



## **PART SEVEN: STANDARD DETAILS**



## **PART EIGHT: IRRIGATION DESIGN & EQUIPMENT**

### **A: IRRIGATION DESIGN**

Irrigation design within the City of San Jacinto public areas, such as parks, open spaces, trails, and LMD/CFD areas, shall incorporate water-wise irrigation principles. Irrigation head spacing shall be designed to provide 120% coverage and shall not be placed farther than 85% of the maximum design radius for the specified nozzle.

Systems for public parks, LMD/CFD areas, trails or open space areas, and commercial projects within the City shall be designed to allow complete summer peak water requirements to be applied between the hours of 10 pm and 6 am. Daytime watering shall be limited to seed germination, plant establishment, and turf renovation.

The use of low volume bubbler irrigation systems is encouraged for LMD/CFD shrub and groundcover plantings. All low volume irrigation shall be installed using schedule 40 PVC and swing joints.

All street landscape within the City right-of-way, LMD/CFD, parks, open space areas, and all other public landscape irrigation systems shall be installed with Cal-sense controllers. The Cal-sense controller installation shall include the controller assembly, flow sensor, ET gauge, and tipping rain-bucket. Controller installations shall be certified by Cal-sense.

Commercial developments are encouraged to install and utilize irrigation controllers that use ET data that is updated from on-site sensors or download ET data collected from local weather stations. Only one controller shall be installed per point of connection. Irrigation water meters shall not be cross-connected by the irrigation mainline.

Where recycled water for irrigation is available or planned to be available, irrigation systems that comply with recycled water irrigation requirements shall be installed. Irrigation equipment specified shall comply with reclaimed water requirements.

When irrigation plans are submitted for review by the City Landscape Architect, a projected water use estimate shall be included. For each point of connection, a worst-case pressure loss calculation shall be prepared. For all public works and commercial or industrial projects, a water time estimate must be completed and submitted.

The water budget estimate shall be part of the project water/irrigation calculations package. The water/irrigation calculation package shall include the following:

- A water use estimate for each point of connection.
- A worst-case pressure calculation for one peak demand valve per point of

connection.

- A watering window calculation for each controller for July and August.

The water/irrigation calculations packet may be prepared at an 8 ½" x 11" format. It must include a title sheet that provides the following information:

- Project Name
- Tract Number / APN Number
- Owner / Builder
- Owner's / Builder's Contact Name and Phone Number
- Document Preparer's Name and Phone Number
- The date on which the documents were prepared

Each sheet must list within the header or footer or a combination of both the following:

- The project name
- Tract number and phase
- Owner's / Builder's Name
- Preparer's Name
- The date on which the documents were prepared

## **B: WATER USE ESTIMATE PREPATION:**

The City has adopted the water use estimate method utilized by EMWD. A water use estimate shall be prepared for each water meter. Construction drawings for all parks, open space areas, and CFD / LMD areas must be accompanied with water use estimates. Water use calculations may be submitted in an 8 ½" x 11" format. The following is a guide to the preparation of a project water use estimate:

### **B-1 ESTIMATED ANNUAL WATER USE**

This is provided to assist architects and designers in estimating the water needs of plant materials listed in the WUCOLS plant guide.

The estimated annual water use for the entire landscaped area per individual irrigation meter can be determined by following these steps:

STEP 1 Calculate the estimated annual water use (EAWU) for each hydrozone in the landscaped area (per the formula in this exhibit).

STEP 2 Add the EAWU of all hydrozones in the landscaped area.

STEP 3 Round off the sum of EAWU for all hydrozones to the nearest whole number as follows: if > .50, round UP; if < .49, round DOWN.

The estimated annual water use of a hydrozone can be calculated using the following formula:

$$\text{EAWU} = \frac{(56.65) (ks) (HA)}{(DE)(AE)(1200)}$$

EAWU = Estimated Annual Water Use in billing units per year (one billing unit = 100 cubic feet = 748 gallons)

56.65 = Reference evapotranspiration in inches of water per year

ks= Species Factors (for a specific plant from the WUCOLS plant guide)

HA = Hydrozone Area in square feet

DE= Distribution Efficiency of the irrigation system expressed as a decimal (found later in this exhibit)

AE= Application Efficiency of the irrigation system expressed as a decimal (found later in this exhibit)

1200 = Conversion factor to produce an answer in billing units (to convert the answer to gallons, multiply the formula by 748)

Typical irrigation system "DISTRIBUTION EFFICIENCY" or "DE" for the various types of irrigation heads or emitters are expressed in the following decimals:

- ▶ 0.60 for spray heads
- ▶ 0.85 for gear-driven, impact, or all-driven rotors
- ▶ 0.85 for bubbler heads
- ▶ 0.90 for drip irrigation systems

Irrigation system "APPLICATION EFFICIENCY" or "AE" is expressed as a decimal for the following systems:

- ▶ 0.85 for irrigation systems that have a centralized control system or controllers that measure or can be programmed to use evapotranspiration rates, or systems that use other controls such as moisture sensors.
- ▶ 0.65 for irrigation systems which do not have any of the above soil or weather-driven type of controls.

## B-2 EXAMPLE OF CALCULATING WATER USE

For a small, individually metered landscape project with two hydrozones and a total landscaped area of 8,000 square feet:

$$\begin{array}{l} \text{EAWU for} \\ \text{hydrozone no. 1} \end{array} = \frac{(56.65)(0.5)(3,000)}{(0.9)(0.85)(1,200)} = 92.56 \text{ billing units}$$

$$\begin{array}{l} \text{EAWU for} \\ \text{hydrozone no. 2} \end{array} = \frac{156.65(0.5)(5,000)}{(0.7)(0.85)(1,200)} = 198.35 \text{ billing units}$$

$$\text{SUBTOTAL} = 92.56 + 198.35 \text{ billing units}$$

$$= 290.91 \text{ billing units (round off to nearest whole number per previous instructions)}$$

$$\text{TOTAL EAWU FOR THIS PROJECT} = 291 \text{ billing units per year}$$

**NOTE:** The EAWU for the total established landscaped area per individual irrigation meter **SHOULD NOT EXCEED** the annual maximum allowable water budget of that landscaped area.

### B-3 ANNUAL MAXIMUM ALLOWABLE WATER BUDGET

The annual maximum allowable water budget for the total landscaped area per individual irrigation meter can be determined by following these steps:

STEP 1 Calculate the annual maximum allowable water budget (AMAWB) (per the formula in this exhibit).

STEP 2 Round off the AMAWB to the nearest whole number as follows: if > or equal to 0.50, round UP; if < 0.49, round DOWN.

The annual maximum allowable water budget for the total landscaped area per individual irrigation meter should be calculated using the following formula:

$$\text{AMAWB} = \frac{(56.65)(1.0)(\text{TLA})}{1200}$$

$$\text{AMAWB} = \text{Annual Maximum Allowable Water Budget in billing units per year (one billing unit = 100 cubic feet = 748 gallons).}$$

56.65 = reference evapotranspiration in inches of water per year

1.0 = allowable percentage

TLA = Total Landscaped Area per meter in square feet.

1200 = Conversion factor to produce an answer in billing units (to convert the answer to gallons, multiply the formula by 748).

#### CALCULATION EXAMPLE:

An individually-metered landscape project with a total landscaped area of 40,000 Square feet:

$$\text{AMAWB} = \frac{(56.65)(1.0)(40,000)}{1200}$$

$$= 1888.33$$

$$= \mathbf{1,888} \text{ Billing Units per Year}$$

(rounded off to the nearest whole number per previous instructions)

## B-4 MONTHLY TARGET WATER BUDGET

The schedule of monthly target water budgets for the total landscaped area per individual irrigation meter is determined by following these steps:

STEP 1 Calculate the monthly target water budget (Target) for each month of the year (per the formula in this exhibit).

STEP 2 Round off each Target to the nearest whole number as follows: if > or equal to 0.50, round UP; if < 0.49, round DOWN.

Each monthly target water budget for the total landscaped area per individual irrigation meter is calculated using the following formula:

$$\text{TARGET} = \frac{\text{AMAWB}}{\text{MAF}}$$

Monthly Target Water Budget in billing units per the month chosen is to be calculated. Annual Maximum Allowable Water Budget in billing units per year (rounded off to the nearest whole number and calculated per instructions in EXHIBIT C).

Monthly Adjustment Factor for the month chosen to be calculated and taken from the following table:

January	0.037	July	0.140
February	0.051	August	0.134
March	0.071	September	0.108
April	0.073	October	0.073
May	0.108	November	0.046
June	0.125	December	0.034

### CALCULATION EXAMPLE;

For the TARGET for the month of August for an individually-metered landscape project with a total landscaped area of 40,000 square feet and an AMAWB of 1,888 billing units per year:

$$\begin{aligned} \text{TARGET} &= (1888)(0.134) \\ &= 252.992 \\ &= \mathbf{253} \text{ Billing units for the month of August} \\ &\quad \text{(rounded off to the nearest whole number per previous instructions)} \end{aligned}$$

## B-5 "SPECIES FACTORS AND PLANT WATER NEEDS"

This list is provided to assist architects and designers in estimating the water needs of many (but not all) plant materials.

The water needs of the plants (listed in the WUCOLS guide) appear in the form of a "Species Factor"

For the purpose of this guide, the WUCOLS plant list is organized into one of four categories, each representing a range of Species Factors (ks) as follows:

VERY LOW	ks Factor (VL): ks less than 0.1
LOW	ks Factor (L): ks range = 0.1 - 0.3
MODERATE	ks Factor (M): ks range = 0.4 - 0.6
HIGH	ks Factor (H): ks range = 0.7 - 0.9

A suggestion for using these (ks) values is to use the lower portion of the range if a plant is located in shaded or Northerly exposures, and to use the higher (ks) portion of the range if the plant is located in direct sun or Southerly exposures.

NOTE: The (ks) values provided in this exhibit reflect good estimates of the water needs of many plant materials, (ks) have not been scientifically determined for all landscape plants. Although extensive, the WUCOLS plant guide is by no means complete. Horticultural reference books and horticulturists can provide useful information in estimating the water needs of plants not found in the WUCOLS plants guide. **REMEMBER**, this guide **DOES NOT REQUIRE** that only the plants listed be used. The WUCOLS plant guide will be amended as further data is made available.

## **B-6 GLOSSARY**

The words used in this guide have the meaning set forth below:

- A. "ALLOWABLE PERCENTAGE" means a factor of 1.0 (100%) that when applied to reference evapotranspiration determines the annual maximum allowable water budget for an individually metered landscape project.
- B. "APPLICATION EFFICIENCY" or "AE"- See "IRRIGATION EFFICIENCY"
- C. "ANNUAL MAXIMUM ALLOWABLE WATER BUDGET" or "AMAWB" - See "MAXIMUM ALLOWABLE WATER BUDGET."
- D. "DISTRIBUTION EFFICIENCY" or "DE" - See "IRRIGATION EFFICIENCY"
- E. "ESTIMATED ANNUAL WATER USE" or "EAWU" means the estimated annual water use for an established landscape area as calculated in EXHIBIT A. It is based upon reference evapotranspiration, the crop coefficient of the plants involved, and the size of the landscaped area. The EAWU for the entire landscaped area per individual irrigation meter equals the sum of the estimated water use of all hydrozones in that landscape area. NOTE: the EAWU for the entire landscape area per individual irrigation meter SHALL NOT EXCEED the annual maximum allowable water budget of that landscape area.
- F. "EVAPOTRANSPIRATION" means the quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time. Evapotranspiration data is collected from the Riverside UCR, CIMIS Field Station # 44.
- G. "HYDROZONE" means a portion of the landscape area having plants with similar water needs.
- H. "IRRIGATION EFFICIENCY" means the measurement of the amount of water beneficially used divided by the amount of water applied. IRRIGATION EFFICIENCY is a product of distribution efficiency (DE) - based upon characteristics of the various types of sprinklers/emitters, and application efficiency (AE) - based upon characteristics of the various types of irrigation system controls such as moisture sensors, etc.
- J. "NON COMPLIANCE SETTLEMENT CHARGE" means a monetary dollar amount charged to any landscape irrigation water account that exceeds its AMAWB or ETo (whichever is highest) at year's end.
- K. "REFERENCE EVAPOTRANSPIRATION" or 56.65 inches means a standard measurement of environmental parameters that affect the water use of plants. REFERENCE EVAPOTRANSPIRATION, is given as 56.65

inches of water per year, and represents the annual historic average evapotranspiration of a large field of 4-7 inch tall, cool-season grass that is well watered and located in the area of Riverside County. REFERENCE EVAPOTRANSPIRATION is used as the basis of determining the maximum allowable water budgets.

- L. "SPECIES FACTOR" or "ks" are classified as high (H), moderate (M), low (L), or very low (VL) in irrigation water needs. Each classification corresponds to a species factor range (a numerical value) that is expressed as a percentage of reference evapotranspiration (ETo). Species factors are used with ETo values to quantify water needs for a species. (for more information see the WUCOLS guide). "Target" refers to the monthly water budget, and is used as an indicator in relationship to the "WATER USE CLASSIFICATION OF LANDSCAPE SPECIES" or "WUCOLS" list is intended solely as a guide to help landscape professionals identify irrigation water needs of landscape species. It can be used either for the selection of species or to assist in developing irrigation schedules for existing landscapes. It is not intended to be used as a **"required" or "approved"** list by EMWD for selection of plant species. Monthly Water Budget Statement for Landscape Meters

Listed below is a brief explanation of important information that will help explain the new and improved "Monthly Water Budget Statement for Landscape Meters" report.

1. The PC# refers to the Plan Check Number that is assigned by EMWD Conservation Department for tracking purposes.
2. This section contains essential information about the account, Name that appears on the account, the Service Address , Account # and Meter # . The Sq. Ft. (Square Feet) is obtained from the landscape developer; this number is used to calculate the AMAWB .
3. This critical part reveals the Usage Period, the Target that should be met each month, the Actual amount of water used, and any Adjustments made to account. The ETo is displayed in Inches and in Billing Units, and reflects the amount of water that is evaporated and transpired from the ground and landscape. The AMAWB is the twelve-months of Targets added together.
4. The AMAWB means the upper limit of water (annually) for the entire landscape area. Mg (shown in inches) is the amount of water that was evaporated-transpired during the month. Target refers to the annual budget. Actual Usage (minus adjustments) field will show Adjustments made to the account. The Percent Over Target (to date) gives a quick indication if the account is in jeopardy of a Non Compliance Settlement Charge .

5. The Monthly Usage Graph compares the Target, Actual and ETo mounts for water.
6. The Annual Non-Compliance Settlement Charge is a monetary dollar amount, charged to any landscape irrigation account that exceeds its AMAWB or the ETo (whichever is highest) at year's end.
7. The Notes section contains terminology explanations that are used in the Monthly Water Budget Statement for Landscape Meters.
8. The Comments area is used for helpful suggestions, explanations, and alerting accounts on water use overage.

## C: STANDARD IRRIGATION EQUIPMENT

### C-1 IRRIGATION LEGEND FOR PARKS LMD OR CFD PROJECTS – USING POTABLE WATER

The equipment listed in accompanying legend is for sites where only potable water is available and which are not planned to have recycled / reclaimed water available.

EQUIPMENT	MANUFACTURER	MODEL NUMBER / NOTE
Controller – Single Unit / Single Site	CALSENSE	ET-2000-# of stations – R-G-RB-RR
Controller – Multiple Units / Single Site	CALSENSE	ET-2000 – Call Rep for spec.
Controller Enclosure	CALSENSE	SSE-R
ET Gage	CALSENSE	ETGE
Rain Bucket	CALSENSE	RB-1
Back Flow 2" & Under	FEBCO	825YA
Back Flow 2 1/2" +	FEBCO	825Y
Basket Strainer	HAYWARD	80-mesh filtration
Flow Meter	CALSENSE	FM-size (see catalog for size)
Master Valve	SUPERIOR	3300 – Normally Open
Control Valve	RAINBIRD	PESB
Drip Valve Assembly	RAINBIRD	XCZ-100-COM
Quick Couplers	RAINBIRD	33 DLRC
Turf Spray Heads	RAINBIRD	1806-SAM-PRS
Shrub Heads	RAINBIRD	1812-SAM-PRS
Slope Rotors	HUNTER	PGJ-12 or PGH
Small Radius Rotors	HUNTER	PGJ-06
Medium Radius Rotors	HUNTER	I-20-6P
Large Radius Rotors	HUNTER	I-60
Swing Joints	RAINBIRD / HUNTER	
Mainline 2" or under		Schedule 40 PVC – 18" min. cover
Mainline 2 1/2" +		Class 315 – 24" min. cover
Fittings for 2 1/2" or smaller		Schedule 80
Fittings for Mainline 3" or Larger	LEEMCO	Ductile Iron Fittings with joint restants
Lateral Lines		Schedule 40 – 12" min. cover
Glue		Gray
Primer		Purple
MV & FM Conduit		Schedule 80 Gray 2" dia.
Control Wire		UL Approved – Single wire -Cooper
Valve Boxes	RAINBIRD / CARSEN	
Drip Equipment	RAINBIRD/BOWSMITH	
Valve Tags	CHRISTY'S	

**C-2 IRRIGATION LEGEND FOR PARKS LMD OR CFD PROJECTS – USING RECYCLED / RECLAIMED WATER**

The irrigation equipment listed in the following legend is for sites which have or for which recycled water is planned for in the future. When recycled / reclaimed water is available reclaimed irrigation equipment must be specified and all applicable details, notes and specifications provides on plans.

<b>EQUIPMENT</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER / NOTE</b>
Controller – Single Unit / Single Site	CALSENSE	ET-2000-# of stations – R-G-RB-RR
Controller – Multiple Units / Single Site	CALSENSE	ET-2000 – Call Rep for spec.
Controller Enclosure	CALSENSE	SSE-R
ET Gage	CALSENSE	ETGE
Rain Bucket	CALSENSE	RB-1
Back Flow 2" & Under	FEBCO	825YA (when required)
Back Flow 2 1/2" +	FEBCO	825Y (when required)
Basket Strainer	HAYWARD	80-mesh filtration
Flow Meter	CALSENSE	FM-size (see catalog for size)
Master Valve	SUPERIOR	3300 – Normally Open – Paint Valve & Valve handle Purple
Control Valve	RAINBIRD	PEB-NP-HAN
Drip Valve Assembly	RAINBIRD	XCZ-100-COM – Provide Warning Labels
Quick Couplers	RAINBIRD	33 DLRC – Provide on separate potable line and potable meter.
Turf Spray Heads	RAINBIRD	1806-SAM-PRS-NP
Shrub Heads	RAINBIRD	1812-SAM-PRS-NP
Slope Rotors	HUNTER	PGJ-12 -R or PGH-3RV or ARV
Small Radius Rotors	HUNTER	PGJ-06-R
Medium Radius Rotors	HUNTER	I-20-6P-3RV or ARV
Large Radius Rotors	HUNTER	I-60-ARS or 3RS
Swing Joints	RAINBIRD / HUNTER	
Mainline 2" or under		Purple Schedule 40 PVC – 18" min. cover
Mainline 2 1/2" +		Purple Class 315 – 24" min. cover
Fittings for 2 1/2" or smaller		Schedule 80
Fittings for Mainline 3" or Larger	LEEMCO	Ductile Iron Fittings with joint restraints
Lateral Lines		Purple Schedule 40 – 12" min. cover
Glue		Gray
Primer		Purple
MV & FM Conduit		Purple Schedule 80 Gray 2" dia.
Control Wire		UL Approved – Single wire -Cooper
Valve Boxes	RAINBIRD / CARSEN	Purple
Warning Tape		Install per code
Valve Tags	CHRISTY'S	
Warning Tape	CHRISTY'S	

**C-3 IRRIGATION LEGEND FOR COMMERCIAL PROJECTS** The equipment listed in accompanying legend is for sites where only potable water is available and which are not planned to have recycled / reclaimed water available.

**NOTES:**

1. The city encourages the installation of irrigation controllers which have the capacity to adjust watering times based on the collection of ET data from an on site source or which can collect data from local weather stations. ET based controllers must have the capability to obtain current ET data.
2. When recycled / reclaimed water is available reclaimed irrigation equipment must be specified and all applicable details, notes and specifications provides on plans.

<b>EQUIPMENT</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER / NOTE</b>
Controller	See Note 1	
Controller Enclosure	PTS	Stainless Steel
Back Flow 2" & Under	FEBCO	825YA
Back Flow 2 1/2" +	FEBCO	825Y
Basket Strainer	Recommended	80-mesh filtration
Flow Meter	Required	
Master Valve	Required	Normally Open
Control Valve		Scrubber Type
Drip Valve Assembly		1" below grade assembly
Quick Couplers		3/4" size
Turf Spray Heads		6" pop up with in-head check valve
Shrub Heads		12" pop up with in-head check valve
Slope Rotors		12" pop up with in-head check valve
Small Radius Rotors		6" pop up with in-head check valve
Medium Radius Rotors		6" pop up with in-head check valve
Large Radius Rotors		6" pop up with in-head check valve
Swing Joints	Required	
Mainline 2" or under		Schedule 40 PVC – 18" min. cover
Mainline 2 1/2" +		Class 315 – 24" min. cover
Fittings for 2 1/2" or smaller		Schedule 80
Fittings for Mainline 3" or Larger	LEEMCO	Ductile Iron Fittings with joint restraints
Lateral Lines		Schedule 40 – 12" min. cover
Glue		Gray
Primer		Purple
MV & FM Conduit		Schedule 80 Gray 2" dia.
Control Wire		UL Approved – Single wire -Cooper
Valve Boxes	RAINBIRD / CARSEN	
Drip Equipment	RAINBIRD/BOWSMITH	
Valve Tags	CHRISTY'S	

## **PART NINE:**

# **FUEL MODIFICATION PLANS**

Fuel modification plans must be submitted to City and to the fire chief. For projects where fuel modification is required, fuel modification plans must be approved before grading permits will be issued.

Three (3) sets of prints of the final fuel modification plans prepared at a scale of one inch equals forty feet scale minimum which have been prepared by a licensed landscape architect shall be submitted to the City.

The fuel modification drawings package shall include the following drawings:

1. An overall fuel modification plan which includes the following:
  - a. Clearly show and define all buildings proposed or existing
  - b. Show and define all walls and fences. Identify the fence and wall materials.
  - c. Show and define all property lines, right-of-ways, easements and utilities.
  - d. Show and label all existing vegetation within the fire zones.
  - e. Show the location of all existing and proposed fire hydrants.
  - f. Show proposed grading contours and slopes.
  - g. Clearly show and define the applicable fuel modification zones.
  - h. Provide specifications defining specifications for the fire protection zones.
  - i. Dimensions for each of the fire protection zones shall be shown.
  - j. Show on the fuel modification plans exactly what is one hundred (100) feet beyond the development property line in all directions.
  - k. Indicate emergency and maintenance access easements on the plans.
  - l. State, on the plans, who has ultimate maintenance responsibility.
  - m. Include on the title sheet any tract/project conditions, CC&Rs, and/or deed restrictions related to the project's fuel modification areas.
  - n. Define on the plans where and how permanent zone markers will provide.
2. Provide irrigation and planting plans and specifications.
  - a. The planting plan must include both the botanical and common names of existing vegetation within the fuel modification area and those plantings which are proposed. Clearly indicate on the plans the disposition of impacted existing vegetation
  - b. Irrigation plans must comply with the City standards for irrigation and must be fully automatic.

## FIRE PROTECTION ZONES

Fuel modification plans must depict the fire protection zones and define landscape and fuel modification activities within each zone. Exact delineation of the fuel modification zones with respect to topographical features and wildland exposure is required. All zone dimensions are measured on a horizontal plane; however, the actual *dimensions* of the zones on the slope will vary from the horizontal dimensions on the plans.

The integrity and longevity of the fuel modification zones shall be maintained with sufficient tract/project conditions and CC&R's to specifically *identify* the restrictions within the fuel modification areas. Likewise, when fuel modification zones are located on private property, deed restrictions are re<sup>q</sup>uired to specifically identify the restrictions on any portions of the property subject to fuel modification.

There are three fire protection zones. They are defined as follows:

### **SETBACK ZONE (ZONE A)**

*The* purpose of the setback zone is to provide a defensible space for fire suppression forces and to protect structures from radiant and convective heat. No combustible construction shall be allowed within the twenty (20) foot setback zone (Zone A).

If the setback zone must be located on privately owned lots, the following options should be considered: 1) locate the setback zone within a designated easement, i.e., fuel modification maintenance, scenic preservation, etc.; 2) incorporate building footprint/envelope limitations to eliminate the encroachment of residences and other combustible accessory structures into Zone A.

### **IRRIGATED ZONE (ZONE B)**

The next fifty (50) feet of fuel modification consists of irrigated landscaping. The plans must delineate that portion of the fuel modification area which will be permanently irrigated. Plant material selection, irrigation system design, and the landscape maintenance management plan shall sensitively address water conservation practices and include methods of erosion control to protect 'against slope failure. All irrigation shall be kept a minimum of twenty (20) feet from the drip line of \*any Quercus (oak) species. These irrigated zones are a minimum of fifty (50) feet in width and may be increased as conditions warrant. Zone B shall be cleared of all existing vegetation, irrigated, and planted. Exceptions to save desirable species may be submitted to the' fire chief. Drought-tolerant and fire-resistant plant

**THINNING ZONE (ZONE C)**

Thinning zones are utilized to reduce the fuel load of a wildland area adjacent to urban developments, thereby reducing the radiant and convective heat of wildland fires. Thinning zones are located adjacent to the irrigated zone and can extend one hundred (100) feet or more into wildland areas. Natural vegetation is thinned by reduced amounts as the zones move away from the development. The percentage of vegetation to be removed is determined by many factors, including topography, exposure, and vegetation type and density. All dead and dying vegetation shall also be removed from the thinning zones. Additionally, certain plant species should be removed from the thinning zones due to their susceptibility to wildland fire. These fire-prone species are:

- |                         |                      |
|-------------------------|----------------------|
| Adenostoma fasciculatum | Chamise              |
| Adenostoma sparsifolium | Red Shanks           |
| Cortaderia selloana     | Pampas Grass         |
| Artemisia californica   | California Sagebrush |
| Eriogonum fasciculatum  | Common Buckwheat     |
| Salvia mellifera        | Black Sage           |

Debris and trimmings produced by thinning and pruning shall be removed from the site, or, if left, shall be converted into mulch by a chipping machine and evenly dispersed to a maximum depth of five (5) inches.

In Zones B and C care shall be taken to protect existing protected plant species. These plants shall be identified on the fuel modification plans and tagged in the field. Trees and large tree-form shrubs (e.g., oaks, sumac, toyon) which are being retained with the approval of the agency having jurisdiction shall be pruned to provide clearance, of three times the height of the understory plant material or ten (10) feet, whichever is higher (See Figure 4). Dead and excessively twiggy growth shall also be removed.

## PERMANENT IDENTIFICATION OF FUEL MODIFICATION ZONES

To ensure long-term identification and maintenance, each fuel modification zone shall be identified by a permanent marker system meeting the approval of the agency having jurisdiction.

## MAINTENANCE AND ENFORCEMENT

Provisions for continuous maintenance must be documented on the fuel modification plans, i.e., by homeowners' associations, property owners, or other entities. Maintenance refers to anything needed to maintain the fuel modification area in a fire-safe condition as required by the agency having jurisdiction, including the periodical removal and/or thinning of undesirable combustible vegetation; replacement of dead/dying fire-resistant plantings; maintenance of the operational integrity and programming of the irrigation system; and preservation of identification markers. Written evidence indicating responsibility for maintenance must be submitted with both the preliminary and final fuel modification plans.

Enforcement of the provision of maintenance shall be accomplished through any legal remedies available to the jurisdiction, including fees, liens, prosecution, etc.

## OFF-SITE FUEL MODIFICATION

Due to the variable and sometimes considerable amount of land necessary for fuel modification, development proposals often include a request to have the required fuel modification zones extend onto adjacent properties. However, off-site fuel modification is not recommended due to problems inherent with enforcement of regulations on adjacent property and the potential for *confusion* regarding responsibility for fuel modification on areas outside of legal ownership. Proper on-site fuel modification design should determine where development can safely be located and should be an integral part of the development proposal.

Every attempt should be made to include fuel modification on site. If the fuel modification zones, consistent with these guidelines, *cannot* be fully contained on the subject property, on-site alternative means and methods should be sought to provide an equal level of protection from wildland fire. Alternative means and methods may include, but are not limited to, the following: 1) increasing the width of the setback or irrigated zones to reduce thinning zone dimensions, 2) requiring enhanced fire protective construction techniques for development, and 3) a combination of construction improvements and adjustments to the fuel modification zones. Only if on-site alternative means and methods fail to provide an equal level of protection should off-site fuel

modification be considered. Jurisdictions may want to consider requiring that special findings or criteria be met in order to permit off-site fuel modification.

Should off-site fuel modification be deemed appropriate by the jurisdiction, appropriate recorded instruments should be established which clearly state the responsibilities and rights of the parties involved relative to the establishment and maintenance of the fuel modification area. Appropriate recorded documents should include a recorded agreement between all parties and a grant of easement for the establishment and maintenance of the fuel modification area. It should be understood that the allowance of off-site fuel modification by an adjacent property owner may affect the rights and/or use of the off-site property.