

**SECTION 20 - LANDSCAPING  
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## SECTION 20 LANDSCAPING

### 20-1 GENERAL

Landscaping work shall consist of performing roadway planting, park landscaping, irrigation installation, and other work necessary for improving the appearance of the roadside and park facilities, as shown on the Plans and in accordance with these Specifications.

### 20-2 MATERIALS

Landscaping materials must conform to the requirements in Section 50-43, "Landscaping Materials", and these Specifications.

#### 20-2.01 Root Control Barrier

Root control barriers must conform to Section 50-43.13, 'Root Control Barrier', the Special Provisions, and these Specifications. Root control barrier must be installed prior to topsoil placement or by means of trenching against existing surfaces. Panels must be installed vertical in planter, flush against edge of pavement or header board. Top of barrier must be one-inch (1") higher than planter finish grade. Top of barrier must be covered from view by mulch layer. Barrier deflectors must face inward towards root ball. Root control panels must provide a continuous barrier along the perimeter of each median planter, tree well, sidewalk, or other hardscape surface. Contractor must take measures to prevent separation, sagging, warping and damage to root barriers during construction.

#### 20-2.02 Topsoil

Topsoil must be placed and spread to the line and grade as shown on the Plans or as directed by the Agency. Topsoil must be compacted to approximately eighty percent (80%) relative compaction, or as indicated on the Plans. All lumps and clods must be broken up before topsoil is spread. Topsoil in tree or shrub pits must be lightly tamped by hand so as to form a firm setting for the plant, but not hinder growth. Mechanical tamping will not be permitted.

After spreading the topsoil, any extraneous or unacceptable material not previously removed must be raked off and removed from the topsoil area. Spreading and compacting must be completed in such a manner that seeding, sodding, or planting can proceed without additional grading.

Immediately before planting, the topsoil must be cultivated and raked to provide a uniformly smooth, firm, friable, fine textured finished surface. No grading equipment will be permitted on the topsoil after the area has been finish graded and prepared for planting.

#### 20-2.03 Soil Amendment

Soil amendment must be uniformly spread at the rate specified and thoroughly incorporated with a rotary cultivator to obtain a homogeneously blended soil six inches (6") in depth, unless specified otherwise in the Special Provisions.

#### 20-2.04 Liquid Green Dye

Liquid green dye used in erosion control and hydroseeding work must be 48-hour colorfast, applied at the rate of two (2) quarts per acre, unless otherwise specified in the Special Provisions.

#### 20-2.05 Mulch

Mulch must be top dressed, where specified, to a minimum depth of three inches (3") over

soil level. Ground cover areas planted from containers less than one-gallon in size may receive a minimum depth of two-inches (2") of mulch. Do not bury or cover over plant material with mulch layer. Taper mulch away from the crowns of all newly planted and existing trees.

**20-3 EROSION CONTROL**

Erosion control materials must conform to Section 50-43, "Landscaping Materials", the Special Provisions, and these Specifications.

**20-3.01 Seeding Application**

Seeding application must conform to the Special Provisions and these Specifications.

If the Contractor elects to hydroseed, a minimum of fifteen hundred (1,500) pounds of fiber per acre must be mixed and applied with the seed, and fertilizer (if required) may be mixed with the seed and fiber and applied in the hydroseeding operation.

The Contractor must scarify to a depth of six inches (6") and uniformly fine grade so that proper drainage of the entire ground cover is assured. All rocks, soil lumps, and other deleterious materials larger than one inch (1") must be removed and the area raked smooth.

The Contractor must avoid any compaction of the soils after treatment, and must not permit traffic over such areas. In case of such compaction, the areas must be recultivated by the Contractor, at the Contractor's expense.

Areas to be treated for weed control must be treated as shown or specified in the Contract .

Equipment for hydroseeding application must have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of fiber, fertilizer, seed, and water. The discharge line must provide even distribution of the slurry on the slopes to be seeded. The slurry tank must have a minimum capacity of one thousand (1,000) gallons.

The slurry preparation must begin by adding water to the tank. When the water level has reached the height of the agitator shaft, the stabilizing agent must be added. Seed and fertilizer must then be added, followed by the fiber mulch. The combined materials must then be uniformly blended prior to application. Spraying must commence within two (2) hours after the tank is full.

The Contractor must perform hydroseeding during calm wind conditions. The operator must spray the slopes with a uniform, visible coat, using the color of the mulch as a guide. The slurry must be applied in a sweeping motion to allow the fibers to build on each other, until a good coat is achieved. Unless otherwise specified in the Special Provisions, the application rates must be:

<b>Material</b>	<b>Application Rate per Acre</b>
Mulch	1,500 pounds
6-20-20 fertilizer	400 pounds
Seed Mix	See Plans or Special Provisions
Liquid Green Dye	2 quarts
Stabilizing Emulsion	As approved by the Agency

**20-3.02 Measurement and Payment**

The quantity of erosion control to be paid for by the square foot, square yard, acre or as designated in the Contract will be calculated on the basis of actual or computed slope measurements.

The price paid per square foot, square yard, or acre includes compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in performing erosion control work and hydroseeding, complete in place, including site preparation, hydroseeding application, and clean-up as shown on or specified in the Contract, as specified in these Specifications, and as directed by the Agency.

## **20-4 PLANTING**

This work shall consist of furnishing and installing planting materials, clearing planting areas, preparing planting areas, planting plants and establishing plants as shown on the Plans and as specified in these Specifications and the Special Provisions.

Planting materials must be as specified in Section 50-43, "Landscaping Materials", and these Specifications, and must be installed in accordance with Standard Drawings L-1 and L-2.

### **20-4.01 Pesticides**

The Contractor must obtain recommendations for the use of pesticides from a licensed Pest Control Adviser in accordance with the requirements of the California Food and Agricultural Code. At least twenty-four (24) hours prior to using any pesticides, a copy of such recommendations must be submitted to the Agency for approval. The recommendations must include, but not be limited to, the pesticides to be used, rates of application, methods of application and areas to which pesticides are to be applied.

Pesticides for weed control must be applied with a photosensitive dye which will produce a contrasting color when sprayed upon the ground. The color must disappear between two (2) and three (3) Calendar Days after being applied. The dye must not stain any surfaces nor injure plant or animal life when applied at the manufacturer's recommended application rate.

Pesticides must not be applied when weather conditions, including wind conditions, are unsuitable for such work.

Any new or existing plants which, in the opinion of the Agency, have been damaged by the application of pesticides must be replaced by the Contractor at his expense.

### **20-4.02 Preparing Planting Areas**

The Agency must approve the ground locations of plants by inspecting the placement of the plants, stakes, or other suitable markers. The Contractor must furnish all labor, materials, and transportation required to adequately mark the various plant locations.

In areas to be planted, all rocks and other debris greater than one inch (1") in diameter must be removed and disposed of.

In areas to be planted, the grade must be one to two inches (1"-2") below the planned finish grade prior to conditioning the soil. In all other areas, the grades must be as indicated at the grading plane for the type of facility to be constructed thereon.

The formation and compaction of embankments must conform to the provisions as specified in Section 18, "Earthwork", of these Specifications and as modified herein. In areas to be planted, compaction of the fill must be not more than eighty-five percent (85%) for the upper one foot (1') of such fill.

Cultivation must be performed with as many passes with the cultivator as necessary, as determined by the Agency, to produce a friable, uniformly mixed soil, free of pockets of unmixed soil, amendments, or fertilizers if such are specified.

Areas adjacent to walks, structures, or other such facilities that are inaccessible or difficult to reach by mechanical rotary cultivators must be cultivated by hand.

After cultivation, the surface must be raked, rolled, or otherwise smoothed to remove ridges and fill depressions. The finished surface must be uniform, evenly graded, and reasonably firm. The grades of the finished surface must be approximately two inches (2") below the top of adjacent curbs or pavement, unless otherwise shown on the plans.

Soil preparation and planting operations must be conducted under favorable weather conditions only. Soil must not be worked when excessively dry or wet and the Agency has the right to stop any work taking place during a period when conditions are considered detrimental to soil structure or plant growth.

The work involved in preparing planting areas must be so conducted that the existing flow line in drainage ditches will be maintained. Material displaced by the Contractor's operations that interferes with drainage must be removed and dispersed of as directed by the Agency.

Cultivation must be performed until the soil is in a loose condition to a minimum depth of six inches (6"). Soil clods must not be larger than two inches (2") in any dimension after cultivation. Planting areas that have been cultivated and become compacted for any reason must be recultivated by the Contractor at his expense.

Areas to receive a pre-emergent weed control must be treated following planting and prior to applying mulch layer, as noted in the Plans or specified in the Special Provisions.

Follow the manufacturer's recommendations for proper application rate, precautions and safety. Apply with a properly calibrated applicator that will distribute granules uniformly on surface of planting area. After application, remove excess granules from plant foliage. Do not apply to wet foliage. Irrigate planting area lightly following application.

#### **20-4.03 Header Boards**

Header boards must conform to Section 50-43.11, "Lumber", of these Specifications and must be installed in accordance with Standard Drawing L-30.

Header board stakes must be of the size and shape shown on the Plans. Each stake must be driven flush with the top edge of the header board and the stake top must be beveled away from the header board on a forty-five-degree (45°) angle. Stakes must be at four feet (4') on center along the length of the header board. Stakes must be attached to header boards with a minimum of two (2) 12-penny hot-dip galvanized common nails per stake.

Where asphalt concrete or portland cement concrete surfacing must be removed to permit the installation of header boards, and no joint exists between the surfacing to be removed and surfacing to remain in place, the surfacing must be cut in a neat line to a minimum depth of 0.17-foot with a power driven saw before the surfacing is removed.

#### **20-4.04 Planting**

Plant material must conform to Section 50-43.14, "Plants", of these Specifications and must be installed in accordance with Standard Drawings L-1 and L-2, unless otherwise noted in the Plans or Special Provisions.

No planting must be done in any area until the area concerned has been prepared in accordance with these Specifications and the Special Provisions and presents a neat and uniform appearance satisfactory to the Agency. When an irrigation system is required, the irrigation system must be installed and checked for coverage to the satisfaction of the Agency prior to planting plants.

Planting will not be allowed in any area that in the opinion of the Landscape Architect is too wet or too dry or that is in any other way unacceptable for planting.

Where vines are to be planted against walls or fences, the vines must be planted as close as possible to the wall or fence as shown on the Plans.

Plants must be removed from the containers in such a manner that the ball of earth surrounding the roots remains intact, and they must be planted and watered as hereinafter specified immediately after removal from the containers. Containers must not be cut prior to delivery to the planting site.

Roots of plants not in containers must be kept moist and covered until such plants are planted.

Before planting in holes or trenches, water must be applied to the backfill with a pipe or tube inserted to the bottom of the hole until the backfill material is saturated for the full depth. Backfill for planting holes and trenches must be placed in two (2) lifts. Water must be applied to the backfill between lifts with a hose and allowed to fill and percolate. Additional backfill must not be placed until the water has percolated and saturated the planting hole to its full depth.

Each tree and shrub location must be as shown on the Plans, or as approved by the Agency. Plants must be spaced as indicated on the Plans or in the Special Provisions. Plants in adjacent rows must be staggered. Tree and shrub locations must not conflict with any existing utilities, utility boxes, or other improvements. Conflicts at the time of planting or that can be foreseen upon maturity of the trees or shrubs must be brought to the attention of the Agency immediately. Field adjustments to plant placement must be approved by the Agency. Plants improperly located must be replanted by the Contractor in the proper location at no additional cost to the Agency.

Planting must be performed in accordance with the details shown on the Plans and Standard Drawings. Each plant must be placed in the planting excavation in an upright position in the center of the hole, and the space around it backfilled with planting mix so that amended soil of a thickness equal to at least half the diameter of the root ball is around the sides of the root ball. Organic matter must not be placed beneath the plant's root ball. Plants must be set in the backfill material in flat bottomed holes to such depth that after the soil has settled the top of the plant ball will be one inch (1") above the bottom of the basin or even with surrounding soil where there is no basin.

Plants must be planted in such a manner that the roots will not be restricted or distorted. Soil must not be compacted around the roots or ball of the plant during or after planting operations. The plant must be set so that the root crown is one-half inch (1/2") or three-quarter-inch (3/4") higher than average surrounding grade. The ground around the plant must be shaped to drain water away from the root crown or trunk of plant. Any plants that have settled deeper or stand higher than specified must either be raised back to the required level or replaced, at the option of the Contractor.

After planting operations have been completed, the Contractor must remove all trash, empty plant containers, tools, and equipment used in this work, and any other marks in the area caused by this work must be repaired at the Contractor's expense, and the ground left in a neat and orderly condition.

#### **20-4.04.A Preparation for Ground Covers**

Areas to be planted with ground cover must receive fertilizer and soil amendment, uniformly distributed and thoroughly cultivated into the top six inches of soil (6"). The rate of application for fertilizer and soil amendment must be as shown or specified in the Contract.

The Contractor must fine grade the planting area so that proper drainage of the entire ground cover is assured.

The Contractor must avoid any compaction of the soils after treatment, and must not permit traffic over such areas. In the event of such compaction, the areas must be recultivated by the Contractor, at the Contractor's expense.

Ground covers must be planted in the prepared soil, which must be moist and friable, never dry or wet and soggy. The moist condition must extend to the full depth of cultivation.

Ground cover plants must be planted in neat, straight rows parallel to the nearest pavement or fence.

The spacing of ground cover plants must be as shown on the Plans and in accordance with Standard Drawing L-21. Plants must be planted in neat, evenly spaced rows with staggered triangular spacing. Ground cover must be planted around shrubs to within one foot (1'), and around trees to within eighteen inches (18"). Ground cover in one-gallon containers must not be planted closer than two feet (2') to walls and fences, unless otherwise shown on the Plans or

specified in the Special Provisions. Ground cover from flats must not be planted closer than six inches (6") to walls and fences, unless otherwise shown or specified in the Contract.

**20-4.04.B Preparation for Trees and Shrubs**

Trees, shrubs, and vines in ground cover areas must be planted before ground cover plants or cuttings are planted. Holes for trees and shrubs must be excavated by auger unless otherwise indicated on the Plans or specified in the Special Provisions. Before an augured hole is made, the top six inches (6") of soil amendment treated soil must be removed and stockpiled at one side of hole.

A twelve-inch (12") diameter by ten feet (10') deep tree pit must be bored prior to planting all trees fifteen (15) gallons or larger, unless otherwise specified in the Special Provisions. Boring must take place prior to placement of topsoil. Backfill for bored pit must be excavated bored material. Backfill must be jetted and settled a minimum of four (4) Calendar Days prior to planting trees.

When the backfill around the plant is approximately two-thirds (2/3) completed, the plant must be thoroughly watered, after which the backfill must be completed to the grade of the surrounding area.

Planting tablets conforming to Section 50-43.02, "Commercial Fertilizer", of these Specifications must be installed according to the following schedule:

<b>Plant Container Size</b>	<b>Planting Tablets</b>
One gallon	2 tablets, 21 gram
2 or 5 gallon	3 tablets, 21 gram
15 gallon	6 tablets, 21 gram
24-inch box stock or larger	10 tablets, 21 gram

No boxed, balled, or canned trees must be planted if the rootball is broken or cracked, either before or during the process of planting.

All trees must be provided with two (2) tree stakes. Tree ties must be placed in one place just below the main fork or branches. Tree ties must be nailed or tacked through knot to the tree stake with an appropriate length fastener. Tree stakes must not be driven into the root ball.

Except in turf areas, each plant must have a soil berm constructed around it to retain water. The soil berm must be at least four inches (4") high and must have a minimum inside diameter of two feet (2') for shrubs and three feet (3') for trees.

Each tree in a turf area must have the turf removed in a ring around the tree base. For five-(5) gallon trees, the ring must be twenty-four inches (24") in diameter; for fifteen-(15) gallon and larger trees, the ring must be thirty inches (30") in diameter.

**20-4.04.C Preparation for Turf**

All turf areas must receive fertilizer and soil amendment, uniformly distributed at the following minimum rates per one thousand (1,000) square feet and thoroughly cultivated into the top six inches (6") of soil, unless otherwise specified in the Special Provisions:

<b>Material</b>	<b>Distribution Rate per 1,000 Square Feet</b>
Fertilizer	18 pounds
Soil Amendment	4 cubic yards



After application of fertilizer and preparation of soil has been completed, the areas to be sodded or seeded in lawn must be brought to a smooth, uncompacted grade.

The Contractor must fine grade so proper drainage of the entire area is assured. Rocks, soil lumps, and other deleterious materials larger than one inch (1") must be removed and the area raked smooth.

The Contractor must avoid any compaction of the soils after treatment, and must not permit traffic over such areas. In case of such compaction, the areas must be recultivated by the Contractor, at the Contractor's expense.

The soil on which the turf sod is to be placed must be moist at the time of planting. The Contractor must install the turf sod in conformance with the supplier's recommendations.

Sod must be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such case, sod must be stacked, kept moist, and protected from exposure to the air and sun. The stored sod must be installed in place not more than 48 hours after cutting.

The sod must be installed to the smooth finish grade with tight edges and no gaps. Sod pieces must be placed with ends staggered. Sod must not be stretched. Sod must be rolled or folded prior to lifting. Handling of sod must be done in a manner that will prevent tearing, breaking, drying, or any other damage.

After the sod has been placed, it must be rolled with a roller to ensure no air pockets are between the roots and the soil. Sod must be watered immediately after installation.

Turf to be seeded must be sown in prepared soil at the rate of twelve (12) pounds per one thousand (1,000) square feet or as shown on the Plans or specified in the Special Provisions. Seed must be raked in lightly and rolled.

#### **20-4.05 Watering**

Water from facilities within the limits of the project that are owned by the Agency, located downstream of a water meter, and for which the Owner has an established water billing account, may be obtained by the Contractor free of charge. Water from other sources must be paid for by the Contractor. Before drawing any water from a Sacramento County owned or operated hydrant, tap, outlet, or water system, the Contractor must obtain a Temporary Water Use Permit from the Sacramento County Water Agency.

Trees, shrubs, and vines must be watered immediately after planting. Water must be applied until the backfill soil around and below the roots or ball of earth around the roots of each plant is thoroughly saturated.

Where watering is done with a hose, a water disbursement device or pressure-reducing device must be used. Under no circumstances shall the full force of the water from the open end of a hose be allowed to fall within the basin around any plant.

Sprinklers must water ground cover plants in areas provided with an irrigation system. Several consecutive waterings may be necessary to thoroughly saturate the soil around each plant.

Water must be applied to plants as often and in sufficient amount to keep the plants in a healthy, growing condition during the life of the Contract.

Precautions must be taken to prevent water from wetting vehicles, pedestrians, and pavement. The Contractor, at the Contractor's expense, must repair any erosion or slippage of the soil caused by watering.

Compliance with the provisions in this Section does not relieve the Contractor of responsibility for the replacement of plants. The Contractor, at the Contractor's expense, must furnish any additional watering required to maintain the plants in a growing condition.

#### **20-4.06 Plant Replacement**

Plants that show signs of failure to grow at any time during the plant establishment period, or which have been injured, damaged, vandalized, or stolen as to render them unsuitable for the

purpose intended, as determined by the Agency, must be removed and replaced. Replacement plants must be furnished and planted by the Contractor at the Contractor's expense. The Contractor and Landscape Architect may agree to the substitution of alternative species of plants to be used as replacements. Any damage to the finish grading caused by replanting operations and/or vandalism must be repaired by the Contractor at the Contractor's expense.

Turf damage caused by vandalism or premature use must be repaired and reseeded before final inspection but will not cause extension of the maintenance period. Turf failure caused by improper maintenance practices and/or weather, as determined by the Agency, must be replanted and the maintenance period extended to thirty (30) Calendar Days after the replanting or as required by the Agency.

Unless otherwise permitted by the Agency, the Contractor must complete replacement of unsuitable plants within one (1) week after the Agency marks or otherwise indicates that such plants must be replaced.

#### **20-4.07 Inspection for Plant Establishment Period**

Upon completion of the planting work and irrigation installation, and prior to substantial completion, the Contractor must notify the Agency that the landscaping is ready to enter into the plant establishment maintenance period. The Agency will then schedule a pre-maintenance walk-through inspection and will notify the Contractor and the Landscape Architect of the time and date. Upon inspection, if the Agency and the Landscape Architect find the irrigation and landscape work complete and in compliance with the Contract, the Agency will authorize the start of the plant establishment period. Written notice will be given to the Contractor by the Agency as to the starting date of the plant establishment period.

#### **20-4.08 Plant Establishment Period**

The number of Calendar Days for the plant establishment period must be designated in the Special Provisions.

Plant establishment work must include, but is not limited to, all watering, weeding, fertilizing, cultivation, spraying, cutting, and pruning necessary to keep the plant material in a healthy, growing condition, and to keep the planted areas neat and attractive throughout the plant establishment period. Vines next to walls and fences must be kept staked and tied.

During the plant establishment period, irrigation systems must be operated in the automatic mode, unless otherwise permitted by the Agency. Plants must be watered in an efficient manner to provide optimum growth conditions. The Contractor must provide equipment and means for the proper applications of water to planted areas not provided with an irrigation system. The Contractor must be responsible for the replacement and/or repair of all irrigation equipment which is stolen, vandalized, or damaged during the establishment period.

The project site must be kept free of trash and debris during the plant establishment period.

Commercial fertilizer must be applied to trees, shrubs, vines, and ground cover areas as specified in the Special Provisions and must be watered into the soil after each application. The Contractor must notify the Agency at least forty-eight (48) hours prior to applying each application of commercial fertilizer.

During the plant establishment period, trees, shrubs, vines, and ground cover plants, planted as part of the Contract, must be pruned by the Contractor at the Contractor's expense, as directed by the Agency. Pruning must conform to ANSI standard practices.

Trees and shrubs must be watered, cultivated, and sprayed as required in an efficient manner to assure a vigorous, thriving condition from day of planting to end of plant establishment period. Weeds must be removed during this period. Overhead irrigation watering during the establishment period must adhere to the allowable hours of operation stipulated by County Ordinance or the local water purveyor, whichever of the two is more restrictive. Along roadways, the Contractor must avoid scheduling any irrigation between the hours of 7:00am and 7:00pm, when feasible. Overspray onto paved travel surfaces must be minimized through

adjustments to the system. Operation of the irrigation system outside the normal watering window is allowed for auditing, repairs and review purposes.

Should the Contractor fail, be neglectful, or negligent in this work, the Agency may elect to perform plant establishment work. The Agency will charge the Contractor the cost for performing the required work by deducting this cost from the payments due the Contractor.

Turf must be watered, reseeded, edged, weeded, and mowed as required to assure a neat appearance and a healthy and vigorous growth from the day of seeding to the end of plant establishment period. The first mowing must not be done until the grass is generally at least two inches (2") but less than three inches (3") high. For the first mowing and all subsequent mowing, the mower must be set to cut at a height of one and one-half inches (1-1/2"). Subsequent mowings, as required, must be done before the grass is three inches (3") high. Grass clippings for all mowings must not be allowed to lie after mowing. A catcher must be used on the mower, and grass clippings must be removed and discarded off site.

Immediately following the first mowing of the turf, turf areas must be fertilized at the rate of eight pounds (8 lbs.) per 1,000 square feet or as otherwise specified in the Special Provisions. Reapplication of fertilizer must take place as directed by the Agency during the plant establishment period.

Just prior to the end of the plant establishment period, the Contractor must cut all grass, weed all planting areas, and leave the work area in a neat and attractive condition. Prior to final inspection, all trash and debris must be removed and disposed of off-site.

At the end of the plant establishment period, all plant material must be in a healthy, growing condition. If, in the Agency's opinion, the plant material is not healthy, the Contractor must replace the unhealthy plant material at his expense. If 20% or more of the plant material requires replacement, the plant establishment period will start over.

The Contractor must guarantee a weed free, even stand of the lawn grass, with ninety-five percent (95%) coverage, of the varieties specified. If such stand does not develop as a result of the first seeding, the Contractor must reseed and care for thin spots until an even stand with ninety-five percent (95%) coverage is produced.

Weed control herbicides, in addition to that which is specifically required elsewhere, may be applied to planted areas at no expense to the Agency, if the Contractor deems it necessary. The type of herbicide to be used and method of application must be approved by the Agency.

Record drawings for the irrigation and planting, as well as irrigation controller charts must be prepared by the Contractor, unless otherwise noted in the Special Provisions. Refer to Section 20-6 'Record Drawings and Controller Charts' regarding submittal and approval.

#### **20-4.09 Inspection Prior to Final Acceptance of Landscape**

At least 14 Calendar Days before the end of the plant establishment period, the Contractor must request a final walk-through for the landscape and irrigation system. The project must have been maintained and monitored as specified in Plant Establishment Work and Maintenance Period section of the Special Provisions. The Agency's landscape architect must attend along with the Agency inspector and a representative from the Contractor. Any deficiencies in the landscape and irrigation system observed during the walk-through will be noted and made part of the final inspection punch list.

At least 7 Calendar Days prior to the final walk-through of the landscape and irrigation, instructions (including laminated controller charts if required by the Special Provisions) must be given to Agency maintenance personnel by a qualified person from the Contractor on the use and adjustment of the installed irrigation controllers. The Contractor's representative must perform a field test of the irrigation system operation and equipment at the same time. Any deficiencies with the irrigation system will be noted and made part of the final walk-through punch list items.

**20-4.10 Final Acceptance of Landscape**

The Contractor shall have 21 Calendar Days to address any final punch list items. Agency Inspection must confirm in writing that the final punch list has been addressed and will designate a date for the Agency to take over maintenance responsibilities on the project. Until written notification is received, the Contractor must be responsible for continuing maintenance and the plant establishment period.

**20-4.11 Measurement and Payment**

Planting work will be paid for at a single lump sum price or at unit prices for separate items of planting work, as designated in the Contract. Full compensation for providing planting work is included in the prices paid for the various items and no additional compensation will be paid.

Payment for the plant establishment period is considered to be included in other items of work unless noted otherwise in the Special Provisions.

**20-5 IRRIGATION SYSTEMS**

Irrigation system materials must be as specified in Section 50-43, "Landscaping Materials" of these Specifications.

Recycled, reclaimed, and non-potable irrigation systems must also comply with the requirements of Section 41-22, "Recycled Water," of these Specifications.

This Section 20-5 shall not apply to any portion of a water system upstream of a Water Utility water meter. Refer to Section 41, "Water Distribution Systems," of these Specifications for requirements for water meters and the upstream water system.

**20-5.01 Maintain Existing Water Supply**

The Contractor must notify the Agency and the property owner, manager, or tenant at least forty-eight (48) hours prior to shutting off the water supply to any portion of an existing irrigation system. The Agency and the property owner, manager, or tenant must also be notified when the water supply is returned to said portion of the irrigation system.

Where work is performed on an existing irrigation system, the system must be checked by the Contractor for proper operation after the work is completed and any malfunctions resulting from the Contractor's operations must be corrected at the Contractor's expense. If the work will interrupt the water supply for more than twenty-four (24) hours, the Contractor must water existing landscaping, including that being maintained by Agency landscape maintenance forces, in the area irrigated from that water supply as often as necessary to maintain healthy plant growth. The watering will be at the Contractor's expense. At the option of the Contractor, temporary connections to an operational existing irrigation system may be made as approved by the Agency until the interrupted water supply has been restored.

**20-5.02 Remove Existing Plants for Trenching**

Where trenching for new irrigation facilities is performed in areas planted with existing trees or shrubs, the trenching alignment must be adjusted as necessary to avoid damage to such trees or shrubs and their root systems.

Where trenching for new irrigation facilities is performed in existing ground cover or turf, sufficient plant material must be removed to permit the proper installation of such facilities, but in no case shall the removal width exceed five feet (5'). All turf repair or ground cover replacement planting must be performed before the start of the plant establishment period, or at least fourteen (14) Calendar Days prior to the acceptance of the Contract if there is no plant establishment period.

**20-5.03 Electrical Service for Electric Automatic Irrigation Systems**

Electrical service for electric automatic irrigation systems must conform to Section 49, "Signals, Lighting and Electrical Systems", of these Specifications and Standard Drawing 5-32,

“Signal, Lighting and Electrical Systems Metered Service Can”, of the County Improvement Standards.

**20-5.03.A Components**

Electrical components for electric automatic irrigation systems must include irrigation controllers with weatherproof enclosures; remote control valves; valve boxes; pull boxes; conductors between controllers, pumps and valves; moisture sensors; rain switches; and all appurtenances, incidentals, and accessories required for proper installation and operation of the electrical portions of such systems.

Electrical components requiring modifications to conform to the specified requirements must have such modifications made by the manufacturer before shipment to the project. Components must also include the electric service pedestal for the irrigation controller.

**20-5.03.B Controllers**

Controllers must conform to Section 50-43.20, “Automatic Irrigation Controllers”, of these Specifications and must be installed in accordance with Standard Drawing L-19.

Controllers must be the type and model specified in the Plans and Special Provisions.

All wiring to and from the controller must be through color-coded plugs and sockets.

All controller locations are essentially diagrammatic and must be confirmed in the field prior to installation by the Contractor with the Agency representative.

Remote control valves must be connected to the controller as shown on the Plans, unless otherwise directed by the Agency.

A complete maintenance and operations manual for each type of controller installed must be submitted to the Agency.

The controller housing enclosure must house the irrigation controller and moisture sensor control panel (if specified) and must be installed according to the Standard Drawings.

**20-5.03.C Control Wire, Electrical Conduit and Pull Boxes**

Control wire must conform to Section 50-43.33, “Irrigation Control Wires”, of these Specifications. Unless otherwise stated in the Special Provisions, the color of the control wire from the controller must be red, the common wire must be white, all spare wires must be yellow, and the wires from the master valve must be orange. Pull boxes must conform to Section 50-43.34, “Pull Boxes”, of these Specifications.

Where control wires are installed in the same trench or opening as irrigation pipe, such control wires must be placed at the same depth or below the pipe.

Sharp bends or kinks in the control wires will not be permitted. Control wires must be unreeled in place alongside or in the trench and must be carefully placed along the bottom of the trench and installed in conduit when under pavement. Under no condition shall the cable be unreeled and pulled into the trench from one end.

Not less than one foot (1’) of cable slack must be left on each side of all splices at all points where cable is connected to field equipment. The slack cable must be placed in the trench in a series of “S” curves.

Conductors must be run continuous without splices from controller enclosure to the valve boxes. Splices must be made only in pull boxes or valve boxes. Splices must be clamped and sealed with waterproof connectors. When splices are necessary, the wire color must not change along the wire run. Conductors from controllers to valves must be wrapped together with electrical tape at ten-foot (10’) intervals. An eighteen-inch (18”) wire loop must be provided at each valve.

All pull boxes must be made of reinforced concrete with lids marked ‘irrigation’. Unless otherwise stated in the Special Provisions, pull boxes set in the roadway must be traffic rated with a steel cover. Pullboxes must be installed at the following locations:

1. At all control wire splices, except splices made in valve boxes.

2. At intervals not to exceed two hundred fifty feet (250') along any low voltage, neutral and control wire runs. Valve boxes installed along a control wire run must not be considered as pull boxes in determining the spacing.
3. Within five feet (5') of irrigation controllers or within five feet (5') of cabinets housing one (1) or more controllers.
4. At ends of electrical conduits.
5. At other locations shown on the Plans.

When approved by the Agency, the Contractor may install additional pull boxes to facilitate the work. Additional pull boxes installed for the Contractor's convenience will be at the Contractor's expense.

The tops of all pull boxes must be flush with the surrounding finished grade.

#### **20-5.03.D Testing**

Field tests must be performed by the Contractor to demonstrate that electrical components of the irrigation systems function as specified and the system is operational.

A field test must be satisfactorily completed prior to the start of planting, the plant establishment period, and Final Acceptance, unless otherwise authorized by the Agency. Field test must be done to determine that all sprinklers function according to manufacturer's data. The Contractor must replace any sprinklers/emitters not functioning as specified; otherwise correct system to provide satisfactory performance and retest.

The controller must be tested in the automatic, semi-automatic, and manual operation modes.

#### **20-5.04 Installation**

##### **20-5.04.A General**

Foreign material must be prevented from entering the irrigation system during installation. Immediately prior to assembling, all pipes, valves, and fittings must be cleaned. All unattached ends of pipe, fittings, and valves must be plugged or capped pending attachment of additional pipe or fittings. All lines must be thoroughly flushed out prior to attachment of sprinklers, emitters, and other terminal fittings. Repair of irrigation systems must be made within one (1) Calendar Day after a malfunction or damage to any portion of the system has occurred, unless otherwise directed by the Agency.

The system must completely, efficiently and evenly irrigate all areas, and must be left ready for operation to the satisfaction of the Agency.

The Contractor must install the specified pipe, valves fittings, wiring, switches, controls and appurtenances at the locations shown on the Plans. The irrigation system as shown on the Plans, except for sprinkler locations, is diagrammatic. The Agency will, or direct the Contractor to, determine specific locations.

The Contractor must provide, at the work site, temporary facilities required for the safe and proper storage of materials, tools, etc. These facilities must be constructed only in locations approved by the Agency or as designated on the Plans, and must not interfere with the work of any other contractor. At such times as the Contractor's facilities interfere with the proper installation and completion of the Work, they must be removed by the Contractor, at the Contractor's expense, within three (3) Calendar Days after having been notified by the Agency that such removal is necessary.

##### **20-5.04.B Irrigation Sleeving**

Sleeving for water line crossovers and sprinkler control crossovers must conform to Section 50-43.18, "Irrigation Sleeving Conduit", of these Specifications.

Control wire, water supply line or lateral line pipe crossovers must be installed in conduits or as shown on the Plans. After completing conduit backfill and prior to performing the pressure test on a water line crossover, the Contractor must demonstrate that the water line crossover

can be moved longitudinally within the conduit. Where water line crossovers are installed for future use, the ends of such crossovers must be capped immediately after testing.

Conduits must extend a minimum of twelve inches (12") beyond edge of paving unless otherwise noted on the Plans. At perpendicular crossings, the Contractor must install a No. 5 pull box at each end of the conduit, with eighteen-inch (18") wire loop

The location of each conduit must be designated by cementing a Type A pavement marker to the paved shoulder near each end and over the centerline of the conduit using a standard set type adhesive. Type A pavement markers and adhesive must conform to the provisions in the State Specifications and must not conflict with existing markers within the project site.

#### **20-5.04.C Water Line Crossovers**

Water line crossovers are supply line or lateral line pipes installed in conduits.

Water line crossovers must be polyvinyl chloride (PVC) plastic pipe, Class 315 or Schedule 40, with a minimum pressure rating of three hundred fifteen (315) pounds per square inch, and must be sized as shown or specified in the Contract .

After completing conduit backfill and prior to performing the pressure test on a water line crossover, the Contractor must demonstrate that the water line crossover can be moved longitudinally within the conduit. The water line crossover must then be positioned to extend at least one (1) foot beyond each end of the conduit.

Where water line crossovers are installed for future use, the ends of such crossovers must be capped immediately after testing.

#### **20-5.04.D Trenching and Backfilling**

Trenching and backfilling must be in accordance with Standard Drawing L-20. Trenches must be excavated only as far in advance of pipe laying as is permitted by the Agency. Excavated material must be piled in a manner that will not endanger the Work and will avoid obstructing sidewalks and driveways. Open trenches and piles of dirt must be marked and lighted as to provide safety to all pedestrians and to vehicular traffic.

Rock, pavement, and other debris encountered during trenching operation must be removed and disposed of outside of the project limits at the Contractor's expense. The size and quantity of material to be disposed of will be determined by the Agency.

Trenches for plastic pipe must be smooth and free of jagged rubble or sharp objects which will cause bending stress and uneven weight distribution to pipes, conduits and conductors during backfilling operations. Trenches for solvent-cemented plastic pipe supply lines must be of sufficient width to permit snaking of the pipe. Other trenches must not be excavated wider than necessary for the proper installation of pipe supply lines.

Except as otherwise specified in this Section, backfill material must be material excavated from the trenches, compacted by an Agency-approved method other than ponding or jetting with water until the backfill material, after settlement, is level with the surrounding soil. When any backfilled area has settled excessively, said area must be refilled and compacted by the Contractor at the Contractor's expense, including furnishing, placing, and compacting the fill material.

Trenches for pipe and electrical conductors may be excavated manually or with mechanical trenching equipment. Trenching equipment must be essentially vertical so that a minimum of surface is disturbed. Blades of road graders must not be used to excavate trenches. Trenches for pipe must be excavated to the depths shown on the Plans.

Pipe must have a firm, uniform bearing for the entire length of each pipe line. Wedging or blocking of pipe will not be permitted.

Trenches must not be excessively wet and must not contain pools of water during backfilling operations.

Extreme care must be exercised by the Contractor while backfilling. Any materials or equipment damaged while backfilling must be repaired or replaced by the Contractor as directed by the Agency, at no cost to the Agency.

Rock saw trenching within asphalt pavement must be repaired in accordance with Section 14, "Restoration of Surfaces", of these Specifications.

#### **20-5.05 Pipe**

Plastic pipe supply lines, plastic pipe irrigation lines, and fittings must be installed in accordance with the pipe and fitting manufacturers' printed instructions and these Specifications. Irrigation system trenching must be in accordance with Standard Drawing L-20.

PVC pipe one and one-half inches (1-1/2") or less in diameter must be cut with "PVC cutters", not by sawing. Pipe greater than one and one-half inches (1-1/2") in diameter must be cut with a fine-toothed hacksaw and any burrs must be removed. All pipe must be cut straight and true.

The outside surface of the pipe and the inside surface of the fittings must be wiped with a clean cloth to remove all dirt and moisture before the solvent cement solution is applied. Solvent cement welding must be done in accordance with the printed instructions of the solvent manufacturer.

The male portion of each threaded plastic pipe and fitting connection must be wrapped with at least two (2) layers of approved pipe thread sealant tape. Pipe from the service connection through a backflow preventer assembly to plastic pipe supply lines must be copper, bronze, or as shown on the Plans, and must be wrapped with six (6) mil plastic tape.

Plastic pipe supply lines must be installed not less than twenty-four inches (24") below the finished grade, measured from the top of pipe, unless otherwise shown or specified in the Contract.

Valves and fittings must be designed for and must meet the requirements for service at an operating pressure of one hundred fifty pounds per square inch (150 psi), unless otherwise specified.

Valves and fittings must have connections compatible with the type of pipe joint selected by the Contractor. If mechanical joints or slip-type joints are used, the Contractor must furnish and install necessary Portland cement concrete thrust blocks as specified by the Agency.

Guarantee must cover workmanship of materials from the plastic pipe manufacturer for all plastic pipe and fittings. Main irrigation lines must be Schedule 40 for lines two-inches (2") and smaller and Class 315 PVC for lines two-and-one-half to three-inches, and Class 200 PVC rubber ring and gasket for lines four-inches and larger. Lateral irrigation lines must be Class 200 PVC. PVC pipe must conform to CS 256 and ASTM Designation: D 2241.

Pipe fittings must be of the same material as pipe where applicable and recommended by the pipe manufacturer for the particular type of pipe to which they are to be connected, and must conform to the following specifications.

All slip-joint PVC fittings must be Schedule 40. All Schedule 40 PVC couplings four inches (4") in diameter or larger must be a minimum of seven inches (7") in length.

The Contractor must use only the solvent supplied and recommended by the manufacturer to attach PVC pipe and pipe joints. The pipe and fittings must be thoroughly cleaned of dirt, dust, and moisture before applying solvent.

The Contractor must make solvent weld joints with non-synthetic bristle brush in the following sequence:

1. Apply a liberal, even coat of purple PVC primer to the pipe and fitting immediately before applying the solvent.
2. Apply a liberal even coat of solvent to the inside of the fitting and then to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.



3. Insert the pipe quickly into the fitting and turn the pipe approximately one-quarter (1/4) turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen (15) seconds so the fitting does not push off the pipe.
4. Use a clean rag and wipe off all excess solvent.
5. To prevent disturbing the last completed joint, the pipe must not be twisted when making subsequent joints.

Allow at least fifteen (15) minutes setup time for each welded joint before moving.

On plastic to steel connections, the Contractor must work the steel connections first. For all PVC threaded connections use thread sealing paste with virgin Teflon. In no event must an oil base joint compound be used on a PVC joint.

The Contractor must exercise care in handling, loading, unloading, and storing plastic pipe and fittings. All plastic pipe and fittings must be stored under cover before using, and must be transported in a vehicle that can support the entire length of pipe. The Agency will inspect all pipe before it is laid and will reject any section that is damaged or is found to be defective to a degree which will materially affect function and service of pipe. Any section of pipe that has been bent, dented, or damaged must be discarded until said section of pipe is cut out and rejoined with a coupling.

The Contractor must install the pipe to line and grade, as staked by the Agency. The Contractor's facilities for lowering the pipe into the trench must be such that neither the pipe nor the trench will be damaged.

All pipes must be assembled free from dirt, pipe scale, and burrs. Each section of lateral pipe must be flushed out before sprinkler heads or emitters are attached.

Plastic pipe must not be laid when there is water in the trench.

#### **20-5.05.A Subsurface Dripperline**

Subsurface dripperline must conform to Section 50-43.17, "Subsurface Dripperline", of these Specifications and must be installed in accordance with Standard Drawings L-15, L-16, and L-17.

Dripperlines must be installed four inches (4") below finish grade unless otherwise specified on the Plans or in the Special Provisions. Dripperlines must be installed at the spacing distance specified on the Plans or in the Special Provisions. Install dripperlines with orifices facing down and as shown on the Plans.

Dripperlines must be installed using barbed fittings only. Subsurface dripperline systems must be installed with flush valves and air vacuum relief valves, as recommended by the manufacturer.

#### **20-5.05.B Valves and Valve Boxes**

Irrigation control valves and valve boxes must be of the type shown on the Plans or specified in the Special Provisions and must conform to Sections 50-43.22, "Control Valves," and 50-43.24, "Valve Boxes", of these Specifications. Irrigation control valves must be installed in accordance with the corresponding detail in the Standard Drawings.

The Contractor must provide and install valves as shown on the Plans and as required for the proper control of the piping systems in which they are incorporated. Main shut-off valves must be gate valves.

Where a remote control valve is shown on the Plans as located at the edge of turf and shrub areas, it must be placed in the shrub area.

Valves must be placed in groupings for ease of maintenance.

Valve boxes that contain remote control valves must be identified on the top surface of the valve box covers by the appropriate letters and numbers for controller and station numbers as shown on the Plans.

Valve boxes must be identified by labels attached to the covers that contain the appropriate abbreviations. Remote control valves must be labeled with the controller station. Quick

coupling valves must be labeled "QC". Gate valves must be labeled "GV". Labels for valve boxes must consist of either one of the following:

1. Engraved letters and numbers on a two-layer white over black, exterior sign-plate plastic. The dimensions of the labels must be a minimum of two-inches by three-inches by one-eighth inch thick (2" x 3" x 1/8" thick).
2. Hot-stamped black letters on a yellow background of UV resistant polyurethane Behr Desopan. The dimensions of the labels must be a minimum of two-and-one-quarter inches by two-and-three-quarters inches (2-1/4" x 2-3/4").

The letters and numbers must be a minimum of one and one-eighth inches (1-1/8") in height. Labels must be bolted to the valve box covers with commercial quality brass or stainless steel machine screws, nuts and washers.

#### **20-5.05.C Quick Coupling Valve**

Quick coupling valves must conform to Section 50-43.21, "Quick Coupling Valves", of these Specifications and must be installed in accordance with Standard Drawing L-6. Quick coupling valves must be installed with Sch. 80 PVC fittings and swing joint assemblies.

Valve box for the quick coupling valve must be green heavy duty ten-inch (10") diameter and installed two inches (2") above finished grade.

#### **20-5.05.D Backflow Preventers**

Backflow preventers must conform to Section 50-43.25, "Backflow Preventers", of these Specifications and must be installed in accordance with Standard Drawing 8-8A or 8-8B, unless otherwise specified. Backflow preventer assemblies must consist of backflow preventer, wye strainer (when specified), gate valves, pipe fittings, portland cement concrete supports, and portland cement concrete pad for the assembly, and must conform to the details shown on the Plans, these Specifications, and the Special Provisions. Components of the backflow preventer assembly must be of the type shown on the Plans or specified in the Special Provisions and must conform to Section 50-43.25, "Backflow Preventers", of these Specifications. Backflow preventer assemblies must be from the approved list issued by the Sacramento County Environmental Health Division.

Installation of backflow preventer assemblies must conform to Agency codes and ordinances regarding cross connection control installation, must be UL listed and approved by the Research Foundation for Cross Connection Control, University of Southern California. Special attention must be given to the minimum and maximum heights of assemblies.

The bottom of backflow preventers must be installed twelve inches (12") above finished grade or concrete pad. Exposed top surfaces of concrete foundations and pads must have a medium broom-finish applied parallel to the long dimension of foundations and pads. Backflow preventer assembly must be tested by a certified backflow device tester prior to initial usage and operation of the system.

Backflow preventer installations must include freeze protection in the form of a backflow device blanket cover or insulated enclosure, as indicated on the plans.

#### **20-5.05.E Master Valve/Flow Meter Assembly**

Assembly must conform to Section 50-43.23, "Master Control Valve/Flow Sensor Assembly", of these Specifications and be installed in accordance with the corresponding detail in the Standard Drawings. Assembly must be installed after the water meter and the backflow preventer at the irrigation point of connection. Unit must be installed above grade either on downstream leg of backflow unit or as an isolated installation, as shown on the Plans. Assembly must be as shown or specified in the Contract, and must conform to Section 50-43.23, "Master Control Valve/Flow Sensor Assembly", of these Specifications.

Installation must include providing five (5) #14 control wires, unless otherwise specified, from the master valve/flow meter assembly to the irrigation controller. Wiring must include a hot and a common conductor for both the master valve and the flow meter and one (1) spare conductor.

**20-5.05.F Air Vacuum Relief Valve**

Air vacuum relief valve must conform to Section 50-43.30, "Air Vacuum Relief Valve", of these Specifications and must be installed in accordance with Standard Drawing L-9.

Air vacuum relief valve must be installed in-line with a subsurface dripperline at the highest point of the system. Valve box for the air vacuum relief valve must be ten inches (10") diameter with a two-inch (2") layer of pea gravel and installed two inches (2") above finished grade.

**20-5.05.G Flush Valve**

Flush valve must conform to Section 50-43.31, "Flush Valve Assembly", of these Specifications and must be installed in accordance with Standard Drawing L-8.

Flush valves must be installed at the end of a subsurface dripperline system as shown on the Plans and at a low point of planter, as recommended by the manufacturer. Install a minimum of one flush valve on each circuit for every 15 gallons per minute (GPM) of flow. Valve box for the flush valve must be ten-inch (10") diameter with a four-inch (4") layer of pea gravel inside and installed two inches (2") above finished grade. Installation must include a plastic ball valve before the flush valve and a thirty-inch (30") minimum length of flexible one-half inch (1/2") polyethylene tubing coiled within the valve box, for the purpose of periodic maintenance. Flush valves must be installed at the end of tubing and be able to be extended outside of valve box for manual flushing.

**20-5.05.H Sprinklers and Emitters**

Sprinklers and emitters must conform to Section 50-43.19, "Sprinklers and Emitters", of these Specifications and must be installed in accordance with the corresponding details in the Standard Drawings.

**20-5.05.I Pressure Testing**

Except for non-rigid pipelines and lateral irrigation lines, pressure testing for leakage must be performed on all supply lines installed by the Contractor. Pipelines must be tested in place and all open ends of the pipeline and fittings must be plugged or capped prior to testing.

The Contractor must notify the Agency at least twenty-four (24) hours prior to performing any pressure test. Pressure tests must be performed only between the hours of 8:00 a.m. and 5:00 p.m. except that no pressure tests shall be made on Saturdays, Sundays, or legal holidays, unless otherwise approved in writing by the Agency. Each pressure test must be observed by the Agency.

Pipelines to be tested must be filled with water, and a pressure gauge must be connected to the pipeline. The pipe must then be placed under a pressure of one hundred twenty-five pounds per square inch (125 psi) (except as otherwise specified below) by air or water pressure, after which the source of pressure must be cut off, leaving the line under the required pressure.

The pressure gauge must be calibrated from zero (0) to two hundred (200) pounds per square inch (psi) in five (5) pound increments and must be accurate within a tolerance of two (2) pounds.

The Contractor must provide the necessary pump and equipment required for this test.

The pipeline must be tested under the required pressure for a period of one (1) hour. The pressure gauge must remain in place until each test period has been completed. Leaks that develop in the tested portion of the system must be located and repaired after each test period when a drop of more than two (2) pounds is indicated by the pressure gauge when testing pipe over one hundred feet (100') in length. There must be no pressure drop permitted when testing

pipe from one foot (1') to one hundred feet (100') in length. After such leaks have been repaired, the one-hour pressure test must be repeated and additional repairs made until there is no drop in pressure for pipe lengths up to one hundred feet (100'), or the drop in pressure is two pounds per square inch (2 psi) or less for pipe lengths over one hundred feet (100'). If testing by means of water pressure, air must be expelled from the pipe prior to testing.

Tests on pressure lines must be completed prior to backfilling; however, sufficient backfill must be placed in trenches between fittings to insure the stability of the line under pressure. In all cases, fittings and couplings must be open to visual inspection for the full period of the test.

No testing shall be done until the last solvent welded joint has had twenty-four (24) hours to cure.

Where any section of the pipe system is provided with a concrete thrust block, the test must not be made until at least five (5) Calendar Days have passed after the concrete thrust block was installed. If higher early-strength cement is used in the concrete thrust block, the test must not be made until at least two (2) Calendar Days have elapsed.

Contractor must disinfect potable water lines according to AWWA standards.

#### **20-5.05.J      Repairs and Coverage**

All leaks that develop and all defective material in any portion of the irrigation system installed by the Contractor must be repaired or replaced by the Contractor.

The entire system must be checked and, if necessary, adjusted for uniform and complete coverage after installing the sprinklers. All emitters must be checked for proper operation and, if necessary, cleaned and replaced.

The risers for sprinklers on slopes must be set approximately perpendicular to the slope. Each series of sprinklers must be installed and test operated. Nozzles of all sprinklers and bubblers must be adjusted for proper rate of flow and coverage. Sprinklers and/or bubblers must be relocated as required to produce uniform coverage.

Any revision of the proposed irrigation systems ordered by the Agency and necessary to achieve complete and adequate coverage and operation of the system, which is not within the scope of work, must be paid for as extra work as provided in Section 9, "Changes and Claims", of these Specifications.

#### **20-5.06      Measurement and Payment**

Except as otherwise provided in these Specifications or the Special Provisions, full compensation for conforming to the requirements in this Section (Section 20) is included in the prices paid for the various items of work and no additional compensation will be paid.

### **20-6      RECORD DRAWINGS AND CONTROLLER CHARTS**

The Contractor must maintain neat and accurate record drawings in conformance with the requirements in Section 11, "Preconstruction Photographs and Record Drawings", of these Specifications and this Section. Drawings shall be subject to the inspection of the Agency at all times and must be kept current with all work instructions, change orders, substitutions, and construction adjustments shown thereon and initialed by the inspector.

Immediately following the start of the Plant Establishment Period, the Contractor must submit to the Agency one (1) full size set of Record Drawings. Record drawings will be reviewed by the Landscape Architect and shall be returned to the Contractor with comments for revisions, if necessary. Notes and dimensions must be drafted on the record drawings in a neat and legible manner. Drawings must be of sufficient quality to allow further black and white reproduction of the original to be clear. Illegible, inaccurate, or incomplete record drawings will be returned to the Contractor for revisions.

The work will not be formally accepted until the Record Drawings are approved by the Landscape Architect. Upon approval by the Landscape Architect, two (2) bond sets of these

record drawings must be delivered to the Agency in good and acceptable condition prior to final acceptance of the Work.

The Contractor must provide two (2) sets of 11" x 17" charts for each controller. One copy must be placed on the inside of the controller enclosure door. The second copy must be provided to Agency maintenance personnel. The base plan for the controller charts must be the approved irrigation Record Drawings.

Each controller chart must show the as-built condition of the area controlled by the automatic controller. All symbols must be readable at the final reduced size. The controller chart must include:

1. Connections to existing water lines (point-of-connections);
2. Location of backflow preventer(s) and controller(s);
3. Routing of pressure lines and sleeves (show typical station offset and/or dimensions on record drawings);
4. Routing of irrigation conduit and pull boxes;
5. Locations of remote control valves, gate valves, and quick coupling valves (show station offset and/or dimensions on record drawings); and
6. Other items as directed by the Agency.

The chart must be color-coded to easily identify each valve and the respective hydrozone area it irrigates.

When completed and approved, the chart must be hermetically sealed between two (2) pieces of 10 mil plastic, minimum.

Each chart must be completed and approved prior to final inspection of the irrigation system.