UNITED STATES DEPARTMENT OF VETERANS AFFAIRS

SOLICIATION PACKAGE INCLUDING PROJECT MANUAL
FOR

LOUISIANA
NATIONAL CEMETERY
GRAVESITE EXPANSION PHASE 1D

Project Number 870-CM-3023D

Prepared
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SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL INTENTION

A. Contractor shall completely prepare site for construction operations, including demolition and removal of existing structures and substructures, and furnish labor and materials and perform Work for construction of Cemetery expansion, including general grading; grading of cremain burial areas for installation of preplaced urn crypts; drainage system infrastructure; and irrigation and landscaping as required by Construction Documents (Drawings and Specifications, as well as all other Contract Documents).

B. Visits to the site by Bidders may be made only by appointment with the Cemetery Director, Mr. Rex Kern, 225.654.3767. Louisiana National Cemetery Gravesite Expansion Phase 1D is located at West Mt. Pleasant-Zachary Road and Salvant Road, Zachary, LA 70791.

C. Offices of Jacobs Engineering Group Inc (“Jacobs”), 1050 20th Street, Suite 200 Sacramento, California 95811, Phone 916.929.3323, as Architect-Engineers (A/E), 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 (CO), Contracting Officer’s Representative (COR), or his duly authorized representative.

D. Before placement and installation of Work subject to tests by testing laboratory retained by the Contractor, the Contractor shall notify the COR in sufficient time to enable COR or authorized personnel to be present at the site in time for observation of testing of specimens and field inspection. Such prior notice shall be not less than three work days unless otherwise designated by the COR.

E. All employees of General Contractor and subcontractors shall comply with VA security management program and obtain permission of the VA police, be identified by project and employer, and be restricted from unauthorized access.

F. Prior to commencing Work, Contractor shall provide proof that an OSHA certified “competent person” (CP) (29 CFR 1926.20(b)(2) will maintain a presence at the Work site whenever the general Contractor or subcontractors are present.

G. Training:
1. All employees of Contractor or subcontractors shall have the 10-hour OSHA certified Construction Safety course and/or other relevant competency training, as determined by VA.
2. Submit training records of all such employees for approval before the start of Work.

1.2 STATEMENT OF BID ITEMS

A. CONTRACT LINE ITEM NUMBER (CLIN) I, GENERAL CONSTRUCTION: Work includes general construction; demolition and removal of existing surface and subsurface features; earthwork; excavation, fill and grade; storm drainage piping and appurtenances; irrigation system piping and appurtenances; installation of urn crypts; landscaping; and incidental improvements as required by the plans and specifications.

B. CONTRACT LINE ITEM NUMBER (CLIN) 2, PRE-PLACED URN CRYPTS: Purchase and deliver to site 847 pre-placed Urn Crypts, including 20 extra lids, and 3 lid lifting devices.

C. CONTRACT LINE ITEM NUMBER (CLIN) 3, ADD ALTERNATE 1: Work includes general construction; demolition and removal of existing surface and subsurface features; earthwork; excavation, fill and grade; storm drainage piping and appurtenances; irrigation system piping and appurtenances; installation of additional pre-placed urn crypts, landscaping; and incidental improvements as required by the plans and specifications in the area designated as Add Alternate 1.

D. CONTRACT LINE ITEM NUMBER (CLIN) 4, ADD ALTERNATE 2: PRE-PLACED URN CRYPTS: Purchase and deliver to site 283 pre-placed Urn Crypts.

1.3 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

A. AFTER AWARD OF CONTRACT, 1 (one) full size set of specifications and drawings will be furnished by A/E.

B. Electronic copies of plans (pdf or AutoCAD) may be made available to the Contractor upon request subject to Agreement by the A/E.

1.4 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:
1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
2. The Contractor is responsible for assuring that all subcontractors working on the project and their employees also comply with these regulations.
3. Contractor shall submit the Security Plan to COR for review and approval prior to beginning on-site Work.

B. Security Procedures:
1. Contractor’s employees shall not enter the project site without an appropriate badge or means of identification. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. For working outside the “regular hours” as defined in the Contract, the General Contractor shall give 3 (three) days notice to the COR so that security arrangements can be provided for the employees. This notice is

separate from any notices required for utility shutdown described later in this Section or elsewhere in the Construction Documents.

3. No photography of VA premises is allowed without written permission of the COR except for photography as required for daily reporting.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a National Emergency. The General Contractor may return to the site only with the written approval of the COR.

C. Key Control:
1. The General Contractor shall provide duplicate keys and lock combinations to the COR for the purpose of security inspections or emergency access of every area of project.

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

E. Motor Vehicle Restrictions
1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.

1.5 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article to the extent referenced. Publications are referenced in text by basic designations only.
   1. National Fire Protection Association (NFPA):
      10-2010..... Standard for Portable Fire Extinguishers
      30-2008..... Flammable and Combustible Liquids Code
      51B-2009..... Standard for Fire Prevention During Welding, Cutting and Other Hot Work
      70-2008..... National Electrical Code
      241-2009..... Standard for Safeguarding Construction, Alteration, and Demolition Operations
   2. Occupational Safety and Health Administration (OSHA):
      29 CFR 1926 Safety and Health Regulations for Construction

B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926. Prior to start of Work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to COR/Cemetery Director for review for compliance with Contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Prior to any worker for the Contractor or subcontractors beginning Work, they shall undergo a safety briefing provided by the General Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of NCA equipment, etc. Documentation shall be provided to the COR that individuals have undergone the Contractor's safety briefing.

C. Site Access: Maintain free and unobstructed access to emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.

D. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from new construction by distances in accordance with NFPA 241. For small facilities with less than 20 feet exposing 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 paths from exits to roads. Minimize disruptions and coordinate with COR/Cemetery Director.

G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to COR.

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

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

J. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Designate Contractor's responsible project-site fire prevention program manager to permit hot work.

K. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to COR.

L. Smoking: Smoking is prohibited in and adjacent to construction areas and on Cemetery grounds.

M. Dispose of waste and debris in accordance with NFPA 241. Remove from site daily.

N. Perform other construction, alteration and demolition operations in accordance with 29 CFR 1926.

1.6 OPERATIONS AND STORAGE AREAS

A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the COR. The Contractor shall hold and save the Government and its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

B. Temporary buildings (e.g., storage trailers, office trailers) and utilities may be erected by the Contractor only with the approval of the COR and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the Work.

C. The Contractor shall, under regulations prescribed by the COR, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the COR. When materials are transported in prosecuting the Work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads. (FAR 52.236-10).

D. Working space and space available for storing materials shall be as shown on the Construction Documents. Adjustments may be made in the field upon written request and authorization by the COR.
   1. Contractor employee parking shall be in areas designated on the Construction Documents or requested in writing and authorized by the COR.

E. Workmen are subject to rules of the Cemetery applicable to their conduct.

F. Execute Work so as to interfere as little as possible with normal functioning of Cemetery 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 in quantities sufficient for not more than two work days.
   3. Where access by Cemetery is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
   4. All such actions shall be coordinated with the Utility Company involved:
      a. 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.
      b. Whenever it is required that a connection fee be paid to a public utility provider for temporary 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.

G. Phasing: To insure such executions, the Contractor shall furnish the COR with a schedule of approximate dates on which the Contractor intends to accomplish Work in each specific area of Site. In addition, the Contractor shall notify the COR two weeks in advance of the proposed date of starting Work in each specific area of Site. Arrange such dates to insure accomplishment of this Work in successive phases mutually agreeable to the Cemetery Director, COR and Contractor, as follows:
   1. The Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Cemetery’s operations will not be hindered. The Contractor shall permit access to Department of Veterans Affairs personnel through other construction areas which serve as routes of access to such affected areas and equipment. Coordinate alteration Work in areas occupied by Department of Veterans Affairs so that Cemetery operations will continue during the construction period.
   2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.

H. Construction Fence: Before construction operations begin, the Contractor shall provide a chain link construction fence, seven feet minimum height, around the construction area indicated on the Construction Documents by “LIMIT OF WORK” line. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 15 inches. Bottom of fences shall extend to one inch above grade. Remove the fence when Work is substantially complete and/or as directed by COR.
   1. Construction fence shall include screening such that views of construction operations are acceptably obstructed from normal Cemetery operations.

I. Utilities Services: Where necessary to cut existing water, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR and coordination with the Utility owner.
2. 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 COR and Cemetery Director's prior knowledge and written approval.
3. The Contractor shall submit a request to interrupt any such services to COR and Cemetery Director, in writing, 48 hours in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
4. The Contractor will be advised (in writing) of approval of request.
5. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
6. In case of a Contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
7. 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.
8. Whenever it is required that a connection fee be paid to a public utility provider for temporary 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.

J. 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 purged and sealed, capped or plugged.

K. To minimize interference of construction activities with flow of Cemetery traffic, comply with the following:

1. Keep roads, walks and entrances to grounds, to parking and to occupied areas clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times.
2. Method and scheduling of required cutting, altering and removal of existing improvements must be approved by the COR.

L. Coordinate the Work for this Contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.

M. Coordination of Construction with Cemetery Director: The burial activities at a National Cemetery shall take precedence over construction activities. The Contractor must cooperate and coordinate with the Cemetery Director, through the COR, in arranging construction schedule to cause the least possible interference with Cemetery activities in actual burial areas. Construction noise during the interment services shall not disturb the service. Trucks and workmen shall not pass through the service area during this period:
   1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation adjacent to existing burial plots before these dates.
   2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition to the satisfaction of the COR.

1.7 ALTERATIONS

A. Survey: Before any Work is started, the Contractor shall make a thorough survey with the COR of areas in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed, to the Contracting Officer. This report shall list by areas:
   1. Shall note any discrepancies between Construction Documents and existing conditions at site.
   2. Shall designate areas for working space, materials storage and routes of access to areas where alterations occur and which have been agreed upon by Contractor and COR.

B. Any items required by Construction Documents to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by the Contractor with new items in accordance with specifications which will be furnished by the 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 COR together shall make a thorough re-survey of the areas of construction involved. They shall furnish a report on conditions then existing, of improvements and all 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 the Contractor to such surfaces, despite protection measures; and, will form the basis for determining extent of repair work required of the Contractor to restore damage caused by the Contractor's workmen in executing Work of this contract.

D. Protection: Provide the following protective measures:

1. 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.

1.8 ENVIRONMENTAL CONTROLS

A. In general, the following preventive measures shall be adopted during construction to keep down dust:
   1. Dampen debris to keep down dust.

B. Final Cleanup:
   1. Upon completion of the Project, or as Work progresses, remove all construction debris from the site daily.

1.9 DISPOSAL AND RETENTION

A. Materials and equipment accruing from Work and from demolition of site elements, or parts thereof, shall be disposed of as follows:
   1. Reserved items which are to remain property of the Government are noted on Drawings or in Specifications as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.
   2. Items not reserved shall become property of the Contractor and be removed by Contractor from the Cemetery.
   3. The Contractor shall be responsible for disposal of materials in accordance with the procedures of the Environmental Protection Agency (EPA) and the Department of Transportation (DOT) as outlined in Code of Federal Regulation (CFR), Titled 40 and 49 respectively. The EPA's Toxic Substance Control Act (TSCA) Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7 also apply. Upon removal of hazardous materials for disposal, the "originator" copy of the Uniform Hazardous Waste Manifest (EPA Form 8700-22), along with the Uniform Hazardous Waste Manifest Continuation Sheet (EPA Form 8700-22A) shall be returned to the COR who will annotate the Contract file and transmit the Manifest to the Cemetery's Director.
      a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:
         40 CFR 261 ... Identification and Listing of Hazardous Waste
         40 CFR 262 ... Standards Applicable to Generators of Hazardous Waste
         40 CFR 263 ... Standards Applicable to Transporters of Hazardous Waste
         40 CFR 761 ... PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions
         49 CFR 172 ... Hazardous Material tables and Hazardous Material Communications Regulations
         49 CFR 173 ... Shippers - General Requirements for Shipments and Packaging
         49 CRR 173 ... Subpart A General
         49 CFR 173 ... Subpart B Preparation of Hazardous Material for Transportation

49 CFR 173 ... Subpart J Other Regulated Material; Definitions and Preparation
TSCA ..... Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7

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

A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the Work site, which are not to be removed and which do not unreasonably interfere with the Work required under this Contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during Contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the COR.

B. The Contractor shall protect from damage all existing improvements and utilities at or near the Work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this Contract or failure to exercise reasonable care in performing the Work. If the Contractor fails or refuses to repair the damage promptly, the COR may have the necessary Work performed and charge the cost to the Contractor. (FAR 52.236-9)

C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

D. Refer to FAR clause 52.236-7, "Permits and Responsibilities," which is included in General Conditions. A National Pollutant Discharge Elimination System (NPDES) permit is not required for the base bid project; however, the Contractor shall exercise care in performance of the Work so as not to allow pollutants to leave the project site. A National Pollutant Discharge Elimination System (NPDES) permit is required for this project if Add Alternate 1 is awarded. The Contractor is considered an "Operator" under the permit and has extensive responsibility for compliance with permit requirements. The Contractor and affected subcontractors shall furnish all information and certifications that are required to comply with the permit process and permit requirements. Many of the permit requirements will be satisfied by completing construction as shown and specified. Some requirements involve the Contractor's method of operations and operations planning and the Contractor is responsible for employing best management practices. The affected activities often include, but are not limited to the following:

1. Designating areas for equipment maintenance and repair;

2. Providing waste receptacles at convenient locations and provide regular collection of wastes;
3. Locating equipment wash down areas on site, and provide appropriate control of wash-waters;
4. Providing protected storage areas for chemicals, paints, solvents, fertilizers, and other potentially toxic materials; and
5. Providing adequately maintained sanitary facilities.
6. Protect the environment from soils migration by air or water.
7. Permits, including all required documentation to obtain the permit and maintain the permit, are the responsibility of 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 COR. Existing Work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is disturbed. Materials and workmanship used in restoring Work shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

B. Upon completion of Contract, deliver Work complete and undamaged. Existing work (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 at least as good condition as existed before commencing Work.

C. At the Contractor's own expense, the Contractor shall immediately restore to service and repair any damage caused by the Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment, whether shown on the Construction Documents or not.

D. Expense of repairs to such utilities and systems not shown on Construction Documents and not identified by a Utility Locator Service or locations of which are unknown will be covered by adjustment to Contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.12 PHYSICAL DATA

A. Data and information furnished or referred to below is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.
   1. The indications of physical conditions on the drawings and in the specifications are the result of site investigations by W.L. Burle Engineers, P.A.

(FAR 52.236-4)

B. Subsurface conditions have been developed by core borings and test pits. Logs of subsurface exploration are included in the soil report – reference Appendix.

C. A copy of the soil report titled *Geotechnical Investigation and Engineering Report for Gravesite Expansion Project VA Project No. 870 CM 3022 at Port Hudson National Cemetery Zachary, LA*, dated February 15, 2011, by W.L. Burle Engineers, P.A. shall be considered part of the Contract Documents. See Appendix.

D. The Government does not guarantee that other materials will not be encountered nor that proportions, conditions or character of several materials will not vary from those indicated by explorations. Proposed Contractor is expected to examine the site of Work and logs of borings and, after investigation, decide for him/herself the character of materials and make their bids accordingly. Upon proper application to the Department of Veterans Affairs, proposed Contractor will be permitted to make subsurface explorations of his own at site.

1.13 PROFESSIONAL SURVEYING SERVICES

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

1.14 LAYOUT OF WORK

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

(FAR 52.236-17)

B. Establish and plainly mark center lines for each structure, gravesite control monument, and such other lines and grades that are reasonably necessary to properly assure that location, orientation, and elevations established for each such structure, gravesite control monuments, etc are in accordance with lines and elevations shown on Construction Documents.

C. Following completion of general mass excavation and before any other permanent Work is performed, establish and plainly mark (through use of appropriate batter boards or other means) sufficient additional survey control points or system of points as may be necessary to assure proper alignment, orientation, and grade of all major features of Work. The Survey shall include, but not be limited to, location of lines and grades of preplaced urn crypts, center lines of columns in both directions, major utilities and elevations of preplaced urn crypt subgrades:

1. Such additional survey control points or system of points thus established shall be checked and certified by a registered land surveyor or registered civil engineer. Furnish such certification to the COR before any Work (such as preplaced urn crypts, utilities and other major controlling features) is placed.

D. During progress of Work, and particularly as Work progresses from area to area, the Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of Construction Documents. Furnish such certification to the COR before any major items of concrete work are placed. In addition, the Contractor shall furnish to the COR certificates from a registered land surveyor or registered civil engineer that the following Work is complete in every respect as required by Construction Documents.

1. Elevations of bottoms of preplaced urn crypt subgrades.
2. Lines and elevations of storm sewers and distribution systems.
3. Lines of grave plot documentation.
4. Lines of elevations of all swales and interment areas.
5. Lines and elevations of curbs.
6. Northing/Easting coordinate locations of all storm and irrigation structures, directional fittings, control wire and lines.

E. Upon completion of the Work, the Contractor shall furnish the COR with reproducible drawings, in AutoCAD format, at the scale of the Construction Documents, showing the finished grade on the grid developed for constructing the Work, including burial monuments and preplaced urn crypt finished grades at fifty foot stationing. These Construction Documents shall bear the seal of the registered land surveyor or registered civil engineer.

F. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.15 AS-BUILT DRAWINGS

A. The Contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, which will include all Contract changes, modifications and clarifications.

B. All variations shall be shown in the same general detail as used in the Construction Documents. To insure compliance, as-built drawings shall be made available for the COR's review, as often as requested.

C. The Contractor shall deliver two approved completed sets of as-built drawings to the COR within 15 calendar days after each completed phase and after the acceptance of the project by the COR.

D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.16 USE OF ROADWAYS

A. For hauling, use only established public roads and roads on Cemetery property and, when authorized by the COR and/or shown on Contract Drawings, such temporary roads which are necessary in the performance of Contract Work. Temporary roads shall be constructed by the Contractor at the Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.

B. When new permanent roads are to be a part of this contract, the Contractor may construct them immediately to facilitate construction operations. These roads may be used by all who have business thereon within zone of construction operations.
   1. Roadways are to be kept free and clear of dirt, gravel, and debris for the full curb-to-curb width. Tracking onto roadways by project vehicles and non-project vehicles is to be cleaned immediately.
   2. Roadways installed as part of the Work shall be protected from damage until construction is complete and the Cemetery is turned over to the VA.
   3. Roadways may be used by vehicles which are not loaded and which will not cause damage. Damaged roadways or roadway bases will be reconstructed by the Contractor at his own expense.

1.17 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

A. Use of mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power, etc will be permitted subject to compliance with the following provisions:
   1. Permission to use each unit or system must be given by COR. If the equipment is not installed and maintained in accordance with the following provisions, the COR 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, and their overload elements shall be properly sized, coordinated and adjusted. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.
   3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
   4. Any and all fees accrued to use such utilities and equipment shall be paid by the Contractor.

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.

1.18 TEMPORARY TOILETS

A. Provide where directed, for use of all Contractor's workmen, ample temporary sanitary toilet accommodations with suitable sewer and water connections, or when approved by COR, provide suitable dry closets where directed. Keep such places clean and free from flies. 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 supplies, as specified in the Contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.

B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the COR, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity and/or water used for the purpose of determining charges. Before final acceptance of the Work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

C. The Contractor shall install meters at the Contractor's expense and furnish the Cemetery a monthly record of the Contractor's usage of electricity and/or water as hereinafter specified.

D. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the local electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices providing temporary heat. Where not available the Contractor shall supply power via portable generators at his own expense.

E. Water (for Construction and Testing): Furnish temporary water service.
1. Obtain water by connecting to the local water distribution system. Provide reduced pressure backflow preventer at each connection. Comply with water purveyor’s requirements for connection and use, including obtaining and paying for permitting, metering, cross-contamination control, etc. and all costs to remove such connections.

F. Fuel: Natural and LP gas required shall be furnished by the Contractor at Contractor's expense.

1.20 TESTS

A. Conduct final tests required in various Sections of specifications in presence of an authorized representative of the COR. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.

B. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.

C. 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.

1.21 INSTRUCTIONS

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

B. Manuals: Maintenance and operating manuals (four copies each) for each separate piece of equipment shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component, accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

C. Instructions: the Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed instructions to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical Sections. Instructions for different items of equipment that are component parts of a complete system shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded

only when the COR is satisfied in regard to complete and thorough coverage. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.22 RELOCATED ITEMS

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

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

C. Suitably cap existing service lines, such as water, drain, gas, air, and/or electrical, whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".

D. Provide all electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.

E. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

1.23 CONSTRUCTION SIGN

A. Provide a Construction Sign where directed by the COR. 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 as directed.

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 COR.

D. Detail drawing of construction sign showing required legend and other characteristics of sign is shown on the Construction Documents.

1.24 SAFETY SIGN

A. Provide a Safety Sign where directed by COR. 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.

B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.

C. Maintain sign and remove it when directed by COR.

D. Detail drawing of safety sign showing required legend and other characteristics of sign is shown on the Construction Documents.

E. Post the number of accident free days on a daily basis.

1.25 CONSTRUCTION DIGITAL IMAGES

A. During the construction period through completion, furnish Department of Veterans Affairs with a minimum of 200 views of digital images, including one color print of each view and one Compact Disc (CD) per month containing those views taken during that month. Each view shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) and the images will be a minimum of 2272x1704 pixels for the 8x10 inch prints as per these specifications:

1. Normally such images of the site will be taken at daily intervals. However, the COR may also direct the taking of special digital images at any time prior to completion and acceptance of contract.
2. In event a greater or lesser number of images than specified above are required by the COR, adjustment in Contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88).

B. Prints shall be made on 8 by 10 inch regular-weight matte archival grade photographic paper and produced by a process with a minimum of 300 pixels per inch (PPI). Prints must be printed using the commercial RA4 process (inkjet prints will not be acceptable). Photographs shall have 8x8 inch full picture print with no margin on three sides and a 2 inch margin on the bottom for pre-typed self-adhesive identity label to be added by COR. It is required that the prints are professionally processed so the quality will meet or exceed that of the same size print made with a film camera. Prints must be shipped flat to the COR.

C. Images on CD-ROM shall be recorded in JPEG format with a minimum of 24 bit color and no reduction in actual picture size. Compressed size of the file shall be no less than 80% or the original with no loss of information. File names shall contain the date the image was taken, the Project number and a unique sequential identifier. The CD-ROM shall also contain an index of all the images contained therein in either a TXT or Microsoft Word format.

D. In case any set of prints are not submitted within five days of date established by COR for taking thereof, the COR may have such images/photographs taken and cost of same will be deducted from any money due to the Contractor.

E. Aerial Photographs: Submit aerial photographs at one-month intervals during the entire construction period. The first aerial photo shall be taken just prior to the start of construction and then at one-month intervals. The final aerial photograph shall be taken at full project completion during a growing season when lawns are green and not dormant.

1.26 HISTORIC PRESERVATION

A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction Work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the COR verbally, and then with a written follow up.

1.27 PROJECT HEALTH AND SAFETY PLAN

A. Prior to commencing any construction, the Contractor shall submit a site specific Project Health and Safety Plan (PHSP). At a minimum, the PHSP shall cover the following topics:
   1. Organizational structure (including Responsible Persons)
   2. Site Characterization and Job Hazard Identification
   3. Site Control and Security
   4. Training
   5. Medical Surveillance
   6. PPE
   7. Exposure Monitoring
   8. Heat Stress
   9. Spill Containment
   10. Decontamination
   11. Emergency Response
   12. Confined Spaces
   13. Hosting Operations
   14. Trench Safety
   15. Lockout/Tagout

1.28 ARCHEOLOGICAL AWARENESS

A. Purpose
   1. There were no findings of significance in the project area. This does not preclude the existence of items or remains to be encountered during construction. The following information is provided to the Contractor in the event that items are encountered.

B. Legal Responsibility
1. Federal entities have a responsibility to protect specific Native American and public interests in historical and archaeological remains under laws and regulations such as the National Environmental Policy Act (NEPA) and Section 106 and Section 110 of the National Historic Preservation Act (NHPA) (16 USC 470), the Native American Graves Protection and Repatriation Act (NAGPRA) (25 USC 3001), and the Archaeological Resources Protection Act (ARPA) (16 USC 470aa-11). Theft or deliberate destruction of archaeological remains may be prosecuted as a felony under ARPA.

C. Archaeological Remains
1. Generally archaeological remains are understood to be the traces of the lives of prehistoric and historical people. In North America this includes both Native American and historical remains. Remains may include structural remains, debris, and the remains of the people themselves, discovered in marked or unmarked burials.

D. Archaeological Phenomena
1. Phenomena of interest to archaeology are generally found buried in the soil, though the presence of archaeological remains may sometimes be signaled by surface evidence. They include a broad range of objects and conditions including:
    a. Midden accumulations – Soils for Earthwork types caused by human occupations. Midden is generally an accumulation of the waste and discarded materials from daily lives, including ash and charcoal from cooking fires, food remains such as bone, shell, and burned seeds, and discarded tools,
    b. Features – fixed objects, hearths, structures, cairns, foundations, pipelines, and similar items,
    c. Interments, both human and animal,
    d. Artifacts – arrowheads, spear heads, shell beads and ornaments, historic table-wares, bottles, metal objects, ceramic, glass, and similar materials.

E. Prehistoric Materials
1. Prehistoric materials that are commonly recognized include chipped stone tools and weapon tips, milling tools such as mortars, pestles, hand stones and grinding slabs, and debris such as the flakes and pieces from stone working. Burials and other kinds of remains including hearths may also be found. Typical materials may include stone such as obsidian and flint or chert, shell, and bone.

F. Historic Materials
1. Historic materials to be aware of include ceramics, glass, metal, brick, cut stone, and wood, as well as food remains that include both animal bone and shell. Foundations and both abandoned and unmapped utilities in use may be encountered. Hollow features, such as wells or privies, often

are filled with household debris upon abandonment and may be legally significant.

G. Resource Treatment – General Rule

1. Generally, when potentially important objects are discovered they need to be evaluated as quickly as possible. Halt Work in the location. Leave the discovery in place (if it is still in place) in the soil and establish an exclusion area around the find to buffer it from construction. If an object is found in spoils from trenching or grading, set it aside where it cannot be lost and notify the archaeological monitor immediately. If possible, halt excavation and construction Work where the spoils came from. Prehistoric or historic features such as burials, trash pits, foundations and similar finds made in place must be protected from further disturbance until the find can be evaluated. The Contractor shall halt construction within a five-meter radius of the outer edge of the find location. The exclusion area should be flagged to alert equipment operators. Discoveries such as interments should be covered with a tarp or loose soil to protect them from the elements and the curious.

H. Native American Issues

1. Native Americans have specific concerns regarding prehistoric sites, especially human burials. These remains are the direct evidence of their own ancestral past and the significance is direct and personal, not scientific interest or simple curiosity. They appreciate respectful treatment of such remains, just as Euroamericans would expect for the remains of their own ancestors. This respectful treatment is mandated by federal law and the right to define what respectful treatment consists of in general belongs to the most likely descendants. If, as part of the Native American handling of ancestral remains, ritual is conducted on site, it is best to maintain quiet and at a distance unless invited to observe or participate, in which case the officiating person will usually explain the ground rules for observers.
2. Note that the unauthorized removal of prehistoric or historic archaeological objects or the deliberate damage of archaeological sites on federal land may be a violation of Federal or State law.

I. Contacts

1. In all cases, the COR must be contacted prior to the notification of any other entity.
2. In case of exposed human remains (even one bone), first call the COR to prior to calling the East Baton Rouge Parish Coroner at (225) 389-3047.
3. If other archaeological remains (prehistoric or historic) are uncovered during construction, the contractor shall stop Work and call the COR.

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SECTION 01 32 17

NETWORK ANALYSIS SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Contractor shall develop a Microsoft Project 2003 (or later) Gantt Chart (bar chart) schedule demonstrating fulfillment of the Contract requirements. The Contractor shall keep the schedule up-to-date in accordance with the requirements of this Section. The Contractor shall utilize the plan for scheduling, coordinating, and monitoring Work under this Contract (including all activities of subcontractors, equipment vendors and suppliers). The Gantt Chart will be utilized to satisfy time and payment applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

A. The Contractor shall designate an in-house representative who will be responsible to prepare the schedule, review the schedule and report progress of the project to the COR.

B. The Contractor's in-house representative shall be given authority to act on behalf of the Contractor in fulfilling the requirements of this specification Section. Such authority shall not be interrupted throughout the duration of the project.

1.3 COMPUTER PRODUCED SCHEDULES:

A. The Contractor shall provide to CO/COR monthly computer processing of all computer produced schedules generated from monthly Project updates. The Contractor shall provide to CO/COR two (2) copies of the updated Microsoft Project Gantt Chart and an electronic copy of this data. This must be submitted with and substantively support the Contractor's monthly payment request.

B. The Contractor is responsible for the correctness and timeliness of the computer-produced reports. The Contractor is also responsible for the accurate and timely submittal of the updated Project schedule.

C. CO/COR shall report errors in computer-produced reports to the Contractor's representative within ten (10) calendar days from receipt of reports. The Contractor shall reprocess the Gantt Chart and associated CDs, when requested by the COR, to correct errors that affect the schedule for the Project.

1.4 THE COMPLETE PROJECT GANTT CHART SUBMITTAL:

A. The Complete Project Microsoft Project Gantt Chart will contain sufficient Work activities/events as necessary to fully detail the Project schedule.

B. Within ten (10) calendar days after receipt of the Notice to Proceed, the Contractor shall submit for the COR's review, a Microsoft Project Gantt Chart and

a CD. Each activity/event on the Gantt Chart schedule shall contain as a minimum, but not limited to, activity/event description, duration, start dates and finish dates. Activity constraints not required by the Contract will not be accepted. Logic events (non-Work) will be permitted where necessary to reflect proper sequence among Work events, but must have zero duration.

C. The complete working Gantt Chart shall reflect the Contractor's approach to scheduling the complete Project. The final Gantt Chart in its original form shall contain no Contract changes or delays that may have been incurred during the final Gantt Chart development period. It shall reflect the Contractor's "AS BID" or "DAY 1" schedule. Changes and/or delays shall be entered at the first monthly update after the final Gantt Chart has been approved. The Contractor shall provide their requests for time and supporting time extension analysis for Contract time as a result of Contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

D. Within ten (10) calendar days after receipt of the complete project Gantt Chart, the Contracting Officer (CO) or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
2. Schedule a meeting with the Contractor at or near the job site, or via conference call, for joint review, correction or adjustment of the proposed plan. Within ten (10) calendar days after the joint review, the Contractor shall revise and shall submit two (2) copies of the revised Gantt Chart and a revised CD as specified to the CO/COR. The revised submission will be reviewed by the CO and, if found to be as previously agreed upon, will be approved.

1.5 WORK ACTIVITY/EVENT AND COST DATA INFORMATION:

A. The Contractor shall not be required to "cost load" the computerized Microsoft Project Gantt Chart. As part of this submission, the Contractor shall provide a separate Schedule of Costs on AIA document G703. This Schedule of Costs shall reflect and contain all the same activities/events identified on the Gantt Chart.

B. The Contractor and the CO shall use this Schedule of Costs for monthly payment purposes as referenced in the General Conditions of this agreement.

C. The Contractor and CO shall agree on percentages for monthly Work accomplished. The cumulative total amount of all cost loaded activities/events (including alternates) shall equal the total Contract price.

D. Prorate overhead, profit and general conditions on all Work activities/events for the entire Project. Negative Work activity/event cost data will not be acceptable, except on VA issued Contract changes.

1.6 GANTT CHART REQUIREMENTS:

A. Show on the Gantt Chart the sequence and interdependence of Work activities/events required for complete performance of all items of Work. In preparing the Gantt Chart, the Contractor shall:
   1. Show the following on each Work activity/event:
      a. Concise description of the Work represented by the activity/event.
      b. Duration (in work days).
   2. Show activities/events as:
      a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction Work.
      b. COR's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
      c. Interruption of VA Cemetery utilities, delivery of Government-furnished equipment, project phasing and any other specification requirements.
      d. Test, balance, and adjust various systems and pieces of equipment.
      e. VA inspection and acceptance activity/event with a minimum duration of five (5) work days at the end of each phase and immediately preceding any VA move activity/event required by the Contract phasing for that phase.
   3. Break up the Work into activities/events of durations no longer than thirty (30) work days each, except as to non-construction activities/events (i.e. procurement of materials, delivery of equipment, concrete and asphalt curing) and any other activities/events for which the CO may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals shall not be less than ten (10) workdays. The construction time as determined by the Gantt Chart schedule from start to finish for any sub-phase, phase or the entire project shall not exceed the total Contract duration. Describe Work activities/events clearly, so the Work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.
   4. Exterior Label Information: Provide the following information on an external label attached to each diskette(s):
      a. VA Project Number and Project location.
      b. Name and telephone number of a point of contact, preferably the person who created the schedule.
      c. The CD number and total number of CDs in the set.
      d. The Project data status date.

1.7 PAYMENT TO THE CONTRACTOR:

A. Monthly, the Contractor shall submit the Gantt Chart updated for remaining activity durations and a Schedule of Costs updated for costs. AIA application and certification for payment documents G702 and G703 will be used. The

payment request should reflect and be in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS of Section GENERAL CONDITIONS. The Contractor is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated Schedule of Costs unless, in special situations, the Contracting Officer permits an exception to this requirement. Monthly payment requests shall include: two (2) copies of the updated Microsoft Project Gantt Chart, a listing of all project schedule changes, and associated data, made at the update. These must be submitted with and substantively support the Contractor's monthly application and certificate for payment request documents.

1. Monthly updates to the Gantt Chart shall include a summary of changes in the form of baseline duration/start/end dates and current month's variance from baseline duration/start/end dates.

B. When the Contractor fails or refuses to furnish to the CO the information and the associated updated Gantt Chart data, which, in the sole judgment of the CO, are necessary for validating the monthly progress payment, the Contractor shall not be deemed to have provided supporting schedule data upon which progress payment may be reasonably determined.

1.8 PAYMENT AND PROGRESS REPORTING:

A. Monthly job site progress meetings shall be held on dates mutually agreed to by the CO/COR and the Contractor. Presence of subcontractors during the progress meeting is optional unless required by the CO/COR. Job progress will be reviewed to verify:

1. Actual start and/or finish dates for updated/completed activities/events.
2. Remaining duration, required to complete each activity/event started, or scheduled to start, but not completed.
3. Time and cost data for change orders, and supplemental agreements that are to be incorporated into the Gantt Chart.
4. Percentage for completed and partially completed activities/events.
5. Logic and duration revisions required by this Section of the specifications.
6. Activity/event duration and percent complete shall be updated independently.

B. The Contractor shall submit a narrative report as a part of his monthly review and update, in a form agreed upon by the CO. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed. This report is in addition to the daily reports pursuant to the provisions of Article, DAILY REPORT OF WORKERS AND MATERIALS in the GENERAL CONDITIONS.

C. As part of the monthly jobsite progress meeting, the General Contractor, specifically requested subcontractors, and the CO/COR shall meet to discuss the monthly updated schedule. The main emphasis shall be to address Work

activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period.

1.9 RESPONSIBILITY FOR COMPLETION:

A. Whenever it becomes apparent from the monthly progress review meeting or the monthly computer-produced Gantt Chart schedule that phasing or Contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
   1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.
   2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
   3. Reschedule the Work in conformance with the specification requirements.
   4. Remedial actions shall be at no additional cost to the Government.

B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the CO for the proposed schedule changes. If such actions are approved, the revisions shall be incorporated by the Contractor into the Gantt Chart before the next update, at no additional cost to the Government.

1.10 CHANGES TO GANTT CHART SCHEDULE:

A. Within ten (10) calendar days after VA acceptance and approval of any updated computer-produced schedule, the Contractor shall submit a revised Gantt Chart, the associated CDs, and a list of any activity/event changes including predecessors and successors for any of the following reasons:
   1. Delay in completion of any activity/event or group of activities/events, which indicate an extension of the project completion by twenty (20) working days or 10 percent of the remaining project duration, whichever is less. Such delays which may be involved with Contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the Gantt Chart as the direct cause for delaying the project beyond the acceptable limits.
   2. Delays in submittals, or deliveries, or Work stoppage are encountered which make rescheduling of the Work necessary.
   3. The schedule does not represent the actual prosecution and progress of the project.
   4. When there is, or has been, a substantial revision to the activity/event costs of the network diagram regardless of the cause for these revisions.

B. Revisions made under this paragraph, which affect the previously approved computer-produced schedules for Government-furnished equipment, Contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, must be furnished in writing to the CO for approval.

C. CO's approval for the revised Gantt Chart and all relevant data is contingent upon compliance with all other paragraphs of this Section and any other previous agreements by the CO/COR.

D. The cost of revisions to the Gantt Chart resulting from Contract changes will be included in the cost of the change.

E. The cost of revisions to the Gantt Chart not resulting from Contract changes is the responsibility of the Contractor.

1.11 ADJUSTMENT OF CONTRACT COMPLETION:

A. The Contract completion time will be adjusted only for causes specified in this Contract. Request for an extension of the Contract completion date by the Contractor shall be supported with a justification, Gantt Chart data and supporting evidence as the CO may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals.

B. The CO's determination as to the total number of days of Contract extension will be based upon the current computer-produced Gantt Chart schedule for the time period when the change took place and all other relevant information. The CO will, within thirty (30) calendar days after receipt of such justification and supporting evidence, advise the Contractor in writing of his decision on the matter.

C. The Contractor shall submit each request for a change in the Contract completion date to the CO in accordance with the provisions specified under Article CHANGES in the Section GENERAL CONDITIONS. The Contractor shall include, as a part of each change order proposal, a sketch showing all revisions, duration (in work days) changes, and cost changes, for Work in question and its relationship to other activities on the approved network diagram.

D. All delays due to non-Work activities/events such as RFI's, WEATHER, STRIKES, and similar non-Work activities/events shall be analyzed on a month by month basis.

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

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

1.2 For the purposes of this Contract, samples, including laboratory samples to be tested, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.

1.3 Submit for approval all of the items specifically mentioned under the separate Sections of the specification, with information sufficient to evidence full compliance with Contract requirements. Materials, fabricated articles and the like to be installed in permanent Work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:

A. Satisfactory written evidence is presented to and approved by CO that manufacturer cannot make scheduled delivery of approved item; or,

B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity; or,

C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.

1.4 Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of Contract-required items. Delays attributable to untimely and rejected submittals (including any laboratory samples or testing) will not serve as a basis for extending Contract time for completion.

A. The VA review period for submittals shall be 14 calendar days.

1.5 Submittals will be reviewed for compliance with Contract requirements by A/E, and action thereon will be taken by COR on behalf of the CO.

A. Substitutions: Requests for substitution shall be submitted in writing, with full material information and product literature, justification for seeking substitution, and demonstration by the Contractor that the substitution requested meets or exceeds quality and/or performance of the specified Item. COR concurrence is required prior to providing submittal for substituted item.

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 therefore by CO, adjustment in Contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

1.8 Schedules called for in Specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and A/E. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The CO and A/E assume 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. CO assumes no responsibility for checking quantities or exact numbers included in such submittals.

A. Submit samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.

B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Cemetery, name of Contractor, Contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
   1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
   2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Cemetery, 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.
   4. Submit full sections. Partial section submittals shall not be acceptable.

C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests shall be tested, at the expense of Contractor, in a commercial laboratory approved by CO.
   1. Laboratory shall furnish CO with a certificate stating that it is fully equipped and qualified to perform intended Work, is fully acquainted with specification requirements and intended use of materials, and is an independent establishment in no way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
   2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.

3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
4. Contractor shall send a copy of transmittal letter to both COR and to A/E simultaneously with submission of material to a commercial testing laboratory.
5. Laboratory test reports shall be sent directly to COR for appropriate action.
6. Laboratory reports shall list Contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.

D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.

E. Approved samples will be kept on file by the COR at the site until completion of Contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical Sections of specifications, approved samples in good condition may be used in their proper locations in Contract Work. At completion of Contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the Contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of Contract.

F. Submittal drawings (shop, erection or setting drawings) and schedules, required for Work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with Contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
1. For each drawing required, submit one legible photographic paper or vellum reproducible.
2. Reproducible shall be full size.
3. Each drawing shall have marked thereon proper descriptive title, including Cemetery location, project number, manufacturer's number, reference to Contract drawing number, detail Section Number, and Specification Section Number.
4. A space 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 A/E under one cover.

1.10 Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

Jacobs Engineering Group Inc
1050 20th Street, Suite 200
Sacramento, California 95811
ATTN: LNC1D Project Manager
Phone: 916.929.3323

A. Digital Submittals: Digital submittals will be permitted only after the Contractor has demonstrated that the process can accommodated within the limits of the VA and A/E network limitations.

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

Department of Veterans Affairs
National Cemetery Administration (41F1)
425 I Street, NW, 5E425I
Washington, DC 20001
ATTN: Mr. Philip Obianwu
Phone: 202.632.5407

END OF SECTION

SECTION 01 45 29

TESTING LABORATORY SERVICES – RETAINED BY CONTRACTOR

PART 1 - GENERAL

1.1 DESCRIPTION

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

1.2 APPLICABLE PUBLICATIONS

A. 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. Use the latest edition of the referenced publication.

B. American Association of State Highway and Transportation Officials (AASHTO):
- T27 ..... Sieve Analysis of Fine and Coarse Aggregates
- T96 ..... Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- T99 ..... The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
- T104 ..... Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- T180 ..... Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
- T191 ..... Density of Soil In-Place by the Sand-Cone Method

C. American Society for Testing and Materials (ASTM):
- A325 ..... Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A370 ..... Definitions for Mechanical Testing of Steel Products
- A490 ..... Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
- C31 ..... Making and Curing Concrete Test Specimens in the Field
- C33 ..... Concrete Aggregates
- C39 ..... Compressive Strength of Cylindrical Concrete Specimens
- C109 ..... Compressive Strength of Hydraulic Cement Mortars
- C138 ..... Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
- C140 ..... Sampling and Testing Concrete Masonry Units and Related Units
- C143 ..... Slump of Hydraulic Cement Concrete
- C172 ..... Sampling Freshly Mixed Concrete

C173 ..... Air Content of freshly Mixed Concrete by the Volumetric Method
C330 ..... Lightweight Aggregates for Structural Concrete
C567 ..... Density Structural Lightweight Concrete
C780 ..... Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C1019 ..... Sampling and Testing Grout
C1064 ..... Freshly Mixed Portland Cement Concrete
C1077 ..... Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
C1314 ..... Compressive Strength of Masonry Prisms
D698 ..... Laboratory Compaction Characteristics of Soil Using Standard Effort
D1143 ..... Piles Under Static Axial Compressive Load
D1188 ..... Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
D1556 ..... Density and Unit Weight of Soil in Place by the Sand-Cone Method
D1557 ..... Laboratory Compaction Characteristics of Soil Using Modified Effort
D2166 ..... Unconfined Compressive Strength of Cohesive Soil
D2216 ..... Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
D2974 ..... Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
D3666 ..... Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
D3740 ..... Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material
D6938 ..... Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
E94 ..... Radiographic Testing
E164 ..... Ultrasonic Contact Examination of Weldments
E329 ..... Agencies Engaged in Construction Inspection and/or Testing
E543 ..... Agencies Performing Non-Destructive Testing
E709 ..... Guide for Magnetic Particle Examination
E1155 ..... Determining FF Floor Flatness and FL Floor Levelness Numbers

D. American Welding Society (AWS):
D1.1-07 ..... Structural Welding Code-Steel

1.3 REQUIREMENTS

A. Accreditation Requirements: Testing Laboratory retained and paid for by Contractor must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the

geographic region for the project. Furnish to the COR a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the COR for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to the testing field.

1. Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
2. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
3. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.
4. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880.
5. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543.
6. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.

B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by COR. When it appears materials furnished or Work performed by Contractor fail to meet construction Contract requirements, Testing Laboratory shall direct attention of COR to such failure.

C. Written Reports: Testing laboratory shall submit test reports to COR, A/E, and Contractor within 24 hours after each test is completed unless other arrangements are agreed to in writing by the COR. Submit reports of tests that fail to meet construction Contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to COR immediately of any irregularity.

1.4 CONTRACTOR SUBMITTALS

A. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of full time registered Engineer and responsible officer.

B. Submit copy of report of laboratory facilities inspection made by Materials Reference Laboratory of National Bureau of Standards during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

1.5 TESTING AGENCY/LABORATORY RESPONSIBILITIES

A. Test samples of mixes submitted by Contractor.

B. Provide qualified personnel at site. Cooperate with COR and Contractor in performance of services.

C. Perform specified sampling and testing of Products in accordance with specified standards.

D. Ascertain compliance of materials and mixes with requirements of Contract Documents.

E. Promptly notify COR and Contractor of observed irregularities or non-conformance of Work or Products.

F. Perform additional tests required by COR.

G. Attend preconstruction meetings and progress meetings.

1.6 TESTING AGENCY/LABORATORY REPORTS

A. After each test, promptly submit two copies of report to COR, A/E, and Contractor.

B. Include:
1. Date issued.
2. Project title and number.
3. Name of inspector.
4. Date and time of sampling or inspection.
5. Identification of product and specifications Section.
6. Location in the Project.
7. Type of inspection or test.
8. Date of test.
9. Results of tests.
10. Conformance with Contract Documents.

C. When requested by COR, provide interpretation of test results.

1.7 LIMITS ON TESTING AGENCY/LABORATORY AUTHORITY

A. Testing agency or laboratory may not release, revoke, alter, or enlarge on requirements of Contract Documents.

B. Testing agency or laboratory may not approve or accept any portion of the Work.

C. Testing agency or laboratory may not assume any duties of Contractor.

D. Testing agency or laboratory has no authority to stop the Work.

1.8 CONTRACTOR RESPONSIBILITIES

A. Deliver to testing agency/laboratory at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.

B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

C. Provide incidental labor and facilities:
   1. To provide access to Work to be tested.
   2. To obtain and handle samples at the site or at source of products to be tested.
   3. To facilitate tests.
   4. To provide storage and curing of test samples.

D. Notify COR, A/E, and Laboratory 24 hours prior to expected time for operations requiring testing services.

E. Employ services of an independent qualified testing laboratory and pay for additional samples and tests required by Contractor beyond specified requirements.

1.9 SCHEDULE OF TESTS

A. Individual Specification Sections: Tests required and standards for testing.

B. Summary of Tests required are shown in Part 3. The approximate numbers of tests are shown for reference only. Contractor shall provide sufficient number of tests to satisfy Testing requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EARTHWORK

A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The Work to be performed shall be as identified herein and shall include but not be limited to the following:
   1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the COR regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness excavation of unsuitable material and recommend to COR extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.
   2. Provide full time observation of fill placement and compaction and field density testing in preplaced urn crypt areas to verify that earthwork compaction obtained is in accordance with Contract Documents.
   3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural and engineered fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with ASTM D698, and in no case fewer than three (3) tests.
2. Make field density tests in accordance with the primary testing method following ASTM D6938 wherever possible. Field density tests utilizing ASTM D1556 or ASTM D2167 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the COR before the tests are conducted.
    a. Preplaced Urn Crypt Subgrade: At least one test of subgrade for every 2,000 square feet of preplaced urn crypt subgrade, but in no case fewer than nine (9) tests. In each compacted fill layer, perform one test for every 2,000 square feet of preplaced urn crypt subgrade, but in no case fewer than nine (9) tests.
        1) Perform three (3) additional tests in the Add Alternate 1 area.
    b. Curb, Gutter, and Sidewalk: One test for each 300 feet, but in no case fewer than one (1) test.
    c. Trenches: One test at maximum 100 foot intervals per 2 foot of vertical lift and at changes in required density, but in no case fewer than four (4) tests for each type of utility trench.

C. Testing Materials: Test suitability of on-site and off-site borrow as directed by COR.

3.2 LANDSCAPING

A. Test existing and imported topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.
    1. Test for organic material by using ASTM D2974.
    2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.
        a. Consolidated sample test – no amendments
        b. Consolidated sample test with proposed amendments specified
        c. Consolidated sample test with Contractor’s recommend amendment rate.

B. Submit laboratory test reports of topsoil configurations with final amendment recommendations to COR.

3.3 SITE WORK CONCRETE

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

3.4 CONCRETE

A. Batch Plant Inspection and Materials Testing:

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of COR with concurrence of CO and perform periodic inspections thereafter as determined by COR.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to COR.
3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate Project site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor’s expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 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 COR make three cylinders for each 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. COR may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day’s pumping operations to determine change in slump.
5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 25 cubic yards thereafter each day. For concrete not required to be air-entrained, test every 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. 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 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 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.

C. Laboratory Tests of Field Samples:
1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by COR. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Furnish certified compression test reports (duplicate) to COR. In test report, indicate the following information:
    a. Cylinder identification number and date cast.
    b. Specific location at which test samples were taken.
    c. Type of concrete, slump, and percent air.

d. Compressive strength of concrete in 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.

3.5 TYPE OF TEST

	Approximate Number of Tests Required
A. Earthwork:	
Laboratory Compaction Test, Soils (ASTM D698)	3
Field Density, Soils (ASTM D6938)	
Base Bid	9
Add Alternate 1	3
Trench	4
B. Landscaping:	
Topsoil Test	3
C. Aggregate Base:	
Field Density, ASTM D1556	2
Aggregate, Base Course	
Gradation (AASHTO T27)	1 for each type
Wear (AASHTO T96)	1 for each type
Soundness (AASHTO T104)	1 for each type
D. Concrete:	
Making and Curing Concrete Test Cylinders (ASTM C31)	3
Compressive Strength, Test Cylinders (ASTM C39)	2
Concrete Slump Test (ASTM C143)	1
Concrete Air Content Test (ASTM C173)	1
Aggregate, Normal Weight:	
Gradation (ASTM C33)	1 for each type
Deleterious Substances (ASTM C33)	1 for each type
Soundness (ASTM C33)	1 for each type
Abrasion (ASTM C33)	1 for each type
Unit Weight (ASTM C138)	1

END OF SECTION

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SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of 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, and solid waste, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various Contract items of Work.

B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely affect human health or welfare.
2. Unfavorably alter ecological balances of importance to human life.
3. Affect other species of importance to humankind.
4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.

1.2 RELATED DOCUMENTS

A. Storm Water Pollution Prevention Plan (SWPPP) outline for Louisiana National Cemetery, prepared by Jacobs Engineering Group Inc.

B. The preceding related documents are available for review at the offices of the A/E in the event that the Add Alternate 1 project Work is awarded:

JACOBS ENGINEERING GROUP INC
1050 20th Street, Suite 200
Sacramento, California 95811
Phone: 916.929.3323

1.3 DEFINITIONS OF POLLUTANTS

A. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.

B. Debris: Combustible and noncombustible wastes, such as leaves, tree trimmings, ashes, and waste materials resulting from construction or maintenance and repair work.

C. Sediment: Soil and other debris that has been eroded and transported by runoff water.

D. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from project construction activities.

E. 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 "waters of the United States" and require a permit to discharge water from the Governing Agency.

F. Rubbish: Combustible and noncombustible wastes such as, but not limited to, paper, plastic, metal and plastic containers and cans, boxes, metal and lumber scrap.

G. Sanitary Wastes: Domestic sanitary sewage.

1.4 QUALITY CONTROL

A. Contractor shall establish and maintain quality control for the environmental protection of all items set forth herein.

B. Contractor shall record on daily reports any problems in complying with laws, regulations, and ordinances and note any corrective action taken.

1.5 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, Waters of the United States.

C. Federal Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:

1. Storm water permits; refer to The Office of Wastewater Management, NPDES Storm Water Program: http://www.epa.gov/npdes/stormwater
2. Dredge and fill (Section 404) permits; refer to U.S. EPA Office of Wetlands, Oceans, and Watersheds (OWOW): http://www.epa.gov/owow/
3. RCRA hazardous and non-hazardous solid waste requirements; refer to EPA’s Office of Solid Waste and Emergency Response: http://www.epa.gov/epaoswer/osw/laws-reg.htm
4. Oil spill requirements for construction activities; refer to EPA Oil Program web site: http://www.epa.gov/oilspill/
5. Hazardous substances (Superfund Liability) requirements for construction activities; refer to EPA’s Superfund website: http://www.epa.gov/superfund/index.htm
6. Polychlorinated Biphenyl (PCB) waste requirements; refer to EPA’s Polychlorinated Biphenyl (PCB) Homepage: http://www.epa.gov/pcb/
7. Air quality requirements for construction activities; refer to EPA’S Air Program Mobile Sources Page: http://www.epa.gov/ebtpages/airmobilesources.html
8. Asbestos requirements for construction activities; refer to EPA’s Asbestos Management and Regulatory Requirements Website: http://www.epa.gov/fedsite/cd/asbestos.html

9. National Environmental Policy Act (NEPA) requirements for construction activities
10. Endangered Species Act; refer to The US Fish and Wildlife Service Endangered Species Program: http://endangered.fws.gov/
11. National Historic Preservation Act

D. State and Local Environmental Regulatory Requirements: Comply with applicable regulations. The following is for Contractor's information only:
1. Louisiana State Office/Department of Environmental Quality.
2. East Baton Rouge Parish Local Office/Department of Environmental Quality.
3. The Construction Industry Compliance Assistance Center: http://www.cicacenter.org/index.cfm
4. The National Environmental Compliance Assistance Clearinghouse: http://cfpub.epa.gov/clearinghouse/

1.6 SUBMITTALS

A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, the Contractor shall 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 COR 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) and qualifications of person(s) within the Contractor's organization who is (are) responsible for:
1) Ensuring adherence to the Environmental Protection Plan.
2) Manifesting hazardous waste to be removed from the site.
3) Training the Contractor's environmental protection personnel.
b. Description of the Contractor's environmental protection personnel training program.
c. 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.
d. 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.
e. Procedures to provide environmental protection that complies 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.

f. Permits, licenses, and the location of the solid waste disposal area.
g. 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.
h. Environmental Monitoring Plans for the job site including land, water, air, and noise.
i. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of construction limits or protected areas. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.

B. Within 20 days after the date of its submittal, the COR shall approve the Contractor's Comprehensive Environmental Protection Plan, or respond with an explanation for its rejection and required resubmittal.

C. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.7 PROTECTION OF ENVIRONMENTAL RESOURCES

A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent Work during the duration of this Contract. Confine construction activities to areas defined by construction limits, 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, land forms, wetlands or wetland buffers without prior approval from the COR. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or dictated by special emergency use.
1. Work Area Limits: Prior to any construction, mark/fence/protect the areas that require Work to be performed under this Contract. Mark/fence/protect monuments, works of art, and markers prior to construction. Convey to all personnel the purpose of marking and protecting all marked and protected objects.
2. Protection of Specific Regulated Elements: Wetlands and wetland buffers and other landscape features shown on the Construction Documents to be preserved by marking, fencing, or using any other approved protective techniques.
    a. Protect trees and shrubs to remain on site to protect from damage per Contract details.
    b. All damage to existing trees and shrubs shall be immediately repaired 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 only as needed to use to work the area to be developed. Form earthwork to final grade as shown as quickly as possible to minimize potential erosion damage. Immediately protect side slopes and back slopes upon completion of rough grading or clearing with appropriate material as defined in the Erosion and Sediment Control Plan.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, check dams and berms to retard and divert run-on and runoff from the construction site to protected drainage areas as intended 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 2 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 COR. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING and 32 90 00 PLANTING.
   c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: Construct or install temporary and permanent erosion and sedimentation control features to avoid violating water quality in accordance with Federal and State regulations. 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 and control borrow and spoil areas on Government property to minimize erosion and to prevent soil and/or sediment from entering nearby water courses.
7. Protect adjacent areas from despoilment by temporary excavations and embankments.
8. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
9. Store chemical waste away from the Work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
10. Handle discarded materials other than those included in the solid waste category as directed by the COR.

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 sediment basins prior to entering retention/detention ponds, allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
2. Monitor water areas, wetlands and wetland buffers 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 protected 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 Louisiana Air Pollution Regulation and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.

1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials 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, 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, or other methods are permitted to control particulates in the Work area as approved in the Environmental Protection Plan.
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. Noise Control: 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 7:00 a.m. and 6:00 p.m. unless otherwise permitted by local ordinance or the COR. 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 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
Scrapers	80	Pile Drivers	95
Graders	75	Jack Hammers	75
Trucks	75	Rock Drills	80
Pavers, Stationary	80	Pneumatic Tools	80
Pumps	75		
Generators	75	Saws	75
Compressors	75	Vibrators	75

   b. Provide soundproof housings or enclosures for noise-producing machinery.
   c. Use efficient silencers on equipment air intakes.
   d. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
   e. Line hoppers and storage bins with sound deadening material.
   f. 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 75 dBA noise level. Measure noise exposure at the property line or 50 feet from the noise source, whichever is greater. Measure the sound levels on the A weighted sound level of a General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at three to six feet in front of any building face. Submit the recorded information to the COR 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 as approved by the COR. Cleaning shall include off-Cemetery 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, clearing, logging and general construction in accordance with State and local regulations and the Contract.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section specifies the requirements for the management of non-hazardous demolition waste.

B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled, or reused.

C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle, not limited to the following:
   1. Waste Management Plan development and implementation.
   2. Techniques to minimize waste generation.
   3. Sorting and separating of waste materials.
   4. Salvage of existing materials and items for reuse or resale.
   5. Recycling of materials that cannot be reused or sold.

D. At a minimum the following waste categories shall be diverted from landfills:
   1. Soil.
   2. Inerts (e.g., concrete, masonry and asphalt).
   3. Clean dimensional wood and palette wood.
   4. Green waste (biodegradable landscaping materials).
   5. Metal products (e.g., steel, wire, beverage containers, etc).
   6. Cardboard, paper and packaging.
   7. Plastics (e.g., ABS, PVC).
   8. Paint.

1.2 RELATED WORK

A. Section 01 00 00, GENERAL REQUIREMENTS.

B. Section 02 41 10, DEMOLITION.

1.3 QUALITY ASSURANCE

A. Contractor shall practice efficient waste management when sizing, cutting and installing construction 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 maximum extent practical.

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, and/or 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. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).

E. 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.

F. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.

G. 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.

H. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.

I. 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.

J. 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.

K. 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.

L. 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.

M. Reuse: Materials that are recovered for use in the same form, on-site or off-site.

N. Return: To give back reusable items or unused products to vendors for credit.

O. Salvage: To remove waste materials from the site for resale or re-use by a third party.

P. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.

Q. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.

R. 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, and/or 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.
5. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.

C. Prepare and submit monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the Work site and disposed of or diverted from disposal through recycling.
1. Submit material tracking data listed in Article 2.1.
2. Report as defined in Article 3.3.

1.6 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.

U.S. Green Building Council (USGBC):

LEED Green Building Rating System for New Construction

1.7 RECORDS

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

1. The Project is not seeking LEED Certification. Records are to be provided for Government's use.

PART 2 - PRODUCTS

2.1 MATERIALS

A. List of each material and quantity to be salvaged, recycled, and/or 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, and/or 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, and invoices. Include the net total costs for each disposal.

END OF SECTION

SECTION 02 41 10

DEMOLITION AND SITE CLEARING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section specifies all site preparation Work, demolition and removal of utilities and other structures and debris.

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. Waste Management: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT

1.3 PROTECTION

A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities, and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required, for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.10 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. 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 or use sweeper at the Work area daily.

E. In addition to previously listed fire and safety rules to be observed in performance of Work, include following:
   1. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
   2. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 15 feet of fire hydrants.

F. 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 Cemetery; any damaged items shall be repaired or replaced as approved by the COR. The Contractor shall coordinate the Work of this Section with all other Work and shall construct and maintain shoring, bracing, and supports as required. Repairs, reinforcement, or replacement must have COR's approval.

G. The Work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

H. The Work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.27 PROJECT HEALTH AND SAFETY.

1.4 UTILITY SERVICES

A. Demolish and remove outside utility service lines shown to be removed. Cap ends of utility services lines at end of removals.

B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SITE CLEARING

A. General: Remove trees, shrubs, grass, and other vegetation, pavements, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
   1. Cut minor roots (less than 1 inch and outside of drip line of the tree) and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

B. Erosion Control: Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or

airborne dust to adjacent properties and walkways. Contractor shall install silt fence and inlet protection as shown on the Contract Drawings, prior to any soil disturbance activities.

1. Maintain site controls in accordance with LPDES permit.
2. Add Alternate #1: Maintain all records as required by the SWPPP. Perform inspections as required by the SWPPP.

C. Topsoil - On-site: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 6 inches. Satisfactory topsoil is reasonably free and/or screened of subsoil, clay lumps, stones, and other objects over 1 inch in diameter, and without weeds, roots, and other objectionable material.

1. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping.
   a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
2. Stockpile topsoil in storage piles in areas indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles to prevent wind erosion in accordance with the Storm Water Pollution Prevention requirements of the State. Refer to Division 32 Section 32 90 00 PLANTING for soil amendments required prior to spreading topsoil.
   a. Stockpile shall be contained with erosion and sediment controls (silt fence, fiber roll) and stabilized if undisturbed in accordance with the Storm Water Pollution Prevention requirements of the State.
3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material only after approval of the COR.

D. Clearing and Grubbing: Clear site of trees, shrubs, and other vegetation, except for those indicated to be left standing.

1. Completely remove stumps, roots, and other debris protruding through ground surface. Grind tree stumps and roots to a minimum of 18 inches below existing ground or finished surface, whichever is lower.
2. Use only hand methods for grubbing inside drip line of trees indicated to remain.
3. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
   a. Place fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

E. Removal of Improvements: Remove existing above-grade and below-grade improvements, including gravel base materials, as indicated and as necessary to facilitate new construction.

F. Abandonment or removal of certain underground pipe or conduits may be indicated on Drawings and is included under Work of this Section and related Division 33 Sections. Removing abandoned underground piping and conduits

interfering with construction is included under this Section, except as indicated to be abandoned in-place.

G. Continue maintenance of erosion controls in compliance with the requirements of the State until the Work is completed and the threat of erosion is gone by either ground surface stabilizer or lawn “grow-in” is at 85% complete. Temporary erosion control devices shall not be removed until the area is certified as being stabilized by the COR.

3.2 DEMOLITION

A. Completely demolish and remove utilities, including all appurtenances related or connected thereto, as noted below:
   1. As required for completion of Work, installation of new utility service lines, and as shown on the Drawings.
   2. To full depth.
   3. Record on As-Built Drawings any remaining lines (location, size, type, material, and depth) which have been abandoned in place.

B. Remove and legally dispose of all materials and debris (including brick, concrete, stone, metals and similar materials), other than earth or items to remain as part of Project Work. 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 indicated to be removed shall be included as part of the lump sum compensation for the Work of this Section.
   1. Materials that cannot be removed daily shall be stored in areas specified by the COR. Implement appropriate storm water pollution prevention best management practices.
   2. Materials that are discovered to be hazardous shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
   3. Burning is not permitted on the property.
   4. Contractor shall pay for all dumping charges or permits required to dispose of materials.

C. Remove existing utilities as indicated or uncovered by Work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the COR. When utility lines are encountered that are not indicated on the Construction Documents, the COR shall be notified prior to further Work in that area.

3.3 CLEAN-UP

A. Upon 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 Cemetery Property 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.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE

A. The Work of this Section includes furnish, place and finish cast in place concrete and related Work as indicated on the Construction Documents and specified here.
   1. Provide and erect formwork as required.
   2. Install miscellaneous metal and other items furnished by other trades to be installed in concrete work.
   3. Provide facilities for job curing of test cylinders and transporting to Testing Laboratory.

1.2 RELATED WORK

A. Concrete Paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

B. Section 33 49 00, STORM DRAINAGE STRUCTURES.

1.3 QUALITY ASSURANCE

A. Standards and References: (Latest Edition unless otherwise noted)
   1. 2009 International Building Code (IBC).
   2. American Association Of State Highway And Transportation Officials (AASHTO)
      - M31 ..... Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
      - M42 ..... Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
      - M55 ..... Plain Steel Welded Wire Fabric for Concrete Reinforcement
   3. American Concrete Institute (ACI)
      - 117 ..... Standard Tolerances for Concrete Construction and Materials
      - 305R ..... Hot Weather Concreting
      - 306 ..... Cold Weather Concreting
      - 318 ..... Building Code Requirements for Reinforced Concrete
      - SP-66 ..... Detailing Manual
   4. American Society For Testing And Materials (ASTM)
      - A618..... Standard Specification for Hot-Formed Welded and Seamless High-Strength Low-Alloy Structural Tubing
      - C31 ..... Making and Curing Concrete Test Specimens in the Field
      - C33 ..... Concrete Aggregates

C39 ..... Compressive Strength of Cylindrical Concrete Specimens
C42 ..... Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C94 ..... Ready-Mixed Concrete
C138 ..... Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
C143 ..... Slump of Hydraulic Cement Concrete
C150 ..... Portland Cement
C172 ..... Sampling Freshly Mixed Concrete by the Volumetric Method
C173 ..... Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C192 ..... Making and Curing Concrete Test Specimens in the Laboratory
C260 ..... Air-Entraining Admixtures for Concrete
C309 ..... Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C494 ..... Chemical Admixtures for Concrete
C618 ..... Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete
C1064 ..... Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
D1751 ..... Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

B. Submittals:
1. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
2. Concrete mix designs. See “Mix Design” below. Include results of test data used to establish proportions.
3. Certificates of Compliance from Manufacturer
   a. Cement
   b. Aggregates
   c. Admixtures
   d. Other Products specified herein
4. Transit-mix delivery slips:
   a. Keep record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slips certifying contents of the pour.
   b. Make the record available to the COR for his inspection upon request.
   c. Upon completion of this portion of the Work, deliver the record and the delivery slips to the COR.
5. Manufacturer's Certificates: Air entraining admixture, chemical admixtures, curing compounds.
6. Product data for all Products specified

C. Tests and Inspections:

1. Per the requirements of Section 01 45 29.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Portland Cement: ASTM C 150, Type I or Type II. One brand of cement shall be used throughout to maintain uniform color for all exposed concrete.

B. Concrete Aggregate: Fine and coarse Aggregates shall be regarded as separate ingredients. Each size of coarse Aggregate, as well as combination of sizes when two or more are used, shall conform to grading requirements of appropriate ASTM Standards.
   1. Concrete Aggregates for Standard Weight Concrete: ASTM C 33.
   2. Aggregate shall be crushed granite or Perkins type. Max size is 1 inch.

C. Water: Clean and free from injurious amounts of oil, acids, alkali, organic matter and other deleterious substances; suitable for domestic consumption per ACI 318.

D. Admixtures shall be subject to prior approval by the COR, in accordance with ACI 318, Calcium Chloride is not permitted.
   1. Water Reducing
      a. ASTM C494 Type A - for use in cool weather.
      b. ASTM C494 Type D - for use in hot weather.
   2. Air Entraining
      a. Conform to ASTM C 260
   3. Fly Ash
      a. Conform to ASTM C 618
   4. Mid-Range Water-Reducers
      a. Master Builders “Polyheed” or approved equal.
   5. Fly Ash Pozzolan
      a. Conforming to ASTM A618 Class F.

E. Sand: Clean, dry, well graded.

F. Expansion Joint Filler:
   1. Joint fill shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D 1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.

G. Expansion Anchors: All expansion bolts installed in concrete shall be KB-TZ expansion bolts as manufactured by Hilti Inc. See Drawings for installation requirements and tension testing requirements as applicable. See Drawings for special head requirements as needed. Substitution of other brands or anchors shall proceed only after written approval from the COR has been obtained.

H. Reinforcing Steel:

1. Welded wire-fabric shall conform to AASHTO M55.
2. Dowels shall be plain steel bars conforming to AASHTO M31 or M42. Tie bars shall be deformed steel bars conforming to AASHTO M31 or M42.

2.2 CONCRETE

A. Concrete Mixes:
   1. Type C Concrete:
      a. Strength: 4000 lbs. per square inch at 28 days.
      b. Maximum Aggregate Size: 1 inch.
      c. Minimum Cement Content: As required by mix design (ACI 318 Section 5.2).
      d. 6.5 sacks per yard minimum.
      e. Maximum Water to Cement Ratio: 0.50
      f. Admixture: Water reducing, Air entraining.
      g. Weight:145 lbs. per cubic foot
      h. Use for concrete exterior paving, sidewalks, curb, gutters, elevated slabs, and as otherwise specified
      i. Maximum Fly Ash content as a percentage of total cementitious material: 15%

B. Consistency of Concrete: Concrete slump, measured in accordance with ASTM C 143, shall fall within following limits.
   1. For General concrete placement: 3 inch plus or minus 1 inch.
   2. Mixes employing the specified mid-range water reducer shall provide a measured slump not to exceed 7 inch +1 inch after dosing, 2 inch +1 inch before dosing.
   3. Concrete slump shall be taken at point of placement. Use water reducing admixtures as required to provide a workable consistency for pump mixers. Water shall not be added at the jobsite without written review by the COR.

C. Mix Design:
   1. Initial mix design shall be prepared for Type C concrete by recognized testing laboratory (approved by the COR) in accordance with IBC Section 1905.3 or IBC Section 1905.4. In the event that additional mix designs are required due to depletion of Aggregate sources, Aggregate not conforming to Specifications, or at request of Contractor, these mixes shall be prepared as above.
   2. Contractor shall notify the Testing Laboratory and COR of intent to use concrete pumps to place concrete so that mix designs can be modified accordingly.
   3. Fly ash shall not exceed the percentages of the total cementitious material listed in the Concrete Mixes above.
   4. Provide 3-6% air entrainment.
   5. COR shall review and approve all mix designs before use.
   6. If special mixes are required for slip form or machined place concrete, Contractor is to submit these separately and indicate them as such.

D. Mixing:

1. Equipment: All concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials.
2. Method of Mixing:
   a. Transit Mixing: Comply with ASTM C 94. Ready mixed concrete shall be used throughout, except as specified below.
   b. On-Site Mixing: Use only if method of storing material, mixing of material and type of mixing equipment is approved by the COR. Approval of site mixing does not relieve Contractor of any other requirements of Specifications.
   c. Mixing shall be in accordance with IBC Section 1905.8.
3. Mixing Time: After mix water has been added, concrete shall be mixed not less than 1-1/2 minutes nor more than 1-1/2 hours. Concrete shall be rejected if not deposited within the time specified.
4. Admixtures:
   a. Air entraining and chemical admixtures shall be charged into mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by manufacturer. Accuracy of measurement of any admixture shall be within plus or minus 1.5%.
   b. Two or more admixtures may be used in same concrete, provided such admixtures are added separately during batching sequence, and provided further that admixtures used in that combination retain full efficiency and have no deleterious effect on concrete or on properties of each other.
   c. All admixtures are to be approved by COR prior to commencing this Work.
5. Retempering:
   a. Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall be discarded, not retempered.
   b. Indiscriminate addition of water to increase slump is prohibited.
   c. When concrete arrives at project with slump below that suitable for placing, water may be added only if neither maximum permissible water-cement ratio nor maximum slump is exceeded. Water shall be incorporated by additional mixing equal to at least half of total mixing time required. Any addition of water above that permitted by limitation of water-cement ratio shall be accompanied by a quantity of cement sufficient to maintain proper water-cement ratio. Such additions shall only be used if approved by COR. In any event, with or without addition of cement, not more than 2 gallons of water per cubic yard of concrete, over that specified in design mix, shall be added.
6. Cold Weather Batching: When temperature is below 40 degrees F or is likely to fall below 40 degrees F during 24 hour period after placing, provide adequate equipment for heating concrete materials. No frozen materials or materials containing ice shall be used. Temperatures of separate materials, including mixing water, when placed in mixer shall not exceed 100 degrees F. When placed in forms, concrete shall have a temperature between 50 degrees F and 85 degrees F.

7. Hot Weather Batching: Concrete deposited in hot weather shall have a placing temperature below 85 degrees F. If necessary, ingredients shall be cooled to accomplish this.

PART 3 - EXECUTION

3.1 PLACEMENT

A. Before any concrete is placed, the following items of Work shall have been completed in the area of placing.
   1. Forms shall have been erected, adequately braced, cleaned, sealed, lubricated if required, and bulkheaded where placing is to stop.
   2. Any wood forms other than plywood shall be thoroughly water soaked before placing any concrete. The wetting of forms shall be started at least 12 hours before concreting.
   3. 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.
   4. Reinforcing steel shall have been placed, tied, and supported.
   5. Embedded Work of all trades shall be in place in the forms and adequately tied and braced including weepholes, screens and sleeves.
   6. The entire place of deposit shall have been cleaned of wood chips, sawdust, dirt, debris, hardened concrete, and other foreign matter. No wooden ties or blocking shall be left in the concrete except where indicated for attachment of other Work.
   7. Reinforcing steel, at the time the concrete is placed around it, shall be cleaned of scale, mill scale, or other contaminants that will destroy or reduce bond.
   8. Concrete surfaces to which fresh concrete is to be bonded shall be brush cleaned to remove all dust and foreign matter and to expose the Aggregate, and then coated with the bonding adhesive herein specified.
   9. Prior to placing concrete for any slabs on grade, the moisture content of the subgrade below the slabs shall be adjusted to at least optimum moisture.
   10. No concrete shall be placed until the COR has observed formwork and reinforcement. Clean forms of all debris and remove standing water. Thoroughly clean reinforcement and all handling equipment for mixing and transporting concrete. Concrete shall not be placed against reinforcing steel that is hot to the touch. Notify COR 48 hours in advance of concrete pour.

B. Machine Placed Concrete: Control lines and surfaces shall be carefully checked and prepared to reflect drawings and specifications. Abrupt changes in direction or grade not indicated will require replacement.

C. Conveying: Handle concrete from mixer to place of final deposit by methods which will prevent separation or loss of ingredients. Deposit concrete in forms as nearly as practicable at its final position in a manner which will insure that

required quality is obtained. Chutes shall slope not less than 4 inches and not more than 6 inches per foot of horizontal run.

D. Depositing: Deposit concrete into forms in horizontal layers not exceeding 24 inches in thickness, proceeding along forms at a uniform rate and consolidating into previous pour. In no case shall concrete be poured into an accumulation of water ahead of pour, nor shall concrete be flowed along forms to its final place of deposit. Fresh concrete shall not be permitted to fall from a height greater than 6 feet without use of adjustable length pipes or, in narrow walls, of adjustable flexible hose sleeves. Concrete shall be scheduled so that placing is a continuous operation for the completion of each section between predetermined construction joints. If any concreting operation, once planned, cannot be carried on in a continuous operation, concreting shall stop at temporary bulkheads, located where resulting construction joints will least impair the strength of the structure. Location of construction joints shall be as shown on the Drawings or as approved by the COR. The rate of rise in walls shall not be less than 2 feet per hour.

1. Consolidation: Concrete shall be thoroughly compacted and worked to all points with solid continuous contact to forms and reinforcement to eliminate air pockets and honeycombing. Power vibrators of approved type shall be used immediately following pour. Spading by hand, hammering of forms or other combination of methods will be allowed only where permitted by COR. In no case shall vibrators be placed against reinforcing steel or used for extensive shifting of deposited fresh concrete. Provide and maintain standby vibrators, ready for immediate use.
2. Hot Weather Concreting: Unless otherwise directed by the COR, perform all Work in accordance with ACI 305 when air temperature rises above 75 degrees F and the following:
    a. Mixing Water: Keep water temperature as low as necessary to provide for the required concrete temperature at time of placing. Ice may be required to provide for the design temperature.
    b. Aggregate: Keep Aggregate piles continuously moist by sprinkling with water.
    c. Temperature of Concrete: The temperature of the concrete mix at the time it is being placed in the forms shall not exceed 85 degrees F. The method employed to provide this temperature shall in no way alter or endanger the design mix or the design strength required.
    d. Dampen subgrade and formwork before placing concrete. Remove all excess water before placing concrete. Keep concrete continuously wet when air temperature exceeds 85 degrees F for a minimum of 48 hours after placing concrete.
    e. Protection: Minimize evaporation from concrete in place by providing shade and windbreaks. Maintain such protection in place for 14 days minimum.
3. Cold Weather Concreting: Follow recommended ACI 306 procedures when air temperature falls below 40 degrees F, as approved by the COR. Concrete placed in freezing temperatures shall have a temperature of not less than 50 degrees F. Maintain this temperature for at least 7 days. No

chemicals or salts shall be used to prevent freezing and no accelerating agents shall be used without prior approval from the COR.

E. Construction Joints: Install as indicated and noted on Drawings. Joints not indicated on Drawings shall be so located, when approved, as to least impair strength of structure and shall conform to typical details. Construction joints shall have level tops, vertical sides. Horizontal construction joints shall be thoroughly cleaned and roughened by removing entire surface film and exposing clean Aggregate solidly embedded in mortar matrix. Joints between concrete and masonry shall be considered construction joints. Vertical construction joints need not be roughened. See Drawings for doweling and required keys.
   1. Roughen construction joints by any of following methods:
      a. By sandblasting joint.
      b. By thoroughly washing joint, using a high pressure hose, after concrete has taken initial set. Washing shall be done not less than 2 hours nor more than 4 hours after concrete has been poured, depending upon setting time.
      c. By chipping and wire brushing.
   2. All decisions pertaining to adequacy of construction joint surfaces and to compliance with requirements pertaining to construction joints shall rest exclusively with COR.
   3. Just before starting new pour, horizontal and vertical joint surfaces shall be dampened (but not saturated).
   4. Before placing regular concrete mix, horizontal construction joint surfaces shall be covered with a layer of mortar composed of cement and fine Aggregate of same proportions as that used in prescribed mix, but omitting coarse Aggregate.

3.2 REINFORCEMENT:

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

3.3 CONCRETE SLABS ON GRADE (EXTERIOR):

A. Exterior concrete slabs on grade shall be poured as required under this Section and Section 32 05 23. Base shall be accurately leveled and compacted prior to placing of concrete.

B. Control Jointing - Slabs on Grade:
   1. Joints shall be in locations indicated on Drawings, or as directed by COR.
   2. Control jointing in exterior paving slabs shall be poured in a checkerboard pattern with joint edges tooled to provide a uniform joint at least 3/8 inch in depth.
      a. Slab reinforcing need not be terminated at control joints.
      b. Construction and expansion joints shall be counted as control joints.

C. Expansion Joints - Slabs on Grade:

1. Unless otherwise indicated, use 1/2 inch thick expansion joint filler.
2. Joints in exterior slabs on grade shall be installed at each side of fixed structures, walls, at curb transitions opposite apron joints, at ends of curb returns, at back of curb when adjacent to sidewalk or other concrete pad, and at uniformly spaced intervals not exceeding 20 feet.
3. Edges of concrete at joints shall be edger finished to approximately 3/8 inch radius.
4. Interrupt reinforcing at all expansion joints.

D. Score markings on exterior slabs on grade shall be located as indicated. Where not indicated, mark slabs into rectangles of not less than 12 square feet nor more than 20 square feet using a scoring tool which will leave edges of score markings rounded.

3.4 CURING AND PROTECTION

A. Curing: Exposed surfaces of all concrete used in structure shall be maintained in a moist condition for at least 7 days after placing. The following final curing processes shall normally be considered to accomplish this. Concrete shall be maintained at not less than 50 degrees F nor more than 100 degrees F for a period of 72 hours after being deposited.
   1. Initial Curing Process - Flat Work:
      a. Mist Spraying: As soon as troweling of concrete surfaces is completed, exposed concrete shall be sprayed continuously with a special atomizer spray nozzle, capable of producing a fine mist. Spraying shall be done without any dripping of water from nozzle. Amount of spraying shall be such as to maintain surface of concrete moist without any water accumulating on surface. Maintain spraying for a minimum of 12 hours, or until such time as hereinafter described curing process is applied. Mist spraying will not normally be required when the ambient air temperature is below 90 degrees F.
   2. Final Curing Process - Flatwork: Except as noted, use any of following:
      a. Water Curing: Concrete shall be kept wet by mechanical sprinklers or by any other approved method which will keep surfaces continuously wet.
      b. Saturated Burlap Curing: Finished surfaces shall be covered with a minimum of two layers of heavy burlap which shall be kept saturated during the curing period.
      c. Curing Compounds: Apply a water based curing compound as indicated in Materials in Section 32 05 23 Article 2.4. Membrane curing compounds of chlorinated rubber or resin type conforming to ASTM C309 may be used only if specifically approved by COR. Use of membrane curing compound will not be permitted on surfaces to be painted, membrane water-proofing or hardeners and sealers. Agitate curing compounds thoroughly by mechanical means continuously during use and spray or brush uniformly in accordance with manufacturer's recommendations. Apply immediately following final finishing operation. All curing compounds shall conform to State of Louisiana VOC Regulations.

B. Protection: Contractor shall be responsible for protection of finished concrete against injury by rain, cold, vibration, animal tracks, marking by visitors, vandalism, etc.

C. Provide additional curing agents or compounds, not necessarily listed herein, but as recommended and/or required for use with shake type hardeners or other special coatings and coverings by their manufacturers for a complete and proper installation.

3.5 FINISHES

A. Flatwork:
   1. Unless otherwise indicated or specified, flatwork shall have an integral monolithic finish.
   2. Integral Monolithic Finish: Apply as soon as freshly poured concrete slabs will bear weight of workers. Pour slabs full thickness to finish elevations indicated. At proper time, tamp surface repeatedly with a wire mesh or grid tamper in a manner to force Aggregate down below surface and to bring sufficient mortar to surface to provide for a smooth coating of cement mortar over entire surface. Allow surface mortar to partially set, then float with wooden floats and finish with the following:
      a. Broom Finish: Steel trowel surface to a smooth dense surface free of lines, tool marks, cat faces, and other imperfections. After troweling, and before final set, give surface a broom finish, brushing in direction noted on Drawings, or as directed. Broom finish shall be used typically on exterior flatwork except as otherwise indicated or specified and shall be "light" texture as approved by COR.
   3. Tolerances:
      a. For tolerances not indicated, refer to ACI 117.
      b. Finished surfaces of exterior integral finished flatwork shall not vary more than 1/4 inch from a 10' long straightedge, except at grade changes.

3.6 DEFECTIVE CONCRETE

A. Defective concrete shall mean any of the following:
   1. Concrete not meeting 100 percent of the specified 28 day compressive strength.
   2. Concrete exhibiting rock pockets, voids, spalls, streaks, cracks, exposed reinforcing to extent that strength, durability, or appearance is adversely affected.
   3. Concrete significantly out of place, line, or level.
   4. Concrete not containing the required embedded items.

B. Upon determination that concrete strength is defective:
   1. Should cylinder tests fall below minimum strength specified, concrete mix for remainder of Work shall be adjusted to produce required strength. Core samples shall be taken and tested from cast-in-place concrete

where cylinders and samples indicate inferior concrete with less than minimum specified strength.

a. Cores of hardened concrete shall be taken and tested in accordance with ASTM C 42 and C 39. Number and location of such cores shall be subject to the approval of COR.
b. Cost of core sampling and testing will be paid for by the Contractor.
c. “500 psi” and “85 percent” reduction in IBC Section 1905.6 will not justify low cylinder tests.

C. Upon determining that concrete surface is defective, Contractor may restore concrete to acceptable condition by cutting, chipping, pointing, patching, grinding, if this can be done without significantly altering strength of structure or appearance. Permission to patch defective areas will not be considered a waiver of the right to require removal if patching does not, in the opinion of the COR, satisfactorily restore quality and appearance.

D. If core tests indicate that concrete is below the strength specified, or if patching does not restore concrete to specified quality and appearance, the concrete shall be deemed defective, and shall be removed and replaced without additional cost to the Government.

E. No repair Work shall begin until procedure has been reviewed and approved by the COR.

3.7 ADJUSTING AND CLEANING

A. Remove all debris, excess materials, tools and equipment resulting from or used in this operation at completion of this Work.

END OF SECTION

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SECTION 03 48 22

PRECAST CONCRETE URN CRYPTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work covered by this Section includes fabrication, handling, delivery to the site, storage and installation of preplaced precast concrete urn crypts, hereafter referred to as units, crypt, crypts, preplaced urn crypts, or urn crypts, complete with lid, hatch, and headstone containment box with cover; subbase foundation and drainage; placement of the units; backfilling preplaced urn crypt field gaps and cover over lids with hatch; grading, fine grading and turf establishment; and other, all as shown on the Drawings or specified herein. In addition Contractor to provide:
   1. Three (3) OSHA-approved preplaced urn crypt lid lifting apparatus.
   2. Two (2) extra concrete preplaced urn crypt square lids.
   3. Eight (8) extra circular concrete hatches for preplaced urn crypt access.

B. The design of the units shall be as described in this Section and their installation layout shall be as illustrated on the Drawings. All preplaced urn crypts shall be structurally designed for overhead and lateral soil pressure plus live loads specified hereafter. All designs will require that the manufacturer provide fabrication drawings stamped by a Professional Engineer indicating that the design meets or exceeds the structural requirements contained herein. The Contractor may propose alternative designs of the corresponding components if all the following requirements are met.
   1. Any proposed alternative design shall comply with the design criteria and the functional tests of this specification.
   2. All provisions of this specification shall apply to any proposed alternative design.
   3. The Government may accept or reject part or all of any proposed alternative design. The Contractor will pay for all cost for alternate designs, submittals, and reviews.

1.2 RELATED WORK

A. Excavation and Backfill: Section 31 20 00 EARTHWORK.

B. Materials Testing and Inspection during Fabrication and Construction: Section 01 45 29, TESTING LABORATORY SERVICES.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: With submittal of bid documents, Contractor shall submit documentation regarding the manufacture of the units. Contractor shall provide evidence that manufacturer has a minimum of three years experience

with pre-casting units of similar type, and provide evidence that the manufacturer plant(s) used are certified by the National Precast Concrete Association (NPCA).

B. Precast concrete manufacturer shall provide a licensed Structural Engineer to certify that the units conform to specified requirements.

C. Installation Qualifications: Regularly engaged for at least three years in installation of pre-cast concrete similar to this project.

D. Fabricate preplaced urn crypts to the interior dimensions described below and indicated on Drawings. Replace or repair units that do not comply with the individual dimensions and tolerances.

E. Prior to or in the initial stage of preplaced urn crypt production, furnish at the site, a single preplaced urn crypt section (8 combined preplaced urn crypts), including lids, hatches, and headstone boxes, and a wire rope lid and hatch lifting apparatus to demonstrate quality of construction of preplaced urn crypts and conduct on-site buried preplaced urn crypts load testing. Commence production of preplaced urn crypts only after submittal approval and on-site load testing has been scheduled for witnessing by the NCA Crypt Specialist.

F. Functional Load Test: A functional on-site load test will be made at the Contractor's expense to insure the units are capable of supporting loads stated. The functional test will consist of following loading conditions:
   1. Confined Loading: A preplaced urn crypt unit shall be placed in a hole dug in the ground on site and covered with 24 inches of soil or covered to the maximum depth as shown on the plans, whichever is greater. The soil will be compacted to Standard Proctor (AASHTO T-99) a density along the sides of 95% and reduced density over the lid, both as shown on the Drawings. An axle load of 12,000 lbs. will then be passed over the covered preplaced urn crypts for a minimum of 10 times in repetition, in a manner that causes maximum lateral pressure due to wheel load on the sides of the preplaced urn crypts. The preplaced urn crypts shall then be fully excavated, exposed and the hatch and lids removed to allow careful examination inside and outside. The preplaced urn crypts must not show any signs of stress or cracking.

1.4 DESIGN CRITERIA (PREPLACED URN CRYPT):

A. The units shall be of the following type, style, and size:
   1. Type: Precast concrete.
   2. Style: One-piece multiple preplaced urn crypt section with separate removable lids that each are monolithically poured with headstone containment box and a hatch opening. A circular removable concrete tapered hatch with flush-mounted anchor for lifting shall complete the lid section. The unit shall have a 4-inch diameter drain hole in each preplaced urn crypt floor bottom and 1-inch holes in the headstone containment box to allow complete water drainage with no standing water.

3. Preplaced urn crypt interior size: As indicated on Drawings. Interior minimum dimensions are as follows: 43 ½" minimum clear width at the inside bottom floor preplaced urn crypt tapered to 44 ½" clear at top of preplaced urn crypt base.
4. Preplaced urn crypt height and wall thickness: Exterior maximum height dimension: 34" including the lid. Preplaced urn crypt wall thickness varies between 1 ½" and 4 ½" as shown on plans.
5. Preplaced Urn Crypt Layout: Preplaced urn crypt shall fit in a 4-foot by 4-foot plot size as noted on the Drawings. If the Contractor's layout or preplaced urn crypt size dimensions differ, the Contractor, at no cost to the Government, shall submit a Layout/Size Plan for approval by the COR.

B. Units shall be designed for a burial depth with soil cover as indicated on the Drawings, and be capable of structurally withstanding a center point load of 6,000 lbs prior to burial, passage of a wheel axle load of 12,000 lbs after burial, and a 3-foot tall pile of excavated material on top of or adjacent to buried preplaced urn crypts.

C. The Contractor shall submit to the COR for approval five sets of design documentation showing structural design of the units. Contractor to provide one set to NCA Crypt Specialist. This documentation shall include dimensions, methods of construction, and calculations. All design calculations and drawings shall be signed and sealed by qualified licensed Structural Engineer.

D. The preplaced urn crypt lid, with one hatch and one monolithically poured headstone containment box each, shall be designed to be removable and replaceable. Lid lifting shall be from top positioned galvanized anchors (4-required per lid) with removable anchor covers to prevent dirt from entering the anchor bowl and installed in such a manner as to stay in-place when excavating equipment is scraping backfill off the top of the lid. The Contractor shall furnish the cemetery with three (3) OSHA approved and tag certified wire rope lifting devices for removing the hatch and lid. No chain lifting devices allowed.

E. The square concrete preplaced urn crypt lid shall be beveled along the entire top perimeter. Chamfer top edge of lid with a 1:1 chamfer beginning ½ inch down from top.

F. The preplaced urn crypt lifting outside wire/cable shall be designed for transport and installation along with provisions for removal/abandonment of preplaced urn crypt lifting wire once preplaced urn crypt has been installed.

G. Design Criteria (Alternate):
1. An alternate concrete preplaced urn crypt unit configuration may be used as an approved equal in lieu of the eight- crypt units. Alternate design must be submitted to and approved by Government, at no additional cost to the Government. The units shall conform to all other specified herein including:

a. The shared interior wall thickness may be increased to allow for a gap between lids as deemed appropriate to meet layout requirements.

1.5 ALLOWABLE TOLERANCES

A. Tolerances of individual units shall be as follows:
1. Variation in overall preplaced urn crypt outside dimensions of unit (height, length and width): 1/8” plus or minus. There is zero tolerance for any lesser preplaced urn crypt inside minimum clear dimensions.
2. Variation in thickness of precast panels and elements: 1/16” plus or minus.
3. Maximum height differential in final placement in the ground: 1/4” above or below design grade.
4. Cracks greater than 0.030 inch in width are cause for preplaced urn crypt rejection. With evidence of fiber or steel reinforcement, any cracking 0.030 or lesser width that does not extend thru wall is acceptable. Any cracking 0.016 inch or lesser that extends thru wall is acceptable. All other cracks are cause for rejecting preplaced urn crypts that shall be repaired or removed and replaced at no cost to VA.

1.6 SUBMITTALS

A. In accordance with Section 01 33 23, SAMPLES AND SHOP DRAWINGS, within 45 days of the approval of the shop drawings, Contractor shall furnish to the COR and the NCA Crypt Specialist the following:
1. Samples: deliver to the site for testing and inspection:
a. One eight-crypt unit or other approved multiple crypt unit configuration.
b. Lid and hatch lifting devices.

B. Submit a detailed concrete Mix Design of Self Consolidate Concrete (SCC) with a 15% minimum requirement of a cement substitute of fly ash and/or other pozzalons.

C. Submit Shop Drawings:
1. Erection Narrative:
a. Method of transportation.
b. Method of handling and placement.
2. Production Drawings:
a. Elevation view of each unit.
b. Plan view of unit.
c. Sections and details to show quantities, sizes and position of reinforcing steel, inserts, and essential embedded hardware for fabrication, handling, transportation and installation.
d. Section, details and location of specialty lid lifting anchors, caps, and lid lifting system.
e. Dimensions and finishes.

D. Submit Product Design Data:

1. Structural adequacy calculations of units (preplaced urn crypts), performed by a licensed Structural Engineer.
2. Loadings for Design Calculations:
   a. Initial handling and erection stresses.
   b. Dead and live loads specified.
   c. Other loads specified for units as applicable.
   d. Deflection of precast members.
   e. Product test reports:
      1) The concrete shall be tested for the compressive strength and beam flexural strength as specified herein. An approved independent, commercial testing laboratory shall perform tests. Certified copies of test reports, including test data and results shall be submitted to the COR immediately after the strength tests have been completed. The tests shall be as specified herein.
      2) Prior to backfilling over preplaced urn crypts and at Contractor expense, the COR may pick a single preplaced urn crypt for coring another bottom slab drainage hole by an independent lab with said core being analyzed (petrography testing) and results submitted verifying evidence of fly ash or other pozzalons as specified.
      3) Based on failed testing, the COR may request more frequent testing to ensure quality of the product and pozzalons content is present, again at contractor expense.
3. Manufacturer's Literature and Data:
   a. Each type of anchorage, angle, and fastener.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery and Handling: Units shall be transported, stored and handled so as to prevent damage to surfaces, edges and corners and to prevent development of stresses and cracks. The Contractor shall provide temporary bracing protection devices and measures as necessary to prevent damage to the units during transportation, handling, and storage. Contractor is responsible for transportation, handling, and storage of units such that any negligence on the Contractor's part shall be corrected at the Contractor's expense. Use the designed preplaced urn crypt lifting cable to transport preplaced urn crypts. On the job site, forklift handling of preplaced urn crypts may be approved by the VA upon demonstration that no preplaced urn crypt damage will be incurred.

B. Storage:
   1. Units may be stored at designated locations(s) on site.

C. Markings and Identifications:
   1. Markings, including logos, trademarks and proprietary information are prohibited on surfaces of preplaced urn crypts.
   2. Date of manufacture (month, day, and year) shall be written on the box and lid with permanent ink or an equivalent marking.

1.8 COORDINATION

A. Coordinate the manufacture, delivery, storage, and installation of the units with related work.

1.9 GUARANTEE

A. After erection, completed work will be, subject to terms of Article, GUARANTEE in Section 01 00 00, GENERAL CONDITIONS, except guarantee period is extended to five years.

1.10 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.

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

T99-01(2004) ..... Moisture-Density Relations of Soils Using a 2.5 kg (5.5 lb) Rammer and a 305 mm (12 inch) Drop

T180-01(2004) ..... Moisture-Density Relations of Soils using a 4.54 kg (10 lb) Rammer and a 457 mm (18 inch) Drop

C. American Concrete Institute:

ACI Manual of Concrete Practice 2011 Edition

ACI 318-05..... Building Code Requirements for Structural Concrete and Commentary

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

A 36/A 36M-08..... Standard Specification for Carbon Structural Steel

A 82/A 82M-07..... Standard Specification for Steel Wire, Plain for Concrete Reinforcement

A 153/A 153M-09..... Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware

A 185/A 185M-07..... Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

A 615/A 615M-09..... Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

C 31/C 31M-10 ..... Standard Practice for Making and Curing Concrete Test Specimens in the Field

C 33/C 33M-11 ..... Standard Specification for Concrete Aggregates

C 39/C 39M-10 ..... Standard Test Method for Compressive Strength of Cylindrical Concrete Specimen

C 78/C 78M-10 ..... Standard Test Method for Flexural Strength for Concrete (Using Simple Beam with Third-Point Loading)

C 150/C 150M-09..... Standard Specification for Portland Cement

C 172/C 172M-10..... Standard Practice for Sampling Freshly Mixed Concrete

C 260/C 260M-10..... Standard Specification for Air-Training Admixtures for Concrete

C 494/C 494M-10..... Standard Specification for Chemical Admixtures for Concrete

C 595/C 595-10 ..... Standard Specification for Blended Hydraulic Cement

C 1017/C 1017M-07.. Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

C 1116/C 1116M-10.. Standard Specification for Fiber-Reinforced Concrete

C 1157/C 1157M-10.. Standard Performance Specification for Hydraulic Cement

C 1602/C 1602M-06.. Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

C 1399/C 1399M-10.. Standard Test Methods for Obtaining Residual-Strength of Fiber-Reinforced Concrete

PART 2 - PRODUCTS

2.1 MATERIALS

A. Precast Concrete: All preplaced urn crypts shall be of concrete with a minimum 28 days compressive strength of 5,000 psi, be Self Consolidated Concrete (SCC) containing structural fiber with an inverted slump between 22” and 28”; and shall contain a minimum of 15% cement substitute of fly ash and/or other pozzalons. Fiber is required for urn preplaced urn crypts, including lid sections. All to be in conformance to the following requirements:
   1. Hydraulic Cement: ASTM C150 or ASTM C1157 or ASTM C595
   2. Normal weight Aggregates: ASTM C 33
   3. Water: ASTM C1602
   4. Chemical Admixtures:
      a. Water reducers, accelerating and retarding: ASTM C 494
      b. Air Entraining: ASTM C260
      c. Admixtures for flowing concrete: ASTM C1017
      d. Admixtures with no standard designation shall be used only with approval of VA.
   5. Prohibited Admixtures: Calcium Chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions.

B. Reinforcement:
   1. Welded Steel Wire Fabric: ASTM A185.
   2. Steel Wire Reinforcement: ASTM A82, cold drawn.
   3. Steel Reinforcement: ASTM A615 Grade 60, deformed.
   4. Inserts, Anchors, Dowels and Accessories: Steel, ASTM A36, zinc coated ASTM A153 hot-dipped galvanized finish G90.
   5. Fiber: Macrofiber complying with ASTM C1116

C. Form Coatings:
1. Use commercial formulation form-coating compounds that will not bond with, stain, or adversely affect concrete surfaces.

D. Paint:
1. Use commercial Concrete & Garage Floor Epoxy Acrylic Paint for preplaced urn crypt concrete lid & inside wall surface numbering as shown on Drawings. Paint as manufactured by BEHR Deep Base #930 or approved equal.

2.2 FABRICATION

A. General:
1. Units shall be fabricated in accordance with the minimum interior dimensions and tolerances indicated herein, with concrete surfaces that are smooth and free of irregularities.

B. Finishes:
1. Surface holes (1/4” and smaller) caused by air bubbles, normal color variations, normal form joint marks, small chips (1/4” and smaller) and spalling (no more than one square foot total per unit) are permitted.
2. Exposed steel reinforcing, honeycomb, bugholes, and cracks not within tolerances are not permitted.
3. 3. The lifting system shall be top mounted and consist of hot dip galvanized steel anchors installed lid and hatch as per Drawings with each in a 2-1/2” diameter minimum recessed bowl of depth sufficient to easily connect lifting device as designated compatible by anchor manufacturer. Anchors to be installed at locations to ensure maximum lifting stability. A removable plastic cap secured to the anchor will prevent fill material from entering the anchor bowl. Cap to be flush mounted to ensure the entire assembly is not an obstruction for unit excavating equipment.
4. Concrete shall have no evidence of segregation of materials.

C. Reinforcement:
1. Provide steel and fiber reinforcing as required for casting, handling, erection loads, lateral and overhead fill, and equipment live loads.
2. Reinforcing steel shall be free of dirt, mill scale, rust, oil, grease, ice, snow, water and placed within approved tolerances in accordance with ACI 318. Careful placement of reinforcing is required to avoid overlapping at thin points of the units.

D. Concrete Placement:
1. Porosity, strength, weight and gradation of coarse aggregate shall be as required to produce specified characteristics.
2. Units shall be cast in steel forms designed to suit shape and finish required. Each element of the unit shall be cast as an integral piece free of joints and seams.

E. Curing:

1. 90% of specified concrete compressive strength shall be attained before transportation of units to the Cemetery or storage site.
2. Units shall be cured as required to develop specified structural characteristics and shall be stored in a manner that will permit all surfaces to cure equally.
3. Units shall be properly cured in accordance with the applicable provisions of the current ACI Manual of Concrete Practice.

F. Surface Treatment and Corrective Work:
1. Units that have minor chipping of edges and corners shall be repaired by a method approved by the COR.
2. Cracked/damaged units exceeding tolerances shall be removed by the contractor at no cost to the government.

2.3 ACCESSORIES

A. Plywood
1. APA rated Exposure 1 or Exterior; panel grade CD or better
2. Treated, Exterior grade ¾" thick.

B. Treated Miscellaneous Lumber
1. Exterior grade; 2 x 2 dimensional.

C. Screws
1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.
2. Galvanized deck screw, 2 ½: size.

2.4 TESTING AND INSPECTION

A. Contractor's Responsibility for Inspection: The Contractor is responsible for the performance of all inspection requirements including the removal of hatches, painting numbers on preplaced urn crypt interior wall and top surface of hatches, allow preplaced urn crypt interior inspection by the COR followed by replacement of hatches. The COR reserves the right to perform any of the inspections set forth in the specification when deemed necessary to assure that the units conform to prescribed requirements.

PART 3 - EXECUTION

3.1 PREPLACED URN CRYPTS FIELD QUALITY ASSURANCE

A. Testing: The contractor shall procure an independent qualified testing agency to perform concrete tests during preplaced urn crypt production and prepare test reports.
1. Concrete Cylinder testing for compressive strength: Three cylinders per day of preplaced urn crypt production to be taken in accordance to ASTM C172 as applicable to SCC. Strength to exceed 5000 psi after 28 days curing in accordance to ASTM C31 & C39. Test inverted slump when cylinders are made.

2. Beam testing to confirm design flexure strength: Once at the beginning of preplaced urn crypt production, a minimum of three beams with fiber shall be taken for testing of Flexural Performance of Fiber-Reinforced Concrete in accordance with ASTM C78 and C1399. All beams' flexural strength shall exceed the preplaced urn crypt design flexural strength requirements and residual strength of fiber reinforced concrete, and shall exceed capacity of conventionally reinforced concrete wall design as submitted by the Structural Engineer and approved by VA. Fiber Manufacturer shall verify type and dosage rate of the test beams are identical in preplaced urn crypt production.
3. A single verification test of fly ash in the preplaced urn crypt concrete mix required at the discretion of the COR.

3.2 GENERAL LAYOUT CONTROL

A. A professional registered Land Surveyor shall establish and control horizontal and vertical alignment of units.

3.3 PREPARATION

A. Before beginning installation, inspect work of other trades insofar as it affects the work of this section. Commencing installation of units will be construed as accepting as suitable the work of other trades.

B. Verify by survey, grading of subgrade and aggregate base for proper installation of units. Provide survey to NCA inspector prior to setting.

C. Verify by testing, compaction of prepared subgrade and subbase to meet Standard Proctor (AASHTO T-99).

D. Verify by survey locations and elevations of units relative to control points indicated on plans. Submit new control point layout if a preplaced urn crypt size other than specified is used.

3.4 HANDLING, INSTALLTION AND PAINITNG

A. Handling:
1. Units shall be handled in a vertical plane at all times and stacked vertically on wood supports of adequate strength, until erected. On the job site, use the designed lifting cable to transport preplaced urn crypts from the truck to storage to the final installation.
2. Lift units with suitable lifting devices at points provided by manufacturer.
3. Provide temporary wood bracing to comply with manufacturer's recommendations to keep preplaced urn crypt bottom off ground during storage.

B. Installation and Painting:
1. Install units by competent erector crews trained and certified as competent by unit manufacturer.

2. Use all means necessary to protect units from being damaged in transport and during and after installation. Lids that show damage from bouncing during transport shall be replaced by the contractor at no cost to the Government.
3. Accurately install by aligning and leveling units in accordance with Drawings. Assure that units are in straight horizontal alignment and headstone containment boxes meet critical alignment requirements (Sec 3.7).
4. After preplaced urn crypt installation and prior to backfill, the Contractor shall remove hatches with the specified lifting apparatus for inspection by the COR and paint numbering. Numbers furnished by NCA shall be painted by the Contractor on the top of hatches and on the preplaced urn crypts' inside wall to be easily seen from an open hatch. Numbers shall be permanent paint as specified and six inches high. Preplaced urn crypt hatch number painting must be applied to a clean, dust-free surface requiring paint application within 10 seconds of surface cleaning. After completion of inspection and marking, the Contractor shall replace the hatches. Any damage will be the responsibility of the Contractor.

3.5 PROTECTION OF WORK

A. Use all means necessary to protect units from being damaged during and after installation.

3.6 REPLACEMENT AND REPAIR

A. Remove and replace units that the COR has determined are damaged, cracked, broken, improperly fabricated, or otherwise defective and are structurally unsound and unacceptable.

B. Units having minor defects not affecting serviceability or appearance may be repaired when approved by COR.

C. Repair work shall be sound, permanent, and flush with adjacent surfaces.

D. Replacements and repairs shall be done at no additional cost to the Government.

3.7 HEADSTONE BOX ALIGNMENT, BACKFILLING AND PROTECTION

A. Align center of headstone containment boxes to preplaced urn crypt field plot dimensions on Drawings to within 1/8" tolerance. Contactor to provide tolerance verification to COR prior and after backfill level to headstone box top.

B. Protect installed preplaced urn crypt units and alignment during backfill operations.

C. Install approved backfill against outside walls of all units, insuring no voids are remaining. Approved backfill shall contain no material that will cause a concentrated point load. The perimeter wall backfill shall be compacted to a

Standard Proctor (AASHTO T-99) to 95% density to the level equal to the hatch level.

D. Install an approved pea gravel (rounded) fill per gradation into gaps between preplaced urn crypts leaving no voids. Use rodding to assure no bridging occurs and void areas are eliminated. No sand allowed. At NCA's discretion, a cut aggregate substitute of same gradation may be approved with demonstration that filling gaps between preplaced urn crypt sections leaves no voids.
1. Provide angular stone fill to same gradation between lids.

Aggregate Size No	Grading Requirements - Amounts finer than Each Sieve (Square Openings), Mass Percent					
	1/2"	3/8"	No. 4	No. 8	No. 16	No. 50
8	100	85 to 100	10 to 30	0 to 10	0 to 5	
89	100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5

E. Install plywood headstone containment box cover. Ensure dimension of plywood headstone cover and lumber substructure is adequate to cover headstone containment box securely and level, with no gaps, and with minimal movement side to side and front to back. Cut or sand down in field to fit flush to top exterior surface of headstone box. Smooth all surfaces; do not allow splintering. Fasten plywood to the lumber substructure using galvanized deck screws as indicated on the Drawings.

F. Install backfill on top of units and compact to level with top of headstone containment box followed by verification that box alignment remains within tolerances. Backfill shall be as shown on Drawings. The entire backfill atop the units shall be compacted to 85% density per Standard Proctor (AASHTO T-99).

G. Complete backfill and topsoil installation without disturbing headstone box alignment.
1. Provide pre- and post-backfill and compaction survey.

H. No equipment over the preplaced urn crypts should exceed preplaced urn crypt design loads as specified herein (12,000 lbs axle), which includes compacting equipment. No vibratory compaction equipment over the preplaced urn crypts unless impact loads are shown not to exceed preplaced urn crypt design loads.

I. Immediately during preplaced urn crypt install, contractor to mark the preplaced urn crypt field edges with temporary driven 5-foot tall lathes & signage for easy identification by vehicles carrying fill, topsoil, compost, sod, water or other. Signage shall state "12,000-lb axle load maximum."

J. Lathes & signage to be maintained in-place during backfilling thru final acceptance of the preplaced urn crypt field.

K. Finish grading and prepare topsoil as indicated on Drawings.

L. The Contractor shall not store or stockpile any stone, sand, backfill or any other material over 4-feet in height within ten (10) yards of or on top of installed preplaced urn crypts. Affected units subject to said loading condition as determined by the COR shall be inspected for possible damages with all excavation, lid lifting, fill replacement and all other work as necessary, all at Contractor's expense.

M. The Contractor shall not allow any vehicle that exceeds a 12,000-lb axle load, 6000-lb wheel load or equivalent pressure per square inch to traverse or park within ten (10) yards of or on top of installed units. Affected preplaced urn crypts subject to said loading condition as determined by the COR shall be inspected for possible damages with all excavation, unit lifting, fill replacement and all other work as necessary, all at Contractor's expense

3.8 INSPECTION AND ACCEPTANCE

A. Final inspection and acceptance will be by COR / NCA inspector.

END OF SECTION

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SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section covers all sealant materials and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK

A. Sealing of site Work concrete paving: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.3 QUALITY CONTROL

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.

D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field-test their adhesion to joint substrates in accordance with sealant manufacturer’s recommendations:
   1. Locate test joints where indicated or, if not indicated, as directed by COR.
   2. Conduct field tests for each application indicated below:
      a. Each type of elastomeric sealant and joint substrate indicated.
   3. Notify COR seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint sealant manufacturer’s technical representative present.

E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.

1.4 SUBMITTALS

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

B. Manufacturer's installation instructions for each product used.

C. Cured samples of exposed sealants for each color where required to match adjacent material.

D. Manufacturer's Literature and Data:
   1. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
   2. Joint fillers.
   3. Joint sealant backing.

1.5 PROJECT CONDITIONS

A. Environmental Limitations:
   1. Do not proceed with installation of joint sealants under following conditions:
      a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 °F.
      b. When joint substrates are wet.

B. Joint-Width Conditions:
   1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions:
   1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 DELIVERY, HANDLING, AND STORAGE

A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.

B. Carefully handle and store to prevent inclusion of foreign materials.

C. Do not subject to sustained temperatures less than 40° F or exceeding 90° F.

1.7 DEFINITIONS

A. Definitions of terms in accordance with ASTM C717 and as specified.

B. Back-up Rod: A type of sealant backing.

C. Bond Breakers: A type of sealant backing.

D. Filler: A sealant backing used behind a back-up rod.

1.8 WARRANTY

A. Warranty exterior sealing against leaks, adhesion and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that Warranty period shall be extended to two years.

B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

1.9 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Use the latest edition of the referenced publication.

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

C717 ..... Standard Terminology of Building Seals and Sealants

C920 ..... Elastomeric Joint Sealants

C1021 ..... Laboratories Engaged in Testing of Building Sealants

C1193 ..... Standard Guide for Use of Joint Sealants

C1330 ..... Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants

D1056 ..... Specification for Flexible Cellular Materials—Sponge or Expanded Rubber

D1751 ..... Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Provide color of exposed joint sealants as selected. Custom colors will be used to provide blending of finish colors.

B. Provide joint sealers, joint fillers and other materials that are compatible with one another and with joint substrates, as demonstrated by testing and field experience.

2.2 ELASTOMERIC JOINT SEALANTS

A. Horizontal Joint Sealant: Two-part pourable urethane; ASTM C920, Type M; Grade P; Class 25; Uses T and O; Pecora Corp. "NR-200 Urexpan", Sonneborn "Sonolastic Paving Joint Sealant", Tremco, Inc. "THC-900/901" or approved equal. Horizontal joint sealant shall have a minimum Shore A hardness of 30.

2.3 JOINT FILLERS FOR CONCRETE PAVING

A. Joint filler shall be a preformed non-extruded resilient filler, saturated with bituminous materials and conforming to ASTM D1751. Products shall be equivalent to Burke "Fiber Expansion Joint", W.R. Meadows "Fibrated Expansion Joint Filler", or approved equal.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Type C: Closed-cell material with a surface skin.

C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26° F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 COLOR

A. Sealants used with unpainted concrete shall match color of adjacent concrete.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.

B. Coordinate for repair and resolution of unsound substrate materials.

C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS

A. Prepare joints in accordance with manufacturer's instructions and SWRI.

B. Clean surfaces of joint to receive sealants leaving joint dry to the touch and free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
   1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
   2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
      a. Concrete.
   3. Remove laitance and form-release agents from concrete.

C. Do not cut or damage joint edges.

D. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions.
   1. Apply primer prior to installation of back-up rod or bond breaker tape.
   2. Use brush or other approved means that will reach all parts of joints.

E. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION

A. Install back-up material, to form joints enclosed on three sides as required for specified depth of sealant.

B. Where deep joints occur, install filler to fill space behind the back-up rod and position the rod at proper depth.

C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.

D. Install back-up rod, without puncturing the material, to a uniform depth, within plus or minus 1/8 inch for sealant depths specified.

E. Where space for back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

F. Take all necessary steps to prevent three sided adhesion of sealants.

3.4 SEALANT DEPTHS AND GEOMETRY

A. At widths up to 1/4 inch, sealant depth equal to width.

B. At widths over 1/4 inch, sealant depth 1/2 of width up to 1/2 inch maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION

A. General:
   1. Comply with manufacturer's written installation instructions for products and applications indicated.

B. For application of sealants, follow requirements of ASTM C1193 for use of joint sealants as applicable to materials, applications and conditions indicated unless specified otherwise.

3.6 PROTECTION AND CLEANING

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage.

B. Cut out and remove damaged or deteriorated joint sealers and reseal joints with matching new materials.

C. Clean fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the sealant manufacturer.

D. After filling and finishing joints, remove masking tape.

E. Leave adjacent surfaces in a clean and unstained condition.

3.7 LOCATIONS

A. As indicated.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of 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. Subsoil and topsoil materials.
   3. Excavation.
   4. Filling and backfilling.
   5. Grading.
   6. Soil Disposal.
   7. Clean Up.

1.2 DEFINITIONS

A. Unsuitable Materials:
   1. Fills: Topsoil; frozen materials; construction materials and materials subject to decomposition; clods of clay and stones larger than 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 35 and 25 respectively. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction, as defined by ASTM D698.
   2. Existing Subgrade: Same materials as 1.2.A.1, that are not capable of direct support of preplaced urn crypt units and cover and similar items with possible exception of improvement by compaction, proofrolling, or similar methods.

B. Building Earthwork: Earthwork operations required in area enclosed by a line located 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 5 feet outside of principal building perimeter and within new construction area with exceptions noted above.

E. Degree of compaction: Degree of compaction is expressed as a percentage of maximum density obtained by laboratory test procedure. This percentage of maximum density is obtained through use of data provided from results of field test procedures presented in ASTM D1556.

F. Fill: Satisfactory soil materials used to raise existing grades. In the Construction Documents, the term “fill” means fill or backfill as appropriate.

G. Backfill: Soil materials or controlled low strength material used to fill an excavation.

H. Unauthorized excavation: Removal of materials beyond indicated sub-grade elevations or indicated lines and dimensions without written authorization by the COR. 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 COR based on the determination by the soils testing agency that unsuitable bearing materials are encountered at required subgrade 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 subgrade and base course for asphalt paving or layer placed between the subgrade 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 contaminates as defined and determined by the COR or the Government’s testing agency.

1.3 RELATED WORK

A. Safety requirements: Section 01 00 00, GENERAL REQUIREMENTS, HEALTH AND SAFETY PLAN.

B. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

C. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, Article, PHYSICAL DATA.

D. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

E. Erosion Control: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

F. Concrete placement: Section 03 30 00 CAST-IN-PLACE CONCRETE.

G. Site preparation: Section 31 23 19, DEWATERING, and Section 02 41 10, DEMOLITION AND SITE CLEARING.

H. Paving subgrade requirements: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

I. Utilities: Section 33 41 00 STORM UTILITY DRAINAGE PIPING, Section 33 46 00 SUBDRAINAGE, Section 33 49 00 STORM DRAINAGE STRUCTURES.

1.4 SUBMITTALS

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

B. Furnish to COR:
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 D698 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 sub-base 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.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Use the latest edition of the referenced publication.

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

M6 ..... Standard Specification for Fine Aggregate for Hydraulic Cement Concrete

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

C33 ..... Standard Specification for Concrete Aggregates

D448 ..... Standard Classification for Sizes of Aggregate for Road and Bridge Construction

D698 ..... Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft. lbf/ft3 (600 kN m/m3))

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

D1557 ..... Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2700 kN m/m3))

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

D2940 ..... Standard Specifications for Graded Aggregate Material for Bases or Subbases for Highways or Airports

D2974 ..... Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

1.6 SOURCE QUALITY CONTROL

A. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698.

B. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D698, and ASTM D2974.

C. If tests indicate materials do not meet specified requirements, change material and retest.

D. Provide materials of each type from same source throughout the Work.

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 CL (silty clays), CL (sandy clays), or SC (clayey sands), or any combination of these groups; free of rock or gravel larger than 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 110 pcf, a Plasticity Index within the range of 5 to 25, and a maximum Liquid Limit of 35.

1. Native soil fill: Native excavated and re-used material; limiting organic content to no more than 3% and no large roots allowed.

C. Engineered Fill: Naturally or artificially graded mixture of compliance with ASTM D2487 Soil Classification Groups CL (silty clays), CL (sandy clays), or SC (clayey sands), or any combination of these groups, or as approved by the COR or material with at least 90 percent passing a 1 1/2-inch sieve and not more than 12 percent passing a No. 200 sieve, per ASTM D2940. Minimum dry density of 110 pcf, a Plasticity Index within the range of 5 to 25, and a maximum Liquid Limit of 35. Fill shall be approved by COR and Project Geotechnical Engineer at least 48 hours prior to being transported to the site.

D. Topsoil: Per 32 90 00 PLANTING.

E. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; 3/4" or 1/2"; having a minimum of one fractured face.

F. Drainage Fill: Washed, narrowly graded mixture of crushed stone or crushed or uncrushed gravel; free of shale, clay, friable material, and debris; ASTM D448; coarse-aggregate grading Size 57; with the following gradation:

DRAINAGE FILL #57	
Sieve Size	Percent Passing
1 ½”	100
1”	95 – 100
½”	25 – 60
No. 4	0 - 10
No. 8	0-5

G. Pea Gravel (Flowable Fill): As specified in Section 03 48 22.

2.2 FINE AGGREGATE MATERIALS

A. Sand: Natural river or bank sand conforming to AASHTO M6 or ASTM C33; washed; free of silt, clay, loam, friable or soluble materials, and organic matter; graded within the following limits:

SAND	
Sieve Sizes	Percent Passing
No. 4	90-100
No. 200	<5

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. Call Louisiana One Call (811) before starting any Work.

B. Clearing: Clear within limits of earthwork operations as indicated. Work includes removal of trees, shrubs, fences, foundations, incidental structures, paving, debris, trash, and other obstructions. Remove materials from Cemetery property.

C. Grubbing: Remove stumps and roots 2 inch and larger diameter. Undisturbed sound stumps, roots up to 2 inch diameter, and nonperishable solid objects a minimum of 3 feet below subgrade or finished embankment may be left. Do not leave material within burial profile up to 8 feet below finished grade.

D. Trees and Shrubs: Trees and shrubs, not shown for removal, may be removed from areas within 15 feet of new construction Work and 7.5 feet of utility lines when removal is approved in advance by COR. Remove materials from Cemetery property. Trees and shrubs, shown to be transplanted, shall be dug with a ball of earth and burlapped in accordance with latest issue of, "American Standard for Nursery Stock" of the American Association of Nurserymen, Inc. Transplant trees and shrubs to a permanent or temporary position within two hours after digging. Maintain trees and shrubs held in temporary locations by watering as necessary and feeding semiannually with liquid fertilizer with a minimum analysis of 5 percent nitrogen, 10 percent phosphorus, and 5 percent potash. Maintain plants moved to permanent positions as specified for plants in temporary locations until conclusion of Contract. Box, and otherwise protect from damage, existing trees and shrubs which are not shown to be removed in Work 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, which are to remain, than farthest extension of their limbs.

E. 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 COR. Eliminate foreign materials, such as weeds, roots, stones, subsoil, frozen clods, and similar

foreign materials larger than 1/2 cubic foot in volume, from soil as it is stockpiled. Retain topsoil on station. Remove foreign materials larger than 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.

1. Test the soil for chemicals, pesticides and fertilizers to verify suitability for use as topsoil in the Cemetery where new lawn areas are to be established.

F. Stockpile materials on-site at locations designated by COR or as indicated on the Drawings. Stockpile in sufficient quantities to meet Project schedule and requirements. Separate differing materials with dividers or stockpile apart to prevent mixing. Direct surface water away from stockpile site to prevent erosion or deterioration of materials. Material shall be stockpiled on impervious material and covered over with same material until disposal. Place erosion control measures as required by Storm Water Pollution Prevention requirements of the state of Louisiana. Remove stockpile at end of construction or when no longer needed, whichever is earlier; leave area in a clean and neat condition. Grade site surface to prevent free standing surface water.

G. 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 of the Geotechnical Engineer 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 Drawings, except spot elevations, are approximate from a site survey that measured spot elevations and subsequently generated existing contours and spot elevations. Proposed spot elevations and contour lines have been developed utilizing the existing conditions survey and developed contour lines and may be approximate. Contractor is responsible to notify COR of any differences between existing elevations shown on plans and those encountered on-site by Surveyor described above. Notify COR of any differences between existing or constructed grades, as compared to those shown on the Drawings.
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.

H. 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 on-site.

3.2 EXCAVATION

A. Shoring, Sheeting and Bracing: Shore, brace, or slope, its angle of repose or to an angle considered acceptable by the local OSHA and Authority, banks of excavations to protect workmen, banks, adjacent paving, structures, and utilities.
   1. Design of the temporary support of excavation system is the responsibility of the Contractor.
   2. Construction of the support of excavation system shall not interfere with the permanent Work and may begin only after a review by the COR.
   3. Extend shoring and bracing to a minimum of 5 feet below the bottom of excavation. Shore excavations that are carried below elevations of adjacent existing foundations.

B. Excavation Drainage: Operate pumping equipment, and/or provide other materials, means and equipment as required to keep excavation free of water and subgrade dry, firm, and undisturbed until approval of permanent Work has been received from COR. Approval by the COR is also required before placement of the permanent Work on all subgrades.

C. Subgrade Protection: Protect subgrades from softening, undermining, washout, or damage by rain or water accumulation. Reroute surface water runoff from excavated areas and not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches. When subgrade for preplaced urn crypts 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 COR.

D. Blasting: Not permitted.

E. Proofrolling:
   1. After rough grade has been established in cut areas and prior to placement of fill in fill areas under preplaced urn crypts and paving, proofroll exposed subgrade with a fully loaded dump truck to check for pockets of soft material.
   2. Proofrolling shall consist of at least two complete passes with one pass being in a direction perpendicular to preceding one. Remove any areas that deflect, rut, or pump excessively during proofrolling, or that fail to consolidate after successive passes, to suitable soils and replace with compacted fill. Maintain subgrade until succeeding operation has been accomplished.

F. Trench Earthwork:
   1. Utility trenches:
      a. Trench width shall be as indicated on Drawings. When not indicated, trench width shall not exceed pipe diameter plus 18 inches.
      b. Bed bottom quadrant of pipe granular fill.

1) Bell holes shall be no larger than necessary for jointing.
2) Granular Fill: Depth of fill shall be 12 inches below pipe to 12 inches above top of pipe or as indicated on the Drawings. Place and tamp fill material by hand.

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

G. Site Earthwork: Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation. Excavation shall be accomplished as required by Drawings and Specifications. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other Work, complying with OSHA requirements, and for inspections.

1. Remove subgrade materials that are determined by COR 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 COR, and the materials shall be examined by an independent testing laboratory for soil classification to determine whether it is unsuitable or not. When unsuitable material is encountered and removed, Contract price and time will be adjusted in accordance with Articles, DIFFERING SITE CONDITIONS, CHANGES and CHANGES-SUPPLEMENT of the GENERAL REQUIREMENTS as applicable. Adjustments to be based on volume in cut section only.

H. Site Grading:

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
3. 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:
   a. Lawn or Unpaved Areas: Plus or minus 1 inch.
   b. Walks or other pavements: Plus or minus 1/2 inch.
   c. Preplaced Urn Crypts: as specified in 03 48 22.

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 preplaced urn crypts have been completed above grade and adequately braced,

foundation subdrainage and pipes coming in contact with backfill have been installed, and Work inspected and approved by COR.

B. Placing: Place materials in horizontal layers not exceeding 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 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. Moisten or aerate material as necessary to provide moisture content that will readily facilitate obtaining specified compaction with equipment used. Compact soil to not less than the following percentages of maximum dry density, according to ASTM D698 or ASTM D1557 as specified below:
   1. Fills, Embankments, and Backfill
      a. Under proposed paved and preplaced urn crypts subgrade areas, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material in accordance with ASTM D698, 95 percent.
      b. Curbs, curbs and gutters, ASTM D698, 95 percent.
      c. Landscaped areas, top 16 inches, ASTM D698, 85 percent.
      d. Landscaped areas, below 16 inches of finished grade, ASTM D698, 90 percent.
   2. Natural Ground (Cut or Existing)
      a. Under paved areas, top 12 inches, ASTM D698, 95 percent.
      b. Curbs, curbs and gutters, top 12 inches, ASTM D698, 95 percent.

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. Cut rough or sloping rock to level beds for foundations. In pipe spaces or other unfinished areas, fill low spots and level off with coarse sand or fine gravel.

C. Finish grade earth floors in pipe basements as shown to a level, uniform slope and leave clean.

D. Place crushed stone or gravel fill under concrete slabs on grade, tamped, and leveled. Thickness of fill shall be 6 inches unless otherwise shown.

E. Finish subgrade in a condition acceptable to COR 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 Work when approved compacted subgrade is disturbed by Contractor's subsequent operations or adverse weather.

F. Grading for Paved and Preplaced Urn Crypt Areas: Provide final grades for both subgrade and base course to +/- 0.25 inches of indicated grades.

3.5 DISPOSAL OF UNSUITABLE AND EXCESS EXCAVATED MATERIAL

A. Remove surplus waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Cemetery property.

B. Transport surplus satisfactory soil to designated storage areas on Cemetery property. Stockpile or spread soil as directed by COR.
1. Transport off of Cemetery property at the completion of construction as directed by COR.

C. Place excess excavated materials suitable for fill and/or backfill on site where directed during construction operations.

D. Remove from site and dispose of any excess excavated materials after all fill and backfill operations have been completed.

E. Segregate all excavated contaminated soil designated by the COR from all other excavated soils, and stockpile on site on two 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 CLEAN UP

A. 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 Cemetery property.

END OF SECTION

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SECTION 31 23 19

DEWATERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section specifies performance of dewatering Work required to lower and control groundwater table levels and hydrostatic pressures to permit excavation, backfill, and construction Work to be performed in the dry. Control of surface water shall be considered as part of the Work under this Specification.

1.2 SUMMARY

A. The Work to be completed by the Contractor includes but is not necessarily limited to the following:
   1. Implementation of the Erosion and Sedimentation Control Plan.
   2. Dewater excavations, including seepage and precipitation.

B. The Contractor shall be responsible for providing all labor, materials, tools, equipment, power and services necessary for care of water and erosion control. Excavation work shall not begin before the approved Erosion and Sedimentation Control Plan and/or Storm Water Pollution and Prevention measures are in place.

1.3 REQUIREMENT

A. Dewatering system shall be of suitable facilities with sufficient size and capacity necessary to lower and maintain groundwater table to an elevation at least 1 foot below lowest subgrade or bottom of pipe trench and to allow material to be excavated in a reasonably dry condition. Materials to be removed shall be sufficiently dry to permit excavation to grades shown and to stabilize excavation slopes where sheeting is not required. Operate dewatering system continuously until backfill Work has been completed.

B. Reduce hydrostatic head below any excavation to the extent that water level in the construction area is a minimum of 1 foot below prevailing excavation surface and/or that localized excavations are dewatered sufficiently to conduct the Work in dry conditions until the backfill has been completed at least 1-foot above the initial observed groundwater level.

C. Prevent loss of fines, seepage, boils, quick conditions or softening of foundation strata.

D. Maintain stability of sides and bottom of excavation.

E. Construction operations are performed in the dry.

F. Control of surface and subsurface water is part of dewatering requirements. Maintain adequate control so that:
   1. The stability of excavated and constructed slopes are not adversely affected by saturated soil, including water entering prepared subbase and subgrades where underlying materials are not free draining or are subject to swelling or freeze-thaw action.
   2. Erosion is controlled.
   3. Flooding of excavations or damage to structures does not occur.
   4. Surface water drains away from excavations.
   5. Excavations are protected from becoming wet from surface water, or insure excavations are dry before additional Work is undertaken.

G. Permitting Requirements: The Contractor shall comply with and obtain the required State, County, and local permits where the Work is performed.

1.4 RELATED WORK

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Safety Requirements: Section 01 00 00, GENERAL REQUIREMENTS, Article, HEALTH AND SAFETY PLAN.

C. Submittal requirements as specified in Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

D. Protection of existing utilities, fire protection services, existing equipment, roads, and pavements: Section 01 00 00, GENERAL REQUIREMENTS.

E. Subsurface Investigation: Section 01 00 00, GENERAL REQUIREMENTS, PHYSICAL DATA.

F. Excavation, backfilling, site grade and utilities: Section 31 20 00, EARTH MOVING.

1.5 SUBMITTALS

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

B. Drawings and Design Data:
   1. Submit drawings and data showing the method to be employed in dewatering excavated areas 30 days before commencement of excavation.
   2. Material shall include: location, depth and size of wellpoints, headers, sumps, ditches, size and location of discharge lines, capacities of pumps and standby units, and detailed description of dewatering methods to be employed to convey the water from site to adequate disposal. Details of the dewatering facilities, including equipment and erosion protection facilities, shall be submitted. The submittal materials shall include

facilities and procedures for insuring discharge water quality in accordance with the applicable provisions of the Erosion Control Plan and/or SWPPP and/or NPDES requirements.

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

C. Inspection Reports.

D. All required permits.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install a dewatering system to lower and control ground surface water in order to permit excavation, construction of structure, and placement of backfill materials to be performed under dry conditions. Make the dewatering system adequate to pre-drain the water-bearing strata above and below the bottom of structure foundations, utilities and other excavations.

B. In addition, reduce hydrostatic pressure head in water-bearing strata below structure foundations, utility lines, and other excavations, to extent that water levels in construction area are a minimum of 1 foot below prevailing excavation surface at all times.

3.2 OPERATION

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

B. Place an adequate weight of backfill material to prevent buoyancy prior to discontinuing operation of the system.

3.3 WATER DISPOSAL

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

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

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

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

3.4 STANDBY EQUIPMENT

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

3.5 CORRECTIVE ACTION

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

3.6 DAMAGES

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

3.7 REMOVAL

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

END OF SECTION

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SECTION 32 05 23

CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section shall cover site work concrete constructed upon the prepared subgrade or base course per Drawings and in conformance with the lines, grades, thickness, and cross sections shown. Construction shall include, but not limited to, the following:
   1. Curb, gutter, and combination curb and gutter.
   2. Concrete pads and walks.

1.2 RELATED WORK

A. Laboratory and Field Testing Requirements: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Subgrade Preparation: Section 31 20 00, EARTH MOVING.

C. Concrete Materials, Quality, Mixing, Design and Other Requirements: Section 03 30 00, CAST-IN-PLACE CONCRETE.

D. Joint sealing: Section 07 92 00 JOINT SEALANTS.

1.3 DESIGN REQUIREMENTS

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

1.4 WEATHER LIMITATIONS

A. Placement of concrete shall be as specified for Cold Weather Placement and Hot Weather Placement.

1.5 SUBMITTALS

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

B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified:
   1. Expansion joint filler
   2. Hot poured sealing compound
   3. Reinforcement
   4. Curing materials

C. Data and Test Reports:
   1. Subbase or base material.

2. Job-mix formula.
3. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.

1.6 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Refer to the latest edition of all referenced Standards and codes.

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

M31..... Deformed and Plain Billet Steel Bars for Concrete Reinforcement (ASTM A615/A615M-96A)

M42..... Standard Specification for Rail-Steel Deformed and Plain Bars for Concrete Reinforcement

M55..... Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A185)

M148..... Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309A)

M171..... Sheet Materials for Curing Concrete (ASTM C171)

M182..... Burlap Cloth Made from Jute or Kenaf

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

C94..... Ready-Mixed Concrete

C143 ..... Slump of Hydraulic Cement Concrete

PART 2 - PRODUCTS

2.1 GENERAL

A. Concrete shall be Type C, air-entrained as specified in Section 03 30 00, CAST-IN-PLACE CONCRETE, with the following exceptions:

TYPE	MAXIMUM SLUMP*
Curb & Gutter	3"
Pedestrian Pavement	3"
Vehicular Pavement	2" (Machine Finished) 4" (Hand Finished)
Equipment Pad	3" to 4"
* 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.

B. Welded wire fabric shall conform to AASHTO M55.

C. Dowels shall be plain steel bars conforming to AASHTO M31 or M42. Tie bars shall be deformed steel bars conforming to AASHTO M31 or M42.

2.3 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 in any ten foot long section, in either a horizontal or vertical direction.

C. Wood forms should be at least 2 inches thick (nominal). Wood forms shall also be free from warp, twist, loose knots, splits, or other defects. Use approved flexible or curved forms for forming radii.

2.4 CONCRETE CURING MATERIALS

A. Concrete curing materials shall conform to one of the following:
1. Burlap conforming to AASHTO M182 having a weight of seven ounces or more per square yard when dry.
2. Impervious Sheeting conforming to AASHTO M171.
3. Liquid Membrane Curing Compound conforming to AASHTO M148 (ASTM C309), Type 1 and shall be free of paraffin or petroleum.

2.5 EXPANSION JOINT FILLERS

A. Material shall be as specified in Section 07 92 00 JOINT SEALANTS.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Prepare, construct, and finish the subgrade as specified in Section 31 20 00, EARTH MOVING.

B. Maintain the subgrade in a smooth, compacted condition, in conformance with the required Section, and established grade until the succeeding operation has been accomplished.

3.2 SETTING FORMS

A. Base Support:

1. Compact the base material under the forms true to grade so that, when set, they will be uniformly supported for their entire length at the grade as shown.
2. Correct imperfections or variations in the base material grade by cutting or filling and compacting.

B. Form Setting:
1. Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines.
2. 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 when checked with a straightedge and shall not deviate from true line by more than 1/4 inch at any point.
   a. Slopes of walks shall not exceed those allowable by ADA.
4. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing.
5. Clean and oil forms each time they are used.

C. The Contractor's Registered Professional Land Surveyor, specified in Section 01 00 00, GENERAL REQUIREMENTS, shall establish and control the alignment and the grade elevations of the forms or concrete slipforming machine operations.
1. Make necessary corrections to forms immediately before placing concrete.
2. When any form has been disturbed or any subgrade or subbase or base has become unstable, reset and recheck the form before placing concrete.

3.3 EQUIPMENT

A. The COR shall approve equipment and tools necessary for handling materials and performing all parts of the Work prior to commencement of Work.

B. Maintain equipment and tools in satisfactory working condition at all times.

3.4 PLACING REINFORCEMENT

A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.

B. Before the concrete is placed, the COR shall approve the reinforcement, which shall be accurately and securely fastened in place with suitable supports and ties. The type, amount, and position of the reinforcement shall be as shown.

3.5 PLACING CONCRETE - GENERAL

A. Obtain approval of the COR 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.

3.6 PLACING CONCRETE FOR CURB AND GUTTER

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.
   1. Pavements for pedestrian access shall not exceed 2% cross slope.

3.7 CONCRETE FINISHING - GENERAL

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

3.8 CONCRETE FINISHING CURB AND GUTTER

A. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/4 inch or as otherwise detailed.

B. Float the surfaces and finish with a smooth wood or metal float until true to grade and section and uniform in textures.

C. Finish the surfaces, while still wet, with a bristle type brush with longitudinal strokes.

D. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the surface, while still wet, in the same manner as the gutter and curb top.

E. Except at grade changes or curves, finished surfaces shall not vary more than 1/8 inch for gutter and 1/4 inch for top and face of curb, when tested with a 10 foot straightedge.

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

G. Correct any depressions which will not drain.

H. Visible surfaces and edges of finished curb, gutter, and combination curb and gutter shall be free of blemishes, form marks, and tool marks, and shall be uniform in color, shape, and appearance.

3.9 CONCRETE FINISHING PEDESTRIAN PAVEMENT

A. Walks and pads:
1. Finish the surfaces to grade and cross section with a metal float, trowled smooth and finished with a broom moistened with clear water.
2. Brooming shall be transverse to the line of traffic.
3. Finish all slab edges, including those at formed joints, carefully with an edger having a radius as shown on the Drawings.
4. Unless otherwise indicated, edge the transverse joints before brooming. The brooming shall eliminate the flat surface left by the surface face of the edger. Execute the brooming so that the corrugation, thus produced, will be uniform in appearance and not more than 1/16 inch in depth.
5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 3/16 inch when tested with a 10 foot straightedge.
6. The thickness of the pavement shall not vary more than 1/4 inch.
7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.

B. Carefully finish all slab edges with an edger having a radius as shown in the Drawings.

1. 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 when tested with a 10 foot straightedge.
2. Correct irregularities exceeding the above.

3.10 JOINTS - GENERAL

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

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

3.11 CONTRACTION JOINTS

A. Cut joints to depth as shown with a grooving tool or jointer of a radius as shown or by sawing with a blade producing the required width and depth.

B. Construct joints in curbs and gutters by inserting 1/8 inch steel plates conforming to the cross sections of the curb and gutter.

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

D. Finish edges of all joints with an edging tool having the radius as shown.

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

3.12 EXPANSION JOINTS

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

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

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

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

E. Form expansion joints as follows:
1. Without dowels, about structures and features that project through, into, or against any site work concrete construction.
2. Using joint filler of the type, thickness, and width as indicated.
3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

3.13 CONSTRUCTION JOINTS

A. Locate longitudinal and transverse construction joints between slabs of vehicular pavement as indicated.

B. Place transverse construction joints of the type shown, where indicated and whenever the placing of concrete is suspended for more than 30 minutes.

C. Use a butt-type joint with dowels in curb and gutter if the joint occurs at the location of a planned joint.

D. Use keyed joints with tiebars if the joint occurs in the middle third of the normal curb and gutter joint interval.

3.14 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.

3.15 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 COR.

B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 6 inches.

C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 4 mils in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 12 inches. Securely anchor sheeting.

D. Liquid Membrane Curing:
1. Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 200 square feet per gallon for both coats.
2. Do not allow the concrete to dry before the application of the membrane.
3. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing

compound, in a manner to prevent the curing compound entering the joint.

4. Immediately re-spray any area covered with curing compound and damaged during the curing period.

3.16 CLEANING

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

3.17 PROTECTION

A. 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 COR, 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.

3.18 FINAL CLEAN-UP

A. Remove all debris, rubbish and excess material from the Cemetery.

END OF SECTION

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SECTION 32 30 00

SITE FURNISHINGS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 – GENERAL REQUIREMENTS, which are hereby made part of this Section of the Specifications.

B. The Work of this Section includes: Provide labor, materials and equipment necessary to complete the Work of this Section, including but not limited to the following:
   1. Furnish and install the Gravesite Layout Markers at the specified locations.
   2. Furnish and install bench at the specified location.
   3. Furnish and install granite section markers at the specified locations.

1.2 RELATED WORK

A. The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 03 30 00, CAST-IN-PLACE-CONCRETE.
   2. Section 31 20 00, EARTH MOVING.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES:
   1. General: For each item specified in description of Work or PART 2 - Products, provide information showing complete detail, location in the Project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors. Mark items requiring field assembly for erection identification and furnish erection drawings and instruction.
   2. Provide templates and rough-in measurements as required.
   3. Provide samples of full range of colors and finishes available for review and approval, prior to ordering.

1.4 REFERENCE STANDARDS

A. The publications listed below form a part of this specification and the Work shall comply with pertinent standards of the latest editions as specified below or by industry standards unless designated otherwise herein.

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

B221-08 ..... Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

C. American Welding Society (AWS):
D1.2-97..... Structural Welding Code Aluminum

D. National Association of Architectural Metal Manufacturers (NAAMM)

PART 2 - PRODUCTS

2.1 GRAVESITE LAYOUT MARKERS

A. General: Gravesite layout markers for this project shall consist of Gravesite Grid Monuments.
1. Gravesite grid monuments shall be comprised of a bronze survey marker (monument marker) set into a cast-in-place concrete base
a. Materials:
1) Monument Base: Cast-in-place concrete monument base shall be a minimum of 3,500 psi @ 28 days, reinforced as shown on Drawings; dimensions as shown on Drawings.
2) Monument Marker: Domed-top, 3 1/2" diameter, domed bronze concrete survey marker with integral locator magnet, and flared anchor post for securing to concrete.

B. Text and Cross-hairs: Text of top as shown on Drawings; text all caps with height to be 3/16”. Cross hairs shall be field engraved as shown on the Drawings, aligned with the gravesite grid and engraved based upon Contractor-surveyed location data.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include those manufacturer’s that can demonstrate, during the submittal process, that they have provided these products as part of successful installations matching the specifications and drawings, at a minimum of three VA National Cemeteries.

2.2 BENCHES

A. To establish an acceptable level of quality for the bench materials and fabrication process, the following manufacturing features are listed and required for the purpose of identifying manufacturers that provide work and materials generally complying with these specifications. Their selection for this Work shall not relieve them from performing the Work as specified.

B. Manufacturing Features: Front welds are to be ground and polished until they form a continuous surface from the top tubular section to each vertical steel slat. Steel seat members shall be gently reversing contoured for maximum comfort. The end sections shall be solid steel bar, welded and ground, structurally adequate for the maximum loads, including an industry standard or greater design load safety factor. End arm rests are required and shall be standard

integral welded configuration, with no center arm rests. All fabricated metal components are to be steel shot-blasted, etched, phosphatized, preheated and electrostatically powder-coated with TGIC polyester powder coatings.

C. Benches shall be at the locations, sizes and in the quantities indicated on the Drawings.

D. Bench color shall be VS Black, as approved during the submittal process.

E. All mounting hardware shall be stainless steel. Use of acorn nuts is required; exposed bolt ends or flat bolt heads are not acceptable.

F. WARRANTY:
1. All benches shall be free from defects in material and/or workmanship for a minimum period of three years from final acceptance. Warranty shall not apply to damage resulting from accident, alteration, misuse, tampering, negligence or abuse.

2.3 GRANITE SECTION MARKERS

A. Provide granite section markers in size and length as depicted on Drawings. Install in locations and as shown on Drawings. Markers are to match existing Cemetery section markers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to installation of any of the Work in this Section, Contractor shall inspect the planned installation locations to insure that conditions are not significantly different from those indicated on the Drawings. All materials shall be inspected prior to installation to insure compliance with the Contract Documents and to insure there is no damage. Should conditions be different from those indicated on the Contract Documents, Contractor shall immediately notify the COR.

3.2 PREPARATION

A. Stake alignment and locations for all site furnishings for review and approval by COR. Verify that all elements in this section “fit” within location provided.

B. Install items rigid, plumb and true to lines and levels shown.

C. Assemble (if required) and install items as per manufacturer’s printed instructions, or approved shop drawings, unless otherwise specified or shown.

3.3 INSTALLATION

A. Gravesite Grid Monuments and Markers:
1. All material must be checked upon receipt at the job site prior to installation to check for any damage that may have occurred during

transport. Units will be installed in complete accordance with manufacturers' recommendations and as shown the Construction Documents.

2. Cross-hairs on bronze monuments and marker shall be field-inscribed, based upon accurate Contractor-survey: refer to Drawings.

B. Benches:

1. Benches shall be shipped assembled. Mount benches as recommended by the manufacturer and as specified herein. All mounting hardware shall be stainless steel. Use of acorn nuts is required; exposed bolt ends or flat bolt heads are unacceptable.

C. Granite Section Markers:

1. Install as shown on the drawings.
2. Backfill and compact excavation around marker in accordance with Section 31 20 00 – EARTH MOVING.
3. Ensure that markers are plumb and set vertically.
4. Clean any excess material from surface of marker.

3.4 CLEAN UP

A. Clean up area of excess material and debris. Clean above ground portions of all receptacles and other site improvements.

END OF SECTION

SECTION 32 84 00

PLANTING IRRIGATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Contractor is responsible for providing a system with full and complete coverage. Furnish all labor, materials, supplies, equipment, tools, and transportation, and perform all operations in connection with and reasonably incidental to the complete installation of the irrigation system, and guarantee/warranty as shown on the drawings, the installation details, and as specified herein. Items of Work specifically included are:
   1. Procurement of all applicable licenses, permits, and payment of required fees.
   2. Coordination of Utility Locates ("Call Before You Dig").
   3. Maintenance period.

1.2 RELATED WORK

A. Section 32 90 00 PLANTING

1.3 QUALITY ASSURANCE

A. Contractor:
   1. Irrigation Contractor must have demonstrated, using persons directly employed by the Contractor, experience with the installation of at least five (5) irrigation systems having large diameter HDPE pipe (3-inch and larger), electro weld fittings and butt fusion fittings and joints, centralized control systems with two wire decoder communication, electrically operated sprinklers and remote control valves, large radius rotary sprinklers (minimum 1-inch inlet with swing joint) and pre-fabricated pump stations. Provide documentation indicating past projects that conform to the above project descriptions. Submittal reviews will not be returned before the contractor qualifications have been submitted.
   2. Contractor and project superintendent must be certified by control system manufacturer as a certified contractor for installation of control system wiring and grounding systems. Provide documentation from control system manufacturer regarding certification.
   3. Contractor must be licensed in Louisiana.

B. Equipment Manufacturer:
   1. Manufacturer regularly and presently manufactures the item as one of their principal products.

C. System Requirements:

1. Full and complete coverage is required. Contractor shall, at no additional cost to the Government, make necessary adjustments to layout required to achieve full coverage of irrigated areas.
2. Layout work as closely as possible to Drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown.

1.4 SUBMITTALS

A. Make submittal and provide number of copies per Specification Section 01 33 23. Unless otherwise noted, provide four (4) copies of irrigation information in a 3-ring binder with table of contents and index sheet. Provide sections that are indexed and labeled for valves, sprinklers, pipe and fittings, wire and wire connectors, ID tags, shop drawings, “DO NOT DRINK” sign and all other irrigation equipment shown or described on the drawings and within these specifications. Highlight items being supplied on the catalog cut sheets. Submittal package must be complete prior to being reviewed by the COR. Incomplete submittals will be returned without review.

B. Materials List: Include all materials and products that are part of the irrigation system including, but not limited to: pipe, fittings, valves, mainline components, water emission components, and control system components. Quantities of materials need not be included.

C. Manufacturers' Data: Submit manufacturers' catalog cuts, specifications, manufacturer’s location of origin (and operating instructions for equipment shown on the materials list. For rotary sprinklers include Center for Irrigation Technology SpacePro Single Leg Profile showing the Distribution Uniformity and Scheduling Coefficient for the nozzles being used at the specified offset spacing.

D. Shop Drawings: Submit shop drawings called for in the installation details. Show products required for proper installation, their relative locations, and critical dimensions. Note modifications to the installation detail.

E. Testing: Submit a proof of testing report following completion of each test listed in Part 1 of these specifications. Unless otherwise noted, include name of test, date of test, name of the individual completing the test, name of the company completing the test and a summary of the test results. If system fails test, document any and all retests until system passes test.

F. Maintenance and Operation Instructions: Submit information listed in Part 3 of these specifications.

G. Record Drawings: Submit information listed in Part 3 of these specifications.

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 National Standard Institute (ANSI):

A21.10 .....Ductile-Iron and Gray-Iron Fittings

A21.11 .....Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

B16.1 .....Cast Iron Pipe Flanges and Flanged Fittings

B40.1-91 .....Gauges-Pressure Indicating Dial Type Elastic Element

C. American Society of Agricultural Engineers (ASAE):

S398 .....Sprinkler Testing and Performance Reporting.

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

A536 .....Standard Specification for Ductile Iron Castings

D1784 .....Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D1785-91 .....Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120

D2241-89 .....Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)

D2464-91 .....Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

D2466-90 .....Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

D2564-94 .....Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Pipe And Fittings

D2855-96 .....Making Solvent Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings

D3350 .....Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

F714 .....Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

F477-90 .....Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F1970 .....Standard Specification for Special Engineered Fittings, Appurtenances or Valves for use in Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Systems

F2164 .....Field Leak Testing of Polyethylene Pressure Piping Systems

B209-96 .....Aluminum and Aluminum-Alloy Sheet and Plate

E. American Water Works Association (AWWA):

C110-93 .....Ductile-Iron and Gray-Iron Fittings, 3-Inch Through 48-Inch for Water and Other Liquids

C111-90 .....Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe Fittings

C500-93 .....Gate Valves for Water and Sewerage Systems

C509 .....Resilient-Seated Gate Valves for Water-Supply Service

C901-02 Polyethylene (PE) Pressure Pipe and Tubing, ½ In. (13 mm) Through 3 In. (76 mm), for Water Service

F. National Electrical Manufacturers Association (NEMA):

250-85 .....Enclosures for Electrical Equipment (1000 Volts Maximum); Revision 1, May 1986

G. National Electric Code: (latest edition)

H. Uniform Plumbing Code: (latest edition)

1.6 RULES AND REGULATIONS

A. Work and materials will be in accordance with the latest edition of the National Electric Code, the Uniform Plumbing Code, and applicable laws and regulations of the governing authorities.

B. When the Contract Documents call for materials or construction of a better quality or larger size than required by the above-mentioned rules and regulations, provide the quality and size required by the Contract Documents.

C. If quantities are provided either in these specifications or on the drawings, these quantities are provided for information only. It is the Contractor's responsibility to determine the actual quantities of all material, equipment, and supplies required by the project and to complete an independent estimate of quantities and wastage.

1.7 AVAILABILITY AND USE OF UTILITY SERVICES

A. The Government shall make NO utilities available to the Contractor from existing outlets and supplies. Upon completion of the irrigation system or completion of portions thereof, water will be available for flushing and testing of the new irrigation system. The Contractor may use water at no cost through the irrigation system for establishing turf and maintaining plant material. No other expressed or implied uses of Government furnished water exist.

B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the COR, shall install and maintain all necessary temporary connections and distribution lines, and meters required by the public utilities. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated appurtenances.

1.8 TESTING

A. Notify the COR five working days in advance of testing.

B. Pipelines jointed with solvent-welded PVC joints will be allowed to cure at least 24 hours before testing.

C. Subsections of mainline and submainline pipe may be tested independently, subject to the review of the COR.

D. Furnish clean, clear water, pumps, labor, fittings, and equipment necessary to conduct tests or retests.

E. Hydrostatic pressure testing of HDPE pipe must be conducted in accordance with ASTM F2164, Field Leak Testing of Polyethylene Pressure Piping Systems Using Hydrostatic Pressure. Fill HDPE pipe with water, raise to test pressure and allow to stabilize. Test pressure must be 1.5 times the operating pressure at the lowest point in the system. In accordance with ASTM F2164 Section 9.8, pipe will pass test if the final pressure is within 5% of the test pressure for 1 hour. For safety reasons, hydrostatic testing only will be used.
   1. Purge air from pipe before test. Attach pressure gauge to a sprinkler riser in the middle of the submainline pipe.
   2. Cap all sprinkler risers.

F. Hydrostatic Pressure Test – Solvent Weld Lateral Pipe:
   1. Subject pipe to a hydrostatic pressure equal to the anticipated operating pressure of 90 PSI for 30 minutes.
   2. Cap all sprinkler risers.
   3. Backfill to prevent pipe from moving under pressure. Expose couplings and fittings.
   4. Leakage will be detected by visual inspection. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat the test until the pipe passes test.
   5. As an alternative to the visual inspection described in Item 4. above, the COR may request that a pressure drop test be performed:
      a. Purge air from pipe before test. Attach pressure gauge to a riser in the middle of the lateral. Cap all sprinkler risers.
      b. Pressurize the lateral via the remote control valve then turn down flow control handle on remote control valve to seal off lateral.
      c. Observe pressure loss on pressure gauge. If pressure loss is greater than 5 PSI, identify reason for pressure loss. Replace defective pipe, fitting, joint, valve, or appurtenance. Repeat test until pressure loss is equal to or less than 5 PSI.
   6. Cement or caulking to seal leaks is prohibited.
   7. After lateral passes test and prior to operational test, install sprinklers and backfill and compact all pipe, fittings, joints, or appurtenance.

G. Operational Test – Valve-in-Head Sprinklers; Remote Control Valves, Lateral Piping and Sprinklers:
   1. Activate each valve-in-head sprinkler and remote control valve in sequence from each controller. Manual operation of the sprinklers or valves is not an acceptable method of activation. The COR will visually observe operation, water application patterns, and leakage.

2. Replace defective remote control valve, solenoid, wiring, or appurtenance to correct operational deficiencies.
3. Replace, adjust, add, or move water emission devices to correct operational or coverage deficiencies.
4. Replace defective pipe, fitting, joint, valve, sprinkler, or appurtenance to correct leakage problems. Cement or caulking to seal leaks is prohibited.
5. Repeat test(s) until each lateral pass all tests. Repeat tests, replace components, and correct deficiencies at no additional cost to the Government.

H. Distribution Uniformity (DU):
1. Perform a DU Test on one group of eight (8) burial section rotors.
2. In conjunction with the COR, select the zones of sprinklers that are representative of the area being irrigated by the controller.
3. Perform a catch can test using procedures recommended by the Irrigation Association.
4. Calculate and provide a written documentation of the DU for each zone tested.
5. An Irrigation Association Certified Landscape Irrigation Auditor must perform the test. Provide written evidence of certification prior to conducting test.

I. Control System Grounding:
1. Test for proper grounding of control system per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.
2. Replace defective wire, grounding rod or appurtenances. Repeat the test until the manufacturer's guidelines are met.
3. A written report of the test data listing decoder address, date of test, name of the individual completing the test, name of the company completing the test and the ohms resistance to ground for each controller must be submitted to the COR.

J. Acceptance Test Prior to Final Inspection:
1. Upon completion of construction and prior to Final Inspection, an Acceptance Test must be passed.
2. Coordinate start of Acceptance Test with COR.
3. During the Acceptance Test, the irrigation system must be fully operational from the control system. The irrigation system must operate with no faults for 14 consecutive days. If at any time during the 14 day test period, a system fault occurs, the source of the fault must be determined and corrected and the 14 day evaluation period will start again. If a system fault occurs, make repairs within 72 hours of notification from COR. Document any faults in the proof of test report listing date of fault, fault, cause of the fault and the corrective action taken.
4. If the fault is found to be due to factors outside of the Contractor’s control (for example, mainline pipe break in area not being renovated) the evaluation period will continue.

5. When the system has operated for 14 days without fault, contact the COR to schedule Final Inspection.

1.9 CONSTRUCTION REVIEWS

A. The purpose of on-site reviews by the COR is to periodically observe the work in progress, the Contractor's interpretation of the Construction Documents, and to address questions with regard to the installation.
   1. Schedule reviews for irrigation system layout or testing with the COR as required by these Specifications.
   2. Impromptu reviews may occur at any time during the project.
   3. A Final Inspection will occur at the completion of the irrigation Acceptance Test. The intent of the Final Inspection is to verify that all installation; testing; maintenance and operation submittals; and project record drawing submittals are completed prior to the start of the Maintenance and Guarantee/Warranty periods.
   4. All costs, including travel expenses and site visits by the Veterans Administration or Veterans Administration representative(s) for additional Inspection(s) that may be required after the Final Inspection due to non-compliance with the Construction Documents are the sole responsibility of the Contractor.

1.10 GUARANTEE/WARRANTY AND REPLACEMENT

A. The purpose of this guarantee/warranty is to insure that the Government receives irrigation materials of prime quality, installed and maintained in a thorough and careful manner.

B. Guarantee/warranty irrigation materials, equipment, and workmanship against defects for a period of one year from Final Inspection by COR. Fill and repair depressions. Restore landscape, utilities, structures or site features damaged by the settlement of irrigation trenches or excavations. Repair damage to the premises caused by construction or a defective item. Make repairs within 72 hours of notification from COR.

C. Replace damaged items with identical materials and methods per contract documents or applicable codes. Make replacements at no additional cost to the contract price.

D. Guarantee/warranty applies to originally installed materials and equipment and replacements made during the guarantee/warranty period.

1.11 GENERAL CONSTRUCTION REQUIREMENTS

A. Coordinate construction of irrigation system with COR. See irrigation Drawings and installation details for required coordination efforts related to the installation of specific irrigation components.

B. Install irrigation components in landscaped areas only.

C. Construction cannot proceed unless staking of irrigation mainline, submainline, isolation gate valve locations, quick coupling valve locations, remote control valve locations, sprinkler, and controller locations are reviewed and accepted by the COR.

PART 2 - MATERIALS

2.1 QUALITY

A. Use new materials without flaws or defects.

2.2 SUBSTITUTIONS

A. Unless noted otherwise, use specified equipment. COR must approve equipment prior to construction. The Contactor, through written request prior to purchase or installation, may request substitutions to the approved equals listed herein. Changes and associated design costs to accommodate alternative equipment are Contractor's.

B. Pipe sizes and pressure ratings referenced in the Construction Documents are a minimum and may be increased at Contractor's option.

2.3 PIPE AND FITTINGS

A. HDPE Mainline and Submainline Pipe and Fittings:
1. Use high density, extra high molecular weight polyethylene pipe (HDPE), extruded from material meeting the specifications of cell classification on PE 345434C, ASTM standard D3350, SDR 11, rated at 160 PSI conforming to the dimensions and tolerances established by ASTM F714 for mainline pipe.
2. Join pipe lengths using butt-fusion technique as recommended by pipe manufacturer.
3. Join HDPE to PVC pipe materials using HDPE (butt-fusion) x adapter with ductile iron back-up ring.

B. Lateral Pipe and Fittings:
1. Use rigid, unplasticized polyvinyl chloride (PVC) 1120, 1220 National Sanitation Foundation (NSF) approved pipe, extruded from material meeting the requirements of Cell Classification 12454-A or 12454-B, ASTM Standard D1784, with an integral belled end suitable for solvent welding.
2. Use Class 160, SDR-26, rated at 160 PSI, conforming to dimensions and tolerances established by ASTM D2241. Use PVC pipe rated at higher pressures than Class 160 in the case of small nominal diameters not manufactured in Class 160.
3. Use solvent weld pipe for lateral pipe. Use Schedule 40, Type 1, PVC solvent weld fittings conforming to ASTM D2466 and D1784 for PVC pipe. Use primer approved by pipe manufacturer. Solvent cement to conform to ASTM D2564, of type approved by pipe manufacturer.

C. Specialized Pipe and Fittings:
1. Use mechanical joints conforming to ANSI A 21.10 (AWWA C110) and ANSI A21.11 (AWWA C111) or flanged fittings conforming to ANSI/AWWA C110 and ANSI B16.1 (125#).
2. Joint sealant: Use only teflon-type tape or teflon based paste pipe joint sealant on plastic threads. Use nonhardening, nontoxic pipe joint sealant formulated for use on water-carrying pipes on metal threaded connections.

D. Joint Restraint Harness:
1. Use a joint restraint harness as presented in the installation details and wherever joints are not positively restrained by flanged fittings, threaded fittings, and/or thrust blocks.
2. Use a joint restraint harness with all ductile iron fittings 6 inch and larger, transition fittings between metal and PVC pipe, where weak trench banks do not allow the use of thrust blocks, or where extra support is required to retain a fitting or joint.
3. Use a joint restraint harness on all mainline gate valve assemblies as necessary.
4. Use bolts, nuts, retaining clamps, all-thread, or other joint restraint harness materials that are stainless steel. Use retainer conforming to ASTM A536. Use high strength, low alloy steel bolts and connecting hardware conforming to ANSI/AWWA C111/A21.11.
5. Acceptable manufacturer is EBBA Iron Megalug Series, Harco Knuckle Restraint or approved equal.

2.4 MAINLINE COMPONENTS

A. Sprinkler Isolation Gate Valve Assembly:
1. As presented in the installation details.
2. Iron body, bronze mounted, double disc with parallel or inclined seats, non-rising stem turning clockwise to close, 200 PSI minimum working pressure and mechanical joint ends meeting AWWA C509. Acceptable manufacturers are NIBCO, Clow, Kennedy, Mueller or approved equal.
3. Valve Box: Use plastic (ABS) 10-inch round valve box with black lid. Acceptable manufacturer is Carson, Pentek, Rain Bird or approved equal.
4. Filter Fabric: Use a spunbond polyester 3.5 oz. per square yard landscape fabric.

2.5 SPRINKLER IRRIGATION COMPONENTS

A. Remote Control Valve Assembly:
1. As presented in the installation details.
2. Remote Control Valve: Use a normally closed 24 VAC 50/60 cycle solenoid actuated globe pattern design. The valve pressure rating will not be less than 200 PSI. The valve body and bonnet will be constructed of heavy-duty glass-filled UV resistant nylon and have stainless steel studs and flange nuts; diaphragm will be of nylon reinforced nitrile rubber. The valve will have both internal and external manual open/close control (internal and external bleed) to manually open and close the valve without

electrically energizing the solenoid. The valve's internal bleed will prevent flooding of the valve box. The valve will house a fully encapsulated, one-piece solenoid. The solenoid will have a captured plunger with a removable retainer for easy servicing and a leverage handle for easy turning. Use 24 VAC 50/60 Hz solenoid that is compatible with a two-wire decoder control system. Valve must have a flow control stem for accurate manual regulation and/or shutoff of outlet flow. The valve must open or close in less than 1 minute at 200 PSI and less than 30 seconds at 20 PSI. The valve will have a self-cleaning stainless steel screen designed for use in dirty water applications. Provide for all internal parts to be removable from the top of the valve without disturbing the valve installation. Valve must have a pressure regulation module to regulate outlet pressure as specified. Acceptable manufacture and model is Hunter ICV Filter Sentry, Rain Bird PESB, Toro P-220 or approved equal.

3. PVC Ball Valve: Use a true union ball rated to 235 PSI. Use valve with safe-t-blocked seal carrier (full rated pressured) safe-t-shear stem, and self adjusting floating seat. Acceptable manufacturer is Spears or approved equal.
4. PVC Union: Use a Schedule 40 threaded union with O-ring seal. Acceptable manufacturer is Spears or approved equal.
5. Valve Box: Use plastic (ABS) standard valve box with black lid or combination of standard and round valve boxes with black lid. Acceptable manufacturer is Carson, Pentek, Rain Bird or approved equal.
6. Filter Fabric: Use a spunbond polyester 3.5 oz. per square yard landscape fabric.
7. Install assembly over gravel sump as presented in the installation details.
8. Decoder: Single station decoder with surge suppression and ground wire.
9. Wire connectors: Use 3M DBR/Y.
10. Lightning protection: Provide grounding rods at decoders as recommended by control system manufacturer.
11. Use standard Christy I.D. tags with hot-stamped black letters on a yellow background.

B. Valve-In-Head Sprinkler Assembly:

1. As presented in the installation details.
2. Sprinkler: Use a valve-in-head gear drive sprinkler capable of covering the radius with the discharge rate at the pressure as presented on the drawings. Furnish part circle sprinklers with a minimum adjustable arc of 30- to 345-degrees and full circle sprinklers with a non adjustable arc. Nozzle must be tested per ASAE S398.1 and be verified to deliver Distribution Uniformity of 80% or more and a Scheduling Coefficient of 1.2 or less at the specified offset spacing. Furnish sprinkler with closed case construction, self flushing mode at pop-up an pop-down, stainless steel retract spring, ACME inlet threads, minimum 1 1/2-inch size inlet, top serviceable rock screen, replaceable valve seat, pressure regulation range from 50 to 100 PSI. Use 24 VAC 50/60 Hz solenoid that is compatible with a two-wire decoder control system. Minimum pop-up height is 3 1/4-inches. Acceptable manufacturer and model is Hunter G800, Rain Bird 900, Toro 855S or approved equal.

3. Swing Joint: Use pre-manufactured triple swing joint compatible with service tee. Use ACME threads on inlet and outlet, size 1 ½-inch. Acceptable manufacturer is Rain Bird, Spears, Lasco or approved equal.
4. Tap't Saddle Tee: Use PVC tap't saddle tee rated at 235 PSI working pressure per ASTM F1970 for use with HDPE pipe. Use saddle tee with 304 stainless steel hardware and 1 ½ inch ACME thread outlet. Acceptable manufacturer is Lasco or approved equal.
5. Decoder: Single station decoder with surge suppression and ground wire.
6. Wire connectors: Use 3M DBR/Y.
7. Lightning protection: Provide grounding rods at decoders as recommended by control system manufacturer.

C. Pop-Up Rotor Sprinkler Assembly:
1. As presented in the installation details.
2. Rotary Sprinkler: Use a gear drive sprinkler capable of covering the radius with the discharge rate at the pressure as presented on the drawings. Furnish part circle sprinklers with an adjustable arc of 20- to 340-degrees, and full circle sprinklers with a non adjustable arc. Furnish sprinkler with stainless steel pop-down spring. Nozzle must be tested per ASAE S398.1 and be verified to deliver Distribution Uniformity of 80% or more and a Scheduling Coefficient of 1.2 or less at the specified offset spacing. Furnish sprinkler with stainless steel risers, integral check valve in base of the case capable of holding back 10 feet of elevation. Minimum pop-up height is 3 ½-inches. Acceptable manufacturer and model is Hunter I-35, Rain Bird 8005, Toro 2001 or approved equal.
3. Swing Joint: Use pre-manufactured triple swing joint. Acceptable manufacturer is Rain Bird, Spears, Lasco or approved equal.

D. Pop-Up Spray Sprinkler Assembly:
1. As presented in the installation details.
2. Spray Sprinkler: Use a spray sprinkler capable of covering the radius with the discharge rate at the pressure as presented on the drawings. Furnish sprinkler with pressure reducing module in the riser stem and integral check valve in base of the case capable of holding back a minimum of 8 feet of elevation. Minimum pop-up height is 4-inches. Acceptable manufacturer and model is Hunter Institutional Series, Rain Bird 1800-SAM-PRS, Toro 570Z-COM Series or approved equal.
3. Low Density Polyethylene Hose (Swing Pipe): Use pipe specifically intended for use as flexible swing joint. Use spiral barb fittings supplied by the same manufacturer as hose. Acceptable manufacturer is Hunter, Rain Bird, Toro, or approved equal.

2.6 CONTROL SYSTEM COMPONENTS

A. Field decoder units: Decoder units that are compatible with the central control system specified and that acts as a switching station for digital commands to remote control valves. The unit must have a pre-coded address. Acceptable manufacturer and model compatible with controller installed during phase 1A.

B. Surge protection: Use manufacturer required surge arrestors as presented in the installation details.

C. Lightning protection: Provide one 5/8”x4 foot copper clad UL listed grounding rod per manufacturer’s recommendations.
   1. Lightning protection: Provide one 12”x36”x0.0625” ground plate, one 5/8”x10 foot copper clad UL listed grounding rod, approximately 30 feet of #6 AWG bare copper grounding wire, two 6-inch plastic round valve boxes, and one CADWELD connector at each surge protector group.
   2. Control Wire: Use American Wire Gauge (AWG) #14 two-wire cable between control unit and decoder as recommended by control system manufacturer.
   3. Color: Wire color must be continuous over its entire length.
   4. Splices: Use 3M DBR/Y splices as recommended by control system manufacturer.
   5. Valve Box: Use plastic (ABS) standard rectangular valve with black lid. Acceptable manufacturer is Carson, Pentek, Rain Bird or approved equal.
   6. Warning tape: Inert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. Three inches wide colored red and imprinted with "CAUTION: BURIED ELECTRIC LINE BELOW", in black lettering.

2.7 OTHER COMPONENTS

A. Tools and Spare Parts: Provide operating keys, servicing tools, spare parts and other items indicated in the General Notes of the Drawings.

B. Other Materials: Provide other materials or equipment shown on the drawings or installation details that are part of the irrigation system, even though such items may not have been referenced in these specifications.

PART 3 - EXECUTION

3.1 INSPECTIONS AND REVIEWS

A. Site Inspections:
   1. Verify construction site conditions and note irregularities affecting work of this section. Report irregularities to the COR prior to beginning work.
   2. Beginning work of this section implies acceptance of existing conditions.

B. Utility Locates ("Call Before You Dig"):
   1. Arrange for and coordinate with local authorities the location of all underground utilities, and with cemetery maintenance personnel.
   2. Repair any underground utilities damaged during construction. Make repairs at no additional cost to the contract price.

C. Irrigation System Layout Review: Irrigation system layout review will occur after the staking has been completed. Notify the COR one week in advance of review. The COR will identify modifications during this review.

3.2 LAYOUT OF WORK

A. Stake locations of sprinklers in existing burial sections. Use alleys as identified on the drawings.

B. Stake out the irrigation system. Items staked include: irrigation mainline pipe, thrust blocks, isolation gate valve assemblies, air/vacuum relief valve assemblies, quick coupling valves, remote control valves, lateral piping, and sprinklers.

C. If staked irrigation components conflict with utilities or other components or site features, coordinate rerouting of components with COR.

3.3 EXCAVATION, TRENCHING, AND BACKFILLING

A. Excavate to permit the pipes to be laid at the intended elevations and to permit workspace for installing connections and fittings.

B. Existing Survey Markers:
1. Protect markers during construction.
2. If a survey marker is disturbed during construction, the Contractor is responsible for replacing the marker. The Contractor must hire a licensed surveyor to resurvey the location of the marker and replace it.

C. Minimum cover:
1. 24-inches over irrigation mainline pipe in landscaped areas. (distance from top of pipe to finish grade)
2. 18-inches over irrigation submainline and lateral pipe to sprinklers (distance from top of pipe to finish grade) except in preplaced preplaced urn crypt alleys as shown in detail 6 sheet I-2.
3. 24-inches over two-wire cable when not in common trench with mainline, submainline or lateral piping. (distance from top of control wire conduit to finish grade)
4. 6-inches vertical separation between submainline and lateral pipe, and mainline pipe installed in a common trench.
5. 4-inch minimum horizontal separation between pipes and wiring in a common trench.

D. Install and maintain safety fencing around all unattended excavation. Place safety signs adjacent to construction area roadway to the satisfaction of the COR.

E. All excavations must be backfilled by the end of each workday. Do not leave any open trenches overnight, on weekends or on holidays.

F. If trenching operation restricts access to a burial section, provide plywood and safety fencing across open trench to allow access to burial section. Provide access to the satisfaction of the COR.

G. Excavated material is generally satisfactory for backfill. Backfill will be free from rubbish, vegetable matter, and stones larger than 2-inches in maximum dimension. Remove material not suitable for backfill. Backfill placed next to pipe will be free of sharp objects that may damage the pipe.

H. Backfill mainline, submainline and lateral pipe and wiring in turf areas in the following manner:
   1. Backfill the trench by depositing the backfill material equally on both sides of the pipe or wire in 6 inch layers and compacting to the density of surrounding soil.

I. Enclose pipe and wiring beneath roadways, walks, curbs, etc., in sleeves where it is not installed using horizontal boring techniques.

J. Dress backfilled areas to original grade. Remove excess backfill to on-site location as directed by the COR.

K. Where utilities conflict with irrigation trenching and pipe work, contact the COR for trench depth adjustments.

3.4 ASSEMBLING PIPE AND FITTINGS

A. General:
   1. Keep pipe free from dirt and pipe scale. Cut pipe ends square and debur. Clean pipe ends.
   2. Keep ends of assembled pipe capped. Remove caps only when necessary to continue assembly.
   3. Trenches may be curved to change direction or avoid obstructions within the limits of the curvature of the pipe. Minimum radius of curvature and offset per 20-foot length of mainline and lateral pipe by pipe size are shown in the following table. All curvature results from the bending of the pipe lengths. No deflection will be allowed at a pipe joint.

SIZE	RADIUS	OFFSET PER 20' LENGTH
1 ½"	25'	7'-8"
2"	25'	7'8"
2 ½"	100'	1'-11"
3"	100'	1'-11"

B. HDPE Mainline and Submainline Pipe and Fittings:
   1. Join pipe lengths using butt-fusion technique as recommended by pipe manufacturer.

2. Join HDPE pipe to dissimilar pipe materials using HDPE (butt-fusion) x adapter with ductile iron back-up ring. Provide transition fitting as required for connection to dissimilar pipe material valves.

C. Lateral Pipe and Fittings:
   1. PVC Solvent Weld Pipe:
      a. Use primer and solvent cement. Join pipe in manner recommended by manufacturer and in accordance with accepted industry practices.
      b. Cure for 30 minutes before handling and 24 hours before pressurizing or installing with vibratory plow.
      c. Snake pipe from side to side within trench.
   2. Fittings: The use of cross type fittings is not permitted.

D. Specialized Pipe and Fittings:
   1. Mechanical joint connections: Install fittings, fasteners and gaskets in manner recommended by manufacturer and in accordance with accepted industry practices.
   2. PVC Threaded Connections:
      a. Use only factory-formed threads. Field-cut threads are not permitted.
      b. Apply thread sealant in manner recommended by component, pipe and sealant manufacturers and in accordance with accepted industry practices.
      c. Use plastic components with male threads and metal components with female threads where connection is plastic-to-metal.

E. Joint Restraint Harness:
   1. Install harness in the manner recommended by the manufacturer and in accordance with accepted industry practices.
   2. Use restrained casing spacers for gasketed pipe routed through sleeving. Install harness in the manner recommended by the manufacturer and in accordance with accepted industry practices. Install self-restraining casing spacers at all gasketed pipe bell joints and every 10-feet along the gasketed mainline pipe installed through sleeving. Provide correct number and type of restraints per manufacturer's requirements.

3.5 INSTALLATION OF MAINLINE COMPONENTS

A. Sprinkler Isolation Gate Valve Assembly:
   1. As presented in the installation details, per manufacturer's instructions.
   2. Install where indicated in the irrigation plans.
   3. Brand "SIGV" in 2-inch high by 3/16-inch deep letters on valve box lid.

3.6 INSTALLATION OF SPRINKLER IRRIGATION COMPONENTS

A. Mainline and Submainline Pipe Flushing:
   1. Thoroughly flush mainline before installation of Remote Control Valve or Valve-in-Head Sprinkler Assemblies.

2. Identify service tee(s) to be used for mainline flushing. Plug service tees not being used for flushing.
3. Connect 2-inch pipe to flushing service tee(s). Use pipe to direct water away from trench and into drainage swale, curb section or storm sewer, i.e. to an area that will direct the water away from the work area. Direct water so that it does not disrupt the cemetery operations or erode site.
4. Use a volume of water such that the velocity in the largest pipe flushing to this point is a minimum of 3 FPS.
5. Multiple points may be flushed simultaneously.
6. Flush for a minimum of 20 minutes. Continue flushing until the water is clear of any and all debris.
7. COR will review the flushing operation and clarity of water before stopping the flushing operation.
8. Disconnect pipe from service tee(s) and install remote control valve(s) or valve-in-head sprinkler(s).

B. Remote Control Valve Assembly:
1. Install per manufacturer's recommendations where indicated on the Drawings.
2. Adjust valve to regulate the downstream operating pressure to 50 PSI for pop-up rotary sprinklers and 35 PSI for spray sprinklers.
3. Wire connectors and waterproof sealant will be used to connect two-wire cable to decoder and decoder to solenoid wires. Install connectors and sealant per the manufacturer's recommendations.
4. Drive full length of grounding rod into soil. Connect decoder to grounding rod as recommended by control system manufacturer. Install number of grounding rods as recommended by control system manufacturer.
5. Install only one remote control valve to a valve box. Locate valve box 5-feet from and align square with nearby edges of paved areas.
6. Attach ID tag with controller station number to control wiring at solenoid.
7. Brand controller and station number in 2-inch high by 3/16-inch deep letters on valve box lid.

C. Valve-In-Head Sprinkler Assembly:
1. Install per installation details at locations shown on the drawings.
2. Locate sprinklers in water alleys per Water Alley Sprinkler Placement Detail.
3. Install sprinklers perpendicular to the finish grade.
4. Install swing joint with the appropriate angle between the submainline pipe and the lay length nipple per the installation details.
5. Wire connectors and waterproof sealant will be used to connect two-wire cable to decoder and decoder to solenoid wires. Install connectors and sealant per the manufacturer's recommendations.
6. Drive full length of grounding rod into soil. Connect decoder to grounding rod as recommended by control system manufacturer. Install number of grounding rods as recommended by control system manufacturer.
7. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
8. Adjust the radius of throw of each sprinkler for best performance.

9. Install 2-foot square piece of sod around all rotary sprinklers in areas to be seeded.

D. Pop-Up Rotor Sprinkler Assembly:
1. Thoroughly flush lateral pipe before installing sprinkler assembly. Water must be clear of any debris before flushing operation stops.
2. Install per the installation details at locations shown on the drawings.
3. Install rotary sprinklers 3-inches from adjacent edges of paved areas, walls or fences.
4. Install sprinklers perpendicular to the finish grade.
5. Install swing joint with the appropriate angle between the lateral pipe and the lay length nipple per the installation details.
6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
7. Adjust the radius of throw of each sprinkler for best performance.
8. Install 2-foot square piece of sod around all rotary sprinklers in areas to be seeded.

E. Pop-Up Spray Sprinkler Assembly:
1. Thoroughly flush lateral pipe before installing sprinkler assembly. Water must be clear of any debris before flushing operation stops.
2. Install per the installation details at locations shown on the drawings.
3. Install spray sprinklers 3-inches from adjacent edges of paved areas, walls or fences.
4. Install sprinklers perpendicular to the finish grade.
5. Install swing pipe and fittings per manufacturer’s recommendations.
6. Supply appropriate nozzle or adjust arc of coverage of each sprinkler for best performance.
7. Adjust the radius of throw of each sprinkler for best performance.

3.7 INSTALLATION OF CONTROL SYSTEM COMPONENTS

A. Lightning protection: Drive grounding rod into soil its full length. Connect #6 AWG copper grounding wire to rod and plate using CADWELD connections.

B. Control Wire:
1. Route two-wire cable in mainline or submainline trench.
2. Provide a 24-inch excess length of wire in an 8-inch diameter loop at each 90 degree change of direction, at both ends of sleeves, and at 100-foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil 24-inch length of wire within each remote control valve box or valve-in-head sprinkler.
3. If a cable must be spliced, make splice with waterproof connectors and sealant installed per the manufacturer's instructions. Locate splice in turf areas using a valve box that contains an irrigation valve assembly, or in a separate valve box. Use same procedure for connection to valves as for in-line splices. If a separate valve box is used for wire splices, brand “WS” in 2-inch high by 3/16-inch deep letters on valve box lid.
4. Unless noted on plans, install wire parallel with and below mainline or submainline pipe.

5. Protect wire not installed with pipe with a continuous run of warning tape placed in the backfill 6-inches above the wiring.

3.8 INSTALLATION OF OTHER COMPONENTS

A. Tools and Spare Parts:
   1. Prior to the Review at completion of construction, provide operating keys, servicing tools, spare parts, and any other items indicated on the drawings.

B. Other Materials: Install other materials or equipment shown on the drawings or installation details that are part of the irrigation system, even though such items may not have been referenced in these specifications.

3.9 MAINTENANCE AND OPERATION INSTRUCTIONS

A. Irrigation System Maintenance:
   1. Prior to Final Inspection, provide two training sessions to operating personnel on proper operation and maintenance of the irrigation system. Training sessions should be for a period of not less than 4-hours each, scheduled on different days and cover aspects of maintaining, operating and repairing the new irrigation system components. Maintenance training session cannot be concurrent with central control system training sessions.
   2. Unless otherwise noted, provide irrigation operation and maintenance information in a 3-ring binder with table of contents and index sheet. Provide sections that are indexed and labeled. Provide the following information:
      a. Catalog cut sheets for control system, valves, sprinklers, pipe and fittings, wire and wire connectors, ID tags, shop drawings, and all other irrigation equipment shown or described on the drawings and within these specifications.
      b. Manufacturer’s Operation and Maintenance manuals.
      c. Manufacturer’s Technical Service Bulletins.
      d. Manufacturer’s Warranty Documentation.
      e. Recommended routine maintenance inspections for weekly, monthly and annual inspections, recommended actions for the inspections, recommended method for recording the findings of the inspections and proper winterization techniques.
      f. Predictive schedule for component replacement.
      g. Listing of technical support contacts.
   3. Operation and maintenance submittal package must be complete prior to being reviewed by the COR. Incomplete submittals will be returned without review.

B. Control System Programming:
   1. Create and program each controller with a grow-in and a peak season irrigation schedule for the areas being irrigated by the controller.

2. Using the precipitation rate results of the Distribution Uniformity tests calculate the peak season run time for each station.
3. Verify operation of program.
4. Prepare a memorandum documenting the details and assumptions of the programming. Turn over memorandum to COR. Completion of the memorandum is a prerequisite for Final Inspection and operational testing of the irrigation system.

C. Colored Controller Charts:
1. Prepare a map diagram showing location of all valves, piping, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. “As-built” drawings must be approved before charts are prepared.
2. Include legend listing components used for the controller. Include a separate sprinkler table listing station number, sprinkler manufacturer and model, zone capacity, and number of sprinklers on the zone.
3. Provide one colored full sized controller chart for each irrigation controller showing the area covered by the controller. Provide four 11”x17” reduced colored charts of the actual “as-built” drawing. Chart must be readable at the reduced size.
4. Laminate one 11”x17” sized colored chart and place laminated chart in lid of each controller.

3.10 PROJECT RECORD DRAWINGS

A. The Contractor is responsible for documenting installed system and all changes to the design. Maintain on-site and separate from documents used for construction, two complete sets of Contract Documents as Project Record Documents. Keep documents current. Do not permanently cover Work until as-built information is recorded on Project Record Documents.

B. Record irrigation components, pipe and wiring network alterations. Record work that is installed differently than shown on the Drawings. Special attention must be given to pipe routing and controller stationing.

C. At completion of installation, Contractor must hire a Professional Licensed Surveyor to survey/document locations of all sprinklers, irrigation components enclosed within a valve box, controllers, flower water stations, wire splice boxes and “coordination points”. If necessary, Contractor must flag sprinklers for Surveyor. Surveyor must use “SPR” as attribute data for sprinklers, the branding in the valve box lid (for example “GV”, “AV”, “QC”) as the attribute data for components enclosed within a valve box, “CTLR” as the attribute data for controllers, “FWS” for flower water station, “WS” for wire splice boxes and “CP” for coordination points. COR will provide AutoCAD file for Surveyor showing coordination points to produce “Survey Drawing”. Surveyor is to use the AutoCAD files to develop and provide an AutoCAD file of the Survey Drawing.

D. Prior to project completion, Contractor must provide the project redline drawings and the “Survey Drawing” AutoCAD files to COR for delivery to A/E. A/E will

prepare “Record Drawings” by compiling the information on the Contractor redlines drawings and the “Survey Drawing”. Provision of this information prerequisite for Final Inspection.

3.11 MAINTENANCE

A. Operate and maintain irrigation system for a duration of 30 calendar days from Final Inspection. Make periodic examinations and adjustments to irrigation system components so as to achieve the most desirable application of water.

3.12 CLEANUP

A. Upon completion of work, remove from the site all machinery, tools, excess materials, and rubbish. Restore site to normal or original condition.

END OF SECTION

SECTION 32 90 00

PLANTING

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section consists of furnishing and installing all planting materials required for landscaping hereinafter specified in locations as shown on the Drawings and includes, but not limited to, plants, seeding, sodding, soil treatment, and other items as listed.

1.2 EQUIPMENT

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

1.3 RELATED WORK

A. Stripping Topsoil and Stock Piling: Section 31 20 00, EARTH MOVING.

B. Topsoil Testing: Section 01 45 29, TESTING LABORATORY SERVICES.

C. Topsoil Materials: Section 31 20 00, EARTH MOVING.

D. Section 32 84 00, PLANTING IRRIGATION.

E. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

1.4 SUBMITTALS

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

B. Samples: Submit the following samples for approval before Work is started:

Inert Mulch	2.3 kg (5 pounds) of each type to be used.
Organic Mulch	2.3 kg (5 pounds) of each type to be used.
All pesticides required such as preemergence or post emergence herbicides, insecticides, or fungicides.	EPA approved labeling and MSDS sheet for each such product selected for use.

C. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the COR for approval:

1. Plant Materials (Department of Agriculture certification by State Nursery Inspector from the state in which the plant material originates declaring material to be free from insects and disease).
2. Fertilizers.
3. Lime
4. Peat
5. Seed
6. Sod

D. Manufacturer's Literature and Data:
   1. Antidesiccant
   2. Erosion control materials
   3. Pre-emergent herbicide

E. Soil laboratory testing results and any soil amendment recommendations from the Contractor.
   1. Organic Soil Amendment and Imported Topsoil: The Contractor shall provide a one cubic foot representative sample from each proposed source for testing, analysis, and approval. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the COR. Testing reports shall include the following tests and recommendations.
      a. Mechanical gradation (sieve analysis) and chemical (pH soluble salts) shall be performed by public extension service agency or a certified private testing laboratory in accordance with the current standards of the Association of Official Agricultural Chemists. A hydrometer shall be used to determine percent of clay and silt.
      b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 110 °C, plus or minus 5°C.
      c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Soluble Salts, and acidity (pH).
      d. Tests, as specified, for gradation, organics, soil chemistry and pH shall be performed by a testing laboratory retained by the Department of Veterans Affairs as described in Section 01 45 29, TESTING LABORATORY SERVICES.
      e. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for fertilizing and liming applications to support successful turf growth.
      f. All tests shall be performed in accordance with the current standards of the Association of Official Agricultural Chemists.
   2. Amended soil (in place): Following the incorporation of amendments and additives as recommend by soil testing report, the Contractor shall provide a minimum of six (6) samples per forty thousand (40,0000) square feet, six inch (6”) depth by three inch (3”) diameter core samples of amended soil taken from the site for testing, analysis, and approval. The location of each sample shall be as directed by the COR from areas designated as “Lawn” on the Construction Documents. No seeding or hydroseeding operations shall occur until acceptance of the amended soil

samples has been obtained. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the COR. Tests shall be as directed in paragraph 1.4 D.1.d. of this Section.

3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
4. Fertilizer: Submit four (4) certificates of analysis for each type of fertilizer.
5. Hydro Mulching: Prior to the start of hydro mulching, submit a certified statement for approval as to the number of pounds of materials to be used per gallon of water.

1.5 DELIVERY AND STORAGE

A. Delivery:
1. Notify the COR of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.
2. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.
3. The use of equipment such as "tree spades" is permitted provided the plant balls are sized in accordance with ANSI Z60.1 and tops are protected from damage.
4. Deliver fertilizer and lime to the site in the original, unopened containers bearing the manufacturer's warranted chemical analysis, name, trade name or trademark, and in conformance to State and Federal law. In lieu of containers, fertilizer and lime may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.
5. During delivery: Protect sod from drying out.

B. Storage:
1. Sprinkle sod with water and cover with moist burlap, straw or other approved covering, and protect from exposure to wind and direct sunlight. Covering should permit air circulation to alleviate heat development.
2. Keep seed, lime and fertilizer in dry storage away from contaminants.
3. Store plants not installed on the day of arrival at the site as follows:
   a. Shade and protect plants from the wind when stored outside.
   b. Heel in bare root plants.
   c. Protect plants stored on the project from drying out at all times by covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss, or other similar mulching material.
   d. Keep plants, including those in containers, in a moist condition until planted, by watering with fine mist spray.

1.6 PLANTING AND TURFGRASS INSTALLATION SEASONS AND CONDITIONS

A. Perform landscape planting operations within the following dates: From March 15 to June 15 for spring and from September 1 to November 15 for fall, but not before irrigation system installed, tested, and approved.

B. Perform turfgrass installation operations within the following dates, but not before irrigation system installed, tested, and approved.
   1. Spring Planting: March 15 to June 15.
   2. Fall Planting: September 1 to November 15.

C. No Work shall be done when the ground is frozen, snow covered, too wet or in an otherwise unsuitable condition for planting. Special conditions may exist that warrants a variance in the specified planting dates or conditions. Submit a written request to the COR stating the special conditions and proposal variance for approval.

1.7 LANDSCAPE PLANT AND TURF ESTABLISHMENT PERIOD

A. The Establishment Period for landscape plants and turf shall begin immediately after installation, with the approval of the COR, and continue for a minimum of three (3) months during the growing season. When the full three (3) month establishment period cannot be achieved during the current growing season, the establishment period shall continue to the next growing season and shall begin again for a full three (3) months. The Contractor shall be responsible for the health and maintenance of plants and turfgrass between growing seasons. Plants and turfgrass will not be accepted until after completion of the establishment period. During the Landscape Plant and Turfgrass Establishment Period the Contractor shall:
   1. Water all plants and turfgrass to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of 1 inch of absorbed water per week either through natural rainfall or augmented by periodic watering. Apply water at a moderate rate so as not to displace the mulch, create any water ponding or runoff from the soil supporting the plants and turf. Prune plants and replace mulch as required.
   2. Replace and restore stakes and eroded plant saucers as required.
   3. In plant beds and saucers, remove grass, weeds, and other undesired vegetation, including the root growth, before they reach a height of 3 inches. After all unwanted vegetation has been removed and proper mulch quantities have been placed/restored, treat all mulched areas with pre-emergence granular ornamental herbicide containing 2.0% trifluralin and 0.5% isoxaben. Apply at 200 lb per acre prior to both early spring and early fall weed seed germination.
   4. Spray with approved insecticides and fungicides to control pests and ensure plant survival in a healthy growing condition, as directed by the COR in coordination with the MSN Agronomist.
   5. Provide the following during turfgrass establishment:
      a. Eradicate all weeds. Water, fertilize, overseed, and perform any other operation necessary to promote the growth of turfgrass.
      b. Mow the turfgrasses as often as necessary prior to final acceptance. Begin mowing when cool season turfgrass is 4 inches

high. For warm season turfgrasses mow at heights as appropriate for species and cultivar as directed by the COR in consultation with the MSN Agronomist. Final mowing height is 3 inches for cool season turfgrasses and as appropriate for warm season turfgrasses and mow as often as necessary to maintain the proper height while never removing more than 1/3 of the total height of grass leaves in a single mowing. Mow any portion of the newly developing turfgrass stand that requires mowing without waiting for other areas of slowly developing seedlings to catch-up.

6. Replace dead, missing or defective plant material during the establishment period. Immediately replace each plant with one of the same size and species.
7. Replant any areas void of turfgrass.
   a. Sod shall be evaluated for species and health thirty (30) days after laying the last piece of sod and reevaluated each 15 days during the establishment period. A satisfactory stand of grass plants from the sod operation shall be living sod uniform in color and leaf texture. Bare spots shall be a maximum two (2) square inches. Joints between sod pieces shall be tight and free from weeds and other undesirable growth. Unsatisfactory areas shall be resodded within seven (7) days.
   b. Seeding shall be evaluated for species and health thirty (30) days after final planting and reevaluated each 15 days during the establishment period. A satisfactory stand of grass plants from the seeding operation shall be 98% coverage uniform in color and leaf texture. Bare spots shall be a maximum of one-half (0.5) square foot. Unsatisfactory areas shall be reseeded within seven (7) days.
8. Complete remedial measures directed by the COR in consultation with the MSN Agronomist to ensure plant and turfgrass survival.
9. Repair damage caused while making plant or turfgrass replacements.

1.8 LANDSCAPE PLANT AND TURF ACCEPTANCE.

A. Landscape plant and turf acceptance will occur after completion of the Landscape Plant and Turf Establishment Period. The Contractor shall have completed, located, and installed all plants and turfgrass according to the plans and specifications. All plants and turf are expected to be living and in a healthy condition at the time of inspection and acceptance. The Contractor shall make a written request for final inspection of the landscape plants and turf. Upon inspection when Work is found to not meet design intent and Specifications, the PLANT AND TURF ESTABLISHMENT PERIOD shall be extended at no additional cost to the Government until work has been satisfactorily completed, inspected and accepted.

B. Criteria for acceptance of landscape plants.
   1. Planter beds and earth mound water basins are properly mulched and free of weeds.
   2. Tree support stakes are in good condition.

3. Total plants on site as required by specifications and required number of replacements have been installed.
4. Remedial measures directed by the COR to ensure plant material survival and promote healthy growth have been completed.

C. Criteria for acceptance of turfgrass shall be as follows:
1. A satisfactory stand of grass plants from the sod operation shall be living sod uniform in color and leaf texture and well rooted into the soil below so that gentle pulling of the turfgrass leaves by hand does not dislodge the sod. Bare spots shall be a maximum two (2) square inches. Joints between sod pieces shall be tight and free from weeds and other undesirable growth.
2. A satisfactory stand of turfgrass plants from the seeding operation shall be 98% coverage uniform in color and leaf texture. Bare spots shall be a maximum of one-half (0.5) square foot.

1.9 PLANT AND TURFGRASS WARRANTY

A. All Work shall be in accordance with the terms of the Paragraph, "Warranty" of GENERAL CONDITIONS, including the following supplements:
1. A One Year Plant and Turfgrass Warranty will begin on the date that the Government accepts the plants and turfgrass but not before the end of the Landscape Plant and Turfgrass Establishment Period.
2. The Contractor will replace any dead plant material and any areas void of turfgrass immediately during the warranty period. A one year warranty for the plants and turfgrass that are replaced will begin on the day the replacement Work is completed and accepted.
3. Replacement of relocated plants, that the Contractor did not supply, is not required unless they die from improper handling and care during transplanting. Loss through Contractor improper handling, care, or negligence requires replacement in kind and size.
4. The Government will reinspect all replacement plants and turfgrass at the end of the One Year Warranty. The Contractor will replace any dead, missing, or defective plant material and turfgrass immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the Work required by this Specification.
5. The Contractor shall remove stakes from plants having been installed for one year, unless otherwise directed by the COR in consultation with the MSN Agronomist.

1.10 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Submit five (5) copies of the Operation and maintenance (O&M) Manuals for planting materials at the beginning of the LANDSCAPE PLANT AND TURF ESTABLISHMENT PERIOD. Include instructions indicating procedures during one typical year including variations of maintenance for climatic conditions throughout the year. Provide instructions and procedures for watering; promotion of growth, including fertilizing, pruning and mowing; and integrated pest management. O&M manuals shall include pictures of planting materials cross referenced to botanical and common names, with a description of the normal

appearance in each session. Develop a water monitoring program for surface and ground water on the project site in accordance with ASTM D5851 and consistent with the water management program utilized during construction operations.

1.11 APPLICABLE PUBLICATIONS

A. NCA Handbook 3420 – Turfgrass Maintenance in VA National Cemeteries re-certified July 2008. The Agronomic and Horticultural practices specified in this handbook shall serve as the Contractor's official guide to all establishment and preliminary maintenance practices employed during this construction project.

B. Specific to U.S. Dept. of Veterans Affairs and National Cemetery Administration the document titled "Cemetery Construction Requirements for Turfgrass and Landscape Plant Material Installation" Appendix TL as attached to this specification shall serve as Contractor's guide specific to this construction project.

C. 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. Use the latest edition of the referenced publication.

D. American National Standards Institute (ANSI) Publications:

ANSI Z60.1 ..... Nursery Stock

ANSI Z133.1 ..... Tree Care Operations-Pruning, Trimming, Repairing, Maintaining, and Removing Trees and Cutting Brush-Safety Requirements

E. Hortus Third, most current edition. A Concise Dictionary of Plants Cultivated in the U.S. and Canada.

F. American Society for Testing and Materials (ASTM) Publications:

C33 ..... Standard Specification for Concrete Aggregates

C516 ..... Vermiculite Loose Fill Thermal Insulation

C549 ..... Perlite Loose Fill Insulation

D1557 ..... Test Methods for Laboratory Compaction of Soil

D5851 ..... Planning and Implementing a Water Monitoring Program

G. Turfgrass Producers International:

Turfgrass Sodding.

H. U. S. Department of Agriculture Federal Seed Act.

1998..... Rules and Regulations

PART 2 - PRODUCTS

2.1 GENERAL

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

2.2 ORGANIC SOIL AMENDMENT

A. Existing topsoil on site will not be stripped and stockpiled since its organic content is low, unless otherwise directed by the COR, or if topsoil layer contains greater than eight percent (8%) organic material. All areas to receive lawn or meadow seeding will require an organic soil amendment to increase organic content and water retention as well as enhance turf growth. Soils will be amended in-place after grading activities are completed to effectively create a topsoil horizon.

B. Organic soil amendment will be spread and incorporated into the finished subgrade at the depths indicated on the Drawings in order to raise the organic content of the soil to a minimum of four percent (4%) and a maximum of six percent (6%). Contractor will allow for additional depth of the organic soil amendment to bring all grades to the required finished grades as per the grading plans.

1. Organic Soil Amendment shall be dark brown or black in color and capable of enhancing plant growth. Ninety-eight percent (98%) of the material should pass a one inch (1") screen. There shall be no admixture of refuse (i.e. noticeable inert contamination) or other materials toxic to plant growth.
2. Acceptable types of Organic Soil Amendments include peat moss, humus or peat, well rotted manure, various mature composts, and commercially available combinations thereof. Acceptable compost may be derived from natural organic sources such as food or animal residuals, yard trimmings, or biosolids. Organic Soil Amendment shall be free of all woody fibers, seeds, and leaf structures, plastic and other petroleum products, and free of toxic and non-organic matter. Unacceptable sole sources of organic matter include untreated sludge from wastewater treatment plants, fresh manure, sawdust, and immature composts.
3. Organic Soil Amendment shall conform to the following minimum material requirements:

Test Parameter	Acceptable Ranges
Organic Matter	27% to 80%
pH	5.5-8.5
Ash	20-65%
Nitrogen	0.4%-3.5%
Phosphorus	0.2%-1.5%
Potassium	0.4%-1.5%
C:N Ratio	25-30:1
CEC	50-150 meq/100 g

Heavy Metals	Less than max. limits established by EPA 503
Inert Contents	< 1% by weight
Water-Holding Capacity	150-200%
Pathogen/Weed Seed Destruction	Proof of EPA minimum Heating requirements

4. Organic content to be determined by the loss of ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 110 °C, plus or minus 5°C.
5. Any topsoil stripped and stockpiled on the site may be used provided that, after testing and addition of necessary additives, it meets the above specification. The Contractor shall provide additional Organic Soil Amendment as required to complete the required Work.
6. All Organic Soil Amendment proposed for use shall be tested for conformance to the specifications and results provided to the COR/MSN Agronomist.

2.3 PLANTS

A. Plants shall be in accordance with ANSI Z60.1, except as otherwise stated in the Specifications or shown on the Drawings. Where the Drawings or Specifications are in conflict with ANSI Z60.1, the Drawings and Specification shall prevail.

B. Provide well-branched and formed planting stock, sound, vigorous, and free from disease, sunscald, windburn, abrasion, harmful insects or insect eggs with healthy, normal, and unbroken root systems. Provide trees, deciduous and evergreen, that are single trunked with a single leader, unless otherwise indicated, display no weak crotches. Provide symmetrically developed deciduous trees and shrubs of uniform habit of growth, with straight boles or stems and free from objectionable disfigurements, and evergreen trees and shrubs with well developed symmetrical tops with typical spread of branches for each particular species or variety. Provide ground cover and vine plants with the number and length of runners for the size specified, and 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 and anti-desiccant at the nursery before digging.

C. 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 COR, 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.

D. 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.

E. Balled and burlapped (B&B) plant ball sizes and ratios will conform to ANSI Z60.1, consisting of firm, natural balls of soil wrapped firmly with burlap or strong cloth and tied.

F. Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers, but shall not be root bound.

G. Make substitutions only when a plant (or its alternates as specified) is not obtainable and the COR in consultation with the MSN Agronomist authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the Contract price.

2.4 LABELS

A. Each plant, or group and bundles or containers of the same species, variety, and size of plant, shall be legibly tagged with a durable, waterproof and weather-resistant label indicating the correct plant name and size specified in the plant list. Labels shall be securely attached and not be removed.

2.5 TOPSOIL

A. Topsoil shall be a well-graded soil of good uniform quality. It shall be a natural, friable soil representative of productive soils in the vicinity. Topsoil shall be free of admixture of subsoil, foreign matter, objects larger than 1 inch in any dimension, toxic substances, weeds and any material or substances that may be harmful to plant growth and shall have a pH value of not less than 6.0 nor more than 7.0, and should be best suited to the region, climate and plant material specific to the project.

B. Obtain material from stockpiles established under Section 31 20 00, EARTH MOVING, subparagraph, Stripping Topsoil that meet the general requirements as stated above. Amend topsoil not meeting the pH range specified by the addition of pH Adjusters.

C. If sufficient topsoil is not available on the site to meet the depth as specified herein, the Contractor shall furnish additional topsoil. At least 10 days prior to topsoil delivery, notify the COR of the source(s) from which topsoil is to be furnished. Obtain topsoil from well drained areas. Additional topsoil shall meet the general requirements as stated above and comply with the requirements specified in Section 01 45 29, TESTING LABORATORY SERVICES. Amend topsoil not meeting the pH range specified by the addition of pH adjusters.

2.6 LIME

A. Lime shall be agricultural limestone containing not less than 90 percent calcium and magnesium carbonates. Lime must be ground to such fineness that not less

than 90% must pass No. 8 mesh and not less than 25% must pass No. 100 mesh. Moisture is not to exceed 10%.

2.7 SOIL CONDITIONERS

A. Peat shall be a natural product of sphagnum moss peat, or peat moss derived from a fresh-water site conforming to Fed. Spec. Q-P-166, except as otherwise specified. Peat shall be shredded and granulated to pass through a 1/2 inch mesh screen and conditioned in storage piles for at least six months after excavation.

B. Coarse Sand
   1. Coarse concrete sand, ASTM C33 Fine Aggregate, shall be clean, sharp, and free of limestone, shale and slate particles and of toxic materials.

C. Perlite shall conform to ASTM C549.

D. Vermiculite shall be horticultural grade and free of any toxic materials and conform to ASTM C516.

E. Pine Bark shall be horticultural-grade milled pine bark, with 80 percent of the material by volume sized between 0.1 and 15.0 mm. (.004in. and .59in.).
   1. Pine bark shall be aged sufficiently to break down all woody material. Pine bark shall be screened
   2. pH shall range between 4.0 and 7.0.
   3. Submit manufacturer’s literature for approval.

F. Organic Matter shall be commercially prepared compost, composted sufficiently to be free of all woody fibers, seeds, and leaf structures, and free of toxic and nonorganic matter.

2.8 PLANTING SOIL MIXTURE

A. The planting soil mixture shall be composed of 3 parts topsoil, and 1 part peat moss.

2.9 PLANT FERTILIZERS

A. Provide plant fertilizer that is commercial grade and uniform in composition and conforms to applicable State and Federal regulations.

B. For new plant material, provide a uniform free-flowing granular complete analysis fertilizer containing a minimum of 10% by weight of nitrogen, phosphoric acid and potash with a minimum of 50% of the nitrogen from a controlled release source such as sulfur coated urea.

2.10 TURFGRASS FERTILIZER

A. Provide turfgrass fertilizer that is commercial grade, free flowing, uniform in composition, and conforms to applicable State and Federal regulations. Granular fertilizer shall bear the manufacturer's warranted statement of analysis. Granular

fertilizer shall contain a minimum percentage by weight of 20% nitrogen (of which 50 percent shall be from a controlled release source such as sulfur coated urea), 5% available phosphoric acid, and 15% potash. Liquid starter fertilizer for use in the hydro mulch slurry will be commercial type with 50 percent of the nitrogen from a controlled release source such as sulfur coated urea.

2.11 MULCH

A. Mulch shall be free from deleterious materials and shall be stored as to prevent inclusion of foreign material.

B. Organic mulch materials shall be shredded hardwood:
1. Straw for turfgrass seed bed mulch shall be stalks from oats, wheat, rye, barley, or rice that are free from noxious weeds, mold or other objectionable material. Straw shall be in an air-dry condition and suitable for placing with blower equipment.
2. Wood cellulose fiber mulch for use with hydraulic application (Hydro mulch) with fertilizer shall consist of specially prepared wood cellulose fiber, processed to contain no growth or germination-inhibiting factors, and dyed an appropriate color to facilitate visual metering of the application of materials. On an air-dry weight basis, the wood cellulose fiber shall contain a maximum of 12 percent moisture, plus or minus three percent at the time of manufacture. The pH range shall be from 3.5 to 5.0. The wood cellulose fiber shall be manufactured so that:
   a. After addition and agitation in slurry tanks with fertilizers, water, and other approved additives, the fibers in the material will become uniformly suspended to form a homogenous slurry.
   b. When hydraulically sprayed on the ground, the material will form a blotter like cover.
   c. The cover will allow the absorption of moisture and allow rainfall or applied water to percolate to the underlying soil.

2.12 TREE BALL STAPLES (CONTAINER AND BALLED AND BURLAPPED MATERIAL)

A. ManufacturerTree Staple, Inc.
139 South Street
New Providence, NJ 07974
Phone: 1-877-873-3749
Fax: (908) 464-8878
e-mail: sales@treestaple.com

Tree Caliper	Tree Staple Model	# Tree Staples Per Tree
1" - 2"	TS24 (24")	2 with up to a 16" root ball
2" - 4"	TS36 (36")	2 with a 24" root ball
4" - 6"	TS42 (42")	2-3 with a 30"+ root ball
6" - 8"	TS48 (48")	2-3 with a 36"+ root ball

2.13 EDGING

A. Construct concrete mow curbs where indicated on plans. No artificial or constructed product shall be used to edge landscape beds that are bordered by turfgrass except where indicated on Drawings. Properly mulched beds shall be edged by the newly established turfgrass plantings that border and/or surround them.

2.14 WATER

A. Water shall not contain elements toxic to plant life. It shall be obtained as specified in Section 01 00 00, GENERAL REQUIREMENTS, paragraph, Temporary Services.

2.15 ANTIDESICCANT

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

2.16 SEED (EROSION CONTROL SEED MIX)

A. Seed shall be state-certified seed of the latest season's crop and shall be delivered in original sealed packages bearing the producer's warranted analysis for percentages of mixtures, purity, germination, weed seed content, and inert material. Seed shall be labeled in conformance with U. S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable. On-site seed mixing shall be done only in the presence of the COR. All turfgrass seeding operations shall be done separately and prior to the application of any mulch material.

B. Minimum Acceptable Seed Quality standards for all erosion control seed mix utilized are as follows: Purity 95%, Germination 85%, Weed Seed Content less than 0.5%, Noxious Weeds 0.0%, Inert Material less than 3%, Germination Test Date no older than 6 months.

C. All erosion control seed mixtures, sod composition or sprig composition shall conform to the species and cultivar requirements detailed in Appendix TL for NCA Cemetery Construction Requirements. Any deviation from these turfgrass species requirements must be approved in writing by the NCA Chief Agronomist and/or appropriate MSN Agronomist in coordination with the COR.

D. Seed type for general erosion control for re-establishment of disturbed areas shall be:

SOUTHEAST NATIVE GRASS SEED MIX

Scientific Name	Common Name
Elymus virginicus	Virginia Wildrye
Tridens flavus	Purpletop
Andropogon virginicus	Broomsedge

Cover Crop: Common Oats, Annual Rye and Redtop

Mix available from Hancock Seed Compan 800-552-1027, or equal.

Planting rate: 18 lbs/acre.

2.17 SOD

A. Sod shall be nursery grown, certified sod as classified in the TPI Guideline Specifications to Turfgrass Sodding.
1. Sod shall be Celebration Bermudagrass.

2.18 HERBICIDES AND OTHER PESTICIDES

A. All herbicides and other pesticides shall be properly labeled and registered with the U.S. Environmental Protection Agency. Keep all pesticides in the original labeled containers indicating the analysis and method of use.

PART 3 - EXECUTION

3.1 Appendix TL, “MASTER SPECIFICATIONS FOR NCA CEMETERY CONSTRUCTION, U.S. DEPARTMENT OF VETERANS AFFAIRS, National Cemetery Administration, Cemetery Construction Requirements for Turfgrass and Landscape Plant Material Installation” shall be the operational guide for the following Specification Paragraphs 3.1 – 3.20. Any conflicts in wording or interpretation shall default to Appendix TL.

3.2 LAYOUT

A. Stake plant material locations and bed outlines on project site for approval by the COR before any plant pits or beds are dug. The COR may approve adjustments to plant material locations to meet field conditions.

3.3 FINE GRADING AND ORGANIC SOIL AMENDMENT INCORPORATION

A. Contractor shall obtain COR’s written approval of previously completed rough grading work prior to commencing organic soil amendment incorporation work.

B. Immediately prior to dumping and spreading the approved organic soil amendment, the subgrade shall be cleaned of all stones greater than two inches (2”) and all debris or rubbish. Such material shall be removed from the site. Prior to spreading of the organic soil amendment, subgrades which are too compact to drain water and too compact based upon compaction tests shall be ripped with a claw one foot (1’) deep, pulled by a bulldozer two feet (2’) on center, both directions. Contractor shall then regrade surface.

C. Organic soil amendment material shall be placed and uniformly spread over approved finish subgrades to a depth sufficiently greater than the specified depth so that after natural settlement and light rolling, the specified minimum compacted depth will have been provided and the completed Work will conform

to the lines, grades and elevations indicated. Incorporate organic soil amendment by disc harrowing, rototilling or other means in a uniform manner. The depth of incorporation shall be based upon the organic content of the tested and approved organic soil amendment, so as to produce a finished soil with an organic matter content of between four (4) and six percent (6%). Supply additional organic soil amendment material, after in-place testing and approval (see paragraph 1.4. E.1.d), as may be needed to give the required organic matter content and finished grades under the Contract without additional cost to the Government.

D. Disturbed areas outside the limit of Work shall be spread with four inch (4") minimum depth of organic soil amendment material to the finished grade.

E. No subsoil or organic soil amendment material shall be handled in any way if it is in a wet or frozen condition.

F. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Connect contours and spot elevations with an even slope.

G. After organic soil amendment material has been incorporated into the subsoil, it shall be carefully prepared by scarifying or harrowing and hand raking. Remove all large stiff clods, lumps, brush, roots, stumps, litter and other foreign matter. Remove all stones over one and one half inch (1-1/2") diameter from the amended soil bed. The amended soil shall also be free of smaller stones in excessive quantities as determined by the COR.

H. The whole surface shall then be compacted with a roller or other suitable means to achieve a maximum dry density of 88 to 90 percent in accordance with compaction standards of ASTM D1557. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional organic soil amendment and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.

3.4 EXCAVATION FOR PLANTING

A. Prior to excavating for plant pits and bed, verify the location of any underground utilities. Damage to utility lines will be repaired at the Contractor's expense. Where lawns have been established prior to planting operation, cover the surrounding turfgrass before excavations are made in a manner that will protect turfgrass areas. Barricade existing trees, shrubbery, and beds that are to be preserved in a manner that will effectively protect them during the project construction.

B. Remove rocks and other underground obstructions to a depth necessary to permit proper planting according to plans and specifications. Where underground utilities, construction, or solid rock ledges are encountered, the COR may select other locations for plant material.

C. Dig plant pits by any approved method so that they have vertical sides and flat bottoms. When pits are dug with an auger and the sides of the pits become glazed, scarify the glazed surface. See Appendix TL for required planting instructions for all container grown, balled and burlapped or boxed plants.

D. Where ground cover and planting beds occur in existing turfgrass areas, remove turfgrass to a depth that will ensure the removal of the entire root system, with additional bed preparation as specified in the next paragraph.

E. Where existing soil is to be used in place, till new ground cover and plant beds to a depth of 4 inches. Spread peat soil amendment uniformly over the bed to depth of 2 inches and thoroughly incorporate it into the existing soil to a depth of 4 inches using a roto-tiller or similar type of equipment to obtain a uniform and well pulverized soil mix. Where existing soil is compacted (former roadways, parking lots, etc.) till the soil down to a depth necessary to support the growth of new planting. During tillage operations, remove all sticks, stones, roots, and other objectionable materials. Bring plant beds to a smooth and even surface conforming to established grades.

F. In areas of new grading where existing soil is being replaced for the construction of new ground cover and plant beds, remove 4 inches of existing soil and replace with topsoil. Plant beds shall be brought to a smooth and even surface conforming to established grades. Till 2 inches of peat soil amendment into the topsoil as specified.

G. Using topsoil, form earth saucers or water basins for watering around plants. Basins to be 2 inches high for shrubs and 4 inches high for trees.

H. Treat plant saucers, shrub, and ground cover bed areas, after mulching, with preemergence granular ornamental herbicide containing 2.0% trifluralin and 0.5% isoxaben. Apply at 200 lb per acre prior to both early spring and early fall weed seed germination. Plant ground cover in areas to receive erosion control material through that material after material is in place.

3.5 SETTING PLANTS

A. Handle balled and burlapped and container-grown plants only by the ball or container. Remove container-grown plants in such a way to prevent damage to plants or root system. Set plants plumb and hold in position until sufficient soil has been firmly placed around the roots or ball. Set plants so that the root crown is 1” higher than the surrounding grade. Plant ground cover plants after the mulch is in place. Avoid contaminating the mulch with the planting soil.

B. Backfill balled and burlapped and container-grown plants with the native soil removed from the planting hole to approximately half the depth of the ball and then tamp and water. It is desirable to use 100 percent native soil to backfill the hole, but do not use unsuitable fill containing clay, rock or other unsuitable material. For balled and burlapped plants, carefully fold back the top half of the burlap and remove tying materials. Any wire caging or similar material, must be completely removed. Where plastic wrap or treated burlap is used in lieu of

burlap, completely remove these materials before backfilling. Tamp and water remainder of backfill native soil; then form earth saucers or water basins around isolated plants with topsoil.

3.6 STAKING

A. Stake plants as shown on the drawings and as specified.

B. Install Tree Ball Staples per manufacturer’s recommendations.

3.7 EDGING PLANT BEDS

A. Uniformly edge beds using a sharp tool to provide a clear cut division line between the planted area and the adjacent turfgrass. Do not use any type of manufactured edging material. The properly mowed and maintained turfgrass will serve as edging for all landscape beds except as indicated on plans.

3.8 MULCHING PLANTS

A. Mulch within 48 hours after planting and apply a preemergence granular ornamental herbicide containing 2.0% trifluralin and 0.5% isoxaben. Apply at 200 lb per acre prior to both early spring and early fall weed seed germination. Do not mulch in ground cover areas that shall have organic material placed before planting.

B. Placing Organic Material: Spread a mulch of wood based origin to a uniform minimum thickness of 2-3 inches.

C. Keep mulch out of the crowns of shrubs and off buildings, sidewalks, light standards, and other structures.

3.9 PRUNING

A. Prune new plant material and indicated existing plant material in the following manner: Remove dead, broken and crossing branches. Make cuts with sharp instruments as close as possible to the branch collar. Do not make flush cuts. Do not make "Headback" cuts at right angles to line of growth. Do not pole trees or remove the leader. Remove trimmings from the site. Do not use any type of wound dressing on pruning cuts.

3.10 TILLAGE FOR TURFGRASS AREAS

A. Thoroughly till the soil to a depth of at least 6 inches by scarifying, disking, harrowing, or other approved methods. This is particularly important in areas where heavy equipment has been used. Remove all debris and stones larger than one (1) inch remaining on the surface after tillage in preparation for finish grading. To minimize erosion, do not till areas of 3:1 slope ratio or greater. Scarify these areas to a one (1) inch depth and remove debris and stones.

3.11 FINISH GRADING

A. After tilling the soil for bonding of topsoil with the subsoil, spread the topsoil evenly to a minimum depth of 6 inches. Incorporate topsoil at least 2 to 3 inches into the subsoil to avoid soil layering. Do not spread topsoil when frozen or excessively wet or dry. Correct irregularities in finished surfaces to eliminate depressions. Protect finished topsoil areas from damage by vehicular or pedestrian traffic. Complete lawn work only after areas are brought to finished grade.

3.12 APPLICATION OF FERTILIZER AND LIME FOR TURFGRASS AREAS

A. Apply turfgrass fertilizer at a rate that will deliver 1 pound of nitrogen per 1000 sq.ft. In addition, adjust soil acidity as recommended by soil test results and add any soil conditioners as specified herein for suitable topsoil under PART 2, Paragraph 2.2A and B, and 2.5 TOPSOIL.

B. Spread lime as recommended by the soil test results.

C. Incorporate lime into the soil to a depth of at least 4 inches as part of the finish grading operation. Starter fertilizer should be lightly mixed with the top ½ inch of soil. Immediately restore the soil to an even condition before any seeding or sod placement.

3.13 MECHANICAL SEEDING

A. Broadcast seed by approved sowing equipment at the rate as outlined in Appendix T/L. All turfgrass seed shall be planted prior to the application of any mulch material. The seed shall be uniformly distributed in a minimum of 2 directions at right angles to each other. Drag the seeded area to inter-mingle the seed and surface soil by means of spike-tooth harrow, cultipacker, or other approved device.

B. Immediately after dragging, firm the entire area with a roller not exceeding 225 kg/m (150 pounds per foot) of roller width.

C. Immediately after preparing the seeded area, evenly spread an organic mulch of straw by hand or by approved mechanical blowers at the rate of 0.5 kg/m2 (2 tons per acre). Application shall allow some sunlight to penetrate and air to circulate but also reduce soil and seed erosion and conserve soil moisture. Anchor mulch by a mulch tiller, asphalt emulsion, twine, or netting. When asphalt emulsion is used, apply either simultaneously or in a separate application. Take precautionary measures to prevent asphalt materials from marking or defacing structures, pavements, utilities, or plantings.

3.14 HYDRO-MULCHING

A. When hydro-mulching, mix the slow release starter fertilizer, approved wood cellulose mulch material in the required amount of water to produce a homogenous slurry and then uniformly apply slurry under pressure to deliver the recommended quantity of fertilizer per 1000 sq.ft.

3.15 SODDING

A. Accomplish sodding in accordance with the ASPA Guideline Specifications for sodding. Lay sod at right angles to slope or the flow of water. On slope areas, start at the bottom of the slope.

B. After completing the sodding operation, blend the edges of the sodded area smoothly into the surrounding area. All sod should be rolled with a light- weight roller after being laid to eliminate air spaces between the sod and the firmed soil.

3.16 WATERING

A. Apply water to the turfgrass areas immediately following installation at a rate sufficient to ensure thorough wetting of the soil to a depth of at least 2 inches. Supervise watering operation to prevent run-off. Supply all pumps, hoses, pipelines, and sprinkling equipment. Repair all areas damaged by water operations. Keep soil surface constantly moist, not wet, until turfgrass plants are well established.

B. Contractor shall deep water all trees twice each week during the Plant Establishment Period, providing water penetration throughout the root zone to the full depth of the planting pits, as verified in the field by the COR. Watering shall cease at the first hard frost in the fall and shall resume upon ground thaw in the spring.

3.17 PROTECTION OF TURFGRASS AREAS

A. Immediately after installation of the turfgrass areas, protect against traffic or other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

3.18 EROSION CONTROL MATERIAL

A. Install and maintain erosion control material meeting the requirements of the Drawings and State requirements on the designated areas as shown and specified. Prepare, fertilize and vegetate the area(s) to be covered, as specified, before the erosion material is placed. Immediately following the planting operations lay the material evenly and smoothly and in contact with the soil throughout. Omit straw mulch from all seeded areas receiving the erosion control material.

B. Maintenance shall consist of repairs made necessary by erosion, wind, or any other cause. Maintain, protect, repair, or replace the erosion control material until the termination of the Plant and Warranty Period.

3.19 RESTORATION AND CLEAN-UP

A. Where existing or new turfgrass areas have been damaged or scarred during planting and construction operations, restore disturbed area to their original condition. Keep at least one paved pedestrian access route and one paved

vehicular access route to each building clean at all times. In areas where planting and turfgrass work have been completed, clear the area of all debris, spoil piles, and containers. Clear all other paved areas when Work in adjacent areas are completed. Remove all debris, rubbish and excess material from the Cemetery.

3.20 ENVIRONMENTAL PROTECTION

A. All Work and Contractor operations shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

END OF SECTION

Appendix - TL
Master Specifications for NCA Cemetery Construction
U.S. Department of Veterans Affairs
National Cemetery Administration

Cemetery Construction Requirements for Turfgrass and Landscape Plant Material Installation

(Updated July 2008 by NCA Chief Agronomist, A.Thomas Perkins, Ph.D.)

General Requirements

1. Existing Conditions: The Landscape Contractor shall be required to visit the site prior to submitting Bid Proposal to become familiar with all conditions affecting the proposed Work. The Landscape Contractor shall identify and review all underground utility locations prior to commencing Work and shall exercise extreme caution when working close to utilities and shall notify the COR of apparent conflicts with construction and utilities so that adjustment can be planned prior to installation.
2. Layout, Grading and Soil Preparation: Per specifications, the Landscape Contractor shall be responsible for transporting, spreading and mechanically incorporating a 2 inch depth of organic material, such as peat moss or well decomposed compost into the surface 4 inches of tilled existing or replaced topsoil on all areas to be planted to either turfgrass or landscape plant materials such as trees, shrubs, flowers and ground covers. The Landscape Architect, Landscape Contractor, COR, and NCA's Chief Agronomist (or appropriate MSN Agronomist as requested by the Chief Agronomist) shall review the extent of this Work prior to commencement of installation.
    - The Landscape Contractor shall be responsible for the collection and submission for testing of an adequate number of soil samples to fully characterize the soil fertility and pH profile of the soil at the site. Samples shall be submitted to a reputable soil testing laboratory several weeks prior to the commencement of any planting operations and copies of the soil analysis reports shall be provided to the COR and NCA's Chief Agronomist or MSN Agronomist. The Landscape Contractor shall then be responsible for applying the soil analysis report recommended quantities of phosphoric acid, potash and/or limestone and thoroughly incorporating those materials to a minimum depth of 4 inches in the planting area topsoil.
    - The Landscape Contractor shall be responsible for accurately laying out the plant beds and turfgrass lawn areas by scaling the Construction Documents. Layout shall be painted or staked on the ground for review and approval by the COR prior to excavation. Following approval of the layout, closely coordinate the installation of the irrigation system to conform to the approved layout.
    - The Landscape Contractor shall be responsible for cleanup and final grading of all areas to be established to turfgrass. The Landscape Contractor and COR shall review the extent of cleanup and grading prior to commencing Work. All areas to be established to turfgrass whether by seeding, sodding or sprigging shall be raked smooth, removing and disposing of stones of 1 inch diameter or greater and fine graded to feather into the natural grade. The finished surface is properly described as fine textured and firm. The firmness test requires that surface soil not be fluffy or powdery and will support the weight of an average adult person without creating a visible depression. This condition most often requires that the site be rolled with an appropriately weighted turfgrass roller.

All areas shall be fine graded to achieve positive surface drainage without puddles or standing water.

- The Landscape Contractor shall be responsible for erosion control of sloped areas.
- Weed Control: The Landscape Contractor shall be responsible for the elimination of all unwanted vegetation on the site prior to the commencement of planting operations. This shall be accomplished by applying glyphosate at the maximum label rate allowed by the EPA registered label for the total control of all types of perennial vegetation at least 2 weeks prior to the anticipated commencement of planting operations.

3. Plant Warranty: Contractor shall provide a one-year replacement warranty for all plant materials. Warranty shall cover plants that have died or partially died (thereby ruining their natural shape), but shall not include damage by vandalism, browsing, hail, abnormal freezes, drought or negligence by the VA. The Warranty is intended to cover Contractor negligence, insect infestations, plant disease and damage or shock to plants. Plants replaced under the Warranty will be warranted for one year from the date of replacement.

Plant Material Selection and Planting Requirements

1. The Landscape Plant Materials selected for all NCA Cemetery construction projects must be approved by the COR in direct consultation with NCA's Chief Agronomist and appropriate MSN Agronomist. In general all plant material selections must be regionally adapted to the climatic conditions that exist at the site, be of appropriate mature dimensions to fit the planting location and be low maintenance species. This low maintenance requirement will generally exclude or at minimum severely limit the use of rose plants, wild flowers and ground covers. Any exceptions to these species exclusions/limitations must be specifically approved by the COR in consultation with the NCA Chief Agronomist and appropriate MSN Agronomist.
2. Plants: All plants shall be nursery grown, Grade 1 plants meeting American Nursery and Landscape Association standards typical in shape and size for the species. Plants shall not be root-bound or loose in their containers. Handle all plants with care in loading, unloading, and transporting. Never pick-up or move tree species by grasping the trunk. This seriously damages the young bark tissue and often results in eventual tree death. Trees must be picked up or moved by lifting the root soil ball, box or container.
3. Planting Beds and Planting Pits: The Landscape Contractor shall fully excavate plant beds as required to accommodate an approximate 3 inch layer of mulch. Stones of 1 inch diameter or larger shall be removed and disposed of off-site. The optimum planting backfill material for all plant species is the topsoil retained from the excavated beds and/or pits. If the available topsoil is of very poor quality it can be amended by thoroughly mixing it with one part peat moss for every three parts of topsoil.
4. Planting Operations: Large container sizes, boxed or balled and burlapped plants shall be planted in pits no less than 2 and preferably 3 times as wide as the plants soil ball/container. The proper depth of the planting hole must allow placement of the plant soil ball on undisturbed soil that results in the location of the tree's root flare slightly above final soil grade. The root flare should never be placed at a location where it is below the finished soil grade. The Landscape Contractor shall be responsible for ensuring the placement of all plants with their best side facing the nearest Cemetery road. Use the total quantity of landscape plants per the landscape specifications and obtain final approval of plant material lay-out from the COR in consultation with NCA's Chief Agronomist or appropriate MSN Agronomist.

5. Planting Bed Edging: No artificial material such as steel strips, bricks, or landscape timbers is to be installed as edging for finished plant beds or tree pit mulch surrounds. The turfgrass established at the site mowed at its proper maintenance height will serve as the edge material for all planting beds and tree pit mulch surrounds.
6. Mulch: Following planting and proper backfilling all planting beds and tree pits shall be mulched with an approximate 3 inch layer of shredded wood fiber mulch. Mulch must not be mounded at the base of newly planted trees, leaving an un-mulched area immediately adjacent to the trunk and the finished depth of the mulch at the edge of planting beds and tree mulch surrounds should be slightly below the anticipated turfgrass mowing height. This allows mowing maintenance equipment to pass above the mulch edge without interference or mulch disturbance.

Turfgrass Species Selection for Seeding, Sodding or Sprigging
General Considerations

1. Turfgrass species approved for use on NCA cemeteries are limited to a select number of regionally adapted species that deliver acceptable turfgrass quality and appearance when provided with a level of maintenance consistent with NCA's Standard Operating Procedures for Turfgrass and Landscape Maintenance as specified in NCA Handbook 3420. These species are divided into two broad categories based on regional climatic adaptation.
    - Cool Season Turfgrasses are best adapted to the cool humid climatic zones of the United States. They include Kentucky bluegrass, perennial ryegrass, fine fescue and tall fescue. No other turfgrass species are permitted.
    - Warm Season Turfgrasses are best adapted to the warm humid climatic zones of the United States and with adequate irrigation to the warm/hot arid or semi-arid areas of the southwestern United States. They include bermudagrass, St. Augustinegrass, centipedegrass, and bahiagrass.
    - Zoysiagrass is not generally an acceptable turfgrass species for NCA Cemetery use due to its extremely slow rate of growth and high maintenance costs. If unique environmental and growing conditions exist at a NCA construction site suggest that zoysiagrass should be considered as the recommended turfgrass species, a special waiver endorsed by the NCA Chief Agronomist and appropriate MSN Agronomist must be obtained in writing before approval of the planting plan. No other turfgrass species are permitted.

Specific Seed Mixture and Sod Composition Guidelines
Seed Mixtures: Composition is % by Weight

Cool Season: Preferred mixture - 50% perennial ryegrass (a blend of 2 regionally adapted cultivars)
30% Ky. bluegrass (a blend of 2 regionally adapted cultivars)
20% fine fescue (a blend of 2 regionally adapted cultivars)

Seeding Rate = 6 lb /1000 sq.ft. or 250 lb/acre

Secondary mixture - 50% tall fescue (a blend of 2 regionally adapted cultivars)
50% perennial ryegrass (a blend of 2 regionally adapted cultivars)

Seeding Rate = 10 lb/1000 sq.ft. or 450 lb/acre

Warm Season: Preferred mixture, sunny locations- seeded bermudagrass – use a blend that contains 2 or 3 cultivars from this list: Sunsport, Princess, Riviera, Southern Star, Blackjack, Savannah, Primo Blend

Seeding Rate = 2 lb/1000 sq.ft. (hulled seed)

Preferred species, shady locations- St. Augustinegrass – sod only

Secondary/low visibility – Centipedegrass or Bahiagrass

Bahiagrass Seeding Rate = 8 lb/1000 sq.ft. or 350 lb/acre (scarified seed)

Centipedegrass Seeding Rate = 2 lb/1000 sq.ft. or 100 lb/acre

Turfgrass Sod Composition:

On projects where commercially grown sod or plugs is specified select a turfgrass species composition that roughly approximates one of the above seed mixtures. Improved cultivars of St. Augustinegrass and Zoysiagrass should only be established by sodding, sprigs or plugs.

END OF SECTION

SECTION 33 41 00

STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The Work of this Section includes gravity site storm drainage piping, fittings and accessories, and bedding; and connection of drainage system to on-site drains.

1.2 RELATED SECTIONS

A. Section 31 20 00, EARTH MOVING

B. Section 33 49 00, STORM DRAINAGE STRUCTURES

1.3 REFERENCES

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

M252..... Standard Specification for Corrugated Polyethylene Drainage Pipe

M294 ..... Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter

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

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

D2321..... Underground Installation of Flexible Thermoplastic Sewer Pipe

D2729..... Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D6938..... Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods

F477 ..... Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

1.4 SUBMITTALS

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

B. Product Data: Submit data indicating pipe and pipe accessories and any other Product listed.

C. Manufacturer’s Installation Instructions: Submit special procedures required to install Products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, drainage inlets, catch basins, and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

F. Operation and Maintenance Data: Procedures for submittals.

1.5 COORDINATION

A. Coordinate Work with termination of storm sewer connection to existing drainage system.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drain Pipe Materials:
1. Plastic Pipe: Dual Wall Corrugated Exterior, Smooth Interior Polyethylene (HDPE) Plastic Pipe and Fittings: AASHTO M252, Type S, (or ASTM 2648) with smooth waterway for coupling joints.
a. Soil-tight Couplings: AASHTO M252, bell and spigot, corrugated, matching pipe and fittings to form soil-tight joints. Gaskets shall meet requirements of ASTM F477. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.
2. Plastic Pipe: Corrugated, Polyethylene (HDPE) Plastic Pipe and Fittings NPS 12 to NPS 60: AASHTO M294, Type S, with smooth waterway for coupling joints.
a. Soil-tight Couplings: AASHTO M294, bell and spigot, corrugated, matching pipe and fittings to form soil-tight joints. Gaskets shall meet requirements of ASTM F477. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

2.2 ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
1. Corrugated PE Plastic Pipe: Soil-tight joints shall conform to requirements in AASHTO HB-17, Division II, for soil tightness and shall be as recommended by the manufacturer.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

2.3 BEDDING AND COVER MATERIALS

A. Bedding: Granular Fill, as specified in Section 31 20 00.

B. Cover: Granular Fill as specified in Section 31 20 00.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that trench cut is ready to receive Work and excavations, dimensions, and elevations are as indicated on layout drawings.

3.2 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with Aggregate base materials.

B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 20 00 for Work of this Section. Hand trim excavation for accurate placement of pipe to elevations indicated.

B. Place bedding material at trench bottom, level materials in continuous layer not exceeding 6 inches compacted depth.

C. Maintain optimum moisture content of bedding material to attain required compaction density.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories as indicated on the Drawings. Seal joints soiltight.

B. Place pipe on granular fill per Drawings.

C. Lay pipe to slope gradients noted on Drawings with maximum variation from true slope of 1/8 inch in 10 feet.

D. Install Aggregate at sides and over top of pipe. Provide top cover to compacted thickness indicated on Drawings in maximum lifts of 8 inches, compact to 100 percent.

E. Install small manholes, cleanouts, and drain inlets where indicated.

F. Refer to Section 31 20 00 for backfilling and compacting requirements. Do not displace or damage pipe when compacting.

G. Refer to Section 33 49 00 for manhole, cleanout and drain inlet requirements.

H. Connect to collection point, outfalls, or structures as indicated.

3.5 JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to the following.

B. High Density Polyethylene (HDPE) Plastic Pipe and Fittings: As follows:
1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
2. Install according to ASTM D2321 and manufacturer's written instructions.

C. System Piping Joints: Make joints using system manufacturer's couplings, except where otherwise specified.

D. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and fit both systems' materials and dimensions.

3.6 FIELD QUALITY CONTROL

A. Request inspection prior to and immediately after placing Aggregate cover over pipe.

B. Compaction testing will be performed in accordance with ASTM D698, D6938, and D3017.

C. Test: Visually inspect pipe installation for line, grade, and joint tightness. Test for deflection using mandrel per manufacturer's specifications and recommendations.
1. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
2. Frequency of Tests: Per Section 01 45 29 Testing Laboratory Services.

3.7 PROTECTION OF FINISHED WORK

A. Protect pipe and Aggregate cover from damage or displacement until backfilling operation is in progress.
1. Take care not to damage or displace installed pipe and joints during construction of pipe supports, backfilling, testing, and other operations.
2. Where pipe is damaged or displaced, take remedial measures as directed by the COR including, but not limited to, retesting of joints, relaying pipe or replacing pipe. Provide remedial measures at no additional cost to the Government.

END OF SECTION

SECTION 33 46 00

SUBDRAINAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. The Work of this Section specifies foundation drainage system, including installation, backfill, and cleanout extensions, to place of connection to on-site storm drain facilities.

1.2 RELATED WORK

A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Safety requirements: GENERAL CONDITIONS.

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.

1.3 SUBMITTALS

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

B. Samples: For each type of filter fabric, pipe, and fitting indicated

C. Product Data: Certifications from the manufacturers attesting that materials meet specification requirements.

1.4 APPLICABLE PUBLICATIONS

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

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

D2321 ..... Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

D2729 ..... Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

D2737 ..... Standard Specification for Polyethylene (PE) Plastic Tubing

D4533 ..... Standard Test Method for Trapezoid Tearing Strength of Geotextiles

D4632 ..... Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

D4833 ..... Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

F477 ..... Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

F758 ..... Standard Specification for Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

F2306 ..... Standard Specification for 12 to 60 in. Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications

F2648 ..... Standard Specification for 2 to 60 inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pipe for subdrainage system shall be of the type and size indicated. Appropriate transitions, adapters, or joint details shall be used where pipes of different types or materials are connected.

B. Perforated Drainage Pipe:
1. Dual wall corrugated high-density polyethylene (HDPE) drainage pipe with smooth interior and annular exterior corrugations, per ASTM F2648 with perforations.
2. Pipe shall be joined using bell and spigot joint meeting ASTM F2648. The joint shall be soil-tight and gaskets meeting requirements of ASTM F477. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly. Fittings shall conform to ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of ASTM F2306.
3. Perforations shall be AASHTO Class II Perforation

C. Cleanout Extension: ASTM D2729 PVC NPS 6. Gravity Sewer pipes shall have a neoprene gasket joints and long sweep elbow fittings. Cleanouts for underdrains shall be as indicated on the Drawings and shall be set so as to not interfere with mowing operations. Plastic tops for cleanouts in landscape areas shall be

provided with concrete anchorage with all features set so as to not cause damage to the mowers.

D. Filter Fabric
1. Non-Woven Filter fabric shall be a pervious sheet of polyethelyne or polypropylene filaments formed into a uniform pattern with distinct and measurable openings. The filter fabric shall provide an equivalent opening size (AOS) no coarser than the US Standard Sieve No. 80. AOS is defined as the number of the US Standard sieve having openings closest in size to the filter fabric openings. Permittivity shall be minimum 1.5/second and water flow rate shall be minimum 110 gpm/ft^2. The filaments shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure with minimum UV Resistance of 70% retained at 500 hours. The fabric shall have a minimum grab tensile strength of 200 pounds when tested in accordance with ASTM D4632. Grab elongation shall be 50 percent. Puncture strength shall be 110 pounds when tested in accordance with ASTM D4833. Mullen burst value shall be minimum 350 psi. Trapezoidal tear shall be minimum 80 lb when tested in accordance with ASTM D4533. The fabric shall be constructed so that the filaments will retain their relative position with respect to each other.

E. Drainage Material:
1. Bedding: Drainage fill per Section 31 20 00.
2. Fill: Drainage fill per Section 31 20 00.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Trenching and Excavation
1. Perform required trenching and excavation in accordance with Section 31 20 00 EARTH MOVING. Keep trenches dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Use wye fittings at intersections.

B. Bedding
1. Place graded bedding, minimum 4 inches in depth, in the bottom of trench for its full width and length compacted as specified prior to laying of foundation drain pipe. Each section shall rest firmly upon the bedding, through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

C. Pipe Laying
1. Lay drain lines to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Clean interior of pipe thoroughly before being laid. When drain lines are left open for connection to discharge lines, the open ends shall be temporarily closed

and the location marked with wooden stakes. Perforated pipe shall be laid with perforations facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government. Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and piping with physical imperfections shall not be installed.

2. Prior to installation of bedding materials or piping, examination of excavation and subgrades are to be observed by the COR. Invert elevation of drain pipe shall not be higher than the bottom of the adjacent preplaced urn crypts. Lay drain lines and firmly bed in granular material a minimum of 3 inches below invert to top of pipe to true grades and alignment with bells facing upgrade, and to slope uniformly between elevations shown on Drawings. Keep trenches dry until pipe is in place and granular material backfill is completed to 1 foot above top of pipe, unless otherwise noted.
3. Install gaskets, seals, sleeves, and couplings according to manufacturers written instructions and per the applicable standard:
   a. PE and PVC pipe installation shall be per ASTM D2321 and ASTM F758.
   b. PE joint construction shall be per ASTM D2737 and AASHTO HB17, Division II, Section 26.4.2.4, “Joint Properties.”
4. Lay perforated pipe with perforations down. Lay plain end pipe with closed joints held in place with two No. 9 spring steel wire clips at each joint or by standard clay collars.
5. Install cleanout extensions where shown on the Drawings.
6. Prior to backfilling, check drain lines to assure free flow. Remove obstructions and recheck lines until satisfactory.

D. Jointing
   1. Perforated and porous types of drain pipes shall be laid with closed joints.

E. Backfilling: Place granular material, hand tamped, as indicated on the Construction Documents. Remainder of backfill shall be comparable to existing adjacent soils.
   1. Filter fabric shall be installed per the Drawings.
   2. When drain lines are left open for connection to discharge line, the open ends shall be temporarily closed and their location marked with wooden stakes.

END OF SECTION

SECTION 33 49 00

STORM DRAINAGE STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Pre-cast concrete manhole, drain inlets / catch basins with inverts to accommodate HDPE Pipe.

B. Ductile iron and galvanized steel frames, covers, and grates for manholes, drain inlets, and catch basins.

C. Cleanouts.

1.2 RELATED SECTIONS

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

B. Section 31 20 00, EARTH MOVING

C. Section 33 41 00, STORM UTILITY DRAINAGE PIPING

D. Section 33 46 00, SUBDRAINAGE

1.3 REFERENCES

A. American Concrete Institute (ACI)

ACI 318..... Building Code Requirements for Reinforced Concrete

B. American Society for Testing and Materials (ASTM)

A48 ..... Standard Specification for Gray Iron Castings

A536 ..... Ductile Iron Castings

A615 ..... Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

C478 ..... Precast Reinforced Concrete Manhole Sections.

C857 ..... Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

C913 ..... Standard Specification for Precast Concrete Water and Wastewater Structures

C923 ..... Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes

D2729 ..... Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

1.4 DESIGN REQUIREMENTS

A. Equivalent strength shall be based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of lifting devices for precast structures shall conform to ASTM C 913.

C. Design of joints for precast structures shall conform to ASTM C 913. Joints shall be designed for leakage not to exceed 0.025 gallon per hour per foot of joint at 3 feet of head.

1.5 SUBMITTALS

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

B. Shop Drawings: Indicate manhole, inlet, and cleanout locations, elevations, piping, and conduit sizes and elevations of penetrations.

C. Product Data: Submit manhole covers, welded grates, component construction, features, configuration, and dimensions and cleanout pipe and box data.

1.6 QUALITY ASSURANCE

A. Environmental Agency Compliance: Comply with regulations pertaining to storm drainage systems.

B. Utility Compliance: Comply with regulations pertaining to storm drainage systems. Include standards of water and other utilities where appropriate.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.7 DELIVERY, STORAGE AND HANDLING

A. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and drainage structures.

B. Store precast concrete manholes and drainage structure to prevent damage to Cemetery property or other private property. Any property so damaged shall be repaired at the Contractor’s expense.

C. Clearly mark each precast structure by indentation or waterproof paint to indicate date of manufacture, manufacturer and identifying symbols and or numbers shown on Drawings to indicate its intended use. Neatly mark same on inside of structures with 12 inch high lettering

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion go any masonry or grouting work.

PART 2 - PRODUCTS

2.1 MANHOLES, FRAMES, AND COVER

A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923. Box design load to meet H-20 full traffic loading.
   1. Components
      a. Lid and Frame: ASTM A48, Class 30B cast iron construction, ASTM grid pattern, edge pry hole, one main pick hole, machined flat bearing surface, removable lid design; traffic rated; marked “DRAIN” or similar. Use ductile iron open grate top where indicated.
      b. Resilient Pipe Connectors: ASTM C923; cast or fitted into manhole walls, for each pipe connection.
      c. Manhole Steps: Formed FRP rungs; ¾-inch diameter. Formed integral with manhole sections.
      d. Base Pad: Cast-in-place concrete of type specified in Section 03 30 00, leveled top surface. Steel trowel finish.
   2. Configuration
      a. Shaft Construction: Concentric with concentric or eccentric cone or flat top section as indicated; lipped male/female dry joints; sleeved to receive pipe sections.
      b. Shape: Cylindrical.
      c. Clear Inside Dimensions: 48-inch diameter minimum or as indicated on Drawings.
      d. Design Depth: As indicated.
      e. Clear Lid Opening: 24-inch diameter.
      f. Pipe and Conduit Entry: Provide openings as required.
      g. Steps: 12 inches wide, 16 inches on center vertically, set into manhole wall.

2.2 CLEAN OUT TO GRADE

A. Plastic Pipe (PVC) ASTM D2729, SDR 35, nominal inside diameter of 6 inch, threaded cleanout adapter and cleanout plug.

B. Cleanout Box:
   1. Provide cast iron with threaded adjustable housing, flanged ferrule with round scoriated cast iron tractor type cover suitable for placement in a concrete slab or collar. Size opening to accommodate riser size. Lid marked “DRAIN”. Set in an 18” concrete collar.

2.3 DRAIN INLETS, FRAMES AND GRATES

A. Precast Catch Basins: Concrete for precast sections shall have a minimum compressive strength of 5,000 psi at 28 days, ASTM A615, Grade 60 reinforcing steel, rated for AASHTO HS20-44 loading with 30 percent impact, and conform to ASTM C857.

B. Frame and Cover for Gratings: Frame and cover for gratings shall be cast gray iron conforming to ASTM A48; cast ductile iron conforming to ASTM A536 Weight, shape, size, and waterway openings for grates and curb inlets shall be as indicated on the Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items provided by other Sections of Work are properly sized and located.

B. Verify that built-in items are in proper location and ready for roughing into Work.

C. Verify excavation and location for manholes, cleanouts, and drain inlets is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe required by other Sections.

B. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.

C. Inspect precast concrete structures immediately prior to placement in the excavation to verify that they are internally clean and free from damage. Remove damaged units from the construction site and replaced, at no additional cost to the Government.

3.3 INSTALLATION

A. Excavation and Backfill:
   1. Excavate for manholes and drainage structures in accordance with Section 31 20 00 in the location and to depth indicated. Provide clearance around the sidewalls of the structure as required for construction.
   2. If groundwater is encountered, prevent accumulation of water in excavations. Dewater per Section 31 23 19. Place manholes or drainage structures in a dry trench.
   3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.

B. Place base pad, trowel top surface level.

C. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad. Install seals at all section joints. Align steps with opening.

D. Manholes and drainage structures shall be supported at proper grade and alignment on crushed stone bedding or other support system, as shown on Drawings.

E. Backfill excavations for manholes and drainage structures in accordance with Section 31 20 00.

F. Form and place manhole cylinder plumb and level, to correct dimensions and elevations. As Work progresses, build fabricated metal items.

G. Cut and fit for pipe, conduit, and sleeves.

H. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

I. Set cover frames and covers level without tipping, to correct elevations.

J. Coordinate with other Sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND DRAINAGE STRUCTURE INSTALLATION

A. To ensure safety, lift precast structures at the lifting points designated by the manufacturer.

B. When lowering manholes and drainage structures into the excavations and joining pipe to the units, take precautions to ensure that the interior of the pipeline and structure remains clean.

C. Set precast structures so that they firmly and fully bear on crushed stone bedding, compacted in accordance with the provisions of Section 31 20 00 or on other support system shown on Drawings.

D. Assemble multi-section structures by lowering each section into the excavation. Lower, set level, and firmly position the base section before placing additional sections.

E. Ensure joint integrity by removing all foreign materials from joint surfaces and verifying that sealing materials are placed properly. Avoid misalignment by using guide devices affixed to the lower section.

F. Joint sealing materials may be installed at the site or at the manufacturer’s plant.

G. Verify that manholes and drainage structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping so as not to create openings more than that required to receive pipe. Fill annular space with mortar and contour finish surfaces on both interior and exterior of structure for a clean, solid appearance.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole as shown on Drawings to provide positive flow.

3.5 CASTINGS INSTALLATION

A. Set frames using precast grade rings as required to bring to grade.

B. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow the area to be graded away from the cover beginning 1 inch below the top surface of the frame.

C. Provide concrete collar flush with top of frame within unpaved areas.

3.6 FIELD QUALITY CONTROL

A. Field tests will be used to evaluate and approve cast-in-place concrete in accordance with Section 03 30 00.

B. Vertical Adjustment of Existing Manhole and Drainage Structures:
   1. Where required, adjust the top elevation of existing manholes and drainage structures to suit finished grades shown on Drawings.
   2. Reset existing frames, grates and covers, carefully removed, cleaned of all mortar fragments, to the required elevation in accordance with the requirements specified for installation of castings.
   3. Remove the concrete so as not to damage the existing vertical reinforcing bars when removal of an existing concrete wall is required. The vertical bars shall be cleaned of all concrete and bent into the new concrete top slab or spliced to required vertical reinforcement, as shown on Drawings.
   4. Clean and apply sand-cement bonding compound on all existing concrete surfaces to receive cast-in-place concrete. Sand-cement bonding compound and its application shall be in accordance with Section 03 30 00.

3.7 SCHEDULES

A. Manholes, Drain Inlets, and Cleanouts: As indicated on Drawings.

END OF SECTION

APPENDIX

GEOTECHNICAL INVESTIGATION

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