

Exhibit 2.2: Reference Specifications

**SECTION 32 31 13
CHAINLINK FENCES AND GATES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Order and furnish all labor, materials, supplies, tools, and transportation and perform all operations in connection with and incidental to complete installation of the chain link fencing, gates and concrete footings as shown on the Drawings. Items hereinafter are included as an aid to take-off, and are not necessarily a complete list of work items.

1.02 SCOPE OF WORK

- A. Summary: This section covers the work necessary to complete the chain link fence and gate installation.
- B. General: Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement. Major components including but not limited to Fence Framework and Chain-link Fabric shall be manufactured in the U.S.A.
- C. Delivery, Storage and Handling: Deliver material to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

1.03 SUBMITTALS AND MILL CERTIFICATION

- A. Shop Drawings: Include complete details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details.
- B. Product Data: Provide manufacturer's catalog cuts with printed specifications. Manufacturer shall provide certification of compliance with material specifications. Actual samples of the material may be requested.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers
 - 1. Anchor Fence or approved equal
- B. Framework: Steel pipe conforming to Standard Specification ASTM F1043 Group IA (Schedule 40); external coatings per F1043 Type A; internal coatings Type A, or high strength steel pipe triple coated per Standard Specification ASTM F1043 Group IC; external coatings per F1043 Type B; internal coatings per F1043 Type D. All

coatings to be applied after welding. Pipe shall be straight, true to section and conform to the following weights:

Pipe Size	Group IA	Group IC	Outside Diameter	Weight Lbs./Ft.	Weight Lbs./Ft.
1-5/8"	2.27	1.84			
1-7/8"	2.72	2.28			
2-3/8"	3.65	3.12			
2-7/8"	5.79	4.64			
3-1/2"	7.58	5.71			
4"	9.11	6.56			
6-5/8"	18.97	--			
8-5/8"	24.70	--			

- C. Fabric: Aluminized fabric shall be manufactured in accordance with ASTM A491 and coated before weaving with a minimum of 0.4 ounces of aluminum per square foot of surface area. The steel wire and coating shall conform to ASTM A817. Fabric to be 9 gauge woven in a 2" diamond mesh. Top selvage to be twisted and barbed. Bottom selvage to be knuckled unless otherwise specified. Zinc-coated fabric shall be galvanized after weaving with a minimum 1.2 ounces of zinc per square foot of surface area and conform to ASTM A392, Class 1. Fabric to be 9 gauge wire woven in a 2" diamond mesh. Top selvage to be twisted and barbed, bottom selvage to be knuckled unless otherwise specified.

2.02 CONCRETE MIX

- A. Concrete conforming to ASTM C 94, having a minimum compressive strength of 3,000 PSI at 28 days.

2.03 COMPONENTS

- A. Fence Posts:

Group IA or IC Fabric Line Post Terminal Post Height O.D. O.D.
Under 6' 1-7/8" 2-3/8"
6' to 9' 2-3/8" 2-7/8"
9' to 12' 2-7/8" 4"

- B. Swing Gate Posts:

Single Gate or Double Gate Post O.D. Width Group IA or IC
Up to 6' Up to 12' 2-7/8"
7' to 12' 13' to 24' 4"
13' to 18' 25' to 36' 6-5/8" Group IA
Over 18' Over 36' 8-5/8" Group IA

- D. Rails and Braces: 1-5/8" O.D. Group IA or IC.

- E. Gates: Frame assembly of 1-7/8" O.D. pipe Group IA or IC with welded joints. Weld areas repaired with zinc-rich coating applied per manufacturer's directions. Fabric to

match fence. Gate accessories, hinges, latches, center stops, keepers and necessary hardware of quality required for industrial and commercial application. Latches shall permit padlocking.

F. Fittings:

1. Post Caps – Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply dome style caps for terminal posts and loop type for line posts. All fittings to conform to ASTM F626.
2. Rail and Brace Ends – Pressed steel, cast iron or cast aluminum alloy, cup shaped to receive rail and brace ends.
3. Top Rail Sleeves – Tubular steel, 0.051 thickness x 7" long, expansion type.
4. Tension Bars – Steel strip, 5/8" wide x 3/16" thick.
5. Tension Bands – Pressed steel, 14 gauge thickness x 3/4" wide.
6. Brace Bands – Pressed steel, 12 gauge thickness x 3/4" wide.
7. Truss Rods – Steel rod, 3/8" diameter merchant quality with turnbuckle (take up).
8. Barbed Wire Arms – Pressed steel, cast iron or cast aluminum alloy fitted with clips or slots for attaching three strands of barbed wire. Arms shall be set outward on a 45 degree angle and be capable of supporting a 250 pound load at outer barbed wire connecting point without causing permanent deflection.

G. Tension Wire: Marcellled 7 gauge steel wire with minimum coating of 0.80 ounces of zinc or 0.40 ounces of aluminum per square foot of wire surface and conforming to ASTM A824.

H. Tie Wires: Aluminum, 9 gauge, alloy 1100-H4 or equal.

I. Hog Rings: Steel wire, 11 gauge, with a minimum zinc coating of 0.80 ounces per square foot of wire surface.

J. Barbed Wire: If required, commercial quality steel, 12-1/2 gauge, two strand twisted line wire with 4 point barbs at 5 inch spacing. Coating shall consist of a minimum of 0.80 ounces of zinc per square foot of wire surface conforming to ASTM A121 or a minimum of 0.30 ounces of aluminum per square foot of wire surface conforming to ASTM A585.

K. Barbed Tape: If required, options are available in ASTM F1910 Table 1 and 2.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. General: Installation to conform to ASTM F567.
- B. Height: Provide height as indicated on contract drawings.
- C. Post Spacing: Space line posts at intervals not exceeding ten feet.
- D. Post Setting: Set terminal, gate and line posts plumb in concrete footings. Top of footing to be 2" above grade and sloped to direct water away from posts.
- E. Bracing: Brace Gate and terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.
- F. Top Rail: Install through line loop caps connecting sections with sleeves to form a continuous rail between terminal posts.
- G. Top Tension Wire: When top rail is omitted, stretch tension wire through loop caps and fasten to terminal posts.
- H. Bottom Tension Wire: Stretch between terminal posts 6" above grade and fasten to outside of line posts with tie wires.
- I. Fabric: Pull fabric taut with bottom selvage 2" above grade. Fasten to terminal posts with tension bars threaded through mesh and secured with tension bands at maximum 15" intervals. Tie to line posts and top rails with tie wires spaced at maximum 12" on posts and 24" on rails. Attach to bottom tension wire with top rings at maximum 24" intervals.
- J. Barbed Wire: Anchor to terminal extension arms, pull taut and firmly install in slots of line post extension arms.
- K. Gates: Install gates plumb, level and secure for full opening without interference. Anchor center stops and keepers in concrete.
- J. Fasteners: Install nuts for fittings, bands and hardware bolts on inside of fence.

3.02 COMPLETION

- A. The area of installation shall be left free of debris caused by the installation of the fence

END OF SECTION

**SECTION 32 84 00
PLANTING IRRIGATION**

PART 1 - GENERAL

1.01 DESCRIPTION

An automatically-controlled irrigation system, complete, including piping, backflow preventer, booster pump, sprinkler heads, valves, controls, control wiring, fittings, electrical connections and necessary accessories.

1.02 RELATED WORK

- A. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Maintenance of Existing Utilities: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Excavation, Trench Widths, Pipe Bedding, Backfill, Shoring, Sheeting, Bracing: Section 31 20 00, EARTH MOVING.
- D. Protection of Materials and Equipment: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION / Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING / Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION/ /.
- E. Division 26, ELECTRICAL.
- F. Section 32 90 00, PLANTING
- G. Section 01 81 11 Sustainable Design Requirements

1.03 QUALITY ASSURANCE

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

- b. Components are compatible with each other and with the total assembly for the intended service.
 3. Nameplates: Nameplate bearing manufacturer's name or identification trademark securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped, or otherwise permanently marked on each item of equipment.
- C. System Requirements:
 1. Full and complete coverage is required. Contractor shall, at no additional cost to the Government, make necessary adjustments to layout required to achieve full coverage of irrigated areas without overthrow on roadways, sidewalks, window wells, or buildings and to protect trees from close high spray velocity.
 2. Layout work as closely as possible to drawings. Drawings are diagrammatic to the extent that swing joints, offsets and all fittings are not shown. Lines are to be common trenched wherever possible.
 3. Locations of remote control valves is schematic. Remote control valves shall be grouped wherever possible and aligned at a set dimension back of curb along roads.
 4. Irrigation lines and control wire shall run through designated utility lanes or beside roadways where possible.
- D. Maintenance and Operating Instructions: Prior to final acceptance, provide manuals as specified in Section 01 00 00, GENERAL REQUIREMENTS.
- E. Completely program controller according to an appropriate irrigation schedule for establishment of plant material.
- F. Follow manufacturer's instructions for installation.
- G. Manufacturer of Control Systems to certify Control System is complete, including all related components, and totally operational. Submit certificate to Resident Engineer.
- H. As-Built Record Drawings: Maintain a complete set of as-built drawings which shall be corrected daily to show changes in locations of all pipe, valves, pumps and related irrigation equipment. Valves shall be shown with dimensions to reference points.
- I. Controller Chart:
 1. Prepare a map diagram showing location of all valves, lateral lines, and route of the control wires. Identify all valves as to size, station, number and type of irrigation. "As-built" drawings must be approved before charts are prepared.
 2. Provide one controller chart showing the area covered by controller for each automatic controller supplied at the maximum size controller door will allow. Chart shall be a reduced drawing of the actual "as-built" system. If controller sequence is not legible when the drawing is reduced to door size, the drawing shall be enlarged to a size that is readable and placed folded, in a sealed plastic container, inside the controller door.

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

1.04 SUBMITTALS

- A. Submit as one package in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers' Literature and Data:
 1. Piping.
 2. Jointing materials.
 3. Valves.
 4. Backflow preventer.
 5. Automatic control equipment.
 6. Sprinkler heads.
 7. Bubblers
 8. Quick couplers.
 9. Valve boxes.
 10. Wire.
 11. Wire splice sealant packs.
 12. Solvent cement and primer.
 13. Pipe thread sealant.
 14. PVC fittings and nipples.
 15. Flex risers.
 16. Ductile iron fittings.
 17. Joint restraints.
 18. Air release valves.
 19. Booster pump.
- C. Name and address of a permanent service organization maintained or trained by the manufacturers that will render satisfactory service within eight hours of receipt of notification that service is requested.
- D. Reproducible "as-built" drawings.
- E. After "as-built" drawings have been approved, submit print of controller chart.
- F. LEED credit documentation

1.05 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):

- AA-60005 Frames, Covers, Gratings, Steps, Sump And Catch Basin,
Manhole
- C. American National Standard Institute (ANSI):
 - B40.1-98..... Gauges-Pressure Indicating Dial Type-Elastic Element
- D. American Society of Sanitary Engineers (ASSE):
 - 1013-2005 Reduced Pressure Principle Backflow Preventers
- E. American Society for Testing and Materials (ASTM):
 - B61-02..... Steam or Valve Bronze Castings
 - B62-02..... Composition Bronze or Ounce Metal Castings
 - D1785-04a..... Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40, 80, and
120
 - D2241-04b..... Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
 - D2287-96(2001) Nonrigid Vinyl Chloride Polymer and Copolymer Molding and
Extrusion Compounds
 - D2464-99e1..... Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings,
Schedule 80
 - D2466-05..... Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 - D2564-04..... Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping
Systems
 - D2855-96(2002) Making Solvent Cemented Joints with Poly(Vinyl Chloride) (PVC)
Pipe and Fittings
 - F477-02e1 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- F. National Electrical Manufacturers Association (NEMA):
 - 250-2003 Enclosures for Electrical Equipment (1000 Volts Maximum);

PART 2 - PRODUCTS

2.01 PIPING

- A. Irrigation Mains:
 - 1. Polyvinyl Chloride (PVC) Pressure Pipe, PVC 1120, working pressure 1025 kPa (150 psi).
Pipe shall be solvent weld.
- B. Irrigation Laterals: Polyvinyl Chloride, ASTM D2241, PVC 1120, SDR 21, solvent welded.
- C. Threaded Pipe: Polyvinyl Chloride, ASTM D1785, PVC 1120, Schedule 80, for threaded connections, risers and swing joints.
- D. Fittings:
 - 1. Irrigation Mains: 2 ½" and smaller: Solvent weld, ASTM D2466, and threaded Schedule 80 PVC.

2. Irrigation Mains: 3" and larger: Ductile iron O-ring with joint restraint system.
3. Irrigation Laterals: PVC, schedule 40, solvent welded socket type, ASTM D2466.
4. Threaded Pipe: PVC, schedule 80, ASTM D2464.
5. Threaded Pipe: Brass.
6. Swing Joints: Threaded fittings that allow rotation as detailed on Drawings.

E. Jointing Materials:

1. Irrigation Mains and Laterals: Solvent cement, ASTM D2564.
2. Pipe thread sealant as specified on Drawings.

2.02 VALVES (EXCEPT REMOTE CONTROL VALVES)

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

1. Gate valves: Iron body, bronze mounted, double disc with parallel or inclined seats, non-rising stem turning clockwise to close, 1025 kPa (150 psi) minimum working pressure. AWWA C504.

B. Operations:

1. Ends of valves shall accommodate the type of pipe installed.

2.03 VALVE BOX

A. Remote Control Valves: In planter areas, valve boxes shall be HDPE structural foam Type A, Class III, green in color. Box shall be minimum 475 mm (19 inches) long by 350 mm (14 inches) deep with bolt-down cover. 910 Round box for gate valves and quick coupler valves.

1. After installation, label boxes with two 80 mm (3 inch) size stencils designated controller and circuit numbers with permanent white epoxy paint. Numbers shall be placed at center of valve cover and shall face nearest main road or service road.
2. Furnish two (2) 750 mm (30 inch) long valve adjustment keys.

2.04 BACKFLOW PREVENTER

Provide reduced pressure principle backflow preventer in each new connection to existing water distribution system, ASSE 1013, except pressure drop at design flow shall not exceed 70 kPa (10 psi).

2.05 WATER METER

A. Furnished and set by Public Service Company (see Civil drawings).

2.06 AUTOMATIC CONTROL EQUIPMENT—INDEPENDENT ELECTRIC CONTROLLER

- A. Overall control concept: The electric automatic control system shall consist of one controller which operates individual remote control valves in accordance with timing schedules programmed into the independent unit. The location of the controller is shown on the drawings.
- B. 6 independent programs.
- C. Three hundred sixty-five (365) day clock/calendar.
- D. Station run times of one (1) minute to six (6) hours in one (1) minute increments.

- E. 10 total start times per program.
- F. Season adjust global by user, individually by program, and automatic by Solar Sync weather sensor.
- G. Rain delay programmable.
- H. Automatic, semi-automatic, and manual and timed-manual operation.
- I. Two-wire decoder system with field programmable decoders.
- J. Lightning surge protection.
- K. Self-diagnostic circuit breakers that identify and override electrical malfunction of valves.
- L. Non-volatile memory to retain program during power failures of any duration.
- M. Sensor hook-up with sensor override.
- N. Weather-resistant, locking metal cabinet with heavy duty internal transformer.

2.07 REMOTE CONTROL VALVES:

- A. Each sprinkler section shall be automatically operated by a remote control valve installed underground and operated by a 24-volt AC electric solenoid. Valves shall be globe type of heavy duty construction and shall have manual shut-off and flow control adjustment and provide for manual operation. Install valves with unions on each side to allow for easy removal. Valves shall have a minimum of 1025 kPa (150 psi) working pressure.
- B. Valves shall be of all brass construction furnished as straight pattern type.
- C. Valves shall be completely serviceable from the top without removing valve body from the system.

2.08 SPRINKLER HEADS

- A. Shall be of make, type and performance as indicated on drawings. The entire internal assembly including filter screen, to be capable of removal from the top without removing the sprinkler case from the riser.
- B. Shrub and Lawn Spray Heads: Nozzle shall be pop-up as noted on plans. The sprinkler body, stem, nozzle and screen shall be constructed of heavy-duty, ultraviolet resistant plastic. It shall have a heavy duty stainless steel retract spring and a ratcheting system for alignment of the pattern. The sprinkler shall have a soft elastomer pressure-activated co-molded wiper seal for cleaning debris from the pop-up stem. The sprinkler shall have a plastic or brass nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing protective, non-clogging filter screens.

2.09 QUICK COUPLERS

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

- D. Furnish two (2) hose swivels and operating keys for each size coupler to the Resident Engineer.

2.10 LOW VOLTAGE CONTROL VALVE WIRE

Wire: Solid copper wire, Underwriters Laboratories Inc. approved for direct burial in ground. Size of wire shall be in accordance with manufacturer's recommendations, but in no case less than No. 14. Decoder cable shall consist of two wires, twisted together, solid copper conductors with extra thick PE insulation with a minimum wall thickness of 0.060".

2.11 SPLICING MATERIALS: EPOXY WATERPROOF SEALING PACKET.

3M-DBY seal packs.

2.12 SLEEVE MATERIAL

PVC-1120-5DR 17, Class 200 PVC.

2.13 WARNING TAPE

- A. Standard, 4-Mil polyethylene 76 mm (3 inch) wide tape, detectable type blue with black letters (if potable water) and imprinted with "CAUTION BURIED IRRIGATION WATER LINE BELOW".

B. TRACER WIRES

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

PART 3 - EXECUTION

3.01 PIPE LAYING - GENERAL

- A. Do not lay pipe on unstable material, in wet trench or when, in the opinion of Resident Engineer, trench or weather conditions are unsuitable for the work.
- B. Allow a minimum of 80 mm (3 inches) between parallel pipes in the same trench.
- C. Hold pipe securely in place while joint is being made.
- D. Do not work over, or walk on, pipe in trenches until covered by layers of earth well tamped in place to a depth of 300 mm (12 inches) over pipe.
- E. 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.
- F. Install sprinkler lines to avoid heating trenches, electric ducts, storm and sanitary sewer lines, and existing water and gas mains, all of which have right of way.
- G. Clean interior of pipe of foreign matter before installation. Keep pipe clean during laying operations by means of plugs or other methods. When work is not in progress, securely close open ends of pipe and fittings to prevent water, earth, or other substances from entering.
- H. Minimum cover over water mains shall be 450 mm (18 inches). Control valves shall never be less than 80 mm (3 inches) below finished grade. Cover laterals to minimum depth of 300mm (12 inches). See Drawings for specific depth of cover as required for various types and sizes of pipe.

- I. Existing sidewalks and curbs shall not be cut during trenching and installation of pipe. Install pipe under sidewalks and curbs by jacking, auger boring, or by tunneling. Repair or replace any concrete that cracks, due to settling, during the warranty period.
- L. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water and chemical or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- M. Warning tape shall be continuously placed 300 mm (12 inches) above sprinkler system water mains and laterals.

3.02 LAYING PLASTIC PIPE

- A. Shall be snaked in trench at least 1 meter to 100 meters (1 foot per 100 feet) to allow for thermal construction and expansion and to reduce strain on connections.
- B. Joints
 - 1. Solvent Welded Socket Type: ASTM D2855.
 - 2. Threaded Type: Apply liquid teflon thread lubricant of teflon thread type. After joint is made hand tight (hard), a strap wrench should be used to achieve pipe and fitting manufacturer's recommended tightness. Do not over-tighten.

3.03 INSTALLATION OF SPRINKLERS AND QUICK COUPLERS

- A. Install all spray sprinklers and quick couplers on swing joints as detailed on plans.
- B. Install sprinklers and quick coupling valves on a swing joint assembly.

3.04 INSTALLATION OF CONTROL WIRING

- A. Wiring from controllers to valves 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 located with piping shall be set with top of the wires below top of the pipe. Wires shall be bundled, and tied or taped at 4.5 m (15 foot) intervals. A numbered tag shall be provided at each end of a wire, i.e., at valve and at controller. The number at each end of wire to be the same.
- C. Splicing shall be held to a minimum. No splices will be allowed between field located controllers and remote control valves.
- D. Provide 300 mm (12 inch) expansion loops in wiring at each wire connection or change in wire direction. Provide 600 mm (24 inch) loop at remote control valves/decoders.
- E. Power wiring for the operation of irrigation system shall not be run in same conduit as control wiring.

3.07 Tracer Wire installation

- A. Tracer wire shall be installed on bottom of trench, adjacent to vertical pipe projections, carefully installed to avoid stress from backfilling, and shall be continuous throughout length of pipe with spliced joints soldered and covered with insulation type tape.

- B. Tracer wire shall follow main line pipe and branch lines and terminate in yard box with gate valve controlling these main irrigation lines. Provide sufficient length of wire to reach finish grade, bend back end of wire to make a loop and attach a Dymo-Tape type plastic label with designation "Tracer Wire."
- C. Record locations of tracer wires and their terminations on project record documents.

3.08 SETTING OF VALVES

- A. No valves shall be set under roads, pavement or walks.
- B. Clean interior of valves of foreign matter before installation.
- C. Set valve box cover flush with finished grade.

3.09 SLEEVING

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

3.10 TEST AND FLUSHING

- A. Pressure Test: Pressure test lines before joint areas are backfilled. Backfill a minimum of 300 mm (12 inches) over the pipe to maintain pipe stability during test period.
 - a. Test live (constant pressure) and QCV lines hydrostatically at 125 PSI minimum. Lines will be approved if test pressure is maintained for six (6) hours. The lines shall be restored to the original test pressure and the amount of water required to do so shall be measured. Approved tables of allowable loss will be consulted, and the line will be approved or not approved as such results may indicate. The Contractor shall make tests and repairs as necessary until test conditions are met.
 - b. Test RCV controlled lateral lines with water at line pressure and visually inspect for leaks. Retest after correcting defects.

Locate pump at low point in line and apply pressure gradually. Install pressure gage shut-off valve and safety blow-off valve between pressure source and piping. Inspect each joint and repair leaks. Line shall be retested until satisfactory.
- B. Flushing: After testing, flush system with a minimum of 150 percent of operating flow passing through each pipe beginning with larger mains and continuing through smaller mains in sequence. Flush lines before installing sprinkler heads and quick couplers.
- C. Operation Test: Upon completion of the final adjustment of the sprinkler heads to permanent level at ground surface, test each sprinkler section by the visual test to indicate a uniform distribution within any one sprinkler head area and over the entire area. Operate the entire installation to demonstrate the complete and successful operation of all equipment.

3.11 CLEAN-UP

When work of this section has been completed and at such other times as may be directed, remove all trash, debris, surplus materials and equipment from site.

--- E N D ---

**SECTION 32 90 00
PLANTING**

PART 1 - GENERAL

1.01 DESCRIPTION

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

1.02 EQUIPMENT

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

1.03 RELATED WORK

- A. Section 31 20 00, EARTH MOVING, Stripping Topsoil and Stock Piling.
- B. Section 01 45 29, TESTING LABORATORY SERVICES, Topsoil Testing.
- C. Section 31 20 00, EARTH MOVING, Topsoil Materials.
- D. Section 32 84 00, PLANTING IRRIGATION.
- E. Section 01 81 11 Sustainable Design Requirements

1.04 SUBMITTALS

- A. 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.
Pre-Emergent Herbicide	2.3 kg (5 pounds) of each type to be used.

- B. Certificates of Conformance or Compliance: Before delivery, notarized certificates attesting that the following materials meet the requirements specified shall be submitted to the Resident Engineer for approval:

- 1. Plant Materials (Department of Agriculture certification by State Nursery Inspector declaring material to be free from insects and disease).
- 2. Fertilizers.
- 3. Lime
- 4. Peat
- 5. Sod

- C. Manufacturer's Literature and Data:

- 1. Wood Header edging
- 2. Antidesiccant
- 3. Pre-emergent herbicide

- E. Soil laboratory testing results and any soil amendment recommendations from the Contractor.
- F. LEED credit documentation

1.05 DELIVERY AND STORAGE

A. Delivery:

1. Notify the Resident Engineer of the delivery schedule in advance so the plant material may be inspected upon arrival at the job site. Remove unacceptable plant material from the job site immediately.
2. Protect plants during delivery to prevent damage to root balls or desiccation of leaves. Protect trees during transport by tying in the branches and covering all exposed branches.
3. Deliver fertilizer to the site in the original, unopened containers bearing the manufacturer's warranted chemical analysis, name, trade name or trademark, and in conformance to state and federal law. In lieu of containers, fertilizer may be furnished in bulk and a certificate indicating the above information shall accompany each delivery.
4. 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 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. 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.
 - c. Keep plants, including those in containers, in a moist condition until planted, by watering with fine mist spray.

1.06 PLANTING AND TURF INSTALLATION SEASONS AND CONDITIONS

- A. 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 Resident Engineer stating the special conditions and proposal variance.

1.07 PLANT AND TURF ESTABLISHMENT PERIOD

- A. The Establishment Period for plants and turf shall begin immediately after Final Acceptance of landscape by Owner's Representative, with the approval of the Resident Engineer, 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 plants and 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. Prune plants and replace mulch as required.
3. Replace and restore stakes, guy wires, and eroded plant saucers as required.
4. In plant beds and saucers, remove grass, weeds, and other undesired vegetation, including the root growth, before they reach a height of 75 mm (3 inches).
5. Spray with approved insecticides and fungicides to control pests and ensure plant survival in a healthy growing condition, as directed by the Resident Engineer.
6. 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 m² (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 100 mm (4 inches) high. Mow to a 65 mm (2-1/2 inch) height.
7. Remove plants that die during this period and replace each plant with one of the same size and species.

1.08 PLANT AND TURF WARRANTY

- A. All work shall be in accordance with the terms of the Paragraph, "Warranty" of Section 00 72 00, GENERAL CONDITIONS, including the following supplements:
 1. A One Year Plant and Turf Warranty will begin on the date that the Government accepts the project or phase for beneficial use and occupancy. The Contractor shall have completed, located, and installed all plants and turf according to the plans and specifications. All plants and turf are expected to be living and in a healthy condition at the time of final inspection.
 2. The Contractor will replace any dead plant material and any areas void of turf immediately. A one year warranty for the plants and turf that was replaced, will begin on the day the work is completed.
 3. Replacement of relocated plants, that the Contractor did not supply, is not required unless they die from improper handling and care during transplanting. Loss through Contractor negligence requires replacement in kind and size.
 4. The Government will re-inspect all plants and turf at the end of the One Year Warranty. The Contractor will replace any dead, missing, or defective plant material and turf immediately. The Warranty will end on the date of this inspection provided the Contractor has complied with the work required by this specification. The Contractor shall also comply with the following requirements:

- a. Replace dead, missing or defective plant material prior to final inspection.
- b. Mulch and weed plant beds and saucers. Just prior to this inspection, treat these areas to a second application of approved pre-emergent herbicide.
- c. From plants having been installed for one year, remove stakes, guy wires and any required tree wrappings.
- d. Complete remedial measures directed by the Resident Engineer to ensure plant and turf survival.
- e. Repair damage caused while making plant or turf replacements.

1.09 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
ANSI Z133.1-06.....Tree Care Operations-Pruning, Trimming, Repairing,
Maintaining, and Removing Trees and Cutting Brush- Safety
Requirements
- C. Hortus Third, A Concise Dictionary of Plants Cultivated in the U.S. and Canada.
- D. American Society for Testing and Materials (ASTM) Publications:
C136-06.....Sieve Analysis of Fine and Coarse Aggregates
- E. Turfgrass Producers International:
Turfgrass Sodding.
- F. U. S. Department of Agriculture Federal Seed Act.
1998Rules and Regulations

1.10 LEED CREDIT REQUIREMENT

Confirm in writing that planting list provided meets complies with native and drought tolerant plant selections based on LEED credit requirements for water use reduction.

PART 2 - PRODUCTS

2.01 GENERAL

All plant and 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.

2.02 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 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 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 Resident Engineer, 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. 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 Resident Engineer 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. Recalculate water use reduction design case calculations and credit template and provide all required additional documentation for landscape architect's review and approval prior to installation.
- G. When existing plants are to be relocated, ball sizes shall conform to requirements for collected plants in ANSI Z60.1, and plants shall be dug, handled, and replanted in accordance with applicable sections of these specifications.

2.03 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.

2.04 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 Resident Engineer 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.

2.05 LIME

Lime shall be agricultural limestone containing not less than 90 percent calcium and magnesium carbonates. Lime must be ground to such a 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%.

2.06 SOIL AMENDMENTS

- A. Wood Residual Soil Amendments: No amendment shall be delivered to the site without prior approval of the Architect or his appointed agent. Contractor shall supply the Architect or his appointed representative with a sample of amendment accompanied by analytical data from an approved laboratory illustrating degree of compliance.

Physical Properties

Percent Passing	Sieve Designation
95 – 100	6.35 mm, (¼")
75 – 100	2.38 mm, #8, 8 mesh
0 – 30	500 micron, #35, 32 mesh

Source:

- a. Redwood sawdust
- b. Fir or cedar sawdust
- c. Fir bark

Nitrogen content:

- a. 0.4-0.6%

- (dry weight basis if
nitrogen stabilized)
- b. 0.56-0.84%
 - c. 0.8-1.2%

- Dry bulk density:
- a. 270-370
 - b. 270-370
 - c. 450-580

Dry bulk density: Minimum 0.08% dilute acid soluble iron based on dry weight.

Soluble salts: Maximum 3.0 millimhos/centimeter at 25° C as determined in saturation extract.

Organic content: Minimum 92% based on dry weight and determined by ash method.

- B. Fertilizer: Agricultural fertilizer of a formula indicated by the soil test. Fertilizers shall be organic, slow-release compositions whenever applicable

2.07 AMENDING TOPSOIL

Combine the ingredients listed below:

- *1 cubic yard of topsoil.
- *1/3 cubic yard organic amendment as specified.
- *2 pounds pre-plant fertilizer.
- *2 pounds iron sulfate.

- * For bidding purposes only. Actual amendments shall be determined by soils analysis provided by the Landscape Contractor.

2.08 BIOSTIMULANTS

Biostimulants shall contain soil conditioners, VAM fungi, and endomycorrhizal and ectomycorrhizal fungi spores and soil bacteria appropriate for existing soil conditions

2.09 PLANT FERTILIZER

- A. Provide plant fertilizer that is commercial grade and uniform in composition and conforms to applicable state and federal regulations.
- B. * Apply top-dress fertilizer, at the rate of 6 pounds per 1,000 square feet at 30-day intervals. Water bed thoroughly after fertilizer application. Wash all fertilizer from leaves of plant material.
 - * For bidding purposes only. Actual fertilization shall be determined by the soils analysis provided Landscape Contractor.

2.10 TURF FERTILIZER

* Apply top-dress fertilizer, at the rate of 10 pounds per 1,000 square feet at 25 days and 50 days after installing.

* For bidding purposes only. Actual fertilization shall be determined by the soils analysis provided Landscape Contractor.

2.11 MEMBRANES

- A. Landscape Fabric shall be a spunbonded polyester fabric weighing 18 grams per square meter ($\frac{3}{4}$ oz per sq. yd) and with a 9,000 liter per minute flow rate per sq. meter (225 gal. per minute flow rate per sq. ft.).
- B. Weed control mat shall be Biobarrier II.

2.12 MULCH

- A. Mulch shall be free from deleterious materials and shall be stored as to prevent inclusion of foreign material.
- B. Inert mulch materials shall be 3 X 8 inch Lin Creek Cobble.
- C. Organic mulch materials shall be pine or fir wood chips, 1/2" to 1 1/2" diameter free of sticks, dirt, dust, and other debris, as approved.

2.13 STAKES AND GUYING WIRES

- A. Provide stakes for tree support of rough sawn wood, free from knots, rot, cross grain, or other defects that would impair the strength. Stakes shall be a minimum of 50 mm by 50 mm (2 inches by 2 inches), or 65 mm (2-1/2 inches) in diameter, by 2400 mm (8 feet) long and pointed at one end.
- B. Hose chafing guards shall be new or used 2-ply reinforced rubber or plastic hose of all the same color on the project.

2.14 EDGING

Wood header edging shall be Redwood Construction Common grade and shall be 2" nominal thick by 4" nominal inches deep in standard lengths. Anchoring stakes shall be of similar material and 18 inches long and tapered.

2.15 WATER

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 at no cost to the Contractor.

2.16 ANTIDESICCANT

Antidesiccant shall be an emulsion specifically manufactured for agricultural use that will provide a protective film over plant surfaces permeable enough to permit transpiration.

2.17 SOD - BALLFIELD

Sod shall be Blue Rye Blend 50%/50% as available form Delta Bluegrass.

http://deltabluegrass.com/homeowners/about/dbg-sports/dbg-golf/blue_rye

Sod shall be dense with the grass having been mowed at 1" height before lifting from field. Sod shall be in vigorous condition, dark green in color, free of disease and harmful insects, and grown on fumigated soil.

Sod Alternate shall be hydro seeded Blue Rye Blend 50%/50% seed mix as available from Delta Bluegrass.

2.18 HERBICIDES

All herbicides shall be properly labeled and registered with the U.S. Department of Agriculture.

Keep all herbicides in the original labeled containers indicating the analysis and method of use.

PART 3 - EXECUTION

3.01 LAYOUT

Stake plant material locations and bed outlines on project site for approval by the Resident Engineer before any plant pits or beds are dug. The Resident Engineer may approve adjustments to plant material locations to meet field conditions.

3.02 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 Resident Engineer 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. Size the plant pits as shown, otherwise, the minimum allowable dimensions of plant pits shall be regardless of width, 150 mm (6 inches) deeper for shrubs and 225 mm (9 inches) deeper for trees than the depth of ball or root spread; for ball or root spread up to 600 mm (2 feet), pit diameters shall be twice the ball or root spread; for ball or root spread from 600 to 1200 mm (2 to 4 feet), pit diameters shall be 600 mm (2 feet) greater; for ball or root spread over 1200 mm (4 feet), pit diameters shall be 1-1/2 times the ball or root spread.
- D. Where ground cover and planting beds occur in existing turf areas, remove turf 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 100 mm (4 inches). Spread soil amendment uniformly over the bed to depth of 50 mm (2 inches) and thoroughly incorporate it into the existing soil to a depth of 100 mm (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 100 mm (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 50 mm (2 inches) of soil amendment into the topsoil as specified.
- G. Using topsoil, form earth saucers or water basins for watering around plants. Basins to be 2" high for shrubs and 4" high for trees.
- H. Treat plant saucers, shrub, and 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.

3.03 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. Add slow release packet, tablet or pellet fertilizer as each plant is installed as per manufacturer's recommendation for method of installation and quantity.
- B. Backfill balled and burlapped and container-grown plants with planting soil mixture as specified to approximately half the depth of the ball and then tamp and water. For balled and burlapped plants, carefully remove excess burlap and tying materials and fold back. Where plastic wrap or treated burlap is used in lieu of burlap, completely remove these materials before backfilling. Tamp and water remainder of backfill Planting Soil Mixture; then form earth saucers or water basins around isolated plants with topsoil.
- C. Plant bare-root stock arranging the roots in a natural position. Remove damaged roots with a clean cut. Carefully work Planting Soil Mixture in among the roots. Tamp and water the remainder of Planting Soil Mixture; then form earth saucers or water basins around isolated plants with topsoil.

3.04 STAKING AND GUYING

- A. Stake and guy plants as shown on the drawings and as specified.
- B. Drive stakes vertically into the ground to a depth of 800 to 900 mm (2-1/2 to 3 feet) in such a manner as not to injure the ball or roots, unless otherwise shown on the drawings.

3.05 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 lawn.
- B. Install metal edging materials in accordance with manufacturer's recommendations and as shown on the plans.

3.06 MULCHING PLANTS

- A. Mulch within 48 hours after planting and applying a pre-emergent herbicide. Do not mulch in ground cover areas that shall have organic material placed before planting.
- B. Placing Inert Material: Place landscape fabric with edges lapped 150 mm to 300 mm (6 inches to 12 inches) to receive inert mulch material. Spread inert mulch to a uniform thickness over the membrane as shown.
- C. Placing Organic Material: Spread a mulch of fir bark to a uniform minimum thickness of 76 mm (3 inches).
- D. Keep mulch out of the crowns of shrubs and off buildings, sidewalks, light standards, and other structures.

3.07 PRUNING

- A. Prune new plant material and indicated existing plant material in the following manner: Remove dead, broken and crossing branches. Prune deciduous trees and shrubs to reduce total amount of anticipated foliage by 1/4 to 1/3 while retaining typical growth habit of individual plants with as much height and spread as is practicable. 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. Paint cuts 13 mm (1/2 inch) in diameter and larger with the specified tree wound dressing.
- B. Existing trees to be pruned are shown on the drawings. Perform tree pruning and cavity work by a licensed arborist in accordance with ANSI Z 133.1. Remove dead wood 13 mm (1/2 inch) or more in diameter, branches interfering with or hindering the healthy growth of the trees, and diseased branches with a clean cut made flush with the parent trunk. Cut back or remove branches as necessary to give the trees proper shape and balance. In removing large limbs, make the initial cut on the underside at a safe distance from the trunk or lateral, to prevent ripping of bark. Ensure branches and trimmings do not endanger traffic or cause damage to property during removal. Section large branches or limbs that cannot be removed in one piece without endangering traffic or property. Lower sections by ropes. Repair any damage resulting from the Contractor's

negligence during pruning. Workmen are not permitted to climb trees with climbing spurs. To promote proper healing, cut off flush stubs or limbs that have resulted from improper cuts or broken as a result of former pruning. Remove girdling roots. Clean cuts or wounds measuring 13 mm (1/2 inches) or more in diameter, and exposed wood and scars resulting from previous work or damage. Remove decayed wood to expose healthy tissue. Shape cavities to provide drainage.

3.08 FERTILIZATION OF EXISTING TREES

Apply fertilizer to existing trees shown on the drawings at the rate of 36 g/mm (2 pounds per inch) caliper. Apply in 300 mm to 450 mm (12 inch to 18 inch) deep holes 40 to 50 mm (1-1/2 to 2 inches) in diameter, made by an earth auger, distributed evenly at not more than 600 mm (2 feet) on center throughout the outer half of the branch spread zone of each tree. Fertilize to within 100 mm (4 inches) of the surrounding grade. Use topsoil to bring the surface up to the surrounding grade. When using fertilizer in packet, tablet, or wedge form, apply in accordance with manufacturer's recommendations.

3.09 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.

3.10 FINISH GRADING

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 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.

3.11 APPLICATION OF FERTILIZER FOR TURF AREAS

- A. Apply turf fertilizer at the specified rate. In addition, adjust soil acidity and add soil conditioners as required herein for suitable topsoil under PART 2, Paragraph, TOPSOIL.
- B. Spread lime at the specified rate.
- C. Incorporate fertilizers into the soil to a depth of at least 100 mm (4 inches) as part of the finish grading operation. Immediately restore the soil to an even condition before any turf work.

3.12 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.

3.13 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.

3.14 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.

3.15 EROSION CONTROL MATERIAL

- A. Install and maintain erosion control material meeting the requirements of this specification 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 the straw mulch from all seeded areas receiving the erosion control material.
- B. For waterways, unroll the material in the direction of waterflow. When two or more strips are required to cover a ditch area, they shall overlap at least 100 mm (4 inches). In case a strip is to be spliced lengthwise, the ends of the strips shall overlap at least 150 mm (6 inches) with the upgrade section on top.
- C. When using erosion control material on slopes, place the material either horizontally or vertically to the slope with the edges and ends of adjacent strips butted tightly against each other.
- D. Staple each strip in three rows (each edge and center with the center row alternately spaced) with staples spaced not more than 1200 mm (4 feet) longitudinally. When using two or more strips side by side on slopes, use a common row of staples on the adjoining strips. Staple all end strips at 300 mm (one foot) intervals at the end. Firmly embed staples in the underlying soil.
- E. 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.

3.16 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 and one paved vehicular access route to each building clean at all times. In areas where planting and 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 station.

SEISMIC CORRECTION OF BUILDING 323
AND INFRASTRUCTURE ENHANCEMENTS
Menlo Park, California
VA Palo Alto Health Care System

DVA Project No. 640-384

--- E N D ---

**SECTION 32 90 10
LANDSCAPE MAINTENANCE AND PLANT ESTABLISHMENT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section describes the requirement to maintain the landscape in an attractive condition as specified for a period of 90-days.

1.02 QUALITY ASSURANCE

- A. Work Force: Contractor's representative shall be experienced in landscape maintenance and shall have received an education in ornamental horticulture.

1.03 ESTABLISHING THE MAINTENANCE PERIOD

Make a written request to the Landscape Architect for review after all planting operations have been completed per Contract Documents. Such review is for the purpose of establishing the 90-day Maintenance Period.

1.04 MAINTENANCE PERIOD

- A. Continuously maintain planted areas involved in this Contract during the progress of the work and during the Maintenance Period until Final Acceptance of the work by the Owner.
- B. Improper maintenance or possible poor condition of any planting at the termination of the scheduled Maintenance Period may cause postponement of the final completion date of the Contract. Continue maintenance until work is acceptable.
- C. Do not start the Maintenance Period until construction, planting, and irrigation for the entire project are complete.
- D. Make a written request to the Landscape Architect for review after all planting operations have been completed per Contract Documents. Such review is for the purpose of establishing the 90-day Maintenance Period.
- E. Any day when the Contractor fails to adequately maintain plantings, replace unsuitable plants or do weed control or other work, as determined necessary by the Landscape Architect, will not be credited as one of the plant maintenance working days.
- F. The Maintenance Period will be extended if the specified provisions are not met.
- G. Prior to being placed on maintenance, furnish a schedule of activities planned during the Maintenance Period.

1.05 WARRANTY PERIOD AND REPLACEMENT

- A. Contractor shall warrant that all trees, shrubs, and vines planted under this Contract will be healthy and in flourishing condition of active growth one year from date of Final Acceptance. All other plant materials shall be similarly warranted for a period of six months from date of Final Acceptance.

- B. Any delay in completion of planting operations that extends the planting into more than one planting season shall extend the Warranty Period correspondingly.
- C. Replace, without cost to the Owner, and as soon as weather conditions permit, all dead plants and all plants not in a vigorous, thriving condition, as determined by the Landscape Architect during and at the end of Warranty Period. Plants shall be free of dead or dying branches and branch tips, and shall bear foliage of a normal density, size, and color. Replacements shall closely match adjacent specimens of the same species and shall be subject again to all requirements of this Specification.
- D. Contractor shall not be held responsible for failures due to neglect by the Owner, vandalism, etc., during the Warranty Period. Report such conditions to the Landscape Architect in writing.
- E. Plant materials supplied by the Owner shall be under similar warranty against defective workmanship during the planting operations. Plant materials exhibiting conditions that are determined by the Landscape Architect as being unacceptable due to workmanship by the Contractor shall be replaced at no additional cost to the Owner.

1.06 PROGRESS REVIEWS

- A. Normal progress reviews shall be requested by the Contractor from the Landscape Architect at least 7-days in advance of an anticipated review. Reviews are as follows:
 - 1. Commencement of Maintenance (Pre-maintenance).
 - 2. Completion of the Maintenance Period - Final walk-through - 10-days prior to end of the Maintenance Period.

1.07 FINAL ACCEPTANCE

Work under this Section will be accepted by the Landscape Architect upon satisfactory completion of all work, including the Maintenance Period, but exclusive of replacement of plant materials under the Warranty Period. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials used shall either conform to Section 02900, Landscape Planting or shall otherwise be acceptable to the Owner. The Owner shall be given monthly record of all herbicides, insecticides, and disease control chemicals used.
- B. * Top dress fertilizer shall consist of the following percentages by weight and shall be mixed by a commercial fertilizer supplier:
 - 16% nitrogen
 - 6% phosphoric acid
 - 8% potash

* For bidding purposes only. Actual fertilization shall be determined by the soils analysis provided by the Contractor.

PART 3 - EXECUTION

3.01 MAINTENANCE

- A. Maintenance shall be according to the following standards:
 - 1. Areas shall be kept free of debris and planted areas shall be weeded and cultivated at intervals of not more than 10-days. Watering, trimming, fertilization, spraying, and pest control, as may be required, shall be included in the Maintenance Period. Area drains and drain pipe are to remain free of silt and debris.
 - 2. Be responsible for maintaining adequate protection of the area. Damaged areas shall be repaired at the Contractor's expense.
- B. Maintenance of grass areas shall consist of fertilizing, watering, weeding, cutting, repair of all erosion, and reseeding as necessary to establish a uniform stand of the specified grasses. Areas and parts of areas that fail to show a uniform stand of grass for any reason shall be reseeded until all areas are covered with a satisfactory stand of grass. Mulch reseeded areas with 1/8" of specified peat moss.
- C. All planting areas shall be weed-free during the entire Maintenance Period. The use of an approved chemical or manual weed control is at the option of the Contractor.

3.02 TREE AND SHRUB CARE

- A. Watering: Maintain a large enough water basin around plants so that enough water can be applied to establish moisture through the major root zone. When hand watering, use a water wand to break the water force. Use mulches to reduce evaporation and frequency of watering.
- B. Pruning:
 - 1. Trees:
 - a. Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached which have vertical spacing of from 18" to 48" and radial orientation so as not to overlay one another; to eliminate diseased or damaged growth; to eliminate narrow v-shaped branch forks that lack strength; to reduce toppling and wind damage by thinning out crowns; to maintain growth within space limitations; to maintain a natural appearance; to balance crown with roots.
 - b. Under no circumstances will stripping of lower branches ("raising-up") of young trees be permitted. Lower branches shall be retained in a "tipped

- back" or pinched condition with as much foliage as possible to promote caliper trunk growth (tapered trunk). Lower branches can be cut flush with the trunk only after the tree is able to stand erect without staking or other support. Sucker growth shall be removed if deemed appropriate by the Owner's authorized representative.
- c. Evergreen trees shall be thinned out and shaped when necessary to prevent wind and storm damage. The primary pruning of deciduous trees shall be done during the dormant season. Damaged trees or those that constitute health or safety hazards shall be pruned at any time of the year as required to eliminate these conditions.
2. Shrubs:
- a. The objective of shrub pruning is the same as for trees. Shrubs shall not be clipped into balled or boxed forms unless such is required by the design and directed by the Landscape Architect.
- b. Pruning cuts shall be made to lateral branches or buds of flush with the trunk. "Stubbing" will not be permitted.
- C. Staking and Guying: Remove stakes and guys as soon as they are no longer needed. Stakes and guys are to be inspected to prevent girdling of trunks or branches and to prevent rubbing that causes bark wounds. Replace broken stakes and ties with specified materials.
- D. Weed Control: Keep basins and areas between plants free of weeds. Use recommended legally approved herbicides. Avoid frequent soil cultivation that destroys shallow roots. Use mulches to help prevent weed seed germination.
- E. Insect and Disease Control: Maintain a reasonable control.
- F. Fertilization:
1. Fertilize planting areas with the following:
- a. At the end of the first 30-days and at 30-day intervals: 6 pounds per 1,000 square feet of top-dress fertilizer.
- b. At the end of the Maintenance Period and at 30-day intervals should the Maintenance Period be extended: 6 pounds per 1,000 square feet of top-dress fertilizer.
- c. After application, water fertilizer down thoroughly.
- G. Replacement of Plants: Replace dead, dying, and missing plants and plants of a size, condition, and variety acceptable to the Owner at Contractor's expense.

3.03 GROUNDCOVER CARE

- A. Weed Control: Control weeds, with chemical systemic spray or by mechanical means so as to cause minimal damage to planted materials.
- B. Watering: Water enough that moisture penetrates throughout root zone and only as frequently as necessary to maintain healthy growth.
- C. Fertilizing: Fertilize as specified under Tree and Shrub Care.
- D. Remove trash weekly.
- E. Edge groundcover to keep in bounds and trim top growth as necessary to achieve an overall even appearance.
- F. Replace dead and missing plants at Contractor's expense.

3.04 IRRIGATION SYSTEM

- A. Check irrigation systems weekly for proper operation. Lateral line shall be flushed out after removing the last sprinkler head or two at each end of the lateral. Adjust heads as necessary for unimpeded coverage.
- B. Set and program automatic controllers for seasonal water requirements. Give the Owner a key to controllers and written instructions on how to turn off system in case of emergency.
- C. Repair damages to irrigation systems at Contractor's expense. Repairs shall be made within one watering period.

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**SECTION 32 92 19 16
HYDROSEEDING**

PART 1 - GENERAL

1.01 Scope

- A. Work Included: Furnish all labor, tools, equipment, materials, and transportation and perform all operations necessary and incidental to proper execution and completion of all work hydroseeding in accordance with the Drawings and Specifications.
- B. Related specified elsewhere:
 - 1. Earthwork
 - 2. Planting
 - 3. Irrigation system

1.02 Requirements of Regulatory Agencies

- A. Perform work in accordance with all applicable laws, codes, and regulations required by authorities having jurisdiction over such work and provide for all inspections and permits required by Federal, State, and local authorities in furnishing, transporting, and installing materials.

1.03 Quality Assurance

- A. Seed shall be furnished in containers that show the following information: seed name, lot number, net weight, percentage of purity, germination, weed seed and inert material. Seed that has become wet, moldy, or otherwise damaged will not be accepted. Seed shall conform to the requirements of the State of California and when applicable the Federal Seed Act, and shall be "certified" grade or better.

1.04 Submittals

- A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight and percentages of purity, germination and weed seed for each grass species.

1.05 Delivery, Storage and Handling

- A. Deliver seed and fertilizer materials in original unopened containers showing weight, analysis, and name of manufacturer. Store the seed in such a manner that will prevent the wetting and deterioration of the seed.

1.06 Quality Control

- A. Grading Inspection
 - 1. Rough grading shall be inspected and approved by the Engineer prior to topsoil soil.

2. Finish grading shall be inspected and approved by the Engineer prior to hydroseed application.

B. Inspections

1. The Contractor shall request a provisional inspection by the Engineer upon completion of the work. Upon completion of the punch list, the Engineer shall make provisional acceptance in writing.
2. Final acceptance will be at the end of the one-year warranty period, and after all required repairs have been made.

1.07 Warranty and Replacement

- A. Seeded areas must have a relatively uniform stand of grass with no bare spots over 6" square at the time of substantial completion. Reseed at the original rate and fertilize with 10-20-20 at the rate of 20lbs. per 1,000 square feet of blended materials. All areas failing to vigorously establish within 90 days after germination or one growing season (whichever is longest), for any reason whatsoever, shall be redone at the Contractor's expense.

PART 2 - PRODUCTS

2.01 Hydromulch

- A. Mulch shall be wood cellulose fiber from approved sources, containing no growth or germination inhibiting substances; a soil-binding agent (tackifier) is required; mulch shall be dyed a suitable color to facilitate placement.

2.02 Soil Binding Agent

- A. Soil binding agent shall consist of non-toxic, biodegradable materials that are environmentally safe such as ESI – TAK, or approved equal.

2.03 Turf Seed mix

- A. Hydro seeded turf shall be Native Mow Free Turf as available from Delta Bluegrass. http://deltabluegrass.com/homeowners/about/dbg-cal/native_mow_free

PART 3 - EXECUTION

3.01 Soil Preparation

- A. All soil preparation operations, topsoil placement, soil amending, compaction and clean up of debris shall be done prior to hydroseeding.

3.02 Watering

- A. If required by the Engineer, water shall be provided to condition the soil for compaction or to provide dust control. Water shall be furnished and applied by contractor from on site supply or by watering truck if necessary.

3.03 Hydro seeding

- A. Fertilizer, seed and mulch shall be applied in one operation with approved hydraulic equipment. Apply materials at the following rates:
 - 1. Hydromulch, at 50lbs. per 1,000 square feet.
 - 2. Seed, at 8lbs. per 1,000 square feet.
 - 3. Lawn Starter Fertilizer, at 20 lbs. per 1,000 square feet of blended materials.
 - 4. Soil Binding Agent, at 1lb. per 1,000 square feet.

- B. Hydroseeding shall not be done during windy weather (above 25 mph) or when the ground is overly wet (saturated) or frozen. Contractor shall give the Owner 48 hours notice of seeding operations. Seeding, fertilizing, and mulching of prepared areas shall be performed during the following time frames:
 - 1. Hydroseeding shall be done from April 1 to October 31.
 - 2. No seeding shall be done before or after these dates without the Engineer's written approval. Written permission to seed from June 1 to August 31 may be granted only if automatic irrigation is available and operational at the site.
 - 3. Application of pre-germinated seed, moisture retention agents and/or provision for supplemental watering may be required by the Engineer should the Contractor schedule this portion of the Work outside the time frames listed in item 1 immediately above.
 - 4. All areas that are partially completed to grade, shall be prepared and hydroseeded during the first available planting period and shall not be allowed to sit idle for long periods of time without receiving the erosion control specified in the Contract.
 - 5. When environmental conditions are not conducive to acceptable results from seeding operations, the Engineer may order the Work suspended, and it shall be resumed only when the desired results are likely to be obtained.

- C. Equipment shall use water as the carrying agent utilizing a continuous built-in agitation system. Equipment with a gear pump is not acceptable.

- D. Pump a continuous, non-fluctuating supply of homogenous slurry to provide a uniform distribution of material over designated areas.

3.04 Maintenance

- A. Maintain seeded areas until grass is well established and exhibits a vigorous growing condition.

- B. Maintenance shall include protection, watering, and a minimum of two mowing cycles, or until provisional acceptance.

- C. After the first mowing, turf shall be fertilized with specified (16-16-16) Maintenance Fertilizer for lawns and athletic fields, at the rate of 6.25lbs. per 1,000 square feet of blended materials.

- D. All grass clippings shall be removed from the site.

3.05 Completion

- A. Inspection to determine Physical Completion of seeded areas will be made by the Engineer upon the Contractor's request. Provide notification at least five (5) working days before requested inspection date.
 - 1. Seeded areas shall be accepted provided all requirements, including maintenance, have been complied with and grass is well established and exhibits a vigorous growing condition.
 - 2. Areas failing to show a uniform stand of grass shall be reseeded at the Contractor's expense.
- B. Upon Physical Completion, the Owner will assume lawn maintenance.

3.06 Cleaning

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from the site all excess materials, soil, debris, and equipment. Repair the damage resulting from seeding operations.

END OF SECTION