

**VAMC WACO, TEXAS****SECTION 32 05 23  
CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section shall cover site work concrete constructed upon the prepared subgrade and in conformance with the lines, grades, thickness, and cross sections shown. Construction shall include the following:
- B. Combination curb and gutter.
- C. Pedestrian Pavement: Walks, crossings, wheelchair curb ramps.

**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. Metal Components of Steps (Nosing and Railing): Section 05 50 00, METAL FABRICATIONS.

**1.3 DESIGN REQUIREMENTS**

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

**1.4 WEATHER LIMITATIONS**

Placement of concrete shall be as specified under Article 3.8, COLD WEATHER and Article 3.7, HOT WEATHER of Section 03 30 00, CAST-IN-PLACE CONCRETE.

**1.5 SELECT SUBBASE MATERIAL JOB-MIX**

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

**1.6 SUBMITTALS**

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Manufacturers' Certificates and Data certifying that the following materials conform to the requirements specified.
  - 1. Expansion joint filler

- 2. Hot poured sealing compound
- 3. Reinforcement
- 4. Curing materials
- C. Data and Test Reports: Select subbase material.
  - 1. Job-mix formula.
  - 2. Source, gradation, liquid limit, plasticity index, percentage of wear, and other tests as specified and in referenced publications.

**1.7 APPLICABLE PUBLICATIONS**

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

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

- M31.....Deformed and Plain Billet Steel Bars for Concrete Reinforcement (ASTM A615/A615M-96A)
- M55M/55M.....Welded Steel Wire Fabric for Concrete Reinforcement (ASTM A185)
- M147.....Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses (R 1996)
- M148.....Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309A)
- M171.....Sheet Materials for Curing Concrete (ASTM C171)
- M182.....Burlap Cloth Made from Jute or Kenaf
- M213.....Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Type) (ASTM D1751)
- T99.....Moisture-Density Relations of Soils Using a 2.5 kg. (5.5 lb) Rammer and a 305 mm (12 in.) Drop
- T180.....Moisture-Density Relations of Soils Using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

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

- C94/C94M.....Ready-Mixed Concrete
- C143/C143M.....Slump of Hydraulic Cement Concrete

**PART 2 - PRODUCTS**

**2.1 GENERAL**

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

<u>TYPE</u>	<u>MAXIMUM SLUMP*</u>
Curb & Gutter	75 mm (3")
Pedestrian Pavement	75 mm (3")
<del>Vehicular Pavement</del>	<del>50 mm (2") (Machine Finished)</del> <del>100 mm (4") (Hand Finished)</del>
<del>Equipment Pad</del>	<del>75 to 100 mm (3" to 4")</del>
* 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 SELECT SUBBASE**

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

**2.4 FORMS**

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

**2.5 CONCRETE CURING MATERIALS**

- A. Concrete curing materials shall conform to one of the following:
  - 1. Burlap conforming to AASHTO M182 having a weight of 233 grams (seven ounces) or more per square meter (yard) when dry.

2. Impervious Sheeting conforming to AASHTO M171.

SPEC WRITER NOTE: Choice below is Type 1  
contains clear additive, and Type 2  
contains white pigmented additive.

3. Liquid Membrane Curing Compound conforming to AASHTO M148 (ASTM C309), Type 1 and shall be free of paraffin or petroleum.

## **2.6 EXPANSION JOINT FILLERS**

Material shall conform to AASHTO M213.

## **PART 3 - EXECUTION**

### **3.1 SUBGRADE PENETRATION**

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

### **3.2 SELECT SUBBASE**

- A. Mixing: Proportion the select subbase by weight or by volume in quantities so that the final approved job-mixed formula gradation, liquid limit, and plasticity index requirements will be met after subbase course has been placed and compacted. Add water in approved quantities, measured by weight or volume, in such a manner to produce a uniform blend.
- B. Placing:
  1. Place the mixed material on the prepared subgrade in a uniform layer to the required contour and grades, and to a loose depth not to exceed 200 mm (8 inches), and that when compacted, will produce a layer of the designated thickness.
  2. When the designated compacted thickness exceeds 150 mm (6 inches), place the material in layers of equal thickness. Remove unsatisfactory areas and replace with satisfactory mixture, or mix the material in the area.
  3. In no case will the addition of thin layers of material be added to the top layer in order to meet grade.
  4. If the elevation of the top layer is 13 mm (1/2 inch) or more below the grade, excavate the top layer and replace with new material to a depth of at least 75 mm (3 inches) in compacted thickness.
- C. Compaction:
  1. Perform compaction with approved equipment (hand or mechanical) well suited to the material being compacted.

2. Moisten or aerate the material as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
  3. Compact each layer to at least 95 percent or 100 percent of maximum density as determined by AASHTO T180 or AASHTO T99 respectively.
- D. Smoothness Test and Thickness Control:
- Test the completed subbase for grade and cross section with a straight edge.
1. The surface of each layer shall not show any deviations in excess of 10 mm (3/8 inch).
  2. The completed thickness shall be within 13 mm (1/2 inch) of the thickness as shown.
- E. Protection:
1. Maintain the finished subbase in a smooth and compacted condition until the concrete has been placed.
  2. When Contractor's subsequent operations or adverse weather disturbs the approved compacted subbase, excavate, and reconstruct it with new material meeting the requirements herein specified, at no additional cost to the VA.

### 3.3 SETTING FORMS

- A. Base Support:
1. Compact the base material under the forms true to grade so that, when set, they will be uniformly supported for their entire length at the grade as shown.
  2. Correct imperfections or variations in the base material grade by cutting or filling and compacting.
- B. Form Setting:
1. Set forms sufficiently in advance of the placing of the concrete to permit the performance and approval of all operations required with and adjacent to the form lines.
  2. Set forms to true line and grade and use stakes, clamps, spreaders, and braces to hold them rigidly in place so that the forms and joints are free from play or movement in any direction.
  3. Forms shall conform to line and grade with an allowable tolerance of 3 mm (1/8 inch) when checked with a straightedge and shall not deviate from true line by more than 6 mm (1/4 inch) at any point.
  4. Do not remove forms until removal will not result in damaged concrete or at such time to facilitate finishing.
  5. Clean and oil forms each time they are used.

C. The Contractor's Registered Professional Land Surveyor, specified in Section 00 72 00, GENERAL CONDITIONS, shall establish and control the alignment and the grade elevations of the forms or concrete slipforming machine operations.

1. Make necessary corrections to forms immediately before placing concrete.
2. When any form has been disturbed or any subgrade or subbase has become unstable, reset and recheck the form before placing concrete.

### **3.4 EQUIPMENT**

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

### **3.5 PLACING REINFORCEMENT**

- A. Reinforcement shall be free from dirt, oil, rust, scale or other substances that prevent the bonding of the concrete to the reinforcement.
- B. Before the concrete is placed, the Resident Engineer 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.

### **3.6 PLACING CONCRETE - GENERAL**

- A. Obtain approval of the Resident Engineer before placing concrete.
- B. Remove debris and other foreign material from between the forms before placing concrete. Obtain approval of the Resident Engineer 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.

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

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

### **3.8 CONCRETE FINISHING - GENERAL**

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

### **3.9 CONCRETE FINISHING PEDESTRIAN PAVEMENT**

- A. Walks, Wheelchair Curb Ramps:
  - 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 2 mm (1/16 inch) in depth.
  - 5. The completed surface shall be uniform in color and free of surface blemishes, form marks, and tool marks. The finished surface of the pavement shall not vary more than 5 mm (3/16 inch) when tested with a 3000 mm (10 foot) straightedge.

6. The thickness of the pavement shall not vary more than 6 mm (1/4 inch).
  7. Remove and reconstruct irregularities exceeding the above for the full length between regularly scheduled joints.
- B. Steps: The method of finishing the steps and the sidewalls is similar to above except as herein noted.
1. Remove the riser forms one at a time, starting with the top riser.
  2. After removing the riser form, rub the face of the riser with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Use an outside edger to round the corner of the tread; use an inside edger to finish the corner at the bottom of the riser.
  3. Give the risers and sidewall a final brush finish. The treads shall have a final finish with a stiff brush to provide a non-slip surface.
  4. The texture of the completed steps shall present a neat and uniform appearance and shall not deviate from a straightedge test more than 5 mm (3/16 inch).

### **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 3 mm (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 with a standard grooving tool or jointer.

### **3.12 EXPANSION JOINTS**

- A. Use a preformed expansion joint filler material of the thickness as shown to form expansion joints.
- B. Material shall extend the full depth of concrete, cut and shaped to the cross section as shown, except that top edges of joint filler shall be below the finished concrete surface where shown to allow for sealing.

- C. Anchor with approved devices to prevent displacing during placing and finishing operations.
- D. Round the edges of joints with an edging tool.
- E. Form expansion joints as follows:
  - 1. Without dowels, about structures and features that project through, into, or against any site work concrete construction.
  - 2. Using joint filler of the type, thickness, and width as shown.
  - 3. Installed in such a manner as to form a complete, uniform separation between the structure and the site work concrete item.

### **3.13 CONSTRUCTION JOINTS**

- A. Locate construction joints between slabs of vehicular pavement as shown.
- 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 Resident Engineer.
- B. Burlap Mat: Provide a minimum of two layers kept saturated with water for the curing period. Mats shall overlap each other at least 150 mm (6 inches).

- C. Impervious Sheeting: Use waterproof paper, polyethylene-coated burlap, or polyethylene sheeting. Polyethylene shall be at least 0.1 mm (4 mils) in thickness. Wet the entire exposed concrete surface with a fine spray of water and then cover with the sheeting material. Sheets shall overlap each other at least 300 mm (12 inches). Securely anchor sheeting.
- D. Liquid Membrane Curing:
1. Apply pigmented membrane-forming curing compound in two coats at right angles to each other at a rate of 5 m<sup>2</sup>/L (200 square feet per gallon) for both coats.
  2. Do not allow the concrete to dry before the application of the membrane.
  3. Cure joints designated to be sealed by inserting moistened paper or fiber rope or covering with waterproof paper prior to application of the curing compound, in a manner to prevent the curing compound entering the joint.
  4. Immediately re-spray any area covered with curing compound and damaged during the curing period.

### 3.16 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 and construction equipment as soon as curing and sealing of joints has been completed.

### 3.17 PROTECTION

The contractor shall protect the concrete against all damage prior to final acceptance by the Government. Remove concrete containing excessive cracking, fractures, spalling, or other defects and reconstruct the entire section between regularly scheduled joints, when directed by the Resident Engineer, 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 Resident Engineer.

### 3.18 FINAL CLEAN-UP

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

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**SECTION 32 84 00**  
**PLANTING IRRIGATION**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

A. This section specifies materials and procedures for furnishing and installing a complete automatically-controlled lawn and ground cover irrigation system, controllers and all other appurtenances necessary to serve specified landscape and plant bed areas to tie-into existing system. Contractor shall submit complete design for planting irrigation system.

**1.2 RELATED WORK**

- A. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 11, EARTH MOVING.
- B. General plumbing, protection of Materials and Equipment, and quality assurance: Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING.
- C. Submittals: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- D. Plant materials: Section 32 90 00, PLANTING

**1.3 DEFINITIONS**

- A. Circuit Piping: Downstream from control valves to sprinklers, specialties, and drain valves.
- B. Drain Piping: Downstream from circuit-piping drain valves.
- C. Main Piping: Downstream from point of connection to water distribution piping to, and including, control valves.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 volts or for remote-control, signaling power-limited circuits.

**1.4 ABBREVIATIONS**

- A. FPT: Female pipe thread
- B. HDPE: high-density polyethylene plastic
- C. NPT: National pipe thread
- D. PTFE: Polytetrafluoroethylene
- E. PVC: Polyvinyl chloride plastic
- F. WOG: Water, oil and gas

**1.5 PERFORMANCE REQUIREMENTS**

- A. Irrigation zone control shall be automatic operation with controller and automatic control valves.

B. Delegated Design: Provide a 100 percent coverage irrigation system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria to match existing.

C. Minimum Working Pressures: The following are maximum pressure requirements for piping, valves and specialties unless otherwise indicated.

1. Irrigation Main Piping: Shall match existing.

2. Circuit Piping: Shall match existing

#### **1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support pipe to prevent sagging and bending.

#### **1.7 QUALITY ASSURANCE:**

A. Products Criteria:

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

2. A nameplate bearing manufacturer's name or trademark, including model number, shall be securely affixed in a conspicuous place on equipment. In addition, the model number shall be either cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.

B. Installer Certification:

1. Installer should be an employer of workers that include a certified irrigation designer qualified by The Irrigation Association, Professional Class member of the American Society of Irrigation Consultants, or Professional Technical Class member of the American Society of Irrigation Consultants, to perform specified work., and have provided irrigation installations for 5 years.

2. Service provider qualifications shall be maintained and/or trained by the manufacturer to render satisfactory service within 8 hours of service request notification.

C. System Requirements:

1. 100 percent irrigation coverage of specified areas is required. The Contractor shall, at no additional cost to the Government, make minor

adjustments necessary to avoid plantings and obstructions such as signs, utilities and light standards and achieve full and complete coverage of irrigated areas without overspray on roadways, sidewalks, window wells, or buildings and to protect trees from close high spray velocity.

#### **1.8 SUBMITTALS**

- A. Submit product data as one package for each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Submit the proposed irrigation system design signed and sealed by the qualified professional engineer licensed in the State where the project is located and responsible for document preparation.
- C. Submit complete detailed irrigation layout covering design of system showing pipe sizes and lengths; fittings; locations; types and sizes of sprinklers; controls; backflow preventers; valves; drainage pits; location and mounting details of electrical control equipment complete wiring diagram showing routes and wire sizes for; power, signal and control wiring details and connections to water supply main. Do not start work before final shop drawing approval.
- D. Provide qualification data for:
  - 1. A qualified irrigation Installer.
  - 2. A qualified service provider, maintained and/or trained by the manufacturer to render satisfactory service within 8 hours of service request notification.
- E. Include a zone chart and controller timing schedule showing each irrigation zone and its control valve; and show the time settings for each automatic controller zone.
- F. Provide operation and maintenance data for irrigation system to include in operation and maintenance manuals.

#### **1.9 EXTRA MATERIALS**

- A. Furnish extra materials, as called out below, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Rotary and Spray Head Sprinklers, Bubblers, Emitters: 5 percent of amount installed for each type and size indicated, but no fewer than 2 units.

**1.10 APPLICABLE PUBLICATIONS**

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

B. American Society Of Mechanical Engineers (ASME):

- B16.18-2001.....Cast Copper Alloy Solder Joint Pressure Fittings
- B16.22-2001.....Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- B16.24-2006.....Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500
- B18.2.1-2010.....Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
- B40.100-2005.....Pressure Gauges and Gauge Attachments

C. American Society Of Sanitary Engineering (ASSE):

- 1013-2009.....Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers

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

- B32-08.....Solder Metal
- B61-08.....Steam or Valve Bronze Castings
- B62-09.....Composition Bronze or Ounce Metal Castings
- B88/B88M-09.....Seamless Copper Water Tube
- B813-10.....Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
- D1785-06.....Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and 120
- D2241-09.....Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)

- D2464-06.....Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- D2466-06.....Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
- D2467-06.....Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- D2564-04(2009)e1.....Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
- D2609-02(2008).....Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe
- D2683-10.....Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- D2855-96(2010).....Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
- D3261-10a.....Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- F477-10.....Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F656-10.....Primers for Use in Solvent Cement Joints of Poly(Vinyl Chloride) (PVC) Plastic Pipe and Fittings
- F771-99(2005).....Polyethylene (PE) Thermoplastic High-Pressure Irrigation Pipeline Systems
- E. American Water Works Association (AWWA):
- C504-06.....Rubber-Seated Butterfly Valves
- C906-07.....Polyethylene (PE) Pressure Pipe and Fittings, 4 in. (100 mm) Through 63 in. (1600 mm), for Water Distribution and Transmission
- F. American Welding Society (AWS):
- A5.8/A5.8M:2004.....Filler Metals for Brazing and Braze Welding

G. General Services Administration:

A-A-60005.....Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

H. Manufacturers Standardization Society (MSS):

SP-70-2006.....Gray Iron Gate Valves, Flanged and Thread Ends

I. National Fire Protection Association (NFPA):

70 2011 Edition.....National Electrical Code

**1.11 WARRANTY**

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

**PART 2 - PRODUCTS**

**2.1 PIPES, TUBES AND FITTINGS**

A. Comply with requirements in the piping schedule for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes. Provide types as required to match existing system.

**2.2 PIPE JOINING MATERIALS**

- A. Metal, pipe-flange bolts and nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- B. Brazing filler metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- C. Solder filler metals: ASTM B32, lead-free alloys. Include water-flushable flux according to ASTM B813.
- D. Solvent cements for joining PVC piping: ASTM D2564. Include primer according to ASTM F656.
- E. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

**2.3 VALVES**

A. Underground Shut-Off Valves: Shall match existing.

**2.4 VALVE BOX PROVIDE AS REQUIRED BY DESIGN**

- A. Butterfly valve boxes shall be precast concrete boxes with a compressive concrete strength in excess of 4000 psi (30 Mpa). Box dimension shall be adapted to depth of cover required over pipe at valve location. Mark box cover to say "Irrigation" and set flush with finished grade.

**2.5 BACKFLOW PREVENTER**

- A. Reduced pressure principle backflow preventer: ASSE 1013, at each new connection to water distribution system.

**2.6 AUTOMATIC CONTROL EQUIPMENT - INDEPENDENT ELECTRIC CONTROLLERS**

- A. The electric automatic control system shall consist of one or more independent controllers which operate individual remote control valves in accordance with timing schedules programmed into the independent units. The number of units and location of the installations shall be as approved design.

**2.7 SPRINKLER HEADS**

- A. Sprinkler heads: Heads shall match existing. The entire internal assembly including filter screen, to be capable of removal from the top without removing the sprinkler case from the riser.

**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Examine proposed irrigation areas for compliance with requirements and conditions affecting installation and performance.
- B. Set stakes to identify locations of proposed irrigation system. Obtain Project Manager/Contracting Officer's Technical Representative's approval before excavation.

**3.2 PIPE INSTALLATION - GENERAL**

- A. Layout work as closely as possible to approved design. Swing joints, offsets and all fittings are not shown. Lines are to be in a common trench wherever possible.
- B. Install sprinkler lines to avoid heating, ventilating, and air conditioning trenches; electric ducts; storm and sanitary sewer lines; and existing water and gas mains; all of which have the right of way.
- C. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking, auger boring, or by tunneling. Repair or replace any cracked concrete, due to settling, during the warranty period.

- D. Do not lay pipe on unstable material, in wet trenches or, in the opinion of Project Manager/Contracting Officer's Technical Representative, when trench or weather conditions are unsuitable for work.
- E. Allow a minimum of 3 inches (80 mm) between parallel pipes in the same trench.
- F. Clean the interior portion of pipe and fittings of foreign matter before installation. Securely close open ends of pipe and fittings with caps or plugs to protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- G. The full length of each section of pipe shall rest upon the pipe bed with recesses excavated to accommodate bells or joints. Do not lay pipe on wood blocking.
- H. Hold pipe securely in place while joint is being made.
- I. Do not work over, or walk on, pipe in trenches until covered by layers of earth, well tamped, in place to a depth of 12 inches (300 mm) over pipe.
- J. Irrigation lines and control wire in cemetery applications shall run at boundaries of graves, through designated utility lanes or beside roadways so that any gravesite may be opened in the future without disruption of the irrigation system.
- K. Irrigation lines and control wire shall run through designated utility lanes or beside roadways where possible.
- L. Connect new system to existing mains.
- M. Concrete thrust blocks shall be installed where the irrigation main changes direction at "L" and "T" locations and where the irrigation main terminates. Pressure tests shall not be made for a period of 36 hours following the completion of pouring of the thrust blocks. Concrete thrust blocks for supply mains shall be sized and placed in strict accordance with the pipe manufacturer's specifications and shall be of an adequate size and so placed as to take all thrust created by the maximum internal water pressure.
- N. Minimum cover over water mains shall be 30 inches (750 mm). Cover laterals to minimum depth of 24 inches (600 mm).
- O. Warning tape shall be continuously placed 12 inches (300 mm) above sprinkler system water mains and laterals.

**3.3 PLASTIC PIPE INSTALLATION**

- A. Plastic pipe shall be snaked in trench at least 1 foot per 100 feet (1 meter to 100 meters) to allow for thermal construction and expansion and to reduce strain on connections.
- B. Joints
  - 1. Solvent Welded Socket Type: ASTM D2855.
  - 2. Threaded Type: Apply liquid teflon thread lubricant of teflon thread type. After joint is made hand tight (hard), a strap wrench should be used to make up to two additional full turns.
  - 3. Elastomeric Gasket: ASTM F477.

**3.4 EMITTER HOSE INSTALLATION**

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

**3.5 SLEEVE INSTALLATION**

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

**3.6 VALVE INSTALLATION**

- A. Locations of remote control valves are schematic. Remote control valves shall be grouped wherever possible and aligned at a set dimension back of curb along roads.
- B. No valves shall be set under roads, pavement or walks.
- C. Clean interior of valves of foreign matter before installation.
- D. Pressure control valves installed adjacent to remote control valve shall be housed in the same valve box.
- E. Set valve box cover flush with finished grade.
- F. Control valves shall never be less than 3 inches (80 mm) below finished grade.

**3.7 SPRINKLER AND QUICK COUPLER INSTALLATION**

- A. Sprinkler heads and quick couplers shall be placed on temporary nipples extending at least 3 inches (80 mm) above finished grade. After turf is established, remove temporary nipples, ensuring that no dirt or foreign

matter enters outlet, and install sprinkler heads and quick couplers at ground surface as detailed.

- B. Place part circle rotary sprinkler heads no more than 6 inches (150 mm) from edge, of and flush with top of adjacent walks, header boards, curbs, and mowing aprons, or paved areas at time of installation.
- C. Install all sprinklers, shrub sprays and quick couplers on swing joints, as detailed on plans.
- D. Set shrub heads 8 inches (200 mm) above grade and 1 foot (300 mm) from edge of curb or pavement. Place adjacent to walls. Stake heads prior to backfilling trenches. Support stakes to be parallel to riser.
- E. Each sprinkler section shall drain to waste valves placed at lowest elevation points in the system. Waste valves shall discharge to drainage pits composed of three 1 foot (300 mm) long vertical sections of 24 inch (600 mm) diameter sewer pipe placed under the lawn areas. Fill pipe with gravel and cover with 2 inch (50 mm) precast concrete cover before backfilling. Waste valves may also discharge to storm sewers, where available.

### **3.8 DRIP IRRIGATION SPECIALTY INSTALLATION**

- A. Install to match existing.

### **3.9 AUTOMATIC IRRIGATION - CONTROL SYSTEM INSTALLATION**

- A. Install interior controllers on to match existing.

### **3.10 CONTROL WIRE INSTALLATION**

- A. Wiring from master controllers to satellites and stub cuts for future extension shall be located in trench with new mains or in separate trench at back of curb, unless cross-country route is shown. Locate in trench with mains when possible on cross-country routes.
- B. Wiring bundles located with piping shall be set with top of the bundle 2 inches (50 mm) below bottom of the pipe. No two wires in any bundle shall be of the same color. Wires shall be bundled, and tied or taped at 15 foot (4.5 m) intervals. A numbered tag shall be provided at each end of a wire, i.e., at valve, at field located controllers and at master controller. The wires at each end of wire to be the same in number and color.
- C. Splicing shall be held to a minimum. A pullbox shall be provided at each splice. No splices will be allowed between field located controllers and remote control valves.

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

### **3.11 TRACER WIRE INSTALLATION**

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

### **3.12 FIELD TEST AND QUALITY CONTROL**

- A. Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Tests and Inspections:
  - 1. Pressure test lines before joint areas are backfilled. Backfill a minimum of 12 inches (300 mm) over the pipe to maintain pipe stability during test period. Test piping at hydraulic pressure of 150 psi (1025 kPa) for two hours. Maximum loss shall be 0.8 gallons/inch pipe diameter/1,000-feet (3 L/25 mm pipe diameter/300 m). Locate pump at low point in line and apply pressure gradually. Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping. Inspect each joint and repair leaks. Line shall be retested until satisfactory.
  - 2. After testing, flush system with a minimum of 150 percent of operating flow passing through each pipe beginning with larger mains and continuing through smaller mains in sequence. Flush lines before installing sprinkler heads and quick couplers.
  - 3. After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.

4. After electrical circuitry has been energized and final adjustment of the sprinkler heads to permanent level at ground surface is complete, test each sprinkler section by the pan test and visual test to indicate a uniform distribution within any one sprinkler head area and over the entire area. Operate controllers and automatic control valves to demonstrate the complete and successful installation and operation of all equipment.

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

D. Prepare test and inspection reports.

### **3.13 ADJUSTMENTS**

A. Adjust settings of controllers.

B. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

C. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than match existing above, finish grade.

### **3.14 DEMONSTRATION AND DOCUMENTATION**

A. Prior to final acceptance, verbal instructions, for a period of not less than 8 hours, shall be provided to the operating personnel. Provide 2 additional years of software support for one hour each month.

B. Program controller and satellites according to approved irrigation schedule.

C. Follow manufacturer's instructions for installation.

D. Manufacturer of Control Systems shall certify control system is complete, including all related components, and totally operational. Submit certificate to Project Manager/Contracting Officer's Technical Representative.

E. Maintain and provide a complete set of as built drawings which shall be corrected daily to show changes in locations of all pipe, valves, pumps and related irrigation equipment. Valves shall be shown with dimensions to reference points.

F. Controller Drawings and Zone Chart(s):

1. Prepare in digital format a drawing mapping the location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. Digital

formatted "as built" drawings must be approved before controller zone charts are prepared.

2. Provide one controller zone chart for each automatic controller showing the area covered by the controller. The chart shall be a reduced drawing of the actual "as built" system and fit the maximum size controller door will allow. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.
3. The final irrigation "as built" drawings shall be submitted in digital format with a different color code used to show area of coverage for each station. All drawings and zone charts must be completed and approved prior to final inspection of the irrigation system.

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**VAMC WACO, TEXAS****SECTION 32 90 00  
PLANTING****PART 1 - GENERAL****1.1 DESCRIPTION**

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

**1.2 EQUIPMENT**

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. Section 31 20 11, EARTH MOVING, Stripping Topsoil.
- B. Section 01 45 29, TESTING LABORATORY SERVICES, Topsoil Testing.
- C. Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- D. Section 31 20 11, EARTH MOVING, topsoil.

**1.4 SUBMITTALS**

- A. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the Project Manager/Contracting Officers Technical Representative (PM/COTR) for approval:
  - 1. Fertilizers.
  - 2. Sod
  - 3. Mulch
- B. Soil laboratory testing results and any soil amendment recommendations from the Contractor.

**1.5 DELIVERY AND STORAGE**

- A. Delivery:
  - 1. Notify the Project Manager/Contracting Officers Technical Representative (PM/COTR) of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.
  - 2. Deliver fertilizer to the site in the original, unopened containers bearing the manufacturer's warranted chemical analysis, name, trade name or trademark, and in conformance to state and federal law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.

3. 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.

C. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than 6 hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock: Soak roots that are in dry condition in water for two hours. Reject dried-out plants.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet, condition.

#### **1.6 PLANTING AND TURF INSTALLATION SEASONS AND CONDITIONS**

- A. Perform operations at any time of the year, but not before existing or new irrigation system is tested, and approved.
- B. 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 Project Manager/Contracting Officers Technical Representative (PM/COTR) stating the special conditions and proposal variance.

#### **1.7 PLANT AND TURF ESTABLISHMENT PERIOD**

A. The Establishment Period for turf shall begin immediately after installation, with the approval of the Project Manager/Contracting Officers Technical Representative (PM/COTR), and continue until the date that the Government accepts the project or phase for beneficial use and occupancy. During the Plant and Turf Establishment Period the Contractor shall:

1. Water all turf to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of 25 mm

(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 or flood the plants and turf.

2. Provide the following turf establishment:
  - a. Eradicate all weeds. Water, fertilize, overseed, and perform any other operation necessary to promote the growth of grass.
  - b. Replant areas void of turf 0.1 m<sup>2</sup> (one square foot) and larger in area.
  - c. Mow the new lawn at least three times prior to the final inspection. Begin mowing when grass is 4 inches high. Mow to a 2-1/2 inch height.

### **1.8 PLANT AND TURF WARRANTY**

- A. All work shall be in accordance with the terms of the Paragraph, "Warranty" of FAR clause 52.246-21, including the following supplements:
  1. A One Year Plant and Turf Warranty will begin on the date that the Government accepts the project or phase for beneficial use and occupancy. The Contractor shall have completed, located, and installed turf and plants according to the plans and specifications. All plants and turf shall be expected to be living and in a healthy condition at the time of final inspection.
  2. The Contractor will replace any areas void of plants and turf immediately. A one year warranty for the turf that was replaced, will begin on the day the work is completed.
  3. The Government will reinspect all plant and turf at the end of the One Year Warranty. The Contractor will replace any dead, missing, or defective plant and turf immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the work required by this specification. The Contractor shall also comply with the following requirements:
    - a. Replace dead, missing or defective plant material prior to final inspection.
    - b. Complete remedial measures directed by the Project Manager/Contracting Officers Technical Representative (PM/COTR) to ensure plant and turf survival.
    - c. Repair damage caused while making plant or turf replacements.

### **1.9 APPLICABLE PUBLICATIONS**

- A. The publications listed below, form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation only.

- B. American National Standards Institute (ANSI) Publications:  
ANSI Z60.1-04.....Nursery Stock
- C. Hortus Third, A Concise Dictionary of Plants Cultivated in the U.S. and Canada.
- D. Turfgrass Producers International:  
Turfgrass Sodding.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

All turf 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 PLANTS**

- A. Plants shall be in accordance with ANSI Z60.1, except as otherwise stated in the specifications or shown on the plans. Where the drawings or specifications are in conflict with ANSI Z60.1, the drawings and specification shall prevail.
- B. Provide 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 vines and ground cover plants well established in removable containers, integral containers, or formed homogeneous soil sections. Plants shall have been grown under climatic conditions similar to those in the locality of the project. Spray all plants budding into leaf or having soft growth with an anti-desiccant at the nursery before digging.
- 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 Project Manager/Contracting Officers Technical Representative (PM/COTR), 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.
- D. Ground cover and vine plants: Provide the number and length of runners for the size specified on the Drawings, together with the proper age for the grade of plants specified. Provide vines and ground cover plants well established in removable containers, integral containers, or formed homogeneous soil sections. Plants

shall have been grown under climatic conditions similar to those in the locality of the project. Spray all plants budding into leaf or having soft growth with an anti desiccant at the nursery before digging.

- E. Container grown plants shall have sufficient root growth to hold the earth intact when removed from containers, but shall not be root bound.
- F. Make substitutions only when a plant (or its alternates as specified) is not obtainable and the \_\_\_\_\_ authorizes a change order providing for use of the nearest equivalent obtainable size or variety of plant having the same essential characteristics with an equitable adjustment of the contract price.

### **2.3 LABELS**

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.

### **2.4 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 25 mm (one 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 5.0 nor more than 7.5.
- 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 Project Manager/Contracting Officers Technical Representative (PM/COTR) 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.

**2.5 TURF FERTILIZER**

Provide turf 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 18 nitrogen (of which 50 percent shall be organic), 24 available phosphoric acid, and 6 potash. Liquid starter fertilizer for use in the hydro seed slurry will be commercial type with 50 percent of the nitrogen in slow release form.

**2.6 WATER**

Water shall not contain elements toxic to plant life. It shall be obtained as specified in Section 01 00 00, GENERAL REQUIREMENTS, paragraph.

**1.2 SOD**

A. Sod: Certified Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding". Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.

- 1. Sod Species: Grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed: St. Augustinegrass (*Stenotaphrum secundatum*).

**.2.8 PLANTING**

Groundcover shall be nursery grown certified planting as classified in the TPI Guideline Specifications to Planting. The composition of the plant species in the groundcover shall be as follows:

(Botanical and Common Name)  
 Confederate Jasmine,  
*Trachelospermum Jasminoides*, 100%.

Quality shall conform to ASPA Guideline Specifications for Planting.

**PART 3 - EXECUTION**

**3.1 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 turf before excavations are made in a manner that will protect turf areas. Barricade existing trees, shrubbery, and beds that are to be preserved in a manner that will effectively protect them during the project construction.

- 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 Project Manager/Contracting Officers Technical Representative (PM/COTR) may select other locations for plant material.
- C. Treat ground cover bed areas, prior to mulching, with an approved pre-emergent herbicide. Plant ground cover in areas to receive erosion control material through the material after material is in place.

### **3.2 SETTING PLANTS**

- A. Handle container-grown plants only by the 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. Add slow release packet, tablet or pellet fertilizer as each plant is installed as per manufacturer's recommendation for method of installation and quantity.

### **3.3 TILLAGE FOR TURF AREAS**

Thoroughly till the soil to a depth of at least 100 mm (4 inches) by scarifying, disking, harrowing, or other approved methods. This is particularly important in areas where heavy equipment has been used, and especially under wet soil conditions. Remove all debris and stones larger than 25 mm (one 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 50 mm (one inch) depth and remove debris and stones.

### **3.4 FINISH GRADING**

After tilling the soil for bonding of topsoil with the subsoil, spread the topsoil evenly to a minimum depth of 6 mm (inches). Incorporate topsoil at least 50 to 75 mm (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.

### 3.5 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across angle of slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with biodegradable staples spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently until sod is established.

### 3.6 GROUND COVER AND PLANT INSTALLATION

- D. Set out and space ground cover and plants other than trees, shrubs, and vines 9 inches (225 mm) apart in even rows with triangular spacing.
- E. Use planting soil for backfill.
- F. Dig holes large enough to allow spreading of roots.
- G. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- H. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- I. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- J. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
- K. Plant ground cover in areas to receive erosion control materials through the material after erosion control materials are in place.

**3.7 WATERING**

Apply water to the turf areas immediately following installation at a rate sufficient to ensure thorough wetting of the soil to a depth of at least 100 mm (4 inches). Supervise watering operation to prevent run-off. Supply all pumps, hoses, pipelines, and sprinkling equipment. Repair all areas damaged by water operations.

**3.7 PROTECTION OF TURF AREAS**

Immediately after installation of the turf areas, protect against traffic or other use by erecting barricades, as required, and placing approved signs at appropriate intervals until final acceptance.

**3.8 RESTORATION AND CLEAN-UP**

Where existing or new turf areas have been damaged or scarred during planting and construction operations, restore disturbed area to their original condition. Keep at least one paved pedestrian access route to each building clean at all times. In areas where turf work have been completed, clear the area of all debris, spoil piles, and containers. Clear all other paved areas when work in adjacent areas is completed. Remove all debris, rubbish and excess material from the medical center.

**3.9 ENVIRONMENTAL PROTECTION**

All work and Contractor operations shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

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