

Spec. No.

Proj. No. 640-11-229P



## Specifications

**For:** BUILDING 520  
PUBLIC COURTYARD  
LANDSCAPE DESIGN

**At:** VAMC PALO ALTO, VAPAHCS  
3801 MIRANDA AVENUE  
PALO ALTO, CA 94304

Prepared By: The Design Partnership  
San Francisco, California

Issue June 15, 2012

Open Bids

Amendment

No.	Date

Property of Department of Veterans Affairs

WITHIN 10 DAYS AFTER DATE OF OPENING BIDS, RETURN  
THIS SPECIFICATION TOGETHER WITH DRAWINGS, POSTAGE  
PREPAID TO:

**The Design Partnership**  
1412 Van Ness Avenue  
San Francisco, CA 94109  
Attn: Lisa Bruce



**TABLE OF CONTENTS****DIVISION 00 - SPECIAL SECTIONS**

00 01 15 List of Drawings

**DIVISION 01 - GENERAL REQUIREMENTS**

01 00 00 General Requirements  
01 32 16 Network Analysis  
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 Protection  
01 74 19 Construction Waste Management

**DIVISION 02 - EXISTING CONDITIONS**

02 41 10 Demolition and Site clearing

**DIVISION 03 - CONCRETE**

Not Used

**DIVISION 04 - MASONRY**

Not Used

**DIVISION 05 - METALS**

Not Used

**DIVISION 06 - WOOD AND PLASTIC**

Not Used

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

Not Used

**DIVISION 08 - DOORS AND WINDOWS**

Not Used

**DIVISION 09 - FINISHES**

Not Used

**DIVISION 10 - SPECIALTIES**

Not Used

**DIVISION 11 - EQUIPMENT**

Not Used

**DIVISION 12 - FURNISHINGS**

12 93 00 Site Furnishings

**DIVISION 13 - SPECIAL CONSTRUCTION**

Not Used

**DIVISION 14 - CONVEYING SYSTEMS**

Not Used

**DIVISION 21 - FIRE SUPPRESSION**

Not Used

**DIVISION 22 - PLUMBING**

22 05 11 Common Work Results for Plumbing  
22 14 00 Facility Storm Drainage

**DIVISION 23 - HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)**

Not Used

**DIVISION 26 - ELECTRICAL**

26 05 11 Requirements for Electrical Installations  
26 05 21 Low-Voltage Electrical Power Conductors and Cables (600  
Volts and Below)  
26 05 26 Grounding and Bonding for Electrical Systems  
26 05 33 Raceway and Boxes for Electrical Construction  
26 56 00 Exterior Lighting

**DIVISION 27 - COMMUNICATIONS**

Not Used

**DIVISION 28 - ELECTRONIC SAFETY AND SECURITY**

Not Used

**DIVISION 31 - EARTHWORK**

31 20 00 Earth Moving

**DIVISION 32 - EXTERIOR IMPROVEMENTS**

32 13 20 Site Concrete  
32 14 12 Stone Tile Paving  
32 84 00 Plant Irrigation  
32 90 00 Planting  
32 90 10 Structural Planting Soil Mix

**DIVISION 33 - UTILITIES**

33 41 00 Drainage and Structures

**DIVISION 34 - TRANSPORTATION**

Not Used

- - - E N D - - -

**Section 00 01 15**  
**List of Drawings**

**COVER**

G0.01 Cover Sheet

**STRUCTURAL**

SS 5.1.1 General Notes, Symbols & Abbreviations

**PLUMBING**

PS 1.0.1 Courtyard Plan - Plumbing

**ELECTRCIAL**

ES 0.0.1 Symbols, Abbreviations & Drawing Index

ED 1.0.1 Courtyard Plan - Lighting Demolition

EL 1.0.1 Courtyard Plan - Lighting

**LANDSCAPE**

LD 1.1.0 Demolition Plan

LG 1.1.0 Grading Plan

LG 2.1.0 Drainage Plan

LI 1.1.1 Irrigation Plan

LI 1.1.2 Existing Irrigation Plan

LI 2.1.0 Irrigation Details

LP 1.1.0 Layout Plans

LP 2.1.0 Construction Plans

LP 2.2.1 Construction Details

LP 2.2.12 Construction Details

LP 2.2.13 Construction Details

LP 2.2.14 Construction Details

L 3.1.0 Planting Plan

L 3.2.0 Planting Details

- - - E N D - - -

**SECTION 01 00 00  
GENERAL REQUIREMENTS**

**1.1 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 Work in the Building 520 Main Courtyard. Work includes demolition, site preparation, landscape planting, irrigation and site structures as well as site furnishings and as indicated on the drawings.
- B. Visits to the site by Bidders may be made only by appointment with the Medical Center Engineering Officer.
- C. Offices of The Design Partnership LLP, Gayner Engineers, RHAA Landscape Architects; and Degenkolb Engineers, 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. 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.
- E. Prior to commencing work, general contractor shall provide proof that a 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.
- F. Training:
  - 1. All employees of general contractor or subcontractors shall have the 30-hour OSHA certified Construction Safety course and /or other relevant competency training, as determined by VA CP with input from the ICRA team.
  - 2. Submit training records of all such employees for approval before the start of work.

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

- A. ITEM I, GENERAL CONSTRUCTION: Work includes general construction, alterations, walks, grading, drainage, plumbing, irrigation and electrical work, utility systems, planting and site furnishings and

necessary removal of existing structures and construction and certain other items.

### **1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR**

- A. AFTER AWARD OF CONTRACT, 15 sets of specifications and drawings will be furnished. These drawings and specifications will consist of those returned by prospective bidders.
- B. Additional sets of drawings may be made by the Contractor, at Contractor's expense, from original prints furnished by Issuing Office. Such original prints shall be returned to the Issuing Office immediately after printing is completed.

### **1.4 CONSTRUCTION SECURITY REQUIREMENTS**

- A. Security Plan:
  - 1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
  - 2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.
- B. Security Procedures:
  - 1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
  - 2. For working outside the "regular hours" as defined in the contract, The General Contractor shall give 3 days notice to the Contracting Officer so that security arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
  - 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. Key Control:
  - 1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Technical Representative (COTR)/Resident Engineer for the purpose of security inspections of



every area of project including tool boxes and parked machines and take any emergency action.

D. 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.
4. 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.
5. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
6. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
7. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
8. 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.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. Separate permits shall be issued for General Contractor and its employees for parking in designated areas only.
3. Parking is VERY limited at the site, and Contractor shall arrange for off-site parking as needed for his employees and subcontractors or

otherwise coordinate with the Contracting Officer's Technical Representative (COTR).

### 1.5 FIRE SAFETY

- A. Applicable Publications: Publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.
1. American Society for Testing and Materials (ASTM):
    - E84-2009.....Surface Burning Characteristics of Building Materials
  2. National Fire Protection Association (NFPA):
    - 10-2010.....Standard for Portable Fire Extinguishers
    - 30-2008.....Flammable and Combustible Liquids Code
    - 51B-2009.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work
    - 70-2011.....National Electrical Code
    - 241-2009.....Standard for Safeguarding Construction, Alteration, and Demolition Operations
  3. Occupational Safety and Health Administration (OSHA):
    - 29 CFR 1926.....Safety and Health Regulations for Construction
- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COTR and Facility Safety Officer for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the general contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, etc. Documentation shall be provided to the COTR/Resident Engineer that individuals have undergone contractor's safety briefing.
- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).

E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions and/or fencing to provide separations between construction areas and adjoining areas. Construct partitions of gypsum board or treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.
2. Install one-hour fire-rated temporary construction partitions as shown on drawings or as required to maintain integrity of existing exit ways.
3. Provide visual separation between windows and construction areas to the satisfaction of the COTR. Where construction activities will generate noise, provide acoustic walls so that interior building operations are not affected, to the satisfaction of the COTR.
- 4 Where dust or other fumes are generated by construction activities, coordinate with the COTR any need for sealing of building openings.

F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.

G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with // COTR/Resident Engineer and facility Safety Officer.

H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COTR/Resident Engineer and facility Safety Officer.

I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.

J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.

K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.

L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with COTR/Resident Engineer and facility Safety Officer.

All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Resident Engineer.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with COTR/Resident Engineer and facility Safety Officer .
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COTR/Resident Engineer. Obtain permits from facility Safety Officer at least 24 hours in advance.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COTR/Resident Engineer and facility Safety Officer .
- P. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.
- R. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

#### **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.
- D. Working space and space available for storing materials shall be as determined by the Resident Engineer.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. 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. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by Resident Engineer where required by limited working space.
  - 1. Do not store materials and equipment in other than assigned areas.
  - 2. 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.
- G. Building 520 will be occupied during performance of work; but immediate areas of alterations will be vacated, if necessary and coordinated with the COTR.
  - 1. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. Coordinate alteration work in areas occupied by Department of

Veterans Affairs so that Medical Center operations will continue during the construction period.

- 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 Resident Engineer.
- J. When a building (or portion of building) is turned over to Contractor, Contractor shall accept entire responsibility therefore.
  1. 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 Resident Engineer.
  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 Resident Engineer. 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 the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS for additional requirements.
  2. Contractor shall submit a request to interrupt any such services to Resident Engineer, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.

3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time approved by Medical Center may occur at other than Contractor's normal working hours.
  4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the Resident Engineer.
  5. In case of a contract construction emergency, service will be interrupted on approval of Resident Engineer. Such approval will be confirmed in writing as soon as practical.
  6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- 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. 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.
- 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.
  2. Method and scheduling of required cutting, altering and removal of existing walks and entrances must be approved by the Resident Engineer.
- N. Coordinate the work for this contract with other construction operations as directed by Resident Engineer. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

#### **1.7 ALTERATIONS**

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Resident Engineer and a representative of VA Facilities, of areas of buildings in which alterations occur and areas which are

anticipated routes of access, and furnish a report, signed by all three, to the Contracting Officer. This report shall list by rooms and spaces:

1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of building.
  2. Existence and conditions of items such as site furnishings, existing site structures to remain, and finishes along any interior routes of travel, etc., required by drawings to be either reused or relocated, or both.
  3. Shall note any discrepancies between drawings and existing conditions at site.
  4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and Resident Engineer.
- B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of Resident Engineer and/or Facilities Representative, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).
- C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Resident Engineer together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing of finishes along routes of travel and work areas for resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.



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

#### **1.8 INFECTION PREVENTION MEASURES**

- A. Implement the requirements of VAMC's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the construction work and require the Contractor to take corrective action immediately if the safe levels are exceeded.
- B. Establish and maintain a dust control program as part of the contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group and as specified here. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to COTR/Resident Engineer and Facility ICRA team for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
  1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- C. Medical center Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition:
  1. The RE and VAMC Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in the patient-care rooms are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed.

2. In case of any problem, the medical center, along with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.
- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by Resident Engineer. Blank off ducts and diffusers to prevent circulation of dust into occupied areas during construction.
  2. Do not perform dust producing tasks within occupied areas without the approval of the Resident Engineer. For construction in any areas that will remain jointly occupied by the medical Center and Contractor's workers, the Contractor shall:
    - a. Provide dust proof one-hour temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center. (Typically only allowed for work of short duration.)
    - b. HEPA filtration is required where the exhaust dust may reenter the breathing zone. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.
    - c. Adhesive Walk-off/Carpet Walk-off Mats, minimum 600mm x 900mm (24" x 36"), shall be used at all interior transitions from the construction area to occupied medical center area. These mats

shall be changed as often as required to maintain clean work areas directly outside construction area at all times.

- d. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
  - e. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
  - f. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.
  - g. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
  - h. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.
- E. Final Cleanup:
1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling that have been part of the construction.
  2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
  3. All new and existing air ducts affected by construction shall be cleaned prior to final inspection.

**1.9 DISPOSAL AND RETENTION**

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

1. Reserved items which are to remain property of the Government are noted on drawings or in specifications or as indicated by facility 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 Resident Engineer.
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.

**1.10 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.
- 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.

**1.11 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 Resident Engineer. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the Resident Engineer 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 indicated on drawings and 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).

**1.12 NOT USED**

**1.13 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.

**1.14 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. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer 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 center lines for each building and/or addition to each existing building, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure and/or addition, 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 Resident Engineer before any work (such as footings, floor slabs, columns, walls, utilities and other major controlling features) is placed.

- D. 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".

#### **1.15 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 Resident Engineer's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the Resident Engineer within 15 calendar days after each completed phase and after the acceptance of the project by the Resident Engineer.
- D. Paragraphs A, B, & C shall also apply to all shop drawings.

#### **1.16 USE OF ROADWAYS**

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the Resident Engineer, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed 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.

#### **1.17 NOT USED**

#### **1.18 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT**

- A. Use of new and existing installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:

1. Permission to use each unit or system must be given by Resident Engineer. If the equipment is not installed and maintained in accordance with the following provisions, the Resident Engineer will withdraw permission for use of the equipment.
  2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
  3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
  4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
  5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
  6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.

**1.19 NOT USED****1.20 NOT USED****1.21 TEMPORARY TOILETS**

- A. Contractor may have for use of Contractor's workmen, such toilet accommodations as may be assigned to Contractor by Medical Center. Contractor shall keep such places clean and be responsible for any



damage done thereto by Contractor's workmen. Failure to maintain satisfactory condition in toilets will deprive Contractor of the privilege to use such toilets.

#### **1.22 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 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.
- 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.
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
  - 1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.
- F. Water (for Construction and Testing): Furnish temporary water service.
  - 1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection. 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 Resident Engineer's discretion) of use of water from Medical Center's system.

#### **1.23 NOT USED**

#### **1.24 TESTS**

- A. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- B. Conduct final tests required in various sections of specifications in presence of an authorized representative of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a complex which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.
- D. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

#### **1.25 INSTRUCTIONS**

- A. Contractor shall furnish Maintenance and Operating manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.

- B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the Resident Engineer coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.
- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the Resident Engineer and shall be considered concluded only when the Resident Engineer is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Resident Engineer, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

**1.26 GOVERNMENT-FURNISHED PROPERTY**

- A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings.
- B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the Medical Center
- D. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.
  - 1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
  - 2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.
- E. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

**1.27 RELOCATED ITEMS**

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items shown to be relocated by the Contractor.

- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Resident Engineer.
- C. Suitably cap existing service lines, such as condensate return, water, drain, gas, air, and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. All service lines such as noted above for relocated equipment/items shall be in place at point of relocation ready for use before any existing equipment/item is disconnected. Make relocated existing equipment/item ready for operation or use immediately after reinstallation.

**1.28 NOT USED****1.29 NOT USED****1.30 SAFETY SIGN**

- A. Provide a Safety Sign where directed by Resident Engineer. 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 Resident Engineer.
- D. Standard Detail Drawing Number SD10000-02(Found on VA TIL) of safety sign showing required legend and other characteristics of sign.
- E. Post the number of accident free days on a daily basis.

**1.31 NOT USED****1.32 NOT USED****1.33 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 Resident Engineer verbally, and then with a written follow up.

**1.34 PROJECT SCHEDULE:**

Total contract period shall be 90 calendar days (3 months) from Notice to Proceed. Contractor may elect to complete the project in less time.

2 WEEKS SUBMITTALS & MOBILIZATION

1 WEEK DEMOLITION

9 WEEKS CONSTRUCTION

3 MONTH CONSTRUCTION DURATION

**1.35 PALO ALTO DIVISION SPECIAL REQUIREMENTS: (ATTACHMENTS)**

- A. Construction "Rules of the Station" for VAPAHCS
- B. Utility Shutdown Procedures - VAPAHCS Memo 138-08-14
- C. Sign-in/Acknowledgement Sheet for Utility Shut-Downs.
- D. Acceptable Construction Fencing Types.
- E. Site Safety Review Checklist
- F. ILSM (Interim Life Safety Measures) Matrix & Sample Matrix
- G. VAPAHCS Codes of Practice for Tel/Data Cabling Installations
- H. VAPAHCS Tel/Data Jack Conventions
- I. Project Construction Wall Flyer Notice - Sample
- J. Hot Work Program Requirements - VAPAHCS Memo SAFE-09-06

**Attachment A:**

**Construction "Rules of the Station" for VAPAHCS**



# RULES OF THE STATION



## RULES OF THE STATION

### VETERANS AFFAIRS PALO ALTO HEALTH CARE SYSTEM

The guidelines published in this issue are for the use and convenience of construction and maintenance contractors, vendors and others performing contract work at all Divisions of the VA Palo Alto Health Care System.

#### INDEX

- A. Contract Work Hours
- B. Utilities
- C. Protective Clothing/Equipment
- D. Telephones
- E. Elevators/Corridors
- F. Toilets
- G. Parking/Traffic
- H. Deliveries
- I. Loading/Unloading
- J. Federal Police
- K. Locked Areas
- L. Operations and Storage Areas
- M. Construction Waste and Debris
- N. Recreational Facilities
- O. Disposal of Hazardous Materials
- P. Wash Down
- Q. Removal of Government Property
- R. Sexual Harassment
- S. Drugs and Alcohol
- T. Firearms and Explosive Devices
- U. Smoking
- V. Lost and Found
- W. Smoke Barrier Partitions
- X. Welding/Burning
- Y. Low Voltage Cable Installation
- Z. Occupational Health and Safety
- AA. Injury Accidents
- BB. Damage to Government Property
- CC. Dust and Fume Control
- DD. Noise
- EE. Roads and Walks
- FF. Fire Safety Precautions

- A. **CONTRACT WORK HOURS.** All work on the contract shall be performed between 8:00 am and 4:30pm Monday through Friday, excluding National Holidays, unless

approved in writing by the Contracting Officer. Contractors may request, in writing, approval to work other hours or weekends. Except for emergencies, the contract person should receive such requests two weeks before the scheduled work. When possible, Contractors will submit emergency requests at least two days before the scheduled work.

- B. **UTILITIES.** No utility service such as water, gas, medical air and gas, steam, sewer, electric, fire protection or communication shall be interrupted without prior approval of the contact person. This includes those interruptions required by the contract. Construction contracts include provisions for maintaining utility systems or providing temporary facilities. Utility shutdowns shall be done on weekends. Requests for utility shutdowns shall reach the contact person at least 30 days before the scheduled work. Any EMERGENCY REQUIRING AN IMMEDIATE SHUTDOWN WILL BE REPORTED IMMEDIATELY to the contact person. The contact person will in turn immediately notify the Engineering Office and the appropriate Chief, Facilities and Operations. The Contractor will prepare and forward to the Chief, Engineering Service, a written report of the situation, why it happened, a schedule of any further corrective work needed, and what, if any steps are being taken to prevent a recurrence.
- C. **INTERIM LIFE SAFETY MEASURES.** If a Fire Alarm system is out of service for more than 4 hours, or if a Sprinkler system is out of service for more than 4 hours, then this shall require the contractor to implement Interim Life Safety Measures in accordance with the latest issue of the VA Palo Alto Health Care System Memorandum SAFE 07-23.
- D. **PROTECTIVE CLOTHING/EQUIPMENT.** All workers will wear and/or use protective clothing and gear when required. This includes hard hats, goggles, protective shoes, gloves, masks or breathing apparatus, etc. The Contractor shall provide and protective equipment that may be required.
- E. **TELEPHONES.** Contractors may provide their own telephone, or pay telephones are available at many locations throughout the VA Palo Alto Health Care System for public use including contractors and the contract workers. Government telephones will not be used for private business or personal calls. Contractors or their workers may use the Government telephones to call/page the contact person, the Engineering Service office, or when authorized by the contact person - to call their office concerning contract matters. Telephone calls for contract workers will not be accepted by the Health Care System.
- F. **ELEVATORS/CORRIDORS.** Contractors and workers may use corridors and elevators for travel to and from the job sites when in proper attire (shirt and shoes required) provided they don't track mud, wet cement or any form of "dirt" into the buildings. The contact person will assign specific routes, times and elevators to use for transportation of materials and equipment. The Contractor will clean-up any mess caused by their workmen. Smoking is prohibited in elevators and corridors. Elevators will not be used during an emergency.
- G. **TOILETS.** The Contractor is to provide their own toilet facilities, however, the contact person will advise the Contractor which toilet facilities (if available) may be used by the Contractor's workmen. The Contractor will ensure that the facilities are kept clean and will be responsible for any damage done by the Contractor's workers.

- H. **PARKING/TRAFFIC.** Specific parking areas may be assigned for workers on larger construction projects. Workers on smaller construction or maintenance contracts may use that is away from buildings if no parking area is designated. Contractors, including maintenance contractors and workers are specifically prohibited from parking in those spaces reserved for Engineering Vehicles or lawn areas. Further, the Contractor is not to “back in” the space.
- I. **DELIVERIES.** The contact person will assign routes for the delivery of materials and supplies to the job site. The Contractor or construction traffic will not block any Health Care System road or street, walk or building egress without requesting approval in a timely manner.
- J. **LOADING/UNLOADING.** Building loading docks and landings may be used to load or unload construction materials when approved by the contact person. However, any vehicle left unattended for more than a few minutes may be cited by the Health Care System Police. Some areas may be reserved for Health Care System operations only during certain hours.
- K. **FEDERAL POLICE.** The Health Care System Police are Federal Police Officers with full authority to make arrests, investigate crime, and to issue citations. Citations issued for driving, parking violations or other offenses usually require an appearance in the Federal District Court and/or payment of a fine. FOR THE SAFETY OF PATIENTS speed limits, other driving and parking codes are strictly enforced.
- L. **LOCKED AREAS.** The Contractor is to coordinate access to locked areas with the contact person, including obtaining keys required for access to work sites. All buildings at the Health Care System are locked during other than normal work hours. When the Contractor has approval to work other than normal work hours, he will need to make arrangements for his workers to have access to job sites.
- M. **OPERATIONS AND STORAGE AREAS** will be confined to areas designated by the contract or approved in writing by the contact person or the Contacting Officer. The Government will not be responsible for any tools, equipment or materials left or stored on Government facilities, unless exceptions are provided in the contract.
- N. **CONSTRUCTION WASTE AND DEBRIS** will not be disposed of on station or in Health Care System trash containers or dumpsters. The Contractor may provide his own bin or dumpster, however, the use and location of such must be approved in writing by the contract person. Construction waste and debris will not be accumulated in corridors or other building areas where it might cause a fire or safety hazard.
- O. **RECREATIONAL FACILITIES** such as swimming pools, gym, tennis courts, etc. Are not to be used by Contractors or Contractor’s workers. Contractors and workers, in proper attire, are permitted to use the canteen for breaks and lunch and to purchase incidentals in the Canteen Store.
- P. **DISPOSAL OF HAZARDOUS MATERIALS.** Several buildings at the VAPAHCS contain asbestos containing materials (ACM). Some typical types of materials found to contain ACMs are pipe insulation, transit wall panels, floor tile, linoleum backing, floor/roof mastics and others. Contractors are required to communicate this information to all of their employees and subcontractors that will be working at any of the VAPAHCS sites, and failure to do so could result in OSHA citation(s). **Contractors are also required to alert the VAPAHCS immediately in the event**

**any known or suspected ACM is accidentally disturbed or will need to be disturbed before proceeding with work.**

If not indicated in the contract drawings, known locations of ACMs can be determined from the current VAPAHCS asbestos survey. Disposal of any hazardous or potentially hazardous materials in sanitary or storm sewer systems or on Health Care System grounds is strictly prohibited. Hazardous materials, such as asbestos materials, used cleaning solutions and other harmful chemicals shall be disposed of in accordance with State and/or local laws and regulations. In case of an accidental spill of hazardous materials, the contractor is expected to take immediate action to contain the spill and at the same time notify the C.O.T.R./Contracting Officer of the spill. Action should be taken to mitigate the situation until you receive direction from the VAPAHCS Quality Management personnel.

- Q. **WASH DOWN.** Washing leftover cement, plaster, paint, oil or grease, solvents, etc. Into any drains and the washing down of cement trucks or other delivery vehicles is strictly prohibited. **REPORT ANY ACIDENTAL SPILLS THAT MAY RUN INTO STORN DRAINS IMMEDIATELY TO THE ENGINEERING SERVICE AT EXTENSION 62468.** Even accidental spills, particularly those not immediately controlled or contained, may result in legal action by local or state authorities against the responsible parties.
- R. **REMOVAL OF GOVERNMENT PROPERTY,** including empty boxes, crates, wood, etc. is prohibited, except approved by the Chief, Supply Service. Contractors or vendors taking Government equipment off station for repairs will notify the contact person of such action. In most cases, a receipt will be required.
- S. **SEXUAL HARASSMENT** is strictly prohibited. This includes deliberate or unsolicited verbal comments or gestures of a sexual nature, unwelcome sexual advances, requests for sexual favors and/or other unwelcome verbal or physical conduct of a sexual nature.
- T. **DRUGS AND ALCOHOL.** Possession or use of non-prescription drugs or alcohol, including beer and wine, on the Health Care System grounds is strictly prohibited.
- U. **FIREARMS AND EXPLOSIVES.** Possession of firearms, ammunitions, explosive devices and any hand held item that may be considered an offensive weapon is strictly prohibited. This includes carrying such items in vehicles.
- V. **SMOKING POLICY.** Smoking is prohibited in all Health Care System Buildings particularly in corridors, elevators, offices and patient areas, except in designated areas.
- W. **LOST AND FOUND.** Any article or money found on the premises should be delivered immediately to the contact person or the Health Care System Police for safekeeping. Anyone losing an article or money should contact the Health Care System Police to determine if it has been turned in.
- X. **SMOKE/FIRE BARRIER PENETRATIONS.** Any penetrations to smoke or fire barrier walls, ceiling or floor slabs shall be properly sealed immediately. We recommend Hilti Fire Stop 601 or 635 for walls and ceilings and Hilti Fire Stop 657 for floor penetrations.
- Y. **WELDING AND OR BURNING:** Any person planning welding, cutting metal studs or other such burning operations will obtain a burning permit from the Occupational

Health and Safety Office, extension 65894. Welding and/or burning operations are allowed only during normal working hours.

- Z. **LOW VOLTAGE CABLE INSTALLATION**: The contractor shall install low voltage cable in raceways only after scheduling the work with the contact person. Whenever feasible, low voltage cables to be in the ceiling will be installed before the ceiling tile is installed.
- AA. **OCCUPATIONAL HEALTH AND SAFETY**: Contractors and their employees are expected to comply with and are subject to applicable OSHA and CAL-OSHA regulations as at any construction site.
- BB. **INJURY ACCIDENTS**: The Health Care System does not have the equipment, facilities, or personnel trained to handle serious injuries. Call 911 from a pay phone (or use an outside line) for emergency medical assistance and notify the contact person and the Health Care System Police.
- CC. **DAMAGE TO GOVERNMENT PROPERTY** caused by the Contractor or his workmen, whether accidental or incidental to the work, shall be corrected immediately at the Contractor's expense. This includes damage to lawns, shrubbery, irrigation systems, curbs, etc. Caused by construction vehicles/traffic and other operations.
- DD. **DUST AND FUME CONTROL** will be exercised on all construction operations. Workers will be careful not to operate any vehicles, gas or diesel engines, or to perform any fume or dust generating process near a building intake system.
- EE. **NOISE** will be held to a minimum at all times. Jack-hammering, core drilling and other noisy or disturbing operations may have to be rescheduled (or accomplished after hours) to avoid interfering with surgery or other programs. OSHA standards related to decibels are a requirement in any event.
- FF. **ROADS & WALKS**. Any debris dropped along egress from the station will be cleaned up immediately. Mud and dirt on roads and walks will be cleaned up as soon as the construction operation is complete or at the end of each day.
- GG. **FIRE SAFETY PRECAUTIONS** Contractors are expected to comply with all fire safety precautions. In the event of a fire or during regular fire drill, the contractor must vacate the construction site within the zone affected.

--- E N D ---

**Attachment B:**

**Utility Shutdown Procedures - VAPAHCS Memo 138-08-14**

**VETERANS AFFAIRS PALO ALTO HEALTH CARE SYSTEM**  
**3801 Miranda Avenue**  
**Palo Alto, CA 94304-1290**

**January 31, 2008**

---

**HEALTH CARE SYSTEM MEMORANDUM NO. 138-08-14**

---

**SUBJECT: UTILITY SHUTDOWN PROCEDURES**

---

1. **SUMMARY:** Health Care System Memorandum No. 138-04-14, dated November 10, 2004, is rescinded. Minor changes have been made.
2. **PURPOSE:** To establish policy, procedures and responsibilities for planned utility system interruptions or temporary shutdown of any utility throughout this Health Care System. These shutdowns shall be accomplished to minimize disruption and impact on patient care, yet perform the necessary utility work.
3. **POLICY:** It is the policy of this Health Care System to protect the health and safety of our patients, employees, and visitors. It is also necessary to temporarily shutdown utility systems in order to perform necessary preventative maintenance, repairs, or project-initiated improvements on the utilities systems. This policy establishes procedures to notify all VA Palo Alto Health Care System staff, patients, and visitors affected by these scheduled temporary utility shutdown with sufficient notice so coordination efforts can be made to patient care activities.
4. **DEFINITIONS:**
  - a. Minor Interruption or Shutdown: Expected to last no more than four (4) hours and affect no more than one (1) utility service.
  - b. Major Interruption or Shutdown: Expected to last more than four (4) hours and/or affects more than one (1) utility service.
  - c. Emergency Interruptions or Shutdowns: Interruption or shutdowns necessary to minimize further utility loss or failure, utility system and/or equipment damage, or a safety hazard. Advance notification may not be possible during emergency shutdowns.
  - d. Utility System Loss: Loss of utility service from an outside source. This usually includes loss of service from utility companies that VAPAHCS has no control over.

e. Utilities Systems: Includes systems such as electrical power; steam distribution; potable/domestic water; sanitary sewer; natural gas; medical gases; heating, air conditioning and ventilation (HVAC); vertical transportations (elevators); and fire alarms/fire sprinklers.

## **5. PROCEDURES:**

a. Utility Shutdown Forms: Requests for utility shutdowns will be submitted, in writing, at least two (2) weeks prior to the planned requested date. All affected Services will be notified in writing via the Utility Shutdown Form (Attachment A). It will be hand-carried by Engineering Service personnel to the offices of affected Services for concurrence signatures. All Utility Shutdown Forms will be concurred by affected Services at least five (5) working days prior to the planned interruption or shutdown.

b. Required Information: Utility Shutdown Forms will identify all pertinent information about the shutdown and indicate the necessary individuals for notification and concurrence. This includes, but is not limited to:

(1) Day of week (all caps), date, and time of temporary utility shutdown

(2) Utility affected

(3) Building(s) affected

(4) Description of the shutdown, including why the shutdown is necessary, what impact it will have on VAPAHCS patient-care and staff, and who to contact within Engineering Service.

c. Required Concurrence: All Utility Shutdown Forms must receive concurrence from the following Services:

(1) Engineering Service Foreman or Project Planning Contracting Officer's Technical Representative

(2) Chief, Engineering Service (138)

(3) Police & Security Service (07)

(4) Safety Officer (QM/S)

(5) Quality Manager (QM)

d. Communications: Once the Utility Shutdown Form has been concurred by all affected Services, Copies of the signed Utility Shutdown Forms will be distributed to all affected Services and posted within prominent areas of all building(s) affected.



e.       Emergency Shutdowns: All personnel responding to emergency situations requiring utility system service interruption or shutdown will take appropriate action as necessary to minimize disruption to patient care. Before an emergency shutdown, occupants of affected areas and applicable Service Chiefs will be notified as soon as possible or practical under the circumstances. Documentation of any emergency shutdowns will be initiated utilizing the DHCP Incident Report as soon as the information becomes available. This will include any subsequent information and the final solution of the emergency situation. All emergency shutdown incidents will be reported to the Safety Committee.

f.       Restoration of Utility Service: Upon completion of utility shutdown, Engineering Service will coordinate efforts to:

(1)      Verify it is safe to restore the utility service, and that all systems and/or equipment in the affected area are working properly. This includes, but is not limited to, checking reset buttons, pilot lights, breakers, flushometers, etc.

(2)      Notify affected areas and Service Chiefs that the service has been restored and the shutdown is complete.

## **6.    RESPONSIBILITIES:**

a.       The Chief, Engineering Service, is responsible for ensuring if utilities systems must be interrupted, the temporary shutdown does not seriously impact patient care and all precautions have been made to accommodate alternate utility services. This includes coordinating, planning, scheduling, and providing the necessary tools, equipment, materials, and manpower necessary to accomplish the utility shutdown work. He/she is also responsible for ensuring the Utility Shutdown Form is completed and receives concurrence in a timely manner. He/she is also responsible for ensuring all utility shutdowns and interruptions are documented and reported in the quarterly Utility Management report to the VAPAHCS Environment of Care Committee.

b.       Service Chiefs, or designees, are responsible for ensuring all affected staff in their Service are aware and fully understand the impact of the shutdown and will take necessary action(s) to *fully* coordinate and minimize impact to the Health Care System.

## **7.    REFERENCES:**

a.       Health Care System Memorandum [138-04-22](#), "Utilities Management Program"

b.       Health Care System Memorandum [138-40-20](#), "Engineering Work Requests"

c. "Environment of Care Guidebook," VHA Center for Engineering & Occupational Safety and Health (CEOSH), December 2006

8. **RESCISSION DATE:** January 31, 2011

9. **RESPONSIBLE OFFICIAL:** Chief, Engineering Service

Elizabeth Joyce Freeman  
Director

**Attachment C:**

**Sign-in/Acknowledgement Sheet for Utility Shut-Downs.**

I fully understand the impact of this shutdown and will take the necessary action(s) to **fully** coordinate and minimize impact to my service/section.

<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____
<input type="checkbox"/> _____	<input type="checkbox"/> _____

Note: ☒ Indicates that a signature is required.

---

**Attachment D:**

**Acceptable Construction Fencing Types.**

# Examples of Securing Exterior Construction Sites



Posted Construction Signage



Construction Fence with screen



**Attachment E:**

**Site Safety Review Checklist**

**Veteran Affairs Palo Alto Health Care System (VAPAHCS)  
Construction Site Safety Review Checklist**

Project: \_\_\_\_\_ Date: \_\_\_\_\_  
 Contractor: \_\_\_\_\_ Certifier Signature: \_\_\_\_\_  
 \_\_\_\_\_ Time: \_\_\_\_\_  
 \_\_\_\_\_

All Contractor personnel and Subcontractor employees are responsible to conduct work activities in a safe and healthful manner for their health and well-being as well VAPAHCS personnel. The purpose of this Site Safety Review is to increase the Contractor/Subcontractors awareness of the need for safe work habits and a positive attitude toward loss prevention and control. Below columns marked with "NC" answers require the Contractor/Subcontractors implementation of corrective action plans. Additional comments/actions will be described on additional pages to supplement this report.

<b>Safety &amp; Health General</b>	<b>OK</b>	<b>NC</b>	<b>N/A</b>	<b>Concrete Operations</b>	<b>OK</b>	<b>NC</b>	<b>N/A</b>
1. Safety Program / Injury Illness Protectn Plan				50. Cement/Silica dust exposures			
2. Orientation/Code of Safe Practices				51. Cutting Sawing/Grinding Controls			
3. Toolbox Meetings/Pre-Job Safety				52. PPE utilized by Crew			
4. Postings (OSHA) (Project Info/POC)				53. Wall or Structure Supported			
5. Emergency Numbers/First Aid				54. Pumps/equipment set-up/ cond.			
6. Toilets/ Hand Wash/Drinking Water				<b>Ladders</b>			
<b>Environment</b>				55. Ladder Conditions			
7. Ventilation, incl negative air/HEPA filtration				56. 3' Above Landing			
8. Illumination				57. Braced & Tied			
9. Integrity of Dust Control and containment				58. A-Frame Step Ladder Set Up			
10. Openings Guarded/Covered-Marked				59. Correct Height			
11. Stairs/Walkways Guarded & Accessible				60. Proper Use			
12. Rebars Capped				<b>Scaffolds/Shoring (Interior/Exterior)</b>			
13. Equipment/Material Storage				61. Current certified installation doc			
14. Traffic/Public Safety				62. Planks/toe boards			
15. 2 hr. fire separation from Patient Care Areas				63. Railed Properly			
16. Construction Warning Signs Posted				64. Tied to Structure			
17. Housekeeping				65. Ladder Access			
18. Emergency Exits – Clear / Unlocked				66. Daily Inspections			
19. ILSM in place – Exits Blocked/Locked				67. Users trained/Competent person			
<b>Electrical Safety</b>				68. Falling Object Protection			
20. Cords, Plugs Conditions, Surge Protectors				<b>Excavations/Trench</b>			
21. GFI Boxes & Grounding				69. Daily Inspections/Competent Person			
22. Overhead Lines protected/marked/spotter				70. Shored/sloped > 5' or soil cond.			
23. Lock out Tag Out				71. Spoil Piles at least 2' from edge			
24. Power/Generator/breaker panels secured				72. Underground Line located/potholed			
<b>Personal Protection (PPE)</b>				73. Barricades/protective measures			



25. Hard Hats				74. Ladder every 25' & after 4' deep			
26. Eye & Face Protection				<b>Vehicle/Equipment Operations</b>			
27. Ear Protection				75. Seat Belts by Operators			
28. Gloves/Clothing				76. Back Up Alarms – all Equipment			
29. Footwear				77. Reflective garments/PPE			
30. Respiratory (Dust/Canister Masks)				78. Personal cars in designated areas			
<b>Site Security</b>				79. Forklift operators trained			
31. Fencing				80. Flagmen/Traffic Control			
32. Security				<b>Scissors/Zoom Booms/Lift Trucks</b>			
33. Entrance/Exit				81. Controls Operative			
<b>Hand/ Power/Powder Actuated Tools</b>				82. Safety Chains in Place			
34. Guards attached/functional				83. Harness & Lanyards (JLG's)			
35. Grounded Properly				84. Operator Certification			
36. Working Properly				85. Visual Inspection			
37. Trained or Certified Operators/PPE				86. Fluid Levels (Oil, Water)			
<b>Fire Protection</b>				87. Brakes/Lights/Back up Alarm(s)			
38. Fire Extinguishers checked/accessible				88. Gauges – Operative			
39. Alarm/Detection System in Place				89. Scheduled Maintenance			
40. Smoking (No Smoking)				<b>Welding &amp; Cutting</b>			
41. Hot Work Permits approved/current				90. Approved Hot Work Permit			
42. Flammable/Combustible Material				91. Cylinders – Use & Segregation			
<b>Fall Protection</b>				92. Torches,Horses,Gauges,PPE,etc			
43. Use of Fall Protection above 6'				93. Weld Cables, Holders & Grounds			
44. Floor openings/holes securely covered				94. Fire Protection (Task Work)			
45. Perimeter/Interior Shaft Guardrails				<b>Personnel Hoists &amp; Cranes</b>			
46. Falling material/objects				95. Inspections & Maintenance			
47. Trained on Use – Competent Person				96. Crane Set Up & Swing Protection			
48. Handrails for stairs 4 or more steps				97. Rigging & Loads Secured			
49. Fall Protection Equipmt in place/Inspected.				98. Certified Operator			

Legend: OK = Practice in Compliance; NC = Needs Correction -- Identify ID number & correction needed on back of sheet; N/A = Not Applicable

**Attachment F:**


**ILSM (Interim Life Safety Measures) Matrix & Sample Matrix**



**HCSM SAFE-09-23 Attachment A  
Existing Significant Life Safety Code  
Deficiencies or Conditions as a Result of  
Construction**

			A	B	C	D	E	F	G	H	I	J	K	L	M
			Ensuring Egress	Emergency forces access	Emergency forces notification	Ensuring operational life safety system	Temporary construction barriers	Additional fire fighting equipment	Conducting Additional training of incident response team	Temporary fire protections system or measures	Controlling combustible loading	Conducting 2 fire drills per shift in all areas	Increased hazard surveillance	Compartmentation training of personnel	Conducting organizational training on life safety
		Yes	No												
1	Patient room door latching problem							X			X		X	X	
2	Lacking a code complying smoke barrier							X	X				X	X	
3	Fire exit stairs discharge improperly				X				X	x		X		X	X
4	Excessive travel distance to an approved exit									X	X		X	X	
5	Lack of two remote exits								X		X		X	X	
6	Nonconforming building construction type							X			X	X	X		X
7	Improperly protected vertical openings										X	X	X		
8	Large penetrations in fire/smoke barriers								X		X		X		
9	Corridor walls do not extend to the structure										X		X	X	
10	Hazardous areas not properly protected										X		X		
11	Blocking off an approved exit			X		X			X		X		X	X	
12	Rerouting of traffic to emergency room				X	X									
13	Major renovation of an occupied floor			X			X	X	X		X		X	X	
14	Replacing fire alarm system (out-of-service)					X	X		X	X	X	X	X		
15	Installing sprinkler system (out-of-service)					X	X		X	X	X	X	X		X
16	Significantly modifying smoke or fire barrier walls						X				X		X	X	
17	Adding an addition to an existing structure			X	X	X	X		X						X
18	Fire alarm system out-of-service over 4hrs					X	X		X	X					
19	Sprinkler system out-of-service over 4 hrs					X	X		X	X					
20	Disconnecting alarm devices					X				X					
21	ILSM required?														

Notes

				A	B	C	D	E	F	G	H	I	J	K	L	M
Existing Significant Life Safety Code Deficiencies or Conditions as a Result of Construction		Yes	No	Ensuring Egress	Emergency forces access	Emergency forces notification	Ensuring operational life safety system	Temporary construction barriers	Additional fire fighting equipment	Conducting Additional training of incident response team	Prohibiting smoking	Controlling combustible loading	Conducting 2 fire drills per shift in all areas	Increased hazard surveillance	Compartmentation training of personnel	Conducting organizational training on life safety
1	Patient room door latching problem								X		X	X		X	X	
2	Lacking a code complying smoke barrier								X	X	X			X	X	
3	Fire exit stairs discharge improperly	Yes				X				X	X		X		X	X
4	Excessive travel distance to an approved exit										X	X		X	X	
5	Lack of two remote exits									X	X	X		X	X	
6	Nonconforming building construction type								X		X	X	X	X		X
7	Improperly protected vertical openings										X	X	X	X		
8	Large penetrations in fire/smoke barriers									X	X	X		X		
9	Corridor walls do not extend to the structure										X	X		X	X	
10	Hazardous areas not properly protected										X	X		X		
11	Blocking off an approved exit	Yes		X		X				X	X	X		X	X	
12	Rerouting of traffic to emergency room				X	X					X					
13	Major renovation of an occupied floor			X			X	X	X		X	X		X	X	
14	Replacing fire alarm system (out-of-service)					X	X			X	X	X	X	X		
15	Installing sprinkler system (out-of-service)					X	X		X		X	X	X	X		X
16	Significantly modifying smoke or fire barrier walls							X			X	X		X	X	
17	Adding an addition to an existing structure			X	X	X	X	X		X	X					X
18	Taking a fire alarm system out-of-service	Yes				X	X			X	X					
19	Taking a sprinkler system out-of-service					X	X			X	X					
20	Disconnecting alarm devices					X					X					
21	ILSM required?															
22	ILSM Summary (Rows 1 - 21 Marked with Yes)	Yes		X		X	X			X	X	X	X	X	X	X

Notes

**Attachment G:****VAPAHCS Codes of Practice for Tel/Data Cabling Installations****Office of Information and Technology DESIGN AND CONSTRUCTION GUIDANCE  
(revised 3/8/11)****1. General VA Palo Alto Health Care System****1.1 Codes of Practice**

Adherence to **the** VA Network Cable Specifications by cabling installation contractors is a condition of contract. In the event the cabling installation is sub-contracted by the prime contractor, the prime contractor will supply a copy of these specifications to the sub-contractor. This requirement shall cover all levels of sub-contracting.

Any variations to the issued job specification shall be referred for approval to the Contracting Officer Technical Representative (COTR).

Contractors shall install all cable and cabling products with a proven track record for data network cabling installations. Such installations shall also meet all requirements as set out in this specification.

Un-terminated "future capacity" cables are not permitted. All installed cables shall be terminated at each end and documentation, labeling and (where applicable) test results provided. This applies to all permanently installed cable types.

**1.2 Documentation**

At least two copies of documents describing the data cable installation shall be provided.

A copy to be supplied to the COTR for approval

**1.3 Network Equipment**

COTR must approve the installation or removal of network hardware equipment. Non-VA staff shall carry out such work only with prior approval from the COTR.

**1.4 Network Equipment Environment**

Punch down area(s) (location of the data communication rack(s)) will be determined by the building Architect/Engineer and the COTR.

Contractor shall supply at minimum 1000BaseT, Category 6 certified rack-mounted modular RJ45 HIGH DENSITY patch panel (24/48 ports) for jacks meeting the ANSI/EIA/TIA t568-B- category 6 standards.

Contractor shall supply at minimum 1000BaseT, Category 6 certified AT&T style 110 blocks for voice requirements meeting the ANSI/EIA/TIA t568-B- category 6 standards. Contractor shall install one full wall of fire-rated plywood for the 110 blocks to be mounted on.

Contractor will supply contract specified number of 19"W x 84"H steel data communication rack. Both racks shall have a grounding wire and bus bar installed to earth ground.

Each jack on the AT&T style 110 block and HIGH DENSITY rack mountable patch panel will correspond with the jack at the wall device faceplate.

Where network equipment is to be located in a secure room or large closet, the room or closet shall have a dry powder extinguisher, suitable for electrical fires, provided and installed within the room. Air conditioning is required in each IT room. And the OI&T key core should be installed.

## **2. Unshielded Twisted Pair (UTP) Category 6 \*Contractor shall use a Cable color other than White \***

IEEE 802.3 100BaseT UTP Level 6, 24 AWG plenum rated cable.

Insulation - high-speed data grade.

Sheath - high temperature UL data grade.

### **2.1 Network Configuration Constraints \* Contractor shall use a Cable color other than White \***

Each segment comprises a four pair Category 6 cable.

Pin all 8 conductors.

Maximum link length - 90 meters

Maximum channel length - 100 meters

Maximum number of stations per segment - 1.

## **2.2 Installation Constraints**

### **2.2.1 Installation Standards**

Cable and connecting hardware meeting or exceeding the Category 6 specifications shall be used throughout, with pairs terminated according to the T568B wiring scheme.

## 2.2.2 General Requirements

The cabling system shall include all patch panels, horizontal cables, transition blocks, vertical cabling, modular jacks, system cables, patch cables, cable management, and a comprehensive labeling system. Cable trays shall be installed in main hallways in the place of j-hooks.

## 2.2.3 Data Outlets

The following information represents a minimum requirement for the number of UTP outlets that shall be installed in each type of workspace.

If the construction at the location of the voice/data outlet is drywall, provide flush-mounted single-gang outlet boxes with six-port base plates and applicable wall device faceplates (cable to be installed behind drywall).

If the construction at the location of the voice/data outlet is a solid wall, provide surface-mounted single-gang outlet boxes with six-port base plates and applicable wall device faceplates (cable to be installed in plastic wall mold equipped with protective insulator or sleeve).

Where modular furniture is used, the location of the voice/data outlet will be in the baseboard of the furniture, where the networked equipment (computers, printers, etc) will be located. Provide flush-mounted single gang outlet boxes with six-port base plates and applicable wall device faceplates. If flush-mounted single-gang outlet boxes cannot be used, then modular surface mount boxes will be used with six-port inserts. All cable runs in modular furniture will be through furniture wire baseboard ducts/conduit.

## 2.2.4 Horizontal Cabling

The horizontal wiring shall be a star topology connecting each network outlet jack to a jack on a patch panel rack in a communications enclosure/room.

The cable used shall be 4-pair 100-ohm high performance, 24 AWG solid conductor, and unshielded twisted pair cable, meeting or exceeding the Category 6 specification.

## 2.2.5 Network Outlet and Labeling

**\*ETHERNET 568B .5 RJ 45 shall be blue and .6 RJ 45 shall be yellow \***

**\*VOICE Pair one in insert one shall be white and Pair two in insert two shall be white**

Each network outlet faceplate shall incorporate one or more modular, universal RJ45 IDC jack sockets meeting or exceeding the Category 6 specification. Label each jack at this wall device faceplate to correspond with the label on the patch panel jack (N1, N2, etc.). All numbering should be readily visible.

### **2.2.6 Cable Installation**

The cable interconnecting a network outlet to the patch panel shall be one continuous length with no intermediate joins, splices or taps. Each cable runs shall be no longer than 300 feet total in length, from start to finish.

Cable termination onto a horizontal distribution panel or patch panel shall be undertaken in a manner that permits additional cables to be terminated without unduly disturbing previously installed cables.

Each voice/data outlet / device location will have three (3) cable runs. One (1) will terminate on the AT&T style 110 block for voice requirements and two (2) will terminate on the high density rack mounted patch panel.

No more than 24 cables shall be cable tied in a bunch.

A 2-meter loop of cable shall be left within or on the approach to each communications room/enclosure to facilitate re-termination of the cable in the future, should this be required. Such cable slack shall be coiled and supported in a neat and practical manner.

A 0.5-meter loop of cable shall be left in the trunking on the approach to each network outlet to facilitate re-termination of the cable in the future, should this be required.

The amount of untwisting in a pair as a result of termination to connecting hardware shall be no greater than 13mm, and less than this if possible.

Cable bend radii shall be no less than eight times the cable diameter or as specified by the cable manufacturer; whichever is the greater.

Precautions shall be observed to eliminate cable stress caused by tension in suspended cable runs and tightly strapped bundles.

Cable bundles shall not rub on, or be unduly compressed against any cable tray, equipment racking, or other cable support.



Cable bundles shall not obstruct the installation and removal of equipment in equipment racks.

Where UTP cables are run parallel with electrical cables the following minimum separation rules shall be observed:

<u>Circuit rating</u>	<u>Unshielded power/data</u>	<u>Shielded power/data</u>
$\leq 1$ KVA	300mm	25mm
$\geq 1 < 2$ KVA	450mm	50mm
$\geq 2 < 5$ KVA	600mm	150mm
5 KVA	1500mm	300mm

Where UTP cables are run in the proximity of electrical motors or transformers the minimum separation shall be 1 meter.

In situations where the above minimum distances cannot be applied due to a lack of available space, data cables shall be enclosed in rigid and/or flexible steel conduit. Conduit shall be bonded to a protective ground at one point in the installation. No steel cabling enclosure medium shall be installed without having continuity to a protective ground.

### 2.3 Inter-Building Cabling

#### **Wiring Maintenance or other local buildings:**

If local network connectivity for Maintenance or other local buildings is required, follow all specifications as stated in this document.

Connecting Maintenance or other local buildings with the Administration Building:

If the distance between the punch down area in the Administration Building to the punch down area in the Maintenance Building does not exceed 100m or 328' (maximum length of the cable run), then 1000BaseT UTP Level 6 24AWG plenum 4 pair cable may be used. Two cables will be required and must be installed in direct buried conduit that will connect the two buildings.

If the distance to the punch down area in the Maintenance Building exceeds 100m / 328' but is no more than 2km / 1.24 miles (maximum length of the cable run). Cable should be routed as shown on the contract drawing. All feeder and riser copper cabling

shall be terminated on 110 blocks and associated protectors shall be installed according to ansi/eia/tia standards/nec.

If the distance to the maintenance building exceeds 2km / 1.24 miles but is no more than 5km / 3.10 miles, then single-mode fiber 8x125 microns is recommended.

The contractor will install LC connectors at both ends of the SM fiber. A minimum of 12 SM strands will be required and must either be installed in conduit and/or installed below the frost line, however, it is highly recommend the cable be installed in conduit. All bends will be made with long radius conduit. All associated fiber patch panels shall be installed by the contractor.

Below is a list of hardware that is required if fiber is installed. VA will supply the Cisco Catalyst Switch for installation by the contractor on an approval basis. Contact the COTR to arrange delivery.

#### Single-mode

-----  
 Cisco Catalyst 3750-48 port  
 Cisco Catalyst LX uplink port  
 Single-mode Fiber 8.3x125 microns  
 LC Connectors

## 2.4 Testing

Testing shall be carried out with building electrical services operating (lighting, power, air-conditioning plant and lift services where applicable).

Wiring shall be tested to verify the continuity, integrity and polarity of the cable according to the specified pin and pair grouping assignments.

## 2.5 Documentation

The contractor shall provide installation documentation at the completion of the cabling system installation.

The contractor shall certify that the cabling system meets the UTP cabling system requirements for Category 6 performance levels.

## 3. Optical Fiber Cable (Ethernet)

Single-mode Fiber

Core Diameter 7 - 9 microns  
Cladding diameter 125 microns  
Prim. Acryl. Buffer diameter 250 microns  
Proof test not less than 50kpsi.  
Numerical aperture 0.11  
Attenuation not greater than 0.5dB/Km @ 1310nm. not greater than 0.4dB/Km @ 1550nm.  
Termination: All Single-mode terminations shall be made with LC connectors

### **3.1 Fiber Network Configuration Constraints**

Maximum Single-mode segment length – 5 km

### **3.2 Installation Constraints**

Minimum bend radius (during installation)- not less than 20 X outside diameter of cable.

Minimum bend radius (as installed) - not less than 10 X outside diameter of cable or the manufacturer's specification, whichever is the greater.

During installation the pulling force shall not exceed the manufacturer's specified maximum.

Cable slack shall be provided as follows:

Within pits - 2 meters minimum.

At a termination location - 2 meters minimum.

Within a termination enclosure - 0.5 meter minimum.

All fiber cable terminations are to be LC connectors. When using a wall or rack mount enclosure, a patch cord protector shall be included in the installation.

### **3.3 Testing**

100% Insertion Loss (light source and power meter) testing of all terminated fibers shall be performed in both directions at 1310nm for single mode cables.

OTDR tests shall be performed at high wavelength, if the distance is greater than 1000m at 1550nm for single mode cables.

Optical loss covers the total loss between two corresponding optical ports and must include allowances for losses due to fiber, connectors, passive optical components, splices and any margin for maintenance. This loss shall not exceed 5db.

Copies of all test results are to be provided to the COTR on completion of the project.

### 3.4 Documentation

Documentation of a cable installation shall comprise the following:

- Cable type
- Route followed
- Pit locations (where applicable)
- Building names
- Table of losses for each core

### 4. 0 In reference to VA Master Specification Section 27 15 00 Communications Horizontal cabling, the following shall be noted :

Palo Alto EPBX has one in existence and it is located in Bldg 100 FB370.

Page 27 15 00- 24.

- e.1 2 Category 6 rj 11 to be installed
- f. Provide each rj45 type jacks

Page 27 15 00 -25. h. Fiber Optics. VA Palo Alto networking equipment does not support ST type – Provide LC terminations on both ends.

Page 27 15 00 -26. 2. SM fiber – Provide LC terminations.

Page 27 15 00 -29. 4.C Palo Alto no longer uses MM fiber due to the distance limitations. Provide Type SM. VA Palo Alto networking gear has been refreshed by OI&T in March 2009 for SM fiber uplinks.

Page 27 15 00 -29.5. Palo Alto purchases our own patch cables – this purchases is unnecessary.

Page 27 15 00 -34.

h.3 Indicates a clause for growth on Category 6 cabling which should be able to give VA Palo Alto the additional rj45 we are asking

h.4 Indicates a clause for distance on MM vs SM which should be able to give Palo Alto the SM fiber with LC connections we are asking for.

Fiber limitations are identified on Page 27 15 00-34. h..4 –Provide proof of testing of all fibers to VA Palo Alto IT.

The Contractor supply and install the IT equipment rack into each TC.

Provide the IT department with cable warranty and POC so VA Palo Alto can route any cable warranty issues directly with them. Industry standards are 10 years on cabling warranty.

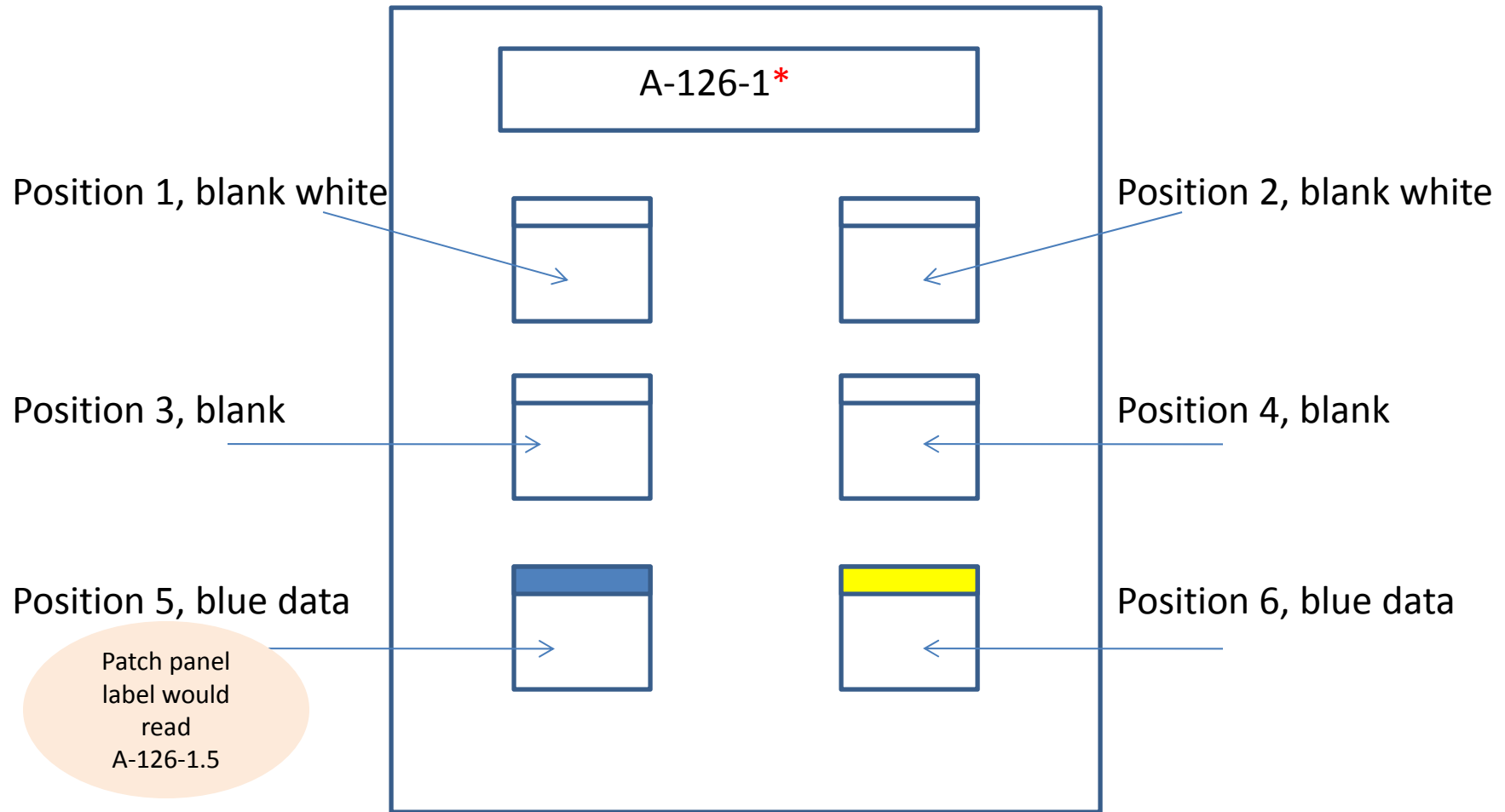
Submit Contractor's telecommunications OEM certifications for the installers as mandated by 27 15 00-9 1.4.E.

Under clause 27 15 00-2 E, Contractor shall use cable tray for the horizontal cabling.

**Attachment H:**

**VAPAHCS Tel/Data Jack Conventions**

## Typical Data Outlet



\* The label for each wall jack should be the Room number hyphen the number of jack in the room. In this example the room number is A-126, and this is the first jack in the room.

**Attachment I:**

**Project Construction Wall Flyer Notice - Sample**





## CONSTRUCTION AREA

ENGINEERING SERVICE has hired a construction contractor to (Project Title, Location) This project (Project Number) began in (Month and Year) and will continue until approximately (Month and Year).

**CONSTRUCTION HOURS:** 8:00 a.m. - 4:30 p.m.

For information regarding this project, contact

**CO's Name, Contracting Officer, x(Extension)**

**COTRs Name, Engineering Service, x(Extension)**

**Mary Barbara, Safety Officer, x65994.**

## Excuse our dust!

**Attachment J:**

**Hot Work Program Requirements - VAPAHCS Memo SAFE-09-06**

**VA PALO ALTO HEALTH CARE SYSTEM**  
**3801 Miranda Avenue**  
**Palo Alto, CA 94304-1290**

**Effective Date: February 21, 2007**

**Issue Date: October 13, 2009**

---

**HEALTH CARE SYSTEM MEMORANDUM No. SAFE-09-06**

---

**SUBJECT: HOT WORK PROGRAM**

---

1. **SUMMARY:** Veterans Affairs Palo Alto Health Care System (VAPAHCS) Memorandum No. SAFE-07-06, dated May 8, 2008, is rescinded. Minor changes have been made.

2. **PURPOSE:** To establish policy and procedures for cutting and welding and other hot work operations in nondesignated areas.

3. **POLICY:** All supervisors, employees, and contractors will take proper precautions when any cutting, welding, or other hot work is to be accomplished and assure all work is done in a safe manner with limited risk to patients, staff and visitors.

4. **DEFINITIONS:**

a. Hot Work: Hot work activities include welding, flame cutting, open-flame brazing or soldering, grinding, thermal spraying and/or other similar activities that generate sparks/heat that can provide an ignition source. The use of a portable engine for temporary power is also considered a hot work operation.

b. Fire Watch: An individual responsible for keeping an eye on the work area during the hot work process. The Fire Watch shall not be the same person actively performing the hot work.

5. **PROCEDURES:** Procedures and controls are established to control all cutting and welding operations conducted in areas not specifically designated for this type of operation. Permits will be authorized and issued by the Safety and Emergency Management (SAFE) Section in written form. Permits are not necessary when hot work is performed in Engineering shops designated for routine use of cutting and welding equipment.

a. When a hot work operation is necessary, SAFE will be contacted by the Contracting Officer's Technical Representative (COTR) or government employee. For major projects, the COTR should coordinate hot work requirements beforehand to preclude delay in contractor work.

- b. When a permit is issued, Section A of the permit (Attachment A) will initially be completed by the SAFE Service.
- c. Section B of the permit will be completed by the contractor or government employee requesting the permit and the permit will be maintained at the job site.
- d. Section C on the permit will be completed by the supervisor or fire watch after the 30-minute inspection of the area has been completed.
- e. When the operation is completed, and Section C of the permit is signed, it will then be forwarded to the SAFE Service where it will be maintained as a permanent record for a period of one year.
- f. A Fire watch is required for all hot work unless specified differently on the permit. A fire watch is normally required in locations meeting the following conditions:
  - (1) Appreciable combustible material, in building construction or contents, closer than 35 feet (10.7 m) to the point of operation.
  - (2) Appreciable combustibles are more than 35 feet (10.7 m) away but are easily ignited by sparks.
  - (3) Wall or floor openings within a 35-foot (10.7 m) radius expose combustible material in adjacent areas including concealed spaces in walls or floors.
  - (4) Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.
- g. The Fire watch shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them or otherwise sound the alarm. A fire watch shall be maintained for at least 30 MINUTES after completion of welding.

## 6. **RESPONSIBILITIES:**

- a. The Chief, Engineering Service is responsible for ensuring hot work permits are completed prior to hot work being conducted by contractors and staff under their purview.

b. The Facility Safety Officer, or authorized SAFE staff, will authorize and issue hot work permits when required and after assuring proper procedures have been put in place.

c. The COTR/Person requesting the Permit is responsible to insure that all required safety precautions as prescribed on the Hot Work Permit are complied with throughout the task.

**7. REFERENCES:**

a. NFPA 51B, Standard for Fire Prevention During Welding, Cutting and Other Hot Work, 1999 Edition.

b. OSHA 29 CFR 1910.119.

**8. RESCISSION DATE:** October 31, 2012.

**9. RESPONSIBLE OFFICIAL:** Chief, Safety, Emergency Management and Occupational Health Section.

Elizabeth Joyce Freeman  
Director

Attachments (1)

**ATTACHMENT A****VA Palo Alto Health Care System****HOT WORK PERMIT****A. Safety & Emergency Management Service Completes**

Date: \_\_\_\_\_

Requester (Section or Company Name): \_\_\_\_\_

Building/Department/Floor: \_\_\_\_\_

COTR/Permit Requestor: \_\_\_\_\_

Description of work: \_\_\_\_\_

\_\_\_\_\_

Special Precautions (other than these listed): \_\_\_\_\_

\_\_\_\_\_

Permit expires on: \_\_\_\_\_

Authorized by: \_\_\_\_\_

Date/Time Issued: \_\_\_\_\_

***ATTENTION***

Before any cutting and welding, ensure that the contractor/employee has inspected the work area and the COTR or permit requestor has confirmed that precautions have been taken to prevent fire. The location where this work is to be done has been examined and necessary precautions have been taken as identified on this permit. (See other side).

**B. CONTRACTOR/PERMIT REQUESTOR COMPLETES:****PRIOR TO INITIAL START UP**

This certifies the actions have been taken as indicated on this permit and the COTR/permit requestor

**ATTACHMENT A (cont.)****VA Palo Alto Health Care System****HOT WORK PERMIT (cont.)****PRECAUTIONS**

- \_\_\_\_ Sprinklers in service (Required for hot work).
- \_\_\_\_ Cutting and welding equipment in good repair.

**WITHIN 35 FT. OF WORK**

- \_\_\_\_ Floors swept clean of combustibles.
- \_\_\_\_ Combustible floors wetted down, covered with damp sand, metal or other shields.
- \_\_\_\_ No combustible material or flammable liquids present.
- \_\_\_\_ Combustibles and flammable liquids protected with covers, guards or metal shields.
- \_\_\_\_ All wall and floor openings covered.
- \_\_\_\_ Covers suspended beneath work to collect sparks.

**WORK ON WALL OR CEILINGS**

- \_\_\_\_ Construction noncombustible and without combustible covering.
- \_\_\_\_ Combustibles moved away from opposite side.

**WORK ON ENCLOSED EQUIPMENT (Tanks, containers, drums, ducts, etc.)**

- \_\_\_\_ Equipment cleaned of all combustibles.
- \_\_\_\_ Containers purged of flammable vapors with an inert gas.

***FIRE WATCH***

- \_\_\_\_ Provided during and 30 minutes after hot work operation.
- \_\_\_\_ Appropriate class fire extinguisher readily available.
- \_\_\_\_ Trained in use of equipment and in sounding fire alarm.

**C. SUPERVISOR/FIRE WATCH COMPLETES:****FOLLOWING COMPLETION OF HOT WORK**

Work area and all adjacent areas to which sparks and heat might be affected (including floors above and below and on opposite sides of walls) were inspected **30 MINUTES** after the work was completed and were found fire safe.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

640-11-229P

VAMC Palo Alto, CA

- - - E N D - - -



**SECTION 01 32 16**  
**NETWORK ANALYSIS SCHEDULES**

**PART 1- GENERAL**

**1.1 DESCRIPTION:**

- A. The Contractor shall develop a Network Analysis System (NAS) plan and schedule demonstrating fulfillment of the contract requirements, shall keep the network up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) Precedence Diagramming Method (PDM) 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 network diagram, 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.

**1.3 CONTRACTOR'S CONSULTANT:**

- A. To prepare the network diagram, and compact disk(s), which reflects the Contractor's project plan, the Contractor shall engage an independent CPM consultant who is skilled in the time and cost application of scheduling using (PDM) network techniques for construction projects, the cost of which is included in the Contractor's bid. This consultant shall not have any financial or business ties to the Contractor, and shall not be an affiliate or subsidiary company of the Contractor, and shall not be employed by an affiliate or subsidiary company of the Contractor.
- B. Prior to engaging a consultant, and within 10 calendar days after award of the contract, the Contractor shall submit to the Contracting Officer:
1. The name and address of the proposed consultant.

2. Sufficient information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
  3. A list of prior construction projects, along with selected PDM network diagram samples on current projects which the proposed consultant has performed complete project scheduling services. These network diagram samples must show complete project planning for a project of similar size and scope as covered under this contract.
- C. The Contracting Officer has the right to approve or disapprove employment of the proposed consultant, and will notify the Contractor of the VA decision within seven calendar days from receipt of information. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor must have their CPM Consultant approved prior to submitting any diagram.

#### **1.4 COMPUTER PRODUCED SCHEDULES**

- A. The contractor shall provide to the VA, Senior Resident Engineer and CPM Schedule Analyst, 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 Primavera (P3 or P6) 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 Primavera (P3 or P6) batch format; and the resulting monthly updated schedule in a compressed electronic file in Primavera (P3 or P6), (PDM) format. These must be submitted with and substantively support the contractor's monthly payment request and the signed lookahead report. The resident engineer 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 and associated compact disk(s), when requested by the Contracting Officer's representative, to correct errors which affect the payment and schedule for the project.

#### **1.5 THE COMPLETE PROJECT NETWORK DIAGRAM SUBMITTAL**

- A. Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the complete network diagram on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in a compressed Primavera (P3 or P6), (PDM) format. 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 without lead or lag constraints. The lead or lag for the SS relationships may only be allowed in limited basis if justified in writing and must be approved by the Contracting Officer. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer's separate approval of the network diagram 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 a 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 entire contract duration as defined in the bid documents.** 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, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- B. Within 30 calendar days after receipt of the complete project network diagram, the Contracting Officer or his representative, will do one or both of the following:
  - 1. Notify the Contractor concerning his actions, opinions, and objections.
  - 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the Contractor shall revise and shall submit three blue line copies of the revised network diagram, 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.
- C. The approved baseline network diagram schedule and the corresponding computer-produced schedule(s) shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

#### **1.6 WORK ACTIVITY/EVENT COST DATA**

- A. The Contractor shall cost load all work activities/events except procurement activities. The cost loading shall reflect the appropriate level of effort of the work activities/events. 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. In the event of disapproval, the Contractor shall revise and resubmit in accordance with Article, THE COMPLETE PROJECT NETWORK DIAGRAM SUBMITTAL. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in the FAR 52.232 - 5 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), Article, and VAAR 852.236 - 83(PAYMENTS UNDER FIXED-PRICE CONSTRUCTION).
- C. In accordance with Article PERFORMANCE OF WORK BY THE CONTRACTOR in FAR 52.236 - 1 and VAAR 852.236 - 72, the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. Work activities/events for Contractor bond shall have a trade code and area code of BOND.

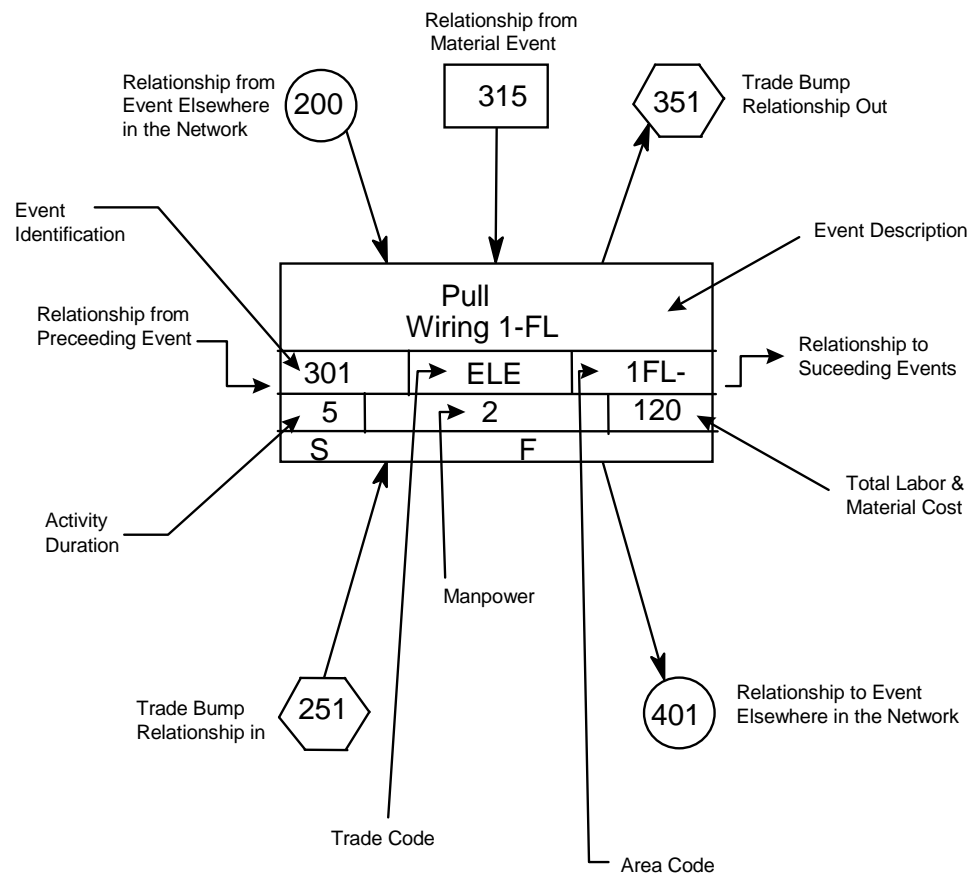
#### **1.7 NETWORK DIAGRAM REQUIREMENTS**

- A. Show on the network diagram 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. Exercise sufficient care to produce a clear, legible and accurate network diagram, refer to the drawing, CPM-1 (Sample CPM Network). Computer plotted network diagrams shall legibly display and plot all information required by the VA CPM activity/event legend or the computer plotted network diagram will not be acceptable. If the computer plotted network diagram is not found acceptable by the contracting officer's representative, then the network diagram will need to be hand drafted and meet legibility requirements. Group activities related to specific physical areas of the project, on the network diagram for ease of understanding and simplification. Provide a key plan on each network diagram sheet showing the project area associated with the work activities/events shown on that sheet.
  - 2. 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 (in accordance with Article, ACTIVITY/EVENT COST DATA of this section and less than \$9,999,999 per activity).
- f. Work location or area code (five characters or less), descriptive of the area involved.
- g. Manpower required (average number of men per day).
- h. The SYMBOL LEGEND format shown below and on the drawing, CPM-1 (Sample CPM Network) is mandatory and shall be followed in preparing final network diagrams.

## SYMBOL LEGEND

Show Network Diagram page number location(s) for all incoming/outgoing node connector(s).



### 3. 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.
- 4. 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.
  - 5. Break up the work into activities/events of a 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. Refer to drawing CPM-1 for VA approval activities/events which will require minimum duration longer than 20 workdays. 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.
  - 6. 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.
  - 7. Uniquely number each activity/event with numbers ranging from 1 to 99998 only. The network diagram should be generally numbered in such a way to reflect either discipline, phase or location of the work.
- B. Submit the following supporting data in addition to the network diagram, 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 network diagram 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 network diagram or any revised network diagram 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 network diagram.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA (Senior resident Engineer and CPM Schedule Analyst) an electronic file(s) containing one file of the data required to produce a Primavera (P3 or P6), (PDM) produced schedule, reflecting all the activities/events of the complete project network diagram being submitted.

#### **1.8 PAYMENT TO THE CONTRACTOR:**

- A. Monthly, the contractor shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article FAR 52.232 - 5 (PAYMENTS UNDER FIXED-PRICE CONSTRUCTION), and VAAR 852.236 - 83(PAYMENTS UNDER FIXED-PRICE CONSTRUCTION). 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 Primavera (P3 or P6), (PDM) 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 Primavera (P3 or P6), (PDM) 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 Primavera (P3 or P6), (PDM) 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.

#### **1.9 PAYMENT AND PROGRESS REPORTING**

- A. Monthly job site progress meetings shall be held on dates mutually agreed to by the Contracting Officer (or Contracting Officer's representative) and the Contractor. Contractor and the CPM consultant will 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. Changes in activity/event sequence and duration which have been made pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
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 pursuant to the provisions of Article, DAILY REPORT OF WORKERS AND MATERIALS in the GENERAL CONDITIONS.
- 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 in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- D. After completing the monthly schedule update, the contractor's scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer for the contract change(s). When there is a disagreement on logic and/or durations, the consultant shall use the schedule logic and/or durations provided and approved by the resident engineer. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the resident engineer within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for**

**regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**

- E. After VA acceptance and approval of the final network diagram, and after each monthly update, the contractor shall submit to the Contracting Officer three blue line copies of a revised complete network diagram showing all completed and partially completed activities/events, contract changes and logic changes made on the intervening updates or at the first update on the final diagram. The Contracting Officer may elect to have the contractor do this on a less frequent basis, but it shall be done on a quarterly basis as a minimum.
- F. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, RE office representatives, and all subcontractors needed, as determined by the SRE, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

#### **1.10 RESPONSIBILITY FOR COMPLETION**

- A. 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 network diagram before the next update, at no additional cost to the Government.

#### **1.11 CHANGES TO NETWORK DIAGRAM AND 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 compact disk(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 network diagram resulting from contract changes will be included in the proposal for changes in work as specified in Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 - 88 (CHANGES - SUPPLEMENTS), 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 network diagram not resulting from contract changes is the responsibility of the Contractor.

#### **1.12 ADJUSTMENT OF CONTRACT COMPLETION**

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the 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 in the network, will not be the basis for a change to the contract completion date. The Contracting Officer will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under Article, FAR 52.243 -4 (CHANGES), VAAR 852.236 - 88 (CHANGES - SUPPLEMENTS). 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.

#### **1.13 CONSTRUCTION SCHEDULE RISK ANALYSIS / MITIGATION PLAN**

- A. Schedule Risk Analysis - The contractor shall conduct the statistical schedule risk analysis based on the above detailed construction activities in the Day 1 approved diagram, identifying major schedule risk areas and recommended risk mitigation plans as outlined below.
- B. The risk analysis shall be conducted by a person or firm skilled in the statistical method of schedule risk analysis based on the (PDM) network techniques for major construction projects, preferably in the major health care related projects. The cost of this service shall be included in the Contractor's proposal.
- C. The Contracting Officer has the right to approve or disapprove the Person or firm designated to perform the risk analysis.

#### **1.14 RISK ANALYSIS FORMAT / REQUIREMENTS / SUBMITTALS**

- A. Risk Analysis Software / Format - Within 45 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; a Risk Analysis software to be utilized, the method of performing the analysis, the format of presenting the data and the reports for VA approval.
- B. Conduct Risk Analysis / **Submittals - Based on the approved software / format, the consultant shall** perform statistical risk analysis on the detailed approved Day 1 diagram. The contractor shall review and utilize any previous Risk analysis performed by the A/E of record based on the "semi-detailed" (yet at an overall level) construction logic and schedule to ensure the continuity of previous schedule risk analysis. The contractor's project manager and Superintendent shall identify the major schedule risk areas and possible risk mitigation strategy/plan and record it in a narrative format, with **electronic file submission** to the VA. **The risk analysis exercise shall be performed or updated at least on a quarterly basis or as directed by the VA Contracting officer.**
- C. The submittal shall include three copies of a computer-produced risk analysis results, predicting the various meaningful probability curves of achieving the contract schedules. It shall also include a detailed

narrative list of all major and minor potential and specific schedule and cost risk areas, and a contractor's recommendations of mitigating the identified risks which must be addressed by the VA Project and Resident engineer teams to maintain the contract schedule.

- - - E N D - - -

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

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples (including laboratory samples to be tested), 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 (including any laboratory samples to be tested) will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Resident Engineer on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant to request therefor by Contracting Officer, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.
- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer 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 in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
  - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
    - 1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
    - 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
    - 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
  - C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.
    - 1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
    - 2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
    - 3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
    - 4. Contractor shall send a copy of transmittal letter to both Resident Engineer and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
    - 5. Laboratory test reports shall be sent directly to Resident Engineer for appropriate action.
    - 6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
    - 7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
  - D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be

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

- E. Approved samples will be kept on file by the 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.
- F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
  - 1. For each drawing required, submit one legible photographic paper or vellum reproducible.
  - 2. Reproducible shall be full size.
  - 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
  - 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
  - 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
  - 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
  - 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples (except laboratory samples), shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

The Design Partnership  
1412 Van Ness Avenue, Second Floor  
San Francisco, California 94109

- 1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Resident Engineer.

- - - E N D - - -

**SECTION 01 42 19  
REFERENCE STANDARDS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. 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)**

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

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

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

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

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

AABC	Associated Air Balance Council <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>

NWWDA	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 <a href="http://www.steeljoist.org">http://www.steeljoist.org</a>
SMACNA	Sheet Metal and Air-Conditioning Contractors National Association, Inc. <a href="http://www.smacna.org">http://www.smacna.org</a>
SSPC	The Society for Protective Coatings <a href="http://www.sspc.org">http://www.sspc.org</a>
STI	Steel Tank Institute <a href="http://www.steeltank.com">http://www.steeltank.com</a>
SWI	Steel Window Institute <a href="http://www.steelwindows.com">http://www.steelwindows.com</a>
TCA	Tile Council of America, Inc. <a href="http://www.tileusa.com">http://www.tileusa.com</a>



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>

- - - E N D - - -

**SECTION 01 45 29**  
**TESTING LABORATORY SERVICES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

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

**1.2 APPLICABLE PUBLICATIONS**

- A. 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 Society for Testing and Materials (ASTM):
- A490-06.....Heat Treated Steel Structural Bolts, 150 ksi  
Minimum Tensile Strength
  - C31/C31M-06.....Making and Curing Concrete Test Specimens in the  
Field
  - C33-03.....Concrete Aggregates
  - C39/C39M-05.....Compressive Strength of Cylindrical Concrete  
Specimens
  - C109/C109M-05.....Compressive Strength of Hydraulic Cement Mortars
  - C143/C143M-05.....Slump of Hydraulic Cement Concrete
  - C173-07.....Air Content of freshly Mixed Concrete by the  
Volumetric Method
  - C780-07.....Pre-construction and Construction Evaluation of  
Mortars for Plain and Reinforced Unit Masonry
  - C1019-08.....Sampling and Testing Grout
  - C1064/C1064M-05.....Freshly Mixed Portland Cement Concrete
  - C1077-06.....Laboratories Testing Concrete and Concrete  
Aggregates for Use in Construction and Criteria  
for Laboratory Evaluation
  - C1314-07.....Compressive Strength of Masonry Prisms
  - 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
  - D2167-94(R2001).....Density and Unit Weight of Soil in Place by the  
Rubber Balloon Method

D2922-05.....	Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D2974-07.....	Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666-(2002).....	Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740-07.....	Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
E329-07.....	Agencies Engaged in Construction Inspection and/or Testing
E543-06.....	Agencies Performing Non-Destructive Testing
E1155-96(R2008).....	Determining FF Floor Flatness and FL Floor Levelness Numbers

### 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 Resident Engineer 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 Resident Engineer 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.

## **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 D1556 and ASTM D1557.
  - 2. Make field density tests in accordance with the primary testing method following ASTM D2922 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Resident Engineer before the tests are conducted.
    - a. Pavement Subgrade: One test for each 335 m<sup>2</sup> (400 square yards), but in no case fewer than two tests.
    - b. Trenches: One test at maximum 30 m (100 foot) intervals per 1200 mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
    - c. 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.

### **3.2 LANDSCAPING**

- A. Topsoil (planting soil) shall be imported in accordance with Section 32 90 00, PLANTING.
- B. Submit laboratory test report of imported topsoil to Resident Engineer.

### **3.3 STRUCTURAL PLANTING SOIL MIX**

- A. Aggregate Base Course:
  - 1. Determine maximum density and optimum moisture content for structural planting soil mix base as described in Section 32 90 10, STRUCTURAL SOIL.

### **3.4 SITE WORK CONCRETE**

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

### **3.5 CONCRETE**

- A. Batch Plant Inspection and Materials Testing:
  - 1. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Resident Engineer.
  - 2. Sample and test mix ingredients as necessary to insure compliance with specifications.
  - 3. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.
- B. Field Inspection and Materials Testing:
  - 1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
  - 2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
  - 3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 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 20 m<sup>3</sup> (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 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. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
  8. Verify that specified mixing has been accomplished.
  9. 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.
  10. 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.
  11. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
  12. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
  13. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
  14. 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.
  15. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
  16. Observe concrete mixing:
    - a. Monitor and record amount of water added at project site.
    - b. Observe minimum and maximum mixing times.
- 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. 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 kg/m<sup>3</sup> (pounds per cubic foot).
    - f. Weather conditions during placing.
    - g. Temperature of concrete in each test cylinder when test cylinder was molded.
    - h. Maximum and minimum ambient temperature during placing.
    - i. Ambient temperature when concrete sample in test cylinder was taken.
    - j. Date delivered to laboratory and date tested.

### 3.6 REINFORCEMENT

- A. Review mill test reports furnished by Contractor.

### 3.7 MASONRY

- A. Mortar Tests:
  1. Laboratory compressive strength test:
    - a. Comply with ASTM C780.
    - b. Obtain samples during or immediately after discharge from batch mixer.
    - c. Furnish molds with 50 mm (2 inch), 3 compartment gang cube.
    - d. Test one sample at 7 days and 2 samples at 28 days.
  2. Two tests during first week of operation; one test per week after initial test until masonry completion.
- B. Grout Tests:
  1. Laboratory compressive strength test:
    - a. Comply with ASTM C1019.
    - b. Test one sample at 7 days and 2 samples at 28 days.
    - c. Perform test for each 230 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 460 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 460 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.

### 3.8 TYPE OF TEST

Approximate  
Number of  
Tests  
Required

- A. Earthwork:
 

Laboratory Compaction Test, Soils (ASTM D1556 and ASTM D1557)	_____
Field Density, Soils (ASTM D2922 and ASTM D1556 or ASTM D2167)	_____
Penetration Test, Soils	_____

B. Landscaping:	
Topsoil Test	_____
C. Concrete:	
Making and Curing Concrete Test Cylinders (ASTM C31)	12
Compressive Strength, Test Cylinders (ASTM C39)	12
Concrete Slump Test (ASTM C143)	4
Concrete Air Content Test (ASTM C173)	4
Aggregate, Normal Weight:	
Gradation (ASTM C33)	2
Deleterious Substances (ASTM C33)	2
Soundness (ASTM C33)	2
Abrasion (ASTM C33)	2
D. Masonry:	
Making and Curing Test Cubes (ASTM C109)	_____
Compressive Strength, Test Cubes (ASTM C109)	_____
Sampling and Testing Mortar, Comp. Strength (ASTM C780)	_____
Sampling and Testing Grout, Comp. Strength (ASTM C1019)	_____
Masonry Unit, Compressive Strength (ASTM C140)	_____
Prism Tests (ASTM C1314)	_____
E. Inspection:	
Technical Personnel (Man-days)	_____

- - - E N D - - -



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

**PART 1 - GENERAL**

**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 effect 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 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 top soil, and land forms without permission from the Resident Engineer.
  - 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 markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
  - 2. 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.
  - 3. 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 10 (design 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 AND SOIL PREPARATION.
    - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
  - 4. 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 shown. 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.
  - 5. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
  - 6. Manage and control spoil areas on Government property to limit spoil to areas and prevent erosion of soil or sediment from entering nearby water courses or lakes.
  - 7. Protect adjacent areas from despoilment by temporary excavations and embankments.
  - 8. 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.
9. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
  10. 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 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 California, California Air Pollution Statue, Rule, Regulation and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
  2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
  3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
  4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- E. 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,	80	PNEUMATIC TOOLS	80
STATIONARY			
PUMPS	75		
GENERATORS	75	SAWS	75
COMPRESSORS	75	VIBRATORS	75

- b. Use shields or other physical barriers to restrict noise transmission.
- c. Provide soundproof housings or enclosures for noise-producing machinery.
- d. Use efficient silencers on equipment air intakes.
- e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
- f. Line hoppers and storage bins with sound deadening material.
- g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 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 900 to 1800 mm (three to six feet) in front of any building face. Submit the recorded information to the Resident Engineer noting any problems and the alternatives for mitigating actions.
- F. 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.
- G. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items

and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

- - - E N D - - -

**SECTION 01 74 19**  
**CONSTRUCTION WASTE MANAGEMENT**

**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
  - 1. Waste Management Plan development and implementation.
  - 2. Techniques to minimize waste generation.
  - 3. Sorting and separating of waste materials.
  - 4. Salvage of existing materials and items for reuse or resale.
  - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
  - 1. Soil.
  - 2. Inerts (eg, concrete, masonry and asphalt).
  - 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, copper, 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.
  - 14. Fluorescent lamps.

**1.2 RELATED WORK**

- A. Section 02 41 10, DEMOLITION AND SITE CLEARING.
- B. Section 01 00 00, GENERAL REQUIREMENTS.

### 1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
1. Excess or unusable construction materials.
  2. Packaging used for construction products.
  3. Poor planning and/or layout.
  4. Construction error.
  5. Over ordering.
  6. Weather damage.
  7. Contamination.
  8. Mishandling.
  9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to 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.cwm.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, recycled.
- b. List of each material and quantity proposed to be taken to a landfill.
4. Detailed description of the Means/Methods to be used for material handling.
  - a. On site: Material separation, storage, protection where applicable.
  - b. Off site: Transportation means and destination. Include list of materials.
    - 1) Description of materials to be site-separated and self-hauled to designated facilities.
    - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
  - c. The names and locations of mixed debris reuse and recycling facilities or sites.
  - d. The names and locations of trash disposal landfill facilities or sites.
  - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

#### **1.6 APPLICABLE PUBLICATIONS**

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

#### **1.7 RECORDS**

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

- - - E N D - - -

**SECTION 02 41 10  
DEMOLITION AND SITE CLEARING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies all site preparation work, demolition and removal of utilities, other structures and debris.

**1.2 RELATED WORK**

- A. Demolition and removal of soil to be demolished: Section 31 20 00, EARTH MOVING.
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- G. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- H. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.
- I. Waste Management: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT

**1.3 PROTECTION**

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.9 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.
- 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; flooding, or pollution.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:

1. 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.
  2. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Veterans Administration; any damaged items shall be repaired or replaced as approved by the Contract Officer's Technical Representative (COTR). 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 COTR's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

#### **1.4 UTILITY SERVICES**

- A. Demolish and remove utility service lines shown to be removed.
- B. Remove abandoned utility lines that would interfere with installation of new utility lines and new construction.

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

#### **PART 3 - EXECUTION**

##### **3.1 SITE CLEARING**

- A. General: Remove vegetation, pavements, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal.
- B. Erosion Control: Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

Contractor shall install silt fence and inlet protection as shown and as per requirements of the SWPPP, prior to any soil disturbance activities. Provide temporary erosion control as required by the SWPPP.

- C. Maintain site controls in accordance with Storm Water Pollution Prevention Plan and repair as directed by COTR to sustain compliance with SPDES permit. Maintain all records as required by the SWPPP. Perform inspections as required by the SWPPP.
- D. Topsoil - On-site: Topsoil is defined imported soil per section 32 90 00 Planting
- F. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
- G. Abandonment or removal of certain underground pipe or conduits may be indicated on mechanical or electrical drawings and is included under work of related Division 15 and 16 Sections. Removing abandoned underground piping or conduits interfering with construction is included under this Section, except as indicated to be abandoned in-place.
- H. Continue maintenance of erosion controls in compliance with the Storm Water Pollution Prevention Plan until the work is completed and the threat of erosion is gone by around surface stabilizer. Temporary erosion control devices shall not be removed until the area is certified as being stabilized by the Qualified Inspector.

### **3.2 DEMOLITION**

- A. Completely demolish and remove structures, including all appurtenances related or connected thereto, as noted below:
  - 1. As required for installation of new utility service lines.
  - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the site to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the COTR. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- 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 (unless otherwise noted) and shall

be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications. Burning is not permitted on the property.

- 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 COTR. When Utility lines are encountered that are not indicated on the drawings, the COTR shall be notified prior to further work in that area.

### **3.2 CLEAN-UP**

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to COTR. Clean-up shall include off-site 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.

- - - E N D - - -



**SECTION 12 93 00  
SITE FURNISHINGS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. Furnish and install all site furnishings shown on drawings and specified in accordance with the manufacturer's instructions and as shown on the drawings and as specified
- B. Related requirement specifications elsewhere:
  - 1. Section 32 13 20 Site Concrete
  - 2. Section 32 90 00 Planting

**1.2 REFERENCES:**

- A. Perform work in accordance with all applicable laws, codes and regulations required by the City and the State of California.
- B. Manufacturer's Instructions: Where required in the Specifications that materials, products, processes, equipment or the like to be installed or applied in accordance with manufacturer's instructions, directions or specifications, or words to this effect, it shall be constructed to mean that said application or installation shall be in strict accordance with printed instructions furnished by the manufacturer of the material for use under conditions similar to those at the job site.
- C. Reference Standards:
  - 1. State of California, Business and Transportation Agency, Department of Transportation: Caltrans Standard Specifications
  - 2. Manufacturers' specifications and recommendations.

**1.3 COORDINATION:**

- A. Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in concrete and for the provision of connections, holes, openings, etc., necessary to the execution of the work of the trades.

**1.4 SUBMITTALS: SECTION 01 33 00 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES**

- A. Surface-Mounted Benches
- B. Trash/recycling Receptacles
- C. Paver Grate

**PART 2 - MATERIALS****2.1 BASIS OF DESIGN:**

- A. The design of Site Furnishing equipment is based on products specified. Subject to compliance with requirements, provide named product or a comparable product.

**2.2 SURFACE-MOUNTED BENCHES:**

- A. Forms and Surfaces "Knight" Bench with back-rest, surface mounted in place:
  - Solid Aluminum frame with polished edges
  - Powdercoated interior frame surfaces
  - FSC Pure Ipe slats, with sealant coating
  - No Armrests
  - Custom length as shown in layout plan to be one continuous bench divided into 3 equal segments

**2.3 PAVER GRATE:**

- A. 72" Square Galvanized Steel Paver Grate as available from Ironsmith, 41-701 Corporate Way, Unit 3, Palm Desert, CA 92260 (800) 338-4766
- B. Paver-Grates shall be manufactured from standard steel shapes to ASTM A36 and expanded metal grating 3# to ASTM A569/569M. If required, Tubing to ASTM A500. Units shall be manufactured true to design and all components shall fit together in a satisfactory manner. Grates are to be of uniform quality, flat and free from distortion.
- C. Tree grates shall be: PAVER GRATE Model 6220 "72" Galvanized steel PAVER-GRATE in halves for use with pavers with "12,24" inch tree opening, or approved equal.
- D. Finish: Grates are to be supplied galvanized by hot spray and / or hot dip method.

**PART 3 - EXECUTION****3.1 GENERAL INSTALLATION:**

- A. Install manufactured items in accordance with the manufacturer's instruction and as shown in the drawings and as specified herein.
- B. Perform all work in accordance with all applicable laws, codes and regulations required by State of California and the City of Palo Alto.

- C. Set all work true and square, plumb and level. Remove and replace any wood that splits during or after erection until acceptance. Keep nailing neatly lined up.
- D. Fabricate wood in as long pieces as practical unless otherwise indicated. End joints shall occur at supports. Keep all work clean, accurately cut, closely fitted and set to the required lines and levels. Blunt exposed edges by sanding or with plane.
- E. Place washer under the head and nut of bolts where same bear on wood, except head of carriage bolt. Drill bolt holes same diameter as bolt.
- F. Size bolts to fit flush with nuts. Countersink nuts and bolts as detailed.
- G. Hammers with scored faces shall not be used in nailing.
- H. Supply all miscellaneous metal units and install as specified herein under the Sections titled Miscellaneous Metal work
- I Hot-dip galvanize all metal fastenings, angles, etc., after complete fabrication.
- J. Galvanized metal that is cut, damaged or modified after fabrication shall be immediately painted with Zinc-rich paint to prevent rusting.
- K. Touch up paint any damaged surfaces to match original finish as accepted by the Contract Officer's Technical Representative (COTR).
- L. Set site furniture, level. Provide spacers under furniture to level as acceptable to Owner's Representative
- M. Transport, store and handle precast units and manufactured items in a manner to avoid hairline cracks, staining or other damage. Store units free of the ground and protected from mud or rain splashes. Cover units, secure covers firmly, and protect the units from dust, dirt or other staining material.

### **3.2 SURFACE-MOUNT BENCHES:**

- A. Install in accordance with the manufacturer's instruction and as shown.

### **3.3 PAVER GRATE:**

- A. Install in accordance with the manufacturer's instruction and as shown.

- - - E N D - - -

**SECTION 22 05 11  
COMMON WORK RESULTS FOR PLUMBING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The requirements of this Section shall apply to all sections of Division 22.
- B. Definitions:
  - 1. Exposed: Piping and equipment exposed to view in finished rooms.
  - 2. Option or optional: Contractor's choice of an alternate material or method.

**1.2 RELATED WORK**

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

**1.3 QUALITY ASSURANCE**

- A. Products Criteria.
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years.
  - 2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
  - 3. The products and execution of work specified in Division 22 shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Resident Engineer (RE).
- B. Execution (Installation Construction) Quality:
  - 1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instruction and the contract drawings and specifications shall be referred to the RE/Resident Engineer for resolution. Written hard copies or computer files of manufacturer's

installation instruction shall be provided to the RE/Resident Engineer at least two weeks prior to commencing installation of any item.

2. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved.

C. Guaranty: Warranty of Construction, FAR clause 52.246-21.

D. Plumbing Systems: IPC, International Plumbing Code.

E. Plumbing products shall comply with BAA, Buy American Act.

#### **1.4 SUBMITTALS**

A. Submittals shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.

B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 11. COMMON WORK RESULTS FOR PLUMBING", will applicable paragraph identification.

C. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.

D. Upon request by Government, lists of previous installations for selected items of equipment shall be provided. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.

2. Damaged equipment shall be replaced with an identical unit as determined and directed by RE/Resident Engineer. Such replacement shall at no additional cost the Government.

3. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.

2. Piping systems shall be flushed, as necessary to deliver clean systems.
3. Contractor shall fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

#### **1.6 APPLICABLE PUBLICATIONS**

- A. The publication listed below shall 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):
  1. E84-2005 Standard Test Method for Surface Burning Characteristics of Building Materials.
  2. E119-2008a Standard Test Methods for Fire Tests of Building Construction and Materials.
- C. International Code Council, (ICC):
  1. IBC-06, (R 2007) International Building Code
  2. IPC-06, (R 2007) International Plumbing Code

#### **1.7 MILITARY SPECIFICATION**

- A. Mil. Spec. DOD-0-21035B, paint.

### **PART 2 - PRODUCTS**

#### **2.1 FACTORY-ASSEMBLED PRODUCTS**

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. Components of equipment shall bear manufacturer's name and trademark, model number, and performance data cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

#### **2.2 COMPATIBILITY OF RELATED EQUIPMENT**

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

#### **2.3 EQUIPMENT AND MATERIALS IDENTIFICATION**

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings, or shown in the maintenance manuals.

#### **2.4 GALVANIZED REPAIR COMPOUND**

- A. Organic coating containing 95% metallic zinc, by weight in dried film, 52% by volume solid content, 1.5 mils dry film thickness per coat, recognized under the Component Program of Underwriter's Laboratories as equivalent to hot-dip galvanizing, and complies with Mil Spec, currently known as DOD-P-21035A.

**PART 3 - EXECUTION****3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING**

- A. Location of new piping, shall be coordinated with the work of all trades. The drawings shall be submitted for review.
- B. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- C. Location of pipe trenches shall be accurately coordinated with equipment and piping locations.

**3.2 PLUMBING SYSTEMS DEMOLITION**

- A. Rigging access, other than indicated on the drawings, shall be provided after approval for structural integrity by the RE/Resident Engineer. Such access shall be provided without additional cost or time to the Government.
- B. Unless specified otherwise, all piping, associated with the equipment not re-used in the new work shall be completely removed from Government property. This includes all pipe fittings.

**3.3 CLEANING**

- A. Prior to final inspection and acceptance of the underground piping for beneficial use by the Government, the piping shall be flushed of debris.

**3.4 INSTRUCTIONS TO VA PERSONNEL**

- A. Instructions shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.

- - - E N D - - -

**SECTION 22 14 00  
FACILITY STORM DRAINAGE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section describes the requirements for storm drainage systems, including piping, removal of installed catch basins and area drains indicated, connections for drainage piping that is a part of Landscape work, and all necessary accessories as designated in this section.

**1.2 RELATED WORK**

- A. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
1. Piping and fitting.
  2. All items listed in Part 2 - Products.

**1.4 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 National Standards Institute (ANSI).
- C. American Society of Mechanical Engineers (ASME): (Copyrighted Society).
1. B16.3-06 Malleable Iron Threaded Fittings, Classes 150 and 300.
  2. B16.12-98 (R 2006) Cast Iron Threaded Drainage Fittings.
- D. American Society for Testing and Materials (ASTM):
1. A74-06 Standard Specification for Cast Iron Soil Pipe and Fittings
  2. A183-03 Standard Specification for Carbon Steel Track Bolts and Nuts
  3. C564-06a Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- E. International Code Council (ICC):
1. IPC-06 International Plumbing Code
- F. Cast Iron Soil Pipe Institute (CISPI):
1. 301-05 Hubless Cast Iron Soil and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
  2. 310-04 Couplings for Use in Connection with Hubless Cast Iron Soil and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.



**PART 2 - PRODUCTS****2.1 STORM WATER DRAIN PIPING****A. Cast Iron Storm Pipe and Fittings:**

1. Cast iron storm pipe and fittings shall be used for the following applications:
  - a. Pipe buried in or in contact with earth.
2. The cast iron storm Pipe shall be bell and spigot, or hubless (plain end or no-hub) as required by selected jointing method.
3. The material for all pipe and fittings shall be cast iron soil pipe and fittings and shall conform to the requirements of CISPI Standard 301, ASTM A-888, or ASTM A-74.
4. Joints for hubless pipe and fittings shall conform to the manufacturer's installation instructions. Couplings for hubless joints shall conform to CISPI 310.

**B. Polyvinyl Chloride (PVC)**

1. Polyvinyl chloride storm sewer pipe and fittings are permitted for single story structures.
2. Polyvinyl chloride storm sewer pipe and fittings shall be schedule 40 solid core sewer piping conforming to ASTM D1785 and D 2665, Sewer and Drain Series, with ends for solvent cemented joints.
3. Polyvinyl chloride joints shall be solvent welded socket type using solvent cement conforming to ASTM D2564.

**2.2 SPECIALTY PIPE FITTINGS**

- A. Transition pipe couplings shall join piping with small differences in outside diameters or be of different materials. End connections shall be of the same size and compatible with the pipes being joined. The transition coupling shall be elastomeric, sleeve type reducing or transition pattern and include shear erring and corrosion resistant metal tension band and tightening mechanism on each end. The transition coupling sleeve coupling shall be of the following material:
1. For cast iron soil pipes, the sleeve material shall be rubber conforming to ASTM C564.
  2. For PVC soil pipes, the sleeve material shall be elastomeric seal or PVC, conforming to ASTM F 477 or ASTM D5926.

**2.3 CLEANOUTS**

- A. Cleanouts shall be the same size as the pipe, up to 100 mm (4 inches); not less than 100 mm (4 inches) for larger pipe. Cleanouts shall be easily accessible and shall be gastight and watertight. A minimum clearance of 600 mm (24 inches) shall be provided for clearing a clogged storm sewer line.

- b. Grade cleanouts shall be gray iron housing and round, secured, scoriated, gray iron cover conforming to ASME A112.36.2M. A gray iron ferrule with hubless, socket, inside calk or spigot connection and counter sunk, taper-threaded, brass or bronze closure plug shall be included. The frame and cover material and finish shall be galvanized cast iron with round shape. The cleanout shall be vertically adjustable for a minimum of 50 mm (2 inches). Cleanouts shall consist of wye fittings and eighth bends with brass or bronze screw plugs. Two way cleanouts shall be provided where indicated on drawings and at every building exit. The loading classification for cleanouts in sidewalk areas or subject to vehicular traffic shall be heavy duty type.
- c. In horizontal runs above grade, cleanouts shall consist of cast brass tapered screw plug in fitting or caulked/no hub cast iron ferrule. Plain end (no-hub) piping in interstitial space or above ceiling may use plain end (no-hub) blind plug and clamp.

### **PART 3 - EXECUTION**

#### **3.1 PIPE INSTALLATION**

- A. The pipe installation shall comply with the requirements of the International Code and these specifications.
- B. Branch piping shall be installed from the piping system and connect to all drains and outlets.
- C. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe shall be reamed to full size after cutting.
- D. All pipe runs shall be laid out to avoid interference with other work.
- E. The piping shall be installed above accessible ceilings to allow for ceiling panel removal.
- F. Unless otherwise stated on the documents, minimum horizontal slope shall be 25 mm (1 inch) for every 1.22 m (4 feet) of pipe length.
- G. The piping shall be installed free of sags and bends.
- H. Seismic restraint shall be installed where required by code.
- I. Changes in direction for storm drainage piping shall be made using appropriate branches, bends and long sweep bends. Sanitary tees and short sweep  $\frac{1}{4}$  bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Long turn double wye branch and  $\frac{1}{8}$  bend fittings shall be used if two inlets are installed back to back or side by side with common drain pipe. Do not change direction of flow more than 90 degrees. Proper size of standard increaser and reducers shall be used if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

- J. Buried storm drainage piping shall be laid beginning at the low point of each system. Piping shall be installed true to grades and alignment indicated with unbroken continuity of invert. Hub ends shall be placed upstream. Required gaskets shall be installed according to manufacturer's written instruction for use of lubricants, cements, and other installation requirements.
- K. Cast iron piping shall be installed according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings"
- L. Remove existing area drains and turn over to Owner. Caps unused drain risers 305 mm (12 inches) below undisturbed soil. Connect new drain branches to existing drain risers with ¼ bend fitting per above.

### 3.2 JOINT CONSTRUCTION

- A. Hubless, cast iron piping shall be joined in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless piping coupling joints.
- B. Socket fusion PVC piping shall be joined with solvent cement. Apply solvent cement on piping only and insert piping to stop point of fitting.

### 3.3 SPECIALTY PIPE FITTINGS

- A. Transition coupling shall be installed at pipe joints with small differences in pipe outside diameters.

### 3.4 PIPE HANGERS, SUPPORTS AND ACCESSORIES:

- A. Miscellaneous Materials shall be provided as specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories. If the vertical distance exceeds 6 m (20 feet) for cast iron pipe additional support shall be provided in the center of that span. All necessary auxiliary steel shall be provided to provide that support.
- B. Piping shall conform to the following:
  - 1. Storm Water Drain:

Pipe Size	Minimum Pitch
80 mm (3 inches) and smaller	2%
100 mm (4 inches) (4 inches) and larger	2%, unless otherwise noted

### 3.5 TESTS

- A. Storm sewer system shall be tested either in its entirety or in sections.

- B. Storm Water Drain tests shall be conducted before trenches are backfilled or Landscape drainage piping is connected. A water test shall be conducted.
1. The entire system is tested with water, tightly close all openings in pipes except the highest opening, and fill system with water to point of overflow. If system is tested in sections, tightly plug each opening except highest opening of section under test, fill each section with water and test with at least a 3 m (10 foot) head of water. In testing successive sections, test at least upper 3 m (10 feet) of next preceding section so that each joint or pipe except upper most 3 m (10 feet) of system has been submitted to a test of at least a 3 m (10 foot) head of water. Water shall be kept in the system, or in portion under test, for at least 15 minutes before inspection starts. System shall then be tight at all joints.
  2. Repair and/or replace any leaks from piping or fitting and retest until no leak.

- - - E N D - - -

**SECTION 26 05 11  
REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, applies to all sections of Division 26.
- B. Furnish and install electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, transformers, cable, switchboards, panelboards, and other items and arrangements for the specified items are shown on drawings.
- C. Wiring ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are prohibited.

**1.2 MINIMUM REQUIREMENTS**

- A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL) and National Fire Protection Association (NFPA) are minimum installation requirement standards.
- B. Drawings and other specification sections shall govern in those instances where requirements are greater than those specified in the above standards.

**1.3 TEST STANDARDS**

- A. All materials and equipment shall be listed, labeled or certified by a nationally recognized testing laboratory to meet Underwriters Laboratories, Inc., standards where test standards have been established. Equipment and materials which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.
- B. Definitions:
  - 1. Listed; equipment or device of a kind mentioned which:
    - a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.

- b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.
- 2. Labeled; equipment or device is when:
  - a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
  - b. The laboratory makes periodic inspections of the production of such equipment.
  - c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
- 3. Certified; equipment or product is which:
  - a. Has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
  - b. Production of equipment or product is periodically inspected by a nationally recognized testing laboratory.
  - c. Bears a label, tag, or other record of certification.
- 4. Nationally recognized testing laboratory; laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

#### **1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)**

- A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least three years.
- B. Product Qualification:
  - 1. Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
  - 2. The Government reserves the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
- C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

**1.5 MANUFACTURED PRODUCTS**

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts shall be available.
- B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
  - 1. Components of an assembled unit need not be products of the same manufacturer.
  - 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
  - 3. Components shall be compatible with each other and with the total assembly for the intended service.
  - 4. Constituent parts which are similar shall be the product of a single manufacturer.
- D. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Testing Is Specified:
  - 1. The Government shall have the option of witnessing factory tests. The contractor shall notify the VA through the Resident Engineer a minimum of 15 working days prior to the manufacturers making the factory tests.
  - 2. Four copies of certified test reports containing all test data shall be furnished to the Resident Engineer prior to final inspection and not more than 90 days after completion of the tests.
  - 3. When equipment fails to meet factory test and re-inspection is required, the contractor shall be liable for all additional expenses, including expenses of the Government.

**1.6 EQUIPMENT REQUIREMENTS**

Where variations from the contract requirements are requested in accordance with Section 00 72 00, GENERAL CONDITIONS and Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

**1.7 EQUIPMENT PROTECTION**

- A. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain:

1. During installation, enclosures, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing and operating and repainting if required.
2. Damaged equipment shall be, as determined by the Resident Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
3. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
4. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

#### **1.8 WORK PERFORMANCE**

- A. All electrical work must comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J, OSHA Part 1910 subpart S and OSHA Part 1910 subpart K in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
  1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
  2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.
  3. Before initiating any work, a job specific work plan must be developed by the contractor with a peer review conducted and documented by the Resident Engineer and Medical Center staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.
  4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Director of the Medical Center.
- D. For work on existing stations, arrange, phase and perform work to assure electrical service for other buildings at all times. Refer to Article



OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.

- E. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Section 01 00 00, GENERAL REQUIREMENTS.
- F. Coordinate location of equipment and conduit with other trades to minimize interferences. See Section 00 72 00, GENERAL CONDITIONS.

#### **1.9 EQUIPMENT INSTALLATION AND REQUIREMENTS**

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working spaces shall not be less than specified in the NEC for all voltages specified.
- C. Inaccessible Equipment:
  - 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
  - 2. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.

#### **1.10 EQUIPMENT IDENTIFICATION**

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as panelboards, cabinets, motor controllers (starters), safety switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Nameplates shall be laminated black phenolic resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions.

#### **1.11 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or

installation of equipment or material which has not had prior approval will not be permitted at the job site.

- C. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Government to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.
  - 1. Mark the submittals, "SUBMITTED UNDER SECTION\_\_\_\_\_".
  - 2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
  - 3. Submit each section separately.
- E. The submittals shall include the following:
  - 1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required.
  - 2. Elementary and interconnection wiring diagrams for communication and signal systems, control system and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
  - 3. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
- F. Manuals: Submit in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
  - 1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish four copies, bound in hardback binders, (manufacturer's standard binders) or an approved equivalent. Furnish one complete manual as specified in the technical section but in no case later than prior to performance of systems or equipment test, and furnish the remaining manuals prior to contract completion.
  - 2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of

- each subcontractor installing the system or equipment and the local representatives for the system or equipment.
3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
  4. The manuals shall include:
    - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
    - b. A control sequence describing start-up, operation, and shutdown.
    - c. Description of the function of each principal item of equipment.
    - d. Installation and maintenance instructions.
    - e. Safety precautions.
    - f. Diagrams and illustrations.
    - g. Testing methods.
    - h. Performance data.
    - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
    - j. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
- G. Approvals will be based on complete submission of manuals together with shop drawings.
- H. After approval and prior to installation, furnish the Resident Engineer with one sample of each of the following:
1. A 300 mm (12 inch) length of each type and size of wire and cable along with the tag from the coils of reels from which the samples were taken.
  2. Each type of conduit coupling, bushing and termination fitting.
  3. Conduit supports.
  4. Each type of splice box, engraved nameplate, wire and cable splicing and terminating material and single pole molded case circuit breaker.
  5. Each type of light fixture specified in Section 26 56 00, EXTERIOR LIGHTING or shown on the drawings.

#### **1.12 SINGULAR NUMBER**

Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this

reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

#### **1.13 COMMISSIONING**

- A. Participate in the commissioning process, and perform all required pre-commissioning checklist and functional performance tests under the direction of the commissioning Agent.
- B. Refer to Section 01 81 00 for additional requirements.

#### **1.14 TRAINING**

- A. Training shall be provided in accordance with Article, INSTRUCTIONS, of Section 01 00 00, GENERAL REQUIREMENTS.
- B. Training shall be provided for the particular equipment or system as required in each associated specification.
- C. A training schedule shall be developed and submitted by the contractor and approved by the Resident Engineer at least 30 days prior to the planned training.

- - - E N D - - -

**SECTION 26 05 21**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW)**

**PART 1 - GENERAL****1.1 DESCRIPTION**

This section specifies the furnishing, installation, and connection of the low voltage power and lighting wiring.

**1.2 RELATED WORK**

- A. Excavation and backfill for cables that are installed in conduit:  
Section 31 20 00, EARTH MOVING.
- B. General electrical requirements that are common to more than one section in Division 26: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- C. Conduits for cables and wiring: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS.
- D. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

**1.3 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
  - 1. Manufacturer's Literature and Data: Showing each cable type and rating.
  - 2. Certificates: Two weeks prior to final inspection, deliver to the Resident Engineer four copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.

**1.4 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are reference in the text by the basic designation only.
- B. American Society of Testing Material (ASTM):  
D2301-04.....Standard Specification for Vinyl Chloride  
Plastic Pressure Sensitive Electrical Insulating  
Tape
- C. Federal Specifications (Fed. Spec.):  
A-A-59544-00.....Cable and Wire, Electrical (Power, Fixed  
Installation)
- C. National Fire Protection Association (NFPA):

70-05.....National Electrical Code (NEC)

D. Underwriters Laboratories, Inc. (UL):

44-02.....Thermoset-Insulated Wires and Cables

83-03.....Thermoplastic-Insulated Wires and Cables

467-01.....Electrical Grounding and Bonding Equipment

486A-01.....Wire Connectors and Soldering Lugs for Use with  
Copper Conductors

486C-02.....Splicing Wire Connectors

486D-02.....Insulated Wire Connector Systems for Underground  
Use or in Damp or Wet Locations

486E-00.....Equipment Wiring Terminals for Use with Aluminum  
and/or Copper Conductors

493-01.....Thermoplastic-Insulated Underground Feeder and  
Branch Circuit Cable

514B-02.....Fittings for Cable and Conduit

1479-03.....Fire Tests of Through-Penetration Fire Stops

**PART 2 - PRODUCTS**

**2.1 CABLE AND WIRE (POWER AND LIGHTING)**

A. Cable and Wire shall be in accordance with Fed. Spec. A-A-59544, except as hereinafter specified.

B. Single Conductor:

1. Shall be annealed copper.

2. Shall be stranded for sizes No. 8 AWG and larger, solid for sizes No. 10 AWG and smaller.

3. Shall be minimum size No. 12 AWG, except where smaller sizes are allowed herein.

C. Insulation:

1. THW, XHHW, or dual rated THHN-THWN shall be in accordance with UL 44, and 83.

2. Direct burial: UF or USE shall be in accordance with UL 493.

3. Isolated power system wiring: Type XHHW with a dielectric constant of 3.5 or less.

D. Color Code:

1. Secondary service, feeder and branch circuit conductors shall be color coded as follows:

208/120 volt	Phase	480/277 volt
Black	A	Brown
Red	B	Orange

Blue	C	Yellow
White	Neutral	Gray *
* or white with colored (other than green) tracer.		

- a. The lighting circuit "switch legs" and 3-way switch "traveling wires" shall have color coding unique and distinct (i.e. pink and purple) from the color coding indicated above. The unique color codes shall be solid and in accordance with the NEC. Field coordinate for a final color coding with the Resident Engineer.
2. Use solid color compound or solid color coating for No. 12 AWG and No. 10 AWG branch circuit conductors and neutral sizes.
3. Phase conductors No. 8 AWG and larger shall be color-coded using one of the following methods:
  - a. Solid color compound or solid color coating.
  - b. Stripes, bands, or hash marks of color specified above.
  - c. Color as specified using 19 mm (3/4 inch) wide tape. Apply tape in half overlapping turns for a minimum of 75 mm (three inches) for terminal points, and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.
4. For modifications and additions to existing wiring systems, color coding shall conform to the existing wiring system.
5. Color code for isolated power system wiring shall be in accordance with the NEC.

## 2.2 LOW VOLTAGE WIRING (LIGHTING)

- A. UL listed type UF-B, 90 degrees C, 600V, stranded tin coated copper two conductor cable, Q-tran or equal.

## 2.3 SPLICES AND JOINTS

- A. In accordance with UL 486A, C, D, E and NEC.
- B. Branch circuits (No. 10 AWG and smaller):
  1. Connectors: Solderless, screw-on, reusable pressure cable type, 600 volt, 105 degree C with integral insulation, approved for copper and aluminum conductors.
  2. The integral insulator shall have a skirt to completely cover the stripped wires.
  3. The number, size, and combination of conductors, as listed on the manufacturers packaging shall be strictly complied with.

4. Splices in exterior splice boxes shall be insulated crimp-on type, watertight.

#### **2.4 LOW VOLTAGE WIRING SPLICES**

- A. Waterproof nickel plated brass connector body with two stainless steel set screws per connection, Lexan body and cover, silicone end caps and heat shrink tubing cover, Q-tran or equal.

#### **2.5 WIRE LUBRICATING COMPOUND**

- A. Suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive.
- B. Shall not be used on wire for isolated type electrical power systems.

#### **2.6 WARNING TAPE**

- A. The tape shall be standard, 76 mm (3 inch) wide, 4-Mil polyethylene detectable type.
- B. The tape shall be red with black letters indicating "CAUTION BURIED ELECTRIC LINE BELOW".

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Install in accordance with the NEC, and as specified.
- B. Install all wiring in raceway systems.
- C. Splice cables and wires only in outlet boxes, junction boxes, pull boxes, manholes, or handholes.
- D. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.
- E. Seal cable and wire entering a building from underground, between the wire and conduit where the cable exits the conduit, with a non-hardening approved compound.
- F. Wire Pulling:
  1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables.
  2. Use ropes made of nonmetallic material for pulling feeders.
  3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors, as approved by the Resident Engineer.
  4. Pull in multiple cables together in a single conduit.
- G. No more than (3) single-phase branch circuits shall be installed in any one conduit.
- H. The wires shall be derated in accordance with NEC Article 310. Neutral wires, under conditions defined by the NEC, shall be considered current-carrying conductors.



**3.2 SPLICE INSTALLATION**

- A. Splices and terminations shall be mechanically and electrically secure.
- B. Where the Government determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost to the Government.

**3.3 CIRCUIT IDENTIFICATION**

- A. In each interior pulbox and junction box, install metal tags on each circuit cables and wires to clearly designate their circuit identification and voltage.
- B. In each splice box, provide tags of the embossed brass type, showing the cable type and voltage rating. Attach the tags to the cables with slip-free plastic cable lacing units.

**3.4 EXISITNG WIRING**

Unless specifically indicated on the plans, existing wiring shall not be reused for the new installation. Only wiring that conforms to the specifications and applicable codes may be reused. If existing wiring does not meet these requirements, existing wiring may not be reused and new wires shall be installed.

**3.5 FIELD TESTING**

- A. Branch circuits shall have their insulation tested after installation and before connection to utilization devices such as fixtures, motors, or appliances.
- B. Tests shall be performed by megger and conductors shall test free from short-circuits and grounds.
- C. Test conductor phase-to-phase and phase-to-ground.
- D. The Contractor shall furnish the instruments, materials, and labor for these tests.

- - - E N D - - -

**SECTION 26 05 26**  
**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies general grounding and bonding requirements of electrical equipment operations and to provide a low impedance path for possible ground fault currents.
- B. "Grounding electrode system" refers to all electrodes required by NEC, as well as including made, supplementary, lightning protection system grounding electrodes.
- C. The terms "connect" and "bond" are used interchangeably in this specification and have the same meaning.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low Voltage power and lighting wiring.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
  - 2. Include the location of system grounding electrode connections and the routing of aboveground and underground grounding electrode conductors.
- C. Test Reports: Provide certified test reports of ground resistance.
- D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Resident Engineer:
  - 1. Certification that the materials and installation is in accordance with the drawings and specifications.
  - 2. Certification, by the Contractor, that the complete installation has been properly installed and tested.

**1.4 APPLICABLE PUBLICATIONS**

Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the

extent referenced. Publications are referenced in the text by the basic designation only.

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

B1-2001.....Standard Specification for Hard-Drawn Copper  
Wire

B8-2004.....Standard Specification for Concentric-Lay-  
Stranded Copper Conductors, Hard, Medium-Hard,  
or Soft

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

81-1983.....IEEE Guide for Measuring Earth Resistivity,  
Ground Impedance, and Earth Surface Potentials  
of a Ground System

C. National Fire Protection Association (NFPA):

70-2005.....National Electrical Code (NEC)

99-2005.....Health Care Facilities

D. Underwriters Laboratories, Inc. (UL):

44-2005 .....Thermoset-Insulated Wires and Cables

83-2003 .....Thermoplastic-Insulated Wires and Cables

467-2004 .....Grounding and Bonding Equipment

486A-486B-2003 .....Wire Connectors

## **PART 2 - PRODUCTS**

### **2.1 GROUNDING AND BONDING CONDUCTORS**

A. Equipment grounding conductors shall be UL 83 insulated stranded copper, except that sizes 6 mm<sup>2</sup> (10 AWG) and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes 25 mm<sup>2</sup> (4 AWG) and larger shall be permitted to be identified per NEC.

B. Bonding conductors shall be ASTM B8 bare stranded copper, except that sizes 6 mm<sup>2</sup> (10 AWG) and smaller shall be ASTM B1 solid bare copper wire.

C. Isolated Power System: Type XHHW-2 insulation with a dielectric constant of 3.5 or less.

D. Electrical System Grounding: Conductor sizes shall not be less than what is shown on the drawings and not less than required by the NEC, whichever is greater.

### **2.2 SPLICES AND TERMINATION COMPONENTS**

Components shall meet or exceed UL 467 and be clearly marked with the manufacturer, catalog number, and permitted conductor size(s).

## **2.3 GROUND CONNECTIONS**

### **A. Above Grade:**

1. Bonding Jumpers: compression type connectors, using zinc-plated fasteners and external tooth lockwashers.
2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.

## **2.4 SPLICE CASE GROUND ACCESSORIES**

Splice case grounding and bonding accessories shall be supplied by the splice case manufacturer when available. Otherwise, use 16 mm<sup>2</sup> (6 AWG) insulated ground wire with shield bonding connectors.

## **PART 3 - EXECUTION**

### **3.1 GENERAL**

- A. Ground in accordance with the NEC, as shown on drawings, and as hereinafter specified.
- B. System Grounding:
  1. Isolation transformers and isolated power systems shall not be system grounded.
- C. Equipment Grounding: Metallic structures (including ductwork and building steel), enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, and other conductive items in close proximity with electrical circuits shall be bonded and grounded.

### **3.2 SECONDARY EQUIPMENT AND CIRCUITS**

- A. Conduit Systems:
  1. Ground all metallic conduit systems. All metallic conduit systems shall contain an equipment grounding conductor.
  2. Non-metallic conduit systems shall contain an equipment grounding conductor.
- B. Branch Circuits: Install equipment grounding conductors with all power and lighting branch circuits.
- C. Boxes, Cabinets, Enclosures, and Panelboards:
  1. Bond the equipment grounding conductor to each pullbox, junction box, outlet box, device box, cabinets, and other enclosures through which the conductor passes.
  2. Provide lugs in each box and enclosure for equipment grounding conductor termination.
- D. Ground lighting fixtures to the equipment grounding conductor of the wiring system.

### 3.3 CORROSION INHIBITORS

When making ground and ground bonding connections, apply a corrosion inhibitor to all contact surfaces. Use corrosion inhibitor appropriate for protecting a connection between the metals used.

### 3.4 GROUND RESISTANCE

- A. Grounding system resistance to ground shall not exceed 5 ohms. Make necessary modifications or additions to the grounding electrode system for compliance without additional cost to the Government. Final tests shall assure that this requirement is met.
- B. Resistance of the grounding electrode system shall be measured using a four-terminal fall-of-potential method as defined in IEEE 81. Ground resistance measurements shall be made before the electrical distribution system is energized and shall be made in normally dry conditions not less than 48 hours after the last rainfall. Resistance measurements of separate grounding electrode systems shall be made before the systems are bonded together below grade. The combined resistance of separate systems may be used to meet the required resistance, but the specified number of electrodes must still be provided.
- C. Below-grade connections shall be visually inspected by the Resident Engineer prior to backfilling. The Contractor shall notify the Resident Engineer 24 hours before the connections are ready for inspection.

- - - E N D - - -

**SECTION 26 05 33**  
**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation, and connection of conduit, fittings, and boxes to form complete, coordinated, grounded raceway systems. Raceways are required for all wiring unless shown or specified otherwise.
- B. Definitions: The term conduit, as used in this specification, shall mean any or all of the raceway types specified.

**1.2 RELATED WORK**

- A. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Requirements for seismic restraint of nonstructural components.
- B. Bedding of conduits: Section 31 20 00, EARTH MOVING.
- C. Identification and painting of conduit and other devices: Section 09 91 00, PAINTING.
- D. General electrical requirements and items that is common to more than one section of Division 26: Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- E. Requirements for personnel safety and to provide a low impedance path for possible ground fault currents: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

**1.3 SUBMITTALS**

In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:

- A. Manufacturers product data of all materials provided.
- B. Certification: Prior to final inspection, deliver to the Resident Engineer four copies of the certification that the material is in accordance with the drawings and specifications and has been properly installed.

**1.4 APPLICABLE PUBLICATIONS**

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):  
70-05.....National Electrical Code (NEC)
- C. Underwriters Laboratories, Inc. (UL):

- 1-03.....Flexible Metal Conduit
- 5-01.....Surface Metal Raceway and Fittings
- 6-03.....Rigid Metal Conduit
- 50-03.....Enclosures for Electrical Equipment
- 360-03.....Liquid-Tight Flexible Steel Conduit
- 467-01.....Grounding and Bonding Equipment
- 514A-01.....Metallic Outlet Boxes
- 514B-02.....Fittings for Cable and Conduit
- 514C-05.....Nonmetallic Outlet Boxes, Flush-Device Boxes and  
Covers
- 651-02.....Schedule 40 and 80 Rigid PVC Conduit
- 651A-03.....Type EB and A Rigid PVC Conduit and HDPE Conduit
- 797-03.....Electrical Metallic Tubing
- 1242-00.....Intermediate Metal Conduit
- D. National Electrical Manufacturers Association (NEMA):
  - TC-3-04.....PVC Fittings for Use with Rigid PVC Conduit and  
Tubing
  - FB1-03.....Fittings, Cast Metal Boxes and Conduit Bodies  
for Conduit, Electrical Metallic Tubing and  
Cable

## **PART 2 - PRODUCTS**

### **2.1 MATERIAL**

- A. Conduit Size: In accordance with the NEC and as shown on drawings, but not less than 13 mm (1/2 inch) unless otherwise shown.
- B. Conduit:
  - 1. Rigid galvanized steel: Shall Conform to UL 6, ANSI C80.1.
  - 2. Rigid aluminum: Shall Conform to UL 6A, ANSI C80.5.
  - 3. Rigid intermediate steel conduit (IMC): Shall Conform to UL 1242, ANSI C80.6.
  - 4. Direct burial plastic conduit: Shall conform to UL 651 and UL 651A, heavy wall PVC or high density polyethylene (PE).
- C. Conduit Fittings:
  - 1. Rigid steel and IMC conduit fittings:
    - a. Fittings shall meet the requirements of UL 514B and ANSI/ NEMA FB1.
    - a. Standard threaded couplings, locknuts, bushings, and elbows: Only steel or malleable iron materials are acceptable. Integral retractable type IMC couplings are also acceptable.
    - b. Locknuts: Bonding type with sharp edges for digging into the metal wall of an enclosure.

- c. Bushings: Metallic insulating type, consisting of an insulating insert molded or locked into the metallic body of the fitting. Bushings made entirely of metal or nonmetallic material are not permitted.
  - d. Erickson (union-type) and set screw type couplings: Approved for use in concrete are permitted for use to complete a conduit run where conduit is installed in concrete. Use set screws of case hardened steel with hex head and cup point to firmly seat in conduit wall for positive ground. Tightening of set screws with pliers is prohibited.
  - e. Sealing fittings: Threaded cast iron type. Use continuous drain type sealing fittings to prevent passage of water vapor. In concealed work, install fittings in flush steel boxes with blank cover plates having the same finishes as that of other electrical plates in the room.
2. Rigid aluminum conduit fittings:
- a. Standard threaded couplings, locknuts, bushings, and elbows: Malleable iron, steel or aluminum alloy materials; Zinc or cadmium plate iron or steel fittings. Aluminum fittings containing more than 0.4 percent copper are prohibited.
  - b. Locknuts and bushings: As specified for rigid steel and IMC conduit.
  - c. Set screw fittings: Not permitted for use with aluminum conduit.
3. Direct burial plastic conduit fittings:
- a. Fittings shall meet the requirements of UL 514C and NEMA TC3.
  - b. As recommended by the conduit manufacturer.
4. Expansion and deflection couplings:
- a. Conform to UL 467 and UL 514B.
  - b. Accommodate, 19 mm (0.75 inch) deflection, expansion, or contraction in any direction, and allow 30 degree angular deflections.
  - c. Include internal flexible metal braid sized to guarantee conduit ground continuity and fault currents in accordance with UL 467, and the NEC code tables for ground conductors.
  - d. Jacket: Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber material with stainless steel jacket clamps.
- D. In-grade splice boxes: High density pre-cast concrete box and lid, 19-3/4"L x 14"W x 12"D, with non-settling shoulders, lid shall have probe hole and be labeled to indicate "electric".



- E. Warning Tape: Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape detectable type, red with black letters, and imprinted with "CAUTION BURIED ELECTRIC LINE BELOW".

### **PART 3 - EXECUTION**

#### **3.1 PENETRATIONS**

##### **A. Cutting or Holes:**

1. Cut holes through concrete and masonry in new and existing structures with a diamond core drill or concrete saw. Pneumatic hammer, impact electric, hand or manual hammer type drills are not allowed, except where permitted by the Resident Engineer as required by limited working space.

#### **3.2 INSTALLATION, GENERAL**

##### **A. In accordance with UL, NEC, as shown, and as hereinafter specified.**

##### **B. Install conduit as follows:**

1. In complete runs before pulling in cables or wires.
2. Flattened, dented, or deformed conduit is not permitted. Remove and replace the damaged conduits with new undamaged material.
3. Cut square with a hacksaw, ream, remove burrs, and draw up tight.
4. Mechanically and electrically continuous.
5. Close ends of empty conduit with plugs or caps at the rough-in stage to prevent entry of debris, until wires are pulled in.
6. Do not use aluminum conduits in wet locations.

##### **C. Conduit Bends:**

1. Make bends with standard conduit bending machines.
2. Conduit hickey may be used for slight offsets, and for straightening stubbed out conduits.
3. Bending of conduits with a pipe tee or vise is prohibited.

##### **D. Layout and Homeruns:**

1. Install conduit with wiring, including homeruns, as shown.
2. Deviations: Make only where necessary to avoid interferences and only after drawings showing the proposed deviations have been submitted approved by the Resident Engineer.

#### **3.3 CONCEALED WORK INSTALLATION**

##### **A. In Concrete:**

1. Conduit: Rigid steel or IMC. Do not install EMT underground or in concrete slabs.
2. Align and run conduit in direct lines.
3. Installation of conduit in concrete that is less than 75 mm (3 inches) thick is prohibited.

- a. Conduit outside diameter larger than 1/3 of the slab thickness is prohibited.
  - b. Space between conduits in slabs: Approximately six conduit diameters apart, except one conduit diameter at conduit crossings.
  - c. Install conduits approximately in the center of the slab so that there will be a minimum of 19 mm (3/4 inch) of concrete around the conduits.
4. Make couplings and connections watertight. Use thread compounds that are UL approved conductive type to insure low resistance ground continuity through the conduits. Tightening set screws with pliers is prohibited.

### **3.4 EXPOSED WORK INSTALLATION**

- A. Conduit for Conductors 600 volts and below:
  1. Rigid steel, IMC, rigid aluminum, or EMT. Different type of conduits mixed indiscriminately in the system is prohibited.
- B. Align and run conduit parallel or perpendicular to the building lines.

### **3.5 DIRECT BURIAL INSTALLATION**

- A. Exterior routing of Lighting Systems and Other Branch circuits (600 Volt and Less, and 1500 mm (5 feet) from the buildings):
  1. Conduit: Thick wall PVC or high density PE, unless otherwise shown.
  2. Mark conduit at uniform intervals to show the kind of material, direct burial type, and the UL approval label.
  3. Install conduit fittings and terminations as recommended by the conduit manufacturer.
  4. Tops of conduits shall be as follows unless otherwise shown:
    - a. Not less than 600 mm (24 inches) below finished grade.
    - b. Not less than 750 mm (30 inches) below road and other paved surfaces.
  5. Work with extreme care near existing ducts, conduits, cables, and other utilities to avoid damaging them.
  6. Excavation for conduit bedding and back-filling of trenches is specified in Section 31 20 00, EARTH MOVING.
    - a. Cut the trenches neatly and uniformly.
    - b. Do not kink the conduits.
  7. Seal conduits, including spare conduits, at building entrances and at outdoor terminations for equipment with a suitable compound that prevents the entrance of moisture and gases.
  8. Conduit passing through slab on grade: Install threaded heavy wall rigid steel galvanized conduit or type A20 rigid steel galvanized

- conduit coated with .5 mm (20 mil) bonded PVC, or rigid steel or IMC, PVC coated or standard coated with bituminous asphaltic compound.
9. Warning tape shall be continuously placed 300 mm (12 inches) above conduits or electric lines.
- B. Exterior routing of lighting systems and other branch circuits (600 volts and less-under buildings slab on grade to 1500 mm (5 feet) from the building):
1. Pre-coated rigid galvanized steel conduit in accordance with the requirements of Section 26 05 41, UNDERGROUND ELECTRICAL CONSTRUCTION.

### 3.6 WET OR DAMP LOCATIONS

- A. Unless otherwise shown, use conduits of rigid steel or IMC.
- B. Provide sealing fittings, to prevent passage of water vapor, where conduits pass from warm to cold locations, i.e., (refrigerated spaces, constant temperature rooms, air conditioned spaces building exterior walls, roofs) or similar spaces.
- C. Unless otherwise shown, use rigid steel or IMC conduit within 1500 mm (5 feet) of the exterior and below concrete building slabs in contact with soil, gravel, or vapor barriers. Conduit shall include an outer factory coating of .5 mm (20 mil) bonded PVC or field coat with asphaltum before installation. After installation, completely coat damaged areas of coating.

### 3.7 CONDUIT SUPPORTS, INSTALLATION

- A. Safe working load shall not exceed 1/4 of proof test load of fastening devices.
- B. Fasteners and Supports Concrete:
1. New Construction: Use steel or malleable iron concrete inserts set in place prior to placing the concrete.
- C. Attachment by wood plugs, rawl plug, plastic, lead or soft metal anchors, or wood blocking and bolts supported only by plaster is prohibited.
- D. Chain, wire, or perforated strap shall not be used to support or fasten conduit.
- E. Spring steel type supports or fasteners are prohibited for all uses except: Horizontal and vertical supports/fasteners within walls.
- F. Vertical Supports: Vertical conduit runs shall have riser clamps and supports in accordance with the NEC and as shown. Provide supports for cable and wire with fittings that include internal wedges and retaining collars.

### 3.8 IN-GRADE SPLICE BOX INSTALLATION

- A. Install flush with finished grade, top of powers or top of concrete slab.
- B. Provide minimum 8" high  $\frac{3}{4}$ " drain rock base below splice boxes.

- - - E N D - - -

**SECTION 26 56 00  
EXTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

This section specifies the furnishing, installation, and connection of exterior luminaries, controls, poles and supports.

**1.2 RELATED WORK**

- A. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements and items that are common to more than one section of Division 26.
- B. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Conduits, fittings, and boxes for raceway systems.
- C. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Low voltage power and lighting wiring.
- D. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path for possible ground fault currents.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
- B. Shop Drawings:
  - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
  - 2. Include electrical ratings, dimensions, mounting, details, materials, required clearances, terminations, wiring and connection diagrams, photometric data, ballasts, poles, luminaries, lamps and controls.
- C. Manuals: Two weeks prior to final inspection, submit four copies of operating and maintenance manuals to the Resident Engineer. Include technical data sheets, wiring and connection diagrams, and information for ordering replacement parts.
- D. Certifications: Two weeks prior to final inspection, submit four copies of the following to the Resident Engineer:
  - 1. Certification that the materials are in accordance with the drawings and specifications.
  - 2. Certification, by the Contractor, that the complete installation has been properly installed and tested.

**1.4 APPLICABLE PUBLICATIONS**

Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

**A. Aluminum Association Inc. (AA):**

AAH35.1-2006 .....Alloy and Temper Designation Systems for  
Aluminum

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

LTS-4-2003 .....Structural Supports for Highway Signs,  
Luminaries and Traffic Signals

**C. American Concrete Institute (ACI):**

318-2005 .....Building Code Requirements for Structural  
Concrete

**D. American National Standards Institute (ANSI):**

C57.12-2000.....General Requirements For Liquid-Immersed  
Distribution, Power, and Regulating  
Transformers

C81.61-2005 .....Electrical Lamp Bases

**E. American Society for Testing and Materials (ASTM):**

A123/A123M-2002 .....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products

A153/A153M-2001.....Zinc Coating (Hot-Dip) on Iron and Steel  
Hardware - AASHTO No.: M232

B108-03a -2003 .....Aluminum-Alloy Permanent Mold Castings

D3487-2000.....Mineral Insulating Oil Used in Electrical  
Apparatus

**F. Federal Aviation Administration (FAA):**

AC 70/7460-IK CHG 1-2000.....Obstruction Lighting and Marking

AC 150/5345-43E-1995.....Specification for Obstruction Lighting  
Equipment

**G. Illuminating Engineering Society of North America (IESNA)**

HB-9-2000.....Lighting Handbook

RP-8-2000 (R-2005).....Roadway Lighting

**H. National Electrical Manufacturers Association (NEMA):**

C78.41-2001.....Electric Lamps - Guidelines for Low-Pressure  
Sodium Lamps

- C78.42-2004 .....Electric Lamps - Guidelines for High-Pressure Sodium Lamps
- C78.43-2005 .....Electric Lamps - Single-Ended Metal-Halide Lamps
- C78.1381-1998.....(R 1997) Electric Lamps - 70-Watt M85 Metal-Halide Lamps
- C82.4-2002 .....Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type)
- C136.17-2005 .....Roadway Lighting Equipment - Enclosed Side-Mounted Luminaires for Horizontal-Burning High-Intensity-Discharge Lamps
- ICS 2-2005 .....Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts
- ICS 6-2001 .....Industrial Control and Systems Enclosures
- I. National Fire Protection Association (NFPA):
- 70-2005 .....National Electrical Code (NEC)
- J. Underwriters Laboratories, Inc. (UL):
- 496-2004 .....Edison-Base Lamp holders
- 773-1995.....Plug-in, Locking Type Photo controls, for Use with Area Lighting
- 773A-2006 .....Non-industrial Photoelectric Switches for Lighting Control
- 1029-1994.....High-Intensity-Discharge Lamp Ballasts
- 1598-2004 .....Luminaires

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS AND EQUIPMENT**

Materials and equipment shall be in accordance with NEC, UL, ANSI, and as shown on the drawings and specified.

### **2.3 LUMINAIRES**

- A. UL 1598 and NEMA C136.17. Luminaires shall be weatherproof, heavy duty, outdoor types designed for efficient light utilization, adequate dissipation of lamp and ballast heat and safe cleaning and relamping.
- B. Refer to drawings for light fixture (Lummaires) schedule.
- C. Incorporate ballasts in the luminaire housing except where otherwise shown on the drawings.
- D. Pre-wire internal components to terminal strips at the factory.
- E. Bracket mounted luminaires shall have leveling provisions and clamp type adjustable slip-fitters with locking screws.

F. Materials shall be rustproof. Latches and fittings shall be non-ferrous metal.

#### **2.4 LAMPS AND BALLASTS**

A. Refer to fixture schedule on drawings.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

A. Install lighting in accordance with the NEC, as shown on the drawings, and in accordance with manufacturer's recommendations.

#### **3.2 GROUNDING**

Ground noncurrent-carrying parts of equipment including, luminaries, brackets, and metallic enclosures as specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS. Where copper grounding conductor is connected to a metal other than copper, provide specially treated or lined connectors suitable and listed for this purpose.

- - - E N D - - -



**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; 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 ASTM, D 1557.
  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 Contract Officer's Technical Representative (COTR) 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.
- 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 COTR. 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 COTR 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 spring line 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 COTR 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 01 00 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
- F. Site preparation: Section 31 23 19 DEWATERING, and Section 02 41 00, DEMOLITION.
- G. Imported Planting Soil: Section 32 90 00 PLANTING
- H. Paving sub-grade requirements: Section 32 13 20, SITE CONCRETE.
- J. Structural Planting Soil Mix: Section 32 90 10 STRUCTURAL PLANTING SOIL MIX
- K. Drainage: Section 33 41 00 DRAINAGE AND STRUCTURES

### **1.4 CLASSIFICATION OF EXCAVATION**

- A. 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. 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.

#### **1.6 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Rock Excavation Report (if rock excavation is required):
  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.

#### **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

D698-07.....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

D2487-06.....Standard Classification of Soil for Engineering  
Purposes (Unified Soil Classification System)

D2922-05.....Standard Test Methods for Density 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):

J732-92.....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. Planting Soil (top soil) shall be imported per Section 32 90 00 PLANTING.

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-µm (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-µm (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 pavement, crushed stone or gravel graded from 25 mm (1 inch) to 4.75 mm (No. 4), per ASTM D2940.
  - 2. Under courtyard stone paving/concrete sub slab, refer to section 32 90 10 STRUCTURAL PLANTING SOIL,
  - 3. 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 D2940.

### **PART 3 - EXECUTION**

#### **3.1 SITE PREPARATION**

- A. Clearing: Clear within limits of earthwork operations as shown. Work includes removal of foundations, incidental structures, paving, debris, trash, and other obstructions.
- 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 COTR. 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 new 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 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. // from a site survey that measured spot elevations and subsequently generated existing contours and spot elevations. // 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 COTR of any differences between existing elevations shown on plans and those encountered on site by Surveyor/Engineer described above. Notify COTR 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 COTR, 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 COTR.
  - 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 provide a concrete fill support under disturbed foundations, as directed by COTR, at no additional cost to the Government. Do not remove shoring until permanent work in excavation has been inspected and approved by COTR.
- 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 COTR. Approval by the COTR 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 COTR.
- D. Blasting: Blasting of materials classified as rock shall be permitted only when authorized by COTR. Contractor shall meet all federal, state, and local requirements.



1. Blasting shall be done with explosives of quantity and power, and fired in such sequence and locations as to not injure personnel, damage or crack rock against which concrete is to be placed, damage property, or damage existing work or other portions of new work. Contractor shall be responsible for damage caused by blasting operations.

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 proof rolling, or that fail to consolidate after successive passes to suitable soils and replaced with compacted fill. Maintain subgrade until succeeding operation has been accomplished.

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 COTR.
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 COTR 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 COTR, 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 REQUIREMENTS 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 unless otherwise noted:

1) Lawn or Unpaved Areas: Plus or minus 25 mm (1 inch).

2) Walks: Plus or minus 25 mm (1 inch).

3) Pavements: Plus or minus 13 mm (1 inch).

### 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 COTR.
- B. Placing: Place materials as shown. 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 equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 10 feet of new or existing building walls or other improvements that might sustain damage, without prior approval of COTR. 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 and paved areas, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material in accordance with D1557 to 95 percent.
    - b. Curbs, curbs and gutters, D1557 to 95 percent.
    - c. Under Sidewalks, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material in accordance with D1557 to 95 percent.
    - d. Landscaped areas, compact top 16 inches, D1557 to 85 percent.
    - e. Landscaped areas, below 16 inches of finished grade, D1557 to 90 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 COTR 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 DEWATERING**

- 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.
- C. Dewatering system shall be of sufficient size and capacity necessary to lower and maintain ground water table to an elevation at least 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.

- D. 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.
- E. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.
- F. Maintain stability of sides and bottom of excavation.
- G. Construction operations are performed in the dry.
- H. 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.
- I. Permitting Requirements: The contractor shall comply with and obtain the required State and County permits where the work is performed.
- J. 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.
- K. 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.

### **3.7 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 Cemetery property.
- B. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- E. Segregate all excavated contaminated soil designated by the COTR 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.

### **3.8 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 site.

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



**SECTION 32 13 20  
SITE CONCRETE**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section shall cover site work concrete constructed upon the prepared subgrade and in conformance with the lines, grades, thickness, and cross sections shown. Construction shall include the following:
- B. Concrete site walls, planter walls and pavements.
- C. Color and Finishes for site walls and pedestrian concrete paving.

**1.2 RELATED WORK**

- A. Laboratory and Field Testing Requirements: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Subgrade Preparation: Section 31 20 00, EARTH MOVING.

**1.3 TOLERANCES:**

- A. ACI 117

**1.4 DESIGN REQUIREMENTS**

Design all elements with the latest published version of applicable codes.

**1.5 SELECT SUBBASE MATERIAL JOB-MIX**

The Contractor shall retain and reimburse a testing laboratory to design a select subbase material mixture and submit a job-mix formula to the Contract Officer's Technical Representative (COTR), in writing, for approval. The formula shall include the source of materials, gradation, plasticity index, liquid limit, and laboratory compaction curves indicating maximum density at optimum moisture.

**1.6 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified.
  - 1. Expansion joint filler
  - 2. Hot poured sealing compound
  - 3. Cement.
  - 4. Aggregate.
  - 5. Air-entraining admixture
  - 6. Chemical admixtures
  - 7. Curing compounds.
  - 8. Reinforcement
  - 9. Curing materials



- C. Data and Test Reports: Select subbase material.
  - 1. Job-mix formula.
  - 2. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.
- D. Samples and Mockups:
  - 1. 4 foot by 4 foot mock-up of concrete paving, to match color and finish of existing site paving, subject to approval by the COTR.
  - 2. Mock up of planter wall, 6 foot min length, to match color & finish of existing site paving, subject to approval by the COTR.
  - 3. Mock ups shall be constructed at the project site and available for review by the COTR in time to allow time for mix design revision as necessary to achieve color and finish matching existing concrete paving.
- E. Concrete Mix Design: Submit for each type and strength of concrete.
  - 1. Include unit weight, slump, water-cement fly ash ratio curves, concrete mix ingredients, admixtures and compression test reports. Results of testing or test data used to establish mix proportions are to be provided for each mix design.
  - 2. Mix designs to be prepared, stamped and signed by a Professional Engineer registered in the State of California.
- F. Shop Drawings: Reinforcing steel: Complete shop drawings. Comply with requirements of ACI SP-66. Include bar sizes, material types, lengths, spacings, locations, and quantities of reinforcing steel; bar schedules, stirrup spacing, shapes of bent bars, spacing of bars, and types and location of splices.

#### 1.7 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. Refer to the latest edition of all referenced Standards and codes.
- B. American Association of State Highway and Transportation Officials (AASHTO):
  - M31.....Deformed and Plain Billet Steel Bars for  
Concrete Reinforcement (ASTM A615/A615M-96A)
  - M55M/55M.....Welded Steel Wire Fabric for Concrete  
Reinforcement (ASTM A185)
  - M147.....Materials for Aggregate and Soil-Aggregate  
Subbase, Base and Surface Courses (R 1996)
  - M148.....Liquid Membrane-Forming Compounds for Curing  
Concrete (ASTM C309A)

- M171.....Sheet Materials for Curing Concrete (ASTM C171)
- M182.....Burlap Cloth Made from Jute or Kenaf
- M213.....Preformed Expansion Joint Fillers for Concrete  
Paving and Structural Construction  
(Non-extruding and Resilient Bituminous Type)  
(ASTM D1751)
- T99.....Moisture-Density Relations of Soils Using a 2.5  
kg. (5.5 lb) Rammer and a 305 mm (12 in.) Drop
- T180.....Moisture-Density Relations of Soils Using a 4.54  
kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
- C. American Concrete Institute (ACI):
- 117R-06.....Tolerances for Concrete Construction and  
Materials
- 211.1-91(R2002).....Proportions for Normal, Heavyweight, and Mass  
Concrete
- 301-05.....Specification for Structural Concrete
- SP-66-04 .....ACI Detailing Manual
- 318/318R-05.....Building Code Requirements for Reinforced  
Concrete
- 347R-04.....Guide to Formwork for Concrete
- D. American Society for Testing and Materials (ASTM):
- A615/A615M-08.....Deformed and Plain Billet-Steel Bars for  
Concrete Reinforcement
- 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
- C260-06.....Air-Entraining Admixtures for Concrete
- C494/C494M-08.....Chemical Admixtures for Concrete
- C618-08.....Coal Fly Ash and Raw or Calcined Natural  
Pozzolan for Use in Concrete

- E. Reference to "Standard Specifications" shall mean the current Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.

#### **1.8 DELIVERY, STORAGE, AND HANDLING:**

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.
- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.
- C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.
- D. Store reinforcement in a manner that will prevent rusting or coating with grease, oil, dirt, and other objectionable material.
- E. Deliver reinforcement to the job site bundled, tagged and marked using metal tags.

### **PART 2 - PRODUCTS**

#### **2.1 BASIS OF DESIGN:**

- A. The design of Site Concrete is based on products specified. Subject to compliance with requirements, provide named product or a comparable product.

#### **2.2 GENERAL**

- A. Cement and aggregates shall have proven history of successful use with one another. Sources of cement and aggregate shall remain unchanged throughout work.
- B. Mixes:
  - 1. Ready-mixed concrete shall meet requirements of ASTM C94.
  - 2. The Contractor shall perform tests or assemble the necessary data indicating conformance with specifications.
  - 3. For each mix, submit data showing that proposed mix will attain the required strength in accordance with requirements of Caltrans Standard Specifications, Section 90.
  - 4. Instruct Laboratory to base mix design on use of materials specified and approved by the COTR.
  - 5. Insure mix designs will produce concrete to strengths specified and of uniform density without segregation.

6. If mix yield exceeds 1-cubic yard, modify mix design to no more than one cubic yard, without changing cement content.
7. Introduction of calcium chloride will not be permitted.
8. Mix design shall match appearance of existing site concrete, subject to approval by the COTR.

C. Concrete Types (See Drawings for any other miscellaneous items not listed below):

TYPE	28-DAY STRENGTH	AGGREGATE SIZE	FINISH & COLOR	COMMENTS
Concrete Slabs and Pavement	3,000	1" X #4	See Drawings	To match existing concrete paving on site
Concrete Planter Walls	4,000	Size 67	See Drawings	To match existing concrete paving on site

### 2.3 REINFORCEMENT

- A. The type, amount, and locations of steel reinforcement shall be as shown on the drawings and in the specifications.
- B. Welded wire-fabric shall conform to AASHTO M55.
- C. Dowels shall be plain steel bars conforming to AASHTO M31 or M42. Tie bars shall be deformed steel bars conforming to AASHTO M31 or M42.

### 2.4 SELECT SUBBASE (WHERE REQUIRED)

- A. Subbase material shall consist of select granular material composed of sand, sand gravel, crushed stone, crushed or granulated slag, with or without soil binder, or combinations of these materials conforming to AASHTO M147, Grading E or F.
- B. Materials meeting other gradations than that noted will be acceptable whenever the gradations are within a tolerance of three to five percent, plus or minus, of the single gradation established by the job mix formula.
- C. Subbase material shall produce a compacted, dense graded course, meeting the density requirement specified herein.

### 2.5 FORMWORK MATERIALS

- A. For Exposed Smooth Form-finished Concrete: Use Medium Density (or better) Overlaid Concrete Form Exterior (MDO), to provide continuous straight, smooth, exposed surfaces without grain patterns. Furnish in largest practicable sizes to minimize number of joints and to conform to a joint system as approved by the COTR.

- B. For all planter walls: Laminate-lined wood, extra smooth form finish by Olympic Panel, or equal.
- C. Chamfer Strips: Meadow-Burke Concrete Accessories, PVC type CSF ½-inch or as otherwise noted, all exposed corners.
- D. Form Release Agent: Must not stain or otherwise adversely affect architectural concrete surfaces. "Nox-Crete Form Coating"; Industrial Synthetics Corp.'s "Synthex"; or equal.
- E. Do not use forms if they vary from a straight line more than 3 mm (1/8 inch) in any 3000 mm (ten foot) long section, in either a horizontal or vertical direction.
- F. Wood forms should be at least 50 mm (2 inches) thick (nominal). Wood forms shall also be free from warp, twist, loose knots, splits, or other defects. Use approved flexible or curved forms for forming radii.

## **2.6 CONCRETE MATERIALS**

- A. Portland Cement: ASTM C150, Type II. Use one brand of cement throughout project.
- 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. Aggregates: ASTM C33, materials from established sources with proven history of successful use in producing concrete with minimum shrinkage. Course Aggregate to be Size 67.
- D. Water: Clear and potable, free from deleterious impurities.
- E. Admixtures:
  - 1. Admixtures are optional; however, a water reducer or plasticizing admixture shall be included in the concrete mix and it must be compatible with color pigments where color pigments are required. Any proposed admixture shall comply with ASTM C494.
  - 2. Where more than one admixture is proposed, include statement from admixture manufacturer indicating that admixtures proposed for use are compatible, such that desirable effects of each admixture will be realized.
  - 3. Accelerating admixtures and admixtures containing more than 0.05 percent chloride ions are not permitted. If an accelerator is used, it shall be a non-chloride accelerator.
  - 4. Liquid admixtures shall be considered part of the total water.
  - 5. Refer to Color Additives/Pigments herein for color admixtures.
- F. Color Additives/Pigments: Insoluble minerals, light fast, at least 95 percent passing #325 sieve complying with ASTM C979: Davis Colors, Los Angeles, CA (800) 356-4848; Color(s) shall be as follows:

1. Pavement: Davis #641 Sequoia Sand at 1 lbs. per 94 lb. sack of cement.
  2. Walls: Davis #677 Taupe at 2 lbs. per 94 lb. sack of cement, or approved equal.
- Color additives containing carbon black [are] [are not] acceptable.

## 2.7 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. Cementitious Material: An intimate blend of type II Portland cement and fly ash. Cementitious material shall include 15 percent maximum fly ash by weight unless the strength is specified to be achieved on 7 or 14 days.
- C. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.
- D. 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
30 (4000) <sup>1</sup>	325 (550)	0.50	340 (570)	0.50
25 (3000) <sup>1</sup>	280 (470)	0.55	290 (490)	0.55

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.
- E. Air-entrainment is required for all exterior concrete. Air content shall conform with the following table:

**TABLE I - TOTAL AIR CONTENT  
FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)**

Nominal Maximum Size of Coarse Aggregate	Total Air Content Percentage by Volume
10 mm (3/8 in)	6 to 10
13 mm (1/2 in)	5 to 9
19 mm (3/4 in)	4 to 8
25 mm (1 in)	3 1/2 to 6 1/2

F. Lampblack: As supplied by batch plant for plain non-colored concrete work. Concrete for non-colored pavements shall be darkened by the addition of lampblack at the mixer. The proportion of lampblack or other approved colorant shall be that required to properly darken the concrete to reduce glare, and shall be subject to the approval of the COTR. Provide  $\frac{3}{4}$  pound of lampblack per cubic yard of concrete unless required otherwise.

## **2.8 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.

## **2.9 ANCILLARY MATERIALS**

A. Aggregate Base: Class II aggregate base conforming to Section 26 of the Standard Specifications and Subgrade Specifications herein.

B. Expansion Joint Material

1. Fiber Expansion Joint: A non-extruding resilient filler, saturated with high quality bituminous materials having preserving characteristics. Conform to ASTM-D1751-04.

C. Dampproofing behind Retaining-Type & Planter Walls: Per CALTRANS Standard Specifications, Section 54.

D. Subsurface Drain behind Retaining-Type & Planter Walls: All concrete walls that retain 30 inches of soil or more shall include a subsurface drainage system to relieve water pressure in accordance with Section 68 of the CALTRANS Standard Specifications and as shown. If no subsurface drain is shown, provide corrugated polyethylene plastic tubing per 68-1.02K surrounded with an envelope of Class 2 permeable material per 68-

1.025 and wrapped with filter fabric per 68-1.028. Provide black colored rodent-proof cap over exposed outfalls as accepted by the COTR.

- E. Curing Compound for Colored Concrete: Water-base acrylic type, free of permanent color, oil or wax, complying with ASTM C309: "W 1000" by Davis Colors, Los Angeles, CA (800) 356-4848; "Cureseal" semi-gloss by L.M. Scofield Co., Los Angeles, CA (800) 800-9900; or equal.

### **PART 3 - EXECUTION**

#### **3.1 SUBGRADE PENETRATION**

- A. Prepare, construct, and finish the subgrade as specified in Section 31 20 00, EARTH MOVING.
- B. Maintain the subgrade in a smooth, compacted condition, in conformance with the required section and established grade until the succeeding operation has been accomplished.

#### **3.2 SETTING FORMS**

- A. Base Support:
1. Compact the base material under the forms true to grade so that, when set, they will be uniformly supported for their entire length at the grade as shown.
  2. Correct imperfections or variations in the base material grade by cutting or filling and compacting.
- B. Form Setting:
1. Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines.
  2. Formwork installation conform to ACI 347. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints are free from play or movement in any direction and will hold concrete without leakage.
  3. Forms shall conform to line and grade with an allowable tolerance of 3 mm (1/8 inch) when checked with a straightedge and shall not deviate from true line by more than 6 mm (1/4 inch) at any point.
  4. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing.
  5. Clean and oil forms each time they are used.
- C. The Contractor's Registered Professional Land Surveyor, specified in Section 00 72 00, GENERAL CONDITIONS, shall establish and control the alignment and the grade elevations of the forms or concrete slipforming machine operations.
1. Make necessary corrections to forms immediately before placing concrete.



2. When any form has been disturbed or any subgrade or subbase has become unstable, reset and recheck the form before placing concrete.

### **3.3 EQUIPMENT**

- A. The COTR shall approve equipment and tools necessary for handling materials and performing all parts of the work prior to commencement of work.
- B. Maintain equipment and tools in satisfactory working condition at all times.

### **3.4 PLACING REINFORCEMENT**

- A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.
- B. Before the concrete is placed, the COTR shall approve the reinforcement, which shall be accurately and securely fastened in place with suitable supports and ties. The type, amount, and position of the reinforcement shall be as shown.

### **3.5 PLACING CONCRETE - GENERAL**

- A. Obtain approval of the COTR before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the COTR before placing concrete.
- C. Before the concrete is placed, uniformly moisten the subgrade, base, or subbase appropriately, avoiding puddles of water.
- D. Convey concrete from mixer to final place of deposit by a method which will prevent segregation or loss of ingredients. Deposit concrete so that it requires as little handling as possible.
- E. While being placed, spade or vibrate and compact the concrete with suitable tools to prevent the formation of voids or honeycomb pockets. Vibrate concrete well against forms and along joints. Over-vibration or manipulation causing segregation will not be permitted. Place concrete continuously between joints without bulkheads.
- F. Install a construction joint whenever the placing of concrete is suspended for more than 30 minutes and at the end of each day's work.
- G. Workmen or construction equipment coated with foreign material shall not be permitted to walk or operate in the concrete during placement and finishing operations.
- H. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.

- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from COTR.

### **3.6 PLACING CONCRETE FOR CURB AND GUTTER, PEDESTRIAN PAVEMENT, AND EQUIPMENT PADS**

- A. Place concrete in the forms in one layer of such thickness that, when compacted and finished, it will conform to the cross section as shown.
- B. Deposit concrete as near to joints as possible without disturbing them but do not dump onto a joint assembly.
- C. After the concrete has been placed in the forms, use a strike-off guided by the side forms to bring the surface to the proper section to be compacted.
- D. Consolidate the concrete thoroughly by tamping and spading, or with approved mechanical finishing equipment.
- E. Finish the surface to grade with a wood or metal float.
- F. All Concrete pads and pavements shall be constructed with sufficient slope to drain properly.

### **3.7 CONCRETE FINISHING - GENERAL**

- A. The sequence of operations, unless otherwise indicated, shall be as follows:
  - 1. Consolidating, floating, straight-edging, troweling, texturing, and edging of joints.
  - 2. Maintain finishing equipment and tools in a clean and approved condition.

### **3.11 CONCRETE FINISHING PEDESTRIAN PAVEMENT AND SITE WALLS**

- A. Walks, Grade Slabs:
  - 1. Finish the surfaces to grade and cross section with a metal float, troweled smooth with a non slip broom finish as noted herein.
  - 2. Brooming, where applied, shall be transverse to the line of traffic.
  - 3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.
  - 4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 2 mm (1/16 inch) in depth.
  - 5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the

pavement shall not vary more than 5 mm (3/16 inch) when tested with a 3000 mm (10 foot) straightedge.

6. The thickness of the pavement shall not vary more than 6 mm (1/4 inch).

7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

### **3.8 JOINTS - GENERAL**

A. Place joints, where shown, conforming to the details as shown, and perpendicular to the finished grade of the concrete surface.

B. Joints shall be straight and continuous from edge to edge of the pavement.

### **3.9 CONTRACTION JOINTS**

A. Cut joints to depth as shown, min 1/4 of slab thickness, with a grooving tool or jointer of a radius as shown or by sawing with a blade producing the required width and depth.

B. Plates shall remain in place until concrete has set sufficiently to hold its shape and shall then be removed.

D. Finish edges of all joints with an edging tool having the radius 1/8" or as otherwise noted in plans.

E. Score pedestrian pavement with a standard grooving tool or jointer.

### **3.10 EXPANSION JOINTS**

A. Use a preformed expansion joint filler material of the thickness as shown to form expansion joints.

B. Material shall extend the full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.

C. Anchor with approved devices to prevent displacing during placing and finishing operations.

D. Round the edges of joints with an edging tool.

E. Form expansion joints as follows:

1. Without dowels, about structures and features that project through, into, or against any site work concrete construction.

2. Using joint filler of the type, thickness, and width as shown.

3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

### **3.11 FINISHING**

A. Flatwork and Walls

1. Surface Finishes

a. Steel Trowel Finish: After surface water disappears and floated surfaces sufficiently hardened, steel trowel and retrowel to

smooth surface. After concrete has set enough to ring trowel, retrowel to a smooth uniform finish free of trowel marks or other blemishes. Avoid excessive troweling that produces burnished areas.

- b. Washed Finish: Use Top-Cast Surface Retarder by Grace Company/Dayton Superior. Specific product number shall be selected and applied per manufacturer recommendations as necessary to achieve finish texture to match adjacent pedestrian concrete paving.
- c. Staining: Concrete walkway banding shall be stained to match adjacent concrete. The two stain colors are:
  - Tintura 2626 Light gray
  - Tintura 2911 Meadow green

### **3.12 FORM REMOVAL**

- A. Forms shall remain in place at least 12 hours after the concrete has been placed. Remove forms without injuring the concrete.
- B. Do not use bars or heavy tools against the concrete in removing the forms. Promptly repair any concrete found defective after form removal.

### **3.13 CURING OF CONCRETE**

- A. Cure concrete by one of the following methods appropriate to the weather conditions and local construction practices, against loss of moisture, and rapid temperature changes for at least seven days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete shall be on hand and ready to install before actual concrete placement begins. Provide protection as necessary to prevent cracking of the pavement due to temperature changes during the curing period. If any selected method of curing does not afford the proper curing and protection against concrete cracking, remove and replace the damaged pavement and employ another method of curing as directed by the COTR.
- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 150 mm (6 inches).
- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 0.1 mm (4 mils) in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 300 mm (12 inches). Securely anchor sheeting.
- D. Liquid Membrane Curing:

1. Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 5 m<sup>2</sup>/L (200 square feet per gallon) for both coats.
2. Do not allow the concrete to dry before the application of the membrane.
3. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint.
4. Immediately re-spray any area covered with curing compound and damaged during the curing period.

### **3.14 CLEANING**

#### **A. After completion of the curing period:**

1. Remove the curing material (other than liquid membrane).
2. Sweep the concrete clean.
3. After removal of all foreign matter from the joints, seal joints as herein specified.
4. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

### **3.15 PROTECTION**

The contractor shall protect the concrete against all damage prior to final acceptance by the Government. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the COTR, and at no additional cost to the Government. Exclude traffic from vehicular pavement until the concrete is at least seven days old, or for a longer period of time if so directed by the COTR.

### **3.16 FINAL CLEAN-UP**

Remove all debris, rubbish and excess material from the Project Site.

- - - E N D - - -

**SECTION 32 14 12**  
**STONE TILE PAVING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Work Included: Provide all stone tile work complete in place, as indicated on drawings, specified herein, or otherwise needed for a complete proper installation of the work in this section.
- B. Related work:
  - 1. 32 13 20 Site Concrete
  - 2. 01 57 19 Temporary Environmental Controls
  - 3. 33 41 00 Drainage Structures

**1.2 QUALITY ASSURANCE**

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the installation of the tile and who are completely familiar with the methods needed for proper performance of the work of this section.
- B. Tile work shall be subjected to performance standards as set by the American National Standards Institute (ANSI) specification A137.1-88 for ceramic tile or CTI-69-5 for special purpose tile and the Tile Council of America (TCA) current Handbook for Ceramic Tile Installation.
- C. Samples of stone material which are to be used as basis of design for all stone material used in tile paving are held by ASN Stone, Inc. Stone material used for stone tile paving shall be manufactured from this material or equal as approved by the project COTR.

**1.3 SUBMITTALS**

- A. Submit complete materials list of all items proposed to be furnished and installed under this section.
- B. Submit TCA specifications and other data required to demonstrate under this section.
- C. Submit samples of each item, color, finish, and pattern specified for the project.
- D. Submit 5' x 5' minimum mock-up of each stone paving type identified in plans for approval by COTR at project site.

**1.4 PRODUCT HANDLING**

- A. Deliver material to the job site and store in original unopened cartons with all labels intact and legible.
- B. Tile and grout shall be stored in a dry covered area.

**PART 2 - PRODUCTS****2.1 BASIS OF DESIGN**

- A. The design of Stone Tile Paving is based on products specified. Subject to compliance with requirements, provide named product or a comparable product.

**2.2 STONE TILE SHALL BE AS FOLLOWS**

- A. Stone Paving Type A  
See Plans for Stone Type, Finish, and Dimensions
- B. Stone Paving Type B  
See Plans for Stone Type, Finish, and Dimensions

**2.3 SETTING MATERIALS**

- A. Consult the current TCA Handbook for Ceramic Tile installation or the Ceramic Tile Institute for information regarding the selection of methods of setting the work:
- B. Portland Cement Mortar.
- C. Paving Bedding Sand

**2.4 Sand Laying Course:**

- A. Sand laying course shall conform to ASTM C33 as follows:

Sieve Size	3/8 in.	No. 4	No. 8	No. 16	No. 30	No. 50	No. 100
% passing	100	95-100	80-100	50-85	25-60	10-30	2-10

- B. CALTRANS Department of Transportation Specifications 90-3.03, Fine Aggregate Gradings:
  1. Thickness of sand laying course nominal 1" and uniform to ensure an even surface.
  2. The sand laying course shall be the responsibility of the paver installer.

**2.5 SAND JOINT FILLER: Plaster sand.****2.6 SEALER:**

- A. Joint stabilizing Sealer, water-based, single component, epoxy-modified, penetrating sealer and joint sand stabilizer. Shall be VOC, EPA, OSHA and FDA compliant through 2007 as recommended by concrete paver manufacturer.

**2.7 AGGREGATE BASE (Base Rock)**

- A. Crushed aggregate, R-78 minimum, 3/4-inch maximum, conforming to Standard Specification 26.1.02A, Class 2.

**2.8 Mortar Bed**

- A. Latex-Portland cement mortar.

**2.9 OTHER MATERIALS**

- A. All other materials not specifically described herein but required for a complete and proper installation of the work in this section, shall be as recommended by the manufacturer of the materials used, as approved by the COTR, and meet standards as set by ANSI and the TCA.

**PART 3 - EXECUTION****3.1 ACCEPTABILITY OF SURFACES**

- B. Surface to be stone tiled shall be smooth and level for mortar/bed/cleavage membrane method at the required finish elevation, and a steel trowel finish with light broom-textured finish without more than the following maximum variations:

- C. Portland Cement Mortar
  - 1. Walls - 1/4" in 8'
  - 2. Floors - 1/4" in 10'

**3.2 AGGREGATE BASE**

- A. Deliver to site as a uniform mixture and spread each layer in one operation without segregation.
- B. Class II Aggregate Base, 3/4" maximum size, shall be readily compacted and spread with equipment that will provide a uniform layer conforming to the planned section, and as specified in Section 26 of the Standard Specifications. Confirm that the aggregate base is as specified and to the required subgrade before beginning work.

**3.3 SAND LAYING COURSE:**

- A. Install dry sand to uniform depth required for flush finish after pavers are installed. The designed nominal depth shall be one inch thick with no sand thickness less than 3/4" or more than 1 1/2". Sand is to remain undisturbed prior to the installation of pavers. Moisture content of sand to remain constant.

**3.4 PREPARATION**

- A. Prior to the start of laying stone, sweep or vacuum and wash all surfaces to be covered. Surface shall be free from coating, curing compounds, oil, grease, wax and dust.

**3.5 JOB CONDITIONS**

- A. A minimum temperature of 50°F (10°C) shall be maintained during tile work and for seven (7) days thereafter.

**3.6 LAYOUT OF WORK**

- A. Determine locations of all movement (expansion) joints before starting tile work. Lay out all tile work so as to minimize cuts less than one-half tile in size. Locate cuts in both walls and floors so as to be least conspicuous.



**3.7 SETTING METHODS**

- A. On Dimensionally Stable Concrete ANSI A108.1 (reference TCA Method F112, Cement Mortar Bonded).

**3.8 MORTAR**

- A. Follow mortar manufacturer's recommendation as to setting procedures and precautions.

**3.9 FINISHING**

- A. Thoroughly rinse all tile work. Use neutral cleaners for final cleaning. Acid cleaners are not recommended.

- - - E N D - - -

**SECTION 32 84 00  
PLANTING IRRIGATION**

**PART 1 - GENERAL****1.1 DESCRIPTION**

An automatically-controlled irrigation system, complete, including re-use of existing irrigation controller, piping, sub-surface drip, drip emitters, bubblers, valves, controls, control wiring, fittings, electrical connections and necessary accessories.

**1.2 RELATED WORK**

- A. Concrete: Section 32 13 20 Site Concrete.
- B. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- D. Division 26, ELECTRICAL.
- E. Section 32 90 00, PLANTING

**1.3 QUALITY ASSURANCE**

- A. Criteria:
  - 1. Manufacturer regularly and presently manufactures the item submitted as one of their principal products.
  - 2. There is a permanent service organization, maintained or trained by the manufacturer, which will render satisfactory service within eight hours of receipt of notification that service is requested.
  - 3. Installer, or supplier of a service, has technical qualifications, experience, and trained personnel and facilities to perform the specified work.
- B. Products Criteria:
  - 1. Multiple Units: When two or more units of the same type or class of materials or equipment are required, these units are products of one manufacturer.
  - 2. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
    - a. All components of an assembled unit need not be products of the same manufacturer but component parts which are alike are the product of a single manufacturer.
    - b. Components are compatible with each other and with the total assembly for the intended service.

3. Nameplates: Nameplate bearing manufacturer's name or identification 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.

C. System Requirements:

1. Full and complete coverage is required. Contractor shall, at no additional cost to the Government, make necessary adjustments to layout required to achieve full coverage of irrigated areas.
2. Layout work as closely as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched wherever possible.
3. Locations of remote control valves is schematic. Remote control valves shall be grouped wherever possible and aligned at a set dimension back of curb along roads.
4. Irrigation lines and control wire shall run through designated utility lanes or beside walkways where possible.

D. Maintenance and Operating Instructions: Prior to final acceptance, verbal instructions, for a period of not less than 8 hours, shall be provided to the operating personnel. Provide two additional years of software support for one hour each month. Provide manuals as specified in Section 01 00 00, GENERAL REQUIREMENTS.

E. Completely program controller and satellites according to approved irrigation schedule.

F. Follow manufacturer's instructions for installation.

G. Manufacturer of Control Systems to certify Control System is complete, including all related components, and totally operational. Submit certificate to the Contract Officer's Technical Representative (COTR).

H. As-Built Record Drawings: Maintain a complete set of as-built drawings which shall be corrected daily to show changes in locations of all pipe, valves, pumps and related irrigation equipment. Valves and pipelines shall be shown with dimensions to reference points.

I. Controller Chart:

1. Prepare a map diagram showing location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. "As-built" drawings must be approved before charts are prepared.
2. Provide one controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual

"as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.

3. Chart shall be a blackline print with a different color used to show area of coverage for each station. Charts must be completed and approved prior to final inspection of the irrigation system.

#### **1.4 SUBMITTALS**

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data:
  1. Piping
  2. Jointing materials
  3. Valves
  4. Frames and covers
  5. Strainers
  6. Pressure gages
  7. Automatic control equipment
  8. Bubbler heads
  9. Drip Emitters
  10. Subsurface drip
  10. Quick couplers
  11. Valve boxes
- C. Complete detailed layout shop drawings covering design of system showing pipe sizes and lengths; fittings, locations, types and sizes of bubbler heads; controls; valves; location and mounting details of electrical control equipment; complete wiring diagram showing routes and wire sizes; wiring details and source of current and connections to existing services. Do not start work before final shop drawing approval.
- D. Name and address of a permanent service organization maintained or trained by the manufacturers that will render satisfactory service within eight hours of receipt of notification that service is requested.
- E. Reproducible "as-built" drawings.
- F. After "as-built" drawings have been approved, submit print of controller chart.

#### **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. Federal Specifications (Fed. Spec.):

- AA-60005.....Frames, Covers, Gratings, Steps, Sump And Catch  
Basin, Manhole
- C. American National Standard Institute (ANSI):
- B40.1-98.....Gauges-Pressure Indicating Dial Type-Elastic  
Element
- D. American Society of Sanitary Engineers (ASSE):
- 1013-2005.....Reduced Pressure Principle Backflow Preventers
- E. American Society for Testing and Materials (ASTM):
- B61-02.....Steam or Valve Bronze Castings
- B62-02.....Composition Bronze or Ounce Metal Castings
- D1785-04a.....Poly(Vinyl Chloride) (PVC) Plastic Pipe,  
Schedule 40, 80, and 120
- D2241-04b.....Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe  
(SDR Series)
- D2287-96(2001).....Nonrigid Vinyl Chloride Polymer and Copolymer  
Molding and Extrusion Compounds
- D2464-99e1.....Threaded Poly (Vinyl Chloride) (PVC) Plastic  
Pipe Fittings, Schedule 80
- D2466-05.....Poly(Vinyl Chloride) (PVC) Plastic Pipe  
Fittings, Schedule 40
- D2564-04.....Solvent Cements for Poly (Vinyl Chloride) (PVC)  
Plastic Piping Systems
- D2855-96(2002).....Making Solvent Cemented Joints with Poly(Vinyl  
Chloride) (PVC) Pipe and Fittings
- F477-02e1.....Elastomeric Seals (Gaskets) for Joining Plastic  
Pipe
- F. American Water Works Association (AWWA):
- C110/A21.10-03.....Ductile-Iron and Gray-Iron Fittings, 3-Inch  
Through 48-Inch for Water
- C111/A21.11-00.....Rubber-Gasket Joints for Ductile-Iron Pressure  
Pipe and Fittings.
- C115/A21.15-99.....Flanged Ductile-Iron Pipe with Ductile-Iron or  
Gray-Iron Threaded Flanges
- C151/A21.51-02.....Ductile-Iron Pipe, Centrifugally Cast, for Water  
C153/A21.53-00 Ductile-Iron Compact Fittings  
for Water Service
- C500-02.....Metal-seated Gate Valves for Water Supply  
Service C504-00 Rubber Seated Butterfly Valves
- C600-99.....Installation of Ductile-Iron Water Mains and  
Their Appurtenances

## G. Manufacturers Standardization Society (MSS):

SP70-1998.....Cast Iron gate Valves, Flanged and Thread Ends

## H. National Electrical Manufacturers Association (NEMA):

250-2003.....Enclosures for Electrical Equipment (1000 Volts  
Maximum);**PART 2 - PRODUCTS****2.1 PIPING**

## A. Irrigation Mains:

1. See Plans

## B. Irrigation Laterals: See Plans

## C. Threaded Pipe: See Plans

## D. Above Grade and in Concrete Pit: See Plans

## E. Fittings:

1. Irrigation Mains (Ductile Iron and PVC Pipe): Ductile Iron, AWWA 110.
2. Irrigation Laterals: PVC, schedule 40, solvent welded socket type, ASTM D2466.
3. Threaded Pipe: PVC, schedule 80, ASTM D2464.
4. Swing Joints: Threaded fittings with elastomeric seals that allow 360 degree rotation, and designed for minimum 1375 kPa (200 psig) working pressure, may be used in lieu of standard threaded fittings.

## F. Jointing Materials:

1. Irrigation Mains: Solvent cement, ASTM D2564.
2. Irrigation Laterals: Solvent cement, ASTM D2564.

**2.2 VALVES (EXCEPT REMOTE CONTROL VALVES)**

## A. Underground Shut-Off Valves: Provide One of the Following:

1. Gate valves 50 mm (2 inches) and larger: Iron body, bronze mounted, double disc with parallel or inclined seats, non-rising stem turning clockwise to close, 1025 kPa (150 psi) minimum working pressure. AWWA C504.
2. Butterfly valves 80 mm (3 inches) and larger: cast iron body with stainless steel shaft, ductile iron valve disc and resilient rubber coated, 1025 kPa (150 psi) minimum pressure. AWWA C504.
3. Ball valves (for isolation valves 1-1/2" and smaller): Full-port ball valves with bronze body, PTFE seats, and 90 degree on/off handle. Ball valves to have NPT female end connections.

## B. Operations:

1. Underground: furnish valves with 50 mm (2 inch) nut for T-Handle socket wrench operation.
2. Above ground and in pits: MSS SP70, with handwheels.

3. All butterfly valves 150 mm (6 inches) and above shall have enclosed gear drive operators.
  4. Ends of valves shall accommodate the type of pipe installed.
- C. Check: Swing.
1. Smaller than 100 mm (4 inches): Bronze body and bonnet, ASTM B61 or B62, 850 kPa (125 pound) WSP.
  2. One hundred mm (4 inches) and larger: Iron body, bronze trim, vertical or horizontal installation, flange connection, 1375 kPa (200 pound) WOG.
- D. Pressure Reducing Valve: Cast steel body with renewable seats, with stainless steel trim. Flow passages and all parts designed to withstand high velocity applications, flange connected.

### 2.3 VALVE BOX

- A. Gate and Butterfly Valve: Valve boxes shall be precast concrete (from Rigid Cast Iron Forms) with compressive strength of the concrete in excess of 30 Mpa (4000 psi). Box shall be of such length to be adapted to depth of cover required over pipe at valve location. Mark box cover to differentiate between lawn irrigation system and domestic water supply system and set flush with finished grade. Provide 3 "T" handle socket wrenches of 15 mm (5/8 inch) round stock with sufficient length to extend 600 mm (2 feet) above top of deepest valve box cover.
- B. Remote Control Valves: When in pavement, valve boxes shall be precast concrete (from Rigid Cast Iron Forms) with compressive strength of the concrete in excess of 30 MPa (4000 psi). In planter areas, valve boxes shall be HDPE structural foam Type A, Class III, green in color. Box shall be minimum 475 mm (19 inches) long by 350 mm (14 inches) deep with key-lockable hinged cast iron cover.
1. After installation, label boxes with two 80 mm (3 inch) size stencils designated controller and circuit numbers with permanent white epoxy paint. Numbers shall be placed at center of valve cover and shall face nearest walkway.
  2. Furnish 3 750 mm (30 inch) long valve adjustment keys.
- C. Drip zone Lateral Flush Cap Assembly: Round reinforced plastic valve box and lid constructed from HDPE. Opening at top of access box to be 14.5 cm (5-3/4") diameter, minimum. Height of access box to be 23cm (9-1/16"), minimum. Lid to have lift-hole for opening.
- D. Emitter Access Boxes: Round plastic boxes with lid constructed of UV resistant thermoplastic material, tan in color. Top diameter to be 13 cm (5") minimum. Height of box to be 26 cm (10-1/4"), minimum.

**2.4 FRAMES AND COVERS****A. When not in roadway:**

1. Fed. Spec. RR-F-621. Cast Iron. Provide covers with cast-in identification symbol "WATER".
2. Frame: Figure 1, Type I, Style A, Size 30A.
3. Cover: Figure 8, Type A, Size 30A

**B. When in roadway use traffic rated frame and cover****2.5 STRAINERS**

Basket or "Y" type with brass strainer basket. Body smaller than 70 mm (2-1/2 inch) shall be brass or bronze; 70 mm (2-1/2 inch) and larger shall be cast iron or semi-steel. Strainer cover to be furnished with blow-off connection and shut-off valve to accommodate 20 mm (3/4 inch) diameter hose connection.

**2.6 PRESSURE GAUGES:**

ANSI B40 1, 114 mm (4-1/2 inch) diameter, all metal case, bottom connected. Dial shall be either dead black or white lacquered throughout. Provide shut-off cocks. Maximum graduations of 10 kPa (2 psi).

**2.7 AUTOMATIC CONTROL EQUIPMENT—INDEPENDENT ELECTRIC CONTROLLERS****A. Independent controller is existing - see plans.****2.8 REMOTE CONTROL VALVES:**

- A. Each sprinkler section shall be automatically operated by a remote control valve installed underground and operated by a 24-volt AC electric solenoid. Valves shall be of heavy duty construction and shall have manual shut-off and flow control adjustment and provide for manual operation. Install valves with unions on each side to allow for easy removal. Valves shall have a minimum of 1025 kPa (150 psi) working pressure.
- B. Valves shall be of all brass construction furnished as straight or angle pattern type, or valve body shall be cast-iron with brass bonnet, trim and renewable seat and have two inlet tappings (furnished with one plugged) to allow installation as either a straight or angle pattern valve.
- C. Valves shall be diaphragm type designed to operate in water containing sand and debris and shall have a self cleaning type contamination filter to filter all water leading to the solenoid actuator and the diaphragm chamber. Valve shall incorporate a non-adjustable type opening and closing speed control for protection against surge pressures, or valves



shall operate by means of a slow acting direct drive thermal hydraulic motor without ports, screens or diaphragms.

- D. Valves shall be completely serviceable from the top without removing valve body from the system. Furnish 3 750 mm (30 inch) long adjustment keys. Valves to operate at no more than 50 kPa (7 psi) pressure loss at manufacturers maximum recommended flow rate.

## **2.9 BUBBLER HEADS**

- A. Shall be of make, type and performance as indicated on drawings. The entire internal assembly including filter screen, to be capable of removal from the top without removing the bubbler case from the riser.
- D. Drip Emitters: Drip emitters shall be of the pressure compensating, permanently assembled type with 1.25cm ( $\frac{1}{2}$ " ) FPT inlet. Emitters shall be capable of providing 1gpm at inlet pressures between 15 and 50 psi.
- E. Emitter distribution tubing shall be constructed of UV resistant vinyl material with a .22" O.D. and a .16" I.D. Tubing shall be as manufactured by the same manufacturer as the drip emitters.

## **2.10 QUICK COUPLERS**

- A. Shall have all parts contained in a two-piece unit and shall consist of a coupler water seal valve assembly and a removable upper body to allow the spring and key track to be serviced without shut down of the main.
- B. Metal parts shall be brass.
- C. Lids shall be lockable vinyl covered and have springs for positive closure on key removal.
- D. Furnish 3 hose swivels and operating keys for each size coupler to the COTR.

## **2.11 LOW VOLTAGE CONTROL VALVE WIRE**

Wire: Solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground. Size of wire shall be in accordance with manufacturer's recommendations, but in no case less than No. 14.

## **2.12 SPLICING MATERIALS: EPOXY WATERPROOF SEALING PACKET. LOW VOLTAGE CONTROLLER CABLE**

Multi-strand cable, Underwriters Laboratories Inc. approved for direct burial in ground. Size and type of wire shall be in accordance with manufacturer's recommendations.

## **2.13 SLEEVE MATERIAL**

PVC-1120-5DR 17, Schedule 40.

## **2.14 WARNING TAPE**

Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape, detectable type, blue with black letters (if potable water), or purple with black letters

(if reclaimed or untreated well water), and imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW".

A. TRACER WIRES

No. 14, Green, Type TW plastic-coated copper tracer wire shall be installed with non-metallic irrigation main lines.

**PART 3 - EXECUTION**

**3.1 PIPE LAYING - GENERAL**

- A. Do not lay pipe on unstable material, in wet trench or when, in the opinion of COTR, trench or weather conditions are unsuitable for the work.
- B. Concrete thrust block shall be installed where the irrigation main changes direction as at ells and tees and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.
- C. Allow a minimum of 80 mm (3 inches) between parallel pipes in the same trench.
- D. Hold pipe securely in place while joint is being made.
- E. Do not work over, or walk on, pipe in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- F. Full length of each section of pipe shall rest upon the pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipe on wood blocking.
- G. Install sprinkler lines to avoid heating trenches, electric ducts, storm and sanitary sewer lines, and existing water and gas mains, all of which have right of way.
- H. Clean interior of pipe of foreign matter before installation. Keep pipe clean during laying operations by means of plugs or other methods. When work is not in progress, securely close open ends of pipe and fittings to prevent water, earth, or other substances from entering.
- J. Minimum cover over water mains shall be 750 mm (30 inches). Control valves shall never be less than 80 mm (3 inches) below finished grade. Cover laterals to minimum depth of 600mm (24 inches).
- K. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking,

auger boring, or by tunneling. Repair or replace any concrete that cracks, due to settling, during the warranty period.

- L. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- M. Warning tape shall be continuously placed 300 mm (12 inches) above sprinkler system water mains and laterals.

### **3.2 LAYING PLASTIC PIPE**

- A. Shall be snaked in trench at least 1 meter to 100 meters (1 foot per 100 feet) to allow for thermal construction and expansion and to reduce strain on connections.
- B. Joints
  - 1. Solvent Welded Socket Type: ASTM D2855.
  - 2. Threaded Type: Apply liquid teflon thread lubricant of teflon thread type. After joint is made hand tight (hard), a strap wrench should be used to make up to two additional full turns.
  - 3. Elastomeric Gasket: ASTM F477.
    - a. Immediately before joining two lengths of PVC pipe, the inside of the bell or coupling, the outside of the spigot and the elastomeric gasket shall be thoroughly cleaned to remove all foreign material.
    - b. Lubrication of the joint and rubber gasket shall be done in accordance with the pipe manufacturer's specifications.
    - c. Care shall be taken that only the correct elastomeric gasket, compatible with the annular groove of the bell, is used. Insertion of the elastomeric gasket in the annular groove of the bell or coupling shall be in accordance with the manufacturer's recommendations. Pipe that is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.
    - d. The spigot and bell or coupling shall be aligned and pushed until the reference line on the spigot is flush with the end of the bell or coupling. Pushing shall be done in a smooth, steady motion.

### **3.3 LAYING EMITTER HOSE**

- A. Use Type 1/11 solvent weld.
- B. Bushing for adaptation from PVC Schedule 40 fittings to flex-vinyl hose shall be line size by 10 mm (3/8 inch) insert bushings.

### **3.4 INSTALLATION OF QUICK COUPLERS**

- A. Bubbler heads shall be placed as shown.

### **3.5 INSTALLATION OF CONTROL WIRING**

- A. Wiring from master controllers to satellites and stub-cuts for future extension shall be located in trench with new mains or in separate trench at back of curb, unless cross-country route is shown. Locate in trench with mains when possible on cross-country routes.
- B. Wiring bundles located with piping shall be set with top of the bundle below top of the pipe. No two wires in any bundle shall be of the same color. Wires shall be bundled, and tied or taped at 4.5 m (15 foot) intervals. A numbered tag shall be provided at each end of a wire, i.e., at valve, at field located controllers and at master controller. The number at each end of wire to be the same.
- C. Splicing shall be held to a minimum. A pullbox shall be provided at each splice. No splices will be allowed between field located controllers and remote control valves.
- D. Provide 300 mm (12 inch) expansion loops in wiring at each wire connection or change in wire direction. Provide 600 mm (24 inch) loop at remote control valves.
- E. Power wiring for the operation of irrigation system shall not be run in same conduit as control wiring.

### **3.6 TRACER WIRE INSTALLATION**

- A. Tracer wire shall be installed on bottom of trench, adjacent to vertical pipe projections, carefully installed to avoid stress from backfilling, and shall be continuous throughout length of pipe with spliced joints soldered and covered with insulation type tape.
- B. Tracer wire shall follow main line pipe and branch lines and terminate in yard box with gate valve controlling these main irrigation lines. Provide sufficient length of wire to reach finish grade, bend back end of wire to make a loop and attach a Dymo-Tape type plastic label with designation "Tracer Wire."
- C. Record locations of tracer wires and their terminations on project record documents.

### **3.7 SETTING OF VALVES**

- A. No valves shall be set under roads, pavement or walks.
- B. Clean interior of valves of foreign matter before installation.
- C. Where pressure control valves are installed adjacent to remote control valve, they shall be housed in the same valve box.
- D. Set valve box cover flush with finished grade.

**3.8 SLEEVING**

- A. Furnish and install where pipe and control wires pass under walks, paving, walls, and other similar areas.
- B. Sleeving to be twice line size or greater to accommodate retrieval for repair of wiring or piping and shall extend 300 mm (12 inches) beyond edges of paving or construction.
- C. Bed sleeves with a minimum of 100 mm (4 inches) of sand backfill above top of pipe.

**3.9 TEST AND FLUSHING**

- A. Pressure Test: Pressure test lines before joint areas are backfilled. Backfill a minimum of 300 mm (12 inches) over the pipe to maintain pipe stability during test period. Test piping at hydraulic pressure of 1025 kPa (150 psi) for two hours. Maximum loss shall be 3 L/25 mm pipe diameter/300 m (0.8 gallons/inch pipe diameter/1000-feet). Locate pump at low point in line and apply pressure gradually. Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping. Inspect each joint and repair leaks. Line shall be retested until satisfactory.
- B. Flushing: After testing, flush system with a minimum of 150 percent of operating flow passing through each pipe beginning with larger mains and continuing through smaller mains in sequence. Flush lines before installing sprinkler heads and quick couplers.
- C. Operation Test: Upon completion of the final adjustment of the sprinkler heads to permanent level at ground surface, test each sprinkler section by the pan test and visual test to indicate a uniform distribution within any one sprinkler head area and over the entire area. Operate the entire installation to demonstrate the complete and successful operation of all equipment.

- - - E N D - - -

**SECTION 32 90 00  
PLANTING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This work consists of furnishing and installing all planting materials required for landscaping hereinafter specified in locations as shown.

**1.2 TESTING LABORATORY SERVICES**

- A. Materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by Contractor.

**1.3 EQUIPMENT**

- A. Maintain all equipment, tools and machinery while on the project in sufficient quantities and capacity for proper execution of the work.

**1.4 RELATED WORK**

- A. Section 32 84 00, PLANTING IRRIGATION.
- B. Section 32 90 10, STRUCTURAL PLANTING SOIL MIX
- C. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

**1.5 SUBMITTALS**

- A. Product Data: Manufacturer's current catalog cuts and specifications of the following:
  - 1. Fertilizers
  - 2. Iron Sulfate
  - 3. Tree Guy Material
  - 4. Filter Fabric
  - 5. Perforated Drain Pipe
  - 6. Aluminum Edging
- B. Samples: Submit following samples along with certificates of compliance / analytical data from approved laboratory for degree of compliance.  
Plants: Submit typical sample of each variety or entire quantity to site for approval by the Contract Officer's Technical Representative (COTR).

1. Organic Mulch: Submit 1-pint sample with list of ingredients.
2. Gravel Mulch: Submit 1-quart sample(s).
3. Organic (Soil) Amendment: Submit 1-pint sample with Technical Data Sheet and STA certification.
4. Permeable Backfill (Filter Rock): Submit 1-pint sample.
5. Raised Planter Planting Sand Backfill Mix: Submit 1/2-pint sample.
6. Raised Planter Topping Mix: Submit 1 Pint Sample
7. Imported Planting Soil: Submit 1-pint sample
8. Submit 1 quart sample of composted organic amendment along with composter's Compost Technical Data Sheet and STA certification to soil and plant laboratory for analytical packages as specified in Part 2 - Products below. Upon approval of the Laboratory's recommendations by the COTR, the recommendations in the report shall become a part of the Specifications.

#### **1.6 PROJECT/SITE CONDITIONS**

- A. Site Visit: At beginning of work, visit and walk the site with the COTR to clarify scope of work and understand existing project/site conditions.

#### **1.7 WARRANTY AND REPLACEMENT,**

- A. Pre-Emergence Weed Killer: Warrant the work against weed growth for a period of four (4) months after application.
- B. Warrant all plants and planting to be in a healthy, thriving condition until the end of the maintenance period, and deciduous trees beyond that time until active growth is evident.
- C. Replace all dead plants and plants not in a vigorous condition immediately upon discovery and as directed by the COTR at Contractor's expense. Install replacement plants before the final acceptance at the size specified.
- D. Warrant all plant material for a period of one year after final acceptance of the maintenance period against plant materials with defects at the time of installation.
- E. Warrant plant installation and maintenance by Contractor against defects for a period of one year.
- F. Samples: Submit the following samples for approval before work is started:

Gravel Mulch	1 quarts of each type to be used.
--------------	--------------------------------------

Organic Mulch	1 quarts of each type to be used.
---------------	--------------------------------------

- G. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the COTR for approval:
1. Plant Materials (Department of Agriculture certification by State Nursery Inspector declaring material to be free from insects and disease).
  2. Fertilizers.
- H. Manufacturer's Literature and Data:
1. Aluminum edging
  2. Erosion control materials
  3. Pre-emergent herbicide
  4. Filter Fabric
- I. Soil laboratory testing results and any soil amendment recommendations from the Contractor.

#### **1.8 DELIVERY AND STORAGE**

- A. Delivery:
1. Notify the COTR of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.
  2. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.
  3. Deliver fertilizer to the site in the original, unopened containers bearing the manufacturer's warranted chemical analysis, name, trade name or trademark, and in conformance to state and federal law.
  4. During delivery: Protect seed from contamination.
- B. Storage:
1. Keep seed and fertilizer in dry storage away from contaminants.
  2. Store plants not installed on the day of arrival at the site as follows:
    - a. Shade and protect plants from the wind when stored outside.
    - b. Keep plants in a moist condition until planted.



**1.9 LIME TREATMENT OF SUBSOIL**

1. Refer to PART 3 -EXECUTION for mitigation of any lime treatment of soils.

**1.10 PLANTING AND TURF INSTALLATION CONDITIONS**

- A. Perform planting operations after the irrigation system is installed, tested, and approved.
- B. No work shall be done when the ground is too wet or in an otherwise unsuitable condition for planting. Special conditions may exist that warrants a variance. Submit a written request to the COTR stating the special conditions and proposal variance.

**1.11 PLANT WARRANTY**

- A. All work shall be in accordance with the terms of the Paragraph, "Warranty" of FAR clause 52.246-21, including the following supplements:
  1. A One Year Plant and Turf Warranty will begin on the date that the Government accepts the project or phase for beneficial use and occupancy. The Contractor shall have completed, located, and installed all plants and turf according to the plans and specifications. All plants and turf are expected to be living and in a healthy condition at the time of final inspection.
  2. The Contractor will replace any dead plant material and any areas void of turf immediately. A one year warranty for the plants and turf that was replaced, will begin on the day the work is completed.
  3. Replacement of relocated plants, that the Contractor did not supply, is not required unless they die from improper handling and care during transplanting. Loss through Contractor negligence requires replacement in kind and size.
  4. The Government will reinspect all plants and turf at the end of the One Year Warranty. The Contractor will replace any dead, missing, or defective plant material and turf immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the work required by this specification. The Contractor shall also comply with the following requirements:
    - a. Replace dead, missing or defective plant material prior to final inspection.
    - b. Mulch and weed plant beds and saucers. Just prior to this inspection, treat these areas to a second application of approved pre-emergent herbicide.
    - c. From plants having been installed for one year, remove stakes, guy wires and any required tree wrappings.

- d. Complete remedial measures directed by the COTR to ensure plant and turf survival.
- e. Repair damage caused while making plant or turf replacements.

#### 1.12 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 basic designation only.
- B. Ordinances and Regulations: All local, municipal and state laws, codes and regulations governing or relating to all portions of this work are hereby incorporated into and made a part of these Specifications. Anything contained in these Specifications shall not be construed to conflict with any of the herein listed codes, regulations or requirements of the same. However, when these Specifications and Drawings call for or describe materials, workmanship or construction of a better quality, higher standard than is required by the above mentioned codes and regulations, the provisions of these Specifications and Drawings shall take precedence. Furnish without extra charge additional materials and labor required to comply with above rules and regulations
- C. American National Standards Institute (ANSI) Publications:
  - 1. Z60.1-04 Nursery Stock
  - 2. Z133.1-06 Tree Care  
Operations-Pruning, Trimming, Repairing, Maintaining, and Removing  
Trees and Cutting Brush- Safety Requirements
- D. Hortus Third, A Concise Dictionary of Plants Cultivated in the U.S. and Canada.
- E. Contractor shall be familiar with and follow the State of California Model Water Ordinance, California Code of Regulations, Title 23 Waters, Division 2, Department of Water Resources, Chapter 2.7. Also, the Contractor is responsible to follow all local water ordinances and the Soil Management/Analysis Report with verifying implementation.
- F. American Society for Testing and Materials (ASTM) Publications:
  - 1. C136-06 Sieve Analysis of Fine and Coarse Aggregates
- G. "Sunset Western Garden Book," Lane Publishing Co., Menlo Park, California; current edition.
- H. Alameda Countywide Clean Water Program (ACCWP) or member agency having jurisdiction over the project work
- I. US Composting Council Compost analysis Program (CAP)

- J. Test Methods for the Evaluation of Composting and Compost (TMECC)
- K. International Society of Arboriculture, Guide for Plant Appraisal, latest version.
- L. United States Composting Council (USCC) Seal of Testing Assurance (STA) program.
- M. TMECC: Refers to "Test Methods for the Examination of Composting and Compost," published by the United States Department of Agriculture and the United States Compost Council (USCC)
- N. References to "Caltrans Standard Specifications" shall mean the Standard Specifications of the State of California, Business and Transportation Agency, Department of Transportation, CALTRANS.
- O. Manufacturer's recommendations

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. All plant material shall conform to the varieties specified or shown in the plant list and be true to botanical name as listed in Hortus Third.

### **2.2 PLANTS**

- A. Plants shall be nursery grown in containers and in accordance with ANSI Z60.1, except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specification shall prevail.
- B. Plant the variety, quantity and size indicated. The total quantity tabulated on the drawings are considered approximate and furnished for convenience only. Contractor shall perform his/her own plant quantity calculations and shall provide all plants shown on the Drawings.
- C. Tag plants of the type or name indicated and in accordance with the standard practice recommended by the American Association of Nurserymen.
- D. Install healthy, shapely and well rooted plants with no evidence of having been root-bound, restricted or deformed.
- E. Take precautions to ensure that the plants will arrive at the site in proper condition for successful growth. Protect plants in transit from windburn and sunburn. Protect and maintain plants on site by proper storage and watering.

F. Substitutions will not be permitted, except as follows:

1. If proof is submitted to the COTR that any plant specified is not obtainable, a proposal will be considered for use of nearest equivalent size or variety with an equitable adjustment of contract price.
2. Substantiate and submit proof of plant availability in writing to the COTR within 10 days after the effective date of Notice to Proceed.

G. Tree Form: Trees shall have a symmetrical form as typical for the species/cultivar and growth form.

1. Central Leader for Single Trunk Trees: Trees shall have a single, relatively straight central leader and tapered trunk, free of co dominant stems and vigorous, upright branches that compete with the central leader. Preferably, the central leader should not have been headed; however, in cases where the original leader has been remove, an upright branch at least  $\frac{1}{2}$  the diameter of the original leader just below the pruning point shall be present.
2. Potential Main Branches: Braches shall be evenly distributed radially around and appropriately spaced vertically along the trunk, forming a generally symmetrical crown typical for the species.
3. Headed temporary branches should be distributed around and along the trunk as noted above and shall be no greater than  $\frac{3}{8}$ " diameter, and no greater than  $\frac{1}{2}$  diameter of the trunk at point of attachment.

H. Tree Trunk

1. Trunk diameter and taper shall be sufficient so that the tree will remain vertical without the support of a nursery stake.
2. Trunk shall be free of wounds (except properly-made pruning cuts), sunburned areas, conks (fungal fruiting-bodies), wood cracks, bleeding areas, signs of boring insects, galls, cankers and/or lesions.
3. Tree trunk diameter at 6" above the soil surface shall be within the diameter range shown for each container size below, except where shown otherwise:

<u>Container</u>	<u>Trunk Diameter in inches</u>	<u>Soil level from</u>
<u>Container Top</u>		
5 gallon	0.5" to 0.75"	1.25 to 2"
15 gallon	0.75" to 1.0"	1.75 to 2.75"
24" Box	1.5" to 2. 5"	2.25 to 3"

4. Tree trunks shall be undamaged and uncut with all old abrasions and cuts completely callused over. Do not prune plants prior to delivery.

I. Tree Roots

1. Trunk root collar (root crown) and large roots shall be free of circling and/or kinked roots. Contractor may be required to remove soil near the root collar in order to verify that circling and/or kinked roots are not present.
2. The tree shall be well rooted in the container. When the trunk is lifted the trunk and root system shall move as one and the rootball shall remain intact.
3. The top-most roots or root collar shall be within 1" above or below the soil surface. The soil level in the container shall be within the limits shown in above table.
4. The rootball periphery shall be free of large circling and bottom-matted roots.
5. On grafted or budded trees, there shall be no suckers from the root stock.

J. Shrubs

1. Each shrub must stand upright without support.
2. All container shrubs shall be free of girdling roots, defined as those roots greater than 1/8" diameter circling the periphery of the rootball. The top of the rootball shall be free of "Knees" (roots) protruding above the soil, and the bottom shall be free of matted roots.

- K. Measure trees and shrubs with branches in normal position. Height and spread dimensions indicated refer to the main body of the plant, and not from branch tip to tip.

- L. Make substitutions only when a plant (or its alternates as specified) is not obtainable and the COTR authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the contract price.

**2.3 FERTILIZERS**

- A. Commercial fertilizer, pelleted or granular form, conform to the requirements of Chapter 7, Article 2, of the Agricultural Code of the State of California for fertilizing materials as follows:

1. Type A:  
6% Nitrogen, 20% Phosphorus Acid and 20% Potash, (6-20-20).

2. Type B:  
21 gram planting tablets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Agriform or 10gm BestPacks packets 20% Nitrogen, 10% Phosphoric Acid and 5% Potash (20-10-5) available from Best Fertilizer Co.
3. Type C:  
Complete fertilizer 21% Nitrogen, 7% Phosphoric Acid and 14% Potash (21-7-14).
4. If commercial fertilizer having this analysis is not obtainable, other similar commercial fertilizer may be used providing it meets the approval of the COTR.

B. Maintenance Fertilizer: Type C

#### 2.4 ORGANIC AMENDMENT FOR IN SITU SOILS (ON-GRADE):

A. Ground Redwood or Ground Fir Bark with the following properties:

<u>Percent Passing</u>	<u>Sieve Designation</u>	
100	9.51 mm	3/8"
50-60	6.35 mm	1/4"
20-40	4.76 mm	No. 4
0-20	2.38 mm	No. 8 8
mesh		

##### Redwood Sawdust

Dry bulk density, lbs. per cu. yd., 260-280  
 Nitrogen stabilized - dry weight basis, min. 0.4%  
 Salinity (ECe): 4.0 maximum  
 Organic Content: 90% minimum  
 Reaction (pH): 4.0 minimum

##### Ground Fir and/or Pine Bark

Dry bulk density, lbs. per cu. yd., Min. 350  
 Nitrogen stabilized - dry weight basis, min. 0.5%  
 Salinity (ECe): 4.0 maximum  
 Organic Content: 90% minimum  
 Reaction (pH): 4.0 minimum

B. Submit sample along with analytical data from an approved laboratory for degree of compliance to the COTR within two weeks after award of Contract.

#### 2.5 COMPOSTED YARD WASTE AMENDMENT:

A. The above Ground Redwood or Ground Fir Bark or Ground Pine Bark (ORGANIC AMENDMENT FOR IN SITU SOILS) is the specified organic amendment material required. Acceptance of Composted Yard Waste

Amendment in lieu of the above specified ORGANIC AMENDMENT FOR IN SITU SOILS (ON-GRADE) material will be considered if the in situ planting soil salinity and soil structure is favorable for the inclusion of recycled yard waste organic matter, as approved by the COTR. It is the Contractor's responsibility to secure test samples of both the planting soil and the proposed composted yard waste amendment (2 quart samples) and submit to Soils and Plant Laboratory for evaluation and recommendations. The composted yard waste amendment sample shall be a grab sample from the currently available material that has been tested within the last 30 days and shall include the composter's Compost Technical Data Sheet that includes lab analytical test results and directions for product use along with list of ingredients. The composted yard waste amendment shall be a mixture of feedstock materials including green material consisting of chipped, shredded, or ground vegetation and mixed food waste, or clean processed recycled wood products. Single source, Biosolids (sewage waste) compost will not be acceptable.

- B. Based on the Soils and Plant Laboratory evaluation, the addition of composted yard waste amendment shall not be acceptable if it creates a leaching requirement.
- C. The addition of the compost shall result in a final E<sub>ce</sub> of the amended soil of less than 4.0 dS/m @ 25 degrees C. as determined in a saturation extract. Use the following table to determine the maximum allowable E<sub>ce</sub> (dS/m of saturation extract) of compost at desired use rate and allowable E<sub>ce</sub> increase.

DESIRED USE RATE		MAXIMUM ALLOWABLE E <sub>ce</sub> INCREASE FROM AMENDMENT		
Cu. Yds. Amendment Per 1000 Sq. Ft. for Incorporation to 6" depth	Volume percentage of amendment	1 dS/m	2 dS/m	3 dS/m
		Maximum E <sub>ce</sub> of Compost		
1	5	14	28	42
2	11	7	14	21
3	16	5	9.5	14
4	22	3.5	7	10.5
5	27	3	5.5	8.5
6	32	2.5	4.5	7

- Example: Specification calls for 6 cu. Yds. Compost per 1000 sq. ft. for incorporation to 6" depth, and site soil has an E<sub>ce</sub> of 2.0. In order to avoid exceeding E<sub>ce</sub> of 4 in final blend, compost E<sub>ce</sub> shall be less than 4.5 dS/m.

- D. Composted Yard Waste Soil Amendment Properties as follows:

1. Gradation:
 

<u>Percent Passing by weight</u>	<u>Sieve Designation</u>
90	1/2"
85-100	9.51 mm      3/8"
50-80 2.38 mm	No. 8 8 mesh
0-40 500 micron	No. 35      32 mesh
Maximum length 4 inches	
  2. Organic Content: Minimum 45% based on dry weight and determined by ash method.
  3. Carbon to nitrogen ratio: Maximum 35:1 if material is claimed to be nitrogen stabilized.
  4. pH: 5.5 - 8.0 as determined in saturated paste.
  5. Soluble Salts: See above.
  6. Moisture Content: 35-60%.
  7. Physical Contaminants:
    - a. The compost shall be free of contaminants such as glass, metal and visible plastic per Man Made Inert Removal and Classification: TMECC 02.02, % > 4mm fraction. Combined total less than 1.0.
    - b. Man Made Inert Removal and Classification: Sharps % > 4mm fraction. (sewing needles, hypodermic needles) Non Detected.
  8. Pathogens: TMECC 07.01-B Fecal Coliform Bacteria <1000 MPN/gram dry wt. <1000 (Pass)
  9. Pathogens: TMECC 07.01-B Salmonella <3 MPN/4grams dry wt. <3 (Pass)
  10. Maturity: Physical characteristics suggestive of maturity include:
    - a. Color: Dark brown to black.
    - b. Acceptable Odor: None, soil-like, musty or moldy.
    - c. Unacceptable Odor: Sour, ammonia or putrid.
    - d. Particle Characterization: Identifiable wood pieces are acceptable but the balance of the material shall be soil-like without recognizable grass or leaves.
    - e. TMECC 07.01-A Germination and Vigor, % Relative to Positive Control for Seed Emergence and Seedling Vigor: 80 or above.
- E. Submit planting soil and composted yard waste amendment samples along with laboratory report from Soils and Plant Laboratory for degree of compliance as specified above and composter's Compost Technical Data Sheet that includes lab analytical test results and directions for product use along with list of ingredients to the COTR a minimum of 3 weeks prior to beginning soil prep. The laboratory report shall include recommendations for adjusting fertilizer and amendment quantities. Upon approval of the Laboratory's report by the COTR, the



recommendations in the report shall become a part of the Specifications and the quantities of soil amendment and fertilizer shall be adjusted to conform with the report at no additional cost to the owner.

**2.6 IRON SULFATE:** Dry form.

**2.7 PLANT BACKFILL:** Raised Planter Topping Mix as noted below.

**2.8 MULCH**

- A. Organic Mulch: Fir tree or pine tree bark, dark in color; 3/4-inch to 1-inch size.
- B. Gravel Mulch: Sierra Ginger Pathway Stone Gravel or approved equal to match color of Stone Pavers Type B. Refer to Drawings.
- C. Submit samples of organic and gravel mulches to the COTR for approval within two weeks of award of Contract. Resubmit until acceptable to COTR, at no extra cost.

**2.9 TIES**

- A. Rubber strap, 24-inch minimum length without sharp edges adjacent to trunk.

**2.10 TREE GUYING:**

- A. See drawing details

**2.11 TREE ROOT BARRIER**

**2.12 PLANTING SOIL (TOPSOIL):**

- A. Planting soil is defined as screened imported sand/lava rock aggregate/mixture per spec herein.

**2.13 PRE-EMERGENCE WEED KILLER**

- A. Clean non-staining as recommended by a licensed pest control specialist.

**2.14 TREE & SHRUB PLANTER/PLASTER SAND, 100% medium/coarse, washed, sharp, angular, silt-free sand with the following sieve analysis:**

USDA Particle Size		USDA Standard			
<u>Discipline Name</u>		<u>mm</u>		<u>Sieve #</u>	<u>% Retained</u>
<u>Passing</u>					<u>%</u>
Gravel	4.76	4	0%	100%	
Fine Gravel	2.00	10	0-5%	95-100%	

Very Coarse Sand	1.00	18	0-10%	90-100%
Coarse Sand	500 micron	35	0-35%	65-100%
Medium Sand	250 micron	60	50-100%	0-50%
Fine Sand	105 micron	140	0-30%	0-20%
Very Fine Sand	53 micron	270	0-15%	0-5%
Silt and Clay	Pan		0-5%	

1. Reaction (pH) of the saturated sand shall be between 6.0-8.0 as determined on the saturation extract solution:
  - a. Permissible range of Salinity, Boron and Sodium as follows:
    - 1) Salinity (Ece) 0-3.0 dS/m
    - 2) Boron 0.1.0 ppm
    - 3) Sodium 0-20 meq/L

- B. Submit sample of the Tree & Shrub Planter/Plaster Sand along with analytical data from the approved laboratory for degree of compliance.

## 2.15 LAVA ROCK AGGREGATE

- A. Required Properties of Lava Rock Aggregate:

1. GRAIN SIZE DISTRUBUTION

<u>U.S. Std. Sieve Size</u>	<u>-% Retained per Screen</u>	<u>-% Weight Passing-Cumulative</u>
12.5mm	0	95-100
8 mm	1	90-100
4.75 mm (#4)	58	35-50
1.18 mm (#16)	34	0-20
0.850 mm (#20)	0.9	0-20
0.500 mm (#35)	0.1	0-20
0.212 mm (#70)	0.6	0-20
0.150 mm (#100)	1	0-15
0.075 mm (#200)	3	0-5
0.053 mm (#270)	1	0-5
0.045 mm (#325)	0.3	0-5

- a. Sieve Analysis by ASTM 136
  - b. PH - 6.0 to 7.8
  - c. Chloride ppm 9.5 to 19
  - d. Sulfate ppm .4 to 1.1
  - e. Absorption 15 to 30%
  - f. Loose Unit Weight 43 Lbs PCF (ASTM C 29)
- B. Absorption: Lava Rock aggregate shall retain a minimum of 18% of its weight in absorbed water and shall be free of toxic materials, insects, diseases, weed seeds and other pests.
- C. The sieve analysis shall be as shown above and with not more than 5% passing the #200 sieve.

- D. Submit sample of the Lava Rock Aggregate along with analytical data from an approved laboratory for degree of compliance.

#### **2.16 RAISED PLANTER SOIL BACKFILL REQUIREMENTS**

- A. "Raised Planter Base Soil" is a mixture of 50% specified Tree & Shrub Planter/Plaster Sand and 50% specified Lava Rock. Planter Base Soil shall be installed in bottom of raised planters up to minus 12 inches from finish grade.
- B. Except as noted otherwise, "Raised Planter Topping Mix" (sand and Lava Rock) is a mixture of 70% "Raised Planter Base Soil" and 30% specified nitrolized Fir bark Organic Amendment and fertilizer ingredients listed below. Raised Planter Topping Mix shall be installed only in the top 12 inch layer of raised planters.

#### **2.17 RAISED PLANTER TOPPING MIX**

- A. The above Raised Planter Topping Mix shall be delivered to the site in a damp condition and installed immediately to prevent loosing the humus due to wind blow. Include the fertilizer ingredients listed below in the Topping Mix:
- |            |                              |
|------------|------------------------------|
| 0.75 pound | Potassium Nitrate 13-0-44    |
| 0.5 pound  | Calcium Nitrate 15.5-0-0     |
| 0.5 pounds | Urea Formaldehyde 38.0 0.    |
| 2.5 pounds | Single Superphosphate 0-25-0 |
| 4.0 pounds | Calcium Carbonate Lime       |
| 4.0 pounds | Kaiser 65 Dolomite           |
| 1.0 pounds | Iron Sulfate (min. 20% Fe)   |
- B. Submit sample of the sand, fertilizers, Lava Rock, and fir bark Planter Mix proposed for use along with analytical data from the approved laboratory for degree of compliance.

#### **2.18 LANDSCAPE HEADER - ALUMINUM EDGING:**

- A. 3/16" X 4" by 8' black anodized finish with 12" min long stakes set ½" below grade at each joint and maximum 4' spacing, in-line joints without offset or double thickness.

#### **2.19 FILTER FABRIC**

- A. Needle punched nonwoven geotextile Filter Fabric composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids weighing 18 grams per square meter. Meets Aashto M288-06 Class 3 for elongation > 50%.

**2.20 PERFORATED DRAIN PIPE:**

- A. Polyvinyl Chloride (PVC) pipe and pipe fittings shall meet extra strength minimum of SDR-35 of the requirements of ASTM Specification D3034.
- B. Perforated and non-perforated corrugated polyethylene pipe, 3- to 10-inch diameter, shall meet the requirements of ASTM D883 and ASTM F412, and shall conform to Section 68 of the Standard Specifications.
  - 1. Corrugated polyethylene pipe fittings shall comply with all requirements of AASHTO M-252-85I for 3- to 10-inch diameter pipe. Couplings shall be split or snap-on type for perforated pipe and split couplings with gaskets for non-perforated pipe. Cutting pipe with integral couplings will not be allowed.
  - 2. Corrugated polyethylene pipe and fittings manufactured by Advanced Drainage Systems, Inc., shall be considered the standard to determine compliance to this specification.
- C. Inspection Tube Cap
  - 1. Paint cap one coat chocolate-brown color using Flat, exterior grade latex paint as accepted by COTR.

**2.21 PERMEABLE BACKFILL (FILTER ROCK)**

- A. Permeable backfill used in subsurface drain installations to be Class 2 permeable material in conformance with Section 68 "Subsurface Drains" of the Caltrans Standard Specifications; gradation to 3/4" maximum size. Submit Sample for approval.

**2.22 EROSION CONTROL NETTING**

- A. New, with a uniform, open plain-weave, flame-retardant mesh. The mesh shall be [natural brown-tan] [dyed green] and made from unbleached single jute yarn. The yarn shall be of loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Furnish jute mesh in rolled strips to meet the following requirements:
  - 1. Width: 48 inches, with a tolerance of one-inch wider or narrower.
  - 2. Not less than 78 warp ends per width.
  - 3. Not less than 41 weft ends per yard.
  - 4. Weight shall average 1.22 pounds per linear yard, with a tolerance of 5 percent heavier or lighter.

**2.23 ALUMINUM EDGING**

- A. 3/16" X 4" by 8' black anodized finish with 12" min long stakes set ½" below grade at each joint and maximum 4' spacing, in-line joints without offset or double thickness.

**PART 3 - EXECUTION****3.1 FINE GRADING AND SOIL PREPARATION****A. General**

1. Soil in all planting areas shall be moist, but not so moist that it sticks to a hand shovel, and loose and friable to a minimum depth of 12 inches with a relative maximum compaction of 85%. Rip and scarify and dry any areas that do not meet this requirement.
2. Prior to excavating for plant pits and bed, verify the location of any underground utilities. Damage to utility lines shall be repaired at the Contractor's expense. Where lawns have been established prior to planting operation, cover the surrounding turf before excavations are made in a manner that will protect turf areas. Barricade existing trees, shrubbery, and beds that are to be preserved in a manner that will effectively protect them during the project construction
3. No work shall be done when the ground is too wet or in an otherwise unsuitable condition for earthwork and planting. Special conditions may exist that warrants a variance. Submit a written request to the COTR stating the special conditions and proposal variance.
4. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the COTR of any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.

**B. Lime Treated Soil Removal**

1. All Lime treated soils shall be removed full depth of treated soil from planting areas and replaced with approved planting soil as accepted by COTR. Contractor shall field measure and record all lime treated areas on As Built Drawings showing both depth and areas.
2. Following removal of lime treated material, scarify subgrade to a minimum depth of 6 inches prior to backfilling.
3. Test subgrade in all planting areas for drainage by flooding with 4 inch depth of water puddle and verify complete absorption of standing water within two hours. If standing water is still present after two hours, provide perforated pipe and drain rock

"French Drain" system in bottom of non-draining planters and connect to storm drainage system, as accepted by COTR.

C. Planting Soil Placement:

1. Inspect planting areas and remove all base rock and other foreign material. Verify placement of planting soil within dripline of trees with COTR. Except within tree driplines, rip all planting areas in two directions full depth of compacted fill (to a minimum of 12 inches) into undisturbed native soil prior to backfilling. Scarification of any planting area which cannot be accomplished with a tractor shall be accomplished by an alternative method approved by the COTR to the specified depth to ensure proper percolation/drainage.
2. Prior to placing planting soil secure the COTR's acceptance of the planting areas subgrade condition. Test depth of loose soil with hand shovel in presence of COTR in several locations as directed. After acceptance of the planting areas subgrade condition, uniformly distribute and spread planting soil backfill over scarified subgrade in planting areas as specified and compact to a maximum of 85% relative compaction.
3. Do not work planting soil in a wet or muddy condition or dump or spread in areas where subgrade is not in proper condition.
4. Water settling, puddling, and jetting of fill and backfill materials as a compaction method is not acceptable.
5. Provide a minimum of [ 12" ] depth in planting areas, or more where shown or specified otherwise.

D. All planting areas soil shall be loose and friable prior to planting. Rip any overly compacted and re-compacted planting areas in two directions full depth of compacted soil prior to planting.

E. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.

F. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable as described herein.

G. Drag to a smooth, even surface. Grade to form all swales. Pitch grade with uniform slope to catch basins, streets, curb, etc., to ensure uniform surface drainage. Areas requiring grading include adjacent transition areas that shall be uniformly sloped between finish elevations. Slope surface away from walls so water will not stand against walls or buildings. Control surface water to avoid damage to adjoining properties or to finished work on the site. Take

required remedial measures to prevent erosion of freshly graded areas and until such time as permanent drainage and erosion control features have been installed. Refer to Erosion Control Netting below for treatment of slopes 3:1 and steeper.

- H. Finish Grade: Hold finish grade and/or mulch surface in planting areas 1/2-inch below adjacent pavement surfaces, tops of curbs, manholes, etc. The subgrade of the mulch in mulched planting areas shall be a minus 2 inches for a distance of 12 to 18 inch from the edge of pavement. The remainder of the planting area shall be graded to receive the required 3 inch layer of mulch.
- I. In Situ Soil Preparation:
  - 1. Spread organic amendment, iron and Type A fertilizer evenly over installed and rough graded on-site topsoil in all planting areas including turf, ground cover and shrub areas at the following rates:
    - a. Organic Amendment: 6 cubic yards per 1,000 square feet
    - b. Fertilizer: Type A (6-20-20) at 20 lbs. per 1,000 square feet.
    - c. Iron Sulfate: 10 lbs. per 1,000 square feet
  - 2. In the case of a contradiction between the quantity of organic amendment required by the Contractor-obtained soils laboratory analysis and the specified quantity shown above, the greater of the two quantities shall take precedence.
  - 3. Rototill above additives into soil 6 to 8 inches deep. Keep iron sulfate off pavement and other surfaces to prevent rust staining. Correct all rust damage to work.
  - 4. Planting soil shall have a pH range of 6.5 to 7.5.
- J. After the rototill work, float areas to a smooth, uniform grade as indicated on the drawings. Slope all planting areas to drain. Roll, scarify, rake and level as necessary to obtain true, even planting surfaces. Remove rocks, sticks and debris 1 inch and larger in size in turf areas and 2 inches or larger in shrub and ground cover areas. Secure approval of the grade by the COTR before any planting.

### **3.2 ALUMINUM EDGING**

- A. Install in continuous strips as indicated and in accordance with manufacturer's recommendations with stakes spaced 48 inches on center maximum and at all joints.

### **3.3 TREE AND SHRUB PLANTING**

- A. Mark tree and shrub locations on site using stakes, gypsum or similar approved means and secure location approval by the COTR before plant

holes are dug. Review location of plants in relationship to irrigation heads and adjust location(s) that interfere with the function of the spray heads as accepted by the COTR prior to planting.

- B. Test drainage of plant pits by filling with water (minimum 6"). The retention of water in planting beds and plant pits for more than two (2) hours shall be brought to the attention of the COTR. If rock, underground construction work, tree roots, poor drainage, or other obstructions are encountered in the excavation of plant pits, alternate locations may be selected by COTR.
- C. Excavate tree, shrub and vine pits as follows (Note square Tree Pit pattern required below):
- |                                 |              |              |
|---------------------------------|--------------|--------------|
| 1. <u>Excavation for</u>        | <u>Width</u> | <u>Depth</u> |
| Boxed Trees                     | Box + 24"    | Box depth    |
| Canned Trees (15 gc)            | Can + 18"    | Can depth    |
| Canned Shrubs/Vines (1 or 5 gc) | Can + 12"    | Can depth    |
- D. Break and loosen the sides and bottom of the pit to ensure root penetration and water test hole for drainage as required above.
- E. Backfill plant holes with mix as specified, free from rocks, clods or lumpy material. Backfill native soil free of soil amendments under rootball and foot tamp to prevent settlement. Backfill remainder of the hole with soil mix and place plant tablets or packets (Type B fertilizer) 3 inches below finish grade and 1/2-inch from roots at the following rates:
- |                           |                     |
|---------------------------|---------------------|
| 1. <u>Size</u>            | <u>Rate</u>         |
| 1 gallon can plant packet | - 1 tablet or       |
| 5 gallon can plant        | 3 tablets or packet |
| 15 gallon can plant       | 6 tablets or packet |
| 24-inch box plant packet  | - 6 tablets or      |
| 36-inch box plant packet  | - 8 tablets or      |
- F. Carefully remove and set plants without damaging the rootball. Superficially cut edge roots vertically on three sides. Remove bottom of plant boxes before planting. Remove sides of boxes after positioning the plant and partially backfilling.
- G. Set plants in backfill with top of the rootball 2 inches above finished grade. Backfill remainder of hole and soak thoroughly by jetting with a hose and pipe section. Water backfill until saturated the full depth of the hole.
- H. Build 6" high watering basin berms around trees and shrubs to drain through rootball. Basins are not required around trees in turf areas.



- I. Stake and/or guy trees as detailed and noted herein. Drive stake(s) until solid (at least 12" beyond bottom of rootball) and remove excess stake protruding above top tree tie to prevent rubbing against branches. Avoid driving stakes through rootball. If subgrade does not accept stakes to a stable degree, delete stakes and guy the trees as specified herein and as detailed. Locate tree ties to avoid contact with tree branches. Locate top tie at tree flex point.
- J. Where tree guying is required, Guy Trees using 3 cables with below grade anchors and rubber collars secured with cable clamps.
- K. Remove any soil from top of plant rootballs and secure COTR's approval of rootball height prior to mulching.
- L. After approval of rootball height, install mulch as required below.

#### **3.4 GROUND COVER PLANTING**

- A. Plant in neat, straight, parallel and staggered rows as indicated on plan. Plant first row one-half required ground cover spacing behind adjacent curbs, structures, or other plant bed limits. Plant ground cover to edge of water basins of adjacent trees and shrubs.

#### **3.5 MULCH**

- A. Except where gravel mulch is required, mulch all tree, shrub and ground cover areas with organic mulch to a 3-inch depth, except adjacent to walkways where soil grade is 2 inches below top of pavement, mulch shall be 2 inches deep, and 2-inches deep where planting ground cover plants from flats. Hold bark mulch away from base (trunk) of plant 4" or as directed by the COTR. Individual trees and/or shrubs planted in non-irrigated areas shall, at minimum, receive bark mulch over their watering basin and berm.
- B. Install gravel mulch to a minimum 1-inch depth, or as shown on plan.

#### **3.6 RAISED PLANTER PLANTING**

- A. Planting Soil Placement: Prior to installing planting soil, inspect the waterproofing and drainage installation to verify that it is approved and acceptable to receive the planting soil. Install Raised Planter Base Soil and Raised Planter Topping Mix as specified herein. Install specified Raised Planter Topping Mix as a final 12 inch thick lift in all raised planters to finished grades and contours indicated. Specified Raised Planter Base Soil backfill shall be placed below the 12 inch topping mix.
- B. Before proceeding with the work: Carefully inspect all areas and verify all dimensions and quantities. Immediately inform the COTR of

any discrepancy between the drawings and specifications and actual conditions and secure approval to proceed.

- C. Planting operations shall be performed only during periods when beneficial results can be obtained. When excessive moisture or other unsatisfactory conditions prevail, the work shall be stopped until conditions are satisfactory.
- D. Thoroughly wet down the planting areas to settle the soil and confirm irrigation coverage and operation. Allow soil to dry so as to be workable as described herein.
- E. Provide a smooth, even surface.
- F. Finish Grade: Hold finish grade and/or mulch surface in planting areas 1-inch below adjacent tops of curbs, planter wall, or as shown otherwise on the Drawings.

### **3.7 RAISED PLANTER SOIL BACKFILL REQUIREMENTS**

- A. "Raised Planter Base Soil" is a mixture of 50% specified **Tree & Shrub Planter/Plaster Sand** and 50% specified Lava Rock. Planter Base Soil shall be installed in bottom of raised planters up to minus 12 inches from finish grade.
- B. Except as noted otherwise, "Raised Planter Topping Mix" is a mixture of 70% "Raised Planter Base Soil" and 30% specified nitrolized Fir bark Organic Amendment and fertilizer ingredients listed below. Planter Topping Mix shall be installed only in the top 12 inch layer of raised planters.

### **3.8 RAISED PLANTER TOPPING MIX**

- A. The above Raised Planter Topping Mix shall be delivered to the site in a damp condition and installed immediately to prevent losing the humus due to wind blow. Include the fertilizer ingredients listed below in the Topping Mix:

0.75 pound	Potassium Nitrate 13-0-44
0.5 pound	Calcium Nitrate 15.5-0-0
0.5 pounds	Urea Formaldehyde 38.0 0.
2.5 pounds	Single Superphosphate 0-25-0
4.0 pounds	Calcium Carbonate Lime
4.0 pounds	Kaiser 65 Dolomite
1.0 pounds	Iron Sulfate (min. 20% Fe)

### **3.9 PRE-EMERGENCE WEED KILLER**

- A. Apply pre-emergence weed killer in all areas to receive ground cover planting. Work shall be done under the supervision of a person licensed by the State of California as a pest control applicator and

holding a qualified applicator license or a Qualified Applicator Certificate. Obtain approval of the finish grades prior to applying weed killer and coordinate planting and watering with the pest control specialist prior to planting. Take care to keep weed killer off areas to be seeded.

### **3.10 WATERING**

- A. Water all trees, shrubs and ground cover immediately after planting. Apply water to all plants as often and in sufficient amount as conditions may require to keep the plants in a healthy vigorous growing condition until completion of the Contract. Do supplemental hand watering of trees and shrubs during the first 3 weeks of plant establishment.

### **3.11 PRE-MAINTENANCE PERIOD REVIEW AND APPROVAL OF PLANTING**

- A. Maintain plants from time of delivery to site and continue until the date that the Government accepts the project or phase for beneficial use and occupancy.
- B. Receive approval of the installed planting prior to commencement of planting establishment maintenance period. Notify the COTR a minimum of seven (7) days prior to requested review. Before the review, complete the following:
  - 1. Complete all construction work.
  - 2. Present all planted areas neat and clean with all weeds removed and all plants installed and appearing healthy.
  - 3. Plumb all tree stakes.
  - 4. No partial approvals will be given.

### **3.12 PLANTING ESTABLISHMENT MAINTENANCE PERIOD**

- A. General Requirements:
  - 1. Maintenance Period: The Establishment Period for plants and turf shall begin immediately after installation, with the approval of the COTR, and continue until the date that the Government accepts the project or phase for beneficial use and occupancy. During the Plant and Turf Establishment Period the Contractor shall adhere to all requirements specified herein.
  - 2. Planting establishment maintenance immediately follows, coincides with, and is continuous with the planting operations, and continues through turf installation, and after all planting is complete and accepted; or longer where necessary to establish acceptable stands of thriving plants.
  - 3. Keep all walks and paved areas clean. Keep the site clear of debris resulting from landscape work and maintenance operations.

4. Check sprinkler systems at each watering; adjust coverage and clean and repair non-functioning heads immediately. Adjust timing of sprinkler controller to prevent runoff and flooding.
  5. Maintain adequate moisture depth in soil to ensure vigorous growth, without overwatering. Check rootball of trees and shrubs independent of surrounding soils and hand water as required.
  6. Keep Contract areas free from weeds by cultivating, hoeing or hand pulling. Use of chemical weed killers will not relieve the Contractor of the responsibility of keeping areas free of weeds over 1-inch high at all times.
- B. Plant Protection and Replacement
1. Protect all areas against damage, including erosion, trespass, insects, rodents, deer, disease, etc. and provide proper safeguards, including trapping of rodent and applying protective sprays and fencing to discourage deer browsing. Maintain and keep all temporary barriers erected to prevent trespass.
  2. Repair all damaged planted areas. Replace plants and reseed or resod turf immediately upon discovery of damage or loss, including damage from Deer and Rodents.
- C. Tree, Shrub and Ground Cover Maintenance:
1. Maintain during the entire establishment period by regular watering, cultivating, weeding, repair of stakes and ties, and spraying for insect pests. Prune when requested by the COTR.
  2. Keep watering basins in good condition and weed-free at all times.
  3. Replace all damaged, unhealthy or dead trees, shrubs, vines and ground covers with new stock immediately; size as indicated on the drawings.
- D. Fertilizing:
1. Upon approval and after submitting fertilizer delivery tags, maintenance fertilization shall begin 30 days after planting is complete. Fertilize all turf and ground cover areas by broadcast Type C (21-7-14) fertilizer at the rate of 5 lbs. per 1,000 square feet evenly throughout. Reapply every forty-five (45) days until acceptable.
  2. During the winter, for quick turf greening effect, calcium nitrate (15.5-0-0) may be applied at the rate of 6 lbs. per 1,000 square feet.
  3. Early spring and fall substitute a complete fertilizer such as 15-15-15 applied at the rate of 6 lbs. per 1,000 square feet, to help insure continuing adequate phosphorus and potassium.
  4. Observe plant's color, and if a soil pH imbalance is suspected, take soil samples and obtain laboratory analysis for confirmation.

Take necessary action recommended in laboratory analysis such as top dressing with soil sulfur, leaching soil, etc.

### **3.13 FINAL PLANTING REVIEW AND ACCEPTANCE**

- A. At the conclusion of the Maintenance Period, schedule a final review with the COTR. On such date, all project improvements and all corrective work shall have been completed. If all project improvements and corrective work are not completed, continue the planting establishment, at no additional cost to the Owner, until all work has been completed. This condition will be waived by the COTR under such circumstances wherein the COTR has granted an extension of time to permit the completion of a particular portion of the work beyond the time of completion set forth in the Agreement.
- B. Submit written notice requesting review at least 10 days before the anticipated review.
- C. Prior to review, weed and rake all planted areas, repair plant basins, plumb trees, clear the site of all debris and present in a neat, orderly manner.

### **3.14 RESTORATION AND CLEAN-UP**

- A. Where existing or new turf areas have been damaged or scarred during planting and construction operations, restore disturbed area to their original condition. Keep at least one paved pedestrian access route and one paved vehicular access route to each building clean at all times. In areas where planting has been completed, clear the area of all debris, spoil piles, and containers. Clear all other paved areas when work in adjacent areas is completed. Remove all debris, rubbish and excess material from the station.

### **3.15 ENVIRONMENTAL PROTECTION**

- A. All work and Contractor operations shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

- - - E N D - - -

**SECTION 32 90 10**  
**STRUCTURAL PLANTING SOIL MIX**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Provide structural planting soil mix for trees in paved areas as shown on the drawings and as specified.

**1.2 RELATED DOCUMENTS**

- A. Related work specified elsewhere includes:
1. Section 31 20 00, EARTH MOVING
  2. Section 32 84 00, PLANTING IRRIGATION
  3. Section 32 90 00, PLANTING
  4. Section 33 41 00, SITE CONCRETE PAVING
  5. Section 32 14 12, STONE TILE PAVING
  6. Section 33 41 00, DRAINAGE AND STRUCTURES

**1.3 QUALITY ASSURANCE**

- A. Reference Standards:
1. Manufacturer's recommendations.
  2. 727-0330; or Root Zone Associates, P.O. Box 18911, San Jose, CA 95118; Tel. (408) 264-7024. Testing Agency: Soil and Plant Laboratory, Inc. 352 Matthew Street (P.O. Box 153), Santa Clara, CA 95052; Tel. (408)

**1.4 SUBMITTALS: Section 01 33 00 SHOP DRAWINGS, PRODUCT DATA, AND SUBMITTALS**

- A. Product Data: Manufacturer's current catalog cuts and specifications
- B. Certificates of Compliance for the specified materials
- C. Samples:
1. Submit 1-quart sample with certificate of compliance as noted above
  2. Offsite mixing. Submit sample with certificate of compliance and noted above.
- D. Substitutions:

1. If the Contractor desires to substitute a product, he shall list each item and note it as a "substitution" and provide the following information:
  - a. Descriptive information describing its similarities to the specified product.
  - b. Reason Contractor wants the substitution.
2. If the product is approved and, in the opinion of the COTR, the substituted product does not perform as well as it should, the Contractor shall replace it with the specified product at no additional cost to the Owner.

#### **1.5 PROJECT/SITE CONDITIONS**

- A. Site Visit: At beginning of work, visit and walk the site with the COTR to clarify scope of work and understand existing project/site conditions.

#### **1.6 WARRANTY AND REPLACEMENT**

- A. Warrant all of the work under this section to be free of defects of any kind, whether due to workmanship or materials, for a minimum of one year from the time of completion of the project. This one year warranty does not negate the various manufacturer warranties that are longer than one year.

### **PART 2 - PRODUCTS**

#### **2.1 BASIS OF DESIGN**

- A. The Design of Structural Plant Soil is based on products specified. Subject to compliance with requirements, provide named product or a comparable product.

#### **2.2 STRUCTURAL SOIL MIX ( SSM ) GENERAL**

- A. The Structural Soil Mix ( SSM ) shall be CU Structural Soil University Urban Tree Mix by a licensed supplier, as available from TMT Enterprises, Inc. San Jose, CA, Ph: (408) 432 - 9040, or approved equal

**2.3 TREE PIT BACKFILL PLANTING MIX**

- A. The tree pit backfill planting mix shall be Raised Planter Topping Mix as specified in Section 32 90 00 PLANTING.

**2.4 STRUCTURAL SOIL MIX**

- A. Provide a Structural Soil mix using the components listed below:

1. Clay Loam Soil

- a. Mechanical Analysis of clay loam to be as follows:

Gravel, Less than 1%

Sand, 20-50%

Silt, 20-50%

Clay, 20-40%

- b. Chemical Analysis should meet or be amended to meet the following criteria:

1) pH 5.5-7.5

2) Organic Matter, 2-5% by dry weight.

3) Soluble Salt less than 1.0 Millimho per cm.

- c. Any commercial fertilizers to be added will be of the type and application rates recommended by the soil-testing laboratory based on the type of plant material to be installed in the soil.

2. Crushed Stone

- a. 3/4" to 1-1/2" highly angular crushed granite with no more than 10% passing the 1/2" sieve meeting the following criteria:

2" 100% Passing

1.5" 94% Passing

1" 43% Passing

0.75" 12% Passing

0.50" 7% Passing

0.375" 4% Passing

#4 2% Passing

Specific Gravity=2.78

LA Abrasion Loss < 40%

3. Hydrogel



- a. Hydrogel shall be Gelscape as manufactured by Amereq, Incorporated of New York City, NY. Phone:800-832-8788 or approved equal.

## **2.5 PROPORTIONS OF MATERIALS IN STRUCTURAL SOIL MIX**

A. The proportions of materials shall be as follows:

Crushed Stone	100 units
Clay Loam Soil	20 Units
Gelscape	.03 Units
Water	As needed for soil to adhere to stone.

## **2.6 MIXING OFF SITE**

A. Structural Soil

1. Mechanically mix the sand and loam thoroughly if mixing as necessary to meet the specifications.
2. Saturate the crushed stone aggregate with water and mechanically mix the sandy loam until the particles are completely coated.
3. To avoid soil separation do not transport the structural soil by truck more than 100 miles from the construction job site.
4. When stockpiling the finished mix, cover the pile with a plastic tarp to prevent drying out or soil separation from rain.
5. Install the mix within 48 hours of mixing.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

A. General

1. The paving contractor shall obtain necessary approvals before placing each SSM layer.
2. The paving contractor shall use adequate numbers of skilled workmen who are thoroughly trained in the necessary crafts and are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.
3. The contractor must provide access for and cooperate with the testing laboratory.
4. Adequacy of the final compaction of all elements requiring compaction shall be determined in the field, by the engineer, to achieve the minimum specified compaction level.

B. Preparing Subgrade

1. The subgrade shall be prepared according to the following procedure:
  - a. Remove all organic matter, debris, loose material and large rocks.
  - b. Dig out soft and mucky spots and replace with suitable material.
  - c. Loosen hard spots and uniformly compact the subgrade to 95% of its maximum dry density.

C. Perforated Underdrain System

1. The underdrain system shall be installed as shown.

**3.2 PLACING STRUCTURAL SOIL MIX (SSM) BY PAVING CONTRACTOR**

A. General

1. Adequacy of the final compaction shall be determined in the field by the engineer to achieve 90% of the SSM maximum dry density as reported in laboratory tests according to ASTM D-698. Proctor must be figured mathematically because of aggregate content.
2. The soil inspection tubes and drains shall be installed as specified and structural soil compacted under and around each pipe.
3. The SSM shall be placed in approximately uniform lifts over the entire area of project and compact each lift, including the open tree pit areas. Construction equipment, other than for compaction, shall not operate on the exposed structural soil mix. Over-compaction shall be avoided. No foot or equipment traffic will be allowed on the compacted material until the irrigation system and paving are placed.

**3.3 COMPACTING**

A. Use of portable vibratory plate compacting machine is recommended.

1. Place structural soil mix in horizontal lifts not exceeding 12 inches of compacted depth. Use a minimum of two passes, of not less than 10 seconds per pass, before moving the vibratory plate to the next adjacent location. Additional passes may be required and should be determined in the field by the engineer to insure stability of the layer. Continue placing and compacting 12" lifts until the specified depth is reached.

**3.4 CONCRETE SLAB INSTALLATION**

- A. Stub out irrigation vents and other openings as specified on drawings.
- B. Install the concrete unit pavers per drawings and specifications.
- C. Concrete shall be pumped to place slabs. No vehicles or heavy equipment are permitted on the compacted layer course until paving is completely installed.

**3.5 CONCRETE PLACEMENT**

- A. Concrete can be placed as specified directly on the compacted structural soil after installation of the irrigation system and protective visqueen cloth.

**3.6 TREE PIT PREPARATION BY LANDSCAPE CONTRACTOR**

**A. Tree Pit Excavation**

- 1. The Landscape Contractor shall excavate the tree pit using the following procedure:
  - a. Excavate the structural soil mix to a depth equal to the height of the root ball of the tree to be planted to distance as detailed in drawings.
  - b. Complete and test irrigation system with automatic controller, then place the tree in the pit and backfill as soon as possible, as recommended in section "B". Provide temporary wood form restraint to prevent movement of SSM until trees are planted. No tree pit shall remain excavated for more than 2 hours unless forms are used.

**B. TREE PIT BACKFILL PLANTING MIX**

- 1. Backfill the tree pit by using the following procedure:
  - a. Remove any wooden forms. Immediately place the tree in the pit as detailed and replace the excavated structural soil with the specified backfill planting mix in one foot lifts and tamp until firm.
  - b. Tamp the planting mix in one foot lifts until the pit is filled to the specified grade above the paving.
  - c. Dispose of the excavated structural soil mix. Do not reuse.

- - - E N D - - -



**SECTION 33 41 00**  
**DRAINAGE AND STRUCTURES**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Provide drainage and structures complete, including but not limited to site storm drainage piping, fittings and accessories, and bedding, connection of drainage system to existing system, catch basins, inlets, paved area drainage, site surface drainage miscellaneous valve sleeves, valve keys, cleanouts, trench drains, and manholes.
- B. Related work specified elsewhere includes:
  - 1. Section 31 20 00 EARTH MOVING.
  - 2. Section 32 13 20 SITE CONCRETE.
  - 3. Section 32 14 12 STONE TILE PAVING.

**1.2 QUALITY ASSURANCE**

- A. Perform Work in accordance with these specifications and CalTrans Standard Specifications (herein referred to as the "Standard Specifications").
- B. References
  - 1. CalTrans Standard Specifications.
  - 2. Occupational Safety and Health Administration (OSHA).
  - 3. American Society of Testing and Material requirements (ASTM).
  - 4. Deutsches Institut fur Normung e.V. (German Standards Institute) (DIN):  
DIN 19580 Dec 1988; Surface Water Drainage Channels for Traffic Areas; Classification, Design, Marking, Classes A15 to F900.
  - 5. American Society of Mechanical Engineers (ASME):  
ASME A112.21.1M Floor Drains.

**1.3 SUBMITTALS**

- A. Section 01 33 00 - SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: Provide data indicating pipe, pipe accessories, frames, grates and covers.

**1.4 REGULATORY REQUIREMENTS**

- A. Conform with all applicable laws, codes and regulations required by City of Palo Alto for materials and installation of the Work of this section and submit to the Owner for acceptance.

**1.5 AS BUILT RECORD**

- A. Keep an accurate dimensional record of as-built location and depth all drainage structures installed to be provided to owner at completion of project.

**PART 2 - PRODUCTS****2.1 DRAINAGE PIPE MATERIALS**

- A. Cast Iron and Ductile Iron Pipe and Fittings: Shall conform to ASTM A74, Cast Iron Soil Pipe and Fittings.
- B. Reinforced Concrete Pipe and Pipe Joints: Shall conform to ASTM C76, Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- C. Gaskets and Connectors: Gaskets for joints between manhole sections shall conform to ASTM C443. Resilient connectors for making joints between manhole and pipes entering manhole shall conform to ASTM C923.
- D. Polyvinyl Chloride (PVC) Pipe and pipe joints:
  - 1. Polyvinyl Chloride (PVC) Pipe: PVC pipe and fittings shall meet the extra strength minimum of SDR-35 of the requirements of ASTM Specification D3034. Joints shall be rubber ring for Sanitary Sewer and Storm Drainage Pipe. Manufactured by J-M Manufacturing, Stockton, CA (1-800-621-4404), or approved equal.
    - a. Storm Drain Pipe: Ring-Tite sewer pipe, white color, or approved equal.
- E. Perforated and non-perforated corrugated polyethylene pipe, 3- to 10-inch diameter, shall meet the requirements of ASTM D883 and ASTM F412, and shall conform to Section 68 of the Caltrans Standard Specifications.
  - 1. Corrugated polyethylene pipe fittings shall comply with all requirements of AASHTO M-252-85I for 3- to 10-inch diameter pipe.

Couplings shall be split or snap-on type for perforated pipe and split couplings with gaskets for non-perforated pipe. Cutting pipe with integral couplings will not be allowed.

2. Corrugated polyethylene pipe and fittings manufactured by Advanced Drainage Systems, Inc., shall be considered the standard to determine compliance to this specification.

F. Smooth inner wall non-perforated corrugated polyethylene pipe, 4-inch to 36-inch diameter:

1. Corrugated polyethylene pipe shall have a full circular cross-section, with an outer corrugated pipe wall and an essentially smooth inner wall (waterway) and conform to the AASHTO classification "Type S" and shall fittings shall meet the requirements of ASTM D3350.
2. Corrugated polyethylene pipe and fittings manufactured by Advanced Drainage Systems, Inc., shall be considered the standard to determine compliance to this specification.

## **2.2 ACCESSORIES**

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, and other configurations required.
- B. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Storm Drainage" in large letters.
- C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

## **2.3 CATCH BASINS (INLETS)**

- A. Grate and Frame: Cast iron construction, as indicated on Drawings.
- B. Box Construction: Reinforced precast or cast-in-place concrete sections and base, lipped male/female joints. Cast-in-place concrete shall have a minimum compressive strength of 3,000 psi.

**2.4 SLOT DRAIN**

- A. The slot drain shall be manufactured to meet the following specification,
- B. Top slot Grate/Cover as available by ACO Drain, Brickslot model drain system, or approved equal
  - 1.
    - a. Material: [Galvanized steel] [Stainless steel].
    - b. Length: [39.37 inches (1 m)] [19.69 inches (0.5 m)], [19.69 inches (0.5 m) Access Unit for catch basin].
    - c. Grate slot: 0.375 inches (9.5mm) complies with ADA regulations
    - d. Grate Load Class: Class C250 - 56,200 lb/1162 psi (25,515 kg/8006 kPa) in compliance with DIN 19580.
    - e. Grate Locking System: QuickLok.
  - 2. Polymer Concrete Drain Channel, as available by ACO Drain H100K/K100s system, or approved equal
    - a. Material: Polymer concrete.
    - b. Channels: 4 inches (100 mm) internal width.
    - c. Length: [39.37 inches (1 m) neutral] [19.69 inches (0.5 m) neutral].
    - d. Depth: [3.15 inches (80mm) H80K] [4.0 inches (100mm) H100K]
    - e. Slope: Neutral.
    - f. Metal Edge Rail: [Galvanized steel] [Stainless steel].
    - g. Grate Locking System: QuickLok.
    - h. Channel Load Class: Class E600 - 134,800 lb/2788 psi (61,199 kg/19,209 kPa) in compliance with DIN 19580.
    - i. Outlets: Channel bottom drill-out for [4 inches (100 mm)] schedule 40 pipe.
    - j. Accessories: Closing end cap with 4 inches (100 mm) schedule 40 outlet

**2.5 BEDDING AND COVER MATERIALS**

- A. Bedding: Sand backfill, shall be a granular material naturally produced by the disintegration of rock, passing a No. 4 U.S. Standard sieve and conforming generally to ASTM C33 for fine Aggregate.
- B. Structural Backfill: Import backfill, where required, shall meet the requirements of Section 19 "Earthwork" of the Standard Specifications for structural backfill.

**2.6 SUBSURFACE DRAINAGE ACCESSORIES**

- A. Filter Fabric: Mirafi #140N (800) 869-8905, Synthetic Industries Geotex #451 (800) 621-0444, or approved equal, non-woven polypropylene



filter fabric weighing 4.0 oz. per square yard, treated with UV protection, and conforming with Caltrans Standard Specification Section 88.

## **2.7 PERMEABLE BACKFILL**

- A. Permeable Backfill: Permeable backfill used in subsurface drain installations to be Class 2 permeable material in conformance to Section 68 "Subsurface Drains" of the Standard Specifications.

## **2.8 CLEANOUTS**

- A. Pipe fittings riser and cleanout shall conform to City of Palo Alto Standard Specifications unless otherwise noted in drawings/specs.

## **2.9 AREA DRAINS**

- A. In paved areas, shall be 8" x 8" square, nickel bronze finished adjustable strainer head furnished with vandal proof screws and compatible cast iron drain body, unless otherwise noted.

# **PART 3 - EXECUTION**

## **3.1 TRENCH EXCAVATION**

- A. Obtain any required permits and perform excavation or trench work in accordance with the State of California Department of Industrial Relations, Division of Industrial Safety.
- B. Unless otherwise shown on the drawings, the width of trenches at any point below the top of the pipe shall not be greater than the outside diameter of the pipe plus 16" for pipe diameters 33" or less. Sheeting and bracing, where required, shall be placed within the trench width.
- C. Do not over-excavate. Remove stones necessary to avoid point bearing. Pipes shall be bedded in accordance with backfill herein, and additionally where rock, hardpan or other unyielding foundation material is encountered in trenches at the grade or the bottom of the pipe. The hard unyielding material shall be excavated to a minimum depth of 6" below the bottom of the pipe bell or coupling, and such overdepths shall be backfilled with materials specified, for backfill

and for backfilling the lower portion of trenches, compacted to a relative compaction of not less than 95%.

- D. Unsatisfactory material such as mud, quicksand or other unsuitable materials encountered below the grades shown or specified which are directed or specified to be removed shall be replaced with selected materials and compacted to a relative compaction of not less than 95%
- E. In the event of excavation exceeding the trench width specified, furnish higher strength pipe or other construction methods (i.e., improved bedding), as approved by the Contract Officer's Technical Representative (COTR), to provide for the resultant increased loading. The COTR shall have the right to limit the amount of trench that is opened or partially opened at any one time, and to limit the amount of trench left without backfill at any one time.
- F. All materials, regardless of character and subsurface condition, shall be excavated to the depths indicated or specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins, or shall be separately stockpiled as required. Dispose of excess excavated material or unsalvageable material off of the property.

### 3.2 **EXCAVATION FOR STRUCTURES AND APPURTENANCES**

- A. Excavation for manholes, inlets, valve boxes and similar structures shall be sufficient to provide at least 12" clearance between the outer surfaces and the adjacent earth or timber that may be used to hold and protect the banks. Any over-depth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, selected materials, gravel or concrete, as directed and at the expense of the Contractor. Unsatisfactory material such as mud, quicksand or other unsuitable materials encountered below the grades shown or specified for structure foundations, when directed shall be removed and replaced as specified in Trench Excavation above.

**3.3 SAND BACKFILL**

- A. All pipe shall have sand bedding in accordance with the requirements specified herein.
- B. Compacted Granular Bedding with Tamped Backfill: The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of 1/4 the outside pipe diameter and shall extend to the springline of the pipe. Selected material backfill shall be placed at the remainder of the sides of the pipe and to a minimum depth of 12" over the top of the pipe.

**3.4 INSTALLATION OF PIPE**

- A. Install pipe, fittings, and accessories in accordance with the Standard Specifications and manufacturer's instructions. Seal joints watertight.
- B. Lay pipe to slope gradients noted on Drawings with maximum variation from true slope of 1/1000. Do not displace pipe when compacting.
- C. Connect to municipal storm system, manholes, and catch basins as indicated on Drawings and as required for a complete, operable system.
- D. Install trace wire continuous over top of pipe.

**3.5 SUBSURFACE DRAINS**

- A. Install subsurface drains where indicated on the drawings and backfill with permeable material as specified. Provide not less than 4" of permeable material under pipe. Bell and spigot, and tongue and groove concrete pipe shall be laid without mortar in the joints, and lengths shall be pressed firmly together to prevent infiltration of fine material. Metal pipe and bituminous fiber pipe shall be joined by couplers. Lay all pipe perforations down. Where subsurface drains connect to site drainage or plumbing systems, verify inverts of connections and lay pipe accordingly to drain.

**3.6 INSTALLATION - CATCH BASINS**

- A. Form bottom of excavation clean and smooth to correct elevation.

- B. Form and place cast-in-place concrete base pad, with provision for storm drain pipe end sections.
- C. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.
- D. Establish elevations and pipe inverts for inlets and outlets as indicated on Drawings.
- E. Mount lid and frame level in grout, secured to top section to elevation indicated on the Drawings. Set rim of catch basin 1/8" minimum to 1/4" maximum below surrounding pavement finish surface grade.

### **3.7 INSTALLATION - SLOT DRAIN**

- A. Install Slot Drain as indicated on Drawings and per manufacturer's recommendations.

### **3.8 INSTALLATION - PRECAST TRENCH DRAIN**

- A. Install precast trench drain as indicated on Drawings and per manufacturer's recommendations.

### **3.9 DITCHES AND SWALES**

- A. Construct ditches and swales as detailed and in the areas designated to convey storm water to the storm drainage facilities.

### **3.10 BACKFILLING**

- A. Do not backfill trenches until all required tests are performed and inspections made. Remove sheeting, bracing and shoring. Backfill trench with selected material suitable for the specified compaction. Trenches improperly backfilled shall be reopened to the depth required for proper compaction, then refilled and compacted as specified.
- B. Compact granular material bedding by mechanical tampers to the specified relative compaction. Bedding and backfill materials as applicable shall be carefully compacted below the springline of the pipe, and shall be brought up simultaneously on both sides to the full specified depth so as to obviate any displacement of the pipe from its true alignment. Sand bedding and backfill shall be compacted by

careful jetting to saturation only. No ponding of water above the surface of the sand will be permitted.

- C. Backfilling for Structures: Backfill material, placement and compaction for manholes and similar structures shall conform to the requirements stipulated above for the trench using 6" maximum uniform layers.
- D. Backfilling Walls: Provide a subdrain system behind walls consisting of a 4-inch minimum diameter perforated pipe placed near the base of the wall (perforations placed downward). The pipe shall be bedded and backfilled with Class 2 Permeable Material enclosed in Mirafi 140N or equivalent filter fabric per Caltrans Standard Specifications, and connected to a drainage outlet. The permeable backfill material shall extend to at least within 2 feet of finish grade behind wall. Permeable backfill material shall be covered with a relatively impervious layer of clayey soil to prevent surface water from entering the subdrain system.

### **3.11 RELATIVE COMPACTION**

- A. Compact each layer of bedding material and backfill over and around pipes, and around and adjacent to structures, to 95% relative compaction.
- B. Allow sufficient time to perform the necessary testing to assure that the backfill is being properly compacted. Backfill operations shall be scheduled in such manner as to permit making necessary control tests for each backfill lift prior to the placing of subsequent lifts.

### **3.12 DAMAGE BY LEAKS**

- A. The Contractor shall be responsible for all damage to any part of the premises caused by leaks or breaks in pipes, connections or appurtenances furnished and installed under this Specification for a period of one (1) year after date of acceptance of the project by the Owner.

### **3.13 CLOSING OF UNINSPECTED WORK**

- A. Do not allow any of the work installed to be covered up or enclosed before it has been inspected and approved by the **Owner's**

**Representative.** Any work enclosed or covered before it has been approved or directed to be covered shall be uncovered by the Contractor, at his expense, and replaced as directed.

**3.14 FIELD QUALITY CONTROL**

- A. Request inspection prior to and immediately after placing cover over pipe.
- B. Compaction testing will be performed in accordance with the Standard Specifications.
- C. Exfiltration Test, Deflection Test, and Pressure Test: Test in accordance with Standard Specifications.
- D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

**3.15 CARE AND CLEANING:**

- A. During construction, protect work from damage or displacement by accident or otherwise. Upon completion, repair or replace broken, damaged or defective parts. All work shall be left in a condition satisfactory to the Owner. Remove all surplus materials and debris from the premises.
- B. At completion, flush and clean out installed piping systems as required by local codes.

- - - E N D - - -