

SECTION 25 PLANTING AND IRRIGATION SYSTEMS

25-1 BACKFLOW PREVENTER

25-1.1 General

The work consists in general of installing fully functional reduced pressure backflow preventers and connecting them with suitable pipe and fittings to the points of connection shown on the plans.

25-1.2 Material

25-1.3 Backflow Preventer

Reduced pressure backflow preventers shall be Febco Model 825 Y or approved equal.

25-1.4 Piping and Fittings

Underground pipe and fittings shall be Schedule 40 PVC. Above ground pipe and fittings shall be Schedule 40 galvanized steel or malleable iron. Gate valves shall be bronze body and wedge, with solid wedge, non-rising stem, and screwed ends and shall be Walworth 14, Crane 437 or approved equal with 150 psi pressure rating.

25-1.5 Concrete Slab

Concrete shall contain six (6) sacks of cement per cubic yard.

25-1.6 Protective Cage

Protective cage shall conform to the City Standard Details. Contractor shall submit details of the cages to be provided to the Engineer for approval.

25-2 CONSTRUCTION

25-2.1 Excavation and Backfill

All excavations shall conform with Section 16, Trenching and Trench Resurfacing of these Standard Plans and Specifications, including the Trench Construction Safety Orders issued by the Division of Industrial Safety of the Department of Industrial Relations of the State of California including Chapter 9, Section 6705 of the California Labor Code.

The width of trenches at approximately the level of the top of the pipe to be installed shall be not more than the allowable limits specified by the pipe manufacturer. The clearance may be increased to accommodate shoring.

If the Contractor is unable to maintain the trench width allowed in previous paragraph, the Contractor shall provide additional bedding to compensate for the additional loading on the pipe. Such additional bedding may require crushed

rock or other suitable granular bedding material or concrete encasement as necessary to obtain satisfactory pipe support.

Where the pipe is to be laid on sand having less than optimum moisture, as determined by the Engineer, the Contractor shall apply sufficient water and compact the sand prior to placing the pipe.

All existing conduits, sewers and other structures which are not, in the opinion of the Engineer, required to be changed in location shall be carefully supported and protected from injury, they shall be restored by him, without additional compensation, to as good condition as that in which they were found.

The Contractor shall provide, without additional compensation, suitable temporary channels for the water that may flow along or across the site of the work when necessary.

Trench excavation for pipe shall be in open cut except as indicated and shall include the removal of all materials or objects of any nature that would interfere with the execution of the work. The trench shall be braced and drained when necessary so that workman may work therein safety and efficiently.

The location of subsurface obstructions found in the field may necessitate a variance in the depth of the pipe. The depth shall be approved by the Engineer. It shall be the responsibility of the Contractor to locate all substructures, piping and utilities that may effect the installation of the new water main or service.

The completed trench shall be uniformly graded to a flat bottom conforming to the grade to which the pipe is to be laid. Any portion of the trench excavated below the approved grade shall be corrected and brought up to grade with an approved material thoroughly compacted. Material excavated from the trench shall be placed so as to offer the minimum obstruction to traffic. Any exceptions must be approved by the Engineer.

The bottom of the trench shall be excavated or backfilled so that the barrel of the pipe shall uniform bearing for its entire length, except for the area necessary for bell holes. All adjustment of pipe to line and grade must be made by scraping away or filling and tamping. The use of blocks as supports is forbidden. An additional depth and width shall be hand dug at joint or bell locations of sufficient depth to relieve the bell of any load and to allow ample space for making the joint.

Trenches shall be backfilled with select material from excavation. Backfill shall be moistened, placed in lifts with a maximum thickness of eight (8) inches and compacted. Compaction shall be to ninety-percent (90%) minimum.

25-2.2 Pipe, Fittings, Valves and Backflow Preventer

Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe, fittings and valves shall be carefully lowered into the trench by means of suitable equipment in such a manner as to prevent damage to the pipe fittings. The pipe shall be adjusted accurately to the required line and grade. Any damage to the pipe or fittings shall be repaired by the Contractor at his expense. The Contractor shall be responsible for the safety of all materials to the time of acceptance of the finished work.

Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination in accordance with AWWA C651. All of the pipe shall be thoroughly cleaned of all dirt, rock and other debris that may be found in the interior of the pipe as stockpiled. If considered necessary by the Engineer, he may direct the Contractor to swab the pipe to clean it.

Contractor shall secure the ends of all water pipe being installed each and every time the work site is left unattended, i.e., during lunch breaks, overnight, etc. Only water tight plugs in accordance with Section 4.1 of AWWA C651 will be allowed.

Each pipe shall have a firm bearing for its full length in the trench except at bell holes and field joints.

Whenever necessary to deflect the pipe from a straight line either in vertical or horizontal plane to avoid obstructions, or where long radius curves are permitted, the degree of deflection shall be approved by the Engineer.

Concrete shall be installed in accordance with Section 73 of the State Standard Specifications.

The backflow preventer shall be installed in accordance with manufacturer's instructions.

Protective cage shall be installed in a careful and workmanlike manner.

25-2.3 Cleanup

The Contractor shall remove all excess spoil, dirt, rubble and any other material left over as a result of the work performed. The site shall be left clean upon completion of the work. All excess materials shall be disposed of at an approved dump site.

25-3 LANDSCAPE CONSTRUCTION

25-3.1 Work Included

1. Soil Testing
2. Clearing and Grading
3. Cultivation and Soil Amending
4. Furnish and Plant Plants and Trees
5. Fertilization
6. Seeding
7. Weeding
8. Staking
9. Clean-up and Maintenance

25-3.2 Related Work

1. Section 25-4 - Automatic Irrigation System

25-3.3 Guarantee

1. Guarantee shrubs, ground covers, and lawn as to growth and health for one (1) year after final acceptance by Owner. The contractor is responsible for replacement of plant materials due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.
2. Guarantee trees to live and grow upright for a period of one (1) year after completion and final acceptance by the Owner.
3. The contractor is responsible for replacement of trees due to theft and vandalism until final acceptance of the project by the Owner after completion of the specified maintenance period.
4. Replace plants which lose more than 30% of their original leaves within the below described time limits.
5. Remove and replace plants within 15 days of notification which fail to conform. Replace with materials as originally specified. Guarantee for replaced materials shall begin with date of replanting and shall be as previously described.

25-3.4 Soil Testing

An independent soil testing laboratory, Dellavalle Laboratories, Fresno, California, (559) 233-6129, is to test the existing soil with a complete fertility assay to evaluate the soils ability to maintain and support the ornamental landscaping. Samples from five locations on the site are to be taken, with two samples from each location, one at three (3") inches in depth, and the second at sixteen (16") inches in depth. The soil-testing laboratory is also to complete a preliminary screening for detrimental agricultural chemical residue that may be present on site, if these results are positive, notify the Owners authorized representative for a ruling. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations to be submitted to the Owners authorized representative for evaluation.

25-3.5 Construction Observation

Contractor shall contact the construction inspector one week in advance when possible or a minimum of 72 hours ahead and arrange for inspections at the following phases as specified in this section:

1. Preconstruction meeting
2. Staking of sprinklers and mainline routing.
3. Mainlines, wiring, lateral pipes, & valve manifolds prior to backfill.
4. Irrigation coverage test and rough grading.
5. Trees & plants prior to installation, still in containers.
6. Fine grading of turf areas prior to hydroseeding.
7. Substantial completion to start maintenance.
8. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of \$250.00 per extra visit.

25-3.6 Plants

1. Conform to list of plant materials on drawings.
2. Plants shall be the best of their kind and class, and of optimum age.
 1. Plants shall _____ and in conformance with the standards of the American Society of Nurserymen.
 2. Plants shall have normal, well-developed branch systems and shall not be root or pot-bound. Do not prune or top prior to delivery.

3. Delivery to be made not more than 3 days prior to installation unless nursery area approved by landscape architect is established.
4. It will be the responsibility of the contractor to place material order(s) sufficiently in advance of planting to assure availability of plants in species and size specified.
5. No substitutions will be made without approval of the Landscape Architect or Authorized representative.

25-3.7 Soil Amendments

1. Soil amendments (type and quantity) are to be based on the soil test results and recommendations by the soil testing laboratory. The contractor is to include the amendments outlined in part 3.3 of this Section in the bid price. Prices for the soil amendments are to be quoted as unit prices to be adjusted at the recommendation of the testing lab. The soil testing is to be performed by Dellavalle Laboratories, Fresno, California, (559) 233-6129. The contractor is to pay for all required soil tests and consulting time with the soil scientist for detailed recommendations.
2. Nitrolized Forest Humus or approved equal.
 1. John & Bob's Soil Optimizer, Organic Soil Conditioner, as distributed by Sierra Madre Nursery, Fresno, California, (559) 291-4419.
 2. Tri C ENDO 120 Mycorrhizal Inoculum (hydroseed slurry) and Mycorrhizal Inoculum Myco F distributed by Tri C Enterprises, Chino, California, (800) 927-3311.
 3. Commercial fertilizer (15-15-15), gypsum, agricultural grade, soil sulfur agricultural grade, and lime - agricultural grade.
 4. Plant fertilizer tabs: Best Tabs or approved equal, quantities as shown below:
 - a. 1 gal plant - 1 tab
 - b. 5 gal plant - 3 tabs
 - c. 15 gal plant - 5 tabs
 - d. Box tree - 7 tabs
 5. Certificates: In addition to any certificates specified, the contractor shall furnish a certificate with each delivery of bulk material stating the source, quantity, date, and type of material. All certificates shall be delivered to the Owners authorized representative at the time of each delivery.

8. Samples: The contractor is to submit samples of the materials to be used for inspection and approval.

25-3.8 Accessories

1. Tree Stakes: 2 inches by 2 inches by 10 feet long treated lodge pole or natural redwood. Use two stakes per tree. See the tree installation detail.
2. Tree Ties: flexible vinyl "Cinch-Tie", manufactured by V.I.T. Products, San Diego California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use a minimum of four 24" ties per tree. See the tree installation detail.
1. Tree String Trimmer Guard: polyethylene "Trim Guard", manufactured by V.I.T. Products, San Diego, California, (619) 673-1760, and distributed by Horizon Sales, Pleasanton, California, (510) 462-6602. Use one Trim Guard per tree in the lawn areas only.
2. Tree Root Barriers: All trees within ten (10'-0") feet of a hardscaped surface or building are to have root barriers installed that are 24" deep by 24" wide as manufactured by Root Solutions, Inc. and distributed by Vespro Inc., San Rafael, California, (415) 434-3072. Each fifteen gallon tree is to have five panels. If the concrete is only on one side of the tree, the panels are to be installed in a straight line along the concrete as recommended by the manufacturer, or if the concrete is on all sides of the tree, then the panels are to be installed in a circular pattern around the tree as recommended by the manufacturer.
3. Top Soil: If required, imported topsoil shall be natural, fertile, friable loam, capable of sustaining vigorous plant growth, free of subsoil, roots, grass, excessive amount of weeds, stone and foreign matter; acidity range of pH 5.5 to 7.5; containing a minimum of 4% and a maximum of 25% organic matter. Obtain approval from the inspector for placement. The contractor is to submit a topsoil sample to an approved testing lab for a complete fertility assay for approval prior to importing the material on-site.

25-3.9 Weed Control

1. Methods and chemicals shall be suitable with regard to season and shall control weeds and shall be approved by all governing agencies.
2. Treatment shall not damage or impede growth of trees, shrubs, and ground covers to be planted, nor kill or damage any existing plant material specified to remain.

3. Applicator shall be a licensed State of California Agricultural Pest Control Operator, Category E, or as required by all governing agencies.
4. Contractor shall obtain required permits from County Agricultural Commissioner. Weed control treatment shall be in accordance with Federal, State of California, County and local codes and regulations, and shall be safe, not cause a health hazard, nor disrupt or inconvenience continuing business operations of the Owner and neighbors, public street, parking lot and sidewalk use or construction activities.
5. Method of treatment shall be strictly in accordance with manufacturer's recommendations.
6. Method of application and chemicals to be reviewed and approved by the Owners representative.
7. Contractor shall ascertain and insure that all planted areas are weed-free prior to planting.

25-3.10 Site Inspection

1. Locate cables, conduit, piping, and other obstacles prior to beginning excavation. Notify Owners representative of obstacles requiring relocation.
2. Remove rocks and other similar underground obstructions to depths necessary to permit proper installation of lawns and planting.
3. Verify that landscape irrigation system has been properly installed and is fully operational.
4. Verify dimensions shown on plan and notify Owners representative of any discrepancy.
5. Review plant list and consult Owners representative with any questions or concerns.

25-3.11 Grading

1. Work soil in a manner which does not cause excessive compaction or clods which will not break easily. Apply water as necessary to obtain optimum moisture content for tilling and planting.
2. The contractor is responsible for the grading of all planting areas. The grades shall be gently flowing with no abrupt changes. The contractor is responsible to insure that the planting areas have adequate soil and is to fill low areas as needed. The contractor is to grade the areas to drain as intended by the site grading plan by the Project Civil Engineer. Slope

surfaces away from buildings at a 2% slope with no pockets of standing water. The contractor is responsible for all import or export of soil, debris, trash, or other elements to provide the Owner with a completed landscape project at no additional cost to the Owner.

3. Provide neat, smooth, and uniform finish grade. Final soil elevations are to be 11/2" below the adjacent sidewalks or other hardscape features.
4. Notify Owners representative upon completion of grading for approval and to verify the smoothness and accuracy of fine grading and clod-free condition of planting surface. No planting is to be started prior to obtaining the approval of the fine grading from the Owners authorized representative.
5. Install concrete mow strips between all turf and planter boundaries. Install the mow strips as shown in the Concrete Mow Strip Detail.

25-3.12 Soil Preparation

25-3.12.1 Soil Amendments, Cultivation and Weed Control:

The contractor is to cultivate the soil amendments into the top six (6") inches of soil. The following soil amendment types and quantities are to be included in the bid. Pending the results of the soil tests, and recommendations of the soil-testing laboratory, adjustments to the types and quantities of soil amendments to be used may be necessary. The contract price will be adjusted according to the actual soil amendments installed on the project. The contractor is to include the following soil amendments as part of the bid:

25-3.12.2 Lawn Areas

1. Gypsum - agricultural grade (90%), 5 tons per acre.
2. Soil Sulfur - agricultural grade, 1/2 ton per acre.
3. Commercial Fertilizer - 15-15-15, 500 lbs per acre.
4. Nitrolized Forest Humus - 2 cu. yds. per 1000 sq. ft.
5. John & Bob's Soil Optimizer, Organic Soil Conditioner – 5 lbs per 1000 sq. ft.

25-3.12.3 Planter Areas & Garden Area

1. Nitrolized Forest Humus - 4 cu. yds. per 1000 sq. ft.
2. Gypsum - agricultural grade (90%), 5 tons per acre.
3. Soil Sulfur - agricultural grade, 1/2 ton per acre.
4. Commercial Fertilizer - 15-15-15, 500 lbs per acre.
5. John & Bob's Soil Optimizer, Organic Soil Conditioner – 5 lbs per 1000 square feet.

The Owners authorized representative and contractor shall negotiate the differences in costs according to the materials required based upon the recommendations of the soil testing laboratory. No labor difference in cost will be allowed for application of the corrected materials to be used.

After cultivation, water the site until the first weed crop is established. Cultivate or treat with chemicals to assure a weed-free condition.

Planting beds may be established after the second cultivation and final fine grading has been inspected and approved.

25-3.12.3 Planting holes

1. Holes for trees are to be drilled through hard pan until the planting hole drains as outlined in the City Standard Planting Details.
2. Holes are to be excavated three times the size of the rootball. When holes are complete, each hole is to be filled with water. Holes that do not drain shall be drilled deeper with auger until water does drain in two hour period. The contractor is to slightly off-set the drainage holes to prevent settling of the trees after installation. The contractor is to guarantee that the trees and shrubs will not settle below grade.
3. Holes are to be in damp (but not saturated) and friable condition with all hidden obstructions removed before planting. The backfill is to be mixed thoroughly as specified adjacent to the planting hole prior to planting.

25-3.13 PLANTING

1. Water plants immediately upon delivery to site. Maintain in moist condition until planted.
2. Space plants uniformly as shown on plans. Cut cans by cutting vertically on two opposite sides of can with can cutter, or as recommended by the nursery for the type and size of containers supplied with the plant materials. Do not damage plants.
3. Plant immediately after removal from the can or flat. Position the top of the plant root ball 1 inch above finish grade. Backfill as follows:
 - a. 1/2 native soil.
 - b. 1/2 nitrolized forest humus.
 - c. Azaleas and camellias are to have an additional 2 cu. ft. Camellia Mix in backfill.
4. Agriform plant tabs as indicated on plans. Place plant tabs beside root ball as recommended by the fertilizer manufacturer. Construct a watering well

one foot out from stem or trunk that will allow water to fill well at least 4" deep. Fill water well at least six times by hand after planting.

5. Fertilize all ground cover areas with post-plant commercial slow release fertilizer 6-8-8 upon completion of planting, and every 30 days through the first growing season at a rate of 6 lbs per 1000 square feet.
6. At completion of planting, all non-turf planted areas are to receive a 1 1/2" topdressing of shredded walk-on bark. Wash excess bark off leaves and do not engulf stems of plants and ground cover.
7. Lawn Installation:
 - a. The turf areas, as indicated on the plans, shall be hydroseeded in one operation after all trees, weed removal, soil preparation, grading and irrigation system have been completely installed and approved.
 - b. Hydromulch mixing shall be performed in a tank with a built-in continuous agitation and recirculation system of sufficient capacity to produce a homogeneous slurry of fiber, fertilizer, water, and additives in the specified proportion. Hydroseeding Slurry Mix:
 - i. Mulch: Agrono-Mulch @ 1500 lbs per acre. As distributed by Agro Tec Seed Co., Fresno, California, (559) 277-2444.
 - ii. Binder: Agrono-Tac @ 120 lbs per acre. Fiber Plus @ 25 lbs per acre.
 - iii. Fertilizer: Soluble time release granular mixture of 24-4-8 @ 250 lbs per acre.
 - iv. Seed: 100% Pixie Tall Fescue @ 8 lbs per 1000 square feet. As distributed by Medalist America Turfgrass Seed Company, Sacramento, California, (916) 731-5534.
 - c. The final seed mix is subject to change. Verify the final approved seed mixes with the Owners authorized representative prior to seeding. The seed mixes will be adjusted to account for the use, drought tolerance, and the time of year to be installed.
 - d. The area to be seeded shall be slightly moist after the last watering and final weeding operations. The grading must be approved prior to hydroseeding.

- e. The area to be seeded shall be hydromulched with a discharge system that will apply the slurry to the areas to be treated at a continuous, uniform rate. The tank shall have a minimum capacity of 1000 gallons. Nozzle applying the slurry shall be held close enough to the areas to be planted to distribute the slurry in a uniform coating on the surface. A green marker dye shall be used to show such coverage.
- f. A minimum of one trained workman shall be on the site 4 hrs per day after hydroseeding and through the maintenance period. The hydroseeded areas shall be watered immediately and kept damp during the entire germination period. Areas that are drying out too soon due to wind or other causes shall be watered by hand until the whole grass area comes up in a uniform and even covering of grass. Care shall be used to not overwater, which would create erosion. All erosion scars are to be repaired the same day.
- g. The contractor is to carefully observe the newly planted grass to keep moist and in a healthy growing condition. The contractor is to water and fertilize as needed to keep the turf in a vigorous healthy condition.
- h. The contractor is to protect the newly seeded area from foot traffic as needed. The contractor is to continuously reseed and repair damaged areas.

25-3.14 Staking and Tying

1. Remove nursery stakes and ties.
2. Install tree stakes 18" deep on windward and leeward sides of tree and tie to tree with 4 ties. Install ties loose enough to avoid injuring cambium layer of tree and to allow limited movement.
3. Remove nursery ties from shrubs and espaliered plants and install new plastic ties in a loose manner so new plant growth will not girdle the branch or stem.
4. Attach vines to adjacent walls and/or trellis structures. Contractor is to provide hardware, wire, and other materials required for a complete installation.

25-3.15 MAINTENANCE

1. Maintain planted areas during the progress of the work and through the maintenance period. A minimum of one trained workman shall be on the site 2 hrs per day after sodding and through the maintenance period.
2. The maintenance period begins when the work is completed and accepted by the Owner. The maintenance period shall be for one hundred twenty (120) days, after final acceptance by the Owner. The Owner shall be notified 10 days prior to the time that the work is ready for final inspection. This final inspection is required before the maintenance period can begin. The contractor is responsible to provide all materials and labor to maintain the site for the maintenance period at no cost to the Owner. The maintenance period may be extended at no cost to the Owner should prevailing site conditions not warrant final acceptance by the Owner. The site should be in a weed free condition, the lawns should be established, vigorous, have minimum 98% coverage, be weed free, and fertilized, and all plants and trees are to be in good condition. The maintenance period will be extended in one month increments until the contractor brings the site into compliance.
3. During the maintenance period the contractor shall provide, but not limited to, the following services:
 - a. Maintain surfaces and supply additional top soil where necessary, including areas affected by erosion.
 - b. Water to ensure uniform seed germination and to keep surface of soil damp. Fertilize as specified on a monthly, or as needed basis.
 - c. Apply water slowly so that surface of soil will not puddle and crust.
 - d. Maintain planted areas weed free. Hand weed or use chemicals at the Contractor's option.
 - e. Mow and maintain the turf areas, and pick up grass clippings to be hauled off site at the contractors expense.

25-3.16 CLEAN-UP

1. Remove rubbish, trash, and debris resulting from the operation at the end of each working day.
2. Wash paved surfaces clean.
3. Maintenance period will begin with acceptance of installation by the Owner and will continue as noted in article 25-3.15.

SECTION 25-4 AUTOMATIC IRRIGATION SYSTEM

25-4.1 GENERAL DESCRIPTION

Sprinkler systems shall be constructed to the sizes, grades and locations shown on the plans. Sprinkler lines shown on the plans are essentially diagrammatic. Locations of all sprinkler heads, shrub heads, etc. shall be established by the Contractor at the time of construction. Typical spacing of the sprinkler heads are shown on the plans and shall be exceeded only with the permission of the Owner's authorized representative.

Unless otherwise specified, the construction of sprinkler systems shall include the furnishing, installing and testing of all necessary components to provide a complete and fully operational automatic irrigation system in accordance with the plans and specifications. The contractor shall review the plans and specifications, and if he/she feels that more equipment is needed, he/she shall include that in the bid. All extra work to achieve full coverage shall be at the Contractors expense. Sprinkler systems shall be complete, operative, automatic and provide full coverage of the planted areas.

The Contractor is to install an irrigation booster pump station for any irrigation system with rotor sprinklers or a pressure less than 55 psi at the point of connection. The Contractor shall test the main line prior to starting any work and verify that such pressure does exist. If it does not, he/she shall notify the Owner at once for a ruling before starting work. If the Contractor does not test prior to work, all corrective work shall be at the Contractors expense.

25-4.2 VERIFICATION OF PLANS, SPECIFICATIONS & SITE

1. It shall be the responsibility of the contractor to carefully examine the plans and specifications relating to this work for completeness, accuracy, and clarity. Any conflict, error, or clarification shall be immediately brought to the attention of the Owners authorized representative in writing to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the contractors expense.
2. It shall be the Contracting Installer's responsibility to review the site conditions prior to submitting a bid. He/She shall report to the Owner's authorized representative in writing any deviation between the drawings and the site conditions to obtain a ruling. Failure to do so prior to bidding shall result in any corrective work necessary shall be completed at the Contractors expense.

25-4.3 CODES AND PERMITS

Materials and Installation shall conform to all State and Local Codes and Regulations governing the trades included in this work. Requirements of these

plans or specifications not conforming therewith, but exceeding code requirements, shall govern. The contractor shall obtain and pay for all necessary permits required for this work. He/She shall pay for all costs in connection with inspections, examinations, and approvals required by ordinances of governing agencies.

25-4.4 PURPOSE OF SPECIFICATIONS

1. It is the intent of these specifications and plans to form a guide to accomplish the work of installing a complete sprinkler system which will operate in an efficient and satisfactory manner according to the workmanlike standards established for the sprinkler industry. Therefore, any items not specifically noted, but necessary for a complete installation, shall be furnished and installed under this contract.
2. If these specifications are deficient in setting forth a complete detailed description of the work of providing an operable irrigation system, it shall be the Contractors responsibility to provide the necessary labor and material to complete the irrigation system in a complete and operable form.
3. Manufacturer printed instructions shall also be a part of these specifications and shall prevail over these specifications. The Contractor shall be responsible to provide such details and instructions to the inspecting person for approval or rulings.

25-4.5 PRECEDENCE OF DRAWINGS

See Section 2-5.2.

25-4.6 UNDERGROUND OBSTRUCTION

Refer to Section 5, Utilities.

25-4.7 WORKMANSHIP

The contractor shall have experience and demonstrated ability in the installation of irrigation systems of this type. No work shall be completed without supervision. All work shall be installed by skilled persons proficient in the trades required, in a neat, orderly and organized manner, with recognized standards of craftsmanship developed for the industry and as described in the manufacturers installation instructions.

25-4.8 CONSTRUCTION OBSERVATION

The contractor is to coordinate construction observation site visits with the City Inspector during the appropriate phases of construction. The contractor is to schedule site visits one week in advance at the required phases of construction. The following outlines, as a minimum, the phases of construction which require a site visit.

1. Preconstruction meeting
2. Staking of sprinklers and mainline routing.
3. Mainlines, wiring, lateral pipes, & valve manifolds prior to backfill.
4. Irrigation coverage test and rough grading.
5. Trees & plants prior to installation, still in containers.
6. Fine grading of turf areas prior to hydroseeding.
7. Substantial completion to start maintenance.
8. Final acceptance after successful maintenance period.

The Owner will pay for initial construction observation visits, however, any additional visits required due to non-compliance, incomplete work, or substandard performance will be paid by the contractor at a cost of \$250.00 per extra visit.

25-4.9 PROTECTION OF PUBLIC HEALTH AND WELFARE

Refer to Section 7 Responsibilities Of The Contractor In The Conduct Of His Work.

25-4.10 RECORD DRAWINGS

The contractor shall keep one set of clean prints for the purpose of documenting the installation locations of the irrigation system. The contractor shall note dimensions to hardscaped surfaces, and keep the "as built" record drawings up to date on a daily basis. Upon completion of the project, the contractor shall transfer the information to a clean set of prints, and make xerox vellums and an "electronic file" of the "as built" record drawings to provide to the Owner.

25-4.11 MATERIALS

All materials and equipment to be used shall be as outlined on the irrigation legend, or as described in the irrigation notes and irrigation specifications. All materials shall be new and unused.

25-4.12 STAKING

The location of all sprinklers, valves, piping and principal fittings shall be staked out by the contractor. All staking and measurements shall be taken from permanent objects, buildings, or other permanent hardscape features including survey bench markers, and are NOT to be taken from non-permanent boundaries such as turf boundaries which are subject to modification with the Owners authorized representatives written permission. All measurements shall be made in feet and inches, rounding to the nearest inch. All variations from the plans are to be continuously updated on a daily basis on the record drawings, or "as built" drawings.

25-4.13 EXCAVATION, BACKFILL

1. Trenches for AC pipe, PVC plastic and galvanized pipe shall be excavated either by hand or machine and shall be sufficient width to permit proper handling and installation of the pipe and fittings. The backfill shall be compacted and evened off with the adjacent soil level. Selected fill dirt or sand shall be used if soil conditions are rocky, or have debris. No material over 2" shall be allowed near the pipe, below it, or 4" above the pipe. Backfill shall be made early in the morning when the soil and pipe temperatures are the same. Pipe to be a minimum depth of 18" on pressure pipe, and 12" on PVC lateral, or non pressure pipe.
2. Contractor shall compact fill as required to prevent settling of trenches. Contractor to guarantee trenches against settling.
3. All pipe in the same trench shall have a minimum clearance of 4 inch from each other. Final fill over trenches shall be compacted to a level grade with no depressions.

25-4.14 ROAD, DRIVEWAY AND PARKING LOT CROSSINGS

1. Any pipe that crosses any existing road, driveway, parking area or otherwise paved area shall generally be by directional horizontal boring. Paved area pipeline crossings are to be marked and approved by the site inspector. No cutting and patching of any paved surface will be permitted without written permission of the Owners authorized representative. Newly paved areas are to be protected and preserved from construction damage. Care is to be taken to bore under crossings at a sufficient depth as to not adversely effect the paved surface.
2. If approval to cut and patch a paved/hardscaped surface has been obtained, the Contractor shall make cuts by a saw or other approved means. Where any cutting or breaking of sidewalks and/or concrete/hardscaped surface work is necessary, it shall be removed and replaced by the contractor conforming with the project specifications. Barriers and night lighting shall be erected to protect the public health

- welfare and safety. All materials and labor for all crossings, whatever method, are to be supplied by the contractor.
3. All pipe and low voltage wire under paving shall be installed in PVC class 200 pipe sleeves of an appropriate size, (minimum of two times larger than the pipe being sleeved), and a minimum sleeve size of two (2") inch. The contractor is to verify the inside and outside diameters of pipes being sleeved to insure proper fit and installation. All sleeves are to be installed a minimum of 24" below grade.
 4. Backfill shall be compacted to 95%. The Owner reserves the right to test such backfill. If the backfill does not meet the required 95% the contractor shall re-compact the trench. The Contractor shall pay for all testing until work meets specifications.
 5. Paving shall be completed to an equal quality to the project specifications. Paving in concrete or asphalt shall meet a finished grade of the existing work. Sloppy work will be rejected.

25-4.15 PIPELINES

1. Plastic pipe shall be as called for on plan and extruded from PVC 1120/1220 and shall meet commercial standards CS 256-63. Class and schedule of pipe shall be as called for in the plans. Strict accordance the Mfg. recommendations shall be used in the installation of the pipe. Galvanized / ductile iron pipe and fittings (schedule 40) are to be used for any pipe installed above ground.
2. The contractor is to install concrete thrust blocks as outlined in the thrust block detail to secure all changes in direction or dead ends of all mainline pipe. The contractor is to use rebar if necessary to insure the stability of the pipe.
3. Where piping on the drawings is shown under paved areas, but, running parallel and adjacent to planted areas, the intent of the drawing is to install the piping in the planted area. PVC class 200 sleeves are to be used with all pipe and wire under walks or roadways. All galvanized pipe is to be schedule 40. Connections to mainline supply shall be by Contractor according to existing code.

25-4.16 PLASTIC PIPE FITTINGS AND CONNECTION

All plastic pipe fittings to be installed shall be molded Geon Type, and shall be suitable for solvent weld, gasket, or threaded connections. Fittings shall be PVC schedule 40/80, solvent weld, by Lasco or approved equal. When connection is plastic to metal, schedule 80 TOE nipple with schedule 40 coupling shall be used. Teflon tape shall be used on all small diameter (3/4" to 3") threaded

connections. PVC, AC pipe shall be installed as per industry standards. After testing, and prior to putting on heads, flush system of all debris. All PVC fittings, 3" and smaller, are to be either schedule 40 or 80 solvent weld fittings as called for on the plans. All fittings not specified as schedule 80 are to be schedule 40 fittings. All mainline fittings, 4" and larger, are to be Leemco/Harco ductile iron gasketed fittings.

25-4.17 WIRING

All low voltage valve wire is to be installed under pipe, taped in bundles 8'-0" O.C. All wiring, pull boxes, connections shall be UL approved as to material and installation. All work shall comply with existing codes, laws, and manufacturer's recommendations. All low voltage "hot" wiring is to be continuous, between the valve location and the irrigation controller. Low voltage wire shall be color coded by controller. All low voltage wire splices shall be done in valve boxes with all connections soldered, taped and coated with a catalytic epoxy water proof sealing packet, or 3M dby wire splicing and weatherproofing kits. Contractor shall call out any conflict in the recommendations. Low voltage "hot" wire shall be #14-1 or heavier, and "common" wire shall be #14-1 or heavier. Wire size shall be as specified by manufacturer of clocks and valves. All wire shall be specifically designed for direct burial use. A minimum loop of eighteen (18") inches shall be left at each valve, at each splice, at each change in direction, and at each controller for expansion and/or servicing.

25-4.18 SPRINKLER HEADS

Sprinkler heads shall be of the type and size as shown on the plan. Heads adjacent to existing walks, curbs, or other paved areas shall be set to grade. Heads adjacent to curbs and walks shall be 2" away from such surfaces and 12" away from building walls or fencing. Adjust heads to prevent over spray from hitting buildings, fences, walls, or walks. Install anti-drain check valves under all heads that show drainage after operation. Check-valves should be installed in pipe lines to prevent drainage if necessary.

Sprinkler heads shall be set plumb and level with established turf at the locations indicated on the plans.

25-4.19 ISOLATION VALVES

All ball valves, 3" and smaller, shall be all brass or bronze of domestic manufacture with resilient seat and have a minimum working pressure of 200 psi. Furnish operation nut and handle.

All gate valves, 4" and larger, shall be ductile iron resilient seat gasketed joint gate valves rated for 200 psi minimum. Contractor is to provide one gate valve operating handle to the Owner.

25-4.20 QUICK COUPLER VALVES

The quick coupling valves shall be universal keyed of brass construction with IPS female pipe connections. The valve body shall be one or two piece construction with a rubber cover. Two (2) quick coupler keys, and two (2) hose ells shall be supplied to the Owner at the end of the job. Quick couplers are to be installed in 10" round valve box flush with the final grade

25-4.21 AUTOMATIC IRRIGATION CONTROLLER

Automatic controller shall be as specified in the City Standard Details. Pedestal mount shall be stainless steel with separate meter socket pedestal and have concrete base. All installation is to be in accordance with Manufacturers recommendations. All electrical connections to the clock shall be the responsibility of the Contractor and shall be UL approved and meet all codes. All wiring from electrical source to clock shall be in U.L. approved conduit.

The automatic controllers are to be wired to start the irrigation booster pump (if applicable) and operate during the watering cycle. The contractor is responsible for the wiring between the irrigation controllers and the irrigation booster pump as needed for complete automatic operation of the irrigation system.

25-4.22 ELECTRIC VALVES

Contractor shall furnish and install all valves of the type specified on the plans. Valves shall have a manual operation device. All work shall be as per Manufacturers detailed instructions. Electrical connection to electric valves shall have a 18" wire loop to each valve in valve box, see details. Valves shall be installed in a heavy duty plastic valve box with bolt down lid as per the details on the plan.

All valves with bubblers and drip are to have a pressure reducing feature installed on each valve, Irritrol OmniReg, to adjust (lower) pressure for each valve to achieve the optimum performance of the given sprinkler equipment noted.

25-4.23 VALVE BOXES

All valves, manual or automatic shall have a valve box, set flush with grade. All boxes shall meet State and City codes. All valve boxes shall have a bolt down heavy duty lid. Unless otherwise called for boxes shall be heavy duty plastic, standard rectangular size, Applied Engineering or approved equal. Maximum of one valves per box, no exceptions. Placement of the valves within the valve boxes shall allow for proper servicing and maintenance space, or the installation will be rejected.

25-4.24 BACKFLOW PREVENTION UNITS

Unless otherwise specified, the backflow prevention unit shall be as called for in the City Standard Details, or what is acceptable to City code, and installed as per

Mfg. detailed instructions. It shall be placed at least 12" higher than the highest head.

25-4.25 MAINLINE TESTING

The irrigation system mainline pipes and valves are to be pressure tested up to 100 psi for not less than one hour. The contractor is to keep a record of the test conditions, leaks, date, repairs made, and re-test information.

25-4.26 COMPLETION OF WORK

Prior to final acceptance of the work, the Contractor shall deliver to the Owner a complete, blue-line and xerox vellum copy of the "as built" plan, (2) two sets of manuals covering all materials in the irrigation system, (2) two keys to each controller, (2) two quills for quick couplers and wrenches etc. that are part of the maintenance equipment of all parts of this system. Irrigation system shall be fully automatic, operable and provide coverage of the planting areas. Irrigation controllers shall have color coded waterproof diagrams of station operation sequence and locations mounted on the inside of the cover.

25-4.27 GUARANTEE

The entire irrigation and water system shall be guaranteed to provide satisfactory service for a period of one year from the date of acceptance by the Owners authorized representative. Any repairs required are to be completed by the contractor in a timely manner at no additional cost to the Owner.