

DEPARTMENT OF VETERANS AFFAIRS
NORTH LOOP RD LANDSCAPE IMPROVEMENT
3801 MIRANDA AVE
PALO ALTO, CA 94304

Project No.: 640-16-126

**SECTION 01 00 00
GENERAL REQUIREMENTS**

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1.1 GENERAL INTENTION

- A. Contractor shall completely prepare site for construction operations, and furnish all labor, equipment and materials and perform work for the expansion and modification of the 640-16-126 project, as required by the drawings and specifications.
- B. Office of Facility Planning and Development, 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.
- C. Before placement and installation of work subject to tests by a testing laboratory approved by the COR and retained by the contractor, the Contractor shall notify the Contracting Officer's Representative and the testing laboratory in sufficient time to enable the COR and the testing laboratory personnel to be present at the site in time for proper taking and testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the Contracting Officer's Representative.
- D. All employees of the Contractor and subcontractors shall comply with the VA security management program and obtain permission for site entry from the VA police, be identified by project and employer, and be restricted from unauthorized access.
- E. The Contracting Officer's Representative will assign specific routes and times for pathways, corridors and elevators for transportation of personnel, materials and equipment. The Contractor will continually clean-up any dust, dirt or debris caused by their jobsite Ingress/egress.
- F. Dust and fume control will be exercised during 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 air intake system. Noise will be held to a minimum at all times. Jack-hammering, core drilling and other noisy or disturbing

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operations may have to be rescheduled or accomplished after hours to avoid interfering with surgery or patient care services.

1.2 STATEMENT OF BID ITEM(S)

A. ITEM I, GENERAL CONSTRUCTION: see attached SOW

1.3 SPECIFICATIONS AND DRAWINGS

A. The Contractor shall maintain on the job site one (1) printed set of specifications, one (1) printed set of drawings, one (1) printed copy of all RFI's and any documents that modify the original specifications and drawings.

1.4 ACCIDENT PREVENTION

A. The Contractor shall provide and maintain work environments and procedures which will:

1. Safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;
2. Avoid interruptions of Government operations and delays in project completion dates;
3. Control costs in the performance of this contract; and
4. Maintain a safe and healthy worksite to prevent adverse impacts to Contractor and subcontractor employees.

B. The Contractor shall:

1. Before commencing the work, submit a written Safety Plan for implementing actions to prevent accidents. The plan shall include an analysis of significant hazards to life, limb and property inherent in contract work performance and measures for controlling these hazards and avoiding personnel exposure. Meet with the Contracting Officer's Representative to discuss and develop a mutual understanding relative to administration of the overall safety program and obtain approval for the Contractor's Safety Plan from the Contracting Officer's Representative before work start.

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2. Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 (OSHA); and Title 8, California Administrative Code - Construction Standards (CAL OSHA)
 3. Prior to commencing work, provide proof that an OSHA designated competent person (CP) per 29 CFR 1926.20(b) / 1926.32(f)(2) will maintain a presence at the work site whenever the Contractor or subcontractors are present.
 4. Provide appropriate safety barricades, signs, signal lights and personal protective equipment (hard hats, goggles, protective shoes, gloves, masks or breathing apparatus, etc.).
 5. Ensure all Contractor and subcontractor employees have the 10-hour or 30-hour OSHA Construction Safety course and other relevant competency training, as determined by Contracting Officer's Representative. General Contractor shall maintain at least one person on site at all times who has completed the 30 hours OSHA Construction Safety Course (submittal of 30 hour training certificate required prior to start of work). Submit training records of all such employees for approval before the start of work.
 6. Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for accident protection and safety of personnel are taken.
- C. Whenever the Contracting Officer becomes aware of any noncompliance with safety requirements or any condition which poses a serious or imminent danger to the health or safety of personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.
- D. The Contractor shall insert the above clause with appropriate changes in the designation of the parties in subcontracts.

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1.5 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan (Submittal of Security Plan is required prior to mobilization):

1. The Security Plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
2. The 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. Contractor and subcontractor employees shall not enter the project site without an appropriate badge. They will be subject to inspection of their personal effects when entering or leaving the project site.
2. The Contractor shall create an Employee Daily Log of all personnel working on the site. The Employee Daily Log shall contain the employee's (a) Full Name, (b) Employer/Company Name and (c) Occupation/Trade. The Employee Daily Log shall be submitted with the Contractor's Daily Work Report.
3. Contractor's normal working hours for work shall be 8am to 4pm Monday through Friday excluding federally observed holidays.
 - I. Contractor must observe Federal Holidays with no work allowed on such days. Refer to the OPM website www.opm.gov for the observed Federal Holidays and their dates for the applicable year.
 - a. Contractor must obtain written prior approval by the COR to work outside of defined working hours. This notice is separate from any notices required for utility shutdown described later in this specification.
4. No photography of VA premises is allowed without written permission of the VA Public Affairs Officer.
5. The VA Police are Federal Police Officers with full authority to make arrests, investigate crimes and issue traffic citations. Citations issued require an appearance in the Federal District Court and/or

Comment [SEV1]: Confirm Working Hours

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payment of a fine. Speed limits and other driving and parking codes are strictly enforced. Any vehicle left unattended for more than a few minutes may be cited by the VA Police.

6. 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.
7. Possession or use of non-prescription drugs or alcohol, including beer and wine, on the Health Care System grounds is strictly prohibited. Possession of firearms, knives with blades over 4", ammunition, explosive devices and any item that may be considered an offensive weapon is strictly prohibited. This includes carrying such items in vehicles.
8. The Health Care System does not have the equipment, facilities, or personnel trained to handle serious injuries. Call 911 for emergency medical assistance and notify the Contracting Officer's Representative and the VA Police.
9. Vehicle authorization requests shall be required for any contractor vehicle entering the site and such requests 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.
10. VA reserves the right to shut down the project site and order Contractor's employees and subcontractors off the premises in the event of a national emergency or local disaster. The Contractor may return to the site only with the written approval of the Contracting Officer's Representative.

C. Guards: NOT USED

D. Key Control:

1. The Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Representative for the purpose of security inspections and emergency actions for every area of the project site including tool boxes and parked machines.

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2. The Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation.

E. Document Control:

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

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

1.5 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article.

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

E84-13a.....Surface Burning Characteristics of Building
Materials

2. National Fire Protection Association (NFPA):

NFPA 10.....Standard for Portable Fire Extinguishers

NFPA 30.....Flammable and Combustible Liquids Code

NFPA 51.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

NFPA 70/NEC.....National Electrical Code

NFPA 241.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

29 CFR 1910/1926.....Safety and Health Regulations for Construction

B. Fire Safety Plan (Submittal acceptance by COR of Fire Safety Plan is required prior to mobilization):

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 Contracting Officer's Representative for review for compliance with contract requirements. Prior to any worker for the Contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VA safety guidelines, means of egress, break areas, work hours, locations

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of restrooms, use of VA equipment, etc. Documentation shall be provided to the Contracting Officer's Representative that individuals have undergone Contractor's safety briefings.

- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and fire, police and other emergency response forces in accordance with NFPA 241. In the event of a fire or during a fire drill, the Contractor must vacate the construction site if within the zone affected.
- 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 20 feet exposed overall length, separate by 10 feet.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer's Representative.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily and report findings and corrective actions weekly to Contracting Officer's Representative.
- H. Fire Extinguishers: Provide, maintain and show proof of extinguisher maintenance in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10. Provide minimum of (2) 10 pound fire extinguishers at all times.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Standpipes: Maintain standpipes at each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.
- K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.

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- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection and fire alarm systems except for portions immediately under construction or temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. If a Fire Alarm system or sprinkler system is out of service for more than 4 hours, then the Contractor shall implement Interim Life Safety Measures in accordance with VA Palo Alto Health Care System Memorandum SAFE 13-23. Request interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Contracting Officer's Representative. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the Contracting Officer's Representative.
- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer's Representative.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51. Any welding, cutting metal or other burning or spark producing operations require a hot work permit. Welding and/or burning operations are allowed only during normal working hours. Coordinate with Contracting Officer's Representative to obtain permits from the Facility Safety Officer at least 24 hours in advance. Evidence of training of all personnel assigned to be a fire watch shall be provided before Hot Work Permits will be issued. A fire watch is required for all hot work unless specified differently on the permit. The fire watch shall have fire extinguishing equipment readily available and be trained in its use and 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 then otherwise sound the alarm. A fire watch shall be maintained for at least 30 minutes after completion of hot work.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with and report findings and corrective actions weekly to Contracting Officer's Representative.
- P. Smoking: Smoking is prohibited in all buildings and adjacent construction areas. Smoking is prohibited except in designated smoking areas.

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- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily. Waste and debris will not be disposed of on station or in VA trash containers or dumpsters. The Contractor shall provide their own bin or dumpster; however, the use and location of such must be approved in writing by the Contracting Officer's Representative. Construction waste and debris will not be accumulated in corridors or other building areas where it might cause a fire or safety hazard. Contractor shall provide a 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 per SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT.
- R. Smoke/fire Barrier Penetrations: Any penetrations to smoke or fire barrier walls, ceilings or floor slabs shall be properly sealed immediately with Hilti Fire Stop 601 or 635 for walls and ceilings and Hilti Fire Stop 657 for floor penetrations or approved equal.
- S. Install one-hour temporary construction partitions as shown on drawings or as required to separate the work site from the occupied portion of the building and maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures. 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.
- S. If required, submit documentation to the Contracting Officer's Representative that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

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's Representative. 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

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Contracting Officer's Representative 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 their expense upon completion of the work. With the written consent of the Contracting Officer's Representative, the buildings and utilities may be abandoned and need not be removed.

- C. The Contractor shall, as prescribed by the Contracting Officer's Representative, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer's Representative. 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, code 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 Contracting Officer's Representative.
- E. Workmen are subject to rules of the VA Campus applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of the VA Campus as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others.
 - 1. Do not store materials and equipment in other than assigned areas.
 - 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by the VA in quantities sufficient for not more than two work days. Provide unobstructed access to VA Campus areas required to remain in operation.
- G. Utilities Services: Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing pipes, electrical wires, conduits,

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cables, etc., of utility services, or of fire protection systems or communications systems, they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Contracting Officer's Representative. All such actions shall be coordinated with any Utility Company involved:

- H. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, six-foot minimum height, around the construction area, material storage areas and dumpsters/waste locations. Contractor shall provide and maintain visual screening fabric for all fencing. Contractor shall provide gates as required for access with necessary hardware including hasps and locks. All gates shall be locked when no workers are present. Contractor shall coordinate with the COR to assure VA access at any time. Contractor shall remove the fence when directed by Contracting Officer's Representative.

Contractor shall place all applicable safety signs as required by 29 CFR 1926, securely attached to fence or approved surface. Contractor shall also place construction area signs on the exterior of the construction fence alerting campus and contractor personnel that the fence is enclosing a construction area. Sign shall indicate Construction Area, Authorized Personnel Only, Hard Hats and safety shoes required - Spacing of signs shall not exceed 50' on center, with a minimum of one safety sign on each direction of fence.

- I. Work areas will be vacated by Government and turned over to Contractor after date of Notice to Proceed and all pre-construction activities and submittals have been accepted by the COR.
- J. When a building/ area are turned over to Contractor, Contractor shall accept entire responsibility therefore.
1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
 2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (VA or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

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K. Utilities Services: Maintain existing utility services for the VA Campus at all times.

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 Contracting Officer's Representative. 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 Contracting Officer's Representative prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
2. Contractor shall submit a request to interrupt any such services to Contracting Officer's Representative, in writing, 3 weeks 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 the VA. Interruption time approved by Contracting Officer's Representative may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 30 calendar days prior to the desired time and shall be performed as directed by the Contracting Officer's Representative.
5. In case of a contract construction emergency, service will be interrupted on approval of Contracting Officer's Representative. 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 Contractor.

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- 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 VA Campus traffic, comply with the following:
 - 1. The Contractor shall not block any road or street, walkway or building egress without requesting in writing for approval from the Contracting Officer's Representative. Written requests shall be made at least (14) days prior to proposed interruption. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new work crosses existing roads, at least one lane must be open to traffic at all times.
 - 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Contracting Officer's Representative.
- N. Coordinate this contract with other construction operations as directed by Contracting Officer's Representative. This includes the scheduling of traffic and the use of roadways.

1.7 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Contracting Officer's Representative, of buildings areas in which alterations occur and areas which are anticipated routes of access, and furnish a signed report, to the Contracting Officer's Representative. 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 the building.

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2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
 3. Shall note any discrepancies between drawings and existing conditions at site.
 4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contracting Officer's Representative.
- 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 Contracting Officer's 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 Contracting Officer's Representative together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workmen in executing work of this contract.
- D. Protection: Provide the following protective measures:
1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.

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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. 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 VA'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 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. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Contracting Officer's Representative and Facility ICRA team for review for compliance with contract requirements.
 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. VA Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the Contracting Officer's Representative prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition in patient-care areas:
 1. The Contractor, Contracting Officer's Representative and VA Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in patient-care areas are appropriate for their settings. The requirement for negative air pressure in the

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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. The contractor shall install negative air machines as directed by the Contracting Officer's Representative and shall be required to add machines as directed.

2. In case of a problem - the VA, 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 Contracting Officer's Representative. Blank off ducts and diffusers to prevent circulation of dust into patient-occupied areas during construction.
 2. Do not perform dust producing tasks within patient-occupied areas without the approval of the Contracting Officer's Representative. 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 temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Construct the dust proof barrier with a one hour fire rating. 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 in certain circumstances where hard walls cannot be constructed and an agreement is reached with the Contracting Officer's Representative and VA Fire Protection Specialist.
 - b. HEPA filtration is required. 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

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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. The contractor shall install a state of the art air pressure differential monitor. The monitor shall be placed at such a location that anyone entering or leaving the work site shall be able to determine if negative air pressure is being maintained.
- d. Adhesive Walk-off/Carpet Walk-off Mats, minimum 24" x 36", shall be used at all interior transitions from the construction area to occupied medical center area. A shop vacuum with HEPA filtration shall be placed at any exit from the work site. These shop vacuums shall be used to remove dust that has accumulated on workers clothing while working whenever they leave the work site. The mats shall be changed as directed by the Contracting Officer's Representative to maintain clean work areas directly outside construction area at all times.
- e. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Shop vacuums and vacuum cleaners 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.
- f. The contractor shall not haul debris through patient-care areas without prior approval of the Contracting Officer's Representative. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with tape. No sharp objects should be allowed to cut through the plastic. Wipe down the wheel treads and 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. Wheels and tires shall not track debris on floors outside the work zone.

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- g. 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.
- h. 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 4 hours. Remove and dispose of porous materials that remain damp for more than 24 hours.
- i. 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, vertical shafts and utility chases that have been part of the construction.
- 2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
- 3. All new and existing air ducts shall be cleaned prior to final inspection.

1.9 DISPOSAL AND RETENTION

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

- 1. Reserved items which are to remain property of the Government are noted on drawings or in specifications as items to be stored. Items that remain property of the Government shall be removed from present locations in such a manner as to prevent damage. Store such items where directed by Contracting Officer's Representative.
- 2. Items not reserved shall become property of the Contractor and be removed by Contractor.

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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 VA during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.
4. The Contractor is required to alert the VA immediately in the event any known or suspected hazardous materials are disturbed or will need to be disturbed before proceeding with work. Hazardous materials, such as PCB's, asbestos, lead paint, cleaning solutions and other harmful chemicals shall be disposed of in accordance with federal, state and local laws and regulations. In case of an accidental spill of hazardous materials, the Contractor shall take immediate action to contain the spill and notify the Contracting Officer's Representative. Washing cement, plaster, paint, oil or grease, solvents, etc. into any drains is strictly prohibited. **REPORT ANY ACCIDENTAL SPILLS THAT MAY RUN INTO STORM DRAINS IMMEDIATELY TO ENGINEERING SERVICE AT 650-493-5000 EXTENSION 62468.**

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 as directed by the Contracting Officer's Representative.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party,

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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's Representative may have the necessary work performed and charge the cost to the Contractor.

C. The Contractor shall protect existing trees to remain by placing temporary fencing at the drip line of the trees. Provide 6' high tree protection fencing completely enclosing the tree(s). Avoid driving major fence posts or stakes into major roots.

1. Treatment of roots exposed during construction. For roots over 1 inch in diameter damaged during construction, make a clean straight cut to remove damaged portion of the root. All exposed roots should be temporarily covered with damp burlap and covered with soil or mulch as soon as possible to prevent drying.

2. No equipment or machinery shall be used within the tree protection zone. Work within the protection zone shall be done manually.

3. No stockpiling of materials, vehicular traffic, or storage is allowed within the tree protection zone.

E. 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's Representative may have the necessary work performed and charge the cost to the Contractor.

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 Contracting Officer's Representative. Existing work to be altered or

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extended and that which is found to be defective in any way, shall be reported to the Contracting Officer's Representative 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, computer network, etc.) which are indicated on drawings or reasonably discovered during execution of the work and which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings for which locations are unknown and not reasonably discovered will be considered for 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 PHYSICAL DATA

- A. Data and information (test borings, hydrographic data, test pits, weather conditions, etc.) furnished or referred to is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor. (FAR 52.236-4)

1.13 LAYOUT OF WORK

- A. The Contractor shall lay out the work and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all templates, 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 that

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may be established or indicated by the Contracting Officer's Representative. The Contractor shall also be responsible for maintaining and preserving all marks established by the Contracting Officer's Representative until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer's Representative 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)

1.14 AS-BUILT DRAWINGS

- A. The Contractor shall maintain one full size set 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 Contracting Officer's Representative's review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings to the Contracting Officer's Representative within 15 calendar days after each completed phase and after the acceptance of the project by the Contracting Officer's Representative.

Contractor shall provide all final as-built drawings prepared in CAD software. An electronic copy shall be delivered to the COR in both DWG format and PDF along with the two hard copy sets. Drawing size, style, and fonts shall match construction drawings provided to the contractor by the contracting officer. Coordinate with COR for allowable version of DWG files.

1.15 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on the VA Campus and, when authorized by the Contracting Officer's Representative, 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 transitions.

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1.16 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to compliance with the following provisions:
1. Permission to use each unit or system must be given by Contracting Officer's Representative. If the equipment is not installed and maintained in accordance with the following provisions, the Contracting Officer's Representative 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 use 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. Boilers, pumps, feedwater heaters and auxiliary equipment must be

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operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.

- 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.

1.17 EXCLUSIVE TEMPORARY USE OF EXISTING ELEVATORS

- A. Exclusive use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
 - 1. Contractor shall coordinate all arrangements with the Contracting Officer's Representative for use of elevators. The Contracting Officer's Representative will ascertain that elevators are in proper condition. Personnel for operating elevators will not be provided by the VA.
 - 2. Contractor covers and provides maximum protection of following elevator components:
 - a. Entrance jambs, heads soffits and threshold plates.
 - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c. Finish flooring.
 - 3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes.
 - 4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced with new brake lining.

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5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer's Representative.

1.18 TEMPORARY TOILETS

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

1.19 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. If applicable, 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's Representative, shall install and maintain all necessary temporary connections and distribution lines, transformers and electrical panels, 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 equipment at contractor's own expense.
- C. Contractor shall install meters at Contractor's expense and furnish the Contracting Officer's Representative a monthly record of the Contractor's usage of electricity as required.

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- 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:
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the VA Campus electrical distribution system where practical. 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.
 2. Where Campus power is not practical or available for project power requirements, contractor shall provide portable power generators at contractor's own expense.
- F. Water (for Construction and Testing): Furnish temporary water service.
1. Obtain water by connecting to the VA Campus 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 Contracting Officer's Representative's discretion) of use of water from VA Campus system at no cost.
 3. Provide drinking water for construction personnel at all times.
- G. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished or reimbursed by the Contractor at Contractor's expense.

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1.20 NEW TELEPHONE EQUIPMENT

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

1.21 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 the Contracting Officer's Representative. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests, and re-tests as required.
- 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 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.

1.22 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 (two copies each plus pdf file) for each separate piece of equipment shall be delivered to the Contracting Officer's Representative 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 manufacturer representatives to give detailed instructions to assigned VA 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 Contracting Officer's Representative and shall be considered concluded only when the Contracting Officer's Representative is satisfied in regard to complete and thorough coverage.

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The VA reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Contracting Officer's Representative, does not demonstrate sufficient qualifications in accordance with requirements for the above.

1.23 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 building.
- 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 building.
- D. Notify Contracting Officer's Representative 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 the Contracting Officer's Representative. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Contracting Officer's 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 Contracting Officer's Representative.
- 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.

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- 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.

1.24 RELOCATED EQUIPMENT ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Contracting Officer's Representative.
- C. 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.

1.25 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the Contracting Officer's Representative. All wood members shall be of framing lumber. Cover sign frame with 24 gage galvanized sheet steel nailed securely around edges and on all bearings. Provide three 4 inch by 4 inch posts or equivalent round posts set four feet into ground. Set bottom of sign level at three feet above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with two by four inch material. Minimum sign size shall be 48"x48".
- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the Contracting Officer's Representative.
- D. Provide detailed drawing of proposed construction sign showing required legend and other characteristics of sign for approval by the Contracting

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Officer's Representative - COR can provide examples of previously approved signs.

1.26 SAFETY SIGN

- A. Provide a Safety Sign where directed by Contracting Officer's Representative. Face of sign shall be 3/4 inch thick exterior grade plywood. Provide two four by four inch posts extending full height of sign and three feet into ground. Set bottom of sign level at four feet above ground. Minimum sign size shall be 48"x48".
- 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 and approved by Contracting Officer's Representative.
- C. Maintain sign and remove it when directed by Contracting Officer's Representative.
- D. Provide detailed drawing of proposed sign showing required legend and other characteristics of sign for approval by the Contracting Officer's Representative - COR can provide examples of previously approved signs.
- E. Post the number of accident free days on a daily basis.

1.27 PHOTOGRAPHIC DOCUMENTATION

- A. Contractor to provide digital photographic exhibit of existing site and work performed. Digital color photos shall be taken from a digital camera with a minimum of 7.0 megapixels. Photos shall be transmitted to the COR by DVD in jpeg or tiff, and PDF formats. Each photo's electronic file size shall be a minimum of 300k with a maximum file size of 1.5meg.
- B. Photos shall document all phases of construction and shall be updated weekly until the project has been completed. Photos shall be submitted each month along with the project invoice for monthly payment.

1.28 FINAL ELEVATION DIGITAL IMAGES - NOT USED

1.29 HISTORIC PRESERVATION

- A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible

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archeological, historical and/or cultural resources, the Contractor shall immediately notify the Contracting Officer's Representative verbally, and then with a written follow up.

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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, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by COR on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, COR 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. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer 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. The transmittal letter shall contain the list of items, Project Name, 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, Product Data shall be marked to indicate specific items submitted for approval.
1. The transmittal letter must be enclosed with submittals and submittals received without transmittal 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 Project, 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.
- 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. Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
- Identification: Attach label on unexposed side of Samples that includes the following:
1. Generic description of Sample.
 2. Product name and name of manufacturer.
 3. Sample source.
 4. Number and title of applicable Specification Section.
 5. Specification paragraph number and generic name of each item.

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. Sample sets may be used to determine final acceptance of construction associated with each se. 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 building location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to COR.
- 1.11 Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
5. Submit product schedule in the following format: PDF electronic file.

1.12 Processing Time:

1. Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on COR's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
2. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. COR will advise Contractor when a submittal being processed must be delayed for coordination.
3. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
4. Resubmittal Review: Allow 10 business days for review of each resubmittal.
5. Sequential Review: Where sequential review of submittals by consultants, Owner, or other parties is indicated, allow 15 business days for initial review of each submittal.

1.13 Electronic Submittals - Not allowed for samples:

1. Identify and incorporate information in each electronic submittal file as follows:
2. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
3. Name file with submittal number or other unique identifier, including revision identifier.
4. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect-Engineer.

5. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or another electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number[, numbered consecutively].
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
6. Metadata: Include the following information as keywords in the electronic submittal file metadata:
 - a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.

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SECTION 01 42 19
REFERENCE STANDARDS

PART 1 - GENERAL

1.1 DESCRIPTION

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

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

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

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

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

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

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

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

AA	Aluminum Association Inc. http://www.aluminum.org
AAMA	American Architectural Manufacturer's Association http://www.aamanet.org
AAN	American Nursery and Landscape Association http://www.anla.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
AGC	Associated General Contractors of America http://www.agc.org
AISC	American Institute of Steel Construction http://www.aisc.org
AISI	American Iron and Steel Institute http://www.steel.org
ANLA	American Nursery & Landscape Association http://www.anla.org
ANSI	American National Standards Institute, Inc. http://www.ansi.org
ASCE	American Society of Civil Engineers http://www.asce.org
ASME	American Society of Mechanical Engineers http://www.asme.org
ASSE	American Society of Sanitary Engineering http://www.asse-plumbing.org
ASTM	American Society for Testing and Materials http://www.astm.org
AWS	American Welding Society http://www.aws.org

AWWA	American Water Works Association http://www.awwa.org
BHMA	Builders Hardware Manufacturers Association http://www.buildershardware.com
CISPI	Cast Iron Soil Pipe Institute http://www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute http://www.chainlinkinfo.org
CPMB	Concrete Plant Manufacturers Bureau http://www.cpmc.org
CRSI	Concrete Reinforcing Steel Institute http://www.crsi.org
DHI	Door and Hardware Institute http://www.dhi.org
EEI	Edison Electric Institute http://www.eei.org
EPA	Environmental Protection Agency http://www.epa.gov
ETL	ETL Testing Laboratories, Inc. http://www.etl.com
FM	Factory Mutual Insurance http://www.fmglobal.com
ICBO	International Conference of Building Officials http://www.icbo.org
ICEA	Insulated Cable Engineers Association Inc. http://www.icea.net
IEEE	Institute of Electrical and Electronics Engineers http://www.ieee.org
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry Inc. http://www.mss-hq.com
NAAMM	National Association of Architectural Metal Manufacturers http://www.naamm.org
NBS	National Bureau of Standards See - NIST
NEC	National Electric Code See - NFPA National Fire Protection Association

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

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

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

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

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

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

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

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

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

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

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

IBC The International Building Code
See ICBO

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

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SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory approved by the COR and retained by the contractor.

1.2 APPLICABLE PUBLICATIONS:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

D3666-11.....Standard Specification for Minimum Requirements
for Agencies Testing and Inspecting Road and
Paving Materials

E94-04 (2010).....Standard Guide for Radiographic Examination

E164-08.....Standard Practice for Contact Ultrasonic Testing
of Weldments

E329-11c.....Standard Specification for Agencies Engaged in
Construction Inspection, Testing, or Special
Inspection

E543-09.....Standard Specification for Agencies Performing
Non-Destructive Testing

D. American Welding Society (AWS):

D1.D1.1M-10.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory's scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications.

Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific laboratory performing the actual testing, not just the "Corporate Office."

B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Contracting Officer's Representative. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Contracting Officer's Representative to such failure.

C. Written Reports: Testing laboratory shall submit test reports to Contracting Officer's Representative, Contractor, unless other arrangements are agreed to in writing by the Contracting Officer's Representative. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to Contracting Officer's Representative immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SITE WORK CONCRETE:

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

3.3 CONCRETE:

A. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m³ (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. After good concrete quality control has been established and maintained as determined by Contracting Officer's Representative make three cylinders for each 80 m³ (100 cubic yards) or less of each concrete type, and at least three cylinders from 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 m³ (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m³ (100 cubic yards) at random. For

- pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
 7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
 8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
 9. Verify that specified mixing has been accomplished.
 10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
 11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
 12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
 13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
 14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
 15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.

16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
 17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
 18. Other inspections:
 - a. Grouting under base plates.
 - b. Grouting anchor bolts and reinforcing steel in hardened concrete.
- B. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Contracting Officer's Representative. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
 2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
 3. Furnish certified compression test reports (duplicate) Contracting Officer's Representative. 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. Weather conditions during placing.
 - f. Temperature of concrete in each test cylinder when test cylinder was molded.
 - g. Maximum and minimum ambient temperature during placing.
 - h. Ambient temperature when concrete sample in test cylinder was taken.
 - i. Date delivered to laboratory and date tested.

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

EP-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.

DEPARTMENT OF VETERANS AFFAIRS
NORTH LOOP RD LANDSCAPE IMPROVEMENT
3801 MIRANDA AVE
PALO ALTO, CA 94304

Project No.: 640-16-126

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.

EP-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.

EP-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

EP-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 COR 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.

EP-5. PROTECTION OF ENVIRONMENTAL RESOURCES

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

B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Resident Engineer. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
 - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local (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.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
- 5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features required by the latest edition of the Best Management Practices Handbook of the California Stormwater Quality Association (CASQA). Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
 - 6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
 - 7. Manage and control spoil areas on Government property to limit spoil to areas on the Environmental Protection Plan and prevent erosion of soil or sediment from entering nearby water courses or lakes.
 - 8. Protect adjacent areas from despoilment by temporary excavations and embankments.
 - 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
 - 10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
 - 11. Handle discarded materials other than those included in the solid waste category as directed by the Resident Engineer.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to

control water pollution by the listed construction activities that are included in this contract.

1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of California 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.

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3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the COR. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00p.m unless otherwise permitted by local ordinance or the Resident Engineer. Repetitive impact noise on the property shall not exceed the following dB limitations:

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

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:
 - a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75
TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS, STATIONARY	80	PNEUMATIC TOOLS	80
PUMPS	75	BLASTING	//--//
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.
- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Resident Engineer. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.
- C. 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.
- D. 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.
- E. At a minimum the following waste categories shall be diverted from landfills:
 - 1. Soil.
 - 2. Inerts (eg, concrete, masonry and asphalt).
 - 3. Clean dimensional wood and palette wood.
 - 4. Green waste (biodegradable landscaping materials).
 - 5. Engineered wood products (plywood, particle board and I-joists, etc).
 - 6. Metal products (eg, steel, wire, beverage containers, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 10. Carpet and/or pad.

11. Gypsum board.
12. Insulation.
13. Paint.

1.2 RELATED WORK

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

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
 1. Excess or unusable construction materials.
 2. Packaging used for construction products.
 3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to reuse and recycle new materials to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling,

reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.

- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.

- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 - 1. Procedures to be used for debris management.
 - 2. Techniques to be used to minimize waste generation.
 - 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 - 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.

- d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- B. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- C. 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 including weight tickets, manifests, and invoices.

1.6 APPLICABLE PUBLICATIONS

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.

- A. 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.

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SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK:

- A. Safety Requirements: GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- E. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.8, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. 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.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
1. No wall or part of wall shall be permitted to fall outwardly from structures.
 2. 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.
 3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.8 INFECTION PREVENTION MEASURES.

PART 2 - EXECUTION

2.1 DEMOLITION:

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
1. As required for installation of project requirements.
 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition

site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- E. When Utility lines are encountered that are not indicated on the drawings, the COR shall be notified prior to further work in that area.

2.2 CLEAN-UP:

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to COR. Clean-up shall include off the Medical Center disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

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SECTION 03 30 53
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies cast-in-place structural concrete and material and mixes for other concrete.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.3 TOLERANCES:

- A. ACI 117.
- B. Slab Finishes: ACI 117, F-number method in accordance with ASTM E1155.

1.4 REGULATORY REQUIREMENTS:

- A. ACI SP-66 ACI Detailing Manual
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Concrete Mix Design.
- C. Shop Drawings: Reinforcing steel: Complete shop drawings.
- D. Manufacturer's Certificates: Air-entraining admixture, chemical admixtures, curing compounds.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Concrete Institute (ACI):
 - 117-10.....Specification for Tolerances for Concrete Construction, Materials and Commentary
 - 211.1-91 (R2009).....Standard Practice for Proportions for Normal, Heavyweight, and Mass Concrete
 - 301-10.....Specifications for Structural Concrete
 - 305.1-06.....Specification for Hot Weather Concreting
 - 306.1-90 (R2002).....Standard Specification for Cold Weather Concreting
 - SP-66-04ACI Detailing Manual

- 318-11.....Building Code Requirements for Structural
Concrete and Commentary
- 347-04.....Guide to Formwork for Concrete
- C. American Society for Testing And Materials (ASTM):
- A185/A185M-07.....Standard Specification for Steel Welded Wire
Reinforcement, Plain, for Concrete Reinforcement
- A615/A615M-09.....Standard Specification for Deformed and Plain
Carbon Steel Bars for Concrete Reinforcement
- A996/A996M-09.....Standard Specification for Rail Steel and Axle
Steel Deformed Bars for Concrete Reinforcement
- C31/C31M-10.....Standard Practice for Making and Curing Concrete
Test Specimens in the Field
- C33/C33M-11a.....Standard Specification for Concrete Aggregates
- C39/C39M-12.....Standard Test Method for Compressive Strength of
Cylindrical Concrete Specimens
- C94/C94M-12.....Standard Specification for Ready Mixed Concrete
- C143/C143M-10.....Standard Test Method for Slump of Hydraulic
Cement Concrete
- C150-11.....Standard Specification for Portland Cement
- C171-07.....Standard Specification for Sheet Material for
Curing Concrete
- C172-10.....Standard Practice for Sampling Freshly Mixed
Concrete
- C173-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Volumetric Method
- C192/C192M-07.....Standard Practice for Making and Curing Concrete
Test Specimens in the Laboratory
- C231-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method
- C260-10.....Standard Specification for Air-Entraining
Admixtures for Concrete
- C330-09.....Standard Specification for Lightweight
Aggregates for Structural Concrete
- C494/C494M-11.....Standard Specification for Chemical Admixtures
for Concrete
- C618-12.....Standard Specification for Coal Fly Ash and Raw
or Calcined Natural Pozzolan for Use in Concrete
- D1751-04 (R2008)Standard Specification for Preformed Expansion
Joint Fillers for Concrete Paving and Structural

Construction (Non-extruding and Resilient
Bituminous Types)

D4397-10.....Standard Specification for Polyethylene Sheeting
for Construction, Industrial and Agricultural
Applications

E1155-96(2008).....Standard Test Method for Determining F_F Floor
Flatness and F_L Floor Levelness Numbers

PART 2 - PRODUCTS

2.1 FORMS:

Wood, plywood, metal, or other materials, approved by Contracting
Officer's Representative, of grade or type suitable to obtain type of
finish specified.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150, Type I or II.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional
requirements relating to reactive aggregates and alkalis, and loss on
ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33, Size 67. Size 467 may be used for footings
and walls over 300 mm (12 inches) thick. Coarse aggregate for applied
topping and metal pan stair fill shall be Size 7.
- D. Fine Aggregate: ASTM C33.
- E. Mixing Water: Fresh, clean, and potable.
- F. Air-Entraining Admixture: ASTM C260.
- G. Chemical Admixtures: ASTM C494.
- H. Vapor Barrier: ASTM D4397, 0.25 mm (10 mil).
- I. Reinforcing Steel: ASTM A615 or ASTM A996, deformed, grade 60.
- J. Welded Wire Fabric: ASTM A185.
- K. Expansion Joint Filler: ASTM D1751.
- L. Sheet Materials for Curing Concrete: ASTM C171.
- M. Liquid Hardener and Dustproofer: Fluosilicate solution or magnesium
fluosilicate or zinc fluosilicate. Magnesium and zinc may be used
separately or in combination as recommended by manufacturer.
- N. Liquid Densifier/Sealer: 100 percent active colorless aqueous silicate
solution.
- O. Grout, Non-Shrinking: Premixed ferrous or non-ferrous, mixed and applied
in accordance with manufacturer's recommendations. Grout shall show no
settlement or vertical drying shrinkage at 3 days or thereafter based on
initial measurement made at time of placement, and produce a compressive

strength of at least 18mpa (2500 psi) at 3 days and 35mpa (5000 psi) at 28 days.

2.3 CONCRETE MIXES:

- A. Design of concrete mixes using materials specified shall be the responsibility of the Contractor as set forth under Option C of ASTM C94.
- B. Compressive strength at 28 days shall be not less than 3000 psi.
- C. Establish strength of concrete by testing prior to beginning concreting operation. Test consists of average of three cylinders made and cured in accordance with ASTM C192 and tested in accordance with ASTM C39.
- D. Maximum slump for vibrated concrete is 100 mm (4 inches) tested in accordance with ASTM C143.
- E. Cement and water factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete: Strength	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio
25 (3000) ^{1,3}	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.
 - 2. For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
 - 3. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.
- F. Air-entrainment is required for all exterior concrete and as required for Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS. Air content shall conform with the following table:

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

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

2.4 BATCHING & MIXING:

- A. Store, batch, and mix materials as specified in ASTM C94.
 - 1. Job-Mixed: Concrete 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.

PART 3 - EXECUTION

3.1 FORMWORK:

- A. Installation conform to ACI 347. Sufficiently tight to hold concrete without leakage, sufficiently braced to withstand vibration of concrete, and to carry, without appreciable deflection, all dead and live loads to which they may be subjected.
- B. Treating and Wetting: Treat or wet contact forms as follows:
 - 1. Coat plywood and board forms with non-staining form sealer. In hot weather cool forms by wetting with cool water just before concrete is placed.
 - 2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather cool metal forms by thoroughly wetting with water just before placing concrete.
 - 3. Use sealer on reused plywood forms as specified for new material.
- C. Inserts, sleeves, and similar items: Flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges and other items specified as furnished under this and other sections of specifications and required to be in their final position at time

concrete is placed shall be properly located, accurately positioned and built into construction, and maintained securely in place.

D. Construction Tolerances:

1. Contractor is responsible for setting and maintaining concrete formwork to assure erection of completed work within tolerances specified to accommodate installation or other rough and finish materials. Remedial work necessary for correcting excessive tolerances is the responsibility of the Contractor. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 REINFORCEMENT:

Details of concrete reinforcement, unless otherwise shown, in accordance with ACI 318 and ACI SP-66. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

3.3 PLACING CONCRETE:

- A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval of COR before placing concrete. Provide screeds at required elevations for concrete slabs.
- B. Before placing new concrete on or against concrete which has set, existing surfaces shall be roughened and cleaned free from all laitance, foreign matter, and loose particles.
- C. Convey concrete from mixer to final place of deposit by method which will prevent segregation or loss of ingredients. Do not deposit in work concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Vibration shall be carried on continuously with placing of concrete.

- D. Hot weather placing of concrete: Follow recommendations of ACI 305R to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete.
- E. Cold weather placing of concrete: Follow recommendations of ACI 306R, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly, except that use of calcium chloride shall not be permitted without written approval from Resident Engineer.

3.4 PROTECTION AND CURING:

Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical injury, and excessively hot or cold temperature. Curing method shall be subject to approval by Resident Engineer.

3.5 FORM REMOVAL:

Forms remain in place until concrete has a sufficient strength to carry its own weight and loads supported. Removal of forms at any time is the Contractor's sole responsibility.

3.6 SURFACE PREPARATION:

Immediately after forms have been removed and work has been examined and approved by COR, remove loose materials, and patch all stone pockets, surface honeycomb, or similar deficiencies with cement mortar made with 1 part portland cement and 2 to 3 parts sand.

3.7 FINISHES:

1. Floating: Allow water brought to surface by float used for rough finishing to evaporate before surface is again floated or troweled. Do not sprinkle dry cement on surface to absorb water.
2. Float Finish: Ramps, stair treads, and platforms, both interior and exterior, equipment pads, and slabs to receive non-cementitious materials, except as specified, shall be screened and floated to a smooth dense finish. After first floating, while surface is still soft, surfaces shall be checked for alignment using a straightedge or template. Correct high spots by cutting down with a trowel or similar tool and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat the slab to a uniform sandy texture.

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3. Broom Finish: Finish all exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after the surfaces have been floated.

- - - E N D - - -

Section 32 01 93
Tree and Plant Protection

PART 1 - General

1.1 Description

- A. The work in this Section consists of:
- i. Protection of existing trees, landscaping and irrigation systems to remain, and maintenance of the existing trees and plants in healthy growing condition.
 - ii. Restoration and repair of all existing trees, landscaping, and irrigation systems damaged as result of the Contractor's work, activities, equipment, materials and personnel.

1.2 Related Work

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
- B. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROL
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT
- D. Section 02 41 00, DEMOLITION
- E. Division 31, Earthwork
- F. Division 32, Exterior Improvements

1.3 DEFINITIONS

- A. Certified Arborist: An arborist certified by the International Society of Arboriculture (ISA). The tree care and maintenance work specified in this Section shall be performed by or under the supervision of a Certified Arborist. The Certified Arborist shall be supplied at the expense of the Contractor
- B. Project Arborist: An arborist certified by the International Society of Arboriculture (ISA), who is responsible for assessing the existing trees and their needs, and supervising the implementation of the tree protection measures, mitigations and maintenance work for this Project. The Project Arborist shall be supplied at the expense of the Contractor.
- C. Drip Line: The outer edge of the tree canopy.
- D. Existing Tree: Any tree growing on the VA property and not planted under this contract.
- E. Injury: Is without limitations, any bruising, scarring, tearing, or breaking of roots, branches, or trunk of a tree, or direct effects of heat, drought, chemicals, and root compaction.
- F. Tree Protection Zone: The Tree Protection Zone is defined for each species. Species tolerance to construction impacts and the tree's age determine the radius of the Tree Protection Zone. The Tree Protection Zone shall be defined by the Project Arborist or the Contracting Officer's Representative, or a distance of one-foot radial distance from the trunk for each one-inch of trunk diameter

measured at 54 inches above nature grade and/or to the drip line of the tree, whichever is the greater distance.

1.4 REFERENCE, CODES AND STANDARDS

- A. The Contractor shall comply with all Federal, state and local standards and regulations, as well as Organization of Safety Health Agency (OSHA) and Environmental Protection Agency (EPA) regulations, throughout the duration of the Project.
- B. The Contractor shall procure all permits, licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the provisions of services.
- C. All tree work shall be in accordance with contract specifications and the latest edition of the following:
 - i. Natural pruning guidelines from U.C. Extension publications
 - ii. Arboriculture by Harris, Matheny & Clark
 - iii. National Arborist Association Standards and other industry standard publications, including:
 - a. ANSI A300 - Standard Practices for Tree Care Operations, including referenced Combined Federal Regulations (Utility Pruning and Emergency Service Restoration)
 - b. ANSI Z133.1 - Safety Requirements for Arboricultural Operations
 - iv. International Society of Arboriculture, Best Management Practices (BMP)

1.5 Quality Assurance

- A. The Contractor shall be directly responsible for protection and welfare of all existing trees within the Project site that are noted to remain, and all existing trees outside of the Project site which may be damaged by the Contractor's work, activities, equipment, materials and personnel. This responsibility shall continue until the entire Project is completed and accepted by the VA and through maintenance period.
- B. All tree care and maintenance work shall be performed by or under the supervision of a Certified Arborist (Arborist).
- C. Only recognized and approved methods, techniques and standards for tree care shall be used. All tree work shall be performed in accordance with the contract specifications and the standards and publications per Article 1.4.C.
- D. Pre-construction Conference: Conduct conference at the Project site with Contracting Officer's Representative.

1.6 Submittals

- A. Submit in accordance with Section 01 33 23, Shop Drawing, Product Data, and Samples.
- B. Submit Qualification Data for approval before work is started:
 - i. ISA certification of Certified Arborist who will be performing or supervising the tree removal and protection.

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- C. If pesticides and chemicals are to be used, submit the labels, and Material Safety Data Sheets (MSDS) of pesticide and chemicals, and a copy of their license authorizing the Contractor to apply pesticide and chemicals to maintain a healthy planting. The pesticides and chemicals must be approved prior to their use on the VA property.

1.7 Maintenance Period

- A. The maintenance period for the existing trees and plants shall be concurrent with the landscape maintenance period for the new planting and irrigation system of the Project. If the Project does not include a landscape maintenance period, then the maintenance period for the existing trees and plants shall be through the date of the Project's Final Acceptance.
- B. Maintenance shall be performed in accordance with Article 3.14 of this Section.

1.8 Repairs

- A. Any damage to existing tree trunks, or to limbs or roots over 2-inch in diameter shall be immediately reported in writing to the Contracting Officer's Representative, and at the direction of the Contracting Officer's Representative, repaired immediately by the Contractor.
- B. The Arborist shall direct repair and any necessary maintenance treatments of trees damaged by construction operations. Repairs shall be made promptly after damage occurs to prevent progressive deterioration of damaged trees.
- C. Do not remove damaged tree limbs or trees which have died as a result of injury without the written permission of the Contracting Officer's Representative.
- D. Repair shrubs, turf and other plant materials damaged by the Contractor's work in a manner acceptable to the Contracting Officer's Representative.
 - i. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged plant. Remove and replace all dead and damaged plant up to six inches diameter that are determined by the Contracting Officer's Representative as being incapable of restoration to normal growth pattern.
- E. Repair or replace damaged irrigation components and/or systems to the satisfaction of the Contracting Officer's Representative where damage is attributable to the Contractor's work. Cost of repairs or replacements shall be at Contractor's expense.

PART 2 - PRODUCTS

2.1 Tree Protection Fencing

- A. Mesh construction fencing, 5 to 6 feet high, orange color. Mount mesh fabric on galvanized steel or iron posts, driven to the ground to a depth of at least 2 feet at no more than 10 feet on center. Secure mesh fabric to posts with #14 gauge wires.

2.2 Organic Mulch (Wood Chips)

- A. Fir tree or pine tree bark mulch, natural color, 1 to 2 inch in size.

2.3 Accessory Materials

- A. As determined by the Contactor as necessary for sustaining the health of the trees and plants, subject to acceptance by Contracting Officer's Representative. Accessory materials may include tree and plant stakes, temporary barriers, temporary irrigation and covers.

PART 3 - EXECUTION

3.1 Preparation

- A. The Contractor shall comply with all applicable laws, codes and regulation required by authorities having jurisdiction over the work. The Contractor shall immediately notify the Contracting Officer's Representative in writing where the Contract Documents or instructions conflict with applicable laws, codes and regulations. Do not proceed with affected work without written directions from the Contracting Officer's Representative.
- B. The Contractor shall become acquainted with all site conditions and take necessary precautions to protect the site conditions and improvements to remain. Damage caused by the Contractor shall be repaired to its original conditions or equal replacement shall be done to the satisfaction of the Contracting Officer's Representative. Should utilities, grade changes, or other conditions not shown on the Contract Documents be found within the Tree Protection Zone during the course of the Project, report to the Contracting Officer's Representative in writing, and obtain instructions prior to proceeding with the work affected.
- C. The Contractor shall field verify all dimensions, grades, and coordinates, which affect existing trees and plants. Report discrepancies to the Contracting Officer's Representative in writing, and obtain instructions prior to proceeding with the work affected.

3.2 Pre-construction Conference

- A. It shall be the responsibility of the Contractor to call for a meeting at the Project site with the Contracting Officer's Representative. Meeting attendees shall include the Contractor, Contracting Officer's Representative. The meeting shall occur prior to the start of construction of any nature within the protection zone of the trees.
- B. The purpose of the meeting shall be to:
 - i. Confirm the limits of the protection zone of all existing trees to remain
 - ii. Confirm what work is to occur near the trees and discuss mitigation of the potential impacts on the trees to be preserved if necessary.

3.3 TREE PROTECTION FENCING

- A. Tree protection fencing shall be erected and approved by the Contracting Officer's Representative, at least 24 hours before the start of construction.
- B. Fencing at a height of 5 or 6 feet shall be installed either at the edge of the Tree Protection Zone or at the edge of the construction zone if the construction protrudes into the Tree Protection Zone.
- C. The Contractor shall maintain the tree protection fencing and prohibit all access into the fenced areas by construction personnel and equipment. All fencing shall remain until Project completion, and it shall then be removed only as directed by the Contracting Officer's Representative.
- D. During the course of construction, Contractor shall relocate the fence if required to facilitate construction only after notifying the Contracting Officer's Representative, to avoid compaction or other injury of tree roots.
- E. The Contractor shall protect the fencing and be responsible for any damage incurred to the fencings requiring replacement or reinstallation.
- F. Activities prohibited in the fenced area are described in Article 3.4.C of this Section.

3.4 TREE PROTECTION

- A. Take all necessary precautions to protect the existing trees to remain against damage from construction operations. Protection shall be given to the roots, trunk, limbs and foliage of all existing trees, and the soil within the Tree Protection Zone of the tree.
- B. Approval by the Contracting Officer's Representative to work within the Tree Protection Zone shall not waive the Contractor's responsibility for complying with the requirements of this Section. Special protection to prevent compaction of tree roots or other damages shall be implemented.
- C. The following activities are NOT permitted within the Tree Protection Zone of an existing tree, except as otherwise specified in this Section.
 - i. Construction traffic - heavy equipment, vehicles, construction personnel
 - ii. Parking of vehicles
 - iii. Storage of construction equipment, building materials, refuse, and excavated materials.
 - iv. Skinning and bruising of bark.
 - v. Use of tree as temporary support post, power pole, or signpost; anchorage for ropes, guy wires or power lines or other similar functions.
 - vi. Dumping of poisonous or hazardous materials on and around trees and roots. Such materials include, but are not limited to, paint, petroleum products, concrete or stucco

- mix, contaminated water, herbicides and other materials that may be harmful to tree health.
 - vii. Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, and other miscellaneous excavation without prior written approve by the Contracting Officer's Representative.
 - viii. Damage to trunk, limbs, or foliage caused by maneuvering vehicles or storing material or equipment too close to the tree.
 - ix. Compaction of the root area by movement of trucks, equipment outriggers, or grading machines, storage of equipment, materials or tools; stockpiling or gravel or soil; or erection of temporary structures.
 - x. Excessive water or heat from equipment or construction under or near shrubs or trees.
 - xi. Alternation of existing site surface drainage patterns within the area of the drip line, except as shown on the Contract Documents or as approved in writing by the Contracting Officer's Representative.
 - xii. Use of herbicide, within the Tree Protection Zone, without prior written approval by the Contracting Officer's Representative.
- D. All necessary measures shall be taken to maintain healthy living conditions for existing trees to be preserved. Such measures are permitted or required in the Tree Protection Zone and shall include, but not limited to, the following.
- i. Dust Control. During periods of extended drought, wind or grading, spray wash trunk, limbs and foliage to remove accumulated construction dust and other detrimental materials.
 - ii. Mulching. During construction, wood chips shall be spread within the Tree Protection Zone to a 4 to 6 inch depth, leaving the trunk clear of mulch, to help inadvertent compaction and moisture loss from occurring. The mulch may be removed if improvements or other landscaping is required.
 - iii. Root buffer. When areas under the tree canopy cannot be fenced, a temporary buffer of mulch, gravel and plywood is required and shall cover the root zone and remain in place at the specified thickness until final grading stage.
 - iv. Irrigation. Irrigate trees as necessary to maintain their health before, during and after the construction work under the Contract, as directed by the Arborist.
 - a. Irrigate to wet the soil within the Tree Protection Zone to a depth of 24 to 30 inches. The soil should not be oversaturated.

- b. Duration of irrigation shall be until Project completion and through the post-construction maintenance period. Quantities and lengths of watering time are variable and shall depend upon seasonal rainfall. Irrigation recommendations shall be specified by the Project Arborist.
 - c. If the soil within the Tree Protection Zone of the tree is compacted, then prior to watering or fertilizing trees, rototill the area within the Tree Protection Zone of the tree to loosely break up the top two (2) inches of existing soil.
 - E. If a tree is adjacent to or in the immediate proximity to a grade slope of 8% (23 degrees) or more, approved erosion control or silt barriers shall be install outside the Tree Protection Zone to prevent siltation and/or erosion within the zone.

3.5 Demolition and Site Clearing

- A. The Contracting Officer's Representative shall review any tree removal work within 50 feet of a Tree Protection Zone. The removal of trees adjacent to protected trees shall follow the following tree removal practices.
 - i. Tree Removal. Removal of trees that extend into the branches or roots of protected trees shall not be attempted by demolition or construction personnel, grading or other heavy equipment. A Certified Arborist shall perform the work or supervise the removal by qualified tree worker. The tree shall be removed carefully in a manner that causes no damage above or below ground to the trees that remain. Excavation equipment shall operate from outside the Tree Protection Zone.
 - ii. Stump Removal. Before performing stump extraction, the Contractor shall determine whether or not roots may be entangled with the trees that are to remain. If so, these stumps shall have their roots severed before extracting the stump.
 - a. Removal shall include the grinding of stumps and roots to a minimum depth of 18 inches, exposing the soil beneath stump to provide drainage. If dug below 30 inches, compact the backfill to prevent settling.
 - b. Large surface roots that are 3 feet from the outside circumference shall be removed, including the spoils, and backfilled with approved topsoil to grade. The area shall be tamped to settle the soil.
- B. Removal of existing pavement over tree roots in the Tree Protection Zone shall include the following precautions.
 - i. Break hardscape into manageable pieces with a jackhammer or pick, and hand load the pieces onto a loader. The loader must remain on undisturbed pavements or off exposed roots.

- ii. Do not remove based rock that has been exploited by established absorbing roots.
- iii. Apply wood chips over the exposed areas within one hour, then wet the chips and base rock, and keep moist until overlay surface is applied.
- C. Excavation equipment shall operate from the outside of the Tree Protection Zone.
- D. All shrub and groundcover removal should be performed with hand equipment when within a Tree Protection Zone.

3.6 Grading Limitation within the Tree Protection Zone

- A. Grade changes outside of the Tree Protection Zone shall not significantly alter drainage to the tree.
- B. Grade changes within the Tree Protection Zone are not permitted, except as shown on the Contract Documents or as approved in writing by the Contracting Officer's Representative.
- C. Grade changes under specifically approved circumstances shall not allow more than 6 inches of fill soil added or allow more than 4 inches of existing soil to be removed from natural grade unless otherwise mitigated.

3.7 Trenching and Excavation within the Tree Protection Zone

- A. Trenching and excavation shall not occur within the Tree Protection Zone without the written approval of the Contracting Officer's Representative. Excavation within the drip line of trees for new utilities may occur only when there is no other alternative for realignment or relocation of the utilities, and only with the Contracting Officer's Representative's written approval.
- B. Roots Severance
 - i. Roots 2 inches or greater shall remain injury free. Smaller roots that interfere with installation of new work may be cut.
 - ii. Any roots 1 inch in diameter or larger requiring removal shall be cut cleanly to sound tissue. Tree roots shall be cut with a saw or tooth grinding wheel rather than broken as in typical backhoe trenching, to minimize root wrenching.
 - iii. Moisten roots and surrounding soil and cover with a 4 to 6 inches mulch layer to prevent desiccation.
 - iv. Cut and exposed roots shall not be allowed to dry out before permanent backfill is placed.
 - a. Temporary earth cover shall be provided or roots shall be placed with wet peat moss or four layers of wet untreated burlap, and temporary supported and protected from damage until permanently covered with back fill.
 - b. The cover over the roots shall be wetted to the point of saturation runoff daily.
- C. Excavation

- i. Any approved excavation, demolition or extraction of materials shall be performed with equipment sitting outside of the Tree Protection Zone.
- ii. Methods permitted are by hand digging, hydraulic or pneumatic air excavation technology.
- iii. If excavation or trenching for utilities, drainage and irrigation lines, it is the responsibility of the Contractor to tunnel under any roots that are 2 inches in diameter or greater.
- iv. Prior to excavation, grading or trenching within the Tree Protection Zone, cleanly sever the roots that are 1 foot outside the Tree Protection Zone to the depth of the future excavation. The trench must be hand dug and roots pruned with a saw, sawzall, narrow trencher with sharp blades or other approved root pruning equipment.

D. Tunneling and Directional Drilling

- i. Approved trenching or pipe installation within the Tree Protection Zone shall be either cut by hand, air-spade, hydraulic vac-on excavation or by mechanically boring the tunneling under the roots with a horizontal directional drill or hydraulic or pneumatic air excavation technology. In all cases, install utility pipe immediately, backfill with soil and soak within the same day.
- ii. Recommended trenching or boring distances are as follows.

Tree Diameter Measured at 54 Inches Above Grade	Minimum Distance for Trench / Boring from face of Trunk in Any Distance
9 inches or less	6 to 9 feet
10 to 14 inches	10 to 14 feet
15 to 19 inches	15 to 19 feet
Greater than 19 inches	20 feet +

- iii. Recommended depths of tunneling are as follows.

Tree Diameter Measured at 54 Inches Above Grade	Depth of Tunneling
9 inches or less	2.5 feet
10 to 14 inches	3.0 feet
15 to 19 inches	3.5 feet
Greater than 19 inches	4.0 feet

E. Backfilling

- i. Approved excavations shall be carefully backfilled with uncontaminated soil approved the Contracting Officer's Representative for backfilling at each location.
- ii. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.
- iii. Jet backfill when trench has been backfilled to half its depth and again when fully backfilled, making certain no air pockets exist around the roots.

- iv. Tamp backfill carefully using hand tools. Refill and re-tamp as necessary to offset settlement. Do not use mechanical equipment to compact backfill.

3.8 Heavy Equipment

- A. Use of backhoes, steel tread tractors or any heavy vehicles within the Tree Protection Zone is prohibited, unless approved by the Contracting Officer's Representative.
- B. If such activities are allowed, a protective buffer shall be installed by the Contractor.
 - i. The protective buffer shall consist of a base course of 2 inch wood chips, spread over the root area to a minimum of 6 inch depth, layered by $\frac{3}{4}$ inch quarry gravel to stabilize $\frac{3}{4}$ inch thick plywood sheets on top.
 - ii. The protection buffer within the Tree Protection Zone shall be maintained through the entire construction process.

3.9 Soil Compaction Mitigation

- A. If inadvertent compaction of the upper 12 inch of soil horizon within the Tree Protection Zone has occurred within the Tree Protection Zone, the soil shall be loosened by one or more of the following methods to promote favorable root conditions: vertical mulching, radial trenching, soil fracturing or other methods recommended by the Arborist and approved by the Contracting Officer's Representative.
 - i. Vertical Mulching. Auger holes 2 to 4 inch diameter, 2 to 3 feet deep, on 4 foot centers, and backfilled with porous materials such as perlite, vermiculite or volcanic rock.
 - ii. Radial Trenching. Excavate with an air excavator, a soil trench 3 to 6 inches wide and a minimum of 12 inches deep from approximately 3 feet from the trunk out to the drip line area. The trenches shall radiate out from one foot apart at the closest point.
 - iii. Soil Fracturing. Loosen soil in the Tree Protection Zone with a pneumatic air-driven device.

3.10 Cutting and Trimming

- A. No trees shall be cut or fell without the written permission of the Contracting Officer's Representative. Trees which are cut without the Contracting Officer's Representative's permission or are damaged shall be repaired or replaced with comparable material at the Contractor's expense per Article 1.8 of this Section.
- B. The Certified Arborist shall identify and direct the removal of branches from trees and large shrubs where necessary to accommodate new construction or access to the Project site.
- C. The Certified Arborist shall identify and direct correctional pruning and cabling of trees, if required to clear new construction, and tree root pruning work.

- D. The cutting and pruning of existing trees to remain shall be performed according to the Certified Arborist's written instructions and with written approval by Contracting Officer's Representative.
- E. A Certified Arborist shall supervise or perform the pruning and tree work.
- F. The Contractor shall remove from the VA property all dead and damaged trees, as determined by the Contracting Officer's Representative, that are incapable of restoration to normal growth pattern.

3.11 Damage to Trees

- A. Any damage or injury to trees shall be reported within 6 hours to the Contracting Officer's Representative so that mitigation can take place. These include mechanical or chemical injury to branches, trunk or to roots over 2 inches in diameter.
- B. In the event of injury, the following measures shall apply:
 - i. Root Injury. If trenches are cut and tree roots 2 inches or larger are encountered, they must be cleanly cut back to a sound wood lateral root. The end of the root shall immediately be protected from drying. All exposed root area shall be backfilled or covered within one hour.
 - ii. Bark or Trunk Wounding. Current bark tracing and treatment methods shall be performed by a qualified tree care specialist within 2 days.
 - iii. Scaffold Branch or Leaf Canopy Injury. Remove broken or torn branches back to an appropriate branch capable of resuming terminal growth within 5 days. Tree limb pruning shall be performed by a qualified tree care specialist

3.12 Landscape Protection

- A. Protect and avoid damage to shrubs, groundcover, turf and other plant materials that are to remain. The Contractor shall restore damaged shrubs, turf, and other plant materials to original condition per Article 1.8 of this Section.
- B. Take necessary precautions to protect existing irrigation systems. Contractor shall repair or replace damaged irrigation systems or components to original condition per Article 1.8 of this Section.

3.13 Clean Up

- A. Clear all areas of debris and spoil piles.
- B. Remove all debris, rubbish and excess materials from the VA property when the work of this Section has been completed or at such other times as may be directed by the Contracting Officer's Representative.

3.14 Maintenance Period

- A. The maintenance period for the existing trees and plants shall be concurrent with the landscape maintenance period for the new planting and irrigation system of the Project. If the Project does not have a landscape maintenance period, then the maintenance period

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for the existing trees and plants shall be through the date of the Project Final Acceptance.

B. During the maintenance period, the Contractor shall:

- i. Continue the necessary measures to maintain healthy living conditions for the existing trees in accordance with Article 3.4.D of this Section. Performed the additional measures as directed by the Contracting Officer's Representative.
- ii. Complete the required mitigation measures addressing soil compaction and tree injuries in accordance with Articles 3.9 and 3.11 of this Section. Perform the additional measures as directed by the Contracting Officer's Representative.
- iii. Perform pruning, trimming and thinning as needed to improve the health and structure of the existing trees per the directions of the Arborist.

C. At the end of the maintenance period, the Contractor shall schedule a final review with the Contracting Officer's Representative for the acceptance of the Project

- i. The Contractor shall be responsible for notifying the Contracting Officer's Representative 48 hours in advance for the review at the end of the maintenance period.
- ii. If the mitigation and pruning work is incomplete, continue tree maintenance, at no additional cost to the VA, until all work has been completed.

END OF SECTION

SECTION 31 20 00
EARTHWORK

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. Filling and backfilling.
 4. Grading.
 5. Soil Disposal.
 6. Clean Up.

1.2 DEFINITIONS:

- A. Unsuitable Materials:
1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 75 mm (3 inches); organic material, including silts, which are unstable; and inorganic materials, including silts, too wet to be stable and any material with a liquid limit and plasticity index exceeding 40 and 15 respectively. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction, as defined by ASTM D1557.
 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 design requirements, excavate to acceptable strata subject to Contracting Officer's Representative's approval.
- B. Building Earthwork: Earthwork operations required in area enclosed by a line located 1500 mm (5 feet) outside of principal building perimeter. It also includes earthwork required for auxiliary structures and buildings.
- C. Trench Earthwork: Trenchwork required for utility lines.
- D. Site Earthwork: Earthwork operations required in area outside of a line located 1500 mm (5 feet) outside of principal building perimeter and within new construction area with exceptions noted above.

- E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This percentage of maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1556, ASTM D2167, and ASTM D6938.
- 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 Contracting Officer's Representative. 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 Contracting Officer's Representative based on the determination by the Government's soils testing agency that unsuitable bearing materials are encountered at required sub-grade elevations. Removal of unsuitable material and its replacement as directed will be paid on basis of Conditions of the Contract relative to changes in work.
- J. Subgrade: The undisturbed earth or the compacted soil layer immediately below granular sub-base, drainage fill, or topsoil materials.
- K. Structure: Buildings, foundations, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- L. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- M. Drainage course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- N. Bedding course: Layer placed over the excavated sub-grade in a trench before laying pipe. Bedding course shall extend up to the springline of the pipe.
- O. Sub-base Course: Layer placed between the sub-grade and base course for asphalt paving or layer placed between the sub-grade and a concrete pavement or walk.
- P. Utilities include on-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

- Q. Debris: Debris includes all materials located within the designated work area not covered in the other definitions and shall include but not be limited to items like vehicles, equipment, appliances, building materials or remains thereof, tires, any solid or liquid chemicals or products stored or found in containers or spilled on the ground.
- R. Contaminated soils: Soil that contains contaminants as defined and determined by the Contracting Officer's Representative or the Government's testing agency.

1.3 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Safety requirements: Section 00 72 00, GENERAL CONDITIONS, Article, ACCIDENT PREVENTION.
- C. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.
- E. Erosion Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, and Section 32 90 00, PLANTING.

1.4 CLASSIFICATION OF EXCAVATION:

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

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Furnish to Contracting Officer's Representative:
 - 1. Contactor shall furnish resumes with all personnel involved in the project including Project Manager, Superintendent, and on-site Engineer. Project Manager and Superintendent should have at least 3 years of experience on projects of similar size.
 - 2. Soil samples.
 - a. Classification in accordance with ASTM D2487 for each on-site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - b. Laboratory compaction curve in accordance with ASTM D1557 for each on site or borrow soil material proposed for fill, backfill, engineered fill, or structural fill.
 - c. Test reports for compliance with ASTM D2940 requirements for subbase material.

- d. Pre-excavation photographs and videotape in the vicinity of the existing structures to document existing site features, including surfaces finishes, cracks, or other structural blemishes that might be misconstrued as damage caused by earthwork operations.
 - e. The Contractor shall submit a scale plan daily that defines the location, limits, and depths of the area excavated.
3. Contractor shall submit procedure and location for disposal of unused satisfactory material. Proposed source of borrow material.
- Notification of encountering rock in the project. Advance notice on the opening of excavation or borrow areas. Advance notice on shoulder construction for rigid pavements.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Association of State Highway and Transportation Officials (AASHTO):
 - T99-10.....Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop
 - T180-10.....Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop
- C. American Society for Testing and Materials (ASTM):
 - C33-03.....Concrete Aggregate
 - D448-08.....Standard Classification for Sizes of Aggregate for Road and Bridge Construction
 - D698-07e1.....Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft. lbf/ft³ (600 kN m/m³))
 - D1140-00.....Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
 - D1556-07.....Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method
 - D1557-09.....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2700 kN m/m³))

- D2167-08.....Standard Test Method for Density and Unit Weight
of Soil in Place by the Rubber Balloon Method
- D2487-11.....Standard Classification of Soils for Engineering
Purposes (Unified Soil Classification System)
- D2940-09.....Standard Specifications for Graded Aggregate
Material for Bases or Subbases for Highways or
Airports
- D6938-10.....Standard Test Method for In-Place Density and
Water Content of Soil and Soil-Aggregate by
Nuclear Methods (Shallow Depth)
- D. Society of Automotive Engineers (SAE):
- J732-07.....Specification Definitions - Loaders
- J1179-08.....Hydraulic Excavator and Backhoe Digging Forces

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. General: Provide borrow soil material when sufficient satisfactory soil materials are not available from excavations.
- B. Fills: Material in compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups; free of rock or gravel larger than 75 mm (3 inches) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. Material approved from on site or off site sources having a minimum dry density of 1760 kg/m³ (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 slab, - granular fill shall consist of clean, poorly graded crushed rock, crushed gravel, or uncrushed gravel placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below. Fine aggregate grading shall conform to ASTM C 33 with a maximum of 3 percent by weight passing ASTM D 1140, 75 micrometers (No. 200) sieve.
 2. Bedding for sanitary and storm sewer pipe, crushed stone or gravel graded from 13 mm (1/2 inch) to 4.75 mm (No 4), per ASTM D2940.
- G. Buried Warning and Identification Tape: Polyethylene plastic with metallic core warning tape manufactured specifically for warning and identification of buried utility lines. Provide tape on rolls, 3 inch minimum width, color coded as specific below for the intended utility with warning and identification imprinted in bold black letters continuously over the entire tape length. Warning and identification to read, "CAUTION, BURIED (intended service) LINE BELOW" or similar wording. Color and printing shall be permanent, Unaffected by moisture or soil. Warning tape color codes:
- | | |
|---------|------------------------------------|
| Red: | Electric |
| Yellow: | Gas, Oil, Dangerous Materials |
| Orange: | Telephone and Other Communications |
| Blue: | Water Systems |
| Green: | Sewer Systems |
| White: | Steam Systems |
| Gray: | Compressed Air |
- H. Warning Tape for Metallic Piping: Acid and alkali-resistant polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of tape shall be 0.076 mm (0.003 inch). Tape shall have a minimum strength of 10.3 MPa (1500 psi) lengthwise, and 8.6 MPa (1250 psi) crosswise, with a maximum 350 percent elongation.
- I. Detectable Warning Tape for Non-Metallic Piping: Polyethylene plastic tape conforming to the width, color, and printing requirements specified above. Minimum thickness of the tape shall be 0.102 mm (0.004 inch). Tape shall have a minimum strength of 10.3 MPa (1500 psi) lengthwise and 8.6 MPa (1250 psi) crosswise. Tape shall be manufactured with integral wires, foil backing, or other means of enabling detection by a metal detector when tape is buried up to 0.9 m (3 feet) deep. Encase metallic

element of the tape in a protective jacket or provide with other means of corrosion protection.

- J. Detection Wire For Non-Metallic Piping: Detection wire shall be Insulated single strand, solid copper with a minimum of 12 AWG.

PART 3 - EXECUTION

3.1 SITE PREPARATION:

- A. Clearing: Clear within limits of earthwork operations as shown. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstructions. Remove materials from Medical Center.
- B. Grubbing: Remove stumps and roots 75 mm (3 inch) and larger diameter. Undisturbed sound stumps, roots up to 75 mm (3 inch) diameter, and nonperishable solid objects a minimum of 900 mm (3 feet) below subgrade or finished embankment may be left.
- C. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 4500 mm (15 feet) of new construction and 2250 mm (7.5 feet) of utility lines when removal is approved in advance by Contracting Officer's Representative. Remove materials from Medical Center. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in construction area. Immediately repair damage to existing trees and shrubs by trimming, cleaning and painting damaged areas, including roots, in accordance with standard industry horticultural practice for the geographic area and plant species. Do not store building materials closer to trees and shrubs, that are to remain, than farthest extension of their limbs.
- D. Stripping Topsoil: Strip topsoil from within limits of earthwork operations as specified. Topsoil shall be a fertile, friable, natural topsoil of loamy character and characteristic of locality. Topsoil shall be capable of growing healthy horticultural crops of grasses. Stockpile topsoil and protect as directed by Contracting Officer's Representative. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar foreign materials larger than 0.014 m³ (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.

- 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 Medical Center.
- 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 elevations indicated on plans are from a site survey that measured spot elevations and subsequently generated existing contours and spot elevations. Contractor is responsible to notify Contracting Officer's Representative of any differences between existing elevations shown on plans and those encountered on site by Surveyor/Engineer described above. Notify Contracting Officer's Representative 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. 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 Contracting Officer's Representative. Groundwater flowing toward or into excavations shall be controlled to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. French drains, sumps, ditches or trenches will not be permitted within 0.9 m (3 feet) of the foundation of any structure, except with specific written approval, and after specific contractual provisions for restoration of the foundation area have been made. Control measures shall be taken by the time the excavation reaches the water level in order to maintain the integrity of the in situ material. While the excavation is open, the water level shall be maintained continuously, at least one foot below the working level.

- B. 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 Contracting Officer's Representative.
- C. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; 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 for installing services and other construction, complying with OSHA requirements, and for inspections. Remove subgrade materials that are determined by Contracting Officer's Representative 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 Contracting Officer's Representative, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL

CONDITIONS as applicable. Adjustments to be based on volume in cut section only.

1. Site Grading:

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

3.3 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 pipes coming in contact with backfill have been installed and work inspected and approved by Contracting Officer's Representative.
- B. Placing: Place materials in horizontal layers not exceeding 200 mm (8 inches) in loose depth for material compacted by heavy compaction equipment, and not more than 100 mm (4 inches) in loose depth for material compacted by hand-operated tampers and then compacted. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. Place no material on surfaces that are muddy, frozen, or contain frost.
- C. Compaction: Compact with approved tamping rollers, sheepsfoot rollers, pneumatic tired rollers, steel wheeled rollers, vibrator compactors, or other approved equipment (hand or mechanized) well suited to soil being compacted. Do not operate mechanized vibratory compaction equipment within 3000 mm (10 feet) of new or existing building walls without prior approval of Contracting Officer's Representative. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Backfill adjacent to any and all types of structures shall be placed and compacted to at least 90 percent laboratory maximum density for cohesive

materials or 95 percent laboratory maximum density for cohesionless materials to prevent wedging action or eccentric loading upon or against the structure. 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 paved areas, scarify and recompact top 300 mm (12 inches) of existing subgrade and each layer of backfill or fill material in accordance with ASTM D1557 Method A 95 percent.
- b. Landscaped areas, top 400 mm (16 inches), ASTM D1557 Method A 85 percent.
- c. Landscaped areas, below 400 mm (16 inches) of finished grade, ASTM D1557 Method A 90 percent.

2. Natural Ground (Cut or Existing)

- a. Under paved areas, top 150 mm (6 inches), ASTM D1557 Method A 95 percent.

D. Borrow Material: Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from approved private sources. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

E. Opening and Drainage of Excavation and Borrow Pits: The Contractor shall notify the Contracting Officer's Representative sufficiently in advance of the opening of any excavation or borrow pit to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, borrow pits and other excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. Borrow pits shall be neatly trimmed and drained after the excavation is completed. The Contractor shall ensure that excavation of any area, operation of borrow pits, or dumping of

spoil material results in minimum detrimental effects on natural environmental conditions.

3.4 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. Finish subgrade in a condition acceptable to Contracting Officer's Representative 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.
- C. Grading for Paved Areas: Provide final grades for both subgrade and base course to +/- 6 mm (0.25 inches) of indicated grades.

3.5 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 Medical Center property.
- B. Place excess excavated materials suitable for fill and/or backfill on site where directed.
- C. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.
- D. Segregate all excavated contaminated soil designated by the Contracting Officer's Representative 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.

3.6 PLACE 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 Medical Center.

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

SECTION 32 05 23
CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

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 on the Drawings. Construction shall include the following:
- B. Miscellaneous Storm Drainage Structures.

1.2 RELATED WORK

- A. Section 00 72 00, GENERAL CONDITIONS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- C. Section 01 45 29, TESTING LABORATORY SERVICES.
- D. Section 03 30 00, CAST-IN-PLACE CONCRETE.
- E. Section 31 20 00, EARTHWORK.
- F. All Sections listed in the Table of Contents are a condition of this Section.

1.3 DESIGN REQUIREMENTS

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

1.4 WEATHER LIMITATIONS

- A. Hot Weather: Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by COR.
- B. Cold Weather: Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by COR.

1.5 SELECT SUBBASE MATERIAL JOB-MIX

The Contractor shall retain a testing laboratory to design a select subbase material mixture and submit a job-mix formula to the COR, 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. Cost of the testing laboratory to be included in the Contractor's cost of project.

1.6 SUBMITTALS

Contractor shall submit the following.

- A. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified.
 - 1. Reinforcement
 - 2. Curing materials
- B. Concrete Mix Design.
- C. Concrete Test Reports
- D. Construction Staking Notes from Surveyor.
- E. 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.

1.7 APPLICABLE PUBLICATIONS

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.

- A. American Association of State Highway and Transportation Officials (AASHTO):
 - M147-65-UL.....Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses (R 2004)
 - M148-05-UL.....Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309)
 - M171-05-UL.....Sheet Materials for Curing Concrete (ASTM C171)
 - M182-05-UL.....Burlap Cloth Made from Jute or Kenaf and Cotton Mats
- B. American Society for Testing and Materials (ASTM):
 - A82/A82M-07.....Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - A185/185M-07.....Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - A615/A615M-12.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

A653/A653M-11.....Standard Specification for Steel Sheet, Zinc
Coated (Galvanized) or Zinc Iron Alloy Coated
(Galvannealed) by the Hot Dip Process

A706/A706M-09b.....Standard Specification for Low Alloy Steel
Deformed and Plain Bars for Concrete
Reinforcement

A767/A767M-09.....Standard Specification for Zinc Coated
(Galvanized) Steel Bars for Concrete
Reinforcement

A775/A775M-07b.....Standard Specification for Epoxy Coated
Reinforcing Steel Bars

A820/A820M-11.....Standard Specification for Steel Fibers for
Fiber Reinforced Concrete

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

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

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

C94/C94M-12.....Standard Specification for Ready Mixed Concrete

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

C150/C150M-12.....Standard Specification for Portland Cement

C171-07.....Standard Specification for Sheet Materials for
Curing Concrete

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

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

C192/C192M-07.....Standard Practice for Making and Curing Concrete
Test Specimens in the Laboratory

C231/C231M-10.....Standard Test Method for Air Content of Freshly
Mixed Concrete by the Pressure Method

C260/C260M-10a.....Standard Specification for Air Entraining
Admixtures for Concrete

C309-11.....Standard Specification for Liquid Membrane
Forming Compounds for Curing Concrete

C494/C494M-12.....Standard Specification for Chemical Admixtures
for Concrete

C618-12.....Standard Specification for Coal Fly Ash and Raw
 or Calcined Natural Pozzolan for Use in Concrete
 C666/C666M-03(2008).....Standard Test Method for Resistance of Concrete
 to Rapid Freezing and Thawing
 D1751-04(2008).....Standard Specification for Preformed Expansion
 Joint Filler for Concrete Paving and Structural
 Construction (Non-extruding and Resilient
 Bituminous Types)
 D4263-83(2012).....Standard Test Method for Indicating Moisture in
 Concrete by the Plastic Sheet Method.
 D4397-10.....Standard Specification for Polyethylene Sheeting
 for Construction, Industrial and Agricultural
 Applications

PART 2 - PRODUCTS

2.1 GENERAL

- A. Concrete Type C: Concrete shall be as per Table 1 - Concrete Type, air entrained.

TABLE I - CONCRETE TYPE

	Concrete Strength		Air-Entrained	
	Min. 28 Day Comp. Str. Psi (MPa)	Min. Cement lbs/c. yd (kg/m ³)	Min. Cement lbs/c. yd (kg/m ³)	Max. Water Cement Ratio
Type C	3000 (25) ^{1,3}	470 (280)	490 (290)	0.55

- If trial mixes are used, the proposed mix design shall achieve a compressive strength 1200 psi (8.3 MPa) in excess of the compressed strength. For concrete strengths above 5000 psi (35 Mpa), the proposed mix design shall achieve a compressive strength 1400 psi (9.7 MPa) in excess of the compressed strength.
 - For concrete exposed to high sulfate content soils maximum water cement ratio is 0.44.
 - Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.
- B. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP - INCHES (MM)

TYPE	MAXIMUM SLUMP*
------	----------------

Curb & Gutter	3 inches (75 mm)
Pedestrian Pavement	3 inches (75 mm)
Vehicular Pavement	2 inches (50 mm) (Machine Finished) 4 inches (100 mm) (Hand Finished)
Equipment Pad	3 to 4 inches (75 to 100 mm)
* For concrete to be vibrated: Slump as determined by ASTM C143. Tolerances as established by ASTM C94.	

2.2 REINFORCEMENT

A. The type, amount, and locations of steel reinforcement shall be as shown on the drawings and in the specifications.

2.3 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, as follows.

GRADE REQUIREMENTS FOR SOILS USED AS SUBBASE MATERIALS, BASE COURSES AND SURFACES COURSES

AASHTO M147		Percentage Passing by Mass					
Sieve	Size	Grades					
(mm)	(in)	A	B	C	D	E	F
50	2	100	100				
25	1		75-95	100	100	100	100
9.5	3/8	30-65	40-75	50-85	60-100		
4.47	No. 4	25-55	30-60	35-65	50-85	55-100	70-100
2.00	No. 10	15-40	20-45	25-50	40-70	40-100	55-100
0.425	No. 40	8-20	15-30	15-30	25-45	20-50	30-70
0.075	No. 200	2-8	5-20	5-15	5-20	6-20	8-25

- 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, or as recommended by the geotechnical engineer and approved by the COR.
- C. Subbase material shall produce a compacted, dense-graded course, meeting the density requirement specified herein.

2.4 FORMS

- A. Use metal or wood forms that are straight and suitable in cross-section, depth, and strength to resist springing during depositing and consolidating the concrete, for the work involved.
- B. Do not use forms if they vary from a straight line more than 1/8 inch (3 mm) in any ten foot (3000 mm) long section, in either a horizontal or vertical direction.
- C. Wood forms should be at least 2 inches (50 mm) 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.

2.5 CONCRETE CURING MATERIALS

- A. Concrete curing materials shall conform to one of the following:
 - 1. Burlap having a weight of seven ounces (233 grams) or more per yard (square meter) when dry.
 - 2. Impervious Sheeting conforming to ASTM C171.
 - 3. Liquid Membrane Curing Compound conforming to ASTM C309, Type 1 and shall be free of paraffin or petroleum.

2.6 EXPANSION JOINT FILLERS

Material shall conform to ASTM D1751-04.

PART 3 - EXECUTION

3.1 SUBGRADE PENETRATION

- A. Prepare, construct, and finish the subgrade as specified in Section 31 20 00, EARTHWORK.
- 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 SELECT SUBBASE

- A. Mixing: Proportion the select subbase by weight or by volume in quantities so that the final approved job-mixed formula gradation, liquid limit, and plasticity index requirements will be met after subbase course has been placed and compacted. Add water in approved quantities, measured by weight or volume, in such a manner to produce a uniform blend.
- B. Placing:
 - 1. Place the mixed material on the prepared subgrade in a uniform layer to the required contour and grades, and to a loose depth not to exceed 8 inches (200 mm), and that when compacted, will produce a layer of the designated thickness.

2. When the designated compacted thickness exceeds 6 inches (150 mm), place the material in layers of equal thickness. Remove unsatisfactory areas and replace with satisfactory mixture, or mix the material in the area.
3. In no case will the addition of thin layers of material be added to the top layer in order to meet grade.
4. If the elevation of the top layer is 1/2 inch (13 mm) or more below the grade, excavate the top layer and replace with new material to a depth of at least 3 inches (75 mm) in compacted thickness.

C. Compaction:

1. Perform compaction with approved hand or mechanical equipment well suited to the material being compacted.
2. Moisten or aerate the material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
3. Compact each layer to at least 95 percent or 100 percent of maximum density as specified in Section 31 20 00, EARTHWORK.

D. Smoothness Test and Thickness Control: Test the completed subbase for grade and cross section with a straight edge.

1. The surface of each layer shall not show any deviations in excess of 3/8 inch (10 mm).
2. The completed thickness shall be within 1/2 inch (13 mm) of the thickness as shown on the Drawings.

E. Protection:

1. Maintain the finished subbase in a smooth and compacted condition until the concrete has been placed.
2. When Contractor's subsequent operations or adverse weather disturbs the approved compacted subbase, excavate, and reconstruct it with new material meeting the requirements herein specified, at no additional cost to the Government.

3.3 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. 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.
 3. Forms shall conform to line and grade with an allowable tolerance of 1/8 inch (3 mm) when checked with a straightedge and shall not deviate from true line by more than 1/4 inch (6 mm) 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.
 6. Make necessary corrections to forms immediately before placing concrete.
 7. When any form has been disturbed or any subgrade or subbase has become unstable, reset and recheck the form before placing concrete.
- C. The Contractor's Registered Professional Land Surveyor, specified in Section 00 72 00, GENERAL CONDITIONS, shall establish the control, alignment and the grade elevations of the forms or concrete slipforming machine operations. Staking notes shall be submitted for approval to the Contracting Officer's Representative prior to placement of concrete. If discrepancies exist between the field conditions and the Drawings, Contractor shall notify COR immediately. No placement of concrete shall occur if a discrepancy greater than 1 inch (25 mm) is discovered.

3.4 EQUIPMENT

- A. The Contracting Officer's Representative 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.

3.5 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. All reinforcement shall be supported for proper placement within the concrete section.
- B. Before the concrete is placed, the Contracting Officer's Representative shall approve the reinforcement placement, 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 on the Drawings.

3.6 PLACING CONCRETE - GENERAL

- A. Obtain approval of the Contracting Officer's Representative before placing concrete.
- B. Remove debris and other foreign material from between the forms 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. Cracked or Chipped Concrete Surfaces and Bird Baths. Cracked or chipped concrete and bird baths will not be allowed. Concrete with cracks or chips and bird baths will be removed and replaced to the nearest joints, and as approved by the Contracting Officer's Representative, by the Contractor with no additional cost to the Government.

3.7 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.

3.8 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.

3.9 CONCRETE FINISHING MISCELLANEOUS STRUCTURES

- A. After the surface has been struck off and screeded to the proper elevation, provide a smooth dense float finish, free from depressions or irregularities.
- B. Carefully finish all edges with an edger having a radius as shown in the Drawings.
- C. After removing the forms, rub the faces of the pad with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. The finish surface of the pad shall not vary more than 1/8 inch (3 mm) when tested with a 10 foot (3000 mm) straightedge.
- D. Correct irregularities exceeding the above. See Article 3.6, Paragraph H, above.

3.10 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.

3.11 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 Contracting Officer's Representative.

- 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 4 mils (0.1 mm) 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 12 inches (300 mm). 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 200 square feet per gallon (5 m²/L) 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.

3.12 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 specified.
 - 4. Clean the entire concrete of all debris and construction equipment as soon as curing and sealing of joints has been completed.

3.13 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 Contracting Officer's Representative, 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 COR.

DEPARTMENT OF VETERANS AFFAIRS
NORTH LOOP RD LANDSCAPE IMPROVEMENT
3801 MIRANDA AVE
PALO ALTO, CA 94304

Project No.: 640-16-126

3.14 FINAL CLEAN-UP

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

- - - E N D - - -

SECTION 32 84 00
PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This Section specifies materials and procedures for furnishing and installing a complete automatically-controlled irrigation system, including all necessary accessories as shown on the Drawings and described herein.

1.2 RELATED WORK

- A. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT
- C. Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS
- D. Section 32 90 00, PLANTING

1.3 ABBREVIATIONS

- A. FPT: Female pipe thread
- B. HDPE: high-density polyethylene plastic
- C. PVC: Polyvinyl chloride plastic
- D. PE: Polyethylene
- E. O.D.: Outside diameter
- F. I.D.: Inside diameter
- G. GPH: Gallons per hour
- H. GPM: Gallons per minute
- I. IPS: Iron pipe size

1.4 REFERENCE, CODES AND STANDARDS

- A. All current International Building Code, state, local, federal, and VA codes, standards, regulations, and ADA requirements shall pertain to this project. These may include but not limited to, architectural, structural, mechanical, electrical, fire and life safety codes. The project shall follow the most stringent and current rules codes, standards, and regulations.

1. AB1881 State of California Model Water Efficient Landscape Ordinance, California Code of Regulation
2. Water Use Classification of Landscape Species (WUCOLS)
3. America Society of Irrigation Consultant (ASIC) Design Guidelines
4. California Landscape Standards, California Landscape Contractors Association (CLCA), Sacramento, California
5. CAL-OSHA, Title 8, Subchapter 4-Construction Safety Orders, and Subchapter 7-General Industry Safety Orders
6. NFPA 70, National Electrical Code (NEC)
7. California Electrical Code
8. Uniform Plumbing Code (UPC)
9. California Plumbing Code (CPC)
10. National Fire Protection Association (NFPA) 24, Section 10.4 Depth of Cover
11. Underwriters Laboratories (UL): Electrical wiring, controls, motors and devices, UL listed and so labeled.
12. American Society of Testing Materials (ASTM)

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society For Testing And Materials (ASTM):
 - D1785-12..... Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120
 - D2241-09..... Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
 - D2464-13..... Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
 - D2466-06..... Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 - D2467-13..... Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

- D2564-12..... Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
- D2609-02(2008) Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
- D2683-10..... Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- D2855-96(2010) Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- F656-10 Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- F771-99(2005)..... Polyethylene (PE) Thermoplastic High-Pressure Irrigation Pipeline Systems

C. American Water Works Association (AWWA):

- C500-09..... Metal-Seated Gate Valve for Water Supply Service
- C504-10..... Rubber-Seated Butterfly Valves
- C906-07..... Quality Assurance:

A. General Criteria

1. The Contractor, personally or through an authorized representative, shall supervise the work constantly, and shall keep the same foreman and workers on the job from commencement to completion.
2. The Contractor should be an employer of workers that include a landscaping contractor licensed by the State of California and a certified irrigation contractor (CIC) qualified by The Irrigation Association. Contractor shall have a minimum of five (5) years of experience in installing irrigation systems of a similar size.

B. Products Criteria:

1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.
2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be cast integrally with equipment, or stamped, or otherwise permanently marked on each item of equipment.

C. System Requirements:

1. Full and complete coverage is required. The Contractor shall, at no additional cost to the Government, make minor adjustments necessary to avoid plantings and obstructions such as signs, utilities and light standards to achieve full and complete coverage of irrigated areas without overspray on roadways, sidewalks, window wells, and buildings, and to protect trees from close high spray velocity.
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 whenever possible.

1.6 SUBMITTALS

A. Qualification Data

1. Provide qualification data, including contractor license and certificate by Irrigation Association, and a list of three (3) projects of similar size and three (3) references.

B. Material List

1. Submit product data as one package for each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Complete material list shall be submitted prior to performing any work.
2. Equipment or materials installed or furnished without prior approval of the Contracting Officer's Representative may be rejected and the Contractor required to remove such materials from the site at Contractor's own expense.

C. As-Built Drawings

1. The Contractor shall provide as-built drawings.
2. The original "as-built" plan shall be submitted to the Contracting Officer's Representative for approval prior to preparing the final As-Built prints, PDF and CAD files, and producing Controller Chart. See 1.7D for Controller Chart.
3. Drawings shall include depth, if applicable, and dimensions from two permanent points of reference, building corners, sidewalk, or road intersections, providing the location of the following items:
 - a. Connection to existing water lines
 - b. Connection to existing electrical power
 - c. Relocated existing equipment

- d. Gate valves
 - e. Routing of sprinkler pressure lines (dimension maximum 100 feet (30m) along routing)
 - f. Sprinkler control valves
 - g. Routing of control wiring (dimension maximum 100 feet (30m) along routing)
 - h. Quick coupling valves
 - i. Controller location
 - j. Other related equipment as directed by the Contracting Officer's Representative
- 4. Identify all valves as to size, station, number and type of irrigation. All changes made during construction shall be shown in color red. Label plans "AS-BUILT" with date and the General Contractor's and Landscape Contractor's name, address and phone number.
 - 5. Submit the approved As-Built drawings as a hard copy at original scale, an electronic PDF file, and an electronic CAD file in conformance with the VA CAD Standards. Deliver the above items to the Contracting Officer's Representative prior to final inspection.
 - 6. All costs associated with this work will be included in the Contract prices paid for the various items of work and no additional compensation will be allowed therefore.
- D. Controller Chart
- 1. Provide one laminated 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.
 - 2. Controller 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 by the Contracting Officer's Representative prior to final inspection of the irrigation system.

E. Maintenance and Operating Instructions and Manuals

1. Contractor shall prepare an Operation and Maintenance Manual, organized in a 3-ring binder, containing the following information.
 - a. Contractor's name, address, and telephone number
 - b. Duration of guarantee, periods as specified herein
 - c. List of equipment with names and addresses of local manufacturer's representatives with duration of written warranties
 - d. Complete operating and maintenance instructions on all equipment
 - e. Spare parts lists and related manufacturer's information
2. Submit two (2) copies of the Operation and Maintenance Manual to the Contracting Officer's Representative within 10 Calendar Days of completion of work of this Section and as a condition of project acceptance.
3. In addition to the above-mentioned maintenance manuals, provide the Government's maintenance personnel with training at the jobsite to provide instructions for major components. Training shall be conducted to the satisfaction of the Contracting Officer's Representative. Contractor shall be required to repeat the training at his own expense until the Contracting Officer's Representative has concluded that the training has been conducted satisfactorily.

1.7 SPARE PARTS / EXTRA MATERIALS

- A. Furnish spare parts / extra materials, as listed below, that match products installed. The extra materials shall be packaged with protective covering for storage and identified with labels describing contents.
1. Spray Head Sprinklers, Bubblers, Emitters: Provide two (2) for each type and size installed for the project.
 2. Two (2) sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve installed for the project.
 3. Two (2) - 5 foot valve keys for operation of gates valves.
 4. Two (2) keys for each automatic controller.
 5. Two (2) quick coupler keys and matching hose swivels for every type of quick coupling valve installed.
- B. The above-mentioned equipment shall be delivered to the Government at the conclusion of the project. Before final inspection can occur, evidence that the

Government has received the spare parts / extra materials must be shown to the Contracting Officer's Representative.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic piping protected from direct sunlight. Support pipe to prevent sagging and bending.
- C. Any section of pipe that has been dented or damaged will be discarded and, if installed, be replaced with new piping.

1.9 WARRANTY

- A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting there from within a period of one (1) year from final acceptance. Further, the Contractor will provide all manufacturers' and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

PART 2 - PRODUCTS

2.1 PIPES AND FITTINGS

- A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.
- B. If dissimilar metal materials are used in the piping system, use the appropriate dielectric union to isolate the metals.
- C. PVC pipe: Use only new, non-corroded, defect free materials of brands and types that meet the specified standards specified herein, or approved equals.
 - 1. Irrigation Mains:
 - a. 3 inches (76.2 mm) and smaller: Polyvinyl Chloride (PVC) Pressure Pipe, 1120 - Schedule 40 PVC compound conforming to ASTM Specification D 1785
 - 2. Irrigation Laterals: Polyvinyl Chloride, ASTM D2241, PVC 1120, Schedule 40

3. Flexible PVC Risers for Emitters or Bubblers: Flexible PVC sized to fit standard Schedule 40 PVC fittings, 100 psi working pressure, 350 psi burst pressure, color black.
 4. Threaded Pipe: Polyvinyl Chloride, ASTM D1785, PVC 1120, Schedule 80, for threaded connections, risers and swing joints
 5. All PVC pipes shall bear the following markings:
 - a. Manufacturer's name
 - b. Nominal pipe size
 - c. Schedule of class
 - d. Pressure rating in psi
 - e. NSF (National Sanitation Foundation) approval
 - f. Date of extrusion
 6. Pipes shall be purple color for irrigation system using reclaimed water
- D. Fittings:
1. Irrigation Mains (3 inches (76.2 mm) and smaller): Schedule 40, solvent welded socket type, ASTM D2466.
 2. Irrigation Laterals: PVC, Schedule 40, solvent welded socket type, ASTM D2466.
 3. Threaded Pipe: Schedule 80, ASTM D2464
 4. Swing Joints: Threaded fittings with elastomeric seals that allow 360-degree rotation, and designed for minimum 200 psi (1380 kPa) working pressure, may be used in lieu of standard threaded fittings.

2.2 PIPE JOINING MATERIALS

- A. Solvent cements for joining PVC piping: ASTM D2564. Include primer according to ASTM F656.
 1. Solvent cement for flexible PVC is to be specifically formulated for that use.
- B. Plastic fittings: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.3 VALVES

- A. Underground Manual Shut-Off Valves:

1. Gate valves (3 inches (75 mm) and smaller): Bronze body, Screw-in Bonnet, Threaded with Cross Handle non-rising stem turning clockwise to close, 200 psi (1380 kPa) minimum working pressure.
2. Operations:
 - a. Underground: furnish valves with square or T-Handle (depending on size) socket wrench for operation.
 - b. Ends of valves shall accommodate the type of pipe installed.
- B. Check Valves: Swing or spring. High impact PVC Type II body and bonnet, with minimum working pressure of 235 psi (1620 kPa).
- C. Pressure Reducing Valve: Bronze body with stainless steel strainer and union
- D. Ball Valves (2 inch (50 mm) and smaller): Full-port ball valves with Schedule 80 PVC body, O-Ring under seat, and 90 degree on/off handle. Ball valves to have union NPT female end connections.
- E. Remote Control Valves:
 1. Valves shall be globe type of heavy duty construction and shall have manual shut-off and flow control adjustment and provide for manual operation.
 2. Brass body with brass bonnet, trim and renewable seat.
 - a. Install valves with unions on each side to allow for easy removal.
 - b. Valves shall have a minimum of 150 psi (1035 kPa) working pressure.
 - c. Each sprinkler section shall be automatically operated by a remote control valve installed underground and operated by a 24 volt AC electric solenoid.
 - d. Each valve shall be in a valve box.
 3. Valves to operate at no more than 7 psi (50 kPa) pressure loss at manufacturers maximum recommended flow rate.
 4. Valves shall be completely serviceable from the top without removing valve body from the system.

2.4 VALVE BOXES

- A. General Dimensions per valve type:
 1. Gate Valve and Quick Coupler: 10 inches(250 mm), Round
 2. Master Valve: 14 inches (350mm)W x 19 inches(475 mm)L x 12 inches (300 mm)D, Rectangular shaped.

3. Flow Sensor: 14 inches (350mm)W x 19 inches(475 mm)L x 12 inches (300 mm)D, Rectangular shaped.
 4. Remote Control Valve: 14 inches (350mm)W x 19 inches(475 mm)L x 12 inches (300 mm)D, Rectangular shaped.
 5. Remote Control Valve (Drip): 20 inches (500 mm)W x 26 inches (620 mm)L x 12 inches (300 mm)D, Rectangular shaped.
 6. Drip components: Top diameter to be 6 inches (150 mm) minimum, height of box to be 10-1/4 inches (260 mm).
- B. Gate valve and quick coupler valve boxes shall be round made of reinforced plastic with a lid constructed from HDPE, color: black. Box dimension shall be adapted to depth of cover required over pipe at valve location. Box shall have a bolt down lid.
1. Set box cover flush with finish grade
 2. Label boxes by heat branding "GV" for gate valve or "QC" for quick coupler, into the lid. Size of letters shall be a minimum of 2 inches (50 mm). Letters shall be located at center of valve cover and shall face nearest main road or service road.
- C. Remote control valve boxes shall be HDPE structural foam Type A, Class III, color: black. Box shall have a bolt down lid.
1. Set box cover flush with finish grade
 2. Label boxes by heat branding the designated controller and circuit number into the lid. Size of numbers shall be a minimum two (2) inches (50 mm). Numbers shall be located at center of valve cover and shall face nearest main road or service road.
- D. Drip zone components: Round reinforced plastic valve box and lid constructed from HDPE, color: black. Lid shall have lift-hole for opening. Box shall have a bolt down lid.
- E. All valve boxes in pavement shall be precast concrete with a cast iron lid. Compressive concrete strength shall be in excess of 4000 psi (30 MPa). Box shall have a bolt down lid.
- F. Provide tampered proof bolts for all lids.

2.5 PRESSURE GAUGES

- A. Pressure gauges: ASME B40.100, 4-1/2 inches (114 mm) diameter, all metal case, with bottom connection. Dial shall be white lacquered throughout with maximum graduations of 2 psi (10 kPa). Provide shut-off cocks.

2.6 AUTOMATIC CONTROLLER

- A. Utilize existing controller on site.

2.7 SPRINKLER HEADS

- A. Sprinkler heads: Heads to be as indicated on Drawings. The entire internal assembly including filter screen, to be capable of removal from the top without removing the sprinkler case from the riser.
- B. Spray head shall be pop-up type of standard, undersize or oversize configuration as noted on Drawings.
 - 1. The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultraviolet resistant plastic.
 - 2. Sprinkler body to be equipped with an integral anti-drain valve (self-closing at pressures of 10 feet (3.0 m) of head or less) and pressure regulating riser.
 - 3. It shall have a heavy duty stainless steel retract spring and a ratcheting system for alignment of the pattern.
 - 4. The sprinkler shall have a soft elastomer pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem.
 - 5. The sprinkler shall have a plastic nozzle with an adjusting screw capable of regulating the radius and flow.
 - 6. The sprinkler shall be capable of housing protective, non-clogging filter screens or pressure compensating screens (PCS) under the nozzle.
 - 7. Use 12 inch pop-up body for shrubs and 6 inch pop-up for lawn.

2.8 BUBBLERS

- A. Bubblers shall be of the pressure compensating, permanently assemble type with 1/2 inch (12 mm) FPT inlet.

2.9 DRIP SYSTEMS

- A. Drip Emitters: Drip Emitters shall be of the pressure compensating, permanently assembled type with 1/2 inch (1.25 cm) FPT inlet. Emitters shall be capable of providing 1 GPM (3.8 LPM) at inlet pressures between 15 and 50 psi (105 and 342 kPa).
- B. Drip Accessories: Provide a dripline flush valve as required and detailed.

2.10 QUICK COUPLERS

- A. Quick couplers 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. Also see 2.4 VALVE BOXES of this Section.

2.11 LOW VOLTAGE CONTROL VALVE WIRE

- A. Wire shall be solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground.
- B. Size of control wire shall be in accordance with manufacturer's recommendations, never less than No. 14.
- C. Wire colors shall be as follows:
 - 1. Common ground wire shall have white insulating jacket
 - 2. Control wire shall have a red insulating jacket
 - 3. Spare wires shall have a yellow insulating jacket
 - 4. Master valve control wire shall have a blue insulating jacket
 - 5. Flow sensor shall have one orange and one black insulating jacket
- D. Provide a separate ground wire for each controller. Where there is more than one controller, provide a different color control wire for each controller.
- E. //Weather sensor//Rain sensor// wire shall be 18 gauge, 2-conductor direct burial wire. Wire run shall be no longer than 100 feet (30 m). Wire shall be black in color.

2.12 SPLICING MATERIALS:

- A. Splicing materials shall be epoxy waterproof sealing packet.

2.13 SLEEVE MATERIAL

- A. ASTM D2241, PVC Schedule 40
- B. White color pipe for water
- C. Grey color pipe for wires

2.14 WARNING TAPE

- A. Provide standard, 4-Mil polyethylene 3 inch (76 mm) wide tape, detectable type, // blue with black letters (if potable water // purple with black letters (if reclaimed or untreated well water) //, and imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW" above all main lines.

2.15 TRACER WIRES

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Examine proposed irrigation areas for compliance with requirements and conditions affecting installation and performance.
- B. Set flags to identify locations of proposed irrigation system – main line routing, valves and sprinklers. Obtain approval of the layout by the Contracting Officer's Representative before excavation.

3.2 PIPE INSTALLATION - GENERAL

- A. Layout work as closely as possible to Drawings. Swing joints, offsets and all fittings are not shown. Lines are to be in a common trench wherever possible.
- B. Install sprinkler lines to avoid underground utilities, such as, but not limited to: heating, ventilating, and air conditioning trenches; electric ducts; steam, condensate, chilled water, storm and sanitary sewer lines; and existing water and gas mains; all of which have the right of way.
- C. 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 cracked concrete, due to settling, during the warranty period.
- D. Do not lay pipe on unstable material, in wet trenches or, in the opinion of Contracting Officer's Representative, when trench or weather conditions are unsuitable for work.
- E. Allow a minimum of 4 inches (100 mm) between parallel pipes in the same trench.

- F. Clean the interior portion of pipe and fittings of foreign matter before installation.
Securely close open ends of pipe and fittings with caps or plugs to protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- G. The 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.
- H. Hold pipe securely in place while joint is being made.
- I. Do not work over, or walk on, pipe in trenches until covered by layers of earth, well tamped, in place to a depth of 12 inches (300 mm) over pipe.
- J. Connect new system to existing mains or new point of connection as required.
 - 1. Coordinate capping, rerouting, and required modifications to adjacent existing irrigation systems prior to the start of demolition and excavation work.
 - 2. Ensure that existing irrigation systems adjacent to and beyond the project limits are and remain fully functional and protected from construction damage.
 - 3. Work includes, but not necessarily limited to, the following:
 - a. Protect the existing irrigation systems mainline water sources and install new mainline connections to provide and maintain water to existing plants served by the existing irrigation systems
 - b. Protect electrical low voltage wire connections from the existing irrigation controllers to remote control valves serving existing irrigation systems beyond the project limits and/or install new wires so that existing irrigation systems remain fully functional at all times
 - c. Test and repair existing irrigation systems as required and directed by the Contracting Officer's Representative.
- K. Remove existing irrigation equipment within the project limits as required and directed by the Contracting Officer's Representative. Minimum cover over water mains shall be 18 inches (450 mm). Cover laterals to minimum depth of 12 inches (300 mm).
- L. Warning tape shall be continuously placed 3 inches (75 mm) above sprinkler system water mains.
- M. Backfill and Compacting
 - 1. Backfill excavations and trenches with clean soil, free of debris.

2. Regardless of the type of pipe covered, compact to minimum 95% density under pavements and 85% under planted areas.
3. Firmly compact soil around swing joints and sprinklers to minimize settling.
4. Dress off areas to finish grades. Re-dress any areas that subsequently settle.

3.3 PLASTIC PIPE INSTALLATION

- A. Plastic pipe shall be snaked in trench at least 1 foot per 100 feet (1 meter to 100 meters) 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 on threaded joints. After joint is made hand tight (hard), a strap wrench should be used to make up to two additional full turns.

3.4 EMITTER HOSE INSTALLATION

- A. Joint: Solvent weld connection.
- B. Bushing: Adaptation from PVC Schedule 40 fittings to flex vinyl hose shall be line size by 3/8 inch (10 mm) insert bushings.

3.5 SLEEVE INSTALLATION

- A. Furnish and install where pipe and control wires pass under walks, paving, walls, and other similar areas.
- B. Use grey color pipe for wires and white pipe for water lines.
- C. Sleeves to be twice line size or greater to accommodate retrieval for repair of wiring or piping and shall extend 12 inches (300 mm) beyond edges of paving or construction.
- D. Bed sleeves with a minimum of 4 inches (100 mm) of sand backfill above top of pipe in areas where pipe is placed prior to hardscape is installed.

3.6 VALVE INSTALLATION

- A. Install valves where shown on Drawings and group together where practical. Limit one remote control valve per box.

- B. Locate valve boxes 12 inches (300 mm) from and perpendicular to walk edges, buildings, and walls. Provide 12 inches (300 mm) between valve boxes where valves are grouped together.
- C. Thoroughly flush main line before installing valves.
- D. Clean interior of valves of foreign matter before installation.
- E. Install valves in shrub or groundcover areas where possible.
- F. No valves shall be set under roads, pavement or walks. Label control line wire at each valve with a 2-1/4 inch by 2-3/4 inch polyurethane identification tag, indicated identification number of valve (controller and station number). Attach label to control wire.
- G. Place gopher wire mesh under the valve box and wrap up each side a minimum of 6 inches (150 mm). Wire mesh shall be 19 gauge galvanized steel with 1/2 inch (13 mm) mesh.
- H. Install 4 inch (100 mm) layer of pea gravel or 3/4 inch (20 mm) drain rock on top of the wire mesh at the bottom of the valve box.
- I. Set valve box cover flush with finished grade.
- J. Heat brand controller and station number or valve type (gate valve or quick coupler) into the valve box lid.

3.7 SPRINKLER AND QUICK COUPLER INSTALLATION

- A. Sprinkler heads and quick couplers shall be placed on temporary nipples extending at least 3 inches (80 mm) above finished grade. After turf is established, remove temporary nipples, ensuring that no dirt or foreign matter enters outlet, and install sprinkler heads and quick couplers at ground surface as detailed.
- B. Place part circle sprinkler heads minimum 1 inch (25 mm), but not over 2 inches (50 mm) for turf and 6 inches (150 mm) for shrubs from edge of, and flush with top of adjacent walks, header boards, curbs, and mowing aprons, or paved areas at time of installation.
- C. Install all sprinklers, shrub sprays and quick couplers on swing joints, as detailed on Drawings.
- D. All sprinklers heads shall be set perpendicular to finish grade unless otherwise designated on the Drawings.

- E. Flush all main and lateral lines prior to the installation of sprinkler heads and quick couplers.

3.8 DRIP EMITTER TUBING INSTALLATION

- A. Thoroughly flush all lateral lines before installing drip emitter tubing.
- B. Install as per manufacturer's recommendations.
- C. Install drip emitter tubing with direct-attached emitters 2 to 4 inches (50 to 100 mm) below grade, stake down every four (4) feet and at every fitting. Cover with a minimum 2 inches (50 mm) of mulch.
- D. Install pressure regulators and filter units in control valve boxes
- E. Adaptation from PVC Schedule 40 fittings to flex vinyl hose shall be line size by 3/8 inch (10 mm) insert bushings.
- F. Tape all ends during installation and do not allow dirt or debris to enter tubing.
- G. Use fittings at sharp bends and do not allow dripper line to kink.
- H. Install a minimum two (2) manual flush valves per zone at the low points and ends of the zone.
- I. Use manufacturer recommended fittings for all changes in direction.

3.9 CONTROL WIRE INSTALLATION

- A. Wiring from controller to valves and stub cuts for future extension shall be located in trench with new mains, 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 under the shoulder of the pipe. Wires shall be bundled, and tied or taped at 15 foot (4.5 m) intervals. A numbered tag shall be provided at each end of a wire, i.e., at valve, at field located controllers. The wires at each end of wire to be the same in number and color. Do not tape wires located within sleeves.
- C. Install a minimum three (3) spare wires of a different color along the entire main line. The spare wires shall be pulled into every valve box or group of valves along the main line.
- D. 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.

- E. Provide 12 inch (300 mm) expansion loops in wiring at each wire connection or change in wire direction. Provide 24 inch (600 mm) loop at remote control valves.
- F. The power wire(s) for the operation of irrigation system shall not be run in same conduit as the irrigation control wire(s).

3.10 TRACER WIRE INSTALLATION

- A. 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 plastic label with designation "Tracer Wire."
- B. 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.
- C. Record locations of tracer wires and their terminations on project record documents.

3.11 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall comply with the provision of Section 01 00 00 General Requirements for the protection of existing vegetation.
- B. Excavation in areas where 2 inch (50 mm) or larger roots occur shall be done by hand. All roots 2 inch (50mm) and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap, to prevent scarring or excessive drying.
- C. Where a ditching machine is run close to trees having roots smaller than 2 inch (50 mm) in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through.

3.12 ADJUSTMENTS

- A. Adjust settings of controllers to provide adequate water to each irrigation zone.
- B. Contractor shall flush and adjust all sprinkler heads for optimum performance, and to prevent overspray onto walks, roadways, and building, as much as possible.
- C. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to

planting. Adjustments may include changes in nozzle sizes and degrees of arc as required.

- D. Adjust flow control of remote control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.
- E. Adjust sprinklers and devices as follows.
 - 1. Pop-up rotary sprinklers in turf: 1 inch above finish grade, lower to finish grade when turf is well established.
 - 2. Pop-up rotary sprinklers in shrubs and groundcovers: 2 inches above finish grade
 - 3. Pop-up spray sprinklers in turf : flush with finish grade
 - 4. Pop-up spray sprinklers in shrubs and groundcovers: 1 inch above finish grade
 - 5. Tree bubblers: Install bubblers on top of rootball as per detail
- F. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by Contracting Officer's Representative.

3.13 TESTING AND SITE OBSERVATIONS

- A. Coordinate scheduling testing / observations with the Contracting Officer's Representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Observations conducted by persons other than the Contracting Officer's Representative shall not be permitted without prior written authorization of the Contracting Officer's Representative.
- C. No site observations will commence without as-built drawings. In the event the Contractor calls for a site visit without as-builts drawings, without completing previously noted corrections, or without preparing the system for said visit, he shall be responsible for reimbursing the Contracting Officer's Representative at his current bill rates per hour portal to portal (plus transportation costs) for inconvenience. No further site visits will be scheduled until this charge has been paid and received.
- D. Contractor shall be responsible for notifying the Contracting Officer's Representative in advance for the following inspections/observation meetings, according to the time indicated:
 - 1. Pressure supply line installation and testing-48 hours
 - 2. Remote control valves (RCV) and lateral lines visual inspection – 48 hours
 - 3. Coverage test-48 hours

4. Final inspection- 7 days

E. Tests and Inspections:

1. Pressure supply line installation and testing:

- a. Make hydrostatic tests with risers capped when welded PVC joints have cured at least 24 hours. Center load piping with backfill to prevent pipe from moving under pressure. Keep all couplings and fittings exposed
- b. Test solvent weld main line as follows after welded plastic pipe joints have cured for at least 24 hours: Remove all the air from the piping system then test live (constant pressure) and quick coupler valve lines hydrostatically at 125 psi minimum. Lines will be approved if test pressure is maintained for six (6) hours. The Contractor shall make tests and repairs as necessary until test conditions are met.

2. RCV and lateral lines visual inspection:

- a. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

3. Coverage Test:

- a. After electrical circuitry has been energized and final adjustment of the sprinkler heads and drip system have been complete, test each remote control valve with a visual coverage/wetting pattern test in the presence of the Contracting Officer's Representative, to determine if the water coverage for planting areas is complete and adequate. Furnish all material and perform all work required to correct any inadequacies of coverage due to deviation from Drawings. Contractor is responsible to perform all work required correcting any inadequate coverage at his own expense where the system has been willfully installed as indicated on the Drawings and the coverage is obviously inadequate, without bringing this to the attention of the Contracting Officer's Representative.
- b. This test shall be accomplished prior to the burial of the drip lines and any planting being installed.

4. Final Inspection:

- a. Operate controllers and automatic control valves to demonstrate the complete and successful installation and operation of all equipment.

- b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Any irrigation product will be considered defective if it does not pass tests and inspections.

3.14 FINAL INSTRUCTIONS AND DOCUMENTATION

- A. Program controller according to approved irrigation schedule
- B. Manufacturer of Control Systems shall certify control system is complete, including all related components, and operational. Submit certificate to Contracting Officer's Representative.
- C. As-Built Drawings:
 - 1. Maintain and provide 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.
 - 2. Prepare As-Built drawings showing location of all valves, lateral lines, and route of control wires.
 - 3. See 1.7C As-Built Drawings of this Section for the requirements for the drawings.
- D. Controller Chart
 - 1. Provide one controller chart showing the area covered by controller for each automatic controller
 - 2. Use the approved As-Built drawings for the controller chart.
 - 3. See 1.7D Controller Chart of this Section for the requirements for the controller chart.
- E. Maintenance and Operating Instructions and Manuals
 - 1. Prior to final acceptance, verbal instructions, for a period of not less than 8 hours, shall be provided to the operating personnel. Multiple instructions may be required for a total of 8 hours. Instructions shall be conducted to the satisfaction of the Contracting Officer's Representative. Contractor shall be required to repeat the training at Contractor's own expense until the Contracting Officer's Representative has conclude that the training has be conducted satisfactorily.
 - 2. Deliver manuals to the Contracting Officer's Representative, within 10 Calendar Days of completion of work of this Section and as a condition of its acceptance, to the Contracting Officer's Representative

3. See 1.7E Maintenance and Operating Instructions and Manuals of this Section for the requirements for the Operation and Maintenance Manuals

3.15 MAINTENANCE PERIOD

- A. Maintenance period duration to start on the date of the project final acceptance. The irrigation may be installed and final tested prior to the project completion; however, the system remains in the Contractor's possession until the project is certified complete and formally turned over to the government. The Contracting Officer shall provide written documentation to the Contractor stating this date.
- B. Maintain, make minor adjustments, repair and / or replace any breaks, malfunctions or deficiencies of the irrigation system for the full duration of the 90 day maintenance period.
- C. The Contracting Officer's Representative reserves the right to waive or shorten the maintenance period.

3.16 CLEAN UP

- A. Remove all trash, debris, surplus materials and equipment from the project site when the work of this Section has been completed and at such other times as may be directed by the Contracting Officer's Representative.

3.17 WARRANTY

- A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn, planting and hard surfaces due to the settlement of irrigation trenches, and to replace all necessary lawn and planting impacted by the lack of proper irrigation coverage due to workmanship for one (1) year following completion and acceptance of the job.

--- E N D ---

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.1 DESCRIPTION

The work in this section consists of furnishing and installing plant and landscape materials required as specified in locations shown.

1.2 RELATED WORK

- A. Topsoil Testing: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Section 32 84 00, PLANTING IRRIGATION.

1.3 DEFINITIONS

- A. Backfill: The earth used to replace earth in an excavation.
- B. Balled and Burlapped Stock: ANSI Z60.1. Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required, wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball.
- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Finish Grade: Elevation of finished surface of planting soil.
- E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- G. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

- H. Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, turf and grasses, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- I. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- J. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- K. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Notify the Contracting Officer's Representative of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant and landscape materials from the job site immediately.
- B. Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable. Keep seed and other packaged materials in dry storage away from contaminants.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants. Keep bulk materials in dry storage away from contaminants.
 - 2. Provide erosion control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.

- F. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than 6 hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
1. Do not remove container-grown stock from containers before time of planting.
 2. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet, condition.
- G. All pesticides and herbicides shall be properly labeled and registered with the U.S. Department of Agriculture. Deliver materials in original, unopened containers showing, certified analysis, name and address of manufacturer, product label, manufacturer's application instructions specific to the project and indication of conformance with state and federal laws, as applicable.

1.5 PROJECT CONDITIONS

- A. Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- C. Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.
- D. Plant trees, shrubs, and other plants after finish grades and irrigation system components are established.
1. When planting trees, shrubs, and other plants, protect irrigation system components and promptly repair damage caused by planting operations.

1.6 QUALITY ASSURANCE:

- A. Products Criteria:
1. When two or more units of the same type or class of materials or equipment are required, these units shall be products of one manufacturer.

2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
 1. Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association with 5 years experience in landscape installation.
 2. Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 3. Installer's field supervisor shall have certification in the following category from the Professional Landcare Network and submit one copy of certificate to the Contracting Officer's Representative:
 - a. Certified Landscape Technician (CLT) - Exterior, with installation and irrigation specialty areas, designated CLT-Exterior.
 4. Pesticide Applicator: Licensed in state of project, commercial.
- C. A qualified Arborist shall be licensed and required to submit one copy of license to the Contracting Officer's Representative.
- D. Include an independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- E. For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60, "Diagnosis and Improvement of Saline and Alkali Soils".
 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Contracting Officer's Representative. A minimum of 3 representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for plant growth.

- a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. (92.9 sq. m) or volume per cu. yd (0.76 cu. m) for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- F. Provide quality, size, genus, species, variety and sources of plants indicated, complying with applicable requirements in ANSI Z60.1.
- G. Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Measure trees and shrubs with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4 inch (100 mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
 2. Measure other plants with stems, petioles, and foliage in their normal position.
- H. Contracting Officer's Representative may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Contracting Officer's Representative retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Contracting Officer's Representative of plant material sources twenty-one days in advance of delivery to site.
- I. Include product label and manufacturer's literature and data for pesticides and herbicides.
- J. Conduct a pre-installation conference at Project site.

1.7 SUBMITTALS

- A. Submit product data for each type of product indicated, including soils:
1. Include quantities, sizes, quality, and sources for plant materials.

2. Include EPA approved product label, MSDS (Material Safety Data Sheet) and manufacturer's application instructions specific to the Project.
 3. Include color photographs in digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of 3 photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Submit samples and manufacturer's literature for each of the following for approval before work is started.
1. Organic and Compost Mulch: 1-pint (0.5-liter) volume of each organic and compost mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 2. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).
 3. Erosion Control Materials: 12 by 12 inches (300 by 300 mm).
 4. Root Barrier: Width of panel by 12 inches (300 mm).
- C. Qualification data for qualified landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- D. Prior to delivery, provide notarized certificates attesting that each type of manufactured product, from the manufacturer, meet the requirements specified and shall be submitted to the Contracting Officer's Representative for approval:
1. Plant Materials (Department of Agriculture certification by State Nursery Inspector declaring material to be free from insects and disease).
 2. Manufacturer's certified analysis of standard products.
 3. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

E. Material Test Reports: For existing in-place surface soil and imported or manufactured topsoil.

F. Maintenance Instructions: Recommended procedures to be established by the VA for maintenance of plants during a calendar year. Submit before start of required maintenance periods.

1.8 PLANT ESTABLISHMENT PERIOD

A. The establishment period for plants shall begin immediately after installation, with the approval of the Contracting Officer's Representative, and continue until the date that the Government accepts the project or phase for beneficial use and occupancy. During the Establishment Period the Contractor shall maintain the plants and turf as required in Part 3.

1.9 PLANT AND TURF MAINTENANCE SERVICE

A. Provide initial maintenance service for trees, shrubs, ground cover and other plants by skilled employees of landscape Installer. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: 3 months from date of planting completion.

B. Obtain continuing maintenance proposal from Installer to VA, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.10 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. American National Standards Institute (ANSI):

Z60.1-04..... Nursery Stock

C. American Society For Testing And Materials (ASTM):

C602-07 Agricultural Liming Materials

D5268-07 Topsoil Used for Landscaping Purposes

D. Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada.

E. United States Department of Agriculture (USDA): Handbook No. 60 Diagnosis and Improvement of Saline and Alkali Soils; Federal Seed Act Regulations.

1.11 WARRANTY

A. The Contractor shall remedy any defect due to faulty material or workmanship and pay for any damage to other work resulting therefrom within a period of one year from final acceptance, unless noted otherwise below. Further, the Contractor will provide all manufacturer's and supplier's written guarantees and warranties covering materials and equipment furnished under this Contract.

1. Plant Warranty Periods will begin from the date of Substantial Completion.
 - a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
2. The Contractor shall have completed, located, and installed all plants 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.
3. The Contractor will replace any dead plant material immediately, unless required to plant in the succeeding planting season. Provide extended warranty for period equal to original warranty period for replacement plant materials. Replacement plant warranty will begin on the day the work is completed.
4. Replacement of relocated plants, that the Contractor did not supply, is not required unless plant failure is due to improper handling and care during transplanting. Loss through Contractor negligence requires replacement in plant type and size.
5. The Government will reinspect all plants at the end of the Warranty Period. The Contractor will replace any dead, missing, or defective plant material and turf immediately. The Warranty Period will end on the date of this inspection provided the Contractor has complied with the warranty work required by this specification. The Contractor shall also comply with the following requirements:
 - a. Replace plants that are more than 25 percent dead, missing or defective plant material prior to final inspection.
 - b. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - c. Mulch and weed plant beds and saucers. Just prior to final inspection, treat these areas to a second application of approved pre-emergent herbicide.

- d. Complete remedial measures directed by the Contracting Officer's Representative to ensure plant and turf survival.
- e. Repair damage caused while making plant replacements.
- B. Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by the VA, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. Plant materials: ANSI Z60.1; will conform to the varieties specified and be true to botanical name as listed in Hortus Third; nursery-grown plants and turf material true to genus, species, variety, cultivar, stem form, shearing, and other features indicated on Drawings; healthy, normal and unbroken root systems developed by transplanting or root pruning; well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf; free of disease, pests, eggs, larvae, and defects such as knots, sun scald, windburn, injuries, abrasions, and disfigurement.
 - 1. Trees-deciduous and evergreen: Single trunked with a single leader, unless otherwise indicated; symmetrically developed deciduous trees and shrubs of uniform habit of growth; straight boles or stems; free from objectionable disfigurements; evergreen trees and shrubs with well developed symmetrical tops, with typical spread of branches for each particular species or variety. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots will be rejected.
 - 2. Ground cover and vine plants: Provide the number and length of runners for the size specified on the Drawings, together with the proper age for the grade of plants specified. Provide vines and ground cover plants well established in removable containers, integral containers, or formed homogeneous soil sections. Plants shall have been grown under climatic conditions similar to those in the locality of the

project. Spray all plants budding into leaf or having soft growth with an anti desiccant at the nursery before digging.

3. The minimum acceptable sizes of all plants, measured before pruning with branches in normal position, shall conform to the measurements designated. Plants larger in size than specified may be used with the approval of the Contracting Officer's Representative, with no change in the contract price. When larger plants are used, increase the ball of earth or spread of roots in accordance with ANSI Z60.1.
 4. Provide nursery grown plant material conforming to the requirements and recommendations of ANSI Z60.1. Dig and prepare plants for shipment in a manner that will not cause damage to branches, shape, and future development after planting.
 5. Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers, but shall not be root bound.
 6. Make substitutions only when a plant (or alternates as specified) is not obtainable and the Contracting Officer's Representative authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant with the same essential characteristics and an equitable adjustment of the contract price.
 7. Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Label at least one-third of plants of each variety, size, and caliper with a securely attached, waterproof and weather-resistant label bearing legible the correct designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as indicated in the Plant Schedule or Plant Legend shown on the Drawings. Labels shall be securely attached and not be removed.

2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36 mm) sieve and a minimum of 75 percent passing through No. 60 (0.25 mm) sieve.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent sulfur, with a minimum of 99 percent passing through No. 6 (3.35 mm) sieve and a maximum of 10 percent passing through No. 40 (0.425 mm) sieve.

- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30 mm) sieve.
- E. Coarse Sand shall be concrete sand, ASTM C33 Fine Aggregate, clean, sharp free of limestone, shale and slate particles, and toxic materials.

2.3 ORGANIC SOIL AMENDMENTS

- A. Organic matter: Commercially prepared compost. Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2 inch (13 mm) sieve; soluble salt content of 0 to 8 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight, with a minimum 250 pounds of organic matter per cubic yard.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.4 PLANT FERTILIZERS

- A. Soil Test: Evaluate existing soil conditions and requirements prior to fertilizer selection and application to minimize the use of all fertilizers and chemical products. Obtain approval of Contracting Officer's Representative for allowable products, product alternatives, scheduling and application procedures. Evaluate existing weather and site conditions prior to application. Apply products during favorable weather and site conditions according to manufacturer's written instructions and warranty requirements. Fertilizers to be registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer applicable to specific areas as required for Project conditions and application. Provide commercial grade plant and turf fertilizers, free flowing, uniform in composition and conforms to applicable state and federal regulations.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition shall be nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

- C. Slow-Release Fertilizer: Granular or pellet fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition shall be nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Plant Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
1. Size: 21-gram tablets.
 2. Nutrient Composition shall be 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.5 PLANTING SOILS

- A. Existing Planting Soil: Existing, native surface topsoil formed under natural conditions retained during excavation process. Verify suitability of native surface topsoil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
1. Supplement with import planting soil when quantities are insufficient.
 2. Mix existing, native surface topsoil with the following soil amendments and fertilizers as recommended by the soils analysis.
- B. Imported Planting Topsoil: Imported topsoil or manufactured topsoil from off-site sources can be used if sufficient topsoil is not available on site to meet the depth as specified herein. The contractor shall furnish imported topsoil. At least 10 days prior to topsoil delivery, notify the contracting officer's representative of the source(s) from which topsoil is to be furnished. Obtain imported topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes. Imported topsoil shall meet the following criteria:
1. Salinity (ece): 0-3.0 ds/m.
 2. Sodium (sar): 0-4.
 3. Boron (saturated extract): 0-0.7 ppm.
 4. Particle size: the clay plus silt fraction shall not exceed 50%, and gravel shall not exceed 8%.
 5. Decomposed organic matter: 2% to 15%.
 6. Should the samples not meet all of the standards given above, the soil laboratory may submit in the report what additives (in addition to the material already called for in

these specifications) should be installed to correct these problems. Contractor shall install the additives as recommended by the soils laboratory at no additional cost to the Government.

2.6 BIOSWALE PLANTER SOIL

A. Previously installed by others.

2.7 BIOSTIMULANTS

A. Biostimulants: Contain soil conditioners, VAM fungi, and endomycorrhizal and ectomycorrhizal fungi spores and soil bacteria appropriate for existing soil conditions.

2.8 LANDSCAPE MEMBRANES

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101 g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally-encountered chemicals, alkalis, and acids.
- B. Composite Fabric shall be woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd. (162 g/sq. m).

2.9 MULCH

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
1. Type: Recycled wood mulch.
 2. Size Range shall be 3 inches (76 mm) maximum, 1/2 inch (13 mm).
 3. Color shall be natural.

2.10 WATER

A. Water shall not contain elements toxic to plant life. Water to be obtained from on-site source at no cost to the Contractor.

2.11 ANTIDESICCANT

A. Antidesiccant: An emulsion specifically manufactured for agricultural use that will provide a protective film over plant surfaces permeable enough to permit transpiration.

2.12 PESTICIDES

A. Consider IPM (Integrated Pest Management) practices to minimize the use of all pesticides and chemical products. Obtain approval of Chief Engineer for allowable products, product alternatives, scheduling and application procedures. Evaluate existing weather and site conditions prior to application. Apply products during favorable weather and site conditions according to manufacturer's written instructions and warranty

requirements. Pesticides to be registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
 - 5. Special conditions may exist that warrant a variance in the specified planting dates or conditions. Submit a written request to the Contracting Officer's Representative stating the special conditions and proposal variance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Contracting Officer's Representative and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

- B. Install 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.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain approval by the Contracting Officer's Representative of layout before excavating or planting. The Contracting Officer's Representative may approve adjustments to plant material locations to meet field conditions.
- D. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
 - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- E. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

3.3 PLANTING AREA ESTABLISHMENT

- A. Loosen subgrade of planting areas to a minimum depth of 8 inches (200 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Government property.
 - 1. Apply fertilizer or conditioner recommended by the soil testing laboratory directly to subgrade before loosening.
 - 2. Spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 6 inches (150 mm) but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Contracting Officer's Representative acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45 degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1. Excavate approximately 3 times as wide as rootball diameter.
 - 2. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 3. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 4. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 5. Maintain supervision of excavations during working hours.
 - 6. Keep excavations covered or otherwise protected after working hours.
 - 7. Use topsoil to form earth saucers or water basins for watering around plants. Basins to be 2 inches (50 mm) high for shrubs and 4 inches high for trees.
- B. Subsoil and topsoil removed from excavations may not be used as planting soil.
- C. Notify Contracting Officer's Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- D. Notify Contracting Officer's Representative if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow water to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

- A. Prior to planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set container-grown stock plumb and in center of planting pit or trench with root flare of shrubs 1 inch above adjacent finish grades, and root flare of trees 2 inches above adjacent finish grades.
 - 1. Use planting soil for backfill.
 - 2. Carefully remove root ball from container without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half full, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.
 - 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
 - 6. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside soil-covered roots about 1 inch (25 mm) from root tips; do not place tablets in bottom of the hole or touching the roots.
 - 7. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. When planting on slopes, set the plant as detailed on the drawings; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Contracting

Officer's Representative, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

C. Do not apply pruning paint to wounds.

3.7 ROOT-BARRIER INSTALLATION

- A. Install root barrier where trees are planted within 6 feet of paving or other hardscape elements, such as walls, curbs, and walkways unless otherwise shown on Drawings.
- B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- C. Install root barrier continuously for a distance of 4 feet in each direction from the tree trunk, for a total distance of 8 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 - 1. Position top of root barrier per manufacturer's recommendations //.
 - 2. Overlap root barrier a minimum of 12 inches (300 mm) at joints.
 - 3. Do not distort or bend root barrier during construction activities.
 - 4. Do not install root barrier surrounding the root ball of tree.

3.8 GROUND COVER AND PLANT INSTALLATION

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 MULCH INSTALLATION

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches (150 mm) and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated. Keep mulch out of plant crowns and off buildings, pavements, utility standards/pedestals, and other structures.

1. Organic Mulch in Planting Areas: Apply 3 inch (75 mm) average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches (75 mm) of trunks or stems. Do not install mulch in Flow-Through Planter.

3.10 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring plant saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use IPM (Integrated Pest Management) practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with the VA's operations and others in proximity to the Work. Notify Contracting Officer's Representative before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Non-Selective): Applied to tree, shrub, and ground-cover areas in accordance with manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Non-Selective): Applied only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.

- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- D. Erect temporary fencing or barricades and warning signs, as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- E. After installation and before Project Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- F. Remove nondegradable erosion control measures after grass establishment period.
- G. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Government property.

--- END ---