

CITY OF MORENO VALLEY



PUBLIC WORKS DEPARTMENT
LANDSCAPE DESIGN GUIDELINES

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APPENDIX - 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.

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.

SUBMITTAL PROCEDURES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

- 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:

LANDSCAPE PLAN PREPARATION - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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;

LANDSCAPE PLAN PREPARATION - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

- (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);

LANDSCAPE PLAN PREPARATION - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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;

LANDSCAPE PLAN PREPARATION - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

- 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.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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 ¹	1"	1¾"	2½"	4"
Canopy Diameter	3'	4'	5'	7'

¹Trunk 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

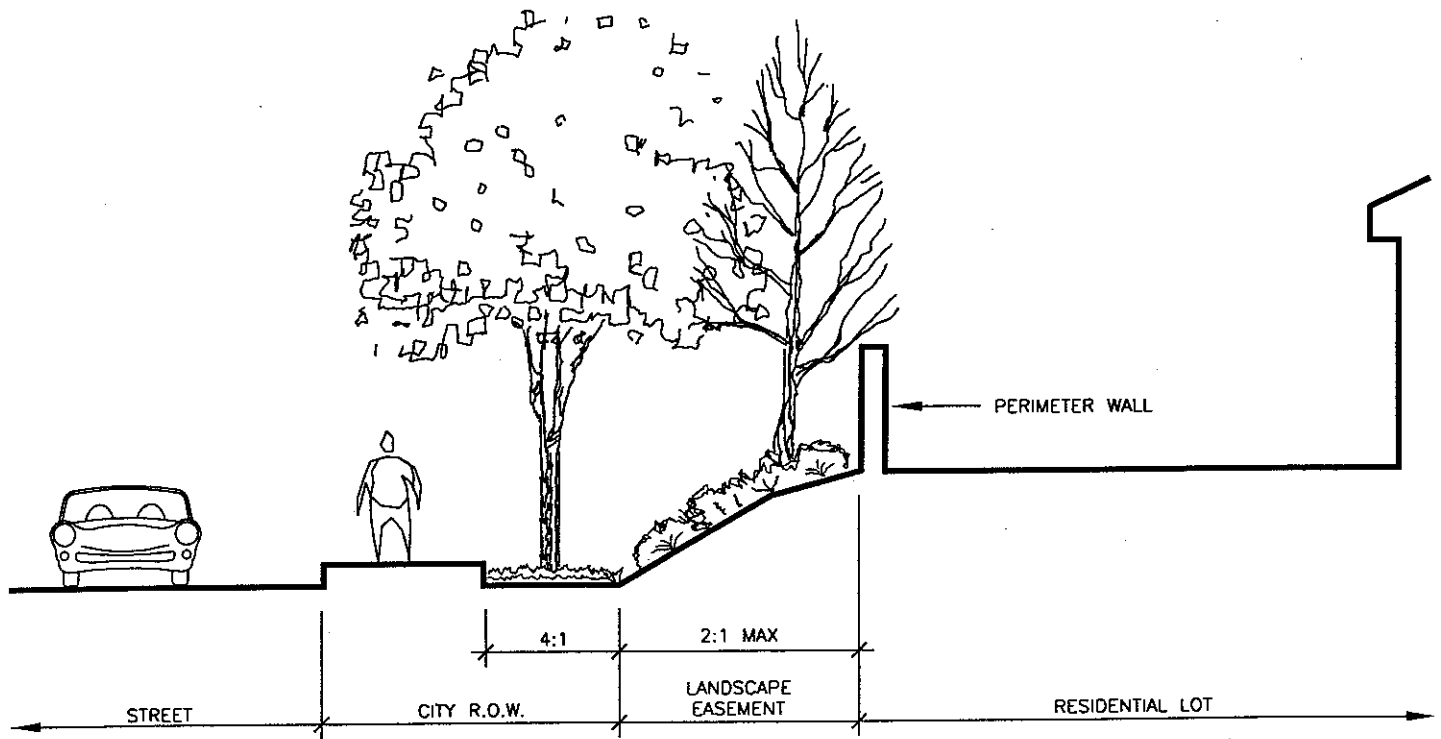
1. Turf areas should be limited to twenty-five percent (25%) to thirty percent (30%) of the total landscaped area, planting the remaining area with shrubs, groundcover, and/or hardscape;
2. Turf areas shall be a minimum of six feet (6') wide, subject to site specific approval;
3. Separate tree irrigation (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).

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



SLOPE PLANTING

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.

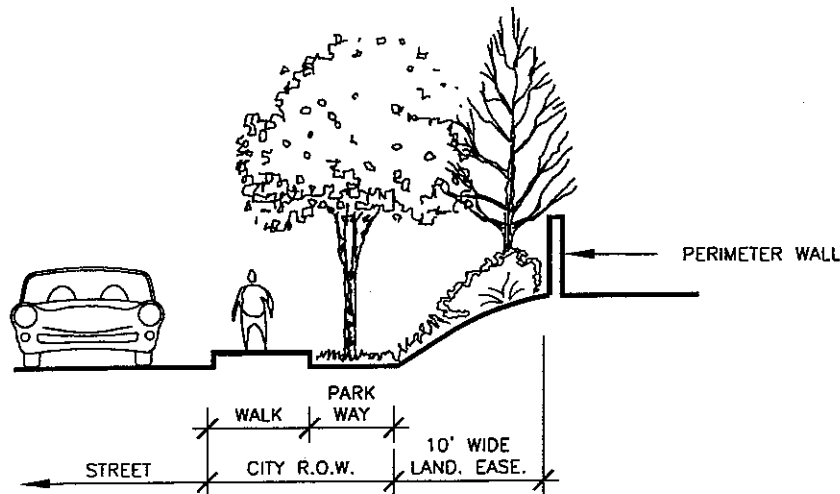
D. Maintenance

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.

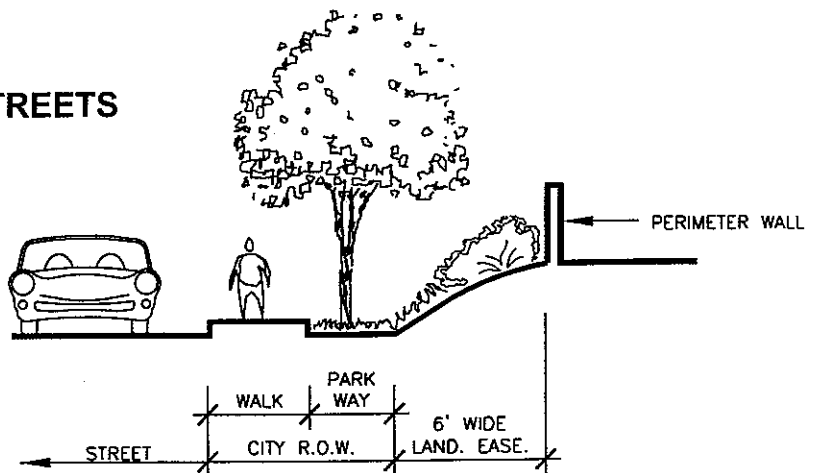
E. Standard Landscape Easements (Refer to Page 12 for Examples)

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.

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



MAJOR ARTERIAL / ARTERIAL STREETS



MINOR ARTERIAL STREETS

LANDSCAPE EASEMENTS

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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.

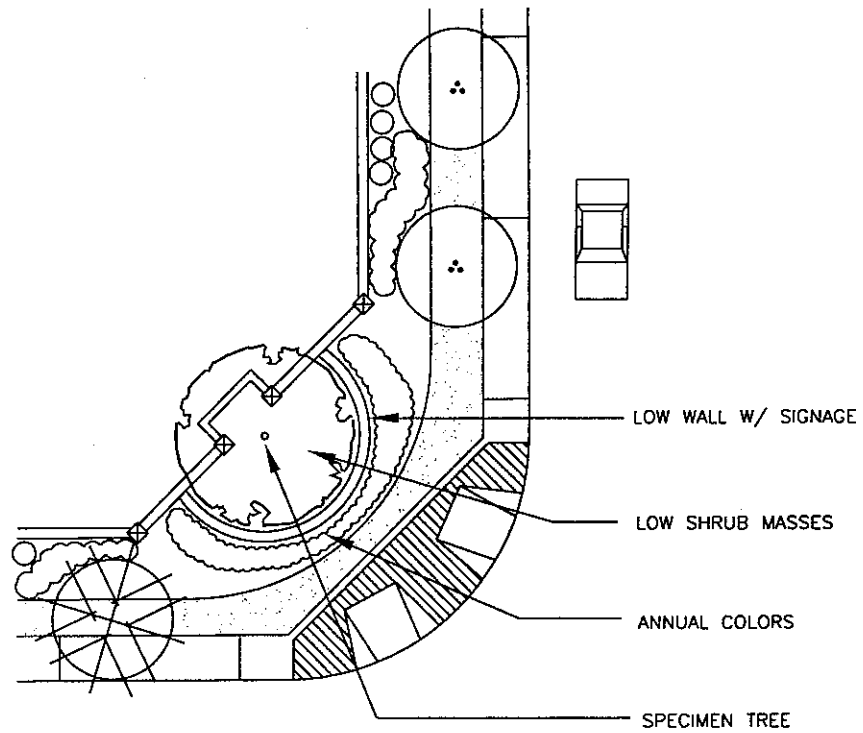
B. Safety

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.

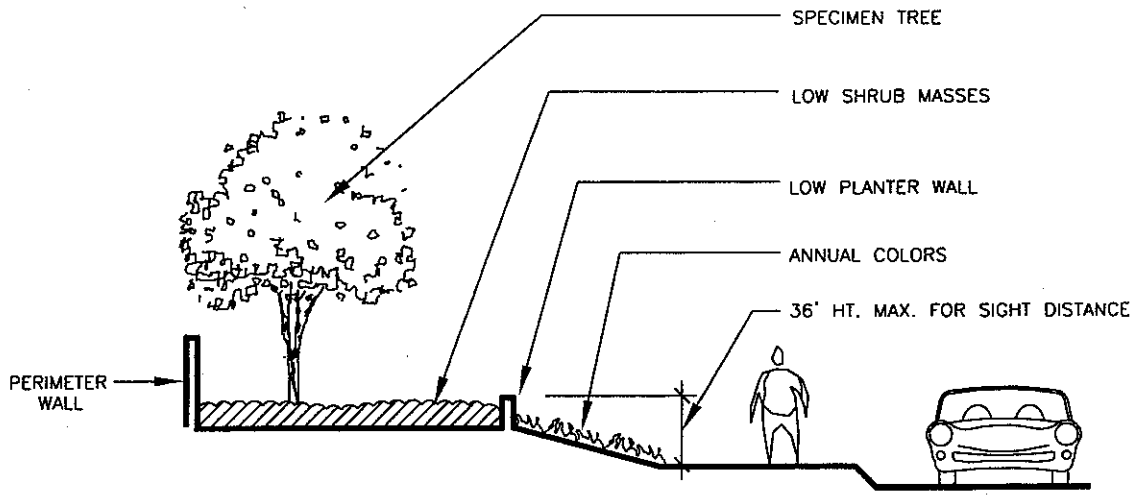
C. Materials

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.

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



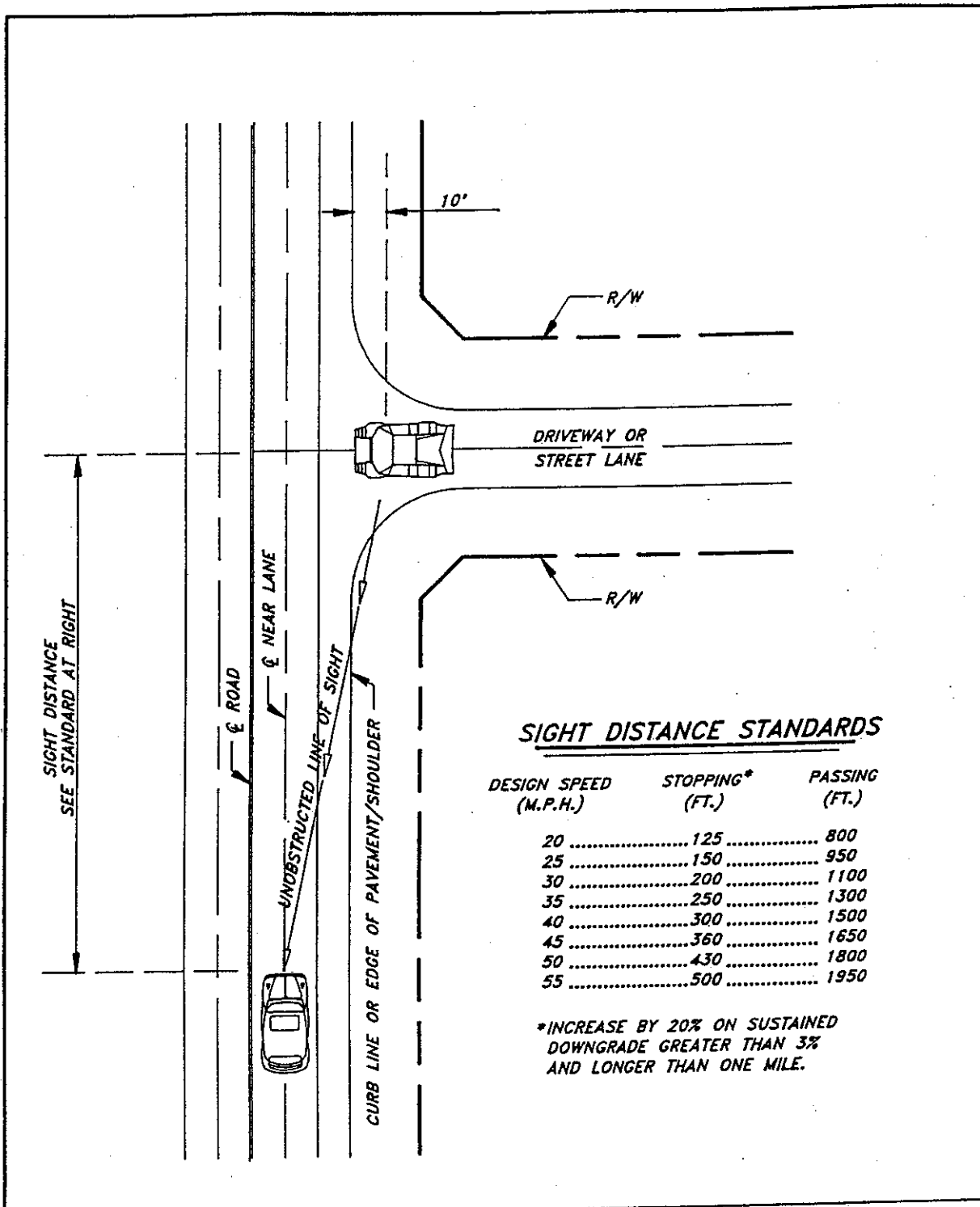
PLAN VIEW



SECTION

INTERSECTION PARKWAYS

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



SIGHT DISTANCE STANDARDS

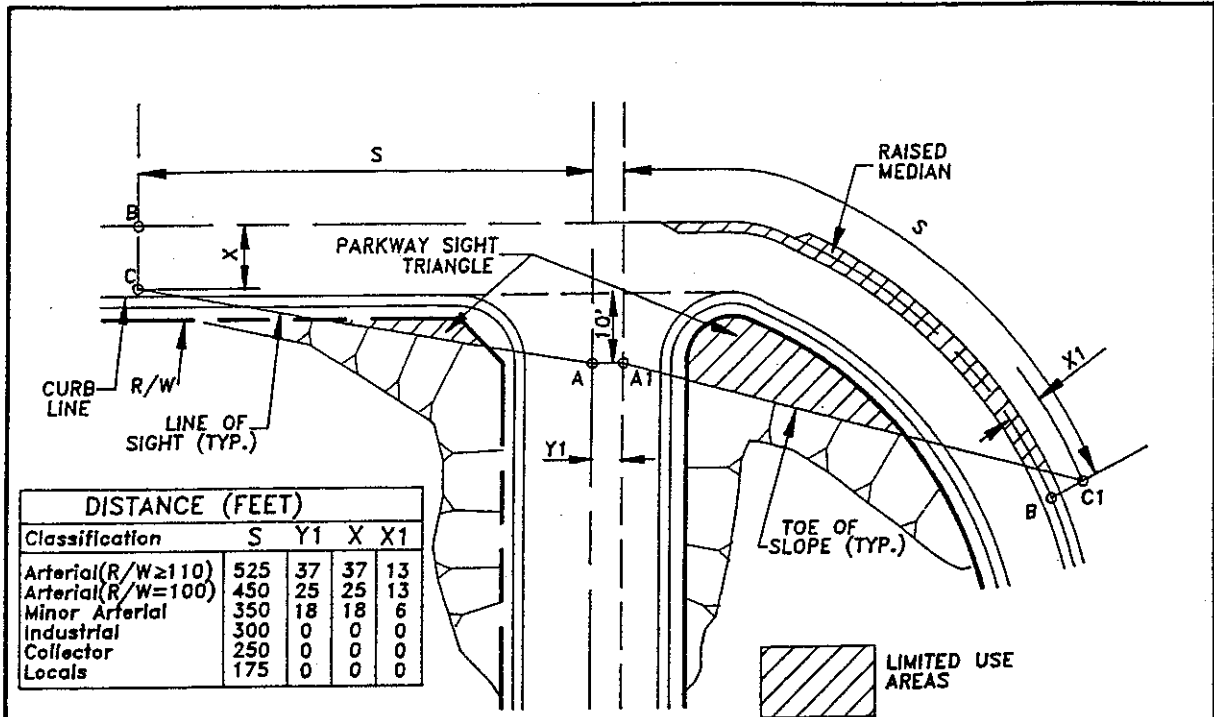
DESIGN SPEED (M.P.H.)	STOPPING* (FT.)	PASSING (FT.)
20	125	800
25	150	950
30	200	1100
35	250	1300
40	300	1500
45	360	1650
50	430	1800
55	500	1950

*INCREASE BY 20% ON SUSTAINED
DOWNGRADE GREATER THAN 3%
AND LONGER THAN ONE MILE.

REVISION		DRAWN CAPITAL PROJECTS DATE 04/94
DATE	APPROVED	
		APPROVED BY
		<i>Barry D. McCalla</i>
		DIRECTOR OF PUBLIC WORKS

CITY OF MORENO VALLEY	
SIGHT DISTANCE REQUIREMENT	NO. 125

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



1. The limited use area is determined by the graphical method using the appropriate distances given in the above table. It shall be used for the purpose of prohibiting or clearing obstructions in order to maintain adequate sight distance at intersections.
2. The line of sight shall be shown at intersections on all landscaping plans, grading plans, and tentative tract plans where safe sight distance is questionable. In cases where an intersection is located on a vertical curve, a profile of the sight line may be required.
3. Walls or any obstructions that could restrict the view within the limited use area shall not be permitted.
4. The toe of the slope shall not encroach into the limited use area.
5. The limited use area shall be as near level as possible yet maintain proper drainage.
6. Plants and shrubs shall be of the type that will grow no higher than 30 inches above the ground within the limited use area.
7. No trees shall be allowed within the Parkway Sight Triangle.
8. Points A and A1 are the locations of a driver's line of sight while in a vehicle at an intersection 10 feet back from the projection of the curb line. The distance Y1 is the distance measured from the centerline of the road to the far right through traffic lane. The distance Y1 is equal to zero for T-intersections.
9. The distance S represents the safe stopping distance measured along the centerline of the road.
10. Points C and C1 are the locations (centerline of the travel lanes) where the driver of a vehicle, traveling at a given speed, has the minimum stopping sight distance required to bring the vehicle to a safe stop.

REVISION		DRAWN CAPITAL PROJECTS DATE 04/94	CITY OF MORENO VALLEY	
DATE	APPROVED			
		APPROVED BY	SIGHT DISTANCE DETAIL	
		<i>Barry D. McChella</i>		
		DIRECTOR OF PUBLIC WORKS		

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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.

DESIGN GUIDELINES - cont.

PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

- 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.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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.

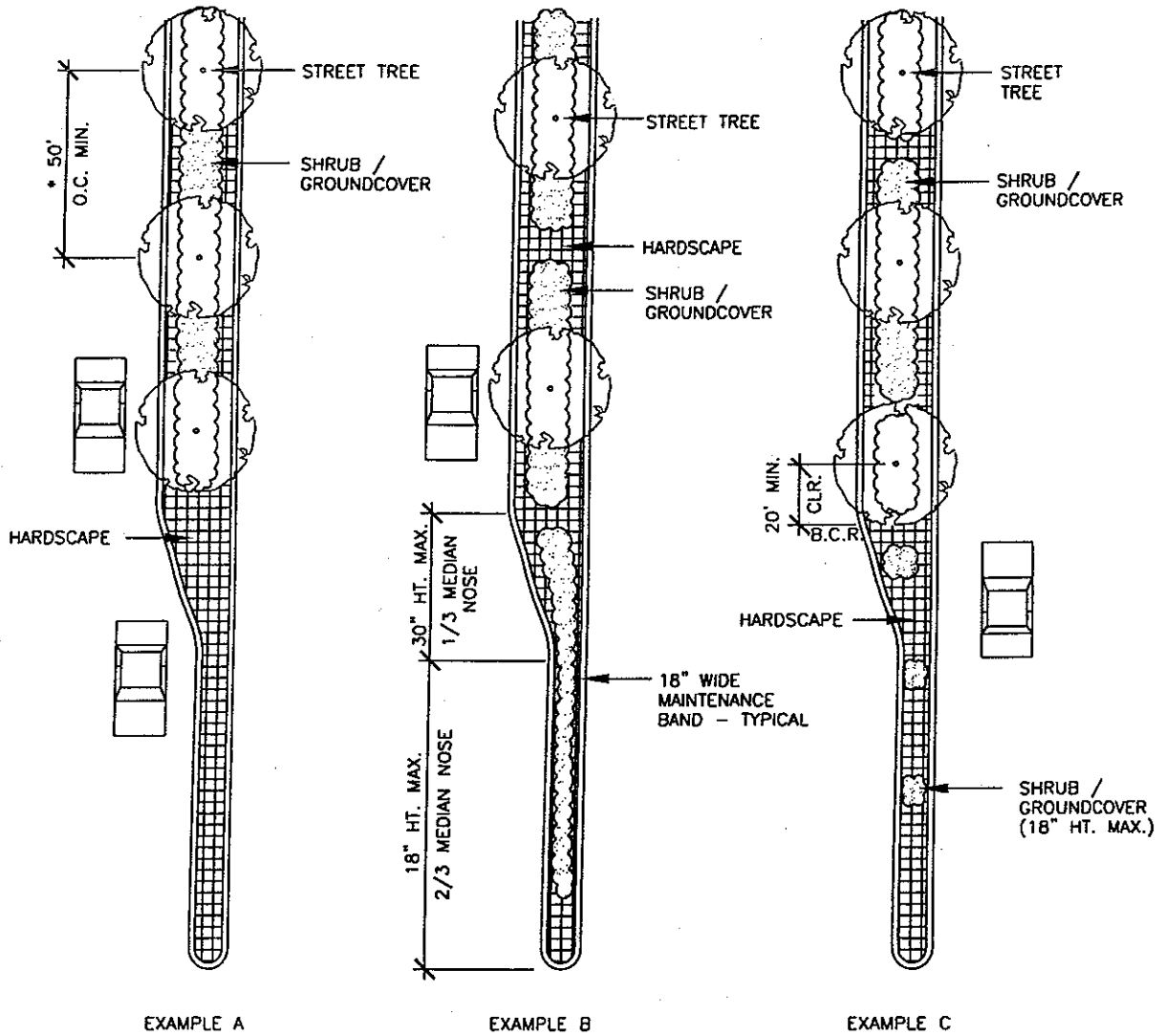
F. Trees

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.

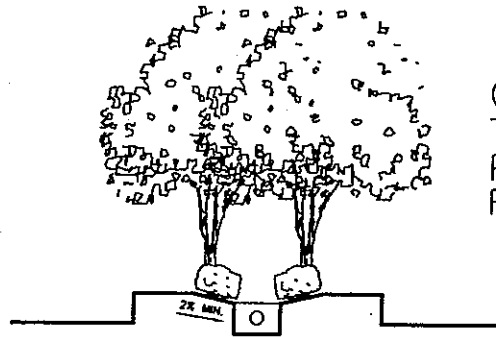
DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



* TREES WITH 4' MATURE CALIPER OR LESS ARE NOT RESTRICTED TO MINIMUM SPACING STANDARD

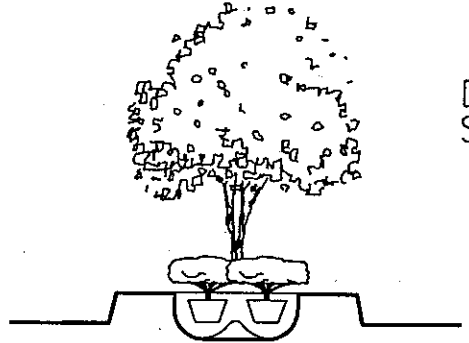
STREET TREE / MEDIAN DESIGN

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES



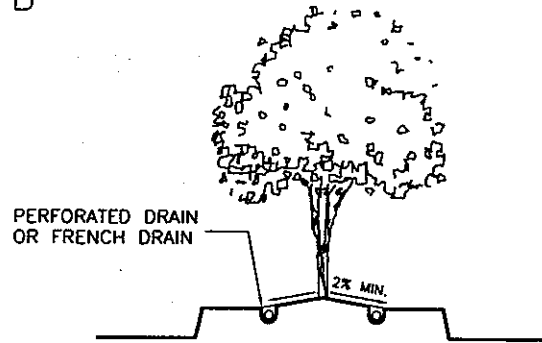
COLLECT WATER RUNOFF AT THE CENTER OF MEDIAN WITH PERFORATED DRAIN OR FRENCH DRAIN

EXAMPLE A



DRIP OR BUBBLER IRRIGATION SYSTEM

EXAMPLE B



FRENCH DRAIN SYSTEM
(4:1 SLOPE MAX.)

EXAMPLE C

WATER CONSERVATION EXAMPLES

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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.

DESIGN GUIDELINES - cont.
PUBLIC WORKS LANDSCAPE DESIGN GUIDELINES

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 ("pigtails") 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 10³/₄"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"x21¹/₂"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"x21¹/₂"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"x½" 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.