

**CITY OF MORENO VALLEY**  
**PUBLIC WORKS DEPARTMENT**  
**LANDSCAPE DESIGN GUIDELINES**



**SUBMITTAL PROCEDURES**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. SUBMITTAL PROCEDURES**

Landscape and irrigation plans are required to be approved by the City prior to installation. The submittal requirements and plan approval process is outlined below.

A. Conceptual Plan Submittal

1. Conceptual Landscape Plan - This plan will show approximate locations of landscape materials to be used, and will indicate specific species and sizes of each plant. See Plan Preparation Procedures, Section I. for requirements.
2. Number of Plans - The number of plans required for submittal will be the same as required for the development proposal. For example, a Conditional Use Permit (CUP) requires thirty-five (35) sets of plans, therefore, thirty-five (35) sets of landscape plans are also required.

Plans will be reviewed along with the development proposal, and will be approved or denied as part of the total development proposal. Once the development proposal is approved by the Planning Commission and the City Council, if necessary, the applicant may submit landscape working drawings for Plan Check.

B. Plan Check Process For Landscape Construction Drawings

The plan check process should require no more than three (3) submittals. Plans will be reviewed for conformance with the approved conceptual drawings, and Conditions of Approval.

Public and private landscape areas shall be separated into two (2) individual packages. Landscape plans for all public areas shall be prepared on photo mylar originals. Small projects may be submitted as one (1) set of plans with prior approval of the Public Works Director.

1. Public Landscape Areas

- a. First Submittal - The applicant shall submit to the Public Works Department-Enterprise Services Administration Division the following items:
  - (1) Initial plan review fee;
  - (2) Six (6) sets of Landscape Plans and Specifications;
  - (3) One (1) set of Grading Plans;
  - (4) One (1) set of Street Improvement Plans;
  - (5) Three (3) sets of Preliminary Cost Estimate.

Public Works Department will distribute plans to the Planning Department, and Public Works Department-Transportation Division.

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- b. Second Submittal - The applicant shall submit to the Public Works Department-Enterprise Services Administration Division (commensurate with street improvement plans) the following items:
- (1) Three (3) sets of revised Landscape Plans and Specifications;
  - (2) Red-lined First Submittal set;
  - (3) Three (3) sets of Irrigation Pressure Calculations.

The Second Submittal shall address previous comments, and include irrigation pressure calculations that reflect changes from the First Submittal.

Plans for projects that will use reclaimed water for irrigation should be submitted for review by Eastern Municipal Water District at this point in the plan review process.

- c. Third Submittal - The applicant shall submit to the Public Works Department-Enterprise Services Administration Division the following items:
- (1) Two (2) sets of revised Landscape Plans and Specifications;
  - (2) Red-lined Second Submittal set;
  - (3) Two (2) copies of revised Cost Estimates;
  - (4) Two (2) copies of revised Irrigation Pressure Calculations (as requested);
  - (5) One (1) set of photo mylars for public landscape package-**preliminary acceptance, and notification must be made by Public Works prior to submittal of mylars.**
  - (6) Landscape construction inspection fee.

This Third Submittal is intended to be the last.

Upon preliminary acceptance, Public Works will notify the owner to submit a final set of photo mylars with a “wet” seal, and signature of a State of California licensed landscape architect\*. These plans will then be in compliance with City Standards, and shall then be approved by the Public Works Director. These approved plans will in turn be forwarded to the Planning Department for final approval.

- d. Inspection - Public landscape areas, except parks, trails, and developed open space, will be inspected by Public Works Department-Enterprise Services Administration.

\* *Landscape Plans with a licensed architect’s “wet” seal, and signature will be accepted, provided that the architect has prepared the project’s site plan as well.*

**LANDSCAPE PLAN PREPARATION**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. PLAN PREPARATION PROCEDURES**

The following procedures shall be utilized in preparing Landscape Plans for the Public Works Department.

A. Conceptual Landscape Plan

1. Standard sheet size shall be 30"x42". Oversize sheets for large projects, to be reduced at a later date, are permitted as approved by the Planning Department.
2. Indicate scale on the drawing.
3. North arrow on each sheet.
4. Title of project.
5. Indicate owner, developer's name on each sheet.
6. Indicate species of proposed trees, shrubs, and groundcovers.
7. Indicate any special hardscape materials.

B. General (Landscape Construction Drawings)

1. Standard sheet size shall be 24"x36" - Standard City Title Block.
2. Plans which are incomplete will not be accepted.
3. Sheets shall be numbered consecutively, "Sheet \_\_\_ of \_\_\_."
4. Minimum scale: 1"=20' or if legible, matching the grading plan scale, and shall be shown on each sheet.
5. North arrow shall be shown on each sheet.
6. Match lines, where necessary, shall be labeled, and drawn clearly to provide easy cross-reference.
7. Streets within, and adjacent to the project shall be labeled.
8. All landscape plans shall be prepared by a State of California licensed landscape architect. A State of California licensed architect may prepare landscape plans if that person has also prepared the project's site plans (Business & Professions Code, Chapter 3, Division 3).

C. Title Sheet

The first sheet shall be a Title Sheet (see Appendix), and shall include the following:

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1. Vicinity map showing all streets within or adjacent to the project, street names, north arrow, project limits and match lines, if applicable;
2. Sheet index;
3. General Notes:
  - a. All work shall be done in accordance with the City of Moreno Valley Landscape Development Guidelines and Specifications;
  - b. Turf areas shall have a maximum design slope of twenty percent (20%), and a minimum design slope of one percent (1%);
  - c. Owner shall provide a six inch (6") concrete mow strip between turf and ground cover, and an eight inch (8") concrete mow strip between turf and walls;
  - d. The Contractor is responsible for obtaining building and plumbing permits prior to commencing wall construction, and irrigation installation, respectively;
  - e. The Contractor must notify the City of Moreno Valley Public Works Department two (2) working days prior to commencing construction;
  - f. Landscape or irrigation contractor shall verify existing p.s.i. at job site prior to installing landscape irrigation system;
  - g. At the conclusion of rough grading, agronomic soils testing shall be provided for Public landscape areas, and areas that are adjacent to public right-of-ways, and the results approved by the City of Moreno Valley Public Works Department prior to any landscape installation;
  - h. The Contractor of Developer shall maintain all landscaping for a period of one (1) year after City acceptance of all improvements within landscape maintenance districts.
4. Standard City of Moreno Valley Title Block:
  - a. Project title;
  - b. Tract number, tentative tract number, parcel number of City project number (i.e., CUP, variances, plot plan, etc.);
  - c. Project address or cross street;
  - d. Signature Block for approvals by the following departments:
    - (1) Planning Department;

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- (2) Public Works Department:
  - (a) Traffic Division;
  - (b) Enterprise Services Administration Division for the Moreno Valley Community Services District;
- 5. Owner/Developer's name, address, and phone number;
- 6. Landscape Architect's firm name, address, phone number, date plans prepared, signature, and seal of Registered Landscape Architect;
- 7. Block noting project name, and Moreno Valley Community Services District's landscape maintenance zone;
- 8. Landscape area Quantity Block;
- 9. Maintenance Area Map;
- 10. City of Moreno Valley Logo;
- 11. Approval Block (projects using reclaimed water for irrigation will also require an approval block for use by Eastern Municipal Water District);
- 12. Landscape Architect's Stamp Block.

D. Plan Sheets

Subsequent sheets shall be plan sheets, and shall include:

- 1. Title block containing:
  - a. Project title;
  - b. City project number;
  - c. Landscape Architect's name;
  - d. Developer's name;
  - e. Revision block;
  - f. Sheet Number \_\_\_ of \_\_\_;
  - g. Sheet title (i.e., irrigation plan, planting plan, construction details, etc.).
- 2. North arrow, and scale.;
- 3. Match lines, as applicable;
- 4. Indicate existing, and proposed grades with flow lines;
- 5. Note all grades (existing and proposed);

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6. Indicate elevations on curb returns at control points;
7. Indicate utilities which are related to the site per street and water improvement plans, including any or all of the following:
  - a. Fire hydrants;
  - b. Gas lines;
  - c. Power poles;
  - d. Sewer lines;
  - e. Street lights;
  - f. Street signs;
  - g. Telephone poles;
  - h. Television cable lines;
  - i. Water service lines;
  - j. Utility vaults.
8. Indicate point-of-connection information for each irrigation system including:
  - a. Source (potable or reclaimed);
  - b. Available water pressures based on twelve (12) month period;
  - c. Meter size (in inches);
  - d. Peak flow through the meter in gallons per minute;
  - e. Finished grade at backflow preventer, and highest head served (potable water only).
9. Standard notes, and information that are to be included on all plans for irrigation systems using reclaimed water shall be as follows:
  - a. Installation of the irrigation system shall conform to regulations for construction of irrigation water systems of Eastern Municipal Water District (EMWD), the Riverside County Health Department, State of California Department of Health and Services, and the accompanying plans, and specifications as approved by all reviewing agencies;
  - b. All onsite constant pressure reclaimed and potable water main line piping installed on this project shall be identified in accordance with EMWD's regulations, and irrigation specifications;

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- c. Pigmented color coded PVC pipe labeled "CAUTION RECLAIMED WATER" shall be used on all constant pressure main line pipes carrying on-site reclaimed water;
  - d. Reclaimed water pressure mainline pipe shall be installed with a minimum twenty-four inch (24") cover;
  - e. Pipe sleeving for reclaimed water mainlines shall be installed with a minimum twenty-four inch (24") cover;
  - f. EMWD shall be notified two (2) days prior to the start of construction. Phone (909) 928-3777;
  - g. All pressure main line pipe from a reclaimed water system shall be installed to maintain 10-foot-minimum-horizontal separation from all potable water piping. Where reclaimed and potable water pressure main lines cross, the reclaimed water pipes shall be installed below the potable water pipes in a PVC Class 200 pipe sleeve, which extends a minimum of five feet (5') on either side of the potable water pipe. Provide a minimum vertical clearance of six inches (6");
  - h. Quick coupling valves connected to the reclaimed water system shall be of a type approved by EMWD, labeled "DO NOT DRINK" in English and Spanish, and secured in a manner that only permits use by personnel authorized by the owner;
  - i. There shall be no drinking fountains installed within a reclaimed water system;
  - j. The use of hose bibs on the reclaimed water system shall not be permitted.
10. On irrigation plans, provide a comprehensive legend showing all pertinent data for materials used in the system with references to corresponding construction details. Legend shall include symbols for all materials used in the system, shall be located on the first sheet on which the symbols are used, and shall be cross-referenced on all subsequent sheets;
11. On irrigation plans, show the electrical and water source locations and responsible utility service company and/or subcontractor, the location of each valve listing the maximum operating gallons per minute and precipitation rate for that valve, and pump locations, if required. Each irrigation system shall have a pressure calculation sheet on the plan for the worst condition, and will include verification of EMWD's pressure information. (Refer to Appendix for City Irrigation Pressure Calculation Sheet);
12. On planting plans, provide a comprehensive plant legend botanical name, common name, size, quantity, special remarks, and references to corresponding construction details. Legend shall include symbols for all plant materials and shall be located on the first sheet on which the symbols are used, and shall be cross-referenced on all subsequent sheets;



**LANDSCAPE PLAN PREPARATION - cont.**  
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13. On planting plans, specify trunk caliper, and canopy diameter for each species of tree specified in the plant legend. The following minimum guidelines shall be used:

Container Size	15 Gallon	24" Box	36" Box	48" Box
Trunk Caliper <sup>1</sup>	1"	1¾"	2½"	4"
Canopy Diameter	3'	4'	5'	7'

<sup>1</sup>Trunk caliper shall be measured at twelve inches (12") above the root ball

14. On Irrigation Plan Sheets, provide cross-reference to corresponding Planting Plan Sheets. On Planting Plan Sheets, provide cross-reference to corresponding Irrigation Plan Sheets.

**E. Specifications And Details**

1. Specifications shall be in conformance with the Landscape Specifications as set forth in the Public Works Landscape Design Guidelines.
2. Landscape irrigation and planting details shall be in conformance with the Standard Details as set forth in the Public Works Landscape Design Guidelines.

**DESIGN GUIDELINES**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. REVERSE FRONTAGE PARKWAYS**

Reverse Frontage Parkways generally include the landscape area between walls, sidewalks, and landscape parkways adjacent to the street curb. Particular attention should be directed to the following design criteria:

A. Water Conservation

1. Turf areas should be limited to twenty-five percent (25%) to thirty percent (30%) of the total landscaped area, planting the remaining area with shrubs, groundcover, and/or hardscape;
2. Turf areas shall be a minimum of six feet (6') wide, subject to site specific approval;
3. Separate tree irrigation (bubbler in below grade pipe with gravel) will allow deep watering for future drought periods when water use is curtailed;
4. Moisture sensing equipment is required to provide better water use management;
5. Select trees, shrubs, and groundcovers which are drought tolerant;
6. Use reclaimed water for irrigation system wherever possible;
7. Shrub and groundcover areas shall be covered with mulch to improve water holding capacity of the soil;
8. Central irrigation control.
9. Provide a master valve for each irrigation system's point of connection.

B. Slope Planting

Do not exceed a 4:1 (four feet (4') of run to every one foot (1') of rise) slope ratio within the City right-of-way. The additional landscape easement shall not exceed a slope of 2:1. (Refer to Slope Planting Examples on Page 10).

"Land Forming" shall be applied to all parkway slopes greater than one hundred feet (100') in length or ten feet (10') in vertical height, and shall be accomplished by use of variable slope ratios, and undulating of tops and toes (excerpt, Municipal Code, Section 9.08.080-Grading).

**“SLOPE PLANTING”  
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**DESIGN GUIDELINES - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

C. Minimum Plant Sizes

1. Trees - Use minimum fifteen (15) gallon trees or corresponding trunk caliper size, based on tree species.
2. Shrubs - Use minimum five (5) gallon shrubs, based on shrub species.
3. Ground Cover
  - a. Woody Plant Species And Perennials - Use minimum one (1) gallon size.
  - b. Herbaceous/Trailing-Spreading Species - Use minimum four inch (4") pot or liners. Use of ground cover species from flats is subject to approval by the Public Works Department.
4. Vines - Use minimum one (1) gallon size, based on vine species.
5. Turf Grass - Species shall be installed as sod. Installation of turf grass species by means of hydroseeding, sprigging or stolonizing is subject to approval by the Public Works Department.

D. Maintenance

1. Use overhead spray, and bubbler irrigation to reduce long term maintenance. Fixed riser sprinklers are not permitted.
2. Use concrete headers (mow strips) for turf separation, at the base of walls and vine pockets, and transition between public and private landscaped areas for ease of maintenance, and protection of plant materials. A minimum header of six inches (6") wide is required between turf and groundcover, and eight inches (8") between turf and walls.
3. Use deep-root barriers for all trees within five feet (5') of walks, and walls to reduce damage by root penetration.
4. Use drought-tolerant disease-resistant plant materials to reduce maintenance work, and frequency of plantings.

E. Standard Landscape Easements (Refer to Page 12 for Examples)

1. Ten feet (10') wide for major arterial, divided arterial, and arterial streets.
2. Six feet (6') wide for minor arterial streets; collector streets, as determined by the Public Works Department.

**“LANDSCAPE EASEMENTS”  
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**DESIGN GUIDELINES - cont.**  
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F. Planting Requirements

1. Minimum one (1) tree (fifteen (15) gallon) per every 1,000-square feet of total landscape area, exclusive of required street trees. These trees shall provide a background to street tree plantings.
2. Minimum one (1) shrub (five (5) gallon) per every fifteen (15) square feet of landscape area, exclusive of turf areas.

II. INTERSECTION PARKWAYS

These corners can be treated with special landscape, decorative walls, and entry statements. The theme may identify neighborhood entry, and create a sense of place for each particular street. (Refer to Intersection Parkway Example on Page 14). Intersection parkways should adhere to the following criteria:

A. General Concept

1. Provide identification for the street corner;
2. Create a sense of entry;
3. Provide signage, and night lighting to identify neighborhood or project.

B. Safety

1. Designers shall refer to street improvement plans which may be related to the proposed corner easement dedication. Landscape Plans shall be consistent with street improvement plans which take precedence;
2. On unsignalized intersections, plant materials and constructed elements shall not exceed thirty inches (30") in height from road surface within the sight distance triangle area. (Refer to City Standard Plan No.'s 125, and 126 for sight distance guidelines on Pages 15, and 16);
3. Line of sight shall be considered when designing the entry statements. (Refer to City Standard Plan No.'s 125, and 126 for sight distance guidelines on Pages 15, and 16);
4. Specimen trees shall have a minimum of five feet (5') clearance from the ground to the bottom of the tree canopy.

C. Materials

1. Decorative walls or constructed elements shall match the surrounding architectural elements in color, style, and texture;
2. Materials such as specimen trees, flowering shrubs, and annual colors are encouraged;
3. Minimum tree size, twenty-four inch (24") box or corresponding trunk caliper, based on tree species.

**“INTERSECTION PARKWAYS”  
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**DESIGN GUIDELINES - cont.**  
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**DESIGN GUIDELINES - cont.**  
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**DESIGN GUIDELINES - cont.**  
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D. Corner Sight Distance

The Limited Use Area is determined by the graphical method using the appropriate distances given in the table shown on City Standard Plan No.'s 125, and 126. It shall be used for the purpose of prohibiting or clearing obstructions in order to maintain adequate sight distance at intersections.

The Line of Sight line shall be shown at intersections on all landscaping plans. In cases where an intersection is located on a vertical curve, a profile of the sight line may be required.

No trees shall be used in the Limited Use Area unless approved by the Traffic Engineer.

Walls or any obstructions that could restrict the view within the Limited Use Area shall not be permitted.

The toe of the slope shall not encroach into the Limited Use Area.

The Limited Use Area shall be as near level as possible, yet maintain proper drainage.

Plants and shrubs shall be of the type that will grow no higher than one foot (1') above the curb level within the Limited Use Areas. Plants and shrubs may have to be lower on crest vertical curves.

III. **STREET MEDIANS**

Street medians are divider islands which are located in the middle of major streets or highways. The width of a median varies dependent on the width of the street. Medians, to include reverse frontage or parkway design, if applicable, can become a special landscape feature for the City and are subject to Public Works City Street Standards for construction requirements.

A. Median Landscape Overall Design Concept

1. Medians six feet (6') and less in width, curb face to curb face, shall consist of enhanced paving (hardscape) only.
2. Medians over six feet (6') in width, curb face to curb face, shall consist of a mixture of hardscape to include the twelve inch (12") hardscape band along the curb (eighteen inches (18") inches including six inch (6") curb), and landscaping to include trees, shrubs, and ground cover.
3. Exhibit 1 - Street Tree/Median Design Examples (Refer to Page 19)
  - a. Example A - Illustrates a planting of shrub areas throughout the wider areas of the median with street trees uniformly spaced the length of the median. Hardscape materials are used in the nose area with no planting. This hardscape material shall complement the perimeter maintenance band and should be either interlocking pavers or colored stamped concrete to create more interest, and character.

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- b. Example B - Illustrates alternating hardscape, and shrub masses with uniformly placed street trees. The nose area is planted with a uniform low mass of shrubs, and no trees. The front two-thirds (2/3) of the nose shall be planted with shrubs not exceeding eighteen inches (18") (from the road surface), and the back one-third (1/3) shall be planted with shrubs not exceeding thirty inches (30") (from the road surface). Hardscape areas (pavers or stamped concrete) are provided between the shrub areas, as well as on the perimeter.
- c. Example C - Illustrates alternating shrub, and hardscape areas with the planter nearest the median nose area complementing small planter cutouts in the nose. Trees are planted in the wide areas of the median only. Shrub planting in the median nose is limited to an eighteen inch (18") height (from the road surface) in the front two-thirds (2/3). The back one-third (1/3) can be planted with shrubs up to a thirty inch (30") height (from road surface). Hardscape materials (pavers or stamped concrete) are used through the balance of the nose area for more interest, and character.

**B. Water Conservation**

- 1. Median design shall consist of seventy-five percent (75%) landscape (plant materials), and twenty-five percent (25%) hardscape (can include the twelve inch (12") maintenance band behind the curb in the hardscape percentage).
- 2. Use "self contained" drainage solutions such as French drains or interior swales to prevent "sheet flow" runoff of irrigation water onto street.
- 3. Moisture sensing equipment is required to provide better water use management.
- 4. Use reclaimed water whenever possible.
- 5. Exhibit 2 - Water Conservation Examples (Refer to Page 20)
  - a. Example A - Collect water runoff at the center of median with perforated drain or French drain.
  - b. Example B - Drip/bubbler irrigation system.
  - c. Example C - Mounded turf with French drain system (4:1 slope maximum.)

**C. Maintenance**

- 1. Use overhead spray, and bubbler systems where applicable. Fixed riser sprinklers are not permitted.
- 2. Use concrete headers (mow strips) for separation of plant materials for ease of maintenance, and protection of plant materials.

**D. Safety**

- 1. Provide an eighteen inch (18") wide perimeter hardscape band in all medians as a maintenance strip. The six inch (6") curb can be used in this overall width.

**DESIGN GUIDELINES - cont.**  
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2. Provide a master valve for each irrigation system point of connection to prevent leakage in the event of a mainline break.

E. Prohibited In Medians

1. Boulders.
2. Concrete monument signs.
3. Turf.
4. Trees in median nose areas or in turn-pocket areas.
5. Tall trees under existing power lines.

F. Trees

1. Minimum Size - Fifteen (15) gallon or corresponding trunk caliper size (based on tree species).
2. Trees shall be selected from the approved City street tree list.
3. Planting of first tree must maintain a minimum setback distance of twenty feet (20') back from the beginning of the turn-pocket transition or median openings.
4. Tree varieties with a mature caliper of four inches (4") or greater shall be planted at a minimum spacing of fifty feet (50') on center.
5. Minimum tree distance from curb is based on street speed limit:
  - a. Forty (40) mph or greater - seven feet (7');
  - b. Less than forty (40) mph - five feet (5').

G. Shrubs

1. Minimum Size - Five (5) gallon.
2. One shrub shall be planted for every fifteen (15) square feet of landscaped area.
3. Height in nose or turn-pocket areas:
  - a. In the first two-thirds (2/3) of the nose/pocket area, shrub height shall not exceed eighteen inches (18") above road surface;
  - b. In the back one-third (1/3) of the nose/pocket area, shrub height shall not exceed thirty inches (30") above road surface.

**“STREET TREE/MEDIAN DESIGN”  
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**“WATER CONSERVATION EXAMPLES”  
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**IV. EROSION CONTROL**

Erosion Control reduces the hazard of soil erosion, and excess water runoff due to new construction. Landscaping can provide erosion control while maintaining the aesthetic values of the hillside. With the proper selection of plant materials, the hillside can provide attractive views from surrounding areas of the City. The following criteria shall be followed when developing landscape plans for erosion control.

**A. General**

1. Landscape, and irrigation are required for all cut or fill slopes which are over three feet (3') high.
2. Cut and fill slopes shall not be constructed steeper than 2:1 in parkway landscape easement areas. (See also Municipal Code, Section 9.08.080-Grading).
3. All installations shall be in accordance with the approved landscape plan.
4. Elements such as benching, trenching, and downdrains that are related to slope construction shall be hidden from public views by design and/or landscaping.
5. Slopes graded adjacent to roadways shall be designed to enhance their visual impact by the use of variable slope ratios, meandering top and toes of slopes, and integrated landscaping with right-of-way areas.
6. In all cases, where manual, mechanical, or hydraulic seeding of plant materials is allowed, the percentage of approved species or specified plant materials shall be germinated at the rate of 80%. Germination shall be determined by the growth of seedlings with two-three (2-3) true leaves. Final inspections for private landscape areas will be conducted by the Building and Safety Department, and for public areas by the Public Works Department.
7. All sloped areas will be covered with a three inch (3") layer of wood fiber mulch. Any slopes that have a vertical dimension greater than ten feet (10') shall be treated with tackifier or utilize other erosion control devices as deemed appropriate by the Public Works Department.

**B. Planting Design**

1. Planting must establish or reinforce a theme for the specific hillside area.
2. Placement of plant materials shall reinforce the natural terrain, and general topography of the area.
3. Tree planting must respect and maintain views of the surrounding countryside, and lower elevations.
4. Planting shall compliment building types, and streetscapes themes.

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5. Hillside planting criteria shall require the following:
  - a. Shrubs will be planted at ten feet (10') on center maximum, and shall be five (5) gallon can size minimum.
  - b. Trees will be planted at twenty feet (20') on center maximum, and shall be fifteen (15) gallon can size minimum.
  - c. Sub-shrubs, vines, and groundcovers shall be one (1) gallon can size minimum. Use of rooted cuttings, liners, or other container sizes smaller than one (1) gallon, or planting by means of manual, mechanical, or hydraulic seeding is subject to the express approval of the Public Works Department.
6. After planting container stock, a pre-emergent herbicide shall be applied according to manufacturer's recommendations.

C. Irrigation Design

1. Buried PVC pipe on all slopes, unless special circumstances are proven, and approved by the Public Works Department.
2. For public slopes where above-ground irrigation lines are approved, piping shall be galvanized steel, or Schedule 40/Class 315 PVC pipe formulated with ultra violet ray inhibitors ('brown-line' or approved equal). Pipe staking, and installation shall be per manufacturer's specifications.
3. All slope irrigation systems shall be an automatic system.
4. A master valve is required for each irrigation point of connection in public slope areas to prevent erosion in the event of a line break, and leakage in the irrigation system.
5. Reduced Pressure Backflow Preventers shall be used for all public slopes. (Refer to Standard Detail No. 553). Atmospheric Vacuum Breakers will not be permitted at the top of slope.



**LANDSCAPE SPECIFICATIONS - IRRIGATION**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. SCOPE**

Furnish all materials, equipment, services, supervision, transportation and labor necessary to perform all irrigation work in its entirety, including: drawings and specifications, service manuals, record drawings, loose equipment, guarantee, materials, and installation.

**II. GENERAL CONDITIONS**

A. Approvals

1. All work described under this section shall be inspected and approved by the Project Engineer, or Project Engineer's designated representative, prior to commencing work on project improvements, including but not limited to, hardscape installation, and planting.
2. Contractor shall protect in place all existing improvements, including but not limited to curb and gutter, traffic signs, utility vaults, irrigation mainlines and valve wires, trees, shrubs, groundcovers, turf. Any existing improvements damaged by Contractor's work shall be repaired or replaced as directed by Project Engineer, at Contractor's sole expense.

B. Plans And Specifications

1. The intent of the Plans and Specifications is to indicate and specify a complete and efficient sprinkler irrigation system.
2. Plot dimensions are approximate. Contractor shall carefully check and verify all dimensions and shall report any variations to the Project Engineer.
3. Due to the scale of the Plans, it is not possible to indicate all offsets, fittings, etc., which may be required. Contractor shall carefully investigate the structural and finished conditions affecting all of Contractor's work, and plan said work accordingly. Plans are generally diagrammatic, and indicative of the work to be installed. The work shall be installed in the most direct and professional manner, so that conflicts between sprinkler systems, planting, and architectural/engineering features will be avoided.
4. All material furnished and all construction methods used, including but not limited to trenching, installation, backfill, and testing, shall conform to the applicable specifications of the following standards in the precedence indicated:
  - a. Project Specifications;
  - b. Project Plans;
  - c. *Procedural Guide And General Design Requirements For Construction Of Reclaimed Water Facilities - Eastern Municipal Water District* (if applicable);
  - d. *Standard Specifications For Public Works Construction* – current edition.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

C. Service Manuals/Materials List

1. Contractor shall furnish two (2) manuals to the Project Engineer. The manual may be loose leafed, and shall contain complete exploded drawings of all equipment installed, showing components and catalog numbers together with the manufacturer's name, and address. Additional sheets shall cover operation instructions simple enough to be understood without specialized knowledge.
2. Contractor shall furnish a materials list to the Project Engineer for approval. Said list shall conform to performance standards and data, as shown on project plans, or in plan legend, and details.

D. Record Drawings

1. Contractor shall provide sepia mylars of the sprinkler layout, and mark the exact "as built" arrangement including locations of all equipment installed. Locations shall be shown from easily identified permanent features such as buildings, walks, curb returns, etc. The "as built" drawings shall be drafted employing a competent draftsman. After final inspection, and before final payment, the transparency shall be delivered to the Department of Public Works. "As built" drawings shall be stamped and signed by a registered Landscape Architect or Civil Engineer, as may be required by the Project Engineer.
2. Contractor shall furnish an irrigation controller chart for placement within each irrigation controller enclosure. The chart shall be reduced, and laminated in plastic. Valve and main line locations, and valve sequencing shall be shown "as built". Controller charts shall be correct and accurate in all respects, and shall be complete, and easily understood. Controller charts shall be submitted to the Project Engineer for approval at the time of final inspection, and before final acceptance.

E. Loose Equipment

Prior to final acceptance, loose irrigation equipment, operating keys and spare parts shall be furnished by the Contractor in the following types, and quantities:

1. Ten (10) nozzles of each type specified on irrigation plan legend;
2. Five (5) bodies of each sprinkler type specified on irrigation plan legend;
3. One (1) quick coupler key as specified on irrigation plan legend;
4. One (1) quick coupler swivel hose ell – sized to match specified quick coupler key;
5. Two (2) keys each for: all irrigation controller doors, and all controller enclosure doors as necessary.

F. Observation Sequences

1. All irrigation observations shall be made by the Project Engineer or Engineer's designated representative. Contractor shall request inspection at least forty-eight (48) hours prior to time inspection is required.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. Irrigation observation sequences are as follows:
  - a. Testing of mainline prior to backfilling;
  - b. Installation of remote control valves prior to setting of valve boxes;
  - c. Lateral line trenching/routing;
  - d. Installation of irrigation controllers, and controller enclosures;
  - e. System water audits, and coverage tests prior to plant material installation, but after finish grading. Water audits shall be performed by a Certified Landscape Irrigation Auditor in the presence of the Project Engineer, at Engineer's election;
  - f. Test of fully operational systems after completion of plant material installation. Controller charts are to be available for inspection at this time.
3. Contractor shall compile a written observation report for each visit by the Project Engineer, or Engineer's designated representatives. A copy of said report shall be submitted to the Project Engineer. In the event Contractor fails to notify the Project Engineer for the above listed observations and approvals when job certification is required by a local agency, the Contractor shall be solely responsible to prove the work is certifiable to the Project Engineer. Contractor shall be responsible for all costs resulting from said failure to notify.

**G. Warranty**

1. The entire sprinkler system shall be unconditionally guaranteed by Contractor as to material and workmanship, including settling of backfilled areas below grade, for a period of one (1) year following the date of final acceptance of the work. City may exercise the option to withhold part of final payment until the one (1) year product/workmanship guarantee has elapsed from date of final acceptance.
2. Any settlement of excavations, trenches, etc., occurring within one (1) year from the date of final acceptance shall be repaired by Contractor as part of project Scope Of Work. Said repairs shall include, but not limited to, adjustments in pipes, valves, valve boxes, sprinklers, plant materials, and paving, as necessary to bring the irrigation system and/or adjacent plant materials, and/or paving to the proper level of permanent grades. All such adjustments, and repairs shall be made by Contractor at no additional charge to City.
3. Any irrigation system failures occurring within the one (1) year guarantee period, that the City determines are due to inferior materials, and/or workmanship, shall be immediately corrected by the Contractor to the satisfaction of the Public Works Department. Such corrections shall include, but not limited to, repair/replacement of any, and all other damage caused by materials/workmanship defects. Corrections shall be made within forty-eight (48) hours of written notice by the City, at no additional charge. Should Contractor fail to repair defects/damage in a timely manner, the City reserves the right to make needed repairs, and deduct the cost of same from Contractor's materials, and workmanship security.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

III. **MATERIALS**

A. **Pipe and Fittings**

1. **Brass** – Brass pipe shall be IPS standard weight eighty-five percent (85%) Red Brass. Fittings shall be with standard one hundred twenty-five (125) pound cast bronze threaded fittings.
2. **PVC Conduit** – Pipe that is used for control wires shall be PVC conduit Schedule 80, Type 1220. All UF 14/12/10 – 24-volt (low voltage) wires under paving shall be installed in PVC conduit (or sleeves) as indicated on project plans, at a twenty-four inch (24”) depth.
3. **PVC Normal Impact Pipe-Type 1220 (PVC Schedule 40 & 80)**
  - a. Type II Grade I high impact pipe.
  - b. ASTM D – 1785 conformance.
  - c. Outside diameter shall be same size as iron pipe.
  - d. Pipe shall be marked at intervals not to exceed five feet (5') with the following information: manufacturer's name, nominal pipe size, PVC type and grade, SDR rating class, NSF approval, and commercial standard designation CS 256-60.
  - e. PVC Schedule 40 shall not be threaded.
  - f. Fittings for intermittent pressure piping shall be PVC Schedule 40, Type II, NSF approved. Fittings for constant pressure piping shall be PVC Schedule 80, Type I, cell classification 12454, NSF approved, and conforming to ASTM D 1784.
4. **PVC Pressure Rated Pipe – Type 1220 (PVC Class 200 & 315) and Type 1120 (PVC Schedule 40)**
  - a. Type I Grade II Pressure Rated Pipe.
  - b. ASTM D – 2241 conformance (Class 200 & 315); ASTM D- 1785 conformance (Schedule 40).
  - c. Outside diameter of pipe shall be the same size as iron pipe.
  - d. Pipe shall be marked at intervals not to exceed five feet (5') with the following information: manufacturer's name, nominal pipe size, PVC type and grade, SDR rating class, NSF approval, and commercial standard designation CS 256-63.
  - e. PVC Type I shall not be threaded.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- f. Fittings for intermittent pressure piping shall be PVC Schedule 40, Type II, NSF approved. Fittings for constant pressure piping shall be PVC Schedule 80, Type I, cell classification 12454, NSF approved, and conforming to ASTM D 1784.

5. Ring-tite PVC Pipe (where required)

- a. All ring-tite pipe indicated on project plans shall be Class 200 PVC pipe with ring-tite joints.
- b. All ring-tite joints shall be sealed with rubber rings as provided by the manufacturer. All pipe joints shall provide for expansion, and contraction.
- c. Thrust blocks shall be provided as required for proper anchorage, and durability of the ring-tite pipe.

6. Pipe Identification – Reclaimed Water Facilities

- a. PVC pipe, and fittings shall be manufactured with purple-colored (Panatone 522C) material.
- b. PVC pipe shall be marked with the words “CAUTION RECLAIMED WATER”, in black letters repeated every twenty-four inches (24”) along entire length of pipe.
- c. Purple-colored (Panatone 512C), four (4) mil thick polyethylene warning tape shall be installed in all trenches containing constant pressure (mainline) pipe. Warning tape shall be six inches (6”) wide, and have the words “CAUTION RECLAIMED WATER ” in one inch (1”) high letters printed continuously along its entire length.
- d. Warning tape shall be installed in trench continuously at six inches (6”) above the top of all constant pressure (mainline) piping.

B. Solvent Cement

All solvent cement shall be NSF approved, comply with SCQAMD Rule 1168/316A, and conform to ASTM D-2564. Solvent cement used to join constant pressure (mainline) piping shall be a gray, heavy-bodied, medium set compound. All solvent weld pipe joints shall receive an application of primer immediately prior to application of solvent cement.

C. Sprinkler Heads, Nozzles and Accessories

Sprinkler heads, nozzles, and accessories shall be as shown on project plans. No substitutions shall be allowed without written authorization from Project Engineer. Sprinkler nozzles shall be as produced by the sprinkler manufacturer, and shall be compatible for use with the type/model identified on the project plans.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

D. Valves

1. Remote Control Valves – Electric remote control valves shall be as shown on project plans. No substitutions shall be allowed without written authorization from Project Engineer. (Refer to City Standard No's. 516, 517-drip).
2. Gate/Ball Valves – Shall be as shown on project plans, and shall be brass with bronze turning handles. No substitutions shall be allowed without written authorization from Project Engineer.
3. Quick Coupling Valves – Shall be as shown on project plans. All quick coupling valve keys and hose swivels shall be produced by quick coupler valve manufacturer, and shall be compatible for use with type/model identified on project plans. No substitutions shall be allowed without written authorization from Project Engineer. (Refer to City Standard No. 518).
4. Warning Labels – Three inches by four inches (3"x4") tag-type warning labels shall be attached to all valves using heavy duty nylon fasteners. Labels shall be: ten (10) mil thick, made from an inert plastic film, purple in color (Panatone 512-C), imprinted with the words "CAUTION: RECLAIMED WATER-DO NOT DRINK", and the international symbol for "DO NOT DRINK" in black ink.

E. Controllers and Controller Enclosures

Controllers, and controller enclosures shall be as shown on project plans.

F. Control Wire for Remote Control Valves

All wiring used for connecting irrigation controllers to electric remote control valve solenoids shall be Type UF-600V, solid copper, PVC insulated, single conductor, No. 12 (Common Wire) and No. 14 UL (Pilot Wires) approved underground feeder cable. Pilot ("hot") wire insulation color shall be red (or other color as approved), and common wire insulation color shall be white. Three foot (3') expansion loops ("pigtailed") shall be provided every 1500-linear feet, and at each 90-degree turn in wire path. Enclose expansion loops in rectangular valve boxes with cover heat-branded "EL" in one and one-half inch (1½ ") letters.

G. Valve Boxes

1. All remote control valves, gate/ball valves, pressure relief valves, expansion loops, and control wire splices (as allowed) shall be installed in rectangular valve boxes of a size large enough to accommodate the valve, and all valve appurtenances (e.g., unions, isolation valves, wire splice kits). Valve boxes shall be as shown on project plans, and shall be furnished with locking covers. Valve box covers shall be marked "RCV", "GV", "PRV", or "WS" as appropriate, and covers marked "RCV" shall also be marked with the appropriate station number. All lettering shall be one and one-half inches (1½ ") high. Metal valve box covers shall be marked using white paint and stencils, and plastic valve box covers shall be heat-branded.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. All quick coupler valves shall be installed in round valve boxes of a size large enough to accommodate use of quick coupler keys and hose swivels. Valve boxes shall be as shown on project plans, and shall be furnished with locking covers. Valve box covers shall be marked "QC". All lettering shall be one and one-half inches (1½") high. Metal valve box covers shall be marked using white paint and stencils; plastic valve box covers shall be heat-branded.
3. Reclaimed Water Facilities – Valve box requirements are as above. In addition, valve box covers must be purple in color (Panatone 522C), and marked with the words "RECLAIMED WATER".

H. Pressure Regulation Device

A Pressure Regulation Device shall be installed between water meter and reduced pressure backflow prevention assembly wherever mainline working pressure exceeds 85-p.s.i., unless Project Engineer determines that site conditions, and/or approved irrigation calculations provide grounds for waiver of this requirement.

I. Backflow Prevention Units

All backflow prevention units shall be of type and manufacture approved for use by Eastern Municipal Water District. (Refer to City Standard No's. 512, and 513).

**IV. INSTALLATION**

A. Trenching

1. Excavation shall be open vertical construction sufficiently wide to provide free working space around the material installed and to provide ample space for backfilling and compacting. (Refer to City Standard No's. 520, and 521).
2. Trenches for pipe shall be cut to required grade lines, and trench bottom shall be compacted to provide an accurate grade, and uniform bearing for the full length of the line.
3. All trenching within three feet (3') of any tree trunk shall be done by hand, and care shall be taken to preserve existing root systems. Any tree failure determined to be the result of Contractor's trenching operations, occurring within twelve (12) months of final project acceptance shall be replaced by Contractor at no cost to the City.
4. When two (2) pipes are to be placed in the same trench, a six inch (6") vertical offset shall be maintained between pipes, unless City Codes require otherwise. (Refer to City Standard No's. 520, 521, and 522).

B. Backfilling

1. Backfill material shall be City approved. Unsuitable material including clods, rocks over one inch (1") in size, and tree roots, shall be removed from the project site, and disposed of in a legal manner, at no extra cost to the City.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. All backfilling shall be done carefully and shall be properly compacted for approval purposes. Wheel rolling will not be allowed.
3. Depth of trenches shall be sufficient to provide a minimum cover above the top of the pipe as follows:
  - a. Twelve inches (12") over PVC intermittent pressure (lateral) lines;
  - b. Eighteen inches (18") over PVC constant pressure (mainline) lines, two and one-half inches (2½") and smaller;
  - c. Twenty-four inches (24") over PVC constant pressure (mainline) lines, three inches (3") and larger;
  - d. Twenty-four inches (24") over all sleeving – except 120-Volt hot wire sleeving for landscape lighting, which requires a thirty inch (30") cover, and steel conduit.

C. PVC Pipe

1. PVC pipe shall be snaked in a manner which will allow for expansion and contraction, or as recommended by pipe manufacturer.
2. All plastic to metal joints shall be made using an assembly consisting of a line-size by twelve inch (12") Schedule 80 TOE (Threaded One End) nipple solvent welded to a Schedule 40 slip x slip coupler ("TOE Nipple Assembly" – City Standard No. 509). Two (2) wrappings only of three-quarter inch (¾") Teflon tape shall be used on male threads prior to joining TOE Nipple Assembly to metal pipe or fittings.
3. All plastic pipe joints shall be solvent welded, and shall receive an application of primer immediately prior to application of solvent cement. Solvent welded joints shall be allowed to set at least twenty-four (24) hours before pressure is applied, or as recommended by the cement manufacturer. Caution shall be used in handling pipe due to the possibility of cracking, or of splitting when dropped or handled carelessly.
4. For mainline piping of one and one-quarter inch (1¼") diameter or larger, concrete thrust blocks shall be poured wherever changes in pipeline direction exceed 22½ - degrees (tees included). Thrust blocks shall be of class "C" (4½ sack mix) concrete, and shall be poured against undisturbed soil. Minimum dimensions for thrust blocks poured against three inch (3") piping shall be one foot high by one foot wide (1'H x 2'W for 90-degree bends).
5. After all new mainline pipe and risers are in place and connected to water supply, a full head of water shall be used to flush out the system for a minimum of five (5) minutes. After the system is thoroughly flushed, and prior to backfilling of trench line, the risers shall be capped off and the system shall be pressure tested for a period of not less than six (6) hours @ 150-psi. During this test period, the mainline piping shall show no leakage or loss of pressure. Minimum test pressure at the highest point of the mainline section being tested shall be as determined by the Project Engineer. Center filling of mainline pipe lengths is allowed, however all fittings shall remain exposed for inspection.



**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

6. At the conclusion of a system pressure test, the remote control valves and sprinkler heads shall be installed, and tested under normal operating pressure for operation in accordance with design requirements. Contractor shall verify sprinkler head pressures with pitot tube, and adjust remote control valves to correspond with design pressure.

D. Ring-Tite PVC Pipe

1. Except as may be noted in other parts of the Specifications or on project plans, installation of Ring-Tite PVC pipe, and connecting fittings shall be in accordance with instructions supplied by pipe manufacturer. This shall include, but not be limited to, the installation of the pipe at the proper depth, and the correct location of concrete thrust blocks of adequate size. Contractor shall make available the services of the manufacturer's representative at the start of the installation, and during construction.
2. Each line shall be tested at a pressure 50-p.s.i. greater than the manufacturer's recommended working pressure for a period of six (6) hours, with the couplings and connections exposed, and with the center of pipe section sufficiently supported, and filled to hold pipe in place.

E. Sprinklers

1. All nozzles on stationary pop-up sprinklers shall be tightened after installation. All sprinklers having an adjustment stem or Pressure Compensation Device shall be adjusted on a lateral line for the proper radius, diameter, and/or gallonage per approval of the Project Engineer.
2. Plastic sprinkler heads, and risers shall be installed according to City Standard No's. 523, 524, 525, and 526 as applicable.
3. Non-Rotor Sprinklers - Shall be of the following sizes:
  - a. Six inch (6") pop-up in all City turf applications;
  - b. Twelve inch (12") pop-up shall be used in all City ground cover/shrub applications.
4. Rotor Sprinklers - Shall be of the following sizes:
  - a. Six inch (6") pop-up rotor sprinklers only for turf application;
  - b. Twelve inch (12") high pop-up rotor sprinklers for ground cover/shrub application;
  - c. Slope Conditions - Top and toe of slope shall be twelve inch (12") pop-up rotor sprinklers. Center (mid-slope) row rotor sprinklers may be shrub (fixed riser) type only if shown as such on plans.

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

F. Valves

1. Gate/Ball valves shall be installed on constant pressure (mainline) piping at locations indicated on project plans. (Refer to City Standard No. 515).
2. Remote Control valves shall be installed on constant pressure (mainline) piping at locations indicated on project plans. (Refer to City Standard No. 516). Remote control valves shall be adjusted in order that a uniform distribution of water is applied by the sprinkler heads to the planting areas for each individual valve system.
3. Quick coupling valves shall be set approximately twelve inches (12") from walks, curbs, headerboards, or paved areas where designated. (Refer to City Standard No. 518).

G. Valve Boxes

1. Valve boxes shall be set one inch (1") above the designated finish grade in turf areas, and three inches (3") above finish grade in ground cover areas.
2. Valve boxes installed near walks, curbs, headerboards, and paving shall abut those items. Box tops/covers shall be set flush with the tops of the adjacent hardscape surfaces.

H. Automatic Controller and Enclosure Location and Installation

1. The automatic controller shall be installed in the location shown of the project plans, unless otherwise approved by the Project Engineer.
2. All local, and other applicable codes shall take precedence when connecting the 110-volt electrical service to the controller. Power to the controller enclosure shall be provided by the owner. Contractor shall complete hook-up of power to the controller. (Refer to City Standard No. 503).
3. There shall be adequate coverage of earth (twenty-four inches (24") minimum) over the 24-volt UF control wire. Install wire in mainline trench below and to the side of mainline, and tape at fifteen foot (15') intervals.

I. Control Wire

1. All electrical equipment and wiring shall comply with local and state electrical codes, and be installed by persons skilled, and licensed in the trade.
2. Connecting and splicing of wire at the valves or in the field shall be made using approved water-proof connectors. All splices must occur within an approved valve box. (Refer to City Standard No. 510).

**LANDSCAPE SPECIFICATIONS-IRRIGATION - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

3. Pilot wire runs shall be continuous from valve to controller. Common wire splices shall be allowed only at control valves, wire transition points, and immediately before connection to controller. Where pilot or common wire runs exceed 1500-linear feet, Project Engineer may allow field splicing of wires. Three foot (3') expansion loops ("pigtailed") shall be provided for each wire so spliced; expansion looped splices shall be enclosed in rectangular valve boxes with cover marked "WS" in one and one-half inch (1½") letters. Metal valve box covers shall be marked using white paint and stencils, and plastic valve box covers shall be heat-branded.
4. Provide one (1) extra pilot wire from the controller to the farthest remote control valve in each direction from the controller. This extra pilot wire shall be of a different color than that used for operational pilot wires.

J. Backflow Prevention Units

1. The backflow prevention units shall be installed as shown on Plans and Details. Backflow prevention units shall be installed in accordance with all applicable agency codes, ordinances, etc. including certification. (Refer to City Standard No. 512, and EMWD Standard Drawing No. B-597).
2. Backflow prevention units in public areas shall be housed in a protective enclosure. (Refer to City Standard No. 513).

**LANDSCAPE SPECIFICATIONS - CENTRAL IRRIGATION CONTROL**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. INTERCONNECT SYSTEM**

A. General

1. All incidental parts which are not shown on the plans or specified herein, and are necessary to complete or modify the existing systems, shall be furnished and installed by Contractor as though such parts were shown on plans or specified. All systems shall be in satisfactory operation at the time of completion.
2. Contractor shall coordinate with the City for conduit installation indicated on project plans. Minor changes caused by actual site conditions shall be made at no cost to the City. All changes to the plans shall be approved by the Project Engineer.
3. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in this contract furnish directions covering points not shown in the drawings, and specifications.
4. Contractor shall provide for proper surge protection and grounding at each satellite, and at the cluster control unit (CCU) pedestals.
5. Contractor shall bring interconnect circuit into irrigation satellite controller pedestals, as indicated on project plans. Standard for conduit path shall be as set forth herein for both types of pedestals.
6. Prior to final acceptance, Contractor shall furnish the City with two hundred and ten feet (210') of continuous, unspliced PE 39 cable.

B. Materials

1. Conduit
  - a. PVC Electrical Conduit - Pipe used for interconnect wires shall be PVC Schedule 40, Type 1220, sized as indicated on plans. Fittings/sweeps shall be PVC Schedule 40, Type II.
  - b. Steel Conduit - Pipe and fittings used for interconnect wires shall be of the type and size indicated on plans, and shall conform to applicable provisions of Subsection 209-2.3 of the Standard Specifications For Public Works Construction, most current edition.
2. Warning Tape - Shall be three inch (3") wide, four (4) mil orange pigmented polyolefin film with the words "CAUTION: CITY UTILITY BELOW" permanently printed on one side (Terra Tape Standard 250 as manufactured by Reef Industries, Inc., Houston, Texas, or approved equal).

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

3. Conductors
  - a. Communication Cable - Irrigation interconnect cable shall consist of six (6) pair - #20-AWG or larger insulated copper conductors, each wire pair to be individually shielded with an aluminum/ polyester shield. Cable shall be encased in a black, high density polyethylene jacket. Cable shall meet REA PE-39 specifications, as manufactured by AT&T, or equal.
  - b. 2-Wire Path Wire Splices - All 2-WIRE path wire splices or connections, either in pull boxes or at field satellite units where the connection is NOT being made to the terminal strip, shall be waterproofed by using a 3M series 3500 Scotch-Lok splice connector.
4. Pull Boxes/Grounding Rod Boxes
  - a. Pull and grounding rod boxes for the irrigation interconnect conduit shall be fabricated from a durable plastic material resistant to weather, sunlight, and chemical action of soils. They shall be green in color. The cover shall be secured with a stainless steel bolt-down mechanism. The cover shall be capable of sustaining a load of 1,500-psi. Box extensions shall be by the same manufacturer as the box. Pull boxes shall be Ametek with dimensions of 10¾"x16"x12" or approved equal. Grounding rod boxes shall be Brooks #1100 or approved equal. Pull box covers shall be heat branded with the letters "IRR-COM", two inches (2") high.
  - b. In paved areas, the pull box shall be Brooks 3TL concrete box with cast-iron traffic lid. The cover shall be marked with the letters "IRR-COM", two inches (2") high. Markings shall be applied to the cover prior to galvanizing.
5. Flow Sensors - Shall be Data Industrial Series IR 250B or appropriate equal, sized as indicated on plans.
6. Flow Sensor Boxes - All flow sensors shall be installed in suitable valve boxes, complete with locking covers, 15"x21½"x12" as manufactured by Brooks Products, Inc., or approved equal. Valve box extensions shall be by the same manufacturer as the valve box. All shall be marked "FS" heat branded in letters two inches (2") high on valve box cover by Contractor.
7. Master Valves - Shall be manufacturer/model, and size as indicated on plans.
8. Master Valve Boxes - All master valves shall be installed in suitable valve boxes, complete with locking covers, 15"x21½"x12" as manufactured by Brooks Products, Inc., or approved equal. Valve box extensions shall be by the same manufacturer as the valve box. All master valve box lids shall be marked "MV" heat branded in letters two inches ( 2") high on valve box cover by Contractor.
9. CCU Pedestals - CCU pedestals shall be manufacturer/model, as indicated on plans.
10. Grounding Wire - Shall be #10-insulated solid copper wire, and it shall include all fittings/fasteners necessary to connect grounding wire to pedestal grounding grid.

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.  
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

11. Grounding Rod - Shall be 5/8"x8' copper-clad rod.
12. Radio Antenna Mast - Shall be constructed from two inch (2") threaded steel pipe stock, and fittings.
13. Radio Mast Surface Coating - Shall be an inorganic ethyl silicate type zinc rich coating, GLID-ZINC Y-5536/5537, color: Grey-Green.

C. Execution Of Work

1. Trenching

- a. Excavation shall be open vertical construction sufficiently wide to provide free working space around the material installed, and to provide ample space for backfilling and compacting.
- b. Trenches for pipe shall be cut to required grade lines, and trench bottom shall be compacted to provide an accurate grade, and uniform bearing for the full length of the line.
- c. All trenching within three feet (3') of any tree trunk shall be done by hand, and care shall be taken to preserve existing root system. Any tree failure determined to be the result of Contractor's trenching operations, occurring within twelve months of filing of project Notice of Completion, shall be replaced by Contractor at no cost to the City.
- d. Depth of trenches shall be sufficient to provide a minimum cover above the top of the conduit pipe as follows:
  - (1) Twelve inches (12") over communication conduit placed in landscaped parkways;
  - (2) Thirty inches (30") over communication conduit placed in unlandscaped parkways;
  - (3) Thirty-six inches (36") over communication conduit placed beneath sidewalks, paving, or other hardscaped areas;
  - (4) Twenty-four inches (24") over all 120-volt hot wire conduit for CCU Pedestals (when power supply external to CCU pedestal).

2. Backfilling

- a. Backfill material shall be City approved. Unsuitable material including clods and rocks over one inch (1") in size shall be removed from the premises, and disposed of legally at no extra cost to the City.
- b. All backfilling shall be done carefully, and shall be compacted to the City's satisfaction. Mechanical compaction will not be allowed. Trench backfill material shall be settled, and densified by means of jetting.

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- c. Warning tape shall be installed six inches (6") above top of piping in all trenches carrying communication conduit.

3. Irrigation Interconnect Conduit

- a. The conduit shall be located within the public right-of-way or existing landscape easement whenever possible. If the conduit is installed outside of the public right-of-way or landscape easement, an additional easement shall be provided to the City prior to the City's acceptance of the improvements.
- b. All conduit installed above ground shall be threaded rigid steel, and all conduit installed below ground shall be PVC Schedule 40. Transition from metallic to non-metallic conduit shall occur at the terminus of the first full length of metallic conduit installed below grade.
- c. Route of conduit path shall be as shown on the approved plans. Any changes shall be approved by the Project Engineer prior to installation.
- d. The ends of all conduits, whether shop or field cut, shall be reamed to remove burrs, and rough edges. Cuts shall be made square, and true. Slip joints on running threads shall not be permitted for coupling conduit.
- e. Care shall be taken to keep conduit free of debris during installation. All rocks, debris, moisture, etc., shall be removed from conduit prior to pulling communication cable. Conduit bushings shall be installed at all conduit terminals, including but not limited to sweep ends in pull boxes. After cable is installed, all sweep ends shall be sealed with silicone to keep moisture out of conduit.
- f. Conduit bends, except factory bends, shall have radii of not less than six (6) times the inside diameter of the conduit. Conduits that are crimped or flattened shall be rejected. Bending shall be done by methods recommended by the conduit manufacturer.
- g. All conduit shall have a minimum clearance of six inches (6") from other pipes or conduits. All conduit shall have a minimum clearance of eighteen inches (18") from high voltage electrical utilities.
- h. All conduit placed beneath sidewalks or paving shall be installed at a minimum depth of thirty-six inches (36") below existing grade, and it shall have a minimum of six inches (6") of clearance below the bottom of pavement sections.
- i. Warning tape shall be installed six inches (6") above top of conduit. Warning tape must run continuously, and cover all conduit installed.
- j. A nylon or polypropylene pull rope with a minimum tensile strength of five hundred pounds (500 LBS.) shall be placed in all interconnect conduits installed under project scope of work. At least two feet (2') of pull rope shall be extended beyond each end of the conduit run and secured.

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- k. Plastic to metal conduit connections shall be joined using an assembly consisting of a line-size by six inch (6") Schedule 80 nipple, threaded on one end only, solvent welded to a Schedule 80 slip x slip coupler. Two (2) wrappings of three-quarter inch ( $\frac{3}{4}$ ") teflon tape shall be used on male threads prior to joining metal conduit.
- l. If conduit is installed by means of trenching, Contractor shall use methods described in these Central Irrigation Control Specifications, Section I., C., 1., paragraphs a. through c., and C., 2., paragraphs a. through c.

4. Irrigation Interconnect Conductors

- a. A minimum of two feet (2') of slack shall be left at each field satellite, and within each pull box. Sufficient slack shall be left to allow the cable loop to extend eighteen inches (18") above the top of the pull box grade.
- b. Cable tags, provided by the City, shall be attached to the cable loop in each pull box with a plastic "zip tie" fastener.
- c. The irrigation interconnect wire shall be continuous. Splices shall occur along the interconnect system within controller enclosures and/or flow sensor vaults only, unless specifically authorized by the Project Engineer. All splices shall be made using approved connectors only. All splices shall be capable of satisfactory operation under continuous submersion in water. All splices shall be protected from moisture with 3M Series 3500 Scotch-Lok connector packs. If made outside of controller enclosures, all splices will be housed in pull boxes as described, and specified elsewhere in these Specifications. Care shall be taken with each wire joint or connection to assure that a completely good, waterproof connection will result. It is important that ALL wire connections be absolutely watertight, and with NO leakage to ground nor shorting from one conductor to the other.
- d. Where interconnect wire must cross under streets and/or hardscape through existing sleeves, pull boxes shall be installed at both ends of sleeve. Additional conduit and/or sweeps shall be installed as necessary to bring wire up to specified grade when run through existing sleeves.

5. Pull Boxes (Refer to City Standard No. 505)

- a. Pull boxes shall be installed at intervals not to exceed two hundred feet (200'), and at each location that the installation of the conduit shall be phased, and at each point where the conduit crosses a roadway, bridge, utility installation, or existing improvement which will require significant deviation from normal direct routing.
- b. Pull boxes shall be installed in landscape areas whenever possible.
- c. The bottom of all pull boxes shall be bedded in crushed rock six inches (6") deep .
- d. Boxes shall be set one inch (1") above the designated finish grade in lawn areas, and two inches (2") above finish grade in ground cover areas.



**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.  
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- e. Boxes installed near walks, curbs, headerboards, and paving shall abut those items. Box top surfaces shall be flush with the tops of the hardscape surfaces shown.
  - f. Boxes shall be installed in shrub planters, not in turf areas whenever possible, unless otherwise approved by City Inspector.
6. Flow Sensors (Refer to City Standard No. 504)
- a. Flow sensors shall be installed at indicated POC's, downstream of the POC Master Valve. Flow sensors shall be installed in-line at a distance equal to ten (10) times sensor-sized pipe diameter downstream, and five (5) times sensor- sized pipe diameter upstream of any valve, fitting, meter, or backflow device.
  - b. Wires connecting flow sensor to controller shall be as specified in Section I., B., 3., a. of these Specifications.
  - c. Flow sensor shall be housed in a valve box as specified in Section III., G., 1. of the Irrigation Specifications, and be installed per Section IV., G. of the Irrigation Specifications.
7. Master Valve Solenoids - Shall be connected to the nearest satellite controller with 14-gauge direct burial wire. Wire splices shall be made with waterproof connector kits. An extra pilot wire shall be provided to the master valve vault.
8. Master Valve/Flow Sensor Boxes
- a. Boxes shall be set one inch (1") above the designated finish grade in lawn areas, and two inches (2") above finish grade in ground cover areas.
  - b. Boxes installed near walks, curbs, headerboards, and paving shall abut those items. Box top surfaces shall be flush with the tops of the hardscape surfaces shown.
  - c. Boxes shall be installed in shrub planters, not in turf areas whenever possible, unless otherwise approved by City Inspector.
9. CCU Pedestals - Shall be mounted on a 36"x36"x6" concrete footing with sweep ells of number and size sufficient to accommodate communication cable, 110-volt power, grounding wire, telephone service wiring, and radio antenna cable in separate sweeps. Contractor shall be responsible for bringing communication cable, 110-volt power, grounding wire, and antenna cable into pedestal. (Refer to City Standard No. 506).

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

10. Surge Protection/Grounding (Refer to City Standard Nos. 506, 507)
  - a. Each Satellite Unit - Shall be grounded, by means of a #10 or larger solid conductor copper grounding wire to a five-eighths inch (5/8") diameter copper clad rod eight feet (8') long (satellite units placed in non-irrigated areas will require a two (2) rod grid - per these Central Irrigation Control Specifications, Section I., C., 10., b.). Rods shall be installed in landscape areas wherever possible. It is IMPORTANT that a good ground be maintained for the surge arrestors to be effective.
  - b. CCU/Encoder Unit - Run ground wires to a two (2) rod grid copper grounding network (two (2) five-eighths inch (5/8") diameter copper clad rods eight feet (8') long arranged at least ten feet (10') apart, and tied together underground with #10 or larger solid copper wire). A #10 or larger grounding wire shall be run from the ground terminal of the CCU Unit to the grounding network. Grounding network shall measure 15-OHMS or less when measured with a Vibra-Ground instrument. It is IMPORTANT that a good ground be maintained for the surge arrestors to be effective.
  - c. All grounding rods installed outside of pedestal shall be protected by a ten inch (10") round plastic valve box with locking lid.
11. Radio Antenna Masts (Radio Link CCU's only) (Refer to City Standard No. 502)
  - a. Radio antennas shall be installed at each CCU location, and shall be mounted atop masts constructed from two inch (2") steel pipe stock.
  - b. Prior to erection, mast pipe surfaces shall be cleaned of all foreign matter by hand or power tool cleaning. A solvent cleaner shall be used as necessary to remove any oil, grease, or dirt. Following surface preparation, a zinc rich flat finish paint shall be applied (two (2) coats minimum). Any paint marred or damaged during mast erection shall be re-primed, and re-painted as necessary.
  - c. The base of the antenna mast shall extend at least five feet (5') below finish grade, and shall be encased in a 24"x24"x30" concrete footing.
  - d. Antenna wiring shall be routed inside mast piping, and shall exit mast below grade.
  - e. Antenna wiring path shall be routed to CCU through PVC Schedule 40 conduit, and enter CCU pedestal through a dedicated 90-degree sweep.

D. Inspection

Interconnect Circuitry - The contractor shall cause the following warranty tests to be performed by the equipment supplier on all electrical circuits, and shall submit a written approval from the equipment supplier to the City Inspector prior to the start of the maintenance period. All tests shall be made to the satisfaction of the City Electrical Inspector.

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.  
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

1. Continuity - Each circuit shall be tested for continuity.
2. Ground - Each circuit shall be tested for leaks to ground with an ohm meter after each interconnect circuit has been installed, and connections have been made. No circuit checking lower than one (1) megohm will be acceptable.
3. Functional - A functional test shall be made in which it is demonstrated that each, and every part of the system functions as specified or intended. The test may commence only with the approval of the City Electrical Inspector. The functional test for each new or modified electrical system shall consist of not less than five (5) days of continuous, satisfactory operation. If unsatisfactory performance of the system develops, the condition shall be corrected, and the test shall be repeated until the five (5) days of continuous satisfactory operation are obtained.

Starting of functional tests, and turn-ons shall not be made on a Friday, or on the day preceding a legal holiday.

Shutdown caused by factors beyond the contractor's control shall not constitute discontinuity of the functional test.

4. Faults - Any material revealed by these tests to be faulty in part of the installation shall be replaced or corrected by the contractor at his expense in a manner permitted by the Project Engineer, and the same test shall be repeated until no fault is evident.
5. Results of circuitry tests shall be recorded, and submitted to the City Inspector prior to acceptance of the work.

**II. TELEPHONE SERVICE CONDUIT AND APPURTENANCES**

A. General

Contractor shall install Telephone Service Conduit where indicated on project plans, using materials, and methods described below.

B. Materials

1. Conduit and Fittings - Shall be PVC Schedule 40, installed with a plastic or nylon pull rope of not less than one thousand pounds (1,000 LBS.) tensile strength.
2. Telephone Mounting Bracket - Shall be minimum 8"x8"x1½" CDX grade plywood, and it shall include all fittings/fasteners necessary to install bracket in CCU Pedestals, as indicated on project plans.
3. Grounding Wire - Shall be #10-solid copper wire, and of sufficient length to connect CCU telephone equipment with pedestal grounding grid, and it shall include all fittings/fasteners necessary to connect grounding wire to pedestal grounding grid.
4. Pull Boxes - See Section I., B., 4., paragraphs a. and b. of these Specifications. Pull box covers shall be heat branded with the letters "TEL-COM", two inches (2") high.

**LANDSCAPE SPECIFICATIONS-CENTRAL IRRIGATION CONTROL - cont.  
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

C. Execution Of Work

1. Conduit

- a. Conduit shall connect Verizon handholes, and designated CCU Pedestals.
- b. Minimum depth of conduit shall be eighteen inches (18") below existing grade.
- c. Conduit run shall be continuous from Verizon handhole to pedestal, with no more than two (2) 90-degree bends, eighteen inches (18") minimum radius. Should more than two (2) bends be required to complete conduit run, pull boxes/sweeps shall be installed as necessary.
- d. Conduit paths of one hundred fifty feet (150') or less shall be furnished with one and one-half inch (1½") nominal O.D. conduit. Conduit paths exceeding one hundred fifty feet (150') shall be furnished with two inch (2") nominal O.D. conduit.
- e. Contractor shall install nylon pull rope, per Section II., B., 4. of these Specifications.

2. Pull Boxes - See Section I., C., 5., paragraphs a. through f. of these Specifications.

**LANDSCAPE SPECIFICATIONS - SOIL MOISTURE SENSING TECHNOLOGY**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. GENERAL**

- A. To achieve the goal of managing this landscape in the most resource conscious manner possible, all systems will incorporate soil moisture sensing technology whether it is operated through central control or not. In cases where no MaxiCom equipment is used, the control system shall include WaterMark control modules, and sensors. Where MaxiCom is utilized, the system will be equipped with WaterMark soil moisture sensors. These sensors will be tied into the MaxiCom system.
- B. Contractor shall coordinate with the City for conduit installation indicated on project plans. Minor changes caused by actual site conditions shall be made at no cost to the City. All changes to the plans shall be approved by the Project Engineer.
- C. Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers used in this contract furnish directions covering points not shown in the drawings, and specifications.
- D. All incidental parts which are not shown on the plans or specified herein and are necessary to complete installation shall be furnished, and installed by Contractor as though such parts were shown on plans or specified. All systems shall be in satisfactory operation at the time of acceptance.
- E. Contractor shall route sensor conduits into irrigation controller pedestals, as indicated on project plans. Standard for conduit path shall be as set forth herein.

**II. MATERIALS**

- A. Conduit
  - 1. PVC Electrical Conduit - Pipe used for sensor wiring paths shall be PVC Schedule 40, Type 1220, sized as indicated on plans. Fittings/sweeps shall be PVC Schedule 40, Type II.
  - 2. Steel Conduit - All Pipe and fittings used for conduit path that will run above grade shall be rigid steel of the type and size indicated on plans, and shall conform to applicable provisions of Subsection 209-2.3 of the Standard Specifications For Public Works Construction, most current edition. No thin wall conduit will be accepted.
- B. Terminal Strip
  - 1. Each control pedestal shall be equipped with a terminal strip to facilitate wiring of the control modules, and/or sensors. Each strip shall be sized to allow four (4) positions per sensor location as described on the plan sheets. In addition, four (4) positions must be available for each control module to be installed in the pedestal. Project Engineer must approve terminal strip prior to installation.
  - 2. All connections to the terminal strip to be made using a good quality alloy type insulated crimp-on spade connector.

**LANDSCAPE SPECIFICATIONS-SOIL MOISTURE SENSING TECHNOLOGY - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

C. Conductors

1. Sensor Cable - Soil moisture sensors shall be connected to control device via multi-conductor, direct burial rated cable, 4 - #18-AWG or larger insulated copper conductors, each wire with uniquely colored insulation. Cable shall be encased in a black, high-density polyethylene jacket. If more than two (2) sensors are to use the cable, supply 8-conductor cable so each sensor lead has a dedicated conductor running back to the controller pedestal.
2. Wire Path Splices - All field connections, either in splice boxes or at field satellite units where the connection is NOT being made to the terminal strip, shall be waterproofed by using a 3M series 3500 Scotch-Lok splice connector or approved equal.
3. Common Wiring - In most cases multiple hydrozones will exist within an Landscape Maintenance District (LMD) design. If there is no MaxiCom control system it will be necessary to install multiple valve commons, one (1) to serve each valve associated with each distinct hydrozone. The valve groupings should be listed on the plan sheets, see Project Engineer for additional direction if necessary. Each common must be of a different color. The master valve shall have a separate common conductor as well.

D. Pull Boxes/Splice Boxes

Pull and splice boxes for the sensor conduit shall be fabricated from a durable plastic material resistant to weather, sunlight, and chemical action of soils. They shall be green in color. The cover shall be secured with a stainless steel bolt-down mechanism. Box extensions (where needed) shall be by the same manufacturer as the box. Pull/splice boxes shall be round Ametek with dimensions of 10"x12" or approved equal. Splice box covers shall be heat branded with the letters "SENSOR", two inches (2") high. Pull boxes shall be heat branded with the letters "P-BOX".

E. Moisture Sensors

Moisture sensors shall be the WaterMark™ series by The Irrrometer Company. Two (2) sensors are required at each sensor location indicated on the plans.

F. Moisture Control Modules (non centrally controlled systems only)

All projects that do not feature MaxiCom central control will be equipped with WaterMark Electronic Modules (WEM). Modules shall be by the same manufacturer as the sensor. In cases where separate valve common conductors are not provided for each hydrozone, a WaterMark multi-zone interface device shall also be installed.

G. Sensor Override Device (non centrally controlled systems only)

Each Pedestal shall be equipped with a self re-setting sensor override device. This device shall be an Intermatic™ Model FF60MC timed switch. This device shall be housed in an outdoor junction box such as RED DOT Model RIH31MWH.

**LANDSCAPE SPECIFICATIONS-SOIL MOISTURE SENSING TECHNOLOGY - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**III. EXECUTION OF WORK**

**A. Trenching**

1. Excavation shall be open vertical construction sufficiently wide to provide free working space around the material installed, and to provide ample space for backfilling and compacting.
2. All trenching within three feet (3') of any tree trunk shall be done by hand, and care shall be taken to preserve existing root system. Any tree failure determined to be the result of Contractor's trenching operations, occurring within twelve months of filing of project's Notice of Completion, shall be replaced by Contractor at no cost to the City.
3. Depth of trenches shall be sufficient to provide a minimum cover above the top of the conduit pipe as follows:
  - a. Twelve inches (12") over sensor conduit placed in landscaped parkways;
  - b. Thirty inches (30") over sensor conduit placed in unlandscaped parkways;
  - c. Thirty-six inches (36") over sensor conduit placed beneath sidewalks, paving, or other hardscaped areas.

**B. Backfilling**

1. Backfill material shall be City approved. Unsuitable material including clods and rocks over one inch (1") in size shall be removed from the premises, and disposed of legally at no extra cost to the City.
2. All backfilling shall be done carefully and shall be compacted to the City's satisfaction. Mechanical compaction will not be allowed. Trench backfill material shall be settled, and densified by means of jetting.

**C. Moisture Sensor Wiring Conduit**

1. The conduit shall be located within the public right-of-way or existing landscape easement whenever possible. If the conduit is installed outside of the public right-of-way or landscape easement, an additional easement shall be provided to the City prior to City acceptance of the improvements.
2. All conduit installed above grade shall be threaded, rigid steel, and all conduit installed below grade shall be PVC Schedule 40. Transition from metallic to non-metallic conduit shall occur at the terminus of the first full length of metallic conduit installed below grade.
3. Route of conduit path shall be as shown on the approved plans. Pull boxes shall be located at intervals not to exceed two hundred (200) linear feet. Any changes shall be approved by the Project Engineer prior to installation.

**LANDSCAPE SPECIFICATIONS-SOIL MOISTURE SENSING TECHNOLOGY - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

4. The ends of all conduits, whether shop or field cut, shall be reamed to remove burrs, and rough edges. Cuts shall be made square, and true. Slip joints on running threads shall not be permitted for coupling conduit.
5. Care shall be taken to keep conduit free of debris during installation. All rocks, debris, moisture, etc., shall be removed from conduit prior to pulling sensor cable. Conduit bushings shall be installed at all conduit terminals, including but not limited to sweep ends in pull boxes. After cable is installed, all sweep ends shall be sealed with silicone to keep moisture out of conduit.
6. Conduit bends, except factory bends, shall have radii of not less than six (6) times the inside diameter of the conduit. Conduits that are crimped or flattened shall be rejected. Bending shall be done by methods recommended by the conduit manufacturer.
7. All conduit shall have a minimum clearance of six inches (6") from other pipes or conduits. All conduit shall have a minimum clearance of eighteen inches (18") from high-voltage electrical utilities.
8. All conduit placed beneath sidewalks or paving shall be installed at a minimum depth of thirty-six inches (36") below existing grade, and it shall have a minimum of six inches (6") of clearance below the bottom of pavement sections.
9. Plastic to metal conduit connections shall be joined using an assembly consisting of a line-size by six inch (6") Schedule 80 nipple, threaded on one end only, solvent welded to a Schedule 80 slip x slip coupler. Two (2) wrappings of three-quarter inch (3/4") Teflon tape shall be used on male threads prior to joining metal conduit.
10. If conduit is installed by means of trenching, Contractor shall use methods described in Section IV., A. and B. of the Irrigation Specifications.

D. Sensor Field Conductors

1. A minimum of two feet (2') cable shall be left exposed from the end of all sweeps within each field splice box, and within each pull box. Sufficient slack shall be left to allow the cable loop to extend twelve inches (12") above the top of the pull box.
2. The sensor cable shall be continuous. Splices shall occur within splice boxes at sensor locations only. If sensors are located more than four hundred feet (400') from the controller, one field splice shall be allowed per four hundred feet (400') of distance. Such field splices must occur within a splice box with a lid that is heat branded "SEN-SPLICE" in two inch (2") tall letters. All splices shall be made using approved connectors only. All splices shall be capable of satisfactory operation under continuous submersion in water. All splices shall be protected from moisture with 3M Series 3500 Scotch-Lok connector packs or approved equal. If made outside of controller enclosures, all splices will be housed in pull boxes as described, and specified elsewhere in these Specifications. Care shall be taken with each wire joint or connection to assure that a sound, waterproof connection will result. It is important that ALL wire connections be absolutely watertight, and with NO leakage to ground nor shorting from one conductor to the other.



**LANDSCAPE SPECIFICATIONS-SOIL MOISTURE SENSING TECHNOLOGY - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

3. Where sensor wire must cross under streets, and/or hardscape through existing sleeves, pull boxes shall be installed at both ends of sleeve. Additional conduit, and/or sweeps shall be installed as necessary to bring wire up to specified grade when run through existing sleeves.

**E. Pull Boxes**

1. Pull boxes shall be installed at intervals not to exceed two hundred feet (200'), and at each location that the installation of the conduit shall be phased, and at each point where the conduit crosses a roadway, bridge, utility installation, or existing improvement which will require significant deviation from normal direct routing.
2. Pull boxes shall be installed in landscape areas whenever possible.
3. The bottom of all pull boxes shall be bedded in crushed rock six inches (6") deep.
4. Boxes shall be set one inch (1") above the designated finish grade in lawn areas, and two inches (2") above finish grade in ground cover areas.
5. Boxes installed adjacent to walks, curbs, headerboards, and paving shall be set so that the top of the box shall be flush with the tops of the hardscape surfaces shown.

**F. Moisture Sensors**

1. A set of two (2) moisture sensors shall be installed at all locations indicated on plans. Sensors to be installed after all soil preparation, and planting operations have been completed. Each sensor must be pre-soaked in water prior to installation. The exact depth, and location of sensors will be determined by the Project Engineer.
2. Each sensor has two (2) leads, each of which must be connected to one of the field conductors leading back to the controller. The multi-conductor cable used to connect sensors to the controller shall be as specified in Section II., C., 1. of these Specifications.

**G. Control Modules (non MaxiCom control systems only)**

Control modules (WEM)s shall be mounted within the controller pedestal per direction of the Project Engineer. All module wiring connections will be made using a terminal strip as called for in Section II., B. of these Specifications.

**H. Sensor Override Device (non MaxiCom control systems only)**

1. This device shall be connected to the control circuit (terminal strip) with 16-AWG utility wire. This, and all wiring connections to the control circuit shall be made using crimp-on spade connectors. A tool specifically designed for this purpose shall be used to secure the connector to the conductor (channel-locks or other utility pliers will not be acceptable). The proper size spade must be used depending on the AWG value of the wire being terminated. Contractor to coordinate device wiring with the Project Engineer.
2. The override assembly shall be mounted in the controller pedestal adjacent to the WEM/controller per direction of the Project Engineer.

**LANDSCAPE SPECIFICATIONS-SOIL MOISTURE SENSING TECHNOLOGY - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**IV. INSPECTION**

A. Conduit and Field Wiring

1. Prior to backfilling, the conduit path shall be checked for the following: trench depth, clearance from structures and other utilities, and pull box spacing/placement.
2. Once the complete field wiring network is installed (but prior to connection of sensors) it will be tested for the following: wire continuity for each sensor location, and splice integrity where field splices have been made.

B. Sensor Installation and Wiring

1. The Project Engineer shall be present when sensors are sited, and installed.
2. The wire splices to connect the sensor leads to the field wiring network shall be made while the Project Engineer is present. The conductor colors must be recorded to allow each sensor to be connected properly at the terminal strips in the controller enclosure.

C. Control Modules (non MaxiCom control systems only)

Each control module will be tested to verify that all control functions are being performed per manufacturers specifications.

**LANDSCAPE SPECIFICATIONS - PLANTING**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. SCOPE**

Furnish all labor, materials, and equipment required to complete the work indicated on project plans. The work shall be performed in accordance with the best standards of practice relating to the various trades, and under the continuous supervision of a competent foreman, capable of interpreting the project plans, and specifications. The work included under this section is as follows:

Finish grading for planting; Soil preparation; Fertilization; Planting including turf; Maintenance; Inspection and Certifications; Guarantees; Clean Up; Staking, Guying, and Espaliering; and Miscellaneous allowances.

**II. GENERAL CONDITIONS**

**A. Approvals**

1. All project irrigation work shall be Inspected, and approved by the Project Engineer prior to the start of any planting.
2. Prior to excavation for planting or placing of stakes, locate all utilities, electric cables, conduits, irrigation lines, heads, valves, and valve control wires, and all utility lines so that proper precautions may be taken to avoid damaging the aforesaid improvements. In the event of a conflict between such lines and plant locations, promptly notify Project Engineer, who shall arrange for the relocation of one or the other. If Contractor fails to follow this procedure, Contractor shall then assume all responsibility for the cost of all repairs resulting from any damage to aforesaid improvements caused by Contractor's work.

**B. Plans And Specifications**

1. The intent of the Plans and Specifications is to indicate and specify installation of trees, shrubs, vines, turf, and groundcover, including but not limited to placement of mulch materials, at the locations shown.
2. Plot dimensions are approximate. Contractor shall carefully check and verify all dimensions and quantities, and shall report to the Project Engineer any variations and/or discrepancies between project plans and specifications, and actual site conditions. No work shall commence in any area where discrepancies have been noted until the Project Engineer has given approval. The work shall be installed in the most direct and professional manner, so that conflicts between plantings and irrigation systems, and architectural/engineering features will be avoided.
3. Plant materials shall be furnished in the quantities and/or spacing as shown or noted for each location, and shall be of the species, kinds, sizes, etc., as symbolized, and/or described on the project plans. The Contractor shall verify all sizes, and quantities with the Project Engineer.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

4. All material furnished and all construction methods used, including but not limited to plant species type and container size, installation locations and methods, backfill, and staking, shall conform to the applicable specifications of the following standards in the precedence indicated:
  - a. Project Specifications;
  - b. Project Plans;
  - c. *Standard Specifications For Public Works Construction* – current edition.

C. Observation Sequences

1. All observations shall be made by the Project Engineer or Engineer's designated representative. Contractor shall request inspection at least forty-eight (48) hours prior to time inspection is required.
2. Planting observation sequences are as follows:
  - a. At completion of finish grading, prior to irrigation system water audit, and coverage test;
  - b. Plant delivery approval, including but not limited to trees, shrubs, vines, turf (sod or hydroseed), groundcover, and mulch;
  - c. Plant pit locations, depths, and backfill mix, including turf areas, and construction items prior to planting;
  - d. Prior to installing sod or hydroseeding (as applicable);
  - e. Final irrigation system operational test following plant material installation, and before start of project maintenance period;
  - f. At end of maintenance period, prior to acceptance for City maintenance.
3. Contractor shall compile a written observation report for each visit by the Project Engineer, or Engineer's designated representatives. A copy of said report shall be submitted to the Project Engineer. In the event Contractor fails to notify the Project Engineer for the above listed observations and approvals when job certification is required by a local agency, the Contractor shall be solely responsible to prove the work is certifiable to the Project Engineer. Contractor shall be responsible for all costs resulting from said failure to notify.

D. Loose Equipment/Materials

Prior to final acceptance, the following equipment/materials shall be furnished by the Contractor, in the quantities specified:

1. Ten (10), ten foot (10') lodgepole tree stakes;
2. Forty (40), tree ties as specified;

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

3. Six (6), fifty pound (50 LB.) bags of post-plant fertilizer as specified;
4. One (1) box of planting tablets as specified.

E. Certifications

Prior to job acceptance, written certifications shall be submitted to the Project Engineer for the following, as required:

1. Quantity and quality of commercial fertilizer and organic fertilizer called for by project plans, and specifications;
2. Quantity and quality of all soil amendments called for by project plans, and specifications;
3. Quantity and quality of hydromulch components, including but not limited to seed tags, called for by project plans, and specifications.

III. **MATERIALS**

A. Plant Materials

Plant materials indicated on project plans, and herein specified shall conform to the following:

1. Nomenclature – Plant names indicated of project plans conform to “Standard Plant Names” established by the American Joint Committee on Horticulture. Except for names covered therein, the established custom of the nursery trade is followed;
2. Condition – Plants shall be symmetrical, typical for variety and species, sound, healthy, vigorous, free from plant diseases, insect pests, or their eggs, and shall have healthy, normal root systems, well filling their containers, but not to the point of being root bound. Circling or kinked roots are not permitted. Plants shall not be pruned prior to delivery, except as authorized by the Project Engineer. In no case shall trees be topped, or have primary scaffold branches removed or headed back before delivery;
3. Dimensions – The height and spread of all plant material shall be measured with branches in their normal position, and shall be as indicated on project plans. The caliper of all trees shall be measured twelve inches (12”) above the surface of the ground. Where caliper or other dimensions of any plant materials are omitted from project plans, it is understood that these plant materials shall be normal “American Nurserymen” stock for type listed;
4. Inspection – All plant materials must have been previously inspected at the nursery by a State or County Agriculture/Horticulture Department, and shall be subject to the inspection, and approval of the Project Engineer before planting;
5. Plant List – As indicated on drawings and legend, including spacing requirements;

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

6. Sizes Of Plants – Shall be as stated on the project plans. Container stock (one (1) gallon, five (5) gallon, and fifteen (15) gallon), shall have been grown in their respective containers for at least one (1) year, but not over two (2) years;
7. Substitution – Substitutions for the indicated plant materials shall be permitted provided that the substitute materials have been approved in writing by the Project Engineer, and that the substitutions are made at no additional cost to the City. Except for authorized variations, all substitute materials shall conform to the requirements of these specifications. If the accepted substitute materials are of a less value than those indicated or specified, the Contract price shall be adjusted in accordance with the provisions of the Contract;
8. Plants Not Approved – Plants not approved are to be removed from the site immediately, and replaced with City approved plants. The Project Engineer reserves the right to reject entire lots of plants represented by defective samples.

**B. Fertilizers And Soil Conditioners**

Samples of all soil amendments, sod, plants, and mulch material shall be submitted for inspection, and stored on site until the furnishing of materials is completed. Delivery may begin upon approval of samples by the Project Engineer.

1. Organic fertilizer shall have a minimum content of one percent (1%) Nitrogen, and two percent (2%) Phosphoric Acid. Method of processing shall not destroy normal bacterial content.
2. Nitrogen stabilized sawdust shall be bulk, with the following nitrogen content based on dry weight:
  - a. 0.5% for Redwood sawdust;
  - b. 0.7% for Fir Sawdust;
  - c. 1.0% for Bark or Pine Bark, or Mixture;
  - d. Salinity – The saturation extract conductivity shall not exceed 3.5-milimhos/cm at 25-degrees C.
3. Commercial fertilizer shall be delivered in sacks or containers with the manufacturers label showing weight, and analysis attached to each sack or container.

**C. Staking Materials**

1. Tree staking shall be as shown on project plans.
2. Tree ties, and/or tree guys shall be as shown on project plans.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**IV. PLANTING INSTRUCTIONS**

A. Grading And Soil Preparation

1. Contractor is to finish grade to within one inch (1") below the top of hardscape where turf will be installed, and three inches (3") below top of hardscape where shrubs, and ground cover will be planted. This grade difference allows for the placement of mulch materials in planter areas.
2. Moisture Content – The soils shall not be worked when the moisture content is so great that excessive compaction will occur, and not when it is so dry that dust will form in the air or that clods will not break readily. Water shall be applied if necessary to provide ideal moisture content for tilling or planting.
3. Preliminary Grading – Preliminary grading shall be done in such a manner as to anticipate the finish grading. Excess soils shall be removed or redistributed before application of fertilizer, and mulch. Where soil is to be replaced by plants and mulch, allowance shall be made so that when finish grading has begun, there shall be no deficiency in the specified depth of mulched planting beds.
4. Weeding – Before and during preliminary and finish grading, all weeds and grasses shall be dug out by the roots, and disposed of off site. Perennial weeds, and grasses to be removed include but are not limited to the following:
  - St. Augustine Grass
  - Bermuda Grass
  - Johnson Grass
  - Field Bindweed (Morning Glory)
  - Puncture Vine
  - Alfalfa
  - Wire Weed
  - Dallas Grass
  - Nut Grass
  - Mustard Plant

After planting of rooted groundcovers, a pre-emergent herbicide shall be applied according to manufacturer's recommendations.

5. All planting areas shall be scarified to a depth of six inches (6"), and rototilled in two directions with soil amendments, and conditioners as called for in the Agricultural Suitability Report.

B. Soil Conditioners

1. For bid purposes, unless otherwise instructed by a Soil Agricultural Suitability Report, or planting notes, in all planting areas the following application shall be made per 1,000-square feet of area, and shall be thoroughly cultivated in two directions into the top six inches (6") of soil, and the area watered down:
  - a. Five (5) cubic yards nitrolized wood shavings;
  - b. Twenty pounds (20 LBS.) 12-12-12 commercial fertilizer;
  - c. One hundred pounds (100 LBS.) Agricultural grade gypsum;
  - d. Ten pounds (10 LBS.) soil sulfur;
  - e. Twenty pounds (20 LBS.) iron sulfate.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. For bid purposes, unless otherwise instructed by a Soil Agricultural Suitability Report, or planting notes, prepare soil mix for backfill in pits for trees, shrubs, and vines (other than azaleas, ferns and palms) as follows:
  - a. Two-thirds (2/3) cubic yard screened site soil;
  - b. One-third (1/3) yard nitrolized wood shavings;
  - c. One pound (1 LB.) 12-12-12 commercial fertilizer;
  - d. One pound (1 LB.) soil sulfur;
  - e. Two pounds (2 LBS.) iron sulfate.

Planting pits shall be excavated one and one-half (1½ ) times the diameter of the rootball and the same depth as the rootball for trees and shrubs. Backfill shall then be added as outlined above. (Refer to City Standard No's. 532 and 534).

3. The prepared soil shall be uniformly blended in an area adjacent to the planting work, and shall be accurately proportioned using a suitable measuring container. Mix backfill in one central location – not at each plant site – unless otherwise approved. A site shall be pre-selected by the Contractor, and approved by the Project Engineer. Unused excavated soil shall be removed from the project site. Protect mix from water until it has been placed in backfill around plants.

C. Finish Grading

When preliminary grading, including weeding and fertilizing, has been completed and the soil has dried sufficiently to be readily worked, all turf and planting areas shall be graded to the elevations indicated on the project plans. Grades not otherwise indicated shall have uniform levels of slopes between points where elevations are given. Minor adjustments of finish grades shall be made under the direction of the Project Engineer, if required.

Finish grade shall be a smooth, even and uniform plane without abrupt change of surface. Soil areas adjacent to buildings shall be graded to allow for a natural run-off of water, and surface drainage shall be directed as indicated on the Project plans by regrading surfaces to facilitate the natural "run-off" of water. Low spots, and pockets shall be a minimum one inch (1") below grade of adjacent pavement of any kind. Grading shall be done when soil is at optimum moisture content for working.

D. Method Of Planting And Work Procedure

1. No planting shall commence until all operations in conjunction with the installation of the project irrigation system have been completed, final grades have been established, the planting areas have been properly graded and prepared as specified, and the work approved by the Project Engineer.
2. The relative position of all trees and plants is subject to approval by the Project Engineer, and will be relocated as necessary per Engineer's direction as part of Contractor's Scope of Work.



**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

3. All plants shall be removed from their container and set, so that when settled, they bear the same relation to the specified grade that they bore to the container soil surface prior to transplanting. Each plant shall be planted in the center of the pit, and backfilled unless otherwise specified, with the prepared soil. No soil in muddy condition shall be used for backfilling. No filling will be permitted around trunks or stems. All broken or frayed roots shall be properly pruned before backfilling of planting pit.
4. Project Engineer shall approve the placement of all plants prior to being planted out of their containers.
5. In the event that underground construction work or obstructions are encountered in the planting operation, alternate locations for plant materials will be approved by the Project Engineer, and planting completed at no extra cost to the City.
6. Plant identification tags, and ties shall only be removed after inspection.

**E. Planting Of Trees**

1. Position plants in plant locations indicated on drawings, and secure approval before excavating pits. Make necessary adjustments as directed by Project Engineer.
2. All pits for trees shall be dug square with bottoms level, the length of sides equal to one and one-half (1½) times the diameter of the rootball, and the same depth as the rootball. Compacted soils at sides, and bottoms shall be loosened by scarifying or other approved method. Pits shall be backfilled with a soil mix in accordance with these Planting Specifications, Section IV., B. (Refer to City Standard No. 532).
3. Fill the planting pit with backfill soil mix to bottom of rootball.
4. Set plants in center of pit, in a vertical position, so that crown of the rootball will be level with finish grade after allowing for watering, and settling. Plants shall bear the same relation to finish grade that they did to the soil surface in their individual containers.
5. When tree has been properly set, the pit shall be filled to the required grade with backfill soil mix, and thoroughly settled by tamping, and watering.
6. Prepare depressed water basin for each plant, as wide as plant rootball. Water in thoroughly, backfilling any voids with additional prepared soil mix.

**F. Planting Vines, Shrubs, And Groundcovers**

1. Position plants in plant locations indicated on drawings, and secure approval before excavating pits. Make necessary adjustments as directed by Project Engineer. (Refer to City Standard No. 534).

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. All pits for shrubs and vines shall be dug square with bottoms level, the length of sides equal to one and one-half (1½) times the diameter of the rootball, and the same depth as the rootball. Compacted soils at sides, and bottoms shall be loosened by scarifying or other approved method. Pits shall be backfilled with a soil mix in accordance with these Planting Specifications, Section IV., B. (Refer to City Standard No. 534).
3. Fill the planting pit with backfill soil mix to bottom of rootball.
4. Set plants in center of pit, in a vertical position, so that crown of the rootball will be level with finish grade after allowing for watering, and settling. Plants shall bear the same relation to finish grade that they did to the soil surface in their individual containers.
5. When plant has been properly set, the pit shall be filled to the required grade with backfill soil mix, and thoroughly settled by tamping, and watering.
6. Prepare depressed water basin for each plant, as wide as plant rootball. Water in thoroughly, backfilling any voids with additional prepared soil mix.
7. All non-adhering vines shall be removed from nursery stakes, untied, and securely fastened in a approved manner to the adjacent wall, fence, or other surface next to which they are planted. (Refer to City Standard No. 537).
8. Adhering-type vine stakes shall be removed at the end of the maintenance period. Vines shall be fastened to the wall in an approved manner in accordance with Project Engineer's instructions.

**G. Trees And Vines Occurring In Turf**

1. Trees and vines, located in turf areas, shall be planted before final preparation of these areas.
2. All trees shall be installed with bark protection devices at their crowns. (Refer to City Standard No. 532).
3. All vines shall be installed with crown protection devices in turf areas only.

**H. Care Of Plants Before And During Planting**

1. Plants shall not be allowed to dry out before or while being planted. Keep exposed roots moist by means of wet sawdust, peat moss, or burlap at all times during planting operations. Do not expose roots to the air except while being placed in the ground. Wilted plants in or out of containers, will not be accepted and shall be replaced at the Contractor's expense.
2. Existing plants, where indicated, shall be protected in place. Damaged, or destroyed plants shall be replaced in duplicate size by the Contractor within forty-eight (48) hours of notification by the Project Engineer.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

I. Sodded Turf

1. Cultivate all turf areas to a depth of eight inches (8"). Rocks and debris, larger than one inch (1") in diameter which are brought to the surface by cultivation, shall be removed from the site. If cultivation does not break lumps, a spike tooth harrow shall be pulled behind mechanical seeder or tractor.
2. Areas to be planted in sod shall be finished smooth to present a neat, and uniform grade prior to installation. The turf bed shall be inspected by the Project Engineer to determine suitability for planting prior to installing sod.
3. All sodded areas shall be thoroughly watered for one week prior to installation of sod. Sodded areas are to be maintained at a level of moisture that encourages quick rooting of turf by irrigating as often as required.
4. Any turf areas that do not show a prompt "catch" of grass shall be re-sodded at ten (10) day intervals until an acceptable stand of turfgrass is assured.

J. Hydro-Seeding/Hydro-Stolonizing

1. Slope Areas – Refer to planting plan and slope mix designs for types, and amount of seeds to be used. Alternate seed mixes may be used only upon approval of the Project Engineer.

The designed slurry mixes shall be applied by an approved hydromulch company. Designed slurry mixes will be either for irrigated or non-irrigated slope conditions (refer to plans and seed mix designs). Each container of slurry mix shall be applied within a two (2) hour time limit, or be rejected, and removed at Contractor's expense. Eighty percent (80%) germination of slope mix shall be required for City acceptance.

2. Turf Areas – The designed stolon and slurry mix shall be applied in designated areas by an approved hydromulch company within a two (2) hour time limit per container mix. (Refer to Planting Plan and Legend). Where applicable, a substitute seed mix may be used only upon approval of the Project Engineer.
3. Daily Work Sheets – Daily work sheets shall be signed by the nozzle men, and sent to the Project Engineer for payment approval. The following information shall be recorded:
  - a. Seed – types, amounts;
  - b. Fertilizer – analysis, amount;
  - c. Mulch – type, amount;
  - d. Seeding additive – type, amount;
  - e. Number of loads – amount of water;

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- f. Area covered – in acres;
- g. Equipment used – capacity and license number.

**K. Watering**

- 1. Immediately after planting, water shall be applied by hose in a moderate stream in the planting holes until the material about the roots is completely saturated from the bottom of the hole to the top of the ground.
- 2. Plants that cannot be watered efficiently with the existing irrigation system shall be watered by means of a hose.
- 3. Apply water in sufficient quantities, and as often as seasonal and soil conditions require, to keep the ground moist at all times, well below the root system of turf, and planting. Care is to be taken in watering slopes so as not to cause erosion damage.
- 4. Following the planting of groundcover plants, water immediately and thoroughly by means of the irrigation system, or a gentle stream from hose with spray nozzle attached.

**L. Watering Basins**

- 1. Construct a firmly compacted mound of soil around each tree and plant to form a watering basin at the edge of, and following the shape of, the planting pit area. Mounds for trees and for vines from five (5) gallon or larger containers, shall be at least four inches (4") high. Mounds for all other trees, vines, or plants not otherwise specified, shall be at least two inches (2") high. Excavated earth, if capable of retaining water, may be used. Any settlement within the basins retaining water shall be refilled to the required grade with prepared soil mix, and the surface re-mulched as required.
- 2. Remove basins in planter areas immediately prior to installation of shredded mulch, and in turf areas prior to sodding/seeding.

**M. Tree Staking**

- 1. Stake all non-guyed trees at time of planting by placing stake in the prepared hole, and driving it twelve inches (12") into solid ground. Plant the tree as close to the stake as possible. Do not crowd roots. Do not drive stake through rootball. Fasten the tree to the upper end of stake in at least two places using approved ties/braces. (Refer to City Standard No. 532).
- 2. Trees, thirty-six inch (36") box size or larger, shall be immediately guyed after planting with not less than three guys per tree. (Refer to City Standard No. 530).
- 3. Place stakes parallel with prevailing wind, and fasten tree with ties at the point where canopy will return to an upright position after it is deflected.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

N. Espaliering Of Vines

All trellises and stakes are to be removed from plants, and the plants shall be fastened, and trained against fences or walls unless otherwise approved by the Project Engineer. (Refer to City Standard No. 537).

O. Mulching

Contractor shall remove three inches (3") of native soil in designated planting areas. A three inch (3") thick layer of shredded wood fiber mulch shall then be placed after plants have been installed. Care shall be taken not to place mulch directly on tree, and shrub crowns. (Refer to City Standard No. 538).

Contractor shall submit sample of shredded wood fiber mulch for approval by Project Engineer prior to delivery at the project site.

P. Certificates

In addition to any other certificates specified, Contractor shall furnish a certificate with each delivery of bulk material, stating the source, quantity, and type of material, and that the material conforms to the specification requirements. For bulk delivered organic fertilizer, the certificate shall also state the volume, net weight, percent of Nitrogen, and percent of Phosphoric acid. For each fertilizer and soil conditioner, in containers, a similar certificate or invoice shall be furnished stating total quantities by weight, and volume for each material. These certificates shall be submitted to the Project Engineer prior to the start of the maintenance period.

Q. Protection

Contractor shall carefully and continuously protect all areas included in the Contract, including plant materials, fences, walls, supports, utilities, sidewalks, curbs, etc., until final acceptance of the work by the Project Engineer.

**V. MAINTENANCE**

A. Maintenance

1. Contractor shall maintain sufficient personnel, and adequate equipment to perform the work herein specified. Plant maintenance work shall consist of caring for plants (including groundcovers, shrubs, and trees), edging, aerating, and mowing of turf, fertilizing and control of weeds, pests, and diseases. Pesticide applications shall be done by a State of California licensed applicator.
2. Damage to any planted area shall be repaired immediately. Depressions caused by vehicles or foot traffic shall be filled with topsoil, leveled, and replanted. Rodent control shall be performed by a State of California licensed applicator.
3. The entire project shall be maintained for a period of one (1) year commencing from the time all items of work have been completed to the satisfaction of the Project Engineer.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

4. The project shall be maintained in a neat, and clean condition at all times to the satisfaction of the Project Engineer.

**B. Turf Maintenance**

Contractor shall continuously maintain turf areas until final project acceptance for City maintenance.

1. Watering – New lawn areas shall be watered daily for four (4) weeks, or until turfgrass is well rooted, whichever occurs first. Water thereafter in accordance with climatic conditions. Submit a proposed watering schedule to the Project Engineer for approval prior to commencing the maintenance period.
2. Fertilization – For bidding purposes, apply 16-6-8 fertilizer at the rate of three pounds (3 LBS.) per 1,000-square feet three (3) weeks after installation, and water immediately thereafter. In addition, every three (3) months thereafter, apply five pounds (5 LBS.) each of 21-0-0, and 12-12-12 fertilizer per 1,000-square feet.
3. Diseases And Pest Control – Control measures shall be performed according to the recommendation of a State of California licensed Agricultural Pest Control Advisor. Copies of Advisor’s recommendation shall be forwarded to the Project Engineer.
4. Mowing – Cool season grasses shall be mowed to a height of two and one-half inches (2½ “), and warm season grasses shall be mowed to a height of one and one-half inches (1½ “). Catch grass clippings during mowing operations, and remove from site.
5. Edging – Turf shall be edged after each mowing. Blade edgers shall be used next to sidewalks, mow strips, etc., and string trimmers may be used to trim around tree basins, valve boxes, utility vaults, etc.

**C. Groundcover And Shrub Area Maintenance**

1. Watering – New plantings shall be watered daily for two (2) weeks after installation. Water thereafter in accordance with climatic conditions. Submit a proposed watering schedule to the Project Engineer for approval prior to commencing the maintenance period.
2. Fertilization – For bidding purposes, fertilize every three (3) weeks after planting with five pounds (5 LBS.) 12-12-12 fertilizer per 1,000-square feet, and fertilize thereafter every thirty (30) days.
3. Disease And Pest Control
  - a. All pesticide applications shall be performed by personnel licensed by the State of California as a Qualified Applicator.
  - b. Rodent control shall be performed by personnel licensed by the State of California as a Qualified Applicator. Exterminate gophers, moles, voles, ground squirrels, meadow mice, etc., and repair damage.

**LANDSCAPE SPECIFICATIONS-PLANTING - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

4. Pruning – All shrubs and trees shall be pinched pruned as necessary to encourage new growth, and to eliminate rank sucker growth. Old flowers, dead foliage, and limbs shall be removed. No major tree pruning shall be done without the approval of the Project Engineer. Contact Project Engineer forty-eight (48) hours in advance of any pruning.
5. Weeding – All planting areas, including turf areas, shall be kept weed-free at all times. Weeds shall be dug out by the roots, and disposed of off-site in a legal manner.
6. Upon completion of the called-for maintenance period, the Contractor shall fertilize in accordance with these Planting Specifications, Section V., B., 2., and C., 2.

D. Guarantee And Replacements

1. All shrubs and groundcover shall be guaranteed by the Contractor as to growth and health for a period of one hundred and eighty (180) days after completion of the specified maintenance period, and final acceptance for City maintenance by the Project Engineer. All trees up to fifteen (15) gallons in size shall be guaranteed by the Contractor to live and grow in an acceptable upright position for a period of one (1) year after completion of the specified maintenance period, and final acceptance for City maintenance by the Project Engineer. Trees in twenty-four inch (24”) boxes or larger, and all field grown specimens shall be guaranteed by the Contractor to live and grow in an acceptable upright manner for a period of one (1) year after completion of the specified maintenance period, and final acceptance for City maintenance by the Project Engineer.
2. All plants that show signs of failing growth at any time during the life of the Contract, including the maintenance period, or those plants injured or damaged as to render them unsuitable for the purposes intended, shall be immediately replaced in kind and size, at the expense of the Contractor.
3. Contractor shall, within five (5) days’ notice by the Project Engineer, remove, and replace all guaranteed plant materials that for any reason fail to meet the requirements of the guarantee. Replacement shall be made with plant materials as indicated or specified for the original planting, and all such replacement materials shall be guaranteed as specified for the original guaranteed materials.

E. Clean Up

Upon completion of the work in this section, the Contractor shall remove all rubbish, trash, and debris resulting from contractor’s operations. Contractor shall remove all equipment and implements for his service, and leave entire project area in a neat and clean condition, as approved by the Project Engineer prior to acceptance of the work for City maintenance.

**LANDSCAPE SPECIFICATIONS - MEDIAN HARDSCAPE**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

**I. SCOPE**

Furnish all labor, equipment and materials necessary to construct the hardscape improvements depicted on project plans, and described in these specifications. The work shall be performed in a good and workmanlike manner, under continuous supervision of a competent foreman, capable of interpreting project plans, and specifications.

**II. GENERAL CONDITIONS**

A. Approvals

1. All work described under this section shall be inspected, and approved by the Project Engineer, or Project Engineer's designated representative, prior to commencing work on project median improvements, including but not limited to, irrigation, and planting.
2. Contractor shall protect in place all median improvements, including but not limited to, curb and gutter, traffic signs, utility vaults, irrigation mainlines and valve wires, trees, shrubs, groundcovers, and turf. Any median improvements damaged by Contractor's work shall be repaired or replaced as directed by Project Engineer, at Contractor's sole expense.

B. Plans And Specifications

1. Plot dimensions are approximate. Contractor shall carefully check and verify all dimensions and quantities, and shall report to the Project Engineer any variations and/or discrepancies between project plans and specifications, and actual site conditions. No work shall commence in any area where discrepancies have been noted until Project Engineer has given approval.
2. All work performed under this section of the project specifications shall conform to applicable specifications of the following standards in precedence indicated:
  - a. Project Specifications;
  - b. Project Plans;
  - c. *Standard Specifications For Public Works Construction*, current edition.

C. Observation

1. All observations shall be made by the Project Engineer or Engineer's designated representative.
2. Observation sequences are as follows:
  - a. Subgrade preparation and compaction for brick pavers, and/or concrete maintenance bands;
  - b. Form installation for concrete maintenance bands;



**LANDSCAPE SPECIFICATIONS-MEDIAN HARDSCAPE - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- c. Concrete pouring, and finishing for maintenance bands;
  - d. Installation of brick pavers, if applicable.
3. Observation reports shall be made for each visit by the Project Engineer, or Engineer's designated representatives. A copy of said reports shall be submitted to the Project Engineer. In the event Contractor fails to notify the Project Engineer for the above listed observations and approvals when job certification is required by a local agency, the Contractor shall be solely responsible to prove the work is certifiable to the Project Engineer. Contractor shall be responsible for all costs resulting from said failure to notify.

D. Warranty

Contractor shall guarantee all materials, and workmanship against defects for one (1) year following date of acceptance of the work by the City.

**III. MATERIALS**

A. Interlocking Pavers (if applicable)

Pavers shall be as shown on project plans.

B. Concrete Maintenance Bands

Concrete maintenance bands shall be Class 560-C-3250 Portland Cement Concrete.

**IV. INSTALLATION**

A. Pavers (if applicable)

Pavers shall be installed in median areas designated on project plans. Method of installation shall be per manufacturer's recommendation.

B. Maintenance Bands

Maintenance bands shall be installed as shown on project plans. Method of installation shall be as follows:

1. Subgrade

- a. Subgrade shall be compacted to a minimum relative compaction of ninety percent (90%). Any backfill material used to achieve acceptable subgrade shall be placed in uniform layers, and shall be brought up uniformly. The thickness of each backfill layer shall not exceed sixty-seven hundredths of a foot (0.67') before compaction. Backfill material shall be uniform, and free of pockets of course or fine material.
- b. Subgrade compaction shall be achieved through the use of mechanical compactors. Compaction by ponding or jetting shall not be allowed unless approved by the Project Engineer.

**LANDSCAPE SPECIFICATIONS-MEDIAN HARDSCAPE - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

2. Forms And Form Work

- a. Forms shall be used to confine the concrete, and shape it to the required dimensions. The design and engineering of the form work as well as its construction, shall be the responsibility of the contractor, and shall conform to the recommended practice for concrete form work.
- b. Forms shall be constructed accurately to dimensions, and shall be plumb, and level. Forms shall be substantial, mortar tight, and braced and tied so as to maintain position, and shape during concrete placement. Wavy or bulged slab surfaces resulting from settlement or springing of form work shall be acceptable. Forms shall be constructed in such a manner that: forms be thoroughly cleaned out before concrete is placed, and forms may be removed without damage to concrete.
- c. Forms shall remain in place long enough to allow concrete to set properly, and the contractor shall assume all responsibility for removing same. In no case shall supporting forms or shoring be removed until concrete has sufficient strength to carry its own weight, and the load upon it safely.

3. Concrete

- a. Contractor shall furnish Project Engineer with a copy of the mix design to be used. Concrete delivered to (or mixed at) the work site having a water content and/or slump greater than that specified in the mix design, shall be rejected, and removed from the work site.
- b. Total elapsed time between addition of water at the batch plant (or at the work site), and the completion of the discharge of the concrete from the mixer shall not exceed ninety (90) minutes. All concrete remaining in the mixer after said ninety (90) minutes shall be rejected, and removed from the work site.
- c. No concrete shall be ordered and/or placed until the forms and subgrade have been inspected, and approved by the Project Engineer.
- d. Band surface shall receive a medium broom finish. All band edges shall be radiused.
- e. The finished band surface shall be free from humps, sags, blemishes, or other irregularities. All bands shall be a minimum four inches (4") thick.
- f. Concrete curing compound shall be translucent with red fugitive dye, type-1.
- g. Contractor shall barricade and protect placed concrete from all damage, marks, mars, and/or graffiti. Any damaged, defaced, discolored, or defective concrete shall be replaced at contractor's sole expense.
- h. In order to minimize vandalism damage to the finished concrete surface, contractor shall plan to stop pouring after 1:00 p.m. unless otherwise authorized by the Project Engineer.

**LANDSCAPE SPECIFICATIONS-MEDIAN HARDSCAPE - cont.**  
**PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES**

- i. No advertising, impression, stamp, or mark of any kind shall be permitted on surface of concrete or cement finish.
- j. All defects in concrete work shall be corrected as directed by the Project Engineer, and shall be done at contractor's sole expense. Concrete surfaces so repaired shall duplicate the appearance of the unpatched work.
- k. Damaged or defective concrete that cannot be repaired to the satisfaction of the inspector shall be replaced by contractor at contractor's sole expense.

4. Clean Up

- a. All soil, debris, tree roots, concrete forms, etc., to be removed from the work site concurrent with removal, and replacement work.
- b. Work site to be left in "broom clean" condition at the end of each workday. Final inspection, and approval of work for payment will include evaluation of work site cleanliness.
- c. Contractor shall be responsible for securing the work site at the end of each workday, by means of such barricades, warning tapes, delineators, etc. As may be necessary to insure that pedestrian traffic is not impeded, or the work left open, and accessible.
- d. Stockpiling of materials or storage of equipment on the work site shall not be allowed.

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APPENDIX A - Plan Set Title Sheet

## PREFACE

In addition to the *Public Works Department-Landscape Design Guidelines* set forth herein (i.e., Plan Submittal Procedures, Landscape Plan Preparation, Design Guidelines, and Landscape Specifications), designers and constructors of public landscaping within the City of Moreno Valley shall adhere to those Sections of Chapter 9.17 of Title 9 of the City's Municipal Code applicable to the scope of their particular projects.