES001	ELECTRICAL LEGENDS, NOTES, SCHEDULES
ES002	ELECTRICAL DETAILS AND DIAGRAMS
ES101	ELECTRICAL SITE LIGHTING PLAN
ES102	ELECTRICAL SITE PHOTOMETRICS
ES201	ELECTRICAL CCTV
ES301	ELECTRICAL BLUE LIGHT TELPHONES

**SECTION 01 00 00**  
**GENERAL REQUIREMENTS**

**TABLE OF CONTENTS**

1.1 SAFETY REQUIREMENTS.....	1
1.2 GENERAL INTENTION.....	1
1.3 STATEMENT OF BID ITEM(S) .....	3
1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR .....	3
1.5 CONSTRUCTION SECURITY REQUIREMENTS.....	3
1.6 OPERATIONS AND STORAGE AREAS.....	6
1.7 ALTERATIONS.....	11
1.8 DISPOSAL AND RETENTION.....	11
1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS.....	12
1.10 RESTORATION.....	13
1.11 PHYSICAL DATA .....	14
1.12 PROFESSIONAL SURVEYING SERVICES .....	14
1.13 LAYOUT OF WORK.....	14
1.14 AS-BUILT DRAWINGS.....	15
1.15 USE OF ROADWAYS.....	16
1.16 NOT USED.....	16
1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.....	16
1.18 TEMPORARY USE OF EXISTING ELEVATORS.....	16
1.19 TEMPORARY USE OF NEW ELEVATORS.....	16
1.20 TEMPORARY TOILETS.....	16
1.21 AVAILABILITY AND USE OF UTILITY SERVICES.....	16
1.22 NEW TELEPHONE EQUIPMENT .....	17
1.23 TESTS.....	17
1.24 INSTRUCTIONS.....	17
1.25 GOVERNMENT-FURNISHED PROPERTY.....	17
1.26 RELOCATED // EQUIPMENT // ITEMS // .....	17
1.27 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT.....	17
1.28 CONSTRUCTION SIGN.....	18
1.29 SAFETY SIGN.....	18
1.30 PHOTOGRAPHIC DOCUMENTATION .....	19
1.31 FINAL ELEVATION Digital Images.....	22
1.32 HISTORIC PRESERVATION .....	22
1.33 NOT USED.....	22
Appendix A - Approved OSHA Training Providers List	
Appendix B - VA Adopted Codes	
Appendix C - Facilities Management Service - Alert	
Appendix D - Safety and Infection Control Guide	

Attachments 1a & 1b - Fire Protection Notifications

Attachment 2 - Notification of Hot Work Operations by Contractor  
Personnel (Burn Permit)

Attachment 3 - Fire Safety Inspection Checklist for Hot Work  
Operations Area

Attachment 4 - Construction Fire Safety Check List

Attachments 5a & 5b - Contractor Work Plan & Peer Review

Attachment 6 - VA Information and Information System Security/Privacy  
Language

**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. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for Juliet Land Acquisition as required by drawings and specifications.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of Elements, 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 or his duly authorized representative.
- D. Before placement and installation of work subject to tests by testing laboratory retained by Department of Veterans Affairs, the Contractor shall notify the COR in sufficient time to enable testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than seven (7) calendar days unless otherwise designated by the COR.
- 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. The current version of hospital HPMs and SOPs listed below shall be followed:
  - HPM 138-03 Safety and Health During Construction Activities
  - HPM 138-04 Lockout - Tagout Program
  - HPM 138-15 Interim Life Safety Measures
  - HPM 138-23 Utility Shutdown Procedures
  - HPM 138-24 Infection Control During Construction And Renovation

- SOP 138d-03 Ceiling, Floor, Wall or Partition Penetration Permit System
- SOP 138e-02 Fire Sprinkler Valve Supervision Program.
- SOP 138e-10 Hot Work Operations
- SOP 138e-11 Notification of Fire Alarm Impairment
- SOP 138e-17 Smoke Detector Cover Log

F. Prior to commencing work, general contractor shall provide proof that an OSHA 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) Beginning July 31, 2005, all supervisory type personnel/ employees of general contractor and subcontractors shall have the 30-hour OSHA certified Construction Safety course and other relevant competency training, as determined by VA CP with input from the ICRA team.
- (2) Beginning July 31, 2005, all non-supervisory type personnel/ employees of general contractor and subcontractors shall have the 10-hour OSHA certified Construction Safety Course and other relevant competency training, as determined by VA CP with input from the ICRA team.
- (3) Submit copies of certificates and training records for all such personnel and employees that may be and/or will be on the work site(s) to the COTR and Contracting Officer for approval before the start of any work on-site.

**H. Related Work:** This specification section applies to ALL Divisions (0 through 34) of work under ALL other specification sections. A partial list of Codes and Standards adopted by the Department of Veterans Affairs is attached in Appendix B.

**I. Normal Operation / Construction Hours:** Construction operations at the James A. Haley VA Hospital are 7:30 AM to 4:30 PM, Monday through Friday, with the exception of Federal Holidays. Requests to work beyond normal work hours shall be submitted in writing to the COR for approval and will include a description of work to be performed. Approval is subject to availability of the COR, type of work to be performed, and the specific hours requested. Contractors are reminded that patients are generally asleep after 10:00 PM. Approval to work beyond this time will also include an evaluation of the anticipated noise level generated by the contractor. Under no circumstances will the contractor proceed without express, written approval of the COR.



**1.3 STATEMENT OF BID ITEM(S)**

- A. ITEM I, GENERAL CONSTRUCTION: Work includes Tree removal, earthwork for new retention pond, grading for crushed concrete driving lanes and grass parking areas, concrete sidewalk paving and ramps, security fencing, electrical, storm drainage system and associated utilities. Work also includes certain other items required by the drawings and specifications. All work is to be completed in **245 calendar days**.

**OPTIONS:**

**OPTION NO. 1:** Remove CCTV work as shown on sheet ES201. Construction days remain **245 calendar days**.

**OPTION NO. 2:** Remove all emergency Blue Light Telephone work on sheet ES301. Construction days remain **245 calendar days**.

**OPTION NO. 3:** Remove lighting fixtures as shown on sheet ES101 and specified on sheet ES001. Construction days remain **245 calendar days**.

**OPTION NO. 4:** Remove all site lighting wiring and feeders, while all conduits remain. Construction days remain **245 calendar days**.

**1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. Drawings and contract documents may be obtained from the website where the solicitation is posted. Additional copies will be at Contractor's expense.

**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.

3. The General Contractor shall furnish to the COR and Contracting Officer lists of employees that will be or may be on the construction site(s). The List shall be on Company letter head that provides all of the company contact information, shall provide the project number and title, locations of work, names of the employees, their titles, their job types, and personal contact numbers (i.e. cell phone). All sub-contractors, vendors and suppliers for the project shall furnish the same listing on their individual company letter heads to the GC whom will provide the lists to the COR and Contracting Officer. These lists shall be updated as necessary during the entire duration of the project. These lists may be used to provide a check list record of personnel on-site each day to be provided with the contractors Daily Log reports. These lists may be used to provide a check list record of personnel on-site each day to be provided to the VA Police Department and their Dispatch Office where normal sign in and sign out occurs.

4. The General Contractor shall provide 2 ea Kaba Eplex E5731BWL-626-41, Electronic Pushbutton - Prox - Lock, IC "7 Pin 0 Bitted" BEST CORE. To be installed on the jobsite access doors. Locks are to be turned over to the COR upon completion of the project.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. (See hospital HPM 132-05) They may also be subject to inspection of their personal effects when entering or leaving the project site..
2. For working outside the "regular hours" as defined in the contract, the General Contractor shall provide a request for approval 21 calendar days prior to the requested date to the Contracting Officer Representative so that security //escort// arrangements// can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer.
4. 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.

C. N/A

D. Key Control:

1. The General Contractor shall make available as requested keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the COR for permanent installation. See Section 08 71 00, DOOR HARDWARE and coordinate.
3. Contractor may be issued keys for construction thru the COR as required.
4. All keys must be turned in at the end of the Contract.
5. Any key assigned to the contractor, which is lost or stolen will result in a replacement cost of \$100.00 per key either lost or stolen. Any key either lost or stolen shall be reported to the COR; it is the contractor's responsibility to inform the VA Police and give a detailed report about the key loss. The contractor shall take a copy of the official police report and make payment to the Agent Cashier before any additional replacement keys are made. Final payment may be withheld and/or reduced until keys are returned or accounted for. A copy of the police report and receipt of payment shall be provided to the VA COR.

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 upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.

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 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 at least 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.3. Contractor parking is allowed on the 6<sup>th</sup> floor of the parking garage or in the Freedom lot (location subject to change at any time during contract).

**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. 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 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, the buildings and utilities may be abandoned and need not be removed.

- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. 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 determined by the COR. The contractor shall keep all work areas, storage areas, staging areas, access areas and routes clean and neat. The contractor shall provide sufficient trash containers so that there is no debris lying around. The containers shall be emptied at least daily and trash disposed of by the contractor.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.
- G. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others.
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 Medical Center areas required to remain in operation.
  3. Where access by Medical Center 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.
- H. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire

protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR. All such actions shall be coordinated with the COR or Utility Company involved:

1. 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.

I. 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. Provide gates as required for access with necessary hardware, including hasps and padlocks. 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. Remove the fence when directed by COR.

J. 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.

K. Utilities Services: Maintain existing utility services for Medical Center 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, where directed by COR.

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 // COR // [Chief Engineer][Chief of Facilities Management]. 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, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COR, in writing, 21 calendar days in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption. Refer to Attachment 5A.
  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 Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
  4. Major interruptions (deemed by the COR) of any system must be requested, in writing, at least 30 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 COR. Such approval will be confirmed in writing as soon as practical. On the next business day, the contractor's daily log report shall explain the circumstances causing the emergency and the corrective actions taken.
  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.
- L. 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 unless otherwise directed by the COR.

- M. 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. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.
  3. Interruptions to these areas must be requested, in writing, at least twenty-one (21) calendar days prior to the desired time and shall be performed as directed by the COR.
- N. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- O. Coordination of Construction with Medical center Director: The activities at the Medical Center shall take precedence over construction activities. The Contractor must cooperate and coordinate with the Medical Center Director, through the COR, in arranging construction schedule to cause the least possible interference with Medical Center activities. Construction noise during the interment services shall not disturb the service. Trucks and workmen shall not pass through the service area during this period:
1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation adjacent to existing burial plots before these dates.
  2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition.



**1.7 ALTERATIONS - NOT USED****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 and/or in accordance with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT:

1. Reserved items which are to remain property of the Government are identified by attached tags or 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 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. During above ceiling work, the contractor will have to clear rooms, protect VA property/finishes and move furnishings as necessary to protect the area and items from dust and debris, in the performance of the work above the ceiling.
  - 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 CRR 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 as directed by the Contracting Officer Representative.
- 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 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.
- D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge

Elimination System (NPDES) 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 make the permit application available at the (appropriate medical center) office. The apparent low bidder, 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;
- 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 otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. 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 - NOT USED**

#### **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. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer Representative 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 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 lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations

established for roads and parking areas 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. 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 COR.
- E. Upon completion of the work, the Contractor shall furnish the COR one electronic copy and reproducible drawings at the scale of the contract drawings, showing the finished grade on the grid developed for constructing the work, including burial monuments and fifty foot stationing along new road centerlines. These drawings shall bear the seal of the registered land surveyor or registered civil engineer.
- 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 review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings in the electronic version (scanned PDF) to the COR [Chief Engineer][Chief of Facilities Management] 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 shop drawings.

#### **1.15 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center 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 - NOT USED**

#### **1.18 TEMPORARY USE OF EXISTING ELEVATORS - NOT USED**

#### **1.19 TEMPORARY USE OF NEW ELEVATORS - NOT USED**

#### **1.20 TEMPORARY TOILETS**

- A. Provide where directed, (for use of all Contractor's workmen) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by COR, provide suitable dry closets where directed. Keep such places clean and free from flies, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean.

#### **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 amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to

the Government. The Contractor shall carefully conserve any utilities furnished without charge.

- B. The Contractor, at Contractor's expense and in a workmanlike manner, in compliance with code and as satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. 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 install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
  - D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
    - 1. Obtain heat by connecting to Medical Center heating distribution system.
  - F. Water (for Construction and Testing): Furnish temporary water service.
    - 1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection as per code. Water 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 discretion) of use of water from Medical Center's system.
- 1.22 NEW TELEPHONE EQUIPMENT - NOT USED**
- 1.23 TESTS - NOT USED**
- 1.24 INSTRUCTIONS - NOT USED**
- 1.25 GOVERNMENT-FURNISHED PROPERTY - NOT USED**
- 1.26 RELOCATED EQUIPMENT ITEMS - NOT USED**
- 1.27 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT - NOT USED**

**1.28 CONSTRUCTION SIGN**

- A. Provide 48"x36" aluminum frame enclosed bulletin board (similar to Global Industrial item#WC695482) for project information to be displayed next to main entrance to construction site. Top row, from left to right should be as follows:
  - 1. Project Information and Contact List (Supplied by COR)
  - 2. Infection Control Risk Assessment (ICRA)
  - 3. Interim Life Safety Measures (ILSM)
  - 4. Shutdowns/Alerts/Burn Permits (newest to oldest)
- B. Provide a Construction Sign where directed by the COR. All wood members shall be of framing lumber. Cover sign frame with 0.7 mm (24 gage) galvanized sheet steel nailed securely around edges and on all bearings. Provide three 100 by 100 mm (4 inch by 4 inch) posts (or equivalent round posts) set 1200 mm (four feet) into ground. Set bottom of sign level at 900 mm (three feet) above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with 50 x 100 mm (two by four inch) material as directed.
- C. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- D. Maintain sign and remove it when directed by the COR.
- E. Detail Drawing of construction sign showing required legend and other characteristics of sign is attached hereto and made a part of this specification.

**1.29 SAFETY SIGN**

- A. Provide a Safety Sign where directed by COR. Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.
- B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with ;gloss paint of colors noted.
- C. Maintain sign and remove it when directed by COR.
- D. Standard Detail Drawing Number SD10000-02(Found on VA TIL) of safety sign showing required legend and other characteristics of sign is attached hereto and is made a part of this specification.
- E. Post the number of accident free days on a daily basis.



**1.30 PHOTOGRAPHIC DOCUMENTATION**

A. During the construction period through completion, provide photographic documentation 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.

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.
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.
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.
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 photopath.
  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 COR.
  17. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by 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 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-Built's 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 - NOT USED**

**1.32 HISTORIC PRESERVATION**

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.

**1.33 NOT USED**

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**SECTION 01 32 16**  
**PROJECT SCHEDULES (GREATER THAN \$100,000)**

**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 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 will be utilized to satisfy both time and cost applications. All schedule data and reports required under this specification section shall be based upon regular total float, not relative total float schedules.

**1.2 CONTRACTOR'S REPRESENTATIVE:**

- A. The Contractor shall designate an authorized representative in the firm who will be responsible for the preparation of the Project Schedule, review and report progress of the project with and to the Contracting Officer's representative.
- 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 and such authority shall not be interrupted throughout the duration of the project.
- 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.

**1.3 COMPUTER PRODUCED SCHEDULES**

- A. The contractor shall provide to the VA monthly computer processing of 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 Microsoft Project 2007 to the contracting officer's representative; a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data in Microsoft Project 2007 compatible format; and the resulting monthly updated schedule in an electronic file in Microsoft Project 2007. These must be submitted with and substantively support the contractor's monthly payment request and the signed lookahead report. The COTR shall identify the five different

report formats that the contractor shall provide based upon the monthly schedule updates.

- B. The contractor is responsible for the correctness and timeliness of the computer-produced reports. The Contractor is 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 shall report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor will reprocess the computer-produced reports, when requested by the Contracting Officer's representative to correct errors which affect the payment and schedule for the project.

#### **1.4 THE COMPLETE PROJECT SCHEDULE SUBMITTAL**

- A. Within 30 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer and COTR's review; three copies of the complete Project Schedule on sheets of paper 279 x 432 mm (11 x 17 inches) and an electronic file in Microsoft Project 2007. 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, duration, predecessor and successor relationships, trade code, area code, description, 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 and start-to-start, only, 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 Project Schedule. 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 network diagram shall reflect the Contractor's approach to scheduling the complete project. The final network diagram 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 Contractors as bid

schedule. These changes/delays shall be entered at the first update after the final network diagram 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.

- B. Within 15 calendar days after receipt of the complete 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 7 calendar days after the joint review, the Contractor shall revise and shall submit three 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.

#### **1.5 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 test, balance and adjust various systems.
- C. The Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required, 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 ASBESTOS ABATEMENT. The sum of asbestos abatement work activity/event costs shall equal the value of the asbestos bid item in the Contractors' bid.
- E. The Contractor shall cost load work activities/events for all BID ITEMS. The sum of the cost loading for each bid item work activities/events shall equal the value of the item in the Contractors' bid.
- F. Work activities/events for Contractor bond shall have a trade code and area code of BOND.

#### **1.6 PROJECT SCHEDULE REQUIREMENTS**

- A. Show on the project schedule the sequence and interdependence of work activities/events required for complete performance of all items of work. In preparing the network diagram, the Contractor shall:
  - 1. Show the following on each work activity/event:
    - a. Activity/Event ID number.
    - b. Concise description of the work represented by the activity/event. (35 characters or less including spaces preferred).
    - c. Performance responsibility or trade code (five alpha characters or less): GEN, MECH, ELEC, CARP, PLAST, or other acceptable abbreviations.
    - d. Duration (in work days.)
    - e. Cost
    - f. Work location (five characters or less), descriptive of the area involved.
    - g. Manpower required (average number of men per day).
  - 2. 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 Medical Center 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. Schedule these activities/events so that only one phase is scheduled for completion within the same 30 consecutive calendar day period (except for those phases immediately preceding the final acceptance). Maintain this scheduling condition throughout the length of the contract unless waived by the Contracting Officer's representative in writing.

- f. Work activities/events for the asbestos abatement bid item shall have a trade code of ASB.
- g. Bid items other than the Base Bid (ITEM 1) and Asbestos Abatement item shall have trade codes corresponding to the appropriate bid item number (e.g., ITM 3, ITM 4 and other items).
- 3. 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.
- 4. Break up the work into activities/events of duration no longer than 20 work days each, 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 Contracting Officer may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals shall not be less than 20 work days. The construction time as determined by the CPM schedule from early start to late finish for any sub-phase, phase or the entire project shall not exceed the contract time(s) specified or shown.
- 5. 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.
- 6. Uniquely number each activity/event with numbers ranging from 1 to 99998 only.
- B. Submit the following supporting data in addition to the activity/event ID schedule and electronic file (s). Failure of the Contractor to include this data will delay the review of the submittal until the Contracting Officer is in receipt of the missing data:
  - 1. The proposed number of working days per week.
  - 2. The holidays to be observed during the life of the contract (by day, month, and year).
  - 3. The planned number of shifts per day.

4. The number of hours per shift.
  5. List the major construction equipment to be used on the site, describing how each piece relates to and will be used in support of the submitted work activities/events.
  6. Provide a typed, doubled spaced, description, at least one page in length, of the plan and your approach to constructing the project.
- 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 Contracting Officer. 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 Contracting Officer's approval of the Project Schedule.
- D. 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 Microsoft Project 2007, PDM produced schedule, reflecting all the activities/events of the complete project network diagram being submitted.

#### **1.7 PAYMENT TO THE CONTRACTOR:**

- A. Monthly, the contractor shall submit the certificate for payment reflecting updated schedule activities and cost. The Contractor is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated computer-produced calendar-dated schedule unless, in special situations, the Contracting Officer permits an exception to this requirement. Monthly payment requests shall include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of Microsoft Project 2007 to the contracting officer's representative; a listing of all project schedule changes, and associated data, made at the update; and an electronic file (s) of the resulting monthly updated schedule in a compressed Microsoft Project 2007 format. These must be submitted with and substantively support the contractor's monthly application and certificate for payment request documents.
- B. When the Contractor fails or refuses to furnish to the Contracting Officer the information and the associated updated Microsoft Project 2007 schedule in electronic format, which, in the sole judgment of the Contracting Officer, is necessary for processing the monthly progress payment, the Contractor shall not be deemed to have provided an estimate and supporting schedule data upon which progress payment may be made.

#### 1.8 PAYMENT AND PROGRESS REPORTING

- A. Monthly job site progress meetings may be held on dates mutually agreed to by the Contracting Officer (or Contracting Officer's representative) and the Contractor. Contractor and the CPM consultant should be required to attend all monthly progress meetings. Presence of Subcontractors during progress meeting is optional unless required by the Contracting Officer (or Contracting Officer's representative). The Contractor shall update the project schedule and all other data required by this section shall be accurately filled in and completed prior to the monthly progress meeting. The Contractor shall provide this information to the Contracting Officer or the VA representative in completed form three work days in advance of the progress meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
  2. Remaining duration, required to complete 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 network diagram and computer-produced schedules.
  4. Percentage for completed and partially completed activities/events.
  5. Logic and duration revisions required by this section of the specifications.
  6. Activity/event duration and percent complete shall be updated independently.
- B. The Contractor shall submit a narrative report as a part of his monthly review and update, in a form agreed upon by the Contractor and the Contracting Officer. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed. This report is in addition to the daily reports required elsewhere.
- C. After completion of the joint review and the Contracting Officer's approval of all entries, the contractor will generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports.
- D. After completing the monthly schedule update, the contractor's scheduling specialist 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 specialist shall use the schedule logic and/or durations provided and approved by the COTR. 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 project schedule is approved, the contractor must recreate all manual progress payment updates on this approved project schedule 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.**

- E. After VA acceptance and approval of the Project Schedule, and after each monthly update, the contractor shall submit to the Contracting Officer three copies of a revised Project Schedule showing all completed and partially completed activities/events, contract changes and logic changes made on the intervening updates or at the first update.
- F. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Specialist, COTR, and all subcontractors needed, as determined by the Contracting Officer, 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.

#### **1.9 RESPONSIBILITY FOR COMPLETION**

- A. Whenever it becomes apparent from the current monthly progress review meeting or the monthly computer-produced calendar-dated 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 Contracting Officer for the proposed schedule changes. If such actions are approved, the CPM revisions shall be incorporated by the Contractor into the project schedule before the next update, at no additional cost to the Government.

#### **1.10 CHANGES TO THE SCHEDULE**

- A. Within 30 calendar days after VA acceptance and approval of any updated computer-produced schedule, the Contractor will submit a revised network diagram, the associated diskette(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, indicate an extension of the project completion by 20 working days or 10 percent of the remaining project duration, whichever is less. Such delays 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 of the network diagram 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 Medical Center, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, must be furnished in writing to the Contracting Officer for approval.

- C. Contracting Officer's approval for the revised network diagram 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, 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.

#### **1.11 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 Contracting Officer 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, 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 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.

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**SECTION 01 33 23**  
**SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

**PART 1 - GENERAL**

- 1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and SPECIAL NOTES (VAAR 852.236-91).
- 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, 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.
- 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 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/or 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 therefore 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).

- 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 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 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 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. 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.

- D. Approved samples will be kept on file by the Resident Engineer 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.
- E. 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 121 mm by 127 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 At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Resident Engineer.
- 1.11 Samples for approval shall be sent to Architect-Engineer, in care of Resident Engineer, VA Medical Center,

James A. Haley, VA Medical Center  
Engineering Service  
13000 Bruce B, Downs Boulevard

Tampa, Florida 33612

(Architect-Engineer)

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(P.O. Address)

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(City, State and Zip Code)

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**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)

811 Vermont Avenue, NW - Room 462

Washington, DC 20420

Telephone Number: (202) 565-5214

Between 9:00 AM - 3:00 PM

Or can be found on line at [http://wbdg.org/ccb/browse\\_lib.php?l=02](http://wbdg.org/ccb/browse_lib.php?l=02)

**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. <a href="http://www.aluminum.org">http://www.aluminum.org</a>
AABC	Associated Air Balance Council <a href="http://www.aabchq.com">http://www.aabchq.com</a>
AAMA	American Architectural Manufacturer's Association <a href="http://www.aamanet.org">http://www.aamanet.org</a>
AAN	American Nursery and Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
AASHTO	American Association of State Highway and Transportation Officials <a href="http://www.aashto.org">http://www.aashto.org</a>
AATCC	American Association of Textile Chemists and Colorists <a href="http://www.aatcc.org">http://www.aatcc.org</a>
ACGIH	American Conference of Governmental Industrial Hygienists <a href="http://www.acgih.org">http://www.acgih.org</a>
ACI	American Concrete Institute <a href="http://www.aci-int.net">http://www.aci-int.net</a>
ACPA	American Concrete Pipe Association <a href="http://www.concrete-pipe.org">http://www.concrete-pipe.org</a>
ACPPA	American Concrete Pressure Pipe Association <a href="http://www.acppa.org">http://www.acppa.org</a>
ADC	Air Diffusion Council <a href="http://flexibleduct.org">http://flexibleduct.org</a>
AGA	American Gas Association <a href="http://www.aga.org">http://www.aga.org</a>
AGC	Associated General Contractors of America <a href="http://www.agc.org">http://www.agc.org</a>
AGMA	American Gear Manufacturers Association, Inc. <a href="http://www.agma.org">http://www.agma.org</a>
AHAM	Association of Home Appliance Manufacturers <a href="http://www.aham.org">http://www.aham.org</a>
AISC	American Institute of Steel Construction <a href="http://www.aisc.org">http://www.aisc.org</a>
AISI	American Iron and Steel Institute <a href="http://www.steel.org">http://www.steel.org</a>

AITC	American Institute of Timber Construction <a href="http://www.aitc-glulam.org">http://www.aitc-glulam.org</a>
AMCA	Air Movement and Control Association, Inc. <a href="http://www.amca.org">http://www.amca.org</a>
ANLA	American Nursery & Landscape Association <a href="http://www.anla.org">http://www.anla.org</a>
ANSI	American National Standards Institute, Inc. <a href="http://www.ansi.org">http://www.ansi.org</a>
APA	The Engineered Wood Association <a href="http://www.apawood.org">http://www.apawood.org</a>
ARI	Air-Conditioning and Refrigeration Institute <a href="http://www.ari.org">http://www.ari.org</a>
ASAE	American Society of Agricultural Engineers <a href="http://www.asae.org">http://www.asae.org</a>
ASCE	American Society of Civil Engineers <a href="http://www.asce.org">http://www.asce.org</a>
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers <a href="http://www.ashrae.org">http://www.ashrae.org</a>
ASME	American Society of Mechanical Engineers <a href="http://www.asme.org">http://www.asme.org</a>
ASSE	American Society of Sanitary Engineering <a href="http://www.asse-plumbing.org">http://www.asse-plumbing.org</a>
ASTM	American Society for Testing and Materials <a href="http://www.astm.org">http://www.astm.org</a>
AWI	Architectural Woodwork Institute <a href="http://www.awinet.org">http://www.awinet.org</a>
AWS	American Welding Society <a href="http://www.aws.org">http://www.aws.org</a>
AWWA	American Water Works Association <a href="http://www.awwa.org">http://www.awwa.org</a>
BHMA	Builders Hardware Manufacturers Association <a href="http://www.buildershardware.com">http://www.buildershardware.com</a>
BIA	Brick Institute of America <a href="http://www.bia.org">http://www.bia.org</a>
CAGI	Compressed Air and Gas Institute <a href="http://www.cagi.org">http://www.cagi.org</a>
CGA	Compressed Gas Association, Inc. <a href="http://www.cganet.com">http://www.cganet.com</a>

CI	The Chlorine Institute, Inc. <a href="http://www.chlorineinstitute.org">http://www.chlorineinstitute.org</a>
CISCA	Ceilings and Interior Systems Construction Association <a href="http://www.cisca.org">http://www.cisca.org</a>
CISPI	Cast Iron Soil Pipe Institute <a href="http://www.cispi.org">http://www.cispi.org</a>
CLFMI	Chain Link Fence Manufacturers Institute <a href="http://www.chainlinkinfo.org">http://www.chainlinkinfo.org</a>
CPMB	Concrete Plant Manufacturers Bureau <a href="http://www.cpmc.org">http://www.cpmc.org</a>
CRA	California Redwood Association <a href="http://www.calredwood.org">http://www.calredwood.org</a>
CRSI	Concrete Reinforcing Steel Institute <a href="http://www.crsi.org">http://www.crsi.org</a>
CTI	Cooling Technology Institute <a href="http://www.cti.org">http://www.cti.org</a>
DHI	Door and Hardware Institute <a href="http://www.dhi.org">http://www.dhi.org</a>
EGSA	Electrical Generating Systems Association <a href="http://www.egsa.org">http://www.egsa.org</a>
EEI	Edison Electric Institute <a href="http://www.eei.org">http://www.eei.org</a>
EPA	Environmental Protection Agency <a href="http://www.epa.gov">http://www.epa.gov</a>
ETL	ETL Testing Laboratories, Inc. <a href="http://www.etl.com">http://www.etl.com</a>
FAA	Federal Aviation Administration <a href="http://www.faa.gov">http://www.faa.gov</a>
FCC	Federal Communications Commission <a href="http://www.fcc.gov">http://www.fcc.gov</a>
FPS	The Forest Products Society <a href="http://www.forestprod.org">http://www.forestprod.org</a>
GANA	Glass Association of North America <a href="http://www.cssinfo.com/info/gana.html/">http://www.cssinfo.com/info/gana.html/</a>
FM	Factory Mutual Insurance <a href="http://www.fmglobal.com">http://www.fmglobal.com</a>
GA	Gypsum Association <a href="http://www.gypsum.org">http://www.gypsum.org</a>

GSA	General Services Administration <a href="http://www.gsa.gov">http://www.gsa.gov</a>
HI	Hydraulic Institute <a href="http://www.pumps.org">http://www.pumps.org</a>
HPVA	Hardwood Plywood & Veneer Association <a href="http://www.hpva.org">http://www.hpva.org</a>
ICBO	International Conference of Building Officials <a href="http://www.icbo.org">http://www.icbo.org</a>
ICEA	Insulated Cable Engineers Association Inc. <a href="http://www.icea.net">http://www.icea.net</a>
ICAC	Institute of Clean Air Companies <a href="http://www.icac.com">http://www.icac.com</a>
IEEE	Institute of Electrical and Electronics Engineers <a href="http://www.ieee.org/">http://www.ieee.org/</a>
IMSA	International Municipal Signal Association <a href="http://www.imsasafety.org">http://www.imsasafety.org</a>
IPCEA	Insulated Power Cable Engineers Association
NBMA	Metal Buildings Manufacturers Association <a href="http://www.mbma.com">http://www.mbma.com</a>
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. <a href="http://www.mss-hq.com">http://www.mss-hq.com</a>
NAAMM	National Association of Architectural Metal Manufacturers <a href="http://www.naamm.org">http://www.naamm.org</a>
NAPHCC	Plumbing-Heating-Cooling Contractors Association <a href="http://www.phccweb.org.org">http://www.phccweb.org.org</a>
NBS	National Bureau of Standards See - NIST
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors <a href="http://www.nationboard.org">http://www.nationboard.org</a>
NEC	National Electric Code See - NFPA National Fire Protection Association
NEMA	National Electrical Manufacturers Association <a href="http://www.nema.org">http://www.nema.org</a>
NFPA	National Fire Protection Association <a href="http://www.nfpa.org">http://www.nfpa.org</a>
NHLA	National Hardwood Lumber Association <a href="http://www.natlhardwood.org">http://www.natlhardwood.org</a>



NIH	National Institute of Health <a href="http://www.nih.gov">http://www.nih.gov</a>
NIST	National Institute of Standards and Technology <a href="http://www.nist.gov">http://www.nist.gov</a>
NLMA	Northeastern Lumber Manufacturers Association, Inc. <a href="http://www.nelma.org">http://www.nelma.org</a>
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879 (301) 670-0604
NSF	National Sanitation Foundation <a href="http://www.nsf.org">http://www.nsf.org</a>
NWDA	Window and Door Manufacturers Association <a href="http://www.nwwda.org">http://www.nwwda.org</a>
OSHA	Occupational Safety and Health Administration Department of Labor <a href="http://www.osha.gov">http://www.osha.gov</a>
PCA	Portland Cement Association <a href="http://www.portcement.org">http://www.portcement.org</a>
PCI	Precast Prestressed Concrete Institute <a href="http://www.pci.org">http://www.pci.org</a>
PPI	The Plastic Pipe Institute <a href="http://www.plasticpipe.org">http://www.plasticpipe.org</a>
PEI	Porcelain Enamel Institute, Inc. <a href="http://www.porcelainenamel.com">http://www.porcelainenamel.com</a>
PTI	Post-Tensioning Institute <a href="http://www.post-tensioning.org">http://www.post-tensioning.org</a>
RFCI	The Resilient Floor Covering Institute <a href="http://www.rfci.com">http://www.rfci.com</a>
RIS	Redwood Inspection Service See - CRA
RMA	Rubber Manufacturers Association, Inc. <a href="http://www.rma.org">http://www.rma.org</a>
SCMA	Southern Cypress Manufacturers Association <a href="http://www.cypressinfo.org">http://www.cypressinfo.org</a>
SDI	Steel Door Institute <a href="http://www.steeldoor.org">http://www.steeldoor.org</a>
IGMA	Insulating Glass Manufacturers Alliance <a href="http://www.igmaonline.org">http://www.igmaonline.org</a>

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:**

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by the 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):
  - T27-06.....Sieve Analysis of Fine and Coarse Aggregates
  - T96-02 (R2006).....Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
  - T99-01 (R2004).....The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
  - T104-99 (R2003).....Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
  - T180-01 (R2004).....Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
  - T191-02(R2006).....Density of Soil In-Place by the Sand-Cone Method
- C. American Concrete Institute (ACI):
  - 506.4R-94 (R2004).....Guide for the Evaluation of Shotcrete
- D. American Society for Testing and Materials (ASTM):
  - A325-07a.....Structural Bolts, Steel, Heat Treated, 120 ksi Minimum Tensile Strength
  - A370-08a.....Definitions for Mechanical Testing of Steel Products
  - A416/A416M-06.....Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

James A. Haley VA Hospital  
Juliet Land Acquisition - Paving Design

Project No. 673-502

A490-08a.....Heat Treated Steel Structural Bolts, 150 ksi  
Minimum Tensile Strength

C31/C31M-08a.....Making and Curing Concrete Test Specimens in  
the Field

C33-07.....Concrete Aggregates

C39/C39M-05e2.....Compressive Strength of Cylindrical Concrete  
Specimens

C109/C109M-07e1.....Compressive Strength of Hydraulic Cement  
Mortars

C138-08.....Unit Weight, Yield, and Air Content  
(Gravimetric) of Concrete

C140-08.....Sampling and Testing Concrete Masonry Units and  
Related Units

C143/C143M-08.....Slump of Hydraulic Cement Concrete

C172-08.....Sampling Freshly Mixed Concrete

C173-08.....Air Content of freshly Mixed Concrete by the  
Volumetric Method

C330-05.....Lightweight Aggregates for Structural Concrete

C567-05a.....Density Structural Lightweight Concrete

C780-08.....Pre-construction and Construction Evaluation of  
Mortars for Plain and Reinforced Unit Masonry

C1019-08.....Sampling and Testing Grout

C1064/C1064M-08.....Freshly Mixed Portland Cement Concrete

C1077-07a.....Laboratories Testing Concrete and Concrete  
Aggregates for Use in Construction and Criteria  
for Laboratory Evaluation

C1314-07.....Compressive Strength of Masonry Prisms

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

D1143-07.....Piles Under Static Axial Compressive Load

D1188-07.....Bulk Specific Gravity and Density of Compacted  
Bituminous Mixtures Using Paraffin-Coated  
Specimens

D1556-07.....Density and Unit Weight of Soil in Place by the  
Sand-Cone Method

D1557-07.....Laboratory Compaction Characteristics of Soil  
Using Modified Effort

James A. Haley VA Hospital  
Juliet Land Acquisition - Paving Design

Project No. 673-502

D2166-06.....	Unconfined Compressive Strength of Cohesive Soil
D2167-08.....	Density and Unit Weight of Soil in Place by the Rubber Balloon Method
D2216-05.....	Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D6938-08a.....	Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974-07a.....	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-07ael.....	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-08.....	Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
E94-04.....	Radiographic Testing
E164-08.....	Ultrasonic Contact Examination of Weldments
E329-08.....	Agencies Engaged in Construction Inspection and/or Testing
E543-08a.....	Agencies Performing Non-Destructive Testing
E605-93(2006).....	Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
E709(2008).....	Guide for Magnetic Particle Examination
E1155-96(R2008).....	Determining FF Floor Flatness and FL Floor Levelness Numbers

E. American Welding Society (AWS):

D1.1-08.....	Structural Welding Code-Steel
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**1.3 REQUIREMENTS:**

- A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor, must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the Contracting Officer a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has

started, and submit to the Contracting Officer for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.

1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
  2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
  3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D3666.
  4. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.
  5. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
  6. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543.
  7. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.
- B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Resident Engineer. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Resident Engineer to such failure.
- C. Written Reports: Testing laboratory shall submit test reports to Resident Engineer, Contractor, and Local Building Authority within 24 hours after each test is completed unless other arrangements are agreed to in writing by the Resident Engineer. Submit reports of tests that fail to meet construction contract requirements on colored paper.
- D. Verbal Reports: Give verbal notification to Resident Engineer immediately of any irregularity.
- E. Test Standards: The Contractor shall include a lump sum allowance of \$5000 for furnishing published standards (ASTM, AASHTO, ACI, ANSI, AWS, ASHRAE, UL, etc.) referred to or specifically referenced which are pertinent to any Sections of these specifications. Furnish one set of standards in single copies or bound volumes to the Resident Engineer

within 60 days. Photocopies are not acceptable. Billings for the standards furnished shall be at the net cost to Testing Laboratory. A preliminary list of test standards, with the estimated costs, shall be submitted to the Resident Engineer for review before any publications of reference standards are ordered.

**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 Resident Engineer regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to Resident Engineer 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 and/or ASTM D1557.
  2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556 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 Resident Engineer before the tests are conducted.

- a. Building Slab Subgrade: At least one test of subgrade for every 186 m<sup>2</sup> (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 186 m<sup>2</sup> (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
  - b. .
  - c. Pavement Subgrade: One test for each 334 m<sup>2</sup> (400 square yards), but in no case fewer than two tests.
  - d. Curb, Gutter, and Sidewalk: One test for each 91 m (300 feet), but in no case fewer than two tests.
  - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1219 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 Resident Engineer. 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. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.
- D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Resident Engineer.

#### **3.4 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 Resident Engineer.



### **3.5 ASPHALT CONCRETE PAVING:**

#### **A. Aggregate Base Course:**

1. Determine maximum density and optimum moisture content for aggregate base material in accordance with AASHTO T180, Method D
2. Make a minimum of three field density tests on each day's final compaction on each aggregate course in accordance with AASHTO T191
3. 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.

### **3.6 SITE WORK CONCRETE:**

Test site work concrete including materials for concrete as required in Article 3.8, CONCRETE, of this section.

### **3.8 CONCRETE:**

#### **A. Batch Plant Inspection and Materials Testing:**

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Resident Engineer with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Resident Engineer.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
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 38 m<sup>3</sup> (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. Resident Engineer 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 19 m<sup>3</sup> (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 76 m<sup>3</sup> (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 floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
    - c. Provide the Contractor and the Resident Engineer 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.
- 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 Resident Engineer. 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 Resident Engineer. 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  $\text{kg/m}^3$  (pounds per cubic feet).
    - 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.

**3.9 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.
- D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

**3.13 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 51 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 232 m<sup>2</sup> (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 465 m<sup>2</sup> (5000 square feet) of wall area.

D. Prism Tests: For each type of wall construction indicated, test masonry prisms per ASTM C1314 for each 465 m<sup>2</sup> (5000 square feet) of wall area. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

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**SECTION 01 57 19**  
**TEMPORARY ENVIRONMENTAL CONTROLS**

**1.1 DESCRIPTION:**

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
  - 1. Adversely affect human health or welfare,
  - 2. Unfavorably alter ecological balances of importance to human life,
  - 3. Effect other species of importance to humankind, or;
  - 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
  - 1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
  - 2. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.
  - 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
  - 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
  - 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
  - 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.

7. Sanitary Wastes:

- a. Sewage: Domestic sanitary sewage and human and animal waste.
- b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

**1.2 QUALITY CONTROL:**

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

**1.3 REFERENCES:**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):  
33 CFR 328.....Definitions

**1.4 SUBMITTALS:**

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
  - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Resident Engineer to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the Resident Engineer and the Contracting Officer for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
    - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
    - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
    - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
    - d. Description of the Contractor's environmental protection personnel training program.

- e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
  - f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
  - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
  - h. Permits, licenses, and the location of the solid waste disposal area.
  - i. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
  - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
  - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

#### **1.5 PROTECTION OF ENVIRONMENTAL RESOURCES:**

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.



- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
  2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
    - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
    - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
    - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
  3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
  4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
    - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local ( 1 year) storm. After each storm, pump the

- basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
- b. Reuse or conserve the collected topsoil sediment as directed by the Resident Engineer. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
  - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features on the Environmental Protection Plan. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
  6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
  7. Manage and control spoil areas on Government property to limit spoil to areas shown on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
  8. Protect adjacent areas from despoilment by temporary excavations and embankments.
  9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
  10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
  11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.

- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
  2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
  3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- E. 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 Florida DEP 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.
- F. 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 6:00 P.M. unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
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, STATIONARY	80	PNEUMATIC TOOLS	80

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 55 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 914 to 1829 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.
- G. 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.
- H. 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.

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**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).
  - 3. Clean dimensional wood and palette wood.
  - 4. Green waste (biodegradable landscaping materials).
  - 5. Engineered wood products (plywood, particle board and I-joists, etc).
  - 6. Metal products (eg, steel, wire, beverage containers, etc).
  - 7. Cardboard, paper and packaging.
  - 8. Bitumen roofing materials.
  - 9. Plastics (eg, ABS, PVC).
  - 10. Carpet and/or pad.
  - 11. Gypsum board.
  - 12. Insulation.
  - 13. Paint.

**1.2 RELATED WORK**

- A. Section 02 41 00, DEMOLITION.
- B. Section 01 00 00, GENERAL REQUIREMENTS.
- C. Lead Paint: Section 02 83 33.13, LEAD BASED PAINT REMOVAL AND DISPOSAL.

### 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 reuse and recycle new materials to a minimum of 50 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> 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, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the Resident Engineer 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, and 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. Submit copy of waste removal license for Hillsborough County.
  - c. 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.
  - d. The names and locations of mixed debris reuse and recycling facilities or sites.
  - e. The names and locations of trash disposal landfill facilities or sites.
  - f. 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**

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 Reference Guide and LEED 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

James A. Haley VA Hospital  
Juliet Land Acquisition - Paving Design  
Project No. 673-502

fees, manifests, invoices. Include the net total costs for each  
disposal.

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**SECTION 01 81 00**  
**COMMISSIONING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Commissioning Specification section outlines the commissioning process.
- B. Commissioning is a quality based process developed for the contractors use as a means of managing the quality of the installation, start-up, and operation of the building equipment and systems to ensure they perform according to the design intent and the Owner's Project Requirements (OPR) which are incorporated here by reference for informational purposes. The commissioning process shall encompass and coordinate the separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:
  - 1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations, the Owner's needs, and to industry accepted minimum standards and that they receive adequate operational checkout by installing Contractors.
  - 2. Verify and document proper and energy efficient performance of equipment and systems.
- C. The following disciplines will be commissioned:
  - 1. Plumbing & Medical Gas (Division 22)
  - 2. Mechanical and HVAC (Division 23)
  - 3. Security and Nurse Call (Division 27)
  - 4. Fire Alarm (Division 28)
- D. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning project. Commissioning is essentially a quality management process of observing and documenting that the equipment and systems operate and perform as intended.
- E. The commissioning testing shall be based upon the following reference standards: Building Commissioning Association ([www.bcxa.org](http://www.bcxa.org)); ASHRAE Guideline 1.1-2007, ASHRAE Guideline 0-2005, The Commissioning Process.

## 1.2 COMMISSIONING AUTHORITY

- A. The Commissioning Authority (CxA) services shall be provided by the Owner. The Division 1 and 23 Contractors are responsible to execute the commissioning process according to this specification section.
- B. The Commissioning Authority shall be GREAF Inc.

## 1.3 RESPONSIBILITY MATRIX

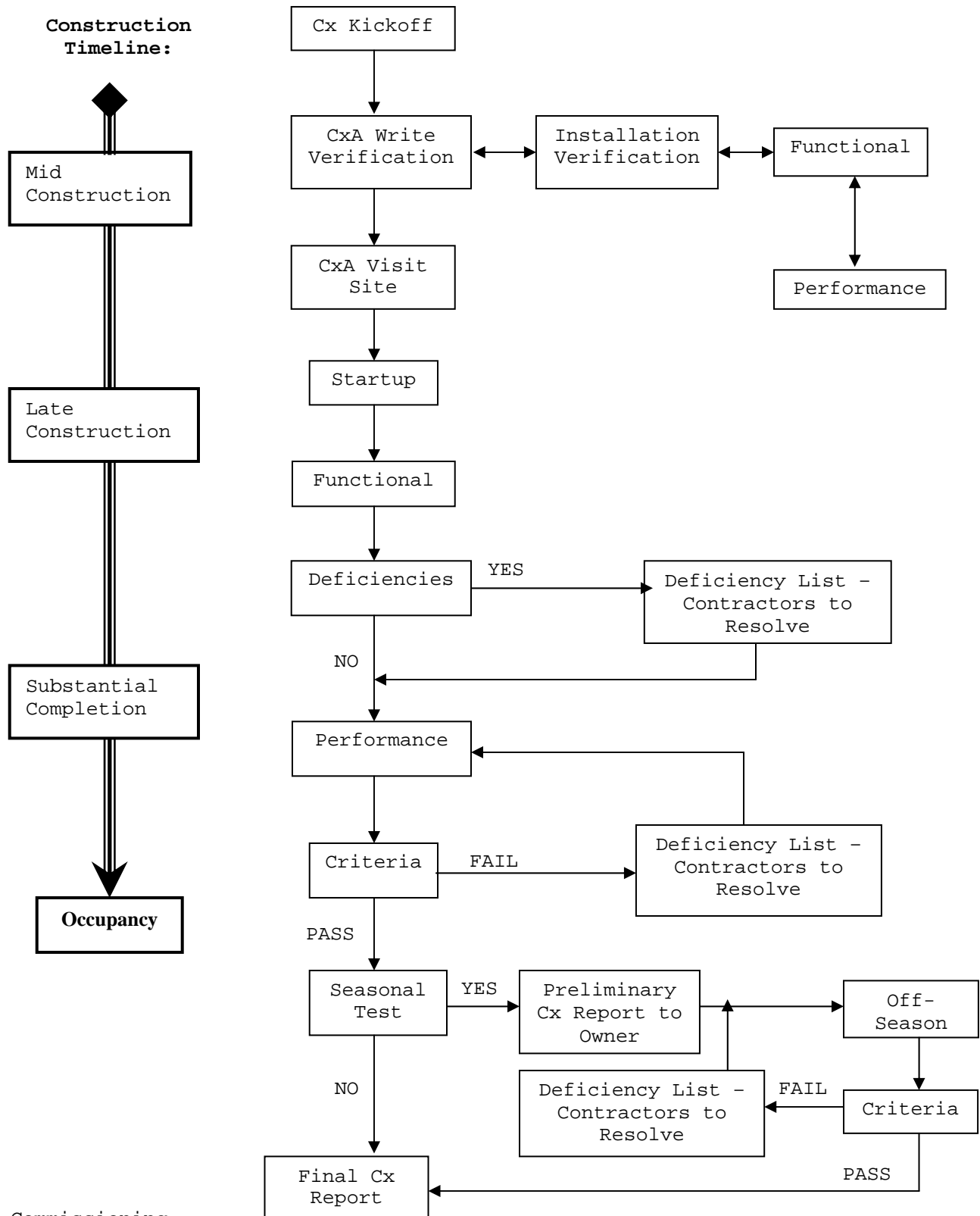
- A. The following responsibility matrix outlines the major tasks of the commissioning process and the parties responsible to carry out the tasks. In general the CxA writes the verification checklists and tests and then verifies that the contractors have executed the checklists and tests through sampling. The Contractors are responsible to execute the tests. The BAS Contractor is typically responsible for the majority of the Division 23 test execution. The shaded cells reflect the major effort for each task / action.

Task/Action	Responsibility					
	Cx Authority	Owner	CM/GC	Div. 22, 23, 27 & 28 Contr.	T&B Contr.	BAS Contr.
Cx Kickoff Meeting. -Early to mid construction phase.	Lead	Attend	Attend	Attend	Attend	Attend
Write Verification checklists, Functional and Performance tests.	Write					
Review and refine tests.	Refine		Review	Review	Review	Review
Cx Agent visit site to review progress.	Observe	Attend	Attend	Attend	Attend	Attend
Equipment Start-up				Perform		
Verification Checklists	Observe and sample		Verify completion	Execute	Execute	Execute
Functional Tests	Lead, Document	Observe	Schedule	Participate	Execute	Execute
Performance Tests	Lead, Document	Observe	Schedule	Participate	Execute	Execute
Deficiency List	Write		Verify completion	Correct	Correct	Correct
Final Cx Report	Write					

## 1.4 SCHEDULE

- A. The following is a general schedule in flowchart form of the commissioning process with milestones. The Cx Authority prepares the documentation for the Functional and Performance tests during the construction administration phase. The shop drawings are used during the write-ups. The Contractors should schedule the Functional Tests and Performance Tests after the Contractor has started up the equipment and

systems, and the TAB is completed. The Contractor should arrange for a BAS Contractor to be present to assist with the majority of the Functional and Performance Tests.





## 1.5 RESPONSIBILITIES

- A. The responsibilities of various parties in the commissioning process are provided in this section. Additional responsibilities of the Mechanical Contractor, TAB and Controls Contractor are included in Division 23. Their responsibilities are listed here to clarify the commissioning process.
- B. Architect and Engineer (A & E):
  - 1. Construction and Acceptance Phase:
    - a. Attend the commissioning scoping meeting and selected commissioning team meetings.
    - b. Perform normal submittal review, construction observation, as built drawing preparation, O&M manual preparation, etc., as contracted.
    - c. Coordinate resolution of system deficiencies identified during commissioning, according to the Contract Documents.
- C. Commissioning Authority (CxA):
  - 1. The CxA is not responsible for design concept, *design* criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem solving, non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor and the A&E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance that systems are functioning and performing in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, checkout, and test equipment and systems, including specified testing with portable data-loggers.
  - 2. Construction and Acceptance Phase:
    - a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
    - b. Revise the project's Commissioning Plan document.
    - c. Plan and conduct commissioning meetings.

- d. Request and review additional information required to perform commissioning tasks, including Contractor start-up and checkout procedures.
  - e. Before start-up, gather and review the current control sequences and interlocks and work with Contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
  - f. Review and approve normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the AJE reviews.
  - g. Write installation Construction Checklists and distribute to CM/GC.
  - h. Write and distribute Functional Tests and Performance Tests.
  - i. Compile and maintain, a Commissioning Book that contains all commissioning related activities:
    - 1) Cx field visits
    - 2) Cx deficiency lists
    - 3) Construction Checklists
    - 4) Functional Test forms
    - 5) Performance Test forms
    - 6) Final Report
  - j. Provide a final commissioning report.
- D. Construction Manager or General Contractor:
- 1. These commissioning requirements are located in specification Division 1 so that the CM and/or GC are responsible for the sub-contractors compliance with the specification requirements. The commissioning process outlined is an ASHRAE based method of quality management during the construction process. This method should be used to enhance the CM/GC's proprietary quality control procedures for managing the quality of sub-contractors work.
  - 2. Construction and Acceptance Phase:
    - a. Facilitate the coordination of the commissioning plan by the CxA and ensure that commissioning activities are being scheduled into the master project schedule.
    - b. Review the Commissioning Plan.
    - c. Review and distribute the checklists and test procedures submitted by the CxA.

- d. Coordinate the resolution of non-compliance deficiencies identified in all phases of commissioning with the various Contractors.
  - e. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
- E. Division 23 Contractor:
- 1. Include scope to complete commissioning requirements for mechanical systems in the contract price.
  - 2. Ensure cooperation and participation of specialty sub-Contractors.
  - 3. Coordinate the use of the equipment installation Construction Checklists.
  - 4. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
  - 5. Prepare schedule for mechanical and electrical system commissioning related activities. Include time in the project schedule for equipment start-up, Functional tests, and Performance tests. Include time for resolution of deficiencies found during Functional tests and Performance tests.
  - 6. Execute the Functional and Performance tests while the CxA witnesses and documents.
- F. Building Automation System (BAS) Contractor:
- 1. Include scope for commissioning requirements in the contract price. The BAS Contractor will execute most of the Division 23 Functional and Performance testing.
  - 2. Review the Functional Tests and Performance Tests developed by the CxA to ensure that control system points are in place to execute the tests. Recommend test revisions to streamline or improve the test procedures.
  - 3. Demonstrate BAS system performance to Commissioning Authority during the Functional and Performance tests including all modes of system operation and explanation/definition of variable names for each piece of equipment and each system.
  - 4. Provide controls system technician intimately familiar with the system for use during execution of the Functional and Performance testing.
- G. Test and Balance (TAB) Contractor:
- 1. Include scope for commissioning requirements in the contract price. The TAB Contractor will execute much of the Division 23 Functional

and Performance testing.

2. Review the Functional Tests and Performance Tests developed by the CxA to ensure that control system points are in place to execute the tests. Recommend test revisions to streamline or improve the test procedures.
3. Demonstrate HVAC system performance to Commissioning Authority during the Functional and Performance tests including all modes of system operation.
4. Provide all manpower, equipment, tools, and software necessary to perform the Functional and Performance Test to validate the Test and Balance Report.
5. Provide test and balance technician intimately familiar with the system for use during execution of the Functional and Performance testing.

#### **1.6 DEFINITIONS**

A. Abbreviations - The following are common abbreviations:

1. A/E - Architect and design engineers
2. CxA - Commissioning Authority
3. Cx - Commissioning
4. Cx Plan - Commissioning Plan document
5. FT - Functional Test
6. GC - General Contractor (Prime)
7. PT - Performance Test
8. TAB - Test and balance Contractor

B. Commissioning Authority (CxA) - The CxA directs and coordinates the commission activities.

C. Commissioning Plan - An overall project specific plan, developed by the CxA that provides the structure, schedule and coordination planning for the commissioning process.

D. Equipment Start-Up - Primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some start-up items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three-phase pump motor of a chiller system). Equipment Start-up checklists augment and are combined with the manufacturer's startup checklist. The CxA requires that the procedures be documented in writing and does not witness much of the

equipment start-up, except for larger or more critical pieces of equipment.

- E. Construction Checklist - An informational document used by the construction team to manage quality and monitor construction progress of equipment installation. The CxA develops a checklist for each piece of equipment or system to be commissioned. The format of the construction checklist is a pre-installation section, an installation section, and a start-up section. Each section contains important items and information that the contractor can use to ensure that the individuals performing the actual installation have a resource identifying important quality criteria. The installing individual is responsible to sign-off on certain sections of the verification checklist as the work is executed.
1. The CxA shall provide the CM/GC with the construction checklists for distribution to the Contractors. The CM/GC shall provide clear plastic sleeves for each construction checklist and secure the checklists to each piece of equipment with a chain or wire.
  2. The installing sub-contractor shall initial each task on the construction checklists as they are performed.
  3. The Division 1 and 23 contractors shall monitor and record the completion progression of the construction checklists on a weekly basis. The CxA will provide an Excel spreadsheet matrix to be used to track the progress of the installation via the construction checklists. The CM/GC shall submit a weekly construction checklist percent-completion spreadsheet for review by the CxA.
  4. The Contractors shall collect the construction checklists after they are completely filled out, and submit to the CxA.
- F. Functional Test (FT) - Tests of individual components of a system to make sure that the wiring, setpoints, and locations are acceptable. Most all independent pieces of equipment such as fan-coil units and pumps will have functional tests. The CxA develops the Functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing. The Functional Tests shall be executed by the installing contractors. The CxA shall use sampling techniques to verify the quality of the contractors testing by retesting randomly selected pieces of equipment. The FTs should be performed immediately after Equipment Start-up is complete.

- G. Performance Test (PT) - Tests of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Performance testing is the dynamic testing of systems (rather than just components) under a full range of operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The Commissioning Authority shall use sampling techniques to verify the quality of the contractors testing by retesting randomly selected pieces of equipment. The PTs should be performed immediately after the associated Functional Tests are completed.

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

**PART 3 - EXECUTION**

**3.1 COMMISSIONING PLAN**

- A. The CxA shall submit a preliminary Cx Plan to the construction team for review prior to 30% construction progress. The preliminary Cx Plan shall include the following:
1. Schedule.
  2. Equipment list for Construction Checklists.
  3. Equipment list for Functional Tests.
  4. System list for Performance Tests.
  5. Example of Functional Test and Performance Test.
- B. The purpose of a Commissioning Plan is to provide guide documentation for the commissioning process. The plan shall provide a clear and concise road map for the Contractors to ensure that the project construction, start-up, optimization, and closeout proceeds in an efficient and timely manner. The benefit to the Owner and Contractors is that when the commissioning process is complete, the systems will be working according to the design documents, and adjusted for optimum energy consumption. The commissioning documentation will provide validation of proper equipment system operation. The Commissioning Plan is a living document and will be updated by the Commissioning Authority as the project progresses.

- C. The Commissioning Authority is responsible for reviewing the design contract documents and developing procedures to test the functionality of the system components, as well as developing performance tests with pass/fail criteria.
- D. The Commissioning Authority will direct the Functional Tests and Performance Tests near the end of the project after the Contractors have started up and confirmed the proper operation the equipment and systems. There are two different types of commissioning tests - Functional Tests and Performance Tests. Before the overall system performance can be tested (Performance Test) it is necessary to ensure that each 'component' of the system be tested (Functional Test) to prove that it is set-up and adjusted to work within intended ranges. By performing the Functional Tests, the proper operation of each 'component' of the system is proven to work as intended. The subsequent Performance Test validates that the 'system' operates according to the design intent and is setup for minimum energy consumption.
- E. Before the Functional Tests and Performance Tests are performed, the Contractors must have completed equipment startup procedures, either on their own, or with the manufacturer's representative. The Contractors should try to get the systems performing to the best of their abilities before the formal commissioning Functional and Performance tests. Ideally, the Contractors would run through the Functional Tests and Performance Tests prior to witnessing by the CxA to ensure that the process runs smoothly.

### **3.2 VERIFICATION OF CHECKLISTS**

- A. Objectives and Scope. The objective of the Construction Checklist is to provide the installing sub-contractors with an informational guide document to assist with quality management during installation. The construction checklists can help the installing subcontractors perform the work properly the first time, avoiding costly re-work. The scope of the construction checklists includes three main sections: pre-installation, installation, and start-up.
- B. The purpose of the Construction Checklists is to help the installing contractors perform the work properly the first time, avoiding costly re-work. The pre-installation section would include items to verify weeks or days prior to installation to identify potential problems such as voltage, left/right access doors, physical size for coordination with concrete housekeeping pad , maintenance access, clearance in front

of electrical panels, etc. The installation section would include items to verify during the installation process such as clearance for maintenance, vibration isolation requirements, critical manufacturer's requirements, etc. The start-up section would include items related to operation of the equipment such as expected operating temperatures or pressures, lubrication, filtration, warranty concerns, control point expected values, etc.

- C. Development of Construction Checklists. Before the checklists are written, the CxA shall obtain project contract documentation, the approved submittals, and the O&M documentation. The CxA shall develop the construction checklists in a manner so they can be used as a quality tool by the installing sub-contractors. The construction checklists shall not merely be a copy of the manufacturer's information, but shall be a supplement to the manufacturer's requirements which includes information specific to this particular project.
- D. Construction Checklist Execution - The CxA shall provide the construction checklists to the CM/GC. The CM/GC shall provide a clear plastic sleeve for each construction checklist and secure the checklists to each piece of equipment with a chain or wire. The installing sub-contractor shall initial each task on the construction checklist as they are performed.
- E. Construction Checklist Tracking. The CM/GC shall use a spreadsheet furnished by the CxA to track the sub-contractors percent completion of the construction checklists. Initially the CM/GC shall submit a copy of the tracking spreadsheet (via email to the CxA) on a monthly basis. During the last three months of the project, the CM/GC shall submit the tracking spreadsheet on every other week.

### **3.3 EQUIPMENT START-UP**

- A. Equipment Start-Up checklists are completed by the Contractors to ensure equipment and systems are installed, tested, and fully operational prior to proceeding with Functional and Performance Testing. Each piece of equipment is required have a start-up form filled out by the Contractor. No sampling strategies are allowed. Proper equipment start-up must be successfully completed prior to Functional or Performance testing of that system.



- B. The Contractors can use the manufacturer's start-up checklists or their own proprietary checklist forms. These forms are separate from the Equipment Start-up Checklist forms.
- C. The Contractor shall submit completed Equipment Start-up checklists to the CxA for record documentation for the Owner.
- D. Start-Up checklists must be submitted for all scheduled mechanical and electrical equipment.

### **3.4 FUNCTIONAL TESTING**

- A. Objectives and Scope. The objective of Functional Testing is to demonstrate that each piece of equipment is operating properly according to the Contract Documents with respect to safety devices, thermostats, valves, control wiring, etc. During the testing process, areas of deficient operation or performance shall be identified to be corrected.
- B. The purpose of the Functional Test is to verify and document that the component level systems of each piece of equipment is wired properly and works correctly prior to beginning the Performance Tests. The Functional Test procedures shall be written in simple pass/fail format.
- C. Development of Test Procedures. Before test procedures are written, the CxA shall obtain project contract documentation and a current list of change orders affecting equipment or systems, including an updated points list program code, control sequences and parameters. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CxA shall provide a copy of the test procedures to the Contractors who shall review the tests for feasibility, safety, equipment and warranty protection.
- D. Test Execution. The Contractors shall use the commissioning test forms to execute the tests and document the results. The commissioning agent shall use random sampling techniques to verify the contractor's quality of testing. The commissioning agent shall select several of the contractor's completed test forms and require that the contractors re-test the selected systems in the presence of the commissioning authority and/or Owner. The re-test results should match the contractors initial test results.
- E. Specific Test forms shall be developed by the CxA during the Construction Phase, after receipt of approved submittals, and shall include (but not be limited to) the following information:

1. System and equipment or component name(s).
2. Instructions for setting up the test.
3. Special cautions, alarm limits, etc.
4. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format.
5. Acceptance criteria of proper functionality with a Yes/No check box to allow for clearly marking whether or not the function of each part of the test was achieved.
6. A section for comments.

### **3.5 PERFORMANCE TESTING**

- A. Objectives and Scope. The objective of Performance Testing is to demonstrate that each system is operating according to the Contract Documents and Owners requirements with respect to capacity, sequence of operations, and optimum energy efficiency. During the testing process, areas of deficient performance are identified to be corrected by the Contractors, improving the operation, functioning, and efficiency of the systems. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc., shall also be tested.
- B. The purpose of any given specific Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. The Performance Test procedures shall be written in simple pass/fail format.
- C. Development of Test Procedures. Before test procedures are written, the CxA shall obtain project contract documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences, and parameters. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Prior to execution, the CxA shall provide a copy of the test procedures to the Contractors who shall review the tests for feasibility, safety, equipment and warranty protection.

- D. Specific Test forms shall be developed by the CxA during the Construction Phase, after Receipt of approved submittals, and shall include (but not be limited to) the following information:
1. System and equipment or component name(s).
  2. Instructions for setting up the test.
  3. Special cautions, alarm limits, etc.
  4. Specific step-by-step procedures to execute the test in a clear, sequential and repeatable format.
  5. 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.
  6. A section for comments.
- E. Test Execution. The Contractors shall use the commissioning test forms to execute the tests and document the results. The commissioning agent shall use random sampling techniques to verify the contractor's quality of testing. The commissioning agent shall select several of the contractor's completed test forms and require that the contractors re-test the selected systems in the presence of the commissioning authority and/or Owner. The re-test results should match the contractors initial test results.
- F. HVAC Systems (Division 23)

System or Equipment	Equipment or Component Tested	General Description of Modes and Functions to Test	Test Strategy	Testing Time Estimate	Seasonal Test
<b>Air Terminal Units</b>	VAV or CV boxes, fan-coil unit.	Verify damper and fan sequences during heating, cooling, occupied, unoccupied modes. Check deadbands, verify flow.	Test min. 10% of identical units, and at least 5 of each type/size.	1 hour per unit.	Anytime.
<b>Building Automation System</b>	Schedules, sequences, lockouts, alarms, interlocks, control strategies, trending, graphics	All sequences of controls for mechanical equipment.	Test all controlled equipment.	2 days	Anytime.
<b>Test, Adjust, Balance</b>	Airflows.	Validate diffuser airflows.	Test most diffusers.	1 hour per AHU zone.	Anytime.

G. Plumbing Systems (Division 22)

System or Equipment	Equipment or Component Tested	General Description of Modes and Functions to Test	Test Strategy	Testing Time Estimate	Seasonal Test
Water Heating	Water heaters, storage tanks, mixing valves.	All sequences of control, temperatures, recirculation pumps, lockouts, safeties.	Test all.	4 hours	Anytime.
Booster Pumps	Water pressure booster pumps.	Sequences of operations, lead lag, lockouts, safeties, emergency power, alarms.	Test all.	2 hours.	Anytime.

**3.6 DOCUMENTATION**

- A. Construction Checklists. The CxA shall provide a construction checklist form for each piece of equipment. The forms shall be filled out by hand by the installing subcontractor. The completion of the construction checklists will provide feedback to the construction team on the progress of the installation of the equipment.
- B. Equipment Start-Up Checklists. The Contractor shall use a checklist type form during the start-up of each piece of equipment and submit to the CxA when complete. The Startup Checklists will be included in the Commissioning book. as a record that the equipment was started up and operating per the Contractors expectations.
- C. Functional Tests. The CxA shall provide a 1-2 page functional test form for each piece of equipment. The forms will be filled out by hand during the on-site tests. The forms will be included in the Commissioning book. If the systems fail the test, a deficiency list will be prepared for the Contractor outlining the failure. After the Contractors have addressed the deficiency, the CxA (or Contractors with Owners representative) will execute the Functional Tests again.
- D. Performance Tests. The CxA shall provide a 2-3 page performance test for each piece of equipment or system. The forms will be filled out by hand during the on-site tests. The pass/fail criteria will be included on the performance test forms. If the systems fail the test, a deficiency list will be prepared for the Contractor outlining the failure. After the Contractors have addressed the deficiency, the CxA (or Contractors with Owners representative) will execute the performance tests again.

- E. Deficiency List. The CxA shall document any non-conformance deficiencies observed during site visits or during tests. The deficiency list will be distributed by the AE.
- F. Final Cx Report. The CxA shall prepare a final report summarizing the commissioning activities, the functional tests, the performance tests, and observed deficiencies. The final report will be submitted to the Owner.
- G. Commissioning Book. The CxA shall manage the Commissioning Book. The Commissioning Book is a 3-ring binder containing all Cx related documents such as letters, memos, Equipment Start-up checklists, Functional Test forms, Performance Test forms, final Cx Report, etc. Two copies of the Commissioning Book shall be turned over to the A/E at the conclusion of the commissioning process.

### **3.7 NON-CONFORMANCE**

#### **A. Non-Conformance:**

- 1. The CxA will record the results of the Functional Tests and Performance Tests. All deficiencies, non-conformance issues, or test failures shall be noted and reported to the Contractors in a deficiency list or in a punch-list format.
- 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. *However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owners Representative.*
- 3. Re-testing:
  - a. If a Functional or Performance Test fails, the Contractors shall make corrections to the deficient equipment or systems. The systems will be re-tested until they pass the Tests.
  - b. The time/cost for the CxA to perform any re-testing required because a specific item was overlooked in the equipment start-up procedures, reported to have been successfully completed, but determined during Functional or Performance testing to be faulty will be back-charged to the General Contractor, who may choose to

recover costs from the party-responsible for executing the faulty prefunctional test.

- c. Any required re-testing by any Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Prime Contractor. The Contractors will be provided with the commissioning test forms in advance of the tests to prepare the systems for the tests.

### **3.8 DEFICIENCIES AND RETESTING**

- A. The CxA documents the results of each test. (Corrections of minor installation or sequence of operation deficiencies are made during tests at the discretion of CxA.)
- B. Deficiencies/non-conformance issues not corrected during testing are reported to the Contractors for corrective action. Upon completion, a request is made by the Contractors to CxA for retest.

### **3.9 DEFERRED TESTING**

- A. Unforeseen Deferred Tests. If any Test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of Testing may be delayed upon approval of the Owner. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties due to unforeseen deferred testing will be negotiated.
- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract at no additional cost. The Contractors shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the Contractor with facilities staff and the CxA witnessing.

### **3.10 MEETINGS**

- A. Kickoff Meeting. After the commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the project team in attendance. The CxA shall distribute a preliminary Cx Plan. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan.
- B. Progress Meetings. Meetings shall be planned and conducted by the CxA at appropriate intervals as construction progresses. These meetings shall cover coordination, deficiency resolution and planning issues with Divisions 1 and 23 Contractors. The CxA shall plan these meetings

in conjunction with regular project meetings to minimize unnecessary travel time.

### **3.11 PROJECT COMPLETION SCHEDULE**

- A. The commissioning Functional and Performance tests are executed at the end of the project after the Contractors are completed with their installation and start-up work. It is possible to execute some tests on completed systems prior to final project completion. In general, the commissioning performance tests are scheduled for AFTER the TAB is complete and the controls contractor has completed the graphics in the BAS system. The commissioning tests typically occur after the contractors request the substantial completion milestone.
- B. The Functional tests are typically executed during a few consecutive days. A deficiency list is prepared and given to the contractors for remediation. It typically takes a week or two to address the deficiencies. Follow-up Functional tests and Performance tests will be scheduled after the contractors report that the deficiencies are completed.
- C. The Performance tests are typically executed during a few consecutive days. A deficiency list is prepared and given to the contractors for remediation. It typically takes a week or two to address the deficiencies. If required, follow-up Performance tests will be scheduled after the contractors report that the deficiencies are completed.
- D. The Contractors should expect the commissioning testing/deficiency identification/contractor remediation time period to span a month or two. The Owner/Contractor may agree to occupy the building during the commissioning timeframe; however, this action may extend the commissioning time frame due to the scheduling difficulties encountered with shutting systems down or accessing equipment in an occupied building.
- E. Retainage will not be released until the commissioning is successfully completed.

### **3.12 COMMISSIONING CONTINUOUS - TRAINING REQUIREMENTS**

- A. This training requirement section shall be a supplement to other specified training requirements.
- B. In efforts to enhance the Owner's knowledge of the facility's new equipment and systems, a continuous training program shall be used by the contractors throughout the construction schedule. The purpose of

the continuous training is to introduce the Owner's facility staff to the equipment and systems early in the construction process so the end-of-project training can better focus on operation and optimization of equipment and systems.

- C. Continuous Training Requirement. The contractors shall define a 1 hour period each week (ie. Tuesday from 11:00 - Noon) for Owners continuous training. During this period, the Owner's representative shall be walked through the construction site by the contractors. Each piece of newly delivered equipment *shall be identified* and the intended operation described.

### **3.13 COMMISSIONING O&M REQUIREMENTS**

- A. This O&M document requirement section shall be a supplement to other specified O&M document requirements.
- B. In efforts to enhance the installing sub-contractor's and the Owner's knowledge of the installation and operating information related to the equipment and systems, one set of O&M documents shall be delivered to the CM/GC's on-site office 4 days after approved equipment submittals. The purpose of this documentation is to have reference material available to the A/E, Owner, CM/GC, and installing sub-contractors' for the purposes of ensuring that the equipment and systems are installed in accordance with the manufacturer's recommendations.
- C. The Owner may make this submission requirement a prerequisite for payment.

### **3.14 COMMISSIONING CONTROLS DOCUMENTATION REQUIREMENTS**

- A. This Controls document requirement section shall be a supplement to other specified controls document requirements.
- B. In efforts to reduce the end-of-project time burden by the Engineer, CxA, and controls sub-contractor, this section defines the timing and completion of the controls software programming. The controls scope of work is not changed, but the timing is.
- C. The controls contractor shall submit a working version of the project control software 45 days after approval of submittals. The controls contractor shall provide the software on the project's BAS user interface PC. If there is no BAS user interface PC, then the controls contractor shall provide a computer on-site to demonstrate the control software. The graphics shall be complete and operable at this time.
- D. The Owner may make this submission requirement a prerequisite for payment.



### 3.15 COMMISSIONING WARRANTY REQUIREMENTS

- A. This warranty requirement section shall be a supplement to other specified warranty document requirements.
- B. The CM/GC shall prepare and manage a warranty matrix (by division) that includes the warranty information for all of the equipment and systems in the project. The purpose of the warranty matrix is so the Owner has a single reference document which provides basic information on warrantees.
- C. The format of the general warranty matrix shall be as follows:

Product	Warranty Duration / Start date	Coverage	Limit/exclusion	Warranty Service
Air Terminal Units	Duration: 1 year after date of startup. Start date was 2/2/02.	Free from manufacturers defects. Parts only, labor not included	Limitation: Must be properly installed.	Factory service contact information.
Exhaust Fan	Duration: 1 year from date of shipment. Start: 1/5/02.	Free from manufacturers defects. Parts only, labor not included.	Limit: Must be properly installed.	Factory service contact information.

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**SECTION 02 21 00**  
**SITE SURVEYS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the gathering of research documents, performance of a topographic survey and preparation of a topographic survey map.

**1.2 DEFINITIONS**

- A. Professional Land Surveyor: One who possesses a valid state license as a "Professional Land Surveyor" from the state in which they practice.
  - B. Professional Civil Engineer: One who possesses a valid state license as a "Professional Civil Engineer" from the state in which they practice.
- For this section, the term "surveyor" shall also include Professional Civil Engineers authorized to practice Land Surveying under the laws of the state in which they practice.

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

**PART 3 - EXECUTION**

**3.1 SITE SURVEYS:**

- A. The surveyor shall research available public records for all mapping, monumentation, plats, governmental surveys etc. that may pertain to the subject property. Research all applicable public utilities for substructure data such as sewers, storm drains, water lines, electrical conduits etc.
- B. The survey shall be performed on the ground in accordance with the current "Accuracy Standards for Land Title Surveys" as adopted, from time to time, by the American Congress on Surveying and Mapping, the National Society of Professional Surveyors, and the American Land Title Association.
- C. The surveyor, when applicable, shall consult with the project Architect to determine scale of plat or map and size of drawings.
- D. The surveyor shall furnish two sets of prints of the plat or map of survey and an electronic CADD file. If the plat or map of survey consists of more than one sheet, the sheets shall be numbered, the total number of sheets indicated and the match lines be shown on each sheet.
- E. On the plat or map, the survey boundary shall be drawn to a convenient scale, or the scale designated by the Architect, with the scale clearly indicated. A graphic scale, shown in feet or meters or both, shall be included. A north arrow shall be shown and when practicable, the plat or map of survey shall be oriented so that north is at the top of the drawing. Symbols or abbreviations used shall be identified on the face

of the plat or map by use of a legend or other means. Supplementary or exaggerated diagrams shall be presented accurately on the plat or map where dimensional data is too small to be shown clearly at full scale. The plat or map shall be 30 by 42 inches.

F. The survey shall contain the following applicable information:

1. The name, address, telephone number, and signature of the Professional Land Surveyor who made the survey, his or her official seal and registration number, the date the survey was completed and the dates of all revisions.
2. The survey drawing(s) submitted shall bear the following certification adjacent to the Engineer's official seal:  
"I hereby certify that all information indicated on this drawing was obtained or verified by actual measurements in the field and that every effort has been made to furnish complete and accurate information."
3. Vicinity map showing the property surveyed in reference to nearby highways or major street intersections.
4. Flood zone designation (with proper annotation based on Federal Flood Insurance Rate Maps or the state or local equivalent, by scaled map location and graphic plotting only).
5. Land area as defined by the boundaries of the legal description of the surveyed premises.
6. All data necessary to indicate the mathematical dimensions and relationships of the boundary represented by bearings and distances, and the length and radius of each curve, together with elements necessary to mathematically define each curve. The point of beginning of the surveyor's description and the basis of bearings shall also be shown.
7. When record bearings or angles or distances differ from measured bearings, angles or distances, both record and measured bearings, angles, and distances shall be clearly indicated. If the record description fails to form a mathematically closed figure, the surveyor shall so indicate.
8. Measured and record distances from corners of parcels surveyed to the nearest right-of-way lines of streets in urban or suburban areas, together with recovered lot corners and evidence of lot corners, shall be noted. The distances to the nearest intersecting street shall be indicated and verified. Names and widths of streets and highways abutting the property surveyed and widths of rights of way shall be given. Observable evidence of access (or lack thereof) to

- such abutting streets or highways shall be indicated. Observable evidence of private roads shall be so indicated. Streets abutting the premises, which have been described in Record Documents, but not physically opened, shall be shown and so noted.
9. The identifying titles of all recorded plats, filed maps, right of way maps, or similar documents which the survey represents, wholly or in part, with their appropriate recording data. The survey shall indicate platted setback or building restriction lines which have been recorded in subdivision plats or which appear in a Record Document which has been delivered to the surveyor. Contiguity, gores, and overlaps along the exterior boundaries of the survey premises, where ascertainable from field evidence or Record Documents, or interior to those exterior boundaries, shall be clearly indicated or noted. Where only a part of a recorded lot or parcel is included in the survey, the balance of the lot or parcel shall be indicated.
  10. All evidence of found monuments shall be shown and noted. All evidence of monuments found beyond the surveyed premises on which establishment of the corners of the survey premises are dependent, and their application related to the survey shall be indicated.
  11. The character of any and all evidence of possession shall be stated and the location of such evidence carefully given in relation to both the measured boundary lines and those established by the record. An absence of notation on the survey shall be presumptive of no observable evidence of possession. The term "possession" does not imply "ownership".
  12. The location of all buildings upon the plot or parcel shall be shown and their locations defined by measurements perpendicular to the boundaries. If there are no buildings, so state. Proper street numbers shall be shown where available.
  13. All easements evidenced by a Record Document which have been delivered to the surveyor shall be shown, both those burdening and those benefiting the property surveyed, indicating recording information. If such an easement cannot be located, a note to this affect shall be included. Observable evidence of easements and/or servitudes of all kinds, such as those created by roads, rights-of-ways, water courses, drains, telephone, telegraph, or electric lines, water, sewer, oil or gas pipelines on or across the surveyed property and on adjoining properties if they appear to affect the surveyed property, shall be located and noted. Surface indications, if any, or of underground easements and/or servitudes shall also be shown.

14. The character and location of all walls, buildings, fences, and other visible improvements within five feet of each side of the boundary lines shall be noted. Without expressing a legal opinion, physical evidence of all encroaching structural appurtenances and projections, such as fire escapes, bay windows, windows and doors that open out, flue pipes, stoops, eaves, cornices, areaways, stoops, trip, etc., by or on adjoining property or on abutting streets, on any easement or over setback lines shown by Record Documents shall be indicated with the extent of such encroachment or projection.
15. Driveways and alleys on or crossing the property must be shown. Where there is evidence of use by other than the occupants of the property, the surveyor must so indicate on the plat or map. Where driveways or alleys on adjoining properties encroach, in whole or in part, on the property being surveyed, the surveyor must so indicate on the plat or map with appropriate measurements.
16. Location, alignment and dimensions of all roads, curbs, walks, parking and paved areas abutting the subject land. Indicate road centerlines with true bearings and lengths by 50 foot stationing. Describe curves by designating the points of curvature and tangency by station. Include all curve data as well a location of radius and vertex points. Elevations on 50' centers on centerline of roads, edges of roads and top and bottom of curbs.
17. As accurately as the evidence permits, the location of cemeteries and burial grounds disclosed in the process of researching title to the premises or observed in the process of performing the field work for the survey, shall be shown.
18. Ponds, lakes, springs, or rivers bordering on or running through the premises being surveyed shall be shown. When a property surveyed contains a natural water boundary, the surveyor shall measure the location of the boundary according to appropriate surveying methods and note on the plat or map the date of the measurement and the caveat that the boundary is subject to change due to natural causes and that it may or may not represent the actual location of the limit of title. When the surveyor is aware of changes in such boundaries, the extent of those changes shall be identified.
19. Contours at a minimum interval of 1 foot. Base vertical control on the permanent (not assumed) National Geodetic Survey (NGS) or VA Medical Center Bench Mark. Note location, description and datum.
20. Identify and show if possible, setback, height, and floor space area restrictions of record or disclosed by applicable zoning or building

- codes (in addition to those recorded in subdivision maps). If none, so state.
21. Exterior dimensions of all buildings at ground level. Show square footage of exterior footprint of all buildings at ground level and gross floor area of all buildings.
  22. Measured height of all buildings above grade at a defined location. If no defined location is provided, the point of measurement shall be shown.
  23. Elevations at each entrance to buildings, service docks, building corners, steps, ramps and grade slabs.
  24. Substantial, visible improvements (in addition to buildings) such as signs, parking areas, swimming pools, etc.
  25. Parking areas and, if striped, the striping and the type (eg. handicapped, motorcycle, regular, etc.) and number of parking spaces.
  26. Indication of access to a public way such as curb cuts and driveways.
  27. Location of utilities existing on or serving the surveyed property as determined by observed evidence together with plans and markings provided by utility companies, and other appropriate sources (with references as to the source of information. Locate and show all fire hydrants located within 500 feet of the subject property.
  28. Railroad tracks and sidings.
  29. Manholes, catch basins, valve vaults or other surface indications of subterranean uses.
  30. Wires and cables (including their function) crossing the survey premises, all poles on or within ten feet of the surveyed premises, and the dimensions of all cross-wires or overhangs affecting the surveyed premises.
  31. Utility company installations on the surveyed premises.
  32. Names of adjoining owners of platted lands.
  33. Observable evidence of earth moving work, building construction or building additions within recent months.
  34. Any changes in street right-of-way lines either completed or proposed, and available from the controlling jurisdiction. Observable evidence of recent street or sidewalk construction or repairs.
  35. Observable evidence of site use as a solid waste dump, sump or sanitary landfill.
  36. All trees with a minimum diameter of 6" measured at 48" above the base of the tree. Perimeter outline only of thickly wooded areas with description of predominant vegetation.

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**SECTION 02 41 00  
DEMOLITION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

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 00, EARTH MOVING, Section 31 20 11, EARTH MOVING (SHORT FORM).
- B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Asbestos Removal: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.
- E. Lead Paint: Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
- F. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- G. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT
- H. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.8, 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.
- 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 1.10 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:
  - 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 4572 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 1.8 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.

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

**PART 3 - EXECUTION**

**3.1 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  
1524 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 610 mm (24 inches) square to permit drainage. Contractor  
shall dispose debris in compliance with applicable federal, state or  
local permits, rules and/or regulations.

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 1524mm (5  
feet) 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 1524 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.

**3.2 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.

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**SECTION 02 65 00**  
**UNDERGROUND STORAGE TANK REMOVAL**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. Underground Fuel Tank Liquid Removal:
  - 1. Material (Liquid) Testing.
  - 2. Removals and Disposal.
  - 3. Certification of Contents and Disposal.
- B. Underground Fuel Tank Cleaning and Disposal:
  - 1. Excavation of Tank.
  - 2. Removals and Disposal.
  - 3. Evacuation of Combustible Vapors.
  - 4. Tank Cleaning.
  - 5. Disassembling of Tank.
  - 6. Certification for Proper Disposal of Tank.
- C. Contamination Assessment:
  - 1. Soil Testing.
  - 2. Reporting
  - 3. Contaminated Soil Disposal
  - 4. Certification for Proper Disposal of Contaminated Soil.
- D. Report:
  - 1. Written report describing in detail the procedures used to remove the liquid and any sludges from the underground storage tank, cleaning and removing of the underground storage tank, and disposal of the liquid residues.
  - 2. Documentation of the work, including photographs, lab and field results, and receipts from the proper authority for the tank, residue and soil disposal.

**1.2 RELATED WORK:**

- A. Section 01 45 29, TESTING LABORATORY SERVICES
- B. Section 02 41 00, DEMOLITION
- C. Section 31 20 00, EARTH MOVING
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION

**1.3 QUALITY ASSURANCE:**

- A. Underground fuel tank removal and disposal shall comply with the following:
  - 1. United States Environmental Protection Agency (EPA), 40 CFR Part 280 and Part 281.

2. United States Environmental Protection Agency (EPA), Test Methods for Petroleum Hydrocarbons, SW-846 Method 8015.
3. State of Florida Department of Environmental Protection (FDEP) Guidelines.
4. OSHA Standards 29 CFR Part 1910 and 1926.1128.

**1.4 SUBMITTAL:**

- A. Furnished detailed CADD generated submittals including:
  1. Detailed plan view
  2. Piping removal diagrams
  3. Control removal diagrams
  4. Component diagrams including tank removal procedure
  5. Detailed sequence of procedure
  6. Local Fire Marshal requirement
  7. Hazardous material plan for local VA management.

**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 Petroleum Institute (API):  
1604-96.....Closure of Underground Petroleum Storage Tanks
- C. Florida Department of Environmental Protection (FDEP):  
Closure Report Requirements for Storage Tank Systems (2005)
- D. National Fire Protection Agency (NFPA):  
30-03.....Flammable and Liquid Combustible Code  
70B-02.....Recommended Practice for Electrical Equipment Maintenance  
326-99.....Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair  
329-99.....Recommended Practice for Handling Release of Flammable Liquids and Gases
- E. National Environmental Laboratory Accreditation Conference (NELAC)

**1.6 PROJECT SITE CONDITIONS:**

Do not close or obstruct streets, sidewalks or drives without permission and approval of the VA.

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

**PART 3 - EXECUTION**

**3.1 GENERAL:**

- A. Remove underground storage tank, liquid, and perform associated work, including soil removal as specified and indicated on the drawings.
- B. Restore the excavated area with new materials as specified to match adjacent (existing) surfaces.

**3.2 UNDERGROUND STORAGE TANK LIQUID REMOVAL:**

- A. Provide samples of liquids and/or sludges from the underground fuel storage tank to a qualified state and NELAC certified laboratory for analysis.
- B. Submit laboratory results to VA and disposal location for approval.
- C. Remove the liquid and sludges from the tank for disposal prior to removing the tank from the ground.
- D. Provide documentation of the liquid/sludge removal and its disposal in a final report to the VA.

**3.3 UNDERGROUND STORAGE TANK CLEANING AND DISPOSAL:**

- A. Provide notification to local Fire Marshal prior to conducting work.
- B. Remove the tank from the ground, place it on the ground adjacent to removal location, and secure it prior to cleaning, or clean in place prior to removal. Cleaning in place is required for fiberglass tanks. Follow appropriate NFPA and API guidance.
- C. Measure levels of combustible vapors and oxygen, and initiate ventilation of the tank, if needed:
  - 1. Ventilate tank using a small gas exhauster until the vapor concentration is reduced to 10 percent or less of the lower explosive limit.
  - 2. Oxygen content shall range from 19.5 to 23.5 percent.
  - 3. Inert tank with CO<sub>2</sub> or equivalent, if required.
  - 4. Cut access ports for cleaning into tank after vapor and oxygen concentrations have met the requirements noted above.
- D. Cleaning of the tank shall include mopping, scraping, and sweeping the interior of the tank. A vacuum-truck may also be utilized to remove the residual contents of the tank.
- E. Collect, contain and place residuals in a United States Department of Transportation (DOT) approved type 17H, 208 L (55 gallon)

capacity drum, or other approved container (i.e., vacuum-truck) for transporting and disposal.

- F. Inspect tank and document any leaks, areas of corrosion, etc.
- G. Ensure final vapor and oxygen concentration are within the requirements noted above before proceeding to cut and dismantle the tank for its disposal.
- H. Remove dismantled tank to an approved disposal facility.
- I. Obtain disposal facility receipts noting proper tank disposal.

#### **3.4 REMOVED TANK AREA ASSESSMENT:**

- A. Collect soil samples from the removed underground storage tank area. Samples should be collected in accordance with FDEP's Closure Report Requirements for Storage Tank Systems (2005). Field screening, consisting of organic vapor analyzer (OVA) readings should be conducted as follows:

When using an organic vapor analysis instrument with a Flame Ionization Detector (FID) or a Photo Ionization Detector (PID), it must be in the survey mode. PIDs should not be used in situations where humidity will interfere with the instrument's sensitivity (i.e., during rainy periods, measuring moist or wet soil). Readings must be obtained from the headspace of samples in half-filled, 16-ounce jars. Each soil sample must be obtained from the vadose zone (the area above the water table), brought (if necessary) to a temperature of between 20°C. (68°F.) and 32°C. (90°F.), and the reading obtained five minutes thereafter. If an FID is used, each soil sample must be split into two jars, and one of the readings must be obtained with the use of an activated charcoal filter unless the unfiltered reading is 10 parts per million (ppm) or less. The total corrected hydrocarbon measurement must be determined by subtracting the filtered reading from the unfiltered reading. Analytical instruments must be calibrated in accordance with the manufacturer's instructions.

- B. Site Restoration: See Section 31 20 00, EARTH MOVING.

#### **3.5 CONTAMINATED SOIL:**

- A. When soil assessments reveal evidence of leakage or spillage of hydrocarbons at levels above those established by the FDEP for underground storage tank closures (10 parts per million on OVA screening), then an Incident Notification Form (INF) shall be filed within 72 hours. The VA shall be notified within 2 hours. Any over-excavation of the tank area to remove contamination shall

not exceed 2 cubic yards of soil removed without prior  
notification to and approval by the FDEP.

- B. Remove all contaminated soil from the site and haul it to an approved disposal facility for proper disposal. Submit all disposal manifests and tare receipts with final report.
- C. Include all regulatory notifications and responses in final report.

- - - END - - -

**SECTION 03 30 53**  
**CAST-IN-PLACE CONCRETE (SHORT FORM)**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies cast-in-place structural concrete 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.

**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, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Concrete Mix Design.
- C. Shop Drawings: Reinforcing steel: Complete shop drawings.
- D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

**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):
  - 117R-06.....Tolerances for Concrete Construction and Materials
  - 301-05.....Specification for Structural Concrete
  - 305R-06.....Hot Weather Concreting
  - 306R-(2002).....Cold Weather Concreting
  - SP-66-04 .....ACI Detailing Manual



- 318/318R-08.....Building Code Requirements for Reinforced  
Concrete
- 347R-04.....Guide to Formwork for Concrete
- C. American Society for Testing And Materials (ASTM):
- A185-07.....Steel Welded Wire, Fabric, Plain for Concrete  
Reinforcement
- A615/A615M-08.....Deformed and Plain Billet-Steel Bars for  
Concrete Reinforcement
- A996/A996M-06.....Standard Specification for Rail-Steel and Axle-  
Steel Deformed Bars for Concrete Reinforcement
- C31/C31M-08.....Making and Curing Concrete Test Specimens in  
the Field
- C33-07.....Concrete Aggregates
- C39/C39M-05.....Compressive Strength of Cylindrical Concrete  
Specimens
- C94/C94M-07.....Ready-Mixed Concrete
- C143/C143M-05.....Standard Test Method for Slump of Hydraulic  
Cement Concrete
- C150-07.....Portland Cement
- C171-07.....Sheet Material for Curing Concrete
- C172-07.....Sampling Freshly Mixed Concrete
- C173-07.....Air Content of Freshly Mixed Concrete by the  
Volumetric Method
- C192/C192M-07.....Making and Curing Concrete Test Specimens in  
the Laboratory
- C231-08.....Air Content of Freshly Mixed Concrete by the  
Pressure Method
- C260-06.....Air-Entraining Admixtures for Concrete
- C330-05.....Lightweight Aggregates for Structural Concrete
- C494/C494M-08.....Chemical Admixtures for Concrete
- D1751-04.....Preformed Expansion Joint Fillers for Concrete  
Paving and Structural Construction (Non-  
extruding and Resilient Bituminous Types)
- D4397-02.....Polyethylene Sheeting for Construction,  
Industrial and Agricultural Applications

E1155-96(R2008).....Determining  $F_F$  Floor Flatness and  $F_L$  Floor  
Levelness Numbers

## **PART 2 - PRODUCTS**

### **2.1 FORMS:**

Wood, plywood, metal, or other materials, approved by Resident  
Engineer, of grade or type suitable to obtain type of finish specified.

### **2.2 MATERIALS:**

- A. Portland Cement: ASTM C150, Type I or II.
- 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.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings and walls over 305 mm (12 inches) thick. Coarse aggregate for applied topping and metal pan stair fill shall be Size 7.
- D. Fine Aggregate: ASTM C33.
- E. Lightweight Aggregate for Structural Concrete: ASTM C330, Table 1
- F. Mixing Water: Fresh, clean, and potable.
- G. Air-Entraining Admixture: ASTM C260.
- H. Chemical Admixtures: ASTM C494.
- I. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).
- J. Reinforcing Steel: ASTM A615 or ASTM A996, deformed. See structural drawings for grade.
- K. Welded Wire Fabric: ASTM A185.
- L. Expansion Joint Filler: ASTM D1751.
- M. Sheet Materials for Curing Concrete: ASTM C171.
- N. Abrasive Aggregates: Aluminum oxide grains or emery grits.
- O. 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. Use liquid chemical floor hardeners only to improve an existing soft or dusting slab.
- P. Liquid Densifier/Sealer: 100 percent active colorless aqueous siliconate solution. Use liquid chemical floor hardeners only to improve an existing soft or dusting slab.
- Q. 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 17 MPa (2500 psi) at 3 days and 34 MPa (5000 psi) at 28 days.

**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 28 MPa (4000 psi).
- 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 102 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 <sup>3</sup> (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m <sup>3</sup> (lbs/c. yd)	Max. Water Cement Ratio
34 (5000) <sup>1,3</sup>	374 (630)	0.45	386 (650)	0.40
28 (4000) <sup>1,3</sup>	326 (550)	0.55	338 (570)	0.50
21 (3000) <sup>1,3</sup>	279 (470)	0.65	291 (490)	0.55
21 (3000) <sup>1,2</sup>	297 (500)	*	309 (520)	*

- 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. For concrete strengths above 34 MPa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.
- 2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
- 3. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.

\* 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 tables:

**TABLE II - 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
38 mm (1 1/2 in)	3 to 6

**TABLE III TOTAL AIR CONTENT  
 AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE**

Nominal Maximum size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 10 mm (3/8 in) 4 to 8	10 mm (3/8 in) or less 5 to 9

#### **2.4 BATCHING & MIXING:**

A. Store, batch, and mix materials as specified in ASTM C94.

1. Job-Mixed: Concrete mixed at job site shall be mixed in a batch mixer in manner specified for stationary mixers in ASTM C94.
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. Mixing structural lightweight concrete: Charge mixer with 2/3 of total mixing water and all of the aggregate. Mix ingredients for not less than 30 seconds in a stationary mixer or not less than 10 revolutions at mixing speed in a truck mixer. Add remaining mixing

water and other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.

**PART 3 - EXECUTION**

**3.1 FORMWORK:**

- A. Installation shall 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:**

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 102 mm (4 inches) of fine granular fill over the vapor barrier to act as a blotter for concrete slab.
- C. Lap joints 152 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 Resident Engineer 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 1524 mm (5 feet) in unexposed work nor more than 914 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 305 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 305 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 Resident Engineer.

**3.5 PROTECTION AND CURING:**

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 Resident Engineer.

**3.6 FORM REMOVAL:**

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:**

Immediately after forms have been removed and work has been examined and approved by Resident Engineer, 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.

**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 Resident Engineer 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. Scratch Finish: Slab surfaces to receive a bonded applied cementitious application shall all be thoroughly raked or wire broomed after partial setting (within 2 hours after placing) to roughen surface to insure a permanent bond between base slab and applied cementitious materials.
  2. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.
  3. 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.
  4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof 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.

5. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.
6. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:

Slab on grade & Shored suspended slabs	Unshored suspended slabs
Specified overall value $F_F$ 25/ $F_L$ 20	Specified overall value $F_F$ 25
Minimum local value $F_F$ 17/ $F_L$ 15	Minimum local value $F_F$ 17

### 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 except those specified to receive non-slip finish.
- 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.

### 3.12 RETAINING WALLS:

- A. Concrete for retaining walls shall be as shown and air-entrained.
- B. Install and construct expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves as shown.
- C. Finish exposed surfaces to match adjacent concrete surfaces, new or existing.

D. Porous backfill shall be placed as shown.

**3.13 PRECAST CONCRETE ITEMS:**

Precast concrete items, not specified elsewhere, shall be cast using 21 MPa (3000 psi) 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 45 00**  
**PRECAST ARCHITECTURAL CONCRETE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section includes the performance criteria, materials, production, and erection of architectural precast concrete cladding and load bearing 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.

**1.2 RELATED WORK**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete: Section 03 30 00, 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 MORTARING, Section 04 05 16, MASONRY GROUTING.
- E. Masonry Facing: Section 04 20 00, UNIT MASONRY.
- F. Cast Stone Facing: Section 04 72 00, CAST STONE MASONRY.
- G. Insulation for Insulated Panels: Section 07 21 13, THERMAL INSULATION.
- H. Sealants and Caulking: Section 07 92 00, JOINT SEALANTS.
- I. Size, type and color of aggregate for exposed aggregate finish and matrix color: Section 09 06 00, SCHEDULE FOR FINISHES.
- J. Ceramic Tile Facing: Section 09 30 13, CERAMIC TILING.
- K. 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 in the state of Florida and who is experienced in providing engineering services of the kind indicated. The

fabricator shall submit signed and sealed drawings and calculations for the Resident Engineer's approval.

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.

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, Category S2 (Complex Structural Systems) for load-bearing members.
2. An erector with a minimum of 2 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 and who meets the following requirements:
  - a. Retains a PCI Certified Field Auditor, at erector's expense, to conduct a field audit of a project in the same category as this Project prior to start of erection. Submits Erectors Post Audit Declaration.
  - b. The basis of the audit is the PCI MNL 127.

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 Resident Engineer. 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 Resident Engineer.
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 Resident Engineer, maintain samples at the manufacturer's plant as color and texture acceptability reference.
- F. Mockups: After sample approval but before production of units, construct full sized mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution. Mockup to be representative of the finished work in all respects including glass, aluminum framing, sealants and architectural precast concrete complete with all anchors, connections, flashings, and joint fillers as accepted on the final shop drawings. Build mockups to comply with the following requirements, using materials indicated for the completed work:
  1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Resident Engineer.
  2. Notify Resident Engineer in advance of dates and times when mockups will be constructed.
  3. Obtain Resident Engineer's approval of mockups before starting fabrication.
  4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  5. Demolish and remove mockups when directed.
- G. Preinstallation Conference: Conduct conference at Project site to comply with the requirements in Division 01, GENERAL REQUIREMENTS.

#### **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.
4. Parking Garage Vehicular Impact Loads: Design spandrel units acting as vehicular barrier for passenger cars to resist a single load of 26.7 kN (6,000 lbs) service load and 44.5 kN (10,000 lbs) ultimate load applied horizontally in any direction, with anchorages or attachments capable of transferring this load to the structure. For design of these units, assume the load to act at a height of 457 mm (18 inches) above the floor or ramp surface on an area not to exceed 0.093 sq. m. (1 sq. ft.).
- B. Design framing system and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live load deflection, shrinkage and creep of primary building structure, and other building movements.
- C. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 27 deg C (80 deg F).
- D. Calculated Fire-Test-Response Characteristics: Where indicated, provide units whose fire resistance has been calculated according to PCI MNL 124, and is acceptable to authorities having jurisdiction.

#### **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.

8. Design Modifications:

If design modifications are necessary to meet the performance requirements and field conditions, submit design calculations and drawings. Do not adversely affect the appearance, durability or strength of units when modifying details or materials and maintain the general design concept.

- D. Comprehensive Engineering Analysis: Provide calculations signed and sealed 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 305 by 305 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 Resident Engineers 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. Insulation
  7. Facing units.
  8. Anchors.

#### **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):
  - A27/A27M-08.....Steel Castings, Carbon, for General Application
  - A36/A36M-08.....Carbon Structural Steel
  - A47/A47M-99(2004)....Ferritic Malleable Iron Castings
  - A82/A82M-07.....Steel Wire, Plain, for Concrete Reinforcement
  - A108-07.....Steel Bar, Carbon and Alloy, Cold-Finished
  - A123/A123M-08.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - A153/A153M-05.....Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - A167-99(2004).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
  - A184/A184M-06.....Fabricated Deformed Steel Bar Mats for Concrete Reinforcement
  - A185/A185M-07.....Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
  - A276-08a.....Stainless Steel Bars and Shapes



A283/A283M-03(2007)..Low and Intermediate Tensile Strength Carbon Steel  
Plates  
A307-07b.....Carbon Steel Bolts and Studs, 60 000 PSI Tensile  
Strength  
A325/A325M-07a.....Structural Bolts, Steel, Heat Treated, 120 ksi  
Minimum Tensile Strength  
A416/A416M-06.....Steel strand, Uncoated Seven-Wire for Prestressed  
Concrete  
A490/A490M-08a.....Structural Bolts, Alloy Steel, Heat Treated, 150  
ksi Minimum Tensile Strength  
A496/A496M-07.....Steel Wire, Deformed, for Concrete Reinforcement  
A497/A497M-07.....Steel Welded Wire Reinforcement, Deformed, for  
Concrete  
A500/A500M-07.....Cold-Formed Welded and Seamless Carbon Steel  
Structural Tubing in Rounds and Shapes  
A563/A563M-07a.....Carbon and Alloy Steel Nuts  
A572/A572M-07.....High-Strength Low-Alloy Columbium-Vanadium  
Structural Steel  
A615/A615M-08b.....Deformed and Plain Billet-Steel Bars for Concrete  
Reinforcement  
A666-03.....Annealed or Cold-Worked Austenitic Stainless Steel  
Sheet, Strip, Plate, and Flat Bar  
A675/A675M-03e1.....Steel Bars, Carbon, Hot-Wrought, Special Quality,  
Mechanical Properties  
A706/A706M-08a.....Low-Alloy Steel Deformed and Plain Bars for  
Concrete Reinforcement  
A767/A767M-05.....Zinc-Coated (Galvanized) Steel Bars for Concrete  
Reinforcement  
A775/A775M-07b.....Epoxy-Coated Steel Reinforcing Bars  
A780-01(2006).....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  
B227-04.....Hard-Drawn Copper-Clad Steel Wire  
B633-07.....Electrodeposited Coatings of Zinc on Iron and  
Steel  
C33-07.....Concrete Aggregates  
C40-04.....Organic Impurities in Fine Aggregate for Concrete  
C150-07.....Portland Cement

- C260-06.....Air-Entraining Admixtures for Concrete
- C330-05.....Lightweight Aggregates for Structural Concrete
- C373-88(2006).....Test Method for Water Absorption, Bulk Density,  
Apparent Porosity, and Apparent Specific Gravity  
of Fired Whiteware Products
- C494/C494M-08a.....Chemical Admixtures for Concrete
- C618-08a.....Coal Fly Ash and Raw or Calcined Natural Pozzolan  
for Use as a Mineral Admixture in Concrete
- C881/C881M-02.....for Epoxy-Resin-Base Bonding Systems for Concrete
- C979-05.....Pigments for Integrally Colored Concrete
- C989-06.....Ground Granulated Blast-Furnace Slag for Use in  
Concrete and Mortars
- C1017/C1017M-07.....Chemical Admixtures for Use in Producing Flowing  
Concrete
- C1107/C1107M-08.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- C1218/C1218M-99(08)..Test Method for Water-Soluble Chloride in Mortar  
and Concrete
- C1240-05.....Silica Fume Used in Cementitious Mixtures
- D412-06ae1.....Test Methods for Vulcanized Rubber and  
Thermoplastic Elastomers—Tension
- D2240-05.....Test Method for Rubber Property—Durometer Hardness
- F436/F436M-07a.....Hardened Steel Washers
- F568M-07.....Carbon and Alloy Steel Externally Threaded Metric  
Fasteners
- F593-02(2008).....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F844-07a.....Washers, Steel, Plain (Flat), Unhardened for  
General Use
- C. American Concrete Institute (ACI):
- ACI 211.1-91.....Selecting Proportions for Normal, Heavyweight and  
Mass Concrete (Reapproved 2002)
- ACI 318/318M-08.....Building Code Requirements for Structural Concrete
- D. American Association of State Highway and Transportation Officials
- AASHTO LFRD-2007.....LRFD Bridge Design Specifications, U.S., 4th  
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-120-02.....Design Handbook - Precast and Prestressed Concrete

MNL-124-89.....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.

G. Structural Steel Painting Council (SSPC):

SSPC-Paint 20 (2002).Zinc-Rich Primers (Type I, Inorganic, and Type II,  
Organic).

## **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.

B. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Provide solid backing and form supports to ensure that form liners remain in place during concrete placement. Use with manufacturer's recommended 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: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Weldable Reinforcing Bars: ASTM A706/A706M, deformed.

1. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized and chromate wash treated after fabrication and bending.
2. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M.
3. Steel Bar Mats: ASTM A184/A184M, assembled with clips.
  - a. Plain-Steel Welded Wire Reinforcement: ASTM A185, fabricated from, as-drawn, galvanized and chromate wash treated, steel wire into flat sheets as noted on drawings.
  - b. Deformed-Steel Welded Wire Reinforcement: ASTM A497, flat sheet.
- C. Epoxy-Coated-Steel Welded Wire Reinforcement: ASTM A884/A884M Class A coated, plain on flat sheet, Type 1 bendable coating.
- D. Prestressing Strand: ASTM A416/A416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.
- E. 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 gray or white (as specified on drawings), 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.
  2. Metakaolin Admixture: ASTM C618, Class N.
  3. Silica Fume Admixture: ASTM C1240 with optional chemical and physical requirement.
  4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
- 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 or Gap graded To match design reference sample.
  - b. // Hard durable // quartz // marble // granite // siliceous stone // aggregate // \_\_\_\_ // carefully graded from coarse to fine in proportions required to match approved samples. //
  - c. Eliminate off color material from exposed aggregate.
2. Face-Mix Fine Aggregates: Selected, natural or manufactured sand of the same material as coarse aggregate, unless otherwise approved by Resident Engineer.
- a. Test sand for color value in accordance with ASTM C40. Sand producing darker than specified color standard is unacceptable.
  - b. Clean washed white sand.
  - c. Special fine aggregate produced by crushing exposed coarse aggregate used for finish specified.
- D. Lightweight Coarse Aggregate: Except as modified by PCI MNL 117, ASTM C 330, with absorption less than 11 percent and free from expanded clay.
- E. Unexposed Surface (Backup) Concrete Aggregates: ASTM C33 or C330.
- F. 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.
- G. 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. Carbon-Steel Shapes and Plates: ASTM A36/A36M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be

galvanized. Steel with chemistry conforming to the formula  $Si + 2.5P \leq 0.09$  is also acceptable.

- B. Carbon-Steel Headed Studs: ASTM A108, Grades 1018 through 1020, cold finished and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.; AWS D1.1, Type A or B, with arc shields.
- C. Carbon-Steel Plate: ASTM A283/A283M.
- D. Malleable Iron Castings: ASTM A47/A47M. Grade 32510.
- E. Carbon-Steel Castings: ASTM A27/A27M, Grade U-60-30 (Grade 415-205).
- F. High-Strength, Low-Alloy Structural Steel: ASTM A572/A572M except silicon (Si) content in the range of 0 to 0.03% or 0.15 to 0.25% for materials to be galvanized. Steel with chemistry conforming to the formula  $Si + 2.5P \leq 0.09$  is also acceptable.
- G. Carbon-Steel Structural Tubing: ASTM A500, Grade B.
- H. Wrought Carbon-Steel Bars: ASTM A675/A675M, Grade 65 (Grade 450).
- I. Deformed-Steel Wire or Bar Anchors: ASTM A496 or ASTM A706/A706M.
- J. Carbon-Steel Bolts and Studs: ASTM A307, Grade A (ASTM F568M, Property Class 4.6) carbon-steel, hex-head bolts and studs; carbon-steel nuts (ASTM A563/A563M, Grade A); and flat, unhardened steel washers (ASTM F844).
- K. High-Strength Bolts and Nuts: ASTM A325/A325M or ASTM A490/A490M, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, (ASTM A563/A563M) and hardened carbon-steel washers (ASTM F436/F436M).
- L. 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 electrodeposition according to ASTM B633, SC 3, Type 1.
  - 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.
- M. Welding Electrodes: Comply with AWS standards.

## **2.5 STAINLESS-STEEL CONNECTION MATERIALS**

- A. Stainless-Steel Plate: ASTM A666, Type 304, of grade suitable for application.
- B. Stainless-Steel Bolts and Studs: ASTM F593, alloy 304 or 316, hex-head bolts and studs; stainless-steel nuts; and flat, stainless steel washers. Lubricate threaded parts of stainless steel bolts with an anti-seize thread lubricant during assembly.
- C. Stainless-Steel Headed Studs: ASTM A276 and bearing the minimum mechanical properties for studs as indicated under PCI MNL 117, Table 3.2.3.

## **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.
  5. High-Density Plastic: Multimonomer, nonleaching, plastic strip.
- 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) or 4.8 mm (3/16-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 INSULATED PANEL ACCESSORIES**

- A. Refer to related specifications for insulation.
- B. Wythe Connectors: Glass-fiber and vinyl-ester polymer connectors or, polypropylene pin connectors, manufactured to connect wythes of precast concrete panels.

## **2.10 CONCRETE MIXES**

- A. Prepare design mixes to match Resident Engineer'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. Lightweight Concrete Mixes: Proportion mixes by either laboratory trial batch or field test data methods according to ACI 211.2, with materials to be used on Project, to provide lightweight concrete with the following properties:
  - 1. Minimum Compressive Strength (28 Days): 34.5 MPa (5000 psi).
  - 2. Unit Weight: Calculated equilibrium unit weight of 1842 kg/cu.m (115 lb/cu.ft.), plus or minus 48 kg/cu.m (3 lb/cu.ft.), according to ASTM C567.
- F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.
- G. 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.



- H. When included in design mixes, add other admixtures to concrete mixes according to manufacturer's written instructions.

#### **2.11 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. Edge and Corner Treatment: Uniformly, chamfered or radiused as noted on drawings.
  3. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during placing of concrete.
  4. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.

#### **2.12 SETTING FACING UNITS**

- A. Place form liner templates accurately to provide grid for brick facings. Provide solid backing and supports to maintain stability of liners while placing bricks and during placing of concrete.
- B. Securely place brick units face down into form liner pockets and place precast concrete backing mix.
- C. Clean faces and joints of brick facing.

#### **2.13 FABRICATION**

- A. Cast-in Anchors, Inserts, Plates, Angles, 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 254 mm (10 inches) in any dimension. Do not drill or cut openings or reinforcing without approval of Resident Engineer.
- E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabrication, placing, and supporting reinforcement.
  - 1. Place reinforcing steel and prestressing strand to maintain at least 19 mm (3/4 inch) minimum concrete cover. Increase cover requirements for reinforcing steel to 38 mm (1-1/2 inches) when units are exposed to corrosive environment, exterior applications or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete.
  - 2. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- F. Prestress tendons for units by pretensioning methods. Comply with PCI MNL 117.
  - 1. Protect strand ends and anchorages with, zinc-rich or epoxy paint to prevent corrosion and rust spots.
- G. 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.
- H. 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.
- I. 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.
- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture.

- K. Repair damaged units to meet acceptability requirements of PCI MNL 117 and the Resident Engineer.

#### **2.14 INSULATED PANEL CASTING**

- A. Cast and screed supported wythe over mold.
- B. Place insulation boards, abutting edges and ends of adjacent boards. Insert wythe connectors through insulation, and consolidate concrete around connectors according to connector manufacturer's written instructions.
- C. Cast and screed top wythe to meet required finish.

#### **2.15 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.
  - 1. Additional Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.
    - a. Location of Bearing Surface from End of Member: Plus or Minus 6 mm (1/4 inch).
    - b. Position of Sleeve: Plus or Minus 13 mm (1/2 inch).
    - c. Location of Window Washer Track or Buttons: Plus or Minus 3 mm (1/8 inch).
- B. Fabricate architectural trim units such as sills, lintels, coping, cornices, quoins, medallions, bollards, benches, planters, and pavers, with tolerances meeting PCI MNL 135.
- C. Brick-Faced Architectural Precast Concrete Units.
  - 1. Alignment of mortar joints:
    - a. Jog in Alignment: 3 mm (1/8 inch).
    - b. Alignment with Panel Centerline: Plus or Minus 3 mm (1/8 inch).
  - 2. Variation in Width of Exposed Mortar Joints: Plus or Minus 6 mm (1/4 inch).
  - 3. Tipping of Individual Bricks from the Panel Plane of Exposed Brick Surface: Plus 1.6 mm (1/16 inch); Minus 6.4 mm (1/4 inch) ≤ depth of form liner joint.
  - 4. Exposed Brick Surface Parallel to Primary Control Surface of Panel: Plus 6.4 mm (1/4 inch); Minus 3.2 mm (1/8 inch).
  - 5. Individual Brick Step in Face from Panel Plane of Exposed Brick Surface: Plus 1.6 mm (1/16 inch); Minus 6.4 mm (1/4 inch) ≤ depth of form liner joint.

## **2.16 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 approved design reference sample or mockups and as follows:
1. PCI's "Architectural Precast Concrete -Color and Texture Selection Guide," of plate numbers indicated.
  2. As-Cast Surface Finish: Provide surfaces free of excessive air voids, sand streaks, and honeycombs.
  3. Textured-Surface Finish: Impart by form liners to provide surfaces free of excessive air voids, sand streaks, and honeycombs, with uniform color and texture.
  4. Bushhammer Finish: Use power and hand tools to remove matrix and fracture coarse aggregates.
  5. Exposed Aggregate Finish: Use chemical retarding agents applied to concrete forms and washing and brushing procedures to expose aggregate and surrounding matrix surfaces after form removal.
  6. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
  7. 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.
  8. Honed Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
  9. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.
  10. Sand-Embedment Finish: Use selected stones placed in a sand bed in bottom of mold, with sand removed after curing.
- B. Finish exposed // top // // bottom // // back // surfaces of units to match face-surface finish.
- C. Finish unexposed surfaces // top // // bottom // //and back // of units by smooth steel-trowel finish.
- D. Finish unexposed surfaces of units by float finish.

## **2.17 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 Resident Engineer, 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 Resident Engineer 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 cast-in place concrete building, structural framing has attained minimum allowable design strength or supporting steel or other structure is structurally ready to receive loads from 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 a minimum of 19 mm (3/4 inch).
- 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.
1. Disruption of roof flashing continuity by connections is not permitted; concealment within roof insulation is acceptable.
  2. Welding: Comply with applicable requirements for welding.
    - a. Protect units and bearing pads from damage by field welding or cutting operations and provide noncombustible shields as required.
    - b. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.
    - c. Clean weld affected metal surfaces and apply a minimum 102  $\mu$ m (0.004 inch) thick coat of galvanized repair paint to galvanized surfaces in conformance with ASTM A780.
    - d. Visually inspect all welds critical to precast connections. Visually check all welds for completion and remove, reweld or repair all defective welds.
  3. At bolted connections, use lock washers, tack welding, or other acceptable means to prevent loosening of nuts after final adjustment.
    - a. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot. For friction connection apply specified bolt torque and check 25 percent of bolts at random by calibrated torque wrench.

4. Grouting Connections: Grout connections where required or indicated.  
Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.
- C. Attachments: Upon approval of Resident Engineer, precast pre-stressed products may be drilled or "shot" for fasteners or small openings. 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 1219 mm (4 feet) on centers.
- E. Setting: Where shown, fill joints with cement mortar specified in Section 04 05 13, MASONRY MORTARING or Section 04 05 16, MASONRY GROUTING.
  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.
  3. Rake out joints 25 mm (1-inch) deep for pointing or sealants.
  4. Joints required to have only sealant: Kept free of mortar for full depth.
  5. Keep exposed faces of precast concrete elements free of mortar.
  6. Remove wedges, spacers, or other appliances which are likely to cause staining from joints.
  7. 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 Section 04 05 16, MASONRY GROUTING. Use same material and color sand used in fabrication of precast concrete elements when specified in Section 09 06 00, SCHEDULE FOR FINISHES.

- 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 FIELD QUALITY CONTROL**

- A. Refer to Section 01 45 29, TESTING LABORATORY SERVICES.  
B. Testing agency will report test results promptly and in writing to Contractor and Resident Engineer.  
C. Repair or remove and replace work that does not comply with specified requirements.  
D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

### **3.5 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.

### **3.6 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 11 12 00**  
**PARKING CONTROL EQUIPMENT**

**PART 1 GENERAL:**

**1.1 DESCRIPTION:**

A. Section Includes:

1. Automatic Barrier Gates.
2. Vehicle Detectors.
3. Card Control Units.

B. This section is for employee access to restricted employee parking areas. Can not use parking control equipment for patient parking areas.

C. Verify with VA Project Manager for the preferred features of the equipment.

**1.2 RELATED WORK:**

- A. Asphaltic paving: Section 32 12 16, ASPHALT PAVING.
- B. Concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.
- C. Concrete foundation work: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Conduit placement for equipment: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS, Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS and Section 28 05 33, RACEWAYS AND BOXES FOR ELECTRONIC SAFETY AND SECURITY.
- F. Power supply to disconnect, junction box, in gate arm unit: Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW), Section 27 10 00, STRUCTURED CABLING and Section 28 05 13, CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY.
- G. Electrical characteristics and wiring connections: Section 26 27 26, WIRING DEVICES.

**1.3 QUALITY CONTROL:**

A. Qualifications:

1. Approval by Contracting Officer is required of products or service of proposed manufacturer, suppliers, and installers, and will be based upon submission by Contractor of certification that:
  - a. Installer: Approved by manufacturer of materials and has technical qualifications, experience, trained personnel and facilities to install specified items.

- b. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project, for three years. Submit list of installations.
- 2. Maintenance Proximity: Installer shall maintain a place of business with maintenance facilities not more than two (2) hours normal travel time from project site.
- 3. UL and NEMA Compliance: Provide internal electrical components required as part of parking control equipment that are listed by UL and comply with applicable NEMA standards.
- 4. Single-Source Responsibility: Obtain parking control equipment from one source and from a single manufacturer.

**1.4 SUBMITTALS:**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, submit following:
  - 1. Manufacturer's Literature and Data:
    - a. Description of parking control equipment material and accessories to be provided.
    - b. Provide data on operating equipment, characteristics and limitations, and operating temperature ranges.
  - 2. Samples:
    - a. Submit two samples of access cards and security program, illustrating size, and coding method.
  - 3. Shop Drawings and Certificates: Indicate plan layout of equipment access lanes, mounting bolt dimensions, conduit and outlet locations, power requirements, and conformation of building electrical requirements. Provide Contractor with mounting bolt template in time for installation.
  - 4. Wiring Diagrams: Detailing wiring for parking control equipment operator, signal, and control systems differentiating clearly between manufacturer-installed wiring and field-installed wiring.
    - a. Show locations of connections to electrical service provided as a unit of work under other Divisions.
  - 5. Maintenance Data: For parking control equipment components for inclusion in Operating and Maintenance Manuals, include the following:
    - a. Maintenance Instructions: Provide manufacturer's instructions for maintenance of parking control equipment.

- 1) Include recommended methods and frequency for maintaining equipment in optimum operating condition under anticipated traffic and use conditions.
  - 2) Include precautions against materials and methods that may be detrimental to finishes and performance.
  - 3) Lubrication Schedule and Information: Provide lubrication and periodic maintenance requirement schedules including parts list and parts numbers.
6. Operation Data: Provide operating data for operating equipment, including clock timer, changing security access code, and any other pertinent information required for Government operation.
7. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
- B. In accordance with Section 00 72 00, GENERAL CONDITIONS, submit following at project closeout: Guaranty.
- C. In accordance with Section 01 00 00, GENERAL REQUIREMENTS, submit following at project closeout:
1. Project Record Documents: Record actual locations of concealed conduit and vehicle detection activators.

**1.5 REGULATORY REQUIREMENTS:**

- A. Conform to applicable code for fire/ambulance emergency vehicle access.
- B. Products Requiring Electrical Connection: Listed and classified by UL testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

**1.6 PROJECT CONDITIONS:**

- A. Coordinate placement of conduit, accessories, and power wiring to operating equipment.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

**1.7 DELIVERY, STORAGE AND HANDLING:**

- A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.
- B. Store materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before, during and after installation.

#### **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 Society for Testing Materials (ASTM):
  - A153/A153M-05.....Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - A500/A500M-07.....Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - A653/A653M-08.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
- C. National Electrical Manufacturers Association (NEMA):
  - MG 1-06.....Motors and Generators.
- D. National Fire Protection Association (NFPA):
  - 70 (Current Edition) ...National Electrical Code.
- E. Underwriters Laboratories Inc. (UL):
  - Electrical Appliance and Utilization Equipment Directory.

#### **1.9 SYSTEM DESCRIPTION:**

- A. Parking Control System: Attended , Automatic operation at entrance and at exit.
- B. Design: Protect against interference or damage by lightning or other electrical influence; include fuse, over-voltage protection, flash-over protection, and line filter.
- C. Entry - Automatic Gate Arm Control: Electrically operated upon insertion of coded card , insertion of pass key , detection of vehicle by sensing loop buried in pavement. Activate automatic arm reversing switch if an obstacle is sensed in downward motion.
- D. Exit - Automatic Gate Arm Control: Electrically operated upon detection of vehicle by sensing loop buried in pavement , insertion of coded card , insertion of pass key. Activate automatic arm reversing switch if an obstacle is sensed in the downward motion.

#### **1.10 SCHEDULING:**

- A. Name Street Gate: Automatic key card operation, single gate arm, single gate exit arm activated with loop detector in pavement, and heated cabinets.

- B. Employee Gate: Automatic coded card operation, double entrance, each with gate arms, double gate exit arm activated with key card.

#### **1.11 WARRANTY**

- A. Submit manufacturer's written warranty for materials and installation in accordance with FAR clause 52.246-21.
  - 1. Warranty: Cover keeping equipment operational.
  - 2. Final Acceptance: Requirement for final acceptance shall be continued acceptable use of parking control equipment without a breakdown or stoppage for a period of fifteen (15) calendar days after final acceptance of project by Government.

### **PART 2 PRODUCTS**

#### **2.1 MATERIALS:**

- A. Iron and Steel Hardware: ASTM A153; Zinc coating (hot-dip) on iron and steel hardware.
- B. Steel: ASTM A653/A653M; Galvanized to G90 , Z275.
- C. Structural tubing in rounds and shapes: A500; Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- D. Wood: Clear fir or. Clear cedar.

#### **2.2 AUTOMATIC GATE:**

- A. Provide UL approved automatic barrier gate parking access-control system.
- B. Cabinet: 1.9 mm, (0.075 inch) minimum cold-rolled steel sheet cabinet, welded and weather tight seams, reinforced internally with welded steel angle framing, thermally insulated to permit heater to maintain cabinet temperature to equipment operating minimum, flush access doors and panels, tamper proof hardware, weather tight gaskets, master keyed locks; furnish two (2) keys for each gate, keyed alike. Conceal mounting bolts inside units:
  - 1. Finish cabinet, interior and exterior, with manufacturer's standard baked enamel finish over primer , color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Arm Control: Mechanism to raise and lower arm by instant reversing electric motor, enclosed speed reducer operated by self contained, plug-in replaceable controller. Design mechanism with slip clutch to prevent breakage if arm is forced, and to permit manual operation if required. Arm movement to stop and start at reduced speed. Components of zinc coated steel.

- D. Electrical Components: Self-contained, plug-in, replaceable components. Include wiring for control units, zinc plated connection box, grounded convenience outlet, switch for automatic or manual operation, switch to disconnect power unit, thermostatically controlled minimum 250 Watt heater strip with control switch and preset thermostat, and thermal protection disconnect for motor.

### **2.3 ELECTRICAL CHARACTERISTICS AND COMPONENTS:**

- A. Electrical Characteristics:
1. Provide electrical characteristic that is compatible between electrical service and parking control equipment.
  2. Provide motor capacity and features as recommended by equipment manufacturer and as approved by VA Project Manager.
  3. Refer to Section 26 27 26, WIRING DEVICES: Electrical connections.
- B. Motor: Instant reversing motor for operation of gate arm. // Refer to Section 11 05 12, GENERAL MOTOR REQUIREMENTS FOR EQUIPMENT, Section 21 05 12, GENERAL MOTOR REQUIREMENTS FOR FIRE-SUPPRESSION, Section 22 05 12, GENERAL MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT, Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC AND STEAM GENERATION EQUIPMENT and Section 26 29 21, DISCONNECT SWITCHES. NEMA MG1.
- C. Controls: Transmit power to gate arm drive shaft through a harmonic acting crank and connecting rod. Fabricate cranks, rod, and drive shaft of galvanized solid bar steel.
- D. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- E. Disconnect Switch: Factory mount disconnect switch in control panel on equipment under provisions of Section 26 29 21, DISCONNECT SWITCHES.

### **2.4 ARM AND SUPPORT:**

- A. Gate Arm: Fabricate gate arm of nominal 25 mm (1 inch) thick, length as indicated, of Aluminum articulating arm with internal counterbalance (with safety rubber bottom edge and automatic instant reversing arm mechanism that stops downward motion of gates if arm strikes an object, and returning arm immediately to upward position. Equip mechanism with a 0 to 60 second variable time reset device.).
1. Finish with manufacturer's standard coating system with black diagonal stripes on traffic side face.

- B. Arm Clamp: Cast metal, quick change clamp and hub bracket, to permit rapid replacement of arm without fitting or drilling. Provide breakaway feature to ensure clean break if arm is struck.
- C. End support post required for gate arm of 4.3 m (14 feet) or longer.
- D. End Support Post: 50 mm (2 inch) round steel tubular section; 1940 mm (37 inches) high, 3.4 mm, (0.135 inch) minimum wall thickness; with alignment bracket, closed cap and baseplate.
- E. Padlocking Feature: To lock gate arm in either open or closed position, if required.

#### **2.5 CARD KEY CONTROL:**

- A. General: Provide pedestal mounted card control units to activate barrier gates.
- B. Control Unit: To activate gate arm by insertion of coded card or pass key.
- C. Cabinet: 1.9 mm (0.075 inch) minimum welded cold-rolled steel sheet, weather tight seams; thermally insulated to permit heater to maintain cabinet temperature to equipment operating minimum, flush access doors and panels, tamper proof flush mounted lock hardware and two (2) keys master keyed to operate access panel, weather tight gaskets. Conceal mounting bolts inside units.
  - 1. Mount housing on a 50 mm (2 inch) square steel tube pedestal with a curved top to receive housing, and a trim plate to cover anchor bolts.
  - 2. Finish interior and exterior of cabinet with manufacturer's standard baked enamel finish over primer. Color as indicated in Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Card Key Slot: Mount above vehicle pavement surface, at height meeting ADA, illuminate and protect with projecting weather shield.
- E. Coded Cards: Material and type as selected by VA Project Manager.
- F. Pass Keys: Supply number of keys as determined by VA Project Manager.

#### **2.6 VEHICLE DETECTION:**

- A. Vehicle Detection: For use in temperature range of -40 to 71 °C (-40 to 160 °F) to consist of detector unit in conjunction with sensing loop to activate card control, barrier gate when vehicle enters or exits.
- B. Loop Wire: 14 gage, XHWN or THWN copper; loop size of 1 200 X 1 800 mm. (48 X 72 inches.)
- C. Loop Groove Fill: Same material as pavement.



- D. Treadle Plate: Steel, galvanized, 3300 X 1800 mm size, (12 X 72 inches); to consist of weatherproof sensor detector to activate card control, barrier gate when vehicle enters or exits.

## **2.7 FINISHES:**

- A. Gate Arm: Two coat enamel with reflective black and yellow diagonal stripes both sides of arm.
- B. Gate Posts and Cabinets: Baked enamel on steel, color as selected.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION:**

- A. Verification of existing conditions before starting work:
1. Prior to beginning installation, examine areas to receive parking control equipment. Verify that critical dimensions are correct and that conditions are acceptable:
    - a. Do not proceed with installation of parking control equipment until unsatisfactory conditions have been corrected.
- B. Verify that anchor bolts are ready to receive work and dimensions are as indicated on shop drawings and as instructed by manufacturer.
- C. Verify that electric power is available and of correct characteristics.

### **3.2 PREPARATION**

Provide templates for anchor bolts and other items encased in concrete or below finished surfaces in sufficient time so as not to delay work.

### **3.3 INSTALLATION**

- A. Install parking control system and components in accordance with manufacturer's instructions and placement drawings.
- B. Cut grooves in pavement surface, install vehicle detection loops and lead-in wires, and fill grooves with loop filler.
- C. Install internal electrical wiring, conduit, junction boxes, transformers, circuit breakers, and auxiliary components required.

### **3.4 ADJUSTING**

- A. Prior to final acceptance of project adjust system components for smooth operation.
- B. Fit and adjust hardware for ease of operation.
1. Lubricate hardware and other moving parts.
  2. Readjust parking control system and components at completion of project.

### **3.5 CLEANING**

- A. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings. Touch up damaged shop-applied finishes as required to restore damaged areas.
- B. Follow recommendations of manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.

### **3.6 FIELD QUALITY CONTROL**

- A. Tests:
  - 1. Test operating functions in accordance with manufacturer's printed checklist.
  - 2. Correct defects revealed by tests. Retest corrected areas until functions are operating properly.

### **3.7 DEMONSTRATION, TESTING AND ACCEPTANCE**

- A. Instruct Owner's personnel in proper operation and maintenance of parking control equipment. Train personnel in procedures to follow in event of operational failures or malfunctions.
- B. Acceptance: At completion of project, and as a condition of acceptance, parking control equipment and systems shall be operated for a period of 15 consecutive calendar days without breakdown.

### **3.8 PROTECTION:**

- A. Protect parking control equipment finished surfaces from damage during erection, and after completion of work until final inspection and acceptance.

- - - END - - -

**LISTED MANUFACTURERS**

**PARKING CONTROL EQUIPMENT:**

American Parking Equipment Inc.  
535 Oxford Street  
Etobicoke, Toronto, Ontario M8Y 1E5  
(800) 565-4666.

Amano Parking Systems (Headquarters)  
140 Harrison Avenue  
Roseland, NJ 07068  
(800) 367-6649

Amano Parking Systems (Factory)  
130 Commerce Boulevard  
Loveland, OH 45140  
(513) 697-9000

Delta Scientific Corporation  
24901 West Avenue Stanford  
Valencia, CA 91335  
(800) 521-9330

Federal APD  
24700 Crestview Court  
Farmington Hills, MI 48335  
(800) 521-9330

Magnetic Automation Corporation  
1715 Independence Blvd., Suite. B-7  
Sarasota, FL 34234  
(941) 351-7116

Parking Products, Inc.  
2517 Wyandotte Road  
Willow Grove, PA 19090  
(215) 657-7500

**SECTION 31 20 00**  
**EARTH MOVING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION OF WORK:**

A. This section specifies the requirements for furnishing all equipment, materials, labor, tools, and techniques for earthwork including, but not limited to, the following:

1. Site preparation.
2. Excavation.
3. Underpinning.
4. Filling and backfilling.
5. Grading.
6. Soil Disposal.
7. Clean Up.

**1.2 DEFINITIONS:**

A. Unsuitable Materials:

1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 75 mm (3 inches); organic material, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable and any material with a liquid limit and plasticity index exceeding 40 and 15 respectively. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction, as defined by AASHTO T 99, Method C.
2. Existing Subgrade (Except Footing Subgrade): Same materials as 1.2.A.1, that are not capable of direct support of slabs, pavement, and similar items with possible exception of improvement by compaction, proofrolling, or similar methods.
3. Existing Subgrade (Footings Only): Same as paragraph 1, but no fill or backfill. If materials differ from reference borings and design requirements, excavate to acceptable strata subject to Resident Engineer's approval.

B. Building Earthwork: Earthwork operations required in area enclosed by a line located 1500 mm (5 feet) outside of principal building perimeter. It also includes earthwork required for auxiliary structures and buildings.

- C. Trench Earthwork: Trenchwork required for utility lines.
- D. Site Earthwork: Earthwork operations required in area outside of a line located 1500 mm (5 feet) outside of principal building perimeter and within new construction area with exceptions noted above.
- E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This percentage of maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1556, ASTM D2167, and ASTM D2922.
- F. Fill: Satisfactory soil materials used to raise existing grades. In the Construction Documents, the term "fill" means fill or backfill as appropriate.
- G. Backfill: Soil materials or controlled low strength material used to fill an excavation.
- H. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or indicated lines and dimensions without written authorization by the Resident Engineer. No payment will be made for unauthorized excavation or remedial work required to correct unauthorized excavation.
- I. Authorized additional excavation: Removal of additional material authorized by the Resident Engineer based on the determination by the Government's soils testing agency that unsuitable bearing materials are encountered at required sub-grade elevations. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- J. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- K. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- M. Drainage course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- N. Bedding course: Layer placed over the excavated sub-grade in a trench before laying pipe. Bedding course shall extend up to the springline of the pipe.

- O. Sub-base Course: Layer placed between the sub-grade and base course for asphalt paving or layer placed between the sub-grade and a concrete pavement or walk.
- P. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- Q. Debris: Debris includes all materials located within the designated work area not covered in the other definitions and shall include but not be limited to items like vehicles, equipment, appliances, building materials or remains thereof, tires, any solid or liquid chemicals or products stored or found in containers or spilled on the ground.
- R. Contaminated soils: Soil that contains contaminants as defined and determined by the Resident Engineer or the Government's testing agency.

**1.3 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- E. Erosion Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, and Section 32 90 00, PLANTING.
- F. Site preparation: Section 31 23 19, DEWATERING, and Section 02 41 00, DEMOLITION.
- G. Foundation system requirements: Section 31 62 00, DRIVEN PILES, Section 31 63 16, AUGER CAST GROUT PILES, Section 31 63 26, DRILLED CAISSONS, Section 31 23 23.33, FLOWABLE FILL.
- H. Paving sub-grade requirements: Section 32 12 16, ASPHALT PAVING.
- I. Material Removal Requirements: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

**1.4 CLASSIFICATION OF EXCAVATION:**

- A. Classification of excavation shall be determined by the VA Project Manager.
- B. Unclassified Excavation: Removal and disposal of pavements and other man-made obstructions visible on surface; utilities, and other items

including underground structures indicated to be demolished and removed; together with any type of materials regardless of character of material and obstructions encountered.

C. Classified Excavation: Removal and disposal of all material except that material not defined as Rock.

D. Rock Excavation:

1. Trenches and Pits: Removal and disposal of solid, homogenous, interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be excavated with a late-model, track-mounted hydraulic excavator; equipped with a 1050 mm (42 inch) wide, short-tip-radius rock bucket; rated at not less than 103 kW (138 hp) flywheel power with bucket-curling force of not less than 125 kN (28,090 lbf) and stick-crowd force of not less than 84.5 kN (19,000 lbf); measured according to SAE J-1179. Trenches in excess of 3000 mm (10 feet) wide and pits in excess of 9000 mm (30 feet) in either length or width are classified as open excavation.
2. Open Excavation: Removal and disposal of solid, homogenous, interlocking crystalline material firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be dislodged and excavated with a late-model, track-mounted loader; rated at not less than 157 kW (210 hp) flywheel power and developing a minimum of 216 kN (48,510 lbf) breakout force; measured according to SAE J-732.
3. Other types of materials classified as rock are unstratified masses, conglomerated deposits and boulders of rock material exceeding 0.76 m<sup>3</sup> (1 cubic yard) for open excavation, or 0.57 m<sup>3</sup> (3/4 cubic yard) for footing and trench excavation that cannot be removed by rock excavating equipment equivalent to the above in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted.
4. Blasting: Removal and disposal of solid, homogenous, interlocking crystalline material firmly cemented, laminated, or foliated masses or conglomerate deposits that cannot be removed with conventional methods may not be performed by blasting.
5. Definitions of rock and guidelines for equipment are presented for general information purposes only. The Contractor is expected to use the information presented in the Geotechnical Engineering Report

to evaluate the extent and competency of the rock and to determine both quantity estimations and removal equipment and efforts.

**1.5 MEASUREMENT AND PAYMENT FOR ROCK EXCAVATION:**

- A. Measurement: Cross section and measure uncovered and separated materials, and compute quantities by Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 00 00, GENERAL REQUIREMENTS. Do not measure quantities beyond the following limits:
1. 600 mm (24 inches) from outside face of concrete work for which forms are required, except for footings.
  2. 300 mm (12 inches) from outside of perimeter of formed footings.
  3. 150 mm (6 inches) below bottom of pipe and not more than pipe diameter plus 600 mm (24 inches) in width for pipe trenches.
  4. From outside dimensions of concrete work for which no forms are required (trenches, conduits, and similar items not requiring forms).
- B. Payment: No separate payment shall be made for rock excavation quantities shown. Contract price and time will be adjusted for overruns or underruns in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable.
- C. Payment for Differing Site Conditions: When rock excavation, as classified, is encountered, contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable.

**1.6 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Rock Excavation Report:
1. Certification of rock quantities excavated.
  2. Excavation method.
  3. Labor.
  4. Equipment.
  5. Land Surveyor's or Civil Engineer's name and official registration stamp.
  6. Plot plan showing elevation.
- C. Furnish to Resident Engineer:



1. Contactor shall furnish resumes with all personnel involved in the project including Project Manager, Superintendent, and on-site Engineer. Project Manager and Superintendent should have at least 3 years of experience on projects of similar size.
2. Soil samples.
  - a. Classification in accordance with ASTM D2487 for each on-site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
  - b. Laboratory compaction curve in accordance with ASTM D1557 for each on site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
  - c. Test reports for compliance with ASTM D 2940 requirements for subbase material.
  - d. Pre-excavation photographs and videotape in the vicinity of the existing structures to document existing site features, including surfaces finishes, cracks, or other structural blemishes that might be misconstrued as damage caused by earthwork operations.
  - e. The Contractor shall submit a scale plan daily that defines the location, limits, and depths of the area excavated.
3. Storm Water
  - a. Submit a plan that employs strategies that reduce storm water runoff and discharges of polluted water offsite.

**1.7 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 Association of State Highway and Transportation Officials (AASHTO):  
T99-01(2004).....Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop  
T180-01(2004).....Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop
- C. American Society for Testing and Materials (ASTM):  
D448-08.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction

- D698-07e1.....Standard Test Methods for Laboratory Compaction  
Characteristics of Soil Using Standard Effort  
(12,400 ft. lbf/ft<sup>3</sup> (600 kN m/m<sup>3</sup>))
- D1556-07.....Standard Test Method for Density and Unit  
Weight of Soil in Place by the Sand-Cone Method
- D1557-07.....Standard Test Methods for Laboratory Compaction  
Characteristics of Soil Using Modified Effort  
(56,000 ft-lbf/ft<sup>3</sup> (2700 kN m/m<sup>3</sup>))
- D2167-08.....Standard Test Method for Density and Unit  
Weight of Soil in Place by the Rubber Balloon  
Method
- D2487-06e1.....Standard Classification of Soil for Engineering  
Purposes (Unified Soil Classification System)
- D6938-08a.....Standard Test Methods for In-place Density and  
Water Content of Soil and Soil-Aggregate in  
Place by Nuclear Methods (Shallow Depth)
- D2940-03.....Standard Specifications for Graded Aggregate  
Material for Bases or Subbases for Highways or  
Airports
- D. Society of Automotive Engineers (SAE):
- J732-07.....Specification Definitions - Loaders
- J1179-02.....Hydraulic Excavator and Backhoe Digging Forces

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. General: Provide borrow soil material when sufficient satisfactory soil materials are not available from excavations.
- B. Fills: Material in compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups; free of rock or gravel larger than 75 mm (3 inches) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material approved from on site or off site sources having a minimum dry density of 1760 kg/m<sup>3</sup> (110 pcf), a maximum Plasticity Index of 15, and a maximum Liquid Limit of 40.
- C. Engineered Fill: Naturally or artificially graded mixture of compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups, or as approved by the Engineer or material with at least 90 percent passing a 37.5-mm (1 1/2-

inch) sieve and not more than 12 percent passing a 75- $\mu$ m (No. 200) sieve, per ASTM D2940;.

- D. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 25 mm (1 inch) sieve and not more than 8 percent passing a 75- $\mu$ m (No. 200) sieve.
- E. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 37.5 mm (1 1/2-inch) sieve and 0 to 5 percent passing a 2.36 mm (No. 8) sieve.
- F. Granular Fill:
  - 1. Under concrete slab, crushed stone or gravel graded from 25 mm (1 inch) to 4.75 mm (No. 4), per ASTM D 2940.
  - 2. Bedding for sanitary and storm sewer pipe, crushed stone or gravel graded from 13 mm (1/2 inch) to 4.75 mm (No 4), per ASTM D 2940.

### **PART 3 - EXECUTION**

#### **3.1 SITE PREPARATION:**

- A. Clearing: Clear within limits of earthwork operations as shown. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstructions. Remove materials from the Property.
- B. Grubbing: Remove stumps and roots 75 mm (3 inch) and larger diameter. Undisturbed sound stumps, roots up to 75 mm (3 inch) diameter, and nonperishable solid objects a minimum of 900 mm (3 feet) below subgrade or finished embankment may be left. Cemetery Projects: do not leave material within burial profile up to 2400 mm (8 feet) below finished grade.
- C. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 4500 mm (15 feet) of new construction and 2250 mm (7.5 feet) of utility lines when removal is approved in advance by Resident Engineer. Remove materials from the Property. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with latest issue of, "American Standard for Nursery Stock" of the American Association of Nurserymen, Inc. Transplant trees and shrubs to a permanent or temporary position within two hours after digging. Maintain trees and shrubs held in temporary locations by watering as necessary and feeding semiannually with liquid

fertilizer with a minimum analysis of 5 percent nitrogen, 10 percent phosphorus, and 5 percent potash. Maintain plants moved to permanent positions as specified for plants in temporary locations until conclusion of contract. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in construction area. Immediately repair damage to existing trees and shrubs by trimming, cleaning and painting damaged areas, including roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Do not store building materials closer to trees and shrubs, that are to remain, than farthest extension of their limbs.

- D. Stripping Topsoil: Strip topsoil from within limits of earthwork operations as specified. Topsoil shall be a fertile, friable, natural topsoil of loamy character and characteristic of locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by Resident Engineer. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials larger than 0.014 m<sup>3</sup> (1/2 cubic foot) in volume, from soil as it is stockpiled. Retain topsoil on station. Remove foreign materials larger than 50 mm (2 inches) in any dimension from topsoil used in final grading. Topsoil work, such as stripping, stockpiling, and similar topsoil work shall not, under any circumstances, be carried out when soil is wet so that the composition of the soil will be destroyed. Cemetery Projects: Test the soil for chemicals, pesticides and fertilizers if topsoil is to be removed from lands formerly utilized as farmland, to verify suitability for use as topsoil in the cemetery where new lawn areas are to be established.
- E. Concrete Slabs and Paving: Score deeply or saw cut to insure a neat, straight cut, sections of existing concrete slabs and paving to be removed where excavation or trenching occurs. Extend pavement section to be removed a minimum of 300 mm (12 inches) on each side of widest part of trench excavation and insure final score lines are approximately parallel unless otherwise indicated. Remove material from the Cemetery Property.
- F. Lines and Grades: Registered Professional Land Surveyor or Registered Civil Engineer, specified in Section 01 00 00, GENERAL REQUIREMENTS, shall establish lines and grades.

1. Grades shall conform to elevations indicated on plans within the tolerances herein specified. Generally grades shall be established to provide a smooth surface, free from irregular surface changes. Grading shall comply with compaction requirements and grade cross sections, lines, and elevations indicated. Where spot grades are indicated the grade shall be established based on interpolation of the elevations between the spot grades while maintaining appropriate transition at structures and paving and uninterrupted drainage flow into inlets.
2. Locations of existing and proposed elevations indicated on plans, except spot elevations, are approximate. Proposed spot elevations and contour lines have been developed utilizing the existing conditions survey and developed contour lines and may be approximate. Contractor is responsible to notify Resident Engineer of any differences between existing elevations shown on plans and those encountered on site by Surveyor/Engineer described above. Notify Resident Engineer of any differences between existing or constructed grades, as compared to those shown on the plans.
3. Subsequent to establishment of lines and grades, Contractor will be responsible for any additional cut and/or fill required to ensure that site is graded to conform to elevations indicated on plans.
4. Finish grading is specified in Section 32 90 00, PLANTING.
- G. Disposal: All materials removed from the property shall be disposed of at a legally approved site, for the specific materials, and all removals shall be in accordance with all applicable Federal, State and local regulations. No burning of materials is permitted onsite.

### **3.2 EXCAVATION:**

- A. Shoring, Sheet piling and Bracing: Shore, brace, or slope, its angle of repose or to an angle considered acceptable by the Resident Engineer, banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities.
  1. Design of the temporary support of excavation system is the responsibility of the Contractor.
  2. Construction of the support of excavation system shall not interfere with the permanent structure and may begin only after a review by the Resident Engineer.

3. Extend shoring and bracing to a minimum of 1500 mm (5 feet) below the bottom of excavation. Shore excavations that are carried below elevations of adjacent existing foundations.
  4. If bearing material of any foundation is disturbed by excavating, improper shoring or removal of existing or temporary shoring, placing of backfill, and similar operations, the Contractor shall underpin the existing foundation, per Section 3.3 or provide a concrete fill support in compliance with specifications Section 31 23 23.33, FLOWABLE FILL, under disturbed foundations, as directed by Resident Engineer, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by Resident Engineer.
- B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required, to keep excavation free of water and subgrade dry, firm, and undisturbed until approval of permanent work has been received from Resident Engineer. Approval by the Resident Engineer is also required before placement of the permanent work on all subgrades.
- C. Subgrade Protection: Protect subgrades from softening, undermining, washout, or damage by rain or water accumulation. Reroute surface water runoff from excavated areas and not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. When subgrade for foundations has been disturbed by water, remove disturbed material to firm undisturbed material after water is brought under control. Replace disturbed subgrade in trenches with concrete or material approved by the Resident Engineer.
- D. Blasting: Blasting shall not be permitted.
- E. Proofrolling:
1. After rough grade has been established in cut areas and prior to placement of fill in fill areas under building and pavements, proofroll exposed subgrade with a fully loaded dump truck to check for pockets of soft material.
  2. Proofrolling shall consist of at least two complete passes with one pass being in a direction perpendicular to preceding one. Remove any areas that deflect, rut, or pump excessively during proofrolling, or that fail to consolidate after successive passes to suitable soils

and replaced with compacted fill. Maintain subgrade until succeeding operation has been accomplished.

F. Building Earthwork:

1. Excavation shall be accomplished as required by drawings and specifications.
2. Excavate foundation excavations to solid undisturbed subgrade.
3. Remove loose or soft materials to a solid bottom.
4. Fill excess cut under footings or foundations with 25 MPa (3000 psi) concrete poured separately from the footings.
5. Do not tamp earth for backfilling in footing bottoms, except as specified.
6. Slope grades to direct water away from excavations and to prevent ponding.

G. Trench Earthwork:

1. Utility trenches (except sanitary and storm sewer):
  - a. Excavate to a width as necessary for sheeting and bracing and proper performance of the work.
  - b. Grade bottom of trenches with bell holes scooped out to provide a uniform bearing.
  - c. Support piping on undisturbed earth unless a mechanical support is shown.
  - d. Length of open trench in advance of piping laying shall not be greater than is authorized by Resident Engineer.
2. Sanitary and storm sewer trenches:
  - a. Trench width below a point 150 mm (6 inches) above top of pipe shall be 600 mm (24 inches) maximum for pipe up to and including 300 mm (12 inches) diameter, and four-thirds diameter of pipe plus 200 mm (8 inches) for pipe larger than 300 mm (12 inches). Width of trench above that level shall be as necessary for sheeting and bracing and proper performance of the work.
  - b. Bed bottom quadrant of pipe on undisturbed soil or granular fill.
    - 1) Undisturbed: Bell holes shall be no larger than necessary for jointing. Backfill up to a point 300 mm (12 inches) above top of pipe shall be clean earth placed and tamped by hand.
    - 2) Granular Fill: Depth of fill shall be a minimum of 75 mm (3 inches) plus one sixth of pipe diameter below pipe to 300 mm

(12 inches) above top of pipe. Place and tamp fill material by hand.

- c. Place and compact as specified remainder of backfill using acceptable excavated materials. Do not use unsuitable materials.
- d. Use granular fill for bedding where rock or rocky materials are excavated.

H. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Excavation shall be accomplished as required by drawings and specifications. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 25 mm (1 inch). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, complying with OSHA requirements, and for inspections. Remove subgrade materials that are determined by Resident Engineer as unsuitable, and replace with acceptable material. If there is a question as to whether material is unsuitable or not, the contractor shall obtain samples of the material, under the direction of the Resident Engineer, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL CONDITIONS as applicable. Adjustments to be based on volume in cut section only.

1. Site Grading:

- a. Provide a smooth transition between adjacent existing grades and new grades.
- b. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- c. Slope grades to direct water away from buildings and to prevent ponds from forming where not designed. Finish subgrades to required elevations within the following tolerances:
  - 1) Lawn or Unpaved Areas: Plus or minus 25 mm (1 inch).
  - 2) Walks: Plus or minus 13 mm (1/2 inch).
  - 3) Pavements: Plus or minus 13 mm (1/2 inch).



- d. Grading Inside Building Lines: Finish subgrade to a tolerance of 13 mm (1/2 inch) when tested with a 3000 mm (10 foot) straightedge.

**3.4 FILLING AND BACKFILLING:**

- A. General: Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation. For fill and backfill, use excavated materials and borrow meeting the criteria specified herein, as applicable. Borrow will be supplied at no additional cost to the Government. Do not use unsuitable excavated materials. Do not backfill until foundation walls have been completed above grade and adequately braced, waterproofing or dampproofing applied, foundation drainage, and pipes coming in contact with backfill have been installed and work inspected and approved by Resident Engineer.
- B. Placing: Place materials in horizontal layers not exceeding 200 mm (8 inches) in loose depth for material compacted by heavy compaction equipment, and not more than 100 mm (4 inches) in loose depth for material compacted by hand-operated tampers and then compacted. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Place no material on surfaces that are muddy, frozen, or contain frost.
- C. Compaction: Compact with approved tamping rollers, sheepsfoot rollers, pneumatic tired rollers, steel wheeled rollers, vibrator compactors, or other approved equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 3000 mm (10 feet) of new or existing building walls without prior approval of Resident Engineer. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact soil to not less than the following percentages of maximum dry density, according to ASTM D698 or ASTM D1557 as specified below:
1. Fills, Embankments, and Backfill
    - a. Under proposed structures, building slabs, steps, and paved areas, scarify and recompact top 300 mm (12 inches) of existing subgrade and each layer of backfill or fill material in accordance with AASHTO T99 Method C 95 percent.

- b. Curbs, curbs and gutters, AASHTO T99 Method C 95 percent.
  - c. Under Sidewalks, scarify and recompact top 150 mm (6 inches) below subgrade and compact each layer of backfill or fill material in accordance with AASHTO T99 Method C 95 percent.
  - d. Landscaped areas, top 400 mm (16 inches), AASHTO T99 Method C 85 percent.
  - e. Landscaped areas, below 400 mm (16 inches) of finished grade, AASHTO T99 Method C 90 percent.
2. Natural Ground (Cut or Existing)
- a. Under building slabs, steps and paved areas, top 150 mm (6 inches), AASHTO T99 Method C 95 percent.
  - b. Curbs, curbs and gutters, top 150 mm (6 inches), AASHTO T99 Method C 95 percent.
  - c. Under sidewalks, top 150 mm (6 inches), AASHTO T99 Method C 95 percent.

### **3.5 GRADING:**

- A. General: Uniformly grade the areas within the limits of this section, including adjacent transition areas. Smooth the finished surface within specified tolerance. Provide uniform levels or slopes between points where elevations are indicated, or between such points and existing finished grades. Provide a smooth transition between abrupt changes in slope.
- B. Cut rough or sloping rock to level beds for foundations. In pipe spaces or other unfinished areas, fill low spots and level off with coarse sand or fine gravel.
- C. Slope backfill outside building away from building walls for a minimum distance of 1800 mm (6 feet).
- D. Finish grade earth floors in pipe basements as shown to a level, uniform slope and leave clean.
- E. Finished grade shall be at least 150 mm (6 inches) below bottom line of window or other building wall openings unless greater depth is shown.
- F. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 150 mm (6 inches) unless otherwise shown.
- G. Finish subgrade in a condition acceptable to Resident Engineer at least one day in advance of paving operations. Maintain finished subgrade in a smooth and compacted condition until succeeding operation has been

accomplished. Scarify, compact, and grade subgrade prior to further construction when approved compacted subgrade is disturbed by Contractor's subsequent operations or adverse weather.

- H. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

**3.6 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL:**

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the property. Transport surplus satisfactory soil to designated storage areas on the property as directed by the VA Project Manager. Stockpile or spread soil as directed by Resident Engineer.
1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the property.
- B. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- C. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- D. Segregate all excavated contaminated soil designated by the Resident Engineer from all other excavated soils, and stockpile on site on two 0.15 mm (6 mil) polyethylene sheets with a polyethylene cover. A designated area shall be selected for this purpose. Dispose of excavated contaminated material in accordance with State and Local requirements.

**3.7 CLEAN UP:**

Upon completion of earthwork operations, clean areas within contract limits, remove tools, and equipment. Provide site clear, clean, free of debris, and suitable for subsequent construction operations. Remove all debris, rubbish, and excess material from the Property.

----- E N D -----

**SECTION 31 23 19**  
**DEWATERING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies performance of dewatering required to lower and control ground water table levels and hydrostatic pressures to permit excavation, backfill, and construction to be performed in the dry. Control of surface water shall be considered as part of the work under this specification.

**1.2 SUMMARY:**

- A. The work to be completed by the Contractor includes, but is not necessarily limited to the following:
  - 1. Implementation of the Erosion and Sedimentation Control Plan.
  - 2. Dewater excavations, including seepage and precipitation.
- B. The Contractor shall be responsible for providing all materials, equipment, labor, and services necessary for care of water and erosion control. Excavation work shall not begin before the Erosion and Sedimentation Control Plan is in place.

**1.3 REQUIREMENT:**

- A. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least 300 mm (1 foot) below lowest foundation subgrade or bottom of pipe trench and to allow material to be excavated in a reasonably dry condition. Materials to be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill work has been completed.
- B. Reduce hydrostatic head below any excavation to the extent that water level in the construction area is a minimum of 300 mm (1 foot) below prevailing excavation surface.
- C. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
- D. Maintain stability of sides and bottom of excavation.
- E. Construction operations are performed in the dry.
- F. Control of surface and subsurface water is part of dewatering requirements. Maintain adequate control so that:

1. The stability of excavated and constructed slopes are not adversely affected by saturated soil, including water entering prepared subbase and subgrades where underlying materials are not free draining or are subject to swelling or freeze-thaw action.
  2. Erosion is controlled.
  3. Flooding of excavations or damage to structures does not occur.
  4. Surface water drains away from excavations.
  5. Excavations are protected from becoming wet from surface water, or insure excavations are dry before additional work is undertaken.
- G. Permitting Requirements: The contractor shall comply with and obtain the required State and County permits where the work is performed.

**1.4 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety Requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- C. Submittal requirements as specified in Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- D. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.11, PHYSICAL DATA.
- F. Excavation, backfilling, site grade and utilities: Section 31 20 00, EARTH MOVING.

**1.5 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Drawings and Design Data:
  1. Submit drawings and data showing the method to be employed in dewatering excavated areas 30 days before commencement of excavation.
  2. Material shall include: location, depth and size of wellpoints, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal.

3. Include a written report outlining control procedures to be adopted if dewatering problem arises.
4. Materials submitted shall be in a format acceptable for inclusion in required permit applications to any and all regulatory agencies for which permits for discharge water from the dewatering system are required due to the discharge reaching regulated bodies of water.

C. Inspection Reports.

D. All required permits.

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

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

- A. Install a dewatering system to lower and control ground surface water in order to permit excavation, construction of structure, and placement of backfill materials to be performed under dry conditions. Make the dewatering system adequate to pre-drain the water-bearing strata above and below the bottom of structure foundations, utilities and other excavations.
- B. In addition, reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, to extent that water levels in construction area are a minimum of 300 mm (1 foot) below prevailing excavation surface at all times.

**3.2 OPERATION:**

- A. Prior to any excavation below the ground water table, place system into operation to lower water table as required and operate it continuously 24 hours a day, 7 days a week until utilities and structures have been satisfactorily constructed, which includes the placement of backfill materials and dewatering is no longer required.
- B. Place an adequate weight of backfill material to prevent buoyancy prior to discontinuing operation of the system.

**3.3 WATER DISPOSAL:**

- A. Dispose of water removed from the excavations in such a manner as:
  1. Will not endanger portions of work under construction or completed.
  2. Will cause no inconvenience to Government or to others working near site.
  3. Will comply with the stipulations of required permits for disposal of water.

4. Will Control Runoff: The Contractor shall be responsible for control of runoff in all work areas including but not limited to: excavations, access roads, parking areas, laydown, and staging areas. The Contractor shall provide, operate, and maintain all ditches, basins, sumps, culverts, site grading, and pumping facilities to divert, collect, and remove all water from the work areas. All water shall be removed from the immediate work areas and shall be disposed of in accordance with applicable permits.

B. Excavation Dewatering:

1. The Contractor shall be responsible for providing all facilities required to divert, collect, control, and remove water from all construction work areas and excavations.
2. Drainage features shall have sufficient capacity to avoid flooding of work areas.
3. Drainage features shall be so arranged and altered as required to avoid degradation of the final excavated surface(s).
4. The Contractor shall utilize all necessary erosion and sediment control measures as described herein to avoid construction related degradation of the natural water quality.

- C. Dewatering equipment shall be provided to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work during construction. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

**3.4 STANDBY EQUIPMENT:**

- A. Provide complete standby equipment, installed and available for immediate operation, as may be required to adequately maintain dewatering on a continuous basis and in the event that all or any part of the system may become inadequate or fail.

**3.5 CORRECTIVE ACTION:**

- A. If dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system (loosening of the foundation strata, or instability of slopes, or damage to foundations or structures), perform work necessary for reinstatement of foundation soil and damaged structure resulting from such inadequacy or failure by Contractor, at no additional cost to Government.

**3.6 DAMAGES:**

- A. Immediately repair damages to adjacent facilities caused by dewatering operations.

**3.7 REMOVAL:**

- A. Insure compliance with all conditions of regulating permits and provide such information to the Resident Engineer. Obtain written approval from Resident Engineer before discontinuing operation of dewatering system.

----- E N D -----



**SECTION 32 31 13**  
**CHAIN LINK FENCES AND GATES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This work consists of all labor, materials, and equipment necessary for furnishing and installing chain link fence, gates and accessories in conformance with the lines, grades, and details as shown.

**1.2 RELATED WORK**

- A. Grounding of fencing for enclosures of electrical equipment and for lightning protection as shown: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- B. Temporary Construction Fence: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Finish Grading: Section 31 20 00, EARTH MOVING, and Section 32 90 00, PLANTING.
- D. Guard Booths: Section 13 34 19, METAL BUILDING SYSTEMS
- E. Card readers and biometric devices: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS
- F. Intrusion alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM
- G. Security fences: Section 32 31 53, PERIMETER SECURITY FENCES AND GATES.

**1.3 MANUFACTURER'S QUALIFICATIONS**

- A. Fence, gates, and accessories shall be products of manufacturers' regularly engaged in manufacturing items of type specified.

**1.4 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, furnish the following:
  - 1. Manufacturer's Literature and Data: Chain link fencing, gates and all accessories.
  - 2. Manufacturer's Certificates: Zinc-coating complies with complies with specifications.
- B. Shop Drawings for sliding gates and as directed by the VA Project Manager.
- C. Certification that fence alignment meets requirements of contract documents for property line fencing or similar purpose requiring accurate alignment..

## **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 for Testing and Materials (ASTM):
- A121-07.....Metallic Coated Carbon Steel Barbed Wire
  - A392-07.....Zinc-Coated Steel Chain-Link Fence Fabric
  - A817-07.....Metal-Coated Steel Wire for Chain-Link Fence  
Fabric and Marcellled Tension Wire
  - C94/C94M-07.....Ready-Mixed Concrete
  - F567-07.....Installation of Chain-Link Fence
  - F626-08.....Fence Fittings
  - F900-05.....Industrial and Commercial Swing Gates
  - F1043-08.....Strength and Protective Coatings on Metal  
Industrial Chain-Link Fence Framework
  - F1083-08.....Pipe, Steel, Hot-Dipped Zinc-Coated  
(Galvanized) Welded, for Fence Structures.
- C. Federal Specifications (Fed. Spec.):
- FF-P-110J.....Padlock, Changeable Combination

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

Materials shall conform to ASTM F1083 and ASTM A392 ferrous metals, zinc-coated; and detailed specifications forming the various parts thereto; and other requirements specified herein. Zinc-coat metal members (including fabric, gates, posts, rails, hardware and other ferrous metal items) after fabrication shall be reasonably free of excessive roughness, blisters and sal-ammoniac spots.

### **2.2 CHAIN-LINK FABRIC**

ASTM A392 9 gauge wire woven in a 50 mm (2 inch) mesh. Top and bottom selvage shall have twisted and barbed finish. Zinc-coating weight shall be 570 grams/m<sup>2</sup> (2.0 ounces per square foot).

### **2.3 POST, FOR GATES AND FENCING**

ASTM F1083, Grade SK-40A, round, zinc-coated steel. Dimensions and weights of posts shall conform to the tables in the ASTM Specification. Provide post braces and truss rods for each gate, corner, pull or end post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.

#### **2.4 TOP RAIL AND BOTTOM RAIL**

ASTM F1083, Grade SK-40A, round, zinc-coated steel. Dimensions and weights of posts shall conform to the tables in the ASTM Specification; fitted with suitable expansion sleeves and means for securing rail to each gate, corner, and end posts.

#### **2.5 TOP AND BOTTOM TENSION WIRE**

ASTM A817 and ASTM F626, zinc-coated, having minimum coating the same as the fence fabric.

#### **2.6 ACCESSORIES**

Accessories as necessary caps, rail and brace ends, wire ties or clips, braces and tension bands, tension bars, truss rods, and miscellaneous accessories conforming to ASTM F626.

#### **2.7 BARBED WIRE SUPPORT ARMS**

ASTM F626, single arm type, steel or malleable iron.

#### **2.8 BARBED WIRE**

ASTM A121, zinc-coated steel wire and barbs; standard size and construction: 2.51 mm (0.099 inch) diameter line wire with 2.03 cm (0.080 inch) diameter, 2-point barbs.

#### **2.9 GATES**

ASTM F900, type as shown. Gate framing, bracing, latches, and other hardware zinc-coating weight shall be the same as the FABRIC. Gate leaves more than 2400 mm (8 feet) wide shall have either intermediate members and diagonal truss rods, or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gates less than 2400 mm (8 feet) wide shall have truss rods or intermediate braces. Attach gate fabric to the gate frame by method standard with the manufacturer, except that welding will not be permitted. Arrange latches for padlocking so that padlock will be accessible from both sides of the gate regardless of the latching arrangement. When required, extend each end member of gate frame sufficiently above the top member or provide three strands of barbed wire in horizontal alignment with barbed wire strands on the fence.

#### **2.10 GATE HARDWARE**

- A. Manufacturer's standard products, installed complete. The type of hinges shall allow gates to swing through 180 degrees, from closed to open position. Hang and secure gates in such a manner that, when locked, they cannot be lifted off hinges.

- B. Provide stops and keepers for all double gates. Latches shall have a plunger-bar arranged to engage the center stop. Arrange latches for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar. Keepers shall consist of a mechanical device for securing the free end of the gate when in full open position.
- C. Padlocks for gates are specified under Section 08 71 00, DOOR HARDWARE. Padlocks shall have chains that are securely attached to the gate or gate post. Before padlocks are delivered to project, submit sample to Resident Engineer for approval. Approved sample may be incorporated in work. Key padlock as directed by the Resident Engineer.

#### **2.11 CONCRETE**

ASTM C94/C94M, using 19 mm (3/4 inch) maximum-size aggregate, and having minimum compressive strength of 25 mPa (3000 psig) at 28 days. Non-shrinking grout shall consist of one part Portland cement to three parts clean, well-graded sand, non-shrinking grout additive and the minimum amount of water to produce a workable mix.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install fence by properly trained crew, on previously prepared surfaces, to line and grade as shown. Install fence in accordance with ASTM F567 and with the manufacturer's printed installation instructions, except as modified herein or as shown. Maintain all equipment, tools, and machinery while on the project in sufficient quantities and capacities for proper installation of posts, chain links and accessories.
- B. A Registered Professional Land Surveyor or Registered Civil Engineer specified in Section 01 00 00, GENERAL REQUIREMENTS, shall stake out and certify the fence alignment to meet the requirements as shown.

#### **3.2 EXCAVATION**

Excavation for concrete-embedded items shall be of the dimensions shown, except in bedrock. If bedrock is encountered before reaching the required depth, continue the excavation to the depth shown or 450 mm (18 inches) into the bedrock, whichever is less, and provide a minimum of 50 mm (2 inches) larger diameter than the outside diameter of the post. Clear loose material from post holes. Grade area around finished

concrete footings as shown and dispose of excess earth as directed by the Resident Engineer.

### **3.3 POST SETTING**

Install posts plumb and in alignment. Set post in concrete footings of dimensions as shown, except in bedrock. Thoroughly compact concrete so as it to be free of voids and finished in a slope or dome to divert water running down the post away from the footing. Straight runs between braced posts shall not exceed 150 m (500 feet).

### **3.4 POST SETTING IN STRUCTURES**

Install post in retaining walls, curbs, concrete slabs, or similar construction in proper size galvanized pipe sleeves set into the concrete or built into the masonry as shown. Set sleeves plumb and 13 mm (1/2 inch) above the finished structure. Fill space solidly between sleeve and post with non-shrinking grout, molten lead, or sulphur, and finish to divert water running down the post away from the post base.

### **3.5 POST CAPS**

Fit all exposed ends of post with caps. Provide caps that fit snugly and are weathertight. Where top rail is used, provide caps to accommodate the top rail. Install post caps as recommended by the manufacturer and as shown.

### **3.6 SUPPORTING ARMS**

Design supporting arms, when required, to be weathertight. Where top rail is used, provide arms to accommodate the top rail. Install supporting arms as recommended by the manufacturer and as shown.

### **3.7 TOP RAILS AND BOTTOM RAILS**

Install rails before installing chain link fabric. Provide suitable means for securing rail ends to terminal and intermediate post. Top rails shall pass through intermediate post supporting arms or caps as shown. The rails shall have expansion couplings (rail sleeves) spaced as recommended by the manufacturer. Where fence is located on top of a wall, install expansion couplings over expansion joints in wall.

### **3.8 TOP AND BOTTOM TENSION WIRE**

Install and pull taut tension wire before installing the chain-link fabric.

### **3.9 ACCESSORIES**

Supply accessories (posts braces, tension bands, tension bars, truss rods, and miscellaneous accessories), as required and recommended by

the manufacturer, to accommodate the installation of a complete fence, with fabric that is taut and attached properly to posts, rails, and tension wire.

#### **3.10 FABRIC**

Pull fabric taut and secured with wire ties or clips to the top rail, bottom rail and tension wire close to both sides of each post and at intervals of not more than 600 mm (24 inches) on centers. Secure fabric to posts using stretcher bars and ties or clips.

#### **3.11 BARBED WIRE**

Install barbed wire, when required, on supporting arms above the fence posts. Extend each end member of gate frames sufficiently above the top member to carry three strands of barbed wire in horizontal alignment with barbed wire strands on the fence. Pull each strand taut and securely fasten to each supporting arm and extended member.

#### **3.12 GATES**

Install gates plumb, level, and secure for full opening without interference. Set keepers, stops and other accessories into concrete as required by the manufacturer and as shown. Adjust hardware for smooth operation and lubricate where necessary.

#### **3.13 REPAIR OF GALVANIZED SURFACES**

Use galvanized repair compound, stick form, or other method, where galvanized surfaces need field or shop repair. Repair surfaces in accordance with the manufacturer's printed directions.

#### **3.14 FINAL CLEAN-UP**

Remove all debris, rubbish and excess material from the station.

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**SECTION 32 31 53**  
**PERIMETER SECURITY FENCES AND GATES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This work consists of all labor, materials, and equipment necessary for furnishing and installing perimeter security fences, gates and accessories in conformance with the lines, grades, and details as shown.

**1.2 RELATED WORK**

- A. Grounding of fencing for enclosures of electrical equipment and for lightning protection as shown: Section 26 05 26 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- B. Temporary Construction Fence: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Finish Grading: Sections 31 20 00, EARTH MOVING and 32 90 00, PLANTING.
- D. Guard Booths: Section 13 34 19 METAL BUILDING SYSTEMS
- E. Card readers and biometric devices: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
- F. Intrusion alarm: Section 28 16 11 INTRUSION DETECTION SYSTEM
- G. Chain link enclosures and barbed wire barriers: Section 32 31 13, CHAIN LINK FENCES AND GATES.
- H. Crash rated fences: Section 34 71 13, VEHICLE BARRIERS and Section 34 75 13.13, ACTIVE VEHICLE BARRIERS.

**1.3 MANUFACTURER'S QUALIFICATIONS**

- A. Fence, gates, and accessories shall be products of manufacturers regularly engaged in manufacturing items of type specified.

**1.4 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, furnish the following:
  - 1. Manufacturer's Literature and Data: Fencing, gates and all accessories.
  - 2. Manufacturer's Certificates:
    - a. Zinc-coating complies with specifications.
    - b. Structural characteristics comply with indicated and criteria.
    - c. Connections comply with requirements indicated.
- B. Shop Drawings for all items as directed by VA Project Manager.
- C. Certification that fence alignment meets requirements of contract documents.

## **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 for Testing and Materials (ASTM):
- A853-04.....Steel Wire, Carbon, for General Use
  - C94/C94M-07.....Ready-Mixed Concrete
  - F626-08.....Fence Fittings
  - F1083-08.....Pipe, Steel, Hot-Dipped Zinc-Coated  
(Galvanized) Welded, for Fence Structures.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Materials shall conform to ASTM F1083 ferrous metals, zinc-coated; and detailed specifications forming the various parts thereto; and other requirements specified herein. Zinc-coat metal members (including fabric, gates, posts, rails, hardware and other ferrous metal items) after fabrication shall be reasonably free of excessive roughness, blisters and sal-ammoniac spots.

### **2.2 PERIMETER SECURITY FENCE**

- A. The perimeter security fence shall be a metal palisade style fence system//other system to be specified by the VA Project Manager. The system shall include all components such as pickets, pales, mesh, fabric, rails, posts, gates and hardware required.
1. Metal palisade style fence system.
  2. Other system.
- B. Material: As required by the VA Project Manager.
1. Strength requirements for posts shall as required by the VA Project Manager.
  2. Strength requirements for the wire shall conform to ASTM A 853 Grade AISI 1006, minimum tensile strength as required by the VA Project Manager.
- C. Heights:
1. Horizontal members that might be used as foot- or hand-holds shall be spaced at a minimum 8 feet (2400 mm) apart or as required by the VA Project Manager..
  2. Extend fence below grade as required by the VA Project Manager.



D. Framework:

1. Framework strength shall provide forced entry resistance and resistance applied force of structural members or other fence framework as required by the VA Project Manager..
2. Fence shall withstand the wind load requirement as required by the VA Project Manager.
3. Fence panels shall be capable of supporting a400 LB. (882 KG) load applied at midspan, or other load as required by the VA Project Manager. without permanent deformation.

E. Gates:

1. Gates shall be designed to meet the same forced entry and anti-climb characteristics as the other portions of the fence.
2. Provide motorized, or manually operated sliding gates for vehicle access as required by the VA Project Manager.
3. Provide hinged pedestrian gates with electric strike or card reader as required by the VA Project Manager.

F. Finishes: As required by the VA Project Manager.

**2.3 ACCESSORIES**

Accessories as necessary caps, rail and brace ends, wire ties or clips, braces and tension bands, tension bars, truss rods, and miscellaneous accessories conforming to ASTM F626

**2.4 CONCRETE**

ASTM C94/C94M, using 3/4 inch (19 mm) maximum-size aggregate, and having minimum compressive strength of 3000 psig (25 mPa) at 28 days. Non-shrinking grout shall consist of one part Portland cement to three parts clean, well-graded sand, non-shrinking grout additive and the minimum amount of water to produce a workable mix.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install fence by properly trained crew, on previously prepared surfaces, to line and grade as shown. Install fence in accordance with the manufacturer's printed installation instructions, except as modified herein or as shown. Maintain all equipment, tools, and machinery while on the project in sufficient quantities and capacities for proper installation of posts, pickets, rails, pales, and accessories.

- B. Engage the services of a Registered Professional Land Surveyor or Registered Civil Engineer specified in Section 01 00 00, GENERAL REQUIREMENTS, to stake out and certify that the fence alignment meets the requirements as shown.

### **3.2 EXCAVATION**

Excavation for concrete-embedded items shall be of the dimensions shown, except in bedrock. If bedrock is encountered before reaching the required depth, continue the excavation to the depth shown or 18 inches (450 mm) into the bedrock, whichever is less, and provide a minimum of 2 inches (50 mm) larger diameter than the outside diameter of the post. Clear loose material from post holes. Grade area around finished concrete footings as shown and dispose of excess earth as directed by the Resident Engineer.

### **3.3 POST SETTING**

Install posts plumb and in alignment. Set post in concrete footings of dimensions as shown, except in bedrock. Thoroughly compact concrete so as it to be free of voids and finished in a slope or dome to divert water running down the post away from the footing. Straight runs between braced posts shall not exceed 500 feet (150 m). Install posts in bedrock with a minimum of one inch (25 mm) of non-shrinking grout around each post. Thoroughly work non-shrinking grout into the hole so as to be free of voids and finished in a slope or dome. Cure concrete and grout a minimum of 72 hours before any further work is done on the posts.

### **3.4 POST CAPS**

Fit all exposed ends of post with caps. Provide caps that fit snugly and are weathertight. Where top rail is used, provide caps to accommodate the top rail. Install post caps as recommended by the manufacturer and as shown.

### **3.5 SUPPORTING ARMS**

Design supporting arms, when required, to be weathertight. Where top rail is used, provide arms to accommodate the top rail. Install supporting arms as recommended by the manufacturer and as shown.

### **3.6 TOP RAILS AND BOTTOM RAILS**

Install rails before installing pickets. Provide suitable means for securing rail ends to terminal and intermediate post. Top rails shall pass through intermediate post supporting arms or caps as shown. The

rails shall have expansion couplings (rail sleeves) spaced as recommended by the manufacturer. Where fence is located on top of a wall, install expansion couplings over expansion joints in wall.

### **3.7 ACCESSORIES**

Supply accessories (post braces, truss rods, and miscellaneous accessories), as required and recommended by the manufacturer, to ensure complete installation.

### **3.8 GATES**

Install gates plumb, level, and secure for full opening without interference. Set keepers, stops and other accessories into concrete as required by the manufacturer and as shown. Test gates, hardware, locking mechanisms and releases for proper operation. Adjust and lubricate as necessary.

### **3.9 REPAIR OF GALVANIZED SURFACES**

Use galvanized repair compound, stick form, or other method, where galvanized surfaces need field or shop repair. Repair surfaces in accordance with the manufacturer's printed directions.

### **3.10 FINAL CLEAN-UP**

Remove all debris, rubbish and excess material from the station.

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**SECTION 33 40 00**  
**STORM DRAINAGE UTILITIES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies construction of outside, underground storm sewer systems. The storm sewer systems shall be complete and ready for operation, including all drainage structures, frames, grate and covers, connections to new buildings, structure service lines, existing storm sewer lines and existing drainage structures and all required incidentals.

**1.2 RELATED WORK:**

- A. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- B. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- C. Concrete Work, Reinforcing, Placement and Finishing: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Fabrication of Steel Ladders: Section 05 50 00, METAL FABRICATIONS.
- E. Protection of Materials and Equipment: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.

**1.3 QUALITY ASSURANCE:**

- A. Products Criteria:
  - 1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
  - 2. Nameplates: Nameplate bearing manufacturer's name, or identifiable trademark, securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Comply with the rules and regulations of the Public Utility having jurisdiction over the connection to public storm sewer lines and the extension, and/or modifications to Public Utility systems.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Manufacturers' Literature and Data: Submit the following as one package:
1. Piping.
  2. Jointing material.
  3. Manhole, inlet and catch basin material.
  4. Frames and covers.
- C. One copy of Florida Department of Transportation standard details of MANHOLES, INLETS and catch basins.
- D. One copy of Florida Department of Transportation specification.

**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 for Testing and Materials (ASTM):
- A48-03/A48M-03.....Gray Iron Castings
- A536-84(2004).....Ductile Iron Castings
- A615-05/A615M-08a.....Deformed and Plain-Billet Steel Bars for  
Concrete Reinforcement
- A742/A742M-03.....Steel Sheet, Metallic Coated and Polymer  
Precoated for Corrugated Steel Pipe
- A760/A760M-06.....Corrugated Steel Pipe, Metallic-Coated for  
Sewers and Drains
- A762/A762M-08.....Corrugated Steel Pipe, Polymer Precoated for  
Sewers and Drains
- A798/M798M-07.....Installing Factory-Made Corrugated Steel Pipe  
for Sewers and Other Applications
- A849-00(2005).....Post-Applied Coatings, Pavings, and Linings for  
Corrugated Steel Sewer and Drainage Pipe
- A929/A929M-01(2007).....Steel Sheet, Metallic Coated by the Hot Dip  
Process for Corrugated Steel Pipe
- C7608a.....Reinforced Concrete Culvert, Storm Drain and  
Sewer Pipe
- C139-05.....Concrete Masonry Units for Construction of  
Catch Basins and Manholes
- C150-07.....Portland Cement
- C443-05a.....Joints for Concrete Pipe and Manholes, Using  
Rubber Gaskets

C478-08.....Precast Reinforced Concrete Manhole Sections  
C506-08a.....Reinforced Concrete Arch Culvert, Storm Drain  
and Sewer Pipe  
C507-08a.....Reinforced Concrete Elliptical Culvert, Storm  
Drain and Sewer Pipe  
C655-07.....Reinforced Concrete D-Load Culvert, Storm Drain  
and Sewer Pipe  
C1433-07a.....Precast Reinforced Concrete Box Sections for  
Culverts, Storm Drains and Sewers  
C828-06.....Low-Pressure Air Test of Vitrified Clay Pipe  
Lines  
C857-07.....Minimum Structural Design Loading for  
Underground Precast Concrete Utility Structures  
C923-08.....Resilient Connectors between Reinforced  
Concrete Manhole Structures, Pipes and  
Materials  
C924-02.....Testing Concrete Pipe Sewer Lines by Low  
Pressure Air Test Method  
C1103-03.....Joint Acceptance Testing of Installed Precast  
Concrete Pipe Sewer Lines  
D698-07e1.....Laboratory Compaction Characteristics of Soil  
Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600  
kN-m/m<sup>3</sup>))  
D1056-07.....Flexible Cellular Materials-Sponge or Expanded  
Rubber  
D2412-02(2008).....Determination of External Loading  
Characteristics of Plastic Pipe by Parallel  
Plate Loading  
D2321-05.....Underground Installation of Thermoplastic Pipe  
for Sewers and Other Gravity Flow Applications  
.  
D3034-08.....Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe  
and Fittings  
D3212-07.....Joints for Drain and Sewer Plastic Pipes Using  
Flexible Elastomeric Seals  
D3350-08.....Polyethylene Plastics Pipe and Fittings  
Materials

D4101-08.....Polypropylene Injection and Extrusion Materials  
F477-08.....Elastomeric Seals (Gaskets) for Joining Plastic  
Pipe  
F679-08.....Poly (Vinyl Chloride) (PVC) Large-Diameter  
Plastic Gravity Sewer Pipe and Fittings  
F714-08.....Polyethylene (PE) Plastic Pipe (SDR-PR) Based  
on Outside Diameter  
F794-03.....Poly (Vinyl Chloride)(PVC) Profile Gravity  
Sewer Pipe and Fittings Based on Controlled  
Inside Diameter  
F894-07.....Polyethylene (PE) Large Diameter Profile Wall  
Sewer and Drain Pipe  
F949-06a.....Poly (Vinyl Chloride) (PVC) Corrugated Sewer  
Pipe with Smooth Interior  
F1417-92(2005).....Installation Acceptance of Plastic Gravity  
Sewer Lines Using Low-Pressure Air

NOTE: ASTM test methods shall be the current version as of the date of  
advertisement of the project.

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

HB-17.....Standard Specifications for Highway Bridges  
M190-04.....Bituminous Coated Corrugated Metal Culvert Pipe  
and Pipe Arches  
M198-05.....Joints for Circular Concrete Sewer and Culvert  
Pipe Using Flexible Watertight Gaskets  
M294-08.....Corrugated Polyethylene Pipe, 300-1500 mm (12  
to 60 inches) Diameter

**PART 2 - PRODUCTS**

**2.1 PIPING:**

A. Gravity Lines (Pipe and Appurtenances):

1. Concrete:

- a. Reinforced pipe, ASTM C76. Class III, or ASTM C655, 19.7kN/lm  
(1350 lbs/lf) per 300 mm (1 foot) inside dia. D-Load, 300 mm  
through 2740 mm (12 inches through 108 inches).. Reinforced  
elliptical culvert and storm drainpipe shall comply with ASTM  
C507, Class HE III or HE IV. Joints shall be watertight flexible  
joints made with rubber-type gaskets conforming to ASTM C443.

## **2.2 JOINTING MATERIAL:**

A. Concrete Pipe: Rubber gasket ASTM C443.

## **2.3 MANHOLES, INLETS AND CATCH BASINS:**

A. Manholes, inlets and catch basins shall be constructed of precast concrete segmental blocks, precast reinforced concrete rings, precast reinforced sections, or cast-in-place concrete. Manholes, inlets and catch basins shall be in accordance with State Department of Transportation standard details, and the following VA requirements, in case of variance, VA requirements supersede:

1. Precast Concrete Segmental Blocks: Blocks shall conform to ASTM C139 and shall not be less than 150 mm (6 inches) thick for manholes to a depth of 3.6 m (12 feet); not less than 200 mm (8 inches) thick for manholes deeper than 3.6 m (12 feet) deep. Blocks shall be not less than 200 mm (8 inches) in length. Blocks shall be shaped so that joints seal and bond effectively with cement mortar. Parge structure interior and exterior with 15 mm (1/2 inch) of cement mortar applied with a trowel and finished to an even glazed surface.
2. Precast Reinforced Concrete Rings: Rings or sections shall have an inside diameter as indicated on the drawings, and shall be not less than 1200 mm (48 inches) in diameter. Wall thickness shall conform to requirements of ASTM C76, except that lengths of the sections may be shorter as conditions require. Tops shall conform to ASTM C478. Top section shall be eccentric cone type. Steps on inside wall shall be in the same plane from bottom of structure to manhole cover.
3. Precast Reinforced Concrete Manhole Risers and Tops: Design, material and installation shall conform to requirements of ASTM C478. Top sections shall be eccentric. Steps on inside wall shall be in the same plane from bottom of structure to manhole cover.
4. Flat top manhole tops shall be reinforced concrete as detailed on the drawings.
5. Precast Catch Basins: Concrete for precast sections shall have a minimum compressive strength of 35 MPa (5,000 psi) at 28 days, ASTM A615, Grade 60 reinforcing steel, rated for AASHTO HS20-44 loading with 30 percent impact, and conform to ASTM C-857.



6. Mortar:
    - a. Precast Concrete Segmental Block Structures: By volume, 1 part of Portland cement, 1/4 part lime hydrate, and 3 parts sand.
    - b. Precast Reinforced Concrete Ring and Riser Structures: By volume, 1 part of Portland cement and 2 parts sand. Water in mixture shall produce a stiff, workable mortar, but shall not exceed 21L (5-1/2 gallons) per sack of cement.
  7. Flexible sealing compound shall be packaged in extruded preformed shape, sized to completely fill the joint between precast sections, and form permanently flexible watertight seal. The sealing compound shall be non-shrink and meet AASHTO M-198B.
  8. Frames and covers shall be gray cast iron conforming to ASTM A48. The frame and cover shall be rated for HS20-44 loading, have a studded pattern on the cover, and the words "storm sewer". The studs and the lettering shall be raised 8 mm (5/16 inch). The cover shall be a minimum of 600 mm (24 inches) in diameter and shall have four 19 mm (3/4 inch) vent holes and two lifting slots. The bearing surface of the frame and cover shall be machine finished. The cover shall fit firmly on the frame without movement when subject to traffic.
  9. Manhole steps shall be polypropylene plastic coated on a No. 4 deformed rebar conforming to ASTM C478, Polypropylene shall conform to ASTM D4101. Steps shall be a minimum of 250 mm (10 inches) wide and project a minimum of 125 mm (5 inches) away from the wall. The top surface of the step shall have a studded non-slip surface. Steps shall be placed at 300 mm (12 inch) centers.
  10. Ladders, brackets and hardware shall be constructed of welded aluminum, rails shall be 9 mm (3/8 inch) by 63 mm (2-1/2 inches) spaced a minimum of 400 mm (16 inches) apart. Rungs shall be 35 mm (1-3/8 inches) in diameter and have a non-slip surface. Standoffs shall offset the ladder 180 mm (7 inches) from the wall. The ladder assembly shall be rated for a minimum of 2200 N (500 pounds).
- D. Frame and Cover for Gratings: Frame and cover for gratings shall be cast gray iron conforming to ASTM A48; cast ductile iron conforming to ASTM A536 in accordance with Florida Department of Transportation standard details. Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the drawings.

## **2.5 CONCRETE:**

Concrete shall be in accordance with Florida Department of Transportation standard specification Section 346. For concrete not specified in above standards, concrete shall have a minimum compressive strength of 20 MPa (3000 psi) at 28 days. The cement shall be Type III conforming to ASTM C150. Concrete shall conform to the provisions of Division 03 of these specifications.

## **2.6 REINFORCING STEEL:**

Reinforcing steel shall be deformed bars, ASTM A615, Grade 40 unless otherwise noted.

## **2.10 WARNING TAPE:**

Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape detectable, purple with black letters, and imprinted with "CAUTION BURIED STORM SEWER BELOW".

## **PART 3 - EXECUTION**

### **3.1 EXCAVATION FOR STORM DRAINS AND DRAINAGE STRUCTURES:**

Excavation of trenches and for appurtenances and backfilling for storm drains, shall be in accordance with the applicable portions of Section 31 20 00, EARTH MOVING.

### **3.2 PIPE BEDDING:**

The bedding surface of the pipe shall provide a firm foundation of uniform density throughout the entire length of pipe. Concrete pipe requirements are such that when no bedding class is specified, concrete pipe shall be bedded in a soil foundation accurately shaped and rounded to conform with the lowest one-fourth of the outside portion of circular pipe. When necessary, the bedding shall be tamped. Bell holes and depressions for joints shall not be more than the length, depth, and width required for properly making the particular type of joint. Plastic pipe bedding requirements shall meet the requirements of ASTM D2321. Bedding, haunching and initial backfill shall be either Class IB or Class II material. Corrugated metal pipe bedding requirements shall conform to ASTM A798.

### **3.3 GENERAL PIPING INSTALLATION:**

- A. Lay pipes true to line and grade. Gravity flow sewer shall be laid with bells facing upgrade.
- B. Do not lay pipe on unstable material, in wet trench or when trench and weather conditions are unsuitable for the work.

- C. Support pipe on compacted bedding material. Excavate bell holes only large enough to properly make the joint.
- D. Inspect pipes and fittings, for defects before installation. Defective materials shall be plainly marked and removed from the site. Cut pipe shall have smooth regular ends at right angles to axis of pipe.
- E. Clean interior of all pipe thoroughly before installation. When work is not in progress, open ends of pipe shall be closed securely to prevent entrance of storm water, dirt or other substances.
- F. Lower pipe into trench carefully and bring to proper line, grade, and joint. After jointing, interior of each pipe shall be thoroughly wiped or swabbed to remove any dirt, trash or excess jointing materials.
- G. Do not lay sewer pipe in same trench with another pipe or other utility.
- H. Do not walk on pipe in trenches until covered by layers of shading to a depth of 300 mm (12 inches) over the crown of the pipe.
- I. Install gravity sewer line in accordance with the provisions of these specifications and the following standards:
  - 1. Reinforced Concrete Pipe: Comply with manufacturer's recommendations with gasketed joints.
- J. Warning tape shall be continuously placed 300 mm (12 inches) above storm sewer piping.

#### **3.4 REGRADING:**

- A. Raise or lower existing manholes and structures frames and covers in regraded areas to finish grade. Carefully remove, clean and salvage cast iron frames and covers. Adjust the elevation of the top of the manhole or structure as detailed on the drawings. Reset cast iron frame and cover, grouting below and around the frame. Install concrete collar around reset frame and cover as specified for new construction.
- B. During periods when work is progressing on adjusting manholes or structures cover elevations, the Contractor shall install a temporary cover above the bench of the structure or manhole. The temporary cover shall be installed above the high flow elevation within the structure, and shall prevent debris from entering the wastewater stream.
- C. The Contractor shall comply with all OSHA confined space requirements when working within existing structures.

#### **3.6 CONNECTIONS TO EXISTING PUBLIC UTILITY MANHOLES:**

- A. Comply with all rules and regulations of the public utility.

B. The connection to the existing utility shall comply with the standard details and specifications of the public utility company, except as specifically modified on the plans and specifications.

### **3.7 MANHOLES, INLETS AND CATCH BASINS:**

#### **A. General:**

##### **1. Circular Structures:**

- a. Precast concrete segmental blocks shall lay true and plumb. All horizontal and vertical joints shall be completely filled with mortar. Parge interior and exterior of structure with 15 mm (1/2 inch) or cement mortar applied with a trowel and finished to an even glazed surface.
- b. Precast reinforced concrete rings shall be installed true and plumb. The joints between rings and between rings and the base and top shall be sealed with a preform flexible gasket material specifically manufactured for this type of application. Adjust the length of the rings so that the eccentric conical top section will be at the required elevation. Cutting the conical top section is not acceptable.
- c. Precast reinforced concrete manhole risers and tops. Install as specified for precast reinforced concrete rings.

##### **2. Rectangular Structures:**

- a. Reinforced concrete structures shall be installed in accordance with Division 03, CONCRETE of these specifications.
- b. Precast concrete structures shall be placed on a 200 mm (8 inch) reinforced concrete pad, or be provided with a precast concrete base section. Structures provided with a base section shall be set on a 200 mm (8 inches) thick aggregate base course compacted to a minimum of 95 percent of the maximum density as determined by ASTM D 698. Set precast section true and plumb. Seal all joints with preform flexible gasket material.

3. Do not build structures when air temperature is 0 degrees C (32 degrees F), or below.

4. Invert channels shall be smooth and semicircular in shape conforming to inside of adjacent sewer section. Make changes in direction of flow with a smooth curve of as large a radius as size of structure will permit. Make changes in size and grade of channels gradually and evenly. Construct invert channels by one of the listed methods:

- a. Forming directly in concrete base of structure.
  - b. Building up with brick and mortar.
5. Floor of structure outside the channels shall be smooth and slope toward channels not less than 1:12 (25mm per 300mm, 1-inch per foot) nor more than 1:6 (50mm per 300mm, 2 inches per foot). Bottom slab and benches shall be concrete.
6. The wall that supports access rungs or ladder shall be 90 degrees vertical from the floor of structure to manhole cover.
7. Install steps and ladders per the manufacturer's recommendations. Steps and ladders shall not move or flex when used. All loose steps and ladders shall be replaced by the Contractor.
8. Install manhole frames and covers on a mortar bed, and flush with the finish pavement. Frames and covers shall not move when subject to vehicular traffic. Install a concrete collar around the frame to protect the frame from moving until the adjacent pavement is placed. In unpaved areas, the rim elevation shall be 50 mm (2 inches) above the adjacent finish grade. Install a 200 mm (8 inches) thick, by 300 mm (12 inches) concrete collar around the perimeter of the frame. Slope the top of the collar away from the frame.

**3.8 CURB INLETS, CATCH BASINS, AND AREA DRAINS:**

Reinforced concrete as shown or precast concrete.

**3.9 INSPECTION OF SEWERS:**

Inspect and obtain the Resident Engineer's approval. Thoroughly flush out before inspection. Lamp between structures and show full bore indicating sewer is true to line and grade. Lip at joints on inside of sewer is prohibited.

**3.10 TESTING OF STORM SEWERS:**

A. Gravity Sewers:

2. Exfiltration Test:

- a. Subject pipe to hydrostatic pressure produced by head of water at depth of 900 mm (3 feet) above invert of sewer at upper manhole under test. In areas where ground water exists, head of water shall be 900 mm (3 feet) above existing water table. Maintain head of water for one hour for full absorption by pipe body before testing. During 1 hour test period, measured maximum allowable rate of exfiltration for any section of sewer shall be 11L (3.0 gallons) per hour per 30 m (100 feet).

- b. If measurements indicate exfiltration is greater than maximum allowable leakage, take additional measurements until leaks are located. Repair and retest.

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