

SECTION 1
PURPOSE AND DEFINITIONS

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SECTION 1

PURPOSE AND DEFINITIONS

1-1 PURPOSE: It is the purpose of these Improvement Standards to provide standards to be applied to improvements and private works to be dedicated to the public and accepted by the County for maintenance or operation, as well as improvements to be installed within existing rights of way and easements. This is necessary to provide for coordinated development of required facilities to be used by, and for the protection of, the public. These Standards shall serve to regulate and guide the design and preparation of plans for: construction of streets, highways, alleys, drainage, sewerage, street lighting, water supply facilities and related public improvements, and set guidelines for all private works which involve drainage, grading, erosion control, trees, and related improvements.

1-2 OMISSIONS: Any items or situations not included in these Improvement Standards shall be designed in accordance with accepted engineering practice, the County of Sacramento Standard Construction Specifications, "Manual of Uniform Traffic Control Devices (MUTCD)," the State of California "Highway Design Manual" and "MUTCD Supplement," and as required by the Director of the Municipal Services Agency.

1-3 DEFINITIONS: When the following terms or titles are used in these standards, or in any document or instrument where these standards govern, the intent and meaning shall be as herein defined:

Consulting Engineer - Shall mean any person or persons, firm, partnerships or corporation legally authorized to practice civil, mechanical or electrical engineering in the State of California who prepares or submits improvements plan and specifications to the Municipal Services Agency of Sacramento County for approval.

Developer - Shall mean any person or persons, firms, partnership, corporation or, combination thereof, financially responsible for the work involved.

Development - Shall mean the act, process, or result of any land grading, utility installation, street or building construction on properties.

Director - Shall mean the Director of the Departments of County Engineering or District Engineering of Sacramento County acting either directly or through the Chiefs of the appropriate Divisions of the Municipal Services Agency or their authorized representatives.

Laboratory - Shall mean any testing agency or testing firm which has been approved by the Municipal Services Agency.

Mitigation Monitoring and Reporting Program (MMRP) – An environmental mitigation program administered by the County Department of Environmental Review and Assessment, in accordance with County Code.

Specifications - Shall mean the latest standard construction specifications adopted by the Board of Supervisors governing the construction of roads, streets, sanitary sewers, storm drainage, concrete structures, water supply, traffic signals, street lighting and other facilities within the County of Sacramento to be accepted by the County for maintenance or operation; also private grading erosion control, drainage, and landscaping.

Standard Drawings - Shall mean the standard drawings as set forth in the Standard Construction Specifications and those drawings included herein.

State - As used in the State Specifications, shall mean Sacramento County.

State Standard Plans - Shall mean the Standard Specifications and Drawings of the State of California, Department of Transportation. (Latest Edition)

Urban Area - Shall mean the area within the boundary as defined by the Sacramento County General Plan.

SECTION 2

GENERAL REQUIREMENTS

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SECTION 2 GENERAL REQUIREMENTS

2-1 ENGINEER REQUIRED: All plans and specifications for Improvements which are to be accepted for maintenance by the County and private, on-site drainage and grading shall be prepared by a Consulting Engineer of the appropriate branch of engineering covering the work submitted.

2-2 PLANS REQUIRED: Complete plans for all proposed streets, bikeways, grading, erosion control drainage facilities, sewerage, street lighting, water distribution systems, including any necessary dedications, easements, and rights of entry shall be submitted to the Municipal Services Agency, for approval. Copies of right of entry obtained from adjacent properties shall be provided to the Municipal Services Agency.

2-3 REFERENCE TO COUNTY SPECIFICATIONS: The General Notes of all plans shall include the following note:

All construction and materials shall be in accordance with the latest edition of the County of Sacramento Standard Construction Specifications.

2-4 WORK IN COUNTY RIGHTS OF WAY, EASEMENTS AND WATERWAYS: The following shall govern work done within County right-of-ways, easements, and waterways:

- A. Possession of a complete set of County approved improvement plans shall allow a contractor duly licensed by the State of California to perform work specified on the plans in County right of way, easements and waterways. The contractor shall be bonded as required and as specified in Chapter 12.08 of the Sacramento County Code.
- B. Possession of a valid encroachment permit issued in accordance with Sacramento County Code Section 12.08 and the County encroachment permit policy, as adopted by the Board of Supervisor, will allow a contractor duly licensed by the State of California to perform work specified in the permit in County rights of way.
- C. Possession of a valid Sacramento County Water Agency permit will allow a contractor duly licensed by the State of California to perform the following work within County waterways and drainage easements:

- Connecting yard drains into existing manholes

- Grading within the flood plain of creeks and swales
- Removing trees within creeks
- Other minor items of work approved by the Director involving waterways.

2-5 IMPROVEMENT PLAN SUBMITTAL: The initial submittal of improvement plans shall be made to the Land Division and Site Improvement Review Section of the Municipal Services Agency. The submittal shall consist of the following:

- A. Eight (8) sets of plans, or nine (9) if the project has an MMRP, complete and in accordance with these Improvement Standards and the Standard Construction Specifications, along with any required specifications, computation, test data, and other material requested by the Director. If the project is in Zone 40 of the Sacramento County Water Agency, submit two (2) additional sets of plans. It is the responsibility of the Consulting Engineer to know if the project has an MMRP, and if the project is in Zone 40.
- B. Two (2) copies of the off-site and on-site watershed map as well as drainage calculation in accordance with Section 9.
- C. Two (2) additional copies of the street lighting plan to be used for street names and block numbering on street name signs.
- D. Six (6) copies of the final "Conditions of Approval" for all rezones, subdivision approvals, variances, use permits, and any other discretionary planning actions for the subject site and development.
- E. A portion of the plan check and inspection fee in accordance with Section 2-7.
- F. The name, address and telephone number of the developer and engineer.
- G. Utility letters in accordance with Section 2-17.
- H. Copies of permits as required by other agencies.

Should there be required alterations or revisions to the plans as submitted, the Director will return one copy with the corrections marked or indicated thereon. If the plans submitted are not prepared in accordance with these Improvement Standards or are not in keeping with the standards of the profession, the Director may return them unmarked and unapproved.

2.6 IMPROVEMENT PLAN RESUBMITTAL: The Director shall indicate the number of plan sets to be resubmitted. The Consulting Engineer shall notify the Director if the plans being resubmitted contain revisions or alterations other than

those required by the Director on previously corrected plans. Revision notations shall not be shown on plans until after the Director has formally approved plans.

2-7 PLAN CHECK AND INSPECTION FEE: When improvement plans are initially submitted to the Municipal Services Agency for checking, a portion of the total plan check and inspection fee for the development will be required as a deposit to initiate checking of the plans.

Should the development not be carried to completion, any portion of the required deposit over and above the accumulated costs expended by the Agency on the development will be refunded to the developer. Failure of a developer to complete a project does not relieve the developer of paying all costs incurred with the County.

The Municipal Services Agency shall be notified of any change of billing address. The Consulting Engineer shall notify the Municipal Services Agency immediately upon change of developer.

2-8 PLAN APPROVAL: No plans will be approved nor construction authorized until the Director signifies approval by signing the cover sheet of the set of plans. Revisions, corrections or additions shall be resubmitted to the Director for approval as prescribed in Section 2-10. At such time as the Consulting Engineer preparing the plans has made the necessary revisions, and signed and stamped the original plans, and fees have been paid, as provided under the provisions of Chapter 12.03 of the County Code, and Ordinance No. 1 of the Sacramento County Water Agency, and amendments thereto, the Director will sign the plans in the space provided. The Director's approval is valid for a period of twelve months. Should work not commence within the 12-month period, the plans shall be resubmitted for re-approval. The Director shall order any contractor to cease work on any project if said contractor does not have properly approved plans in his possession.

2-9 APPROVED PLANS REQUIRED: The Consulting Engineer shall deliver the requested number of sets of prints from the approved original plans to the Director. Typically:

- A. Subdivision - Eight (8) complete sets of plans, three (3) additional sets of the street light plans only, and one (1) set of reproducible prints of the streetlight plans. Two (2) additional sets of the water plans in County owned water districts.
- B. Other Developments - Eleven (11) complete sets of plans, or twelve (12) if the project has an MMRP.

Additional sets of plans shall be delivered when trunk drainage, trunk sewer, or traffic signal facilities are shown on the plans. Additional copies of improvement plans may be required by the Director, and these shall be furnished to the County without cost.

Copies of the final utility letters required by Section 2-17 shall be included with the approved plans delivered to the Director.

2-10 IMPROVEMENT PLAN REVISIONS DURING CONSTRUCTION: Should changes become necessary during construction, the consulting Engineer shall first obtain the consent of the Director and shall then resubmit the title sheet and the plan sheets affected for approval. The changes on the plans shall be made in the following manner:

- A. The original proposal shall not be eradicated from the plans but shall be lined out.
- B. In the event that eradicating the original proposal is necessary to maintain clarity of the plans, approval must first be obtained from the Director.
- C. The changes shall be clearly shown on the plans with the changes and approval noted on the revision signature block, conforming to Standard Drawing G-1.
- D. The changes shall be identified by the revision number in a triangle delineated on the plans adjacent to the change and on the revision signature block.
- E. Minor changes that do not affect the basic design or contract may be made upon the authorization of the Director, but said changes must be shown on record plans when the contract is completed.
- F. The Director may specify changes in the plans in order to complete the necessary facilities, to be agreed by the consultant. Changes in the plans ordered by the Director shall conform to all of the above.

2-11 RECORD PLANS: The Developer shall be responsible for keeping an accurate record of all approved deviations from the plans and shall provide five (5) copies of these records to the Director upon completion of the work before final acceptance of the completed improvements.

Certification by the Consulting Engineer of the finished pad elevations of subdivision lots shall be required prior to final acceptance of the subdivision improvement. Certification shall be in accordance with Section 10-8.

2-12 CONFLICTS, ERROR AND OMISSIONS: Excepted from approval are any features of the plans that are contrary to, in conflict with, or do not conform to any California State Law, Sacramento County Code or Resolution, conditions of approval, or generally accepted good engineering practice, in keeping with the standards of the professions, even though such errors, omissions or conflicts may have been overlooked in the Municipal Services Agency's review of the plans.

2-13 CHANGE IN CONSULTING ENGINEER: If the developer elects to have a registered civil engineer or licensed land surveyor other than the engineer who prepared the plans provide the construction staking, he shall provide the Director in writing the name of the individual or firm one week prior to the staking of the project for construction. The developer shall then be responsible for:

- Verifying all construction
- The preparation of revised plans for construction changes
- The preparation of "as built" plans upon completion of the construction.

In the Developer's notification of a change in the firm providing construction staking, he shall acknowledge that he accepts responsibility for design changes and "as built" information as noted above.

2-14 INCORPORATED AREA SEWER SUBMITTALS: The Consulting Engineer shall submit to the County for approval those sanitary sewer plans for improvements which are within the Cities of Citrus Heights, Elk Grove, Folsom, Rancho Cordova and Sacramento and also within a sanitation district, the collection systems of which is maintained by the County forces. Both City and County approval is required for such plans.

2-15 SEWER ANNEXATION REQUIREMENT: When sanitary sewer plans are submitted for an area that is not within a sanitation or sewer maintenance district, said plans will not be approved until a request for annexation to the appropriate district has been completed, unless otherwise approved by the Director. Annexation request forms and information relative to annexation procedures are available from the Department of Water Quality.

2-16 BORING AND JACKING SAFETY REQUIREMENTS: Any boring or jacking operation involving an opening greater than 30 inches in diameter is subject to the State of California Division of Industrial Safety's tunnel safety requirements. The Consulting Engineer shall submit to the State Division of Industrial Safety plans and specifications applicable to the tunnel operation, with a letter requesting tunnel classification, prior to bidding the project. This procedure is also recommended to avoid project delay if there is the possibility of any personnel entering the tunnel, regardless of diameter and length. The letter should identify the Municipal Services

Agency responsible for the project, and the agency's mailing address. The plans shall identify underground utilities and tanks or areas for storing fuel and toxic gases in the vicinity of the tunnel site, a description of the historical land use in the area. The request for classification should be submitted allowing ample time for the Division of Industrial Safety review in order that any special requirements can be included in the project plans and specifications. The Consulting Engineer shall also attend the required pre-construction meeting.

2-17 EXISTING UTILITIES: All existing utilities are to be shown on the plans. In addition, the Consulting Engineer shall submit prints of the preliminary and approved plans to the utility companies involved. This is necessary for the utilities to properly plan their relocation projects and needed additional facilities. Copies of the transmittal letters to the utility companies shall be provided to the Director. In addition the following note shall appear on the first page of the plans:

"No pavement work will occur within the road right-of-way prior to completion of any necessary utility pole relocation within the right of way."

2-18 PARTIAL PLANS: Where the improvement plans submitted cover only a portion of ultimate development, the plans submitted shall be accompanied by the approved tentative plan or a study plan of the ultimate development.

2-19 OTHER AGENCY NOTIFICATIONS: Prior to County approval, the Consulting Engineer is responsible for obtaining the approval and necessary permits of governmental or municipal agencies when their facilities are involved.

2-20 INSPECTION REQUIRMENTS: The Director shall inspect any improvement during construction that will ultimately be maintained by the County. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases.

The Director shall inspect all grading and drainage during construction.

Any improvement constructed without inspection as provided above or constructed contrary to the order or instruction of the Director will be deemed as not complying with Standard Construction Specifications or these Improvement Standards may not be accepted by Sacramento County for maintenance purposes.

The Consulting Engineer shall notify the Director when the Contractor first calls for grades and staking and shall provide the Director with a copy of all cut sheets.

Within ten days after receiving the request for final inspection. The Director shall inspect the work. The contractor, Consulting Engineer, and Developer will be notified in writing as to any particular defects or deficiencies to be remedied. The

Contractor shall proceed to correct any such defects or deficiencies at the earliest possible date. At such time as the work has been completed, a second inspection shall be made by the Director to determine if the previously mentioned defects have been repaired, altered, and completed in accordance with the plans. At such time as the Director approves the work and accepts the work for Sacramento County, the Contractor, consulting Engineer and Developer will be notified in writing as to the date of final approval and acceptance.

For assessment districts and projects where Sacramento County participates in the costs thereof, quantities will be measured in the presence of the Director, consulting Engineer, and Contractor, and witnessed accordingly.

2-21 SPECIAL NOTICIES AND PERMITS: The Consulting Engineer shall be responsible for advising the Contractor as follows:

- A. Contractors shall be in receipt of official County approved plans prior to construction.
- B. Contractor shall notify all utility companies involved in the development prior to beginning of work.
- C. Contractor shall notify "Underground Service Alert" two working days in advance before any excavation.
- D. Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify Sacramento County Surveyor of any damaged or removed County, State or Bureau monument.
- E. Contractor shall notify Department of Water Quality upon receipt of permit and payment of required fees for sewer taps in accordance with the Standard Construction Specifications.
- F. Contractor shall be responsible for conducting his operation entirely outside of any flood plain boundaries unless otherwise approved. 100-year Floodplain boundaries shall be clearly delineated in the field prior to construction.
- G. Contractor shall be responsible for conducting his operation entirely outside of any no grading area. These areas shall be clearly delineated in the field prior to construction.
- H. Where work is being done in an off-site easement the Contractor shall notify the property owner 48 hours prior to commencing work.
- I. Contractor shall not dispose of chlorinated water into the County drainage system.

SECTION 3
PLAN SHEET REQUIREMENTS

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SECTION 3 PLAN SHEET REQUIREMENTS

3-1 DIGITAL SUBMITTALS: At the discretion of the Director, plans prepared on computer may be submitted in digital format for checking. Only plans prepared using AutoCAD, version determined by Director, will be accepted. Plans may be submitted on disc or via e-mail, as required by the Director. Digital plan submittals shall include all that is required in Section 2-5 of these standards.

3-2 PAPER DETAILS: All improvement plans shall be submitted on 22" X 34" or 24" X 26" paper. Only common engineering scales shall be used.

3-3 DRAFTING STANDARD: All plans approved by the County will be scanned and stored in a management system. Therefore, all line work must be clear sharp and of appropriate weight. Letters and numerals must be 0.1-inch minimum height, well formed and sharp. Line work shall not intersect numerals showing profile elevations. Sharp solid arrowheads shall terminate dimension lines.

3-4 TITLE SHEET: All improvement plans shall have the following information as minimum on the cover sheet:

- A. The entire subdivision or parcel and project
- B. Assessment district limits (if applicable)
- C. City Limits (if applicable)
- D. Street names and widths
- E. Adjacent subdivision, including names, lot lines and lot numbers
- F. Property lines
- G. Public easements
- H. Location map
- I. Scale of drawings, including scale bar
- J. Index of sheets
- K. Legend of symbols
- L. Signature block conforming to Standard Drawing 3-1
- M. Benchmark information

3-5 TITLE BLOCK: Each sheet within the set of drawings shall have an approved title block showing the following:

- Sheet title
- Sheet number

- Date
- Scale
- Consulting Engineer's name, signature and seal. Signature may be placed across the seal.
- Project title.

The title block shall be either across the bottom or along the right edge of each plan sheet.

3-6 DRAINAGE, SEWER, WATER AND GRADING LAYOUT: On all subdivision plans, a separate plan is required for each of the following:

- Water
- Street Lights
- Grading and erosion control

In addition, the storm drainage, sanitary sewer and water systems shall be shown on plan and profile sheets. On all other plans, a composite plan layout will be acceptable but the above facilities shall be shown within the development and on the plan and profile plans.

All plans showing the domestic water systems shall include signature blocks and be approved by the responsible water and fire districts. The signature block shall conform to Standard Drawing 3-1 and shall be situated near the lower right hand corner of the first sheet of the water plans.

3-7 PLAN DETAILS: In addition to the other requirements of these Improvement Standards, the following details shall be shown on the plans submitted for approval. This does not in any way exempt the Consulting Engineer preparing plans from the responsibility of preparing neat, accurate and comprehensive plans in keeping with the standards of the profession.

A. Record Information - All existing and proposed:

- Right of Way lines
- Boundaries of lots fronting on the street
- Easements
- Both on-site and off-site right of way and easement lines shall be properly dimensioned.

B. Existing Facilities - All pertinent existing facilities shall be shown, including:

- Street striping
- Medians
Driveways (on both sides of the street when within 40 feet of the medians ending)
- Curbs
- Sidewalks
- Pavement shoulders
- Location and size of all underground utilities, storm and sanitary sewer lines
- Limits of 100-year flood plains
- Structures
- Trees (6-inch and larger) and other foliage
- Traffic signals, traffic conduits and traffic detector loops
- Street lights, pull boxes, and underground electric conduits
- Drainage ditches
- Utility poles
- Fire Hydrants
- Retaining walls
- Any other features of the area that may affect the design requirements for the area.

When the potential utility conflict exists, the consulting engineer shall verify the “as built” elevations for the utilities. For existing structural sections, the grade of the cross slope on the road and 20 feet into the property at driveways shall be shown.

- C. Contours and Elevations** - Existing contours or supporting spot elevations shall be shown on all plans (see Section 10 for off-site requirements).
- D. Profiles** - The plans shall show the existing profile of all roadway centerline, edges of pavement, curb and gutter flow lines, drainage ditches, storm and sanitary sewers. Designs of proposed public improvements shall include profiles showing centerline elevations at 50-foot intervals and rate of grades, vertical curves and other vertical alignment data. When curb and gutters are designed for reconstructed County roads, elevations shall be shown on the edge of the outside traveled way or if the road has a full paved section, elevations shall also be shown two feet from the proposed lip of gutter. Designs for vertical curves shall show elevations at 25-foot intervals. Where it exists, county stationing shall be used for profiles of public roads. The consulting engineer shall contact the Department of Transportation of the Municipal Services Agency for such stationing.

The plans shall show the existing ground profile for a minimum distance of 200 feet beyond temporary street endings to insure proper vertical alignment within the proposed improvement limits. The 200-foot minimum shall be increased when requested by the Director.

- E. Stationing and Orientation** - The stationing on plan and profile shall read from left to right. Stationing shall increase from south to north or from west to east, except for cul-de-sacs, where stationing shall proceed from the intersection. Plans shall be so arranged that the North arrow points toward the top or upper 180 degrees, insofar as practical.
- F. Bench Marks** - Location, description, and elevation of bench marks shall be clearly delineated on the plans. The datum shall be 1929 North American Datum (U.S.G.S. or U.S.C. & G.S.). Consulting engineers shall contact the Surveying Section of the Municipal Services Agency for location and elevation of the nearest official bench mark nearest to their project.
- G. California Coordinates System** - The Director may require that the proposed improvements be tied into the California Coordinates System if monuments coordinate points are available within a reasonable distance (200 feet or less) or said improvement as determined by the Director.
- H. Cross Sections** - Cross sections shall be included in the plans, where determined necessary by the Director. Sections shall include all pertinent structural and topographical features. Section calls shall be identified by a number and letter and the sheet on which the section appears.
- I. Special Notes** - Special Notes shall be clearly indicated. Notes shall contain a statement regarding obtaining encroachment permits from other agencies when applicable.

3-8 REQUIRED NOTES: A list of County required notes shall be obtained from the Municipal Services Agency and shall be included on all improvement plans submitted to the County for approval.

3-9 STANDARD DRAWINGS: Consulting engineers shall not include the standards drawings included herein on improvement plans, but shall refer to the drawing by number. If a variance to a standard drawing is intended, the drawing shall be shown with the variance noted.

IMPROVEMENT PLAN APPROVAL BLOCK

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY	
PROJECT TITLE:	
ASSESSORS PARCEL NO.:	
CAL COORDINATES:	
APPROVED:	
ORDER NUMBER:	DRAINAGE FEE:
CHECKED BY:	DRAINAGE APPROVED:

- 1. Project name, parcel number, and map coordinates shall be in 10 point Arial font
- 2. Approval block shall be located at the lower right corner of title sheet, within bottom 6 inches, and right 8 inches of page

DIRECTOR APPROVAL BLOCK

APPROVED BY:	
DIRECTOR OF COUNTY ENGINEERING	DATE


DIRECTOR of County Engineering

WATER AND FIRE APPROVAL BLOCKS

APPROVED BY:	
(PUT NAME OF FIRE DISTRICT HERE)	DATE

APPROVED BY:	
(PUT NAME OF WATER DISTRICT HERE)	DATE

Put water and fire approval blocks on water distribution plans for subdivisions, and on the title sheet for all other projects

IMPROVEMENT PLAN REVISION BLOCK

NO.	DESCRIPTION	ENGR INIT	COUNTY APPROVAL	
			BY	DATE

→

1.0 MIN

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0.5 MIN

SECTION 4 STREETS

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SECTION 4 STREETS

General

Streets in Sacramento County help to provide clean, safe and thriving neighborhoods and communities. Streets are a key element in providing greater mobility for all modes of travel including walking and bicycling. It is this vision of a safe and efficient transportation system, that serves our citizens and commerce, which shall guide the implementation of the following standards.

4-1 DEVELOPER'S PAVEMENT, SIGNAL, BRIDGE, LANDSCAPING, SIDEWALK AND STREET LIGHT RESPONSIBILITIES

- A. Where the existing roadway abutting a development does not meet current standards for structural section, centerline profile, width and/or alignment, the Developer shall be responsible for construction or reconstruction of the roadway to the centerline. This responsibility applies to all streets within, adjacent and contiguous to the Developer's project such that those roadway standards are met.

The Developer shall overlay, or remove and replace, any pavement beyond the roadway centerline where the design centerline profile deviates from the existing. In the absence of any project conditions of approval to the contrary, the County will pay for any pavement reconstruction necessary beyond the roadway centerline, where the full structural section is required to be replaced to meet current standards for roadway profile.

The Developer shall also be responsible for overlaying or reconstructing any low pavement areas where the new roadway pavement meets the existing pavement to maintain an acceptable cross slope.

- B. When making connections to existing pavement, the Developer shall be responsible for a one foot minimum saw-cut of the existing pavement along with placement of a minimum of two-feet of new pavement in accordance with Standard Drawing 4-42. When making connections to existing new pavement (within 3 years of resurfacing), 1-1/2" deep grinding shall be performed to the nearest lane line, or center of traffic lane as in accordance with Standard Drawing 4-64 or as required by the Director of County Engineering.

The limit of pavement removal shall extend beyond the one-foot minimum limit as needed to the point where the existing pavement is in good

condition and the cross slope of the existing pavement will approximately match the new pavement section. The area of pavement reconstruction required may be up to the centerline of the road for a length of up to one hundred feet beyond the limit of the Development. Removal shall be made by means of saw cutting.

- C. Roadway construction work shall extend beyond the limits of the Development as needed for vehicle travel lanes, bicycle lanes and sidewalks to make a safe transition to existing facilities.

The end of any roadway construction that abuts a partial street and that terminates a traveled lane shall include construction of pavement sufficient for a safe lane drop. In the direction of travel the lane drop shall be tapered in accordance with the following equations based on the design speed for the roadway:

Less than 45 mph: $L = WS^2/60$

Greater than or equal to 45 mph: $L = WS$

Where L = Length of taper beyond the area warning of lane drop (in feet);

W = Width of lane being dropped (in feet); and

S = Design Speed of roadway (in m.p.h.). See Section 4-8(F).

- D. If Developer's required roadway improvements are located within the limits of a future County roadway construction contract (planned to be constructed within two years), the Director of Transportation may require a cash deposit for the roadway and related work in lieu of actual construction and the County will include the work in the County contract. In addition to the cost of the required roadway improvements, the funds deposited shall include appropriate amounts for related design, inspection and material testing.
- E. The Developer shall be responsible for relocating or replacing existing traffic signal facilities, as necessary to conform to standard roadway and intersection geometry.

The County shall participate in the relocation costs for small lot developments (up to one acre in size) in accordance with the following:

Lot Size (Based on Net Acreage of Development)	Amount of County Participation in Relocation Costs
0.14 acre or less	50%
Greater than 0.14 acre and less than 1.00 acre	Straight-line Prorated Value
1.00 acre or more	0%

- F. New traffic signal facilities shall be designed, constructed and installed by the Developer if identified as a mitigation measure by the Development's approved environmental document, or as required the Development's conditions of approval, or as required by the Director of Transportation.
- G. For intersections with traffic signal construction with existing traffic signal interconnect conductors extending to or through the intersection, the new traffic signal installation work shall include connection of the new traffic signal to the existing signal interconnect system. This work may include replacement of existing interconnect cable to the nearest signalized intersection.

For intersections with new traffic signal construction that does not have existing traffic signal interconnect conductors extending to or through the intersection, the new traffic signal construction work shall include the installation of traffic signal interconnect facilities the nearest intersection with a traffic signal if the distance is less than one-half mile. Should there be no existing traffic signal within one-half mile, the new construction work shall include installation of traffic signal interconnect conduit and conductors for future use. Those facilities for future interconnect use shall extend along each Arterial and Thoroughfare street approach to the intersection from the pull boxes associated with the advanced loop detectors for the traffic signal to the intersection's traffic signal controller cabinet. In addition, conduits and conductors for future signal interconnect shall extend from the new traffic signal in one direction for a distance of up to 2,400 feet along a roadway corridor identified by the Department of Transportation on their Traffic Signal Interconnect Master Plan, or as directed by the Department of Transportation.

The design of the traffic signal interconnect facilities shall be subject to the review and approval of the County's Department of Transportation. For additional traffic signal and accessibility improvement requirements see Section 4-18.

- H. New street lighting facilities shall be installed along all street frontages with Class A or Class B improvements, as described in Section 4-5 of these Improvement Standards.
- I. The Developer shall be responsible for constructing or modifying curbed median islands where required by these standards, or as shown on Standard Drawings 4-2 and 4-3, or when required for traffic control as a result of the Development, as determined by the Director of Transportation. Curbed median island construction shall include landscaping and irrigation facilities for those medians that are at least five feet in width for a length of at least thirty feet. Landscaping and irrigation facilities shall conform to County's

water conservation ordinance and meet the approval of the Director of Transportation.

- J. The developer shall be responsible for the construction of bus stops, bus turnouts, and intersection widening as shown on Standard Drawings 4-6, 4-7, 4-8, 4-9, 4-10, 4-12, 4-13, 4-14, 4-43, and 4-44 and in accordance with Section 4-17 of these Standards.
- K. The Developer shall be responsible for all drainage facilities (bridges, pipes, culverts, and appurtenances) crossing new streets within, adjacent, and contiguous to the project. See Section 4-25 for information as to how the County and developers share in the costs for the replacement of cross culverts.
- L. The Developer shall be responsible for installation of sidewalks and sidewalk ramps conforming to the provisions of Sections 4-18, 4-22 and the County's Standard Drawings of these Improvement Standards. The Developer shall be responsible for modification or reconstruction of existing pedestrian facilities in the vicinity of the Development to allow for access for the disabled, including but not limited to:
 - Providing for minimum clear width of sidewalks (minimum 4 feet).
 - Correction of uplifted sidewalks – Modification of sidewalks are required if vertical change in sidewalk area exceeds one-quarter inch but is less than one-half inch. Removal and reconstruction of sidewalks are required if vertical change exceeds one-half inch.
 - Meeting cross-slope standards for sidewalks (no cross slope greater than 2.0%), including portions of driveways that cross sidewalks.
 - Installation or reconstruction of sidewalk ramps to meet current standards.
 - Installation of audible traffic signals.
 - Installation of pedestrian traffic signal push buttons that meet current County standards for accessibility (type of button, height, orientation, distance from extension of crosswalks and distance from accessible area of sidewalk).

4-2 COUNTY COST PARTICIPATION

With the submittal of improvement plans for checking, the Consulting Engineer shall provide a written request to the County for cost participation if the proposed work is beyond the Developer's responsibility. This application shall show the items of work, the estimated quantities, reimbursable costs, and justification for the request.

The County will notify the Consulting Engineer as to the acceptance and the extent of cost participation. The Consulting Engineer is to submit the County's proposal to the developer for acceptance. Should the Developer not accept the County proposal, negotiations may occur between the Developer and the County to arrive at a mutually acceptable price or a separate course of action will be directed by the County. Once an agreed price for County participation is reached, the Developer and the County will enter into a cost sharing agreement prior to start of construction of the Development's roadway improvements.

Any portion of work shown on the Consulting Engineer's plans, for which the County has agreed to cooperate, shall not be segregated by note or legend, but shall be included in the general contract. The County will reimburse the Developer for these cooperative items after the work has been accepted by the Director and final payment of plan check and inspection fees has been made.

Unit prices prepared for fee and bond calculation and authorized in County Code Section 12.03.080 shall be used as a basis for cooperative work. The Director may negotiate unit or lump sum prices for items not usually encountered, or for unusual field conditions.

4-3 STREET TYPE AND DESIGN WIDTH

The standard approved street types and design widths for Sacramento County are as follows:

- A. 20-Foot Street (Alley) - A street depressed in the center with a right-of-way and surface width of 20 feet. An alley will be accepted by Sacramento County as a public alley only when it is constructed of a minimum of 6-inch thick Portland cement concrete over a minimum of six inches of aggregate base in accordance with Standard Drawing 4-39 of these Improvement Standards.
- B. 32-Foot Street (Minor Residential) - A street with a right-of-way width of 32 feet measured between the backs of the curbs.

As a standard, Minor Residential streets shall have five foot wide sidewalks attached to the curb (monolithic construction). At the Developer's option, the street may also be constructed with five foot wide sidewalks separated from the curb with six foot wide landscaped buffers. If separated sidewalks are selected for use on Minor Residential streets, the sidewalk buffer is eliminated around the bulb portion of cul-de-sacs and around the outside corner of street elbows. See Standard Drawing 4-1.

Curb extensions, conforming to the geometry shown on Standard Drawings 4-53 and 4-56, shall be constructed at all intersections of Minor Residential

streets with other Minor Residential, Primary Residential, Collector and Major Collector streets.

32-foot streets are normally used when serving fewer than 400 single-family residential units. Some duplexes may be included when the total number of duplexes represents less than ten percent of the residential units served by the street. Each duplex, for this purpose, shall be counted as two residential units.

Where a 32-foot street provides access onto an Arterial or Thoroughfare street, the street approach shall conform to the standard for a 38-foot street. The 38-foot street approach shall be provided for a distance of 100 feet from the cross street right-of-way line along with a 40-foot taper to transition to the standard 32-foot street.

- C. 38-Foot Street (Primary Residential) - A street with a right-of-way width of 38 feet measured between the backs of the curbs.

As a standard Primary Residential streets shall have five foot wide sidewalks attached to the curb (monolithic construction). At the Developer's option, the street may also be constructed with five foot wide sidewalks separated from the curb with six foot wide landscaped buffers. If separated sidewalks are selected for use on Primary Residential streets, the sidewalk buffer is eliminated around the bulb portion of cul-de-sacs and around the outside corner of street elbows. See Standard Drawing 4-1.

Curb extensions, conforming to the geometry shown on Standard Drawings 4-53 and 4-56, shall be constructed at all intersections of Primary Residential streets with other Minor Residential, Primary Residential, Collector and Major Collector streets.

38-foot streets are normally used for serving 400 or more, but less than 700, single family residential units, and for serving duplex developments. A 38-foot street cross-section shall be used as the approach width for 32-foot streets that provide access onto Arterial and Thoroughfare streets.

Where a 38-foot street provides access onto an Arterial or a Thoroughfare street and where left turn movements are allowed for traffic traveling from the smaller street onto the Arterial or Thoroughfare street, the street approach shall conform to the standard for a 48-foot street. The 48-foot street approach shall be provided for a distance of 150 feet from the cross street right-of-way line with an additional 100-foot long taper to transition to the standard 38-foot street.

- D. 48-Foot Street (Collector) - A street with a right-of-way width of 48 feet measured between the backs of the curbs. The street shall have five foot

wide sidewalks separated from the curb by eight foot wide landscaped buffers. See Standard Drawing 4-2. Collector streets are typically striped with 5' wide bicycle lanes as shown on Standard Drawing 4-9.

Curb extensions, conforming to the geometry shown on Standard Drawings 4-53 and 4-56, shall be constructed at all intersections of Collector streets with other Minor Residential, Primary Residential, Collector and Major Collector streets.

A 48-foot street approach shall be used as the approach width for 38-foot streets that provide access onto Arterial and Thoroughfare streets. 48-foot streets are used when serving 700 or more residential units, commercial, industrial, and multiple family developments, and are used in the vicinity of parks, schools and other public facilities in residential areas. Where 48-foot streets provide access onto Arterial and Thoroughfare streets, the street approach shall conform to the standard for a 60-foot street. See Standard Drawing 4-9.

- E. 60-Foot Street (Major Collector) - A street with a right-of-way width of 60 feet measured between the backs of the curbs. The street shall have five foot wide sidewalks separated from the curb by eight foot wide landscaped buffers. See Standard Drawing 4-2. Major Collector streets shall be striped with 5' wide bicycle lanes as shown on Standard Drawing 4-9.

Curb extensions, conforming to the geometry shown on Standard Drawings 4-53 and 4-56, shall be constructed at all intersections of Major Collector streets with other Minor Residential, Primary Residential, Collector and Major Collector streets.

60-foot streets may be required in residential or industrial developments when warranted to provide a continuous 12-foot wide center turn lane or a 12-foot wide raised landscaped median. If a raised landscaped median is used on a Major Collector street, additional roadway widening is required at all street intersections with median breaks to provide room for U-turn movements. A minimum outside clear path of 44 feet of pavement shall be required.

A 60-foot street cross-section shall also be used as the approach width for 48-foot streets that provide access onto Arterial and Thoroughfare streets. See Standard Drawings 4-9.

- F. 74-Foot Street (Arterial) - A street with a right-of-way width of 74 feet measured between the backs of the curbs. The street shall have five foot wide sidewalks separated from the curb by eight foot wide landscaped buffers. See Standard Drawing 4-2. Arterial streets shall be striped with 5' wide bicycle lanes as shown on Standard Drawings 4-10 and 4-11.

74-foot streets shall be required as shown on the Sacramento County Transportation Plan or as required by the project traffic analysis. See Standard Drawings 4-6, 4-7, 4-8, 4-10, 4-11 and 4-12 for intersection widening geometry.

If a raised landscaped median is used on an Arterial street, additional roadway widening is required at all street intersections with median breaks to provide room for U-turn movements. A minimum outside clear path of 44 feet of pavement shall be required.

- G. 96-Foot Street (Thoroughfare) - A street with a right-of-way width of 96 feet measured between the backs of the curbs. The street shall have five foot wide sidewalks separated from the curb by eight foot wide landscaped buffers. See Standard Drawing 4-3. Thoroughfare streets shall be striped with 5' wide bicycle lanes as shown on Standard Drawings 4-13 and 4-14.

96-foot streets shall be required as shown on the Sacramento County Transportation Plan or as required by the project traffic analysis. See Standard Drawings 4-8, 4-9, 4-12, 4-13 and 4-14 for intersection widening geometry.

H. Major Street Design

1. Raised Medians:

96-foot streets (Thoroughfares) shall have a solid non-traversable landscaped median between cross street intersections. 74-foot streets (Arterials) shall have a solid non-traversable landscaped median between cross street intersections when a continuous center turning lane is not required by the Director of Transportation or specified by the development's conditions of approval. The standard width for such medians is twelve feet, measured from top front of median curbing, eleven feet between the backs of median curbs. Median areas that are five feet wide or wider for a distance of thirty feet or more shall include landscaping and irrigation facilities. Landscaping and irrigation facilities shall conform to County's water conservation ordinance and meet the approval of the Director of Transportation.

Decorative hardscape treatment shall be installed in median areas less than five feet in width and along the back of curbing in landscaped portions of the median. The design, color, appearance, and associated construction details for decorative median hardscape treatment shall meet the approval of the Director of Transportation.

Raised medians may also be constructed on 60-foot streets (Major Collectors) where specified by a development's conditions of approval,

where desired by a developer, or where required by the Director of Transportation.

2. Median Openings on Major Streets:

Median openings on Arterial and Thoroughfare streets shall be allowed at locations approved by the Director of Transportation and in conformance with the following:

- Median breaks that allow for left turn movements from side streets or driveways shall be allowed only at signalized intersections. The minimum spacing between signalized intersections is 1,200 feet.
- All proposed median breaks shall be analyzed by a traffic study prepared by a qualified Traffic Engineer hired by the Developer. Should the traffic study indicate that traffic signal warrants are met in the cumulative condition, the median break shall be located a minimum of 1,200 feet from the nearest signalized intersection and a minimum of 650 feet from the nearest unsignalized median break.
- Unsignalized median breaks on Arterial or Thoroughfare streets that allow only left turn movements into side streets or driveways may be allowed if all of the follow criteria are met:
 - The Development generates a minimum of 350 peak hour vehicular trips or 3,500 daily trips.
 - Spacing between median breaks shall provide a minimum of 150 feet of full width landscaped median.
 - Median breaks shall be a minimum of 650 feet apart and a minimum of 650 feet from any existing intersection or median break. The spacing is measured along the roadway centerline from the location of the ends of the continuous median between the existing and proposed median breaks.
 - A traffic study shows that the proposed location for a median break does not meet traffic signal warrants for the fully developed (cumulative) condition.
 - Should the median break provide left turn access that could conflict with through traffic on the street that is approaching a signalized intersection within 1,200 feet of the proposed median break, a traffic study shall include queuing, safety, and operational analysis of the proposed left movement turn in both existing and cumulative conditions. The traffic study

must show that both the existing and cumulative condition peak hour queues at the traffic signal will not extend to the location of the proposed median break such that there will be no conflict of the proposed left turning movement with the traffic queue from the neighboring traffic signal.

- Greater consideration will be given to median breaks that provide for joint access to adjacent parcels. If joint access cannot be accomplished then the County reserves the right to require a dedication of a cross access easement between adjacent properties in order to consolidate future driveways.

3. Emergency Vehicle Crossings of Raised Medians:

Emergency vehicle median crossings shall be constructed on all streets with raised medians that exceed 1,000 feet in length between median breaks. For the purpose of determining the need for emergency vehicle median crossings, median breaks shall only be those interruptions in median construction at intersections that allow all through and turning movements. Channelized median openings that restrict some traffic movements (such as those shown on drawing 4-17) shall not be considered median breaks for the purpose of locating emergency vehicle median crossings. For medians that exceed one thousand feet in length between median breaks but are less than two thousand feet long, emergency vehicle median crossings shall be located approximately in the middle of the length of the median. For longer medians, multiple emergency median crossings shall be installed such that the maximum spacing between median breaks and emergency crossings, or between adjacent median crossings, does not exceed one thousand feet.

Emergency vehicle median crossings shall be located a minimum of fifty feet clear distance from any existing or planned side street or major driveway. Emergency median crossings shall be twenty-five feet in length and extend across the full width of the median. Mountable curbing (modified type 1A curb shape extending six inches below pavement surface elevation but without the gutter section) shall be placed on both sides of the median for the twenty-five foot length of the emergency median crossing with five foot long curb transitions to match standard median curbing beyond the limits of the emergency median crossing. Expansion joints shall be placed through the curb at each side of the emergency vehicle crossing. Hardscape paving of the median in the area of the emergency vehicle median crossing shall consist of eight inch thick P.C.C. on six inches of aggregate base. The hardscape median paving shall have integral color and a stamped pattern to match

median hardscape appearance at other adjoining median locations along the roadway or as approved by the Director of Transportation.

4. Design of Streets and Driveways Intersecting with Major Streets:

Where intersecting with 74-foot or wider streets, Minor Residential streets shall have a minimum right-of-way width of 38 feet. Where intersecting with 74-foot or wider streets, Primary Residential streets that only have right turn movements onto the larger street shall have a minimum right-of-way width of 38 feet. Street intersections with right turns only onto 74-foot or wider streets should be no closer than 450 feet from each other or from the nearest cross street intersections. Major driveways which will serve significant traffic volume, as determined by the Director of Transportation, shall be considered as intersecting streets and shall be no closer than 450 feet from each other or from cross street intersections. Driveways should be located as far apart as practical with a minimum of 150 feet between driveways or from driveways to intersections. Major driveways that will be signalized shall be designed in accordance with public street intersection standards and shall not have concrete valley gutters.

Pavement widening shall be required where private lanes and where Class C or Class D streets (see Section 4-5) intersect with 74-foot and 96-foot streets in accordance with Standard Drawing 4-41. Major driveways serving significant traffic or truck volumes, and as determined by the Director, shall be considered as intersecting streets with regard to pavement widening on Class C streets.

5. Intersection Widening on Major Streets:

Intersection widening shall be in accordance with Standard Drawings 4-6 through 4-14 and the requirements in these Special Provisions. The transition lengths associated with intersection widening shall be longer than as indicated on the above listed standard drawings on roadways with a curving centerline so as to accommodate the safe travel of vehicles through the transition area at the design speed of the roadway.

6. Roadway Widening for U-Turns on Streets with Raised Medians:

All Arterial and Thoroughfare streets shall be required to accommodate "U" turns at all traffic signals and at locations of breaks in raised medians that allow for left-turn movements from roadway with raised medians. A minimum outside clear path of 44 feet of pavement shall be required. This requirement also applies to Major Collector streets that have raised medians.

- I. Frontage Road - A street located parallel to and abutting a major roadway or freeway which provides service to abutting properties for which direct access to the major roadway or freeway is prohibited or undesirable. Frontage roads adjacent to State freeways shall conform to the full width standards for 50-foot streets, as shown on Standard Drawing 4-3, unless designated as an Arterial or Thoroughfare street on the County's General Plan. All other frontage roads shall have a 28-foot paved surface with a Type 5 vertical curb on the undeveloped side and curb and gutter and a minimum 5-foot sidewalk with an 8 foot landscaped buffer on the developed side (See Standard Drawing 4-3).
- J. School Frontage – Along the roadway frontage of any school development on Arterial or Thoroughfare streets an additional eight feet of roadway and right-of-way, beyond that shown for standard Arterial and Thoroughfare streets, shall be provided. The additional area shall allow for six feet of roadway width adjacent to the gutter section for on-street pick up and drop off of students along the school's roadway frontage plus two feet of clear area between the on-street parking area and the adjoining bicycle lane.
- K. Other Street Designs – Class C street improvements vary in width and are used as interim improvements for roadways sections not yet improved by adjacent development or in rural areas where Class A or Class D improvements are not required. See Standard Drawing 4-4. Class D street improvements also vary in width and are used in certain portions of rural areas within the County's Urban Services Boundary. Class D streets provide enhanced pedestrian facilities over that of Class C streets. See Standard Drawing 4-5. See Section 4-5 for more information on the use of the various classes of street improvements.

4-4 RIGHT-OF-WAY WIDTH

Building setbacks, landscaping requirements, and parking requirements shall be based on the ultimate right-of-way width regardless of the location of existing public street improvements or right-of-way lines. In case of conflict with any zoning code requirements, the higher standard shall apply.

4-5 STREET CLASS

The standard approved street classes of Sacramento County are as follows:

- A. Class A Street - Class A street improvements shall be in accordance with Standard Drawings 4-1, 4-2, and 4-3 and shall consist of the following:
 - Asphalt concrete pavement over an aggregate base as required.

- Concrete curb, gutter and sidewalks. Landscaped buffers between the curbing and the sidewalk are standard on all Class A Collector, Major Collector, Arterial and Thoroughfare streets. Landscaped buffers are an option on Minor Residential and Primary Residential streets.
- Street lights in accordance with Section 5.
- Side slopes not steeper than 1-1/2:1 in cuts or 2:1 in fills, or a reinforced concrete or masonry retaining wall beginning at the back of sidewalk line. Pedestrian railings may be required along sidewalks when the adjacent property slopes downward away from the street.

All developments on land zoned or used for duplex, multi-family residential, business and professional, commercial, church, school or industrial uses shall have Class A street improvements.

All roadway frontage within the County's Urban Services Boundary on Arterial and Thoroughfare streets shall have Class A street improvements. In addition, this requirement shall apply to areas with "urban character", as approved by the Board of Supervisors, outside the Urban Services Boundary.

Street improvements for all single family residential lots shall have Class A street improvements unless otherwise allowed to have Class B, Class C or Class D street improvements as detailed below.

- B. Class B Street -- Class B street improvements shall be the same as Class A improvements, including street lights, except that sidewalks and landscaped buffers are omitted. The width of the public easements for a Class B Streets is the same as the width of the public easements on corresponding Class A streets with no reduction in width for the omission of the sidewalk or landscaped buffer area. Class B improvements shall only be allowed at developments where the roadway frontage is currently undeveloped with a length of less than three hundred feet and the roadway has been previously developed with Class B improvements on both sides of the proposed development. Class B street improvements shall conform to Standard Drawing 4-A-1.
- C. Class C Street – Class C street improvements shall be in accordance with Standard Drawing 4-4 and shall consist of the following:
- Asphalt concrete pavement over an aggregate base. Intersection widening of Class C streets at connections to Arterial and to

Thoroughfare streets shall be in accordance with Standard Drawing 4-41. For connections to lesser street widths, the approach and departure tapers may be omitted.

- Side slopes not steeper than 1-1/2:1 in cuts or 2:1 in fills (See Standard Drawing 4-4).
- Street lights in accordance with Section 5 so as to provide for intersection safety lighting.

Class C improvements may be installed along the roadway frontage of any property designated in the County of Sacramento's Zoning Code as "Agricultural-Residential Land Use Zone" and meeting one of the following criteria:

- Located within the County's Urban Services Boundary and with a zoning density of less than or equal to AR-5; or
- Located beyond the County's Urban Services Boundary and with a zoning density of less than or equal to AR-1.

The minimum width of the asphalt concrete surface shall be as follows (See Standard Drawing 4-4):

<u>Street Type</u>	<u>Minimum Pavement Width</u>
Minor Residential, Primary Residential	32 feet
Collector, Major Collector, Arterial & Thoroughfare	36 feet

Where Class C improvements are to be installed all proposed public improvements, including but not limited to roadway surfacing and drainage facilities shall be within the dedicated roadway right-of-way, roadway easements, drainage easements, or other appropriate public easements.

D. Class D Street – Class D street improvements shall be in accordance with Standard Drawing 4 -5 and shall consist of the following:

- Asphalt concrete pavement over an aggregate base. Intersection widening of Class D streets to Arterial and Thoroughfare streets shall be in accordance with Standard Drawing 4-41. For connections to lesser street widths, the approach and departure tapers may be omitted.
- Side slopes not steeper than 1-1/2:1 in cuts or 2:1 in fills (See Standard Drawing 4-5).

- Street lights in accordance with Section 5 so as to provide for intersection safety lighting.

Class D improvements shall be installed along the roadway frontage of any property within the County's Urban Services Boundary, and with a zoning of AR-1, AR-2, RD1, RD2 and not otherwise required to have Class A street improvements.

The minimum width of the asphalt concrete surface shall be as follows:

<u>Posted Speed Limit of Roadway*</u>	<u>Minimum Pavement Width</u>
Less than or equal to 40 MPH	32 feet
Greater than 40 MPH	36 feet

* If the roadway has no posted speed limit, the speed limit used shall be the lesser of the prima facie speed limit or the 85th percentile speed as determined by an engineering speed study.

Where Class D improvements are to be installed all proposed public improvements, including but not limited to roadway surfacing, drainage facilities and pedestrian walkways shall be within the dedicated roadway right-of-way, roadway easements, or other appropriate public easements.

4-6 USE OF OLDER STANDARDS FOR IMPROVEMENTS ON IN-FILL DEVELOPMENTS

The following standards for the design of roadway improvements for developments with relatively short lengths of street frontage may be used upon written request by the developer or their agent and with the written approval of the Director of County Engineering. Locations for which these standards may apply are limited to locations where the roadway is undeveloped (currently a Class C roadway) along the entire frontage of the development and where the length of the proposed development's street frontage is less than three hundred feet.

For locations on Collector, Major Collector, Arterial and Thoroughfare streets, and meeting the criteria described above, the street frontage may be designed with rolled curb, Type 1A, if the abutting properties on both sides of the proposed development have street frontage constructed with rolled curb.

At locations meeting the criteria described above, the street frontage may be designed with Class B street improvements if the abutting properties on both sides of the proposed development have Class B street improvements.

At locations meeting the criteria described above, the street frontage may be designed with attached sidewalk, without the standard landscaped buffer, if the abutting properties on both sides of the proposed development have attached sidewalk. For those locations for which attached sidewalk is allowed rather than the standard separated sidewalk, the minimum widths of those attached sidewalks shall meet all of the following criteria, as applicable:

- A minimum of five feet wide on Collector and Major Collector streets;
- A minimum of six feet wide on Arterial and Thoroughfare streets;
- A minimum of eight feet wide at schools and hospitals (see section 4-22);
- A minimum of eight feet wide within pedestrian districts (see section 4-23);
- The width determined through the development review process as described in section 4-23 for locations within commercial corridors; and
- Not less than the wider of the existing sidewalk abutting the proposed development.

As noted earlier in these Improvement Standards, type 1A curb and gutter with attached five foot wide sidewalk is the standard roadway improvement for Minor Residential and Primary Residential Streets.

Details of Class B street improvements are located in the appendix to this section of the Improvement Standards. Other than the use of rolled curbing, attached sidewalks and/or Class B street improvements, all other aspects of street improvements for the proposed development shall conform to current County standards as detailed elsewhere in these Improvement Standards.

4-7 STRUCTURAL SECTION

The following standards for the design of structural sections shall govern the preparation of plans for proposed improvements:

- A. The minimum allowable thickness of the pavement section on 20-foot wide streets (alleys) shall be 6 inches of Portland cement concrete on 6 inches of aggregate base.
- B. Structural sections for all roadways wider than 20 feet shall be designed to conform to the California Department of Transportation Highway Design Manual (Fourth Edition), "Topic 608 - Asphalt Concrete Pavement Structural Section Design" or other method as approved by the Director. The safety factor needed for gravel equivalent increase shall be 0.2 feet for a base type of aggregate base.

- C. The minimum traffic indices (T.I.) used for the calculation of the roadway structural sections shall be as follows:

<u>Street Type by Right-of-Way Width</u>	<u>Minimum Traffic Index</u>
32' and 38' residential streets	5.0
48' and 60' streets without bus routes or high truck traffic	6.0
48' and 60' streets with bus routes or high truck traffic & all cul-de-sacs	6.5
74' streets	9.0
96' streets	10.0

The minimum T.I. for cul-de-sac bulbs shall be 6.5. Special T.I.'s will be provided to the consultant engineer for industrial cul-de-sac bulbs or other special conditions.

74-foot streets may use a T.I. of 8.0 or 8.5 if supported by a traffic study by a registered traffic engineer and subject to the approval of the Director of County Engineering. 96-foot streets may use a T.I. of 9.0 or 9.5 if supported by a traffic study by a registered traffic engineer and subject to the approval of the Director of County Engineering.

- D. A soil report, prepared by a registered geotechnical engineer, citing the "R" value of subgrade of basement soil, along with calculations for structural pavement sections, shall be submitted with any plan indicating construction of roadway. In lieu of a soil report, an "R" value of 5 may be assumed.

With an "R" value of 5, the following minimum structural sections shall be used:

<u>Street Type by Right-of-Way Width</u>	<u>Structural Section</u>
32' and 38' residential streets	3" A.C. on 10" A.B.
48' and 60' streets without bus routes or high truck traffic	3-1/2" A.C. on 13" A.B.
48' and 60' streets with bus routes or high truck traffic, all cul-de-sacs	4" A.C. on 14" A.B.
74' streets	5-1/2" A.C. on 20-1/2" A.B.
96' streets	6-1/2" A.C. on 23" A.B.

- E. As an alternate to the preceding structural sections, a full depth asphalt concrete structural section may be used subject to the approval of the Director. Full depth asphalt concrete sections shall be designed in accordance with the California Department of Transportation Highway

Design Manual (Fourth Edition), “Topic 608 - Asphalt Concrete Pavement Structural Section Design” or other method as approved by the Director. The safety factor needed for gravel equivalent increase shall be 0.1 feet. A soil report of the “R” value of subgrade or basement soil, along with calculations for structural pavement sections, shall be submitted with any plan indicating construction of roadway. In lieu of a soil report, an “R” value of 5 may be assumed.

With an “R” value of 5, the following minimum structural sections shall be used for full depth asphalt concrete design:

<u>Street Type by Right-of-Way Width</u>	<u>Structural Section</u>
32’ and 38’ residential streets	7-1/2” Asphalt concrete
48’ and 60’ streets without bus routes or high truck traffic	9” Asphalt concrete
48’ and 60’ streets with bus routes or high truck traffic, all cul-de-sacs	10” Asphalt concrete
74’ streets	14” Asphalt concrete
96’ streets	16” Asphalt concrete

- F. The use of alternate road building materials will be allowed if supported by a sound pavement design study prepared by a registered geotechnical engineer and approved by the Director of County Engineering. These alternate road building materials may include but not be limited to the following:
- Subgrade stabilizing and/or isolating geotextiles and grids
 - Pavement stress absorbing interlayers
 - In-situ soil and subgrade stabilizing add mixtures
 - The use of recycled materials in the manufacture of subbase, subgrade, and asphalt concrete
 - Rubberized asphalt concrete
 - Subbase drainage facilities
- G. Positive structural section drainage facilities shall be required if the basement soil has permeability less than 100 feet per day. Drainage system design shall be in accordance with California Department of Transportation Highway Design Manual (Fourth Edition) or other method as approved by the Director. At a minimum, subbase drainage shall be provided at all sag points in impermeable soils.
- H. Class C streets, including the shoulders, shall have the same pavement structural section as indicated for the ultimate width of the roadway with full land development.

- I. In transition areas from one street width to another street width standard, the stronger structural section shall be used in the transition area.

4-8 PROFILE STANDARDS

The following standards for the design of profiles shall govern the preparation of plans for proposed improvements. See Section 3-7(D).

- A. The minimum grade on new streets shall be 0.25 percent except that the minimum curb and gutter grade around intersection corners shall be 0.50 percent. Curb and gutter elevations on crest and sag vertical curves shall be adjusted to meet the 0.25 percent minimum grade. The profile grade around corner returns with curb extensions (which are typically found at intersections of residential and/or collector streets) shall be 0.50 percent including the ten-foot transition areas on each side of the extended curb return.
- B. The minimum grade of gutter sections constructed on existing streets shall be 0.20 percent.
- C. Standard cross slope on new streets shall be 2.0 percent.
- D. The minimum cross slope on street widening shall be 1.5 percent and the maximum cross slope shall be 3.0 percent. The cross slope of the widening shall conform to the cross slope of the existing pavement whenever possible. See Section 4-1 C of these Improvement Standards.
- E. When two streets intersect, neither street shall have a longitudinal grade greater than 3.0 percent for a minimum distance of 40 feet measured from the curb line of the intersecting street, except in unusually rough terrain, as determined by the Director of County Engineering for residential and collector streets and by the Director of Transportation for Arterial and Thoroughfare streets.

At all street intersections the centerline crown of the street with the lesser roadway width shall meet the surface pavement elevation of the intersecting roadway at a point along the projected lip of gutter of the larger roadway. If both roadways have the same street width, the larger roadway shall be the street with the higher projected traffic volume with full land development.

At street intersections of two Arterial and/or Thoroughfare roadways, the cross-slope of both roadways shall be reduced from the standard 2.0% slope to 1.0% as the roadways approach the intersection. The transition on each roadway approach shall begin approximately one hundred feet in advance of the corner return, with full cross-slope transition being achieved at the

corner return on the approach roadway. The one percent cross slope shall be carried through the intersection.

The minimum vertical curve length allowable at the intersection of two grades shall be 50 feet. Vertical curves on residential and collector streets may be omitted where the algebraic difference in grades does not exceed 2.0 percent. Vertical curves on all other streets may be omitted where the algebraic difference in grades does not exceed 1.5%. The minimum vertical curve data to be computed and shown on the plans shall consist of the point of intersection elevation, the tangent gradients, the middle ordinate and the length of curve.

- F. The design speed and minimum stopping sight distance over any segment of urban roadway shall be as follows unless the Director specifically approves a lesser design speed:

<u>Street Type</u>	<u>Minimum Design Speed</u>	<u>Minimum Stopping Sight Distance</u>
32-foot R/W	25 MPH	150 feet
38-foot R/W	30 MPH	250 feet
48-foot R/W	35 MPH	250 feet
60-foot R/W	40 MPH	300 feet
74-foot R/W	45 MPH	360 feet
96-foot R/W	50 MPH	430 feet
Rural & Unposted	55 MPH	500 feet

Unless otherwise approved by the Director of Transportation, on 74-foot (Arterial) and 96-foot (Thoroughfare) roadways, the design speed shall be the greater of either the speed indicated in the table above, or the 85th percentile speed of the existing traffic as measured by an engineering speed survey. Copies of engineering speed surveys for most Collector, Major Collector, Arterial and Thoroughfare streets are available upon request from the County's Department of Transportation.

The minimum design speed for rural and/or unposted roadways shall be 55 MPH or conform to the maximum allowable vehicular speed per the California Vehicle Code. Stopping sight distance for other design speeds shall be in accordance with AASHTO Policy on Geometric Design of Highways and Streets, 2004 Edition, or as approved by the Director.

Stopping sight distance is measured from the driver's eyes, which are assumed to be 3.5 feet above the pavement surface, to an object 2.0-feet high on the road.

4-9 PARTIAL STREETS

Partial streets may be permitted by the Director of County Engineering along the boundary of a subdivision or property of the developer where the full right-of-way cannot be dedicated or where the complete street cannot be constructed, but will ultimately be constructed with adjacent development.

Partial streets shall be constructed to a complete geometric and structural section for a minimum paving width specified by the following:

- A. On 32 and 38 foot streets with sidewalk on one side of the roadway, the minimum pavement width shall be 28 feet.
- B. On 32 and 38 foot streets without sidewalk on either side of the roadway, the minimum pavement width shall be 32 feet.
- C. On 48-foot streets and on larger streets, the minimum pavement width shall be 36 feet.

The intersection pavement edges shall have a minimum radius of 25 feet for any corner return that lacks curb & gutter at an intersection of residential and/or collector streets. The minimum radius of a corner return of an intersection that includes either an Arterial or a Thoroughfare roadway is 35 feet.

Partial streets shall be terminated with the end of the pavement perpendicular to the street unless otherwise specified below. A 2"x6" redwood header board shall be required at the pavement ending.

Partial streets that terminate adjacent to an intersection or driveway shall be tapered 45 degrees to the street if right-of-way is available.

4-10 OFFSET INTERSECTIONS

- A. Streets intersecting any 32-foot or 38-foot residential street from opposite sides shall have their centerlines meet, or the offset between intersections shall be a minimum of 150 feet. Lesser distance may be approved for infill projects.
- B. Streets intersecting any 48-foot or 60-foot street from opposite sides shall have their centerlines meet, or the offset between intersections shall be a minimum of 200 feet. Lesser distance may be approved for infill projects.
- C. Streets intersecting any 74-foot street that does not have a raised landscaped median shall have their centerlines meet, or the offset between intersections shall be a minimum of 300 feet. Pursuant to this section major access

driveways shall be considered as streets with respect to offsets. Lesser distance may be approved for infill projects.

- D. See Section 4-3 for intersection spacing requirements for 74-foot streets with raised landscaped medians and for 96-foot streets.

4-11 DRIVEWAYS

Driveway installations shall be in accordance with Standard Drawings 4-35 thru 4-40 as applicable, and the following standards.

Exceptions from any of the following driveway standards associated with driveways on Arterial or Thoroughfare streets may be granted by the Director of Transportation where use of the driveway standard is technically infeasible. Exceptions from any of the following driveway standards associated with driveways on residential or collector streets may be granted by the Director of County Engineering where use of the driveway standard is technically infeasible. Examples of technical infeasibility are significant conflicts with large oak trees, conflicts with major utility facilities, conflicts with major structures or locations where property frontage geometry does not allow conformance with the standards. Exceptions should be requested as early as possible, prior to submission of improvement plans or development plans, during the period of project development when entitlements and conditions of approval are being considered, as applicable.

- A. Driveways entering Class C or Class D streets shall meet the future back of sidewalk line at such a grade and elevation as to permit conversion to a Class A street without regrading the driveway within the public right-of-way and easement areas.
- B. On roadways which are designated to be ultimately developed with Class A street improvements, concrete driveways will not be permitted within the area between the paved roadway and the location of the future back of sidewalk. On all other roadways, concrete driveways will not be permitted within fifteen feet of the paved roadway.
- C. No driveway (including transition tapers) will be allowed within 5 feet of a side property line. Exceptions may be approved by the Director of County Engineering for joint driveways or in unusual cases. Joint driveways may be required by the Director of County Engineering and a joint use driveway agreement will be required prior to approval of improvement plans.
- D. The minimum width for a single family residential and duplex driveway shall be 16 feet. Maximum single family residential and duplex driveway width shall be 35 feet.

- E. All commercial, industrial, church, school and multiple family developments shall install Type A or Type B driveways except as otherwise provided in this section (see Standard Drawings 4-35 & 4-36).
- F. On streets other than Arterial or Thoroughfare roadways, where existing street frontage improvements include rolled curb (Type 1A curbing as shown on Drawing 4-A-30 in the Appendix to this chapter of the Improvement Standards), Type A or Type B driveways shall be installed for all driveways serving more than six single family dwelling units. Driveways serving six or less single family dwelling units may utilize a driveway connection to the existing rolled curb improvements (if any) or to proposed rolled curb improvements (if applicable).
- G. A minimum 35-foot driveway width is required for all commercial, industrial, school and church developments. A 45-foot driveway width is required along any roadway if significant truck traffic is anticipated to use the driveway. The standard driveway width shall be 45 feet on Arterial and Thoroughfare roadways. A center median in a driveway, up to 10 feet wide, may be approved by the Director of County Engineering. The standard for minimum driveway width will be increased by the width of the median.
- H. The design of major driveways, which will serve significant traffic volume, as determined by the Director of Transportation, shall be based on the width, cross section, and geometrics of a 48-foot public street.
- I. Driveways on Arterial and Thoroughfare streets shall have a minimum clear spacing of 150 feet between driveways. Lesser driveway spacing may be approved by the Director of Transportation where the use of cross access easements are not possible or are not desirable, where major conflicts exist, or where property width limitation make use of the standard driveway spacing technically infeasible.
- J. When driveways are abandoned or relocated, the driveway sections must be removed and replaced with standard curb and gutter, sidewalk, and planters.
- K. The maximum driveway slope shall be twelve percent for residential properties. The maximum driveway slope for commercial properties shall be eight percent. Driveways serving commercial properties on all roads shall have a slope not exceeding five percent for a minimum distance of 20 feet, measured from the back of sidewalk. The maximum algebraic difference in grade at any grade change within the public right-of-way and a driveway or between a driveway and public roadway shall be ten percent. (See Standard Drawing 4-35).

Driveways entering levee roads shall have a slope not exceeding five percent for a minimum distance of 20 feet, measured from the edge of roadway pavement. Driveways normally used by vehicles towing horse or boat trailers shall have special requirements to be determined on an individual basis by the Director of County Engineering.

- L. The nearest edge of driveways shall not be closer than 50 feet, measured laterally, to the end of existing or future traffic medians. Medians shall be reconstructed and/or lengthened to conform to this section if necessary, as determined by the Director of Transportation.
- M. Visibility requirements for driveways shall be in accordance with Standard Drawing 4-18 and Section 4-15.
- N. Major commercial driveways which will serve significant traffic volume, as determined by the Director of Transportation, shall be considered as intersecting streets and shall conform to the requirements of Section 4-10 regarding offsets.
- O. Driveways and private roads accessing public streets with no curbs and gutters and sidewalks shall be paved with dust free surfacing (either asphalt concrete or a double chip seal). Driveways and private roads accessing public roads with sidewalks and/or curbs and gutters shall be paved with concrete or asphalt concrete.
- P. Driveways on residential or collector streets at their intersection with a residential street shall be located a minimum of 10 feet clear from the nearest corner return. Driveways on residential or collector streets at their intersection with a Collector, Major Collector, Arterial or Thoroughfare street shall be located a minimum of 40 feet clear from the nearest corner return.
- Q. Driveways on Arterial or Thoroughfare streets shall be no closer than 125 feet from the nearest present or future intersection corner return.

4-12 CUL-DE-SAC

Cul-de-sac streets shall be terminated with a bulb, which shall have right-of-way and back of curb radius dimensions conforming to Standard Drawing 4-15 and the following:

No cul-de-sac shall exceed 600 feet in length.

The minimum T.I. for a cul-de-sac shall be 6.5. Special T.I.'s will be provided to the consultant engineer for industrial cul-de-sacs or other special conditions.

Special turnaround designs may be approved by the Director of County Engineering under unusual topographic or other conditions. Where possible a pedestrian connection should be provided from the bulb end of a cul-de-sac to the nearest neighboring roadway. See Section 4-22 of these Improvement Standards.

4-13 ELBOW INTERSECTIONS

Elbows shall be required at right angle intersections in accordance with Standard Drawing 4-16. Only under unavoidable or extreme conditions will an elbow other than $90^{\circ} \pm 5^{\circ}$ be permitted by the Director of County Engineering.

4-14 CENTERLINE RADII

The curve data (delta angle, length, tangent, and radius) for all centerline curves shall be computed and shown on the plans.

The minimum radius curve for 32-foot streets shall be 200 feet.

The minimum radius curve for 38-foot streets shall be 350 feet with the exception that 38-foot streets exceeding 1,000 feet in length and connecting to Arterial or Thoroughfare streets shall have a minimum radius curve of 500 feet.

The minimum radius curve for 48 streets shall be 500 feet.

The minimum radius curve for 60-foot streets shall be 800 feet.

The minimum radius curve for 74-foot and 96-foot streets shall be 2,000 feet. With the approval of the Director of Transportation, the minimum radius curve for 74-foot and 96-foot streets may be reduced to 1,400 feet.

A minimum tangent length of 200 feet is required between reversing curves on 48-foot and larger streets.

Special consideration will be given to unusually difficult alignment problems. Any exception to the above minimum radius requirements must be approved by the Director of Transportation. Where a centerline radius on an Arterial or Thoroughfare street that is less than the above requirements is approved by the Director of Transportation, superelevation may be required.

4-15 SIGHT DISTANCE AT UNCONTROLLED INTERSECTIONS

Streets that approach uncontrolled intersections, those intersections without all-way stop control or traffic signals, should not be designed to intersect the inside of curves or at any location where in general, sight distance will be inadequate for drivers to tell if they can safely enter the traffic flow or cross the street. The

minimum distance from an intersection to a curve should be the applicable minimum sight distance listed below. Exceptions may be made by the Director for especially difficult design circumstances, only if visibility easements to provide adequate sight distances are dedicated. Minimum intersection design sight distance standards shall be as follows:

<u>Type of Street Being Entered</u>	<u>Recommended Design Speed</u>	<u>Minimum Sight Distance*</u>
Minor Residential	25 MPH	280 feet
Primary Residential	30 MPH	330 feet
Collector	35 MPH	390 feet
Major Collector	40 MPH	440 feet
Arterial	45 MPH	500 feet
Thoroughfare	50 MPH	550 feet

*Distance measured from an entering driver's eye position to the position of the closest approaching vehicle's far front corner.

The entering driver's eye position shall be assumed 3 feet to the right of the entering street's centerline, 3.5 feet above the pavement surface, and 11 feet clear of the nearest vehicle lane on the street being entered. The position of the closest approaching vehicle's far front corner shall be assumed 3 feet from the edge of the nearest approaching vehicle lane and 4.25 feet above the pavement surface for each direction of travel.

Major driveways serving significant traffic volume, as determined by the Director of Transportation, shall be considered as intersecting streets with regard to intersection sight distance requirements. Minor driveways and private streets should provide the recommended intersection sight distance, and at a minimum, shall provide for stopping sight distance.

All streets and driveways shall conform to Standard Drawings 4-16 & 4-18 for corner visibility requirements, as well as to the requirements herein. Visibility easements shall describe an area to be maintained clear of any and all obstructions to a clear view from the adjacent streets except as exempted by the County Code. No sign, hedge, structure, natural growth, fence, or other obstruction of any kind whatsoever to a clear view, higher than 2 1/2 feet above the nearest pavement surface (or traveled area where no pavement exists) shall be installed or maintained or shall be permitted to be installed or maintained within the sight visibility control area. As shown on Standard Drawing 4-18, any trees planted within sight visibility control areas shall have all branches, and foliage above an elevation six feet higher than the nearest roadway surface.

Sight distance at controlled intersections, those intersections with all-way stop control or traffic signals, shall conform to the requirements of Standard Drawing 4-18 for corner visibility requirements.

Visibility easements shall be recorded on subdivision maps when required, or by separate document if no map will be recorded.

All visibility easement areas between fences or walls and curbs or sidewalks shall be improved as follows:

- A. Standard Portland cement concrete sidewalk shall be placed in all areas having a width of 3 feet or less, and in all areas within intersection corner roundings.
- B. All areas having a width greater than 3 feet and not within intersection corner roundings shall be surfaced with 2 inches of asphalt concrete or other impervious, non-raveling surfacing subject to the approval of the Director of Transportation. Soil sterilization shall be applied in accordance with Section SS33-04 of the Standard Construction Specifications.

In lieu of the above described surface treatments for areas within visibility control areas, low profile landscaping may be used providing that area is maintained by a responsible public entity and the landscape plans receive approval from the County.

4-16 INTERSECTION CORNER RADII and CURB EXTENSIONS

Minimum right-of-way and edge of pavement radii for intersection corner roundings shall be in accordance with the Standard Drawings and the following:

Street Type	Intersecting Street Type	R/W Radius	Radius at Lip of Gutter (Class A Street)
Minor Residential, Primary Residential, Collector or Major Collector	Minor Residential, Primary Residential, Collector, or Major Collector	20 feet	17 feet
Minor Residential	Arterial or Thoroughfare	24 feet	27 feet
Primary Residential, Collector, Major Collector, Arterial or Thoroughfare	Arterial or Thoroughfare	31 feet	34 feet

Curb extensions conforming to the geometry shown on Standard Drawings 4-53 and 4-56 shall be constructed at all intersections (except elbow intersections) of

Minor Residential, Primary Residential, Collector and Major Collector streets (any combination thereof).

All intersection pavement edges on partial streets, and at all intersection corner returns on all other Class C and Class D streets, shall have a minimum radius of 25 feet measured along the edge of pavement with the following exception. Where a Class C or a Class D street intersects with an Arterial or a Thoroughfare roadway, the minimum radius of the corner return shall be 35 feet. See Standard Drawing 4-41.

4-17 BUS STOP TURNOUTS

Bus stop turnouts shall be required on Arterial streets at all intersections with Arterial or Thoroughfare streets. Bus stop turnouts may also be required on Arterial streets at intersections with Collector and Major Collector streets as determined by the Director of Transportation. Bus stop turnouts shall be required on Thoroughfare streets at all intersections with Collector, Major Collector, Arterial and Thoroughfare streets. Bus stop turnouts may also be required at other locations along Arterial and Thoroughfare streets, as determined by the Director of Transportation, such that bus stop facilities are provided at approximately one-quarter mile intervals. Bus stop turnouts shall be located on the far right hand side of the intersection and shall be in accordance with Standard Drawings 4-43 & 4-44. Intersection geometry with bus stop turnouts shall conform to the geometry shown on Standard Drawings 4-6, 4-7, 4-8, 4-10, 4-12, 4-13 and 4-14.

Where intersections along Arterial and Thoroughfare streets are too widely spaced to provide satisfactory bus stop intervals, as determined by the Director of Transportation, mid-block bus stop turnouts may be required. Mid-block bus stop turnouts shall conform to the geometry shown on Standard Drawing 4-43.

4-18 SIDEWALK RAMP AND ACCESSIBILITY IMPROVEMENTS

Sidewalk ramps (also commonly referred to as “curb ramps”) shall be constructed at all street intersections and at other locations where required by the Director of County Engineering, in accordance with Standard Drawings 4-16 and 4-50 thru 4-57, as applicable.

At "T" intersections of residential and/or collector streets, one ramp shall be constructed in the appropriate position on the far side of the through street, opposite the ramps at the corner rounding of the intersecting street. The preferred location for that sidewalk ramp is on the side of the street such that pedestrians are encouraged to cross the through street on the leg unaffected by left-turning traffic from the intersecting street. See Standard Drawings 4-55 and 4-56.

All corners at all intersections of any street with an Arterial or Thoroughfare street shall have two sidewalk ramps per corner as shown on Standard Drawing 4-53. An exception to this requirement is for those intersections with roadway that has a raised median extending through the intersection. Those locations require only one ramp per corner.

In accordance with the requirements of the American with Disabilities Act (ADA), California Code of Regulations, Title 24 and the California Manual on Uniform Traffic Control Devices, any modification of any portion of an intersection shall require access improvements to all corners of that intersection. For the purpose of this requirement, modifications include, but are not limited to:

- Roadway widening through the intersection;
- Widening of a portion of the intersection;
- Construction of corner improvements (curbs, gutter, and/or sidewalks) in any portion of the intersection;
- Construction of a new traffic signal;
- Modification of an existing traffic signal;
- Resurfacing the pavement with an asphalt concrete overlay in any portion of the intersection; and
- Removal, replacement or construction of any storm drain facility within any corner return or any portion of a storm drain facility within any portion of a corner return.

Access improvements to the intersection include, but are not limited to, the construction of sidewalk ramps. Should there be existing sidewalk ramps prior to the modification of the intersection, it shall be the responsibility of the Developer to survey the existing sidewalk ramps to ensure that they comply with the current requirements of the ADA for existing ramps. If the Developer believes that any existing ramp on any corner of any intersection being modified as a part of their development meets current requirements of the ADA, that information, along with photographs and measurements of the subject sidewalk ramp(s), shall be provided to the County for review with the submittal of the development's roadway improvement plans for review. Should any existing ramp fail to meet those requirements, that ramp shall be removed and replaced with a sidewalk ramp that conforms to current County standards.

If an intersection is modified, as defined above, and if that intersection has an existing traffic signal, access improvements shall include the installation of ADA compliant pedestrian push buttons, should they not exist. Those push buttons shall conform to the ADA and County requirements including height, orientation, location relative to sidewalk areas, location relative to sidewalk ramps and location relative to the extension of crosswalk stripes.

Access improvement shall include the installation of audible pedestrian traffic signal at all intersections with existing traffic signals for which the work includes the modification of the traffic signal facilities.

4-19 CURB AND GUTTER

Curb and gutter shall be installed adjacent to all developments in accordance with Standard Drawing 4-30 and the following:

Type 1A Curb and Gutter: Type 1A Curb and Gutter has a curb that has a rolled shape so as to allow vehicle access across the curbing, as with a driveway, at any location. Type 1A Curb and Gutter shall be standard on Minor Residential and Primary Residential streets with attached (monolithic) sidewalk. On all other streets, Type 1A Curb and Gutter shall be allowed at developments where the roadway frontage is located within an area of undeveloped roadway with a length of less than three hundred feet and the roadway has been previously developed with rolled curb on both sides of the proposed development. Use of Type 1A curbing on any street other than a Minor Residential or Primary Residential street, or at “in-fill” locations as described above, shall require written approval of the Director of County Engineering.

Type 2 Curb and Gutter: Type 2 Curb and Gutter shall be required on all Class A streets of all street widths with the following exceptions:

- Type 1A Curb and Gutter with attached sidewalk may be used on 32-foot streets (Minor Residential) and 38-foot streets (Primary Residential). At the developer’s option, separated sidewalk with landscaped buffer areas may be constructed on residential streets. If separated sidewalk is used on residential streets, Type 2 Curb and Gutter shall be installed.
- Type 1A Curb and Gutter may be used along cul-de-sac bulbs and the outside portion of elbow intersections where attached (sidewalk) is used. See Standard Drawing 4-15 and 4-16.
- Type 1A Curb and Gutter may be used along the frontage of “in-fill” developments as described in section 4-6 of these Improvement Standards.

Type 2 Reinforced Curb and Gutter, as detailed on Standard Drawing 4-30, shall be installed in areas of bus turnouts as shown on Standard Drawing 4-43.

Type 2 Reinforced Curb and Gutter shall also be used in areas of areas of curb extensions (found at intersections of residential and collector streets) as shown on Standard Drawings 4-53 and 4-56. Regardless of the type of

curbing used on residential streets, either Type 1A or Type 2, the curb extensions on those streets shall have Type 2 Reinforced Curb and Gutter.

4-20 CROSS GUTTERS

Cross gutters may be permitted on 32-foot and 38-foot streets with the specific approval of the Director of County Engineering when the intersection cannot reasonably be drained to an underground system. See Standard Drawing 4-40. No cross gutter will be allowed on 48-foot or greater streets.

Cross gutters will not be allowed on any approach to a signalized intersection.

4-21 BARRIER CURBS

Barrier curbs shall be in accordance with these standards and Standard Drawing 4-30 (Type 3, 4, or 5 curb). Barrier curbs shall be required at all locations where parking will be allowed in a front yard. See Standard Drawing 4-33 for planter and barrier curb details.

A barrier curb shall be required at the back of sidewalk along landscaped corridors, and at the back of sidewalk along all commercial, industrial, church, school and multi-family residential properties, where landscape planters containing soil and/or mulch are adjacent to the sidewalk. A barrier curb is typically not required at the back of sidewalk adjacent to lawn.

A barrier curb shall be required at bus stops behind a sidewalk where the slope is toward the sidewalk (to prevent sheet flow across the sidewalk).

On residential developments, Under Sidewalk Drains may be used to remove drainage collected at the back of the barrier curb, as necessary to prevent any flow across the sidewalk. See Standard Drawing 4-34. On commercial, industrial, church and school developments, an on-site drainage system shall be utilized to collect drain waters which may otherwise collect at the back of the barrier curb.

A barrier curb shall be required behind a sidewalk where the slope behind the sidewalk is steeper than 6:1 and the slope is away from the sidewalk (for pedestrian safety). Where a retaining wall is allowed, creating a drop-off adjacent to the sidewalk, a minimum 36-inch high barrier fence is required in lieu of the barrier curb at the back of the sidewalk (see Section 4-31). Lot grading shall be done so as to not require fencing immediately adjacent to intersections and driveways in violation of the sight distance and visibility requirements of Standard Drawings 4-16 and 4-18 and Section 4-15.

4-22 SIDEWALKS

Sidewalks shall be in accordance with these standards and the geometry shown on the Standard Drawings.

All school developments shall have 8-foot wide sidewalks along all frontages, with the exception that 5-foot wide sidewalks may be used along fenced play areas where no pedestrian access to the school site is provided, as determined by the Director of County Engineering. If the use of the public street frontage along a school development will include the drop or pick up of students by school busses, then a plaza area shall be provided adjacent to the sidewalk and sufficient in size to accommodate student waiting and assembly exclusive of the sidewalk area.

Sidewalks within areas of pedestrian districts, as defined in Section 4-23 of these Improvement Standards, shall have 8-foot wide sidewalks.

For standard sidewalks separated from the roadway curbing by a landscaped buffer, no utility pole, guy wire, cabinet, hydrant, sign or other above ground facility shall be located within the sidewalk area. Traffic signal poles may be located with sidewalk areas to allow for pedestrian access to pedestrian push buttons, however four-foot minimum pedestrian clearance around poles must be provided.

For standard sidewalks that are attached to the roadway curbing (monolithic), all utility poles, guy wires, cabinets, hydrants, signs and other above ground facilities shall be located behind the sidewalk, within the easement for public utilities and public facilities, where possible. If such is not possible, the conflicting facility shall be located such that there is a minimum of four feet clear space for pedestrian use of the sidewalk. Where it is necessary to widen the sidewalk beyond its standard width to attain the 4-foot minimum clearance, the widened area shall extend a minimum of 10 feet beyond each side of the obstruction and a 10-foot taper on each side of the widening shall be provided.

The alignment of separated sidewalk may be altered from the standard roadway geometry so as to avoid conflict with an existing tree or a major utility facility. Realignment of up to three feet shall conform to the details shown on Standard Drawing 4-60. Realignments of separated sidewalk of more than three feet shall require the approval of the Director of County Engineering and shall utilize curving geometry departing from the standard sidewalk alignment by use of 150 foot minimum radii curves that extend to tangent points along the standard sidewalk geometry.

Bus benches located in or near sidewalk areas shall be situated such that there is six feet minimum clear width of sidewalk in front of the bench.

With approval by the Director, sidewalks may be separated from the curb by approved landscaping areas in excess of that indicated in the Standard Drawings.

The minimum width of the sidewalk will remain unchanged from the standard sidewalk for the roadway. The distance between the back of the curb and the edge of the sidewalk can vary, but shall not be more than 28 feet, except at transitions. The separated sidewalks will be designed such that the sidewalk will either:

- have least a 2-foot wide straight path along the alignment of the sidewalk and a 10-foot minimum distance at the back of walk between landscaped areas, or
- have no abrupt changes in direction and will be constructed using tangents of any length and inside radii of at least 150 feet.

Sidewalks separated from the back of curb in excess of twelve feet may require additional pedestrian scaled lighting facilities, including additional provisions for funding the maintenance and operation of those facilities. Determination of the need for additional lighting for non-standard sidewalks shall be determined by the Director of County Engineering. The Director of County Engineering may approve other configurations of separated sidewalks to save existing trees or for special design applications.

Where sidewalks end between intersections without continuity to an existing sidewalk, an AC sidewalk conform shall be provided so as to allow pedestrian access to the roadway shoulder beyond the limit of sidewalk construction (See Standard Drawings 4-58 and 4-59). At locations where sidewalks end between intersections without continuity to an existing sidewalk and a vertical drop off, such as a roadside ditch or swale, will exist beyond the limit of sidewalk, then a sidewalk barricade shall be provided in addition to the AC sidewalk conform (See Standard Drawing 4-61).

4-23 PEDESTRIAN DISTRICTS & COMMERCIAL CORRIDORS

Sidewalks within areas of pedestrian districts shall be 8-feet wide. Pedestrian districts are at the following locations within Sacramento County as specified in the Pedestrian Master Plan adopted by the County's Board of Supervisors:

Pedestrian District Segment	From	To
47th Avenue	Franklin Boulevard	Martin Luther King Jr. Blvd.
47th Avenue	44th Street	Steiner Drive
48th Street	County Line near Baker Avenue	Yosemite Avenue
Alta Arden Expressway	Bell Street	Watt Avenue
American River Drive	Mering Court	Wyndgate Road
Archer Avenue	Plumeria Ave	Fair Oaks Boulevard
Arden Avenue	Hesket way	Fulton Avenue
Auburn Boulevard	County Line near Kitty Lane	County Line (Citrus Heights)
Auburn Boulevard	Bell Street	Pasadena Avenue

Pedestrian District Segment	From	To
Bridge Street	Fair Oaks Boulevard	Grand Avenue
Butano Drive	El Camino Avenue	Cottage Way
Cottage Way	Cortez Lane	Weldon Way
Crondall Drive	Estates Drive	Cul De Sac Near Exeter Street
Cypress Avenue	George Road	Manzanita Avenue
El Camino Avenue	Winsford Lane	Carmichael Way
El Camino Avenue	Ethan Way	Butano Drive
Elkhorn Boulevard	34th Street	Stoneman Drive
Elsie Avenue	Stockton Boulevard	Iona Way
Fair Oaks Boulevard	Vine Grove Lane	Sunrise Boulevard
Fair Oaks Boulevard	El Camino Avenue	Marshall Avenue
Fair Oaks Boulevard	County Line (Near Howe Avenue)	San Lucas Way
Florin Road	Franklin Boulevard	Florin Perkins Road / French Rd.
Folsom Boulevard	Watt Avenue	County Line (Rancho Cordova)
Folsom Boulevard	Sunrise Boulevard	Aerojet Road
Franklin Boulevard	County Line (near 41st Avenue)	Florin Road
Freedom Park Drive	34th Street	Watt Avenue
Fulton Avenue	Auburn Boulevard	Arden Way
Fulton Avenue	Fair Oaks Boulevard	Sierra Boulevard
Garfield Avenue	Leader Avenue	White Fir Way
Gerber Road	Stockton Boulevard	Fernridge Drive
Greenback Lane	Fair Oaks Boulevard	County Line – East of Main Ave.
Howe Avenue	Marconi Avenue	Cottage Way
Howe Avenue	Spanos Court	Fair Oaks Boulevard
Locust Avenue	Younger Way	Manzanita Avenue
M Street	Rio Linda Boulevard	8 th Street
Madison Avenue	Harrison Street	Hemlock Street
Madison Avenue	Almaden Way	1/8 Mi. East of Fair Oaks Blvd.
Madison Avenue	Walnut Avenue	Main Avenue
Main Avenue	1/8 Mi. North of Orangevale Ave.	Madison Avenue
Manzanita Avenue	Bourbon Drive	Fair Oaks Boulevard
Marconi Avenue	Garfield Avenue	Fair Oaks Boulevard
Marconi Avenue	Wright Street	Corabel Lane
Martin Luther King Jr. Blvd	35th Avenue	47th Avenue
Morse Avenue	Cottage Way	Maison Way
North River Way	Ashton Drive	American River Frontage
Old Winding Way	Winding Way	Fair Oaks Blvd
Orange Grove Avenue	Roseville Road	Palomino Lane
Orange Grove Avenue	Creek Road	Sycamore Ave
Palm Drive	Fair Oaks Boulevard	Panama Avenue
Pasadena Avenue	Orange Grove Avenue	Arcade Creek
Plumeria Avenue	West end of Plumeria Avenue	Fair Oaks Boulevard
Pope Avenue	Edison Avenue (extend westerly)	Watt Avenue

Pedestrian District Segment	From	To
Power Inn Road	Elsie Avenue	County Line (Elk Grove)
Rio Linda Boulevard	Elkhorn Boulevard	M Street
Roosevelt Avenue	44th Street	Stockton Boulevard
Roseville Road	1/4 Mi. So. of Orange Grove Ave	Madison Avenue
Sacramento Street	Watkins Drive	Fair Oaks Boulevard
Shangrilla Drive	Fair Oaks Boulevard	Dietz Way
Southwest Avenue	Nina Way	Stockton Boulevard
Stevenson Avenue	E. Stockton Boulevard	Neisa Way
Stockton Boulevard	Southwest Avenue	County Line near McMahon Dr.
Stockton Boulevard	County Line near Patterson Way	Elsie Ave
Sunset Avenue	Livoti Avenue	Tommar Drive
Sutter Avenue	Horton Lane	California Avenue
Watkins Drive	Sacramento Street	Fair Oaks Boulevard
Watt Avenue	Antelope Road / U Street	Roseville Road
Watt Avenue	Auburn Boulevard	Arden Way
Watt Avenue	Fair Oaks Boulevard	The American River
Winding Way	Hackberry Lane	Mary Lynn Lane
Winding Way	Sunrise Boulevard	Fair Oaks Boulevard

Commercial corridors are areas within Sacramento County for which roadway development may be required to exceed the standards described elsewhere in these Improvement Standards. The possible higher level of development standards for the affected roadways may include additional right-of-way, additional width of easements for public facilities and utilities, greater width of street roadways, wider sidewalks, additional landscaping features, additional street lighting, enhanced drainage facilities and improved streetscape features.

Additional time and coordination with County staff will be required to identify special development standards which may apply to specific projects located within the identified commercial corridors.

The following locations are designated as commercial corridors:

Commercial Corridor Segment	From	To
47 th Avenue	County Line (near Stockton Blvd.)	Martin Luther King Jr. Blvd.
65 th Street Expressway	County Line (Sac. City Limit)	Florin Road
Alta Arden Expressway	Wright Street	Watt Avenue
Arden Way	Hesket Way	El Nido Way
Auburn Blvd	County Line (near Kitty Lane)	Manzanita Avenue
Auburn Blvd	Howe Avenue	Pasadena Avenue
Calvine Rd	Golden State Highway (SR 99)	Short Road
El Camino Ave	Winsford Lane	Carmichael Way
El Camino Ave	Ethan Way	Butano Drive
Elsie Ave	Stockton Boulevard	Iona Way
Fair Oaks Blvd	Vine Grove Lane	Sunrise Boulevard

Commercial Corridor Segment	From	To
Fair Oaks Blvd	El Camino Avenue	Marshall Avenue
Fair Oaks Blvd	Howe Avenue	San Lucas Way
Fair Oaks Boulevard	Sun Tree Lane	Woodlake Hills Drive
Florin Road	Franklin Boulevard	Florin Perkins Road / French Rd.
Folsom Boulevard	Sunrise Boulevard	Aerojet Road
Folsom Boulevard	Watt Avenue	County Line (Rancho Cordova)
Franklin Boulevard	County Line (near 41st Avenue)	Florin Road
Fulton Avenue	Auburn Boulevard	Arden Way
Fulton Avenue	Fair Oaks Boulevard	Monroe Street
Greenback Lane	Fair Oaks Boulevard	County Line (East of Main Ave.)
Hazel Avenue	Fortuna Way	Cerezo Drive
Howe Avenue	Spanos Court	Fair Oaks Boulevard
Madison Avenue	Harrison Street	Hemlock Street
Madison Avenue	Almaden Way	1/8 Mile East of Fair Oaks Blvd.
Main Avenue	1/8 Mi. North of Orangevale Ave.	Madison Avenue
Manzanita Avenue	Bourbon Drive	Fair Oaks Boulevard
Power Inn Road	Junipero Street	Loucreta Drive
Stockton Boulevard	Southwest Avenue	County Line near McMahon Dr.
Stockton Boulevard	County Line near Patterson Way	66th Avenue
Stockton Boulevard	14 th Avenue	21 st Avenue
Sunrise Boulevard	Fair Oaks Boulevard	Winding Way
Watt Avenue	Antelope Road / U Street	I-80
Watt Avenue	Auburn Boulevard	Arden Way
Watt Avenue	San Lucas Way	La Riviera Drive

4-24 PEDESTRIAN LANES

Pedestrian lanes within a development shall be constructed with a minimum of 3-5/8 inches of Portland cement concrete on six inches of aggregate base for the full width of the easement, unless otherwise approved by the Director of County Engineering.

The maximum grade for pedestrian lanes shall be 5.0 percent. The minimum grade shall be 0.5 percent.

Pedestrian lanes, where situated between lots, shall be fenced from the street right of way to the back lot line. Fencing materials shall be decorative and shall be acceptable to the Director of County Engineering. Fences shall be 6 feet high from the building setback line to the back lot line and 36 inches high from the building setback line to the limit of the public easement area behind the back of sidewalk.

Cross fencing to control access shall be placed at the street ends of all pedestrian lanes in accordance with Standard Drawing 4-78.

All pedestrian lanes shall have lighting installed in accordance with Section 5-7(C).

4-25 REPLACING CULVERTS

The County will cooperate in the replacement of highway cross culverts for the same length as the existing culverts as follows (See Section 4-2):

- A. The entire cost for inflowing cross culverts to the property under development that must be replaced.
- B. The entire cost for out-flowing cross culverts if the existing culvert is of unsatisfactory size and has unsatisfactory grade.
- C. If the existing out-flowing cross culvert is to a satisfactory grade but unsatisfactory size, the County will pay for the cost of the pipe only.
- D. If the existing out-flowing cross culvert is of satisfactory size, the County will not participate in the cost to replace the culvert.
- E. The Sacramento County Water Agency Code allows for credit / reimbursement of certain truck drainage facilities, excluding culverts and bridges. Such credit / reimbursement will be by Agreement with the Water Agency.

4-26 TRENCHING IN EXISTING PAVED ROADWAYS

Crossings other than perpendicular crossings of existing roadways and all trenching in high traffic locations shall include the use of select backfill material and increased structural section depth over the standard for that particular roadway. Boring may be required on Arterial and Thoroughfare streets where, in the opinion of the Director of Transportation, high peak hour traffic volumes or other unusual conditions exist. The Developer may be required to coordinate trenching work schedules to avoid cutting new pavement in instances where repaving is planned by the County.

No pavement cuts or trenching will be permitted on any street that has been constructed or has been overlaid within the last three years. Special pavement replacement requirements exist for street cuts or trenching in streets that have been constructed or overlaid within a period of three to five years prior to the time of work. See Standard Drawing 4-64 for standard trench sections.

4-27 TESTING OF MATERIAL

Testing of materials to be utilized in work performed under the Standard Construction Specifications shall be performed in accordance with the methods of the Laboratory of the State of California, Department of Transportation. Signed

copies of the test results, as required, shall be submitted to the Director. Test results shall show the name of the individual and firm performing the tests, as well as the name of the project, the date of sampling, and the date of testing. Tests performed by the County Materials Laboratory will be charged to the Developer as part of inspection billing.

The tests indicated in the Standard Construction Specifications will be the minimum required. In large developments, or those developments presenting special problems, a more comprehensive and extensive testing program may be required. Such conditions will be evaluated and an appropriate testing program prescribed on an individual basis. Two copies of any Federal Housing Administration required soils tests shall be submitted with proposed improvement plans.

4-28 STREET NAMES

All roads and streets within a development shall be named by the Developer subject to the approval of the Director of County Engineering. No duplication of names already in use or previously proposed will be permitted. Sound-alike names or names with more than 13 characters (including word spaces) are not acceptable. Street names at intersections shall be continued on both sides of the intersecting streets.

Street name signs shall be furnished and erected by the Developer. Street name signs shall conform to the requirements of the Standard Construction Specifications, as shown on the Standard Drawings, and as specified in these Improvement Standards.

Block numbering shall be required on all street name signs.

Private roads that serve seven or more residences shall have street name signs installed in accordance with Section 4-29 below. Street name signs for private roads may be the same as for public streets (See Standard Drawing 4-70) except the words "Sacramento County" must be omitted. Also, a separate additional sign must be placed on the same post saying "Not a County Road" which shall be 9 inches wide, 8 inches high, and have 1-3/4 inch high black letter on a white background.

Private roads that serve two to six or residences shall have address numbers posted at the private road entry that are visible from both directions of vehicular travel on the public road. Block numbering, 4 inches in height minimum, shall be provided.

4-29 STREET SIGN LOCATION

Street names and street name sign locations shall appear on plans submitted for approval. Sign shall be located in accordance with Standard Drawings 4-71, 4-72, and 4-73.

Street sign locations must also conform to the following:

- A. Two street name sign installations (with four sign plates on each post) are required at each intersection where one or both of the intersecting streets is an Arterial or Thoroughfare roadway. At a four-way intersection, the installations shall be located on both far right-hand corners of the intersection relative to the street having the greater right-of-way width, or relative to the street with the greater volume of daily vehicle traffic if right-of-way widths are equal.

At a "T" intersection, the first installation shall be located on the far right-hand corner of the intersection, relative to the through street, and the second installation shall be located adjacent to the through street at a point in line with the centerline of the terminating street. One sign plate should be omitted from the standard four-plate installation at the "T" intersection sign locations where an approach street does not exist.

- B. One street name sign installation (with four sign plates on each post) is required at each intersection where neither roadway is an Arterial or a Thoroughfare street. At a four-way intersection, the installation shall be located on one of the far right-hand corners of the intersection relative to the street having the greater right-of-way width or relative to street with the greater volume of daily vehicle traffic if the right-of-way widths are equal. At a "T" intersection, the installation shall be located on the far right-hand corner relative to the through street.
- C. For streets with frontage roads, the street name sign installations shall be located in the divider strip between the frontage road and the main traveled lanes of the roadway. All other requirements shall be as outlined above, except that only one sign will be required (in the divider strip in line with the centerline of the intersecting street) when there is no opening in the divider strip for access to the main roadway.
- D. Standard Drawings 4-71 through 4-73 show placement details for street name signs. The street name sign installations are to be located adjacent to the more important street, at the end of the curb return.
- E. Street name signs shall be placed on street light poles wherever possible, in accordance with Standard Drawings 4-73 and 4-74

- F. At signalized intersections, street name signs shall be placed on all four corners of four-legged intersections and on three corners on “T” intersections. Signs shall be suspended from traffic signal mast arms and be made using highly reflective sheeting. Letter size shall be 10-inch for upper case and 8-inch for lower case letters, Clearview 5-W-R font.

4-30 TRAFFIC SIGNS

The Developer shall be 100% responsible for the procurement and installation of all necessary traffic signs and pavement stripping generated by their development. Traffic signs and pavement striping shall conform to the “Manual of Uniform Traffic Control Devices”, “MUTCD State of California Supplement”, and as required by the County’s Department of Transportation. A traffic signing and striping plan, if applicable, shall be included in the improvement plans submitted for approval by the County’s Department of Transportation. A striping plan is required for all developments on Collector, Major Collector, Arterial and Thoroughfare roadways because these streets have standard roadway striping (including striped bicycle lanes).

All cul-de-sac and dead-end (stub) streets greater than 300 feet in length and all cul-de-sac and dead-end (stub) streets less than 300 feet in length where the curb at the centerline of the end of the street is not visible from the standard driver's eye position at the entering intersection shall be posted with a standard 24" x 24" code W14-2 (No Outlet) sign. The bottom of the sign shall be a minimum of 7 feet above the sidewalk. The standard location for the W14-2 sign is on the right hand side at the tangent point of the corner rounding, 6 inches (minimum) from the back of sidewalk.

See Standard Drawings 4-75 and 4-76 for sign post embedment and sign height details.

4-31 ROADWAY & SIDEWALK TERMINATION

Where roadway improvements are terminated on a street planned to be extended in the future creating a stub street (a “dead end” road), the improvements shall include a street barricade at the end of the street extending completely across the right-of-way to prohibit access and to serve as a warning to the public. The barricade shall be constructed, erected, painted, and signed in accordance with Standard Drawing 4-63. If the stub street includes sidewalk, then the street barricade shall extend across the sidewalk area in addition to crossing the terminated roadway. Barricades for such roads shall be a combination of street and sidewalk barricades conforming to both Standard Drawings 4-61 and 4-63.

Gates may be required where streets stub into public park areas or other like areas.

If the stub street is 150 feet or longer, provisions for the turning around of emergency vehicles shall be provided at the end of the stub street. At a minimum, a cul-de-sac constructed with a radius of 33 feet measured from center of bulb to edge of pavement with the bulb signed for “no parking” shall be constructed. Other designs for the safe operation of emergency vehicles may be used subject to the approval of the Director of County Engineer and the local fire authority.

Timber barricades, in accordance with Standard Drawing 4-63, shall be required where partial street widening in excess of eight feet in roadway width terminates without conform to an existing roadway. The barricade is only required on the side of the street termination that faces traffic after the traffic passes the frontage of the development. If the ground beyond the pavement constriction is free of fixed objects and relatively flat, the Director of Transportation may approve the placement of delineators on 6-foot spacing as shown on Standard Drawing 4-62 in lieu of a timber barricade.

Where sidewalks end between intersections without continuity to an existing sidewalk, an AC sidewalk conform shall be provided so as to allow pedestrian access to the roadway shoulder beyond the limit of sidewalk construction. See Standard Drawings 4-58 and 4-59. At locations where sidewalks end between intersections without continuity to an existing sidewalk and a vertical drop off, such as a roadside ditch or a fill slope steeper than 1:20, will exist beyond the limit of sidewalk, then a sidewalk barricade shall be provided in addition to the AC sidewalk conform. See Standard Drawing 4-61.

4-32 STREET TREES

Permission to remove any tree in County right-of-ways or public easements shall be obtained from the Director of Transportation in advance. A Tree Removal Permit Encroachment Permit is required. All trees removed from within the ultimate right-of-way (including areas of public easements) shall be replaced with trees from the approved street tree list if required per the project conditions of approval or required by the Director.

Trees shall not be planted any closer than five feet from the back of sidewalks adjacent to County streets unless approved by the Director. If trees are approved to be planted closer than 5 feet, then a root control barrier shall be installed along the back of the sidewalk. A 20-foot wide panel shall be centered on the trunk of each tree planted. Root control panels adjacent to sidewalks shall be 24” deep minimum.

Root control panels are required around all sides of landscaped medians that include tree plantings. Root control panels are required around all sides of

landscaped buffer areas between curbing and sidewalk. Root control panels shall be 24" deep minimum.

Approved trees for planting in County rights-of-way and public easements are listed as follows (desired trees not listed may be planted with the approval of the Director of the Department of Transportation):

DECIDUOUS STREET TREES

<u>Botanical Name</u>	<u>Common Name</u>
Acer platanoides	Norway Maple
Acer platanoides "Crimson King"	Red Leaf Norway Maple
Acer platanoides "Deborah"	Deborah Maple
Acer rubrum	Red Maple
Acer rubrum "Autumn Flame"	Autumn Flame Maple
Acer rubrum "October Glory"	October Glory Maple
Acer rubrum "Red Sunset"	Red Sunset® Maple
Carpinus betulus	European Hornbeam
Carpinus betulus "Fastigiata"	Pyramidal European Hornbeam
Celtis occidentalis	Hackberry
Celtis sinensis	Chinese Hackberry
Fraxinus americana "Autumn Purple"	Autumn Purple Ash
Fraxinus uhdei	Evergreen Ash
Nyssa sylvatica	Tupelo/Sour Gum
Pistacia chinensis	Chinese pistache
Platanus acerifolia "Bloodgood"	London PlaneTree
Platanus acerifolia "Columbia"	Columbia PlaneTree
Platanus acerifolia "Yarwood"	London PlaneTree
Pyrus calleryana "Aristocrat"	Aristocrat
PearPyrus calleryana "Capital"	Capital Pear
Pyrus calleryana "Chanticleer"	Chanticleer Pear
Quercus cerris	Turkey Oak
Quercus coccinea	Scarlet Oak
Quercus lobata	Valley Oak
Quercus macrocarpa	Burr Oak
Quercus phellos	Willow Oak
Quercus robur	English Oak
Quercus rubra	Red Oak
Sapium sebiferum	Chinese Tallow Tree
Tilia americanaAmericana	American Linden

EVERGREEN STREET TREES

<u>Botanical Name</u>	<u>Common Name</u>
Laurus nobilis	Grecian Laurel
Magnolia grandiflora	Southern Magnolia

EVERGREEN STREET TREES (continued)

<u>Botanical Name</u>	<u>Common Name</u>
Magnolia grandiflora "St. Mary's"	St. Mary's Magnolia
Quercus agrifolia	Coast Live Oak
Quercus ilex	Holly Oak
Quercus suber	Cork Oak
Quercus wislizenii	Interior Live Oak
Umbellularia California	California Bay

CONIFER STREET TREES

<u>Botanical Name</u>	<u>Common Name</u>
Calocedrus decurrens	Incense Cedar
Pinus halepensis	Allepo Pine

STREET TREES UNDER POWER LINES

<u>Botanical Name</u>	<u>Common Name</u>
Acer palmatum	Japanese Maple
Acer buergerianum	Trident Maple
Cercis occidentalis	Western Redbud
Cercis Canadensis	Eastern Redbud
Lagerstroemia indica (tree standard)	Crape Myrtle
Olea europaea 'Fruitless'	Fruitless Olive
Prunus species (tree standard)	Flowering plums
Pyrus kawakamii	Evergreen Pear

4-33 FENCES

The location for fences or walls along public streets shall conform to the requirements of the Sacramento County Zoning Code, Article 5: REGULATIONS PERTAINING TO WALLS AND FENCES. Fences or walls shall not encroach upon visibility easements required by Section 4-15 as well as Standard Drawings 4-16 and 4-18. All fences and walls are subject to the visibility requirements of the Sacramento County Code (Title 12). Fences and walls may require modification to accommodate street light poles and/or foundations.

4-34 PRIVATELY OWNED BRIDGE

A bridge intended for the sole use of the occupants of a multi-family type development shall be located beyond the limits of the public right-of-way and beyond the limits of any adjoining public easements. Privately owned bridges shall be designed to withstand HS20-44 loading, unless specifically approved by the

Director of County Engineering for a lesser loading. Other design features of the bridge, including but not limited to widths, railings, clearances and materials shall be in conformance with County and State Standards. A soil report prepared by a qualified soil engineer will be required. Design calculations signed by the Consulting Engineer and including the registration number shall be required.

4-35 VEHICLE ACCESS AT STREET TERMINATIONS

Vehicular access to private property shall not be permitted from the end of a stubbed street. To obtain vehicular access to such properties, the street must be extended through the property or properly terminated with a standard cul-de-sac bulb.

4-36 STRIPED CROSSWALKS

Striped crosswalks shall be installed at all pedestrian crossings at intersections with traffic signals. Striped crosswalks may be installed at street intersections without traffic signals with the approval of the Director of the Department of Transportation and subject to the Department of Transportation's guidelines.

Striped crosswalks may also be installed at mid-block locations on roadways where high demand for pedestrian crossing is anticipated (adjacent to bus stops, near schools, adjacent to libraries, parks, shopping districts, etc.). All locations of mid-block crossings shall require approval of the Director of Transportation. Mid-block crossings of Arterial and Thoroughfare streets also require the installation of traffic signal controls.

Where a striped crosswalk leads to a sidewalk that is not at the same grade as the roadway surface, a sidewalk ramp conforming to Standard Drawings 4-50 thru 4-55, as applicable, shall be constructed. The terminal ends of the striped crosswalks shall be located such that the fully lowered portion of the associated sidewalk ramp, at the extension of the back of curb, is within the extension of the crosswalk stripes.

All installations of striped crosswalks shall result in crosswalks that have straight alignments, without any change in direction between the terminal ends of the crosswalks. Any modification to a corner return with an existing striped crosswalk shall not result in a change to the existing crosswalk that would introduce a change in direction within the crosswalk's alignment. Modification of a corner return with a crosswalk that exists with a "crooked" alignment, one with a change of direction within the limits of the crosswalk, shall include the necessary modifications to allow for the restriping of that crosswalk such that it will have a straight alignment.

New drain inlets shall be located such that they are a minimum of five feet clear of the location of any crosswalk. New drain inlets should be located on the upstream side of the corner return. Existing drain inlets that are within a crosswalk area

should be either relocated out of the crosswalk or modified such that the grate configuration and the surrounding grades for pavement and gutter meet ADA walkway requirements. If an existing drain inlet is proposed to remain in an area that will be a pedestrian pathway (within a crosswalk) and so is proposed to be modified to conform to ADA walkway requirements, then an additional drain inlet is to be placed in the vicinity of the existing inlet, outside of the crosswalk area so as to provide drain inlet capacity lost by the modification of the existing inlet.

If a new mid-block pedestrian crossing is proposed, modifications to the existing drainage system on the roadway may be required in order to accommodate the storm water flow in the gutters in the vicinity of the new pedestrian connections.

4-37 PEDESTRIAN REFUGE AREAS

Pedestrian Refuge Areas are locations within raised roadway medians for pedestrians to wait to assist them in crossing streets. Pedestrian Refuge Areas shall conform to the guidelines of the Department of Transportation and are subject to the approval of the Director of Transportation. In general, Pedestrian Refuge Areas may be considered for use at the following locations:

- Unsignalized mid-block locations on Major Collector streets that have raised medians and where frequent pedestrian crossings occur or are expected to occur;
- Unsignalized intersections on Major Collector streets that have raised medians extending across the intersection such that turn movements from the side streets that could conflict with the pedestrian movement are prohibited, and where frequent pedestrian crossings occur or are expected to occur;
- Unsignalized intersections on Arterial streets that have raised medians extending across the intersection such that turn movements from the side streets that could conflict with the pedestrian movement are prohibited, and where frequent pedestrian crossings occur or are expected to occur;
- Signalized mid-block locations on streets with raised medians; and
- Signalized intersections on Major Collector, Arterial and/or Thoroughfare streets where sufficient additional width exists within the raised median in the vicinity of crosswalk(s).

Pedestrian Refuge Areas shall conform to the geometry shown on Standard Drawing 4-37.

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4 – 75	Sign Post Embedment Details, Pedestrian Areas
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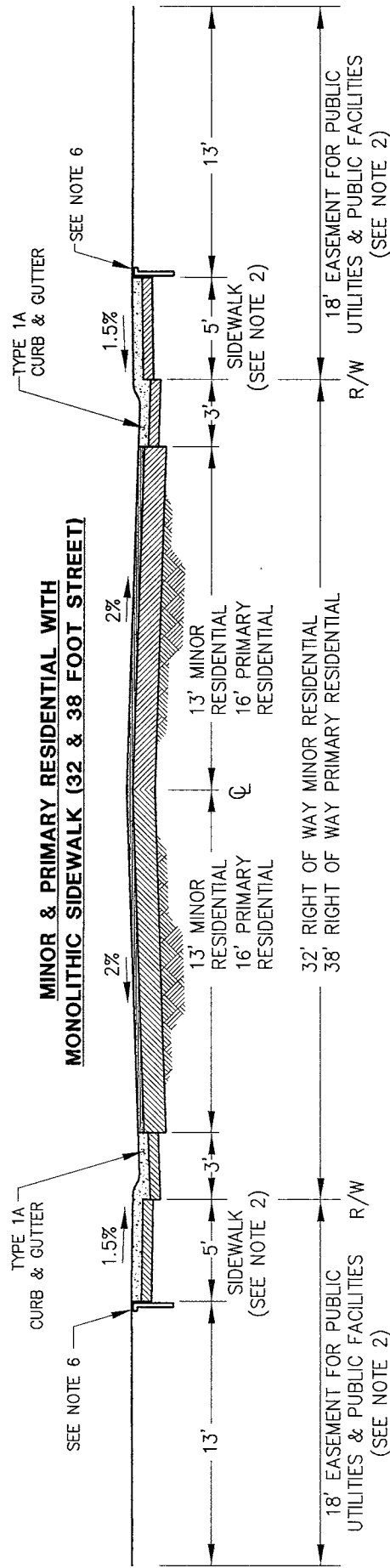
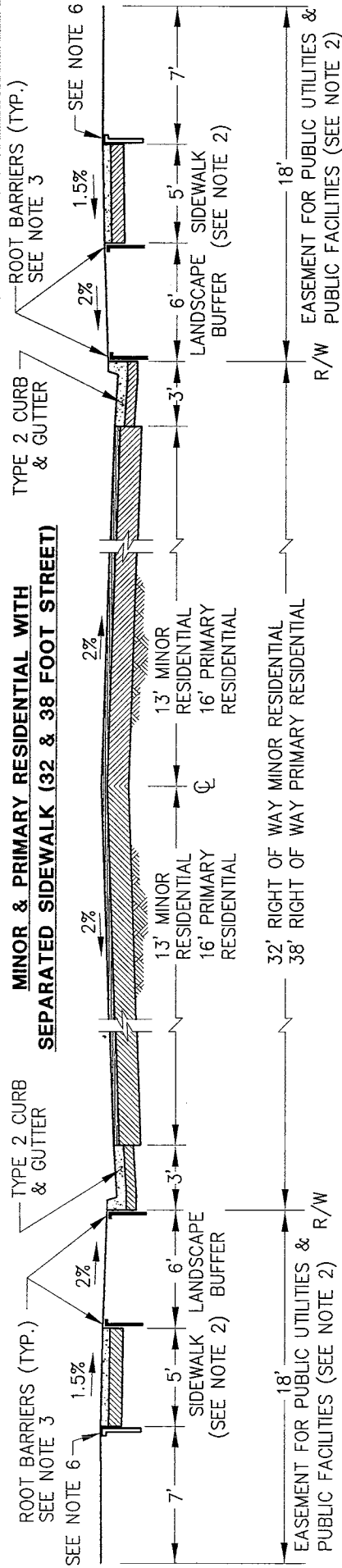
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The following drawings are only to be used on streets with attached sidewalks. Attached sidewalks may be used on Minor Residential and Primary Residential streets, or along street frontage of certain infill development projects (projects with less than three hundred feet of street frontage with existing substandard improvements on both sides of the proposed development). Use of these drawings at any other location requires written permission of either the Director of County Engineering or the Director of Transportation.

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4 – A – 61	Sidewalk Barricade
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4 – A – 73	Street Name Sign Placement Detail on Street Light Pole Installations



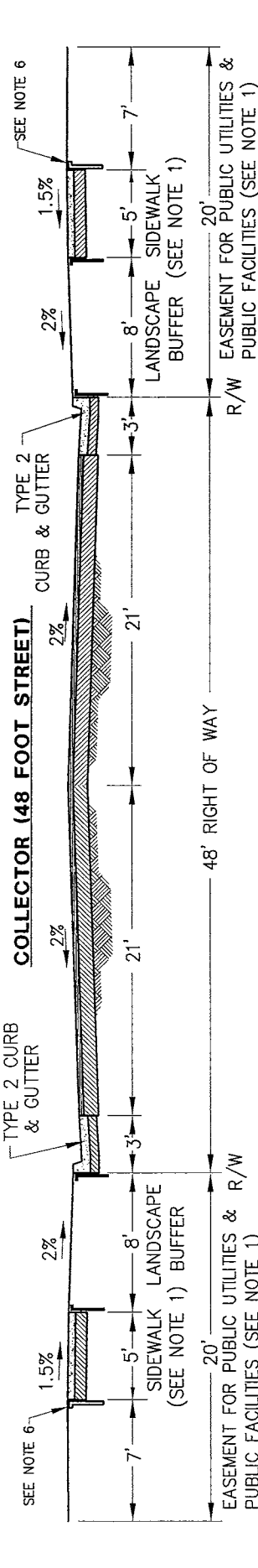
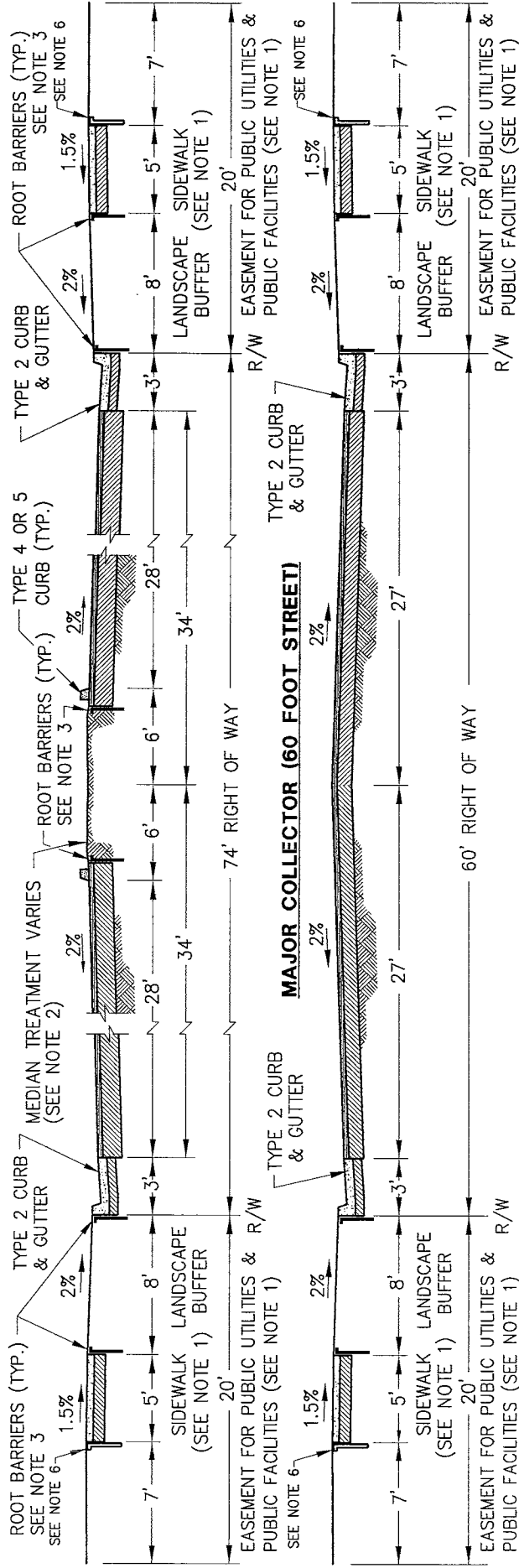
NOTES:

1. FOR MINOR RESIDENTIAL & PRIMARY RESIDENTIAL STREETS, THE STANDARD INSTALLATION INCLUDES ATTACHED (MONOLITHIC) SIDEWALK. AT THE DEVELOPER'S OPTION, SEPARATED SIDEWALK, AS SHOWN ABOVE, MAY BE USED.
2. SIDEWALK WIDTH SHALL BE 8' AND PUBLIC EASEMENT SHALL BE 21' AT SCHOOLS, HOSPITALS, AND PEDESTRIAN DISTRICTS AS SET FORTH IN SECTION 4-23 OF THE IMPROVEMENT STANDARDS.
3. 24" ROOT BARRIERS SHALL BE PLACED CONTINUOUSLY ON ALL SIDES OF LANDSCAPED BUFFERS.
4. LANDSCAPED BUFFER AREAS ARE FOR LANDSCAPING AND IRRIGATION FACILITIES. OTHER THAN FIRE HYDRANTS, COUNTY ROAD SIGNS, STREET LIGHTS, AND PERPENDICULAR CROSSINGS (SUCH AS SERVICE LATERALS) NO UTILITY FACILITIES (NOR COMMERCIAL SIGNS) SHALL BE INSTALLED IN LANDSCAPED BUFFER AREAS.
5. NO ABOVE GROUND FACILITY (CABINET, HYDRANT, POLE, SIGN, ETC.) SHALL BE INSTALLED IN SIDEWALK AREAS.
6. USE ROOT BARRIER ALONG BACK OF SIDEWALK FOR A LENGTH OF TWENTY FEET WHERE TREE TRUNK IS WITHIN FIVE FEET OF BACK OF SIDEWALK.

<p>COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY</p>	
<p>TYPICAL SECTIONS RESIDENTIAL STREETS CLASS A</p>	
<p>SCALE: NONE DATE: 05/29/09 DRAWN BY: B.R. & TRU P.</p>	<p>4-1</p>

[Signature]
CHIEF, DEPT. OF TRANSPORTATION

ARTERIAL WITH MEDIAN (74 FOOT STREET)



- NOTES:
1. SIDEWALK WIDTH SHALL BE 8' AND PUBLIC EASEMENT SHALL BE 23' AT SCHOOLS, HOSPITALS, AND PEDESTRIAN DISTRICTS AS SET FORTH IN SECTION 4-23 OF THE IMPROVEMENT STANDARDS.
 2. MEDIAN LANDSCAPING, IRRIGATION, AND FLATWORK SHALL MEET THE REQUIREMENTS OF THE DEPARTMENT OF TRANSPORTATION. USE OF CENTER TWO-WAY LEFT TURN LANE MAY BE USED IN LEU OF RAISED LANDSCAPE MEDIAN WITH WRITTEN PERMISSION FROM THE DIRECTOR OF THE DEPARTMENT OF TRANSPORTATION.
 3. 24" ROOT BARRIERS SHALL BE PLACED CONTINUOUSLY ON ALL SIDES OF LANDSCAPED BUFFERS.
 4. LANDSCAPED BUFFER AREAS ARE FOR LANDSCAPING AND IRRIGATION FACILITIES. OTHER THAN FIRE HYDRANTS, COUNTY ROAD SIGNS, STREET LIGHT, AND PERPENDICULAR CROSSINGS (SUCH AS SERVICE LATERALS) NO UTILITY FACILITIES (NOR COMMERCIAL SIGNS) SHALL BE INSTALLED IN LANDSCAPING BUFFER AREA.
 5. NO ABOVE GROUND FACILITY (CABINET, HYDRANT, POLE, SIGN, ETC.) SHALL BE INSTALLED IN SIDEWALK AREA.
 6. USE ROOT BARRIER ALONG BACK OF SIDEWALK FOR A LENGTH OF TWENTY FEET WHERE TREE TRUNK IS WITHIN FIVE FEET OF BACK OF SIDEWALK.

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TYPICAL SECTIONS
ARTERIAL & COLLECTOR
STREETS, CLASS A

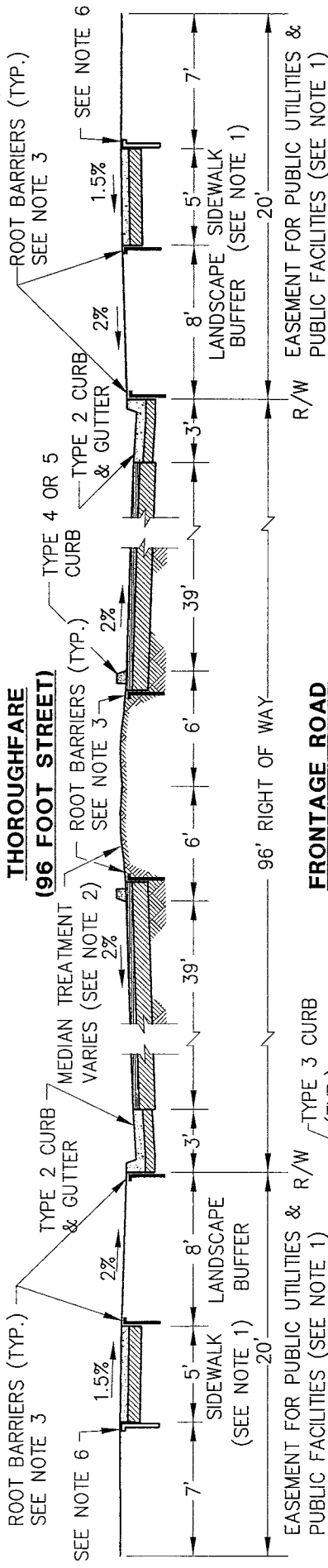
SCALE: NONE
DATE: 06/08/09
DRAWN BY: B.R. & TRU P.

4-2

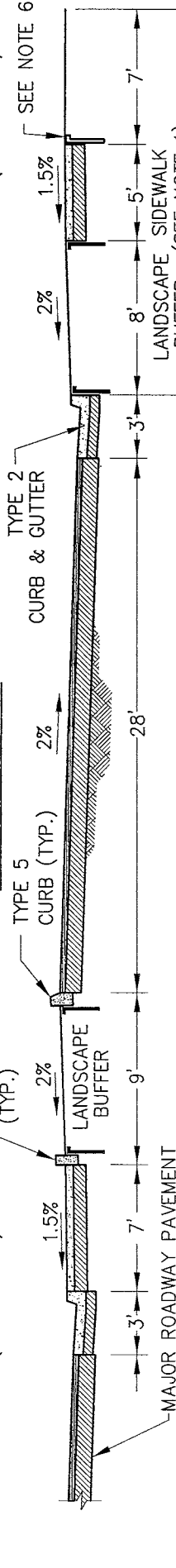
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CHIEF, DEPT. OF TRANSPORTATION

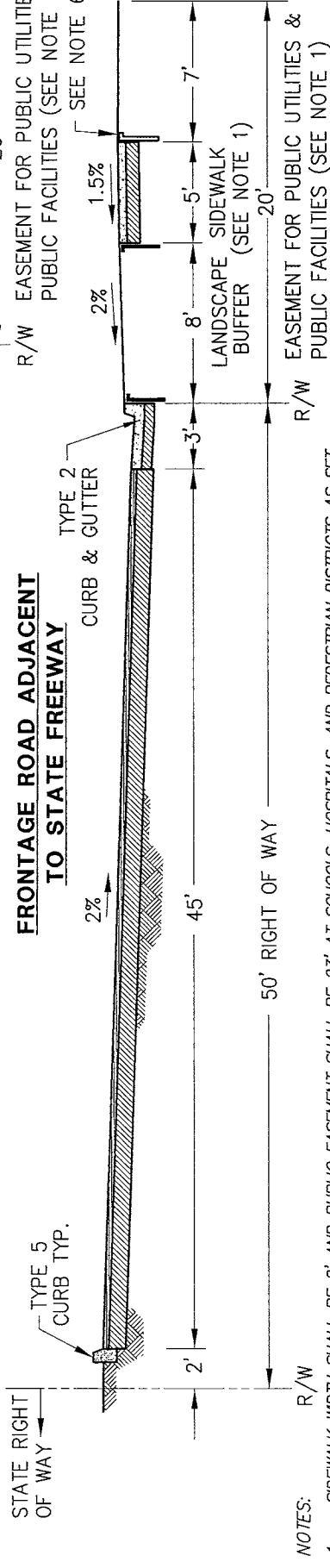
THOROUGHFARE (96 FOOT STREET)



FRONTAGE ROAD



FRONTAGE ROAD ADJACENT TO STATE FREEWAY



NOTES:

1. SIDEWALK WIDTH SHALL BE 8' AND PUBLIC EASEMENT SHALL BE 23' AT SCHOOLS, HOSPITALS, AND PEDESTRIAN DISTRICTS AS SET FORTH IN SECTION 4-23 OF THE IMPROVEMENT STANDARDS.
2. MEDIAN LANDSCAPING, IRRIGATION, AND FLATWORK SHALL MEET REQUIREMENTS OF THE DEPARTMENT OF TRANSPORTATION.
3. 24" ROOT BARRIERS SHALL BE PLACED CONTINUOUSLY ON ALL SIDES OF LANDSCAPED BUFFERS.
4. LANDSCAPED BUFFER AREAS ARE FOR LANDSCAPING AND IRRIGATION FACILITIES. OTHER THAN FIRE HYDRANTS, COUNTY ROADSIGNS, STREET LIGHTS, AND PERPENDICULAR CROSSINGS (SUCH AS SERVICE LATERALS) NO UTILITY FACILITIES (NOR COMMERCIAL SIGNS) SHALL BE INSTALLED IN LANDSCAPED BUFFER AREAS.
5. NO ABOVE GROUND FACILITY (CABINET, HYDRANT, POLE, SIGN, ETC.) SHALL BE INSTALLED IN SIDEWALK AREAS.
6. USE ROOT BARRIER ALONG BACK OF SIDEWALK FOR A LENGTH OF TWENTY FEET WHERE TRUNK IS WITHIN THE FIVE FEET OF SIDEWALK.

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY

TYPICAL SECTIONS THOROUGHFARE STREETS AND FRONTAGE ROADS CLASS A

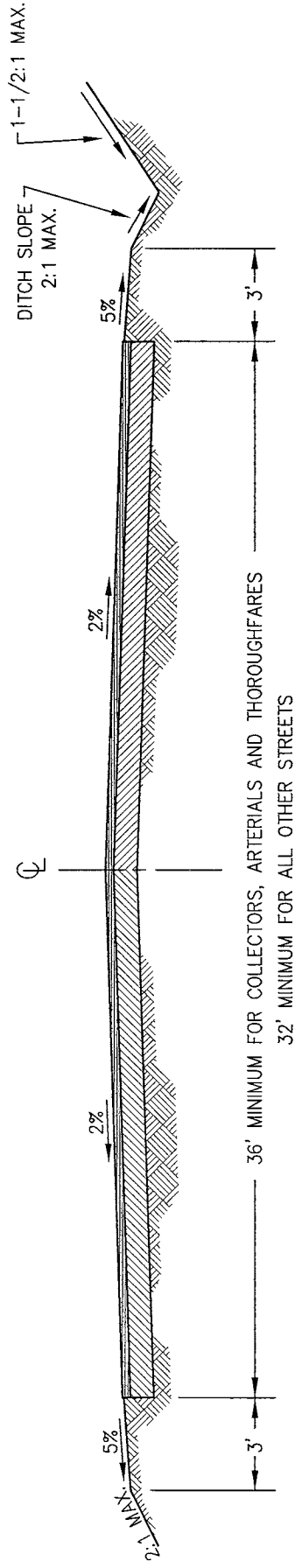
SCALE: NONE
DATE: 06/08/09
DRAWN BY: B.R. & TRU P.

4-3

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

CLASS C STREET



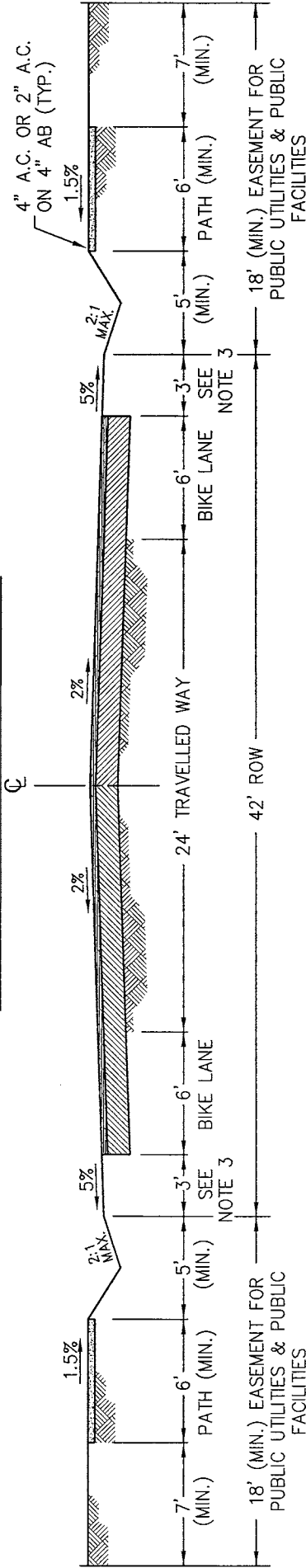
COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
TYPICAL SECTION CLASS C STREETS	
SCALE: NONE DATE: 06/08/09 DRAWN BY: TRU P.	4-4

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

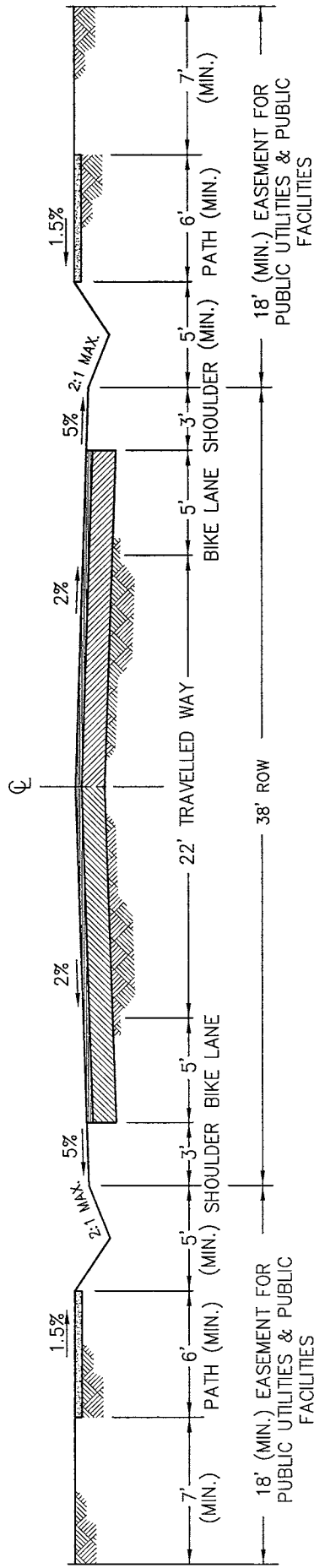
CLASS D STREET

GREATER THAN 40 MPH (see NOTE 2)



CLASS D STREET

40 MPH OR LESS (see NOTE 2)



NOTES:

1. USE CLASS D ON ALL STREETS THAT ARE WITHIN THE URBAN SERVICE BOUNDARY AND ARE ZONED AR-1, AR-2, RD1, RD2 AND NOT OTHERWISE REQUIRED TO HAVE CLASS A STREET IMPROVEMENTS.
2. POSTED SPEED LIMIT. IF NO POSTED SPEED LIMIT MAY USE THE LESSOR OF 85TH PERCENTILE SPEED OR PRIMA FACIE SPEED LIMIT.
3. THREE FOOT DIRT SHOULDER MAY BE REDUCED OR ELIMINATED IF FULL DEPTH AC IS USED IN ROAD CONSTRUCTION.
4. FOR INTERSECTION GEOMETRY OF CLASS D ROADWAYS SEE STANDARD DRAWING 4-41 & 4-57.

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TYPICAL SECTIONS CLASS D STREETS

SCALE: NONE
DATE: 07/15/09
DRAWN BY: TRU P. & B.R.

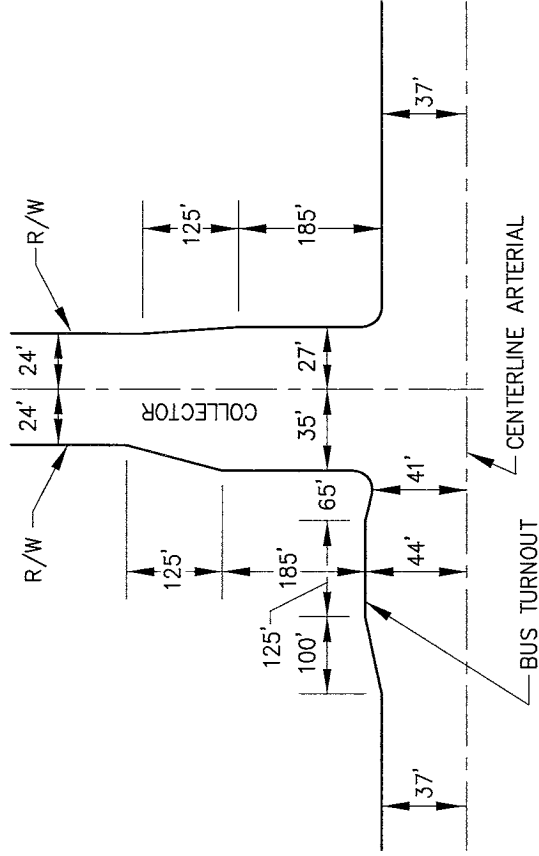
CHIEF, DEPT. OF TRANSPORTATION

[Signature]

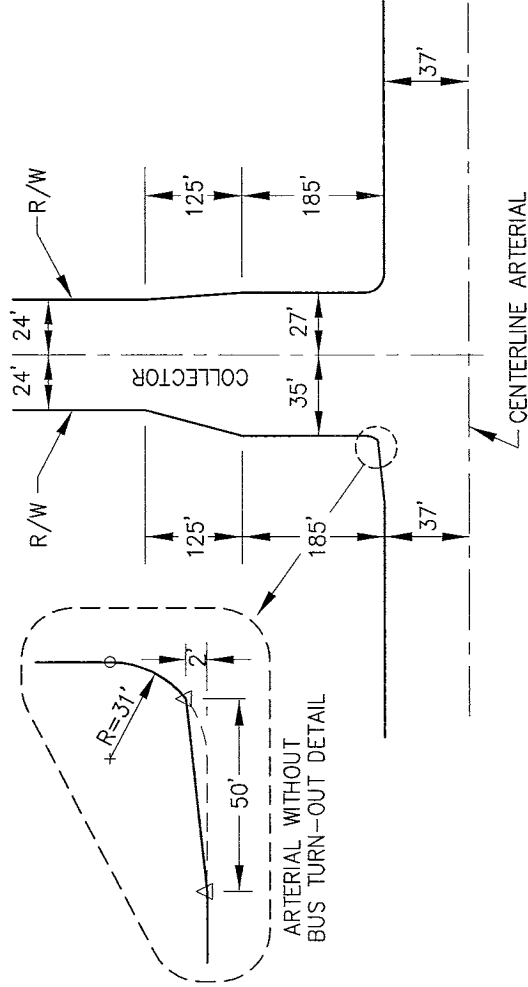
4-5

NOTES:

1. RIGHT OF WAY IS MEASURED TO THE STANDARD BACK OF CURB LOCATION.
2. RADIUS AT CORNERS IS 31'.
3. FOR BUS TURNOUT DIMENSIONS, SEE DRAWING 4-43.
4. PUBLIC EASEMENTS PER STANDARD DRAWINGS 4-2 & 4-3.



WITH BUS TURNOUT



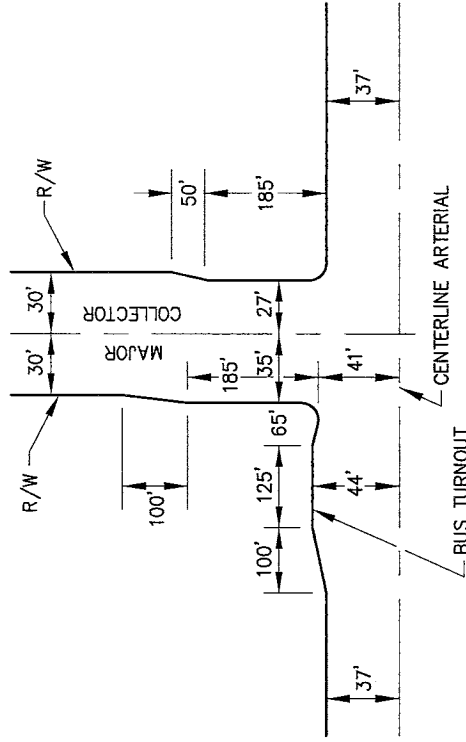
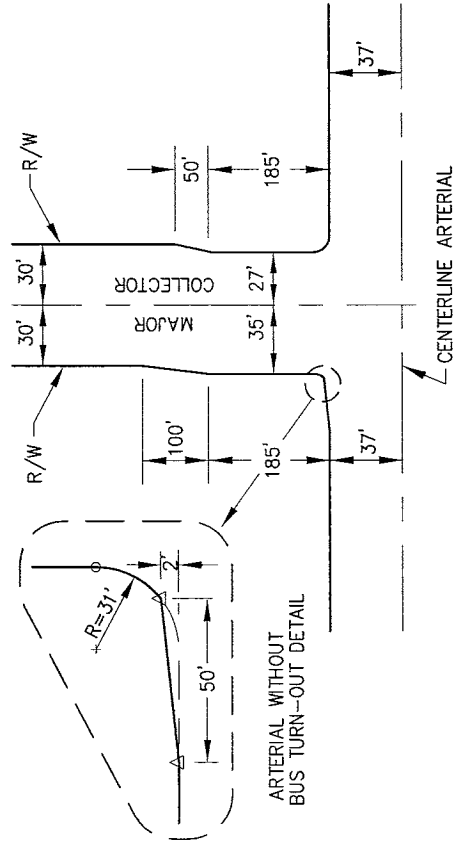
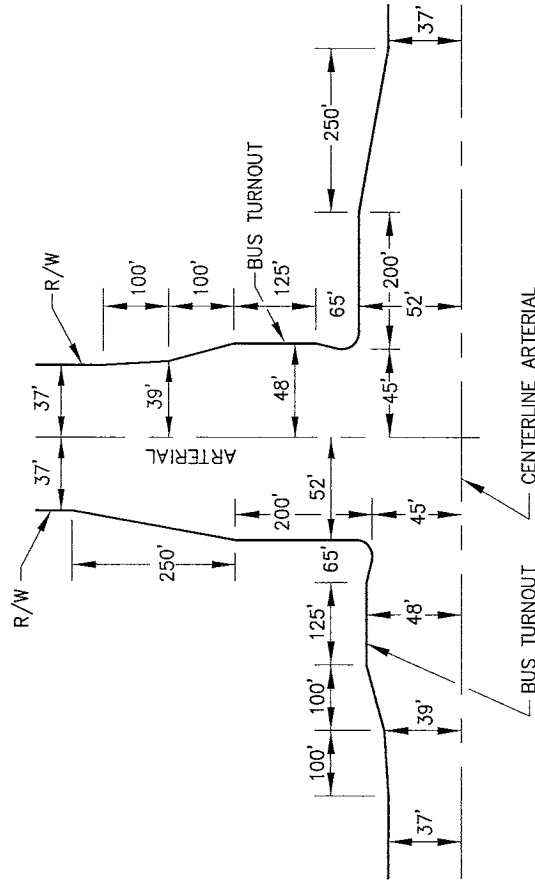
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

RIGHT-OF-WAY FOR ARTERIAL
STREETS AT COLLECTOR
STREET INTERSECTIONS

SCALE: NONE
DATE: 06/08/09
DRAWN BY: TRU P.

CHIEF, DEPT. OF TRANSPORTATION

[Signature]



WITH BUS TURNOUT

NOTES:

1. RIGHT OF WAY IS MEASURED TO THE STANDARD BACK OF CURB LOCATION.
2. RADIUS AT CORNERS IS 31'.
3. FOR BUS TURNOUT DIMENSIONS, SEE DRAWING 4-43.
4. PUBLIC EASEMENTS PER STANDARD DRAWINGS 4-1 TO 4-4.

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

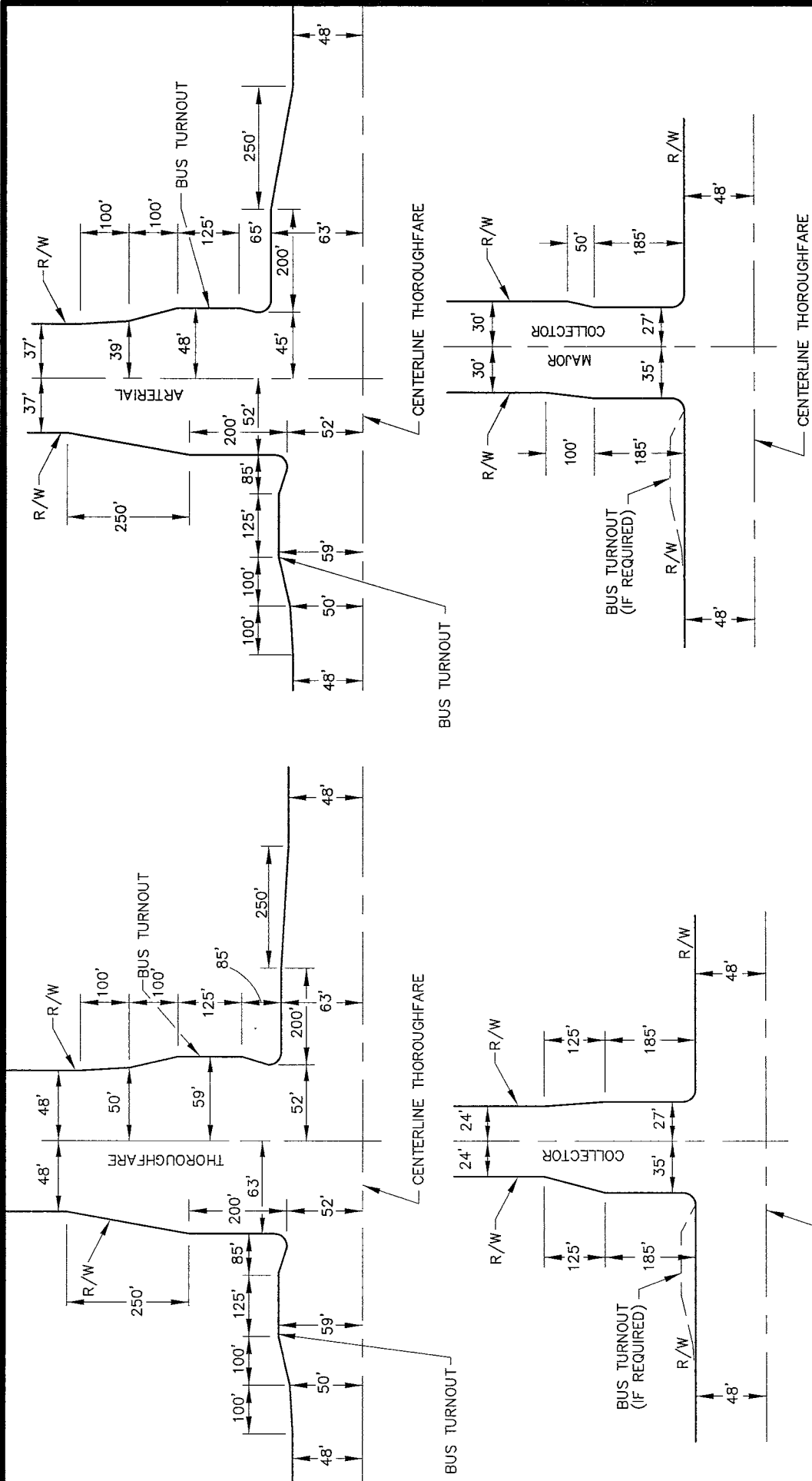
**RIGHT-OF-WAY FOR
ARTERIAL STREETS AT VARIOUS
STREET INTERSECTIONS**

SCALE: NONE
DATE: 06/08/09
DRAWN BY: TRU P.

4-7

[Signature]

CHIEF, DEPT. OF TRANSPORTATION



**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**RIGHT-OF-WAY FOR
THOROUGHFARE STREETS AT
VARIOUS INTERSECTIONS**

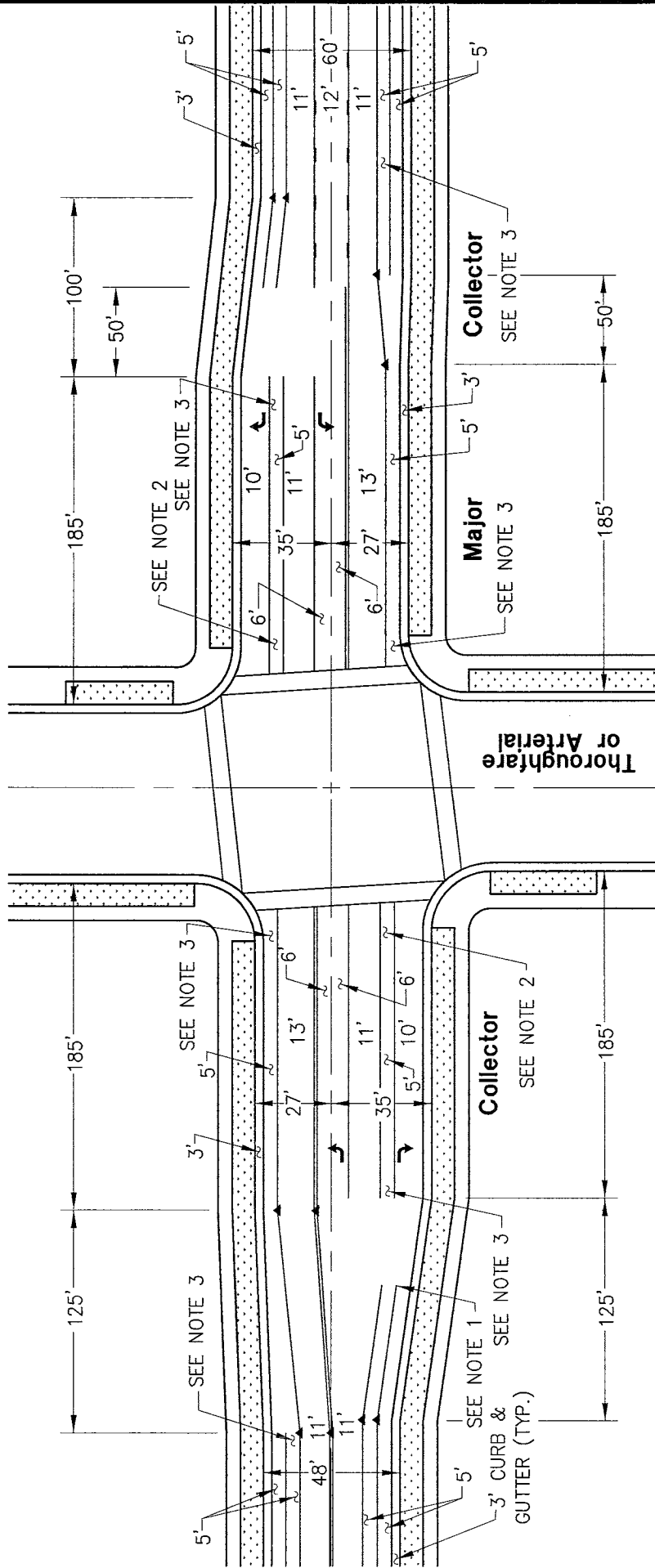
SCALE: NONE
DATE: 07/15/09
DRAWN BY: TRU P.

CHIEF, DEPT. OF TRANSPORTATION

[Signature]

NOTES:

1. RIGHT OF WAY IS MEASURED TO THE STANDARD BACK OF CURB LOCATION.
2. RADIUS AT CORNERS IS 31'.
3. FOR BUS TURNOUT DIMENSIONS, SEE DRAWING 4-43.
4. PUBLIC EASEMENTS PER STANDARD DRAWINGS 4-1 TO 4-4.



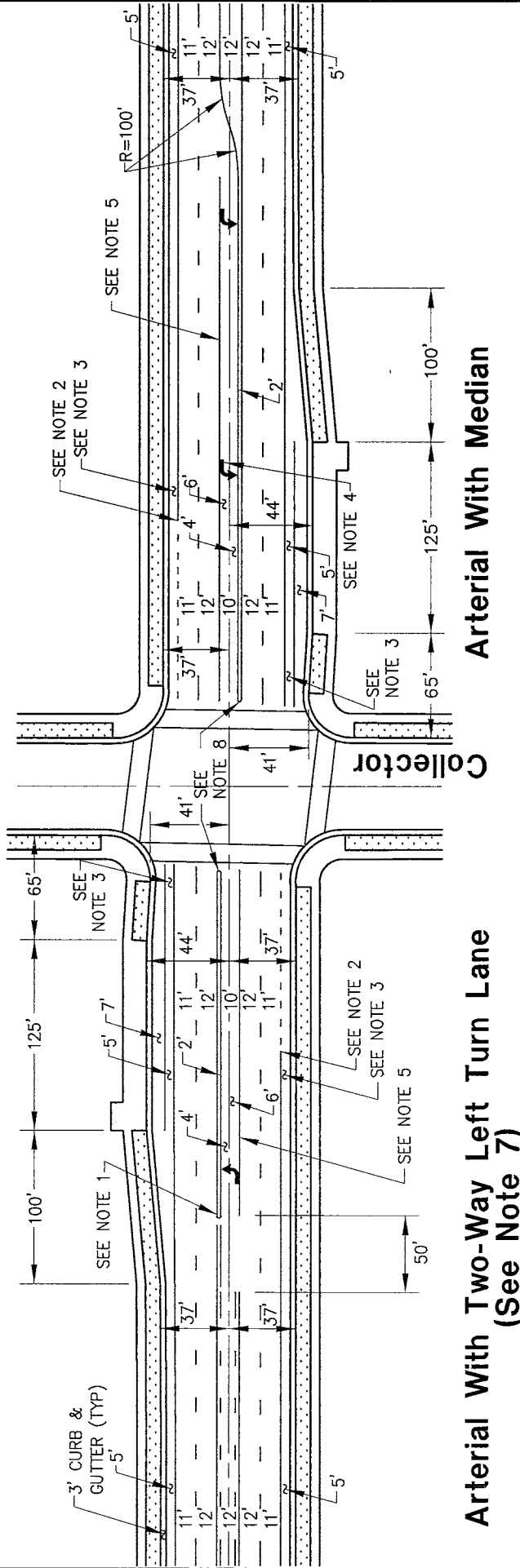
NOTES:

1. BIKE LANE STRIPE TO BE DISCONTINUED 50' FROM RIGHT-TURN LANE AND RESUMED AT BEGINNING OF RIGHT-TURN-ONLY LANE.
2. INSTALL BICYCLE LOOP DETECTOR SYMBOL OVER DETECTOR LOCATIONS, 3' CLEAR OF STOP BAR.
3. INSTALL "BIKE", "LANE" AND "→" PAVEMENT LEGENDS AT THE FOLLOWING LOCATIONS:
 - APPROXIMATELY 10' PAST CROSSWALKS;
 - AT 10' PAST START OF BICYCLE LANE ADJOINING RIGHT-TURN LANES.
4. STRIPE DIMENSIONS ARE TO CENTERLINE OF STRIPES OR LIP OF GUTTER. STREET WIDTH DIMENSIONS ARE TO BACK OF CURB.

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
TYPICAL STRIPING FOR COLLECTOR STREETS AT MAJOR STREET INTERSECTIONS	
SCALE: NONE DATE: 06/08/09 DRAWN BY: TRU P.	4-9



NOTES:

1. END OF RAISED MEDIAN MAY BE MOVED AS NECESSARY FOR DRIVEWAY LOCATIONS. SEE IMPROVEMENT STANDARD SECTION 4-11(L).
2. BIKE LANE STRIPING TO BE DASHED BEGINNING 120' FROM STOP BAR.
3. INSTALL "BIKE", "LANE", AND " " PAVEMENT LEGENDS AT THE FOLLOWING LOCATIONS:
 - APPROXIMATELY 10' PAST CROSSWALKS;
 - BEFORE START OF DASHED BICYCLE LANE STRIPING.
4. INSTALL ADDITIONAL LEFT-TURN ARROW MIDWAY IN THE LENGTH OF THE TURN LANE IF IT EXCEEDS 250'.
5. LENGTH OF TURN POCKET IS TO BE SIZED ACCORDING TO TRAFFIC NEEDS, 180' MINIMUM 300' MAXIMUM. SEE 3-10 (H) OF DEPARTMENT OF TRANSPORTATION DESIGN PRACTICE GUIDE.
6. STRIPE DIMENSIONS ARE TO CENTERLINE OF STRIPES OR LIP OF GUTTER. STREET WIDTH DIMENSIONS ARE TO BACK OF CURB.
7. USE OF TWO WAY LEFT TURN LANE ON ARTERIAL STREETS, INSTEAD OF RAISED CENTER MEDIAN, REQUIRES WRITTEN PERMISSION OF THE DIRECTOR OF THE DEPARTMENT OF TRANSPORTATION.
8. MEDIAN END SET BACK 5' FROM CROSSWALK. INSTALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
TYPICAL STRIPING FOR ARTERIAL STREETS AT INTERSECTIONS WITH COLLECTOR STREETS WITH BUS TURNOUTS	
SCALE: NONE DATE: 06/08/09 DRAWN BY: TRU P. & B.R.	4-10

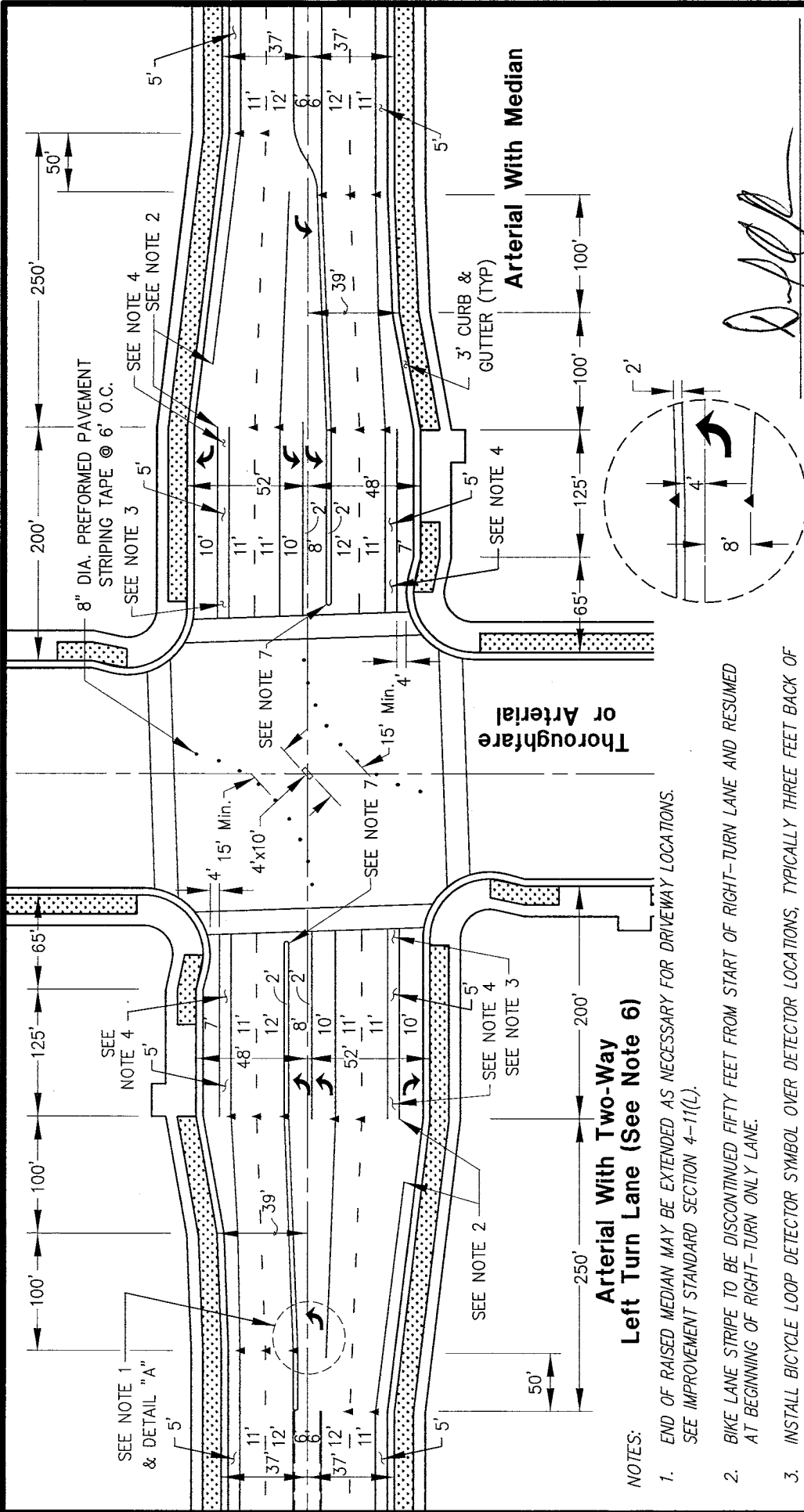


8. MEDIAN END SET BACK 5' FROM CROSSWALK. INSTALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.

CHIEF, DEPT. OF TRANSPORTATION

**TYPICAL STRIPING FOR ARTERIAL
STREETS AT INTERSECTIONS
WITH COLLECTOR STREETS
WITHOUT BUS TURNOUTS**

SCALE: NONE
DATE: 06/08/09
DRAWN BY: TRU P. & B.R.



COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TYPICAL STRIPING FOR
ARTERIAL STREETS AT
INTERSECTIONS WITH
MAJOR STREETS

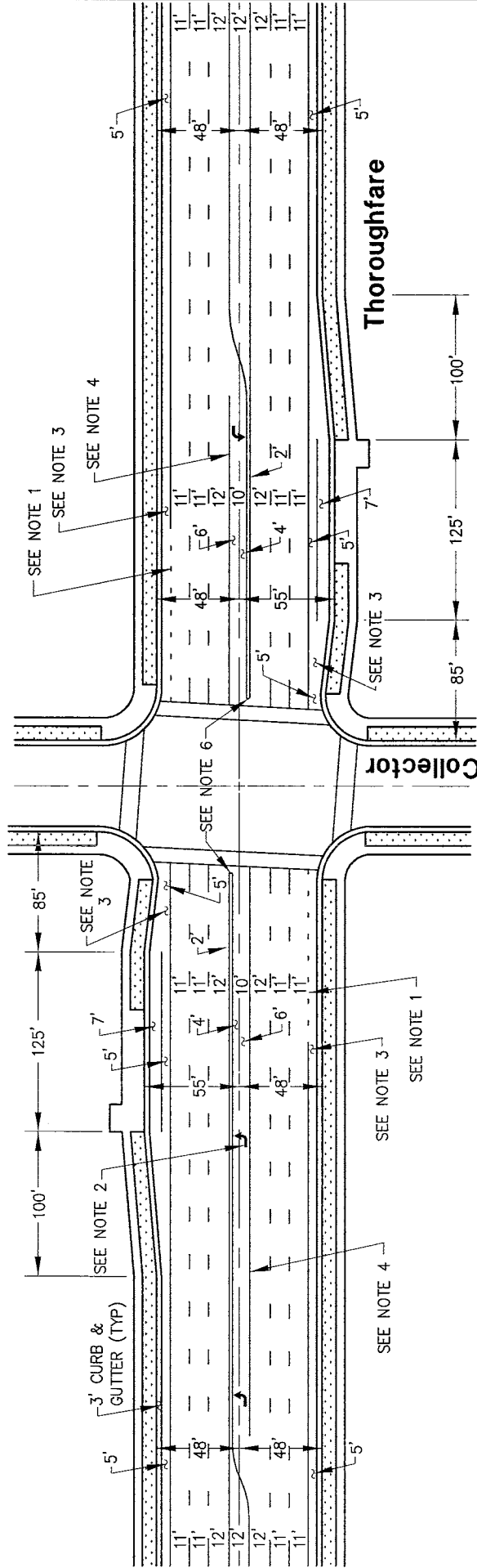
SCALE: NONE
DATE: 03/05/09
DRAWN BY: TRU P. & B.R.

4-12

Detail "A"

- NOTES:
1. END OF RAISED MEDIAN MAY BE EXTENDED AS NECESSARY FOR DRIVEWAY LOCATIONS. SEE IMPROVEMENT STANDARD SECTION 4-11(L).
 2. BIKE LANE STRIPE TO BE DISCONTINUED FIFTY FEET FROM START OF RIGHT-TURN LANE AND RESUMED AT BEGINNING OF RIGHT-TURN ONLY LANE.
 3. INSTALL BICYCLE LOOP DETECTOR SYMBOL OVER DETECTOR LOCATIONS, TYPICALLY THREE FEET BACK OF STOP BAR.
 4. INSTALL "BIKE", "LANE" AND " " PAVEMENT LEGENDS AT THE FOLLOWING LOCATIONS:
 - APPROXIMATELY 10' PAST CROSSWALKS;
 - AT 10' PAST START OF BICYCLE LANE ADJOINING RIGHT-TURN LANES.
 5. STRIPE DIMENSIONS ARE TO CENTERLINE OF STRIPES OR LIP OF GUTTER. STREET WIDTH DIMENSIONS ARE TO BACK OF CURB.
 6. USE OF TWO WAY LEFT TURN LANE ON ARTERIAL STREETS, INSTEAD OF RAISED CENTER MEDIAN, REQUIRES WRITTEN PERMISSION OF THE DIRECTOR OF THE DEPARTMENT OF TRANSPORTATION.
 7. MEDIAN END SET BACK 5' FROM CROSSWALK. INSTALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.

[Signature]
 CHIEF, DEPT. OF TRANSPORTATION



NOTES:

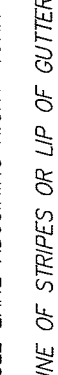
1. BIKE LANE STRIPE TO BE DASHED BEGINNING 120' FROM STOP BAR.
2. INSTALL ADDITIONAL LEFT TURN ARROW MIDWAY IN THE LENGTH OF THE TURN LANE IF IT EXCEEDS 250'.
3. INSTALL "BIKE", "LANE" AND " " PAVEMENT LEGENDS AT THE FOLLOWING LOCATIONS:
 - APPROXIMATELY 10' PAST CROSSWALKS;
 - BEFORE START OF DASHED BICYCLE LANE STRIPING IF INTERSECTION IS SIGNALIZED.
4. LENGTH OF TURN POCKET IS TO BE SIZED ACCORDING TO TRAFFIC NEEDS, 180' MINIMUM 300' MAXIMUM. SEE 3-10 (H) OF TRANSPORTATION DIVISION DESIGN PRACTICE GUIDE.
5. STRIPE DIMENSIONS ARE TO CENTERLINE OF STRIPES OR LIP OF GUTTER. STREET WIDTH DIMENSIONS ARE TO BACK OF CURB.
6. MEDIAN END TO BE SET BACK 5' FROM CROSSWALK. INSTALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
TYPICAL STRIPING FOR THOROUGHFARE STREETS AT INTERSECTIONS WITH COLLECTOR STREETS	
SCALE: NONE DATE: 03/05/09 DRAWN BY: TRU P. & B.R.	4-13

[Signature]

CHIEF, DEPT. OF TRANSPORTATION



1. BIKE LANE STRIPE TO BE DISCONTINUED FIFTY FEET FROM RIGHT-TURN LANE AND RESUMED AT BEGINNING OF RIGHT-TURN-ONLY LANE.
 2. INSTALL BICYCLE LOOP DETECTOR SYMBOL OVER DETECTOR LOCATIONS, TYPICALLY THREE FEET BACK OF STOP BAR.
 3. INSTALL "BIKE", "LANE", AND "→" PAVEMENT LEGENDS AT THE FOLLOWING LOCATIONS:
 - APPROXIMATELY 10' PAST CROSSWALKS;
 - AT 10' PAST START OF BICYCLE LANE ADJOINING RIGHT-TURN LANES.
 4. STRIPE DIMENSIONS ARE TO CENTERLINE OF STRIPES OR LIP OF GUTTER. STREET WIDTH DIMENSIONS ARE TO BACK OF CURB.
 5. MEDIAN END SET BACK 5' FROM CROSSWALK. INTSALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.
- 

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

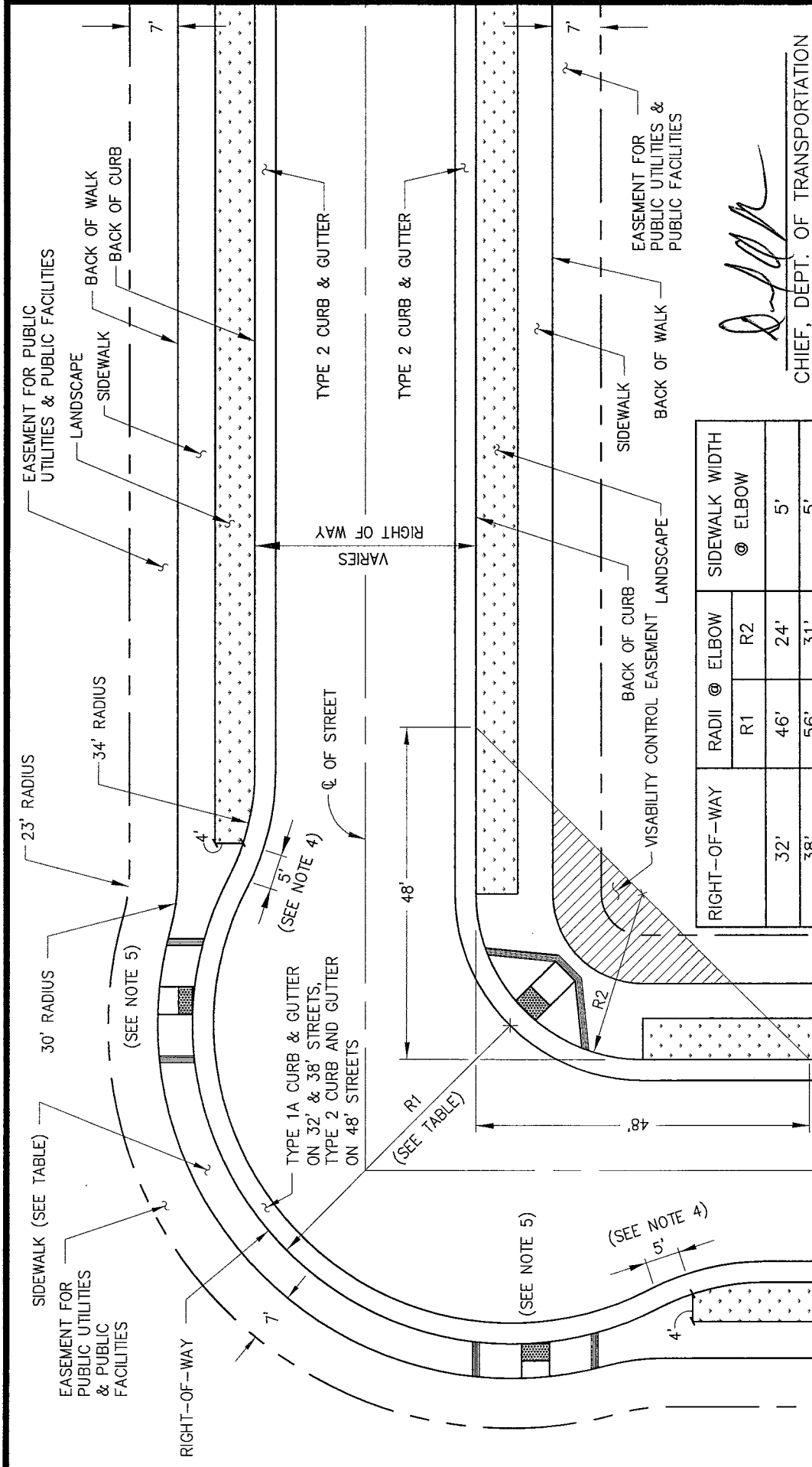
TYPICAL STRIPING FOR THOROUGHFARE STREETS AT INTERSECTIONS WITH MAJOR STREETS

SCALE: NONE
DATE: 03/05/09
DRAWN BY: TRU P. & B.R.

4-14

CHIEF, DEPT. OF TRANSPORTATION

5. MEDIAN END SET BACK 5' FROM CROSSWALK. INSTALL 5' OF DOUBLE YELLOW STRIPING BETWEEN MEDIAN END AND CROSSWALK.



NOTES:

1. INTERSECTION ELBOWS ARE NOT REQUIRED WHERE THE CENTERLINE RADIUS MEET THE MINIMUM REQUIREMENTS IN SECTION 4-14.
2. INTERSECTION ANGLE SHALL BE $90^\circ \pm 5^\circ$.
3. SHADED AREA SHALL HAVE VISIBILITY CONTROL EASEMENT IN ACCORDANCE WITH SECTION 4-15 AND STANDARD DRAWING 4-18 (PERMANENT BUILDINGS EXCEPTED WITHIN SETBACK LINE).

4. TRANSITION FROM TYPE 2 TO TYPE 1A OVER 5' OUTSIDE OF LANDSCAPE BUFFER AREA, EXCEPT ON 48' R.O.W.
5. ONLY ONE SIDEWALK RAMP ON OUTSIDE OF CURVE REQUIRED.

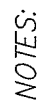
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CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

ELBOW INTERSECTION

SCALE: NONE
DATE: 07/15/09
DRAWN BY: B.R. & TRU P.

4-16




1. MINIMUM LENGTH OF TURN POCKET (LENGTH WITH FULL WIDENING AND STRIPING OF TURN LANE) IS 180'.
2. SEE SECTION 4-3H OF THE IMPROVEMENT STANDARDS FOR RESTRICTIONS ON LOCATION OF MEDIAN BREAKS.

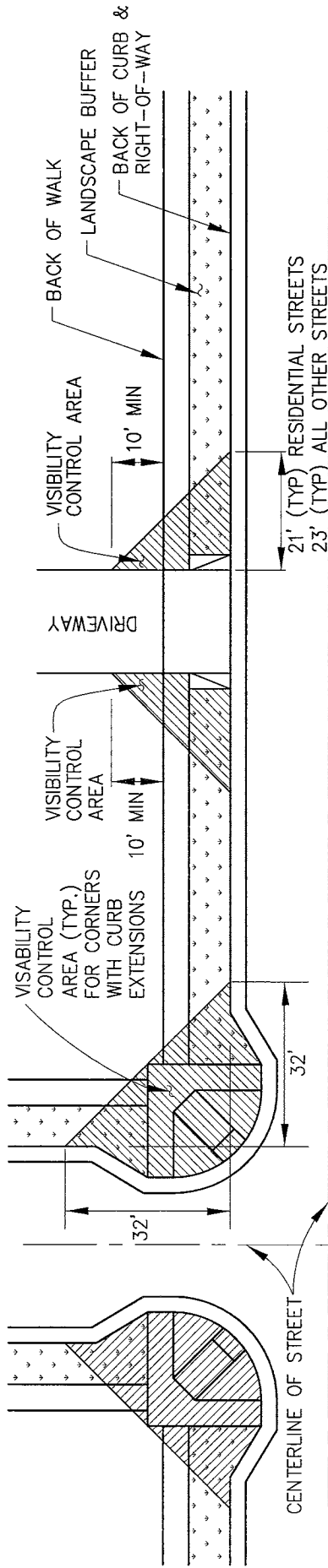
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

TYPICAL MEDIAN GEOMETRY FOR LIMITING ACCESS

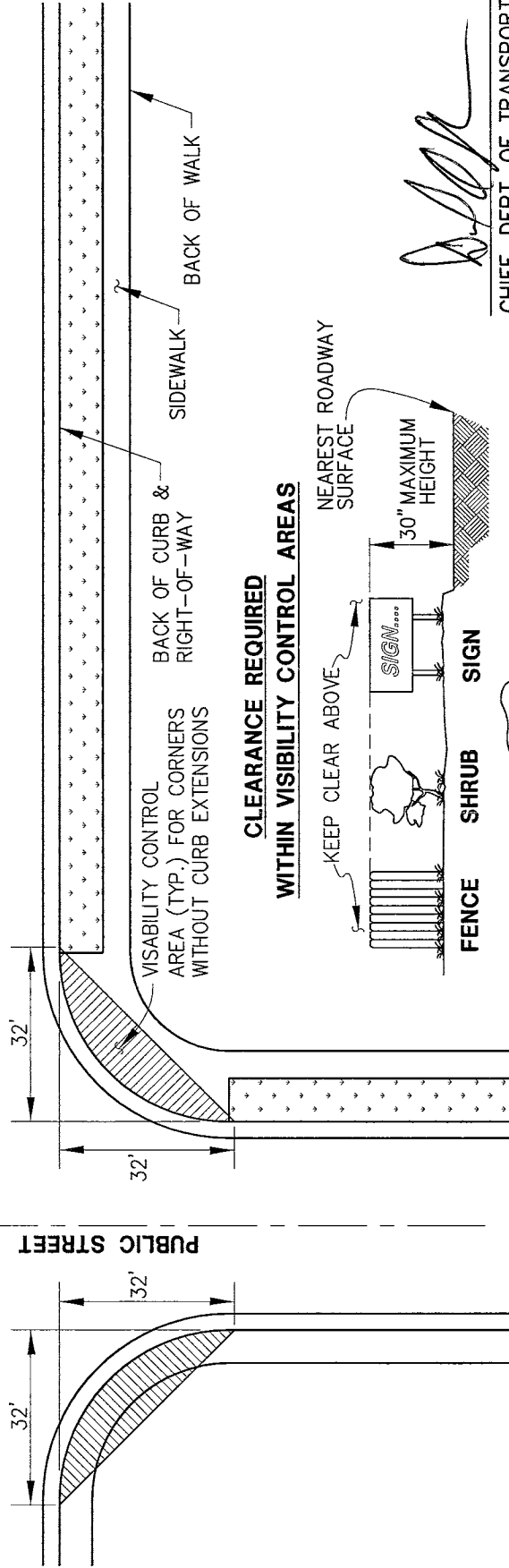
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DRAWN BY: TRU P. & B.R.

4-17

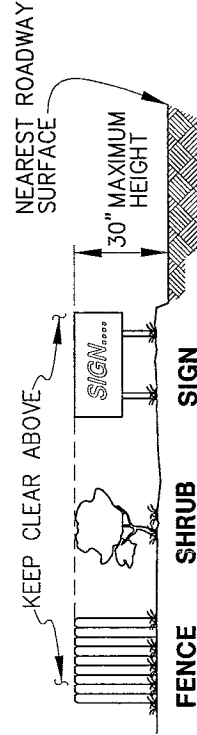

CHIEF, DEPT. OF TRANSPORTATION



PUBLIC STREET



CLEARANCE REQUIRED WITHIN VISIBILITY CONTROL AREAS



CHIEF, DEPT. OF TRANSPORTATION

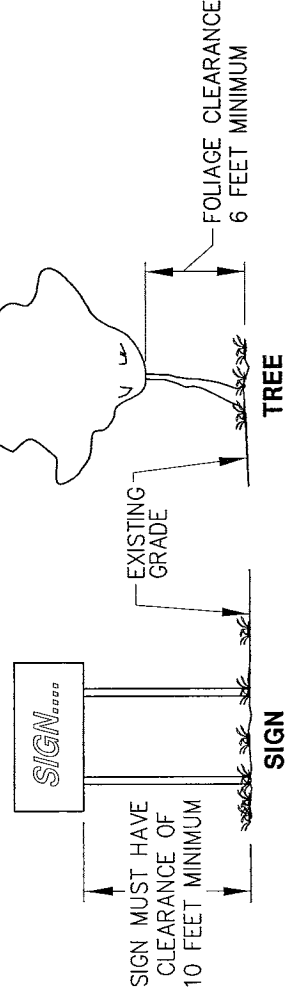
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COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

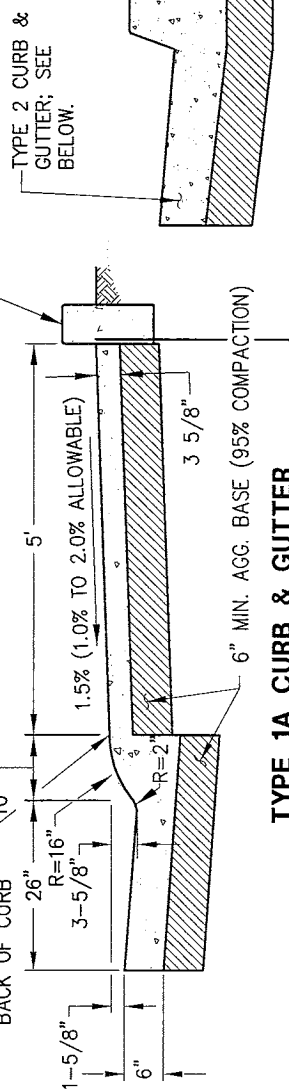
VISIBILITY RESTRICTIONS
AT DRIVEWAYS &
INTERSECTIONS

SCALE: NONE
DATE: 7/20/09
DRAWN BY: B.R. & TRU P.

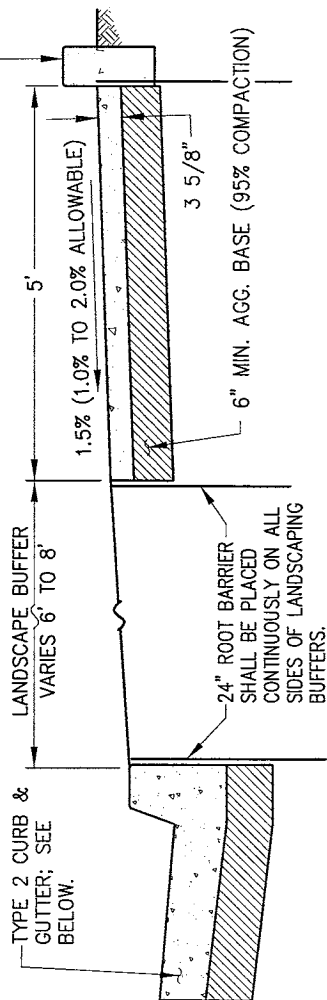
4-18



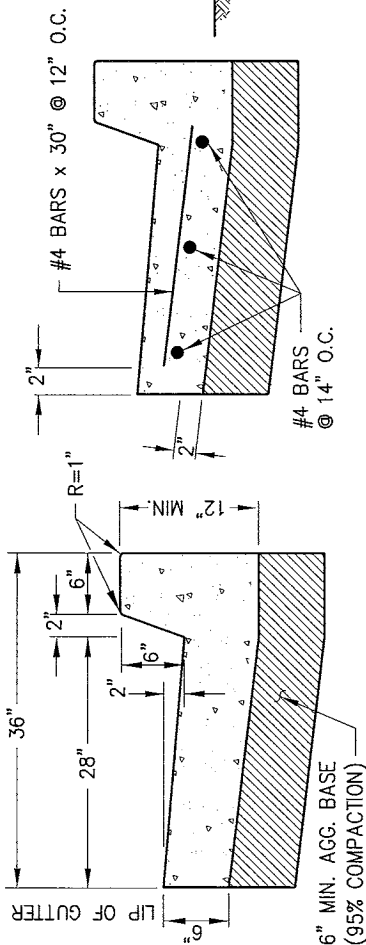
INSTALL TYPE 3 OR TYPE 4 CURB IF ABUTTING PARKING AREA OR LANDSCAPING (EXCEPT LAWN AREA). SEE DWG. 4-33.
USE ROOT BARRIER ALONG BACK OF SIDEWALK FOR A LENGTH OF TWENTY FEET WHERE TREE TRUNK IS WITHIN FIVE FEET OF SIDEWALK.



**TYPE 1A CURB & GUTTER
WITH ATTACHED SIDEWALK**



**BIFURCATED SIDEWALK WITH
TYPE 2 CURB & GUTTER**



TYPE 2

TYPE 2 REINFORCED

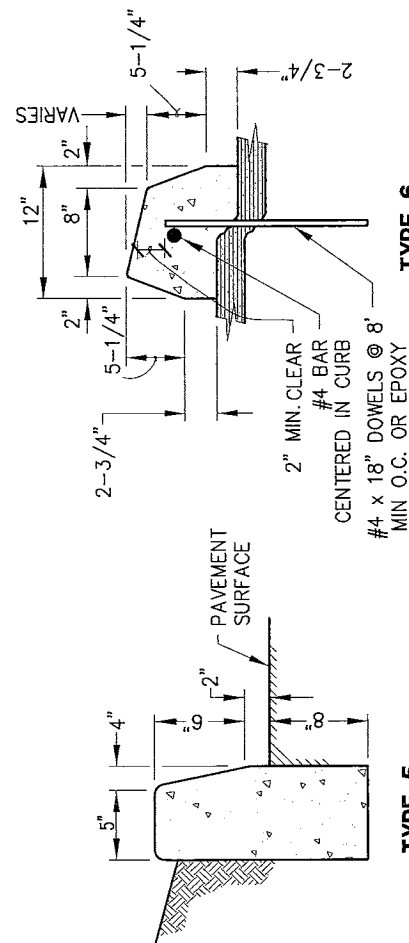
TYPE 3

TYPE 4

TYPE 4A

NOTES:

- SEE SECTION 27-3.01 OF STANDARD CONSTRUCTION SPECIFICATIONS FOR REQUIREMENT FOR EXPANSION JOINTS, WEAKENED PLANE JOINTS AND SCORE MARKS. 1/2" RADIUS ON EXPOSED EDGES UNLESS NOTED OTHERWISE.
- SEE DRAWING 4-31 FOR ADDITIONAL MEDIAN CURB DETAILS.



TYPE 5

TYPE 6

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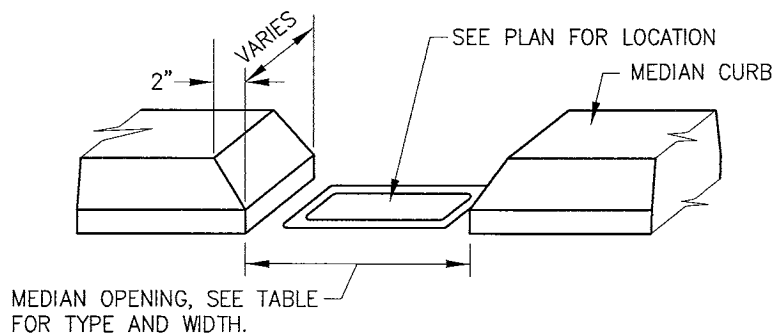
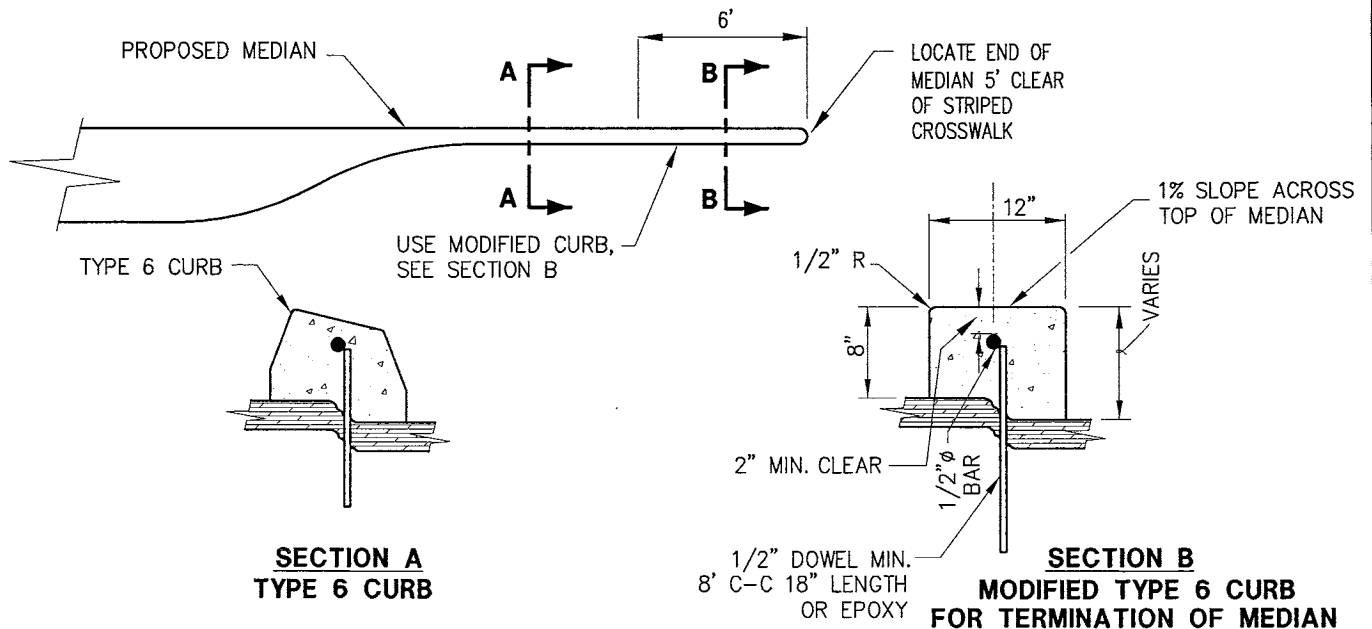
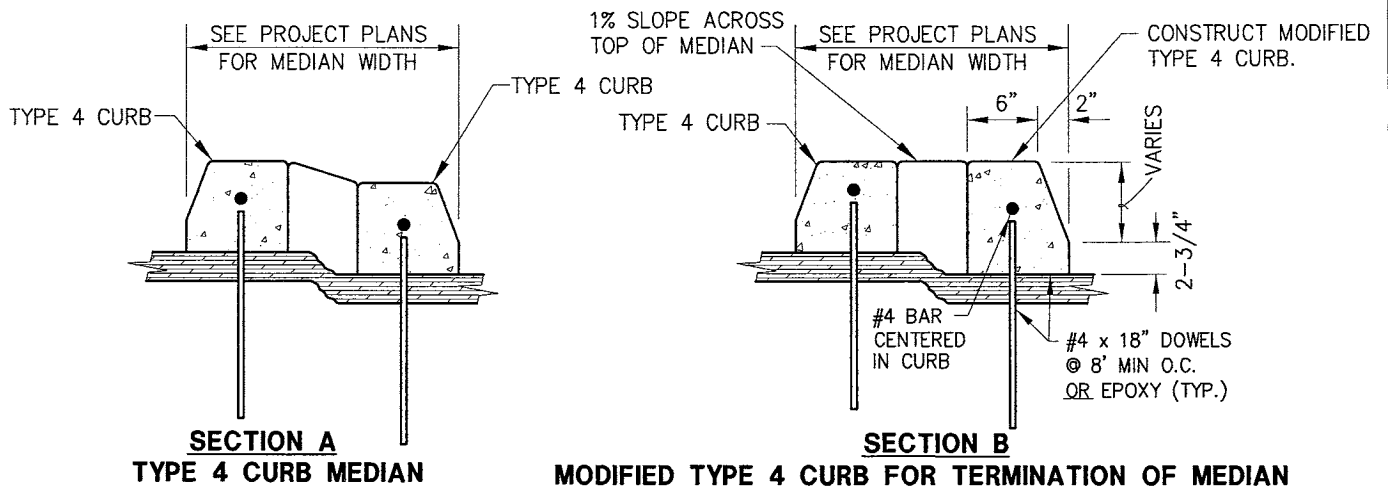
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**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK
CURB & GUTTER
SECTIONS**

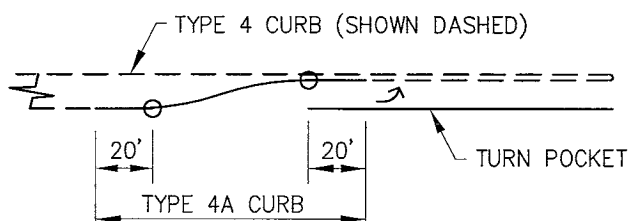
SCALE: NONE
DATE: 07/20/09
DRAWN BY: B.R. & TRU P.

4-30



OPENING TYPE	OPENING WIDTH
DRAINAGE	1'-0"
PULL BOX - #5(T)	3'-0"
PULL BOX - #6(T)	3'-6"

[Signature]
CHIEF, DEPT. OF TRANSPORTATION

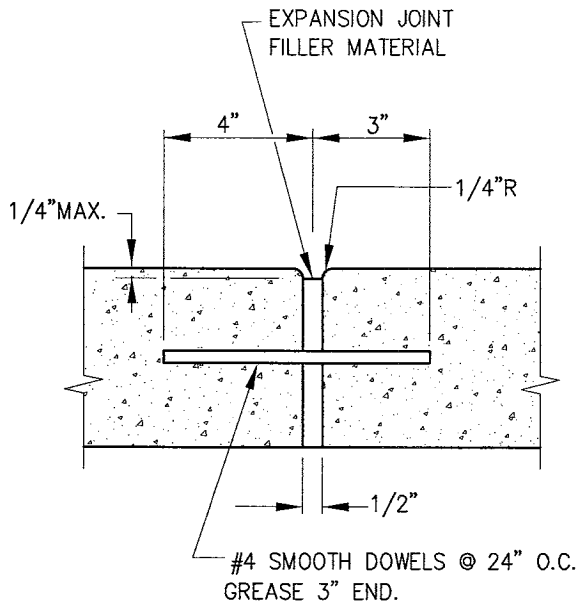


**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

MEDIAN DETAILS

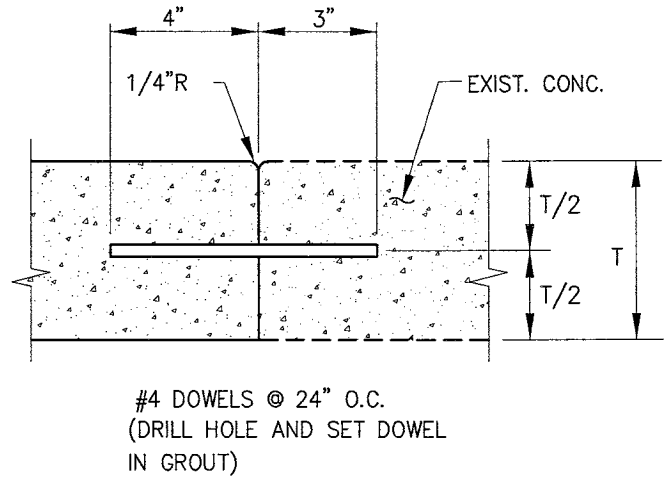
SCALE: NONE
DATE: 01/26/09
DRAWN BY: B.R. & N.S.

4-31



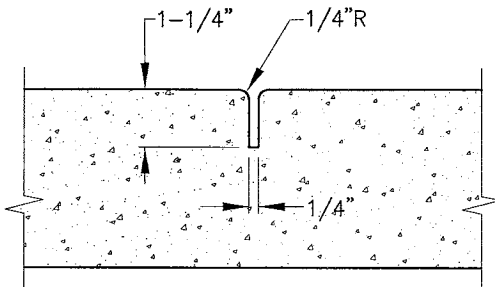
EXPANSION JOINT

USE AT 60' ON CENTER IN SIDEWALK CURB & GUTTER, MEDIAN CURBS, & MEDIAN FLATWORK. ALSO USE AT MAJOR CORNER RETURNS, SIDES OF RAMPS, DRIVEWAYS & LOCATIONS SHOWN ON PLANS & AS SPECIFIED IN SPECIFICATIONS.

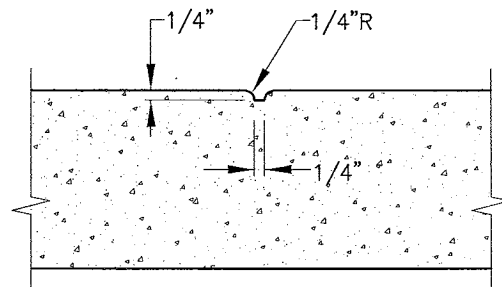


SIDEWALK CONTACT JOINT

USE WHERE NEW CONSTRUCTION OF SIDEWALK, RAMP AND/OR CURB & GUTTER ABUTTS EXISTING IMPROVEMENTS.



WEAKENED PLANE JOINT



SCORE MARK

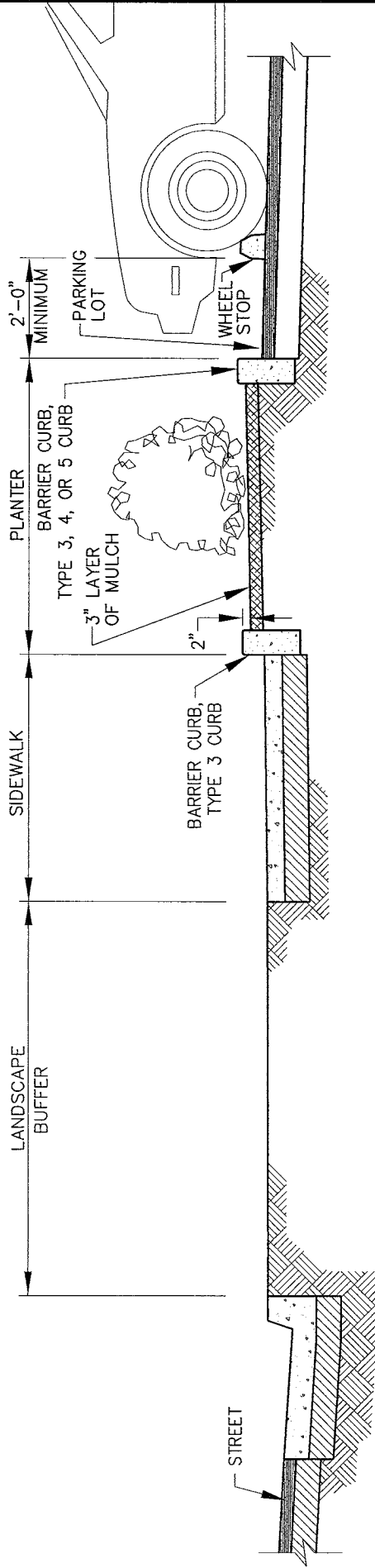

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

CONCRETE
JOINT DETAILS

SCALE: NONE
DATE: 07/18/08
DRAWN BY: TRU P.

4-32



NOTES:

1. USE BARRIER CURB ADJACENT TO SIDEWALK ON ALL ARTERIAL AND THOROUGHFARE STREETS AND ALONG ALL COMMERCIAL DEVELOPMENTS.
2. SEE SECTION 4-21 OF COUNTY IMPROVEMENT STANDARDS FOR REQUIREMENTS.
3. TYPE 3 CURB AT THE BACK OF SIDEWALK MAY BE OMITTED IF LAWN IS PLANTED TO THE BACK OF SIDEWALK.
4. 24" ROOT BARRIERS ARE REQUIRED ON ALL SIDES OF LANDSCAPED BUFFER AREAS AND ALONG BACK OF SIDEWALK IF TREE IS WITHIN 5' (NOT SHOWN).

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BARRIER CURB DETAIL

SCALE: NONE
DATE: 01/21/09
DRAWN BY: TRU P. & B.R.

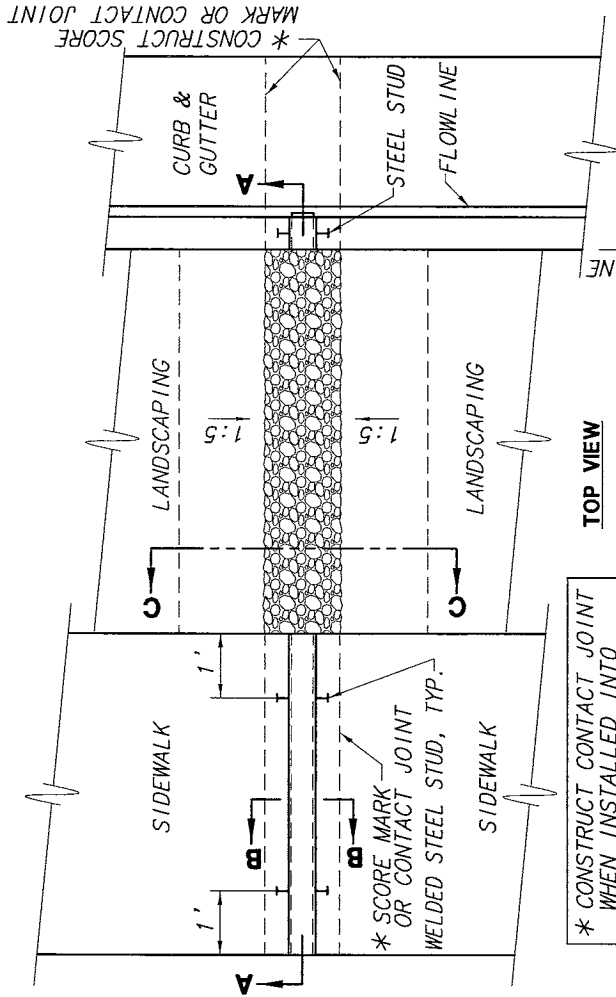
CHIEF, DEPT. OF TRANSPORTATION

[Signature]

4-33

NOTE:

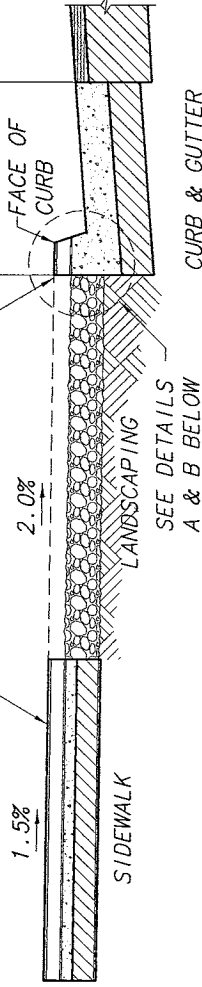
UTILIZE MIN. G-90 GALVANIZED ELEMENTS
GALVANIZE WELDS AFTER FABRICATION



TOP VIEW

* CONSTRUCT CONTACT JOINT
WHEN INSTALLED INTO
EXISTING CURB & GUTTER
PER STD. DWG. 4-32

TOP OF DRAIN TUBE TO
BE FLUSH WITH SIDEWALK
AND TYPE 2 CURB



SECTION A-A

DETAIL OF END
OF CURB DRAIN
FOR TYPE 2 CURB

PROFILE TO MATCH
ADJACENT CURB FACE

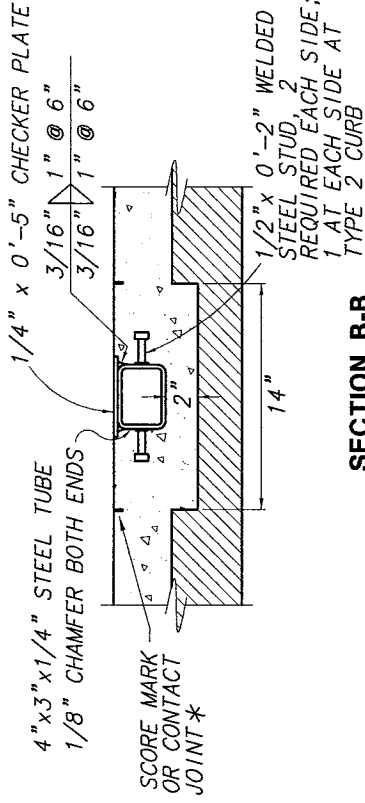
DETAIL OF END
OF CURB DRAIN
FOR TYPE 1A CURB

PROFILE OF ROLLED
CURB IN BACKGROUND

PROFILE TO MATCH
ADJACENT CURB

DETAIL A

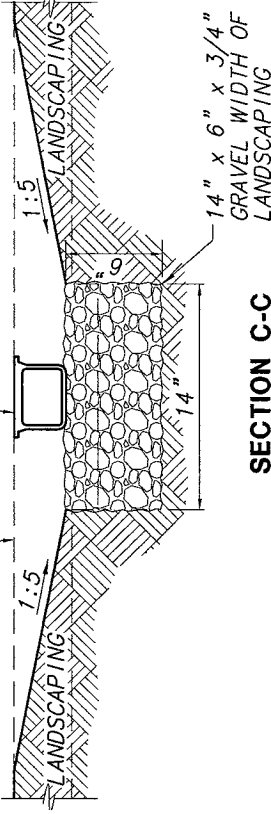
DETAIL B



SECTION B-B

DRAINAGE STRUCTURE
IN BACKGROUND

SIDEWALK IN
BACKGROUND



SECTION C-C

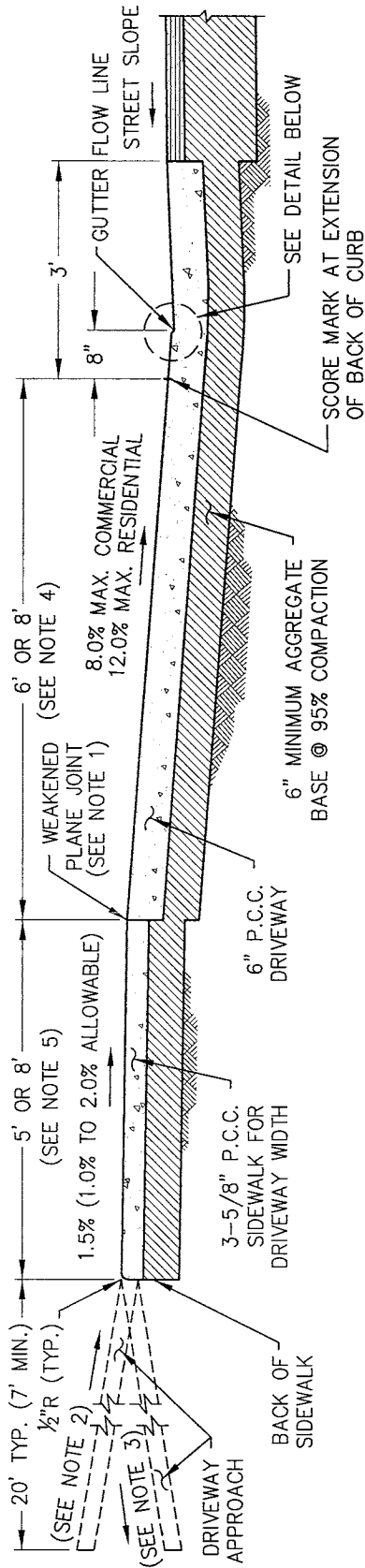
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CHIEF, DEPT. OF TRANSPORTATION

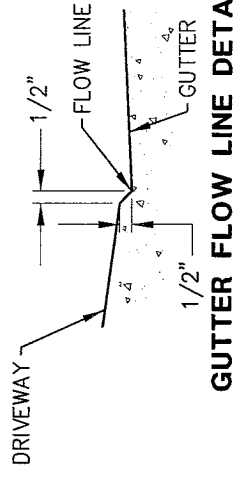
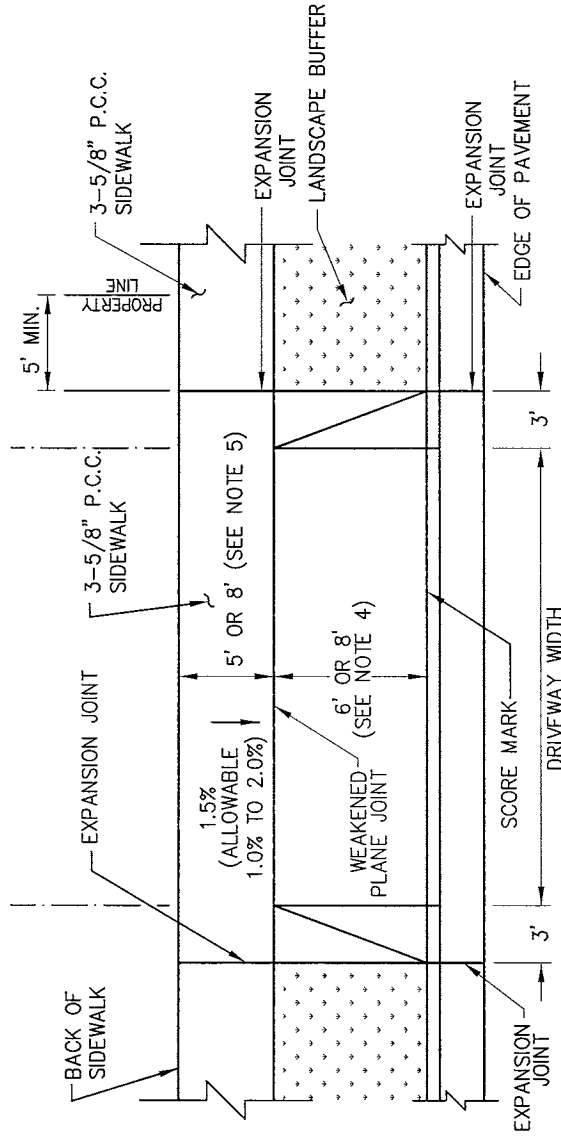
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**UNDER
SIDEWALK DRAIN**

SCALE: NONE
DATE: 08/05/08
DRAWN BY: R. GOODRICH



TYPICAL DRIVEWAY SECTION



[Signature]

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

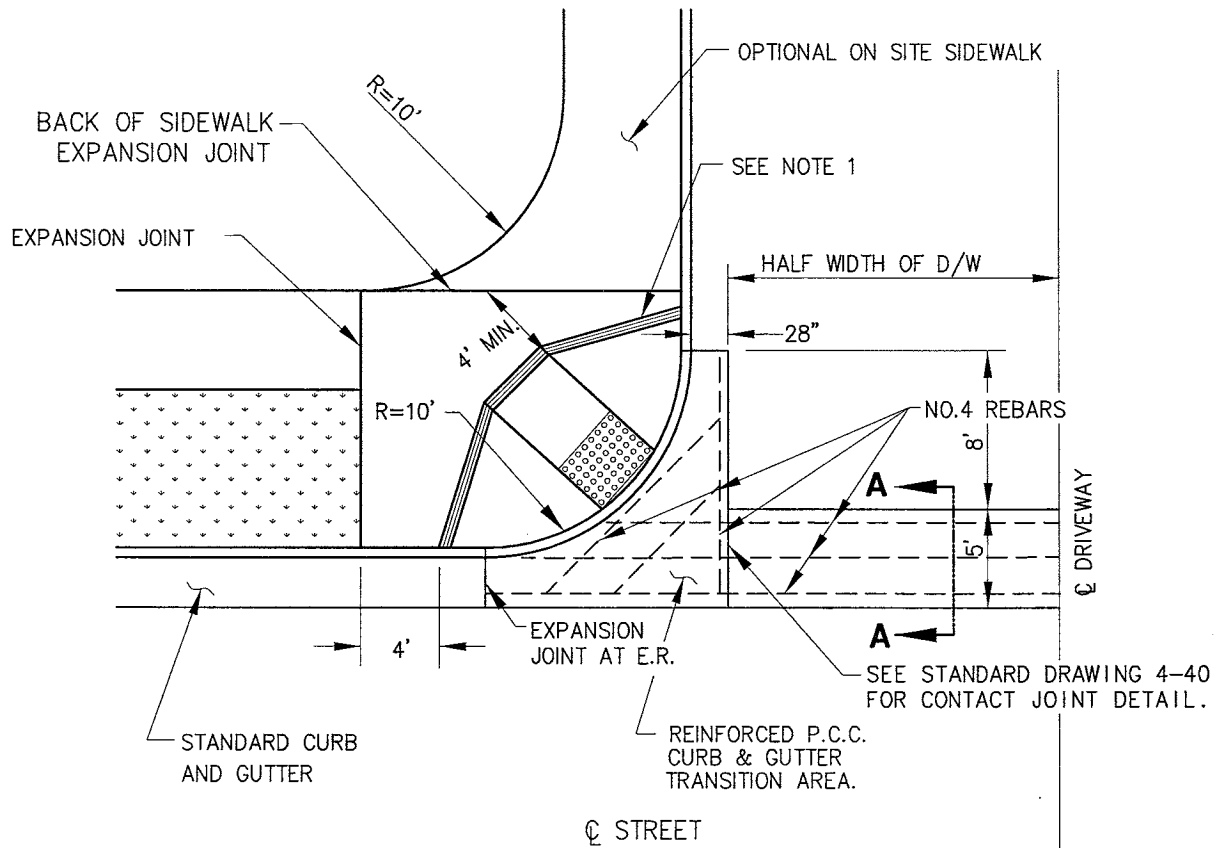
**TYPE A
DRIVEWAY**

SCALE: NONE
DATE: 01/21/09
DRAWN BY: B.R. & TRU P.

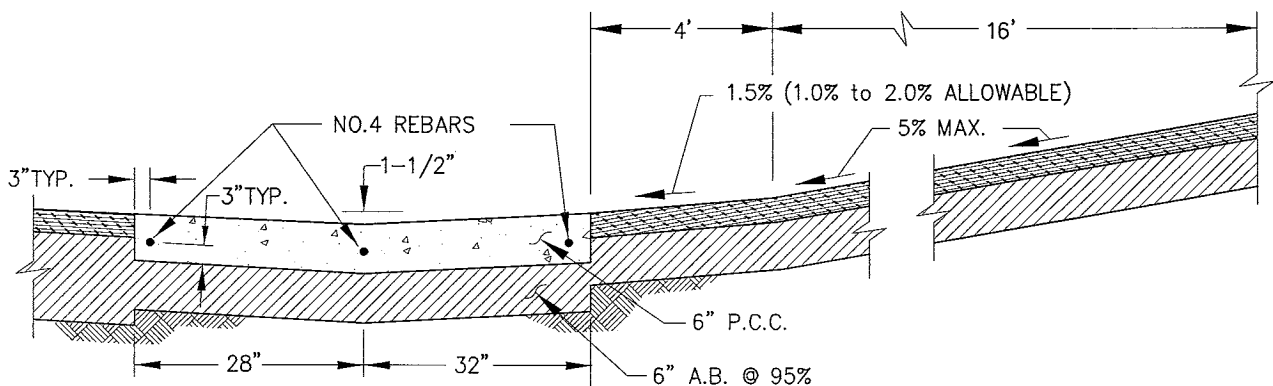
4-35

NOTES:

1. FRONT OF WALK SHALL BE A MINIMUM OF SIX INCHES ABOVE GUTTER FLOW LINE.
2. DRIVEWAY APPROACH SLOPES: 5% MAXIMUM COMMERCIAL & LEVEE AND 12% MAXIMUM RESIDENTIAL SLOPE.
3. DRIVEWAY APPROACH SLOPES: -5% MAXIMUM COMMERCIAL & LEVEE AND -8% MAXIMUM RESIDENTIAL SLOPE.
4. SEE TYPICAL SECTION STANDARD PLANS 4-1 TO 4-3 FOR STANDARD WIDTH.
5. SIDEWALK STANDARD WIDTH IS 5', EXCEPT SIDEWALK WIDTH SHALL BE 8' AT SCHOOLS, HOSPITALS, AND IN PEDESTRIAN DISTRICTS.



PLAN VIEW



SECTION A-A

NOTES:

1. FOR DETAILS OF PLAZA RAMP SEE DRAWING 4-50.

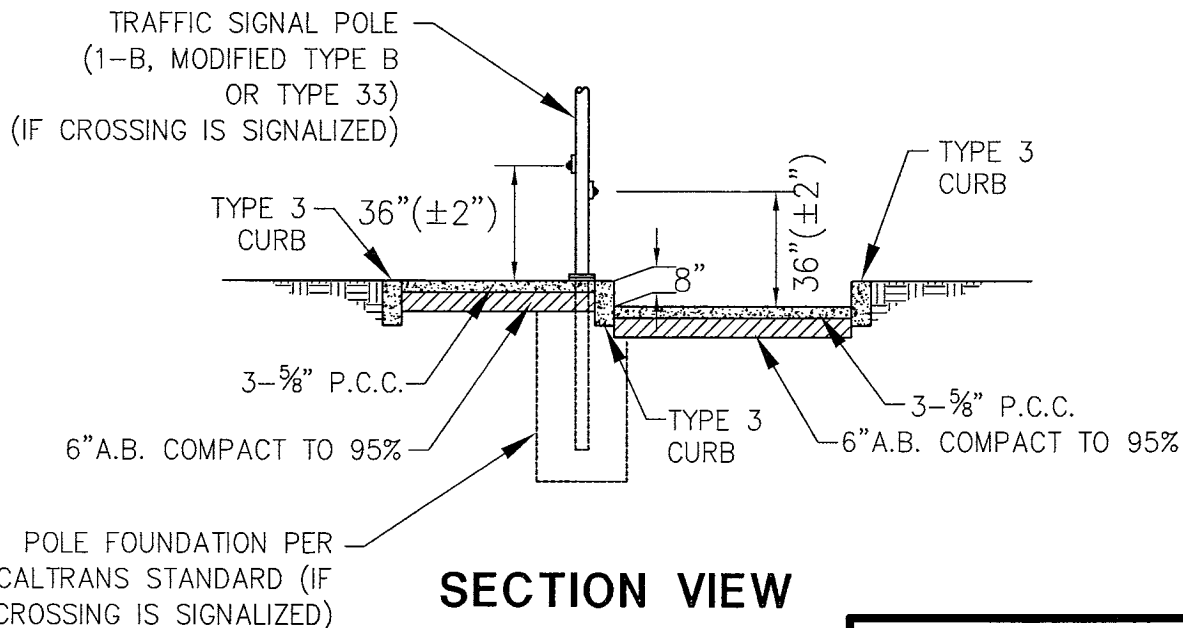
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

TYPE B DRIVEWAY

SCALE: NONE
DATE: 08/06/08
DRAWN BY: TRU P.

4-36

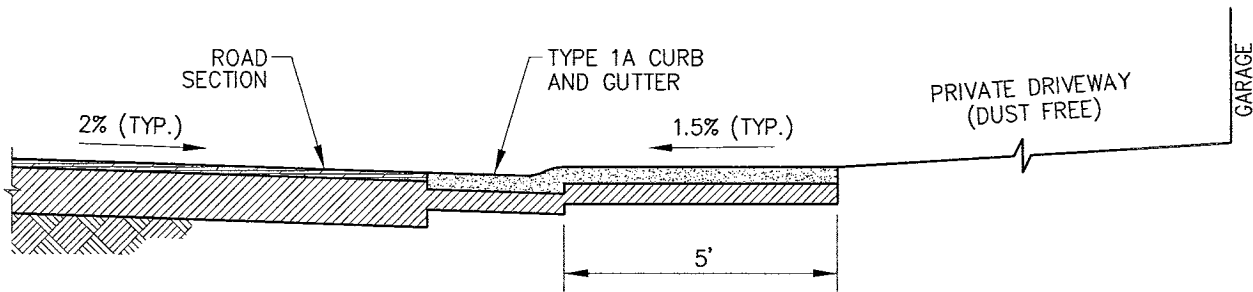


SECTION VIEW

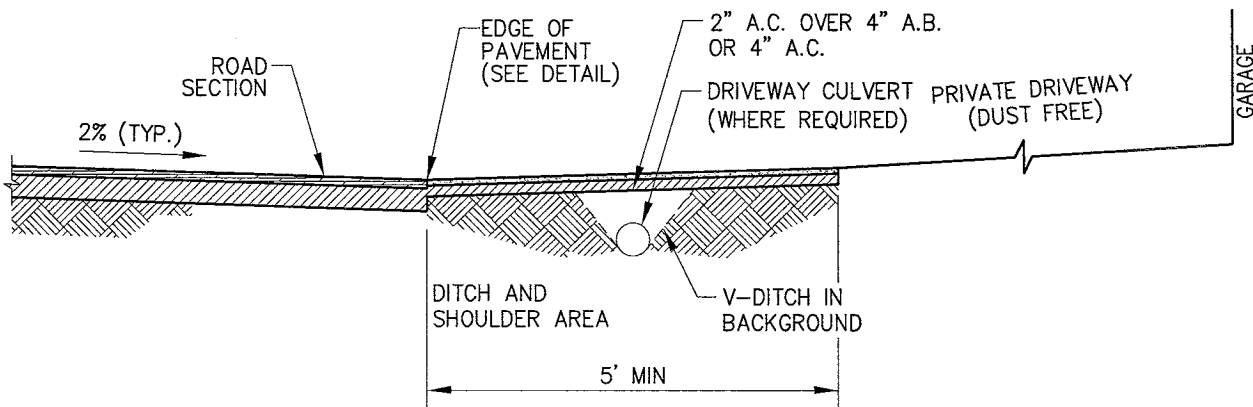
**PEDESTRIAN REFUGE
AREA**

4-37

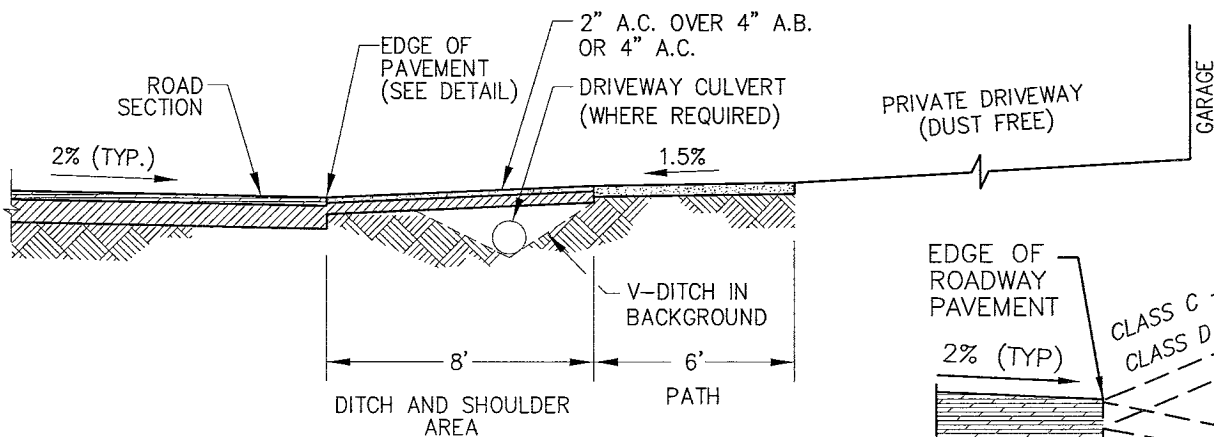
CHIEF, DEPT. OF TRANSPORTATION



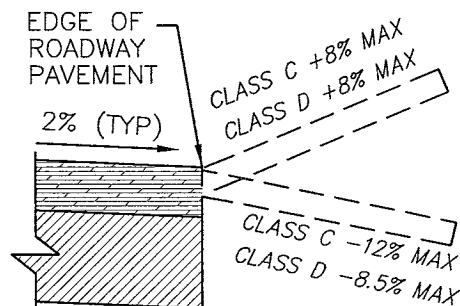
CLASS A



CLASS C



CLASS D



EDGE OF PAVEMENT DETAIL

NOTES:

1. SEE SACRAMENTO COUNTY IMPROVEMENT STANDARDS SECTION 4-11 FOR DRIVEWAY REQUIREMENTS.
2. NO CONCRETE DRIVEWAYS WITHIN 15' OF EDGE OF PAVEMENT WITHOUT PRIOR WRITTEN APPROVAL BY THE DIRECTOR OF COUNTY ENGINEERING.
3. MAXIMUM ALGEBRAIC DIFFERENCE OF A GRADE CHANGE BETWEEN ANY INTERSECTING ROADWAY AND A DRIVEWAY AND OR ANY PORTION OF PUBLIC RIGHT OF WAY AND A DRIVEWAY SHALL NOT BE GREATER THAN 10% (SEE EDGE OF PAVEMENT DETAIL).

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**RESIDENTIAL DRIVEWAY
SECTIONS: CLASS A,
CLASS C AND D STREETS**

SCALE: NONE
DATE: 06/11/2009
DRAWN BY: TRU P.

4-38



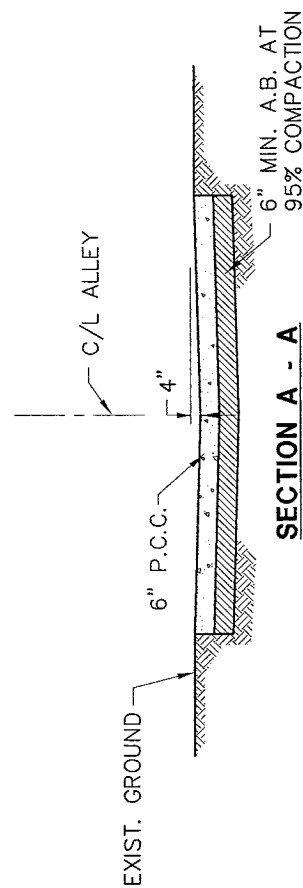
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

ALLEY DETAILS

SCALE: NONE
DATE: 07/18/2008
DRAWN BY: TRU P.

4-39





CROSS GUTTERS ARE NOT ALLOWED WITHIN A SIGNALIZED INTERSECTION.

100

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

CROSS GUTTER

SCALE: NONE
DATE: 09/02/2008
DRAWN BY: TRU P.

4-40

(FOR STREETS CLASSIFIED LESS THAN ARTERIAL, SEE NOTE 4)



1. *USE 100' PAVEMENT TAPER SECTION WHEN MAJOR STREET SHOULD BE UNPAVED OR SEAL COATED, OR WHERE PAVED SHOULDER IS LESS THAN 4' WIDE.*
2. *USE 67' PAVEMENT TAPER SECTION WHEN MAJOR STREET SHOULDER IS FULLY PAVED, AND A MINIMUM OF 4' WIDE.*
3. *FULL ROADBED STRUCTURAL SECTION TO BE PLACED IN ACCORDANCE WITH COUNTY STANDARDS FOR AREA TO BE PAVED.*
4. *PAVEMENT TAPER SECTION MAY BE DELETED WHERE NEW STREET INTERSECTS WITH MINOR OR COLLECTOR STREETS. MINIMUM RADIUS AT THESE INTERSECTIONS SHALL BE 25'.*

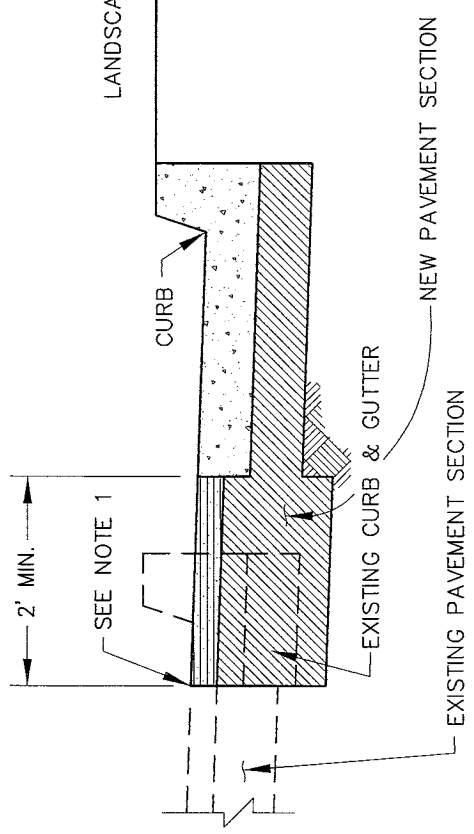
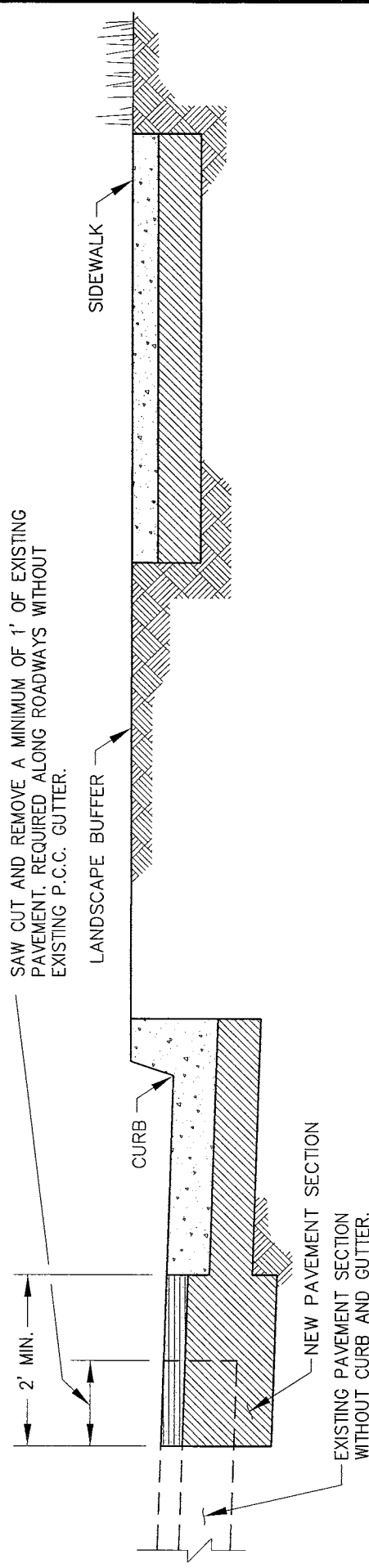
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

CLASS C & D STREET INTERSECTION

SCALE: NONE
DATE: 06/08/09
DRAWN BY: TRU P.

SAW CUT AND REMOVE A MINIMUM OF 1' OF EXISTING PAVEMENT. REQUIRED ALONG ROADWAYS WITHOUT EXISTING P.C.C. GUTTER.



NOTE:
1. SAW CUT AT EDGE OF PAVEMENT PRIOR TO REMOVAL OF EXISTING GUTTER. IF CONDITION OF EXISTING PAVEMENT AT EXISTING LIP OF GUTTER IS UNACCEPTABLE FOR PAVEMENT WIDENING, SAW CUT AND REMOVE ADDITIONAL PAVEMENT WIDTH AS DIRECTED BY THE ENGINEER.

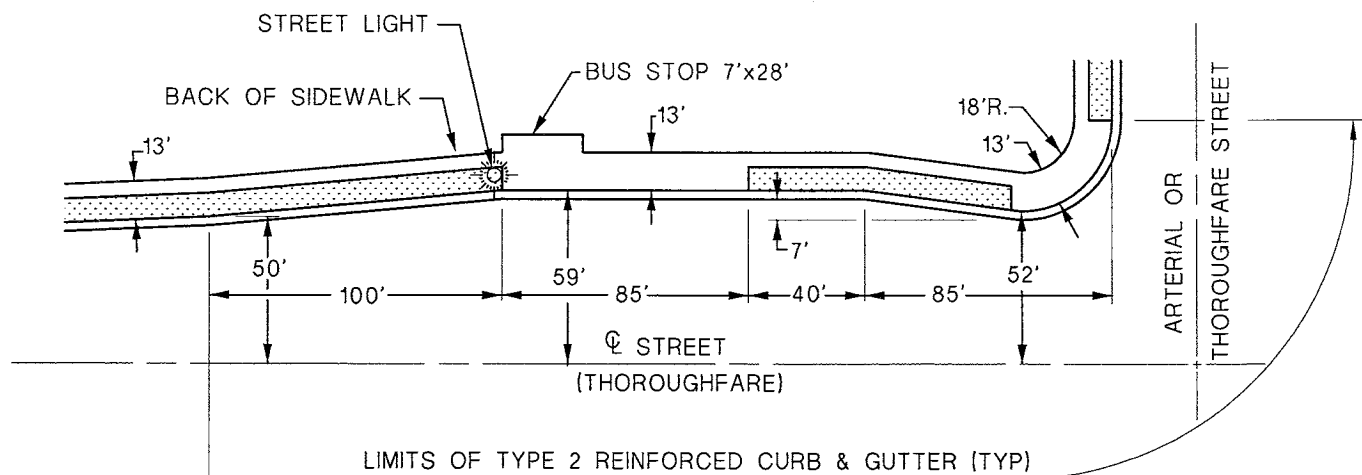
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

PAVEMENT WIDENING
DETAIL

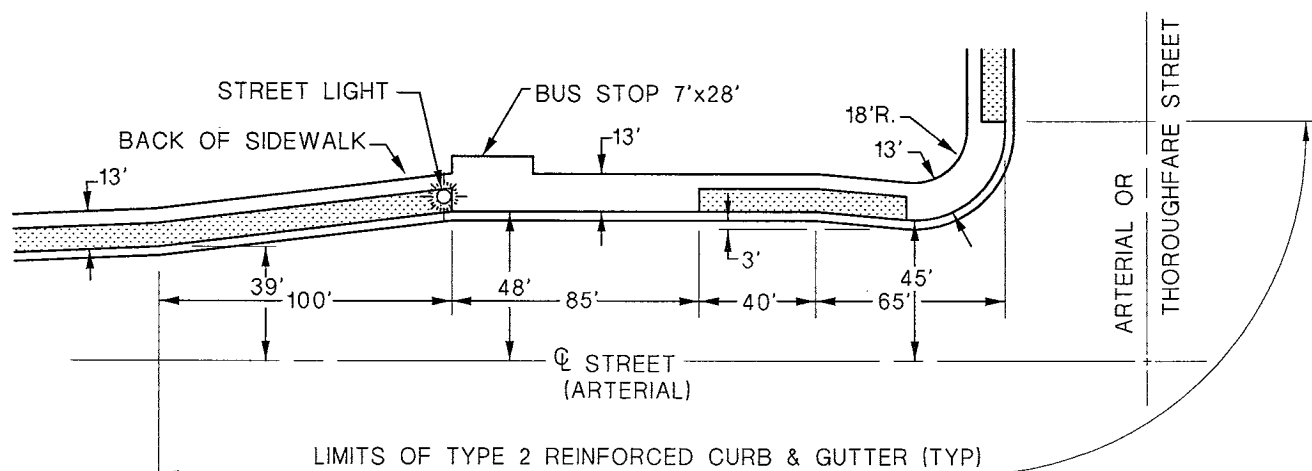
SCALE: NONE
DATE: 01/21/09
DRAWN BY: TRU P. & B.R.

4-42

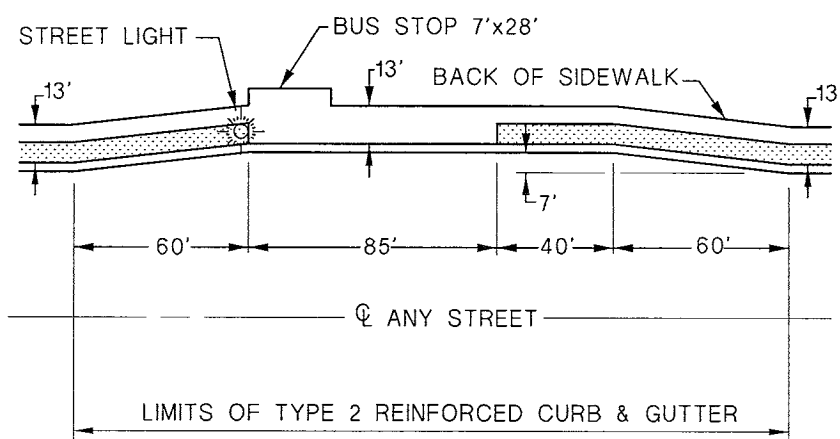
CHIEF, DEPT. OF TRANSPORTATION



BUS TURNOUT ON THOROUGHFARE STREETS



BUS TURNOUT ON ARTERIAL STREETS



TYPICAL MID-BLOCK BUS TURNOUT

NOTES:

1. SEE DRAWINGS 4-6 THRU 4-8, 4-10, 4-12 THRU 4-14 FOR ADDITIONAL BUS STOP GEOMETRY.
2. USE SIMILAR LIMITS FOR REINFORCED TYPE 2 CURB ALONG BUS STOPS ON ARTERIAL AND THOROUGHFARE STREETS THAT INTERSECT WITH COLLECTOR STREETS.

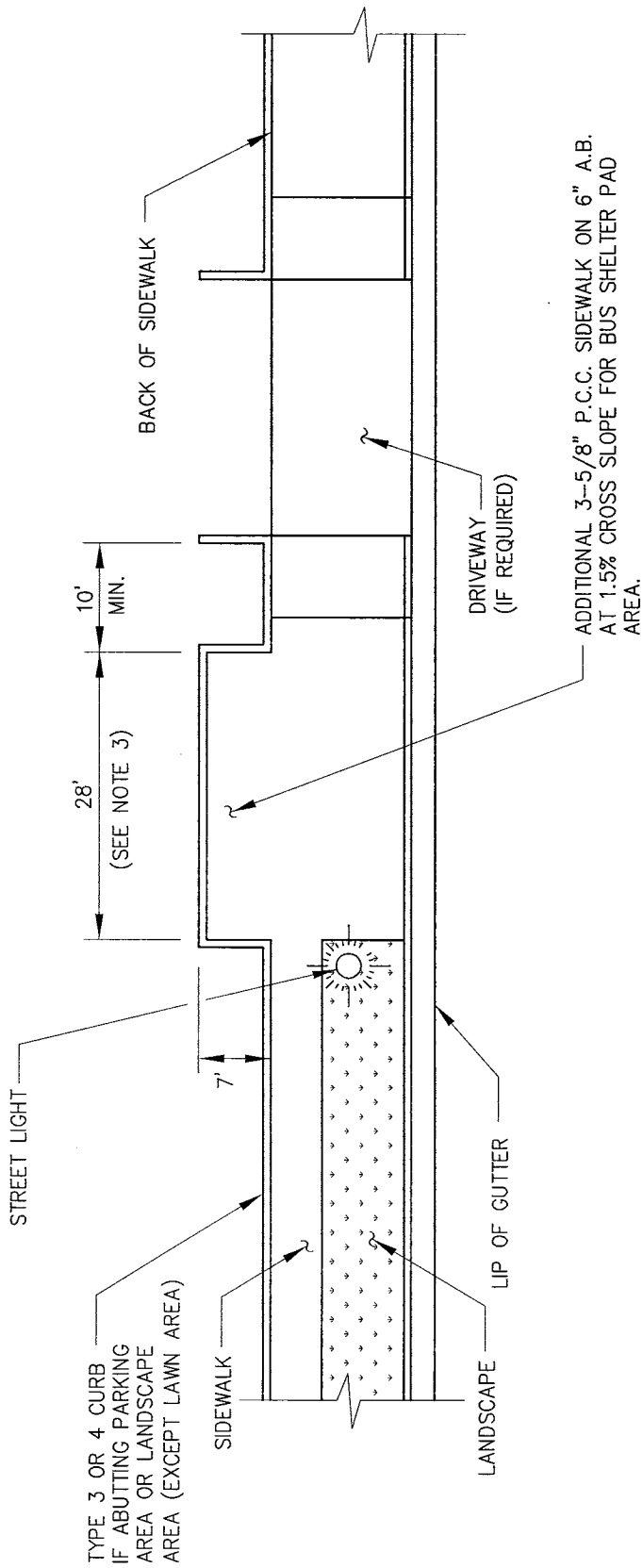
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

BUS TURNOUTS

SCALE: NONE
DATE: 07/15/09
DRAWN BY: TRU P.

4-43

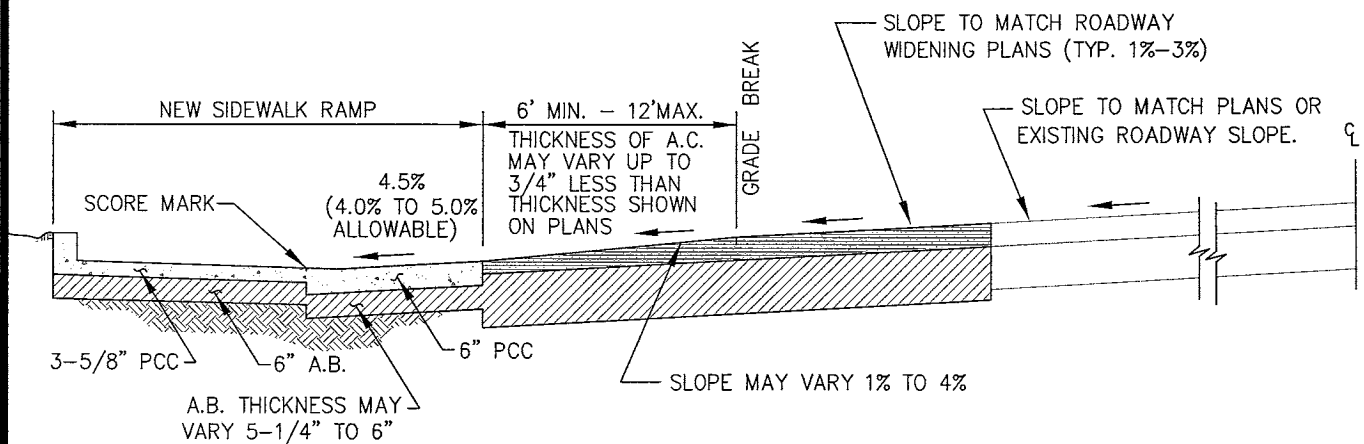
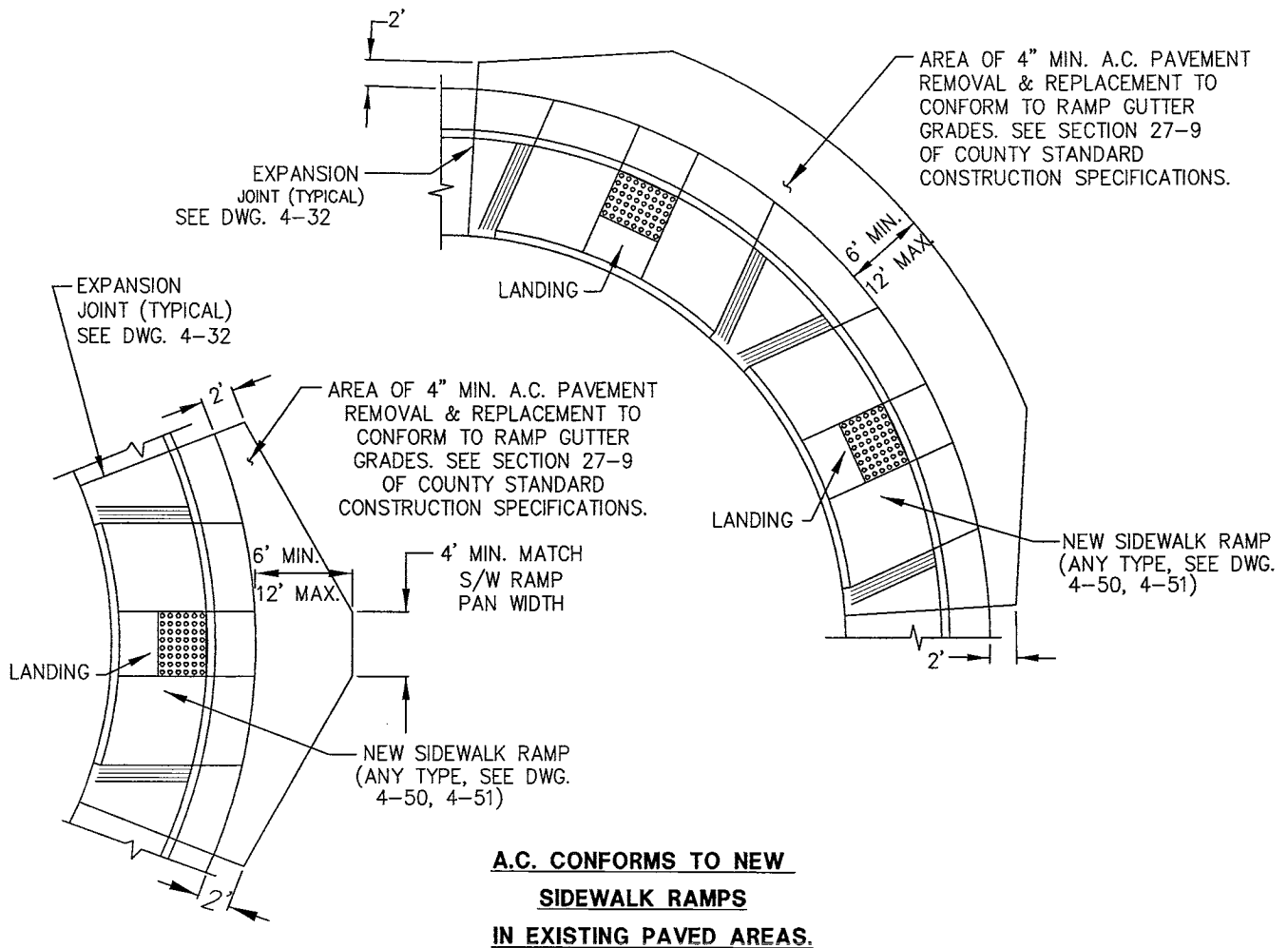


NOTES:

1. FOR BUS STOPS WITHOUT TURNOUTS, TYPE 2 REINFORCED CURB & GUTTER SECTION SHALL BE USED FOR 100' EACH SIDE OF BUS STOP SIGN.
2. SEE STANDARD DRAWING 4-43 FOR APPLICATIONS OF TYPE 2 REINFORCED CURB & GUTTER AT BUS STOP TURNOUTS.
3. PAD LENGTH MAY BE 14' AT MINOR STREET INTERSECTIONS & MID BLOCK LOCATIONS.

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
BUS STOP DETAILS	
SCALE: NONE DATE: 06/08/09 DRAWN BY: TRU P.	4-44

[Signature]
CHIEF, DEPT. OF TRANSPORTATION



A.C. CONFORMS TO NEW SIDEWALK RAMPS WITH PAVEMENT WIDENING OR ROADWAY CONSTRUCTION

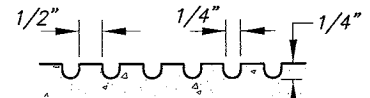
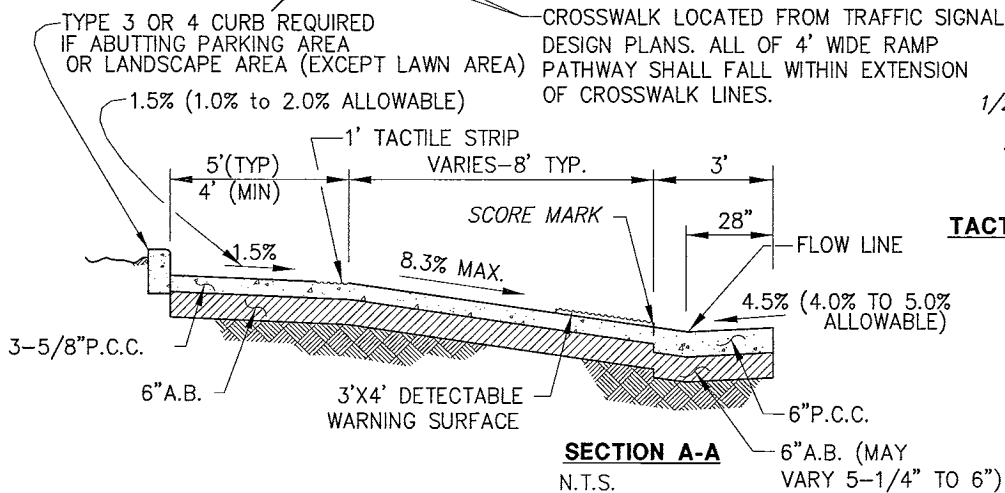
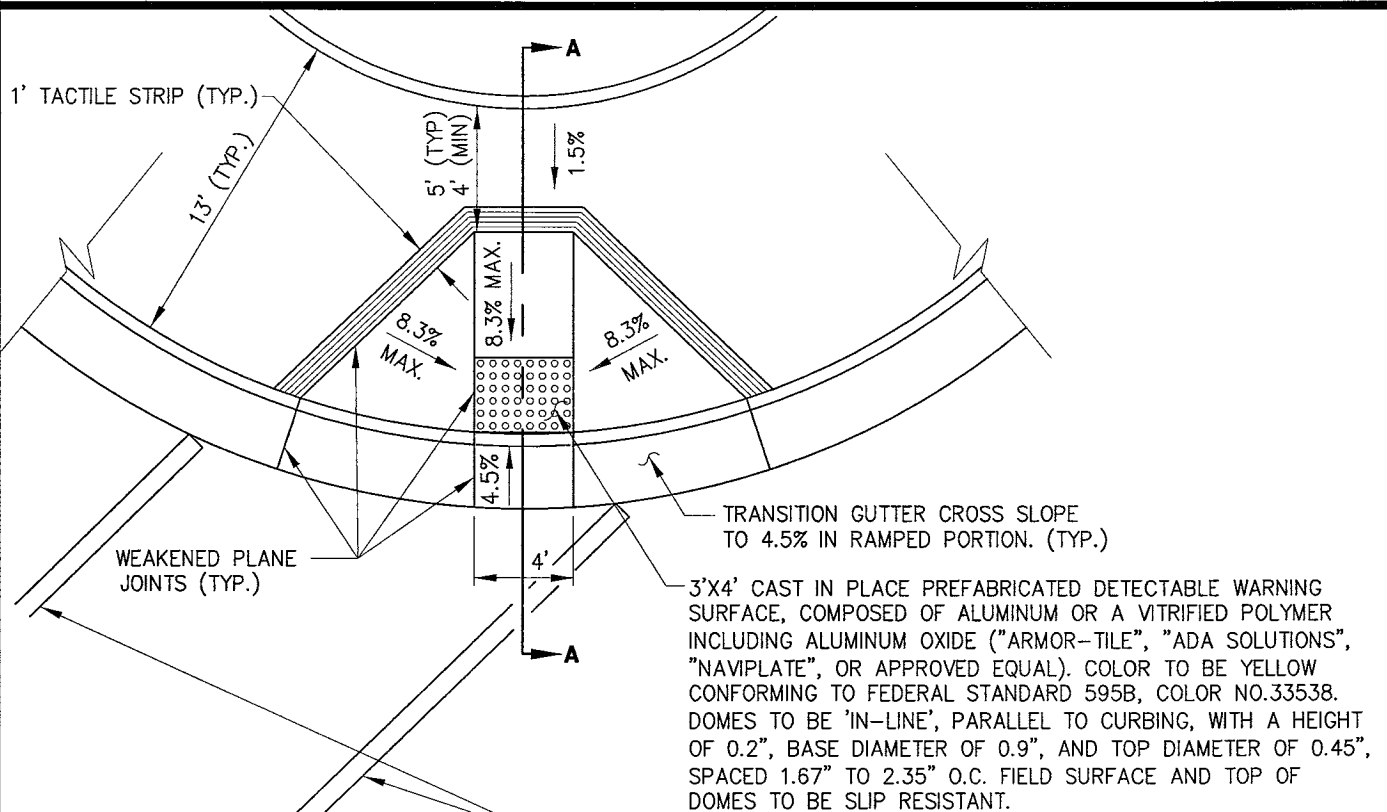
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CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

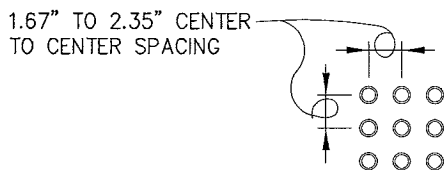
**SIDEWALK RAMP INSTALLATION
DETAIL - AC CONFORMS
IN EXISTING PAVEMENT**

SCALE: NONE
DATE: 01/09/09
DRAWN BY: TRU P. & B.R.

4-49



TACTILE STRIP GROOVE DETAIL



RAISED TRUNCATED DOME PATTERN (IN-LINE)

N.T.S.

NOTES:

1. SEE DWG. 4-51 TO 4-56 FOR RAMP PLACEMENT REQUIREMENTS.
2. NO PULL BOX, UTILITY VAULT, UTILITY POLE, MANHOLE, TRAFFIC SIGNAL POLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
3. IT IS DESIRABLE TO LOCATE ALL DRAIN INLETS OUT OF SIDEWALK RAMP AREA. USE OF DRAIN INLET WITHIN RAMP AREA REQUIRES SPECIAL DESIGN OF INLETS.

[Signature]

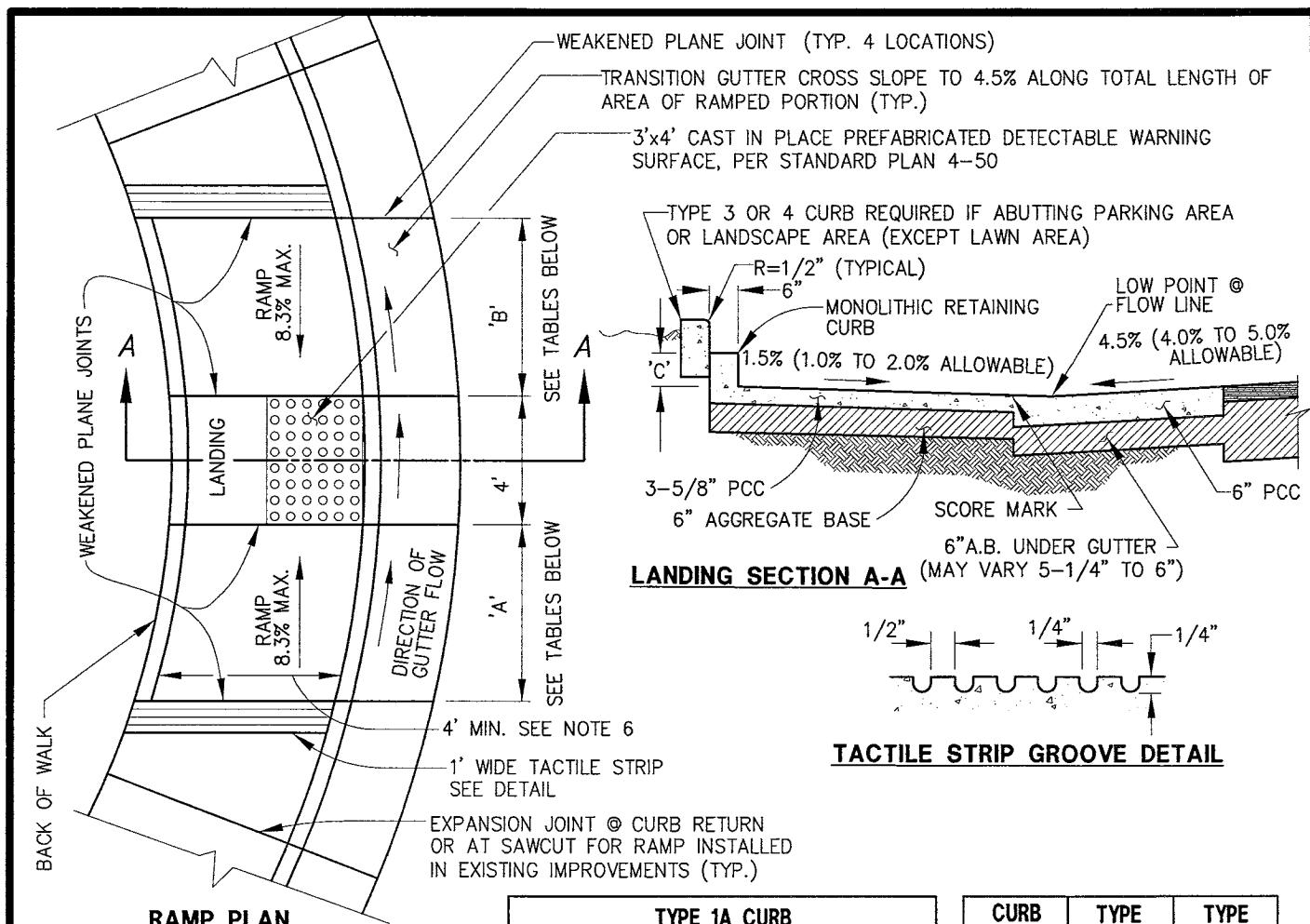
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMP DETAILS
PLAZA STYLE**

SCALE: NONE
DATE: 07/15/2009
DRAWN BY: TRU P.

4-50



TYPE 2 CURB			
SLOPE OF GUTTER		APPROX. RAMP LENGTH	
FROM (%)	TO (%)	A	B
0.5%	1.0%	7'-6"	6'-0"
1.0%	1.5%	8'-0"	6'-0"
1.5%	1.8%	8'-6"	5'-6"
1.8%	2.1%	9'-0"	5'-6"
2.1%	2.7%	10'-0"	5'-0"
2.7%	3.2%	11'-0"	5'-0"
3.2%	3.7%	12'-6"	4'-6"
3.7%	4.1%	14'-0"	4'-6"
4.1%	4.7%	15'-0"	4'-6"
> 4.7%		SEE NOTE #4	

TYPE 1A CURB			
SLOPE OF GUTTER		APPROX. RAMP LENGTH	
FROM (%)	TO (%)	A	B
0.5%	1.0%	4'-6"	4'-0"
1.0%	1.7%	5'-0"	3'-6"
1.7%	2.2%	5'-6"	3'-6"
2.2%	2.7%	6'-0"	3'-0"
2.7%	3.1%	6'-6"	3'-0"
3.1%	3.4%	7'-0"	3'-0"
3.4%	3.7%	7'-6"	3'-0"
3.7%	3.9%	8'-0"	3'-0"
3.9%	4.3%	9'-0"	3'-0"
4.3%	5.0%	10'-0"	2'-6"
5.0%	6.0%	15'-0"	2'-6"
> 6.0%		SEE NOTE #4	

CURB TYPE	TYPE 1A	TYPE 2
DIM 'C' *	3-5/8"	6"

* OR AS NEEDED TO MATCH EXISTING ON SITE IMPROVEMENTS, 8" MAX.

NOTES:

- DIMENSION 'A' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE SAME DIRECTION AS THE FLOW OF THE GUTTER.
- DIMENSION 'B' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE OPPOSITE DIRECTION AS THE FLOW OF THE GUTTER.
- RAMPS SHALL HAVE A HEAVY BROOM FINISH TRANSVERSE TO THEIR SLOPE.
- REQUIRES SPECIAL DESIGN APPROVAL BY THE CHIEF OF THE DEPARTMENT OF TRANSPORTATION.
- NO PULL BOX, UTILITY VAULT, UTILITY POLE, TRAFFIC SIGNAL POLE, MANHOLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
- FOR CURB RETURNS WITH 4' SIDEWALK SEE DRAWING 4-54.

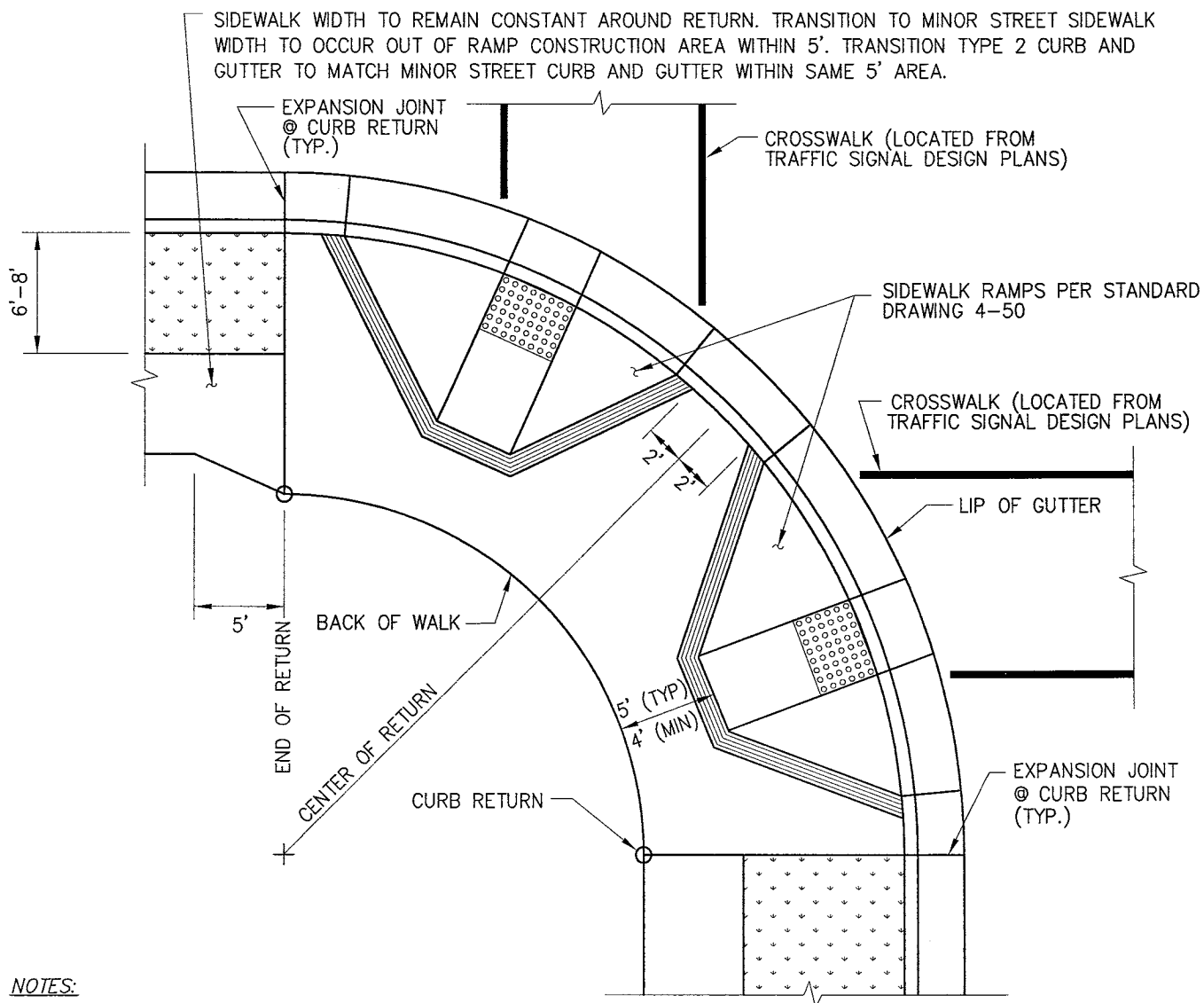
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMP DETAILS
PARALLEL STYLE**

SCALE: NONE
DATE: 07/28/09
DRAWN BY: TRU P. & B.R.

4-51



NOTES:

1. AT INTERSECTIONS WITH ARTERIALS AND/OR THOROUGHFARES, THE CORNER RETURNS SHALL HAVE TWO (2) RAMPS AS SHOWN. EXCEPTIONS SEE NOTES 4 & 5.
2. AT INTERSECTIONS WITH NO ARTERIAL OR THOROUGHFARE STREET, SINGLE RAMPS AT THE CENTER OF THE RETURNS MAY BE USED. SEE STANDARD DRAWINGS 4-53, 4-54, 4-56, 4-57.
3. FULL WIDTH OF RAMP SHALL BE LOCATED WITHIN THE EXTENSION OF THE ASSOCIATED CROSSWALK STRIPES, WHERE STRIPED CROSSWALKS EXIST.
4. ON STREETS WITH A CONTINUOUS RAISED MEDIAN ACROSS THE INTERSECTION, A SINGLE SIDEWALK RAMP IS TO BE INSTALLED ON EACH CORNER AT THE CENTER OF RETURN.
5. FOR CORNERS WITH TWO STRIPED CROSSWALKS AND WITH OBSTRUCTIONS THAT PREVENT THE CONSTRUCTION OF TWO STANDARD RAMPS, A SINGLE SIDEWALK RAMP MAY BE INSTALLED CENTERED IN THE TWO CROSSWALKS. THE WIDTH OF RAMP IS TO BE 6'. THE WARNING SURFACE MATERIAL SHALL BE THREE FEET BY SIX FEET. USE OF THIS OPTION REQUIRES PRIOR WRITTEN APPROVAL BY CHIEF OF THE DEPARTMENT OF TRANSPORTATION.


 CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMP
PLACEMENT
MAJOR STREET INTERSECTION**

SCALE: NONE
DATE: 04/02/2009
DRAWN BY: B.R. & TRU P.

4-52

1. GRADE PLAZA AREA BEHIND RAMP AND ASSOCIATED SIDEWALK CONFORMS TO DRAIN. TYPICAL SLOPE IS 1.5% TOWARD STREET. MAXIMUM SLOPE IS 2.0% IN EITHER DIRECTION.

1. GRADE PLAZA AREA BEHIND RAMP AND ASSOCIATED SIDEWALK CONFORMS TO DRAIN. TYPICAL SLOPE IS 1.5% TOWARD STREET. MAXIMUM SLOPE IS 2.0% IN EITHER DIRECTION.

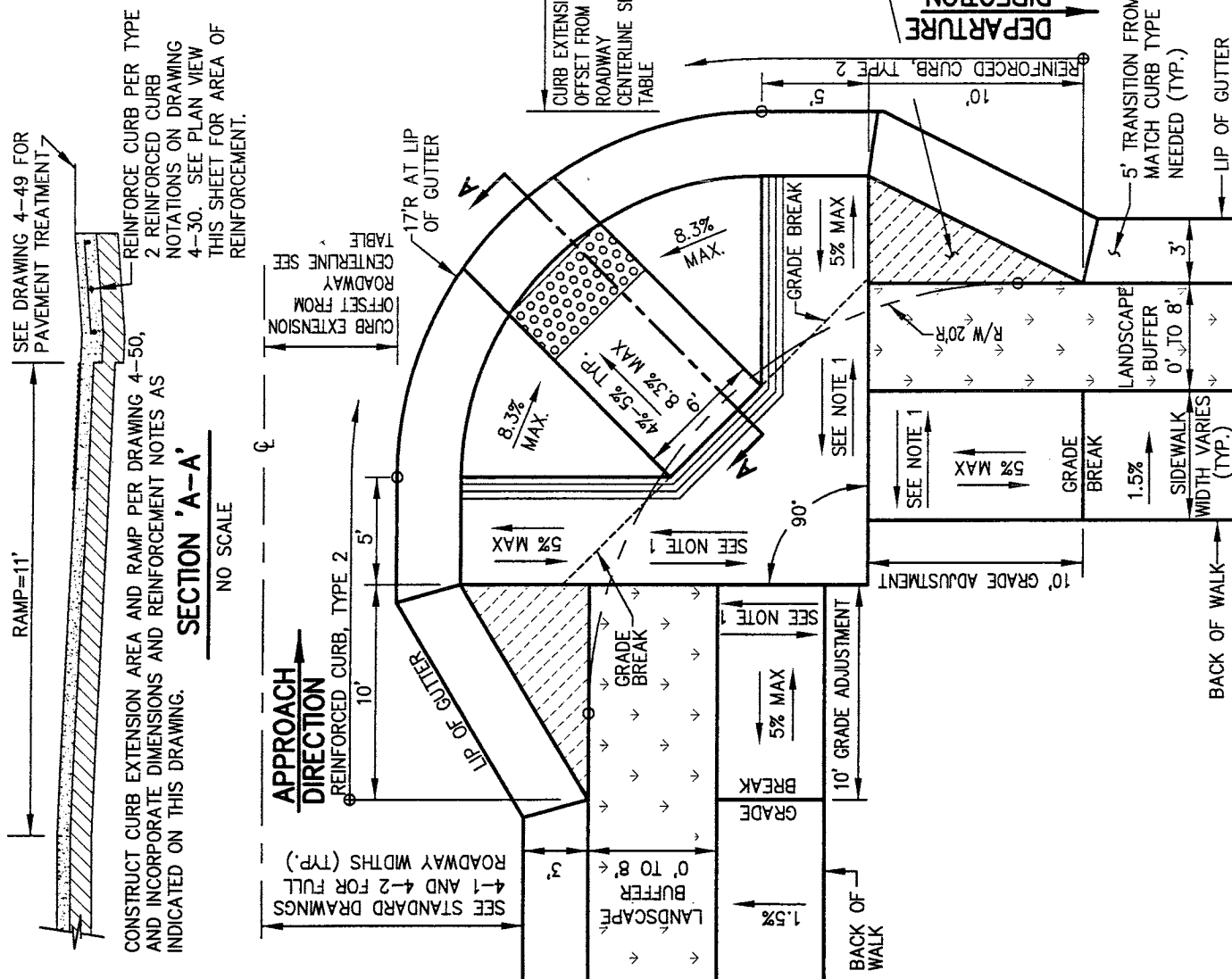
STREET DESIGNATION	APPROACH OFFSET	DEPARTURE OFFSET
MINOR RESIDENTIAL PRIMARY RESIDENTIAL	11'	13'
COLLECTOR	15'	15'
MAJOR COLLECTOR	22'	22'

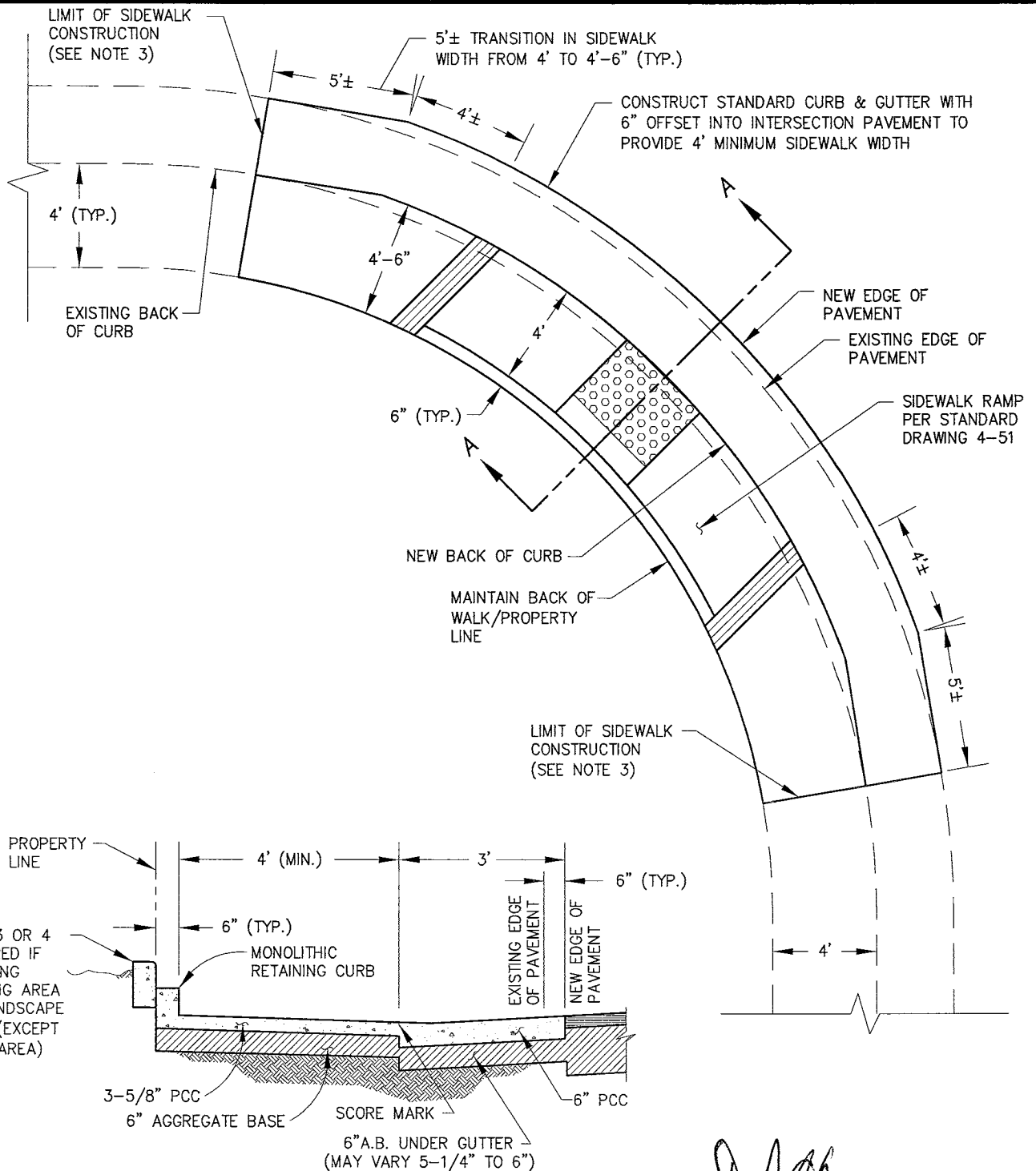
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY
TYPICAL CURB EXTENSION
FOR RESIDENTIAL &
COLLECTOR STREETS**

SCALE: NONE
DATE: 07/28/09
DRAWN BY: G. CORNEJO

4-53





NOTES:

1. RAMPS SHALL HAVE A HEAVY BROOM FINISH TRANSVERSE TO THEIR SLOPE.
2. NO PULL BOX, UTILITY VAULT, UTILITY POLE, TRAFFIC SIGNAL POLE, MANHOLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
3. REMOVE AND REPLACE SIDEWALK TO NEAREST JOINT (CONSTRUCTION, EXPANSION, OR WEAKENED PLANE). DOWELL TO EXISTING PER DRAWING 4-32.
4. ASPHALT CONCRETE RECONSTRUCTION ALONG NEW RAMP SHALL CONFORM TO DRAWING 4-49.
5. USE THIS DETAIL WHERE CURB EXTENSION (STANDARD DRAWING 4-53) IS NOT USED WITH PERMISSION OF DIRECTOR OF COUNTY ENGINEERING.

LANDING SECTION A-A

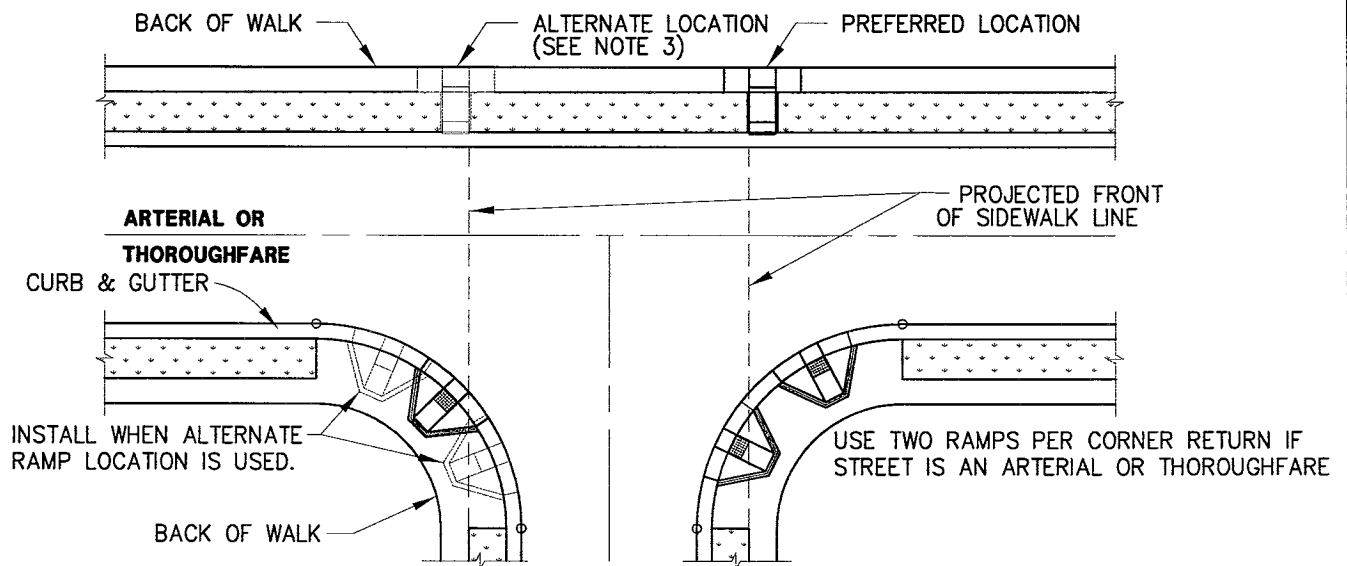
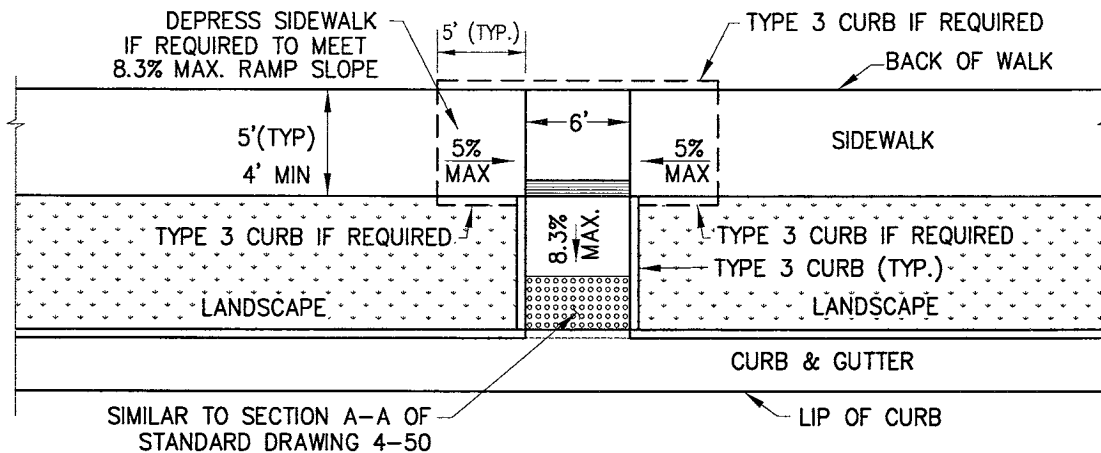
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMP DETAILS
FOR RETROFIT OF EXISTING
4' WIDE SIDEWALKS**

SCALE: NONE
DATE: 04/21/09
DRAWN BY: B.R.

4-54



NOTES:

1. MARKED CROSSWALKS SHALL HAVE RAMPS AT BOTH ENDS WITH THE RAMP TERMINATING WITHIN THE MARKED CROSSWALK.
2. AT "T" INTERSECTIONS WITH UNMARKED CROSSWALKS ONLY 1 RAMP (REFERRED TO AS THE "T-RAMP") IS REQUIRED AT THE TOP OF THE "T" INTERSECTION.
3. AT "T" INTERSECTIONS ADJACENT TO SCHOOLS TWO RAMPS ARE REQUIRED AT TOP OF THE "T" WHETHER THE CROSSWALK IS MARKED OR UNMARKED
4. WHEN CROSSWALK IS UNMARKED, THE T-RAMP SHOULD BE LOCATED IN LINE WITH THE EXTENSION OF THE SIDEWALK FROM ACROSS THE STREET.
5. THIS DETAIL SHALL BE USED IN LOCATIONS WHERE NO CURB EXTENSION EXISTS.

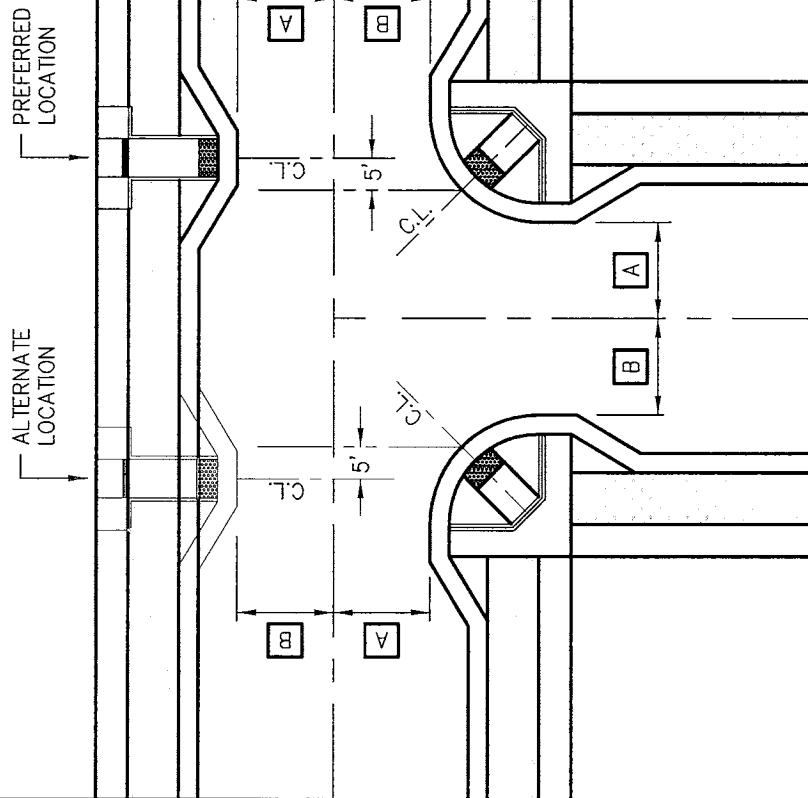
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMPS AT
"T" INTERSECTIONS FOR
ARTERIAL STREETS &
THOROUGHFARE STREETS**

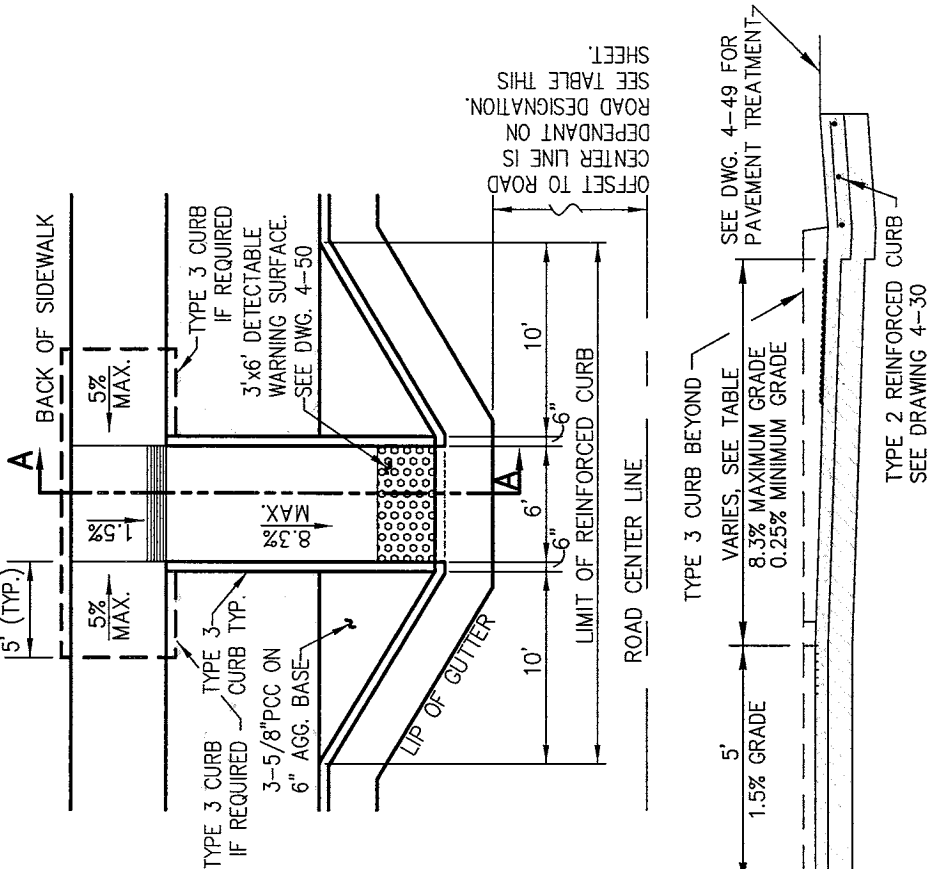
SCALE: NONE
DATE: 04/01/09
DRAWN BY: TRU P. & B.R.

4-55



STREET DESIGNATION	[A] APPROACH OFFSET	[B] DEPARTURE OFFSET
MAJOR COLLECTOR	22'	22'
COLLECTOR	15'	15'
MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL	11'	13'

SEE DWG. 4-53 FOR TYPICAL CORNER EXTENSION DESIGN.



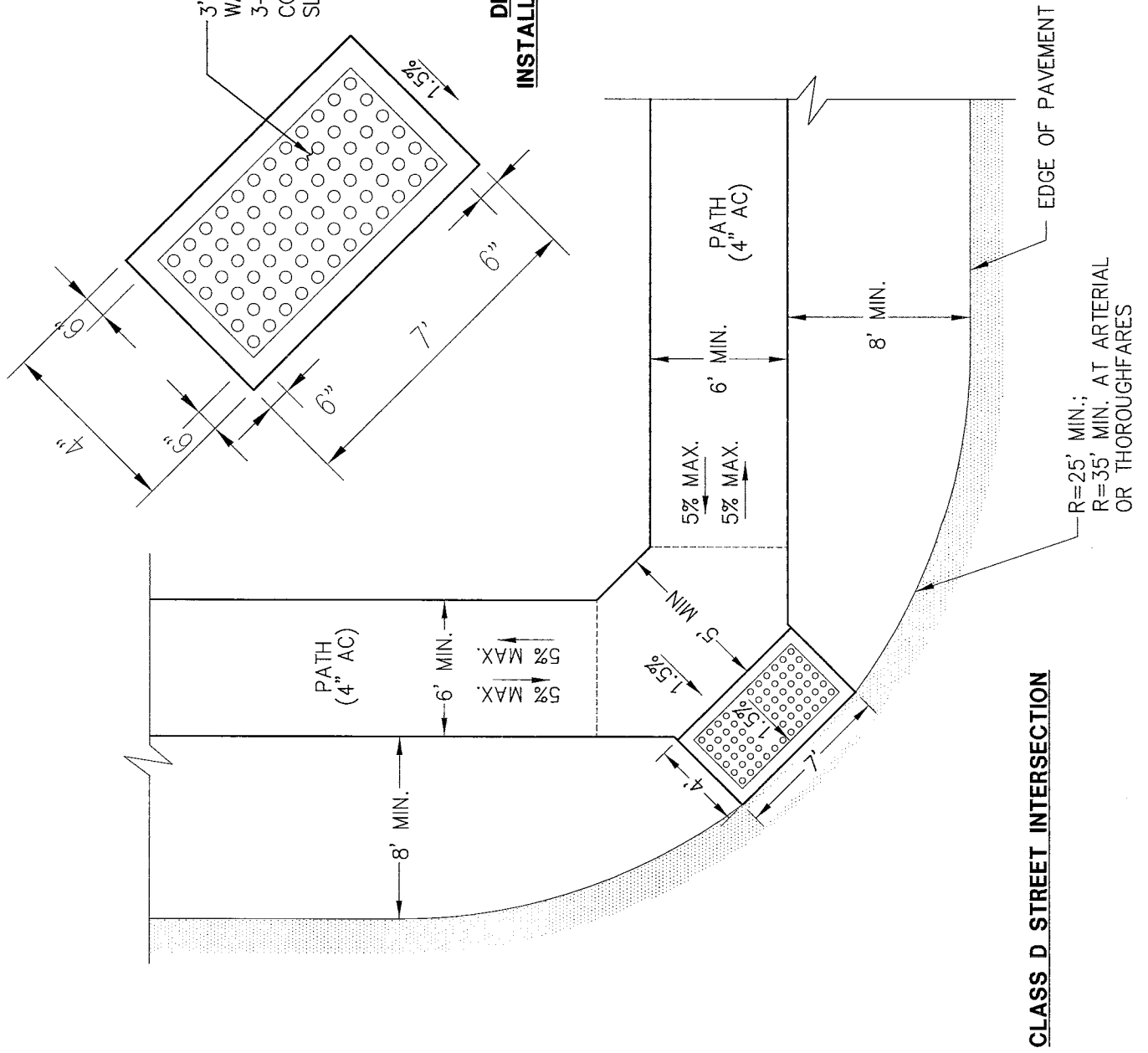
SECTION 'A-A'
NO SCALE

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY
SIDEWALK RAMPS AT
"T" INTERSECTIONS FOR
RESIDENTIAL STREETS &
COLLECTOR STREETS

SCALE: NONE
DATE: 01/22/09
DRAWN BY: G. CORNEJO

[Signature]

CHIEF, DEPT. OF TRANSPORTATION



[Signature]

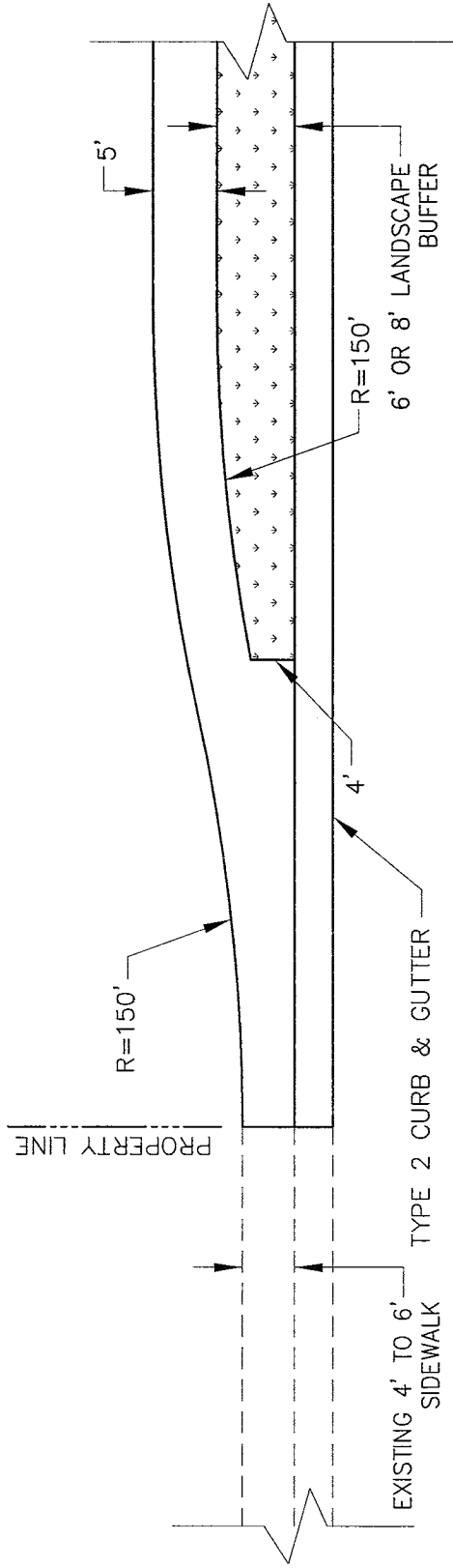
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

PEDESTRIAN LANDINGS
AT CLASS D STREETS

SCALE: NONE
DATE: 04/01/2009
DRAWN BY: J.S.

4-57



CLASS A STREET WITH SEPARATED SIDEWALK TO
CLASS A STREET WITH ATTACHED SIDEWALK

[Signature]

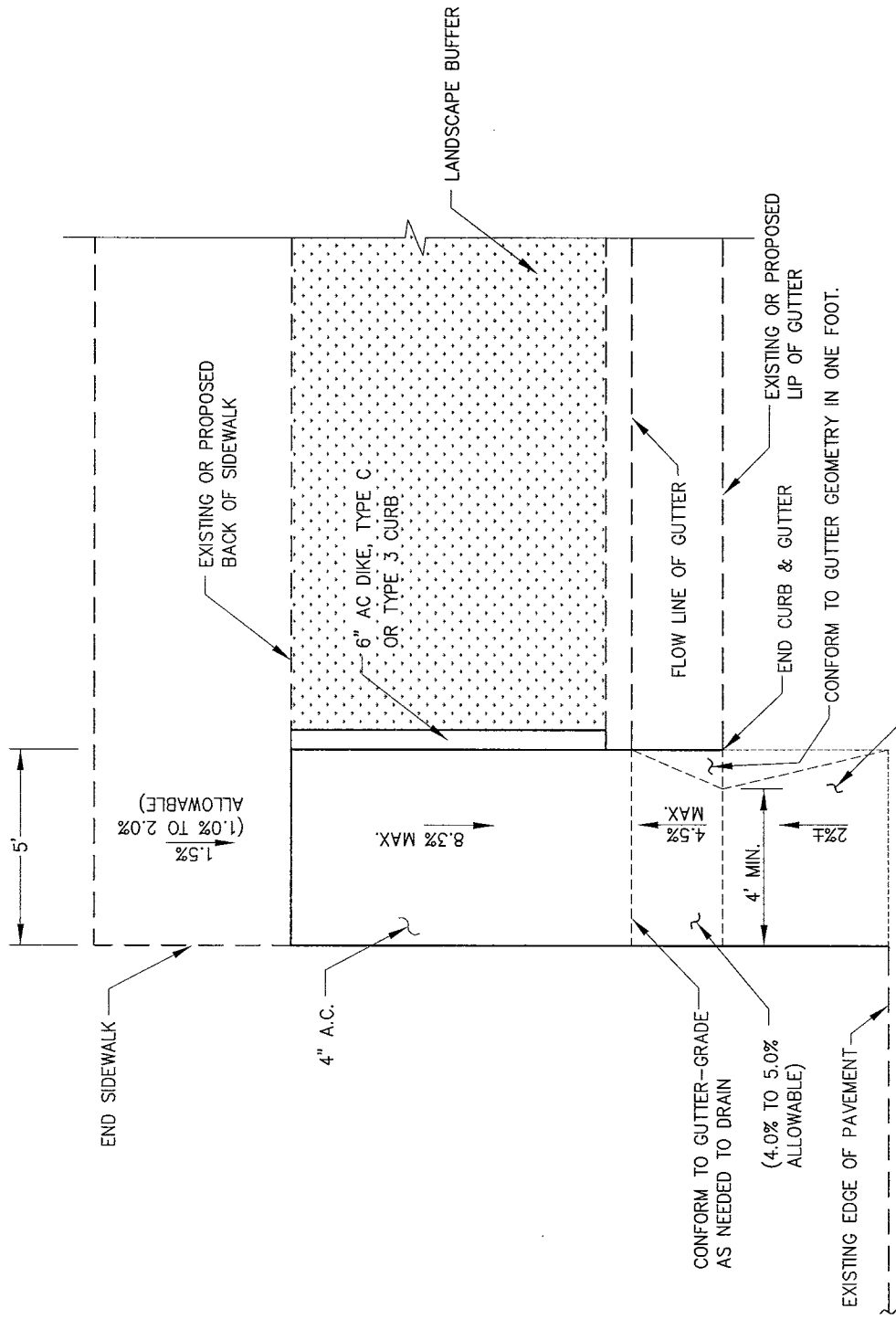
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK CONFORMS

SCALE: NONE
 DATE: 04/01/09
 DRAWN BY: TRU P.

4-58



CONSTRUCT PORTION OF AC SIDEWALK
CONFORM BEYOND EXTENSION OF LIP
OF GUTTER TO ROADWAY STANDARDS IF
CONSTRUCTED WITH ROADWAY WIDENING.

NOTE: A SIDEWALK BARRICADE SHALL BE REQUIRED IF THE
END OF THE A.C. SIDEWALK CONFORM ABUTS A
DRAINAGE DITCH OR ANY OTHER SURFACE THAT WOULD
POSE A HAZARD TO PEDESTRIANS.

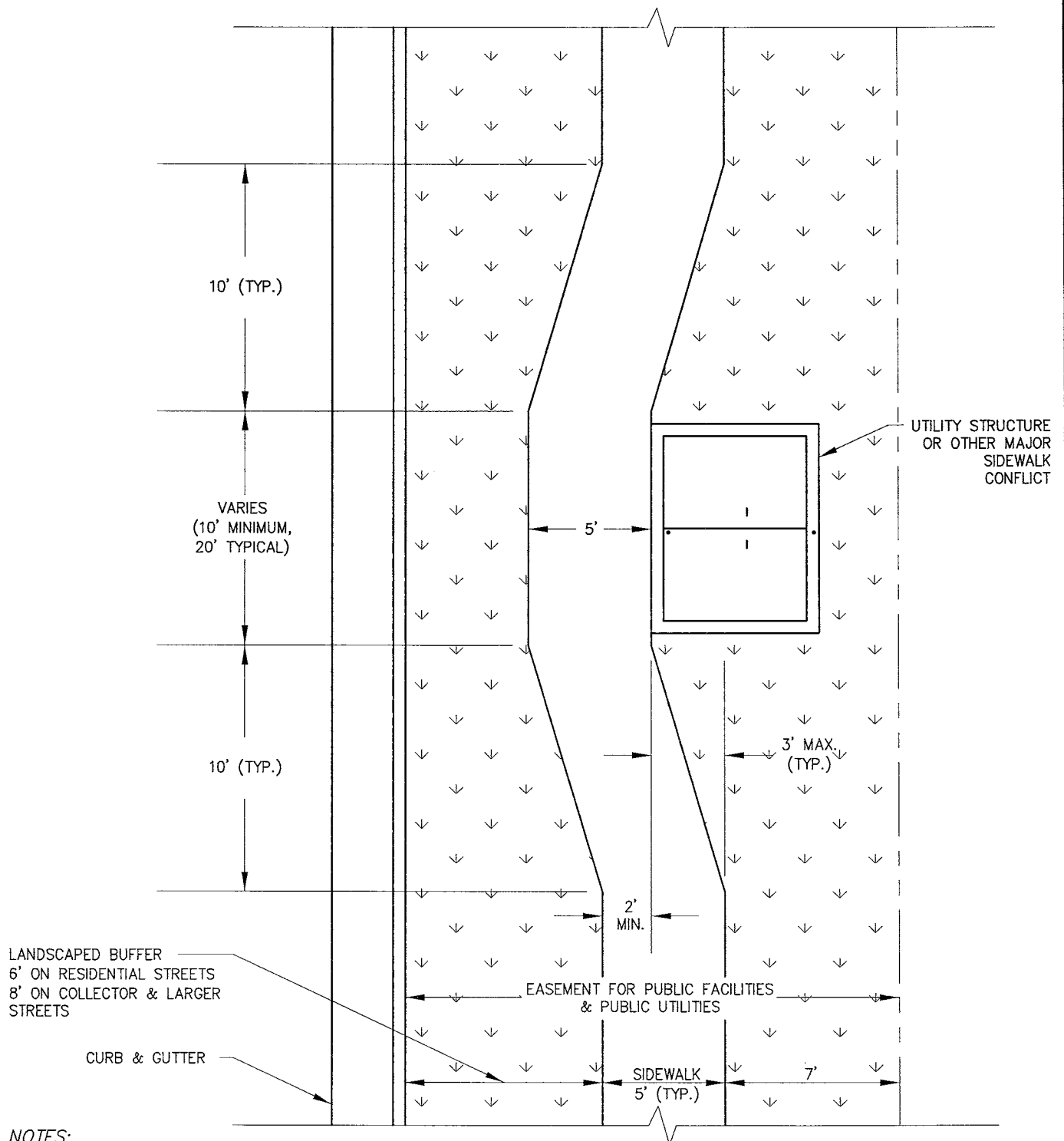
SEE DWG. 4-62 FOR ROADSIDE NARROWING STANDARDS

[Signature]
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK CONFORM
END OF SEPARATED
SIDEWALK

SCALE: NONE
DATE: 04/01/09
DRAWN BY: B.R. & TRU P.



NOTES:

1. THIS DETAIL IS TO BE USED TO RESOLVE CONFLICTS BETWEEN SEPARATED SIDEWALKS AND UTILITY STRUCTURES (OR OTHER MAJOR CONFLICTS).
2. WHERE REASONABLY POSSIBLE, LOCATE UTILITY FACILITIES OUTSIDE OF SIDEWALK AREA OR WITHIN SIDEWALK AT SIDEWALK GRADE TO MINIMIZE USE OF THIS DETAIL.
3. INSTALL EXPANSION JOINTS ACROSS FULL WIDTH OF SIDEWALK ON BOTH SIDES OF THE UTILITY STRUCTURE (OR OTHER MAJOR CONFLICTING FACILITY).

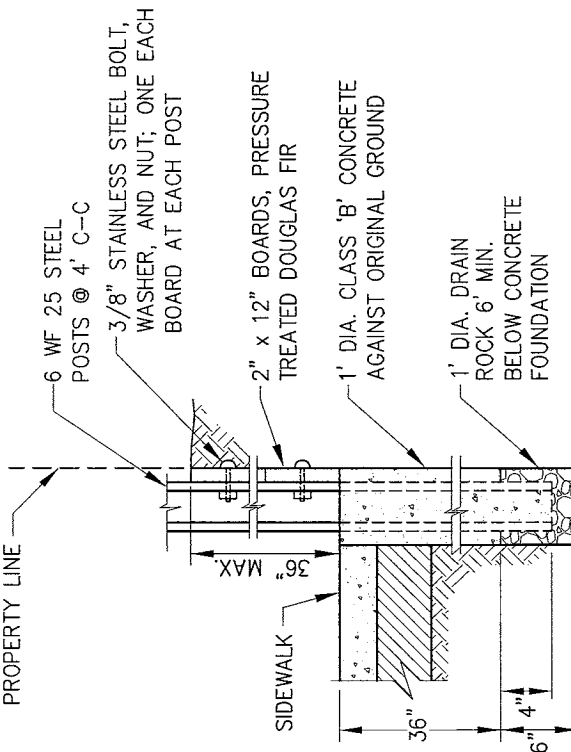
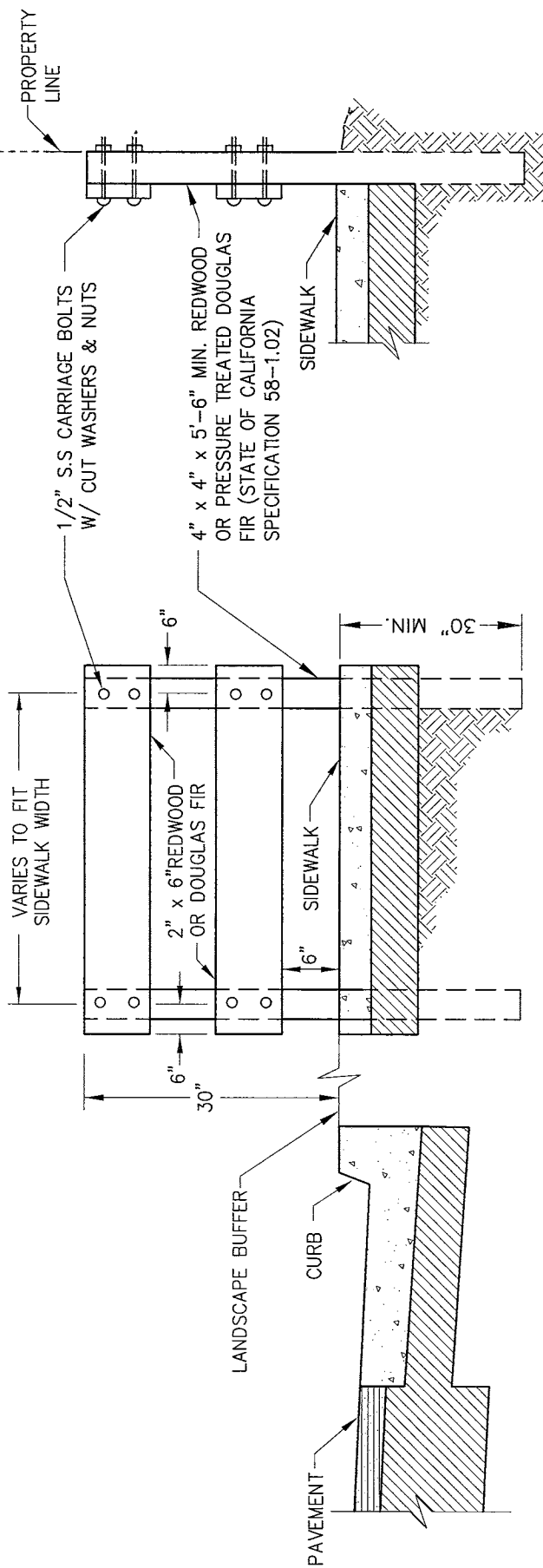
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK FLAIR AT UTILITY
STRUCTURE OR OTHER
MAJOR CONFLICT**

SCALE: NONE
DATE: 05/29/09
DRAWN BY: B.R.

4-60



**DETAIL FOR SIDEWALK BARRICADE
WITH RETAINING WALL**

NOTES:

1. SIDEWALK BARRICADES TO BE ERECTED AT EACH LOCATION WHERE SATISFACTORY PROVISION CAN NOT BE MADE FOR PEDESTRIAN TO CONTINUE BEYOND THE TERMINUS OF A SIDEWALK AND A HAZARD IS PRESENT.
2. ALL EXPOSED SURFACES TO BE PAINTED WITH TWO (2) COATS OF WHITE PAINT CONFORMING TO SECTION 91-3 OF STATE SPECIFICATIONS.

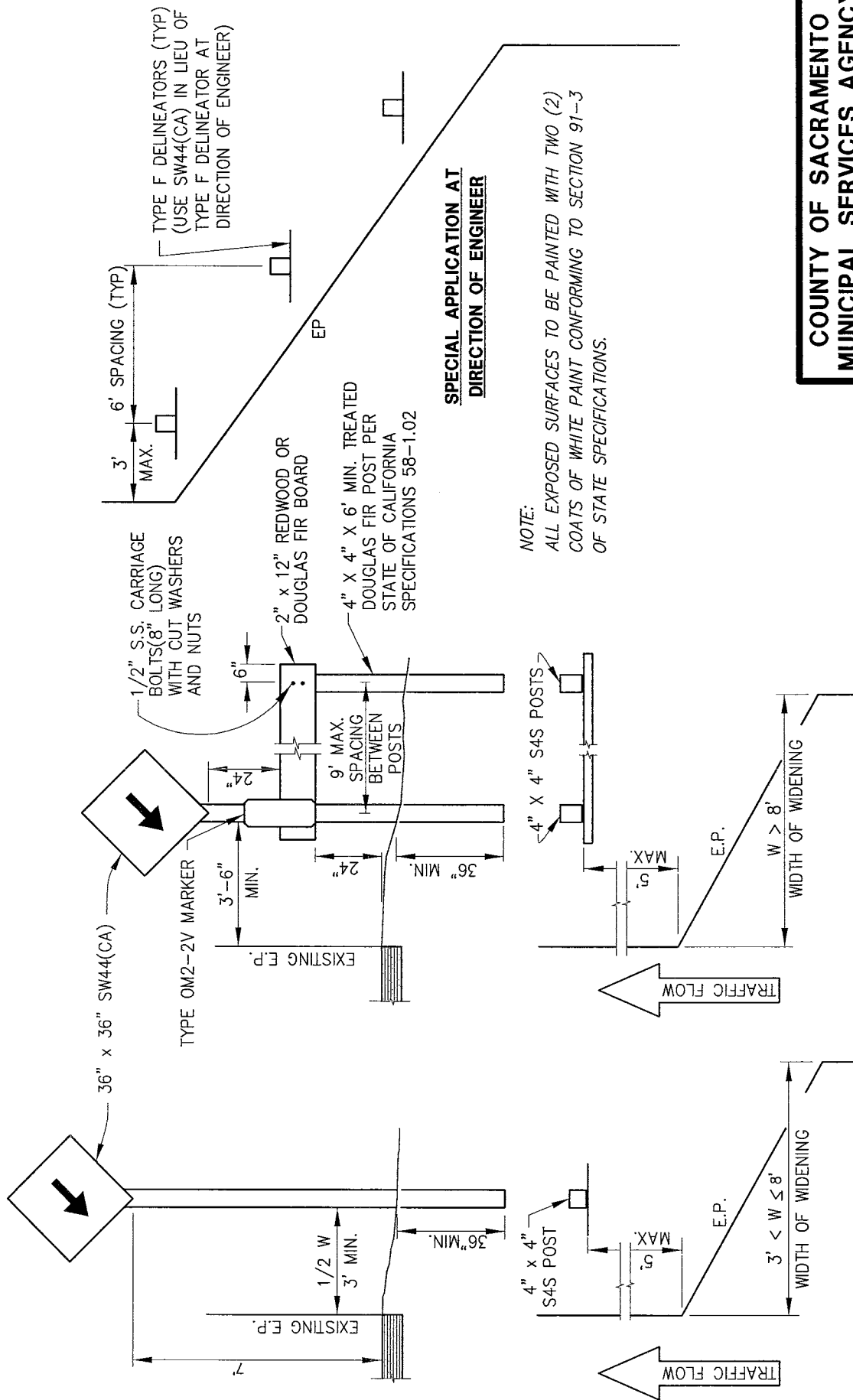
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

SIDEWALK BARRICADE

SCALE: NONE
DATE: 07/24/08
DRAWN BY: TRU P.

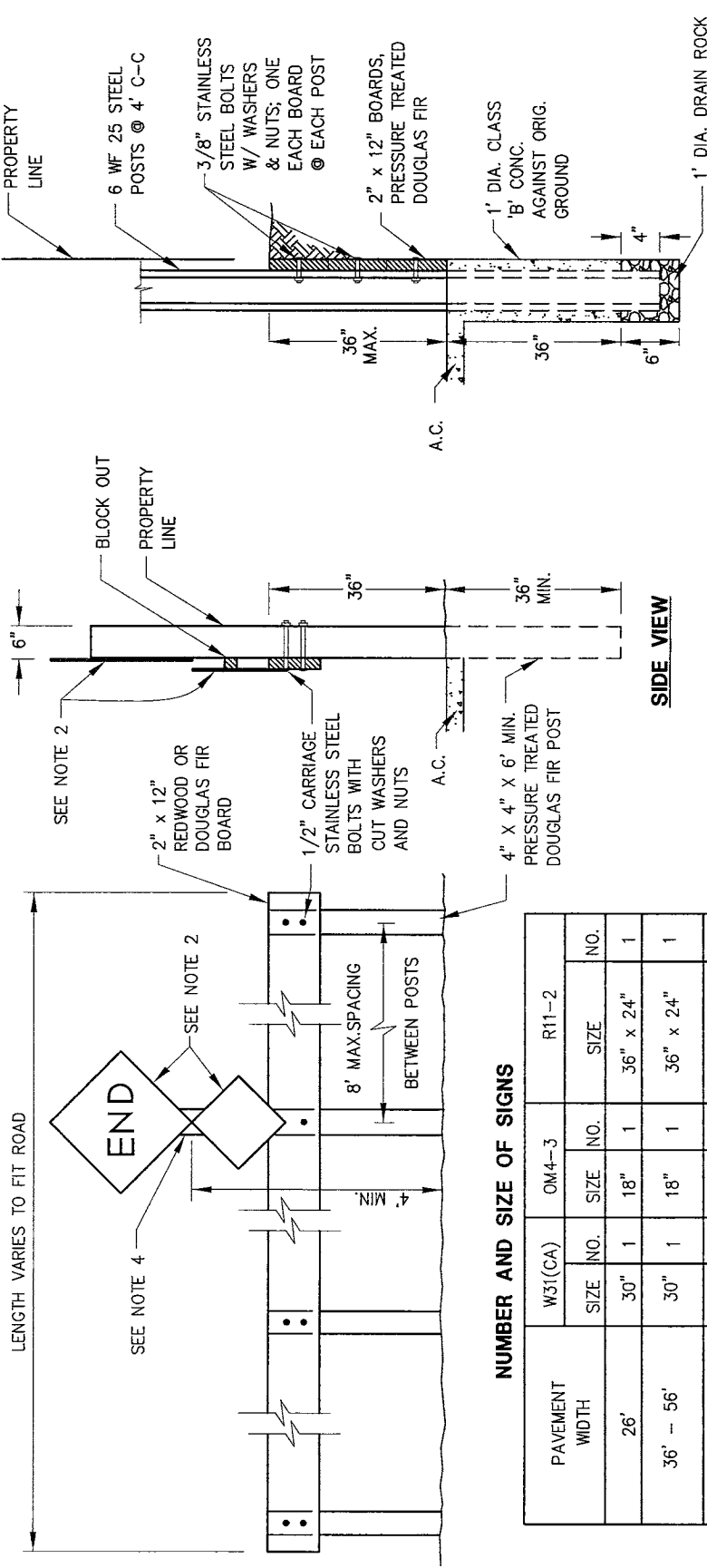
CHIEF, DEPT. OF TRANSPORTATION

4-61



COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
SIGNING OF LOCATIONS WITH ABRUPT CHANGE OF PAVEMENT WIDTH	
SCALE: NONE DATE: 08/06/08 DRAWN BY: TRU P.	4-62

[Signature]
CHIEF, DEPT. OF TRANSPORTATION



NUMBER AND SIZE OF SIGNS

PAVEMENT WIDTH	W31(CA)		OM4-3		R11-2	
	SIZE	NO.	SIZE	NO.	SIZE	NO.
26'	30"	1	18"	1	36" x 24"	1
36' - 56'	30"	1	18"	1	36" x 24"	1
66'	30"	2	18"	2	48" x 30"	1
90' - 110'	30"	3	18"	3	48" x 30"	1

NOTES:

- WHERE PERMISSION HAS BEEN GRANTED TO CLOSE AN EXISTING PUBLIC STREET, A R11-2 "ROAD CLOSED" SIGN MAY BE REQUIRED ON THE CENTERLINE OF THE ROAD IN ADDITION TO THE W31(CA) "END" SIGN.
- 30" x 30" W31(CA) SIGN AND 18" x 18" OM4-3 MARKER. BLOCK OUT AS NECESSARY FOR OM4-3 MARKER TOP MOUNTING BOLT (BOTTOM MOUNTING BOLT NORMALLY THROUGH BARRIER RAIL). OM4-3 MARKER TO HAVE SOLID RED REFLECTIVE BACKGROUND WITHOUT ADDED REFLECTORS.
- ALL EXPOSED SURFACES OF BARRICADE SHALL BE PAINTED WITH WHITE PAINT CONFORMING TO STATE STANDARD SPECIFICATION 91-3.
- POST AT CENTER OR NEAREST TO CENTER ON RIGHT HAND SIDE TO BE EXTENDED TO PROVIDE MOUNTING FOR SIGNS.
- POSTS SHALL BE PRESSURE TREATED PER STATE SPECIFICATION 58-1.02

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

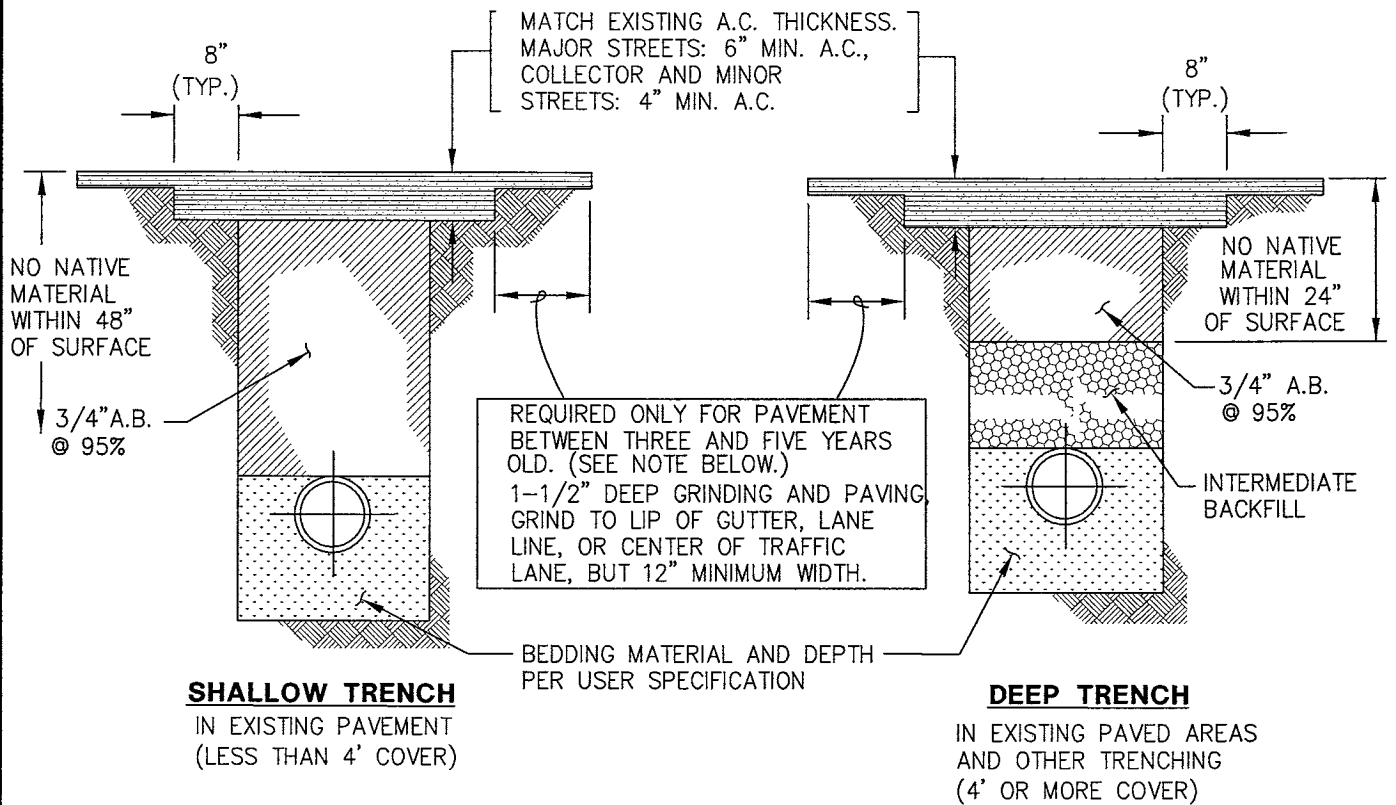
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET CLOSURE
BARRICADE

SCALE: NONE
DATE: 04/28/09
DRAWN BY: TRU P. & B.R.

4-63

STREET ENDING IN
CUT WHERE SLOPE
NOT OBTAINABLE

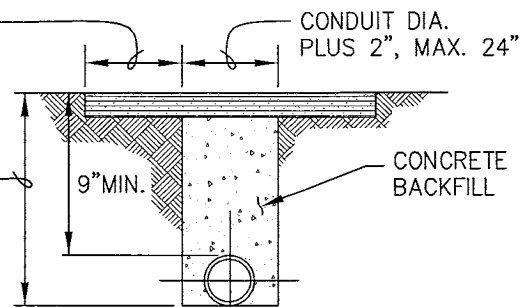


REQUIRED ONLY FOR PAVEMENT BETWEEN THREE AND FIVE YEARS OLD. (SEE NOTE BELOW.)
1-1/2" DEEP GRINDING AND PAVING. GRIND TO LIP OF GUTTER IF CENTER OF TRENCH IS WITHIN 20" OF LIP OF GUTTER, OTHERWISE 6" MINIMUM.

NOTE:

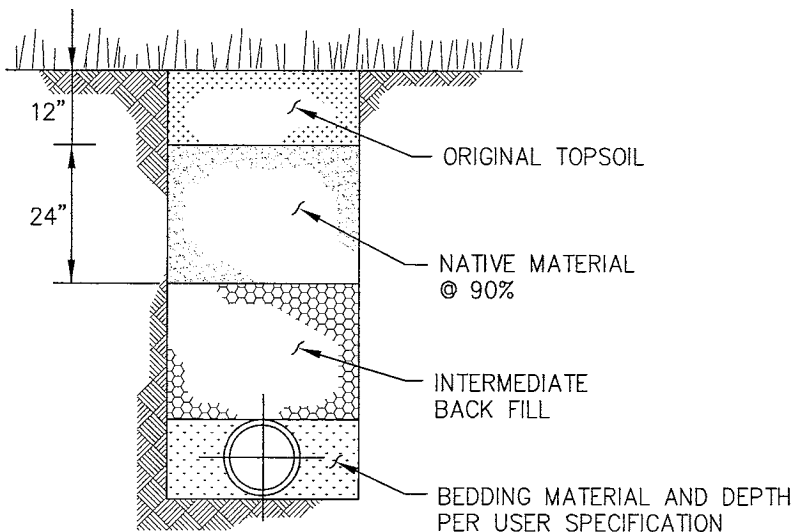
NO PAVEMENT CUTS OR TRENCHES ARE ALLOWED
IN PAVEMENT LESS THAN THREE YEARS OLD.

MAXIMUM DEPTH 15" OR
ROADWAY STRUCTURAL
SECTION LESS 2",
WHICHEVER IS GREATER



**EARTH SAW
TRENCH SECTION**

(SEE SECTION 49-2.02)



**HORTICULTURE, LAWN, OR
CULTIVATED AREAS**

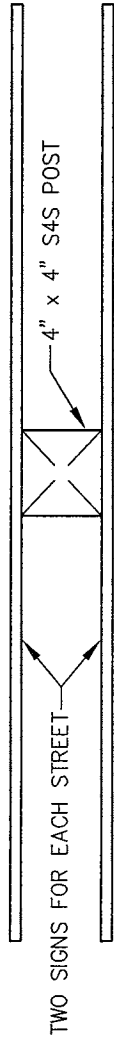
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CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

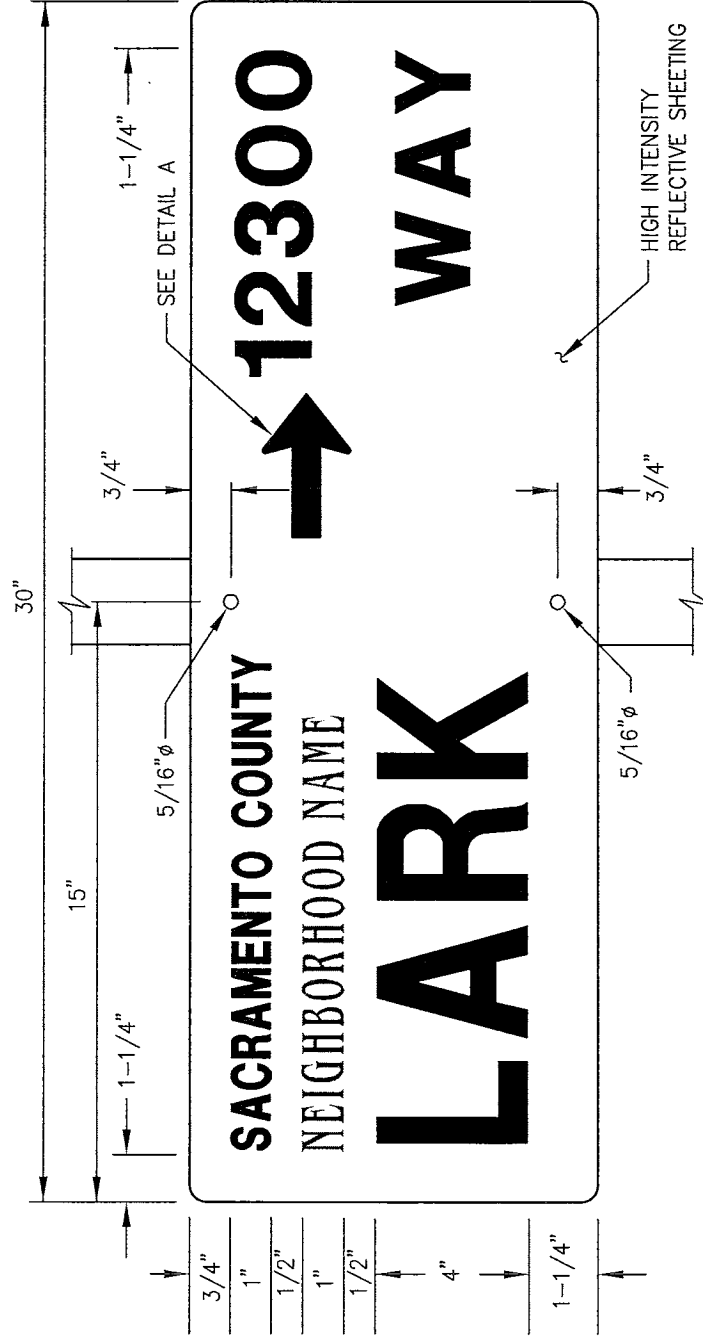
TRENCH SECTIONS

SCALE: NONE
DATE: 04/28/09
DRAWN BY: TRU P. & B.R.

4-64



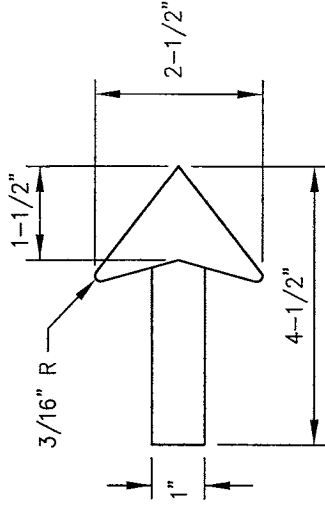
TOP VIEW



SIGN DETAILS FOR SINGLE STREET

NOTES:

1. ALUMINUM SHEET ALLOY 6061-T6 0.080" GAUGE ROUNDED CORNERS 1/4" RADIUS.
2. FOR TWO (2) STREETS, PLACE SECOND PAIR OF SIGNS AT 90° TO SIGNS AS SHOWN.
3. POSTS SHALL BE REDWOOD OR TREATED DOUGLAS FIR (STATE OF CALIFORNIA SPEC. NO. 56-2.02B).
4. FONTS FOR LETTERING AND NUMBERS SHALL BE "HIGHWAY C" EXCEPT FOR THE NEIGHBORHOOD NAME WHICH SHALL BE "BENGEL MD".
5. USE "NEIGHBORHOOD NAME" WHERE NEIGHBORHOOD DESIGNATION EXISTS. CONFIRM APPROPRIATE NEIGHBORHOOD NAME WITH DEPARTMENT OF TRANSPORTATION PRIOR TO SIGN FABRICATION.



DETAIL A

CHIEF, DEPT. OF TRANSPORTATION

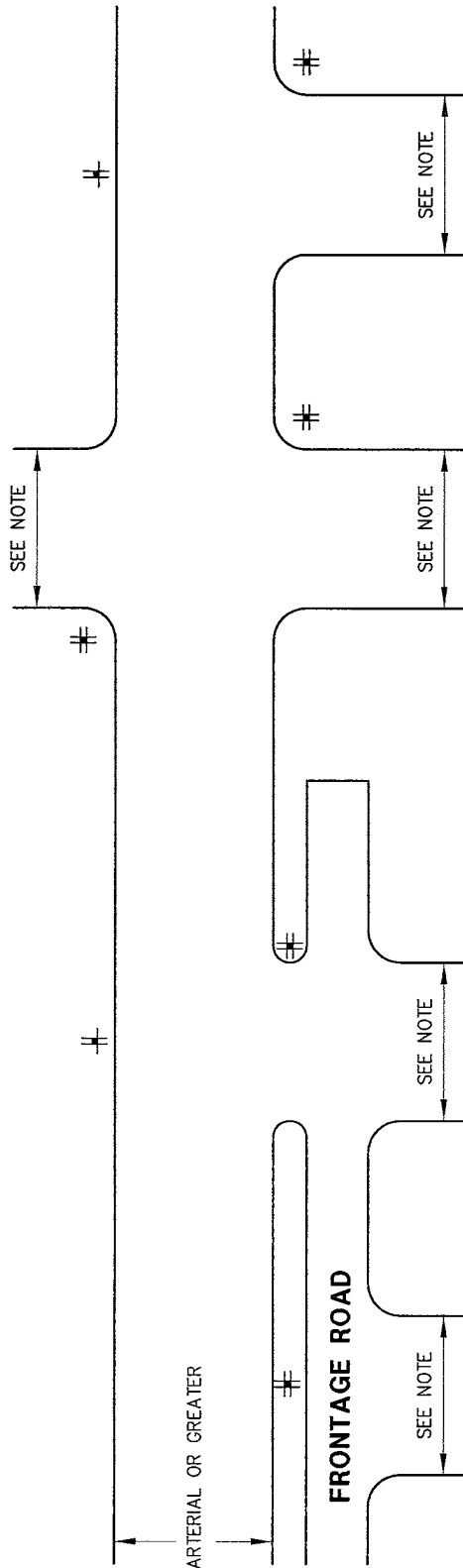
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**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

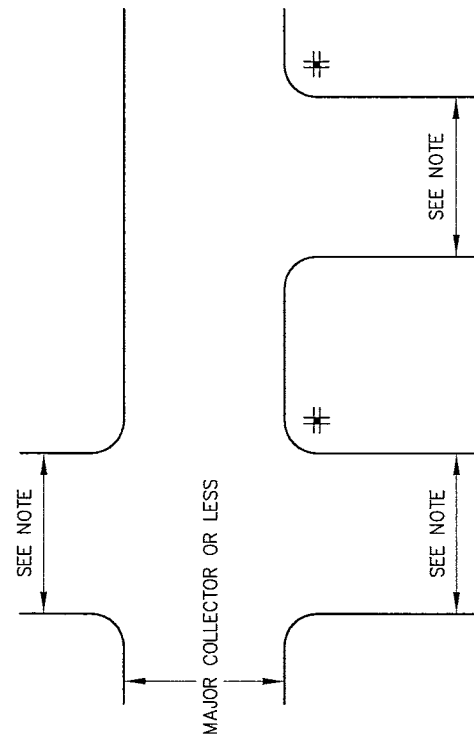
STREET NAME SIGN

SCALE: NONE
DATE: 06/08/2009
DRAWN BY: TRU P. & B.R.

4-70



STREETS CLASSIFIED AS ARTERIAL OR GREATER



NOTE:
SIDE STREETS INDICATED ARE CLASSIFIED EQUAL TO OR LESS THAN THROUGH STREET AS SHOWN ON THE PLAN.

- LEGEND:
- STANDARD STREET NAME SIGN INSTALLATION. FOUR (4) SIGN PLATES ON 4" x 4" POST OR ON STREET LIGHT POLE.
 - THREE (3) SIGN PLATES ON 4" x 4" POST OR ON STREET LIGHT POLE.

[Signature]

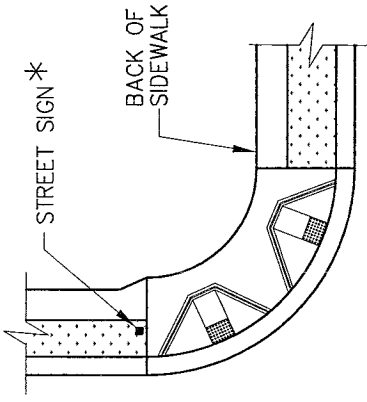
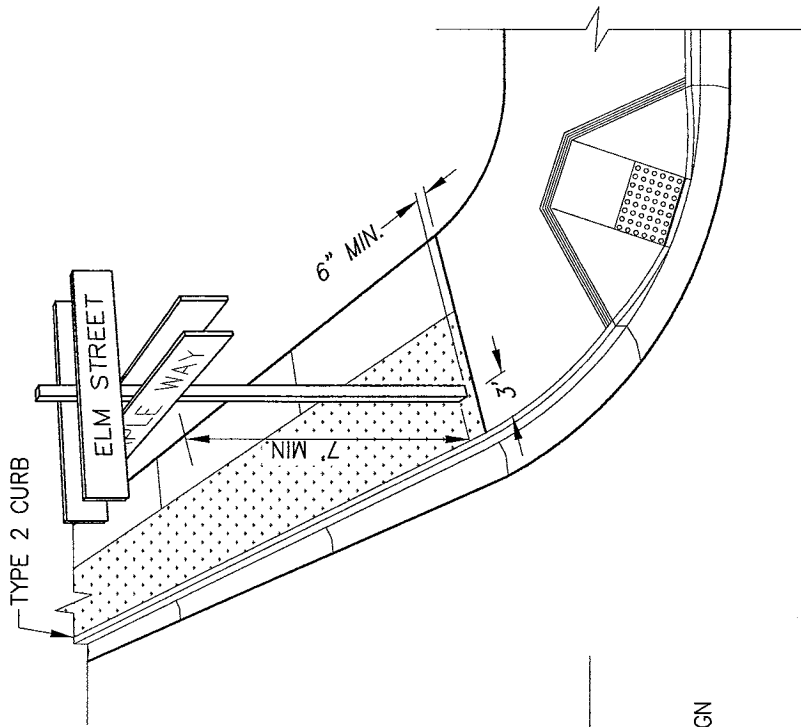
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

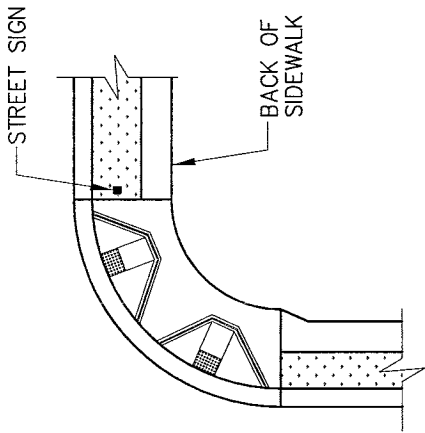
**STREET NAME SIGN
LOCATION REQUIREMENTS**

SCALE: NONE
DATE: 07/18/2008
DRAWN BY: TRU P.

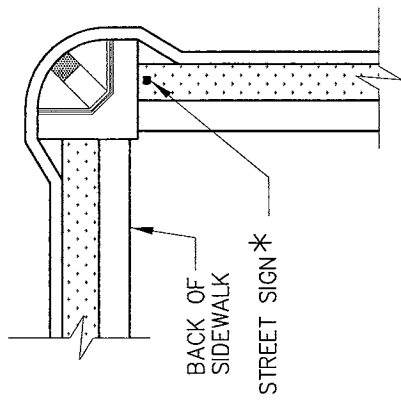
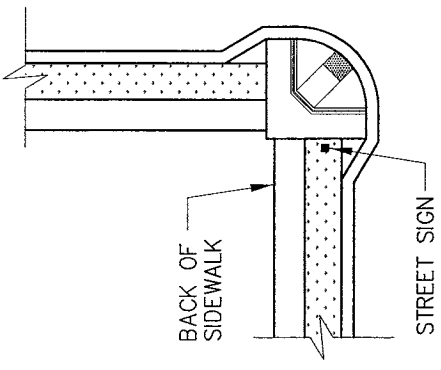
STREETS CLASSIFIED AS MAJOR COLLECTOR OR LESS



LARGER STREET (OR GREATER TRAFFIC VOLUME FOR EQUAL WIDTH STREETS)



SMALLER STREET (OR LESSER TRAFFIC VOLUME FOR EQUAL WIDTH STREETS)



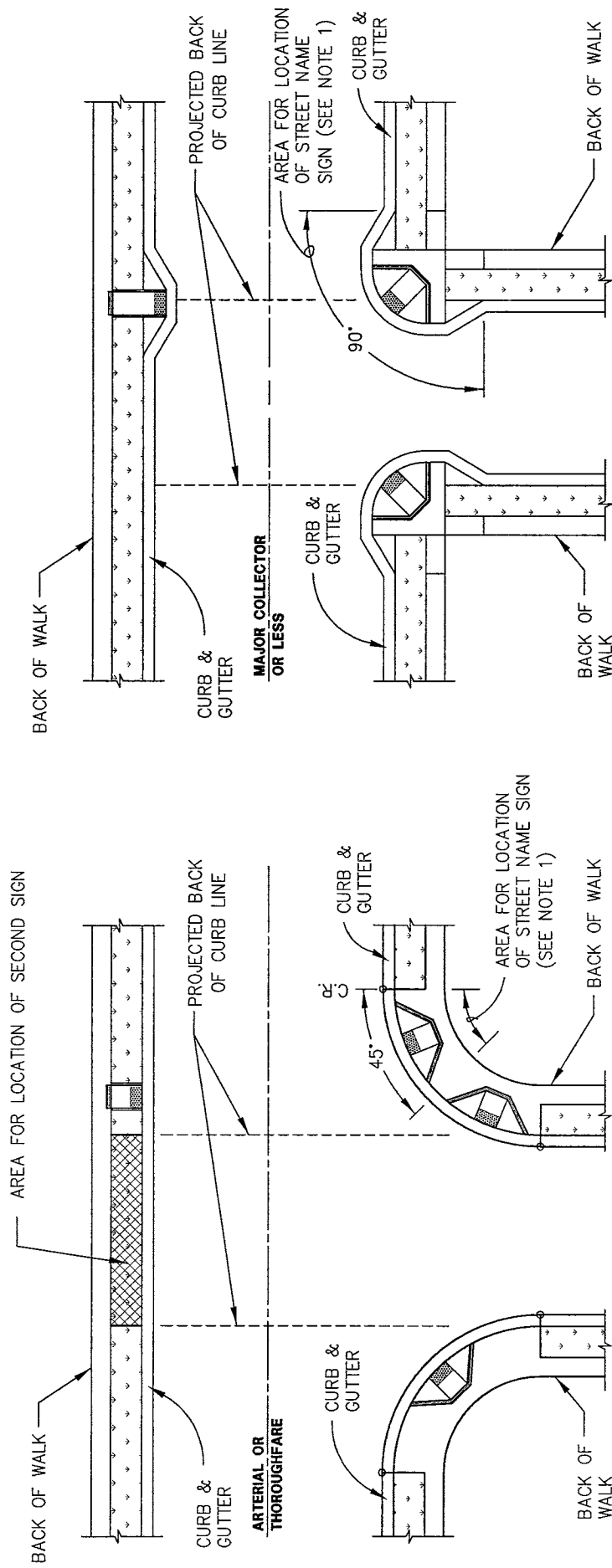
* ADDITIONAL STREET SIGN NEEDED IF LARGER STREET IS AN ARTERIAL OR THOROUGHFARE.
 NOTE: IN LIEU OF INSTALLATION OF STREET NAME SIGNS ON NEW POST, SIGNS MAY BE INSTALLED ON STREET LIGHT POLES PER DWG. 4-73.

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
 MUNICIPAL SERVICES AGENCY

STREET NAME SIGN
 PLACEMENT DETAILS ON
 WOOD POLE INSTALLATIONS

SCALE: NONE
 DATE: 07/20/09
 DRAWN BY: B.R. & TRU P.



NOTES:

1. STREET NAME SIGNS SHALL BE INSTALLED ON STREET LIGHT POLES WHEN THEY ARE LOCATED WITHIN THE LOCATION LIMITS DEFINED ON THIS DETAIL.
2. ALL OTHER STREET NAME SIGN REQUIREMENTS IN SECTIONS 4-28 & 4-29 AND IN DRAWINGS 4-70, 4-71, 4-72 & 4-74 SHALL APPLY.

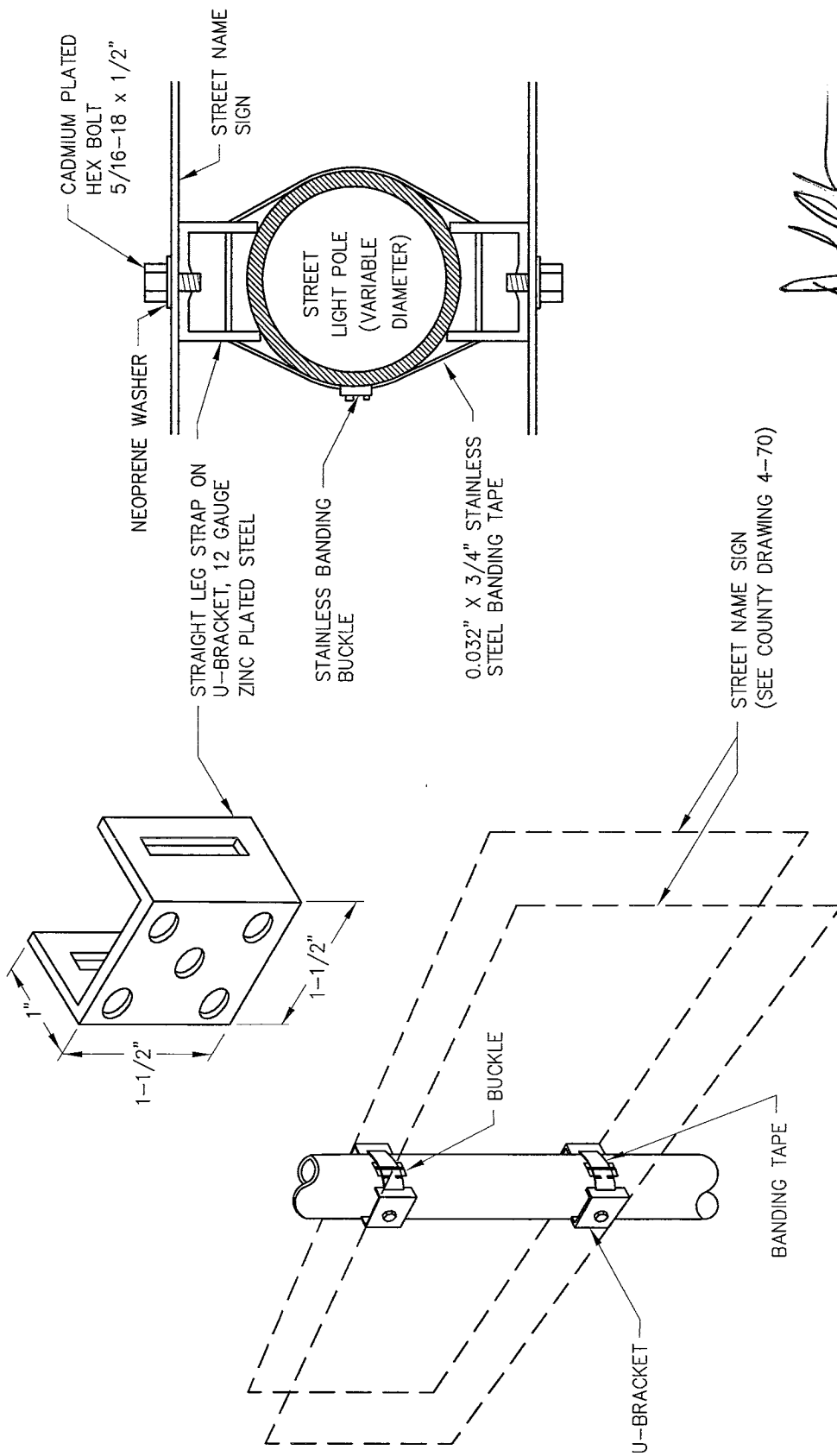
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**STREET NAME PLACEMENT
DETAILS ON STREET LIGHT
POLE INSTALLATIONS**

SCALE: NONE
DATE: 07/20/09
DRAWN BY: B.R. & TRU P.

4-73

[Signature]
CHIEF, DEPT. OF TRANSPORTATION



CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

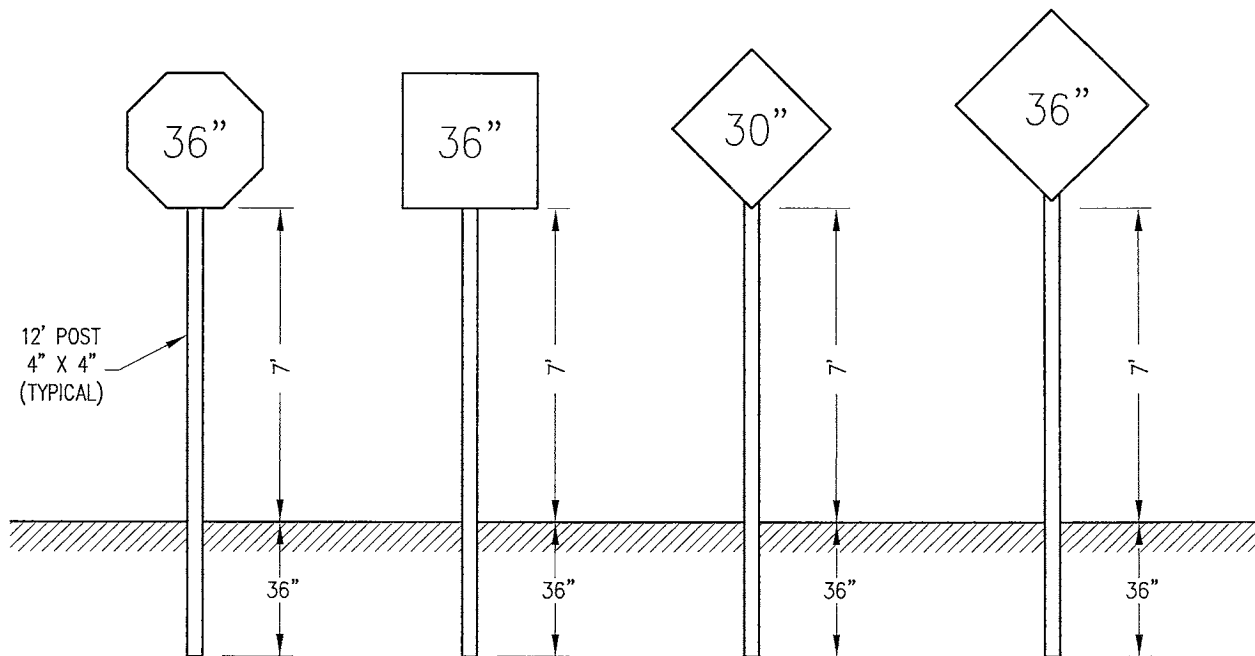
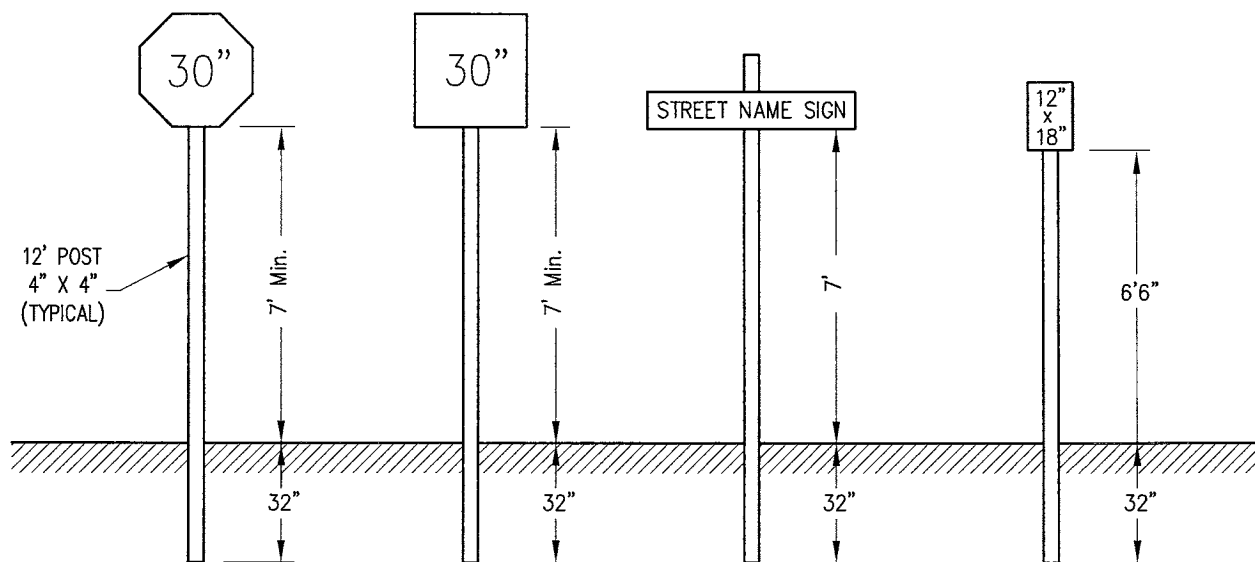
STREET NAME SIGN
INSTALLATION ON
STREET LIGHT POLE

SCALE: NONE
DATE: 07/18/2008
DRAWN BY: TRU P.

4-74

NOTES:

1. DETAIL SHOWN IS FOR A TWO SIGN INSTALLATION. FOUR SIGN INSTALLATIONS MAY BE MADE, WHERE APPLICABLE, BY FASTENING A SECOND PAIR OF SIGNS IN THE SAME MANNER.
2. STANDARD CLEARANCE TO BOTTOM OF LOWEST SIGN IS 7 FEET MINIMUM.



NOTE: USE THIS DETAIL WHERE ANY PORTION OF SIGN EXTENDS OVER ANY PAVED ROADWAY SURFACE, SIDEWALK OR WALKWAY.

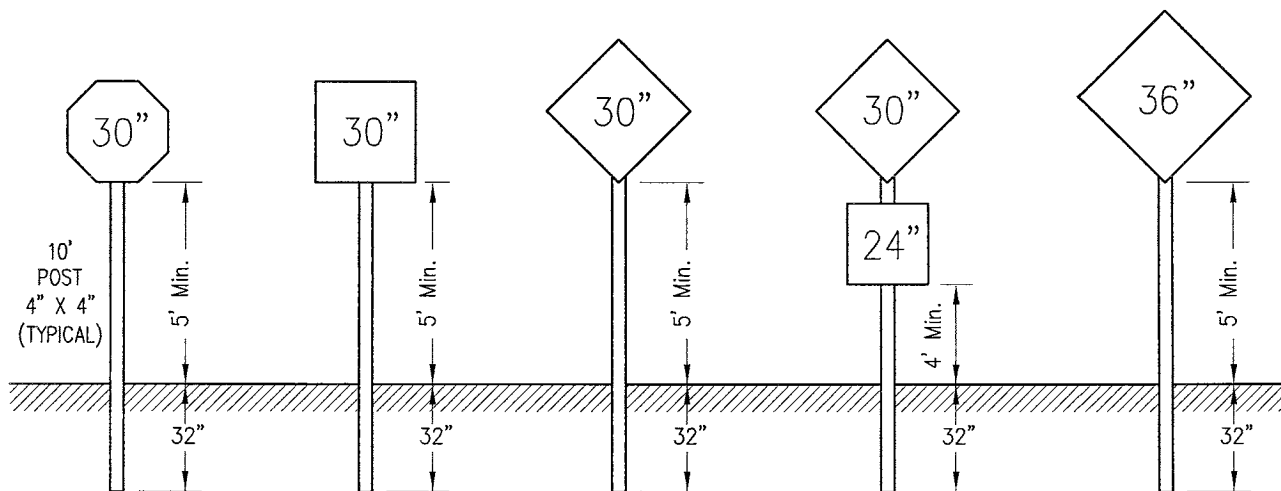

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

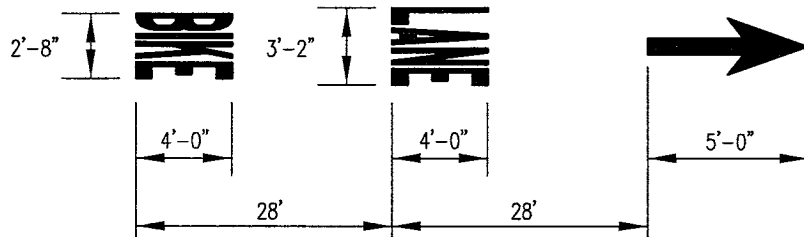
SIGN POST EMBEDMENT
DETAILS
PEDESTRIAN AREAS

SCALE: NONE
DATE: 07/18/2008
DRAWN BY: TRU P.

4-75




CHIEF, DEPT. OF TRANSPORTATION



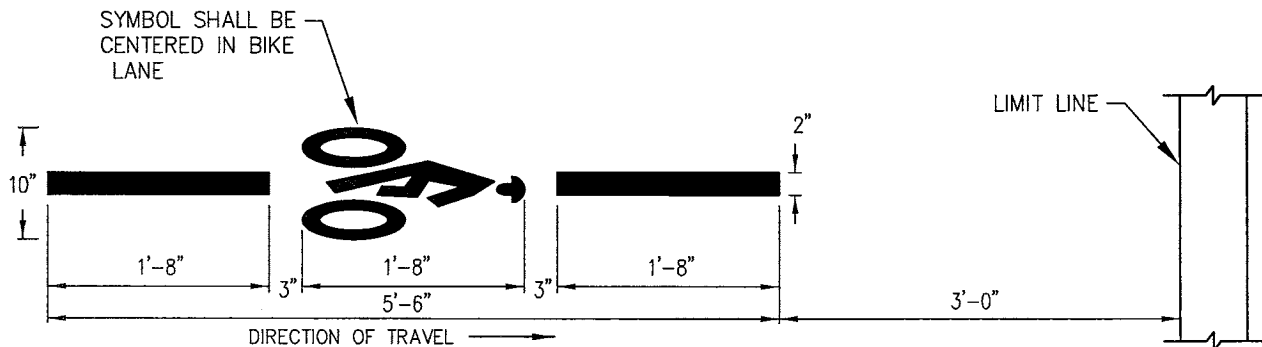
BIKE LANE LEGEND DETAIL

SEE CALTRANS STANDARD PLAN A24A AND A24D
FOR PAVEMENT MARKING WORDS AND ARROW.

BIKE LANE LEGEND

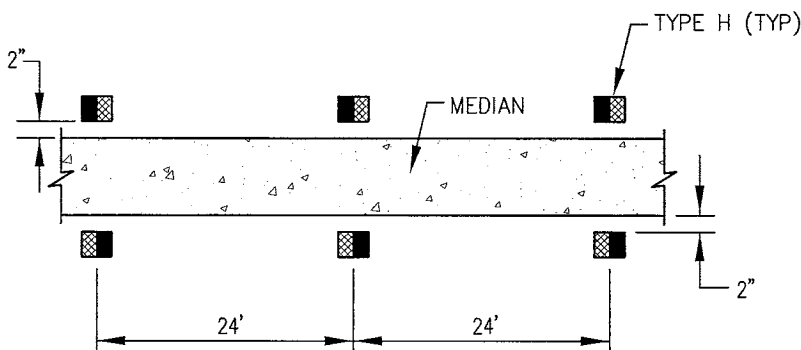
TYPICAL LOCATIONS:

- 10' AFTER START OF BIKE LANE AT INTERSECTION
- 10' AFTER START OF BIKE LANE ALONG RIGHT TURN LANE
- BEFORE 39A STRIPE AT APPROACH TO A TRAFFIC SIGNAL WITHOUT RIGHT TURN LANE



BICYCLE LOOP DETECTOR SYMBOL

SEE CALTRANS STANDARD PLAN A24C
FOR PAVEMENT MARKINGS SYMBOLS.



DETAIL MODIFIELD 26 — FOR USE ADJACENT TO MEDIANS

SEE CALTRANS STANDARD PLAN A20B
FOR PAVEMENT MARKER TYPE.

[Signature]

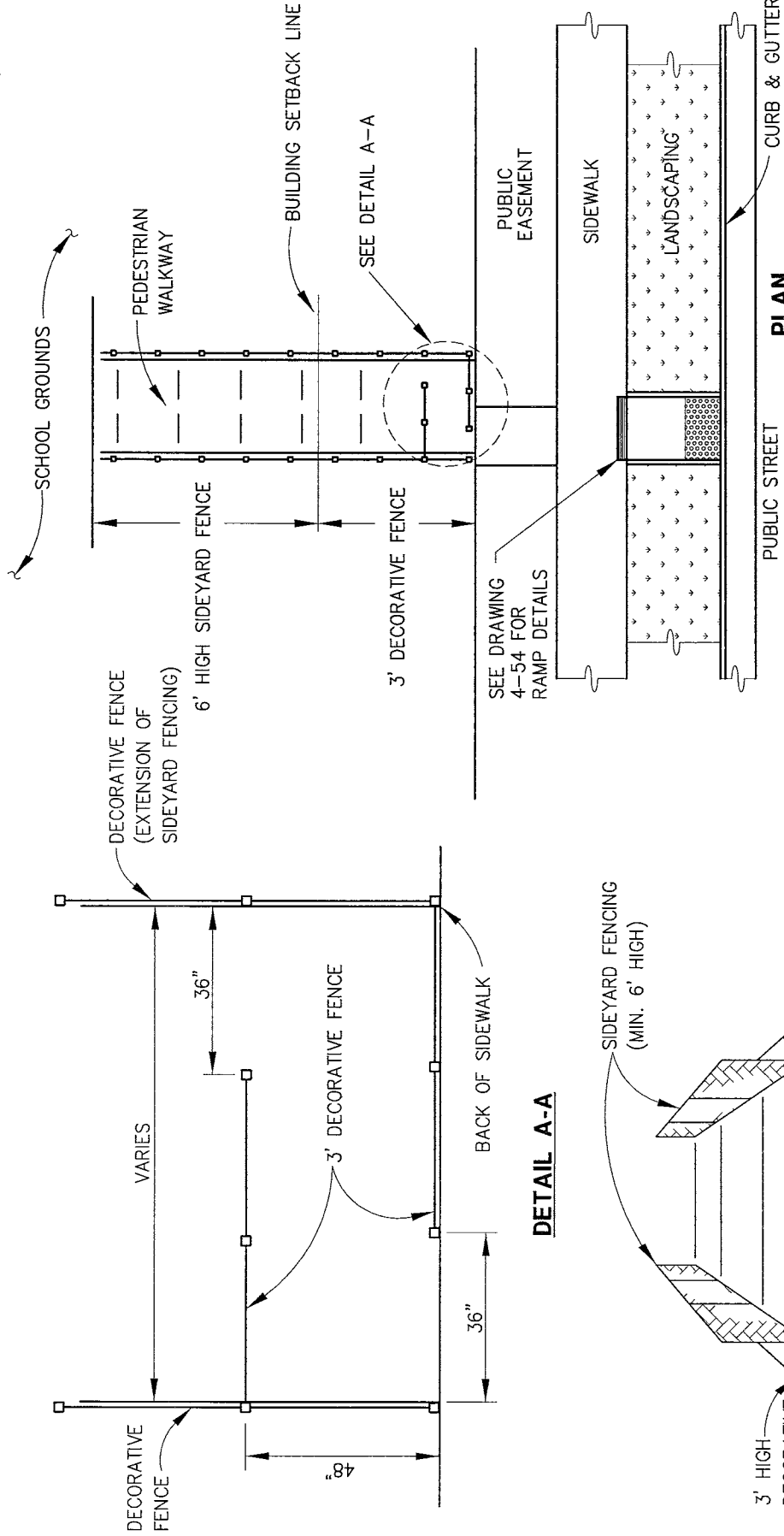
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STRIPING AND PAVEMENT
MARKING DETAILS

SCALE: NONE
DATE: 03/30/2009
DRAWN BY: TRU P.

4-77



PLAN

NOTE:
DECORATIVE FENCING SHALL BE 3 FT. HIGH.
STREET LIGHTS SHALL BE PLACED AT BOTH
ENDS OF THE PEDESTRIAN LANE.

CHIEF, DEPT. OF TRANSPORTATION

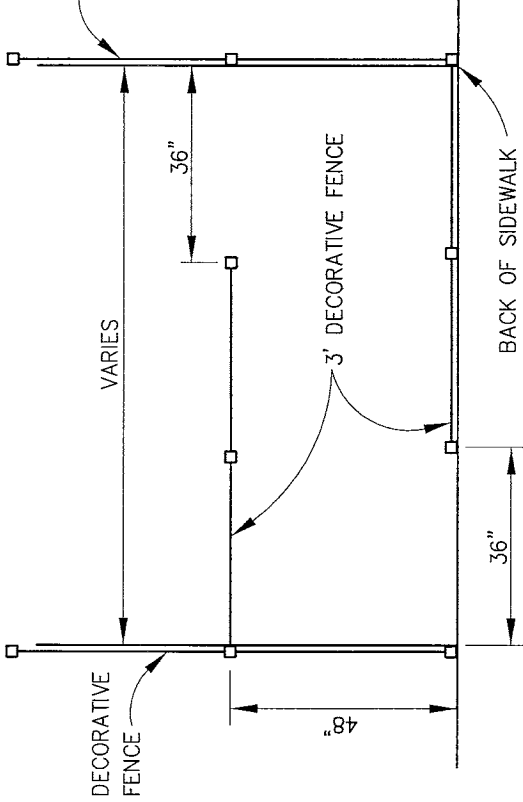
[Signature]

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

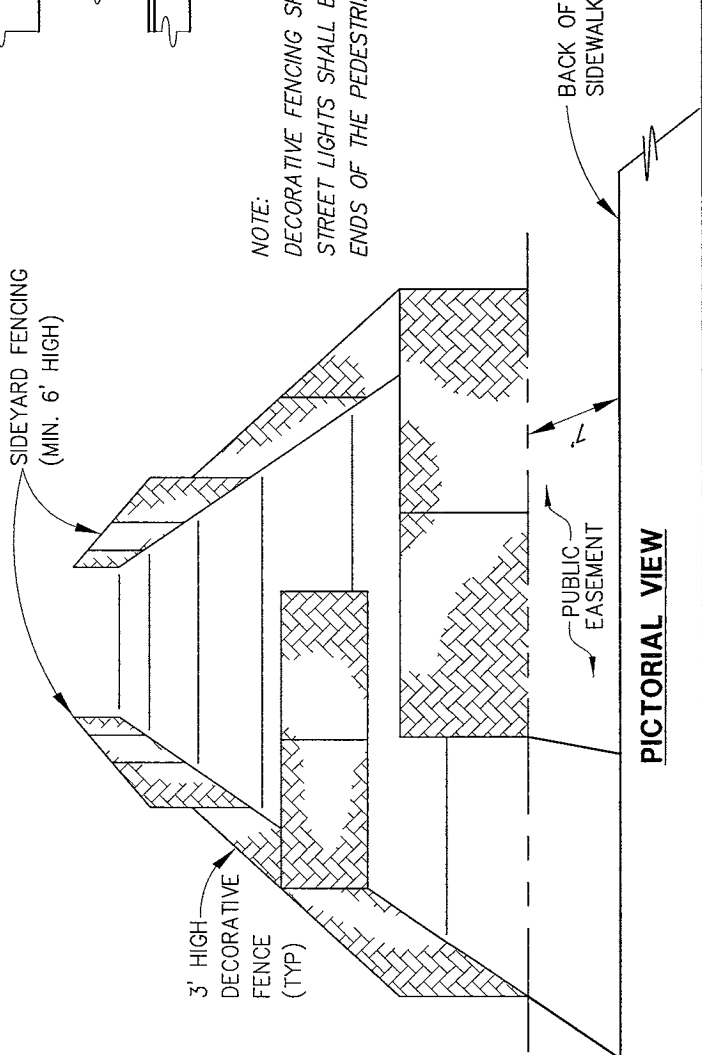
**PEDESTRIAN LANE
WITH
BIKE BARRIER**

SCALE: NONE
DATE: 01/21/2009
DRAWN BY: B.R. & TRU P.

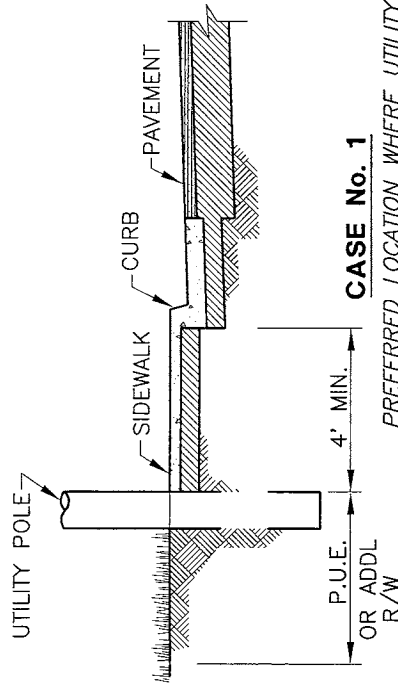
4-78



DETAIL A-A

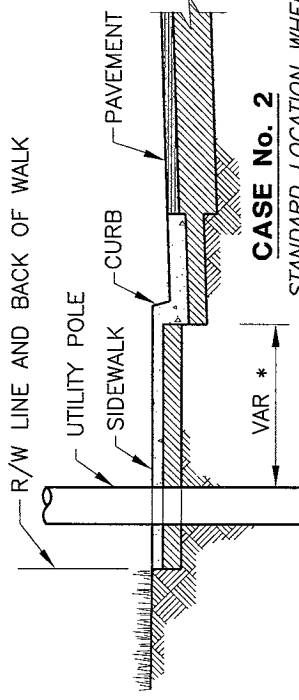


PICTORIAL VIEW



CASE No. 1

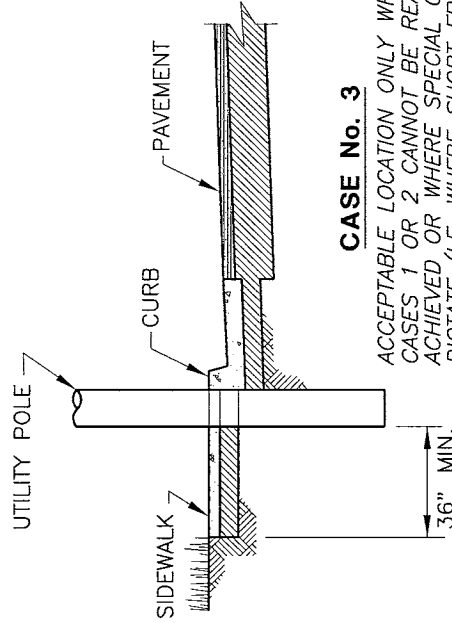
PREFERRED LOCATION WHERE UTILITY CONFLICTS AND PHYSICAL CONDITIONS ALLOW AND AN EASEMENT OR RIGHT OF WAY EXISTS BEHIND WALK.



CASE No. 2

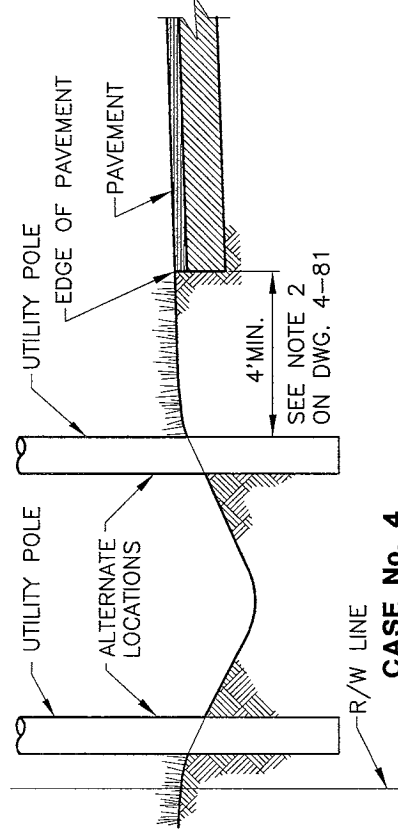
STANDARD LOCATION WHERE CASE #1 IS NOT REASONABLY ACHIEVABLE

* PEDESTRIAN CLEARANCE OF 36" MINIMUM IN FRONT OF THE POLE IS DESIRABLE. POLE CAN BE PLACED 12" MINIMUM FROM BACK OF CURB IF 36" MINIMUM PEDESTRIAN CLEARANCE IS PROVIDED BEHIND POLE. POLE TO BE PLACED WITH BACK OF POLE FLUSH WITH BACK OF WALK IF NOT IN CONFLICT WITH OTHER UTILITIES.



CASE No. 3

ACCEPTABLE LOCATION ONLY WHERE CASES 1 OR 2 CANNOT BE REASONABLY ACHIEVED OR WHERE SPECIAL CONDITIONS DICTATE (I.E. WHERE SHORT FRONTAGE IMPROVEMENT CAUSES SIGNIFICANT DEVIATION FROM POLE LINE RESULTING IN UNDESIRABLE GUYING REQUIREMENTS.



CASE No. 4

REFER TO NOTE 1 ON DWG. 4-81

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**UTILITY POLE
PLACEMENT LOCATIONS
DETAILS**

SCALE: NONE
DATE: 01/20/09
DRAWN BY: TRU P. & B.R.

CHIEF, DEPT. OF TRANSPORTATION

SEE 4-81 FOR NOTES

4-80

NOTES:

1. WHERE STREET IMPROVEMENTS WILL ULTIMATELY BE CLASS A OR B, THE POLE SHOULD BE LOCATED IN CONFORMANCE TO THE APPROPRIATE CASE #1 OR #2 BASED ON THE FUTURE LOCATION OF THE STREET IMPROVEMENTS. IN THE CASE WHERE NO CURBS WOULD EVER BE ANTICIPATED, THE POLE SHOULD BE LOCATED 4 FEET MINIMUM FROM THE EDGE OF PAVEMENT SO AS NOT TO ENCROACH IN AN ADJACENT DITCH AS SHOWN IN CASE #4.
2. WITH ROAD WIDENING PROJECTS, UTILITY POLES MAY BE ALLOWED TO REMAIN AT THE EDGE OF PAVEMENT, WITH 0.5 FEET MINIMUM CLEARANCE (CASE #4). HOWEVER, WHERE THE PRE-PROJECT UTILITY POLE LOCATION IS WITHIN THE PROPOSED PAVEMENT SECTION, UTILITY POLES SHOULD BE RELOCATED TO THE ULTIMATE LOCATION PER CASE #1 OR #2, IN ORDER TO AVOID RELOCATION OF THE UTILITY POLE IN THE FUTURE.
3. UTILITY POLE PLACEMENT UNDER THE FOLLOWING CONDITIONS IS SUBJECT TO APPROVAL BY THE CHIEF OF THE DEPARTMENT OF TRANSPORTATION:
 - A-- POLES IN VISIBILITY CONTROL AREAS (SEE STANDARD DRAWING 4-18).
 - B-- POLES LARGER THAN 18 INCHES IN DIAMETER WITHIN 9 FEET OF EDGE OF PAVEMENT IN CLASS A OR CLASS B STREETS.
 - C-- POLES LARGER THAN 18 INCHES IN DIAMETER WITHIN 9 FEET OF THE EDGE OF TRAVELED WAY ON CLASS C STREETS.
 - D-- POLES LOCATED ON THE OUTSIDE OF SHARP CURVES, OR IN THE TANGENT OF THE CURVES WITHIN 200 FEET OF THE BEGINNING OR END OF CURVE (FOR 45 MPH OR GREATER SPEED LIMIT) OR 100 FEET (FOR A LESSER SPEED LIMIT). IN THESE CASES, SPECIAL DELINEATION AND/OR A GUARDRAIL MAY BE REQUIRED. FOR PURPOSES OF THIS SECTION, SHARP CURVES SHALL BE CONSIDERED THOSE WITH RADII OF LESS THAN 800 FEET FOR URBAN 2 LANE STREETS, AND WITH RADII OF LESS THAN 2000 FEET FOR RURAL ROADS OR MULTI-LANE STREETS.
4. RISERS PROPOSED IN A LOCATION THAT WOULD REDUCE PEDESTRIAN CLEARANCE TO LESS THAN 36 INCHES SHALL NOT BE ALLOWED.
5. FOR LOCATIONS WITH SEPERATED SIDEWALK, UTILITY FACILITIES SHALL BE PLACED OUTSIDE OF THE SIDEWALK AREA. SIDEWALK LOCATION MAY BE ADJUSTED TO RESOLVE CONFLICT WITH EXISTING UTILITIES WITH WRITTEN APPROVAL OF DIRECTOR OF COUNTY OF ENGINEERING.

SEE 4-80 FOR DETAILS



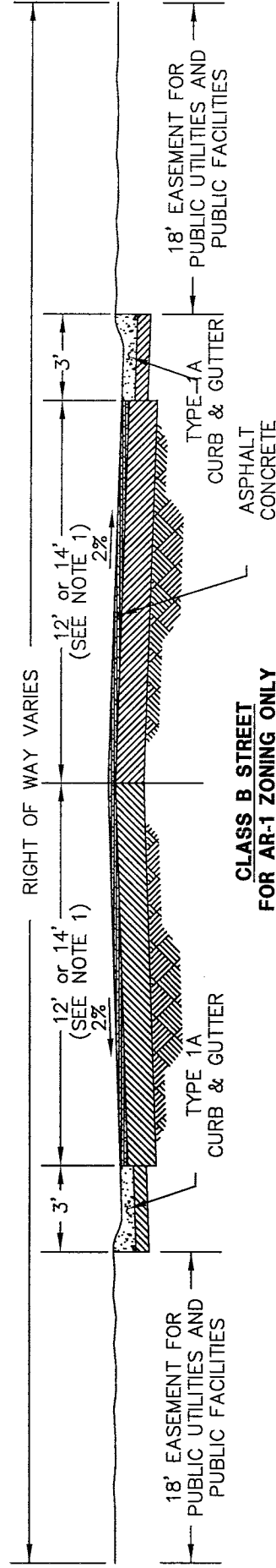
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UTILITY POLE
PLACEMENT LOCATIONS
NOTES

SCALE: NONE
DATE: 01/20/09
DRAWN BY: TRU P. & B.R.

4-81



NOTES:

1. STREET WIDTH ON INFILL DEVELOPMENT TO MATCH LARGER EXISTING ROAD WIDTH ON EITHER SIDE OF PROPERTY.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

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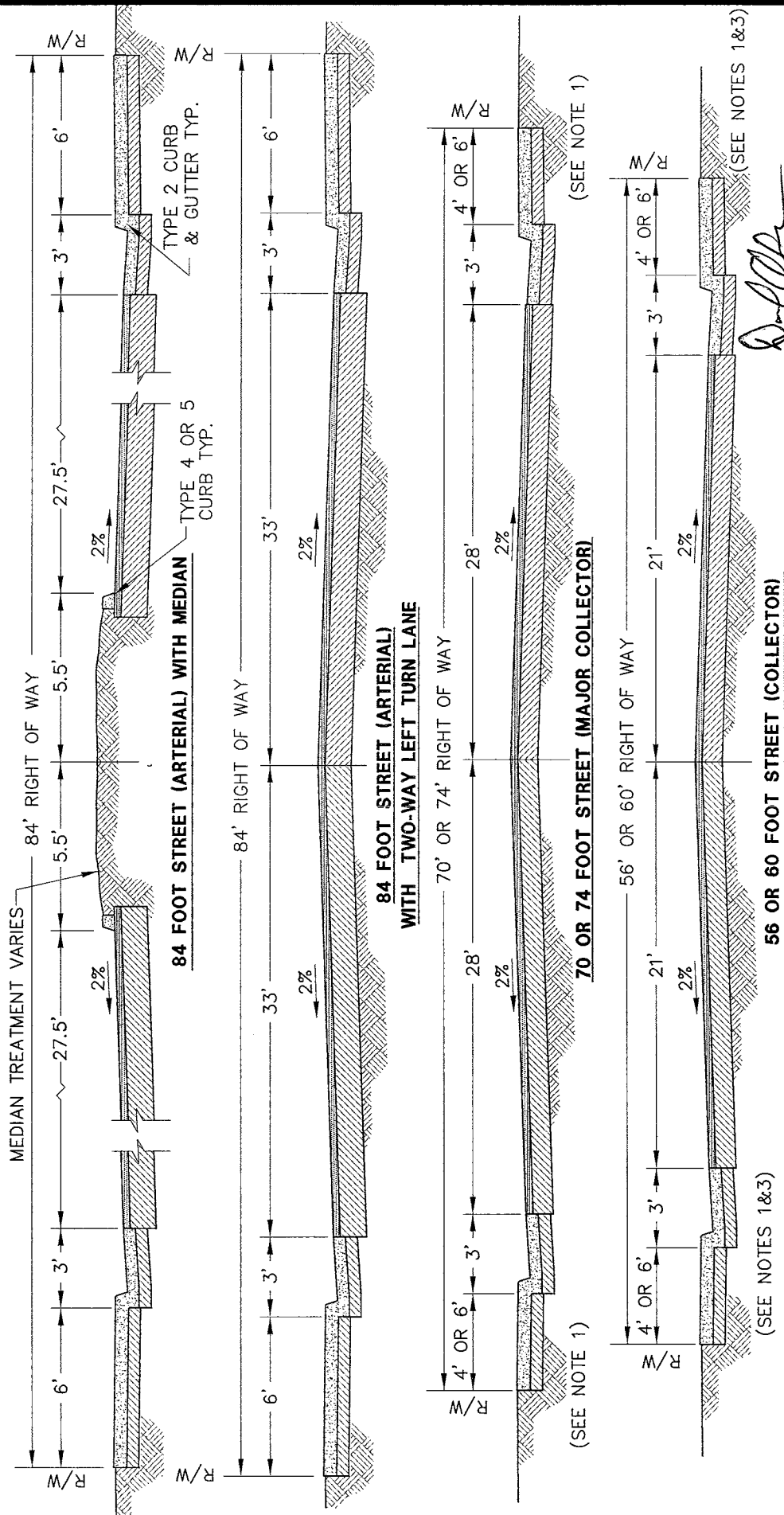
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TYPICAL SECTION
RESIDENTIAL STREETS
CLASS B

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-1



NOTES:

1. SIDEWALK MAY BE 4 FEET WIDE ONLY IN SINGLE FAMILY RESIDENTIAL AREAS, DUPLEX RESIDENTIAL AREAS, AND INDUSTRIAL AREAS.
2. SEE SECTION 4-18 OF IMPROVEMENT STANDARDS FOR REQUIREMENTS REGARDING USE OF VERTICAL CURB (TYPE 2).
3. TYPE 1A CURB & GUTTER MAY BE USED ON 56' AND ON 60' STREETS THAT HAVE FRONT ON DEVELOPMENT OF SINGLE FAMILY RESIDENTIAL UNITS OR FRONT ON DUPLEX RESIDENTIAL UNITS.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
 MUNICIPAL SERVICES AGENCY

TYPICAL SECTIONS
 ARTERIAL & COLLECTOR
 STREETS, CLASS A

SCALE: NONE
 DATE: 07/21/09
 DRAWN BY: TRU P.

4-A-2



1. SIDEWALK MAY BE 4 FEET WIDE IN SINGLE FAMILY AND DUPLEX RESIDENTIAL AREAS ONLY.
2. FRONTAGE ROADS ADJACENT TO STATE FREEWAYS SHALL CONFORM TO THE FULL WIDTH STANDARDS FOR 56 FEET AND 60 FEET STREETS SEE STANDARD DRAWING 4-A-2

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**TYPICAL SECTIONS
THOROUGHFARE STREETS
& FRONTAGE ROADS, CLASS A**

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-3

SIDEWALK (SEE TABLE)

BULB RADIUS REQUIREMENTS			
RIGHT-OF-WAY	RADIUS @ BULB	SIDEWALK WIDTH @ BULB	
32' & 38'	36'	5'	
48'	50'	7'	

EASEMENT FOR PUBLIC UTILITIES & PUBLIC FACILITIES
18' WIDE ON 32' & 38' STREETS
20' WIDE ON 48' STREETS

RIGHT-OF-WAY

SIDEWALK

BACK OF WALK

RADIUS VARIES
(SEE TABLE)

CL OF STREET

VARIES
RIGHT-OF-WAY

TYPE 1A CURB
& GUTTER

TYPE 1A CURB
& GUTTER

TYPE 1A CURB
& GUTTER

SIDEWALK

BACK OF WALK

NOTES:

1. A STANDARD W 14-1 "DEAD END" SIGN MAY BE REQUIRED AT THE ENTRANCE TO THE CUL-DE-SAC (SEE SECTION 4-30).
2. INCREASED STRUCTURAL SECTION REQUIRED IN CUL-DE-SAC BULB SEE SECTIONS 4-7(c) AND 4-12 OF IMPROVEMENT STANDARDS.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

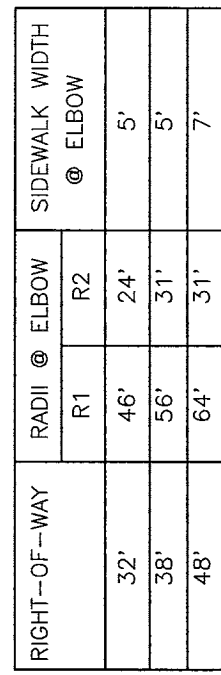
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

CUL-DE-SAC

SCALE: NONE
DATE: 07/30/09
DRAWN BY: TRU P. & B.R.

4-A-15

CHIEF, DEPT. OF TRANSPORTATION



1. INTERSECTION ELBOWS ARE NOT REQUIRED WHERE THE CENTERLINE RADIUS MEET THE MINIMUM REQUIREMENTS IN SECTION 4-14.

2. INTERSECTION ANGLE SHALL BE $90^{\circ} \pm 5^{\circ}$.

3. SHADED AREA SHALL HAVE VISIBILITY CONTROL EASEMENT IN ACCORDANCE WITH SECTION 4-15 AND STANDARD DRAWING 4-18 (PERMANENT BUILDINGS EXCEPTED WITHIN SETBACK LINE).

4. ONLY ONE SIDEWALK RAMP ON OUTSIDE OF CURVE REQUIRED

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

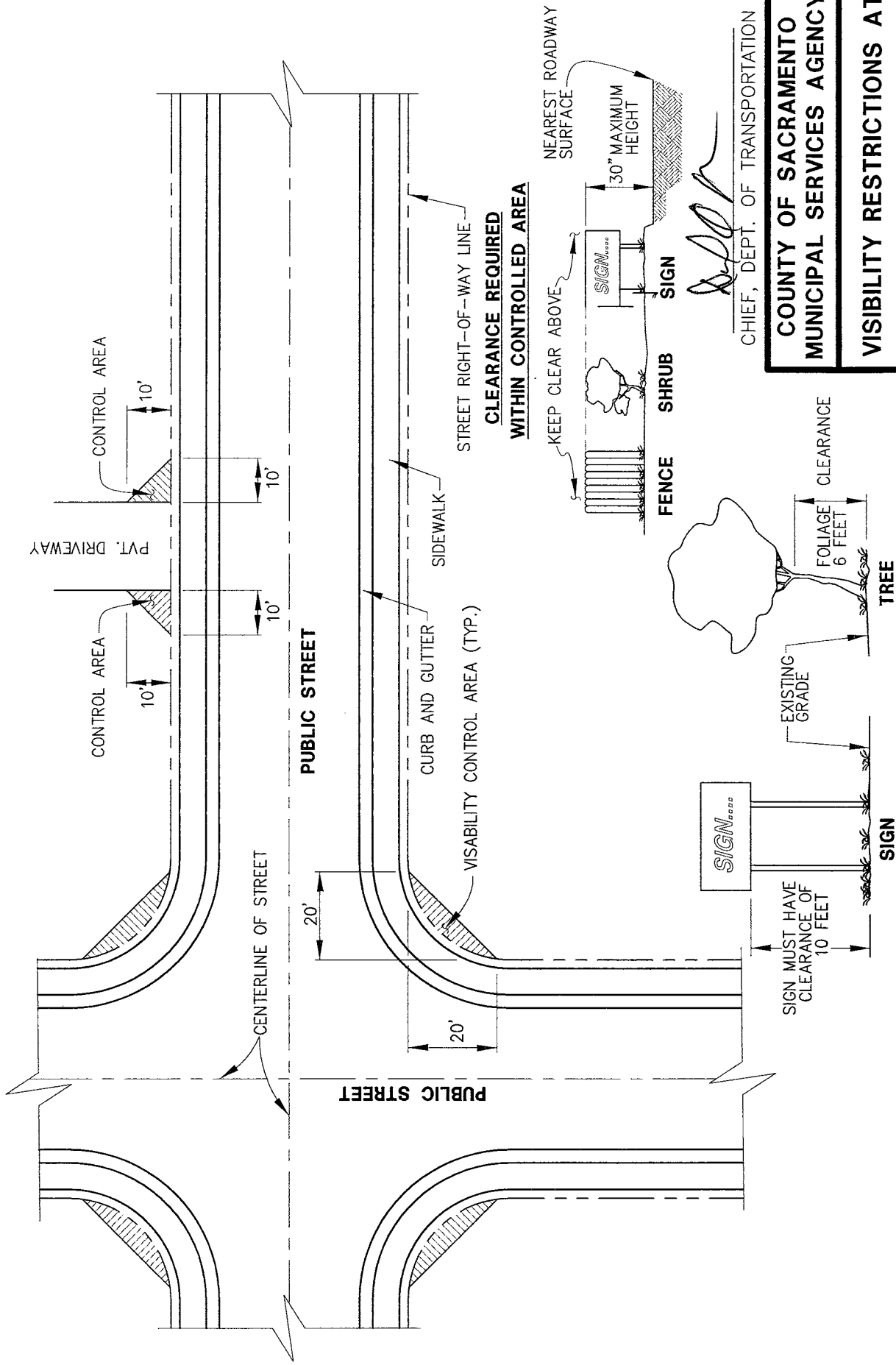
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

ELBOW INTERSECTION

SCALE: NONE
DATE: 07/30/09
DRAWN BY: B.R. & TRU P.

4-A-16



USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

CHIEF, DEPT. OF TRANSPORTATION

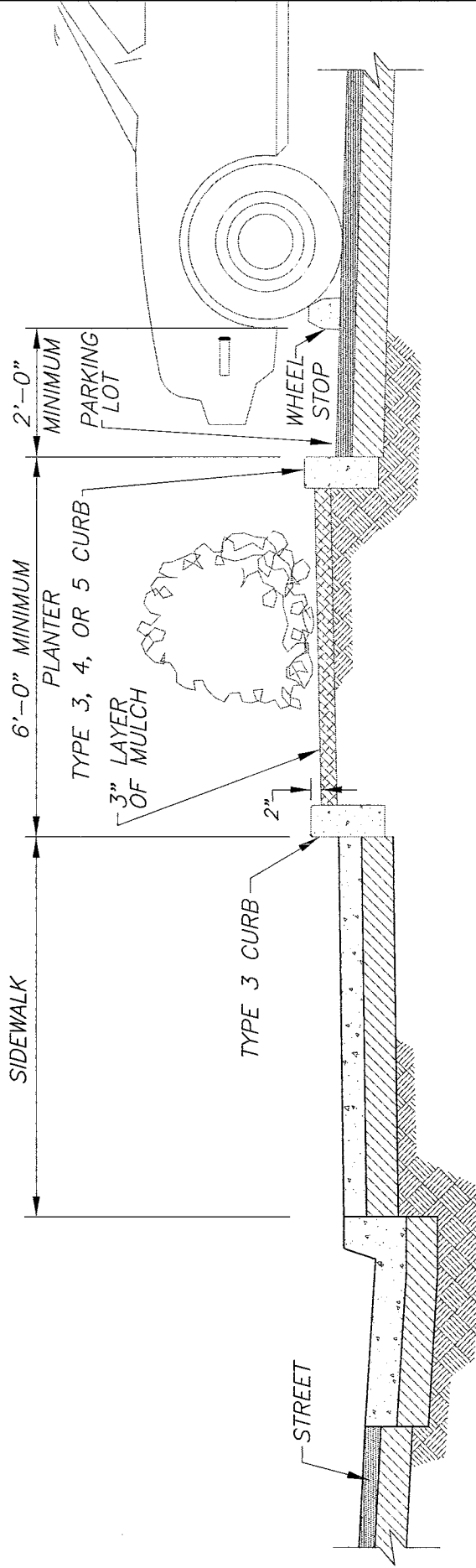
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

VISIBILITY RESTRICTIONS AT
DRIVEWAYS & INTERSECTIONS

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-18

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.



NOTES:

1. USE BARRIER CURB ADJACENT TO SIDEWALK ON ALL 84', 108' AND 130' STREET WIDTHS AND ON ALL COMMERCIAL DEVELOPMENT.
2. SEE SECTION 4-21 OF COUNTY IMPROVEMENT STANDARDS FOR REQUIREMENTS.
3. TYPE 3 CURB AT THE BACK OF SIDEWALK MAY BE OMITTED IF LAWN IS PLANTED TO THE BACK OF SIDEWALK.

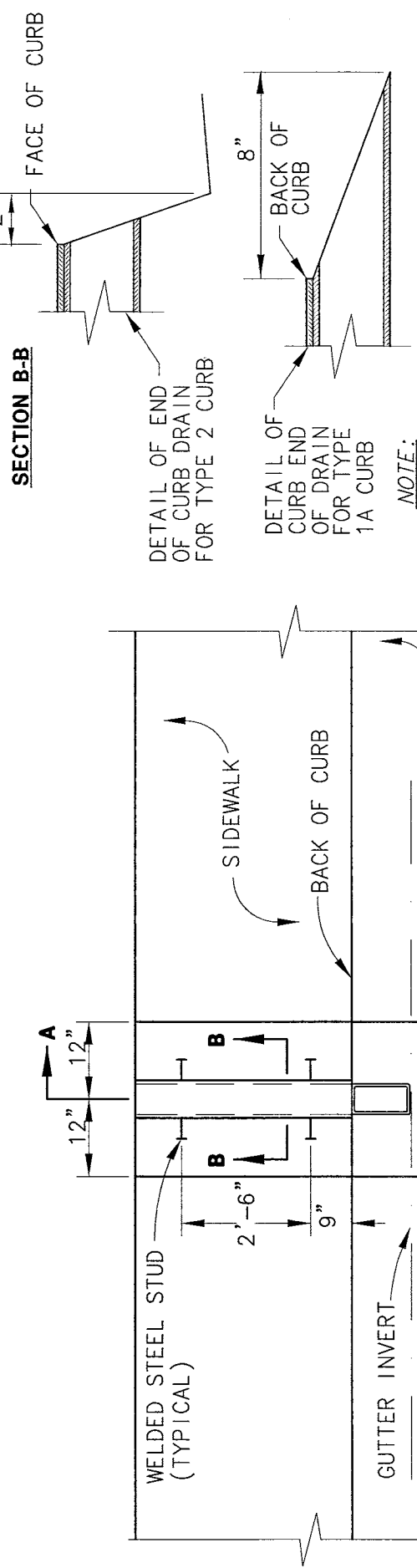
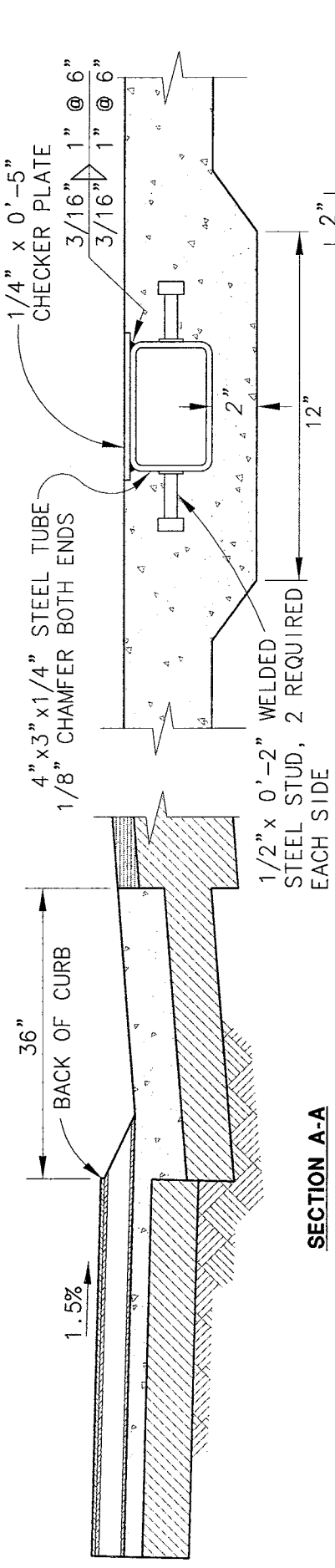
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BARRIER CURB DETAIL

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-33

[Signature]
CHIEF, DEPT. OF TRANSPORTATION



NOTE:
GALVANIZE AFTER FABRICATION

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

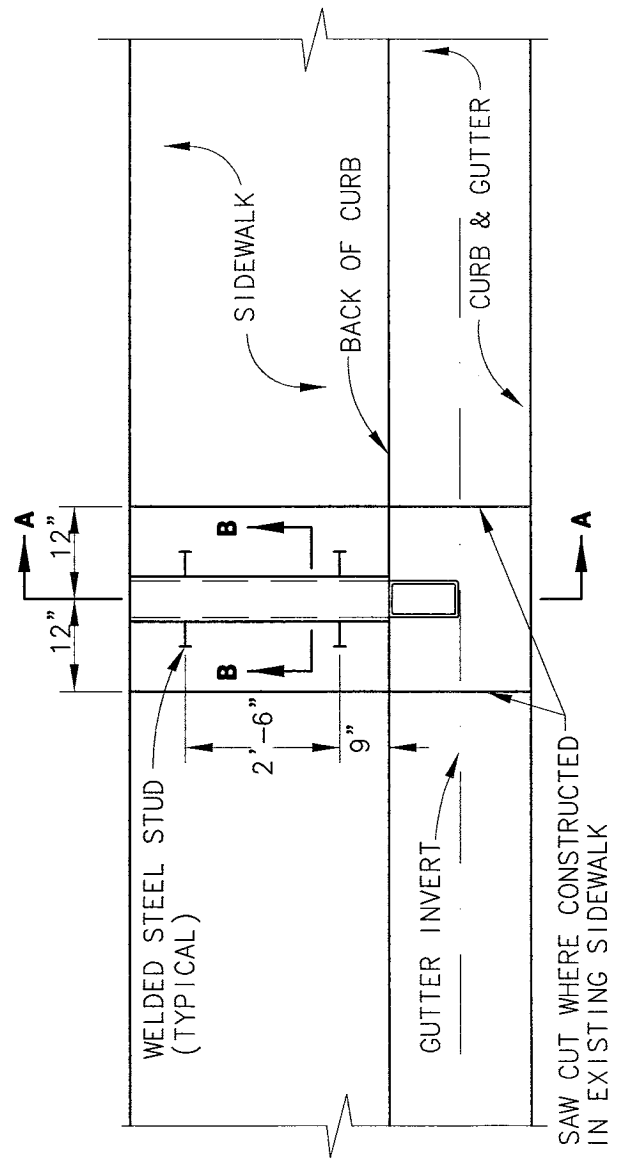
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UNDER
SIDEWALK DRAIN

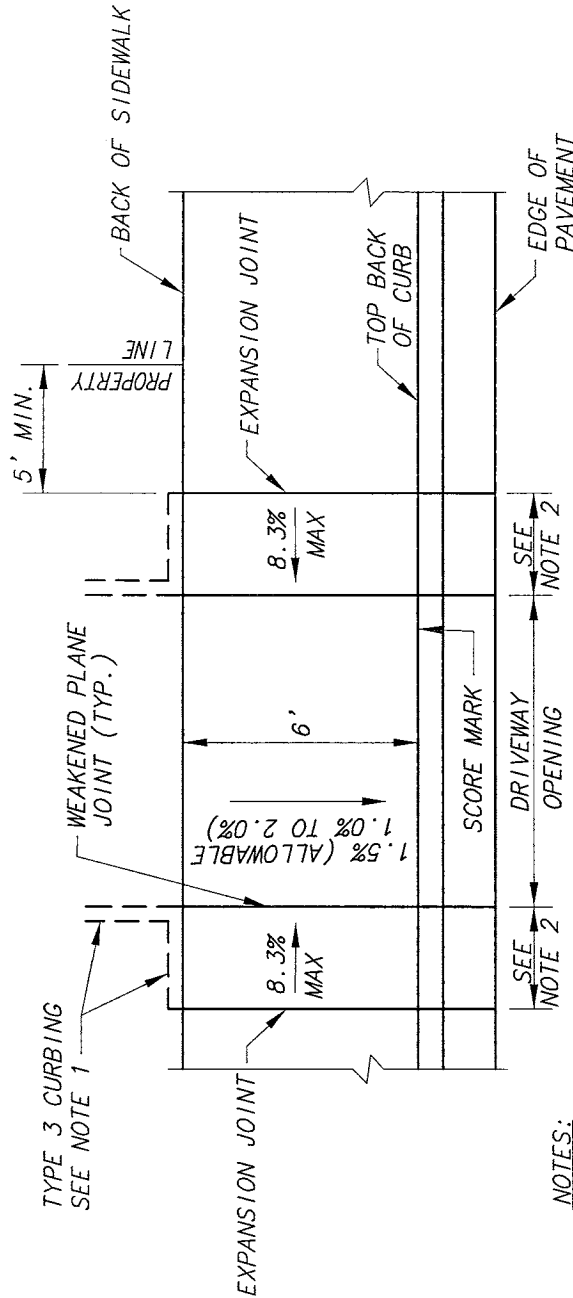
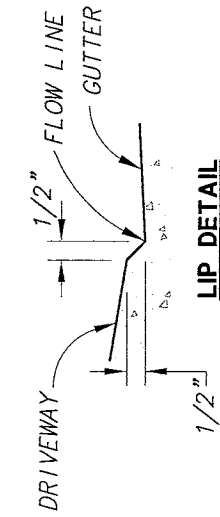
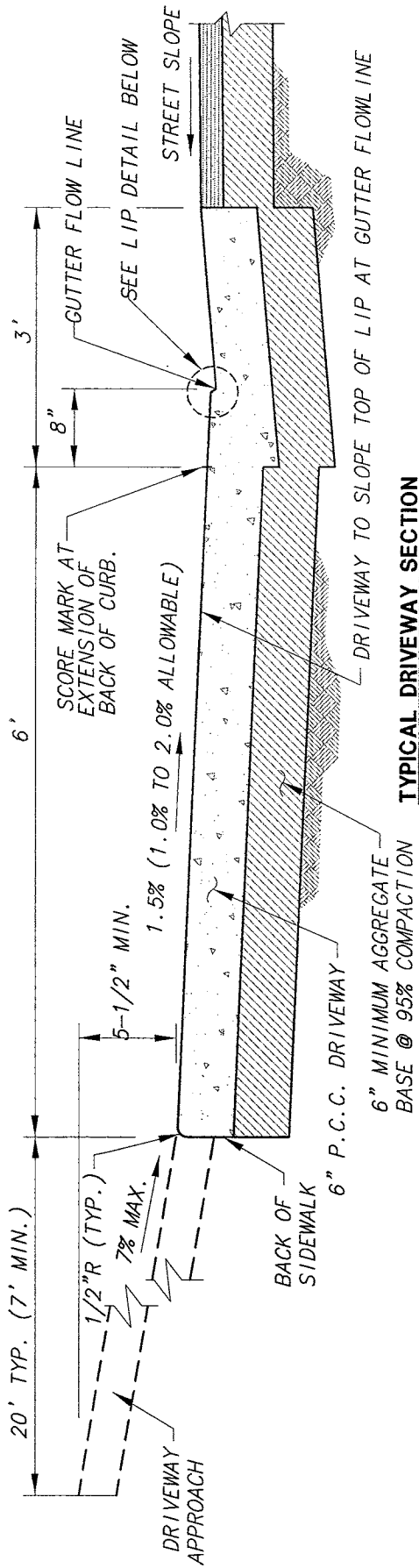
SCALE: NONE
DATE: 07/22/2009
DRAWN BY: TRU P.

4-A-34

PLAN VIEW OF CURB, GUTTER & SIDEWALK



USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.



1. TYPE 3 CURBING ON SITE SHALL EXTEND TO WHERE THE DRIVEWAY APPROACH IS A MINIMUM OF FOUR INCHES ABOVE THE BACK OF SIDEWALK ELEVATION AT THE DRIVEWAY.
2. SEE DRAWING 4-51 FOR APPROX. LENGTH OF INCLINED PORTION OF DRIVEWAY.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

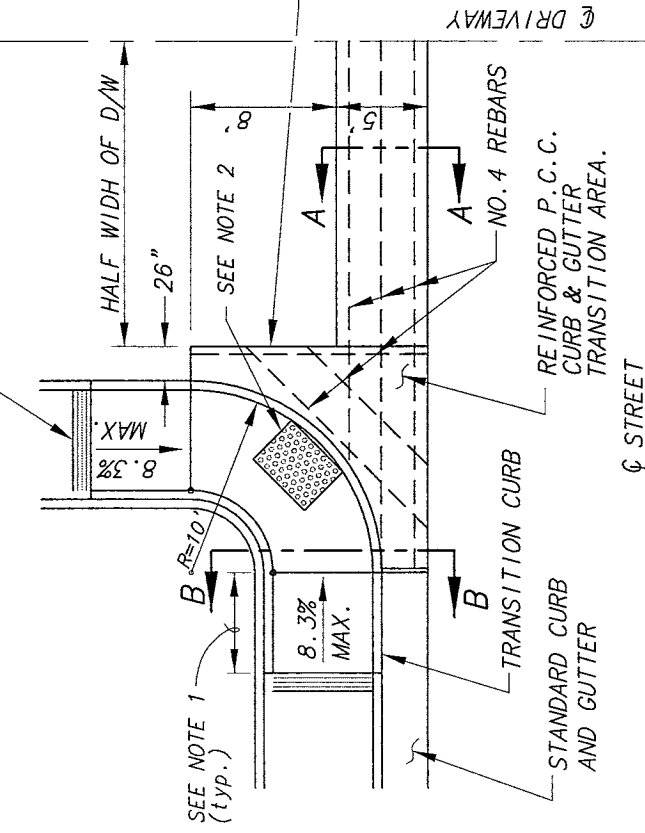
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

TYPE A DRIVEWAY

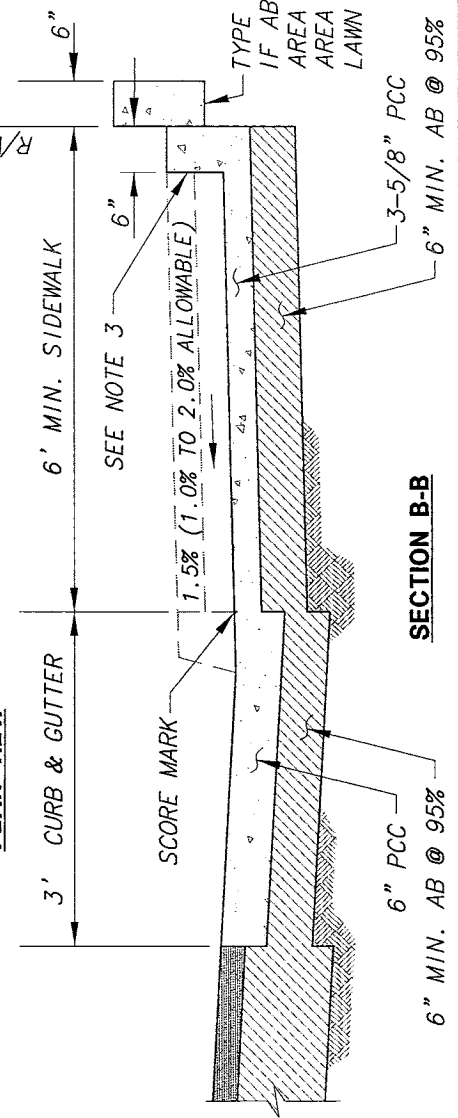
SCALE: NONE
DATE: 07/21/2009
DRAWN BY: B.R.

4-A-35

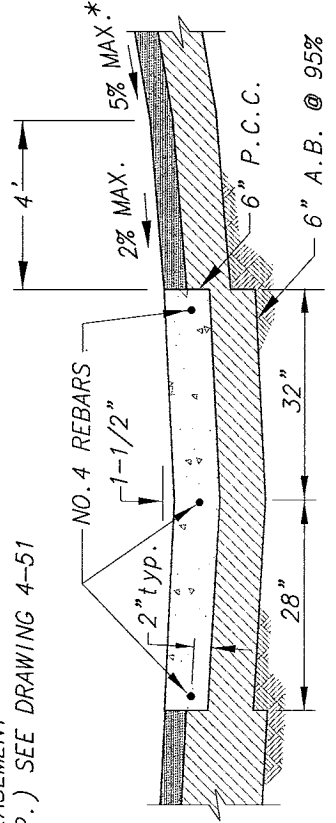
MINIMUM LIMIT OF PEDESTRIAN EASEMENT
1' TACTILE STRIP SECTION (TYP.) SEE DRAWING 4-51



PLAN VIEW



SECTION B-B



SECTION A-A

SEE S.D. NO. 4-26
FOR CONTACT JOINT DETAIL.

* DRIVEWAY SLOPE NOT TO EXCEED 5% FOR A MINIMUM OF 20' FROM EDGE OF PAVEMENT. DRIVEWAY SLOPE SHALL NOT EXCEED 2% WITHIN FOUR FEET OF VALLEY GUTTER.

NOTE:

1. FOR APPROX. LENGTH OF RAMP SEE DRAWING 4-51
2. 4' x 3' DETECTABLE WARNING MATERIAL LOCATED AT CENTER OF RETURN. SEE DRAWING 4-51
3. SEE DRAWING 4-51 FOR RETAINING CURB
4. USE OF THIS DETAIL REQUIRES A PEDESTRIAN EASEMENT

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

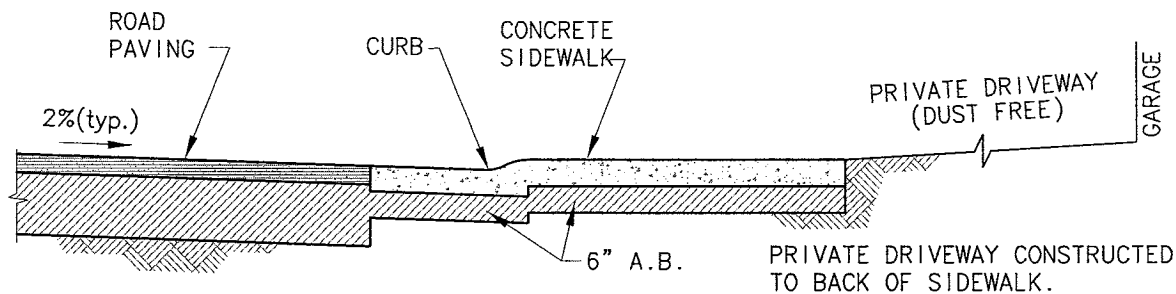
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

TYPE B DRIVEWAY

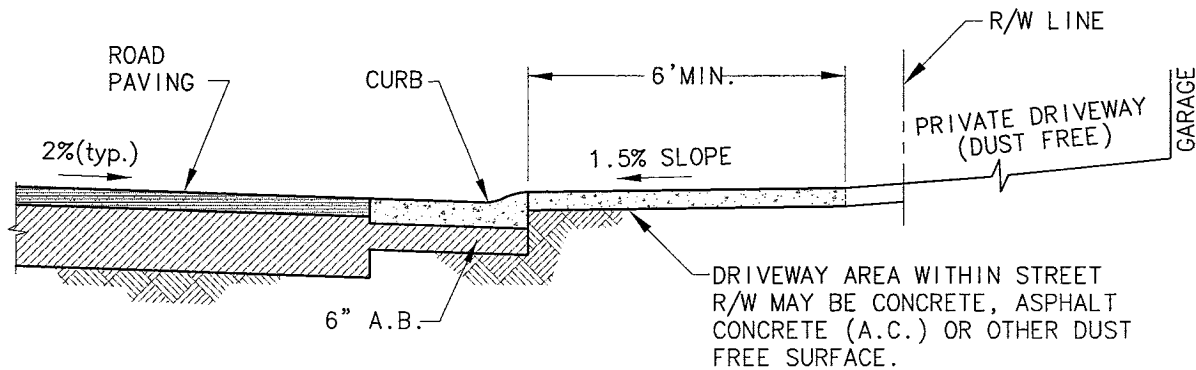
SCALE: NONE
DATE: 07/21/2009
DRAWN BY: TRU P.

4-A-36

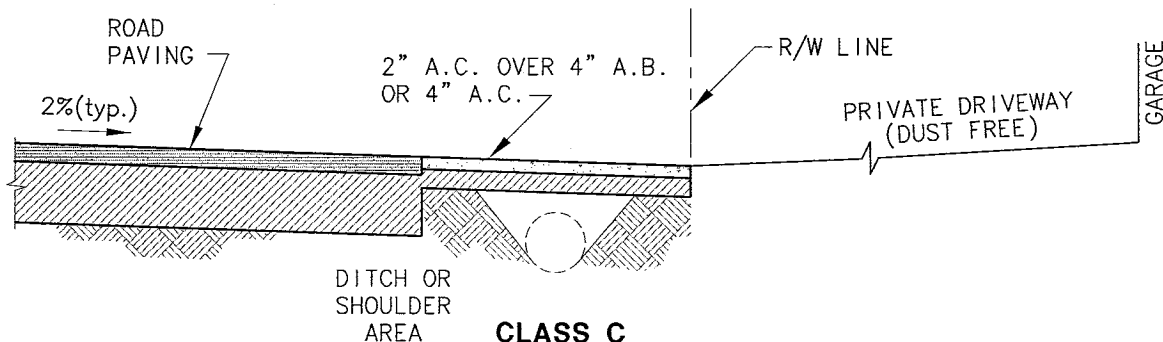
USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.




CLASS A
(CURB, GUTTER & SIDEWALK)



CLASS B
(CURB & GUTTER)



CLASS C
(DITCH OR SHOULDER)


CHIEF, DEPT. OF TRANSPORTATION

1. SEE SACRAMENTO COUNTY IMPROVEMENT STANDARDS
SECTION 4-11 FOR DRIVEWAY REQUIREMENTS.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED
TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK
MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY
RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH
WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING
OR THE DIRECTOR OF TRANSPORTATION.

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**TYPICAL STREET
SECTIONS AT
RESIDENTIAL DRIVEWAYS**

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-38



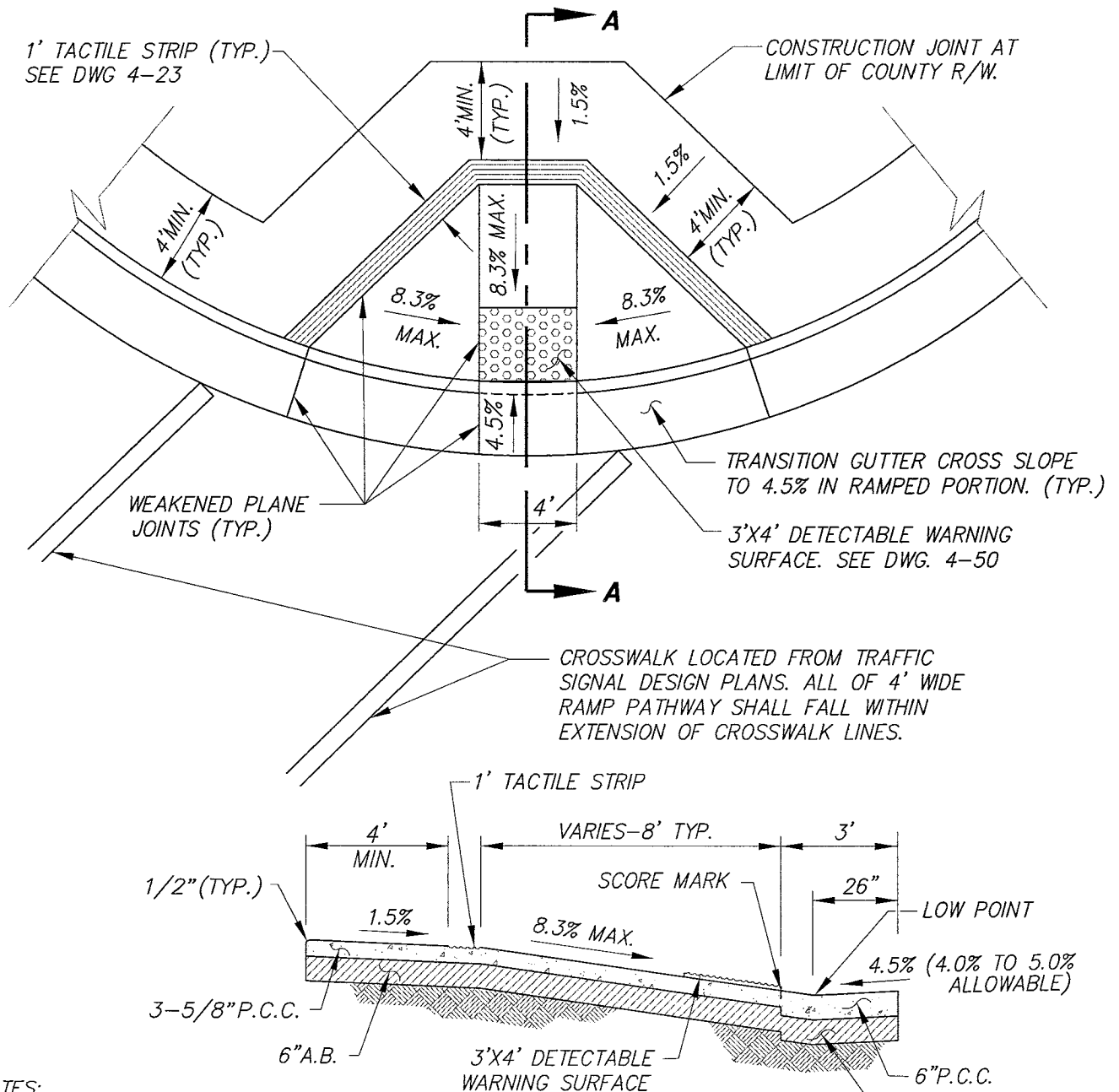
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

ALLEY DETAILS

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-39

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.



NOTES:

1. USE OF THIS DETAIL WITHIN COUNTY REQUIRES ADDITIONAL AREA OF COUNTY R/W OR SIDEWALK EASEMENT
2. SEE DWG. 4-50 FOR FINISH & MATERIAL REQUIREMENTS.
3. SEE DWG. 4-A-53 FOR RAMP PLACEMENT REQUIREMENTS. IF TWO RAMPS OF THIS DESIGN ARE TO BE LOCATED ON ONE CORNER, RAMPS SHALL BE A MINIMUM OF 5' APART AT BACK OF CURB.
4. NO PULL BOX, UTILITY VAULT, UTILITY POLE, MANHOLE, TRAFFIC SIGNAL POLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
5. IT IS DESIREABLE TO LOCATE ALL DRAIN INLETS OUT OF SIDEWALK RAMP AREA. USE OF DRAIN INLET WITHIN RAMP AREA REQUIRES SPECIAL DESIGN OF INLETS.
6. SEE DWG. 4-A-30 FOR SIDEWALK GRADE TOLERANCE.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

SECTION A-A

N.T.S.

CHIEF, DEPT. OF TRANSPORTATION

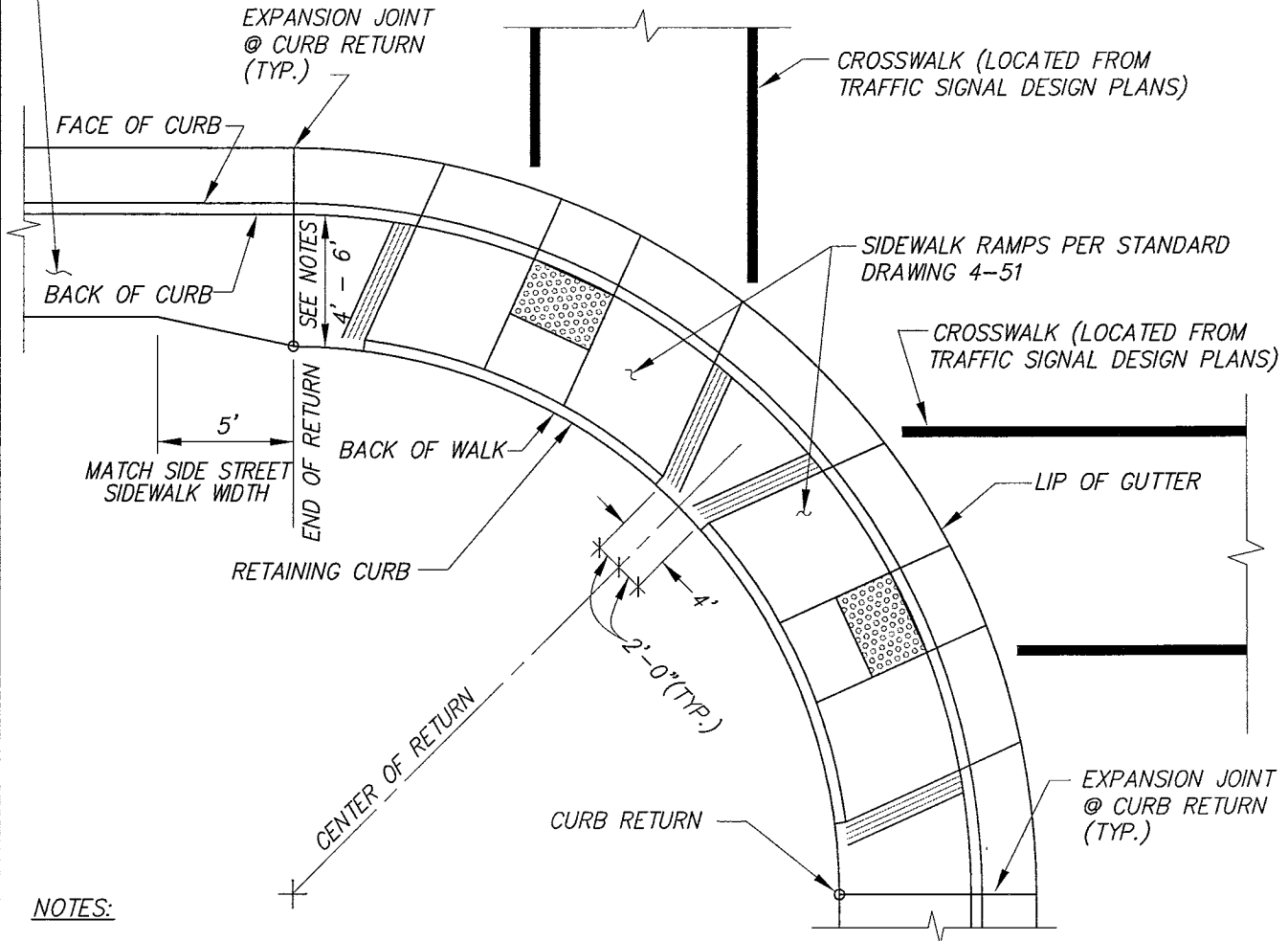
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK RAMP DETAIL
FOR PLAZA AREAS

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-50

SIDEWALK WIDTH TO REMAIN CONSTANT AROUND RETURN. TRANSITION TO MINOR STREET SIDEWALK WIDTH TO OCCUR OUT OF RAMP CONSTRUCTION AREA WITHIN 5'. TRANSITION TYPE 2 CURB AND GUTTER TO MATCH MINOR STREET CURB AND GUTTER WITHIN SAME 5' AREA.



NOTES:

1. AT INTERSECTIONS HAVING A STREET WITH A RIGHT-OF-WAY WIDTH OF 80 FEET OR GREATER, THE CORNER RETURNS SHALL HAVE TWO (2) RAMPS AS SHOWN, AND TYPE 2 CURB & GUTTER AROUND THE RETURNS, AND SIDEWALK WIDTH SHALL BE 6' AROUND THE RETURNS. EXCEPTIONS - SEE NOTES 5 & 6.
2. AT INTERSECTIONS WITH NO MAJOR (84, 108, OR 130 FOOT) STREET, A SINGLE RAMP AT THE CENTER OF THE RETURNS AND TYPE 1 OR 1A CURB & GUTTER MAY BE USED. SIDEWALK WIDTH AROUND RETURNS SHALL BE 4' FOR INTERSECTIONS OF STREETS WITH SINGLE FAMILY RESIDENTIAL DEVELOPMENT.
3. THE PLANS SHALL SHOW THE CORRECT NUMBER & LOCATION OF RAMPS ON EACH CORNER.
4. FULL WIDTH OF RAMP PAN (THE FULLY DEPRESSED PORTION OF RAMP) SHALL BE LOCATED WITHIN THE EXTENSION OF THE ASSOCIATED CROSSWALK STRIPES, WHERE CROSSWALKS EXIST.
5. ON MAJOR STREETS (AS DEFINED IN NOTE #1 ABOVE) WITH A CONTINUOUS RAISED MEDIAN ACROSS THE INTERSECTION, A SINGLE STANDARD SIDEWALK RAMP IS TO BE INSTALLED. LOCATE RAMP AT CENTER OF RETURN.
6. FOR CORNERS WITH TWO STRIPED CROSSWALKS AND WITH OBSTRUCTIONS THAT PREVENT THE CONSTRUCTION OF TWO STANDARD RAMPS, A SINGLE SIDEWALK RAMP MAY BE INSTALLED CENTERED IN THE TWO CROSSWALKS. THE WIDTH OF RAMP PAN (THE FULLY DEPRESSED PORTION OF RAMP) IS TO BE 6'. THE WARNING SURFACE MATERIAL SHALL BE THREE FEET BY SIX FEET. USE OF THIS OPTION REQUIRES PRIOR WRITTEN APPROVAL BY CHIEF OF THE DEPARTMENT OF TRANSPORTATION.

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

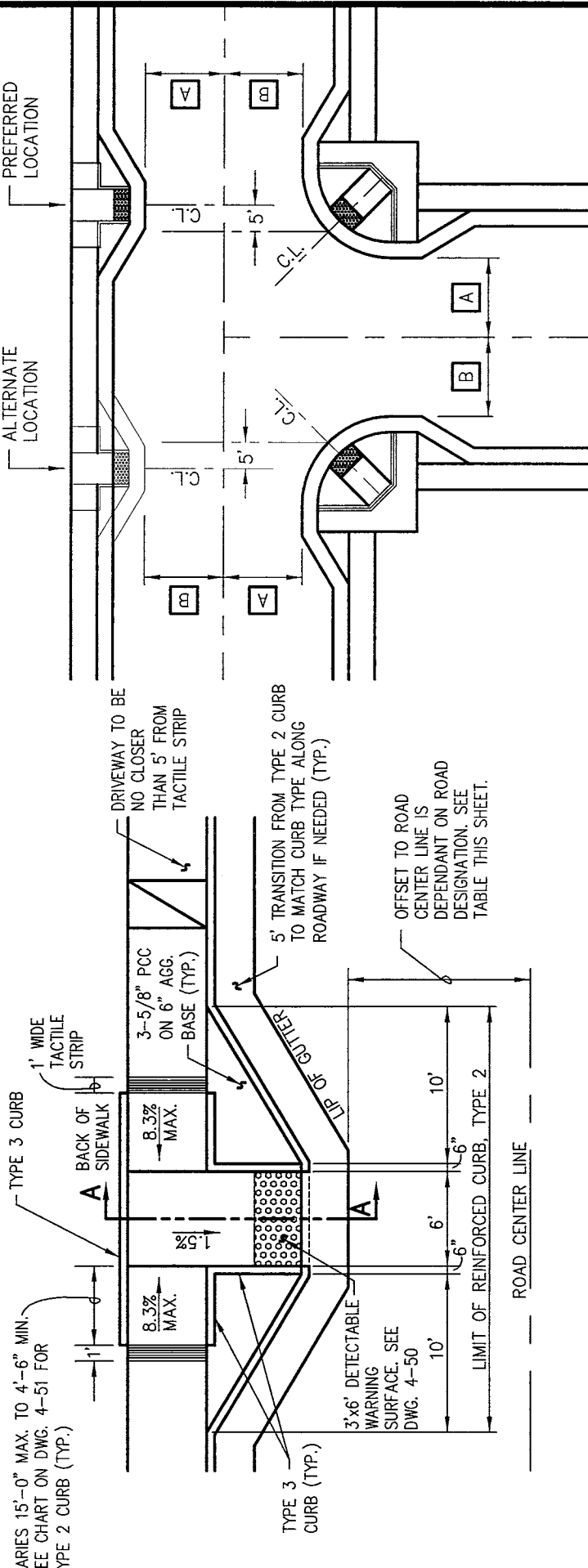
**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**SIDEWALK RAMP
PLACEMENT**

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

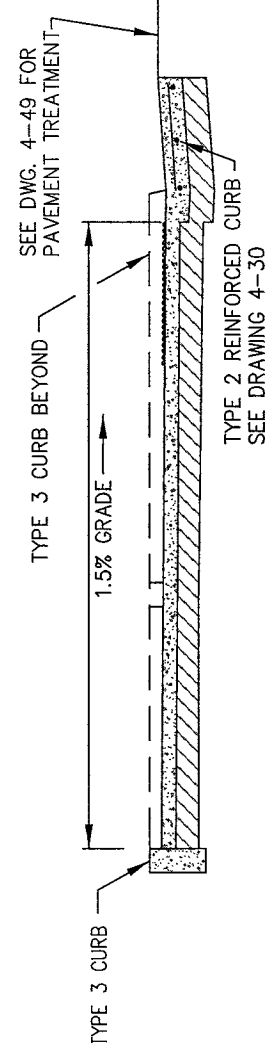
SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-52



STREET DESIGNATION	APPROACH OFFSET	DEPARTURE OFFSET
MAJOR COLLECTOR	22'	22'
COLLECTOR	15'	15'
MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL	11'	13'

SEE DWG. 4-53 FOR TYPICAL CORNER EXTENSION DESIGN.



SECTION 'A-A'
NO SCALE

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK RAMPS AT

"T" INTERSECTIONS FOR

RESIDENTIAL STREETS &

COLLECTOR STREETS

SCALE: NONE

DATE: 07/30/09

DRAWN BY: G. C. & B.R.

4-A-56



- 100

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

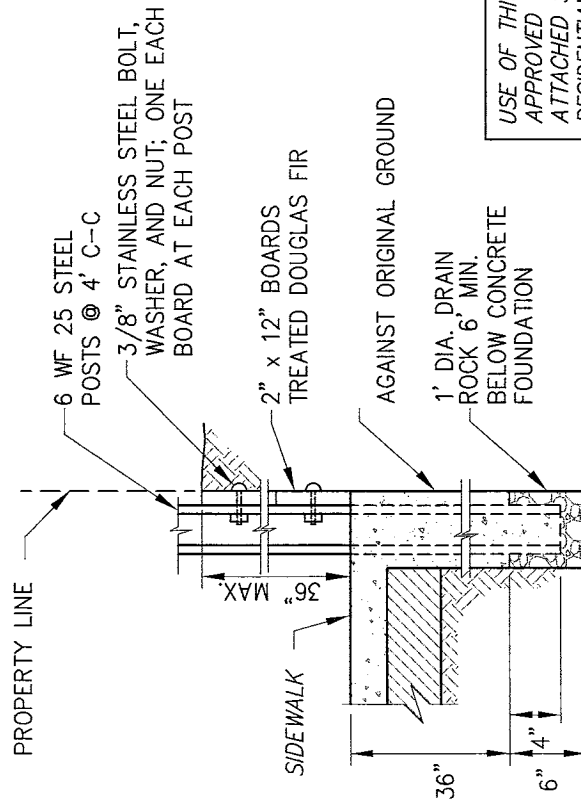
SIDEWALK BARRICADE

SCALE: NONE
DATE: 07/22/09
DRAWN BY: TRU P.

4-A-61

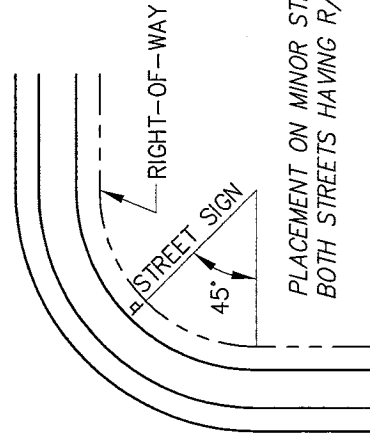
USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

DETAIL FOR SIDEWALK BARRICADE
WITH RETAINING WALL



STREET W/ LESS THAN 80' R/W WIDTH

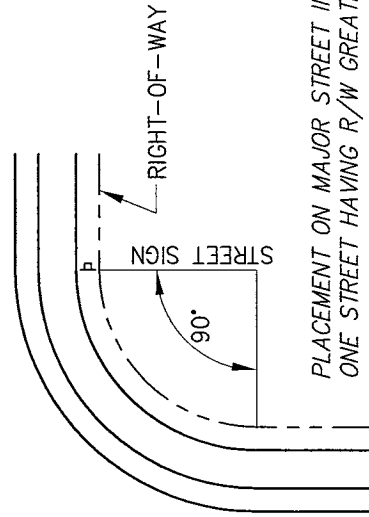
STREET W/ LESS THAN 80' R/W WIDTH



PLACEMENT ON MINOR STREET INTERSECTIONS WITH BOTH STREETS HAVING R/W LESS THAN 80'.

MAJOR STREET 80' OR GREATER R/W WIDTH

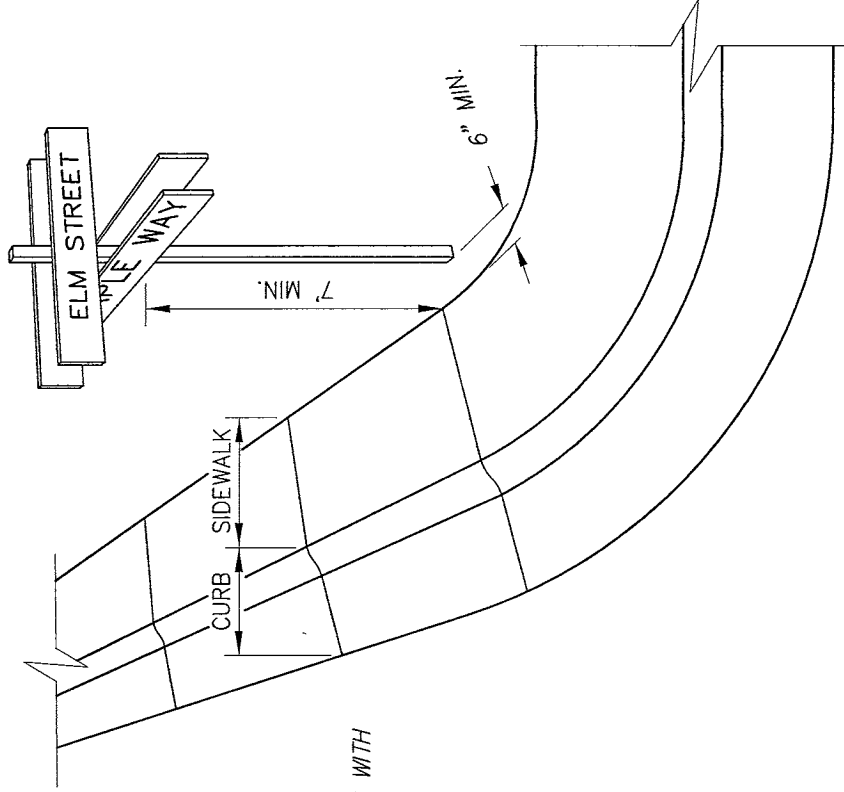
R/W WIDTH EQUAL TO OR LESS



PLACEMENT ON MAJOR STREET INTERSECTIONS WITH AT LEAST ONE STREET HAVING R/W GREATER THAN 80'.

NOTE: IN LIEU OF INSTALLATION OF STREET NAME SIGNS ON NEW POST, SIGNS MAY BE INSTALLED ON STREET LIGHT POLES PER DWG. 4-A-73

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.



COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET NAME SIGN
PLACEMENT DETAILS ON
WOOD POLE INSTALLATIONS

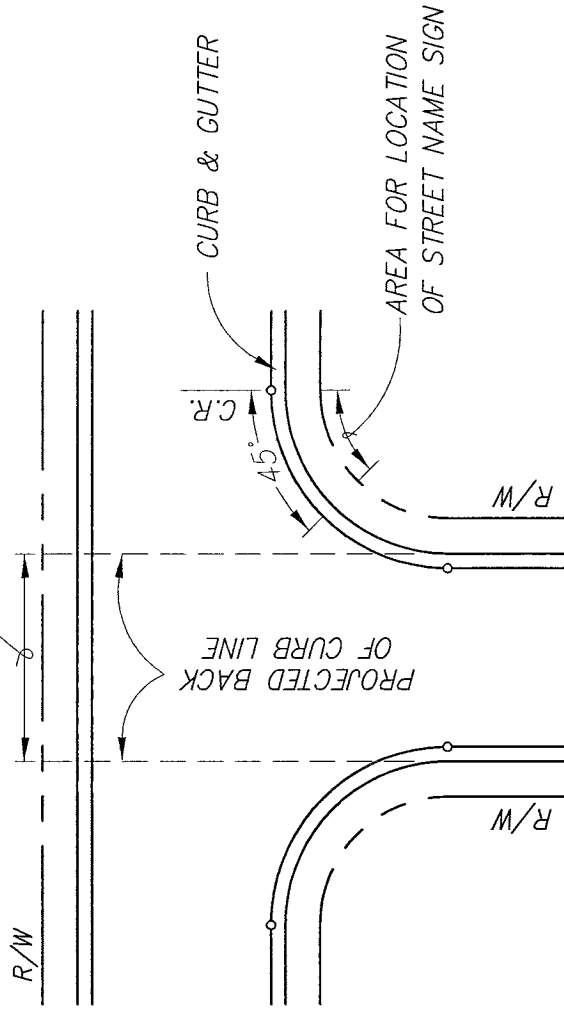
SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-72

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

AREA FOR LOCATION OF SECOND SIGN
IF REQUIRED BY STANDARD DWG. 4-37.



NOTES:

1. STREET NAME SIGNS SHALL BE INSTALLED ON STREET LIGHT POLES WHEN THEY ARE LOCATED WITHIN THE LOCATION LIMITS DEFINED ON THIS DETAIL.
2. ALL OTHER STREET NAME SIGN REQUIREMENTS IN SECT'S 4-26 & 4-27 AND IN DRAWINGS 4-70, 4-A-72, 4-74 & 4-71 OF THE SACRAMENTO COUNTY IMPROVEMENT STANDARDS SHALL APPLY.

USE OF THIS DRAWING IS RESTRICTED TO LOCATIONS APPROVED TO BE BUILT WITH ATTACHED SIDEWALK. ATTACHED SIDEWALK MAY ONLY BE USED ON MINOR RESIDENTIAL AND PRIMARY RESIDENTIAL STREETS, OR ALONG INFILL PROJECTS WITH WRITTEN APPROVAL OF THE DIRECTOR OF COUNTY ENGINEERING OR THE DIRECTOR OF TRANSPORTATION.

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**STREET NAME SIGN
PLACEMENT DETAIL ON STREET
LIGHT POLE INSTALLATIONS**

SCALE: NONE
DATE: 07/21/09
DRAWN BY: TRU P.

4-A-73

SECTION 5

STREET LIGHT DESIGN

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K. Photo Cell	5-5
L. Conduit	5-5
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SECTION 5 STREET LIGHT DESIGN

5-1 STREET LIGHTS REQUIRED -- Street lights shall be required for all lots and parcels being developed or constructed upon unless excepted by Section 5-2. In addition, street lights may be required for lots and parcels containing existing structures which are being improved or altered, depending on the nature and extent of the work. Illustrations of street lights generally required are shown on Standard Drawing 5-1.

5-2 STREET LIGHTS NOT REQUIRED -- Street lights shall not be required under the following circumstances:

- A. Single family residential subdivisions having an average lot street frontage of more than 125 feet will not be required to install a street light system along the streets, but shall as a minimum, be required to install street lights at all intersections, cul-de-sacs, and other locations deemed by the Director to be essential for safety.
- B. For planned developments, residential, commercial, and industrial developments where the internal streets are not offered for dedication, a street lighting system will not be required for the internal non-dedicated streets, but shall be provided by the developer on the external public street frontage.

5-3 DEVELOPER'S RESPONSIBILITY -- Existing street lights which must be relocated or repositioned as a result of the construction of new streets or driveways into a development shall be the responsibility of the developer.

A new service can with a step-down transformer, required as a result of the modification, replacement or relocation of an existing utility service pedestal, shall be the responsibility of the developer. The developer shall also be responsible to ensure that power shall remain to existing street lights during the period of any such modification, replacement or relocation of an existing utility service pedestal.

It shall be the responsibility of the developer to ensure that the power shall remain to the existing street light system until the new street light system to replace it is completed and functioning correctly.

5-4 UTILITY COMPANY AUTHORIZATION -- A written notice from the serving utility company, stating that line clearances and service have been checked and are adequate, shall be submitted to the Director for all developments.

5-5 GENERAL PLAN DETAILS -- The plans shall show and identify all street lights to be installed, all existing lights in the immediate vicinity of the project, all conduit and conductor runs, service points, trees, and all applicable provisions and details specified in these standards.

On subdivision plans, the street lights shall be shown separately. In addition to the above, the following shall be required on the street light portion of subdivision plans, even though duplications may be involved:

- A vicinity map or equivalent
- Utility poles and public utility easements
- Names of adjacent subdivisions
- Intersecting property lines of adjacent properties
- A "Symbols" legend conforming to Standard Drawing 5-1
- A North arrow and appropriate scale (1"=10' to 1"=100')
- All existing street lights on both sides of any streets
- All new tree installations shall be more than 10' from street lights
- All trees within the vicinity of the conduit runs or proposed street lights

5-6 DESIGN STANDARDS -- Street lighting shall be designed in conformance with these specifications, the current edition of the Sacramento County Standard Construction Specifications, and the "American National Standard Practice for Roadway Lighting" of the American Standards Institute, except that the average horizontal maintained foot candles for the various street classifications shall be as shown on Standard Drawing 5-2. Data and calculations supporting the satisfaction of the above requirements shall be submitted for review, or the predetermined design standards included herein shall apply.

5-7 STREET LIGHT DESIGN DETAILS -- Design details for street lights are as follows:

- A. Intersections -- Intersections shall have at least one street light. Intersection street light locations and the number required shall conform to Standard Drawings 5-3 and 5-4.
- B. Cul-de-sacs -- All cul-de-sacs exceeding 130 feet in length, measured from the street light location at the intersection to the right-of-way line at the end of the cul-de-sac, shall have a street light within the bulb. The location of the street light within the bulb shall conform to Standard Drawing 5-4.
- C. Pedestrian Lanes -- Street lights shall be placed at both ends of pedestrian lanes.
- D. Spacing -- Maximum street light spacing, measured along the street centerline, shall conform to Standard Drawing 5-5, except on arterial and thoroughfare streets with a 1,000-foot or smaller radius horizontal curve, in which case the maximum

spacing is 170 feet. Note that on Standard Drawing 5-5, light spacing for 84-foot, 108-foot, and 130-foot streets is based on a one-side arrangement. Spacing on all other streets is based on a two-side arrangement. The one-side spacing arrangement is a system whereby the street light spacing relates to the distance between street lights all on the same side of the street, even though street lights are required on both sides of the street. The two-side arrangement relates to the distance between street lights taking into consideration the street lights on both sides of the street. The actual constructed street type and right-of-way width shall be the controlling factor for determination of street light spacing rather than the street classifications (arterial, collector, etc.).

- E. Street Light Poles -- All street light poles shall be galvanized steel, except as provided for by Item "F" below. All pole construction and materials shall conform to the standards outlined in the Standard Construction Specifications, Section 49-2.05, "Standards, Steel Pedestals and Posts", and the Standard Drawings referenced therein. Poles shall be identified on the plans or in the special provisions. Identification of Type A street light poles shall be by the "A" series numbering procedure" as shown on Standard Drawing 5-17.

The position of the street light poles shall conform to Standard Drawings 5-3, 5-4, and 5-6.

- F. Street Lights on Existing Utility Owned Poles -- Where there are permanent existing (or necessary planned) utility owned poles adjacent to the roadway, the street lights may be installed upon the utility pole in lieu of the poles required. Should the utility pole option be utilized, the following shall apply:

1. In the Sacramento Municipal Utility District (SMUD) service area, the developer shall arrange to install County owned and utility maintained street lights on existing utility poles in accordance with SMUD Rate SL CODM (Rate 52).
2. In the Pacific Gas and Electric Company (PG&E) service area, the developer shall arrange to install PG&E owned and maintained street lights on existing utility poles in accordance with PG&E Rate LS1.
3. Spacing of lights may be varied to meet locations of existing utility poles, but shall not exceed the maximum spacing specified by Standard Drawing 5-5. Street light mounting heights shall be as shown on Standard Drawing 5-5. All luminaires shall have wattages relating to the street classification requirements shown on Standard Drawing 5-5.

G. Luminaires and Ballasts --

1. Luminaires shall be high pressure sodium type with internal ballasts. The type of street light and the appropriate wattage shall be specified on the plans. All luminaires shall conform to the standards outlined in the Standard Construction Specifications, Section 49-6.01, "High Pressure Sodium Luminaires."
2. Ballasts shall conform to the standards outlined in the Standard Construction Specifications, Section 49-6.01, "High Pressure Sodium Luminaires," and Section 49-6.02, "Lamps and Ballasts."

H. Service -- All street light systems shall have underground service provided. Service voltage shall be shown on the plans. Service voltage shall be 120 volts. Service voltage may be 277 volts only when 120 volts service is not available. Service points shall be provided within a Public Utility Easement immediately adjacent to the right-of-way, or within the right-of-way, and at a point which is as reasonably near as possible to the serving utility power source. The service point shall be a pull box which is easily accessible to the street frontage. Types of service are as follows:

1. The Director may approve overhead service in unusual areas when justification is given for why service cannot be provided underground.
2. A direct underground service consists of one light being served from a single service point. New lights on developments adjacent to existing development shall connect to the existing service point. The service point shall be a pull box installed by the developer. See Standard Drawing 5-7 for commercial and residential requirements, and Standard Drawing 5-12 for installation details.
3. Multiple service is two or more lights being served from a single service point installed by the developer. The service point shall be a pull box. Multiple systems shall have a service enclosure (can) which is normally located adjacent to the service point, between the service point and the light system. The service enclosure shall conform to Standard Drawing 5-8, 5-9, 5-10, or 5-11 as appropriate.

I. Pull Boxes -- All pull boxes, including the size, shall be shown and identified on the plans. Pull boxes shall be installed at all locations where more than two conduit runs intersect, where conduit runs are more than 250 feet long, where shown on County Standard Drawings, at critical angle points, at property lines at the end of the required conduit run to the property line (see Section 5-7(L), "Conduit"), behind each light when No. 4 AWG conductors are used, and at such locations ordered by the Director. Normally a No. 3-1/2 pull box will be allowed

when three or fewer conduits of 1-1/4" or smaller size are involved and at the end of the required conduit run to the property line (see Section 5-7(L), "Conduit").

- J. Conductors -- All conductors, including quantity and size, shall be identified on the plans. Unless otherwise specified, conductors shall be single conductor, solid or stranded copper, sized in accordance with these standards and the National Electrical Code.

1. On a direct underground service, the minimum conductor size shall be No. 8 AWG. In general, no conductor shall be larger than No. 4 AWG.
2. On multiple service, the minimum conductor size from the service point to the service enclosure shall be No. 8 AWG. The size of each conductor from the service enclosure to the luminaires shall be such that the voltage drop along each circuit will not exceed 7% for 2-wire systems and 6% for 3-wire systems of the nominal service voltage to the farthest luminaire. The nominal service voltage to be used is 115 volts. Calculations shall be submitted substantiating the design criteria for every circuit. Calculations shall also be submitted showing the total load in amperes of each circuit at the service enclosure. See Standard Drawing 5-13 or 5-14 for typical voltage drop calculations.

In a multiple service system, the photo cell shall be connected to the service enclosure with three No. 14 AWG conductors.

- K. Photo Cell -- A single photo cell receptacle shall be provided on the luminaire nearest to the service enclosure for multiple service systems.

- L. Conduit -- All conduit runs, including the size, shall be shown and identified on the plans. The conduit size shall be determined using Standard Drawing 5-15 as a guideline, with the minimum size being one and one-half inch diameter conduit.

For a system designed using the 3-wire system, only 2 circuits (one set of 3 wires) shall be allowed in any conduit. Circuits based on the 2-wire system and the 3-wire system shall not be mixed in any conduit. All circuits may, however, be mixed in the same conduit from the service enclosure to the first pull box.

The design may include more than two circuits in a conduit if the conductors for each circuit (2-wire) or set of circuits (3-wire) are identified by conductor insulation which is a solid color or a basic color with a permanent colored stripe. The identification stripe shall be continuous over the entire length of the conductor.

New development shall install one and one-half inch conduit, or larger as required, with one No. 10 AWG stranded pullwire from the last light on each end

of the system to the adjacent property line, where the adjacent property has no existing street lighting system.

M. Electrical Equipment and Work -- Control and switching equipment and fusing of all circuits shall meet the requirements of the National Electrical Code, the Basic Electrical Regulations, Title 24, Part 3, of the California Administrative Code, the rules of the National Board of Fire Underwriters, and the County of Sacramento.

N. Installation of Non-Standard Street Lights --

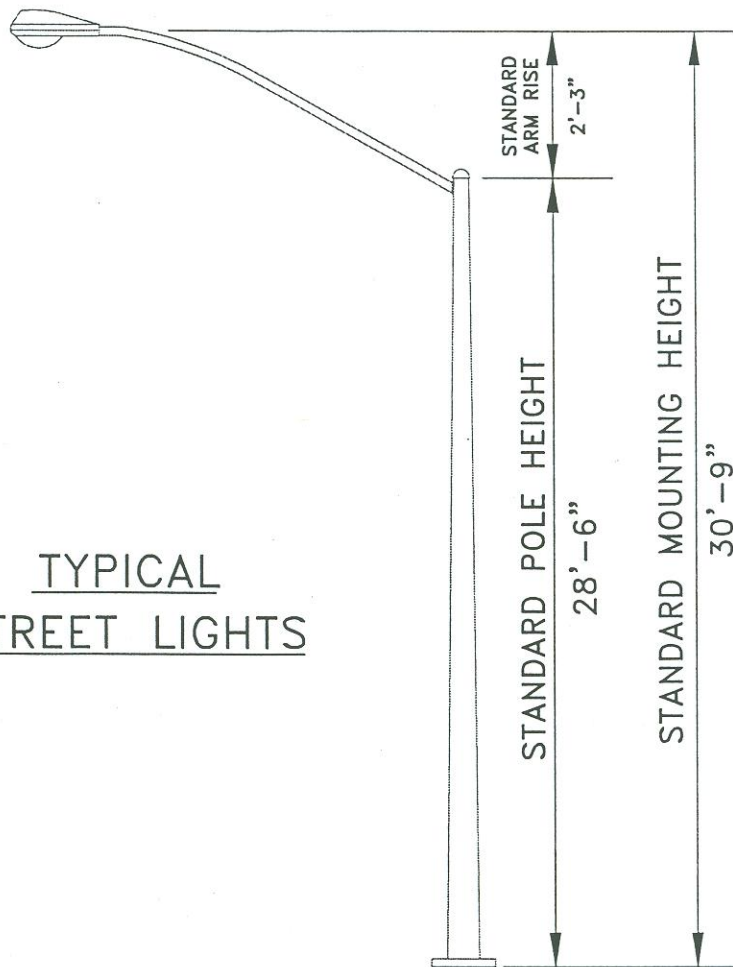
1. The Director may approve the use of non-standard street lights (e.g. decorative street lights) if warranted by the character of the surrounding neighborhood. When the use of non-standard street lights (i.e. poles and luminaires not specified in the Standard Construction Specifications) is approved, the developer shall supply additional street lights (pole, base cover, luminaire, etc.) to the County for future street light replacement. The minimum number of replacement street lights (spares) to be supplied to the County shall be 10% of the lights being installed with any fractional percent rounded up to the next whole number. A note shall be included on the street light plan sheet indicating the requirement for spares as detailed above.
2. When the use of non-standard street lights is approved by the Director, the developer shall be required to submit design calculations for the pole spacing, including photometric calculations and plots from an appropriate computer program. Design criteria may be obtained from the Sacramento County Department of Transportation Street Light Operations Section.
3. The materials and specifications used in the manufacture of the proposed non-standard street lights must be approved by the Director.

5-8 MASTER PLANNING -- Master planning is the determination of street light locations between control points. Control points are proposed street light locations at street intersections in accordance with Section 5-7, Standard Drawings 5-3, 5-4, and 5-5, and existing street lights. The purpose of master planning is to establish an overall uniform street light system meeting minimum requirements. On 84-foot, 108-foot, and 130-foot streets, master planning shall apply to only one side of the street. On all other streets, master planning shall apply to both sides of the street. The procedure for master planning is outlined as follows:

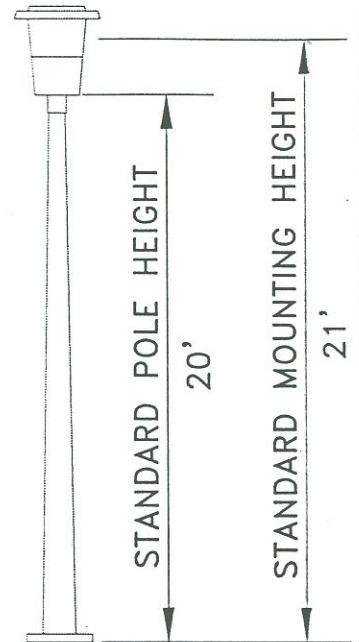
- A. Identify the nearest intersections each way from the street light locations being planned. Determine the location of the street lights at the intersections in conformance with the design standards in Section 5-7 above.

- B. Identify any existing street lights situated between the intersections.
- C. Determine the distance between the adjacent designed intersection street lights and/or adjacent existing street lights, whichever are nearest to the street light locations being planned.
- D. Divide the distance into equal spaces between lights not to exceed the maximum spacing requirements specified in Section 5-7 above.
- E. Compare the light locations to intersecting property lines, driveways, pedestrian lanes, and other obstructions as follows:
 - 1. If the location falls close to a property line and it can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.
 - 2. Generally, street lights should be situated at intersecting property lines for residential lots and parcels with minimal frontage (75 feet or less). The light spacing may have to be unbalanced, with additional lights being added, to attain this and still comply with the maximum spacing allowed.
 - 3. Street light locations shall be adjusted to miss driveways, existing utility poles, and other obstructions by at least five feet.
- F. Where utility-owned poles with overhead electric power lines are existing, the serving utility company shall be contacted to determine if the street lights can be installed on the poles. When a street light location falls within 25 feet of an existing electric power pole, arrangements should be made for the utility company to install the light on their pole in accordance with Section 5-7(F).
- G. Street light locations on 84-foot, 108-foot, and 130-foot streets should be adjusted, when possible, to obtain a more uniform light distribution if there are existing street lights on the opposite side of the street.

TYPICAL STREET LIGHTS



TYPE "A"

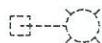


TYPE "B"

SYMBOLS

PROPOSED

EXISTING



.....TYPE "A" STREET LIGHT



.....TYPE "B" STREET LIGHT



.....PULL BOX



.....SERVICE POINT PULL BOX

.....CONDUIT



.....SERVICE ENCLOSURE (CAN)



.....U.G. UTILITY SERVICE



.....TRANSFORMER



.....WOOD POLE

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

STREET LIGHTING
POLES AND SYMBOLS

[Signature]

10/14/03

CHIEF, DEPT. OF TRANSPORTATION

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

5-1

STREET CLASSIFICATION	R/W WIDTH	STREET LIGHT TYPE	STANDARD MOUNTING HEIGHT	AVERAGE MAINTAINED FOOTCANDLE	MAINTENANCE FACTOR
SPECIAL THOROUGHFARE	130'	A	30'-9"	.57	.65
THOROUGHFARE	108'	A	30'-9"	.56	.65
ARTERIAL	84'	A	30'-9"	.36	.65
MAJOR COLLECTOR	74'	A	30'-9"	.36	.65
	70'	A	30'-9"	.36	.65
COLLECTOR	60'	A	30'-9"	.26	.65
	56'	B	21'	.14	.70
RESIDENTIAL	50'	B	21'	.13	.70
	40'	B	21'	.12	.70
PEDESTRIAN LANE	--	B	14'	.17	.70

NOTE:

LUMENS USED TO CALCULATE THE AVERAGE MAINTAINED FOOTCANDLE SHALL BE 80% OF INITIAL LUMEN VALUE RATED BY THE LAMP MANUFACTURER.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

STREET LIGHTING
DESIGN CRITERIA

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

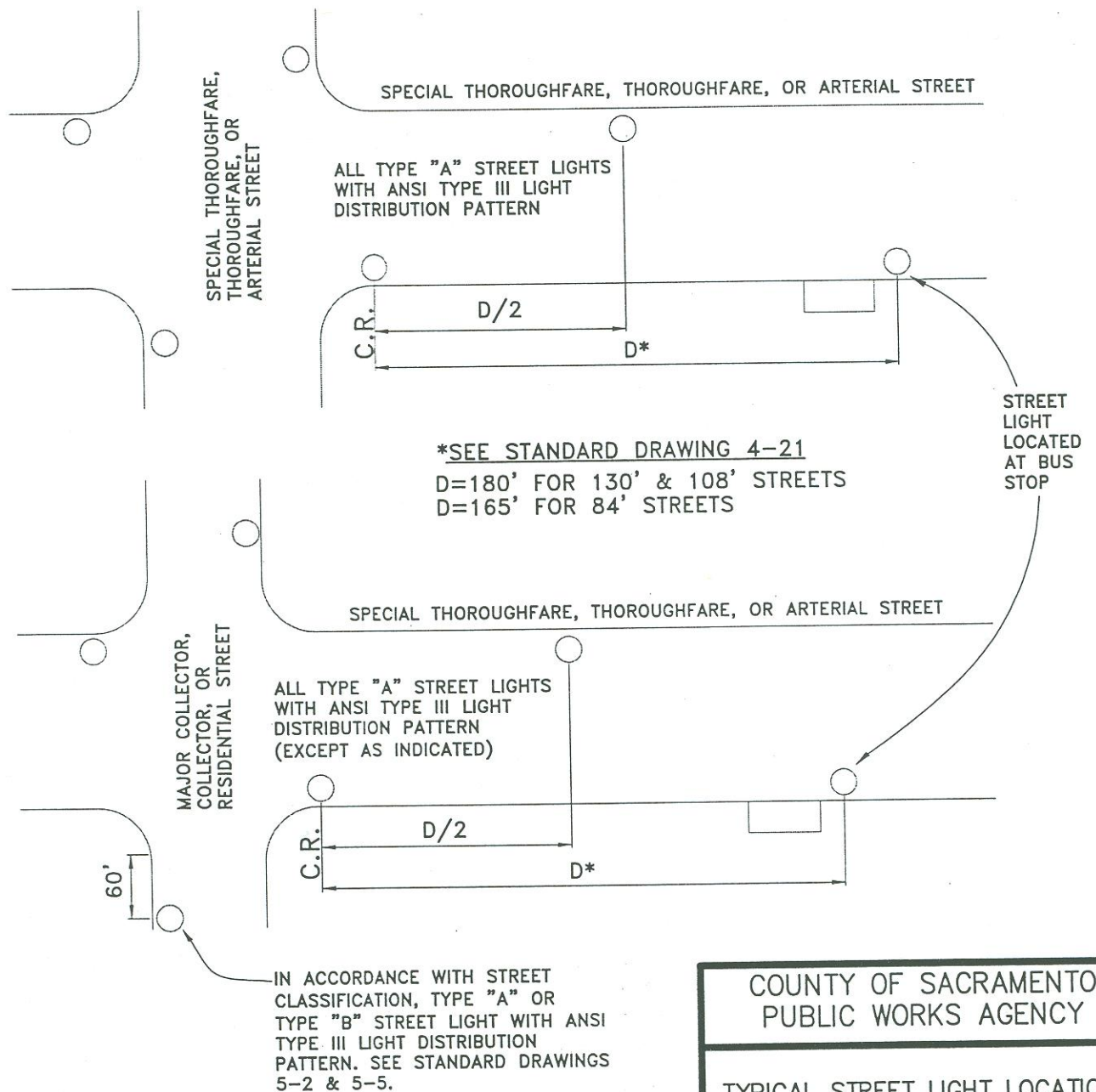
5-2

10/14/03

[Signature]

CHIEF, DEPT. OF TRANSPORTATION

STREET LIGHT PLACEMENT ON SPECIAL THOROUGHFARE, THOROUGHFARE, & ARTERIAL STREETS (130', 108', & 84' STREETS)



COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

TYPICAL STREET LIGHT LOCATIONS
THOROUGHFARES AND ARTERIALS

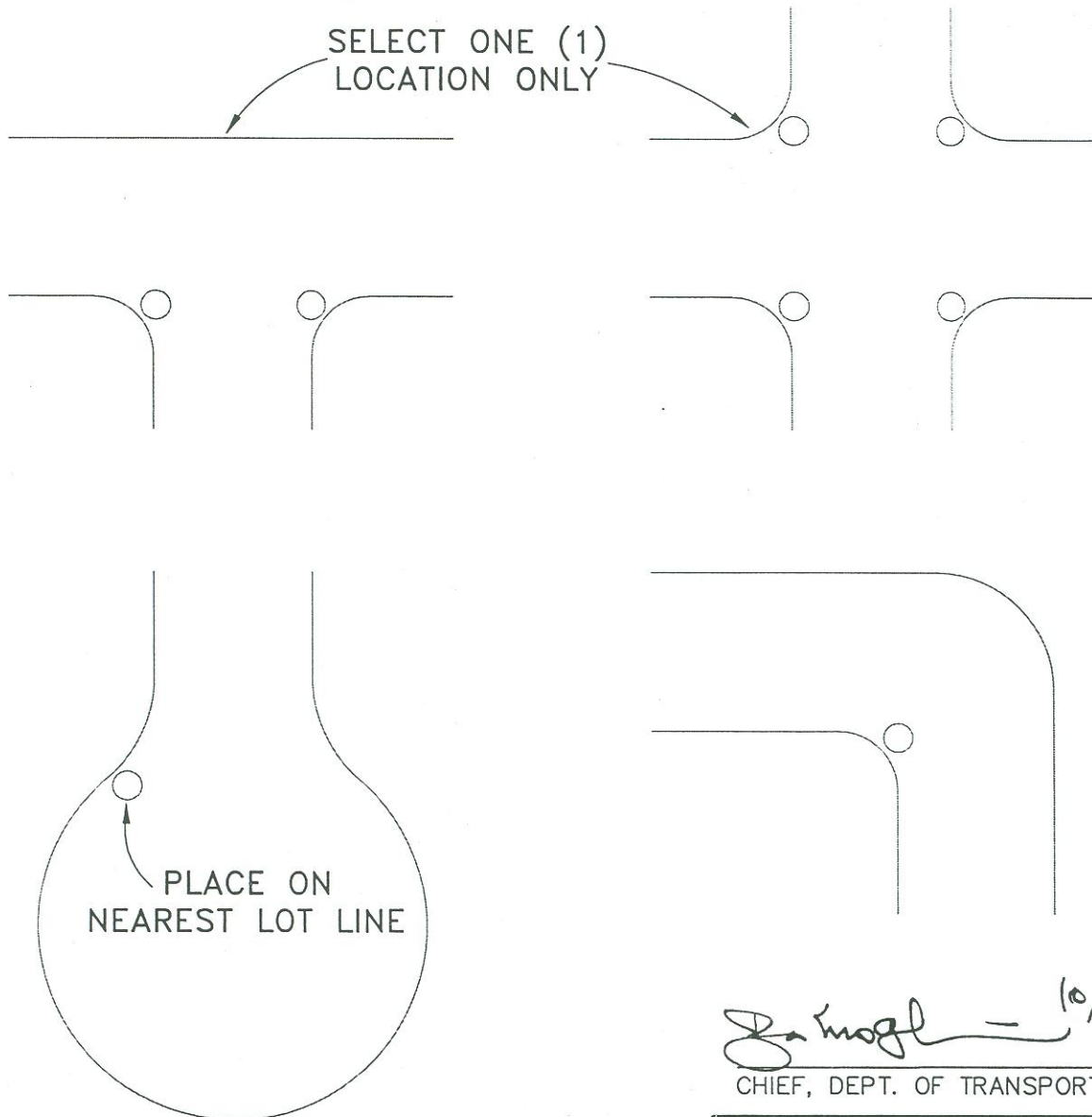
10/14/03

[Signature]
CHIEF, DEPT. OF TRANSPORTATION

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

5-3

STREET LIGHT PLACEMENT ON MAJOR COLLECTOR, COLLECTOR, & RESIDENTIAL STREETS (ALL STREETS OTHER THAN 130', 108', & 84' STREETS)



NOTE:

IN ACCORDANCE WITH STREET CLASSIFICATION, ALL ARE TYPE "A" OR TYPE "B" STREET LIGHTS WITH ANSI TYPE III LIGHT DISTRIBUTION PATTERN. SEE STANDARD DRAWINGS 5-2 & 5-5.

[Signature] 10/14/03
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

TYPICAL STREET LIGHT LOCATIONS
COLLECTORS AND RESIDENTIAL

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

5-4

STREET CLASSIFICATION	R/W WIDTH	STREET LIGHT TYPE	STANDARD MOUNTING HEIGHT	HIGH PRESSURE SODIUM LAMP WATTAGE	SPACING (ONE-SIDE ONLY)
SPECIAL THOROUGHFARE	130'	A	30'-9"	250	180'
THOROUGHFARE	108'	A	30'-9"	250	220'
ARTERIAL	84'	A	30'-9"	150	220'
SPACING (TWO-SIDES)					
MAJOR COLLECTOR	74'	A*	30'-9"	150	220'
COLLECTOR	70'	A*	30'-9"	150	220'
	60'	A*	30'-9"	150	220'
	56'	B	21'	100	180'
RESIDENTIAL	50'	B	21'	100	200'
	40'	B	21'	100	240'

NOTES:

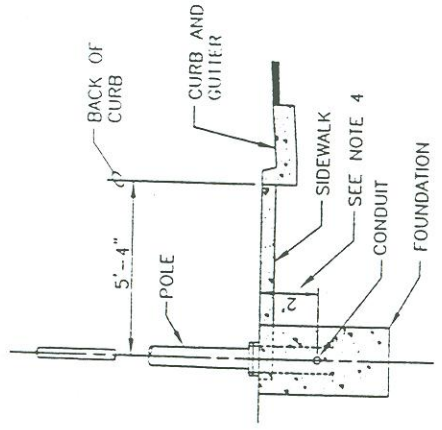
1. Lamp wattage and spacing shown is for high pressure sodium lamp only. Design criteria must be submitted for all other lamps.
2. See Section 5-7D, "Spacing," for definitions of one-side and two-side spacing.
- * 3. Single family and duplex family zoning shall use Type "B" street light, 21' mounting height, 100W HPS lamp, and 180' spacing.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

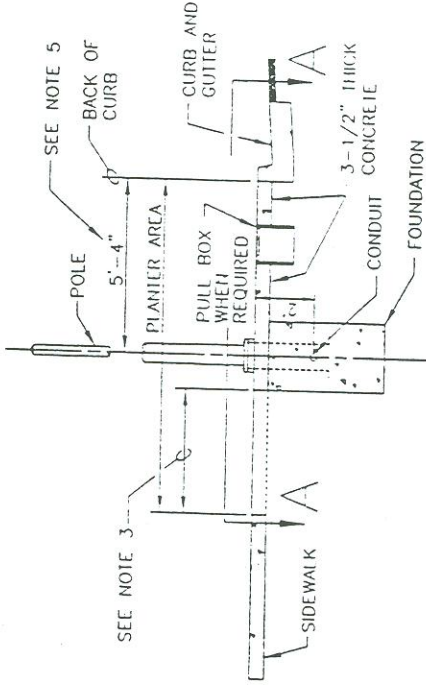
STREET LIGHT
POLE SPACING GUIDE

SCALE: NONE
DATE: 03/04
DRAWN BY: DM

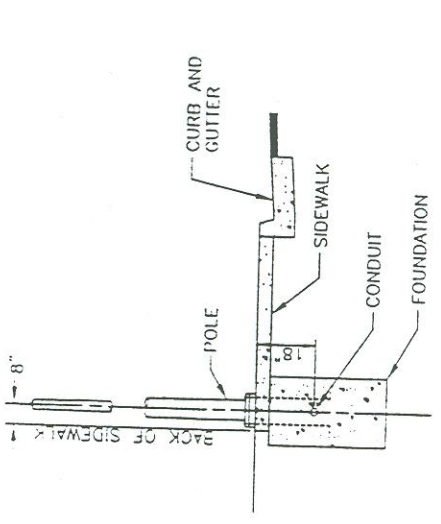

CHIEF, DEPT. OF TRANSPORTATION



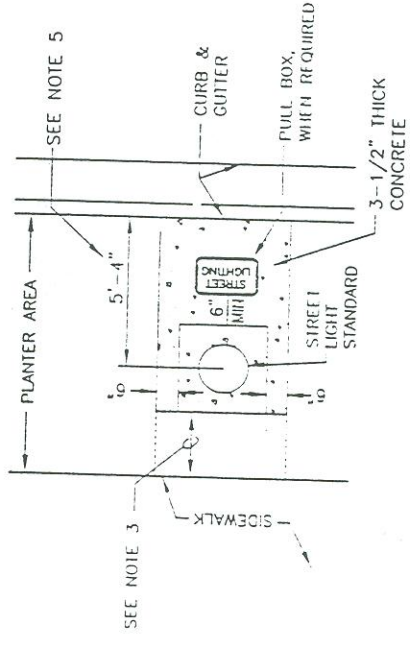
4' to 6' SIDEWALK



SIDEWALK WITH PLANTER AREA



OVER 6' SIDEWALK



SECTION A-A

NOTES:

1. BACKFILL FOR CONDUIT TRENCH LOCATED UNDER CURB, GUTTER, & SIDEWALK AND IN UNIMPROVED AREAS, SHALL BE COMPACTED TO 90% RELATIVE COMPACTION. BACKFILL FOR CONDUIT TRENCH LOCATED IN PAVEMENT SHALL BE COMPACTED TO 95% RELATIVE COMPACTION.
2. LANDSCAPING IN THE AREA OF THE STREET LIGHT STANDARD TO MATCH BASE ELEVATION AND HAVE A MINIMUM OF 12" OF CLEARANCE FROM THE BASE.
3. IF THIS LENGTH IS 12" OR LESS, PLACE 3-1/2" THICK CONCRETE FROM STREET LIGHT BASE TO EDGE OF SIDEWALK. WIDTH TO MATCH CONCRETE AROUND STREET LIGHT FOUNDATION.
4. IF CONDUIT IS LOCATED BENEATH THE SIDEWALK, IT MAY BE PLACED AT 18" DEPTH INSTEAD OF 2'.
5. IF THE PLANTER AREA IS LESS THAN SIX FEET WIDE, THEN PLACE STREET LIGHT STANDARD SO THAT THE BASE PLATE ALIGNS WITH THE EDGE OF SIDEWALK. TOP OF FOUNDATION TO MATCH SIDEWALK GRADE.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

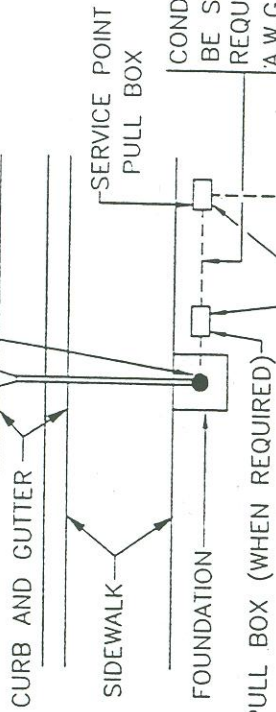
SIGNALS, LIGHTING AND ELECTRICAL
SYSTEMS

BASE LOCATION FOR STREET LIGHTS

SCALE: NONE
DATE: 1/01
DRAWN BY:

DIRECTOR

LUMINAIRE WITH PHOTO CELL
LIGHT STANDARD-TYPE A OR B
(WITHIN RIGHT-OF-WAY OR P.U.E.)



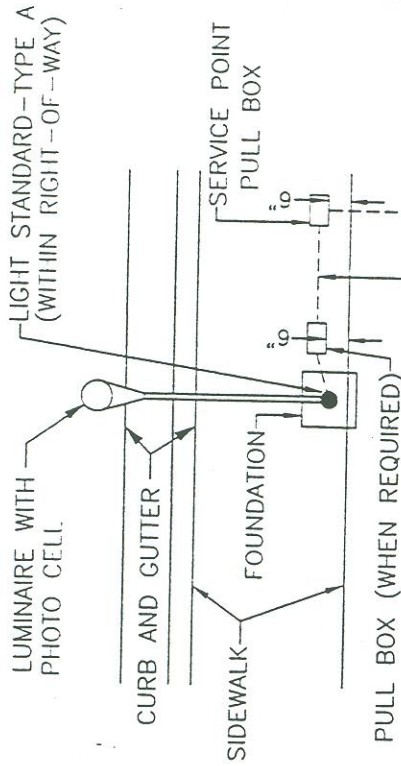
CONDUCTORS AND CONDUIT SHALL BE SIZED ACCORDING TO SERVICE REQUIREMENTS. HOWEVER, NO. 8 A.W.G. CONDUCTOR AND 1-1/2" DIAMETER CONDUIT SHALL BE THE MINIMUM SIZE USED.

PULL BOX(ES) SHALL BE PLACED ADJACENT TO THE SIDEWALK

UTILITY UNDERGROUND SERVICE PEDESTAL, TRANSFORMER, OR POWER POLE

OWNER, DEVELOPER, OR CONTRACTOR SHALL INSTALL CONDUIT WITH PULL ROPE. CONDUIT SIZE & DEPTH, AND INSTALLATION DETAILS PER SERVING UTILITY REQUIREMENTS. OWNER SHALL FURNISH AN EASEMENT AS REQUIRED BY THE SERVING UTILITY.

RESIDENTIAL SERVICE



UTILITY UNDERGROUND SERVICE PEDESTAL, TRANSFORMER, OR POWER POLE

COMMERCIAL SERVICE

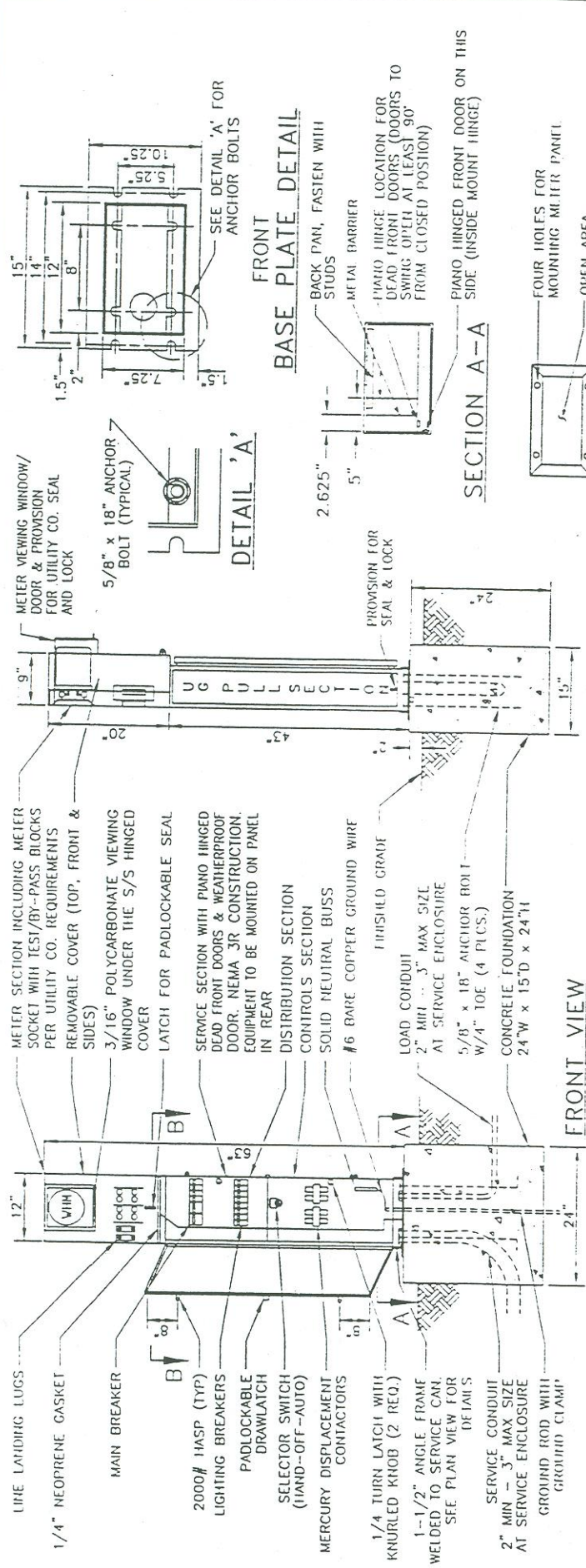
NOTES:

1. ALL COUNTY OWNED FACILITIES SHALL BE WITHIN RIGHT-OF-WAY OR PUBLIC UTILITY EASEMENT.
2. SEE STANDARD DRAWING 5-12 FOR SERVICE POINT PULL BOX DETAILS AND WIRING DIAGRAM.
3. SEE STANDARD DRAWING 5-20A FOR PULL BOX DETAILS.
4. SEE STANDARD DRAWINGS 5-16 AND 5-17 FOR STREET LIGHT AND INSTALLATION DETAILS.
5. THE SERVING UTILITY WILL INSTALL AND MAINTAIN CONDUCTORS FROM THEIR UNDERGROUND SERVICE PEDESTAL, TRANSFORMER, OR POWER POLE TO THE SERVICE POINT PULL BOX.

[Signature]
DIRECTOR

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
DIRECT SERVICE INSTALLATION TO
STREET LIGHTING STANDARD

SCALE: NONE
DATE: 1/01
DRAWN BY:

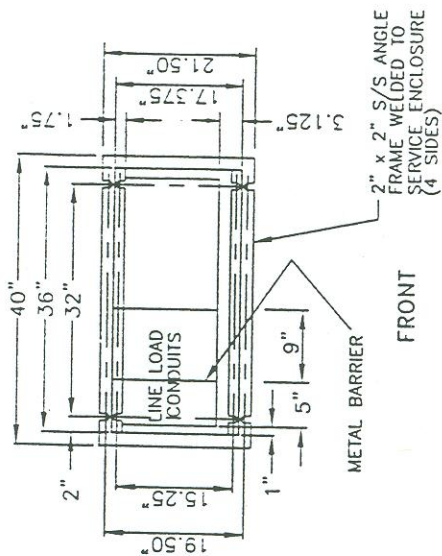


1. EXTERIOR SHALL BE 14 GAUGE #304D STAINLESS STEEL. INTERIOR DEAD FRONT PANEL AND BACK PAN SHALL BE 14 GAUGE STEEL, PAINTED WHITE. ENCLOSURE SHALL BE ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION SHALL BE NEMA 3R AND 12, RAINIGHT AND DUSTTIGHT.
3. ALL NUTS, BOLTS, SCREWS AND HINGES SHALL BE STAINLESS STEEL.
4. NUTS, BOLT IS AND SCREWS SHALL NOT BE USED ON THE OUTSIDE OF THE SERVICE ENCLOSURE.
5. PHENOLIC NAMEPLATES SHALL BE USED TO IDENTIFY ALL OPERATOR CONTROLS.
6. CONTROL WIRING SHALL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM SHALL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. SERVICE ENCLOSURE SHALL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS.
9. SERVICE ENCLOSURE SHALL BE U.L. LISTED AS INDUSTRIAL CONTROL PANELS U.L. 508 FILE NO. E62062
10. WIRING BETWEEN CIRCUIT BREAKER AND CONTACTOR SHALL BE #6 THIN OR THIN MINIMUM.
11. SERVICE ENCLOSURE SHALL BE OF TWO-PIECE CONSTRUCTION.
12. THE WIRING SCHEMATIC DIAGRAM AS SHOWN IS FOR A 2-WIRE STREET LIGHTING SYSTEM. IF THE SERVICE ENCLOSURE WILL BE USED FOR A 3-WIRE STREET LIGHTING SYSTEM, THEN THE LIGHTING BREAKERS WITH INTERNAL COMMON OF 2-POLE BREAKERS WITH INDIVIDUAL ON-OFF TRIP, EACH POLE WITH INDIVIDUAL ON-OFF CONTROL AND HANDLE TIE FOR COMMON OPERATION, FOR EACH 2-POLE BREAKER, THE CIRCUIT LOAD SHALL BE EQUALLY DIVIDED ACROSS THE LIGHTING MAIN.
13. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.

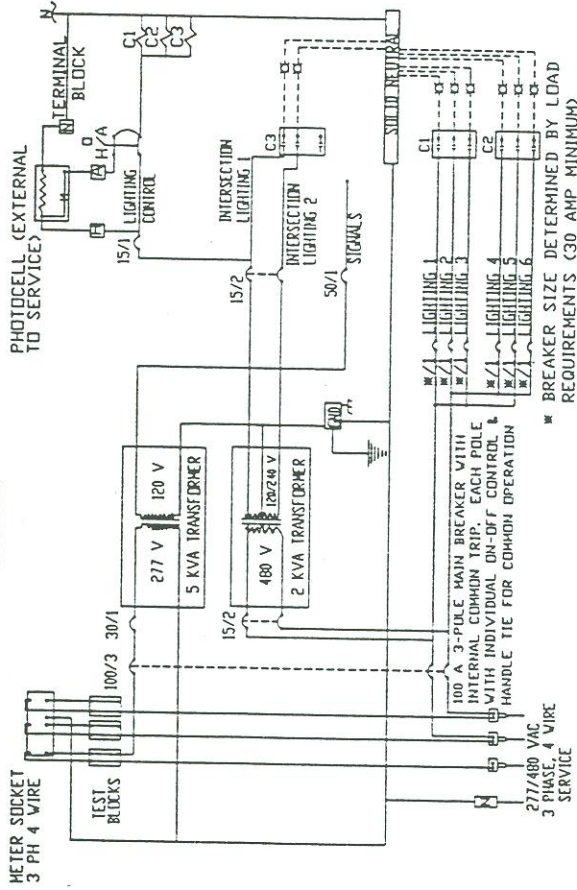
COUNTY OF SACRAMENTO	
PUBLIC WORKS AGENCY	
DEPARTMENT OF TRANSPORTATION	
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS	
METERED SERVICE ENCLOSURE (CAN)	
(120/208V, 120/240V)	
SCALE: NONE	5-8
DATE: 1/01	
DRAWN BY:	

[Signature]
DIRECTOR

METERED SERVICE
WIRING SCHEMATIC DIAGRAM



BASE PLATE DETAIL



1. EXTERIOR SHALL BE 14 GAUGE #304D STAINLESS STEEL. INTERIOR SHALL BE 14 GAUGE STEEL, PAINTED WHITE. ENCLOSURE SHALL BE ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION SHALL BE NEMA 3R AND 12, RAIN-TIGHT AND DUST-TIGHT.
3. ALL NUTS, BOLTS, SCREWS, AND HINGES SHALL BE STAINLESS STEEL.
4. NUTS, BOLTS, AND SCREWS SHALL NOT BE USED ON THE OUTSIDE OF THE SERVICE ENCLOSURE. PHENOLIC NAMEPLATES SHALL BE USED TO IDENTIFY ALL OPERATION CONTROL.
5. CONTROL WIRING SHALL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
6. A PLASTIC COVERED WIRING DIAGRAM SHALL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
7. SERVICE ENCLOSURE SHALL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS.
8. SERVICE ENCLOSURE SHALL BE UL LISTED AS INDUSTRIAL CONTROL PANELS UL 508 FILE NO. E62062
9. WIRING BETWEEN CIRCUIT BREAKER AND CONTACTOR SHALL BE #6 THINW OR THIN MINIMUM.
10. SIZE OF TRANSFORMER FOR SIGNALS SHALL BE 5 KVA. SIZE OF TRANSFORMER FOR 120 V INTERSECTION LIGHTING SHALL BE 2 KVA.
11. WHEN CHANGING VOLTAGE ON A RETRAFIT PROJECT WHERE A NEW SERVICE ENCLOSURE WITH A STEP-DOWN TRANSFORMER IS REQUIRED, THE NEW SERVICE ENCLOSURE SHALL BE PLACED BETWEEN THE SERVICE POINT AND THE OLD SERVICE ENCLOSURE LOCATION WITHIN THE COUNTY R/W. VOLTAGE OUTPUT FROM THE NEW SERVICE ENCLOSURE MAY BE CONNECTED INTO THE EXISTING CONDUIT SYSTEM.
12. THE WIRING SCHEMATIC DIAGRAM AS SHOWN IS FOR A 2-WIRE STREET LIGHTING SYSTEM. IF THE SERVICE ENCLOSURE WILL BE USED FOR A 3-WIRE STREET LIGHTING SYSTEM, THEN THE LIGHTING BREAKERS SHALL CONSIST OF 2-POLE BREAKERS WITH INTERNAL COMMON TRIP, EACH POLE WITH INDIVIDUAL ON-OFF CONTROL, AND HANDLE TIE FOR COMMON OPERATION. FOR EACH 2-POLE BREAKER, THE CIRCUIT LOAD SHALL BE EQUALLY DIVIDED ACROSS THE LIGHTING MAIN.
13. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.
14. SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS METERED SERVICE ENCLOSURE (GAP) WITH STEP-DOWN TRANSFORMER
- COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

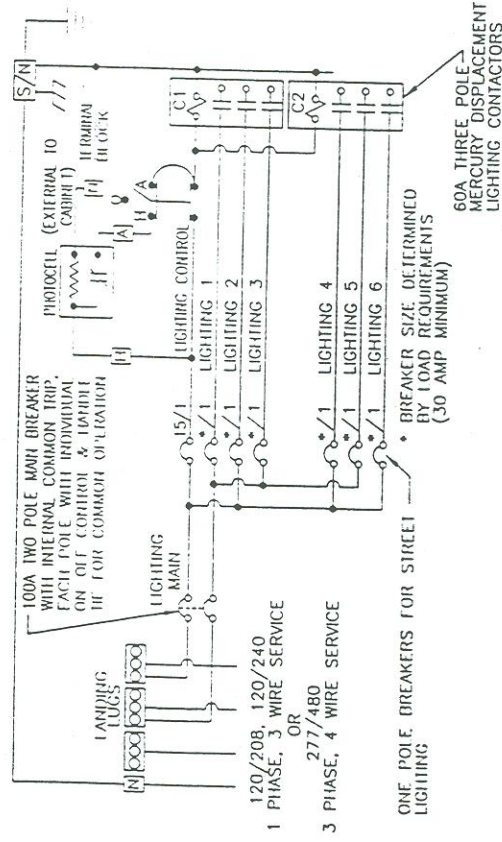
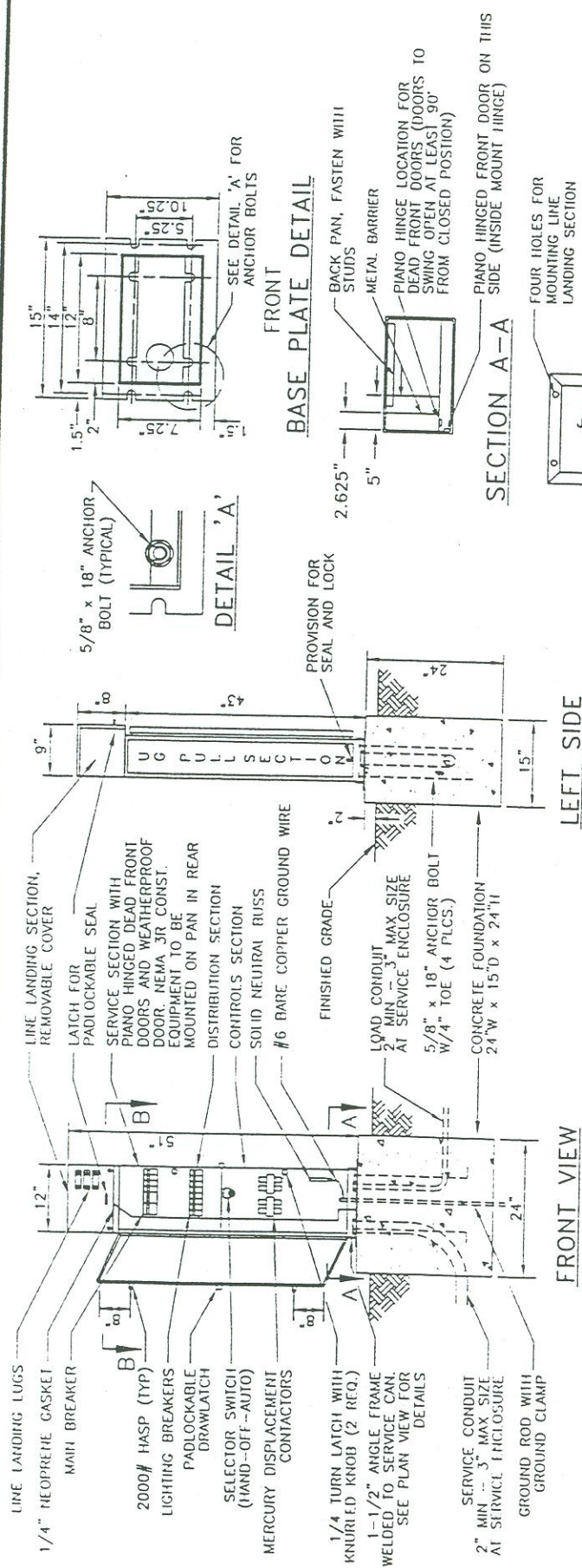
**SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
METERED SERVICE ENCLOSURE (CAN)
WITH STEP-DOWN TRANSFORMER
(277/480V to 120/240V)**

SCALE: NONE
DATE: 1/01
DRAWN BY:

1-1
DIRECTOR

METERED SERVICE WIRING SCHEMATIC DIAGRAM

6-5



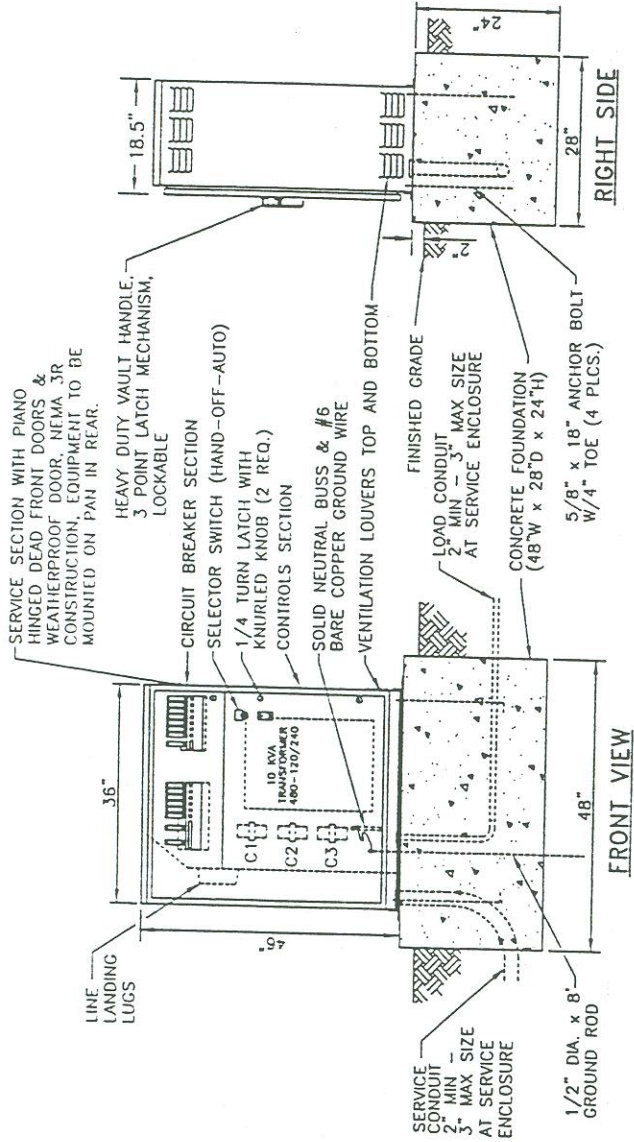
1. EXTERIOR SHALL BE 14 GAUGE #304D STAINLESS STEEL. INTERIOR DEAD FRONT PANEL ATTACHMENT SHALL BE 14 GAUGE STEEL, PAINTED WHITE. ENCLOSURE SHALL BE ELECTRICALLY WELDED AND THE THIRD WIRE BE GROUND.
2. CONSTRUCTION SHALL BE PER 3R AND 12, RAINLIGHT AND DUSTLIGHT.
3. ALL NUTS, BOLTS, SCREWS AND HINGES SHALL BE STAINLESS STEEL.
4. NUTS, BULBS AND SCREWS SHALL NOT BE USED ON THE OUTSIDE OF THE SERVICE ENCLOSURE.
5. PLUMBIC NAMEPLATES SHALL BE USED TO IDENTIFY ALL OPERATOR CONTROLS.
6. CONTROL WIRING SHALL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM SHALL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. SERVICE ENCLOSURE SHALL BE FACTORY WIRE AND CONFORM TO REQUIRED NEMA STANDARDS.
9. SERVICE ENCLOSURE SHALL BE U.L. LISTED AS INDUSTRIAL CONTROL PANELS U.L. 508 FILE NO. E62062
10. WIRING BETWEEN CIRCUIT BREAKER AND CONTACTOR SHALL BE #6 THINW OR THIN MINIMUM.
11. SERVICE ENCLOSURE SHALL BE OF TWO-PIECE CONSTRUCTION.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

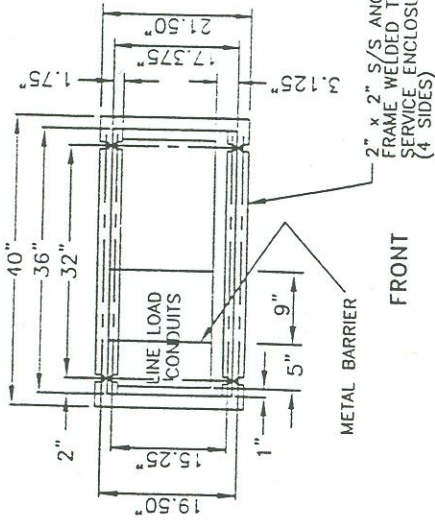
**SIGNALS, LIGHTING AND ELECTRICAL
SYSTEMS - UNMETERED
SERVICE ENCLOSURE (CAN)
(120/208V, 120/240V, 277/480V)**

SCALE: NONE
DATE: 1/01
DRAWN BY:

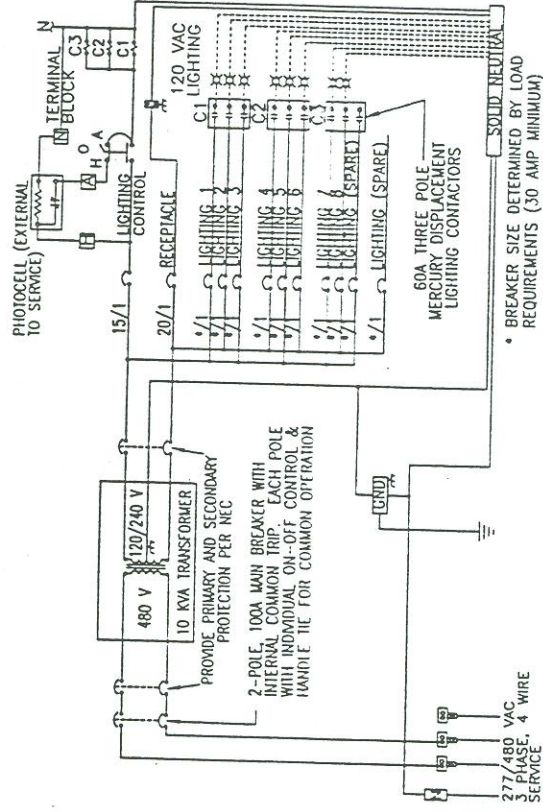
DIRECTOR

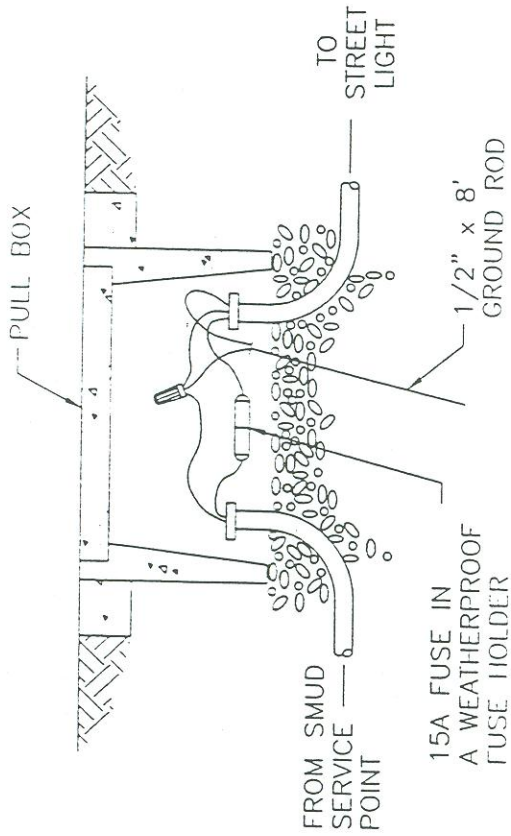


BASE PLATE DETAIL



1. EXTERIOR SHALL BE 14 GAUGE #304D STAINLESS STEEL. INTERIOR SHALL BE 14 GAUGE STEEL. PAINTED WHITE. ENCLOSURE SHALL BE ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION SHALL BE NEMA 3R AND 12, RAIN TIGHT AND DUST TIGHT.
3. ALL NUTS, BOLTS, SCREWS, AND HINGES SHALL BE STAINLESS STEEL.
4. NUTS, BOLTS, AND SCREWS SHALL NOT BE USED ON THE OUTSIDE OF THE SERVICE ENCLOSURE.
5. PHENOLIC NAMEPLATES SHALL BE USED TO IDENTIFY ALL OPERATION CONTROLS.
6. CONTROL WIRING SHALL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM SHALL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. SERVICE ENCLOSURE SHALL BE FACTORY WIRE AND CONFORM TO REQUIRED NEMA STANDARDS.
9. SERVICE ENCLOSURE SHALL BE UL LISTED AS INDUSTRIAL CONTROL PANELS UL 508 FILE NO. E62062
10. WIRING BETWEEN CIRCUIT BREAKER AND CONTACTOR SHALL BE #6 THIN OR THIN MINIMUM.
11. SIZE OF TRANSFORMER SHALL BE 10 KVA. PROVIDE PRIMARY AND SECONDARY PROTECTION PER NEC.
12. WHEN CHANGING VOLTAGE ON A RETROFIT PROJECT WHERE A NEW SERVICE ENCLOSURE WITH A STEP-DOWN TRANSFORMER IS REQUIRED, THE NEW SERVICE ENCLOSURE SHALL BE PLACED BETWEEN THE SERVICE POINT AND THE OLD SERVICE ENCLOSURE LOCATED WITHIN THE COUNTY R.A.V. VOLTAGE OUTPUT FROM THE NEW SERVICE ENCLOSURE MAY BE CONNECTED INTO THE EXISTING CONDUIT SYSTEM.
13. THE WIRING SCHEMATIC DIAGRAM AS SHOWN IS FOR A 2-WIRE STREET LIGHTING SYSTEM. IF THE SERVICE ENCLOSURE WILL BE USED FOR A 3-WIRE STREET LIGHTING SYSTEM, THEN THE LIGHTING BREAKERS SHALL CONSIST OF 2-POLE BREAKERS WITH INTERNAL COMMON TRIP, EACH POLE WITH INDIVIDUAL OPERATION. FOR EACH 2-POLE BREAKER, THE CIRCUIT LOAD SHALL BE EQUALLY DIVIDED ACROSS THE LIGHTING MAIN.
14. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.



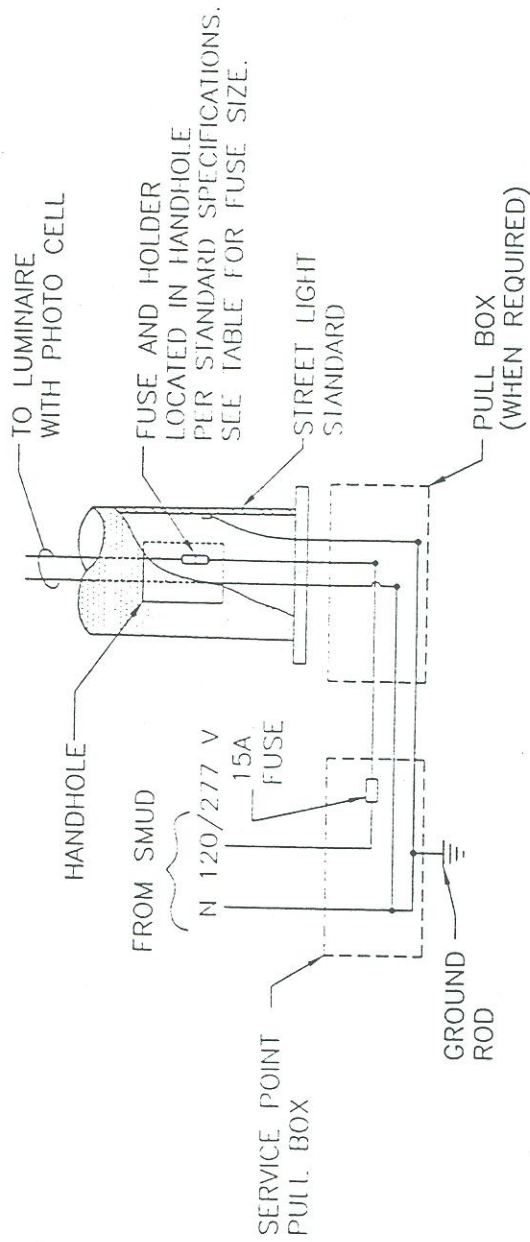


SERVICE POINT PULL BOX DETAILS

LAMP WATTAGE	FUSE SIZE
200 WATT OR LESS	6 AMP
250 WATT - 400 WATT	10 AMP

NOTES:

1. FUSE SHALL BE A MIDGET FERRULE TYPE. RATED AT 600 VOLTS.
2. ATTACH GROUND CONDUCTOR TO THE ELECTROLIER.
3. ALL PULL BOXES SHALL HAVE PROVISIONS FOR LOCKING.



WIRING DIAGRAM

COUNTY OF SACRAMENTO PUBLIC WORKS AGENCY DEPARTMENT OF TRANSPORTATION	
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS	
DETAILS FOR DIRECT SERVICE INSTALLATION STREET LIGHTING POWER	
SCALE: NONE DATE: 1/01 DRAWN BY:	5-12

[Signature]
DIRECTOR

TYPICAL VOLTAGE DROP CALCULATION FOR 2-WIRE SYSTEM

$$\text{VOLTAGE DROP (COPPER CONDUCTOR)} = \frac{D \times A \times N \times 22}{\text{Circular Mils}}$$

D = Length of section, in feet.

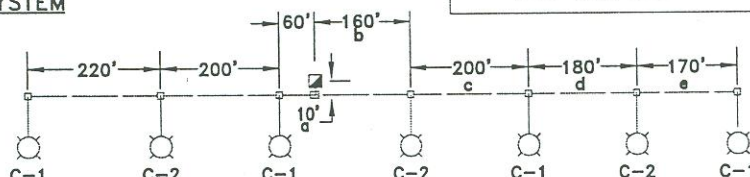
A = Line operating amperes drawn by one light.

N = Number of lights in the circuit beyond the section.

WIRE SIZE (AWG)	AREA (Circular Mils)
14	4,110
12	6,530
10	10,380
8	16,510
6	26,250
4	41,740

LINE OPERATING AMPERES FOR HIGH PRESSURE SODIUM LUMINAIRES (AT 115 VOLTS)	
100 Watt ENERGY EFFICIENT	1.10 Amps
100 Watt	1.25 Amps
150 Watt	1.80 Amps
200 Watt	2.35 Amps
250 Watt	2.90 Amps

TYPICAL MULTIPLE STREET
LIGHTING SYSTEM



EXAMPLE CALCULATION:

FIND TOTAL VOLTAGE DROP IN CIRCUIT #1:
(115 volt system)

NOTE:

Dimension "a" is the distance between the service can and the adjacent load pull box. Use "a"=10' for standard installations where the load pull box is immediately adjacent to the service can.

Voltage drop calculations

$$\text{Section a} = \frac{10 (2.9 \times 4) (22)}{10,380} = 0.25$$

$$\text{Section b + c} = \frac{360 (2.9 \times 2) (22)}{10,380} = 4.43$$

$$\text{Section d + e} = \frac{350 (2.9 \times 1) (22)}{10,380} = 2.15$$

$$\text{TOTAL VOLTAGE DROP} = 6.83$$

LEGEND

	250W High Pressure Sodium Luminaire
	Circuit #1
	Service Can
	Conduit w/ #10 AWG Conductors

NOTES:

- Design must be based on a two (2) wire system, even though three (3) wires (w/ a single common wire) are actually used.
- Maximum voltage drop allowed in 115 volt system = 8.05 volts.

CHIEF, DEPT. OF TRANSPORTATION

10/14/03

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

2-WIRE STREET LIGHT SYSTEM
WIRE SIZE AND VOLTAGE
DROP CALCULATION

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

5-13

TYPICAL VOLTAGE DROP CALCULATION FOR 3-WIRE SYSTEM

$$\text{VOLTAGE DROP (COPPER CONDUCTOR)} = \frac{D \times A \times N \times 11}{\text{Circular Mils}}$$

D = Length of section, in feet.

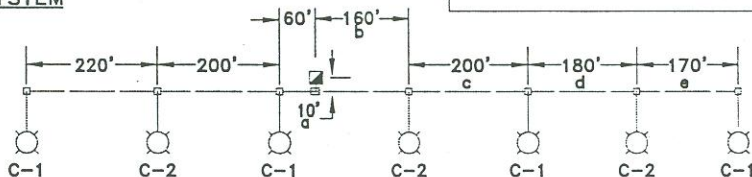
A = Line operating amperes drawn by one light.

N = Number of lights in the circuit beyond the section.

WIRE SIZE (AWG)	AREA (Circular Mils)
14	4,110
12	6,530
10	10,380
8	16,510
6	26,250
4	41,740

LINE OPERATING AMPERES FOR HIGH PRESSURE SODIUM LUMINAIRES (AT 115 VOLTS)	
100 Watt ENERGY EFFICIENT	1.10 Amps
100 Watt	1.25 Amps
150 Watt	1.80 Amps
200 Watt	2.35 Amps
250 Watt	2.90 Amps

TYPICAL MULTIPLE STREET LIGHTING SYSTEM



EXAMPLE CALCULATION:

FIND TOTAL VOLTAGE DROP IN CIRCUIT #1:
(115 volt system)

NOTE:

Dimension "a" is the distance between the service can and the adjacent load pull box. Use "a"=10' for standard installations where the load pull box is immediately adjacent to the service can.

Voltage drop calculations

$$\text{Section a} = \frac{10 (2.9 \times 4) (11)}{6,530} = 0.20$$

$$\text{Section b + c} = \frac{360 (2.9 \times 2) (11)}{6,530} = 3.52$$





$$\text{Section d + e} = \frac{350 (2.9 \times 1) (11)}{6,530} = 1.71$$

$$\text{TOTAL VOLTAGE DROP} = 5.43$$

NOTE:

Maximum voltage drop allowed in 115 volt system = 6.90 volts.

LEGEND

-  250W High Pressure Sodium Luminaire
-  Circuit #1
-  Service Can
-  Conduit w/ #12 AWG Conductors

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

3-WIRE STREET LIGHT SYSTEM
WIRE SIZE AND VOLTAGE
DROP CALCULATION

SCALE: NONE
DATE: 10/03
DRAWN BY: DM

5-14



CHIEF, DEPT. OF TRANSPORTATION

10/14/03

CONDUIT SIZING

CONDUCTOR	EQUIVALENT NUMBER OF #14 A.W.G. CONDUCTORS FOR USE IN CONDUIT SIZING
#12 CONDUCTOR	1.2
#10 CONDUCTOR	1.5
#8 CONDUCTOR	2.3
#6 CONDUCTOR	3
#4 CONDUCTOR	4
#2 CONDUCTOR	5.3
#0 CONDUCTOR	11.5
INTERCONNECT CABLE	18
DETECTOR LEAD-IN CABLE	2.5
EMERGENCY VEHICLE DETECTOR CABLE	2

CONDUIT SIZE	1"	1.5"	2"	2.5"	3"	3.5"	4"
MAXIMUM NUMBER OF #14 A.W.G CONDUCTORS	8	19	31	44	69	91	113

NOTE: MINIMUM SIZE FOR NEW CONDUITS IS 1.5".

SERVICE WIRE MAXIMUM LENGTHS FOR TRAFFIC SIGNALS

WIRE SIZE	LENGTH
#0	576'
#2	360'
#4	224'

CIRCUIT BREAKER SIZING

CONDUCTOR SIZE A.W.G.	MAXIMUM CIRCUIT BREAKER AMPERAGE
#2	100
#4	80
#6	50
#8	40
#10	30

NOTE

THE BREAKER SIZE SHALL BE
DETERMINED BY THE LOAD
REQUIREMENTS. MINIMUM
BREAKER SIZE IS 30 AMPS.

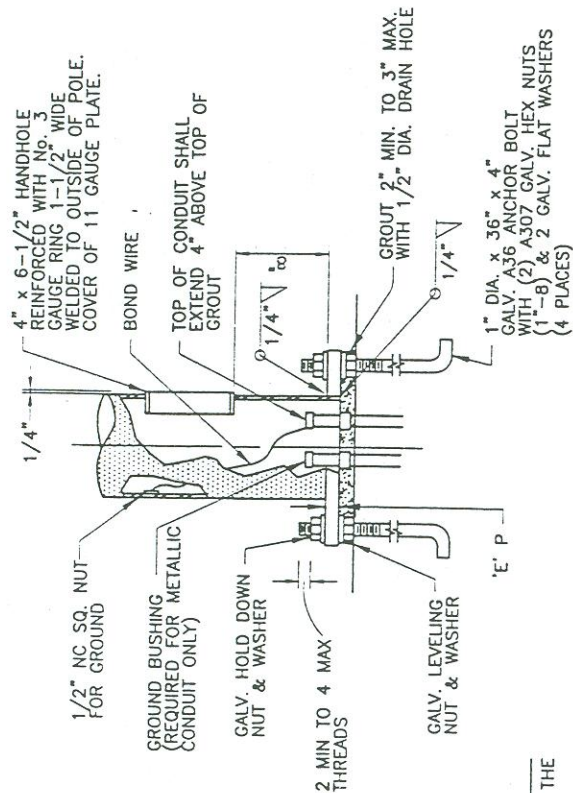

CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY**

**CONDUIT, SERVICE WIRE
AND BREAKER SIZING**

SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

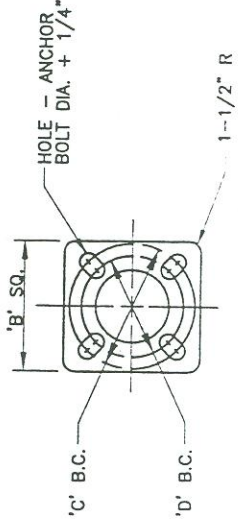
5-15



NOTES:

- STANDARD SHALL BE INSTALLED SO HANDHOLE FACES THE STREET.

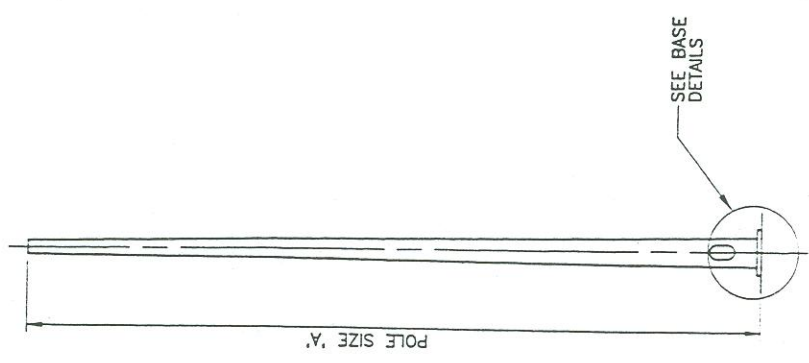
FOUNDATION DIMENSIONS		
	SQUARE	ROUND
'B' SERIES	2' x 2' x 4'	30" x 3'-6"



BASE DETAILS

'B' SERIES					
POLE DATA		BASE PLATE DATA			
		BASE OD		ANCHOR BOLTS	
'A'	TOP OD	MIN	MAX	'B' 'C' 'D' 'E'	
20'-0"	2-7/8"	5.61"	5.85"	10"	1" x 36" x 4"

R. Hughes
CHIEF, DEPT. OF TRANSPORTATION



'B' SERIES

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

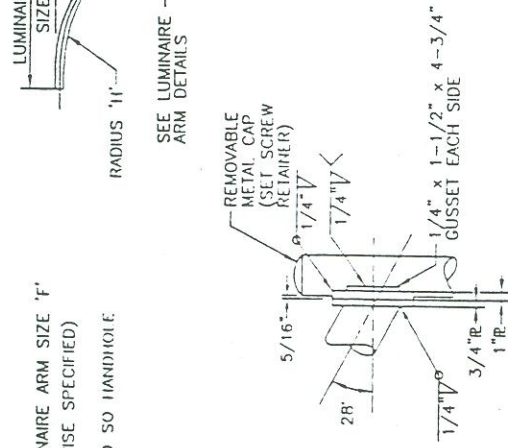
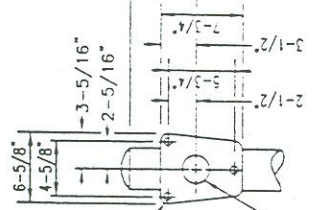
SIGNALS, LIGHTING AND
ELECTRICAL SYSTEMS
TYPE 'B' STREET LIGHT STANDARD

SCALE: NONE
DATE: 10/03
DRAWN BY:

5-16

POLE SIZE 'A' A-286-B

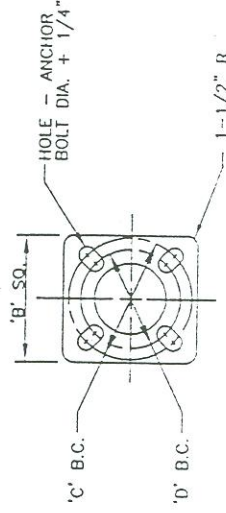
STANDARD SHALL BE IN-
FACES THE STREET.



LUMINAIRE ARM DETAILS

LUMINAIRE ARM DATA				
'F'	'E'HD OD	BASE OD	'G'	'H'
6'-0"	2-3/8"	3-3/8"	10' 1'-6"	7'-5"
8'-0"	2-3/8"	3-11/16"	10' 2'-3"	7'-5"
10'-0"	2-3/8"	3-1/8"	10' 2'-6"	13'-3"
12'-0"	2-3/8"	4-5/16"	10' 3'-9"	13'-3"
15'-0"	2-3/8"	4-3/4"	10' 4'-3"	13'-3"
18'-0"	2-3/8"	4-3/4"	10' 5'-3"	13'-3"

FOUNDATION DIMENSIONS		
	SQUARE	ROUND
'A' SERIES	2'6" x 2'6" x 5'	30" x 6'6"



BASE DETAILS

'A' SERIES

'A' SERIES

IDENTIFICATION NUMBER	POLE DATA				BASE PLATE DATA				ANCHOR BOLTS
	'A'	TOP OD	BASE OD	GA	'B'	'C'	'D'	'E'	
A-250-F	25'-0"	3-7/8"	7-5/16"	10	12"	11-1/2"	11"	1"	1" x 36" x 4"
A-266-F	26'-6"	3-7/8"	7-1/2"	10	12"	11-1/2"	11"	1"	1" x 36" x 4"
A-286-F	28'-6"	3-7/8"	7-3/4"	10	12"	11-1/2"	11"	1"	1" x 36" x 4"
A-300-F	30'-0"	3-7/8"	8"	10	12"	11-1/2"	11"	1"	1" x 36" x 4"

*

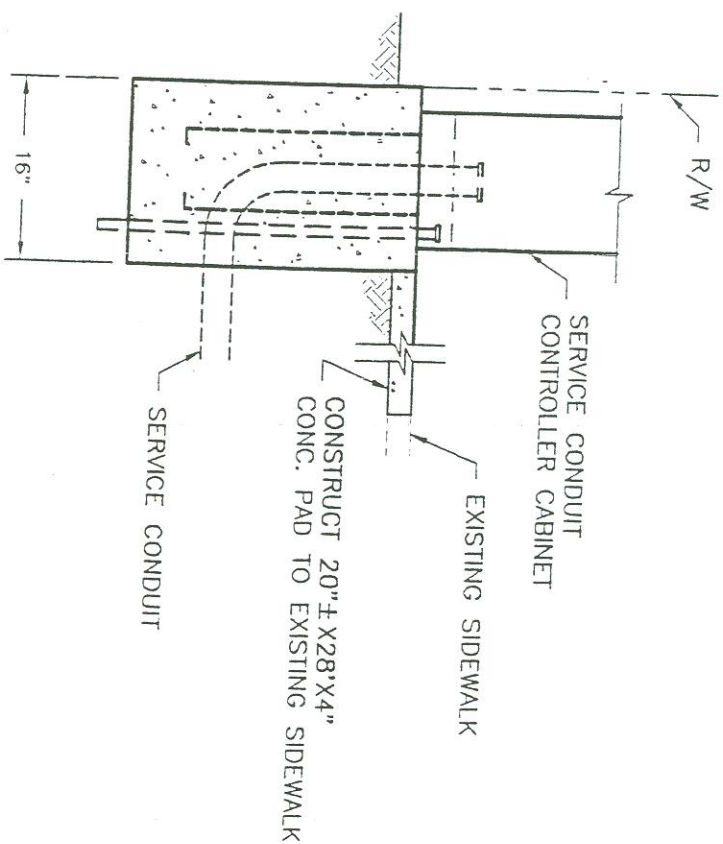
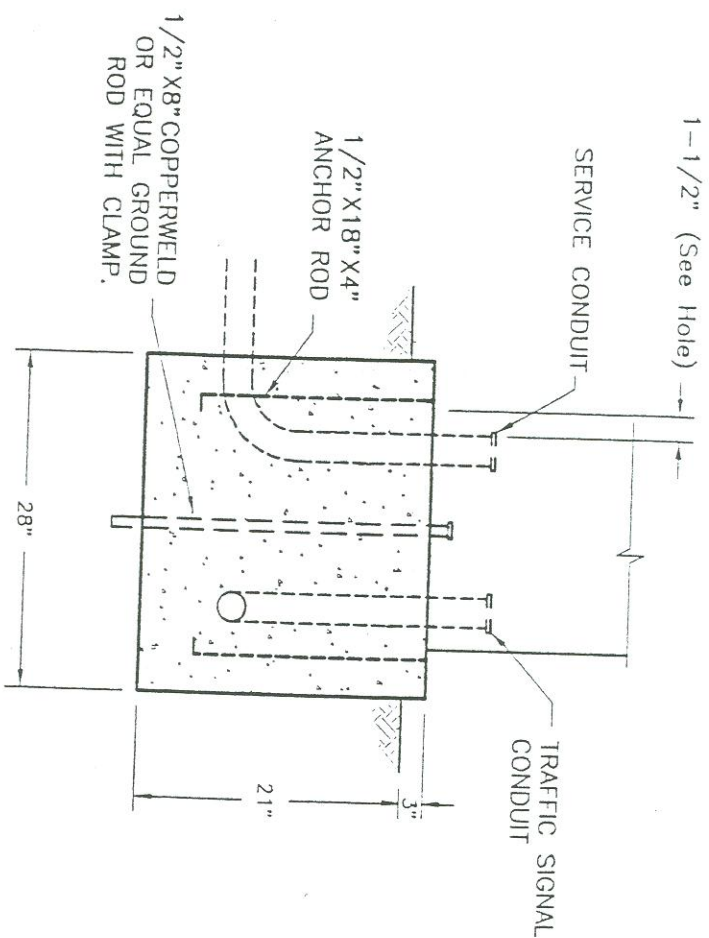
* STANDARD UNLESS OTHERWISE SPECIFIED

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION
**SIGNALS, LIGHTING AND ELECTRICAL
SYSTEMS**
TYPE 'A' STREET LIGHT STANDARD

SCALE: NONE
DATE: 1/01
DRAWN BY:

DIRECTOR

5-17



NOTE: CONDUIT LOCATION IS CRITICAL TO PROPER CABINET INSTALLATION.

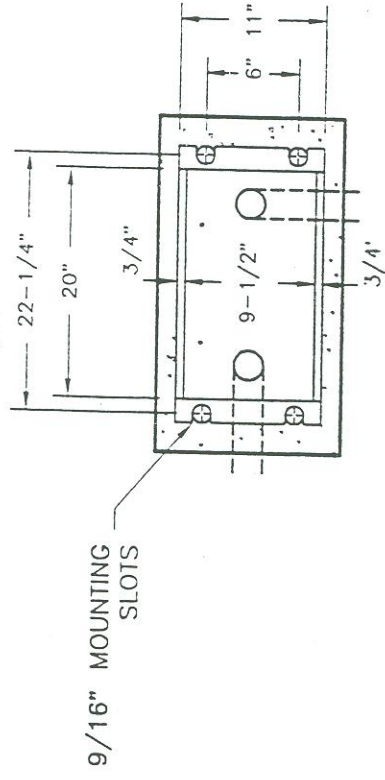
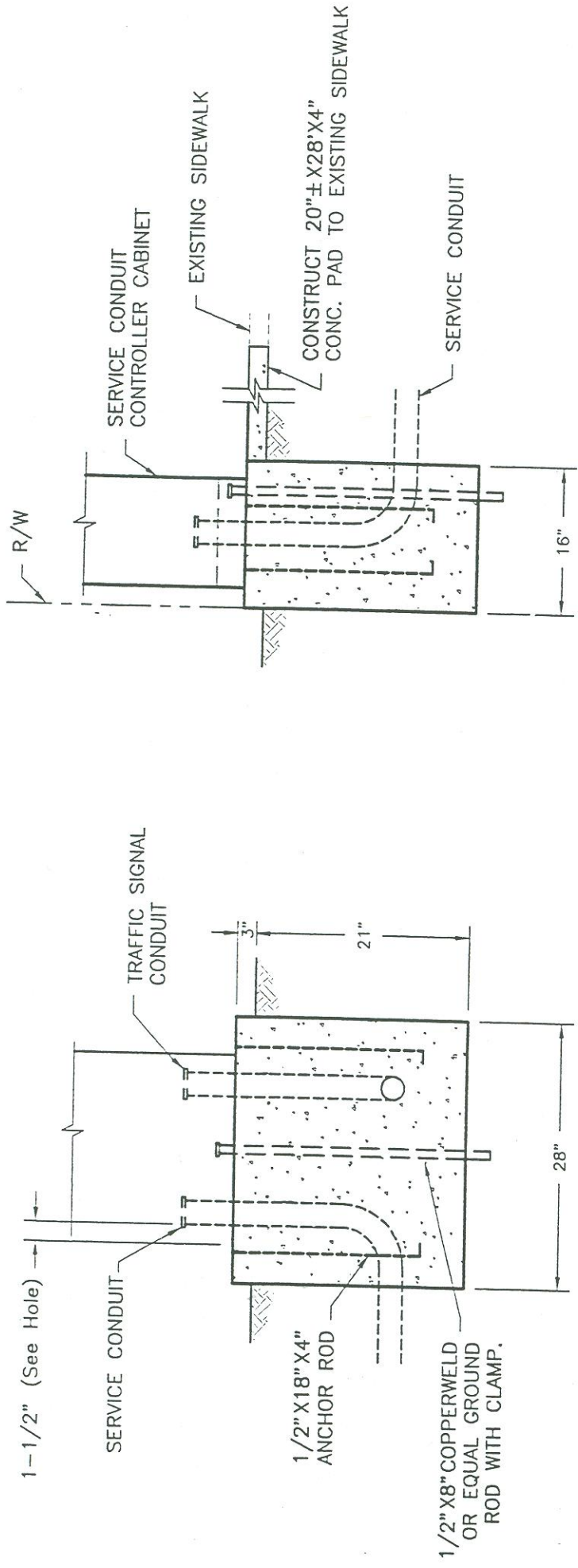
DIRECTOR

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

LOCAL SOLID STATE
PEDESTRIAN CONTROLLER
BASE DETAIL

SCALE: NONE
DATE: 5/2001
DRAWN BY: COUNTY D.O.T

5-19



NOTE: CONDUIT LOCATION IS CRITICAL TO PROPER CABINET INSTALATION.

[Signature]
DIRECTOR

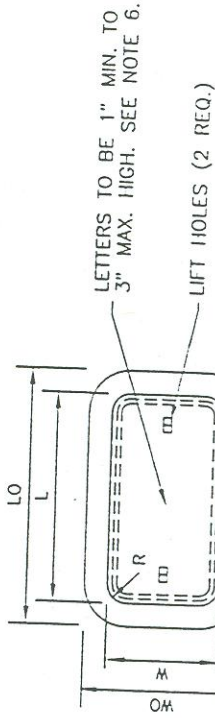
COUNTY OF SACRAMENTO PUBLIC WORKS AGENCY	
LOCAL SOLID STATE PEDESTRIAN CONTROLLER BASE DETAIL	
SCALE: NONE DATE: 5/2001 DRAWN BY: COUNTY D.O.T.	5-19

PULL BOX NO.	REINFORCED CONCRETE BOX			COMPOSITE BOX			REINFORCED CONC. OR COMPOSITE COVER			
	MIN. THICKNESS	MIN. DEPTH AND EXTENSION	LO	WO	MIN. THICKNESS	MIN. DEPTH AND EXTENSION	L***	W***	R	EDGE THICKNESS
3-1/2	1"	NO EXTENSION	20"	14"	5/16"	NO EXTENSION	15-3/8"	10-1/8"	1-1/8"	1-3/4"
5	1"	22"	28"	18"	5/16"	20"	23-1/4"	13-3/4"	1-1/4"	1-3/4"
5A	1"	22"	25-1/4"	15-3/4"	5/16"	20"	20-5/8"	10-1/2"	1-1/4"	1-3/4"
6	1-1/2"	24"	36"	23"	3/8"	20"	30-5/8"	17-5/8"	1-1/4"	1-3/4"

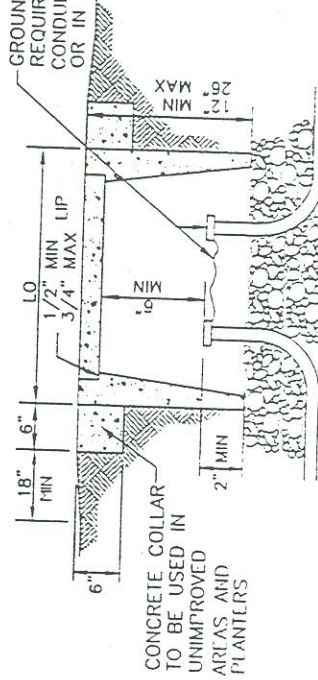
*** TOP DIMENSION
** EXCLUDING CONDUIT WEB

NOTES:

- IN UNIMPROVED AREAS AND PLANTERS, THE TOP OF PULL BOXES SHALL BE PLACED 0.10 FOOT ABOVE THE SURROUNDING GRADE OR, WHEN ADJACENT TO A CURB, FLUSH WITH THE TOP OF THE CURB. THE SURROUNDING GRADE SHALL BE RAMPED UP TO MATCH THE TOP OF THE CONCRETE COLLAR. UNLESS OTHERWISE NOTED, AND WHERE PRACTICAL, PULL BOXES SHOWN IN THE VICINITY OF CURBS SHALL BE PLACED ADJACENT TO THE BACK OF CURB, AND PULL BOXES SHOWN ADJACENT TO SIDEWALKS SHALL BE PLACED ON THE SIDE OF THE FOUNDATION FACING AWAY FROM TRAFFIC.
- IN SIDEWALK AREAS, THE TOP OF PULL BOXES SHALL BE PLACED FLUSH WITH THE SIDEWALK GRADE.
- PLACEMENT OF PULL BOXES IN AREAS SUBJECT TO VEHICULAR TRAFFIC LOADS (INCLUDES TRAFFIC LANES, BIKE LANES, SHOULDERS, AND DRIVEWAYS) SHALL BE AVOIDED WHENEVER POSSIBLE. IF UNAVOIDABLE, THEN A TRAFFIC RATED PULL BOX WITH STEEL TRAFFIC COVER SHALL BE USED. SEE STANDARD DRAWING 5-20B.
- PULL BOXES SHALL NOT BE PLACED WITHIN THE BOUNDARIES OF SIDEWALK RAMPS.
- PULL BOXES SHOULD NOT BE PLACED WITHIN PLANTER AREAS WHENEVER POSSIBLE.
- PULL BOX COVERS SHALL BE MARKED AS FOLLOWS:
 - "TRAFFIC SIGNAL" TRAFFIC SIGNAL CIRCUITS WITH OR WITHOUT STREET LIGHTING CIRCUITS.
 - "STREET LIGHTING" STREET LIGHTING CIRCUITS WHERE NO VOLTAGE IS ABOVE 600V.
 - "STREET LIGHTING-HIGH VOLTAGE" STREET LIGHTING CIRCUITS WHERE VOLTAGE IS ABOVE 600V.
 - "SERVICE" SERVICE CIRCUITS BETWEEN SERVICE POINT AND SERVICE DISCONNECT.
 - "SPRINKLER CONTROL" SPRINKLER CONTROL CIRCUITS, 50 VOLTS OR LESS.
 - "IRRIGATION" CIRCUITS TO IRRIGATION CONTROLLER, 120 VOLTS OR MORE.
 - "RAMP METER" RAMP METER CIRCUITS.
 - "COUNT STATION" COUNT AND/OR SPEED MONITOR CIRCUITS.
 - "COMMUNICATION" COMMUNICATION CIRCUITS.
 - "TELEPHONE" TELEPHONE SERVICE.
 - "TOS COMMUNICATIONS" TOS COMMUNICATIONS TRUNK LINE.
 - "TOS POWER" TOS POWER.
 - "TDC POWER" TELEPHONE DEMARCATION CABINET POWER.
- COVERS SHALL FIT FLUSH WITH THE TOP OF PULL BOXES. THERE SHALL BE 1/8" MAXIMUM CLEARANCE ALL AROUND BETWEEN COVERS AND PULL BOX OPENINGS.
- ALL COVERS AND BOXES SHALL BE INTERCHANGEABLE WITH CALIFORNIA STANDARD MALE AND FEMALE GAUGES. WHEN INTERCHANGED WITH A STANDARD MALE OR FEMALE GAUGE, THE TOP SURFACES SHALL BE FLUSH WITHIN 1/8 INCH.
- THE TOP EDGES OF ALL CONCRETE COVERS AND PULL BOXES SHALL HAVE A 1/4" MIN. RADIUS.
- STACKING OF PULL BOXES IS PERMITTED (TWO PULL BOXES MAXIMUM).
- STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.



GROUND BUSHINGS AND BONDING JUMPER. REQUIRED ONLY WHEN USE OF METALLIC CONDUIT IS SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS.



PLACE 6" LAYER OF CLEAN CRUSHED ROCK BELOW PULL BOX BEFORE INSTALLATION OF CONDUCTORS.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

SIGNALS, LIGHTING AND
ELECTRICAL SYSTEMS
PULL BOX

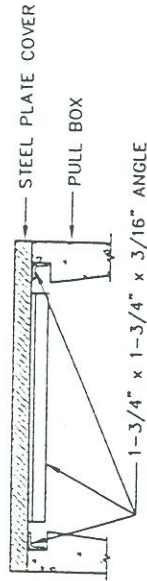
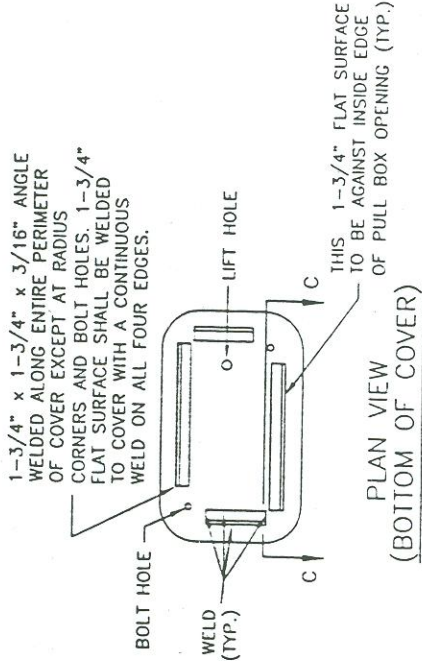
SCALE: NONE
DATE: 1/01
DRAWN BY:

DIRECTOR

5-20A

NOTES:

1. STEEL COVER SHALL HAVE EMBOSSED NON-SKID PATTERN.
2. STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.
3. PULL BOX COVERS SHALL BE MARKED AS DESCRIBED IN NOTE 6 ON STANDARD DRAWING 5-20A. MARKING SHALL BE APPLIED TO EACH COVER PRIOR TO GALVANIZING BY BEAD WELDING THE LETTERS ON THE COVERS. THE LETTERS SHALL BE RAISED AT LEAST 3/32 INCH.
4. BONDING JUMPER FOR COVER SHALL BE A MIN. OF 36" LONG. WHEN NON-METALLIC CONDUIT IS USED, THE BONDING JUMPER FOR THE COVER SHALL BE SPLICED TO THE BOND WIRE IN THE CONDUITS. WHEN THE USE OF METALLIC CONDUIT IS SPECIFIED ON THE PLANS OR IN THE SPECIAL PROVISIONS, THE BONDING JUMPER FOR THE COVER SHALL BE CONNECTED TO THE CONDUIT GROUND BUSHING, AND THE CONDUITS SHALL BE BONDED TOGETHER WITH GROUND BUSHINGS AND A BONDING JUMPER.
5. CONDUITS SHALL ENTER AT BOTTOM OF PULL BOX AS SHOWN IN THE DRAWING.



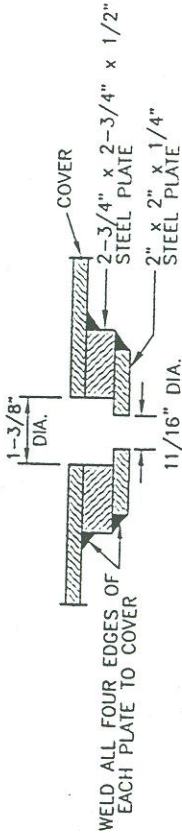
SECTION C-C

COVER DETAIL

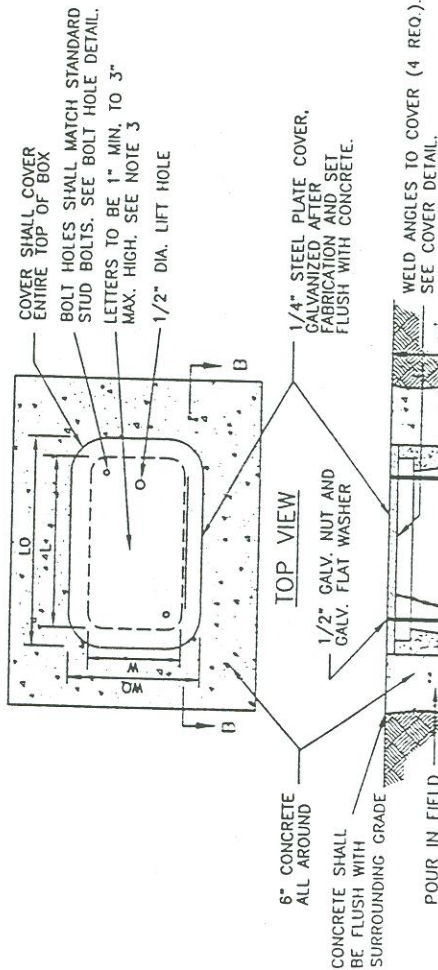
REINFORCED CONCRETE BOX

PULL BOX No.	MIN. THICKNESS	MIN. DEPTH BOX AND EXTENSION	LO	WO	L	W
3-1/2	1"	NO EXTENSION	20"	14"	15-1/2" ±	10" ±
5	1"	22"	28"	18"	23" ±	13-1/2" ±
5A	1"	22"	25-1/4"	15-3/4"	21" ±	10-1/2" ±

** EXCLUDING CONDUIT WEB



BOLT HOLE DETAIL



WELD ANGLES TO COVER (4 REQ.).
SEE COVER DETAIL.

COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY
DEPARTMENT OF TRANSPORTATION

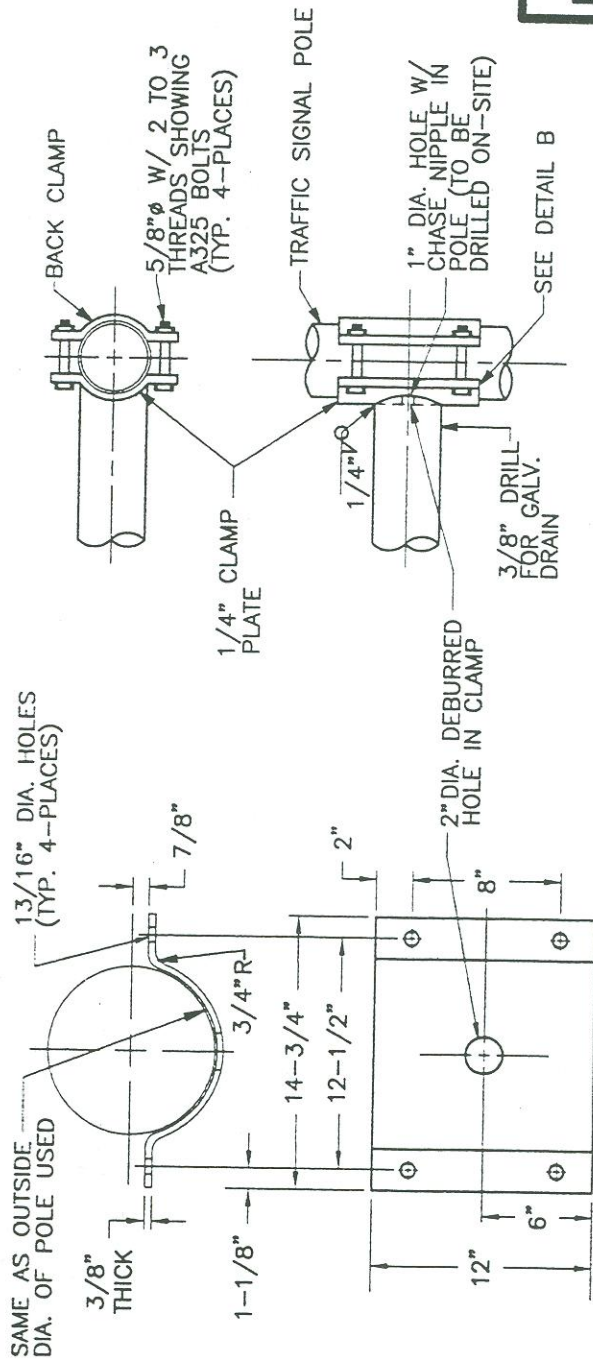
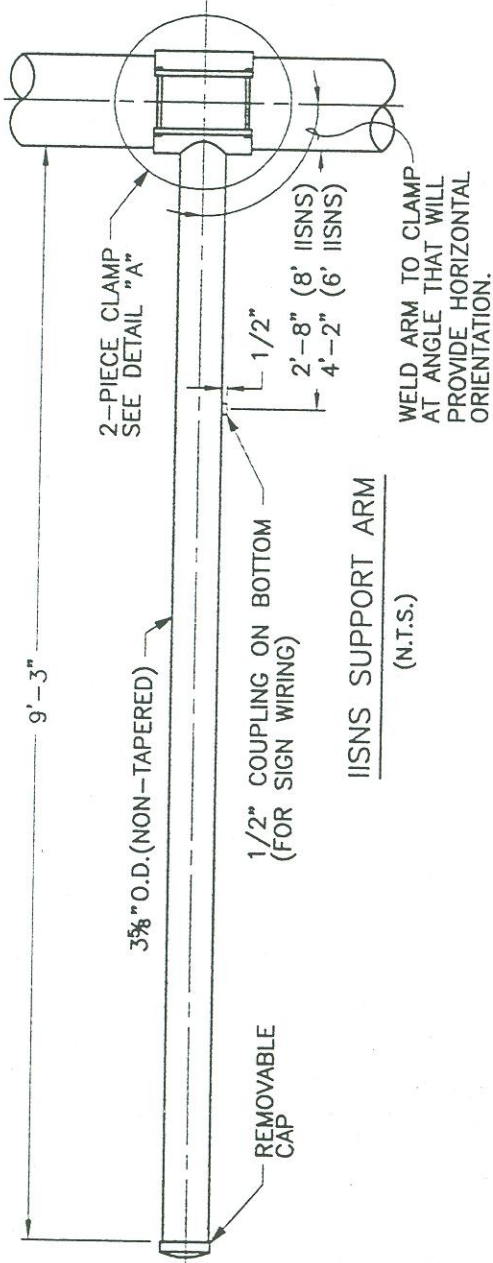
SIGNALS, LIGHTING AND
ELECTRICAL SYSTEMS
TRAFFIC RATED PULL BOX
WITH STEEL TRAFFIC COVER

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-20B

SECTION B-B

DIRECTOR



DETAIL B

CLAMP DETAILS (N.T.S.)

DETAIL A

MOUNTING HEIGHT
25' to base plate or
as directed by the
Engineer in the field

GENERAL NOTES	
MATERIAL SPECIFICATIONS	
SHAFT	STEEL OF 48,000 PSI MINIMUM YIELD AFTER FABRICATION
CLAMP PLATE	ASTM A-572 GR. 50 STEEL
MANUFACTURING PROCESSES	
LONGITUDINAL WELDS	ALL WELDS SHALL CONFORM TO AWS D1.1 WELD SPECIFICATION
FINISH COATING	
STRUCTURE	HOT DIP GALVANIZED PER ASTM A-123
HARDWARE	HOT DIP GALVANIZED PER ASTM A-153
DESIGN CRITERIA	
STRUCTURE, HARDWARE, AND WELDING	IN ACCORDANCE WITH THE "SPECIFICATIONS FOR STRUCTURAL SUPPORTS OF HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS", AASHTO 1994

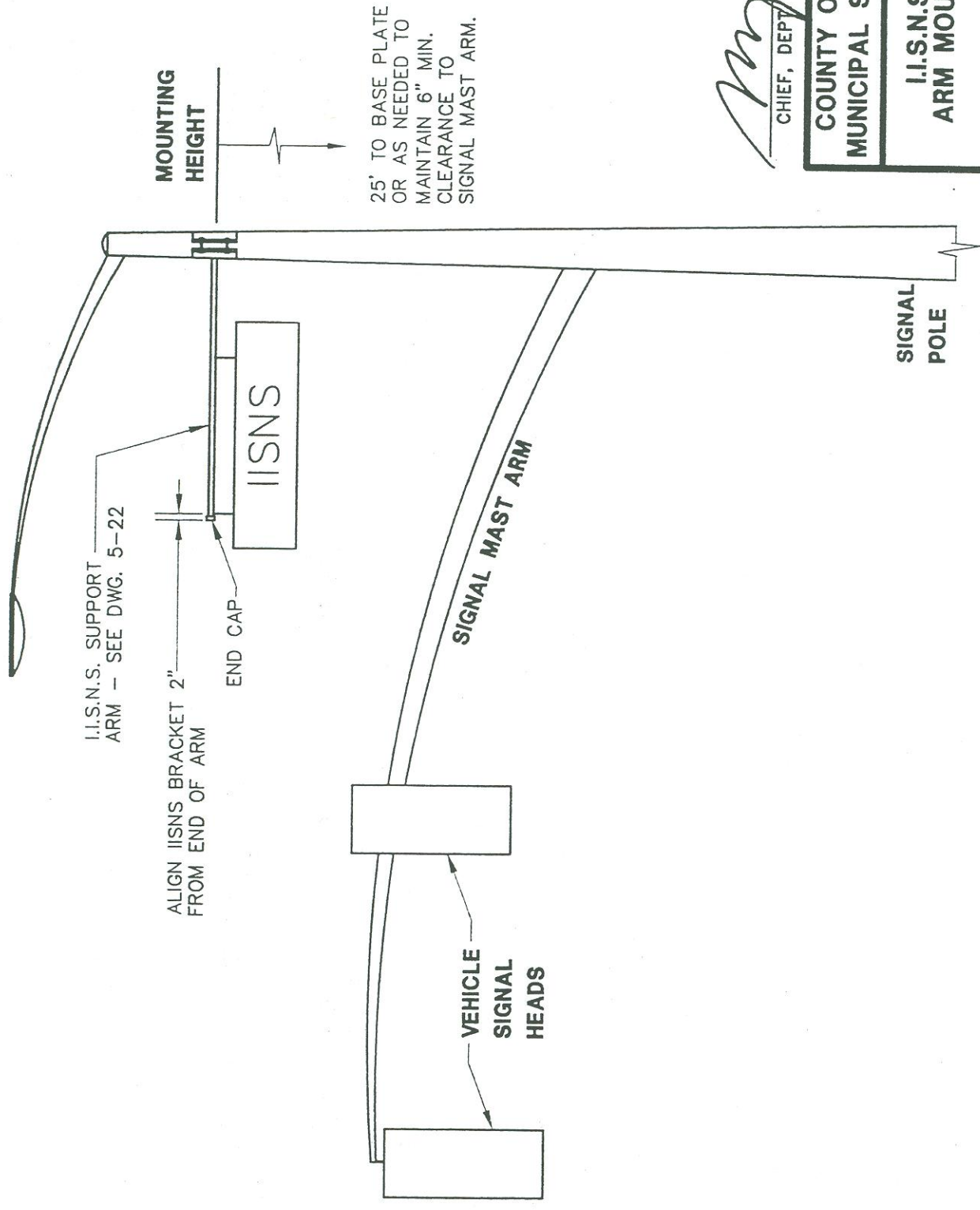
M. J. L.
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

IISNS SUPPORT ARM
TYPICAL CLAMP DETAIL

SCALE: NONE
DATE: 07/05
DRAWN BY: TRU P./ACS

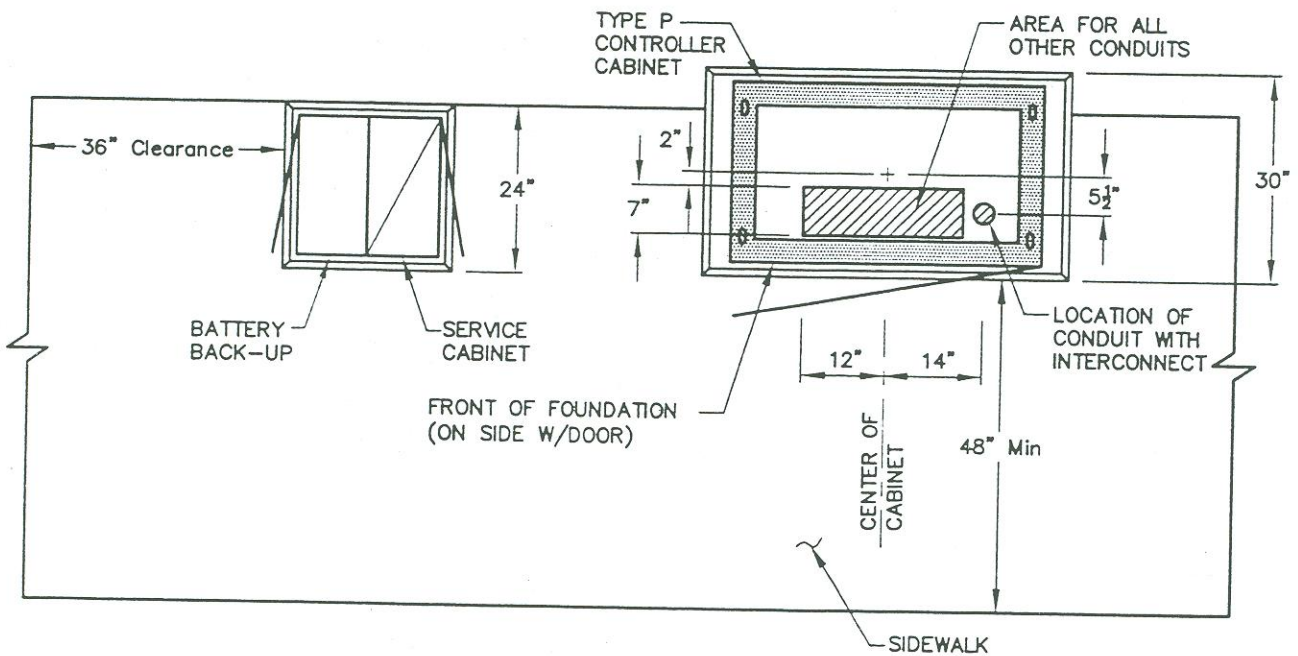
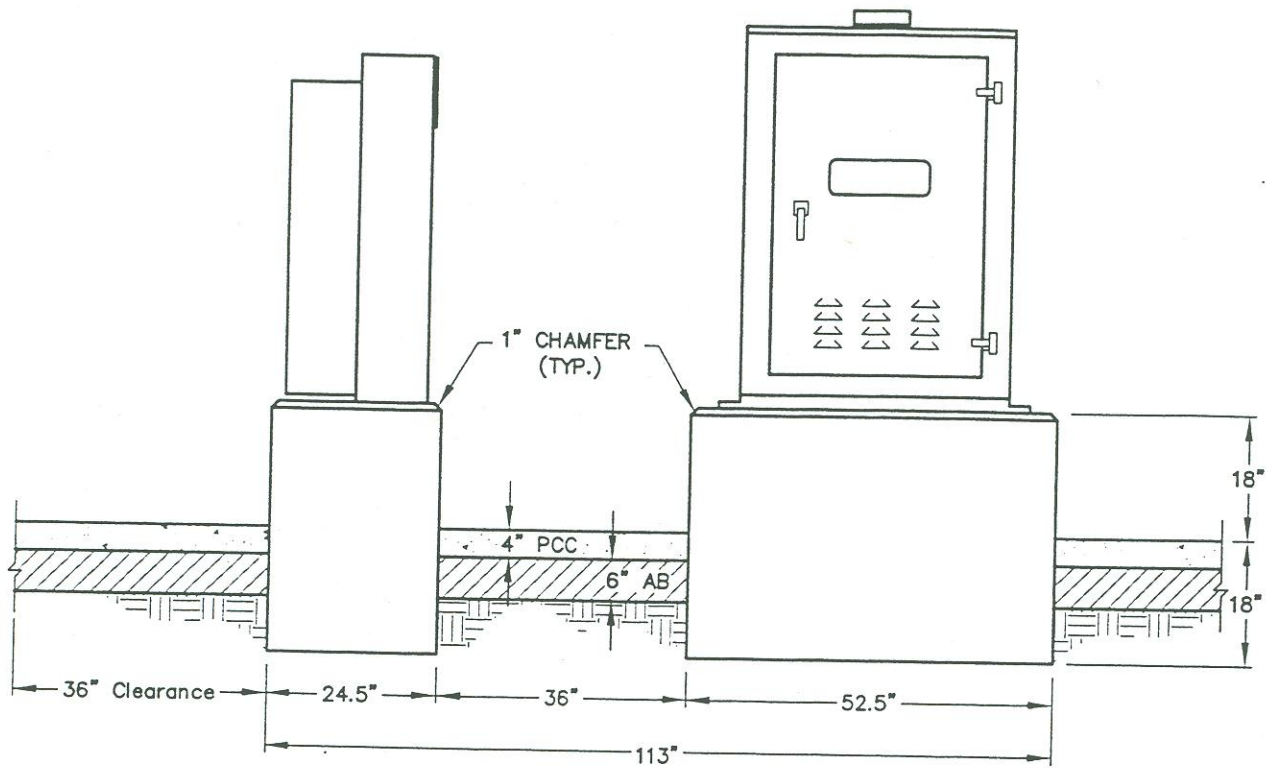
5-22



25' TO BASE PLATE
OR AS NEEDED TO
MAINTAIN 6" MIN.
CLEARANCE TO
SIGNAL MAST ARM.

Tru P.
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
I.I.S.N.S. SUPPORT ARM MOUNTING DETAIL	
SCALE: NONE DATE: 03/05 DRAWN BY: TRU P.	5-23



NOTE:
INSTALLATION OF CABINET FOUNDATION PARTIALLY
BEHIND BACK OF WALK MAY REQUIRE ADDITIONAL
RIGHT-OF-WAY OR EASEMENT.

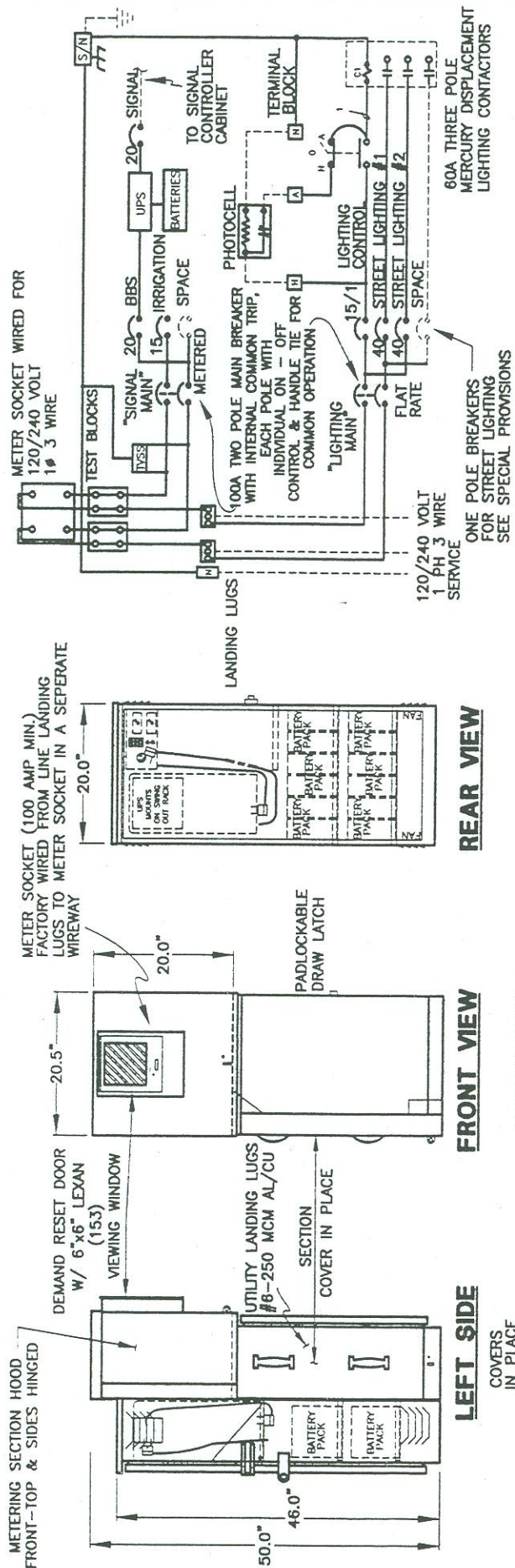
[Signature]
CHIEF, DEPT. OF TRANSPORTATION

**COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY**

**TRAFFIC SIGNAL CONTROLLER CABINET
& SERVICE CAN WITH BATTERY BACKUP
FOUNDATIONS**

SCALE: NONE
DATE: 06/05
DRAWN BY: CL/ACS

5-27



WIRING SCHEMATIC DIAGRAM

ENCLOSURE CONSTRUCTION NOTES

1. EXTERIOR, 1/8" ALUMINUM, AND INTERIOR 14 GA COLD ROLLED STEEL ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION WILL BE NEMA 3R, RAIN TIGHT.
3. ALL NUTS, BOLTS AND SCREWS WILL BE STAINLESS STEEL.
4. NUTS, BOLTS & SCREWS WILL NOT BE VISIBLE FROM OUTSIDE OF ENCLOSURE.
5. NAMEPLATES WILL BE PROVIDED AS REQUIRED.
6. CONTROL WIRING WILL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM WILL BE ATTACHED TO THE INSIDE OF THE FRONT DOOR.
8. ENCLOSURE WILL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS.
9. ANODIZE AFTER FABRICATION.

Myfan

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO MUNICIPAL SERVICES AGENCY	
METERED SERVICE ENCLOSURE WITH BATTERY BACKUP (120/240 V)	
SCALE: NONE DATE: 06/05 DRAWN BY: CL/ACS	5-29

SECTION 6
SOUND BARRIER DESIGN

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6-2	Design	6-1
6-3	Plan Requirements	6-1

SECTION 6 SOUND BARRIER DESIGN

6-1 LOCATION REQUIREMENTS: Sound barriers may be required along the rear and side property lines of residential developments adjacent to freeways, major highways and other ground level noise elements in order to achieve the noise objectives of the Sacramento County Noise Element Noise Ordinance, or as required by the project conditions of approval.

6-2 DESIGN: The sound barrier shall be designed to obtain a 60 LDN at the affected property line or as required by the Director. There are sound barrier systems that have been certified by the County. Information on these systems is available through the Director.

The Director may approve new sound barriers upon request. The request shall include plan details and calculations prepared and signed by an appropriate Consulting Engineer.

Sound barriers shall be designed for a minimum longevity of 30 years.

Sound barriers normally will not be allowed within public rights of way when installed as a condition of the development or as an option of the builder. The Director may allow certain sound barriers to be within the public rights of way with an encroachment permit. Normally, if 2 feet or less of public street right of way is available, no permit will be granted.

Sound barriers constructed along freeways, or at the back of sidewalk along the outside of curved major streets, shall incorporate a barrier-type design element to minimize the potential for vehicles penetrating the wall. Other locations that represent a higher potential for run-off-road accidents shall be required to incorporate a Caltrans Type 50 (or equivalent) barrier-type design element.

Open cells in hollow-type sound barriers shall be grouted on post-tensioned wall systems as required by the Director.

6-3 PLAN REQUIREMENTS: All construction details for sound barriers, including the locations and limits, shall be shown on the site improvement plans.

SECTION 7

SANITARY SEWER DESIGN

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SECTION 7

SANITARY SEWER DESIGN

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SECTION 7 SANITARY SEWER DESIGN

7-1 DESIGN CRITERIA: Design to these minimum criteria without consideration to the actual project conditions does not guarantee plan approval. These Improvement Standards are minimum design criteria. The Actual design parameters must be established by the designer based on site-specific conditions. Improvement Standards shall only apply to collector sewer facilities (less than 1 mgd Peak Wet Weather Flow) to be maintained by County Sanitation District 1 (CSD-1) or, with those exceptions noted, to that within private multiple ownership residential or multi-structural commercial and industrial developments. For design of trunk sewer facilities (1 mgd Peak Wet Weather Flow or greater) refer to the CSD-1 Sanitary Trunk Sewer Design Manual. A basic design criterion is that each property owner is responsible for the installation of a collector sewer across his/her property and/or frontage for an upstream service area. Lacking such construction participation, the in-lieu fee provisions of the appropriate sanitation or sewer maintenance district shall apply unless otherwise approved by the Director. All connections shall comply with the most recent Sewer Use Ordinance, CSD-1 Connection Fee Ordinance, and the Sacramento Regional Sanitation District (SRCSD) Connection Fee Ordinance.

7-2 AVERAGE FLOW DETERMINATION: Flow determination shall be based upon the most recent zoning. The minimum population density used shall be equivalent to that of single family zoning. The area shall be examined for trends toward population concentration greater than present zoning allows and/or more than six lots per acre and, if found, an estimate should be made of the probable extent of such concentration. This estimate shall be used as the basis for determining flow.

A. Development Classification -

1. Equivalent Single Family Dwelling Units (ESD) - Flow shall be based on 310 gallons per residential unit (lot) per day (1 ESD), and a minimum of six lots per acre at developed density. However, if the number of lots per acre is known, and is greater than six, the actual number shall be used.
2. Single Family Planned Unit Developments - Flow per unit shall be 232 gallons per residential unit/day (0.75 ESD) and the actual number of units per acre shall be considered. However, in the absence of known data, the density shall be assumed to be 12 units per acre. If characteristics of the individual dwelling units are similar in characteristics to single family detached units (area, number of rooms), the Director may assign the same design flow values as shown for single family detached residential units.
3. Multiple-Family Residential - The value assigned to each unit shall be 232 gallons per day (0.75 ESD) unless the individual dwelling units are similar

in characteristics to single family detached residential units. In the latter case, the Director may assign flow quantities of 310 gallons per day (1 ESD) per dwelling unit. Multiple-family dwellings include duplexes, triplexes, quadplexes, apartments, mobile homes, condominiums, townhouses and individual dwelling units within a planned unit development.

- 4. Schools - The larger flow, as determined from one of the two following methods shall be used:
 - a. The entire school area shall be assumed to contribute an Average Dry Weather Flow (ADWF) equivalent to that of an equal area of single family, detached residential units: i.e.; 1,860 gallons per day (6 ESDs) per acre.
 - b. Average daily flow per school shall be based on the type of school as follows, with the indicated capita limits including ultimate student population plus administration, teaching and operating personnel.

<u>Type of School</u>	<u>ADWF</u>	<u>Capita Limit</u>
Elementary (K-8)	0.025 MGD	1,000
Upper Elementary (6-8, 7-8 or 7-9)	0.060 MGD	1,500
High School (9-12 or 10-12)	0.080 MGD	2,000

For enrollments and personnel in excess of that indicated, there shall be added 25 gallons per day per additional capita in elementary schools and 40 gallons per day per additional capita in upper elementary and high schools.

- 5. Industrial and Commercial - Every attempt shall be made to base design flows on specific quantities for the type of development expected. In the absence of specific knowledge of the type of development expected, a minimum, flow value of 1,860 gallons per day (6 ESDs) per net acre shall be used for design purposes unless some other value is deemed appropriate based upon surrounding development.

Special consideration by the Water Quality Division shall be given to any facilities with a magnitude or type of discharge that could be detrimental to the public system. In accordance with the SRCSD Connection Fee Ordinance, in cases where a user expects to contribute a peak hourly flow rate that exceeds the average hourly flow rate on the average day of the maximum month by a factor greater than 4.2, the District Engineer may require the user to construct, at his own cost, peak flow attenuation facilities which will reduce the peak hourly flow rate to not more than 4.2 times the average flow rate during said average day of the maximum month.

Other constraints as set forth in that Ordinance shall also be taken into consideration. The requirements of the Sewer Use Ordinance of the Sanitation District shall also apply.

7-3 DESIGN FLOW CRITERIA: Design flow shall be calculated using the average flow for the upstream service area, as described above and used in the design flow equation. The following criteria will be used with the for calculating the average flow design flows unless more current design criteria is available through Master Plan updates:

Category	Conditions				Modifiers
Development Density	Single Family Residential	Multiple-Family Residential	Commercial / Industrial		Minimum plan density shall be RD-6
Flow Generation (310 gpd/ESD)	ESDs per acre shall be either the No. of units/acre per land use zone, or per the proposed development, or 6 which ever is greatest.	Each ESD – 232 gpd (Multiply the ESD’s/Acre by 0.75)	6 ESDs per acre		<u>Rainfall Dependent I/I:</u> Existing Areas – 1,400 gpd/acre *New Areas – 1,000 gpd/acre <u>Groundwater Infiltration:</u> All Areas- 200 gpd/acre
Peaking Factor	PF = 3.5 - 1.8Q ^{0.05} (Q=ADWF)				Minimum shall be 1.2
Velocity Criteria	Minimum 2 fps at Peak Wet Weather flow Maximum 10 fps				
Hydraulic Grade Line	Maximum HGL at Crown of pipe at Peak Wet Weather Flow for pipes without service lateral connections, and 0.7 of the pipe diameter for pipes with service lateral connections.				
Friction Factor	n = 0.013				
Minimum Depth	6.3 feet at periphery of service area measured from the manhole rim to the invert of the exit pipe.				8-inch sewer from periphery to collection point

Design Flow = PWWF = PDWF + I/I

The minimum peaking factor for service areas consisting primarily of commercially and/or industrially zoned lands shall be 1.2.

* New areas are considered to be those constructed within the last 15 years.

7-4 PIPE CAPACITY, SLOPE, VELOCITY SIZE, DEPTH AND MATERIAL:

Design criteria for the pipe are as follows:

- A. Size - The minimum size collector sewer shall be eight inches in diameter unless otherwise approved by the Director.
- B. Slope and Velocity – Manning’s formula shall be used to determine the relation of slope, design flow, velocity, diameter, and “n” value. The “n” value shall be 0.013 for all pipe materials.
 - 1. The following is a table of slopes and design flow capacities for various pipe diameters. Pipe slopes that are less than those listed in this table shall not be used without the approval of the Director. The slopes indicated are based on a velocity of two feet per second with the pipe flowing full. On any collector the minimum slope shall be $S=0.007$ until at least 6 equivalent single family dwellings (ESD’s) are served, after which the design slopes shown below may be used.

Minimum Collector Slopes

Diameter (inches)	Design Slope	Study Slope	Study Slope	Design Flow at Min. Slope (mgd)	Max. ESDs
	Minimum	Alignment in Existing Road	Alignment in Undeveloped Land (1)		
8	0.0035	0.0037	0.0060	0.39	486
10	0.0025	0.0027	0.0035	0.59	756
12	0.0020	0.0022	0.0024	0.86	1122

Slopes shown for 8-inch and 10-inch sewers will be used to check minimum depth of sewer at periphery of trunk shed. Length will be measured on a straight line from trunk sewer to the periphery of the trunk shed. Sewers 12-inches and larger will be shown in the ‘best guess’ location of future roads in the trunk shed.

- 2. The maximum depth of flow at design conditions in any collector (12-inch diameter or less) shall be 0.7 of the pipe diameter. Lines larger than 12-inches in diameter may be designed to flow full unless direct service sewer connections are planned in which case the 0.7 diameter maximum depth shall govern.
- C. Capacity - Pipe capacity and invert elevations, in all cases, shall be adequate to carry the design flow from the entire tributary area, even though said area is not within the project boundaries.

- D. Depth - In the design of a system, one of the controlling conditions shall be that the collector system is to be at sufficient depth to provide a minimum slope for the service sewer of 1/4 inch per foot, at the same time maintaining a minimum cover of 12 inches at any buildable location within the properties to be served, and a minimum of four feet of cover at the right of way line, except that the depth shall be increased to five feet when a water main is installed at the back of the sidewalk.
- E. Material - Pipe material shall be as approved by the Director, and shall conform to the requirements of the Sacramento County Standard Construction Specifications. Pipe materials, which will normally be considered, are as follows:
1. Vitrified Clay, Bell and Spigot Pipe conforming to the provisions the Sacramento County Standard Construction Specifications.
 2. Ductile Iron Pipe conforming to the provisions of the Sacramento County Standards Construction Specifications for pipelines 10 inches in diameter and less.
 3. Reinforced Concrete Pipe conforming to the provisions of the Sacramento County Standard Construction Specifications.

The following pipe materials will be considered on a case by case basis, subject to the provisions stated:

4. Polyvinyl Chloride (PVC) AWWA C900 Class 200 DR 14 conforming to ASTM D1784 for pipes up to 12-inch and AWWA C905 Class 200 DR 14 for larger diameters shall be used for water line conflict applications. Polyvinyl Chloride (PVC) AWWA C900 DR 18 shall be used as a pressure pipe for force main applications. The force main pressure class or DR of the C900/905 shall be determined on a case-by-case basis. Polyvinyl Chloride Pipe (PVC) SDR 26 conforming to ASTM D 3034 for pipes up to 15-inch and F 679 – SDR 26 for larger diameters shall be used for shallow and extra deep applications. Requests for approval shall include either soil testing information or a letter from a Soils Engineer stating that the native soils on the project site within the area of the pipe zone will have a minimum soils reaction modulus (E') of 150 psi. Pipe deflection calculations shall be submitted. Only pipe that meets or exceeds CSD-1 Pipe deflection criteria will be allowed. This type pipe, when allowed, will be permitted in residential subdivisions only.

7-5 GROUNDWATER REQUIREMENTS: [Subject to future revision] Sewer improvements in high groundwater areas shall be subject to the requirements of this section.

- A. Geotechnical Reports - A Geotechnical Report shall be required for all plans installing public sewer facilities or private sewer systems constructed under section 7-15 of these standards.

7-6 SEWER LOCATIONS AND ALIGNMENT REQUIREMENTS: Location and alignment criteria are as follows:

- A. General - All sanitary sewers shall be placed within rights of way dedicated for public streets unless the use of easements is specifically approved by the Director. In some streets, dual collectors may be required.

There shall be a minimum horizontal clearance of ten feet between parallel water and sanitary sewer lines and the water main shall be higher than the sewer. On crossings, the water line shall be at least 12 inches above the sewer line. If a sanitary sewer force main must cross a water main, the requirements of Section 8-14B.4 shall apply.

- B. Location in New Subdivision - In new subdivisions, sewers shall be located six feet south or east of street centerlines within minor and primary streets. If a street loops 180 degrees or more it is not necessary for the collector sewer to cross to the other side of the street to meet this requirement.

- C. Location in Existing Streets - When sanitary sewers are to be installed in an existing street, factors such as curbs, gutters, sidewalks, traffic conditions, traffic lane conditions, pavement conditions, future street improvements plans, and existing utilities shall all be considered. The approval of the Transportation Division, the Water Resources Division, and CSD-1 shall be obtained in every instance.

- D. Easements. - Permanent easements shall be a minimum of 20 feet wide. A trench wall slope of 1 unit of rise to 1 unit of run shall be the basis on which the easement width is widened. The slope may be adjusted as required by existing soil conditions.

Temporary working easements of adequate dimensions shall be provided to allow the construction within the permanent easement to be completed in a safe and reasonable manner. Easements shall be granted to CSD-1 or to SRCSO.

- E. Water Well Clearance - No sanitary sewer interceptor, trunk line, collector, or service shall be placed nearer than 100 feet to any water well, public or private, unless the well has been abandoned in full accord with the Environmental Health Division of the County Environmental Management Department's standards, or the location otherwise approved, in writing, by the appropriate health agencies. If a clearance of less than 100 feet is

approved, all pipes within that distance from the well shall be of material approved by the Director. In no case shall a clearance of less than 50 feet be allowed.

- F. Alignment - Alignment of all sewer pipe and structures shall be designed to provide a minimum one-foot clearance from all other utilities and/or improvements, unless otherwise approved by the director.
1. Horizontal alignment shall be parallel to the street centerline wherever possible. Minimum radius for sanitary sewers 8 inches through 12 inches in diameter shall be 194 feet. A larger radius shall be used wherever practicable or where necessary to avoid joint deflection in excess of 75% of the pipe manufacturers' recommended maximum. Only factory joints will be allowed.
 2. Vertical alignment shall provide a constant slope between manholes. If a change in grade is necessary, construction of a manhole shall be required unless the Director approves the use of a vertical curve. In such case, elevations shall be shown at ten-foot intervals throughout the length of the vertical curve. Joint deflections in excess of 75% of the pipe manufacturers' recommended maximum will not be allowed. Only factory joints will be allowed.

7-7 TRENCH LOADING CONDITIONS AND PIPE DESIGN: The loading condition and pipe design criteria for conduits are as follows:

- A. Rigid Conduit Loading - On rigid conduits, Marston's formula shall be used to determine the load placed on the pipe by backfill. The procedure for rigid pipe is described in the ASCE Manual and Report of Engineering Practice 60, the Clay Pipe Engineering Manual, and in similar handbooks. In the absence of specific soils data, as determined by a Soils Engineer, a soil weight of 120 pcf and a k_u factor of 0.110 shall be used.
- B. Safety Factor - On rigid conduits, a safety factor of 1.25 shall be used for reinforced concrete pipe, and 1.5 for all other rigid pipe. Only the three edge bearing strength of the pipe shall be used in the computations for rigid pipe.
- C. Flexible Conduit Loading - On flexible conduits, Marston's formula for flexible conduits as shown in the ASCE Manual and Report of Engineering Practice No. 60 and in other similar handbooks shall be used to determine the load placed on the pipe by the backfill. The maximum load allowable shall be determined by pipe deflections computed by the Iowa Deflection Formula (or Spangler's Formula). The soils reaction modulus (E') shall be estimated using a method acceptable to the Director, and shall consider the modulus values of both the native and the bedding materials (ATV method). The bedding soils reaction modulus (E') used in the deflection calculation shall be 1,000 psi for Type II and Type IIA bedding, utilizing imported

material to twelve inches above the top of the pipe. Deflection lag factor shall be 1.5. In the absence of specific soil data, as determined by a Soils Engineer, a soil weight of 120 pcf, a k_u factor of 0.110, and a bedding constant of 0.110 shall be used. Placement of flexible conduit within soils equivalent to Class V and types MH and CH of Class IV ASTM D2321 material will not be permitted unless approved by the Director.

- D. Allowable Deflection - On flexible conduits, the maximum allowable deflection shall be 3%. Deflection shall be measured as described in the Sacramento County Standard Construction Specifications. Computations shall be submitted showing the ability of the conduit to withstand local buckling unless the design conforms to Standard Drawing 7-12.
- E. Bedding and Initial Backfill - Bedding types and factors shall conform to Standard Drawing 7-4. Bedding and initial backfill type shall be as necessitated by height of cover over the pipe, trench width, pipe strength, and other factors used to determine safe pipe loading. Special attention shall be given to backfill requirements for pipe located in State rights-of-way and for pipe placed in areas where trench width is excessive, such as in the vicinity of bore pits. See Section 7-13 regarding this condition. Any special backfill requirements shall be noted on the plans.

Unless otherwise noted on the plans, bedding and initial backfill for all pipe sizes shall be Type II, with trench widths subject to limitations set forth in Standard Drawing 7-15 and in the Standard Specifications. The minimum trench width for all rigid collector sewer pipes shall be pipe O.D. plus 12 inches. The minimum trench width for rigid trunk sewer pipe shall be as specified in Table 7-5 of the Trunk Sewer Design Manual.

Bedding and initial backfill for flexible conduit shall be Type II Alternate utilizing imported material to twelve inches above the top of the pipe. Placement of native material between springline and twelve inches above the top of pipe will not be permitted. The minimum trench width for flexible pipe shall be pipe O.D. plus 24 inches. The minimum trench width for flexible trunk sewer pipe shall be as specified in Table 7-4 of the Trunk Sewer Design Manual.

Type III and IV bedding and initial backfill are intended primarily for emergency field conditions. Their use shall normally not be specified on the plans and shall require specific written approval of the Director before use. Type III and IV bedding and initial backfill shall not be used with flexible pipe materials.

- F. Special Pipe Strength Requirements - Ductile iron, or other high-strength pipe approved by the Director, shall be used whenever cover is greater than 25 feet or extra support strength is required. Ductile iron pipe, Class 200 (DR-14) PVC pipe conforming to the requirements of AWWA C900 or other high-strength pipe approved by the Director shall be used whenever

cover is less than four feet, or insufficient clearance exists between the sewer pipe and rigid or load transmitting structures.

- G. Design Guide - Tables which relate cover, pipe diameter, trench width, bedding and initial backfill type for vitrified clay pipe according to the procedures contained in these Standards, are provided on Standard Drawing 7-15.

7-8 MANHOLE CRITERIA: The design criteria for manholes are as follows:

- A. General - Manholes shall be placed at the intersections of all sanitary sewer lines, at the end of any line terminating with a cul-de-sac which has five or more lots fronting on the cul-de-sac, at the end of all permanent lines 120 feet or more in length, and at the end of any temporary line more than 200 feet in length. All manholes from which sewer line extensions are anticipated shall have a pipe stub installed at the grade and in the direction of the anticipated extension. Summit manholes connecting two sewer collectors are not acceptable. Manholes in PVC collector systems shall be located to reduce or eliminate the need to curve the collector pipes.
- B. Spacing - Maximum spacing of manholes shall be 400 feet for all straight lines of ten-inch diameter or less. A line with a radius greater than 400 feet shall be considered as straight for purposes of this section. Manhole spacing on lines, which are on a continuous curve of 194-foot radius (mm. allowable) shall be 200 feet. Manhole spacing on curved lines of radius between 194 and 400 feet, or where only a portion of the line is curved, shall be adjusted proportionately. Reverse curves require a manhole at the point of tangency between the curves. A manhole shall be required at any change in vertical alignment, unless the use of a vertical curve is approved by the Director. A manhole shall also be placed at any abrupt change in horizontal alignment.
- C. Elevation Criteria - When two lines of the same size enter a manhole such that the flow of one must change direction more than 20 degrees or if flow in a single line must change direction more than that amount, the invert grade at the exit must be at least 0.10 foot below that of the entrance pipe or, as a maximum, the crown of the exit pipe shall match the invert of the entrance pipe. If the pipes entering and exiting any manhole are not of the same size, the minimum invert elevation differential shall be that which occurs when the pipes are matched crown to crown and the maximum invert elevation differential shall be based on the invert of the entering pipe matching the crown of the exit pipe. When connection small diameter collectors to larger diameter trunks and through flows are changing direction within the manhole, special consideration shall be made to determine the entering invert elevation. Drop connections are not governed by the above elevation requirements.

When two lines of the same size enter a manhole such that the flow does not change directions, or changes of 20 degrees and less, the invert grade at the exit must be at least 0.05 below that of the entrance pipe for pre-cast manhole bases, and 0.01 below for custom made bases.

- D. Elevation Criteria for Service Sewers - Any service sewer entering a manhole shall be installed with the invert elevation of the service pipe matching the crown elevation of the exit pipe except when an internal drop connection is used. If the manhole at the end of a cul-de-sac is constructed with a pre-cast base, the invert of any service stubs shall be a minimum of one inch above the invert elevation of the exit pipe.
- E. Construction Requirements - Manhole construction shall conform to the provisions of Standard Drawing 7-1, 7-1A, 7-1B, 7-2A and 7-2B. Lock-type or pressure-type manhole covers as shown in Standard Drawing 7-11A shall be used on manholes located in easements and areas subject to flooding. If the distance from the crown of the pipe to the top of the rim is less than 6' 11" an 18-inch high cone shall be used. Manholes, which have through lines and less than 5' 8" from the crown of the pipe to the rim shall use flat slab tops. The plans shall note that the frame on manholes located in unimproved areas shall be set 12 inches above existing ground level. Manholes for flexible conduit shall be designed such that flexing of the pipe does not result in infiltration or exfiltration at the interface between manhole and pipe. Specially designed flexible boots or integrally cast bells may be required by the Director. Pipe material, which does not provide adequate bonding between pipe and manhole, may similarly require special designs.
- F. Connections to the Interceptor System - Improvement plans which require a connection to a SRCSD interceptor or interceptor structure shall include a note specifying that the SRCSD staff be notified at least two working days in advance of the start of intended construction. This is necessary to allow for the special inspection procedures that will apply to such construction.
- G. Vacuum Testing – Vacuum testing shall be performed per ASTM C 1244-93 on all manholes.

7-9 DROP CONNECTION CRITERIA: Drop connections shall conform to Standard Drawing No.'s 7-3, 7-3A & 7-3B. The inside drop connection shall be used for four through eight-inch diameter collectors and services. If an elevation difference as measured from the invert in, to the spring line out, of at least 3 feet is not available, the slope of the incoming line shall be increased to eliminate the need for the drop. There shall be no more than two inside drop connections into a four-foot diameter manhole. Drop connection on 10-inch collectors shall not be allowed unless otherwise approved by the Director and if approved, be installed in a five-foot diameter manhole. The maximum change in flow direction shall not exceed 100 degrees.

7-10 FLUSHING BRANCH CRITERIA: A flushing branch may be used in lieu of a manhole at the end of any collector less than 120 feet in length. A flushing branch may also be used at the end of a collector less than 200 feet in length if the collector extends to a subdivision boundary and if there are definite plans for its extension. If a collector extends to a subdivision boundary, is planned for definite extension, and has no service sewer connections, it may be capped. Flushing branches shall conform to Standard Drawing 7-6 and 7-6A.

7-11 SERVICE SEWER DESIGN: The design criteria for service sewers are as follows:

- A. General - Service sewers shall conform to Standard Drawing 7-5 and shall be constructed normal to the lateral unless otherwise approved by the Director. The service sewer shall extend from the collector sewer to the edge of public right of way or edge of easement unless a water main is to be installed at the back of the sidewalk as part of the subdivision improvements. In such cases the service is to be extended to ten feet back of the sidewalk. The cleanout to grade is to remain within three feet of the back of the sidewalk. See Note 10 of Standard Drawing 7-5 for cover requirements. Service sewers shall extend one foot beyond the edge of the pavement of any private road and easements of adequate width to accommodate the services shall be obtained. A plan and profile of any service sewer shall be supplied to the Director upon request. On any collector, (weather it will be extended in the future or not) starting at the most upstream end, factory type "Y" connections to the collector shall be used for the first 20 or equivalent ESDs. Construction of the cleanout to grade for all sewer services is required. Construction of the top 1 foot of the cleanout riser may be delayed until the installation of the building sewer at the option of the developer, except where the water main is to be installed at the back of the sidewalk (refer to Note 10: Standard Drawing 7-5). If construction of the top 1 foot of the riser is delayed, the location shall be accurately staked with a 4"x 4" post.
- B. Sizing - Normal service sewer size is four inches for residential and six inches for commercial. Six-inch or larger service sewers shall serve schools and other developments expected to contribute high sewage flows. In addition, service sewers shall be sized according to requirements of the Uniform Plumbing Code, the Water Quality Division, and determinations by the Consulting Engineer. If the service sewer and collector are of the same size, a manhole must be constructed; if the collector is larger than the service sewer, a factory fitting at the connection is satisfactory. Service sewer connection to trunk service will not be allowed. Collector service shall be allowed to connect to trunk sewer as directed by CSD-1.
- C. Construction by County Forces - The Water Quality Division, upon application for permit and payment of required fees, shall construct all service sewers from existing sewers and manholes to individual residential

lots and commercial, multiple residential, and industrial developments. If existing collectors and manholes are being utilized for service connections in constructing new subdivision improvements, the requirements shall apply only to County forces making the taps. A note to this effect shall be placed on any plan sheet, which indicates a connection to the existing system.

- D. Connection Limitations - Service sewers shall not directly connect to sewer lines designed to flow full or to lines more than 16 feet in depth without the approval of the Director.
- E. Material - The "T" or "Y", and the service shall be of the same material as the collector to which it connects, except that ABS Schedule 40 per ASTM 2661 pipe may be connected to a VCP "T" or "Y", as shown on Standard Drawing 7-5. Also see Section 7-11G.
- F. Location - When sanitary sewers are constructed as part of new subdivision improvements, a service sewer shall be constructed to each lot. In new subdivisions or developed areas, unless specifically requested otherwise in writing by the property owner or Consulting Engineer, service sewers shall be placed on the low side of any subdivision lot or similar parcel with two percent or greater slope across the front or shall. Otherwise, the sewer service shall be placed in the center of said lot or parcel. Consideration shall be given to trees, improvements, proposed driveways etc., so as to minimize interference when the service sewer is extended to service the house. If the property is located such that service is available both to a line located in an easement and also in right of way, service shall be to the latter location unless otherwise approved by the director. No service sewer shall be located such that future on site construction will result in the line being in such proximity to a water well or water main or service that applicable health standards will be violated.
- G. Depth - The Consulting Engineer shall verify the adequacy of the normal service sewer depth at the edge of easement or right of way to serve the intended parcel. A depth of five feet to crown of pipe, measured from existing ground surface or edge of adjacent roadway, whichever is lower, shall be considered normal service sewer depth, except under conditions stated in Note 10 on Standard Drawing 7-5. Whenever greater depth is required, the Consulting Engineer shall designate the invert elevation of the service sewer at the edge of the right of way or easement on the construction plans. If the service has less than three feet of cover measured from the gutter flowline, Polyvinyl Chloride (PVC) SDR 26 conforming to ASTM D 3034 for pipes up to 15-inches, or other high strength pipe approved by the Director, shall be used. If a joint trench is being utilized for other utilities, the Consulting Engineer shall indicate on the plans that a Joint trench will exist and shall adjust service elevations as necessary. It shall be the responsibility of the Consulting Engineer to arrange for coordination of the grade of utilities located in the joint trench and the service sewers.

- H. Special Requirements in Developed Areas - In developed areas, a service sewer shall be provided to each parcel participating in the project and having a property line less than 200 feet from a collector. A property owner's request for service location shall be honored whenever practicable. Parcels, which have two or more sources of sewage, must have an independent service sewer provided to each sewage source, which can be separated from the rest of the parcel and sold. A service sewer shall be provided to each subdivision lot or lot similar as to size and possible development. At an early stage of design, the Consulting Engineer shall send every property owner affected by the proposed work a questionnaire requesting, in writing, the owner's preferred service sewer location. In absence of a response to this questionnaire, the Consulting Engineer shall provide a service sewer as required by this Section. In addition, when service sewers are staked immediately prior to construction, each property owner shall be given notice that he should give consideration to the staked location of his service sewer and, if not satisfactory, immediately notify, the Consulting Engineer. The date of notification, nature of change, and other pertinent information shall be recorded. Compilation of this information shall be the responsibility of the Consulting Engineer and the information shall be furnished to the Director upon request.

7-12 CREEK CROSSING DESIGN: Advance approval of the Director and of other appropriate agencies is necessary prior to initiating design. The criteria for creek crossing design is as follows:

- A. General - In all cases, the proposed future creek bed elevation shall be used for design purposes. Crossing details of pipe, piers, anchorage, transition couplings, etc., shall be shown upon a detail sheet of the plans in large scale.
- B. Design - Calculations shall be submitted which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions, etc.
- C. Construction and Material - For collector sizes ten inches and smaller, ductile iron pipe or other pipe material as approved by the Director shall be used under the full creek width, plus ten feet each side, unless the pipe is four feet or more below the creek bed elevation. For line sizes twelve inches and larger, pipe used shall be as directed by the Director. Special care shall be taken to provide a firm base for the pipe bedding. The plans shall specify that all soft or organic material within the creek banks shall be replaced with select imported backfill. In addition, the pipe shall be encased in concrete or soil cement shall be used to protect the pipe for the full width of the creek. Unless otherwise directed a clay plug shall be required at the top of the pipe at the downstream side of the crossing. The plug shall be a minimum of four feet in length, shall extend the full width of the trench,

and shall extend twelve inches above and below the pipe or as approved by the Director.

If the pipe must cross above the creek bed, ductile iron or welded steel, pipe shall be used. Steel pipe may be cement lined and coated, fusion epoxy lined and coated, or glass lined; the Director shall approve the type of coating and lining specified, and the gauge; class, or thickness of the pipe. The Director may specify which is to be used.

Reinforced concrete piers of adequate depth shall be located as necessary for adequate support of the pipe. The pipe shall be held in cylindrical cradles, formed in the pier tops, by galvanized steel straps, with galvanized anchor bolts of adequate size. Cushion material shall be placed between the pipe, clamps, and support. The invert elevation at the point of maximum deflection of the suspended pipe shall be invert of the pipe at its downstream support.

7-13 BORING AND JACKING REQUIREMENTS: Where use of conductor casing is specified, the casing shall be corrugated steel pipe, reinforced concrete pipe, or welded steel pipe. The casing shall be of sufficient diameter to allow dry sand to be blown into the void between the carrier and the conductor and to allow adjustment of the carrier pipe to grade. Normally, an inside diameter six inches greater than the outside diameter of the couplings of the carrier pipe is sufficient. Welded steel conductor pipe shall have a minimum wall thickness of $\frac{1}{4}$ inch for sizes up to and including 24 inches in diameter and $\frac{5}{16}$ inch for sizes 27 inches to 36 inches in diameter. Corrugated steel pipe conductor shall not be less than 10 gauge for sizes up to 36 inches, an 8 gauge for diameters to 60 inches. Every R.C.P. conductor must be designed for the loading condition and, if jacked, the additional loading imposed by the jacking operation.

Direct dry boring of reinforced concrete pipe and of the portion of sewers and service sewers, which pass beneath curbs and gutter, sidewalks, and other obstructions, up to a maximum length of 15 feet, is permissible. Six-inch and smaller pipelines may be installed by wet boring where approved by the Director. Pipe material used in the small size dry and wet bores shall be ductile iron pipe, or Class 200 (DR-14) PVC pipe conforming to the requirements of AWWA C900. Installation and other material specifications shall conform to the requirements of the Standard Specifications.

Backfill in bore pits shall be given special attention with respect to preventing structural failure of the pipe entering or exiting the conductor, and adequate bedding and initial backfill shall be specified.

7-14 PUMP STATION AND FORCE MAIN REQUIREMENTS: Every phase of pump station design, including force mains, shall be closely coordinated with and shall be under the direction of CSD-1. CSD-1 will make sample plan sheets available to the

Consulting Engineer which will show the general layout and control system required for a typical acceptable sewage pump station. The plans shall show the testing required prior to acceptance of the pump station. Unless otherwise approved by the Director, "fee title" shall be granted to the Sacramento Regional County Sanitation District or County Sanitation District 1.

7-15 SEWER IMPROVEMENT PLAN REQUIREMENTS: Plans for the construction of sanitary sewers whether in conjunction with other improvements or for a sewer project only, shall conform to the following standards, as well as other standards contained in the General and Plan Sheet Requirements of these Improvement Standards.

A. General Requirements. -. Plans for sewer improvement projects should include a layout sheet, plan and profile of each sewer line, and any necessary detail drawings. The plans must be clearly legible and conform to accepted practice with respect to drafting standards. All information, which, in the opinion of the Director, is necessary for the satisfactory design, review, construction, and maintenance of a project shall be provided and, where applicable, shall be shown on the plans.

B. Layout Sheet - All sewer improvement plans shall include an overall map, which shows the project boundaries, sewer lines, manholes, flushing branches, and other important items of the work. Where pavement is to be cut in several locations, the pavement replacement requirements shall be shown on the layout sheet.

A parcel or area which benefits from and financially participates in a sewer construction project, but is not included within the project boundaries, shall have a note to this effect placed on the layout map and on the plan and profile sheet if the parcel appears thereon. Parcels, which make use of those facilities, may be subject to additional fees at the time of connection, if the participation has not been so noted.

C. Plan and Profile Sheets - Sewers which are to be maintained by County Sanitation District 1 shall be shown in both plan and profile views (adjacently aligned on the same sheet) on approved plan and profile paper. The following standards, with respect to drafting and the information to be included on the plan and profile sheets, generally apply to projects in developed areas. In new subdivisions, only the requirements that are applicable shall apply.

1. Sewer lines to be constructed shall be indicated on the profile by parallel lines spaced by one pipe diameter. Manholes shall also be indicated by parallel lines spaced according to scale. Slope shall be printed 1/8 inch above, and preferable parallel to, the pipeline, or between the parallel lines. The length, size, and type of pipe material between each manhole shall be printed parallel to the horizontal grid

lines and approximately halfway between the ground surface and pipeline. All inlet and outlet pipe inverts at manholes and other structures shall be indicated on the profile. The invert elevations shall be printed parallel to the horizontal grid lines and shall be under scored by a line, which then runs at a 45-degree angle to the corresponding pipe invert. When manholes, manholes with drop connections, flushing branches, or other appurtenances are to be constructed, the profile shall be so noted. Cone heights of 18" and 24" shall be clearly labeled for those manholes requiring the shorter cones due to lack of available depth. Existing facilities shall be shown in profile using dashed lines. Manhole identification on the plan view will be oblique. Stationing shall appear at the lower edge of the profile grid directly under the manhole.

2. In improved areas, the location of each service sewer proposed to be constructed shall be indicated on the plans by stationing, or by reference to a permanent, well-defined structure, if available. In new subdivisions, the service sewers shall be located by stationing unless the situation exists, such as at the end of a cul-de-sac, where stationing is not an adequate description of location. In such cases a dimension to a lot line may be used. The invert elevation of the service sewer at its upstream end shall be shown on the plans whenever the service is not at standard depth. Standard depth and wye connections requirements shall conform to the conditions set forth on Standard Drawing 7-5.

Improvements or lots shown on a plan sheet but served to a line shown on another plan sheet shall have the direction of service shown by a small triangle and letter "S".

3. Both permanent and working easement shall be shown to scale on the plans. Easement dimensions shall be given and each easement shall be tied to both the property line and the sewer line. Each permanent easement shown on the plans shall be identified by a box or table, on the same plan sheet, which gives the property owner's name and the book and page number in which the easement is recorded. The Consulting Engineer shall provide the book and page number.
4. Proposed sewer lines shall be adequately dimensioned from street centerline. If the sewer is to be located outside of the right of way, sufficient dimensions and bearings from an approved horizontal control shall be shown on the plans to locate the line in the field.
5. Indicate the limiting maximum trench width, as measured at the top of the pipe, on the plans between well-defined points of application, the pipe material and class, if more than one class is available; and the bedding-backfill type. If more than one combination of pipe

material or class, maximum limiting trench width, or bedding type is available, a practical range of such combinations shall be shown on the plans.

6. Gas, water, storm sewers, and all other main utility lines above or below ground shall be determined and shown on the plans with accuracy as great as practicable. The location of any utility line which is parallel to and within five feet of the sewer line or which crosses the sewer line at an angle of 30 degrees or less shall be determined with an accuracy of ± 1.0 foot and the clearance shown on the plans. Service lines such as water and gas normally shall not be shown.
 7. Trees and other objects within 10 feet of construction centerline shall have their correct location shown on the plans and the clearance from construction centerline shown. The diameter of tree trunks and interfering heavy tree branches shall be noted. Removal of a tree or object, or other special handling shall be noted on the plans. The Consulting Engineer shall assume full responsibility for such notes as it is assumed that he has made all necessary arrangements with the owner of the object to be handled. Written documentation of any special arrangements regarding preservation of property made between property owners and the Consulting Engineer shall be supplied to the Director if no easement document is involved. If an easement is negotiated, all special arrangements are to be included in the easement document. The Director must approve tree removal within public rights-of-way or easements.
 8. Culverts shall be shown on both plan and profile when crossed by the construction or when parallel and within 20 feet of the construction line. The size and type of all such culverts shall be indicated and when the culvert crosses or is perpendicular or nearly so and within 20 feet of the construction line, the invert of the culvert end nearest the construction line shall be shown.
 9. Addresses of buildings shall be shown on the plan view, within the outline of the building. Only the front line and indication of sidelines of buildings need be shown.
- D. Detail Drawings - Items of a special nature should be shown with detail drawings, either on the plan sheets, or on a separate detail sheet.
- E. Connection to Existing Facilities where bypassing or stoppage of existing flow will be required - When improvement plans require connection to an existing facility which will require bypassing or stoppage of existing flows, a note shall be placed on the plans which provides an estimate of the existing flow to be bypassed (in gpm), or the times between which the flow may be stopped. Coordination with the Water Quality Division Engineering

Section is required in developing these numbers. The note shall also require the contractor to contact the Water Quality Maintenance Section at least 48 hours prior to initiating the bypass/stoppage operation so the temporary facilities and equipment can be evaluated for adequacy. Where the bypassing/stoppage operation will be accomplished on a major trunk or interceptor, submittal of a work plan for review may be required prior to initiation of the operation.

7-16 DESIGN OF ON-SITE SEWER SYSTEMS FOR PRIVATE MULTIPLE OWNERSHIP RESIDENTIAL DEVELOPMENTS: The following design requirements shall apply to that portion of the sanitary sewer system within a privately owned multiple ownership development that is "on-site" and is not an outfall sewer for an upstream area, thereby being considered a private system and not subject to maintenance by County forces.

- A. Planned Unit Developments and Townhouses - Residential developments where separate lots and structures are sold. These differ from usual subdivisions in that adjacent land is owned in common and a homeowner's association performs maintenance.
 - 1. General - Sanitary sewers shall meet all requirements for public sewers contained in these Improvement Standards, except as specified below.
 - 2. Manhole spacing - Maximum spacing of manholes on collectors shall be 300 feet for all straight runs of pipe.
 - 3. Wyes - Wyes shall be used for all service sewers connecting to the "on-site" collectors. Tees as shown on Standard Drawing 7-5 are not allowed.
 - 4. Minimum Depth - All collectors located within vehicular traffic areas shall have a minimum cover of five feet to finish grade. Additionally, if the cover over the pipe at any location may be less than two feet at any time after the pipe is installed, Polyvinyl Chloride Pipe (PVC) DR 26 conforming to ASTM D 3034 for pipes up to 15-inch and F 679 - DR 26 for larger diameters shall be used for shallow and extra deep applications.
 - 5. Plan and Profile Sheets - "On-site" improvement plans may be prepared without the sanitary sewer profile that is required by these Improvement Standards, unless otherwise instructed by the Director. However, the final "on-site" grades and drainage facilities must be shown on the plans on the same sheet as the plan view of the sanitary sewers. Pipe dimensions shall be shown adjacent to the corresponding pipe section. The use of charts shall not be permitted for pipe dimensioning purposes. Plan sheet sizes shall be as specified in Section 3-1 of these Improvement Standards.

6. Backwater Valves - Backwater valve requirements as specified in the appropriate sewer use ordinance shall apply to all service sewers.
 7. Location - Wherever possible, collectors shall be located in areas to be paved.
 8. Review and Approval - Plans must be reviewed and approved by the Water Quality Division of the Municipal Services Agency
- B. Condominiums or Cooperative Developments - Attached residential homes where shares of the total development are sold.

The "on-site" sanitary sewers may be constructed as required by the most current edition of the Uniform Plumbing Code (UPC) adopted by the Board of Supervisors. These plans will require the approval of the Water Quality Division of the Municipal Services Agency in addition to the standard approvals required. The developer has the option of designing the "on-site" sanitary sewers under the requirements of Section 7-15A. If "on-site" sewers are designed in accordance with the standards for Planned Unit Developments, the plans will be reviewed and approved as set forth in Section 7-15A. Approval will be subject to compliance with those standards.

7-17 MULTI-STRUCTURAL COMMERCIAL AND INDUSTRIAL DEVELOPMENTS: The "on-site" sanitary sewers for all new commercial and industrial developments containing more than one structure shall be designed in accordance with the requirements contained in Section 7-16A of these standards unless otherwise specified by the Director. Each separate building within a multi-building commercial or industrial development shall have its own separate connection to a sewer system designed to public standards.

7-18 SEWER STUDY:

A Sewer Study is a plan to provide sewer service to a specific portion of sub-service area of CSD-1. A Sewer Study will fully describe the area to be served by the local collection and trunk facilities, and will fully describe the facilities necessary to provide service to that area.

A Sewer Study shall be submitted and approved if there is a possibility that any of the following exist.

1. Upstream or adjacent areas might require service through the subject property.
2. Downstream capacity is limited.

3. It may not be possible to serve the project and / or surrounding area with gravity service.
4. Interim facilities may be required.

When a Sewer Study is required, it shall be submitted and approved prior to submittal and approval of project improvement plans and prior to recordation of a project Final Map.

A. General Requirements - In order to develop a Sewer Study the following information must- be accumulated and presented in the Sewer Study:

1. Regional Setting
2. Topographic information of the area to be served delineated on the map and discussed in the Sewer Study.
3. Any specific projects, which precipitated the study
4. Relevant assumptions or special conditions
5. Existing and proposed development and sewer infrastructure
6. Ultimate development within the Sewer Study area
7. Hydraulic grade line at point of discharge into major facilities

The flows generated within each sub-service area of the sub-area plan will be calculated in accordance with the procedures contained in Section 7-2 and 7-3 of these standards unless otherwise specified by the Director.

B. Study Map - The method of sewerage the entire service area, including pipe sizes, lengths, slopes, and inverts, shall be shown to the extent necessary to determine the requirements within the subject property.

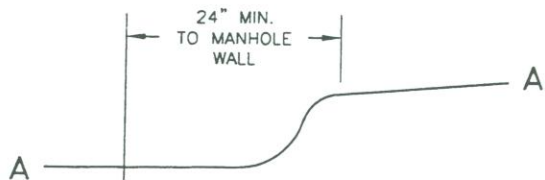
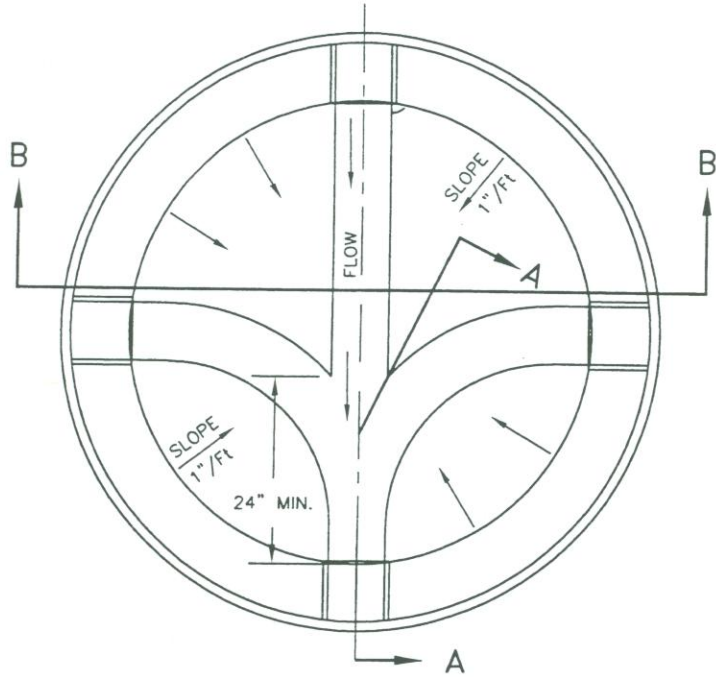
C. Study Slopes - The following is a table of minimum slopes to be used for Sub Area Sewer Service Plans:

Minimum Trunk Slopes		
	Study Slope	Study Slope
Diameter (inches)	Alignment in Existing Road	Alignment in Undeveloped Land (1)
Trunk Sewers		
12	0.0022	0.0024
15	0.0017	0.0019
18	0.0014	0.0016
21	0.0012	0.0013
24	0.0011	0.0012
27	0.0011	0.0012
30	0.0011	0.0012
33	0.0011	0.0012
36	0.0011	0.0012

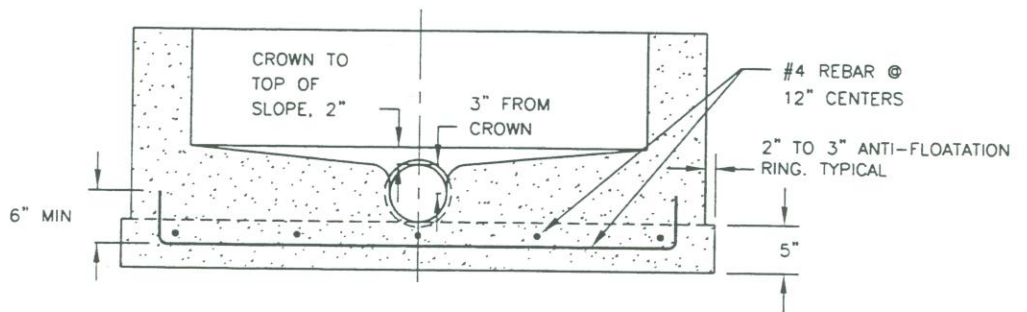
- D. Report Preparation: - In order to insure that all Sewer Studies are compatible and easy to understand, they shall all be published in the following format.
1. Section Headings - Each Sewer Study shall be written with the following sections entitled as follows:
 - a. Executive Summary - A concise description of the recommended sewer system, the capacity issues, the peak wet weather flows generated by the project and study area, the ESDs generated by the project and study area, the interim, service, if any, the impacts upon the Regional system, and any special design criteria necessary due to unusual local conditions.
 - b. Introduction - A thorough background description of the sewer shed, any specific project(s), which precipitated the study, any special conditions, a vicinity map and a discussion of topography.
 - c. Criteria and Design - All of the information (assumption, method of approach and design criteria) upon which the plan was based shall be delineated in this section in an easily readable manner.
 - d. Off-Site Sewer Requirements – Upstream service areas shall be addressed and shown on the map. The project's connection point and invert elevation to the downstream sewer shall be specified. Existing peak wet weather flows, available capacity and resulting flows and capacity after the project's connection shall be discussed for the downstream service area.
 - e. Sewer Alignments – Interim and ultimate sewer facility alignments shall be discussed.
 - f. Phasing Information – The projected and / or proposed phasing of interim and ultimate sewer facilities shall be discussed.
 - g. Spreadsheet – A spreadsheet shall be included that designates for each node the node number, land use, acreage, cumulative acreage, ESDs, cumulative ESDs, cumulative average dry weather flow, the peaking factor, cumulative inflow and infiltration, cumulative peak dry weather flow, cumulative peak wet weather flow, the outgoing pipe size, cumulative peak flow velocity, depth to invert and when required by CSD-1, hydraulic grade line information.

- h. Sewer Study Map – A map at a minimum 1" = 100' scale showing the service area, shed and sub-shed boundaries, the needed sewer facilities (manholes, pipes, pipe diameters, slopes, lengths, flow directions, and depths, exit pipe invert elevation, rim elevations), node information at the node and not in a table (node number, acreage, cumulative acreage, ESDs, cumulative ESD, and cumulative peak wet weather flow), topographic (or grading) information, and relative utility information where potential conflicts exist.
 - i. Appendices – All of the backup information shall be included in an appropriate number of appendices
- 2. Report Format - The Sewer Study shall be bound as a single document with appropriate dividers between each section and pockets for all the required maps.

CAMERA CHANNEL REQUIRED FOR
ALL 8" AND 10" LINES



SECTION A-A

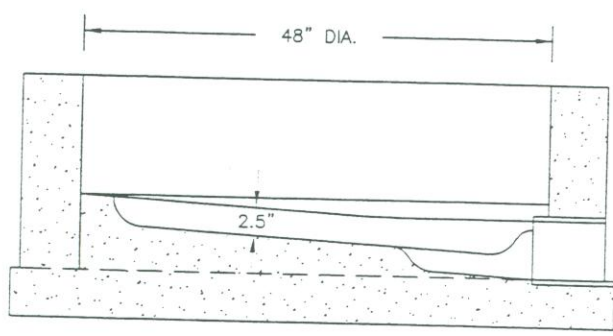
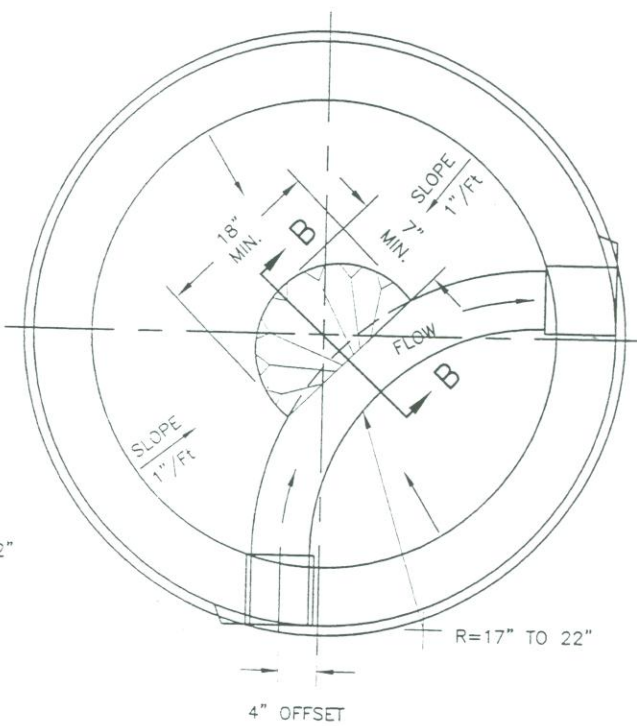
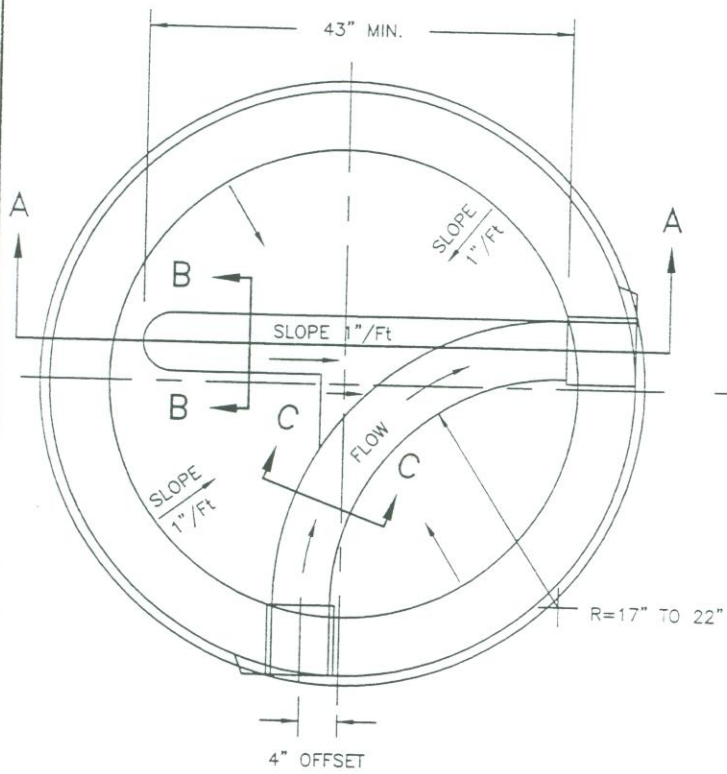


SECTION B-B

Robert Shand
DIRECTOR

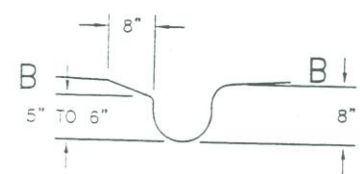
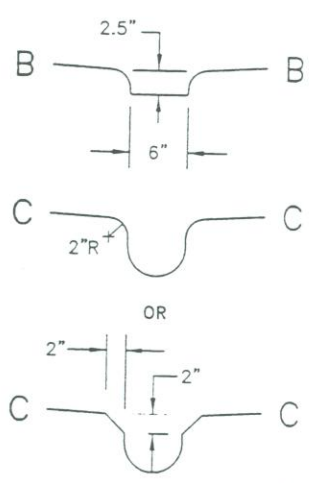
SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
MANHOLE BASE CAMERA CHANNEL DETAIL	
DRAWN BY: RAS SCALE: NONE DATE: 12/03	7-1A

CAMERA CHANNEL REQUIRED FOR
ALL 8" AND 10" LINES

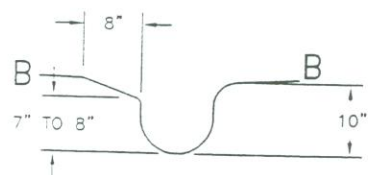


SECTION A-A

FOR 8" LINE ONLY



SECTION B-B
FOR 8" PIPE BASES



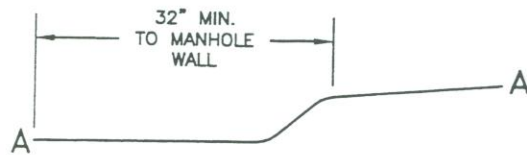
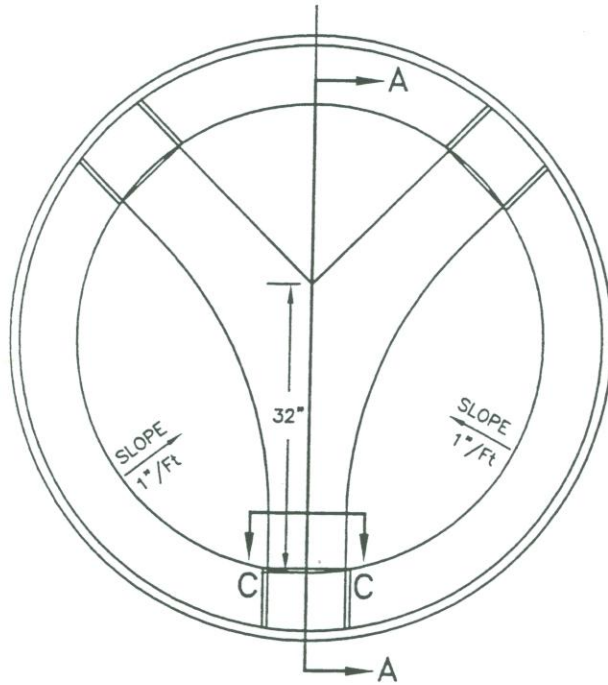
SECTION B-B
FOR 10" PIPE BASES

Robert J. Shamb
DIRECTOR

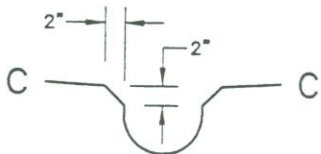
REBAR PATTERN PER 7-1A, SECTION B-B

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
MANHOLE BASE CAMERA CHANNEL DETAIL	
DRAWN BY: RAS SCALE: NONE DATE: 11/02	7-1B

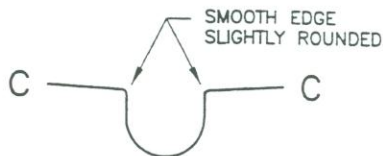
CAMERA CHANNEL REQUIRED FOR
ALL 8" AND 10" LINES



OR



OR



REBAR PATTERN PER 7-1A, SECTION B-B

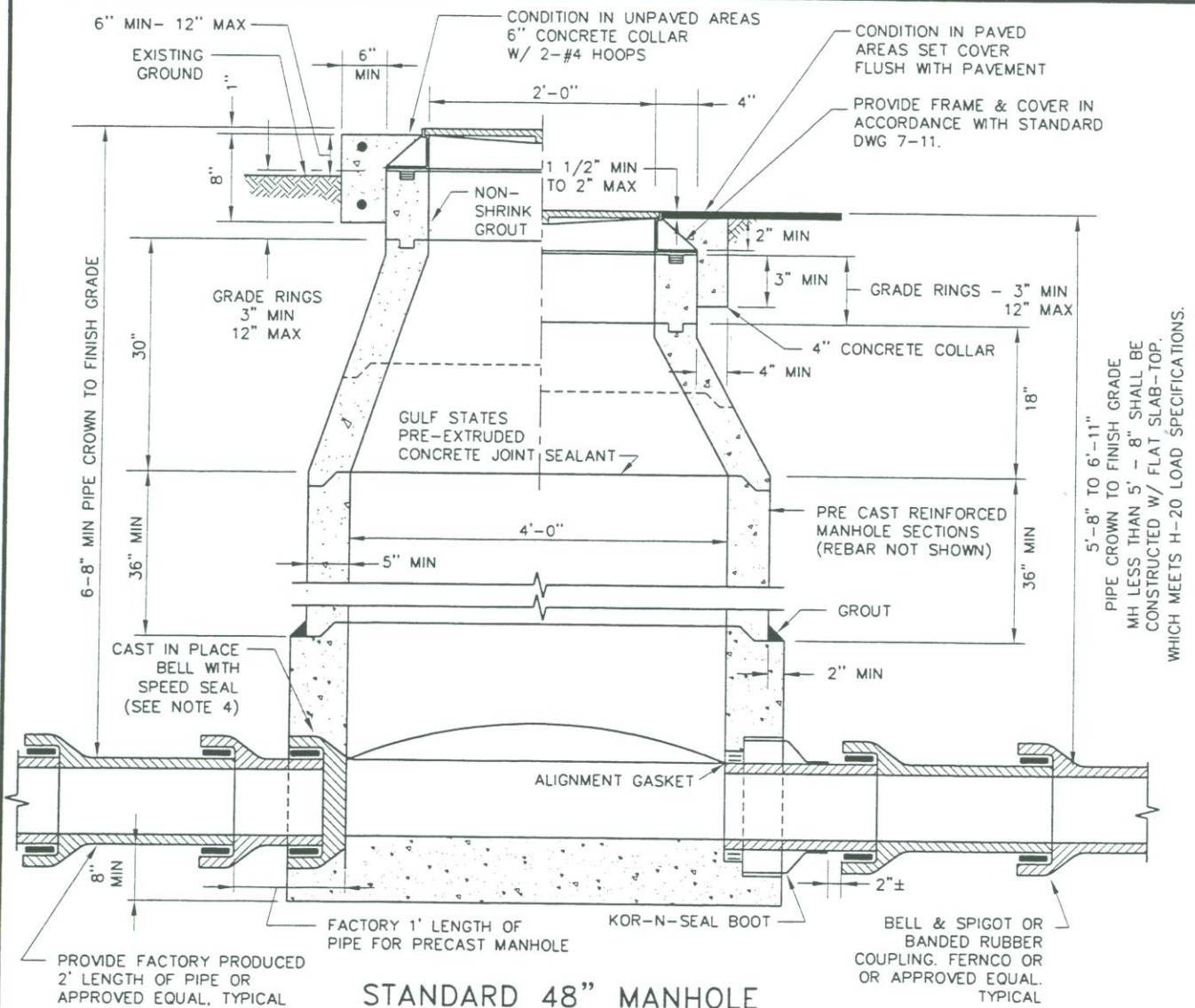
Robert Shank
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

MANHOLE BASE
CAMERA CHANNEL
DETAIL

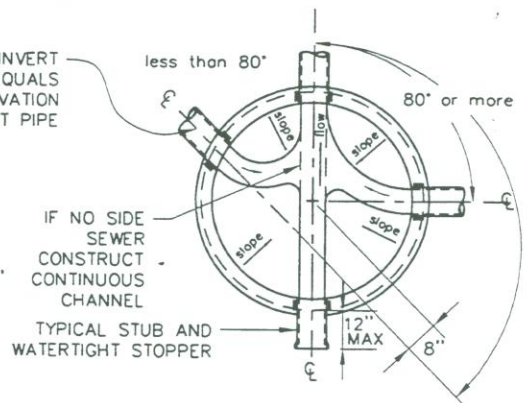
DRAWN BY: RAS
SCALE: NONE
DATE: 10/02

7-1C



NOTES:

1. CLASS A CONCRETE SHALL BE USED FOR MANHOLE BASES.
2. PIPE SHALL STOP AT INSIDE FACE OF MANHOLE, POURED IN PLACE MANHOLES SHALL NOT BE ALLOWED UNLESS APPROVED BY THE DIRECTOR.
3. JOINTS FOR THE BARREL SECTION SHALL BE TONGUE AND GROOVE, ALL LIFTING HOLES SHALL BE SEALED WITH NON METALLIC NON-SHRINK GROUT.
4. ALL MANHOLE BASES SHALL BE PRECAST BASES AND SHALL BE PLACED ON 4" MIN. OF CRUSHED ROCK PLACED OVER UNDISTURBED MATERIAL. CONNECTION OF THE PIPE TO THE MANHOLE SHALL USE A RESILIENT CONNECTOR CONFORMING TO ASTM STANDARD C923 SUCH AS KOR-N-SEAL, A-LOK, OR APPROVED EQUAL. ALL MANHOLE BASES TO INCLUDE AN ANTI-FLOATATION RING PER 7-1A.
5. ANY SERVICE SEWER ENTERING A MANHOLE SHALL BE INSTALLED WITH THE INVERT ELEVATION OF THE SERVICE PIPE MATCHING THE CROWN ELEVATION OF THE EXIT SEWER EXCEPT WHEN AN INTERNAL DROP CONNECTION IS USED. IF THE MANHOLE AT THE END OF A CUL-DE-SAC IS CONSTRUCTED WITH A PRE CAST BASE, THE INVERT OF ANY SERVICE STUBS SHALL BE A MINIMUM OF ONE INCH ABOVE THE INVERT OF THE EXIT PIPE WITH AN INDIVIDUAL SMOOTH TRANSITION CHANNEL.
6. BEDDING FOR PRE CAST MANHOLE SHALL BE SELECT IMPORTED MATERIAL 1/2" OR 3/4" CRUSHED ROCK.
7. THE STANDARD CONE MAY BE PROVIDED AS TWO PRE CAST SECTIONS.
8. FOR ASPHALTIC CONCRETE OVERLAYS ONLY, MANHOLES WITH DEPTHS OF 8" AND GREATER (MEASURED FROM THE FLOW LINE TO THE TOP OF CASING) THE MAXIMUM THROAT DEPTH IS 24 INCHES.
9. CUL-DE-SAC MANHOLES OR END OF LINE MANHOLES WITH A DEPTH OF 6'-11" OR LESS SHALL USE 18" CONES.
10. ANY COLLECTOR ENTERING A MANHOLE WITH LESS THAN 80° TO THE EXIT FLOW DIRECTION SHALL BE INSTALLED WITH THE INVERT ELEVATION OF THE ENTERING COLLECTOR MATCHING THE CROWN ELEVATION OF THE EXIT PIPE.



PLAN VIEW OF 48" MANHOLE
SHOWING INTERSECTING SEWERS

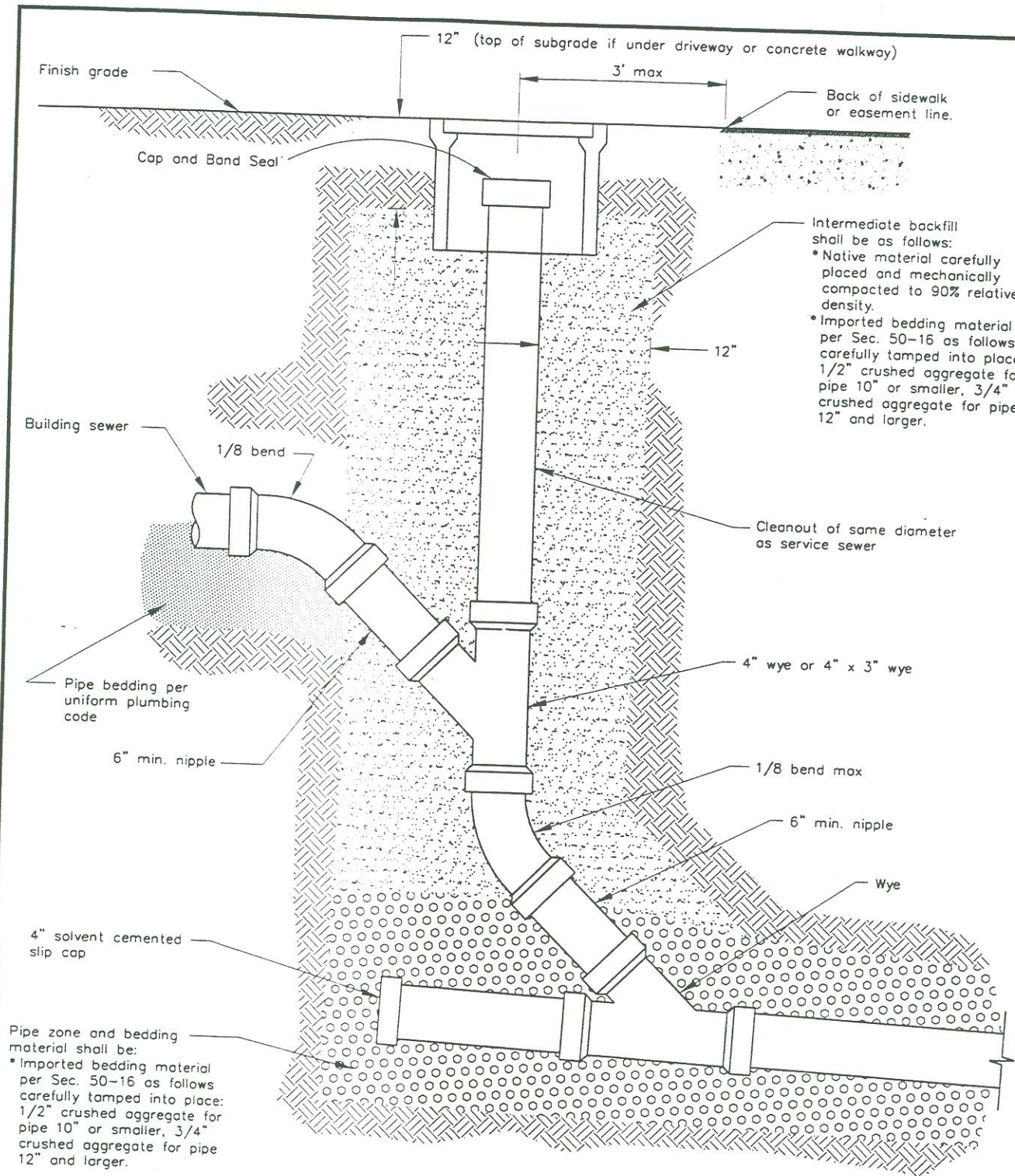
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

STANDARD 48" SEWER MANHOLES

DRAWN BY: RAS
SCALE: NONE
DATE: 12/03

7-1

DIRECTOR



WATER QUALITY DIVISION BEDDING REQUIREMENT FOR BUILDING SEWER CONNECTION

Place a minimum of 12" of backfill all around the outside diameter of the riser and mechanically compacted to 90% relative density. Backfill material shall be used to 12" from grade or to top of subgrade if under concrete.

Robert J. Shaul
DIRECTOR

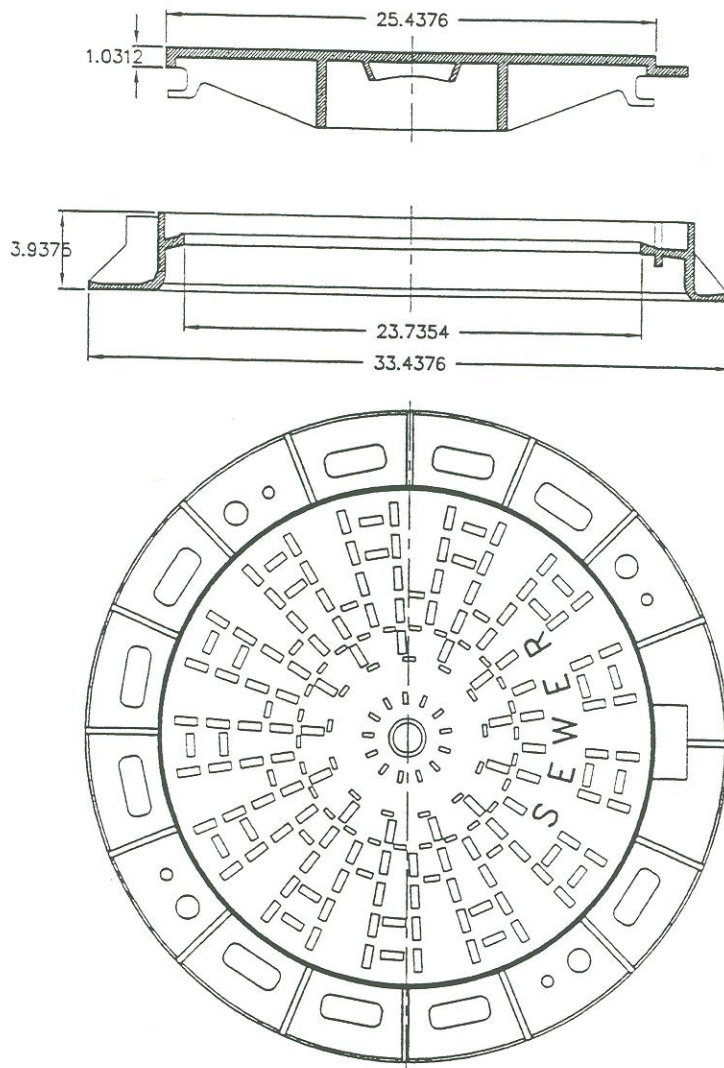
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

MODIFIED VCP, ABS or PVC
CLEANOUT TO GRADE

BUILDING SEWER CONNECTED TO RISER
(Not applicable when the water main is located behind the sidewalk.)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/03

7-10



DUCTILE IRON CASTINGS

1. Manhole frame and cover shall be manufactured using spheroidal or nodular graphite iron (ductile iron) complying with the requirements specified in ASTM A536-80.
2. All castings shall meet or exceed the H-20 load requirement.
3. All castings will be supplied with a coating of bituminous material and be free from cracks, holes, foreign inclusions, scale, lumps, blisters, sandholes, and other injurious defects.
4. The frame shall have a minimum of four bolt holes to anchor to the manhole casting.
5. The frame shall be designed to accept leveling inserts that will allow raising of the cover without excavation. The leveling inserts shall be locked into place using cadmium-plated steel bolts.
6. An anti-theft locking key shall be installed. The bolt shall be stainless steel with a pentagon head design measuring 7/8" point to flat.
7. The frame and cover shall be Model GTS Class 400 manufactured by PAM/LBI, Long Beach, California, 800 628-1093 or equal.

LEVELING INSERT

1. Two heights of locked leveling inserts can be used to raise the level of the cover without removing the frame.
2. Inserts shall be locked on the frame with two cadmium-plated steel bolts.
3. Inserts shall be made from ductile iron and fitted with a polyethylene sound dampening ring.
4. Cover shall be locked and locked into the insert in the same manner as in the original frame.
5. Several inserts can be used on the same manhole to get required height (not to exceed maximum throat heights per 7-1).
6. Leveling inserts shall be reference no. RE85R7MD or RE85R7ND or equal.

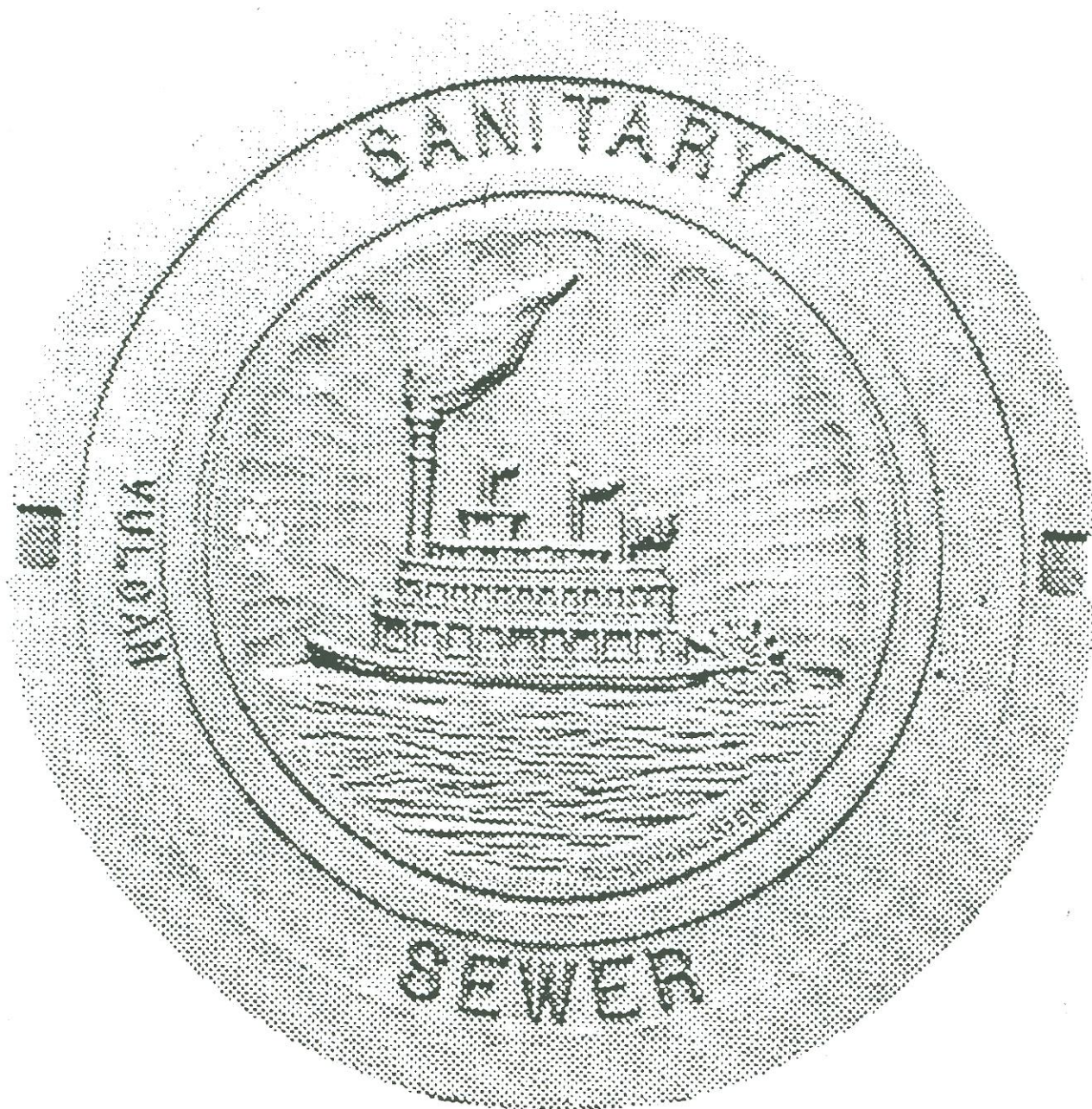
Robert Shaul
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

DUCTILE IRON
FRAME & COVER

DRAWN BY: DAH
SCALE: NONE
DATE: 3/98

7-11A



NOTES:

1. ALTERNATIVE MANHOLE COVER PATTERNS ARE SUBJECT TO APPROVAL OF THE DIRECTOR ON A CASE BY CASE BASIS ONLY.
2. ALL GENERAL REQUIREMENTS FOR THE FRAME AND COVER SPECIFIED ON 7-11 SHALL APPLY.


DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

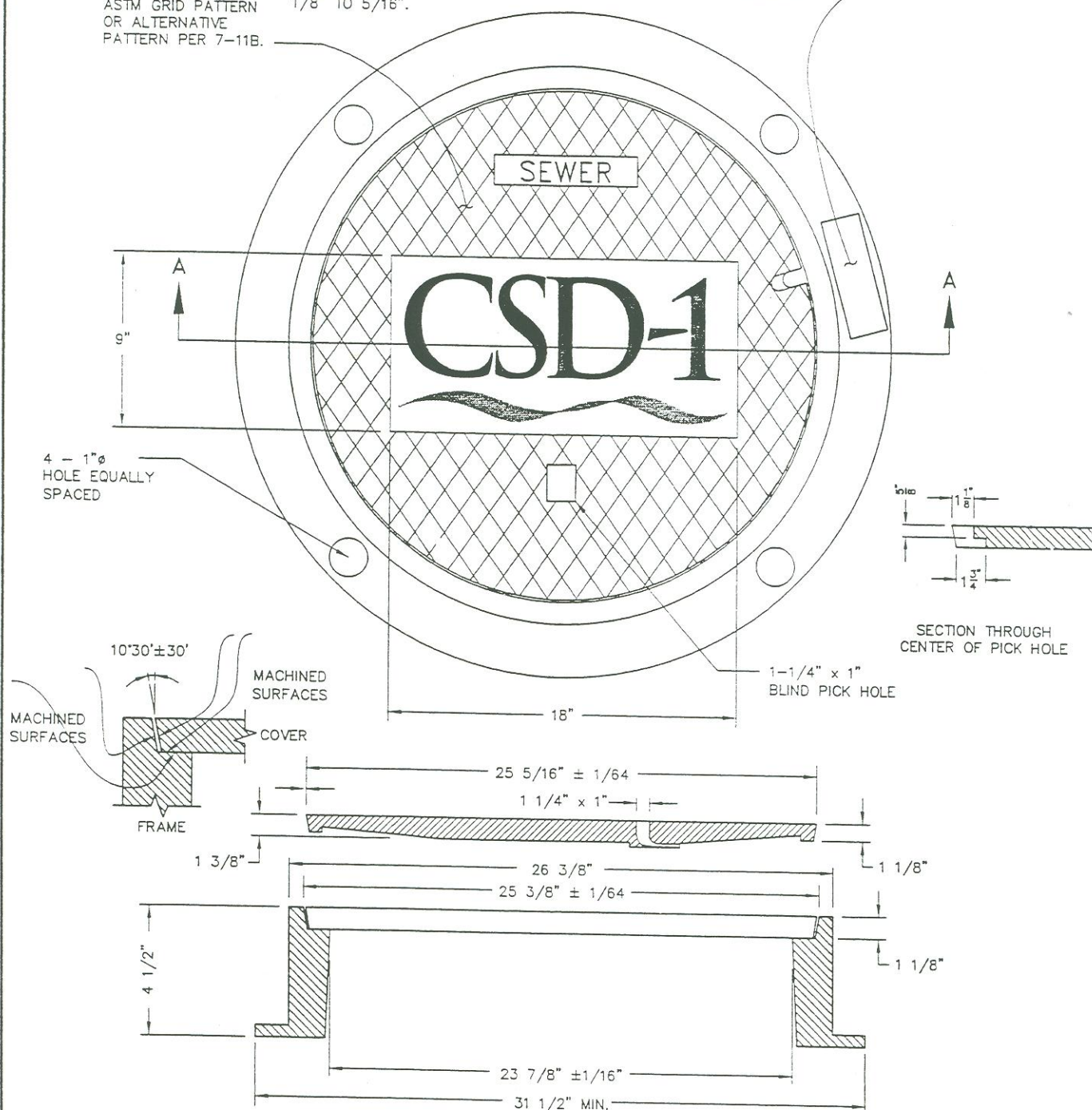
ALTERNATE
MANHOLE COVER

DRAWN BY: DAH
SCALE: NONE
DATE: 4/97

7-11B

MANUFACTURER

ASTM GRID PATTERN
OR ALTERNATIVE
PATTERN PER 7-11B.



NOTES:

1. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B
2. FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS. WEIGHT AND LOAD SPECIFICATIONS TO BE SUBMITTED BY MANUFACTURER.
3. MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64" TOLERANCE.
4. FRAME AND COVER SHALL HAVE A COATING OF BITUMINOUS MATERIAL.
5. EQUIVALENT DUCTILE IRON FRAME AND COVERS MAY BE USED. SEE 7-11A.
6. LOCKING COVER TYPE FRAME AND COVERS SHALL BE USED IN EASEMENT AREAS UNLESS OTHERWISE APPROVED.
7. THE OPENING, WITHOUT BEING EXCESSIVELY LARGE, MUST BE OF SUFFICIENT SIZE AS TO READILY ALLOW A 1/4" O.D. FLEX-TUBE TO PASS THROUGH THE LID.

ITEM	APPROX. WT. (LBS)
COVER	130 ± 5

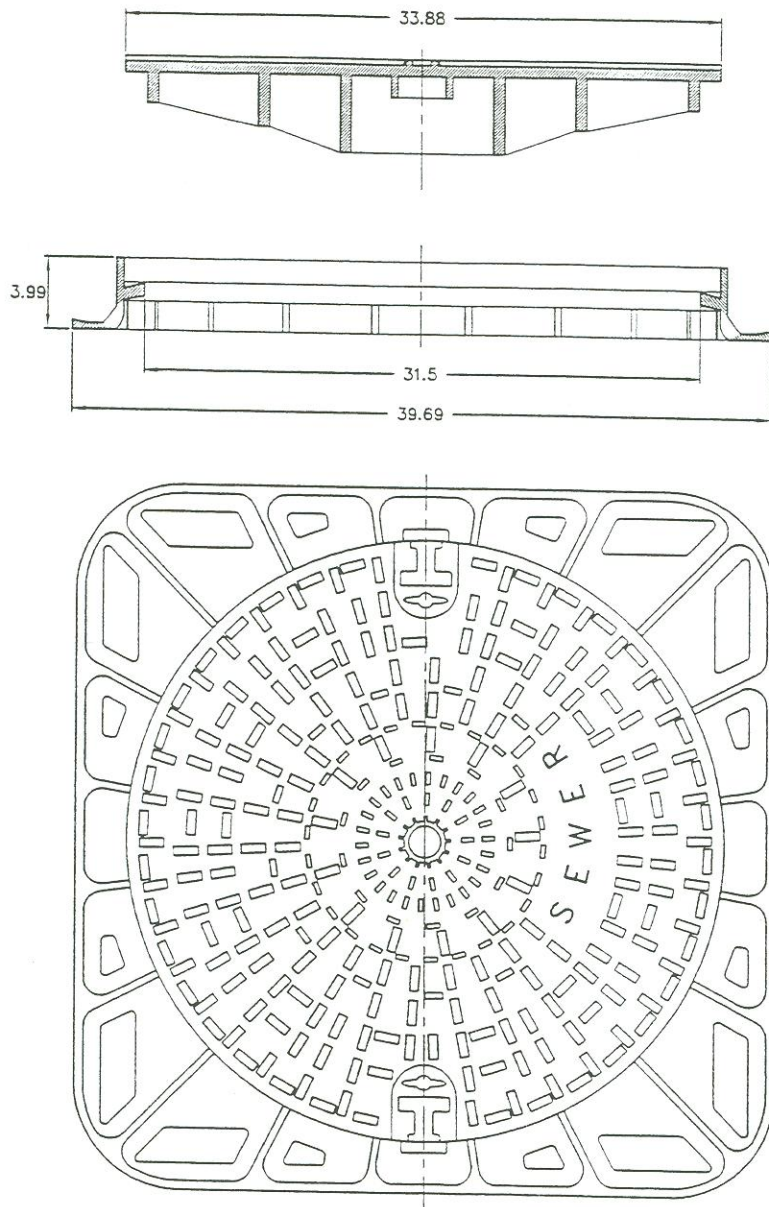
COUNTY SANITATION
DISTRICT 1

**GREY IRON
STANDARD MANHOLE
FRAME & COVER**

DRAWN BY: RAS
SCALE: NONE
DATE: 01/01

7-11

DIRECTOR



DUCTILE IRON CASTINGS

1. Manhole frame and cover shall be manufactured using spheroidal or nodular graphite iron (ductile iron) complying with the requirements specified in ASTM A536-80.
2. All castings shall meet or exceed the H-20 load requirement.
3. All castings will be supplied with a coating of bituminous material and be free from cracks, holes, foreign inclusions, scale, lumps, blisters, sandholes, and other injurious defects.
4. Two anti-theft locking keys shall be installed. The bolts shall be stainless steel with a pentagon head design measuring 7/8" point to flat.
5. The frame and cover shall be Model PARIS-S Class D 400 manufactured by PAM/LBI, Long Beach, California, 800 628-1093 or equal.
6. Lifting key shall be supplied. Model reference RE 80 R 8L, Mass 1.54 lbs.

Robert Shaw
DIRECTOR

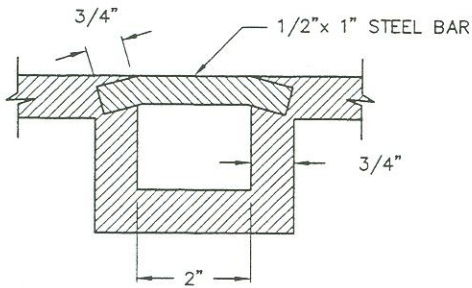
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

DUCTILE IRON
FRAME & COVER

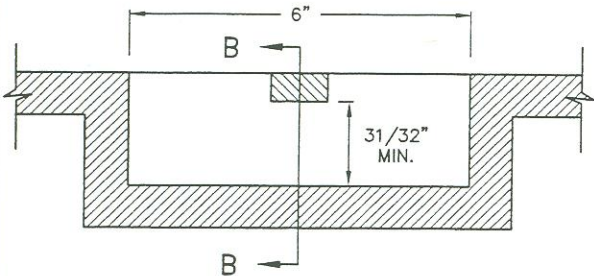
DRAWN BY: DAH
SCALE: NONE
DATE: 3/98

7-12A

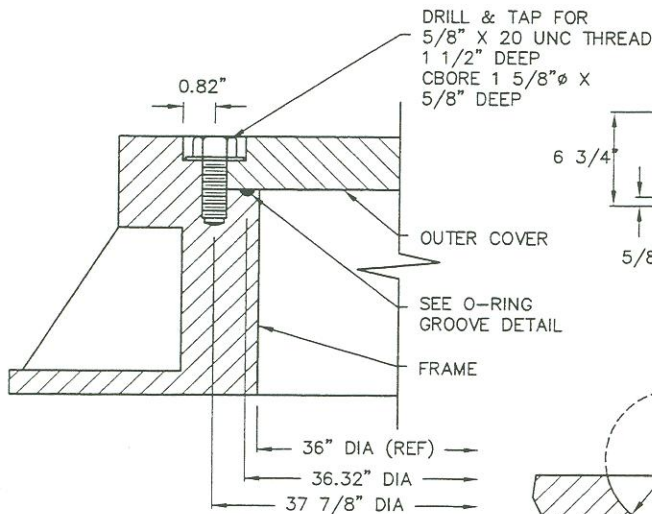
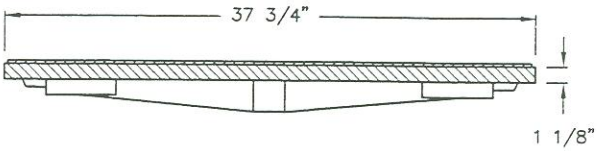
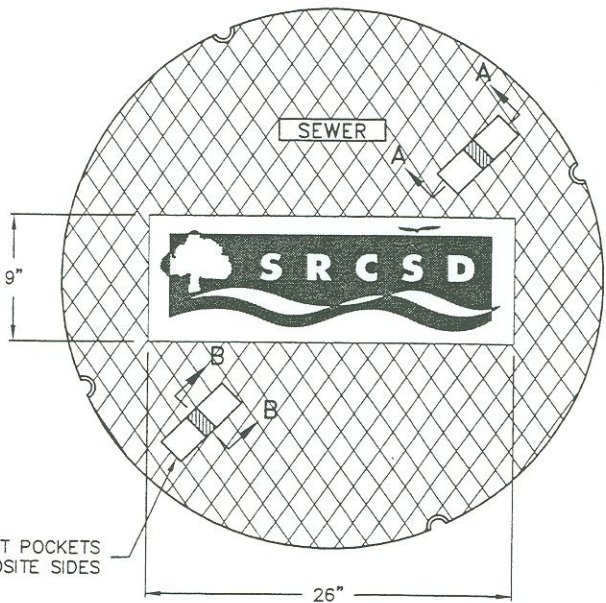
SUPPLIERS TO SUBMIT SAMPLE FOR APPROVAL. THE LETTERS AND IMAGE TO BE SHARP AND CLEAR. THE TREE, SEAGULLS, RIBBON AND LETTERS TO BE THE SAME ELEVATION AND THE CROSS-HATCHED SURFACE AREA WITH THE BACKGROUND RECESSED 1/8" TO 5/16".



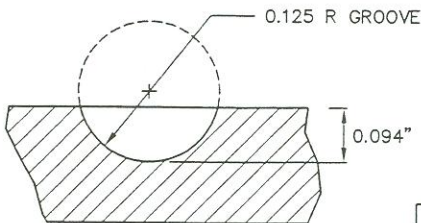
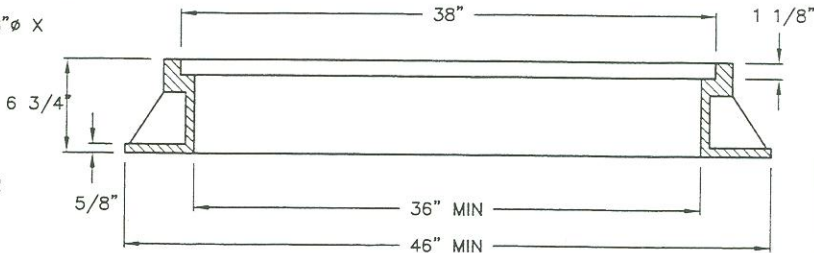
SECTION B-B



SECTION A-A



BOLT DOWN COVER DETAIL



O-RING GROOVE DETAIL

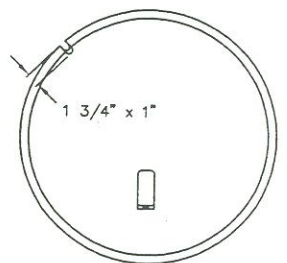
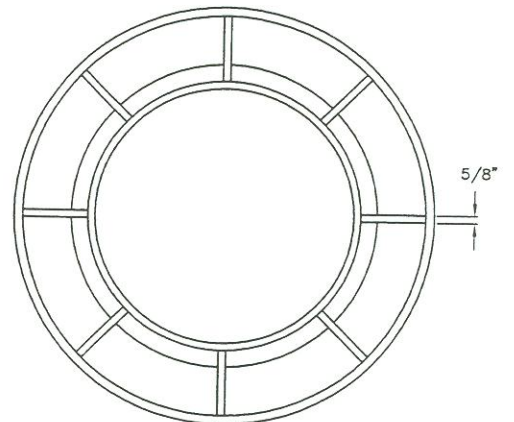
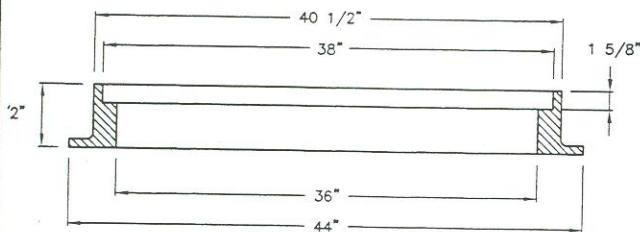
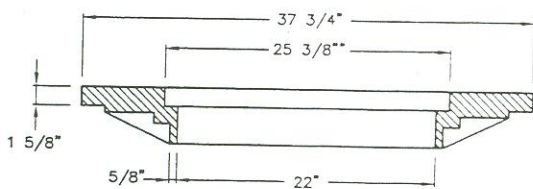
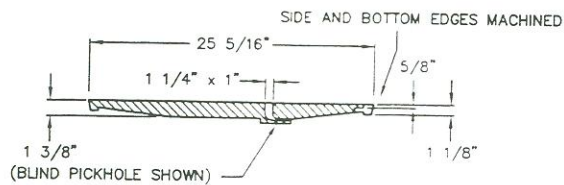
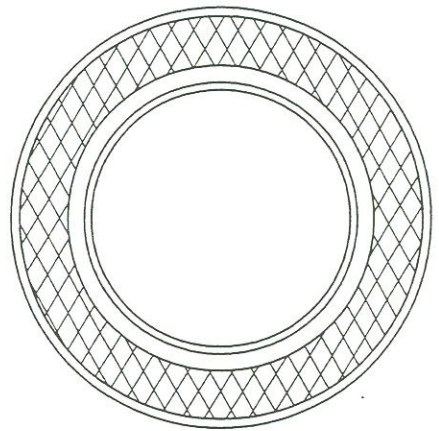
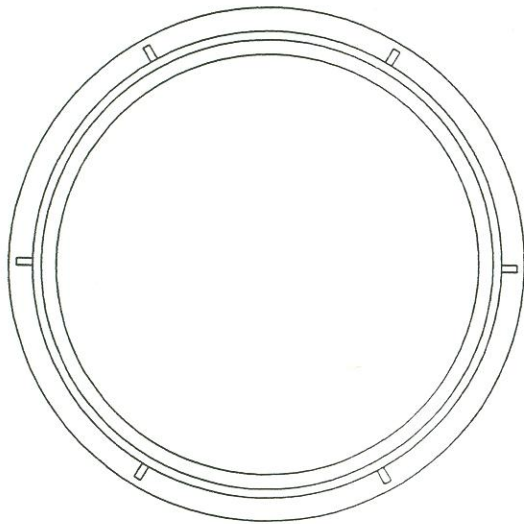
NOTES:

1. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
2. FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS.
3. MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64" TOLERANCE.
4. FRAME AND COVER SHALL HAVE A COATING OF BITUMINOUS MATERIAL.
5. EQUIVALENT DUCTILE IRON FRAME AND COVERS MAY BE USED ONLY WHEN SPECIFIED, SEE 7-12A.
6. 5/8" x 20 UNC THREAD, 316 STAINLESS STEEL SOCKET HEAD CAP SCREW AND 1 1/2" O.D. X 1 1/16" I.D. X 0.078 THICK 316 STAINLESS STEEL WASHER OR APPROVED EQUAL.
7. 1/4" NEOPRENE O-RING GASKET SHALL BE GLUED INTO MACHINED GROOVE. GLUE SHALL MEET THE REQUIREMENTS OF MIL-M-81288 (AMEND. 1)

Robert J. Shank
DIRECTOR

ITEM	APPROX. WT. (LBS)
FRAME	310 ± 5%
COVER	310 ± 5%

SACRAMENTO REGIONAL COUNTY SANITATION DISTRICT	
GREY IRON STANDARD 36" FRAME & COVER	
DRAWN BY: RAS SCALE: NONE DATE: 04/03	7-12B



NOTES:

1. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
2. FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS.
3. MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64" TOLERANCE.
4. FRAME AND COVER SHALL HAVE A COATING OF BITUMINOUS MATERIAL.

Robert A. Shaul

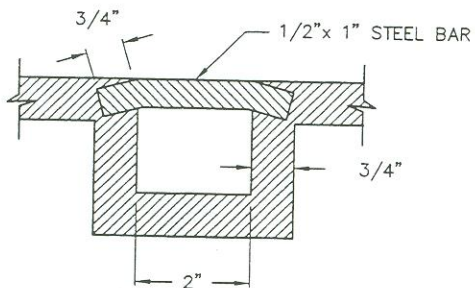
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

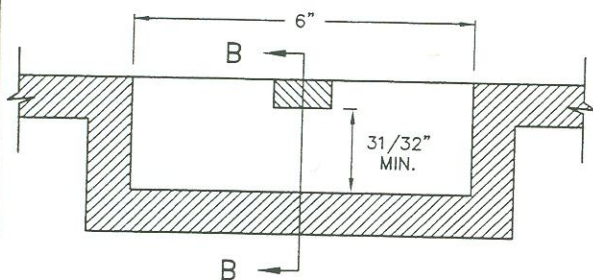
GREY IRON 36"
2 - PIECE FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 04/03

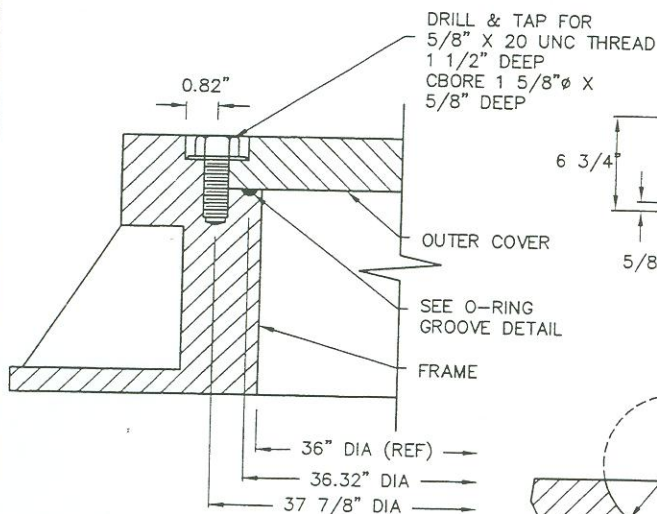
7-12C



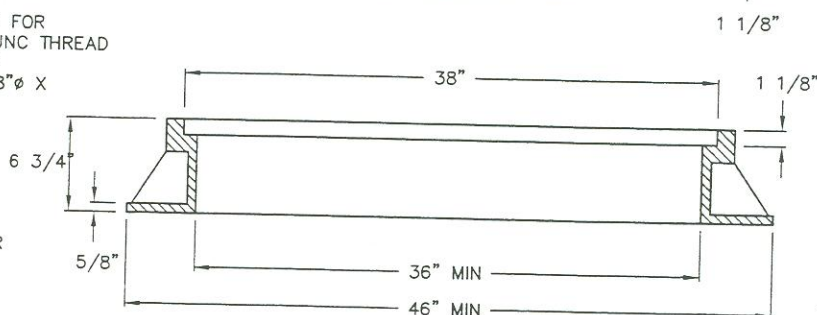
SECTION B-B



SECTION A-A

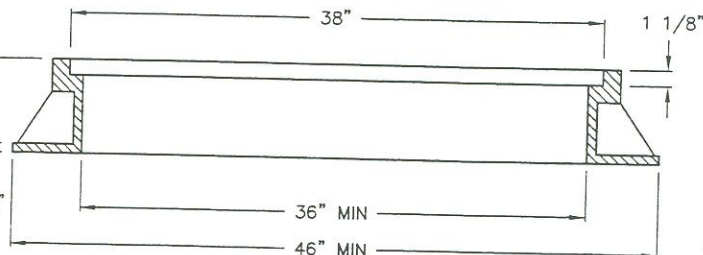
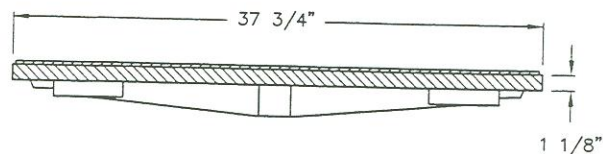
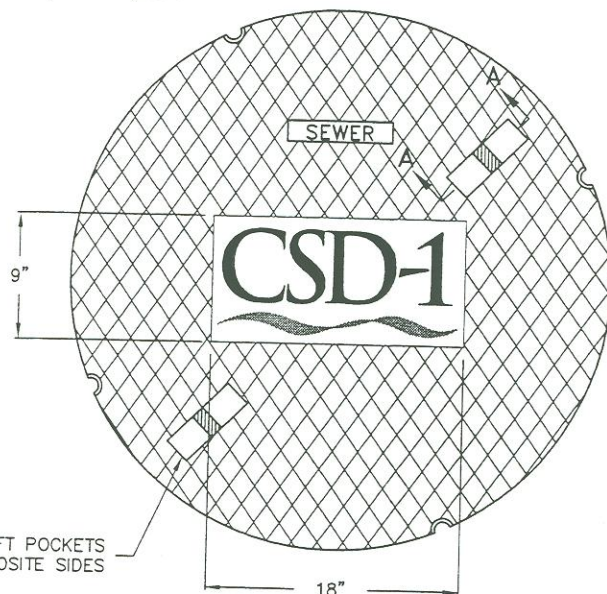


BOLT DOWN COVER DETAIL



O-RING GROOVE DETAIL

SUPPLIERS TO SUBMIT SAMPLE FOR APPROVAL. LETTERS AND RIBBON TO BE SHARP AND CLEAR AND BE THE SAME ELEVATION AS THE CROSS-HATCHED SURFACE AREA WITH THE BACKGROUND RECESSED 1/8\"/>



NOTES:

- ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
- FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS.
- MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64\"/>
- FRAME AND COVER SHALL HAVE A COATING OF BITUMINOUS MATERIAL.
- EQUIVALENT DUCTILE IRON FRAME AND COVERS MAY BE USED ONLY WHEN SPECIFIED, SEE 7-12A.
- 5/8\"/>
- 1/4\"/>

Robert J. Shew
DIRECTOR

ITEM APPROX. WT. (LBS)

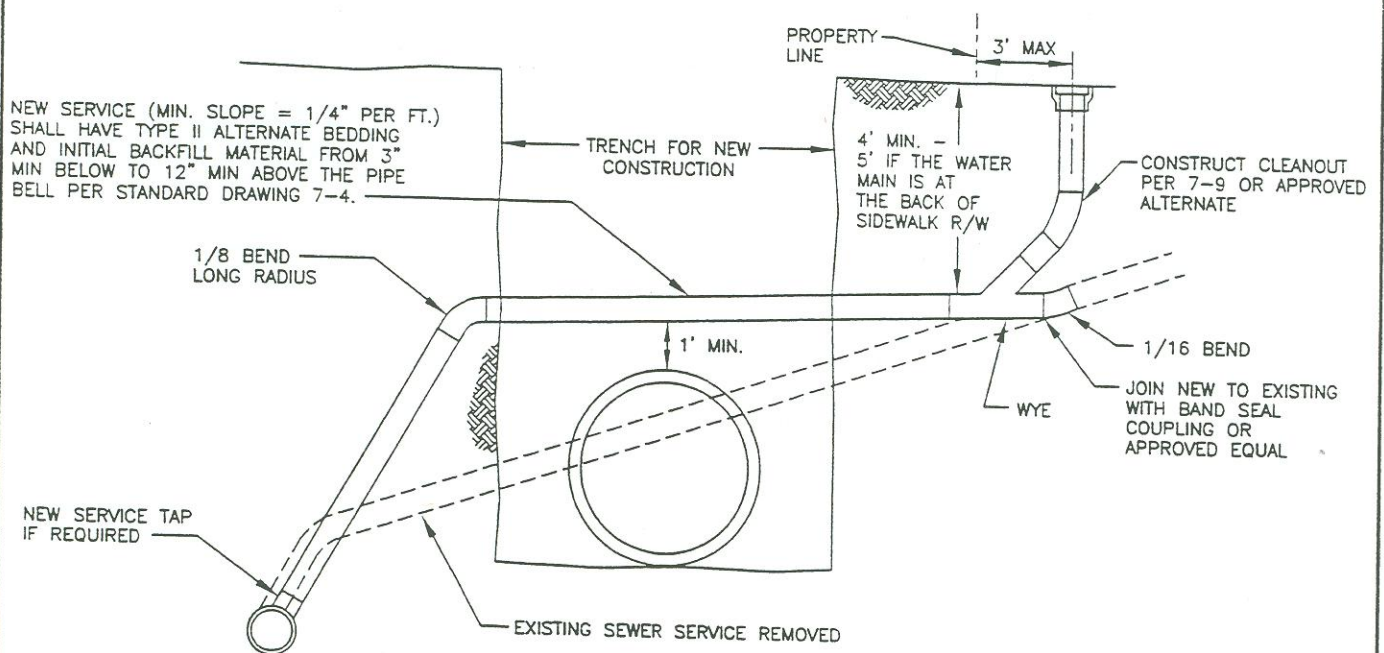
FRAME	310 ± 5%
COVER	310 ± 5%

COUNTY SANITATION
DISTRICT 1

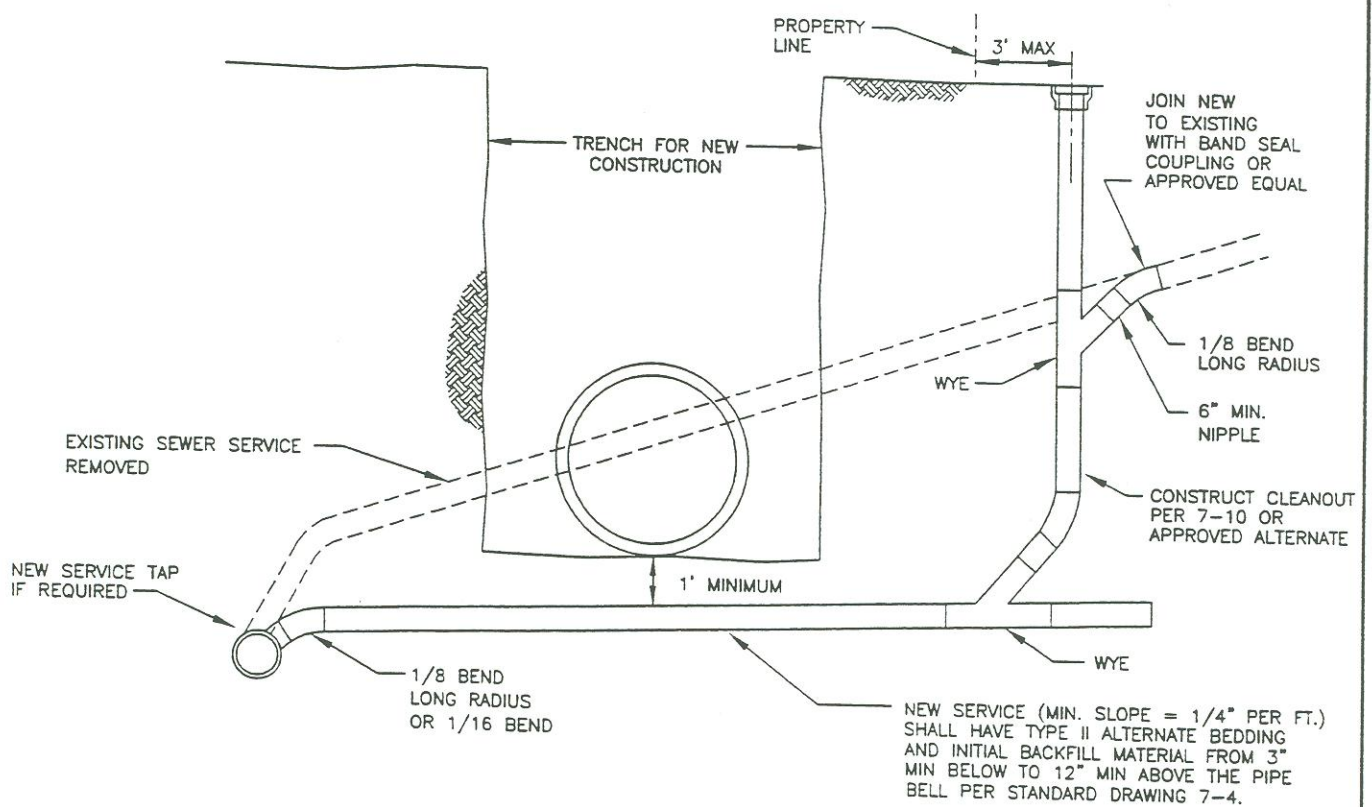
GREY IRON
STANDARD 36\"/>

DRAWN BY: RAS
SCALE: NONE
DATE: 04/03

7-12



SEWER SERVICE RELOCATION OPTION OVER NEW CONSTRUCTION



SEWER SERVICE RELOCATION OPTION UNDER NEW CONSTRUCTION

NOTE:

IF NEITHER OF THESE OPTIONS IS AVAILABLE, THE ELEVATION OF THE NEW FACILITY WILL NEED TO BE ADJUSTED TO ACCOMMODATE ONE OF THESE OPTIONS.

Robert H. Smith
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

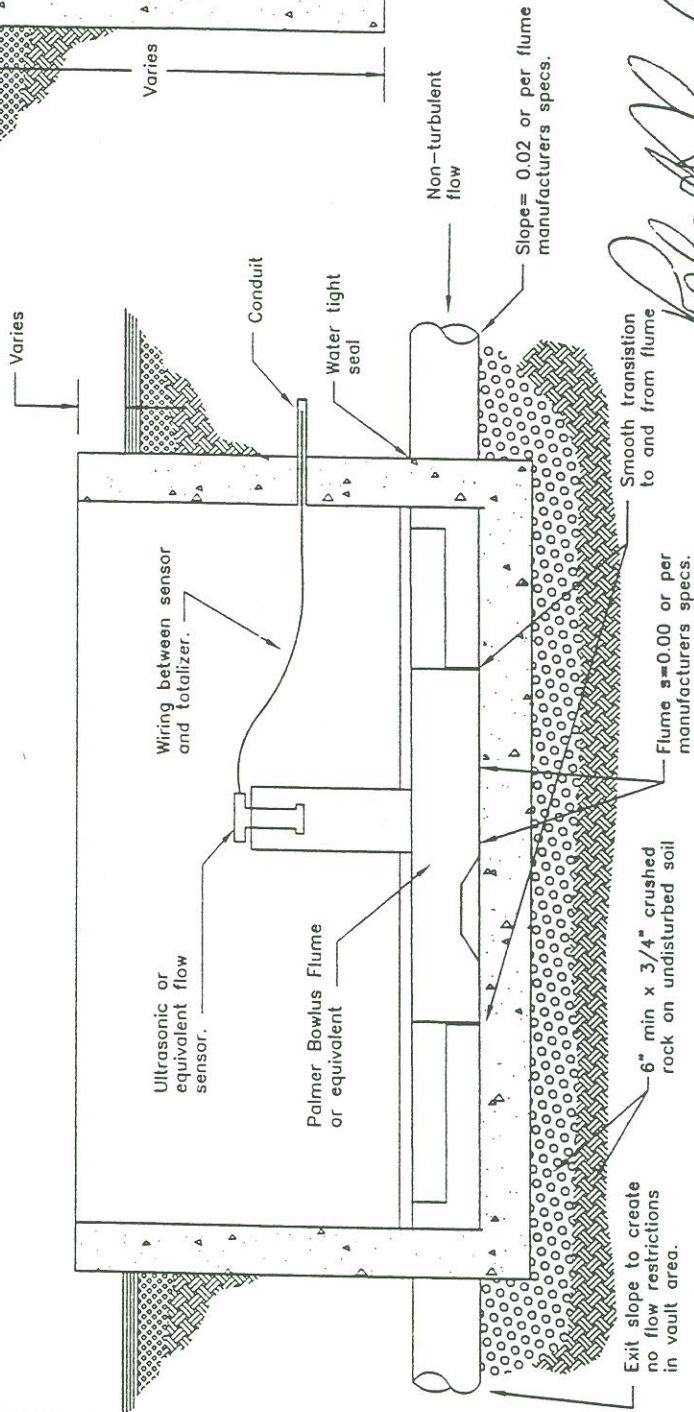
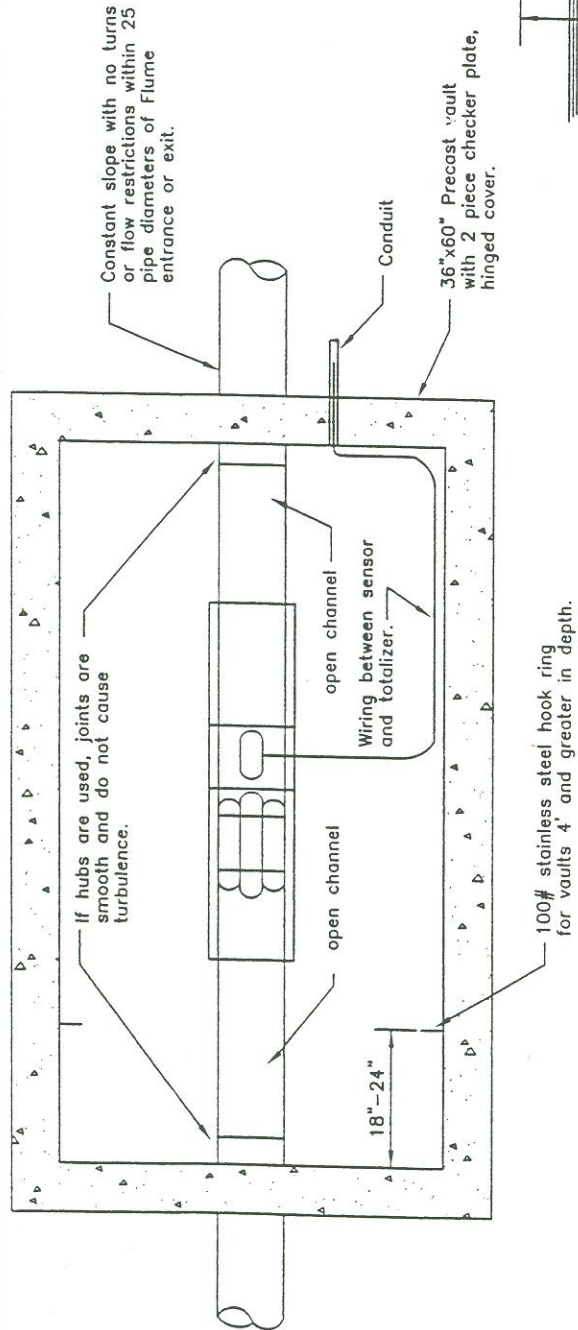
SEWER SERVICE
REPLACEMENT

DRAWN BY: DAH
SCALE: NONE
DATE: 4/97

7-13

Notes:

1. Locate vault as close as practical to the source structure. If located in a parking lot, the vault is to be protected from traffic with steel posts or installed flush with traffic rated H-20 or better lid marked "No Parking".
2. Vault size to be increased for 10" and above pipes.
3. If flow paced sampling, a cable for District use (to also do flow paced sampling) shall be provided. Connectors should be protected from environment if necessary (caps for preventing corrosion).
4. Installation inspection shall be performed by Water Quality Industrial Waste Section.



SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

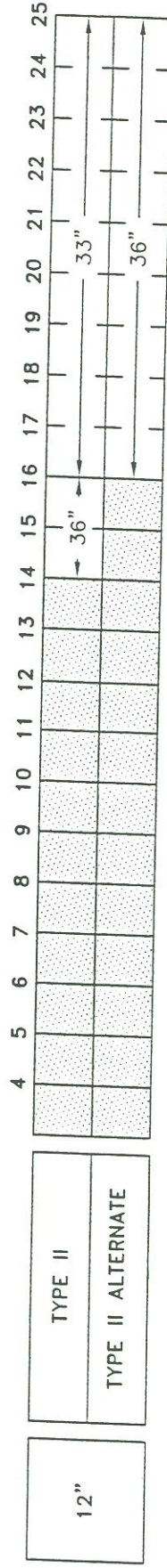
SAMPLING VAULT

DRAWN BY: DAH
SCALE: NONE
DATE: 7/87

DIRECTOR

7-14

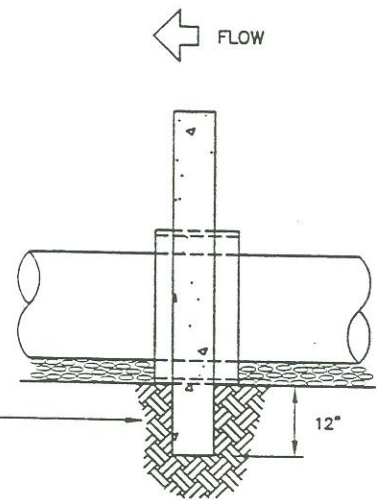
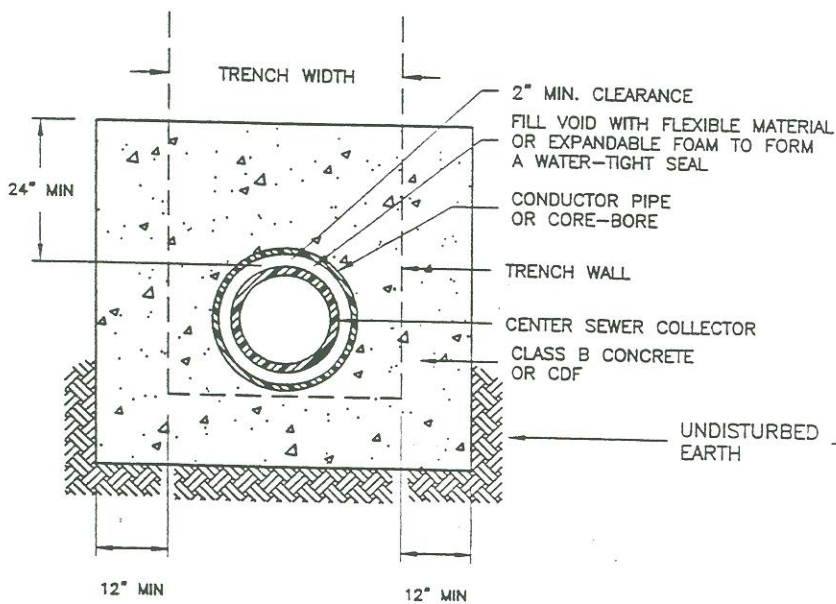
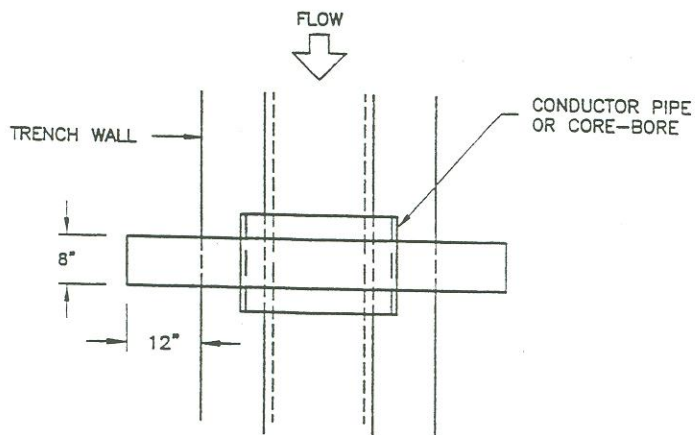
SIZE



Maximum trench width measured at the top of the pipe.

Calculations based in soil WT. = 120 lb/ft³
saturated clay (K_u ' = 0.110)

7-15



NOTES:

1. TOP OF DAM TO EXTEND INTO INTERMEDIATE BACKFILL 12" MINIMUM OR TOP OF GROUND WATER HGL.

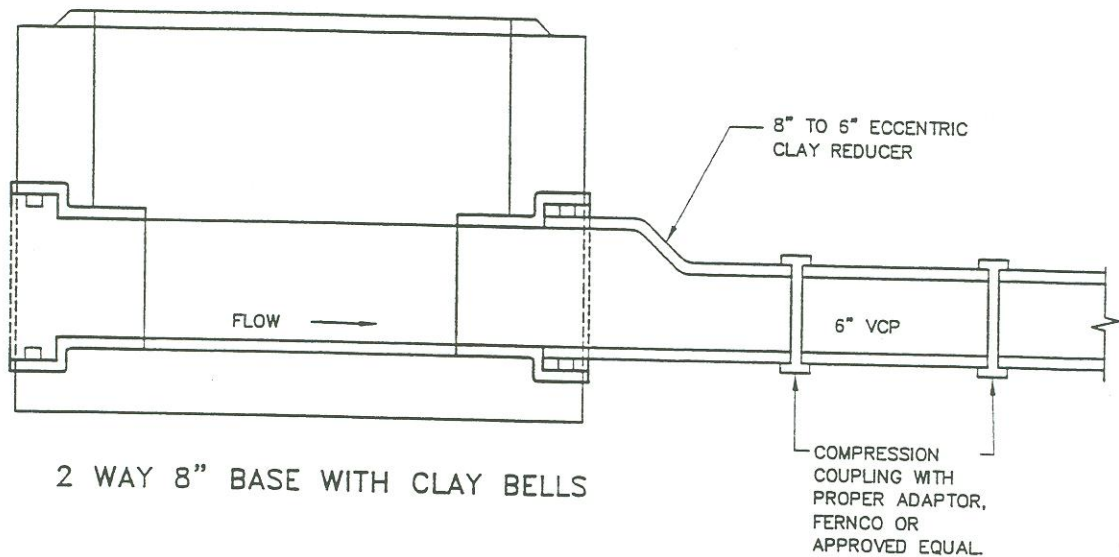
Robert Shank
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**CONCRETE DAM
DETAIL**

DRAWN BY: DAH
SCALE: NONE
DATE: 01/01

7-16



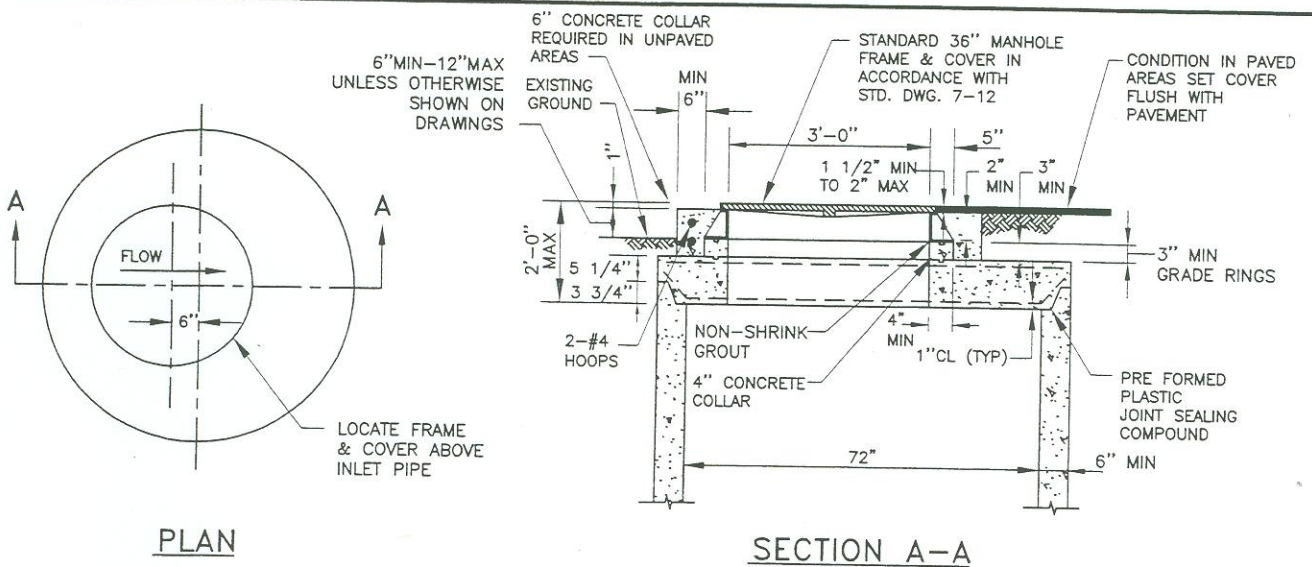
Robert Shaw
 DIRECTOR

SACRAMENTO COUNTY
 PUBLIC WORKS AGENCY

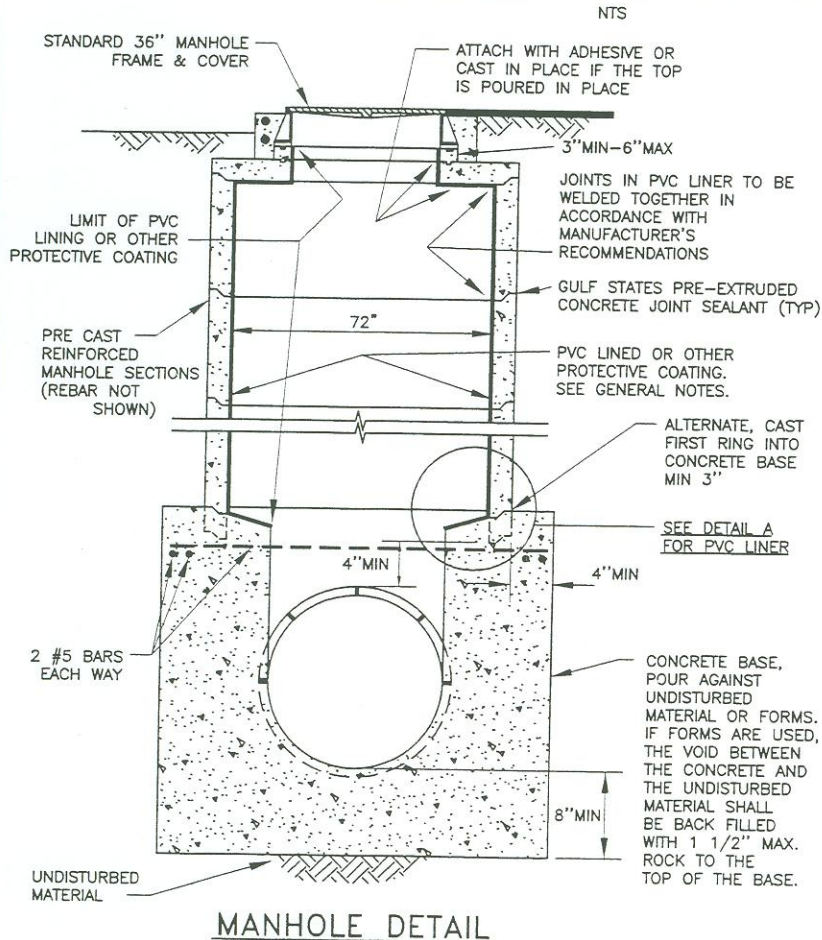
MANHOLE
 CONNECTION

DRAWN BY: RAS
 SCALE: NONE
 DATE: 01/01

7-17



STANDARD SLAB TOP DETAILS



NOTES:

1. PROTECTIVE COATING SHALL BE (a) CCS COATING, HIGH CHEMICAL RESISTANCE EPOXY COATING BY CHEM CO SYSTEMS OF REDWOOD CITY, CA. MULTIPLE LAYER SPRAY APPLIED TO A MINIMUM FINISHED THICKNESS OF NOT LESS THAN 40 MILS. (b) RAVEN 405 EPOXY MORTAR MULTI LAYERED SPRAY APPLIED TO A MINIMUM THICKNESS OF NOT LESS THAN 60 MILS. (c) OR APPROVED EQUAL.
2. BOTH PVC LINING AND PROTECTIVE COATINGS SHALL BE SPARK TESTED FOR INTEGRITY AFTER INSTALLATION.
3. PROTECTIVE COATING SHALL BE APPLIED TO MANHOLE SHELVES, UNDERSIDE OF COVER SLAB, INSIDE OF GRADE RINGS AND ALL OTHER PLACES WHERE PVC IS SHOWN ON MANHOLE DETAIL.
4. PROTECTIVE COATING AND PVC LINER SHALL BE WHITE IN COLOR.
5. SLAB TOP TO MEET H-20 LOAD SPECIFICATIONS. WEIGHT AND LOAD SPECIFICATIONS TO BE SUBMITTED BY MANUFACTURER.

INSTALLATION REQUIREMENTS FOR PVC SHELF LINER:

1. 30 mil PVC SHELF LINER SHALL BE PRECUT AND PREPARED ABOVE GROUND PRIOR TO INSTALLATION WITH SAND EMBEDDED NON-SKID SURFACE $1" \pm$ IN FROM EDGE, ACCORDING TO PVC SHEETING MANUFACTURERS RECOMMENDATION.
2. COAT CLEAN AND DRY CONCRETE SURFACE OF M/H SHELVES w/LINABOND PRIMER EP30 AND LINABOND POLYURETHANE MASTIC TO A MIN. THICKNESS OF 125 mil. ALSO COAT CONTACT SIDE OF THE PRECUT PVC SHEETING WITH LINABOND CLA -1 ACTIVATOR ALL AS MANUFACTURED BY ALLIED COATINGS CO. OF HOLLYWOOD, CA OR EQUAL (SUBMITTAL WILL BE REQUIRED)
3. ALL MATERIALS SHALL BE APPLIED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

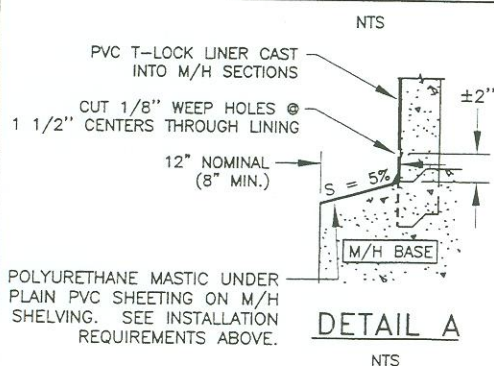
Robert D. Smith
DIRECTOR

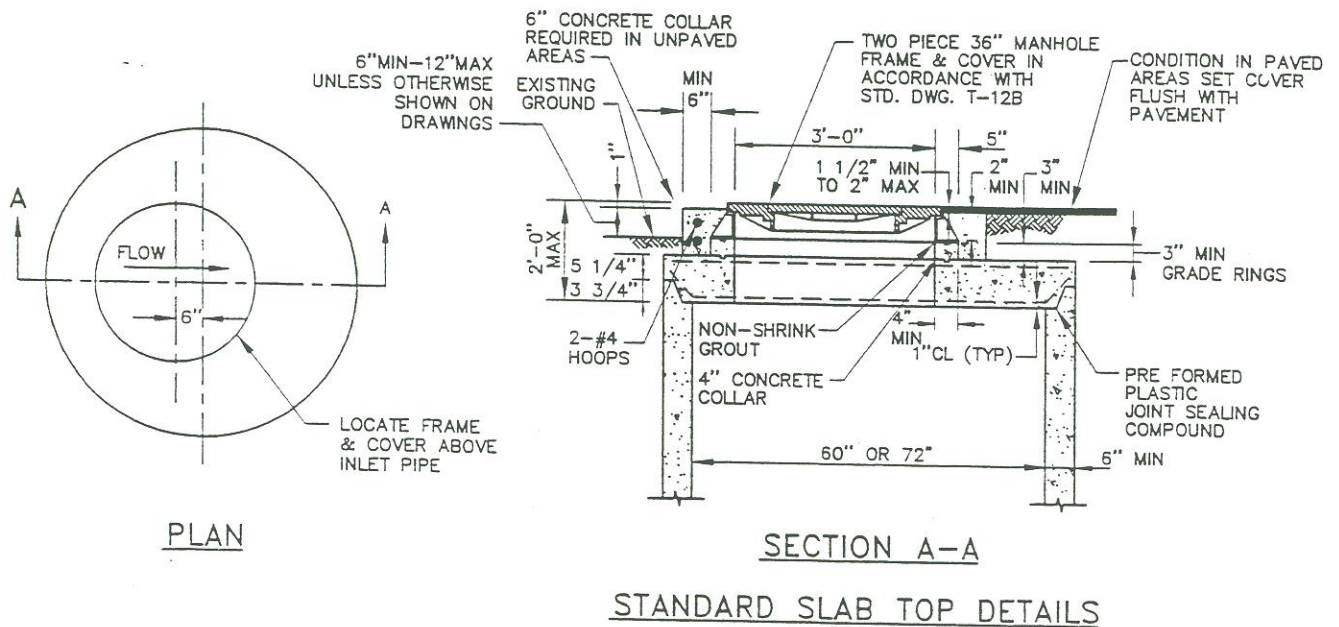
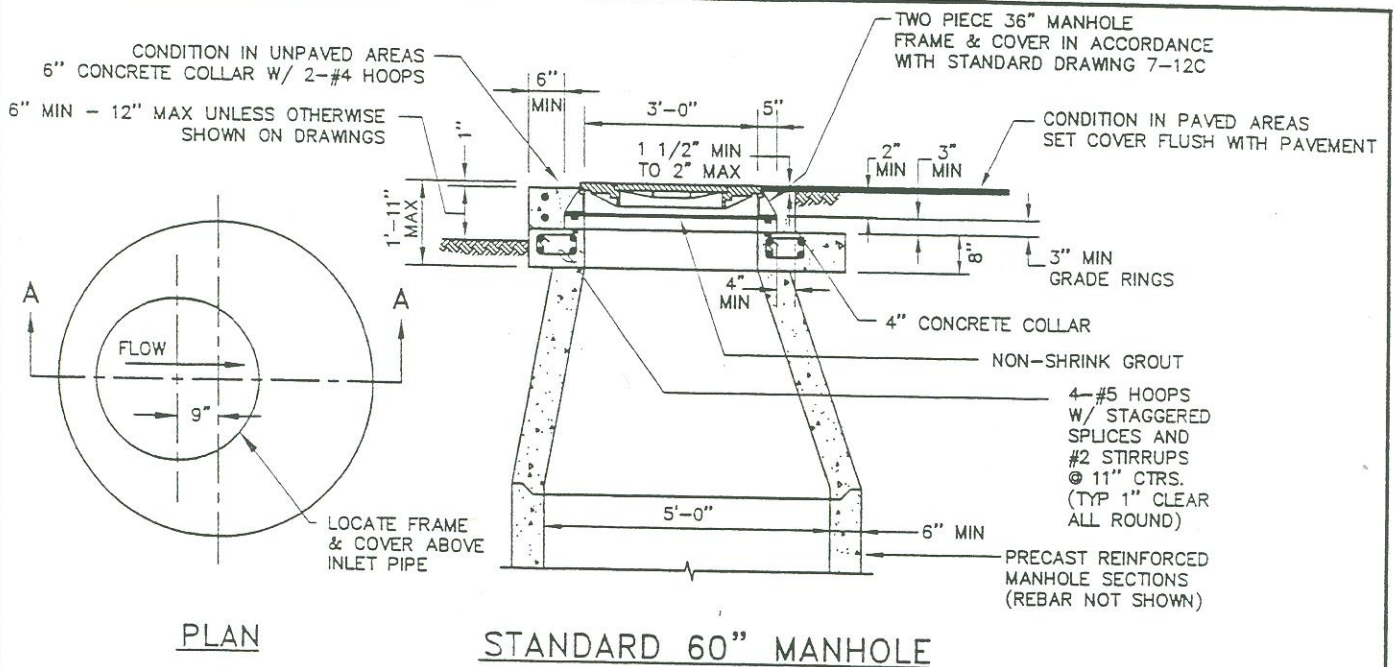
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**STANDARD
72" SEWER MANHOLE
(TYPE B)**

DRAWN BY: RAS
SCALE: NONE
DATE: 04/03

7-2D





NTS

NOTES:

1. JOINTS FOR THE BARREL SECTION SHALL BE TONGUE AND GROOVE. ALL JOINTS MUST BE SEALED WITH GULF STATES PRE-EXTRUDED CONCRETE JOINT SEALANT.
2. FOR ASPHALTIC CONCRETE OVERLAYS ONLY, MANHOLES WITH DEPTHS OF 8' AND GREATER (MEASURED FROM THE FLOW LINE TO THE TOP OF CASING) THE MAXIMUM THROAT DEPTH IS 24 INCHES.
3. ALL MANHOLE SECTIONS TO BE FITTED WITH EXTERNAL LIFTING PINS, NO THROUGH PENETRATION HOLES ALLOWED.
4. VACUUM TESTING PER ASTM C 1244-93 IS REQUIRED WITH THE ADDITION OF THE FOLLOWING CONSTRAINT: A MINIMUM OF 9 INCHES OF MERCURY SHALL BE HELD FOR A MINIMUM TIME OF ONE MINUTE.

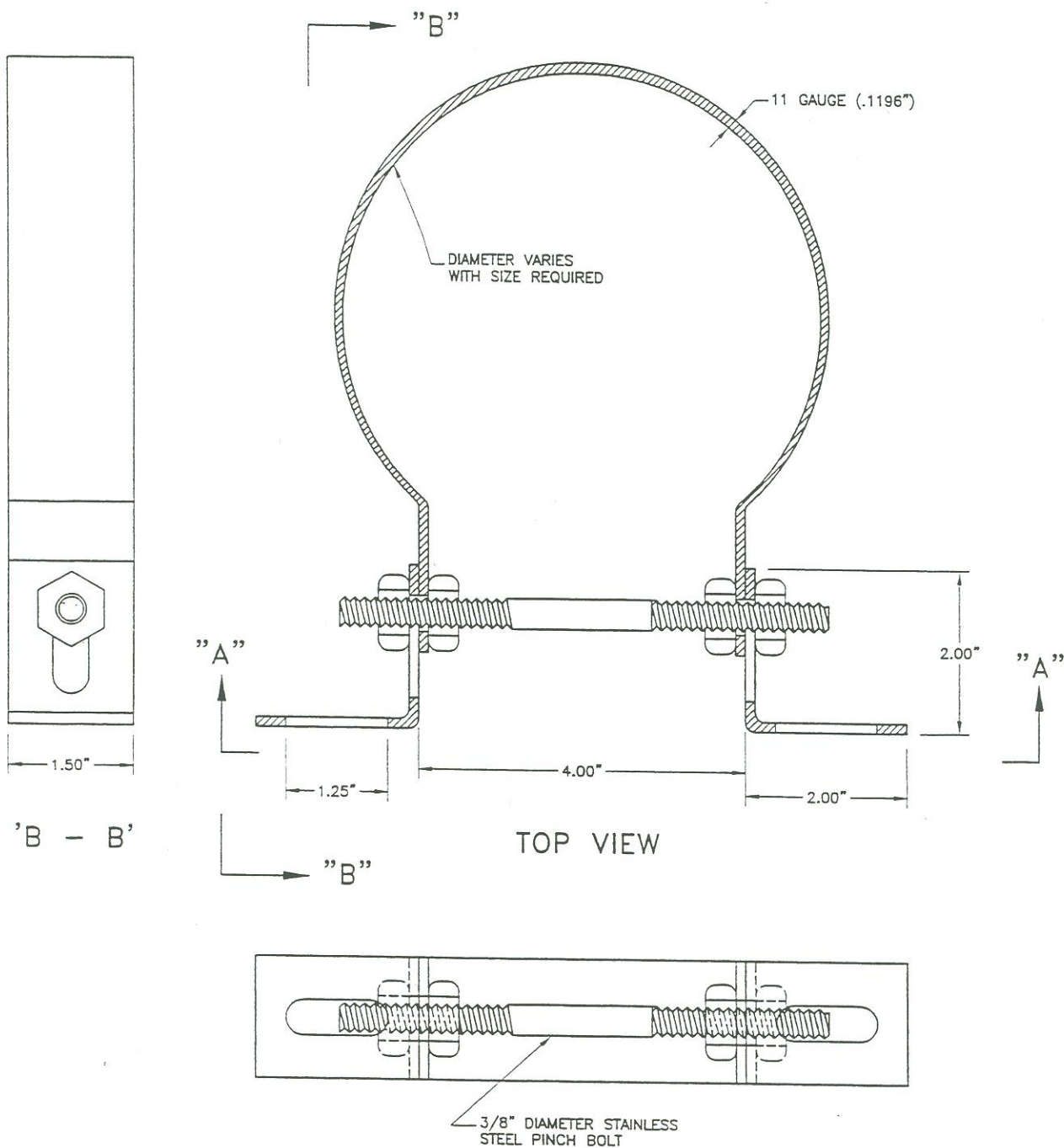
Robert Shank
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

FLOW MEASURING
MANHOLE

DRAWN BY: RAS
SCALE: NONE
DATE: 01/01

7-2E



STAINLESS STEEL ADJUSTABLE CLAMPING
BRACKET AS MANUFACTURED BY:
RELINER-DURAN, INC.
53 MT. ARCHER ROAD
LYME, CT. 06371
(860)434-0277 FAX:(860)434-3195
OR APPROVED EQUAL.

SPECIFICATIONS:

1. CLAMP AND BRACKETS IS TYPE 304 STAINLESS STEEL, 11 GAUGE (.1196").
2. 3/8" ϕ PINCH BOLT AND NUTS IS TYPE 18-8 STAINLESS STEEL
3. STANDARD SIZES TO FIT 6", 8" & 10" PVC SEWER PIPE SDR-26 AND 4" ABS.

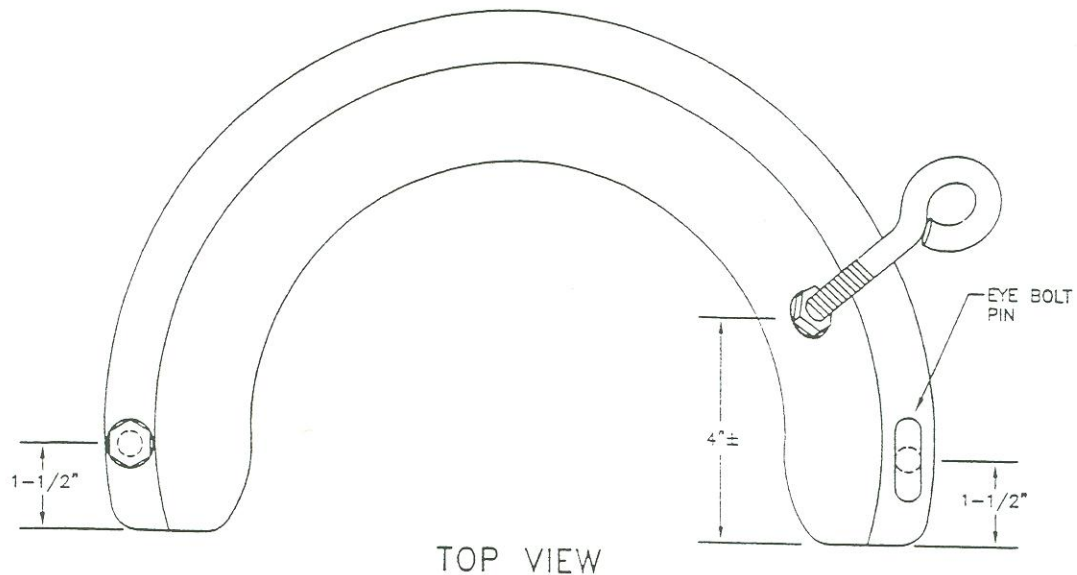
Robert Shum
DISTRICT ENGINEER

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

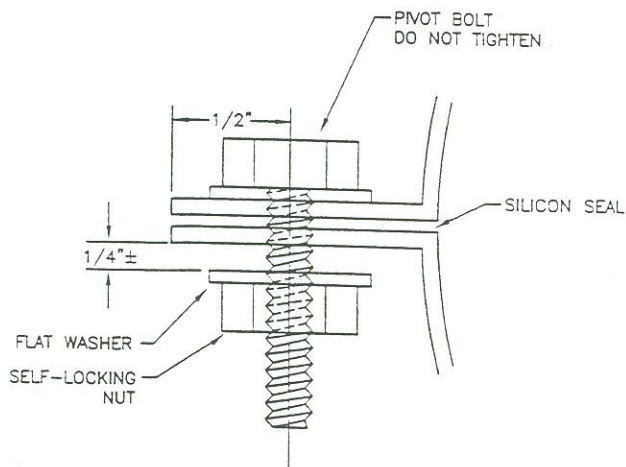
**STAINLESS STEEL
ADJUSTABLE
CLAMPING BRACKETS**

DRAWN BY: RAS
SCALE: NONE
DATE: 03/01

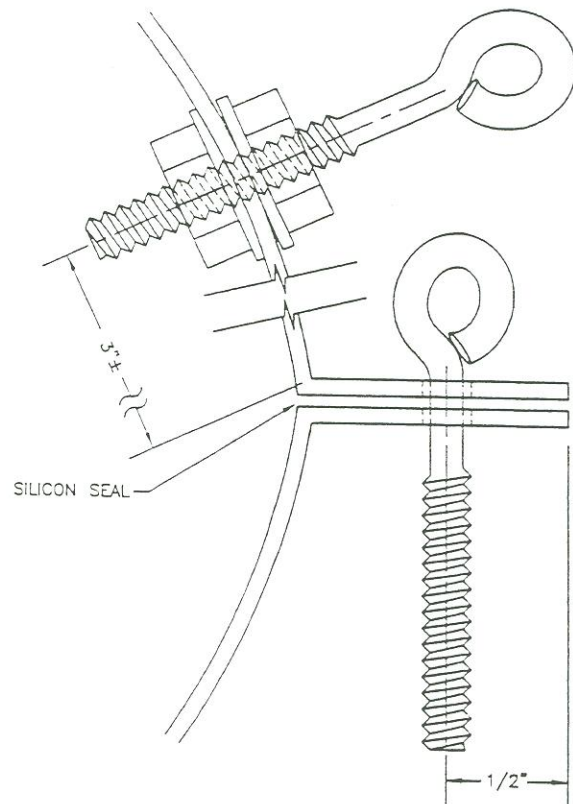
7-3A



TOP VIEW



PIVOT BOLT DETAIL



EYE BOLT PIN DETAIL

NOTES:

1. ALL FORCE LINE HOODS SHALL BE AS PRODUCED BY RELINER-DURAN, INC.
53 MT. ARCHER RD.
LYME, CT 06371
(860)434-0277 FAX:(860)434-3195 OR APPROVED EQUAL
2. SILICON SEAL THE FORCE LINE HOOD TO MODELS "A-4" & "A-6" WHEN THE INCOMING LINE IS FROM A FORCE MAIN OR THE SLOPE IS $S=0.03$ AND GREATER OR WHEN INCOMING FLOWS CANNOT BE FULLY CONTAINED.
3. ATTACHING BOLTS, APPROPRIATE SIZE SELF LOCKING NUTS AND FLAT WASHERS SHALL BE TYPE 304 STAINLESS STEEL REGULAR THREAD AND HAVE THE FOLLOWING DIMENSIONS:
EYE BOLTS SHALL BE $3/8" \times 5"$
PIVOT BOLT SHALL BE $3/8" \times 1 \frac{1}{2}"$

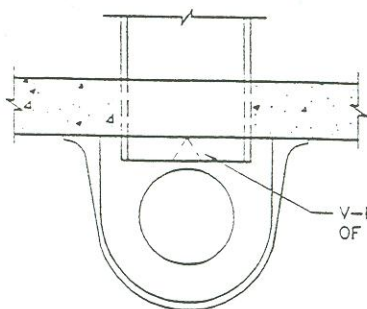
Robert Shum
DISTRICT ENGINEER

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

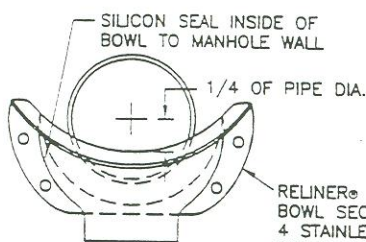
FORCE LINE HOOD
ATTACHMENT
DETAILS

DRAWN BY: RAS
SCALE: NONE
DATE: 03/01

7-3B



DROP BOWL
MOUNTING POSITION
TOP VIEW



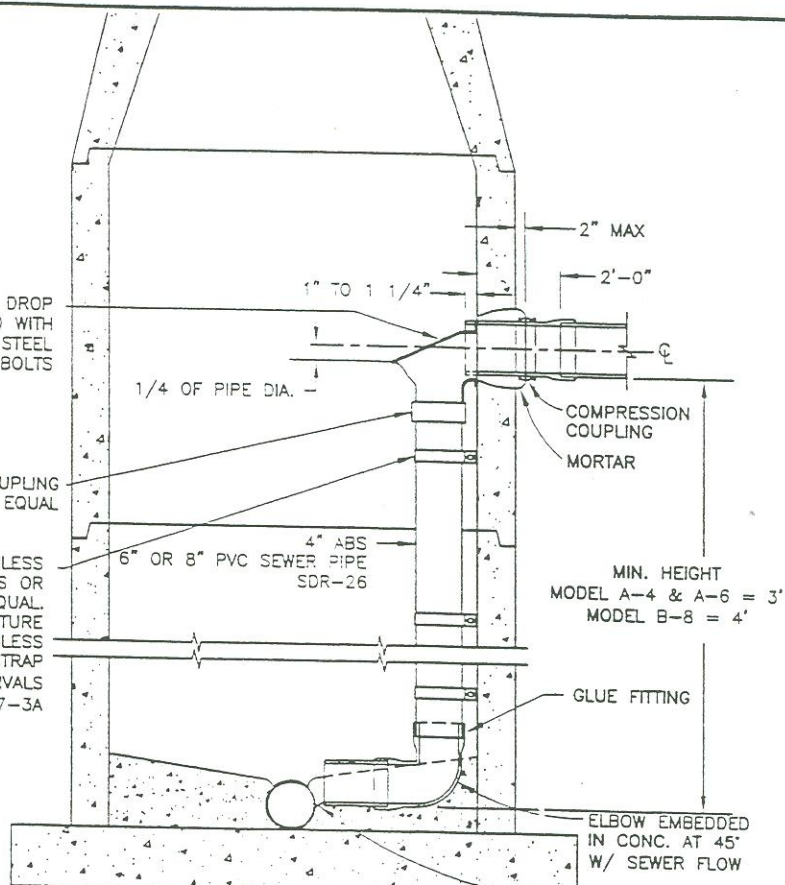
DROP BOWL
MOUNTING POSITION
FRONT VIEW

RELINER® INSIDE DROP
BOWL SECURED WITH
4 STAINLESS STEEL
BOLTS

CI/PVC CAULDER COUPLING
OR APPROVED EQUAL

RELINER® STAINLESS
STEEL STRAPS OR
APPROVED EQUAL
SECURE TO STRUCTURE
WITH 2 STAINLESS
STEEL BOLTS. STRAP
AT 4' INTERVALS
(MIN. OF 2) SEE 7-3A

RELINER® INSIDE DROP
BOWL SECURED WITH
4 STAINLESS STEEL
BOLTS



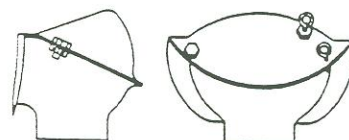
INSIDE DROP CONNECTION

MIN. HEIGHT
MODEL A-4 & A-6 = 3'
MODEL B-8 = 4'

DROP CONNECTION
PIPE INVERT SHALL
MATCH THE
SPRING- LINE OF
THE EXIT PIPE.

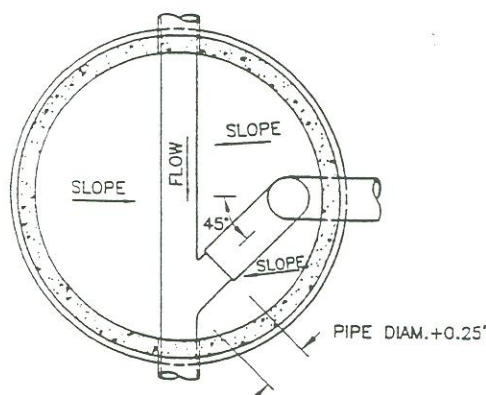
NOTES:

- ALL INSIDE DROP CONNECTIONS FOR SERVICES AND COLLECTOR SEWERS SHALL USE THE DROP BOWL AS PRODUCED BY:
RELINER-DURAN, INC.
53 MT. ARCHER RD.
LYME, CT 06371
(860)434-0277 FAX: (860)434-3195 OR APPROVED EQUAL.
- DROP BOWL MODEL "A-4" SHALL BE USED FOR ALL LINES UP THROUGH FULL 6" INLETS. DROP BOWL MODEL "A-6" SHALL BE USED FOR ALL 8" INLETS. DROP BOWLS MODEL "B-8" SHALL BE USED FOR ALL 10" INLETS. LINES LARGER THAN 10" SHALL BE AS DIRECTED BY THE DIRECTOR.
- THE FORCE LINE HOOD SHALL BE ATTACHED ON MODELS "A-4" & "A-6" WHEN THE INCOMING LINE IS FROM A FORCE MAIN OR THE SLOPE IS $S=0.03$ AND GREATER OR WHEN INCOMING FLOWS CANNOT BE FULLY CONTAINED. SEE PLAT 7-3B FOR ATTACHMENT DETAILS.
- SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS OR APPROVED EQUAL (SEE DETAIL 7-3A).
- ATTACH THE DROP BOWL & EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH $3/8" \times 3 3/4"$ RAMSET/RED HEAD BOLTS. PRE-ROTO DRILL AND SET BOLTS IN PLACE WITH EPOXY PASTE. EPOXY SHALL MEET THE FOLLOWING REQUIREMENTS:
 - EPOXY PASTE SHALL BE A TWO COMPONENT, 100% SOLID SYSTEM. EPOXY SHALL BE SIKADUR 31 HI-MOD GEL BY SIKA CORPORATION (PHONE 592/941-0231) OR EQUAL.
 - THE EPOXY PASTE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI IN 28 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D695 AT 73 DEGREES.
 - THE EPOXY PASTE SHALL DEVELOP A MINIMUM TENSILE STRENGTH OF 3,000 PSI IN 14 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D638.
 - THE EPOXY PASTE SHALL DEVELOP A MINIMUM BOND STRENGTH OF 2,000 PSI IN 2 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM C882 (HARDENED CONCRETE TO HARDENED CONCRETE).
 - MANUFACTURER'S INSTRUCTIONS SHALL BE PRINTED ON EACH CONTAINER IN WHICH THE MATERIALS ARE PACKAGED.



FORCE LINE HOOD

SEE 7-3B FOR ATTACHMENT DETAILS



INSIDE DROP - PLAN

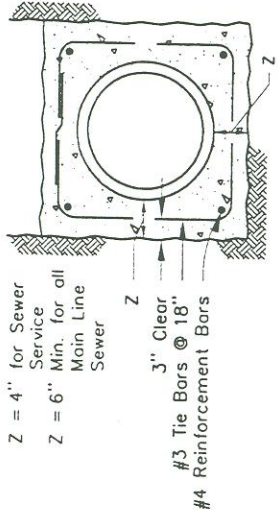
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

DROP CONNECTIONS

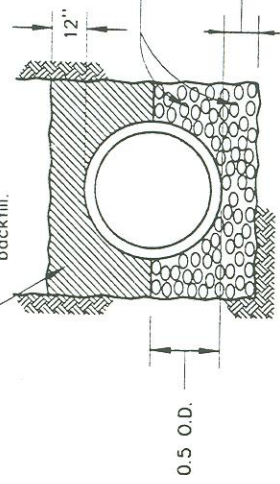
DRAWN BY: RAS
SCALE: NONE
DATE: 04/01

7-3

DISTRICT ENGINEER



Native material carefully placed; compact to 90% relative compaction. Imported bedding material may be used as alternate for initial backfill.



Bedding Factor = 1.9

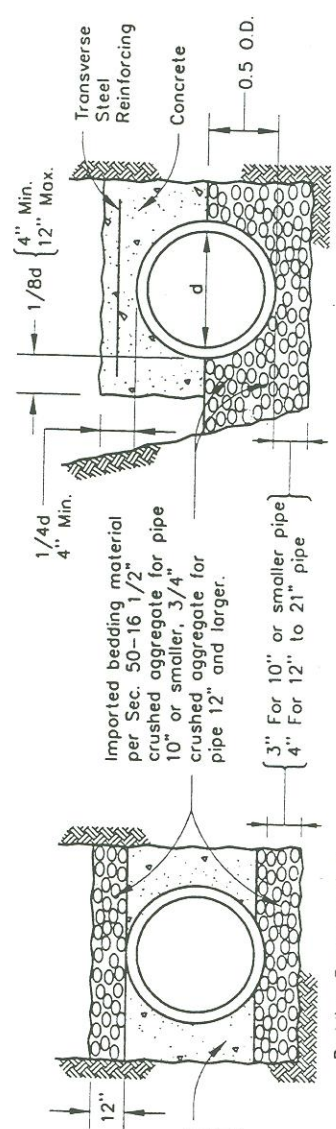
CONCRETE ENCASEMENT

TYPE II

(See Note 6)

Bedding Factor = 2.2 for 36" or less; for greater than 36" dia. field condition only (see note 3).

TYPE II ALTERNATE



Bedding Factor = 3.4
P = 0.4%

TYPE IV

(See Notes 4 & 5)

TYPE III

(See Note 4)

(Concrete must extend from pipe to the trench walls. TYPE III not allowed where soils are expansive)

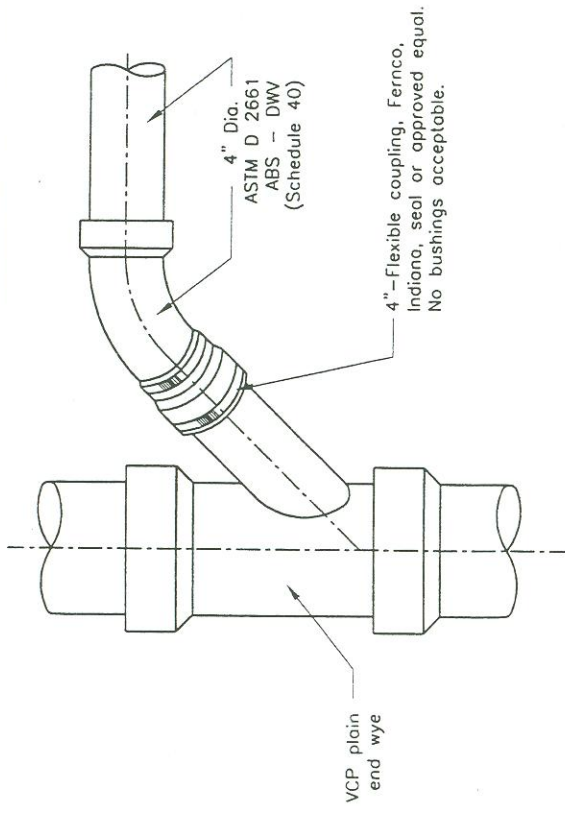
Bedding Factor = 2.7

NOTES:

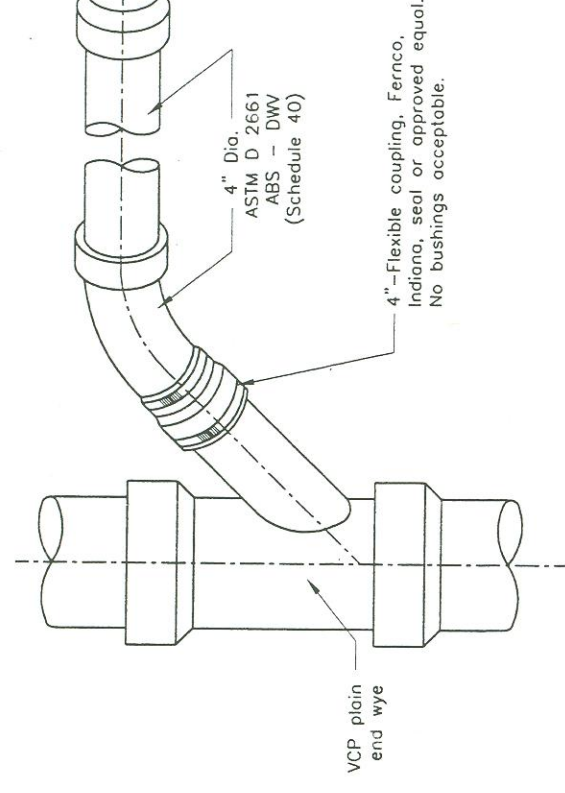
1. See Sections 19-2.02, 19-2.02A, and 19-2.03 for backfill limits.
2. Minimum depth of bedding and material under pipe bells shall be 1 1/2 inches.
3. For pipe greater than 36" in diameter Type II Alternate shall be allowed only when field encountered construction conditions have resulted in the allowable trench width for Type II being exceeded and calculations must be submitted for the Engineer's approval to determine the appropriate bedding factor for the situation. Design method No. 38 as published by the American Concrete Pipe Association shall be the basis for the calculations. Maximum allowable Bedding Factor is 2.2.
4. Type III and IV may be used only when construction conditions encountered in the field have resulted in the allowable trench width for Type II and Type II Alternate being exceeded. Written approval of the Engineer is necessary.
5. For reinforced concrete, P is the percentage of the area of transverse steel to the area of concrete above the top of the pipe barrel. Use wire mesh or uniformly distributed small diameter rebar.
6. For all flexible (non-rigid) pipe, imported material must be used for bedding and initial backfill to 12 inches over pipe bell.

Robert J. Dumb
DIRECTOR

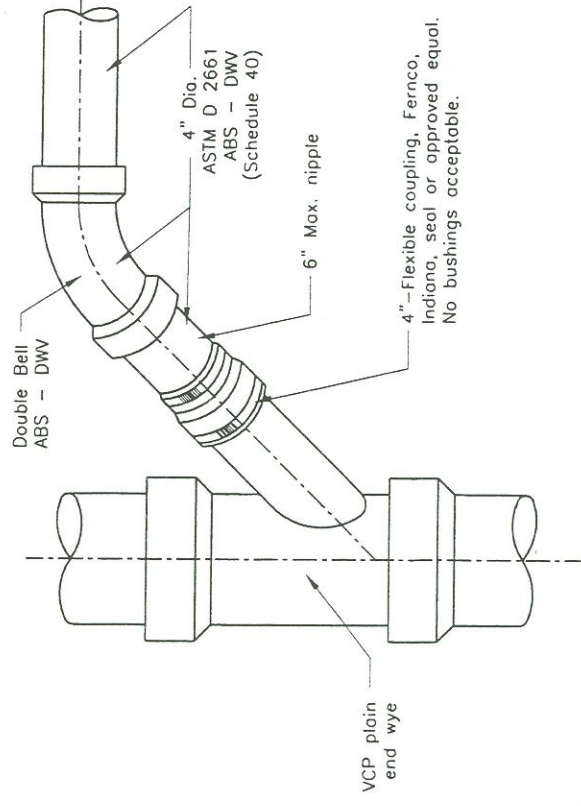
SACRAMENTO COUNTY PUBLIC WORKS AGENCY
SEWER PIPE BEDDING & INITIAL BACKFILL
DRAWN BY: RAS SCALE: NONE DATE: 11/03
7-4



TYPE "A" SERVICE



TYPE "B" SERVICE



"OPTIONAL" SERVICE CONNECTION

Robert J. Dineen
DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
ALTERNATE ABS SEWER SERVICE WYE CONNECTION TOP VIEW	
DRAWN BY: RAS SCALE: NONE DATE: 1/04	7-5A



The diagrams illustrate three methods of pipe installation into a trench wall:

- Top Diagram (Tee fitting):** Shows a horizontal pipe with a vertical tee fitting. Labels include: "Bend not required for Tee fitting", "Limit of bedding material, well compacted, for service.", "1/8 Long radius bend", "Tee only", and "Plastic Pipe only".
- Middle Diagram (Tee or Wye):** Shows a horizontal pipe with a Tee or Wye fitting. Labels include: "1/4 or 1/8 or 1/16 long radius bend", "Tee or Wye (see note 11)", and "25' min".
- Bottom Diagram (Bell to be keyed into trench wall):** Shows a horizontal pipe with a bell end keyed into the trench wall. Labels include: "Limit of bedding material, well compacted, for service.", "Tee or Wye (see note 11)", and "25' min".

TYPE C

1. All residential service lines shall be 4" inside diameter unless otherwise noted. All commercial service lines shall be 6" VCP unless otherwise noted.
2. Sewer services shall have Type II Alternate bedding and initial backfill material from 3" min below to 12" min above the pipe bell per standard drawing 7-4.
3. Contractor shall use the most appropriate type connection (A, B, or C) for the particular situation.
4. The standard sewer service has 4' to 5' of cover at back of sidewalk. The standard cover may need to be deeper should other utilities be located in adjacent areas, see plot 7-13. See note 10.
5. When the collector sewer depth is such that minimum cover at property line cannot be met, the minimum slope of $1/4'$ per foot shall govern the cover.
6. Place concrete 12" wide or well compacted bedding material 18" wide under the tee or wye, the fitting, and unsupported pipe. When bedding material is used, place additional bedding material to top of bend, the full width of the trench.
7. Minimum specified cover at the property line shall be measured from existing ground surface or edge of adjacent roadway, whichever is lower.
8. A specific elevation at the property line, when shown on the plans or designated by the engineer, shall govern.
9. Miter fittings shall be max. 45°.

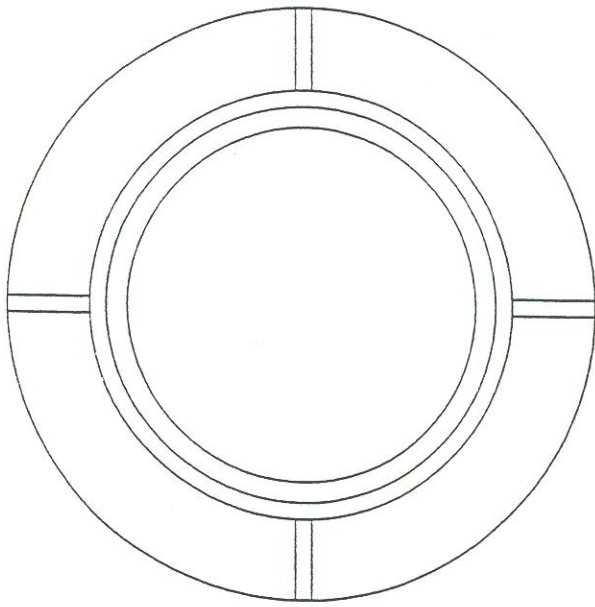
10. Minimum depth of cover to be increased to 5'-6" to where water main is to be installed at the back of sidewalk. The service is to be extended to the back of the 12.5' PUE; cleanout to grade to remain 2' back of sidewalk and a second cleanout to be installed on end of the extension.
11. On any collector, (whether it will be extended in the future or not) starting at the most upstream end, factory type "y" connections to the collector shall be used for the first 20 or equivalent ESDs,

SERVICE SEWERS

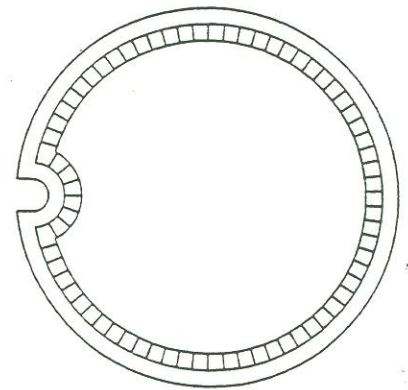
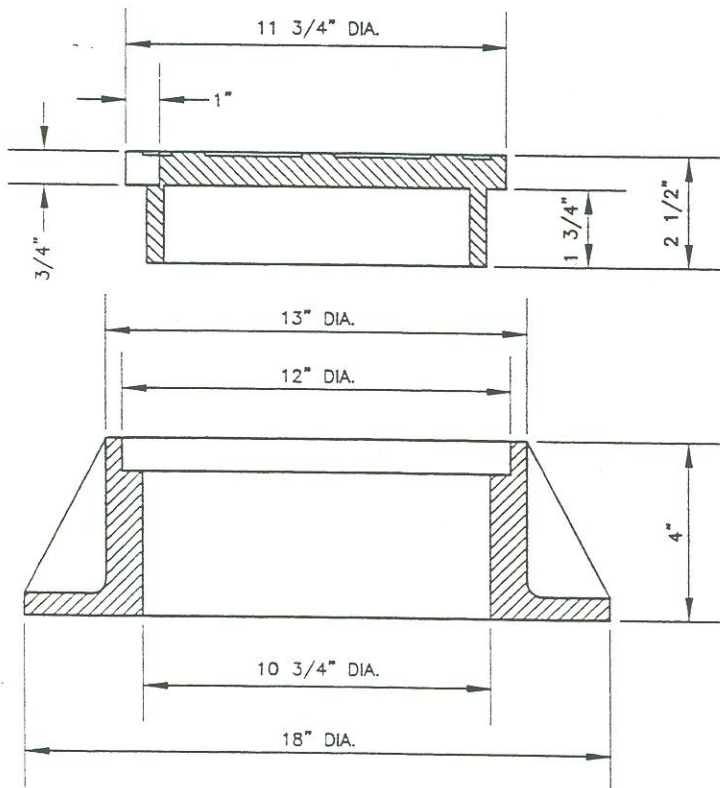
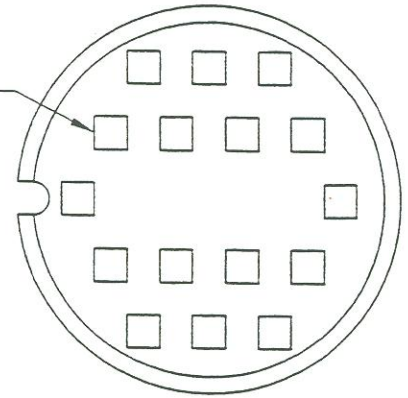
DRAWN BY: RAS
SCALE: NONE
DATE: 01/04

DIRECTOR

CONNECTION DETAILS



1" Squares
Height 1/8"



NOTES:

1. All materials used in manufacturing shall conform to ASTM 48, Class 35B.
2. Castings shall be dipped in black, bituminous paint.
3. Frame and cover meets H-20 wheel loading.

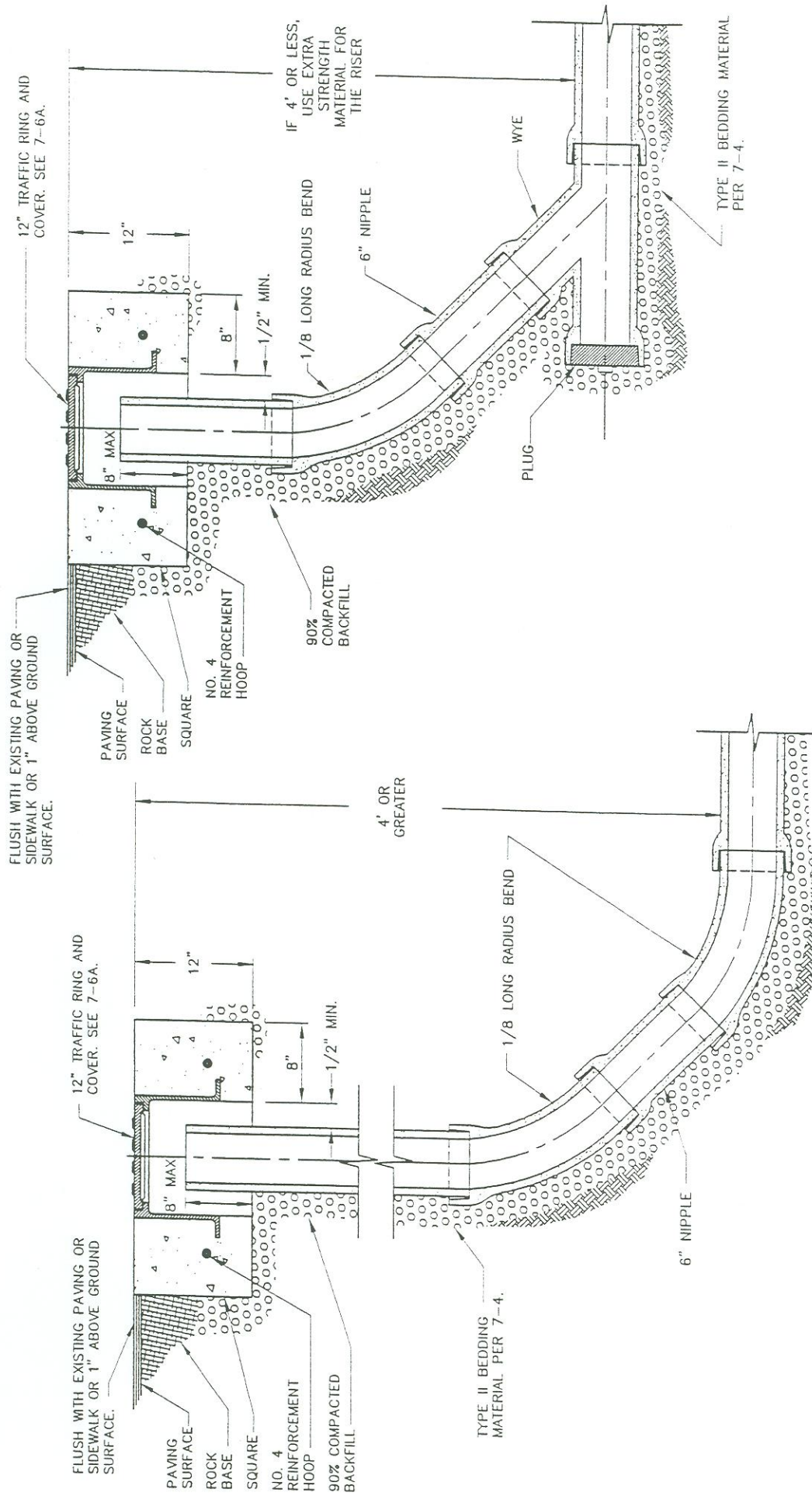
Robert Shamb
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

STANDARD
FLUSHER BRANCH
FRAME AND COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 01/01

7-6A

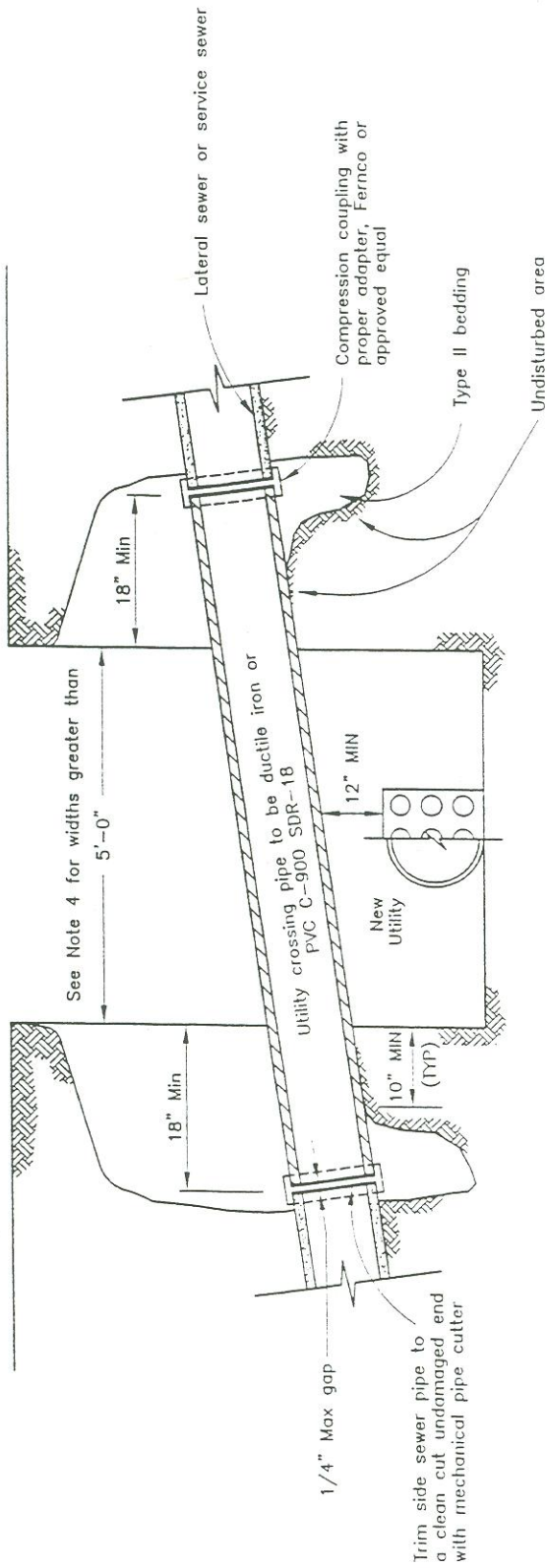


NOTE:

ALL PIPE FITTINGS SHALL BE THE SAME SIZE AND MATERIAL AS THE HORIZONTAL PIPE TO WHICH THEY CONNECT. JOINT SHALL BE AS SPECIFIED FOR THE TYPE OF PIPE USED.

Robert M. Sherrill
DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
FLUSHING BRANCH	
DRAWN BY: DAH SCALE: NONE DATE: 01/01	7-6



NOTES:

1. All lines are to be protected in place. This detail shall apply whenever the main collector or lateral sewer service is cut or damaged when new construction passes beneath these lines, and may only be used when directed to do so by the county engineer.
2. Inside diameter of utility crossing pipe to be the same as the pipe to which it connects.
3. Alteration of sewer grades will be permitted only after written permission has been received from the Sacramento County Public Works Agency and shall comply with 7-13.
4. Whenever the span, whether caused by trench width or crossing angle of the utility crossing pipe exceeds 5'-0", place Type II Alternate bedding to 12" above the new utility and 18" each side of its center line.
5. Any new utility with 6" or less clearance shall place a compressable material (styrofoam or equivalent) between the lines.

Robert A. Shovel
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

UTILITY CROSSING

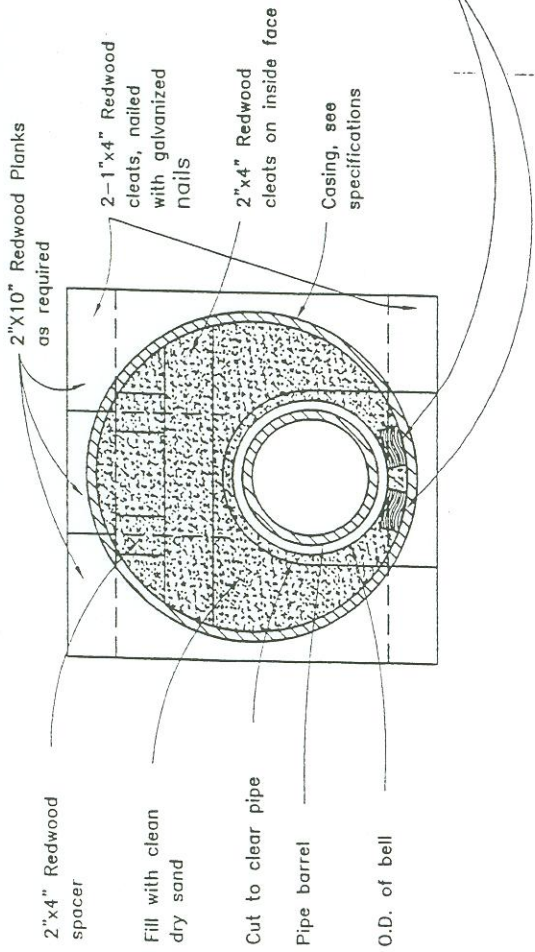
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SCALE: NONE
DATE: 4/97

NOTE:

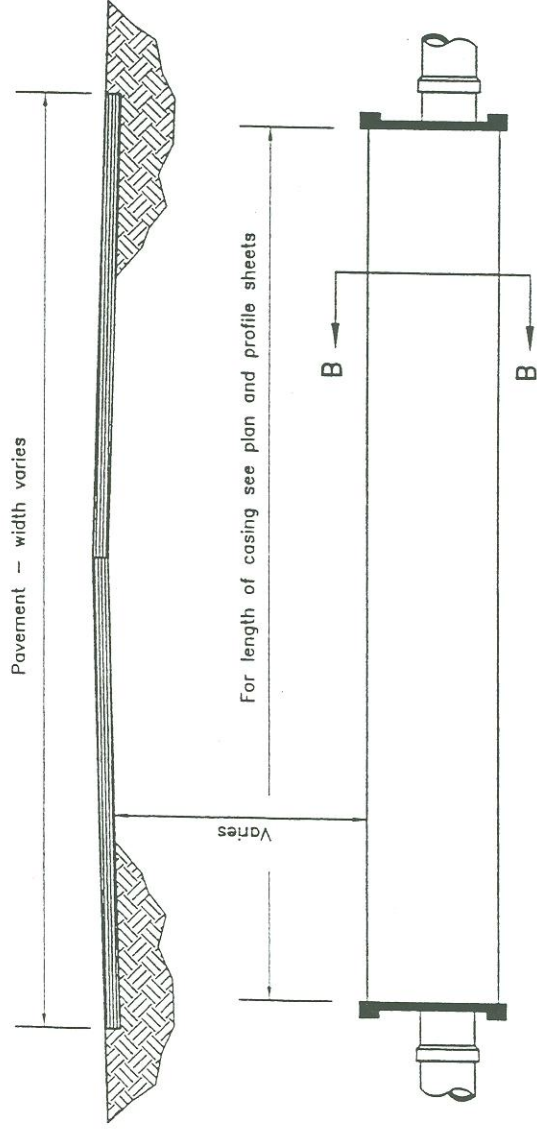
In lieu of 3-2" redwood planks, headwall may be of redwood plywood of thickness approved by the engineer.

Provide 2 redwood skids, 24 to 30 inches in length, near the center of each section of conducted V.C. sewer pipe. Conducted water pipe shall have two pairs of skids, 24 to 30 inches in length from each end.

Skids to be of size such that bell clears conductor. Skid height not to be more than 50% of width. Skids are to be secured to pipe by straps, one at each end. Groove skids for strap clearance.



SECTION B-B



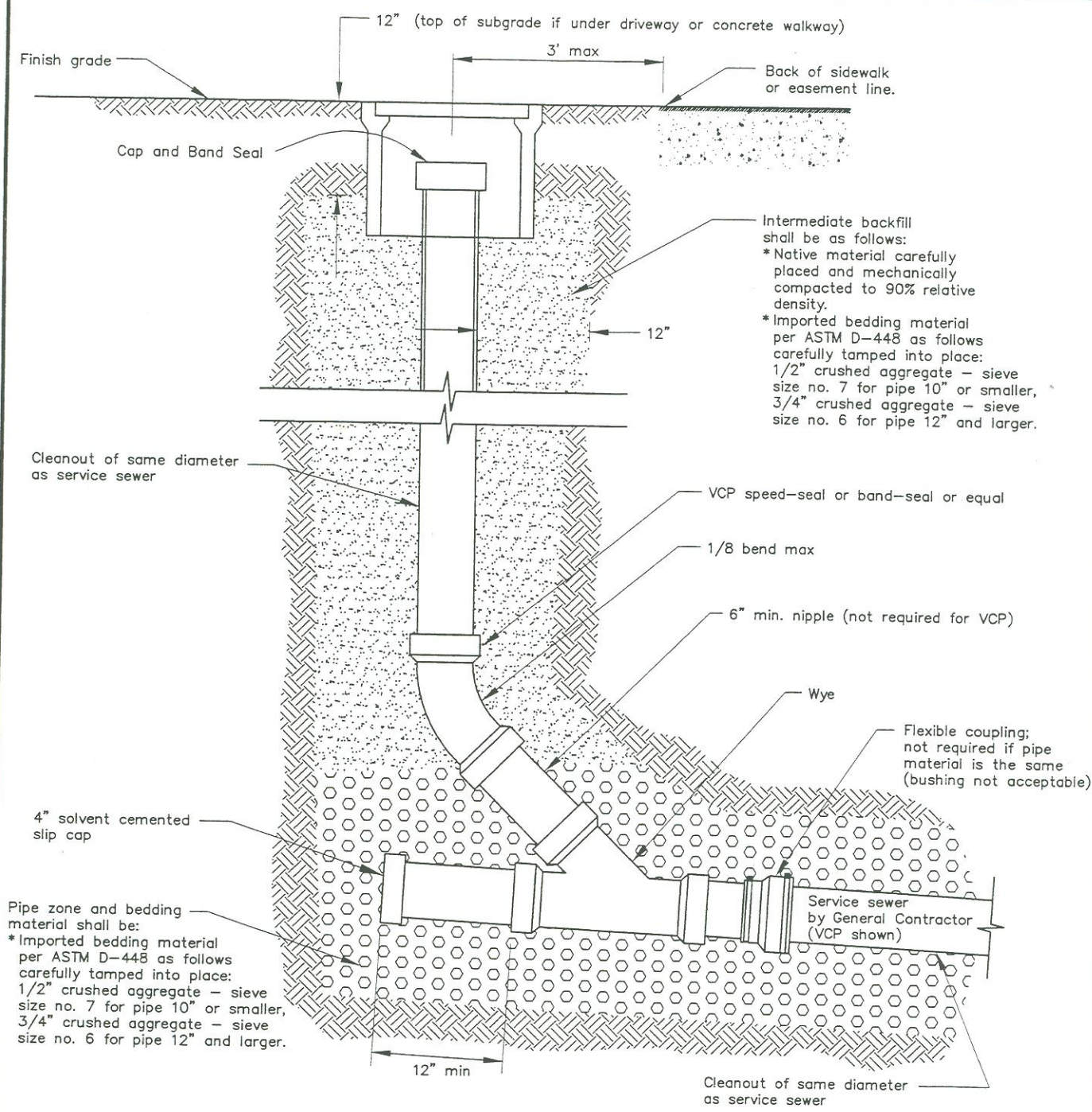
PROFILE

Robert M. Henth
DIRECTOR

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**CONDUCTOR
CASING DETAIL**

DRAWN BY: DAH
SCALE: NONE
DATE: 4/97



- NOTES:**
- Cleanout to grade to be VCP or plastic DWV type PVC (ASTM D2665) or ABS (ASTM D2661) with solvent weld joints.
 - For 4" services in non-travel ways, install round non-traffic type concrete or PVC valve box and cover marked "Sewer". Box inside diameter to be a minimum of 7" and a maximum of 10".
 - For services 4" and 6" or larger in concrete or travel ways, install round concrete traffic type valve box with cast iron cover. Cover to be marked "Sewer".
 - If a water main is to be installed at the back of sidewalk, extend service to the back of the 12.5' P.U.E. back of sidewalk; cleanout to grade to remain 1' to 3' from back of sidewalk and a second cleanout to be installed on the end of the extension 12.5' back of sidewalk.

WATER QUALITY DIVISION BEDDING REQUIREMENT FOR BUILDING SEWER CONNECTION

Place a minimum of 12" of backfill all around the outside diameter of the riser and mechanically compacted to 90% relative density. Backfill material shall be used to 12" from grade or to top of subgrade if under concrete.

Robert J. Shew
DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
VCP, ABS or PVC CLEANOUT TO GRADE	
DRAWN BY: RAS SCALE: NONE DATE: 01/03	7-9

SECTION 8

WATER SUPPLY SYSTEMS

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8-3 Definitions	8-1
8-4 Applicable Standards	8-1
8-5 Improvement and Landscape Plan Submittal	8-2
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<i>A. Improvement Plans</i>	8-3
<i>B. Landscape Plans</i>	8-4
<i>C. Delivery of Approved Improvement and Landscape Plans</i>	8-4
8-7 Improvement Plan Revision	8-4
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8-13 Wells, Treatment Plant and Storage Facility Design	8-6
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SECTION 8

WATER SUPPLY SYSTEMS

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SECTION 8 WATER SUPPLY SYSTEMS

8-1 INTRODUCTION: These Improvement Standards govern the design of all water systems intended for operation and maintenance by the County of Sacramento and the Sacramento County Water Agency. The County of Sacramento provides wholesale and retail water service through the Sacramento County Water Agency.

8-2 INTENT OF WATER SYSTEM IMPROVEMENT STANDARDS: The intent of these water system Improvement Standards is to provide a water system that reliably and safely conveys water at a reasonable capital cost and to provide water systems that minimize operation and maintenance costs.

8-3 DEFINITIONS: When the following terms or titles are used in these water system Improvement Standards or in any document or instrument where these Standards govern, the intent and meaning shall be as herein defined:

- AWWA – American Water Works Association.
- LDSIR – Land Division and Site Improvement Review Section of the Development and Surveyor Services Division of the Department of County Engineering of the County of Sacramento’s Municipal Services Agency.
- Non-potable Water – Water that does not meet the standards for drinking water but is not recycled. For County purposes considered as a type of recycled water.
- Potable Water – Drinkable water.
- Raw Water – Water obtained from ground water wells, prior to treatment.
- Reclaimed Water – Tertiary treated water that meets the requirements of Title 22, Chapter 3 Regulations of the California Administrative Code. For County purposes considered as a type of recycled water.
- Recycled Water – Non-potable or Reclaimed water.
- Water Agency – Shall mean the Sacramento County Water Agency.
- Water Supply – Shall mean the Planning Section, Development Section, Design Section, and Water Operation and Maintenance Section of the Department of Water Resources of the County of Sacramento’s Municipal Services Agency.
- Water System – Refers to potable, raw water, and recycled water systems.

8-4 APPLICABLE STANDARDS: Pertinent and the most current requirements of the following agencies and standards shall apply to design of water systems. In case of conflict between the requirements of these water system Improvement

Standards and the agencies and documents listed below, the most stringent shall govern.

- U. S. Environmental Protection Agency Drinking Water Regulations.
- Laws, Codes, and Standards of the State of California, Department of Health Services relating to Domestic Water Supply.
- Rules and Regulations for Recycled Water Use and Distribution, County of Sacramento.
- Standard Construction Specifications of the County of Sacramento, Municipal Services Agency.
- General Order No. 103 of the California Public Utilities Commission.
- Title 17, Chapter V, Sections 7583-7622, California Administrative Code, and County Ordinance No. 676 regarding cross-connections and backflow prevention.
- California Uniform Fire Code.
- Ordinance No. 18 of the Sacramento County Water Agency where applicable within zones of the Water Agency.
- Chapter 14.10 of Title 14 of the Sacramento County Code Relating to Water Use and Conservation and Water Conserving Landscape Requirements.
- Title 22, Chapter 3 of the Regulations of the California Administrative Code.

8-5 IMPROVEMENT AND LANDSCAPE PLAN SUBMITTAL: Improvement plans for developments that will be served retail or wholesale water by the Water Agency shall be reviewed by Water Supply. Improvement plans shall meet the requirements of Section 2 – General Requirements, of these Improvement Standards. The initial submittal of improvement plans shall be made to LDSIR in accordance with Section 2-5 Initial Plan Submittal Requirements, of these Improvement Standards. Of the sets submitted per Section 2-5, LDSIR will route two (2) sets to Water Supply. Subsequent resubmittals shall be delivered directly to Water Supply.

Landscape plans for developments that will be served retail or wholesale water by the Water Agency, either potable or recycled, shall be reviewed by Water Supply and Sacramento County Department of Transportation. The following types of landscape projects shall be submitted for review and approval: parks, landscape corridors, residential street frontage, commercial, industrial, apartment, school, and street improvement projects. Irrigation systems required by Water Supply to use recycled water shall comply with all requirements of the latest edition of the RULES AND REGULATIONS FOR RECYCLED WATER USE AND DISTRIBUTION; COUNTY OF SACRAMENTO. Two complete sets of landscape plans shall be submitted to Water Supply. Landscape plans shall be submitted on 22" by 34" or 24" by 36" paper.

Commercial, Industrial, or Apartment developments must also submit a completed Cross Connection Control Questionnaire to Water Supply.

8-6 APPROVAL OF IMPROVEMENT AND LANDSCAPE PLANS: All improvement and landscape plans to be served by the Water Agency must be approved and signed by an authorized representative of the Water Agency.

A. Improvement Plans -- The following must occur before the improvement plans can be approved:

- All comments made by Water Supply to the improvement plans must be addressed.
- Two sets of landscape plans shall be submitted to Water Supply. Alternatively, in lieu of submission of landscape plans, a letter and diagram prepared and stamped by a licensed landscape architect shall be submitted with the following information: (1) the water demand and meter sizes, with calculations, (2) a diagram showing the boundaries of the area to be served, street crossing sleeves, and the location of service connections, water meters, and reduced pressure principle backflow devices, (3) a delineation of areas to be served by potable and/or recycled water. It is essential that meters are sized and located properly prior to improvement plan signing to preclude the need to relocate meters in the future. Irrigation services and meters shall be shown on the improvement plans.
- The Fire Department must approve and sign the improvement plans.
- The location of all wells in use and all abandoned wells must be shown on the grading plan. A note shall be placed on the plans indicating that wells shall be properly destroyed in accordance with the requirements of the Sacramento County Environmental Management Department. The note shall also instruct the contractor to call Environmental Management Department for inspection of the well abandonment.
- If the project is within Zone 40 of the Water Agency, initial Zone 40 Water Development Fees must be paid. Initial development fees shall be in accordance with Schedule A of Ordinance No. 18 of the Sacramento County Water Agency and are to be paid at LDSIR.
- Well and treatment plant sites shall be approved by Water Supply. Reservation agreements for well and treatment plant sites, where required by the conditions of approval, shall be executed by the property owners and delivered to Water Supply. Well site and

treatment plant site assessment reports shall be submitted to Water Supply.

B. Landscape Plans -- Water Supply will review landscape plans for the following items:

- The proper water delivery pressure shall be stated, starting at the transmission main, in accordance with Section 8-10 of these Standards.
- The location and size of water services and meters shall match the approved improvement plans.
- The controllers shall be set so that flows do not exceed the maximum continuous flow ratings for the meter.
- No trees shall be planted within five feet of a water main.
- Landscape plans using recycled water for the water source shall meet all requirements of the latest edition of the RULES AND REGULATIONS FOR RECYCLED WATER USE AND DISTRIBUTION; COUNTY OF SACRAMENTO
- A signature block for the Water Agency shall be provided for potable water systems with the label "Approval for Zone 40 Water Fees and Meter Size Only", "Sacramento County Water Agency", and a space for the date. A signature block for the Water Agency shall be provided for recycled water systems with the label "Sacramento County Water Agency" and a space for the date.

Landscaping projects subject to these Improvement Standards shall not be constructed prior to plan approval by the Water Agency.

C. Delivery of Approved Improvement and Landscape Plans -- After approvals have been obtained and prior to the start of construction, plan sets shall be delivered per Section 2 of these Standards. Three additional plan sets shall be delivered directly to Water Supply.

8-7 IMPROVEMENT PLAN REVISION: All plan revisions that affect a water system to be maintained and operated by the Water Agency shall be approved and signed by an authorized representative of Water Supply prior to being approved by LDSIR and prior to construction of the revision.

8-8 CONNECTION PERMITS AND FEES: A water connection permit shall be obtained for each connection to the water system. Contact Water Supply for information concerning Water Agency fees.

8-9 WATER SUPPLY QUALITY: The quality of the potable water supplied by the Water Agency will conform to the Environmental Protection Agency Drinking

Water Act, and the State Department of Health Services Drinking Water Standards.

8-10 WATER SUPPLY PRESSURE: Water supply pressures shall be designed as follows:

- A. Potable Water -- Water transmission and distribution systems shall be designed so that normal operating pressures at service connections to the distribution system are no less than 35 pounds per square inch (psi) and no more than 100 psi. During periods of maximum day domestic demand plus fire demand, the pressure shall not be less than 20 psi at the location of the fire flow and no less than 10 psi elsewhere in the distribution system.
- B. Recycled Water -- Recycled water distribution systems shall be designed to maintain a minimum pressure of 40 psi at the service connection.

8-11 WATER DEMAND: For the design of water distribution systems serving single family residential areas, assume the water demand is one gallon per minute per residential connection (maximum day demand) plus fire flow. For the design of water distribution systems serving commercial areas, water demand shall be determined in accordance with industrial standards and in consultation with the Water Agency.

8-12 FIRE FLOWS: Required fire flows shall be determined by the adopted California Uniform Fire Code, the fire protection district having jurisdiction, and the County of Sacramento. Minimum fire flow pressures are 20 psi above peak day demand. For all projects, a note shall be placed on the water plan stating the design fire flow for the distribution system.

The water distribution system for single family residential water areas is designed for 1,500 gpm. This will meet requirements for homes up to 3,600 square feet of combustible area, including garages and porches. Homes larger than 3,600 square feet of combustible area are a special condition and may require increased fire flows with larger mains or private residential sprinkler systems. Required fire flows are 1,750 gpm for homes from 3,600 to 4,800 square feet of combustible area and 2,000 gpm for homes from 4,800 to 6,200 square feet or more of combustible area, or as required by the local Fire Department.

The minimum fire flow required by the adopted California Uniform Fire Code for commercial/industrial water systems is 1,500 gpm. For all new commercial/industrial projects the Water Agency shall require a distribution system designed for 3,000 gpm. Larger buildings or projects may require fire

flows up to 4,000 gpm and may require water system upgrades or private supplemental water supplies

8-13 WELLS, TREATMENT PLANT AND STORAGE FACILITY DESIGN: Water Supply will either design or provide design oversight for the construction of wells, treatment plants, booster pumping plants, and storage facilities for Agency use.

In general, all developments must have a minimum of two (2) sources of water. If adequate elevated or ground level storage is provided, a single source of water system may be acceptable upon approval by Water Supply and the local fire district.

Sites for the above water facilities shall be provided when required in the Conditions of Approval for the Project.

Sites for wells shall meet the following criteria:

1. Sites shall meet the requirements of the Environmental Health Division of the County Environmental Management Department, and the State Department of Health Services, Office of Drinking Water.
2. Sites shall conform to the requirements of Drawing 8-19. Special provisions in the form of prohibitions, restrictions, and special construction may be required on adjacent properties and improvements.
3. In general, a minimum horizontal separation of 1000 feet shall be maintained between existing wells of any type and new municipal wells. The Agency may require a greater minimum horizontal separation in certain aquifers. If less separation is proposed, a hydrogeologic study shall be provided to evaluate the influence on and by other wells. The study shall be approved by Water Supply.
4. Sites shall be located to minimize the length of raw water mains.
5. Sites shall abut a paved street with a minimum 30 feet frontage.
6. Where possible, well sites shall be bordered by open space, such as parks or school sites. If such open space does not exist, well sites shall be bordered by commercial space.
7. Well sites shall be fenced with six-foot (6') split face masonry wall, other fencing solutions are subject to the approval of the Director.

The applicant shall provide Water Supply with information necessary to verify that proposed well sites and treatment plant sites comply with the setbacks recommended by the Environmental Health Division of the County Environmental Management Department, and the State Department of Health Services, Office of Drinking Water. The information shall consist of copies of existing environmental site assessment reports for all properties within 1000 feet of proposed well sites and treatment plant sites. If these reports are not available, the applicant shall procure the services of a qualified firm, acceptable to Water Supply, to prepare a site assessment report providing the necessary information.

A preliminary hydro-geologic and sanitary assessment, including exploratory test hole drilling and evaluation, shall be performed for each proposed well site. If the results are not acceptable to Water Supply, alternate well site locations shall be provided and evaluated as above until acceptable results are obtained. When well sites are required by the Conditions of Approval, improvement plans will not be approved until acceptable results are obtained and acceptable sites provided for all well sites. Sufficient time shall be provided for this process to be completed prior to plan approval.

8-14 TRANSMISSION MAIN DESIGN: Technical specifications and details for water transmission mains will be prepared by Water Supply and given to the Consultant to be included with the improvement plans.

Transmission mains shall be designed to provide a minimum of 3,000 gpm at distribution main connection points. In order to minimize connections to the transmission main, distribution main connections to the transmission main shall be provided at one-quarter mile intervals beginning one-eighth mile from section corners or arterial intersections as approved by Water Supply. Distribution main connections shall be 12" diameter, with valves and extended to the edge of pavement. A minimum of one valve shall be located on the transmission main at distribution main connection points. Under no circumstances shall fire hydrants or water services be directly connected to a transmission main. If hydrants or services are needed then a distribution main shall be included on the improvement plan.

A. Transmission Main Design Plan Requirements -- The transmission main design requirements on the Improvement Plans shall be as follows:

1. The transmission mains shall be shown in full in plan and profile views, including valves, air relief/vacuum valve assemblies, blow off assemblies, and all other appurtenances.
2. A water plan sheet shall be included as part of the improvement plans, showing locations of valves, fire hydrants, existing water lines, air release/vacuum valves, blow off valves, and water services. The scale of the water plan should be 1"=100'.

However, for residential developments the scale of the water plan may be 1"=200' if the 1"=100' scale does not fit on one plan sheet.

3. Details of distribution mains crossing other utilities or unusual alignments will be provided if deemed necessary by Water Supply.
4. Stationing and elevations for all fittings, hydrants, valves, air release/vacuum valves, end-of-line blow-offs, temporary blow-offs, in-line blow-off valves and locating wire stations shall be called-out in the profile view of the improvement plan sheets. Elevations shall be called-out at all changes in pipe elevation.

B. Transmission Main Location -- All transmission mains shall be installed within public rights-of-way and easements.

1. The water transmission main shall be located on the north or west side of a street. The water transmission main may be located at a minimum of four feet from the lip of gutter. The transmission main and valve actuators will be located so that the valve boxes will be located in the center of a traffic lane or on traffic lane lines. A deviation from these criteria may be allowed if approved by Water Supply in consultation with other affected utility providers.
2. Water transmission mains shall not be located within landscape corridors or medians, unless approved by Water Supply as a result of unresolvable conflicts with other utilities.
3. Ten (10) feet shall be the minimum horizontal separation between water transmission mains and sanitary sewer mains or recycled water mains. Separation may be less if it is accordance with California State Department of Health Services requirements and approved by Water Supply. Every attempt should be made to keep the bottom of the water transmission main at a higher elevation than the sewer main or recycled water main.
4. When crossing a sanitary sewer force main, the crossing shall comply with the California Department of Health Services requirements.
5. Transmission mains shall maintain a minimum vertical clearance of 12-inches from all other utilities.
6. Normal cover under roadways shall be 48 inches and as necessary to provide sufficient cover for air release/vacuum valve lines. A minimum cover of 36 inches for PVC pipe and AWWA C303 pipe, and 30 inches for ductile iron pipe may be allowed in special

circumstances with the approval of the Water Agency. Minimum cover depth shall be measured from gutter flow-line to top of pipe.

7. Minimum cover in open fields shall be 60 inches for PVC pipe and AWWA C303 pipe, and 48 inches for ductile iron pipe.
 8. When not avoiding other utilities, transmission mains shall have a maximum depth of 60-inches, unless otherwise specified by Water Supply. Depths shall be measured from gutter flow-line.
- C. Transmission Main Layout and Sizing -- The transmission main system location and sizing shall conform to Master Water Supply Plans of the Water Agency.
- D. Transmission Main Pipe Restraint -- Thrust restraint shall be provided at all valves, bends, reducers, tees, crosses, and dead ends. Thrust restraint shall be by means of pipe joint restraining devices only; thrust blocks shall not be used unless authorized by Water Supply.
- E. Transmission Main Pipe Type and Pipe Deflection -- Pipes 18 inches and less in diameter may be Ductile Iron or Polyvinyl Chloride. Pipes 20 through 24 inches in diameter shall be Ductile Iron. Pipes 30 inches and more in diameter may be Ductile Iron or Concrete Cylinder pipe.

For Ductile Iron pipe without restrained joints, deflection at joints shall not exceed 2.5 degrees. Pipe deflections greater than 2.5 degrees shall require a fitting.

For Ductile Iron pipe with restrained joints, deflection at joints shall not exceed: 2.5 degrees for 12 inch and smaller pipe, 2.0 degrees for 16 inch – 18 inch pipe, 1.25 degrees for 20 inch – 24 inch pipe, 1.0 degrees for 30 inch pipe, 0.75 degrees for 36 inch pipe, and 0.25 degrees for 42 inch and larger pipe. Pipe deflections exceeding these limits shall require a fitting.

Joint deflection of Polyvinyl Chloride pipe is not allowed. Bending of Polyvinyl Chloride pipe shall not exceed the limits described in Drawing 8-9.

- F. Transmission Main Water System Appurtenances -- Transmission main appurtenance requirements on the Improvement Plans shall be as follows:
1. Valves shall be spaced no greater than 1300 feet apart and shall be located so that any section of main can be shut down without going to more than three locations to close valves. As a minimum, three valves shall be placed where mains cross and two valves where mains tee. Each section of pipeline between crosses or tees shall

have a minimum of one valve. Valves at intersections shall be located within the curb returns and set as close to minimum pipe depth as possible. Valves shall be placed on temporary transmission main dead ends that are longer than 330 feet. Plans shall indicate which side of the water main to install the valve operator.

2. Air release/vacuum valve assemblies shall be required at high points on the transmission main as determined by Water Supply. Transmission mains shall require a 2-inch air release vacuum valve. See Drawing 8-14B for specifications and typical installation details.
3. Temporary blow-offs shall be provided on stub-outs. Temporary blow-offs may be two inches in diameter for mains up to 24 inches in diameter and 3 inches for mains larger than 24 inches, subject to approval by Water Supply.
4. Permanent blow-offs shall be provided at dead ends. Permanent blow-offs shall be 4 inches in diameter for lines up to 24 inches in diameter and 6 inches in diameter for lines larger than 24 inches.
5. In-line blow-off valves shall be required at low points on the water transmission main as determined by Water Supply. In-line blow-off valves shall be 4 inches in diameter for water lines up to 24 inches in diameter and 6 inches in diameter for water lines larger than 24 inches.
6. Locating wire stations shall be placed on transmission mains when the distance between valves and/or permanent and in-line blow-offs exceeds 600 feet. See Drawing 8-4B for specifications and typical installation details.

8-15 DISTRIBUTION MAIN DESIGN: In general, water distribution systems shall be looped, with two points of connection to water sources, separated by a minimum of one valve and an adequate separation distance approved by Water Supply. Sizing of distribution mains shall be such that the normal pressures stated in Section 8-10 and the minimum requirements as stated below for distribution main spacing and sizing are maintained.

The Hazen-Williams formula shall be used in the hydraulic study of the system, using a "C" value of 125 for cement-lined pipe, polyvinyl chloride pipe, and ductile iron pipe. Velocity in distribution mains shall not exceed 7 feet per second at peak hour. Head loss shall not exceed 5 psi per 1,000 feet.

A Hardy-Cross hydraulic analysis of any proposed distribution system shall be supplied to Water Supply. The analysis shall comply with the requirements of Sections 8-10, 8-11, and 8-12.

A. Distribution Main Design Plan Requirements -- The water distribution main design plan requirements on the Improvement Plans shall be as follows:

1. All public distribution mains, including those on commercial and apartment projects, shall be shown in plan and profile. Stub-outs for future extension shall also be shown in profile.
2. A water plan sheet shall be included as part of the improvement plans, showing locations of valves, fire hydrants, existing water lines, air release/vacuum valves, blow off valves, and water services. The water plan shall also indicate driveways, electroliers, and storm drain inlets. The scale of the water plan should be 1"=100'. However, for residential developments the scale of the water plan may be 1"=200' if the 1"=100' scale does not fit on one plan sheet. For commercial and apartment plans, the water plan shall be scaled to fit onto one sheet and electrical and gas utility plans shall be provided.
3. Details of distribution mains crossing other utilities or unusual alignments will be provided if deemed necessary by Water Supply.
4. Stationing for all fittings, shut off valves, hydrants, air release/vacuum valves, and in line blow-off valves shall be called-out in the profile view of the improvement plan sheets. Elevations shall be called-out at all changes in pipe elevation.
5. Commercial, industrial, and apartment Improvement Plans with a water easement shall have a note that states, "Utilities shall not be located within water easement(s) except if the utility crosses the water easement as closely as practical to perpendicular to the water main."
6. All plans shall include Water Notes provided by Water Supply. Recycled, Raw and Landscape Water notes provided by Water Supply shall also be included as necessary.

B. Distribution Main Location -- All water distribution mains shall be installed within public rights-of-way or easements.

1. The centerline of the water distribution main shall be located three (3) feet from the lip of the gutter on the northerly or westerly side

of the street. A deviation from these criteria may be allowed if approved by Water Supply in consultation with other affected utility providers. If it should be necessary because of existing improvements or possible conflict with other utilities, and with the approval of Water Supply, the distribution mains may be installed within a 15-foot wide easement immediately adjacent to and behind the property line fronting on the public right-of-way.

2. If it is necessary to install a water distribution main within a private road, the water easement shall be the width of the paving plus one foot each side.
3. Water easements over water distribution mains located on commercial, industrial, or apartment properties shall have a minimum width of 15 feet. The water main shall be centered in the easement. Signed easements shall be provided to the Water Agency prior to plan approval.
4. If it is necessary to install a water distribution main within a landscape corridor, then no trees shall be planted within five feet of the water main. The water distribution main shall be centered within a 15-foot wide water easement. The landscape plans for the corridor shall be submitted prior to approval of the improvement plans.
5. If a water distribution main is required to be installed between residential homes, the pipe material shall be Class 350 Ductile Iron Pipe. The minimum depth shall be four feet to top of pipe and the center of the main shall be centered within a 15-foot wide easement.
6. Ten (10) feet shall be the minimum horizontal distance between parallel water distribution and sanitary sewer mains or recycled water mains. The water distribution main shall be higher than the sewer main or recycled water main. Separation may be less if it is accordance with California State Department of Health Services requirements and approved by Water Supply.
7. On all utility crossings, the water distribution main shall maintain a minimum separation at least 12 inches from the utility.
8. When crossing an existing sanitary sewer force main, the water distribution main shall be installed a minimum of one foot above the sewer line, as close to perpendicular as possible and be ductile iron with a minimum rated working pressure of 200 psi. All

sanitary sewer and water main crossings shall comply with the latest California Department of Health Services criteria.

9. Water distribution mains to be installed in public right-of-ways or easements not conforming to Items 1 through 5 above may be approved by Water Supply in consultation with other affected utility providers.
- C. Distribution Main Layout and Sizing -- The distribution system, whenever possible, shall be in grid form so that pressures throughout the system tend to become equalized under varying rates and locations of maximum demand, and to provide system redundancy. The minimum pressures and flows as specified in Sections 8-10, 8-11, and 8-12 shall govern design of the system. The following conditions are to be considered for the distribution system design:
1. In general, the minimum pipe size shall be 8 inches for looped systems. Dead end runs of more than 50 feet that have a hydrant at the end shall be a minimum of 8 inches. Dead end runs that do not have a fire hydrant at the end, or dead end runs of less than 50 feet that have a hydrant at the end may be 6 inches in diameter as approved by Water Supply.
 2. Where distribution mains are installed in a major thoroughfare (84 foot right-of-way or greater), dual mains (one pipeline on each side of the street) may be required.
 3. Mains shall maintain a minimum cover of 30 inches in rights of way less than 50 feet and 36 inches in rights-of-way 50 feet and greater, and as necessary to provide sufficient cover for air release/vacuum valve lines and to ensure that gate valve stems are a minimum of 6" below the street subgrade, and when not avoiding other utilities mains shall have a maximum depth of 60 inches, unless otherwise approved by Water Supply. Both depths shall be measured from gutter flow-line. Mains installed in easements between residences shall maintain a minimum cover of 48 inches.
- D. Distribution Main Pipe Restraint -- Pipes shall be restrained from movement as a result of thrust on the fittings and valves of the water system. Thrust restraint shall be provided at all valves, bends, reducers, tees, crosses, and dead ends. Thrust restraint for bends and tees may be accomplished with thrust blocks as described in Standard Drawing 8-3A, or by means of pipe joint restraining devices as described in Standard Drawing 8-3B. Thrust blocks must be poured against undisturbed soil or restraint devices shall be used.

- E. Distribution Main Pipe Type and Pipe Deflection -- Pipe used in the construction of water distribution systems shall be Polyvinyl Chloride or Ductile Iron pipe. For Ductile Iron pipe, deflection at joints shall not exceed two and one-half degrees. Pipe deflections greater than two and one-half degrees shall require a fitting. Joint deflection of Polyvinyl Chloride pipe is not allowed. Bending of Polyvinyl Chloride pipe shall not exceed the limits described in Standard Drawing 8-9.

8-16 DISTRIBUTION MAIN WATER SYSTEM APPURTENANCES: Water system appurtenances include valves, fire hydrants, water service lines, water meters, back-flow devices, air release/vacuum valve assemblies, and blow-off valves.

- A. Valves -- Valves on the distribution main shall be designed per the following requirements.
1. A valve shall be placed on the distribution main at the connection point to a transmission main.
 2. Valves shall be spaced a maximum 500 feet apart. In residential areas, valves shall be spaced such that no single shut-down will result in shutting down more than 15 services.
 3. Valves shall be spaced so that in no case shall more than two fire hydrants be removed from service by a shut-down.
 4. Valves shall be located so that any section of main can be shut down without going to more than three locations to close valves.
 5. Valves at intersections shall be located within the curb returns and set as close to minimum pipe depth (30" to 36") as possible. As a minimum three valves shall be placed where mains cross and two valves where mains tee.
 6. If it is necessary to install valves between street intersections, they shall be located on property lines between lots.
 7. Each section of pipeline between crosses or tees shall have a minimum of one valve.
 8. Valves eight inches and smaller shall be gate valves. Ten inch valves may be gate or butterfly valves. Valves larger than ten inches shall be butterfly valves. The depth of the water line shall be adjusted to keep the stem of gate valves below the street pavement section and base sections. Butterfly valves shall be designated on plans by the initials "B.V." and indicators provided

showing on which side of the pipe to install the valve operator. Operators shall be located as near as possible to lane lines or center of lanes.

- B. Fire Hydrants and End-of-Line Blow-off Assemblies: Fire hydrants and end of line blow-off assemblies shall comply with the requirements of this section, the local fire district, and Water Supply. Fire hydrants and end-of-line blow-off assemblies shall be located as follows:
1. Fire hydrants shall be connected to distribution mains only. Fire hydrants shall not be connected to transmission mains.
 2. Fire hydrants shall be placed at street intersections wherever possible, and located to minimize the hazard of damage by traffic. They shall have a maximum normal spacing of 500 feet measured along the street frontage in residential developments, 300 feet in commercial developments, or closer if deemed necessary by the local Fire District. Hydrants located at intersections shall be installed at the curb return. Within residential areas, all other hydrants shall be located on property lines between lots. See Drawings 8-2A and 8-2B for specifications and typical installation details.
 3. The minimum size distribution main serving a fire hydrant shall be six inches in diameter, however in this situation, the distance from the nearest intersecting distribution main to the hydrant pipeline shall not be greater than 50 feet if fire flow requirements are 1500 gpm, or 10 feet if fire flow requirements are greater than 1500 gpm. Not more than one hydrant shall be placed on a six-inch main between intersecting water distribution mains. The pipeline connecting the hydrant and the main shall be a minimum of six-inch in diameter, with a gate valve flange connected to the main.
 4. A fire hydrant or 4-inch blow-off assembly shall be installed on all permanent dead-end runs including cul-de-sacs. If the local Fire District requires a hydrant at the end of a dead-end run, then a 4-inch blow-off assembly will not be allowed. Two-inch blow-off valves shall be used if dead-end runs are temporary. Wherever possible, the blow-off assemblies shall be installed in the street right-of-way, a minimum distance of three feet from the lip of gutter. In no case shall the location be such that there is a possibility of back-siphon into the distribution system. For specifications and typical installation details see Drawings 8-12 and 8-13.

- C. Water Service Lines -- Service lines from the water distribution main to the property line or edge of easement shall normally be installed at the time the main is constructed. Services from mains installed in private roads shall extend one foot beyond the edge of the pavement. Service line criteria shall be as follows:
1. In all new subdivisions, the water service line shall generally be located between 9 inches and 30 inches from the side property line. Service lines shall be located on residential lots on the side opposite of the driveway. Service lines shall be located a minimum distance of ten feet from a sanitary service, three feet from the edge of the nearest storm drain inlet, three feet from a fire hydrant and five feet from an electroliner. The order of precedence from highest to lowest in locating service lines away from other utilities shall be sanitary service, storm drain inlet, electroliner, and lastly, fire hydrant.
 2. Normal size of a residential service line shall be one inch unless private fire sprinkler systems will be required. Normal minimum commercial service lines shall be one and one-half inch. When the combined water demands for domestic and landscape uses exceed the maximum continuous flow rate of a one and one-half inch meter then separate service lines and meters shall be used for domestic and landscape irrigation. Schools, commercial, industrial, or multiple-family units with higher water demand shall be provided with larger service lines, subject to approval of Water Supply. All services shall be installed with a corporation stop at the main and a curb stop or gate valve at the property line. The curb stop shall be used only when the service is less than 3 inches. A gate valve shall be used if the service size is 3 inches or larger. Installation of a valve box is required over all gate valves.
- D. Water Meters -- Water meters shall be installed on all residential, commercial, industrial, multi-family, and irrigation water services. Residential meters and meter boxes will be installed by the builder after building permits are issued, not when water service lines are installed. The size of water meter shall not be less than the size of the service line unless approved by Water Supply. For irrigation services, turbo meters are not allowed for sizes smaller than two inches. See Standard Drawings 8-6A, 8-6B, 8-6C, and 8-6D for specifications and typical installation details.

- E. Single Detector-Check Valves -- A single detector-check valve and bypass meter shall be required on each fire service line into a building. Single detector check valves are limited to use on fire service lines only. See Standard Drawing 8-7 for specifications and typical installation details.
- F. Back Flow Devices -- Back-flow devices are required in accordance with Title 17, Chapter V, and Sections 7583-7622 of the California Administrative Code.
 - 1. Double Detector-Check Valves -- A double detector-check valve shall be required on looped private water mains at each connection to the public distribution system. See Drawing 8-8C for specifications and typical installation details.
 - 2. Reduced Pressure Principle Back Flow Devices -- A reduced pressure principle back flow device shall be required on all landscaping, commercial, industrial, and apartment service lines. Reduced pressure principle devices are for use on service lines only. See Drawings 8-8A, 8-8B, and 8-8C for specifications and typical installation details.
- G. Air Release/Vacuum Valve Assemblies -- Air release/vacuum valve assemblies shall be required at high points in a distribution system as determined by Water Supply. Distribution mains shall require a one-inch air release vacuum valve. See Drawing 8-14A for specifications and typical installation details.
- H. Blow-off Valves -- Blow-offs valves shall be required as specified in this section.
 - 1. Temporary Blow-off Valve -- A two-inch temporary blow-off valve shall be required at the end of water mains that will be extended in the future. See Drawing 8-12 for specifications and typical installation details.
 - 2. End of Main Blow-off Valve -- A four-inch blow-off valve shall be required at the permanent end of water mains. See Drawing 8-13A for specifications and typical installation details.
 - 3. Cul-De-Sac Blow-off Valve -- A four-inch blow-off valve shall be required at the end of a water main in a cul-de-sac, except in the case that the line ends in a fire hydrant. See Drawing 8-13B for specifications and typical installation details.
 - 4. In-Line Blow-off Valve -- A four-inch in-line blow-off valve shall be required at low points in the water distribution main as

approved by Water Supply. See Drawing 8-13C for specifications and typical installation details.

- I. Locating Wire Stations -- Locating wire stations shall be placed on distribution mains when the distance between valves and/or permanent and in-line blow-offs exceeds 600 feet. See Drawing 8-4B for specifications and typical installation details.

8-17 RECYCLED WATER TRANSMISSION AND DISTRIBUTION MAINS:

Recycled water facilities may be required by the Water Agency for use in specified areas as determined by Water Supply. Design flows and demands for recycled water systems shall be determined by the Water Agency. Design requirements for recycled water transmission mains and distribution mains shall comply with the requirements for potable water; however, there are special provisions described as follows:

1. To avoid cross connection of the potable and recycled water systems, recycled water facilities shall be clearly marked through appropriate coloring of pipe materials and above ground appurtenances.
2. All above ground facilities shall be marked with a sign to caution against drinking water from the recycled water system. All signs shall be made and placed in such a manner as to become a permanent part of the facility or appurtenance. Park sites, large turf areas, and other publicly used areas may require warning signs of the appropriate size as determined by Water Supply or other regulatory agency. See Drawing 8-16 for specifications and installation details.
3. The recycled water system shall maintain a minimum pressure of 40 psi at the service connection.
4. The recycled water mains shall be located on the south and east side of a street. The recycled water mains shall be located at a minimum of four feet from the lip of gutter. The recycled water mains and valve actuators will be located in the center of traffic lanes or on traffic lane lines. The side of the main on which the actuator is to be installed shall be indicated on the plans. A deviation from these criteria may be allowed if approved by Water Supply in consultation with other affected utility providers.
5. Recycled water main plans shall include Recycled Water Notes as provided by Water Supply.

8-18 RAW WATER TRANSMISSION MAINS: Raw water transmission main facilities may be required by the Water Agency for use in specified areas as

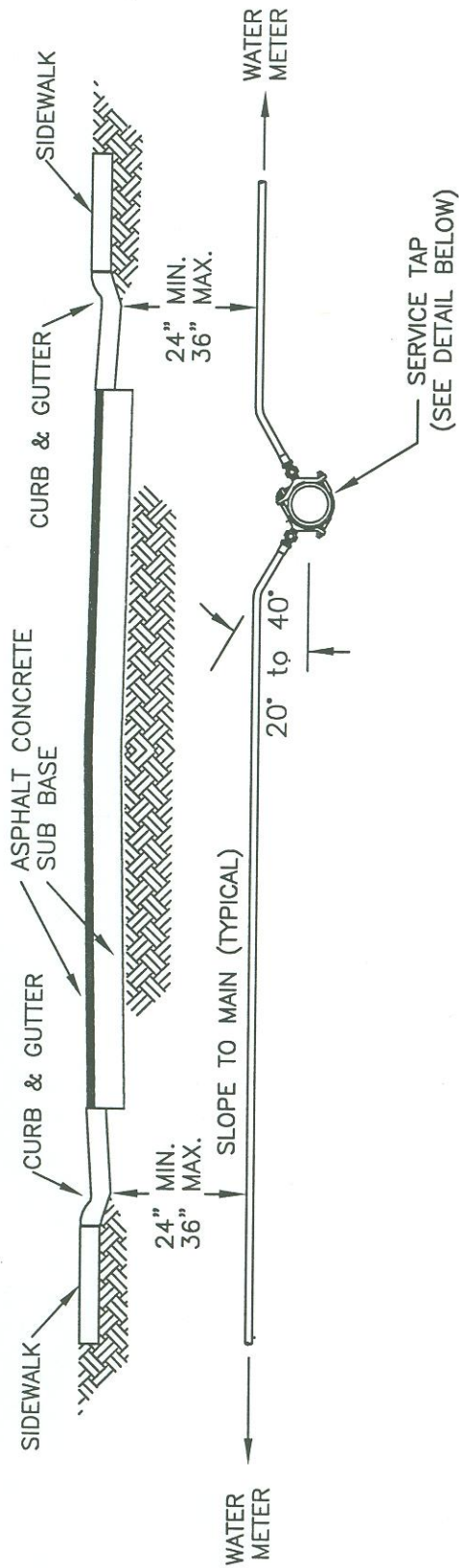
determined by Water Supply. Design flows and demands for raw water systems shall be determined by the Water Agency. Design requirements for raw water transmission and distribution mains shall comply with the requirements for potable water transmission and distribution mains; however, there are special provisions described as follows:

1. Raw water transmission mains shall be located on the north and west side of a street.
2. Raw water plans shall include Raw Water Notes as provided by Water Supply.

8-19 RECORD PLANS: Record Drawings shall be in accordance with Section 2-11 *Record Plans* of these Improvement Standards and shall also include the following:

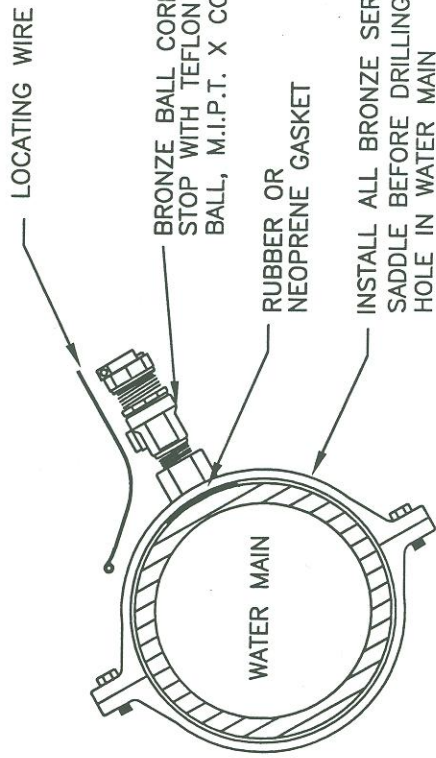
1. Each sheet of the improvement plan shall be labeled or stamped "As-Built" or "Record Drawing".
2. Elevations of the top of the end of distribution mains and transmission mains.
3. The type of water distribution main and transmission main pipe installed shall be clearly marked on each sheet.
4. The type of end fitting and pipe at the end of the distribution mains and transmission mains shall be described.
5. Changes of location of shut-off valves, fittings, air release/vacuum valves, blow-off assemblies, hydrants, and water services for which an improvement plan revision was not obtained.

Record Drawings shall be approved by Water Supply prior to final acceptance of the project.



NOTES:

1. CORPORATION STOP, METER CURB STOP AND WATER SERVICE LINE SHALL BE THE SAME SIZE.
2. SERVICE SADDLES SHALL BE A SINGLE WIDE BRONZE STRAP FOR 1" AND 2" SERVICES. BRONZE 'U' BOLTS MAY BE USED ON CAST IRON AND DUCTILE IRON WATER MAINS.
3. SERVICE SADDLES, CORPORATION STOPS, COUPLING NUTS, BOLTS, AND ALL APPURTENANCES SHALL BE BRONZE.
4. SERVICE TAP SHALL BE MADE BETWEEN 20 DEGREES TO 40 DEGREES ABOVE THE SPRING LINE OF THE PIPE.
5. SERVICE TAPS SHALL BE A MINIMUM OF 18" APART ALONG THE WATER MAIN.
6. INSULATED LOCATING WIRE SHALL BE PROVIDED ON ALL SERVICE LINES, PER DRAWING 8-4. WIRE SHALL BE CONNECTED TO LOCATING WIRE ALONG WATER MAIN FOR CONTINUITY.
7. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.



SERVICE TAP
DETAIL

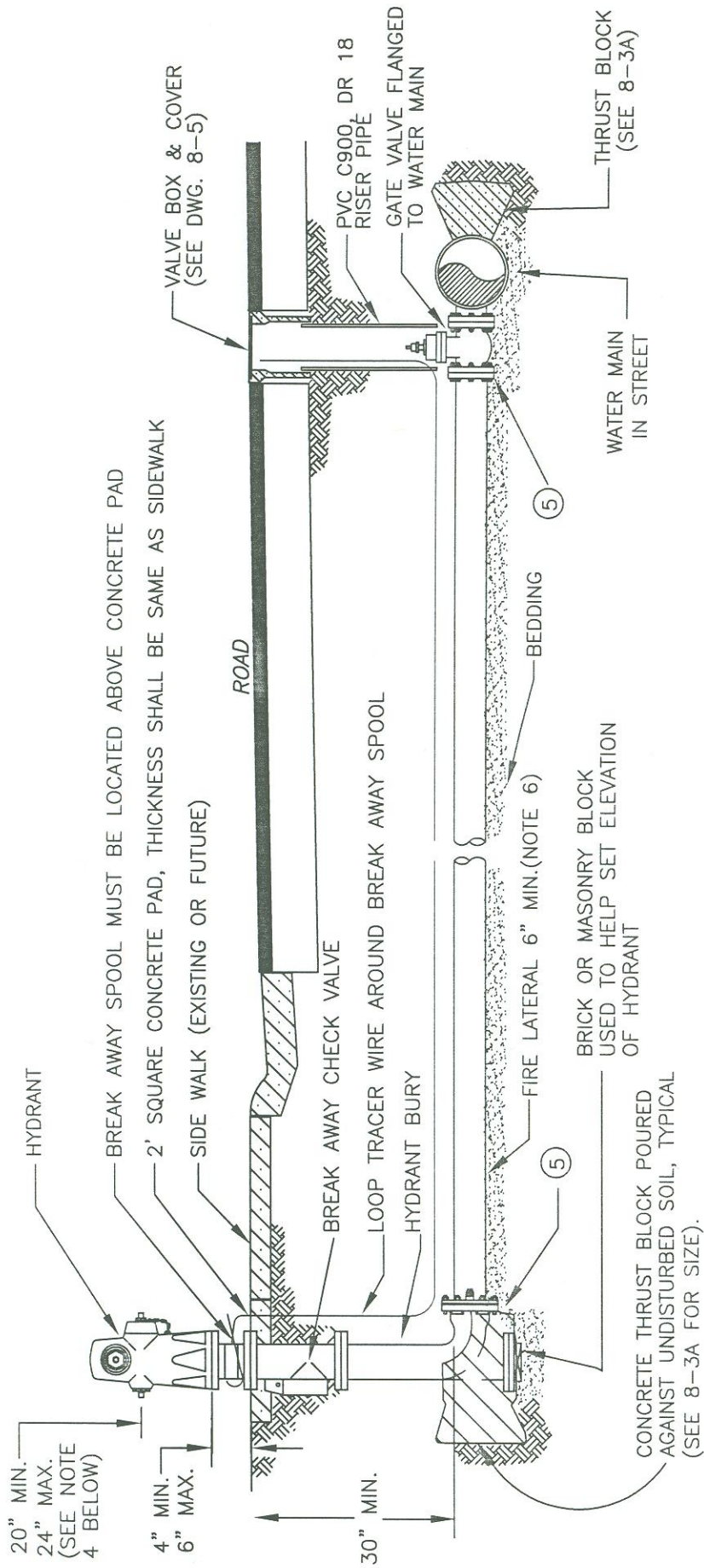
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

1"-2" WATER SERVICE INSTALLATION

DIRECTOR, DEPARTMENT OF WATER RESOURCES

John DeVin

SCALE: NONE
DATE: 12/03



NOTES:

1. IN COMMERCIAL AREAS OR IF HYDRANTS ARE LESS THAN 4' BEHIND THE CURB, FIRE HYDRANTS SHALL BE PROTECTED FROM VEHICULAR DAMAGE BY BOLLARDS AND ACCESSIBLE TO FIRE PROTECTION EQUIPMENT.
2. TYPE OF FIRE HYDRANT SHOWN IS FOR ILLUSTRATION ONLY.
3. GATE VALVE SHALL BE FLANGED TO THE WATER MAIN.
4. LOWEST CAP NUT ON HYDRANT SHALL BE 20" MIN. TO 24" MAX. ABOVE TOP OF CONCRETE PAD.
5. THESE JOINTS MAY BE FLANGED, OR RESTRAINED MECHANICAL JOINTS WITH SCWA APPROVED RESTRAINING DEVICE.
6. FIRE LATERAL SHALL BE DUCTILE IRON IF LENGTH EXCEEDS 20 FT.
7. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

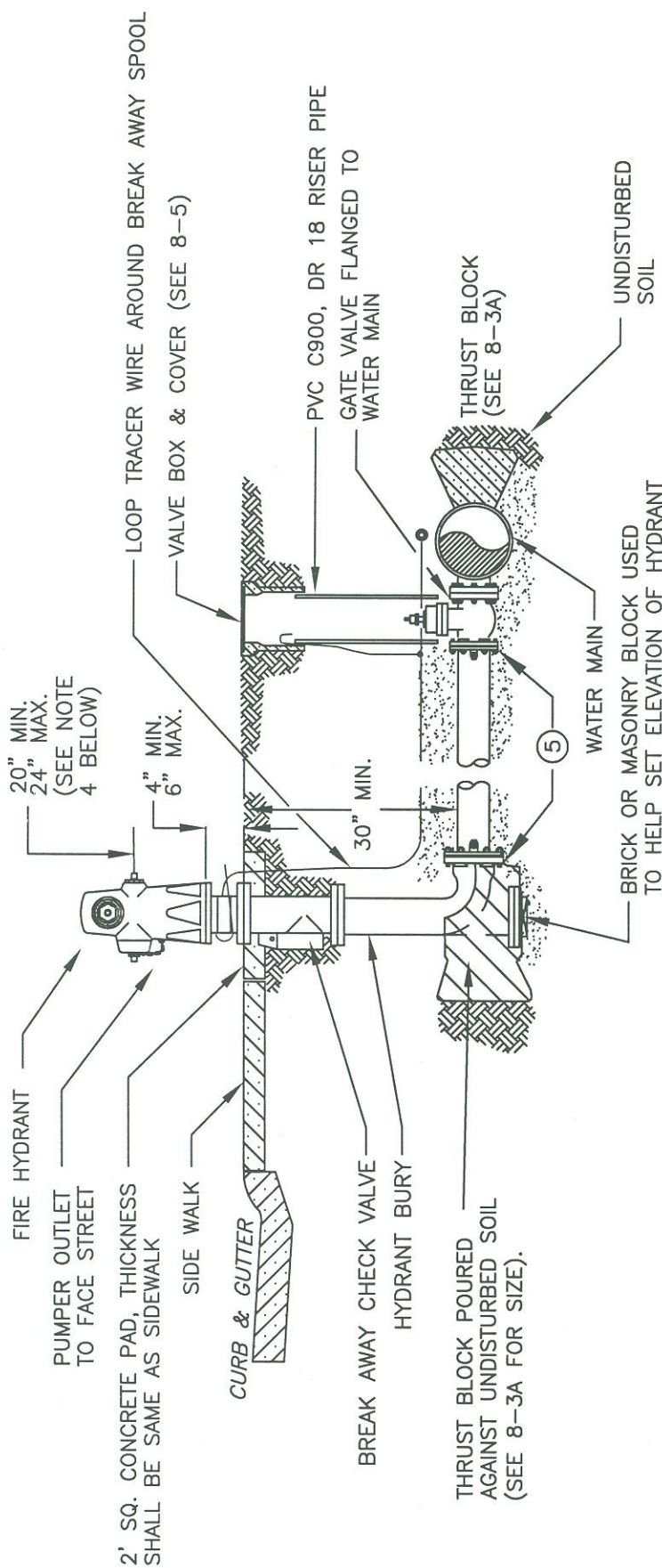
FIRE HYDRANT INSTALLATION WATER MAIN IN STREET

SCALE: NONE
DATE: 12/03

DIRECTOR, DEPARTMENT OF WATER RESOURCES

John DeV

8-2A

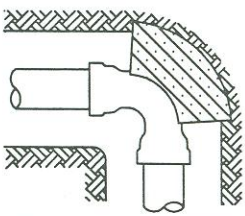
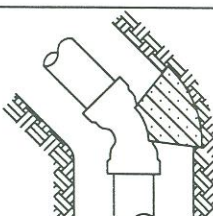
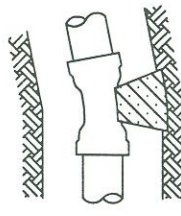
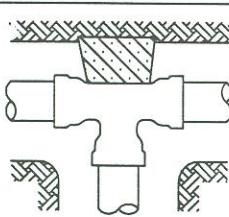
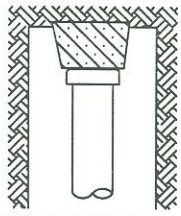


NOTES:

1. IN COMMERCIAL AREAS OR IF HYDRANTS ARE LESS THAN 4' BEHIND THE CURB, FIRE HYDRANTS SHALL BE PROTECTED FROM VEHICULAR DAMAGE BY BOLLARDS AND BE ACCESSIBLE TO FIRE PROTECTION EQUIPMENT.
2. TYPE OF HYDRANT SHOWN IS FOR ILLUSTRATION ONLY.
3. GATE VALVE SHALL BE FLANGED TO THE WATER MAIN.
4. LOWEST CAP NUT ON HYDRANT SHALL BE 20" MIN. TO 24" MAX. ABOVE TOP OF CONCRETE PAD.
5. THESE JOINTS MAY BE FLANGED, OR RESTRAINED MECHANICAL JOINTS WITH SCWA APPROVED RESTRAINING DEVICE.
6. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
FIRE HYDRANT INSTALLATION	
WATER MAIN NOT IN ROADWAY	
SCALE: NONE DATE: 12/03	8-2B

[Signature]
DIRECTOR, DEPARTMENT OF WATER RESOURCES

REQUIRED BEARING AREA IN TOTAL SQUARE FEET							
TYPE OF FITTING	90° BEND	45° BEND	11-1/4° BEND 22-1/2° BEND	TEE	DEAD END	TEE WITH PLUG	CROSS WITH PLUGS
TYPICAL INSTALLATION							
SIZE OF PIPE	4"	2	1	1	2	SEE NOTE 5	
	6"	4	2	1	3	THRUST BLOCKS NOT ALLOWED. USE RESTRAINED JOINTS WITH RESTRAINED LENGTH PER 8-3B FOR "DEAD END".	
	8"	7	4	2	5		
	10"	12	6	3	8		
	12"	16	10	5	12		

NOTES:

- THRUST BLOCKS SHALL BE CONSTRUCTED OF CLASS "B" CONCRETE.
- BEARING AREAS GIVEN ARE FOR TEST PRESSURES OF 150 PSI IN SOIL WITH MINIMUM 2,000 PSF BEARING CAPACITY. IF TEST PRESSURE IS HIGHER OR SOIL BEARING CAPACITY IS LOWER, THRUST BLOCK SIZE SHALL BE APPROVED BY SCWA.
- THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED SOIL. IF THIS CANNOT BE DONE, USE RESTRAINED JOINTS TO RESIST THRUST OVER RESTRAINED LENGTHS APPROVED BY SCWA (FOR A DEAD END, USE RESTRAINED LENGTH PER 8-3B).
- PIPE JOINTS SHALL BE KEPT CLEAR OF CONCRETE.
- FOR DEAD ENDS, INSTALL 2" TEMPORARY BLOW OFF PER 8-12.

Glenn Davis




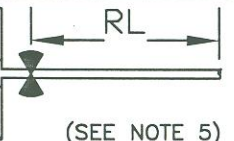
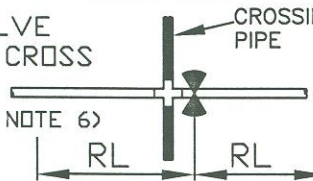

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

THRUST BLOCK
BEARING AREA

SCALE: NONE
DATE: 12/03

8-3A

RESTRAINED LENGTH IN FEET																	
PIPE CONFIGURATION	CROSSING PIPE SIZE	30" COVER AND GREATER								60" COVER AND GREATER							
		6"		8"		10"		12"		6"		8"		10"		12"	
		DIP	PVC	DIP	PVC	DIP	PVC	DIP	PVC	DIP	PVC	DIP	PVC	DIP	PVC	DIP	PVC
X = PVC PIPE NOT ALLOWED IN RESTRAINED LENGTH, USE ONLY DUCTILE IRON.																	
IN LINE VALVE 		38	X	45	X	58	X	70	X	17	17	26	X	32	X	41	X
VALVE AT TEE  INTERSECTING PIPE (SEE NOTE 4) 	6"	6	6	17	13	37	X	48	X	6	6	12	10	20	19	30	X
	8"	6	6	12	8	27	19	43	X	6	6	6	6	17	15	27	X
	10"	6	6	6	6	19	15	39	X	6	6	6	6	12	11	24	X
	12"	6	6	6	6	14	10	32	X	6	6	6	6	10	8	20	19
TEE W/O THRUST BLOCK  (SEE NOTE 5)		37	X	42	X	56	X	68	X	16	15	23	X	30	X	38	X
VALVE AT CROSS  (SEE NOTE 6)	6"	6	6	18	15	41	X	50	X	6	6	14	12	22	20	32	X
	8"	6	6	16	12	32	20	44	X	6	6	6	6	18	16	29	X
	10"	6	6	6	6	20	17	40	X	6	6	6	6	14	12	26	X
	12"	6	6	6	6	18	14	34	X	6	6	6	6	12	10	22	20
DEAD END W/O THRUST BLOCK  (SEE NOTE 5)		64	X	84	X	100	X	118	X	34	X	44	X	53	X	63	X

RL = RESTRAINED LENGTH

NOTES:

- 1) ALL JOINTS WITHIN THE RESTRAINED LENGTH SHALL BE RESTRAINED.
- 2) RESTRAINING DEVICES FOR MJ'S: FOR DUCTILE IRON USE EBAA MEGALUG 1100, STAR PIPE PRODUCTS STARGRIP 3000, OR SIGMA ONE LOK SLD; FOR PVC PIPE USE EBAA 2000PV, OR STAR PIPE PRODUCTS ALLGRIP 3600.
- 3) RESTRAINING DEVICES FOR PUSH-ON JOINTS: FOR DUCTILE IRON USE U.S. PIPE FIELD LOK GASKETS, U.S. PIPE TR FLEX PIPE, OR APPROVED EQUAL; RESTRAINED PVC PUSH-ON JOINTS NOT ALLOWED, USE DUCTILE IRON PIPE ONLY FOR RESTRAINED PUSH-ON JOINTS.
- 4) IF THRUST BLOCK IS NOT INSTALLED BEHIND TEE, RESTRAINED LENGTH SHALL BE APPROVED BY SCWA.
- 5) THIS CONFIGURATION ALLOWED ONLY IF A THRUST BLOCK CANNOT BE INSTALLED BEHIND THE TEE/DEAD END IN ACCORDANCE WITH 8-3A. IF THRUST BLOCK IS INSTALLED, RESTRAINED LENGTH NOT REQUIRED.
- 6) JOINTS ON CROSSING PIPES SHALL BE RESTRAINED FOR MINIMUM 18 FEET IN EACH DIRECTION.
- 7) RESTRAINED LENGTHS ARE BASED ON 150 PSI PRESSURE. IF HIGHER PRESSURES OR HIGHER SURGES ARE ANTICIPATED, THIS TABLE DOES NOT APPLY AND RESTRAINED LENGTHS SHALL BE APPROVED BY SCWA.

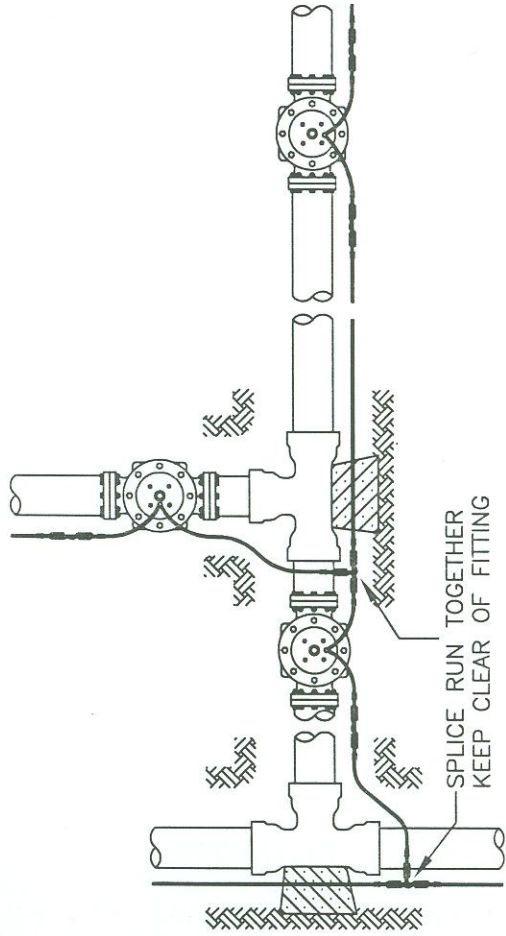

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

PIPE RESTRAINED
LENGTH

SCALE: NONE
DATE: 12/03

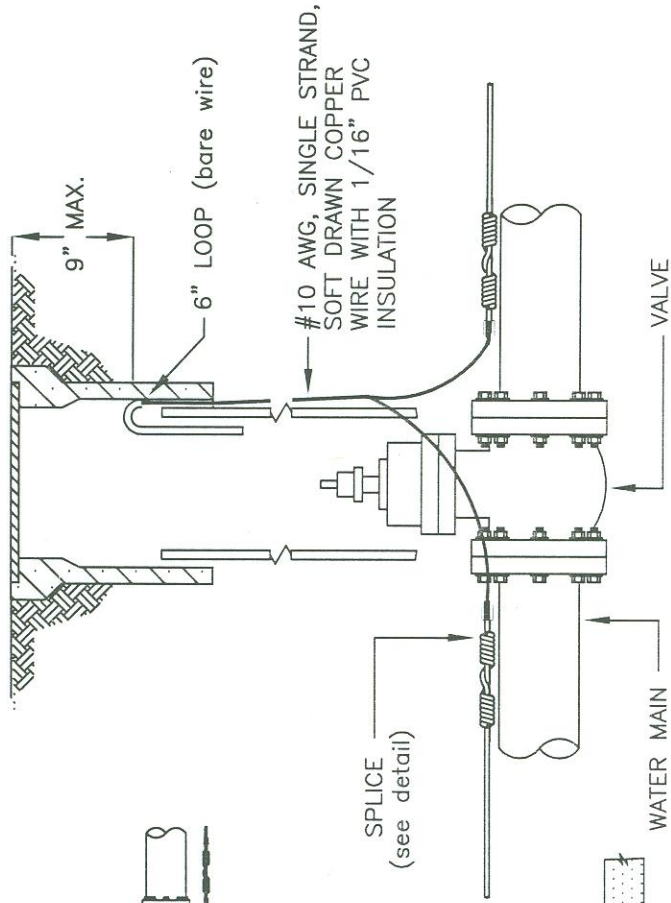
8-3B



TYPICAL LAYOUT



SPICE DETAIL



VALVE DETAIL

NOTES:

1. WIRE SHALL BE CONTINUOUS BETWEEN VALVE BOXES, EXCEPT AS NOTED.
2. LOCATING WIRE SHALL BE LAID ON TOP OF THE WATER MAIN, AND SHALL BE TAPED TO IT OR THE POLYETHYLENE ENCASEMENT (IF THE PIPE IS DUCTILE IRON) AT 10' INTERVALS AND TAPED AT ALL FITTINGS. TAPE SHALL BE 10 MIL POLYETHYLENE.
3. CONTRACTOR SHALL CONDUCT A CONTINUITY TEST ON ALL LOCATING WIRE SPLICES.
4. ALL SPLICES SHALL BE SOLDERED.

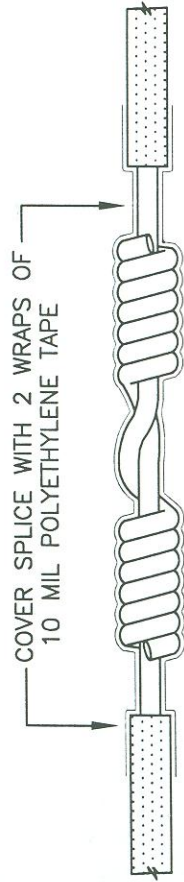
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**LOCATING WIRE
FOR WATER MAINS AND
SERVICES**

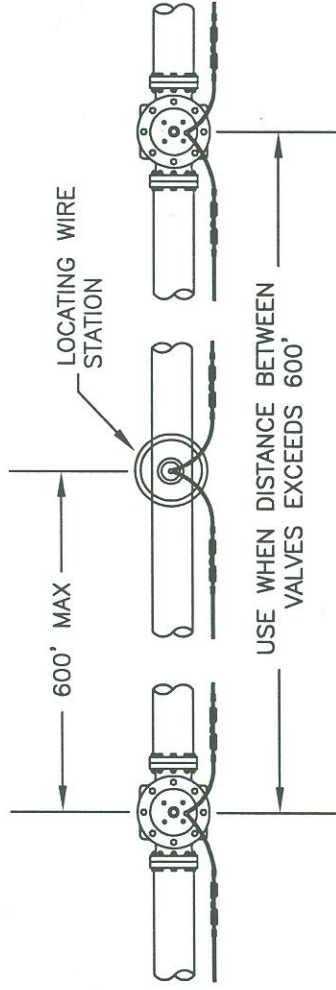
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DATE: 12/03

8-4A

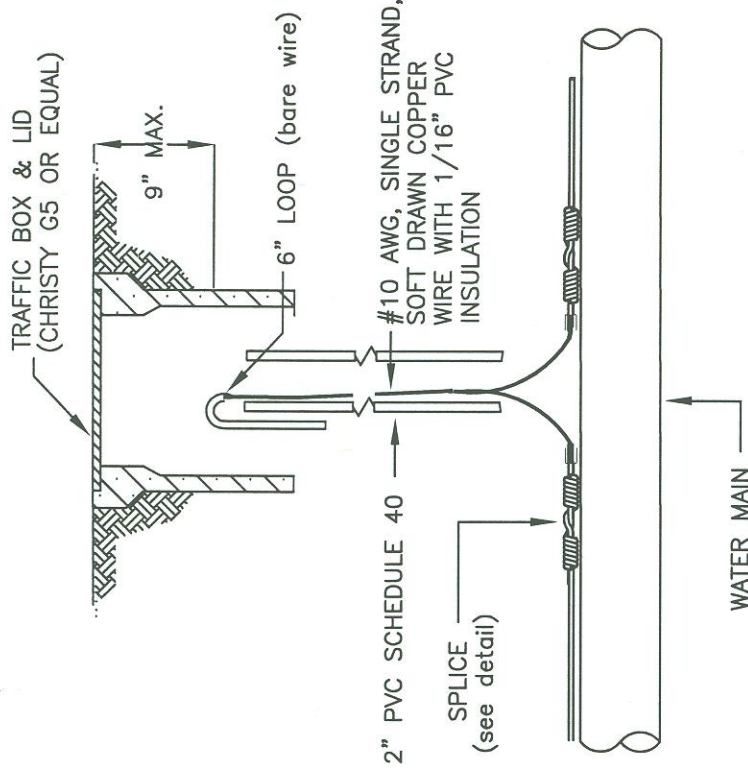
John DeW
DIRECTOR, DEPARTMENT OF WATER RESOURCES



SPLICE DETAIL



TYPICAL LAYOUT



VALVE DETAIL

NOTES:

1. WIRE SHALL BE CONTINUOUS BETWEEN VALVE BOXES, EXCEPT AS NOTED.
2. LOCATING WIRE SHALL BE LAID ON TOP OF THE WATER MAIN, AND SHALL BE TAPED TO IT OR THE POLYETHYLENE ENCASEMENT (IF THE PIPE IS DUCTILE IRON) AT 10' INTERVALS AND TAPED AT ALL FITTINGS. TAPE SHALL BE 10 MIL POLYETHYLENE.
3. CONTRACTOR SHALL CONDUCT A CONTINUITY TEST ON ALL LOCATING WIRE SPLICES.
4. **ALL SPLICES SHALL BE SOLDERED.**
5. LIDS SHALL BE LABELED WITH CAST OR BEAD WELDED LETTERS: "WATER" FOR POTABLE, "RECYCLED WATER" FOR RECYCLED AND NONPOTABLE WATER, "RAW WATER" FOR RAW WATER.

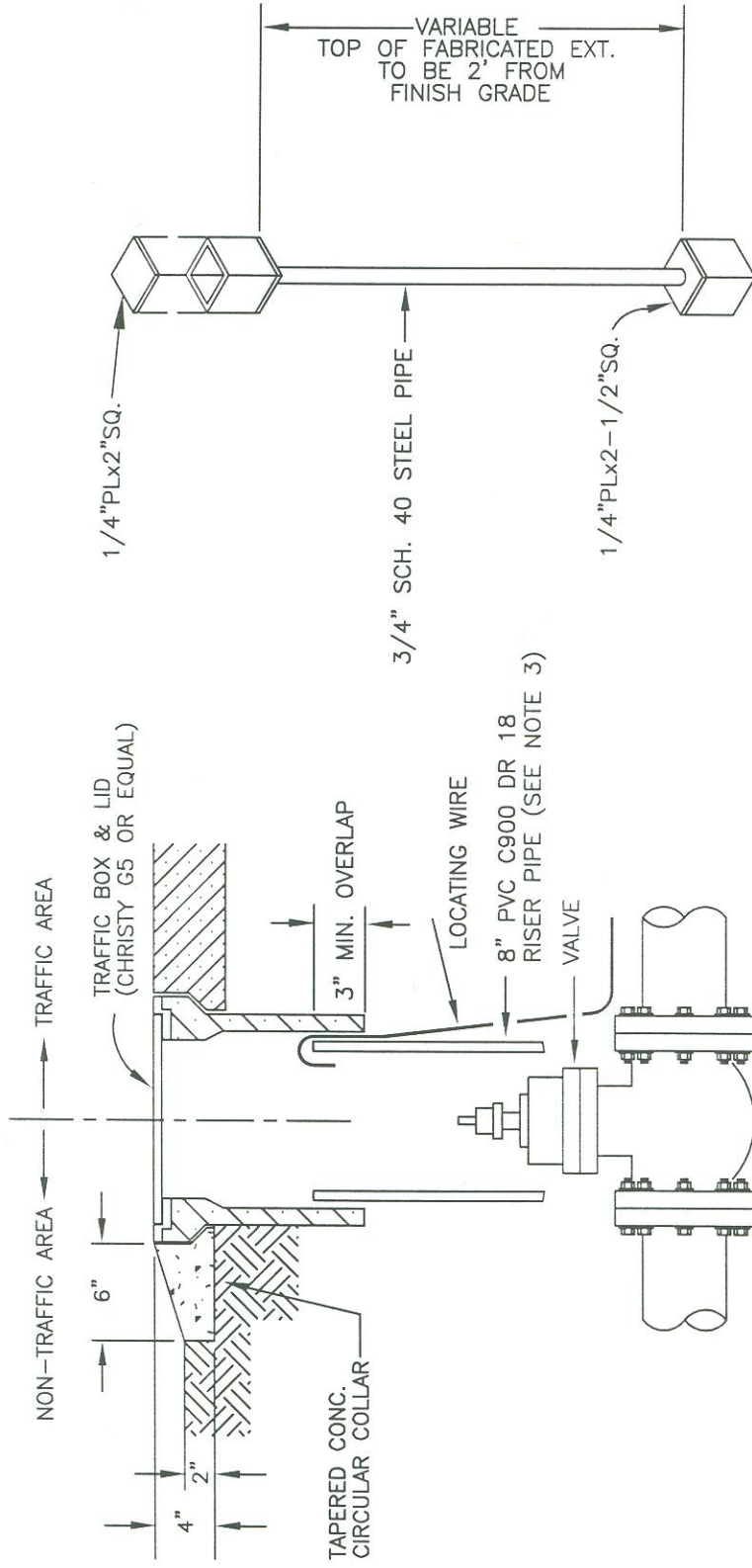
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**LOCATING WIRE
STATION**

SCALE: NONE
DATE: 12/03

8-4B

David DeVu
DIRECTOR, DEPARTMENT OF WATER RESOURCES



TRAFFIC VALVE BOX

VALVE OPERATING NUT EXTENSION

REQUIRED WHERE VALVE NUT IS IN EXCESS OF 10 FEET BELOW FINISH GRADE.

NOTES:

1. VALVE BOX AND RISER SHALL BE SET PLUMB AND CENTERED OVER WATER VALVE NUT.
2. SET VALVE BOX TO FINAL FINISH GRADE. IN AREAS WHERE THE FINISH GRADE HAS NOT BEEN DEFINED, PLACE 4"x4" LOCATING POST WITHIN 1 FOOT OF VALVE BOX. POST SHALL BE 6 FEET IN LENGTH AND BURIED 3 FEET. PAINT POST BLUE FOR POTABLE WATER, PURPLE FOR RECYCLED AND NONPOTABLE WATER, OR GREEN FOR RAW WATER.
3. RISER PIPE SHALL BE BLUE OR WHITE FOR POTABLE WATER, WHITE FOR RAW WATER, OR PURPLE FOR RECYCLED AND NONPOTABLE WATER.
4. RAW WATER ONLY: PAINT BOX INTERIOR & TOP 1 FT. OF RISER GREEN. LIDS SHALL BE LABELED WITH CAST OR BEAD WELDED LETTERS: "WATER" FOR POTABLE, "RECYCLED WATER" FOR RECYCLED AND NONPOTABLE WATER, "RAW WATER" FOR RAW WATER.

FOR

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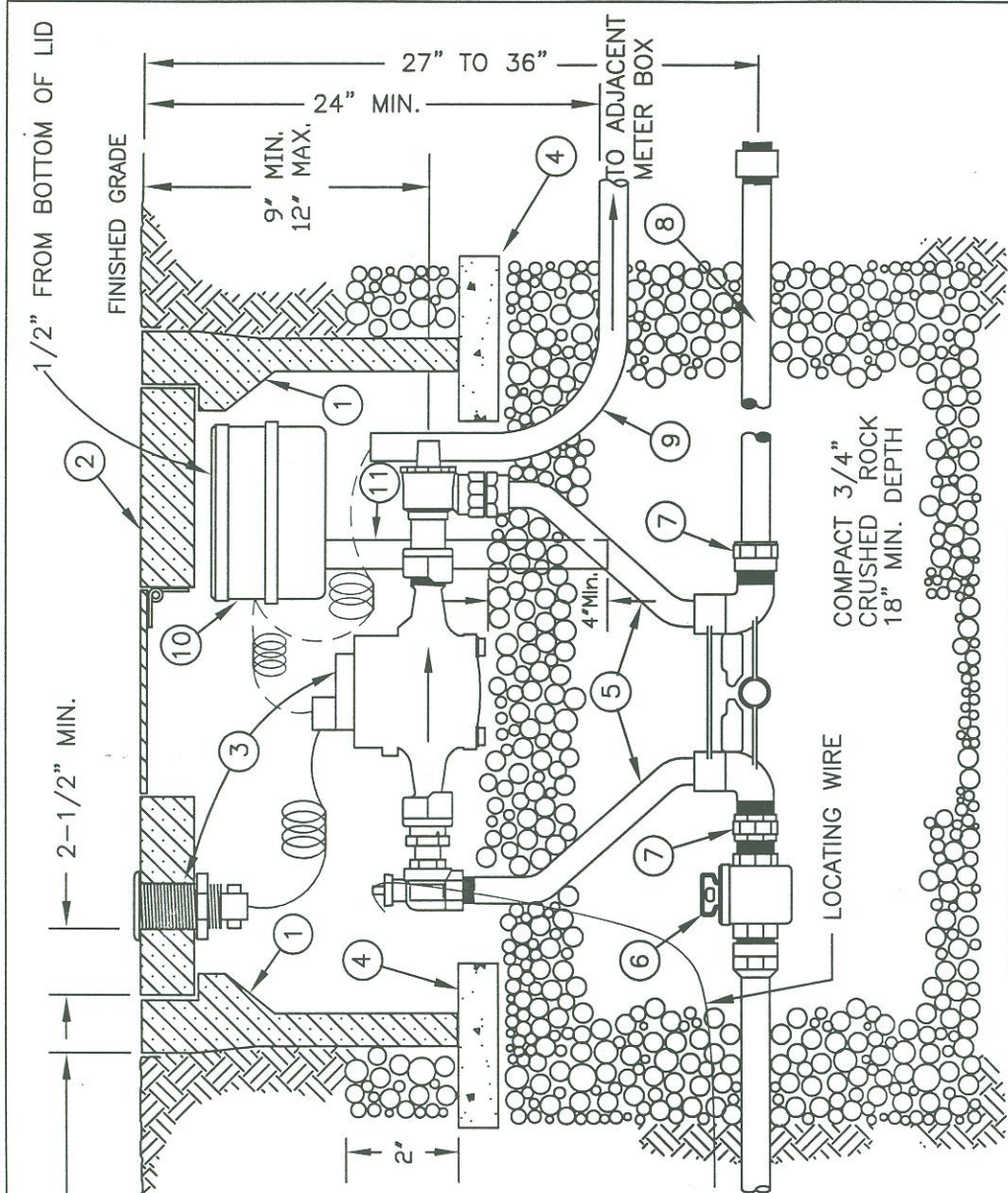
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**VALVE BOX INSTALLATION
AND OPERATING NUT
EXTENSION**

SCALE: NONE
DATE: 12/03

8-5



- ① REINFORCED CONCRETE UTILITY BOX (CHRISTY B30 or equal).
- ② REINFORCED CONCRETE COVER WITH A HINGED CAST IRON LID AND A 1-3/4" PRE-CAST HOLE (Christy B30G Cover or equal).
- ③ 1" INVENSYS SR II TR/PL WATER METER, TOUCH READ MODULE, AND RADIO READ TRANSCIEVER UNIT (100 CU. FT. REGISTER) OR SCWA APPROVED EQUAL.
- ④ 3/4" TO 1"x4"x16" CONCRETE BLOCKS TO HELP LEVEL AND SUPPORT VALVE BOX. USE MINIMUM OF ONE BLOCK ON ALL FOUR SIDES OF METER BOX. COVER ANY OPENINGS OR HOLES IN UTILITY BOX WITH CONCRETE BLOCKS.
- ⑤ 1" COPPER SETTER WITH LOCKWING ANGLE METER STOP FULL PORTED BALL TYPE AND ANGLE METER DUAL CHECK VALVE (MUELLER B-2404-2, or equal).
- ⑥ 1" CURB STOP WITH TEFLON COATED BALL, COMPRESSION x F.I.P.T.
- ⑦ BRONZE ADAPTER (as required).
- ⑧ 1" x 36" BRASS NIPPLE, WITH BRONZE THREADED COUPLING AND PLUG.
- ⑨ 3/4" SCHED. 80 PVC CONDUIT, SEAL ENDS WITH PVC TAPE, INSTALL BETWEEN METER BOXES PAIRED AT PROPERTY LINES AND BETWEEN ANY METER BOXES WITHIN 6 FT. OF EACH OTHER.
- ⑩ RADIO READ TRANSCIEVER UNIT, INVENSYS MXU MODEL 505, TURN OVER TO SCWA FOR INSTALLATION BY SCWA. FURNISH ONE RTU PER METER.
- ⑪ 1/2" EMT SUPPORT.

METER BOX SHALL NOT BE LOCATED IN A DRIVEWAY UNDER ANY CIRCUMSTANCE

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY	
1" RESIDENTIAL METERED WATER SERVICE	
SCALE: NONE DATE: 3/05	8-6A

David DeVine
DIRECTOR, DEPARTMENT OF WATER RESOURCES

NOTE:
ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

1 REINFORCED CONCRETE UTILITY BOX (CHRISTY B36 FOR 1-1/2" & 2", B30 FOR 1", OR EQUAL)

2 REINFORCED CONCRETE COVER WITH A HINGED CAST IRON LID AND A 1-3/4" PRE-CAST HOLE LOCATED OPPOSITE WATER LABEL (Christy B36G cover or equal).

3 INVENSY'S SR TR/PL WATER METER, TOUCH READ MODULE, AND RADIO READ TRANSCIVER UNIT (100 CU. FT. REGISTER) OR SCWA APPROVED EQUAL.

4 FLANGED WINGED ANGLE METER STOP WITH TEFLON COATED BALL

5 OVAL FLANGED 90° BRONZE FITTING

6 3/4" TO 1"x4"x16" CONCRETE BLOCK TO HELP SUPPORT VALVE BOX, USE ONE BLOCK ON ALL FOUR SIDES OF METER BOX. COVER ANY OPENINGS OR HOLES IN THE SIDE OF THE UTILITY BOX WITH CONCRETE BLOCK.

7 BRONZE 90° ELBOW, THREADED.

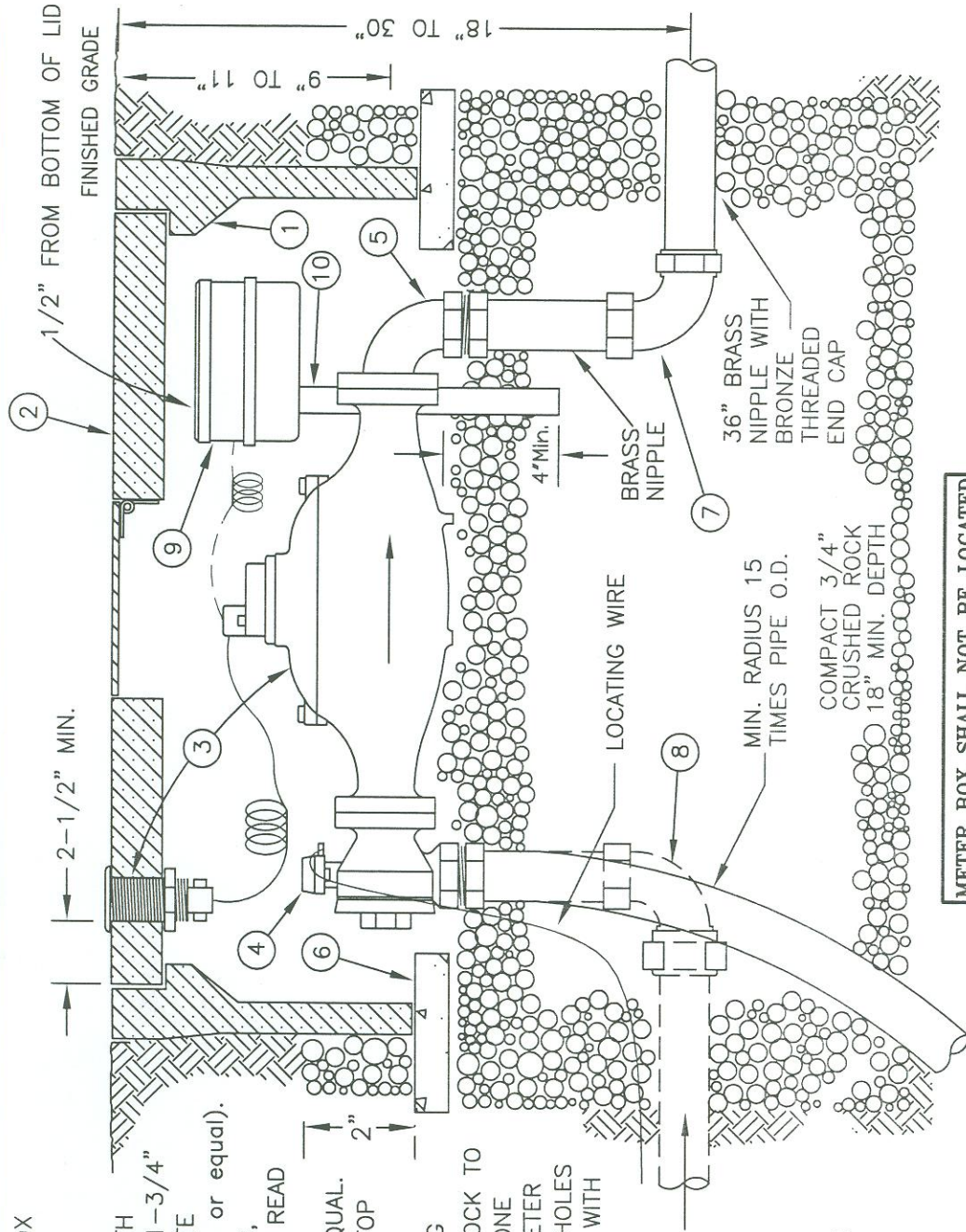
8 BRONZE 90° ELBOW, THREADED OR COMPRESSION.

9 RADIO READ TRANSCIVER UNIT, INVENSY'S MXU MODEL 505, TURN OVER TO SCWA FOR INSTALLATION BY SCWA. FURNISH ONE RTU PER METER.

10 1/2" EMT SUPPORT.

NOTES:

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL. FOR RECYCLED AND NONPOTABLE SERVICES: METER BOX SHALL HAVE A PURPLE POLYETHYLENE FACE RING. READING LID SHALL BE LABELED "RECYCLED WATER" WITH BEAD WELDED OR ENGRAVED LETTERS.



SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

1-1/2" OR 2"
COMMERCIAL METERED
WATER SERVICE

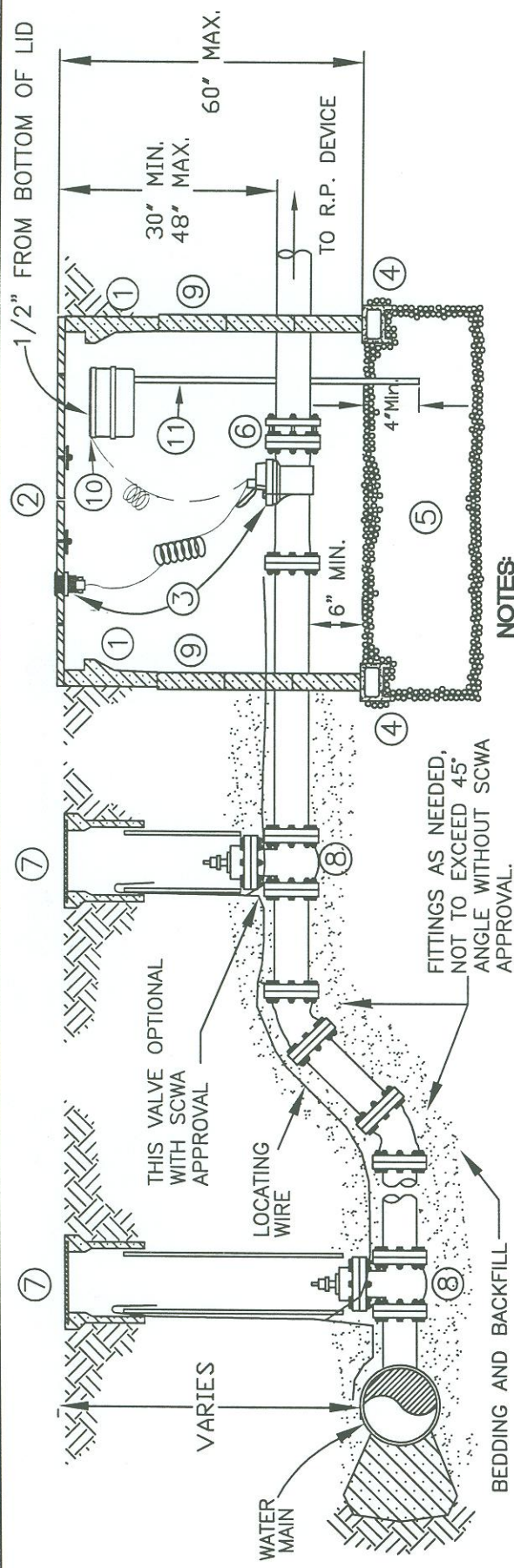
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DATE: 3/05

8-6B

DIRECTOR, DEPARTMENT OF WATER RESOURCES

DeVine

METER BOX SHALL NOT BE LOCATED
IN AN AREA SUBJECT TO TRAFFIC
UNDER ANY CIRCUMSTANCE



NOTES

① REINFORCED CONCRETE UTILITY BOX WITH EXTENSIONS (CHRISTY B48).

② 2 PIECE STEEL CHECKER PLATE W/ TWO 10" ROUND SELF-CLOSING READING LIDS AND 1-3/4" HOLE FOR TOUCH READ MODULE IN ONE READING LID (CHRISTY B48-62G COVER).

③ INVENSY'S COMPOUND METER, TOUCH READ MODULE, AND RADIO READ TRANSCIVER UNIT (CUBIC FEET REGISTER), OR AS CALLED OUT ON PLANS. IF A TURBO METER IS CALLED OUT ON PLANS, TYPE SHALL BE INVENSY'S DRS TR/PL.

④ CONCRETE BLOCKS SHALL BE PLACED ALONG THE ENTIRE PERIMETER TO SUPPORT BOX.

⑤ 3/4" CRUSHED ROCK SUB-BASE, 12" TO 18" DEEP, COMPACT TO 90% COMPACTION.

⑥ FLANGED COUPLING ADAPTER.

⑦ VALVE BOX AND LID (SEE 8-5).

⑧ GATE VALVE, BOTH ENDS FLANGED.

⑨ METER BOX EXTENSION (TYPICAL).

⑩ RADIO READ TRANSCIVER UNIT, INVENSYS MXU MODEL 505, TURN OVER TO SCWA FOR INSTALLATION BY SCWA. FURNISH ONE RTU PER METER.

1 1/2" EMT SUPPORT.

4" TO 6" DIA. PIPE BETWEEN WATER MAIN AND METER SHALL BE DUCTILE IRON. 3" PIPE SHALL BE TYPE K COPPER OR DUCTILE IRON. JOINTS BETWEEN MAIN AND METER SHALL BE RESTRAINED. RESTRAINING DEVICES SHALL BE APPROVED BY SCWA.

INSTALL LOCATING WIRE PER 8-4.

CONCRETE BLOCKS SHALL BE USED TO BLOCK ANY OPENING OR CUT-OUT PORTIONS OF THE METER BOX NOT UTILIZED (MINIMUM 1" THICK BLOCK).

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

FOR RECYCLED AND NONPOTABLE SERVICES:
METER BOX SHALL HAVE A PURPLE POLYETHYLENE FACE RING.
COVER SHALL BE LABELED "RECYCLED WATER" WITH BEAD
WELDED LETTERS.

**METER BOX SHALL NOT BE LOCATED
IN AN AREA SUBJECT TO TRAFFIC
UNDER ANY CIRCUMSTANCE**

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

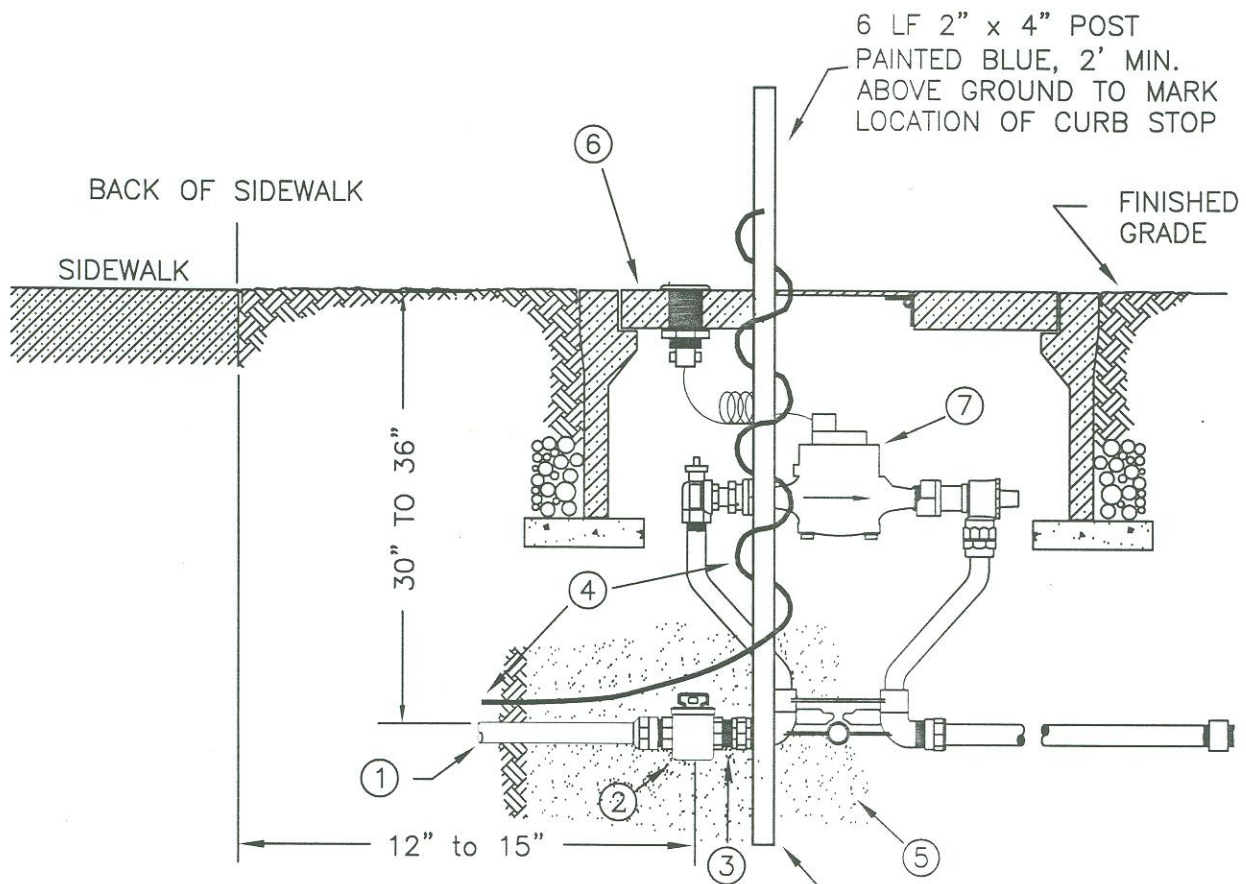
3" TO 6" WATER SERVICE & METER INSTALLATION

SCALE: NONE
DATE: 3/05

8-6C

Wendell Bell
DIRECTOR, DEPARTMENT OF WATER RESOURCES

DIRECTOR, DEPARTMENT OF WATER RESOURCES



- ① 1" WATER SERVICE LINE
 - ② 1" CURB STOP WITH TEFLON COATED BALL (COMP. BY F.I.P.T.)
 - ③ REMOVABLE THREADED BRONZE PLUG
 - ④ LOCATING WIRE – MIN. 3' LENGTH WRAPPED AROUND POST.
 - ⑤ GRADED SAND, 12" THICK.
 - ⑥ REINFORCED CONCRETE UTILITY BOX BY HOME BUILDER
 - ⑦ 1" WATER METER BY HOME BUILDER
- INSTALL LOCATING POST PRIOR TO BACKFILL

NOTES:

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

METER BOX, METER, LOCATING WIRE, AND AGGREGATES SHALL BE INSTALLED BY HOME BUILDER IN ACCORDANCE WITH 8-6A.

David DeWitt

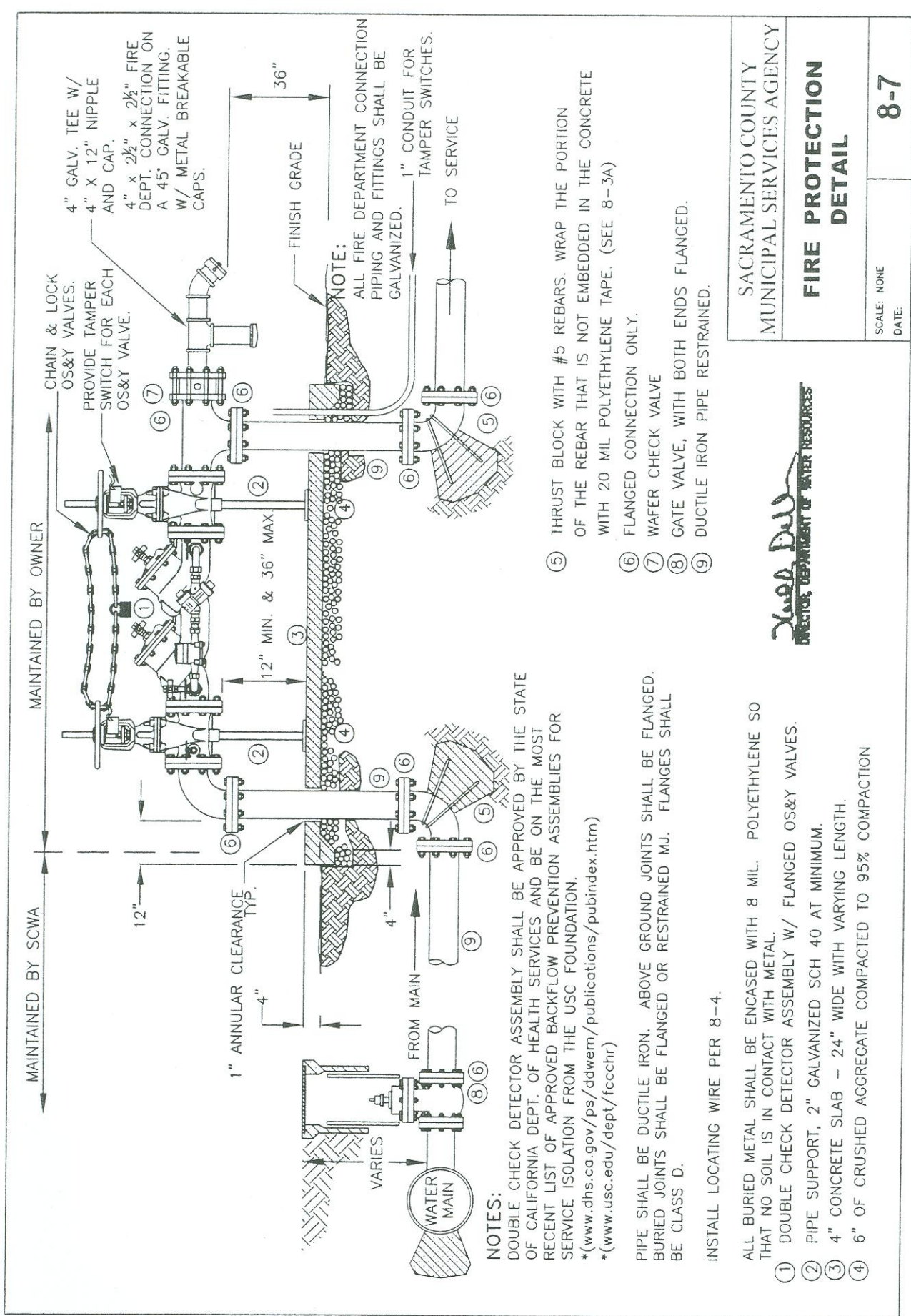
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**1" RESIDENTIAL
WATER SERVICE
POST MARKER**

SCALE: NONE
DATE: 12/03

8-6D



NOTES:

DOUBLE CHECK DETECTOR ASSEMBLY SHALL BE APPROVED BY THE STATE OF CALIFORNIA DEPT. OF HEALTH SERVICES AND BE ON THE MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES FOR SERVICE ISOLATION FROM THE USC FOUNDATION.

*(www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm)

*(www.usc.edu/dept/fccchr)

PIPE SHALL BE DUCTILE IRON. ABOVE GROUND JOINTS SHALL BE FLANGED. BURIED JOINTS SHALL BE FLANGED OR RESTRAINED MJ. FLANGES SHALL BE CLASS D.

INSTALL LOCATING WIRE PER 8-4.

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL. POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

- ① DOUBLE CHECK DETECTOR ASSEMBLY W/ FLANGED OS&Y VALVES.
- ② PIPE SUPPORT, 2" GALVANIZED SCH 40 AT MINIMUM.
- ③ 4" CONCRETE SLAB - 24" WIDE WITH VARYING LENGTH.
- ④ 6" OF CRUSHED AGGREGATE COMPACTED TO 95% COMPACTION

- ⑤ THRUST BLOCK WITH #5 REBARS. WRAP THE PORTION OF THE REBAR THAT IS NOT EMBEDDED IN THE CONCRETE WITH 20 MIL POLYETHYLENE TAPE. (SEE 8-3A)
- ⑥ FLANGED CONNECTION ONLY.
- ⑦ WAFER CHECK VALVE
- ⑧ GATE VALVE, WITH BOTH ENDS FLANGED.
- ⑨ DUCTILE IRON PIPE RESTRAINED.

NOTE:
ALL FIRE DEPARTMENT CONNECTION PIPING AND FITTINGS SHALL BE GALVANIZED.

MAINTAINED BY SCWA

MAINTAINED BY OWNER

CHAIN & LOCK OS&Y VALVES.
PROVIDE TAMPER SWITCH FOR EACH OS&Y VALVE.

4" GALV. TEE W/ 4" X 12" NIPPLE AND CAP.
4" x 2 1/2" x 2 1/2" FIRE DEPT. CONNECTION ON A 45° GALV. FITTING. W/ METAL BREAKABLE CAPS.

12" MIN. & 36" MAX

FINISH GRADE

VARIES

FROM MAIN

TO SERVICE

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

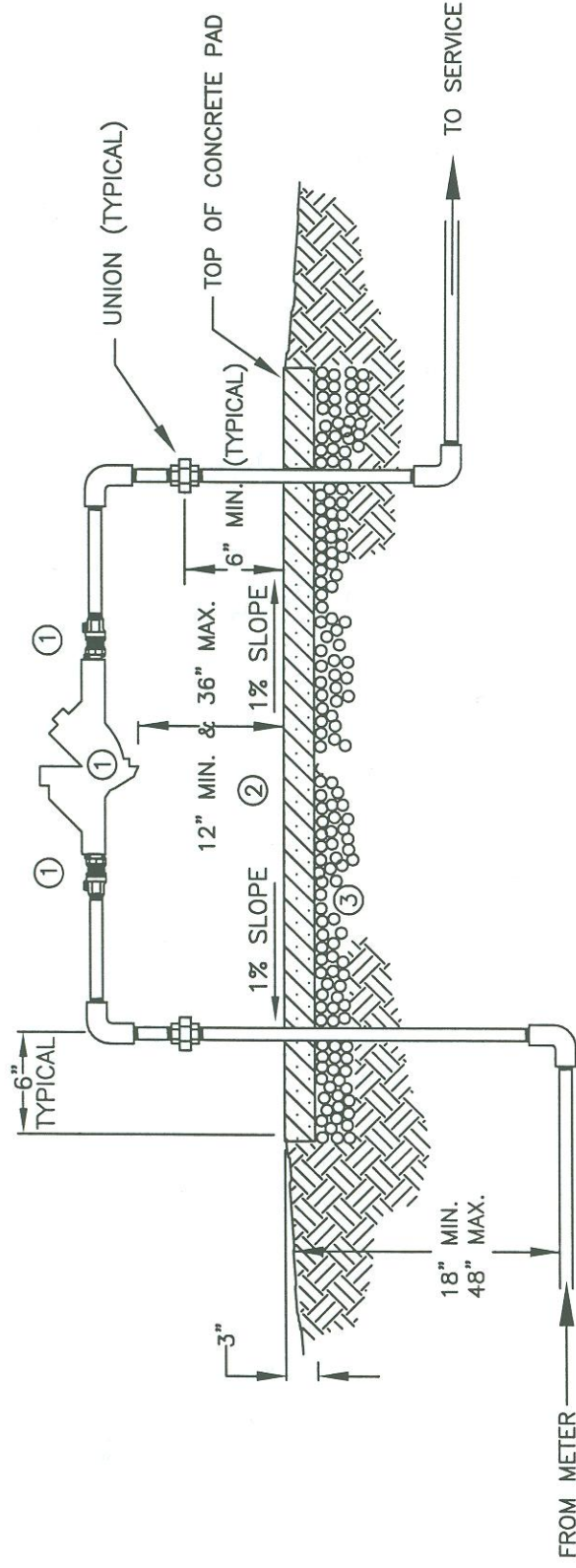
**FIRE PROTECTION
DETAIL**

SCALE: NONE
DATE:

8-7

David D. Du
DIRECTOR, DEPARTMENT OF WATER RESOURCES

THIS DETAIL SUPERCEDES ALL PREVIOUS VERSIONS OF THIS DETAIL.



NOTES:

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON THE STATE OF CALIFORNIA'S DEPT. OF HEALTH SERVICES MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES FOR SERVICE ISOLATION. [*\(www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm\)](http://www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm)

ALL PIPES SHALL BE GALVANIZED SCHEDULE 40 STEEL, TYPE K COPPER, OR BRONZE. BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE WRAP OR 10 MIL POLYETHYLENE TAPE SO THAT NO SOIL IS IN CONTACT WITH METAL.

GALVANIZED PIPE SHALL HAVE ANODE BAG PER COUNTY BUILDING INSPECTION REQUIREMENTS CODE. INSTALL DI-ELECTRIC COUPLING OR FITTING BETWEEN DISSIMILAR METALS.

① REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY, WITH 2 BRONZE RESILIENT SEATED BALL VALVES MINIMUM WORKING PRESSURE 175 PSI.

② 3" SLAB - 18" WIDE WITH VARYING LENGTH

③ 1/2" OR 3/4" CRUSHED ROCK, 4" MINIMUM THICKNESS, MECHANICALLY COMPACTED TO 95% COMPACTION.

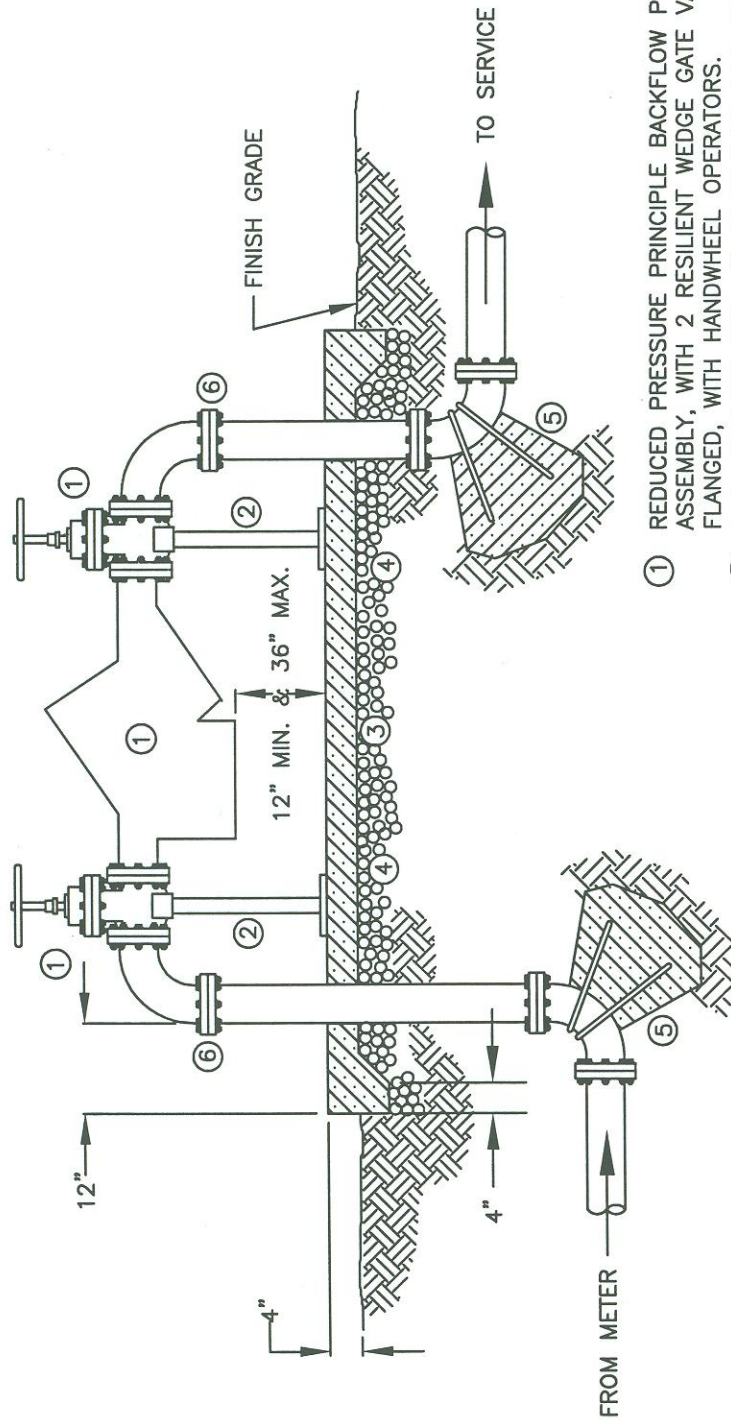
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

REDUCED PRESSURE BACKFLOW
PREVENTER 1" TO 2"

SCALE: NONE
DATE: 12/03

8-8A

David DeV
DIRECTOR, DEPARTMENT OF WATER RESOURCES



NOTES:

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON THE STATE OF CALIFORNIA'S DEPT. OF HEALTH SERVICES MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES FOR SERVICE ISOLATION. [*\(www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm\)](http://www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm)

PIPE SHALL BE DUCTILE IRON. ABOVE GROUND JOINTS SHALL BE FLANGED. BURIED JOINTS SHALL BE FLANGED OR RESTRAINED MJ. FLANGES SHALL BE CLASS D.

INSTALL LOCATING WIRE PER 8-4.

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL. POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

- ① REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY, WITH 2 RESILIENT WEDGE GATE VALVES, FLANGED, WITH HANDWHEEL OPERATORS.
- ② PIPE SUPPORT, MIN. 2" GALVANIZED SCH 40.
- ③ 4" CONCRETE SLAB - 24" WIDE WITH VARYING LENGTH.
- ④ 6" CRUSHED AGGREGATE COMPACTED TO 95% COMPACTION
- ⑤ THRUST BLOCK WITH #5 REBARS. WRAP THE PORTION OF THE REBAR NOT EMBEDDED IN CONCRETE WITH 20 MIL POLYETHYLENE TAPE (SEE 8-3A).
- ⑥ FLANGE CONNECTION ONLY.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

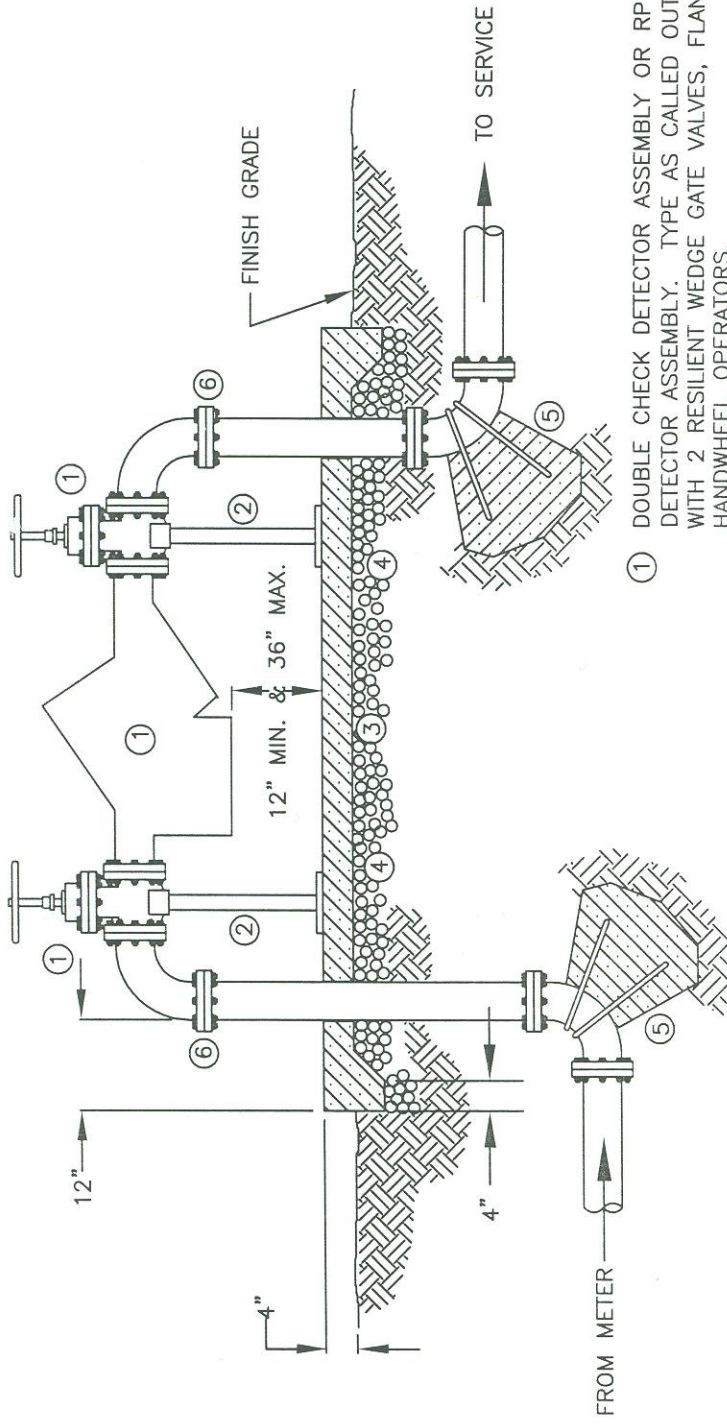
**REDUCED PRESSURE BACKFLOW
PREVENTER 3" AND LARGER**

SCALE: NONE
DATE: 12/03

8-8B

John Della

DIRECTOR, DEPARTMENT OF WATER RESOURCES



NOTES:

DOUBLE CHECK DETECTOR ASSEMBLY AND REDUCED PRESSURE PRINCIPLE DETECTOR ASSEMBLY SHALL BE ON THE STATE OF CALIFORNIA'S DEPT. OF HEALTH SERVICES MOST RECENT LIST OF APPROVED BACKFLOW PREVENTION ASSEMBLIES FOR SERVICE ISOLATION.
*(www.dhs.ca.gov/ps/ddwem/publications/pubindex.htm)

PIPE SHALL BE DUCTILE IRON, ABOVE GROUND JOINTS SHALL BE FLANGED. BURIED JOINTS SHALL BE FLANGED OR RESTRAINED MJ. FLANGES SHALL BE CLASS D.

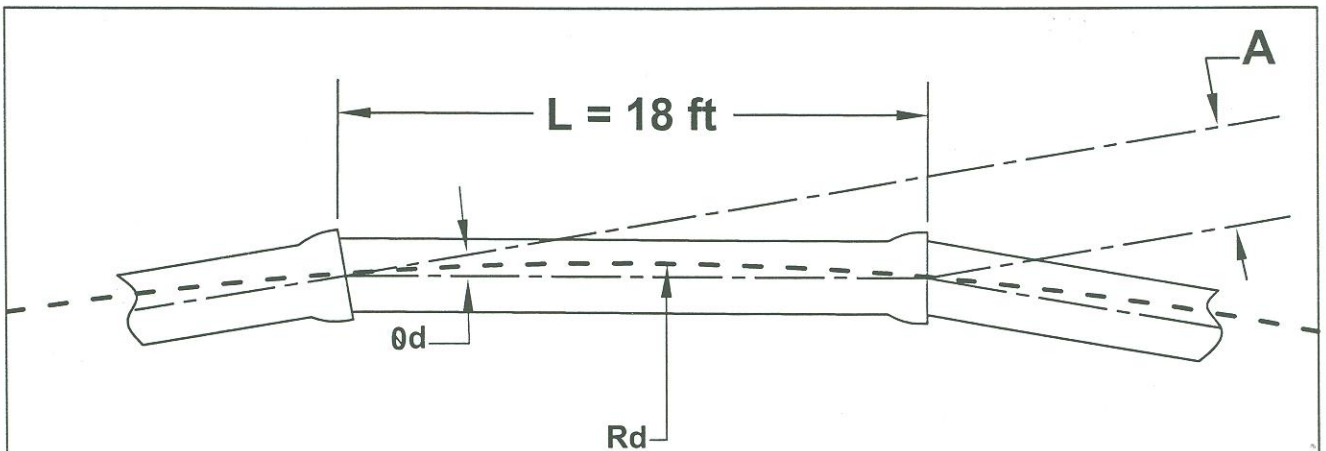
INSTALL LOCATING WIRE PER 8-4.

ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL. POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

- ① DOUBLE CHECK DETECTOR ASSEMBLY OR RP PRINCIPLE DETECTOR ASSEMBLY. TYPE AS CALLED OUT ON PLANS, WITH 2 RESILIENT WEDGE GATE VALVES, FLANGED, WITH HANDWHEEL OPERATORS.
- ② PIPE SUPPORT, MIN. 2" GALVANIZED SCH 40.
- ③ 1" CONCRETE SLAB - 24" WIDE WITH VARYING LENGTH.
- ④ 6" CRUSHED AGGREGATE COMPACTED TO 95% COMPACTION
- ⑤ THRUST BLOCK WITH #5 REBAR. WRAP THE PORTION OF THE REBAR NOT EMBEDDED IN CONCRETE WITH 20 MIL POLYETHYLENE TAPE (SEE 8-3A).
- ⑥ FLANGE CONNECTION ONLY.

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
DOUBLE CHECK DETECTOR OR RP PRINCIPLE DETECTOR 6" AND LARGER	
SCALE: NONE DATE: 12/03	8-8C

Wendy Del
DIRECTOR, DEPARTMENT OF WATER RESOURCES



θ_d = Maximum joint deflection angle (degrees)

A = Offset at the end of the pipe (inches)

R_d = Minimum radius of curve produced by succession of joints (feet)

MAXIMUM JOINT DEFLECTION FOR DUCTILE IRON PIPE						
Size Of Pipe (inches)	UNRESTRAINED JOINTS			RESTRAINED JOINTS		
	Maximum Deflection Angle, " θ_d " (degrees)	Minimum Radius, " R_d " (feet)	Offset At Free End, " A " (inches)	Maximum Deflection Angle, " θ_d " (degrees)	Minimum Radius, " R_d " (feet)	Offset At Free End, " A " (Inches)
4	2.5	400	10	2.5	400	10
6	2.5	400	10	2.5	400	10
8	2.5	400	10	2.5	400	10
10	2.5	400	10	2.5	400	10
12	2.5	400	10	2.5	400	10
14	2.5	400	10	2.0	500	8
16	2.5	400	10	2.0	500	8
18	2.5	400	10	2.0	500	8
20	2.5	400	10	1.25	800	5
24	2.5	400	10	1.25	800	5
30	2.5	400	10	1.00	1100	4
36	2.5	400	10	0.75	1400	3
42	2.0	500	8	0.25	4000	1

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

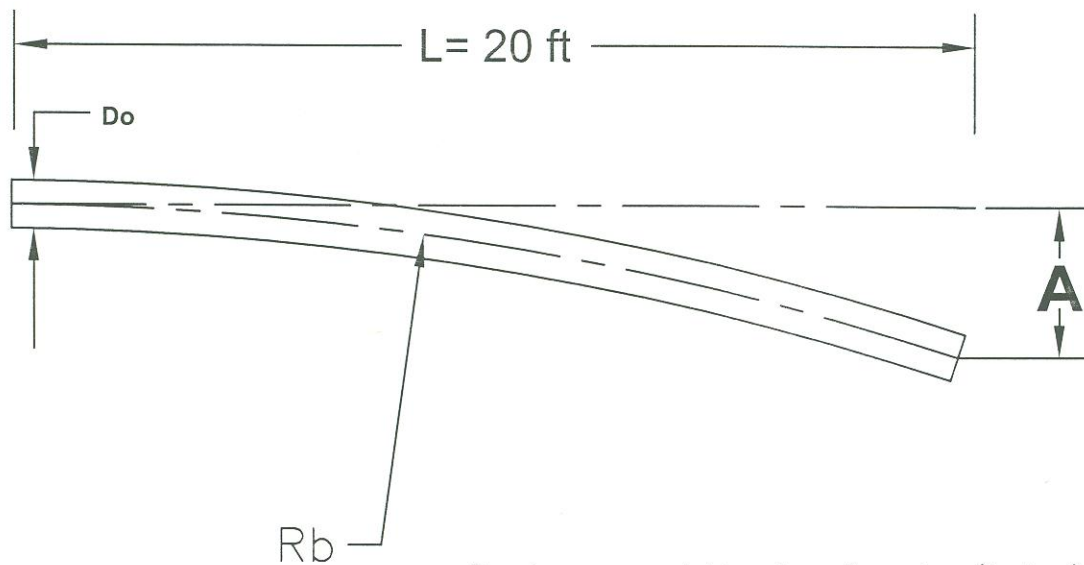
**MAXIMUM DEFLECTION
FOR DUCTILE IRON PIPE**

[Signature]

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SCALE: NONE
DATE: 12/03

8-9A



Do=Average outside pipe diameter (inches)
A=Offset at the end of the pipe (inches)
Rb=Minimum bending radius (feet)

MAXIMUM BENDING DEFLECTION FOR PVC PIPE				
Nominal Pipe Diameter	Average Outside Pipe Diameter "Do"	Minimum Wall Thickness	Minimum Bending Radius "Rb"	Offset at Free End, "A"
(inches)	(inches)	(inches)	(feet)	(inches)
AWWA C900 CLASS 150 DR 18				
4	4.800	0.267	120	20
6	6.900	0.383	185	13
8	9.050	0.503	240	10
10	11.100	0.617	400	6
12	13.200	0.733	800	3
AWWA C905 CLASS 235 DR 18				
14	15.300	0.850	1500	2
16	17.400	0.967	1500	2
18	19.500	1.083	1500	2

JOINT DEFLECTION OF AWWA C900 & C905 PVC PIPE IS PROHIBITED.

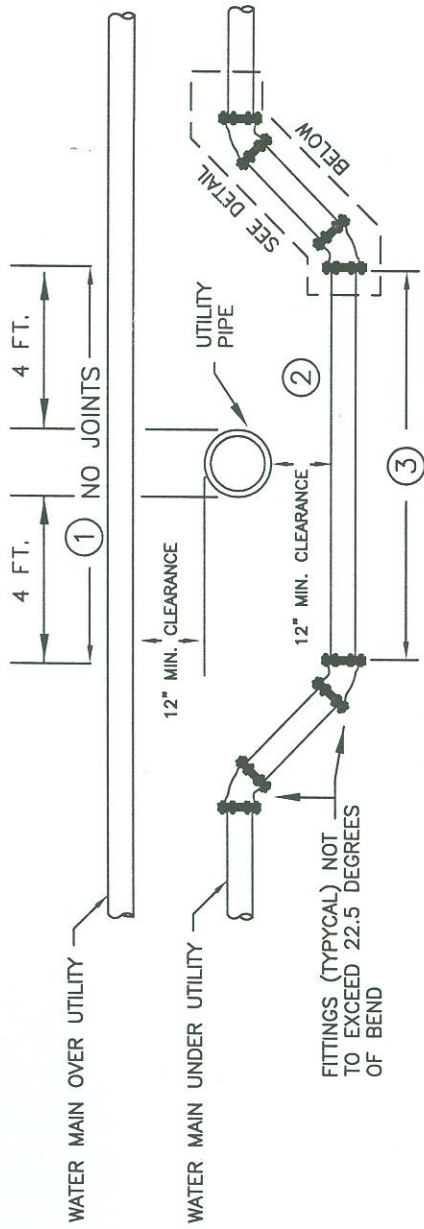
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**MAXIMUM DEFLECTION
FOR PVC PIPE**

[Signature]
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SCALE: NONE
DATE: 12/03

8-9B



LEGEND

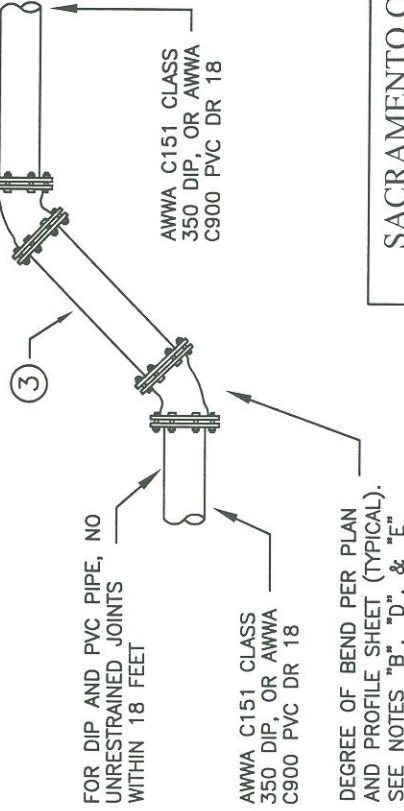
DIP= DUCTILE IRON PIPE
 AWWA= AMERICAN WATER WORKS ASSOC.
 PVC= POLYVINYL CHLORIDE PIPE
 POJ= PUSH ON JOINTS
 SCWA SACRAMENTO COUNTY WATER
 MAINTENANCE DISTRICT

NOTES

- IF DIP IS USED, FITTINGS MAY HAVE BELL ENDS WITH U.S. PIPE FIELD LOK GASKETS FOR RESTRAINING DEVICES OR APPROVED EQUAL BY SCWA. BELL RESTRAINTS FOR PVC PIPE ARE NOT ALLOWED.
- IF BEND IS TO EXCEED 22.5 DEGREES, THE BEND AND THE RESTRAIN LENGTH MUST BE APPROVED BY SCWA
- WRAP ALL DIP AND FITTINGS WITH 8 MIL. POLYETHYLENE ENCASEMENT IN ACCORDANCE WITH AWWA C105.
- RESTRAINING DEVICE FOR DIP: FOR POJs, USE U.S. PIPE FIELD LOK GASKETS OR APPROVED EQUAL; FOR MJ JOINTS USE STAR PIPE PRODUCTS STARGRIP 3000, STAR PIPE PRODUCTS ALLGRIP 3600, EBAA MEGALUG 2000PV SERIES, OR APPROVED EQUAL BY SCWA.
- RESTRAINING DEVICE FOR PVC PIPE: USE MJ FITTINGS WITH STAR PIPE PRODUCTS ALLGRIP 3600, EBAA MEGALUG 2000PV SERIES, OR APPROVED EQUAL BY SCWA.
- SEE PLAN & PROFILE FOR RESTRAINED LENGTH AND DEGREE OF BEND.
- THIS DETAIL IS FOR WATER PIPES 12" IN DIAMETER & SMALLER.

- IF UTILITY BEING CROSSED IS NOT A STORM DRAIN, SEWER, OR OTHER WATER LINE, THEN THE "NO JOINT" REQUIREMENT DOES NOT APPLY
- IF THE UTILITY BEING CROSSED IS A SEWER, STORM DRAIN OR OTHER WATER LINE, THE TYPE OF PIPE MUST BE DUCTILE IRON OR AWWA C900 DR 14 PVC PIPE
- NO JOINTS ALLOWED IF LESS THAN 18 FEET, OR LESS THAN 20 FEET IF THE UTILITY BEING CROSSED IS SEWER. ALL JOINTS BETWEEN FITTINGS MUST BE RESTRAINED WITH EITHER OF THE METHODS DESCRIBED FOR DIP. BELL RESTRAINTS FOR PVC PIPE ARE NOT ALLOWED.

SEE NOTES "B", "D", & "E"
 FOR DIP AND PVC PIPE, NO UNRESTRAINED JOINTS WITHIN 18 FEET
 AWWA C153 MJ X MJ DUCTILE IRON FITTING FOR DIP AND PVC PIPE; OR AWWA C153 POJ X POJ DUCTILE IRON FITTING FOR DIP.



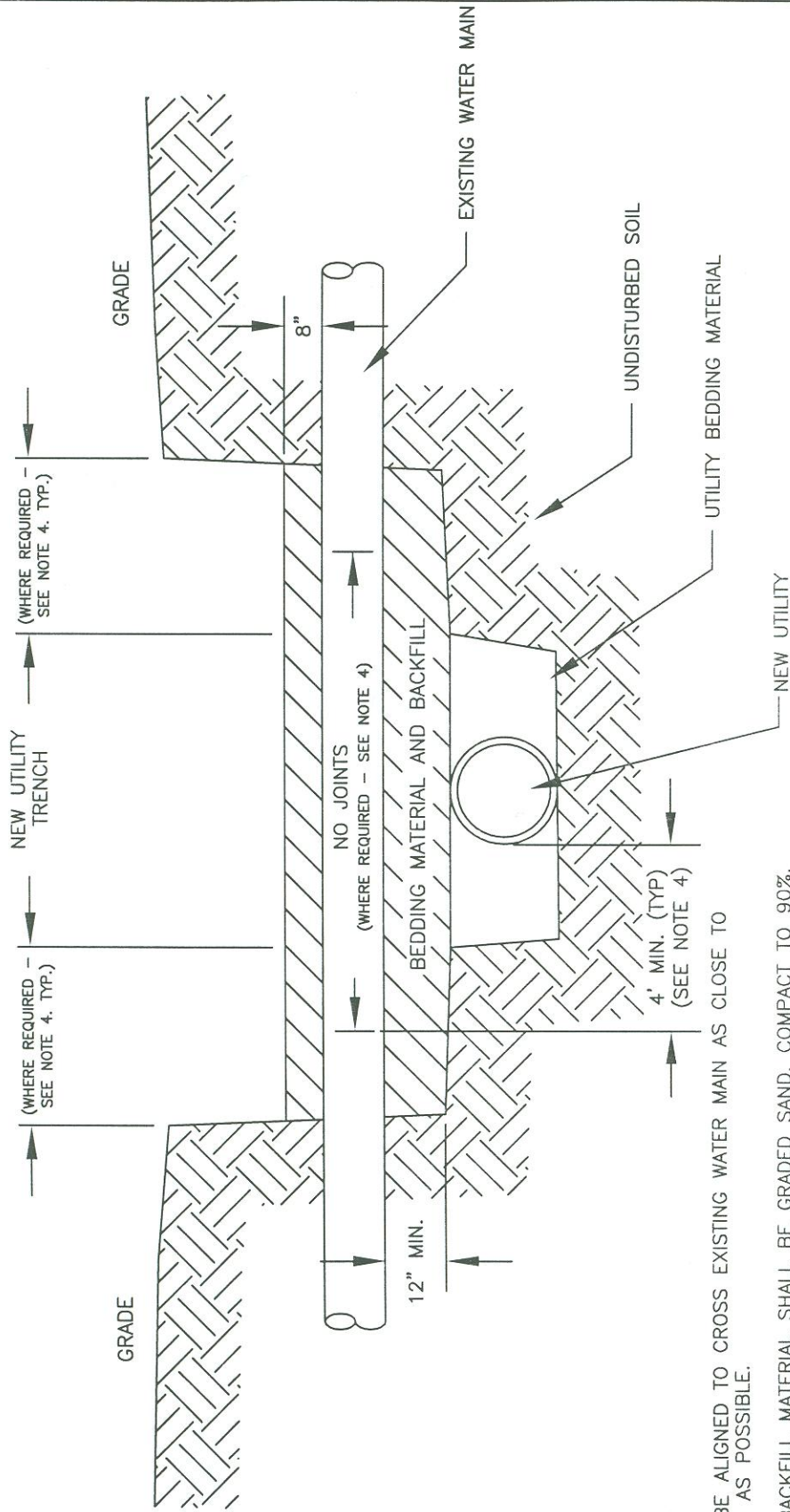
SACRAMENTO COUNTY
 PUBLIC WORKS AGENCY

UTILITY CROSSING

SCALE: NONE
 DATE: 12/03

DIRECTOR, DEPARTMENT OF WATER RESOURCES

8-10



NOTES:

- 1) UTILITY SHALL BE ALIGNED TO CROSS EXISTING WATER MAIN AS CLOSE TO PERPENDICULAR AS POSSIBLE.
- 2) BEDDING AND BACKFILL MATERIAL SHALL BE GRADED SAND. COMPACT TO 90%.
- 3) REPAIR OR REPLACE EXISTING LOCATING WIRE, POLYETHYLENE ENCASEMENT, AND UNDERGROUND MARKING TAPE.
- 4) GRAVITY SANITARY SEWER AND STORM DRAIN UNDERCROSSINGS:
IF SPECIFIED BY SCWA, THE UNDERCROSSING PIPE SHALL NOT BE PERMITTED WITHIN 4 FT. CLEAR OF EXISTING WATER MAIN JOINTS. IN THIS CASE, UNCOVER EXISTING WATER MAIN SUFFICIENTLY ON EACH SIDE OF PROPOSED ALIGNMENT FOR SCWA INSPECTOR TO VERIFY PRIOR TO INSTALLATION.
- 5) FORCE MAIN AND INDUSTRIAL PIPELINE UNDERCROSSINGS:
PIPELINES SHALL BE INSTALLED WITHIN A CONTINUOUS 20 FT. SLEEVE AT THE UNDERCROSSING, CENTERED ON THE WATER MAIN. SLEEVE SHALL BE RATED FOR THE OPERATING PRESSURE OF THE PIPELINE. SLEEVE MATERIAL SHALL BE NON-CORRODING. SLEEVE DESIGN SHALL BE APPROVED BY SCWA.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**UTILITY CROSSING UNDER
EXISTING WATER MAIN**

SCALE: NONE
DATE: 12/03

8-11

Yuel Del

DIRECTOR, DEPARTMENT OF WATER RESOURCES

BOLT DOWN H2O TRAFFIC RATED STEEL COVER. COVER SHALL BE LABELED WITH BEAD WELDED LETTERS: "WATER" FOR POTABLE, "RECYCLED WATER" FOR RECYCLED AND NONPOTABLE WATER, "RAW WATER" FOR RAW WATER.

BRONZE PLUG W/ 1/2" SQUARE INDENTED NUT

CHRISTY B1017BOX (TRAFFIC BOX 10"x17" W/ H/20 LOADING), BROOKS 3 1/2-PB W/ 10"x17", OR APPROVED EQUAL.

2" BRONZE BALL CURB STOP WITH TEFLON COATED BALL, F.I.P.T. x F.I.P.T. WITH LOCKWING.

2" GALVANIZED SCH 40 STEEL PIPE & 90° ELBOW. WRAP WITH 10 MIL POLYETHYLENE TAPE, DOUBLE WRAP PIPE THREADS (TYPICAL). A STREET 90° ELBOW MAY BE USED IF THE END OF THE MJ CAP/PLUG IS FLAT.

3/4" CRUSHED AGGREGATE
COMPACT TO 95%

WATER MAIN

THRUST BLOCK (12" AND SMALLER MAINS), SIZE FOR "DEAD END" IN ACCORDANCE WITH 8-3A.

UNDISTURBED EARTH

CAP OR MJ PLUG WITH 2" NPT THREADED OPENING

FOR MAINS LARGER THAN 12":
DO NOT INSTALL THRUST BLOCK,
USE RESTRAINED JOINTS OVER
RESTRAINED LENGTH SHOWN ON
PLANS.

NOTE:
A 2" TEMPORARY BLOW OFF IS SHOWN. FOR 3" TEMPORARY BLOW OFF, USE 3" BRONZE BALL VALVE OR 3" AWWA GATE VALVE, WITH 3" BRONZE PLUG, 3" GALVANIZED PIPE & FITTING, 3" THREADED TAP AT MJ CAP/PLUG, AND CHRISTY B1324 TRAFFIC BOX, OR EQUAL.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

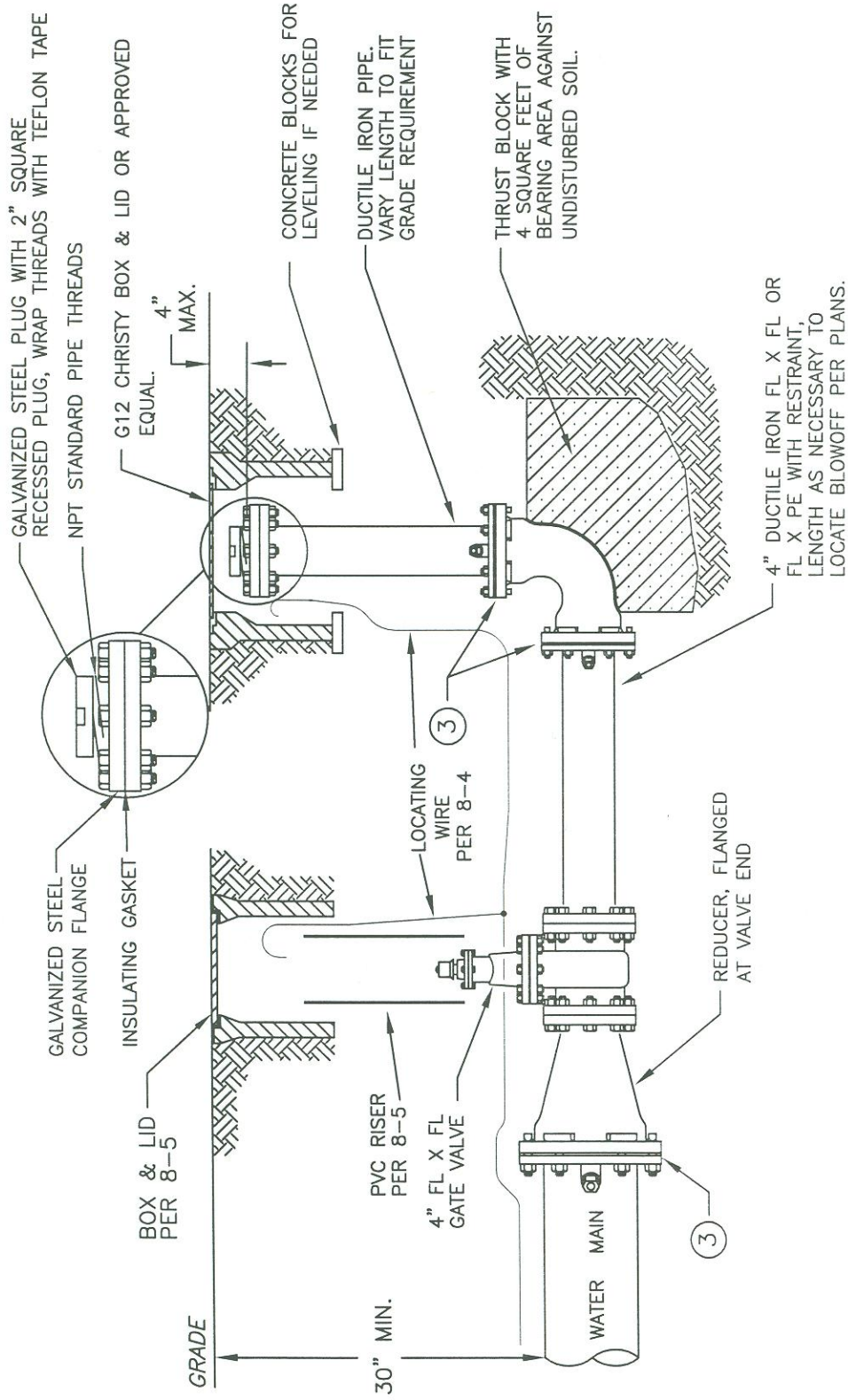
**TEMPORARY
BLOW OFF ASSEMBLY**

SCALE: NONE
DATE: 12/03

DIRECTOR, DEPARTMENT OF WATER RESOURCES

David DeW

8-12



NOTES:

1. FITTINGS SHALL BE DUCTILE IRON, AWWA C110 OR C153.
2. PROVIDE 6 INCHES SAND BEDDING. BACKFILL WITH SAND TO 8 INCHES ABOVE THE TOP OF PIPE. COMPACT TO 90% RELATIVE COMPACTION.
3. THESE JOINTS MAY BE FLANGED, RESTRAINED MECHANICAL JOINT WITH SCWA APPROVED RESTRAINING DEVICES, OR PUSH-ON WITH U.S. PIPE FIELD-LOK GASKETS OR SCWA APPROVED EQUAL.
4. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

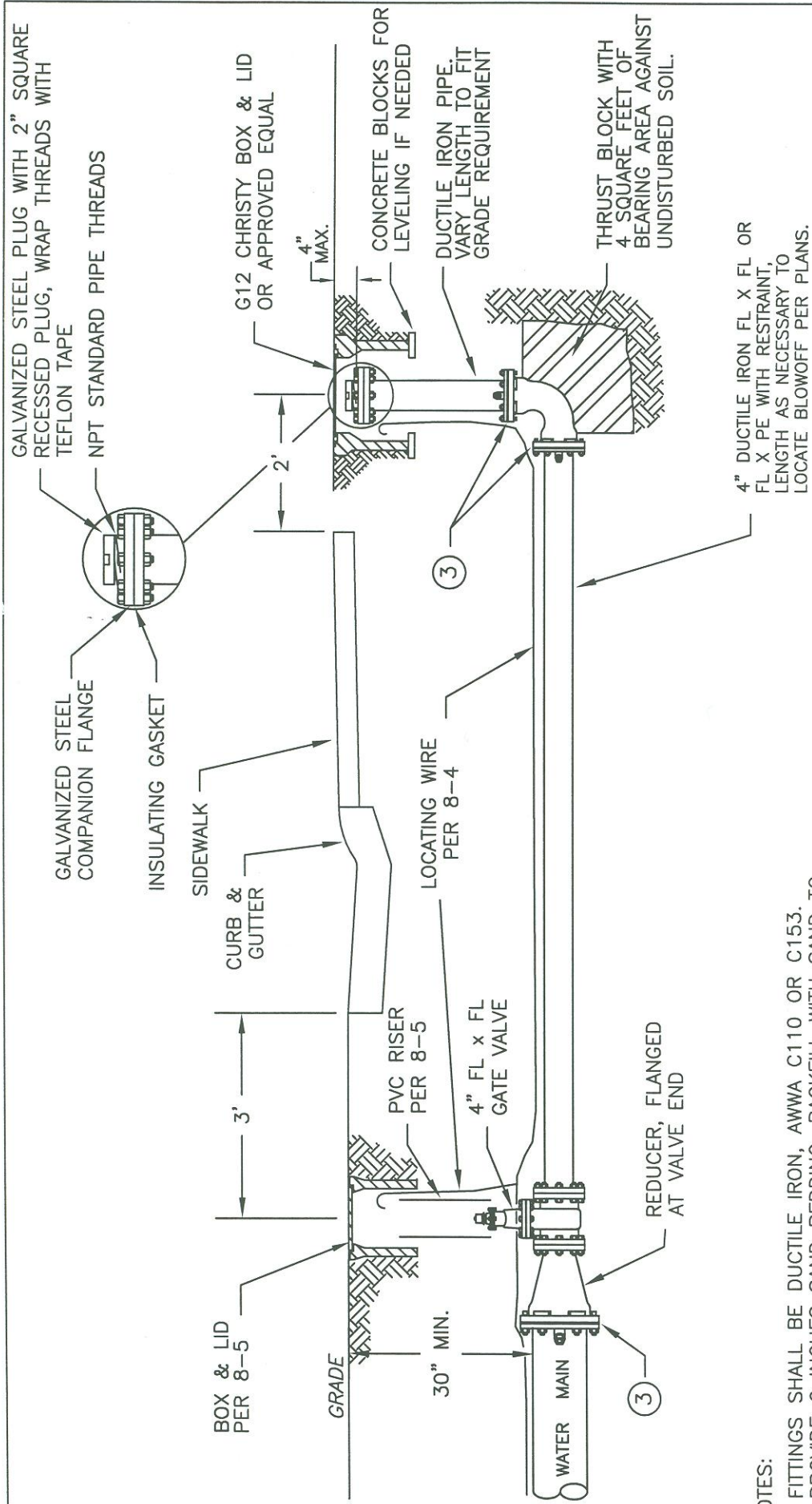
David DeV
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**4" BLOW OFF ASSEMBLY
AT END OF MAIN**

SCALE: NONE
DATE: 12/03

8-13A



NOTES:

1. FITTINGS SHALL BE DUCTILE IRON, AWWA C110 OR C153.
2. PROVIDE 6 INCHES SAND BEDDING. BACKFILL WITH SAND TO 8 INCHES ABOVE THE TOP OF PIPE. COMPACT TO 90% RELATIVE COMPACTION.
3. THESE JOINTS MAY BE FLANGED, RESTRAINED MECHANICAL JOINT WITH SCWA APPROVED RESTRAINING DEVICES, OR PUSH-ON WITH U.S. PIPE FIELD-LOK GASKETS OR SCWA APPROVED EQUAL.
4. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

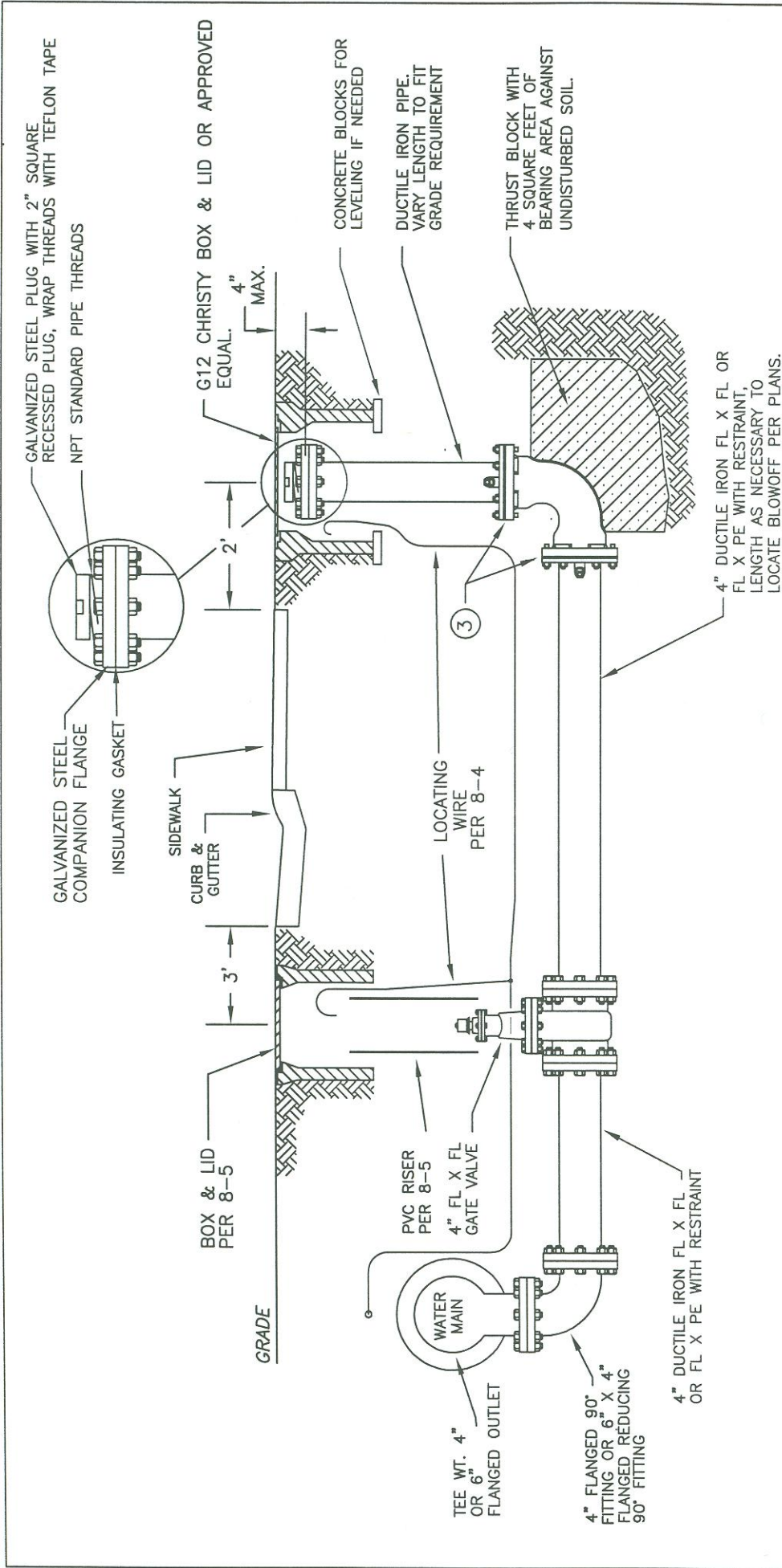
4" BLOW OFF ASSEMBLY AT END OF CUL-DE-SAC

SCALE: NONE
DATE: 12/03

8-13 B

[Signature]

DIRECTOR, DEPARTMENT OF WATER RESOURCES



NOTES:

1. FITTINGS SHALL BE DUCTILE IRON, AWWA C110 OR C153.
2. PROVIDE 6 INCHES SAND BEDDING. BACKFILL WITH SAND TO 8 INCHES ABOVE THE TOP OF PIPE. COMPACT TO 90% RELATIVE COMPACTION.
3. THESE JOINTS MAY BE FLANGED, RESTRAINED MECHANICAL JOINT WITH SCWA APPROVED RESTRAINING DEVICES, OR PUSH-ON WITH U.S. PIPE FIELD-LOK GASKETS OR SCWA APPROVED EQUAL.
4. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

Dee Du
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**4" IN-LINE BLOW-OFF
ASSEMBLY**

SCALE: NONE
DATE: 12/03

8-13C

CLEAN INTERIOR AND EXTERIOR SURFACES OF LID AND TUBE WITH DEVPREP 88 OR EQUAL, THEN COAT ALL SURFACES, NUTS AND BOLTS W/ DEVCOE BAR-RUST 233H EPOXY UNDERCOAT, 2-3MILS, COLOR GRAY; THEN APPLY 2 COATS OF DEVCOE ACRYLIC 1.5 MILS TO 2.0 MILS, EACH. COLOR SHALL BE HUNTER GREEN FOR POTABLE WATER AND RAW WATER; PURPLE FOR RECYCLED AND NONPOTABLE WATER.

3/16" STEEL, 6" X 6" SQUARE TUBE 18" HIGH WITH AN 8-1/2" CAP, SPOT WELDED AT THE TOP.

2-3/8" BOLTS, GRADE 3 WITH WASHER.

1/4" THICK STEEL LID. TACK WELD 1/4" THICK BY 1" WIDE STEEL PLATE AROUND PERIMETER OF LID SO TOP OF LID IS FLUSH W/ TOP OF BOX. CUT 5" X 5" SQUARE HOLE IN TOP OF LID. SQUARE HOLE TO BE CENTERED RELATIVE TO WIDTH OF LID. LID SHALL BE BOLTED TO BOX. LID SHALL BE LABELED WITH BEAD WELDED LETTERS: "RECYCLED WATER" FOR RECYCLED AND NONPOTABLE WATER; "RAW WATER" FOR RAW WATER; AND UNLABELED FOR POTABLE WATER. LID & TUBE ASSEMBLY SHALL BE PWAE118M BY PLACER WATERWORKS OR APPROVED EQUAL BY SCWA.

WELD 2 LOCKING NUTS TO LID TO ACCEPT BOLTS.

1" SCHEDULE 40 GALVANIZED STEEL PIPE W/STEEL THREADED COUPLING AND 1" TO 3/4" PVC ADAPTER. OPERATOR MUST BE ABLE TO UNSCREW PVC RISER FROM COUPLING.

1" CRISPIN UL-10 COMBINATION AIR RELEASE/VACUUM VALVE OR SCWA APPROVED EQUAL

1"- 90° BRONZE FITTING (TYP)

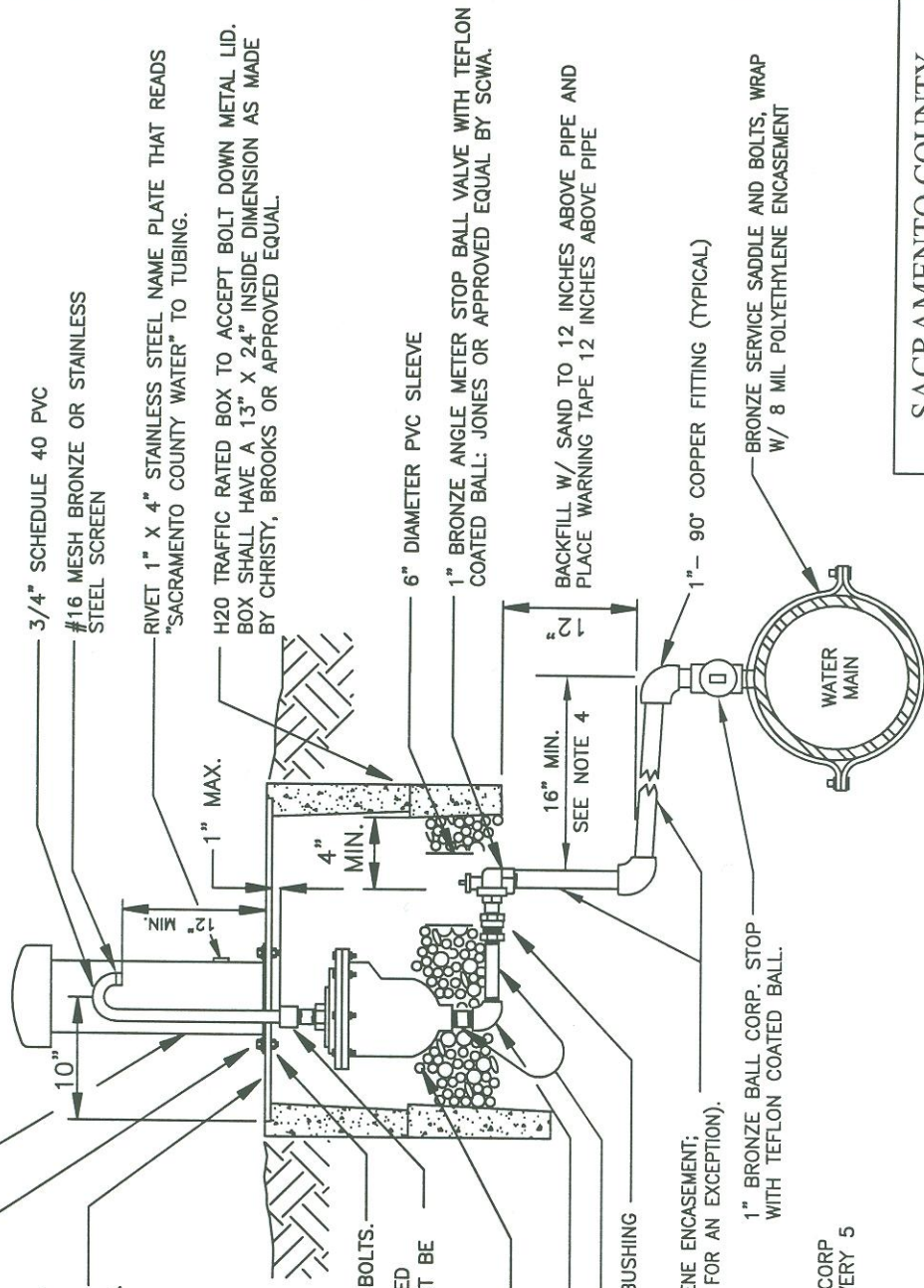
1"- BRASS NIPPLE (TYP)

1 1/4" X 1" BRONZE THREADED BUSHING

COPPER PIPE, TYPE K PER AWWA C800 W/ POLYETHYLENE ENCASEMENT; CONTINUOUS PIPE, NO JOINTS PERMITTED (SEE NOTE 6 FOR AN EXCEPTION).

NOTES:

1. MAINTAIN A MIN 2% CONTINUOUS UPWARD SLOPE FROM CORP STOP TO AIR VALVE. INSPECTOR SHALL VERIFY SLOPE EVERY 5 FEET OF RUN.
2. FLARE, SOLDER JOINT, OR COMPRESSION FITTINGS ARE ACCEPTABLE.
3. PROVIDE 3' X 3' X 3' OF 1/2" CRUSHED AGGREGATE FOR DRAINAGE AND SUPPORT UNDER VALVE. COMPACT TO 95%.
4. SEE PLAN AND PROFILE SHEETS FOR LOCATION OF VALVE BOX.
5. BOX SHALL NOT BE INSTALLED IN LOCATIONS SUBJECT TO TRAFFIC.
6. IF IT IS NECESSARY TO RELOCATE AN EXISTING INSTALLATION THAT IS UNDER EXISTING PAVEMENT: NEW COPPER PIPE MAY BE JOINED TO EXISTING COPPER PIPE WITH A MUELLER 110 H-15403 CONNECTOR.



SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

1" COMBINATION AIR/
VACUUM VALVE

SCALE: NONE
DATE: 12/03

DIRECTOR, DEPARTMENT OF WATER RESOURCES

John D. ...

8-14A

CLEAN INTERIOR AND EXTERIOR SURFACES OF LID AND TUBE WITH DEVPREP 88 OR EQUAL, THEN COAT ALL SURFACES, NUTS AND BOLTS W/ DEVOE BAR-RUST 233H EPOXY UNDERCOAT, 2-3MILS, COLOR GRAY; THEN APPLY 2 COATS OF DEVOE ACRYLIC 1.5 MILS TO 2.0 MILS, EACH. COLOR SHALL BE HUNTER GREEN FOR POTABLE WATER AND RAW WATER; PURPLE FOR RECYCLED AND NONPOTABLE WATER.

3/8" THICK STEEL LID. IF NEEDED, TACK WELD 1/4" THICK BY 1" WIDE STEEL PLATE AROUND PERIMETER OF LID SO TOP OF LID IS FLUSH W/ TOP OF BOX. CUT 5" X 5" SQUARE HOLE IN TOP OF LID. SQUARE HOLE SHALL BE CENTERED RELATIVE TO WIDTH OF LID. LID SHALL BE BOLTED TO BOX. LID SHALL BE LABELED WITH BEAD WELDED LETTERS: "RECYCLED WATER" FOR RECYCLED AND NONPOTABLE WATER; "RAW WATER" FOR RAW WATER; AND UNLABELED FOR POTABLE WATER. LID & TUBE ASSEMBLY SHALL BE PWAE218M BY PLACER WATERWORKS OR APPROVED EQUAL BY SCWA.

WELD 2 LOCKING NUTS TO LID TO ACCEPT BOLTS.

2" SCHEDULE 40 GALVANIZED STEEL PIPE W/STEEL THREADED COUPLING AND 2" TO 1-1/2" PVC ADAPTER. SCWA OPERATOR MUST BE ABLE TO UNSCREW PVC RISER FROM COUPLING.

1 2" CRISPIN C-20 OR UL-20 COMBINATION AIR RELEASE/VACUUM VALVE OR SCWA APPROVED EQUAL

2 2"- BRASS NIPPLE (TYP)

3 COPPER PIPE, TYPE K, PER AWWA C800 W/POLYETHYLENE ENCASEMENT; CONTINUOUS PIPE, NO JOINTS PERMITTED (SEE NOTE 6 FOR AN EXCEPTION).

4 2"- 90° COPPER FITTING (TYP)

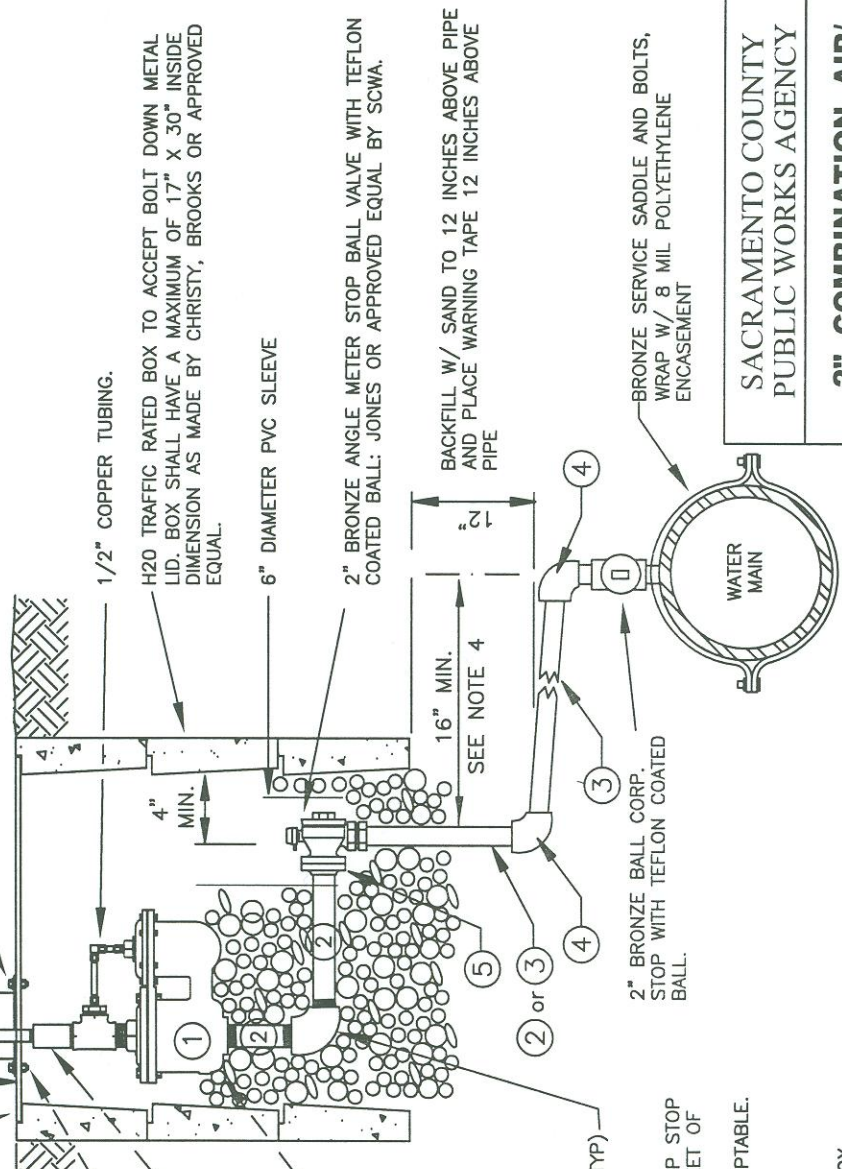
5 2" BRONZE METER FLANGE

2"- 90° BRONZE FITTING (TYP)

NOTES:

1. MAINTAIN A MIN 2% CONTINUOUS UPWARD SLOPE FROM CORP STOP TO AIR VALVE. INSPECTOR SHALL VERIFY SLOPE EVERY 5 FEET OF RUN.
2. FLARE, SOLDER JOINT, OR COMPRESSION FITTINGS ARE ACCEPTABLE.
3. PROVIDE 3' X 3' X 3' OF 1/2" CRUSHED AGGREGATE FOR DRAINAGE AND SUPPORT UNDER VALVE, COMPACT TO 95%.
4. SEE PLAN AND PROFILE SHEETS FOR LOCATION OF VALVE BOX.
5. BOX SHALL NOT BE INSTALLED IN LOCATION SUBJECT TO TRAFFIC.
6. IF IT IS NECESSARY TO RELOCATE AN EXISTING INSTALLATION THAT IS UNDER EXISTING PAVEMENT: NEW COPPER PIPE MAY BE JOINED TO EXISTING COPPER PIPE WITH A MUELLER 110 H-15403 CONNECTOR.

1-1/2" SCHEDULE 40 PVC CAP & WYE.
3/16" STEEL, 6" X 6" SQUARE TUBE 18" HIGH WITH AN 8-1/2" DIAMETER CAP, SPOT WELDED AT THE TOP.
#16 MESH BRONZE OR STAINLESS STEEL SCREEN
1-1/2" SCHEDULE 40 PVC
RIVET 1" X 4" STAINLESS STEEL NAME PLATE THAT READS "SACRAMENTO COUNTY WATER".
2 EA. 3/8" BOLTS, GRADE 3 WITH WASHER.

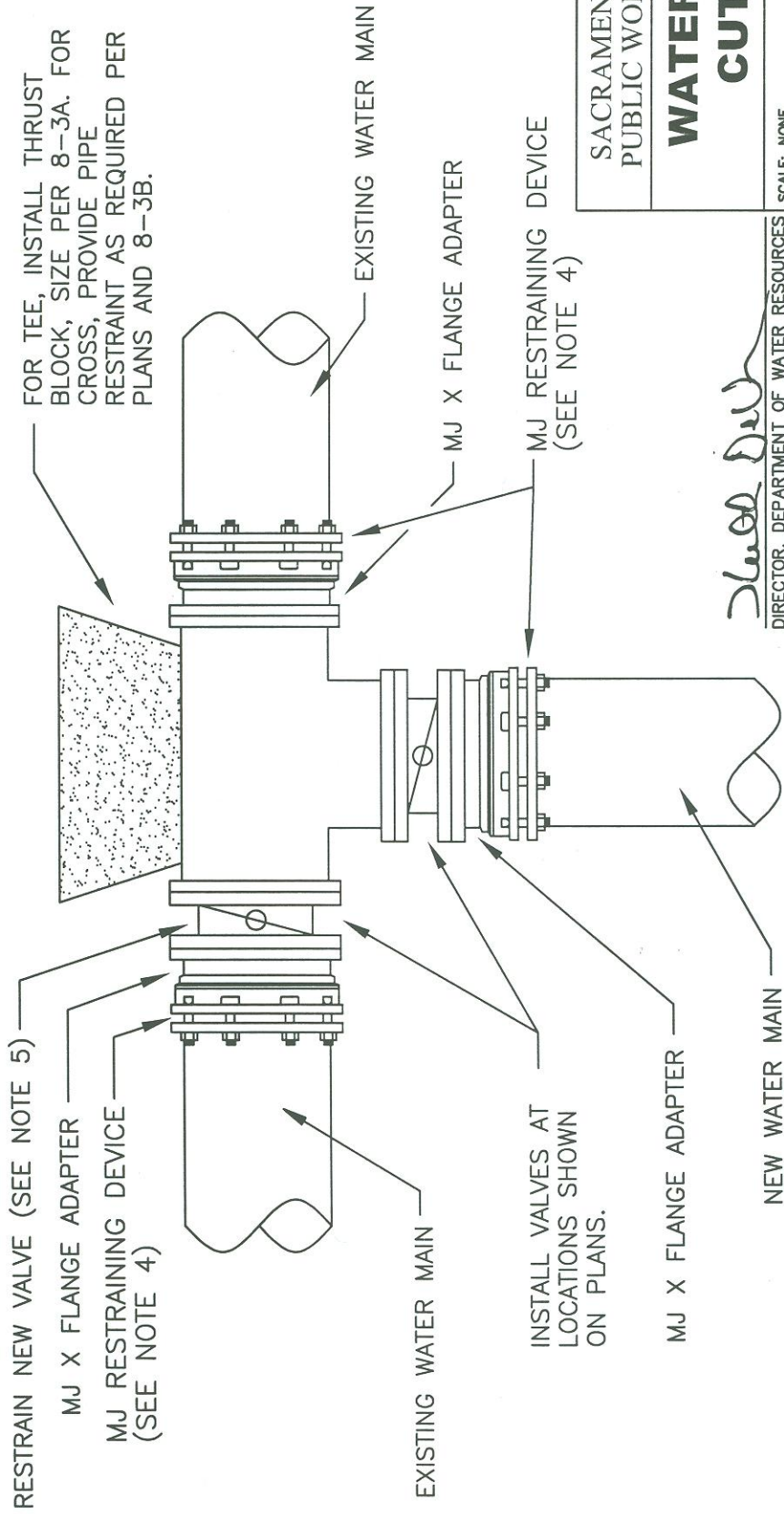


SACRAMENTO COUNTY PUBLIC WORKS AGENCY
2" COMBINATION AIR/ VACUUM VALVE
SCALE: NONE DATE: 12/03
8-14B

David DeVu
DIRECTOR, DEPARTMENT OF WATER RESOURCES

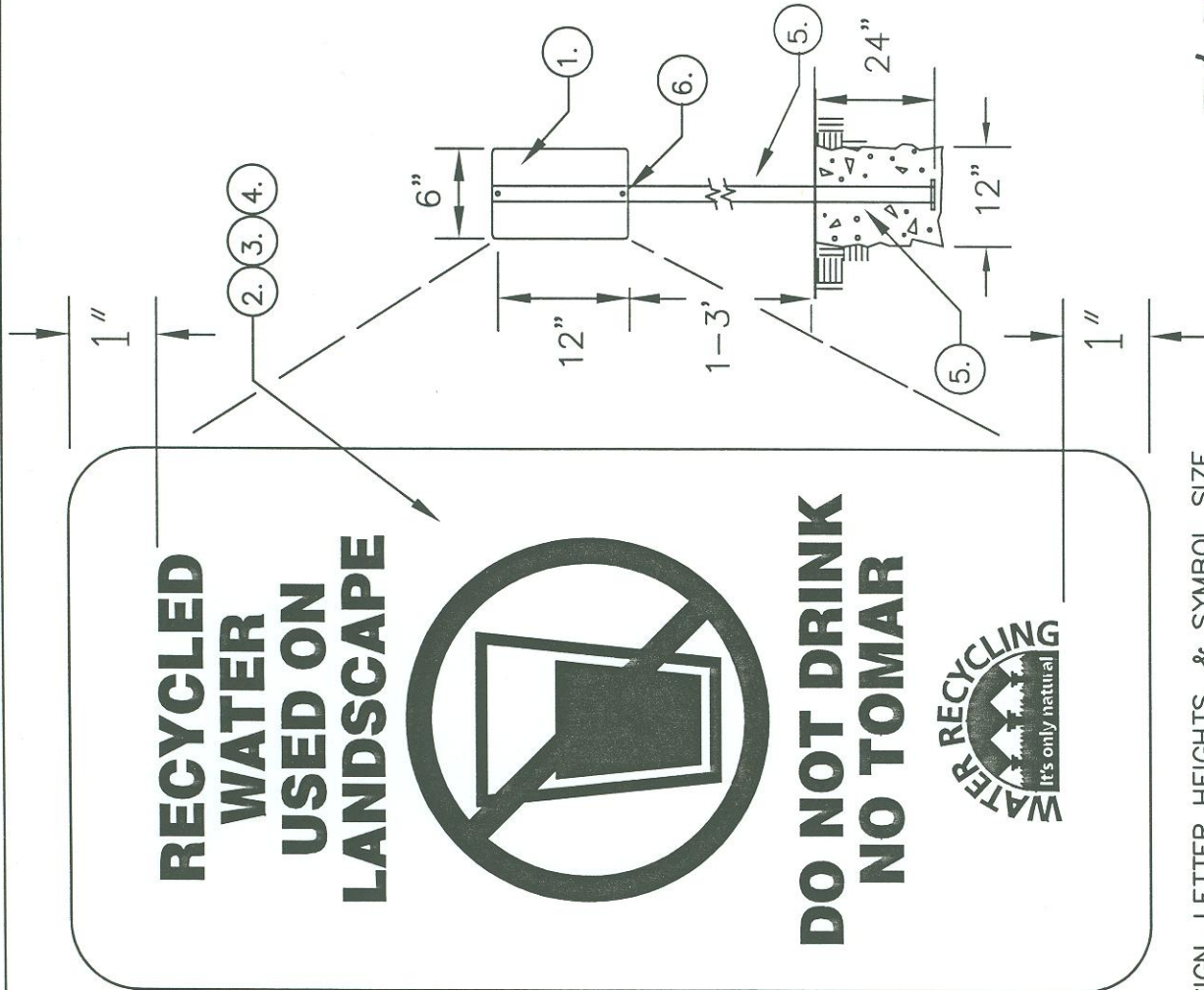
NOTES:

1. THIS DETAIL SHALL BE USED WHEN THE PLANS REQUIRE INSTALLATION OF BOTH A NEW CONNECTION AND NEW IN-LINE VALVE IN AN EXISTING MAIN.
2. DIG SUMP UNDER CUT IN LOCATION AND PUMP ALL WATER FROM EXISTING MAIN AWAY FROM CUT IN LOCATION. DO NO ALLOW ANY WATER TO ENTER EXISTING PIPE. SPRAY EXISTING PIPE, ALL FITTINGS AND VALVES WITH A SOLUTION OF SUPER CHLORINATED WATER JUST PRIOR TO INSTALLATION.
3. RESTRAIN NEW AND EXISTING PIPE JOINTS AS REQUIRED BY THE PLANS, THE WATER NOTES, AND 8-3B.
4. RESTRAINING DEVICES FOR MJ'S: FOR DUCTILE IRON USE EBAA MEGALUG 1100, STAR PIPE PRODUCTS STARGRIP 3000, OR SIGMA ONE LOK SLD; FOR PVC PIPE USE EBAA 2000PV, OR STAR PIPE PRODUCTS ALLGRIP 3600.
5. RESTRAIN NEW IN-LINE VALVE: (1) CONCRETE ANCHOR BLOCK PER SCWA APPROVED DESIGN, OR (2) FOR 12" AND SMALLER MAINS, RESTRAIN EXISTING PIPE PER 8-3B.
6. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.



Sheld Duv
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	SCALE: NONE DATE: 12/03	8-15
WATER MAIN CUT - IN		



SIGN, LETTER HEIGHTS, & SYMBOL SIZE SHOWN ARE IN REQUIRED PROPORTIONS

[Signature]
DIRECTOR, DEPARTMENT OF WATER RESOURCES

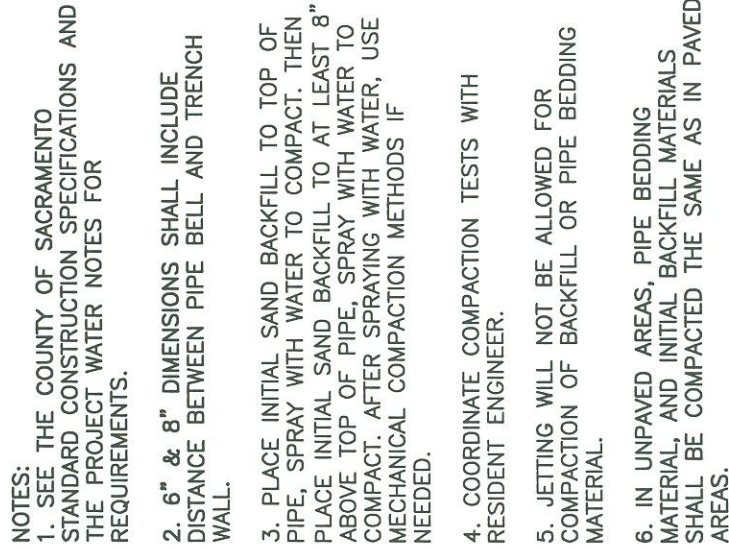
NOTES:

1. 6" x 12" ALUMINUM SHEET ALLOY 6061-T6 0.080" GAUGE, ROUNDED CORNERS (1" RADIUS).
2. LETTER HEIGHT & SYMBOL SIZE SHALL BE PROPORTIONAL TO SIGN SIZE.
3. THE BACKGROUND SHALL BE WHITE. THE LETTERING SHALL BE PURPLE, THE GRASS GREEN, AND THE WATER BLUE.
4. LETTERING AND SYMBOL SHALL BE PRESSURE SENSITIVE VINYL. CLEAR COAT ENTIRE SIGN ONCE LETTERING AND SYMBOLS ARE ATTACHED.
5. 1"x1" SQUARE STEEL POST PAINTED WHITE TO MATCH SIGN BACKGROUND. CAP OFF POST AND FINISH CLEAN. PROVIDE REBAR AT END FOR CONCRETE INSTALLATION AT 24 INCH DEPTH.
6. 5/16"ø x 4-1/2" ZINC PLATED CARRIAGE BOLT WITH VANDAL PROOF NUTS. PAINT WHITE TO MATCH SIGN.

WHEN MOUNTING ON WALLS OR CHAIN LINK FENCE, PROVIDE 1/4 INCH HOLES IN ALL FOUR CORNERS.

3" x 4-1/2" PRESSURE SENSITIVE DECALS ARE REQUIRED FOR IRRIGATION CONTROLLERS AND OTHER ABOVE GROUND FACILITIES REQUIRING A WARNING SIGN. WHEN CONDITIONS AND/OR FACILITY CHARACTERISTICS RENDER THESE SPECIFICATIONS INAPPROPRIATE, ALTERNATIVE SIGNING MUST BE SUBMITTED FOR REVIEW AND APPROVAL BY THE SACRAMENTO COUNTY WATER AGENCY.

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
RECYCLED WATER SIGN	
SCALE: NONE DATE: 12/03	8-16



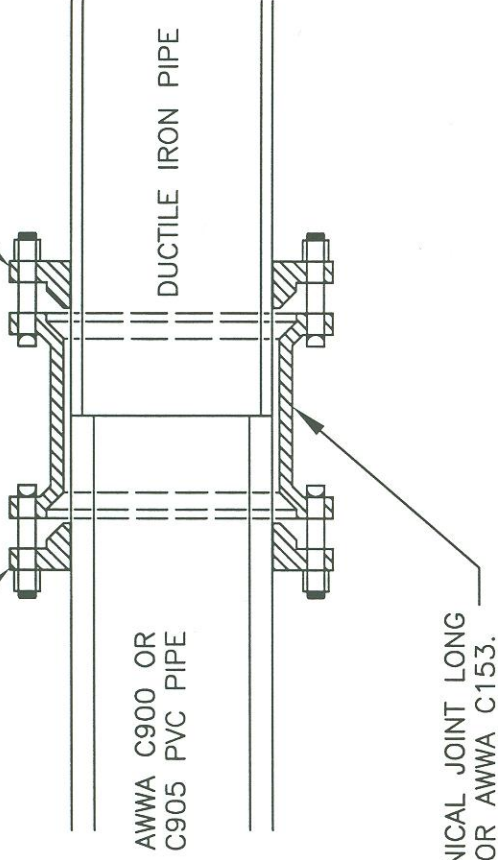
TRENCH DETAIL

SCALE: NONE
DATE: 12/03

8-17

MJ RESTRAINING DEVICE FOR
PVC PIPE (IF REQUIRED),
SEE NOTES

MJ RESTRAINING DEVICE FOR
DUCTILE IRON PIPE (IF REQUIRED),
SEE NOTES



DUCTILE IRON MECHANICAL JOINT LONG
SLEEVE, AWWA C110 OR AWWA C153.

NOTES:

1. THIS DETAIL SHALL BE USED AT ALL TRANSITIONS BETWEEN PVC PIPE AND DUCTILE IRON PIPE.
2. TRANSITIONS SHALL BE LOCATED OUTSIDE OF RESTRAINED AREAS, UNLESS APPROVED BY SCWA.
3. TRANSITIONS LOCATED WITHIN RESTRAINED AREAS SHALL BE RESTRAINED. RESTRAINING DEVICE FOR THE PVC PIPE SIDE SHALL BE EBAA 2000PV OR STAR PIPE PRODUCTS ALLGRIP 3600. RESTRAINING DEVICE FOR THE DUCTILE IRON PIPE SIDE SHALL BE EBAA MEGALUG 1100, STAR PIPE PRODUCTS STARGRIP 3000, OR SIGMA ONE LOK SLD.
4. RESTRAINING DEVICES NOT REQUIRED IF TRANSITION IS NOT IN A RESTRAINED AREA.
5. ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

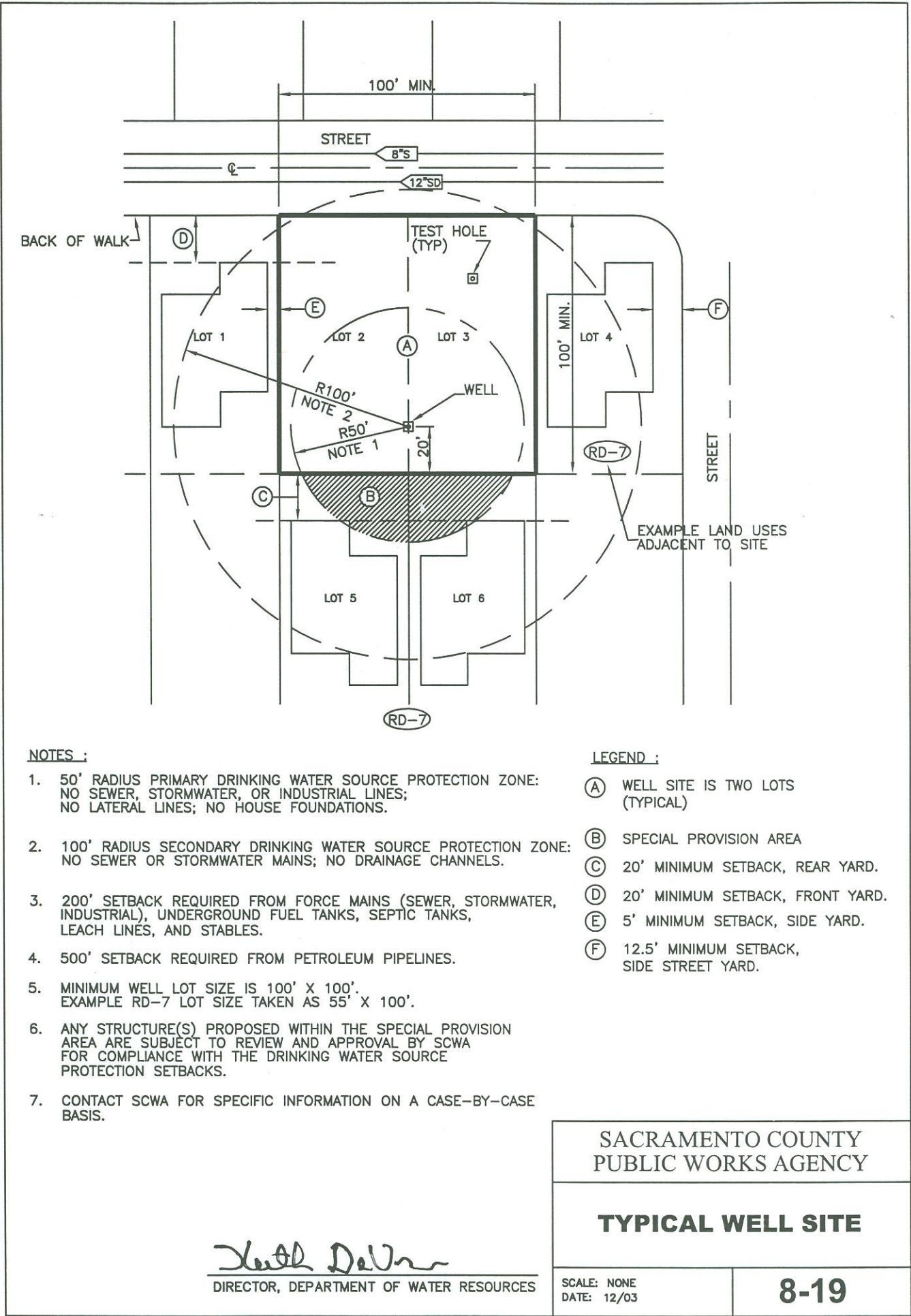
TRANSITION SLEEVE

SCALE: NONE
DATE: 12/03

8-18

W. D. D.

DIRECTOR, DEPARTMENT OF WATER RESOURCES



SECTION 9

STORM DRAINAGE DESIGN

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SECTION 9
STORM DRAINAGE DESIGN

9-1 COUNTY POLICY AND REQUIREMENTS:

- A. The planning, design and construction of drainage facilities and other related appurtenances to be owned, operated and maintained by the County of Sacramento shall comply with these standards herein referred to as the "Standards."
- B. In addition to these Storm Drain Design Standards, other specific requirements for the improvement and construction of drainage facilities are set forth in the Sacramento County Water Agency Drainage Ordinance, the County of Sacramento Standard Construction Specifications, the Sacramento City/County Drainage Manual, the Sacramento County Water Agency Code Titles I and II, the Sacramento County Floodplain Management and Interim Floodplain Development Policies, the Guidance Manual for On-Site Storm Water Quality Control Measures, and the Sacramento County Floodplain Management Ordinance.
- C. All submitted plans shall be signed by a registered Civil Engineer prior to approval and all work shall be in accordance with these design standards and good engineering practice.
- D. The Director shall decide all questions of interpretation of "good engineering practice," guided by the standards and manuals of the discipline in question.
- E. All drainage facilities shall be located within the County's right-of-way unless otherwise approved by the Director. Adequate access for maintenance (including removal and replacement) of the system shall be provided.
- F. All public roads shall be protected from the design storm event (Figure 2-1).
- G. All new structures shall be protected from the 100-year (1%) flood event. Certified pad elevations shall be set at least one and two tenths foot (1.2') above all sources of 100-year flooding.
- H. The design of a new storm drain system shall include consideration of the downstream creek or storm drain. The consulting engineer shall show that the existing storm water system can convey the proposed drainage without adverse flooding, erosion or other water quality impacts to upstream, downstream or adjacent facilities or areas; or that such facilities or areas are being improved or protected to the point where the drainage can be conveyed without adverse impacts.

- I. Private storm drain systems shall be clearly noted on the plans and maintenance responsibilities recorded in the covenants conditions and restrictions for each parcel.
- J. Storm water quality treatment facilities shall be provided for new and redevelopment projects in accordance with these Standards.

9-2 STORMWATER UTILITY: The County maintains public drainage facilities within the Sacramento County Storm Water Utility service area. New development in areas outside the existing Sacramento County Storm Water Utility service area will be required to annex or form a benefit assessment district for storm drain maintenance as required by the Director.

9-3 DEFINITIONS: The following terms, abbreviations or definitions shall apply and the intent and meaning shall be interpreted as stated herein wherever they are encountered in these Standards or in any documents or instruments referenced by these standards unless otherwise approved by the Director.

ASTM	American Society for Testing and Materials.
Base Flood	100-year (1%) flood event pursuant to the County Floodplain Management ordinance or any source of 100-year flooding as determined by Department of Water Resources.
Certified Pad Elevation	As defined in the Grading Section of these Standards
CLOMA/LOMA	Conditional Letter Of Map Amendment / Letter Of Map Amendment.
CLOMR/LOMR	Conditional Letter Of Map Revision / Letter Of Map Revision.
Credit Agreement	An agreement between the SCWA and developer identifying eligible reimbursement costs.
County	The County of Sacramento and incorporated cities who have adopted these Standards.
Design Storm	The design runoff (for pipe design) per acre as indicated on Standard Specifications Drawings 9-2 through 9-5.
Director	Director of Sacramento County Department of Water Resources, or designee.

Drainage Easement	A strip of land dedicated, condemned or reserved for drainage use.
FEMA	Federal Emergency Management Agency.
Interim	A temporary facility- constructed and maintained by the developer.
NFIP	National Flood Insurance Program.
Nolte Method	Pipe design flows (Figures 2-4 to 2-10)
100-Year Storm	A hydrograph created using the Sacramento Method indicating runoff over time for a storm with a one-percent statistical probability of annual recurrence.
Overland Release Path	An alignment that allows the passage of floodwater through a development without damaging structures.
Right-of-Way	A strip of land dedicated, condemned or reserved for public use.
SACCALC	The Sacramento calculator for determining design flows and HEC-1 hydrographs using the Nolte Method and the Sacramento County Hydrology Standards. This is a Windows based software available for free download.
SACPRE	Sacramento preprocessor software for developing runoff flows.
SCDWR	Sacramento County Department of Water Resources.
SCWA	Sacramento County Water Agency, a political subdivision of the State of California
Specifications	County of Sacramento Municipal Services Agency Standard Construction Specifications, latest version.
Standards	These storm drain design standards.
Ten-Year Storm	A hydrograph created using the Sacramento Method indicating runoff over time for a storm with a ten-percent statistical probability of annual recurrence.
Trunk Drainage	Mainline drainage from an area over 30 acres.
Volume 2	Volume 2 of the Sacramento City/County Hydrology Standards.

9-4 FEDERAL FLOOD PROGRAM:

- A. The County of Sacramento is a participant in the National Flood Insurance Program and all development in the County shall comply with the regulations of the Federal Emergency Management Agency (FEMA) and the County's Floodplain Management ordinance. Amendments or revisions of FEMA flood maps will be required for all commercial and subdivision development located in a federal flood zone. Petitions for a Conditional Letter of Map Amendment (CLOMA) or Conditional Letter of Map Revision (CLOMR), including any fee required by FEMA, shall be submitted to the Department of Water Resources and approved by FEMA before improvement plan approval.
- B. Petitions for a Letter of Map Amendment (LOMA) or Letter of Map Revision (LOMR), including any fee required by FEMA, shall be submitted to the Department of Water Resources and approved by FEMA before building permit issuance.
- C. Fill for the removal of land from the FEMA 100-year floodplain of a watercourse, where building pads will be created, must be compacted to 95 percent (95%) of the maximum density obtainable with the standard proctor test method (ASTM Standard D-698) or an equivalent test method acceptable to FEMA.
- D. These regulations do not preclude the County from requiring additional standards to protect the public from projected flood runoff.

9-5 DRAINAGE FEES AND CREDITS: All developments in Zones 11A, 11B and 11C and all future sub-zones, of the Sacramento County Water Agency are subject to payment of a drainage fee. The Sacramento County Water Agency administers said fees for the construction of trunk drainage facilities. The Sacramento County Water Agency will reimburse second parties for the construction of trunk drainage facilities, where the County requires such work, according to a predetermined credit schedule. The fee and credit schedule is shown in the Sacramento County Water Agency Code, Titles 1 and 2, and is revised annually. Credit agreements shall be signed by the developer, and notarized, before approval of improvement plans.

9-6 DRAINAGE DIVERSIONS: All drainage must enter and leave the project area at its existing line and grade, unless otherwise approved by the Director.

9-7 DRAINAGE EASEMENTS:

- A. Install storm drain facilities in easements only where the topography makes it necessary to install storm systems outside of the road right-of-way. Such easements must be wide enough to accommodate normal construction equipment and shall be easily accessible to such equipment as necessary to construct, operate, maintain and reconstruct the facility. The easement shall be dedicated to the County of Sacramento, SCWA, or to the Incorporated City where applicable. Easements shall not be split along property lines unless otherwise approved by the Director.
- B. Where improvements outfall on to an adjacent property (such as day-lighting ditch profiles) drainage easements shall be required. Exceptions may be granted, on a case-by-case basis, by the Director.
- C. In the event necessary permanent offsite easements cannot be acquired through negotiation, the County may condemn necessary rights-of-way providing the person, firm, or corporation requesting such condemnation enters into a written agreement to pay all costs and expenses of the condemnation. The agreement shall require a cash deposit that will consist of the estimated cost of condemnation plus 25%. It shall require payment of all costs and expenses of the deposit as specified by the County. Any unspent funds will be returned.
- D. Acquisition and maintenance of temporary construction easements outside of the limits of the subdivision shall be the sub-divider's responsibility.
- E. Easements for closed conduits shall meet the following width criteria:
 - 1. All easements for closed conduits shall have a minimum width equal to the greater of fifteen feet (15') or the required trench width according to the standard detail for pipe bedding and initial backfill (Drawing 9-1, Specifications) plus two feet (2') of additional width for every foot of depth as measured from the bottom of the pipe to finished grade. Exceptions to the minimum width require approval by the Director.
 - 2. All conduits shall be centered within their easements.
 - 3. Drainage easements for open channels shall have sufficient width to contain the ultimate channel; as well as, fencing and a twenty-foot (20') service road (where required). Additional width shall be provided to allow equipment to safely negotiate the service road for the purposes of construction, operations and maintenance activities. Exceptions may be made on a case-by-case basis depending on the layout of adjoining roadways and recreational paths, with approval from the Director.

4. Easements shall not be split along property lines unless otherwise approved by the Director.

9-8 DRAINAGE CAPACITY / DESIGN:

- A. All drainage systems shall be designed to accommodate the ultimate development of the entire upstream watershed. The Sacramento County Municipal Services Agency Design Runoff (Figures 2-4 to 2-10) shall be used in the design of closed conduit drainage systems. All open channel drainage systems shall be designed to carry the 100-year frequency design storm, using the worst case duration, with freeboard greater than one-foot. Freeboard and roughness requirements shall be determined by the Director on a plan-by-plan basis.
- B. Design criteria for Class "C" subdivisions shall be determined on an individual basis.
- C. The consulting engineer shall design an overland release path and show its incorporation in the grading plan. See Section 9-16 of these Standards.

9-9 DESIGN COMPUTATION: The design computations for drainage shall include the following information that shall be submitted before the plans will be accepted for preliminary review:

- A. Topographic map showing existing and proposed ground elevations.
- B. Shed map including on-site and off-site watershed boundaries draining onto the site. It shall also include land uses, total and sub-shed areas in acres.
- C. Quantity of flow (cfs) to each drainage inlet structure with corresponding area and land uses that generates the quantity.
- D. Quantity of flow (cfs) in each pipe.
- E. Flow line elevation of each manhole or junction structure.
- F. Top of structure rim elevation.
- G. Hydraulic grade line
- H. Pipe size, material type, class, length and slope.
- I. Channel dimensions, flow and water surface profile computations.
- J. Overland Release hydraulic computations for street and non-street releases (including fence/wall openings).

9-10 DESIGN STORM: Use of three design methods, Nolte, Sacramento and Sato for runoff calculations in the County of Sacramento are described in Volume 2 of the City/County Drainage Manual, Hydrology Standards. SACCALC is a Windows based software, available for free download, for assistance with these calculations.

Other methods may be used for special situations where above methods are not applicable, upon approval of the Director of the Department of Water Resources.

The required design methods, their appropriate applications and design tools are summarized in Table 9-1.

A. Under 160 acres

1. The runoff used in storm drain pipe design for drainage area 160 acres and smaller shall be computed from the drainage zone chart and the accompanying design runoff graphs shown on Drawings 9-2 through 9-5. The selection of the appropriate chart will be based on the County General Plan.
2. In drainage areas that contain multiple zoning, the runoff shall be computed from the following formula:

$$Q_{\text{Design}} = Q_r + (Q_m - Q_r) A_m/A_t + (Q_c - Q_r) A_c/A_t$$

Where: Q_r = Flow from residential curve using total area of watershed.

Q_m = Flow from multiple family formula using total area of watershed.

Q_c = Flow from commercial curve using total area of watershed.

A_m = Area of multiple family zoning.

A_c = Area of commercial zoning.

A_t = Area in total.

3. Residential runoff curves shall be used for those areas zoned AR-2 to RD-5, inclusive. Multiple family runoff shall be computed for those areas zoned RD-7 to RD-30, inclusive. Commercial runoff curves shall be used for those areas zoned RD-40, industrial and commercial uses.
4. At sag points where approaching gutter profile slope exceeds 2%, the inlets shall be designed to account for upstream bypass flows of at least 0.7 cfs/acre runoff.

B. Over 160 acres

The runoff to be used in drainage channel and channel/bridge design for watersheds exceeding the capacity of a 72" pipe, typically over 160 acres, shall be determined using the Sacramento Method, Volume 2 Hydrology Standards.

Table 9-1 Minimum Design Methods

Application	Hydrology Calculation	Method	Design Tools
Design of: · street drainage · storm sewers · culverts (driveway)	Flow from Charts	Design Runoff	Design Charts (Dwg. 9-2 to 9-5)
Special Design Case*: · street drainage · storm sewers · culverts	Peak Flow and/or 100-year Volume	Sacramento	Design Charts, HEC-1 and SACPRES
Design of overland release, culverts, and bridges**:	Peak Flow and/or 100-year Volume	Sacramento	Design Charts, HEC-1 and SACPRES
Master Plans Design of: · open channels · bridges · detention facilities	Peak Flow and Volume	Sacramento	HEC-1and SACPRES
Water Quality Detention Basins	Volume	Sato	Design Chart

*Special design cases include: streets designated for emergency evacuation (refer also to the Sacramento County Disaster Mitigation Plan), high use public areas, areas with potential loss of life, areas with potential high property damages, areas with limited overland release, and areas lower than surrounding elevations.

**Overland release flows may be determined from Figures 2-11 and 2-18 thru 2-23 of the Volume 2 Hydrology Standards for shed areas less than 160 acres.

9-11 HYDRAULICS:

A. Hydraulic Grade Line

1. Hydraulic grade line calculations for pipe storm drain systems shall begin at the worst case existing ultimate 10-year channel or basin water surface elevation. For the design storm, the hydraulic grade line shall be a minimum one-half foot (0.5') below the elevation of all inlet grates and a minimum one foot (1') below the elevation of manhole covers.
2. The hydraulic grade line shall be shown on the plans wherever the hydraulic grade line is above the soffit of the pipe.

3. A note shall be made on the plans indicating stationing where the hydraulic grade line is below the soffit of the pipe.
4. For open channel systems, the hydraulic grade line shall be shown for the 10-year and 100-year flood events.
5. In adjacent unimproved areas with no current development plans, the future gutter flow line is assumed one and one-half feet (1.5') lower than the natural ground elevation, for purposes of pipe hydraulics calculations.

B. Hydraulic Gradient

In order to analyze the drainage system to determine if design flows can be accommodated without causing flooding at some locations or causing flows to exit the system at locations where this is unacceptable, the consulting engineer shall analyze the hydraulic gradient. The Manning's Formula shall be used to compute capacities of all open and closed conduits other than driveway- and cross-culverts.

C. Friction Losses

Friction losses can be calculated two ways. These methods cannot be interchanged for design of the pipe system. One method shall be used throughout the analysis. The first method uses a conservative Manning's "n" value to account for minor losses.

Method 1 – Friction Losses

The Manning's formula shall be used to compute capacities of all open and closed conduits and all cross culverts which will become a part of the closed conduit system.

The minimum 'n' values to be used in the Manning's formula shall conform to the following:

Precast Concrete Pipe	0.015
High Density Polyethylene Pipe	0.015
Polyvinylchloride Pipe	0.015
Concrete Box Culvert - (within a closed conduit system)	0.016
Ribbed Metal Pipe	0.015
Concrete Cast-In-Place Pipe	0.015
Pavement Surfaces	0.016
Open Channel Fully Lined	0.018
Corrugated Metal Pipe 2-2/3" x 1/2" Corrugations	0.024
Corrugated Metal Pipe 3" x 1" or 5" x 1" Corrugations	0.028
Open Channel with Lined Bottom, Clean Sides	0.035

Earth Channel with Clean and Uniform Sides	0.060
Earth Channel with natural bottom and sides or higher	0.080

Using Method 1 does not require the analysis of other minor losses. Pipes that are designed with inlet control shall account for losses associated with inlet control.

Method 2 – Minor Losses

Calculation of minor losses more accurately models the system. Energy losses from pipe friction shall be determined by the following:

$$S_f = [Qn/1.486 AR^{2/3}]^2$$

Where:

S_f = friction slope, ft/ft

Q = flow rate, ft³/s

n = Manning's coefficient

A = area, ft²

R = hydraulic radius

The head loss due to friction is determined by the formula:

$$H_f = S_f L$$

Where:

H_f = friction head loss, ft

L = length of outflow pipe, ft

The minimum "n" value used in Manning's formula shall conform to the following:

Precast Concrete Pipe	0.012
High Density Polyethylene Pipe	0.012
Polyvinylchloride Pipe	0.012
Concrete Box Culvert - (within a closed conduit system)	0.013
Ribbed Metal Pipe	0.013
Concrete Cast-In-Place Pipe	0.014
Pavement Surfaces	0.016
Open Channel Fully Lined	0.018
Corrugated Metal Pipe 2-2/3" x 1/2" Corrugations	0.024
Corrugated Metal Pipe 3" x 1" or 5" x 1" Corrugations	0.028
Open Channel with Lined Bottom, Clean Sides	0.035
Earth Channel (Clean, Uniform Sides) or Natural Channel	0.060
Earth Channel with natural bottom and sides or higher	0.080

Velocity Head Losses

Analysis methods must account for all minor losses.

Minor head loss is usually written as:

$$H_L = K_c (V^2/2g)$$

Where:

H_L = the minor head loss

K_c = the sum of minor loss coefficients

$V^2/2g$ = the velocity head

The loss coefficient and the form of the equation are different depending on the type of loss, whether flow is open channel or pressure flow, and at times, whether flow is sub-critical or supercritical. Full discussion and values of coefficients are given in several references (Chow *Open Channel Hydraulics*; Brater and King *Handbook of Hydraulics*; Rouse *Fluid Mechanics for Hydraulic Engineers*; Hendrickson *Hydraulics of Culverts*). The following are minor head loss formulas for hydraulic structures commonly found in storm drain systems and open channels.

Entrance Losses -- Entrance losses to box culverts and pipes of various materials can be estimated by using the entrance loss coefficients listed in Table 9-2 in conjunction with the minor head loss equation.

Manhole and Junction Losses -- Junctions are locations where two or more pipes join together to form another pipe or channel.

Multiple pipes or channels coming together at a junction should flow together smoothly to avoid high head losses. Items that promote turbulent flow and high losses include a large angle between the two ($>60^\circ$), a large vertical difference between the two (greater than 6 inches (6") between the two inverts), and absence of a semicircular channel or benching at the bottom of the junction box in the case of pipes. Special problems arise when smaller pipes join a larger one at a junction.

Straight Through Manhole -- In a straight through manhole where there is no change in pipe size, the minor loss shall be calculated by:

$$H_m = 0.05 (V^2/2g)$$

Incoming Opposing Flows -- The head loss at a junction, H_{j1} , for two almost equal and opposing flows meeting head-on with the outlet direction perpendicular to both incoming directions is considered as the total velocity head of outgoing flow.

$$H_{j1} = V^2/2g$$

Changes in Direction of Flow -- When main storm drainpipes or lateral lines meet in a junction, velocity is reduced within the chamber and specific head increases to develop the velocity needed in the outlet pipe. The sharper the bend (approaching 90°) the more severe the energy loss becomes. When the outlet conduit is sized, determine the velocity and compute head loss in the chamber by the minor head loss formula in conjunction with the following:

K	Degree of Turn (In Junction)
0.19	15
0.35	30
0.47	45
0.56	60
0.64	75
0.70	90 and greater

Any degrees of turn greater than 90 degrees requires the approval of the Director. For a graphic solution to other degree of turns, refer to drawing 9-6.

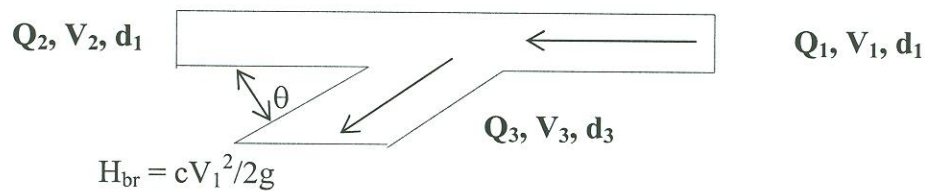
Table 9-2 Entrance Loss Coefficients for Culverts (FHWA 1985) Outlet Control, Full or Partly Full Entrance Head Loss.

$H_e = k_e (V^2/2g)$

Type of Structure and Design of Entrance	Coefficient k_e
<i>Pipe, Concrete</i>	
Projecting from fill, socket end (groove-end).....	0.2
Projecting from fill, sq. cut end.....	0.5
Headwall or headwall and wingwalls	
Socket end of pipe (groove-end).....	0.2
Square Edge.....	0.5
Rounded (radius = 1/12D).....	0.2
Mitered to conform to fill slope.....	0.7
*End-section conforming to fill slope.....	0.5
Beveled edges, 33.78 or 458 bevels.....	0.2
Side- or slope-tapered inlet.....	0.2
<i>Pipe, or Pipe-Arch, Corrugated Metal</i>	
Projecting from fill (no headwall).....	0.9
Headwall or headwall and wingwalls square-edge.....	0.5
Mitered to conform to fill slope, paved or unpaved slope.....	0.7
*End-section conforming to fill slope.....	0.5
Beveled edges, 33.78 or 458 bevels.....	0.2
Side- or slope-tapered inlet.....	0.2
<i>Box, Reinforced Concrete</i>	
Headwall parallel to embankment (no wingwalls)	
Square-edged on 3 edges.....	0.5
Rounded on 3 edges to radius of 1/12 barrel dimension, or beveled edges on 3 sides.....	0.2
Wingwalls at 308 to 758 to barrel	
Square-edged at crown.....	0.4
Crown edge rounded to radius of ½ barrel dimension, or beveled top edge.....	0.2
Wingwalls at 108to 258to barrel	
Square-edged at crown.....	0.5
Wingwalls parallel (extension of sides)	
Square-edged at crown.....	0.7
Side- or slope-tapered inlet.....	0.2

*Note: “End-section conforming to fill slope,” made of either metal, concrete or HDPE are the sections commonly available from manufacturers. From limited hydraulic tests they are equivalent in operation to a headwall in both *inlet* and *outlet* control. Some end sections, incorporating a *closed* taper in their design, have a superior hydraulic performance.

The following equation may be used to determine the loss in head in cases where it may be necessary to split or branch the flow into another drain.



Divergence Angle - θ	$Q_3/Q_1 = 0.3$	$Q_3/Q_1 = 0.5$	$Q_3/Q_1 = 0.7$
90°	$c = 0.76$	0.74	0.80
60°	$c = 0.59$	0.54	0.52
45°	$c = 0.35$	0.32	0.30

Several Entering Flows - The computation of losses in a junction with several entering flows utilizes the principle of conservation of energy, involving both position energy (elevation of water surface) and momentum energy (mass times velocity head). Thus, for a junction with several entering flows, the energy content of the inflows is equal to the energy content of the outflows plus additional energy required by the collision and turbulence of flows passing through the junction. In addition, when two nearly equal flows enter the junction from opposing directions, head loss is considered as the total velocity head of the outgoing flow.

For example, the total junction losses at the sketched intersection is as follows:

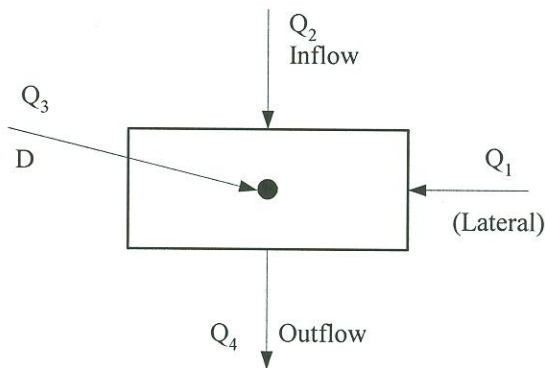


Figure 9-1

$$H_{j2} = [(Q_4V_4^2) - (Q_1V_1^2) - (Q_2V_2^2) + (KQ_1V_1^2)] / (2gQ_4)$$

Where:
 H_{j2} = junction losses, ft
 Q = discharges, cfs
 V = horizontal velocities ft/s

V_3 = is assumed to be zero

K = bend loss factor

Subscript nomenclature for the equation is as follows:

Q_1 = 90 ° lateral, cfs

Q_2 = straight through inflow, cfs

Q_3 = vertical dropped-in flow, from an inlet, cfs

Q_4 = main outfall = total computed discharge, cfs

V_1, V_2, V_3, V_4 are the horizontal velocities of foregoing flows, respectively in feet per second

Also assume: $H_b = K (V_1^2)/2g$ for change in direction. No velocity head of an incoming line is greater than the velocity head of the outgoing line. Water surface of inflow and outflow pipes in junction to be level.

When losses are computed for any junction condition for the same or a lesser number of inflows, the above equation will be used with zero quantities for those conditions not present. If more directions or quantities are at the junction, additional terms will be inserted with consideration given to the relative magnitudes of flow and the coefficient of velocity head for directions other than straight through.

E. Bend Loss -- Bend losses shall be calculated from the following equations:

$$H_b = K_b (V^2/2g)$$

Where:

$$K_b = 0.20 (\Delta/90^\circ)^{0.5}$$

Δ = Central angle of bend in degrees.

Bend losses should be included for all closed conduits, those flowing partially full as well as those flowing full.

F. Trash-rack Head Loss -- The head loss through a stationary trash-rack is commonly determined from the following equation:

$$H_{TR} = K_{TR} (V_n^2/2g)$$

$$K_{TR} = 1.45 - 0.45 A_n/A_g - (A_n/A_g)^2$$

Where:

K_{TR} = Trash-rack coefficient

A_n = Net area through bars, in ft^2

A_g = Gross area of trash-rack and supports (water area without trash-rack in place), in ft^2

V_n = Average velocity through the rack openings (Q/A_n), in ft/sec

For design, assume that the rack is clogged, thereby reducing the value of A_n by 50%.

9-12 CLOSED CONDUITS: The specific type of pipe or alternate pipe to be used in the development shall be shown on the profile sheets. If the Consulting Engineer or contractor proposes to use any type of pipe not shown on the approved plans, the plans shall be resubmitted to the County for approval. The minimum inside diameter for pipes shall be no less than twelve inches (12"). No storm drain conduit shall have a diameter less than that of the conduit immediately upstream of it. Use of plastic, polyvinyl chloride or high density polyethylene pipes at channel or detention basin outfall shall not be allowed unless otherwise approved by the Director.

- A. Material - Publicly maintained drainage systems shall be constructed of the following materials and installed consistent with the latest edition of County of Sacramento Standard Construction Specifications:
1. Reinforced Concrete Pipe -- Class of pipe shall be based upon depth as detailed in the Standard Drawings. Pipe shall conform to ASTM C76, latest revision. The consultant shall specify on the plans that the assembly of joints shall be in accordance with the pipe manufacturer's recommendations and the requirements of ASTM C443.
 2. Concrete Cast-In-Place-Pipe
 - a. Where Concrete Cast-In-Place-Pipe is to be used, a soil report is required for the project that addresses placement of Concrete Cast-In-Place-Pipe.
 - b. The Consulting Engineer shall provide details on the plans for connection of the concrete cast-in-place-pipe to the different piping materials being used.
 3. Polyvinyl Chloride Pipe -- Polyvinyl Chloride (PVC) Pipe may be used conforming to the Construction Specifications.
 4. High Density Polyethylene Pipe
 - a. Use of High Density Polyethylene Pipe downstream of the last manhole or junction structure to open channels, detention facilities or to a daylight condition is not allowed. This condition does not preclude the use of HDPE for driveway culverts, pursuant to the Specifications.
 - b. Unless otherwise authorized by the Director, there shall be no HDPE pipe used for storm drain **inlet laterals in**

roadway intersections, defined as outside curb return to outside curb return.

5. Metal Pipe

- a. Metal pipe shall be corrugated steel, corrugated aluminum, corrugated aluminized steel Type II, ribbed steel, ribbed aluminized steel Type II or ribbed aluminum.
- b. Metal pipe shall be designed for a minimum maintenance free service life of fifty (50) years in accordance with the methods specified in Section 854.3 and 854.4 of the California Department of Transportation Highway Design Manual (a copy of Figure 854.3B may be found in the back of in these Drainage Standards). To assure that the service life is achieved, alternative metal pipe may require added thickness and/or protective coatings. The Consulting Engineer shall provide certified copies of the laboratory report giving the results of pH and resistivity tests. The report shall also include a map showing the location of each site and depth where samples were taken.
- c. Unless otherwise specified by the Director, a minimum of two soil samples shall be taken for the first 1,000 lineal feet of pipe or fraction thereof on a project with a minimum of one additional sample being required for each additional 1,000 lineal feet of pipe or fraction thereof. The samples shall be taken along the approximate alignment and at the approximate depth of the pipe to be installed. Priority in sampling shall be given to trunk facilities.

B. Cover Requirements - At locations where the minimum cover requirements cannot feasibly be obtained, the conduit shall be provided with a concrete cover or other methods of pipe protection as approved by the Director. Cover shall be measured from the top of a rigid Portland cement concrete pavement or the bottom of a flexible asphalt concrete pavement.

1. Minimum Cover -- The minimum cover requirements shall be per Table 9-3.

Table 9-3 Minimum Pipe Cover Requirements

Pipe Material Type and Location	Minimum Cover Requirement
High Density Polyethylene (HDPE) – non traffic areas	Eighteen inches (18”) – top of pipe to top of grade
High Density Polyethylene (HDPE) – for dia. to 36” in traffic areas	Eighteen inches (18”) – top of pipe to bottom of roadway structural section (AC & AB)
High Density Polyethylene (HDPE) – dia. 42” to 60” in traffic areas	Eighteen inches (18”) – top of pipe to bottom of roadway structural section (AC & AB)
Corrugated Metal	Span/8 but not less than twelve inches (12”)
Spiral Rib – Steel	Span/3 but not less than twelve inches (12”)
Spiral Rib – Aluminum with spans less than or equal to 72”	Span/2 but not less than twelve inches (12”)
Spiral Rib – Aluminum with spans greater than 72”	Span/3 but not less than thirty inches (30”)
Reinforced Concrete in unpaved areas	1/8 the diameter or rise (the greater of) but not less than twelve inches (12”)
Reinforced Concrete under flexible pavements (Class IV and V)	1/8 the diameter or rise (the greater of) but not less than twelve inches (12”)
Reinforced Concrete under flexible pavements (Class I, II, and III)	1/8 the diameter or rise (the greater of) but not less than twenty-four inches (24”)
Reinforced Concrete under rigid pavements	A nine-inch (9”) space between top of pipe and bottom of slab consisting of compacted granular fill shall be maintained at a minimum.
Cast-in-Place-Concrete-Pipes in paved areas	The structural section (AC & AB) plus twenty-four inches (24”)
Cast-in-Place-Concrete-Pipes in unpaved areas	Twenty-four inches (24”)
Polyvinyl Chloride – C900 and C905	Twelve inches (12”)
Polyvinyl Chloride – D2241 and D3034	Twenty-four inches (24”)

Note: All depths shown are for a minimum trench width equal to the outside diameter of the pipe plus sixteen inches (16”) measured at the top of the pipe.

2. Maximum Cover -- Maximum height of cover shall be per Tables 9-4a and b.

Table 9-4a Maximum Pipe Cover Requirements - Concrete and Plastic Pipe
Measured to bottom of trench in feet

DIA.	RCP					Cast In Place	PVC	HDPE
	Class							
	I	II	III	IV	V			
12	Not Permitted	8	12	30	No Limit	No Limit	14	49
15		10	15	35			14	45
18		11	16	38			14	43
21		12	17	39			14	
24		12	18	39			14	43
27		13	19	39			14	
30		14	19	38			Not Permitted	34
33		14	20	38				
36		13	17	27	69			45
42		14	18	29	62	38		46
48		15	19	30	60	30		41
54		16	20	31	58	26		
60	14	16	21	31	57	24		48
66	15	17	22	32	56	21		
72	15	18	23	33	56	21		

Note: All depths shown are for a minimum trench width equal to the outside diameter of the pipe plus sixteen inches (16") measured at the top of the pipe.

Table 9-4b Maximum Pipe Cover Requirements - Metal Pipes
Measured to bottom of trench in feet

DIA.	CMP **					Ribbed Steel Pipe			Ribbed Aluminum Pipe			
	Thickness – inches					Thickness - inches			Thickness inches			
	0.064	0.079	0.109	0.138	0.168	0.064	0.079	0.109	0.060	0.075	0.105	0.135
12	99	No Limits										
15	99											
18	99											
21	99	99										
24	93	99										
30	74	93	99			36	50	67	21	29	49	64
36	62	78	99			99	30	40	56	17	24	40
42	53	66	93	99		26	35	48	14	21	34	44
48	46	58	81	99	99	21	31	41	13	18	30	37
54	47	52	72	93	99	20	28	38	12	17	26	34
60	43	53	65	84	99	19	26	34		15	25	31
66	39	48	68	76	93		25	32		14	23	28
72	35	42	62	70	85		22	30			21	26
							22	28			20	25

- Note:
- 1) All depths shown are for a minimum trench width equal to the outside diameter of the pipe plus sixteen inches (16") measured at the top of the pipe.
 - 2) ** Normal pipe corrugation profile is 2 2/3" x 1/2". The corrugation of the pipes within the shaded box area shall have profile of 3" x 1" or 5" x 1".
 - 3) When flow velocity exceeds five (5) feet per second, the next thicker gauge shall be used for CMP pipe.

3. Temporary Construction Vehicle Loading

- a. A note shall be made on the plans stating the minimum cover requirements during construction for temporary heavy construction vehicle loading, such as scraper or truck haul routes.
- b. For flexible pipes, place at least four feet (4') of cover over the top of the pipe.
- c. For rigid pipes, place at least three feet (3') of cover over the top of the pipe.

C. Trench Requirements

1. Trenches shall be excavated with full depth and vertical sides whenever possible.
2. The minimum trench width shall not be less than the outside diameter of the pipe barrel plus sixteen inches (16"), measured at the top of the pipe. Where conditions require side sloping of trenches, the minimum vertical trench shall be from the bottom of the trench to one foot (1') over the top of the pipe.
3. In fill areas, or in areas with poor soil conditions where it is anticipated that a good, firm, vertical-walled trench cannot be constructed, the consulting engineer shall design the pipe structural requirements in accordance with good engineering practice. A note shall be placed on the plans directing the contractor to place the proper strength pipe if trench conditions encountered differ from the design trench.

- D. Spacing Requirements - When multiple adjacent pipe lines are used, they shall be spaced so that the sides of the pipes shall be no closer than two feet (2'), or for parallel pipes larger than forty-eight inch (48") the spacing shall be no closer than one half (1/2) the nominal diameter. This is to permit adequate compaction of backfill material. Special bedding and backfill considerations shall be taken when depths of parallel pipes vary.

E. Alignment Requirements

1. The location of storm drainage pipes in new streets shall be typically six feet (6') north or west of and parallel to the centerline of the street. In special situations, pipelines may be placed in alternative locations, including under curb and gutter, as approved by the Director.

2. All new storm drain mains shall be placed a minimum of one hundred feet (100') from existing and proposed water wells. Encroachments less than one hundred feet (100') require approval of the Environmental Management Department and the water purveyor prior to plan approval.
3. Avoid unnecessary meandering and angular changes of pipelines. Angular changes, when necessary, shall not exceed 90 degrees unless approved by the Director. No angular changes in direction are allowed for concrete cast-in-place-pipe other than on a radius.
4. Pipeline Radius Criteria: All pipe placed on curves shall meet manufacturer's recommendations for curved alignment. All curves, radii, length of pipe joints, and types of pipe shall be shown on the plans. The minimum radius of curvature for concrete cast-in-place-pipe shall be determined by the formula $R = 30D$ where R = radius of curvature, and D = nominal internal pipe diameter, with R and D expressed in the same units.
5. Pipelines shall be laid straight in both horizontal and vertical planes between manholes unless otherwise approved by the Director.
6. Where storm drain pipelines of different diameter join, the invert elevations shall be adjusted to maintain a uniform energy gradient.

F. Velocity

1. The minimum full flow velocity shall be no less than two (2) feet per second. The maximum velocity, at maximum pipe system capacity, shall be less than the critical velocity ($V_c = (gd)^{.50}$), where critical velocity in ft/sec equals the square root of the product of the gravitational constant 32ft/sec/sec times the depth of flow in feet).
2. When full-flowing pipelines produce supercritical velocity, special provisions shall be taken to prevent erosion, pipe displacement, and manhole lid surcharge.

G. Entrances and Exits

1. Headwalls, flared end section and other structures at entrances shall be designed to increase hydraulic efficiency, prevent erosion adjacent to the conduit and provide a counterweight to prevent flotation. Headwalls or flared end sections should be used at discharge ends of culverts and pipes.
2. Where drainage systems discharge into a channel, standard headwalls should be installed per standard drawings of the latest

edition of County of Sacramento Standard Construction Specifications.

3. The vertical face of the headwall shall be set back a sufficient distance from the channel side slope to accommodate flap-gates (when needed) in a fully opened position without encroachment of the flap past the channel side slope face.
4. Energy dissipation shall be designed at outlets into earthen channels.

H. Water and Soil Tight System

1. All storm drain pipe, manholes, and fitting connections, including drain inlet laterals shall be water and soil tight and tested in conformance with Section 38-10 of the Specifications.
 2. A note shall be placed on the improvement plans stating these requirements and that the contractor is responsible for providing equipment and labor for performing tests and making measurements when directed to do so by the County's inspector.
- I. Bored and Jacked Pipe -- All casing pipes shall be sealed at both ends in such a manner as to provide water resistant seal.
- J. Backfill Seepage -- A concrete filled cutoff barrier shall be required at inlets and outlets where water may penetrate pipe backfill material. This shall be detailed on the improvement plans.

9-13 Manholes & Junction boxes: Requirements for manholes are as follows:

- A. Standard pre-cast concrete or saddle type manholes shall be used except where special manholes or junction boxes are required. The design of special manholes and junction boxes must be submitted to the Director for approval. Cast-in-place manholes shall conform to standard drawings of the latest edition of County of Sacramento Standard Construction Specifications.
- A. In no case will junction boxes or manholes be allowed which are smaller than twenty-four inches (24") inside dimension.
- C. Manholes shall be sized to provide a minimum of nine inches (9") wall spacing between annular cutout edges of pipe openings.
- D. Manholes shall be located at junction points, angle points greater than 15 degrees, and changes in pipe size or materials. On curved pipes with radii of 200-feet to 400-feet, manholes shall be placed at the beginning and end of curve and on 300-foot maximum intervals along the curve. On curves

with radii exceeding 400-feet, manholes shall be placed at the beginning and end of curves and on 400 feet maximum intervals along the curve for pipes twenty-four inches (24") and less in diameter and 500-feet maximum intervals along the curve for pipes greater than twenty-four inches (24") in diameter. Manhole spacing on curves with radii less than 200-feet will be determined on an individual basis. Exceptions to these calculated manhole placement shall be allowed if the resulting manholes are within 100 feet of existing or proposed manhole.

- E. Spacing of manhole, junction boxes (or inlets of such size as to be accessible for maintenance) shall not exceed 400-feet for drains fifteen inches (15") and smaller in diameter, 500-feet for drains between eighteen inches (18") and thirty-six inches (36") in diameter, and 600-feet for pipes greater than forty-two inches (42") in diameter.
- F. All manholes and junction boxes other than inlets shall have standard manhole frames and covers as shown in the Specifications. Manholes will not be allowed in the gutter flow line except as approved by the Director.
- G. A reinforced flat top forty-eight inch (48") diameter (no cone) concrete lid as shown in the Construction Specifications shall be required when any pipe would enter the manhole above any portion of the base of a manhole cone. Maximum twenty-four inch (24") diameter riser (chimney) height shall be less than or equal to eighteen inches (18").
- H. Use grated manhole covers (Drawing 9-11) to pick up minor drainage in non-traffic areas only if debris clogging is not a concern.
- I. Improvement plans shall include a special detail for all manholes at junction points where there is a change in pipe direction for pipe diameters exceeding forty-eight inches (48").
- J. Resilient connectors, in conformance with Section 39-2.02 of the Specifications, are required between pre-cast manhole/box and pipe, and between pre-cast drop inlet and pipe. Water stops are required for pipe to cast-in-place manhole/drop inlet connections. Use non-shrinking/non-expansive grout for making connections of pipe and water stop to structure walls.
- K. Stations of manholes/boxes shown on project drawings apply at center line of shaft.
- L. Manhole/box lids shall be bolted to frame where lids are prone to surcharging when the storm drain system is at maximum capacity. A pressure manhole design may be required by the Director.
- M. Storm drain manholes/boxes shall be tested in conformance with Section 39-4.02 of the Specifications.

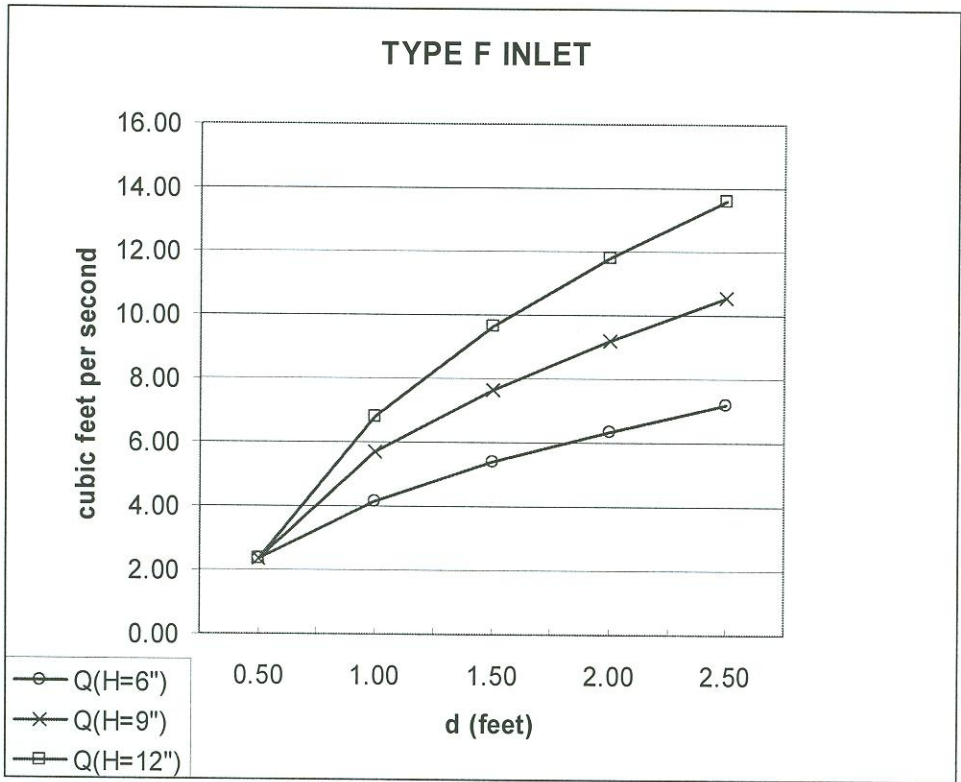
- N. There shall be no sumps in manholes outside of the public right-of-way.
- O. Drop inlets shall not be used as junction boxes, unless approved by the Director.
- P. Junction boxes shall be constructed of pre-cast or cast in place reinforced concrete with minimum wall thickness of six inches (6"). The consulting engineer shall submit calculations indicating the junction box is designed to withstand H-20 loading
- Q. The inside vertical dimension of junction boxes shall be such as to provide a minimum of three-inch (3") clearance on the outside diameter of the largest pipe in each face. Junction boxes shall have a minimum horizontal inside dimension of forty-eight inches (48").
- R. All junction boxes shall be rectangular unless otherwise approved by the Director.
- S. Pipes adjacent to junctions shall have tight, impermeable joints subject to testing requirements of Section 39-4.02 of the Specifications.
- T. Junction boxes larger than ten feet (10') in any dimension shall have two manhole access points.

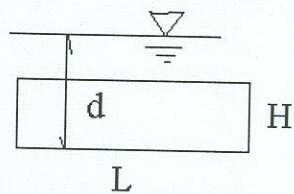
9-14 Inlets: All inlet design curves in these Standards assume clean inlets. The Consulting Engineer shall assume a 50% clogging factor when determining the number and location of inlets.

- A. Additional inlets are required at sump locations per Section 9-10A of these Standards.
- B. Type B inlets are typically used for streets with concrete curbs and gutters. See Standard Drawing 9-12, of these Standards, for flow capacity.
- C. Always use grated inlets when the longitudinal slope of the street exceeds 4% where due to the high velocities it is difficult to direct the flows into the curb opening.
- D. Type F inlets may be used in roadside ditches, swales, unimproved medians, and outside of the road right-of-way. Figure 9-1 provides design capacity for one two-foot wide window of a Type F inlet, clear of debris.
- E. Curb opening catch basins with grating(s) and debris skimmers (Drawings 300,301,308,309 in the Specifications) may be used in locations where additional inlet capacity, beyond a single Type B inlet, is needed, or as where directed by the Director. The inlet width may vary from seven feet

(7') to twenty-eight feet (28'). The H dimension is the gutter depression depth and shall be a standard two inches (2"). When more than one grate is required, use Drawing 9-16 for support assembly. Assure that the lateral is sized to serve the increased inlet capacity. Flow capacity for the 300 and 301 inlets is calculated using the methods found in the Federal Highway Administration (FHWA) Urban Drainage Design Manual Hydraulic Engineering Circular No. 22.

- F. Inlets in Class "A" and "B" streets shall be placed at lot lines in residential subdivisions and at the curb return of intersections. Inlets shall be placed so that the length of flow does not exceed 500 feet, unless otherwise approved by the Director. Inlets at curb returns shall be constructed so that they are not in conflict with the Americans with Disabilities Act requirements for ramps.
- G. All new and replacement storm drain inlets on public rights-of-way, private property and drainage easements shall include a "No Dumping- Drains to Creek" concrete stamp or other approved epoxy affixed permanent marker on the curb adjacent to the drainage inlet in accordance with Drawing 9-35, of these Standards.
- H. Type F inlets shall be designed based on the following chart and Figure 9-1. The chart assumes clean openings, so some clogging shall be accounted for by adding a grated lid or increasing the window opening(s).





$$Q_{\text{weir}} = 3.33L d^{1.5} \quad (d < H)$$

$$Q_{\text{weir}} = 0.60(2gd)^{0.50} \quad (d > H)$$

FIGURE 9-1

9-15 OVERLAND RELEASE: Piped storm drain systems are not designed to convey peak flow from infrequent high intensity storm events. When the pipes and inlets are clogged or overwhelmed, surface runoff will pond in low areas and flow overland along designed overland release routes. The improvement plans shall include overland release routing and the consulting engineer shall provide back up calculations. Risk of flood damage shall be reduced by insuring that the 100-year storm runoff ponds and flows through the proposed development with appropriate freeboard protecting existing and proposed structures, pursuant to Section 9-1 of these Standards. Unless otherwise authorized by the Director, 100-year depth in streets shall be limited to no more than eight inches over back of walk.

- A. For the purposes of determining overland release flows, the 100-year runoff may be obtained from Figures 2-18 through 2-23 of Volume 2. Certain collector streets will require dry lanes in the 100-year storm, as determined by the Sacramento County Department of Transportation.

For purposes of design, assume the storm drain pipes are flowing full capacity into 100-year backwater.

- B. Overland flow passing over street vertical curves shall not exceed a depth of six inches (6") over the back of walk.
- D. Where overland release leaves the right-of-way, concrete improvements shall include a stamp in concrete or epoxy affixed message "EMERGENCY DRAINAGE RELEASE PATH – DO NOT BLOCK".
- C. The overland release, outside of the street right-of-way, shall be a concrete mow strip, gutter or other permanent flow line. Grouted cobbles are not a suitable construction material for overland release paths.

- D. Streets, parking lots, playgrounds, pedestrian areas, pedestrian walkways, utility easements and other open space areas may be considered compatible uses for the overland release routing.

Equation 1

The US Department of Transportation recommends, in Hydraulic Engineering Circular Number 22, the use of the following equation when the depth at the gutter is less than one fortieth (1/40) the width of flow. It is a variation of the Manning's formula because the hydraulic radius does not adequately describe the gutter cross section. The compound gutter and rolled curb are considered negligible and are ignored.

$$Q = \frac{K_c}{n} S_x^{1.67} T^{2.67} S_L^{0.5}$$

Where:

Q = flow rate (ft³/sec)

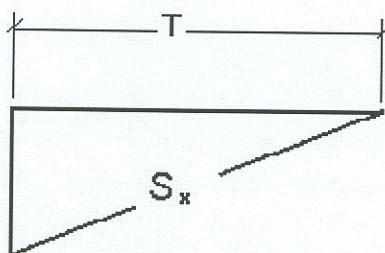
K_c = 0.56 (English units)

n = Manning's coefficient (use 0.016 for paved street)

T = width of flow or spread (ft)

S_x = cross slope, typically 0.020 (ft/ft)

S_L = longitudinal slope (ft/ft)



Depth at gutter = TS_x

9-16 **PIPE STUBS:** The criteria for pipe stubs shall be as follows:

- A. A headwall or flared end and trash rack shall be required where the upstream pipe ends at a park or open field, and the site shall be graded toward the inlet.

- B. Temporary pipe stubs shall be as deep as possible to provide for future extension, and raised to grade using a type F, type H, or type I inlet or other appropriate catchments. Type H Inlets shall be sized two (2) sizes larger than the connecting pipe or pipe stub.

9-17 HEADWALLS AND RACKS: The requirements for headwalls, wing-walls, end walls, trash racks, access control racks and railings are as follows:

- A. All headwalls, wing-walls and end walls shall be considered individually and in general shall be designed in accordance with the Standards and Specifications of the California Department of Transportation.
- B. Erosion control is of high importance where storm drain pipes discharge to natural channels. Energy dissipating structures shall be detailed on the improvement plans.
- C. Trash racks will be provided on all open end inlets to pipes to prevent clogging. Trash racks shall be designed such that the ratio of trash rack open area to drain opening is at a minimum four to one (4:1).
- D. Access control racks shall be required on pipes twenty-four inches (24") or larger, unless otherwise approved by the Director, and shall be designed such that the ratio of access control rack open area to drain opening is at a minimum four to one (4:1). They shall hinge at the top to allow them to open should debris and hydraulic forces provide pressure.
- E. Both trash racks and access control racks on pipe outfalls 37 to 66-inch diameter shall be constructed as two separate hinged sections. For pipe outfalls greater than 66-inch diameter, the racks shall be split into three sections.
- F. Public safety may require metal beam guardrail or wrought iron fencing at culverts, headwalls, box culverts, and on steep side slopes, unless otherwise approved by the Director. Installation shall be in accordance with the Specifications.
- G. Slopes around headwalls, wingwalls, end walls, trash racks and other concrete structures shall be protected from erosion in accordance with Section 11 – Erosion and Sediment Control.

9-18 DRAINAGE PUMPS: Drainage pumping plants shall be designed in accordance with the latest edition of the Hydraulic Institute Standards and as specified by the Director.

9-19 DETENTION SYSTEMS: Flood control detention system designs require the approval of the Director.

9-20 OPEN CHANNELS: Open channels are to be designed pursuant to the drainage study provided by the consulting engineer and to the satisfaction of the Director. Each project has unique hydraulic constraints and storm water quality requirements; therefore, the following should be deemed guidelines.

- A. Open channels are required whenever one or more of the following applies:
 - 1. The design flow rate exceeds the capacity of a seventy-two inch (72") pipe.
 - 2. The outfall is at an elevation such that minimum cover cannot be obtained over the pipe.
 - 3. County, State or Federal Government policies require that the channel remain natural.
- B. Open channels shall consist of vegetated earth channels. Concrete lining may only be allowed with approval by the Director.
- C. Criteria for open channels shall be as follows:
 - 1. Open channel design shall include a water surface profile analysis using the Army Corps of Engineers HEC-RAS computer program, UNET program or other hydraulic program, approved by the Director.
 - 2. ii. Open channels shall be designed to convey the 100-year flood event with a minimum one foot (1') of freeboard. Greater freeboard may be required depending on the sensitivity of the model, obstructions, and surrounding property.
 - 3. 3. There is no minimum velocity for open channels. The maximum velocity shall be as follows:
 - A. Earth channels, six (6) ft/s
 - B. Lined channels, ten (10) ft/s
 - C. Bottom-lined channels, eight (8) ft/s
 - 4. Super elevating the outside bank on bends may be required to maintain specified freeboard.
 - 5. The centerline curve radius of an open channel shall be equal to the greater of twice the bottom width or thirty-five feet (35').
 - 6. Earth channels and the side slopes of bottom lined channels shall be vegetated with native grasses or other permanent vegetative cover. All vegetation shall be approved by the Director. Vegetation shall

be established prior to the wet season (October 1). Hydro-seeding conducted during the wet season (October 1 – April 30) shall include additional appropriate soil stabilization materials to prevent erosion, in accordance with Section 11 of the Improvement Standards. A note shall be added to improvement plans stating “Vegetated open channels shall not be accepted by the County until 70% of the vegetation is established.”

7. Channels, deeper than three feet, shall be constructed to a typical cross section with 3 horizontal to 1 vertical (3:1) or flatter side slopes. Exceptions require approval of the Director.
8. All lined channels shall have a minimum bottom width of six feet (6') and shall have access ramps for maintenance equipment, see Drawing 9-24 and 9-25 of the Specifications.
9. Access ramps are required to allow access for emergency and periodic maintenance. The minimum width shall be ten feet (10') at a maximum slope of ten percent (10%). Ramps may be constructed of concrete (colored to blend with the surroundings) or other durable material. Detail the ramps on the improvement plans, attention to both aesthetics and serviceability is required.
10. When a paved public street or bicycle path are not adjacent to the top of bank, a twenty foot (20') service road shall be provided having a sixteen foot (16') improved surface and two foot (2') shoulders on each side. Curve radii shall be a minimum of forty-two feet (42'). Turnouts shall be placed as dictated by horizontal sight distance, or no greater than one-thousand feet (1000'). The service road shall be constructed of aggregate base rock unless otherwise determined by the Director.
11. Erosion protection shall be placed at the top of the cut or bank where deemed necessary to prevent erosion (see Standard Drawings in the Specifications).
12. For all channels, either improved or natural, the following items shall be shown on improvement plans in addition to information heretofore required:
 - A. Typical sections and cross-sections.
 - B. Profile of the existing channel and top of bank profile including enough of the existing channel each side of the development to establish an average profile grade through the development.

- C. Ten and one-hundred year water surface elevations.
- D. Road crossings with road profile indicating overland release.

9-21 OUTFALL DESIGN: Requirements for outfall design are as follows:

- A. All permanent and temporary drainage outfalls shall be shown in both plan and profile on the improvement plans for a distance until a definite "daylight" condition is established.
- B. The profiles shall include ditch flow-line and left and right top of bank elevations.
- C. When improvements have more than one unit or phase, the drainage outfall shall be shown as extending to the property boundary and beyond, if required, although it may not be constructed with the current unit development.

9-22 FENCING REQUIREMENTS: The requirements for fencing shall be as follows, variations are subject to the approval of the Director:

- A. Improved channels and detention basins exceeding three feet (3') in depth and with side slopes steeper than 3:1 shall be fenced with six foot (6') wrought iron fencing or black vinyl coated chain link, located six inches (6") inside of right of way or easement. Green vinyl coated chain link shall be used where basins or channels are adjacent to landscape area. On culverts with headwalls or parapets, wrought iron fencing shall be used and shall wrap around along the channel for a distance of at least 150 feet.
- B. Walk gates shall be four feet (4') wide
- C. Drive gates shall be two eight-foot gates with a total opening of sixteen feet (16') wide. They shall be set a minimum of twenty feet (20') back from the edge of pavement to allow for a safe parking area off of the traveled way while opening and closing the gates. Gates must swing away from road right-of-way. A concrete driveway shall be provided at vertical curb locations. Asphalt concrete paving shall be provided between the traveled way and drive gate. Design the paving per Section 4, Streets of these Standards.
- D. The gate access shall be marked no parking.

9-23 CROSS CULVERT CRITERIA: The following standards apply when the 100-year water surface elevation is not freely spanned by a bridge:

- A. Cross culverts for minor sheds shall be designed in accordance with procedures outlined in the U.S. Department of Transportation "Hydraulic

Design of Highway Culverts,” Hydraulic Design Series No. 5, September, 1985. For shed areas greater than 160 acres, use HEC-RAS or other software approved by the Director.

- B. Cross culverts shall be checked against 100-year runoff to assure that no adverse effect will occur upstream or downstream.
- C. Cross culvert profile will be determined by an examination of the overall profile of the channel for a minimum distance of 500 feet on each side of the installation, assuring that freeboard requirements are met.
- D. Where no overland release is possible, cross culverts shall be oversized by at least twenty five percent (25 %).
- E. Where roads are not to be overtopped, for public safety or physical constraints, the box culvert soffit shall have one-foot (1') of freeboard over the 100-year water surface elevation.
- F. Culverts shall include a headwall or flared end section at both the upstream and downstream end.

9-24 DRAINAGE ALONG CLASS “C” Streets: The criteria for design of drainage along Class “C” streets are as follows, unless otherwise approved by the Director:

- A. Roadside ditches shall be sized to convey design runoff per Drawings 9-2 through 9-5 of these Standards. Analysis of 100-year flows shall be considered per Section 9-1. Analysis shall include culverts. The 10-year and 100-year hydraulic grade lines shall be shown on the profile.
- B. If the roadside ditch extends beyond the dedicated right-of-way, the right-of way shall be extended or a drainage easement shall be dedicated over the portion of the ditch outside the right-of-way.
- C. To prevent end of pipe distortion Driveway culverts for subdivision improvement plans shall include a flared end section at the upstream and downstream ends or place a six inch (6”) thick concrete collar and headwall.

9-25 STORMDRAIN SYSTEMS IN PRIVATE STREETS:

- A. Private storm drain systems that connect to County maintained drainage facilities shall have a manhole immediately upstream of the connection within the public easement or right-of-way.
- B. It shall be made clear on the plans which facilities are private.

- C. Private storm drain pipes serving more than two parcels shall be built according to the Improvement Standards.

9-26 **STORMWATER QUALITY:** Water quality measures shall be incorporated into new and redevelopment projects in order to reduce the amount of pollution discharged to the storm drain system and local waterways from urban areas. This requirement is necessary to ensure compliance with the County’s National Pollutant Discharge Elimination System (NPDES) Municipal Storm Water Permit.

Water quality may be treated through regional facilities, on-site measures, or a combination. Typically, water quality facilities shall be located off-line to receive the first flush of runoff from a storm event, with provisions for high flow bypass. Some facilities, such as detention basins and channels, may be designed as on-line, dual-purpose facilities (flood control and water quality), subject to the approval of the Director. In no cases will water quality treatment be allowed within natural creeks, tributaries and rivers considered by the State to be “Waters of the State,” unless approval of the design is granted in advance by the Central Valley Regional Water Quality Control Board.

Storm Water Quality
Control Measure Decision Matrix
TABLE 9-5

LAND USE	POST-CONSTRUCTION CONTROL MEASURES				
	WITH REGIONAL CONTROLS ⁽⁶⁾	WITHOUT REGIONAL CONTROLS ⁽⁶⁾			
		<1 acre ⁽⁴⁾	1-5 acres ⁽⁴⁾	5-100 acres ⁽⁴⁾	>100 acres ⁽⁴⁾
Residential - Single Family ⁽¹⁾	Source Control Measures	Source Control Measures ⁽⁸⁾			Regional Control
Residential - Multi-family ⁽¹⁾	Source Control Measures	Source Control Measures	Source Control and Treatment Control Measures		
Commercial ⁽²⁾⁽³⁾⁽⁵⁾	Source Control Measures ⁽⁷⁾	Source Control Measures	Source Control and Treatment Control Measures		
Industrial ⁽³⁾⁽⁵⁾	Source Control Measures and General Permit ⁽⁷⁾	Source Control and Treatment Control Measures and General Permit			

(1) Based on gross acres.
 (2) Includes churches.
 (3) Includes school sites.
 (4) May be subject to State of California NPDES General Permit for Construction Activities during construction.
 (5) May be subject to State of California NPDES General Permit for Industrial Activities.
 (6) Regional control measures are watershed or drainage basin-wide controls.
 (7) Director may require additional treatment control measures.

(8) Director may require additional treatment control measures or regional control measures.

Regional Water Quality Facilities -- Regional Water Quality Detention Basins and Water Quality Channels shall be designed in accordance with the City of Sacramento Department of Utilities Procedures Manual, Section 11.6 (Regional Water Quality Control). These procedures incorporate the Sato Method from Volume 2 of the City/County Drainage Manual (Hydrology Standards) for sizing of detention basins. The final design shall be subject to the approval of the Director. The Consulting Engineer is encouraged to present conceptual design approaches to the County as soon as possible in the earliest possible planning stages of the project.

On-Site Water Quality Control Measures -- Table 9-5 indicates projects that are required to include on-site treatment and/or source control water quality control measures. Treatment measures are intended to remove pollutants from runoff, whereas source control measures are structural and non-structural measures designed to stop pollution at its source, before the pollutants can enter site runoff. Guidance for the selection, design, installation and maintenance of on-site water quality control measures is provided in "Guidance Manual for On Site Storm water Quality Control Measures", prepared jointly by the City and County of Sacramento. Other devices and methods not contained in the guidance manual may be presented to the County for consideration, but additional time should be allowed in the design process. Due to the rapidly evolving nature of water quality treatment, the Consulting Engineer is encouraged to present conceptual design approaches to the County in the earliest possible planning stages of the project.

Maintenance of Storm Water Quality Facilities -- Routine inspection and maintenance is required for all storm water quality facilities in order to continue to ensure optimum pollutant removal performance. A note shall be included on improvement plans where regional storm water facilities are specified stating "A written maintenance plan shall be required for all regional storm water quality facilities before the County will accept the facilities. The maintenance plan shall include procedures and a schedule for vegetation establishment and maintenance, as applicable. The developer shall be responsible for vegetation maintenance on regional storm water quality facilities until vegetation is established to the approval of the Director." If on-site facilities are specified, a note shall be included on the improvement plans stating "A maintenance agreement is required for all on-site storm water quality facilities. The project will not be accepted by the County until the maintenance agreement has been signed by the Developer/Property Owner."

9-27 EASEMENTS: Use the following sample language in preparing drainage easement documents for notary witnessed signature and recordation:

A. EASEMENT FOR DRAINAGE CANAL OR DITCH

Undersigned do(es) hereby grant to the COUNTY OF SACRAMENTO, a political subdivision of the State of California, for the purpose of digging, constructing, reconstructing, repairing and forever maintaining thereon, a drainage canal or ditch of such dimensions as Grantee shall deem necessary

for drainage purposes, together with the spoil banks and appurtenant structures thereof, a drainage easement over that certain real property in the County of Sacramento, State of California, bounded and described as follows, to-wit: [refer to attached legal description exhibit]. Together with the perpetual right and privilege of flowing water in, through, and along said canal or ditch in such amounts and at such times as necessary, and the perpetual right of ingress to and egress from said property, for the purpose of exercising and performing all of the rights and privileges herein granted.

B. EASEMENT FOR SECONDARY FLOWAGE

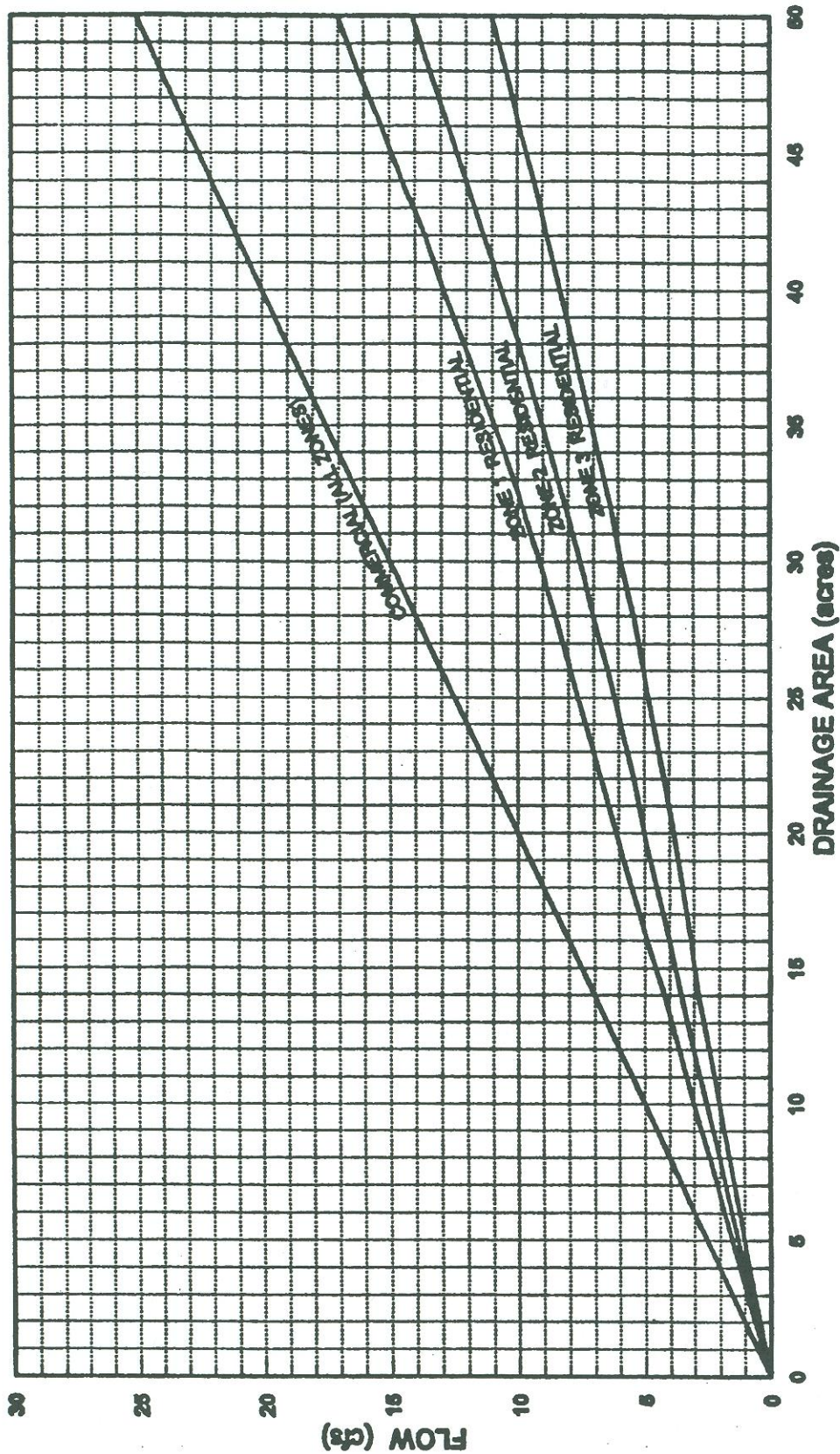
Undersigned do(es) hereby consent to the recording of this indenture to the County of Sacramento for the purpose of designating the hereafter described property as subject to flooding, to-wit: [refer to attached legal description exhibit]. Together with the perpetual right and privilege to flow water in, through and over the subject land during periods of storm water runoff. This is not to exclude the owner from any and all inherent uses or privileges of the subject property.

C. EASEMENT FOR DRAINAGE PIPELINE

Undersigned do(es) hereby grant to the COUNTY OF SACRAMENTO, a political subdivision of the State of California, for the purpose of digging, constructing, reconstructing, repairing and forever maintaining thereon, a drainage pipeline of such dimensions as Grantee shall deem necessary for drainage purposes, a drainage easement over that certain real property in the County of Sacramento, State of California, bounded and described as follows, to-wit: [refer to attached legal description exhibit]. Together with the perpetual right and privilege of flowing water in, through, and along said pipeline in such amounts and at such times as necessary, and the perpetual right of ingress to and egress from said property, for the purpose of exercising and performing all of the rights and privileges herein granted.

D. EASEMENT FOR FLOODPLAIN

Undersigned do(es) hereby consent to the recording of this indenture to the County of Sacramento for the purpose of designating the hereafter described property as subject to flooding, to-wit: [refer to attached legal description exhibit]. Together with the perpetual right and privilege to flow water in, through and over the subject land during periods of flooding. This is not to exclude the owner from any and all inherent uses or privileges of the subject property, subject to applicable County codes, policies, and ordinances.



NOTE: Design runoff for multiple family development shall be based on the following formula:

$$Q_m = Q_r + (Q_c - Q_r) (I-50)/40$$

Where:

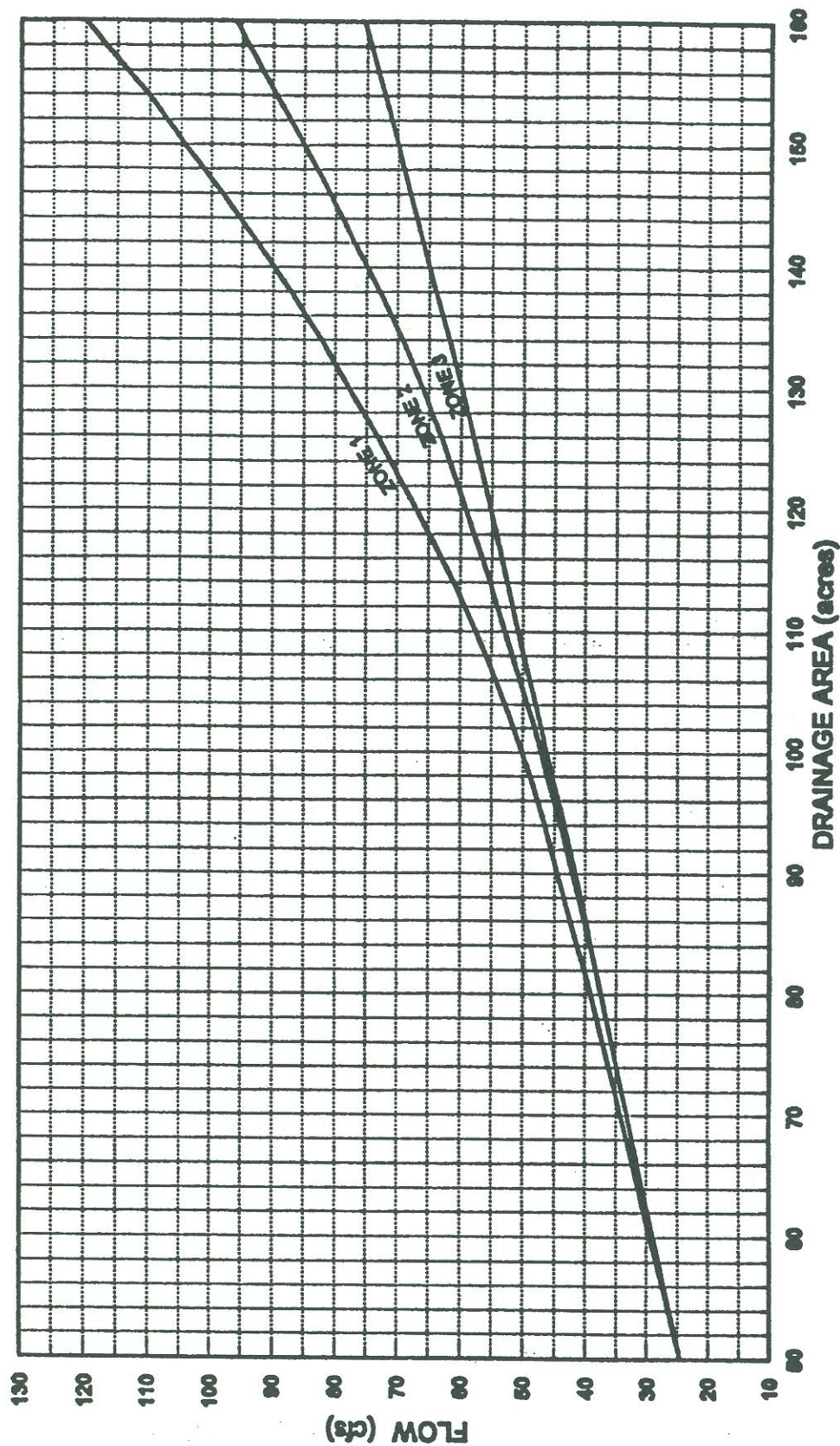
RD-7	I = 60
RD-10	I = 70
RD-20	I = 80
RD-30	I = 90

Source: County of Sacramento Master Drainage Plan,
Part 1, County-wide Hydrology, Nolte and Assoc.

Design Runoff Nolte Method Drainage Areas, <50 Acres

Date: December 1996

Figure 2-5



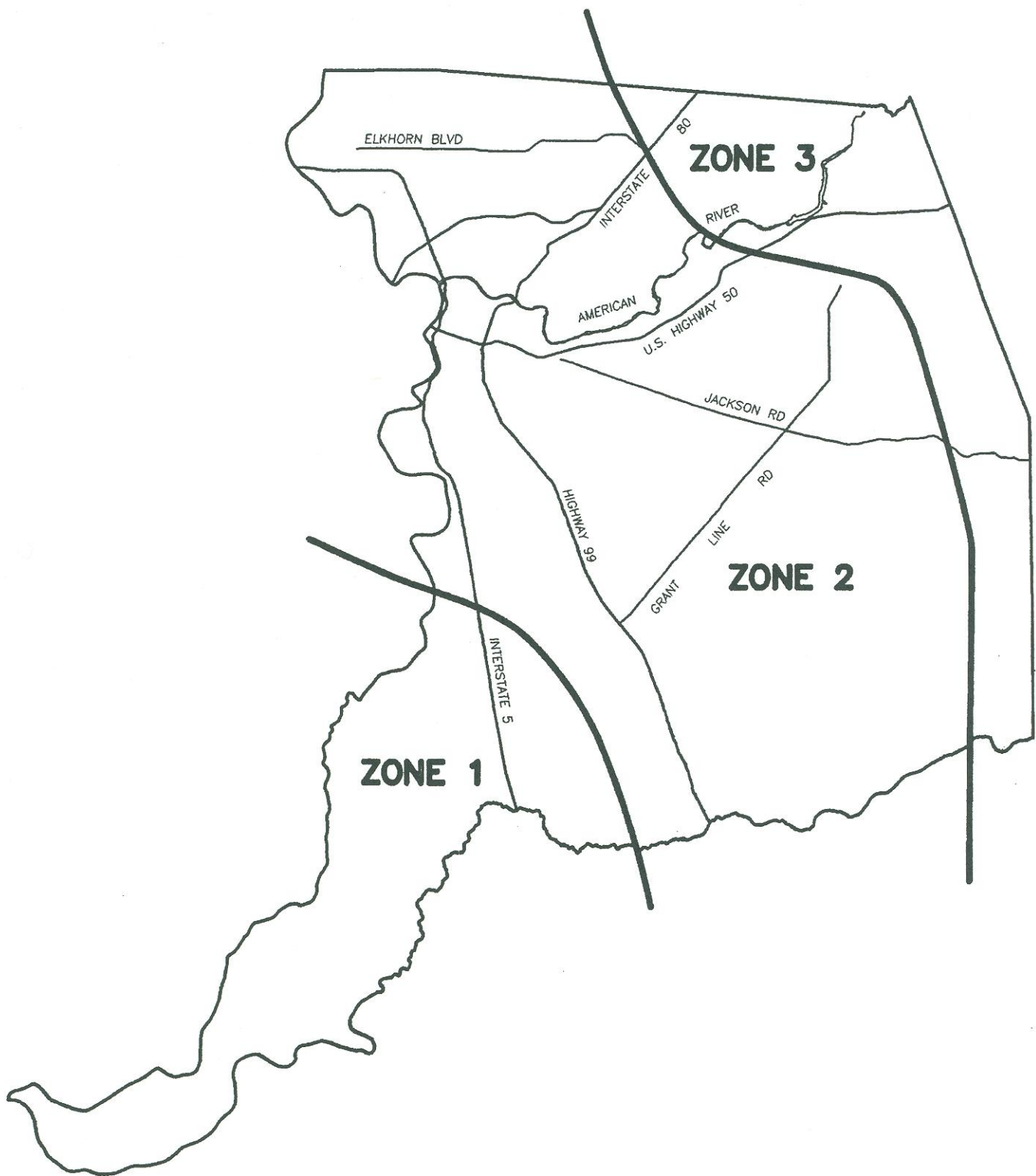
Source: County of Sacramento Master Drainage Plan,
Part 1, County-wide Hydrology, Nolte and Assoc.

Date December 1996

Figure

2-7

Design Runoff Nolte Method Commercial Areas 50-160 Acres

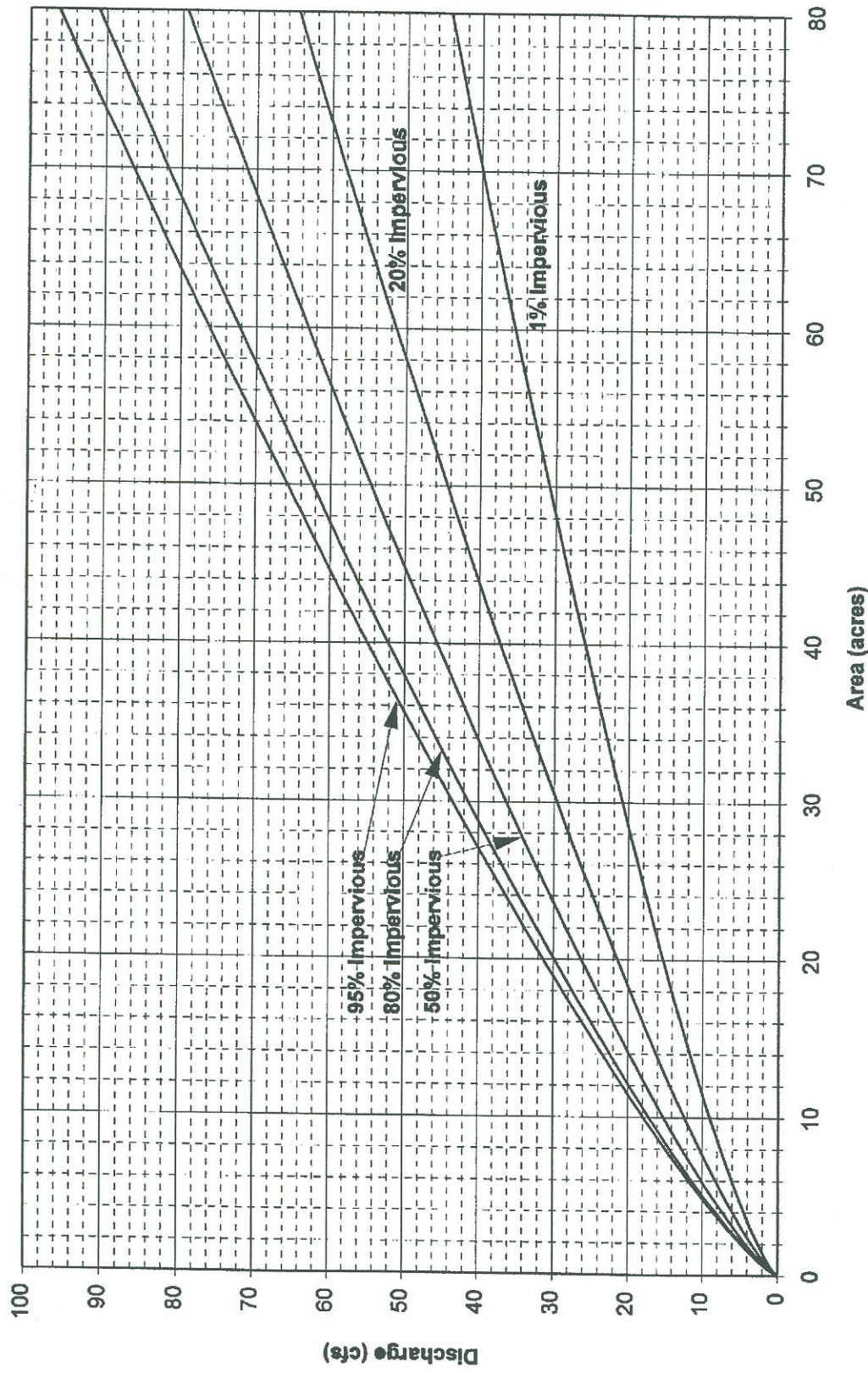


Note : See foldout map in the back of Hydrology Standards
for larger scale map of Rainfall Zones.

Sacramento City and County Rainfall Zones Sacramento Method

Date **December
1996**

Figure
2-11

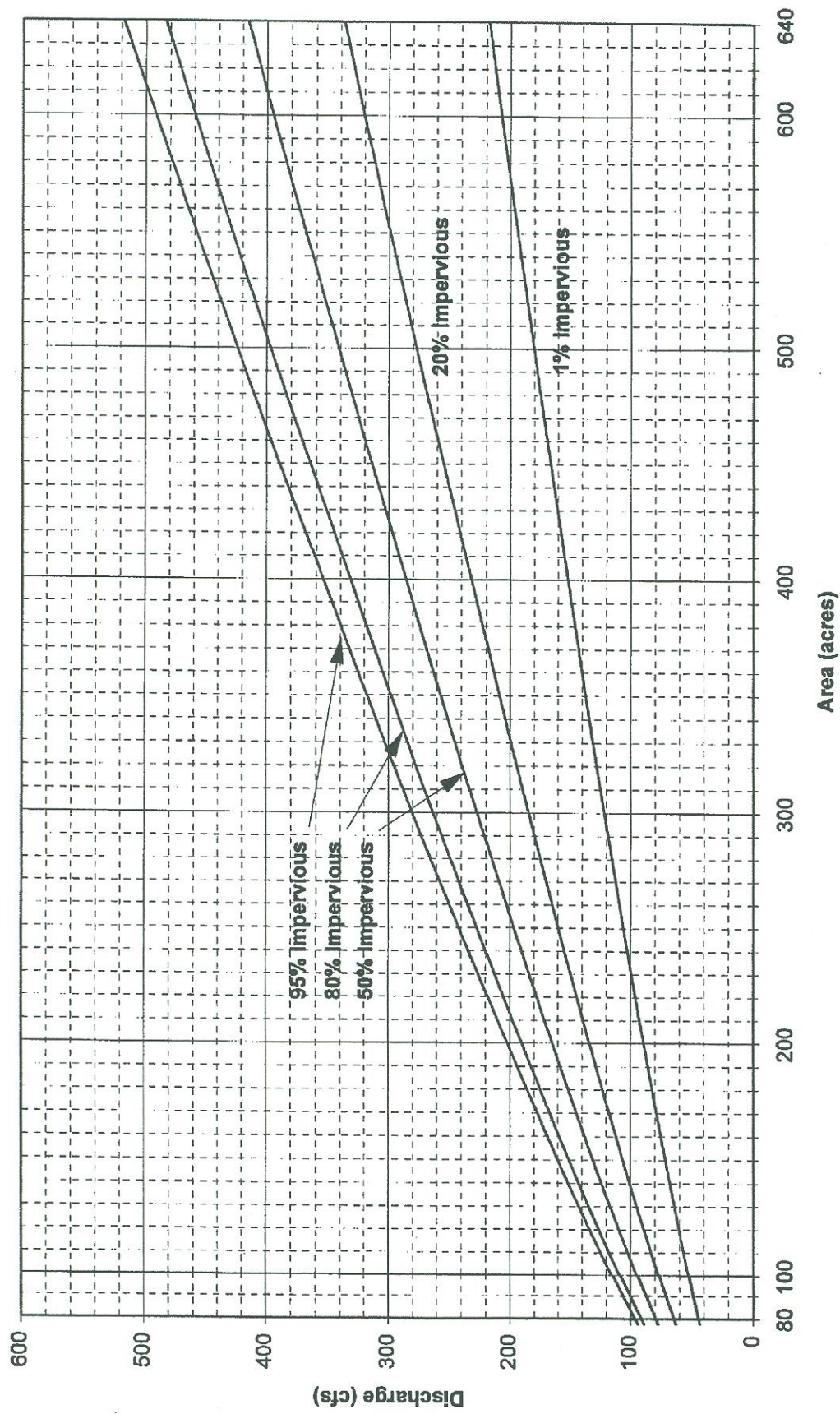


Note: Refer to accompanying disk for assumptions made in deriving this figure.

100-Year Peak Flow Sacramento Method Rainfall Zone 1, <80 Acres

Date: December 1996

Figure 2-18

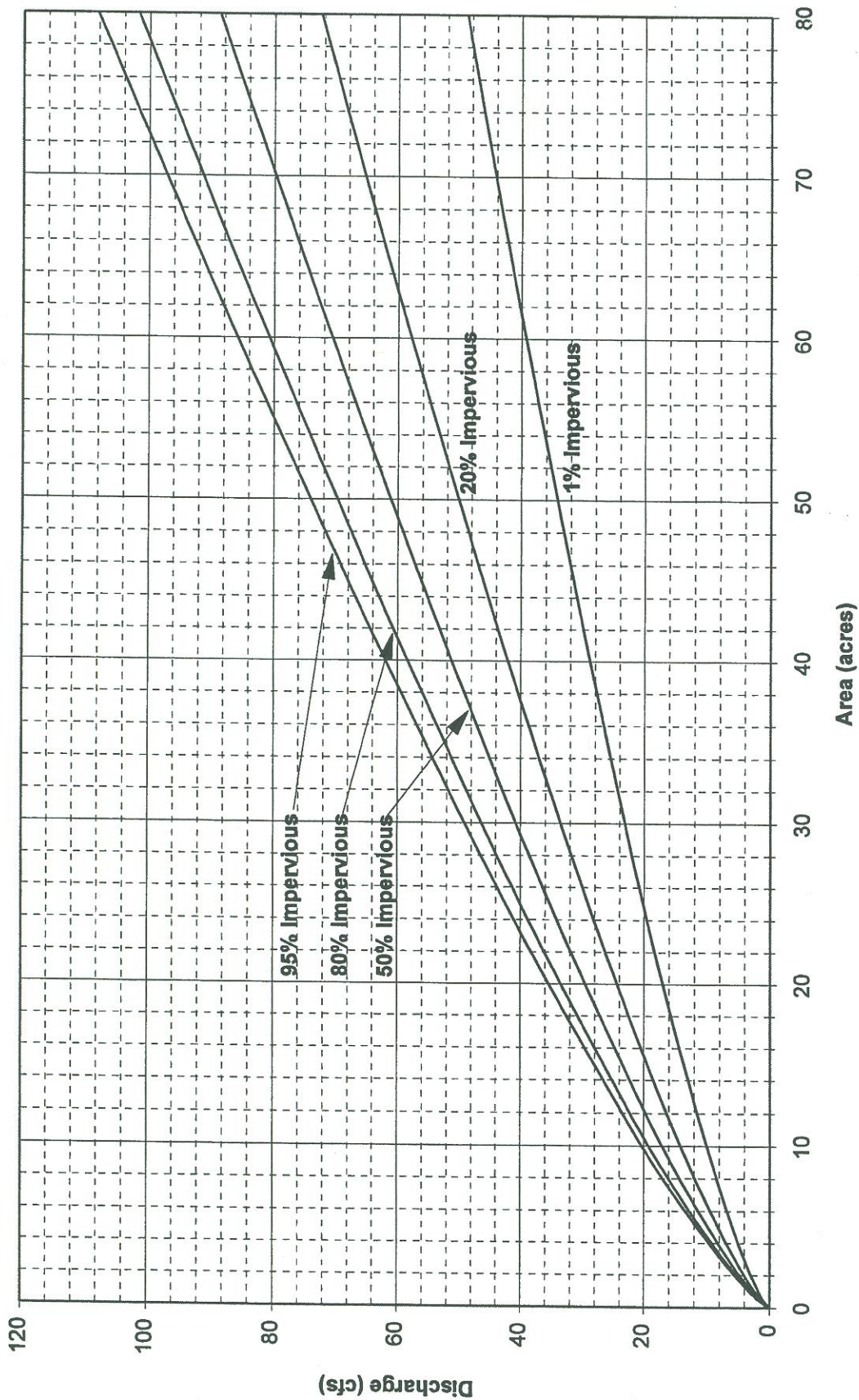


Note: Refer to accompanying disk for assumptions made in deriving this figure.

Date December 1996

Figure 2-19

100-Year Peak Flow Sacramento Method Rainfall Zone 1, 80-640 Acres

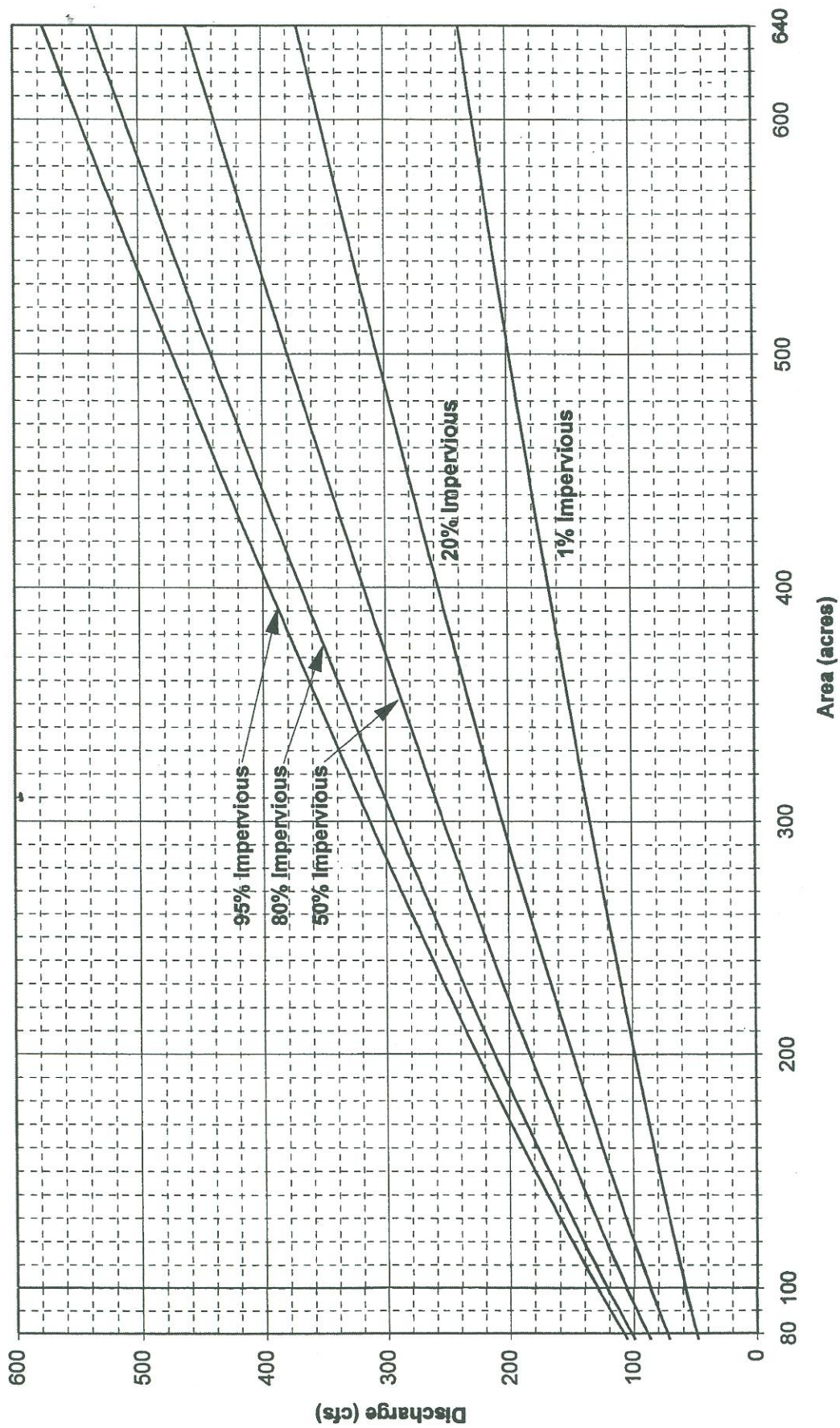


Note: Refer to accompanying disk for assumptions made in deriving this figure.

100-Year Peak Flow Sacramento Method Rainfall Zone 2, <80 Acres

Date **December 1996**

Figure **2-20**

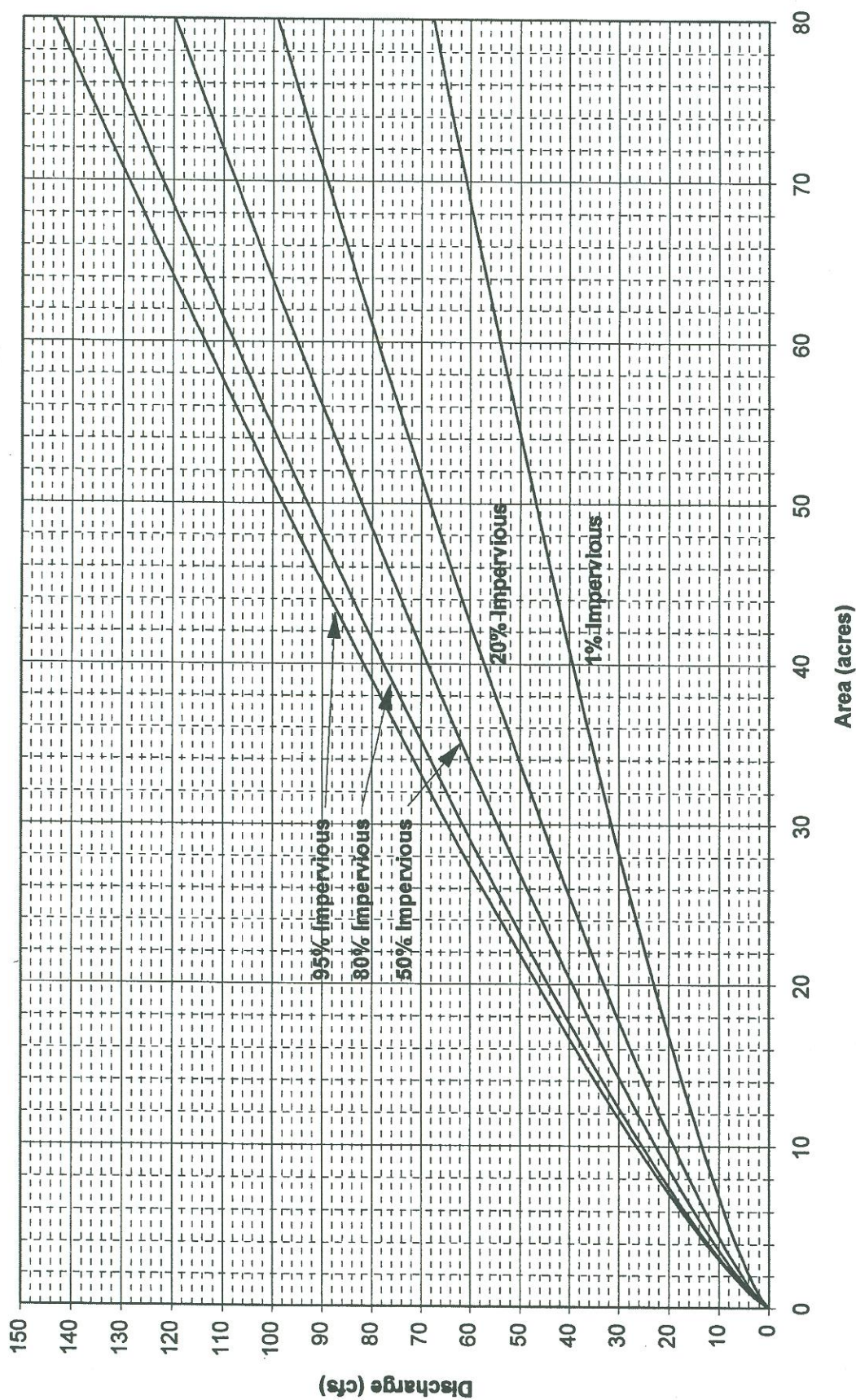


Note: Refer to accompanying disk for assumptions made in deriving this figure.

100-Year Peak Flow Sacramento Method Rainfall Zone 2, 80-640 Acres

Date December 1996

Figure 2-21

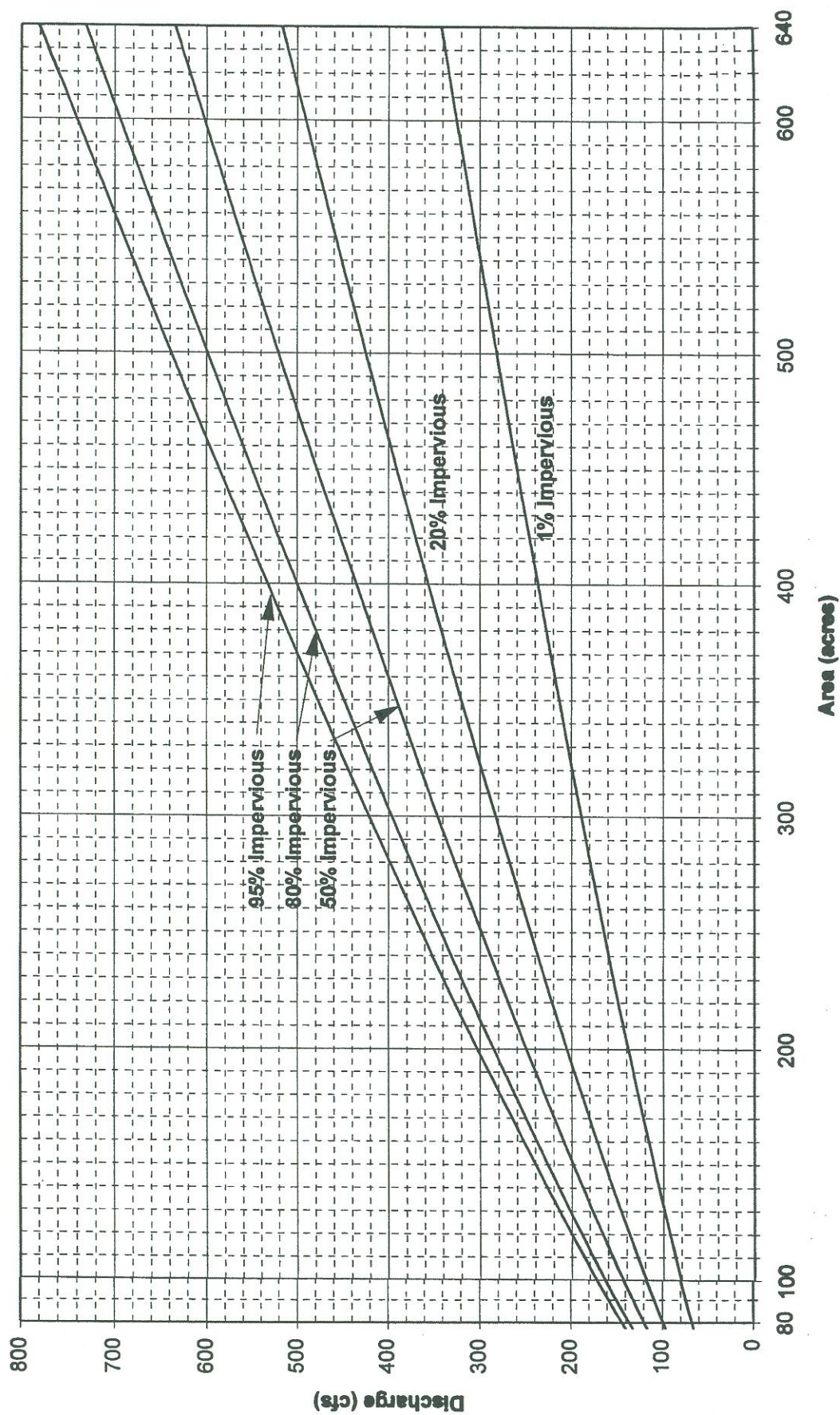


Note: Refer to accompanying disk for assumptions made in deriving this figure.

Date December 1996

Figure 2-22

100-Year Peak Flow Sacramento Method Rainfall Zone 3, <80 Acres

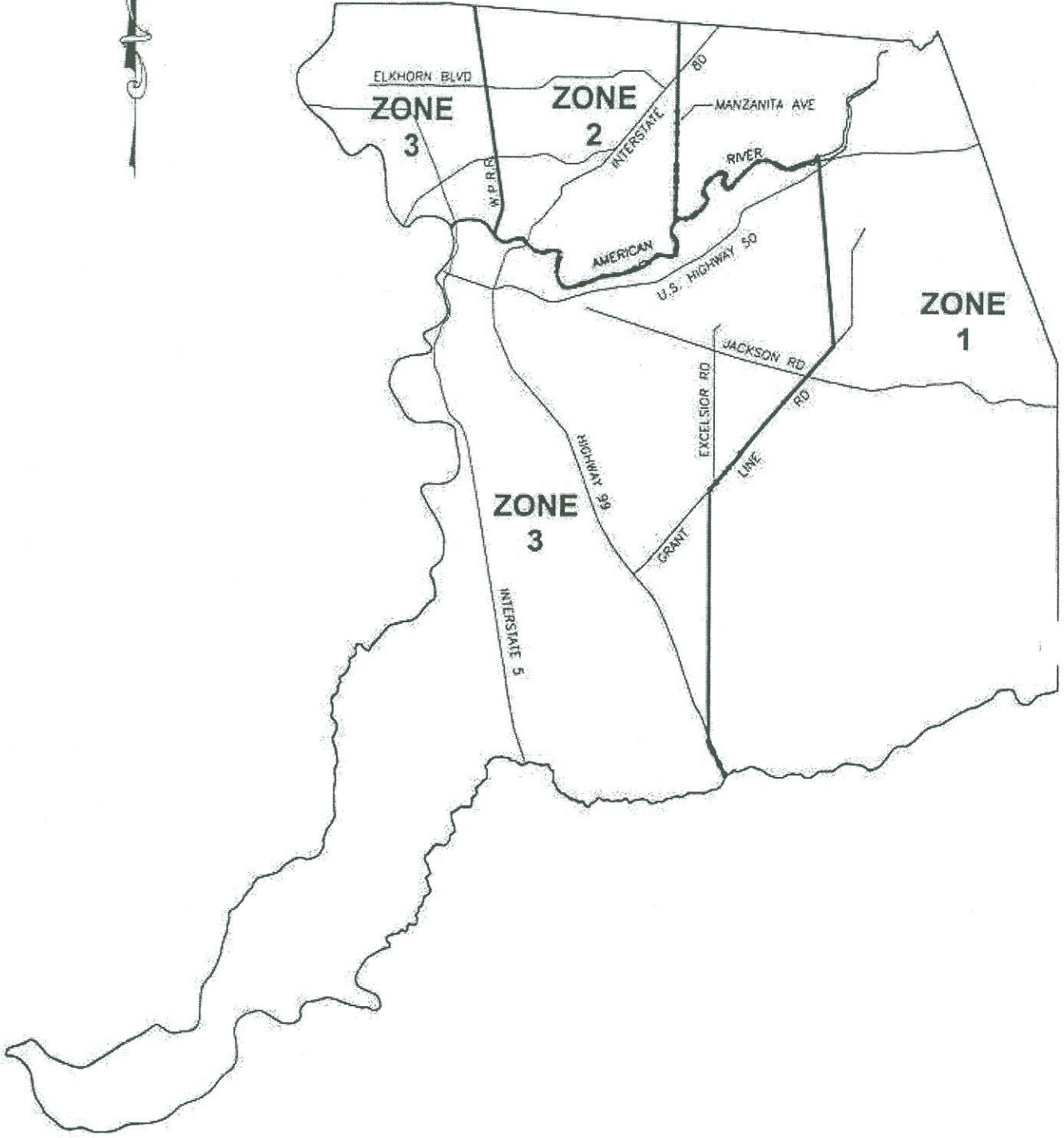


Note: Refer to accompanying disk for assumptions made in deriving this figure.

100-Year Peak Flow Sacramento Method Rainfall Zone 3, 80-640 Acres

Date: December 1996

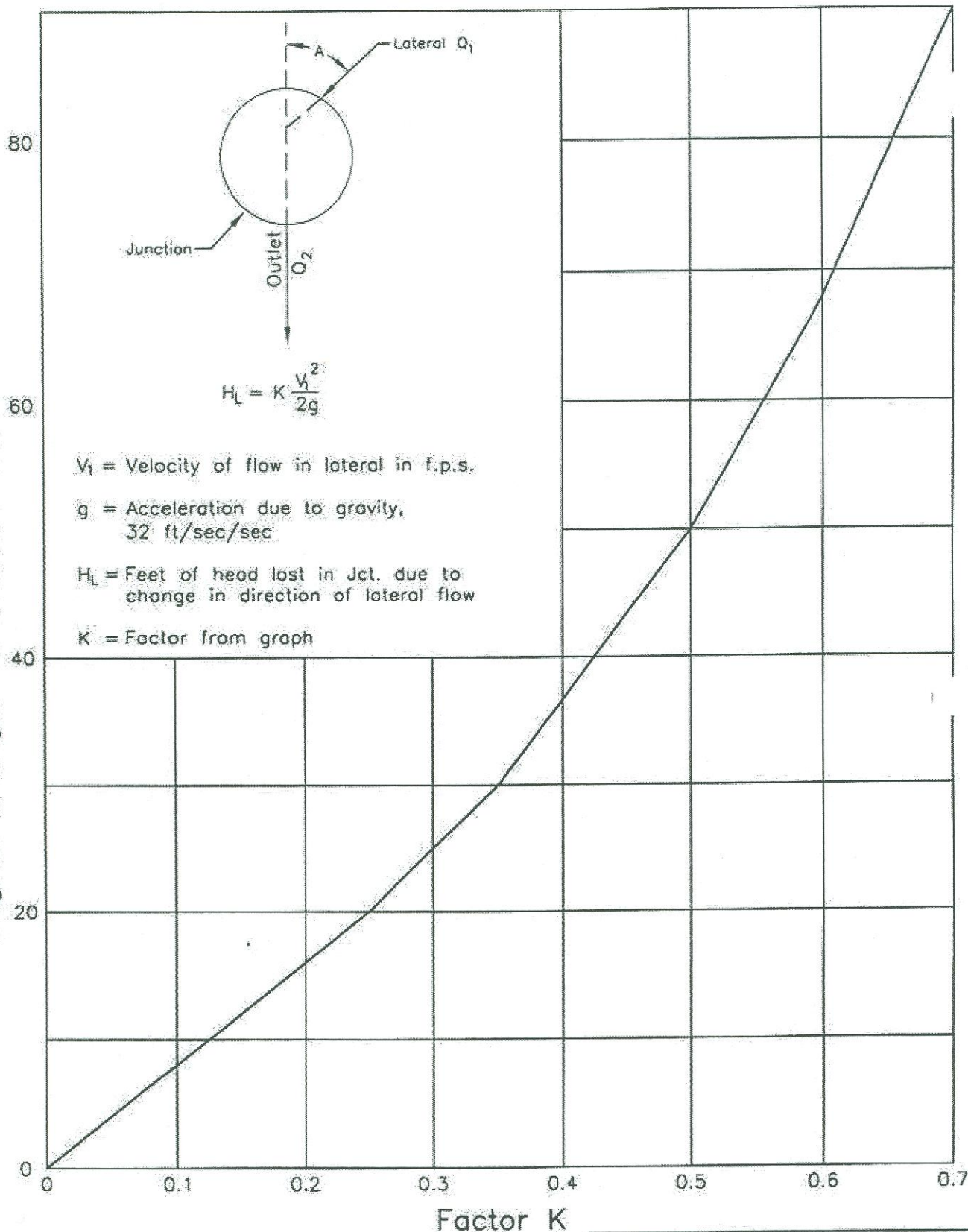
Figure 2-23



Robert Walsh
DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
DRAINAGE ZONES	
DRAWN BY: HEIDI HUBER SCALE: NONE DATE: 11/98	9-2

Degree of Angle "A" Between Lateral & Outlet



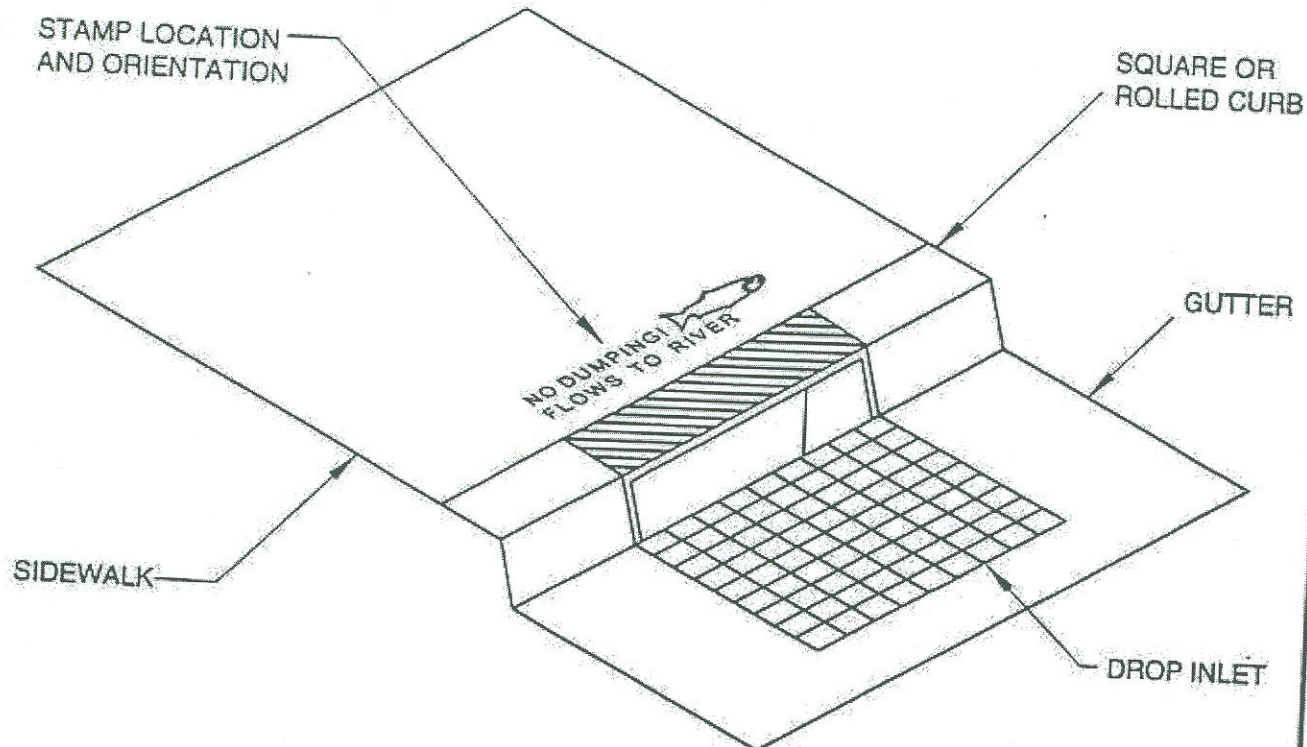
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

LOSS IN JUNCTION DUE TO CHANGE
IN DIRECTION OF FLOW IN LATERAL

Robert J. Shaul
DIRECTOR

DRAWN BY: MYRA FIELDS
SCALE: NONE
DATE: 11/98

9-6



NOTES

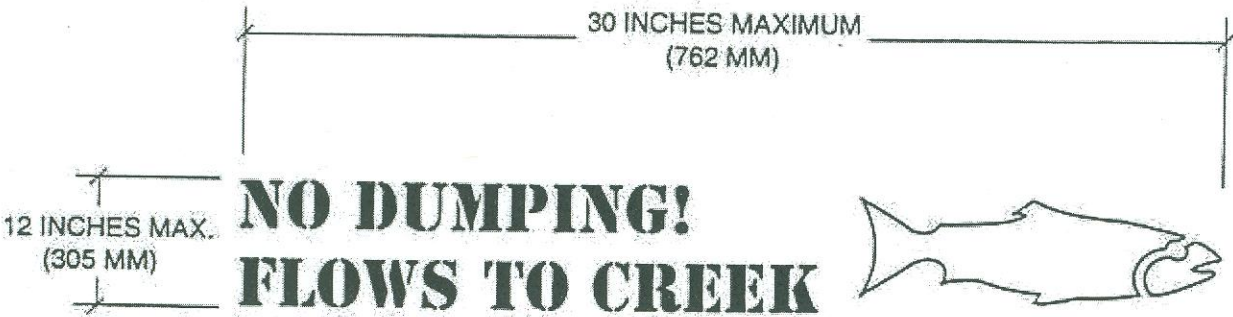
1. MESSAGE AND SYMBOL SHALL BE AS SHOWN ON EC-10B OR AS APPROVED BY THE DIRECTOR.
2. LETTERS SHALL BE 1.5 INCHES (38 MM) IN HEIGHT. THE MESSAGE SHALL BE CENTERED ON THE BACK OF THE INLET.
3. CONCRETE SHALL BE STAMPED IN SUCH A WAY AS TO PROVIDE FOR A CLEAR AND LEGIBLE IMAGE. (APPROXIMATE DEPTH OF .25 INCH OR 6MM.)
4. ALL STAMPS SHALL BE APPROVED BY THE DIRECTOR BEFORE BEING USED.

Robert Shaul
DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
STORMWATER QUALITY DROP INLET CONCRETE STAMP	
SCALE: NONE DATE: JANUARY 3, 1995 DRAWN BY: SLP	11-10A

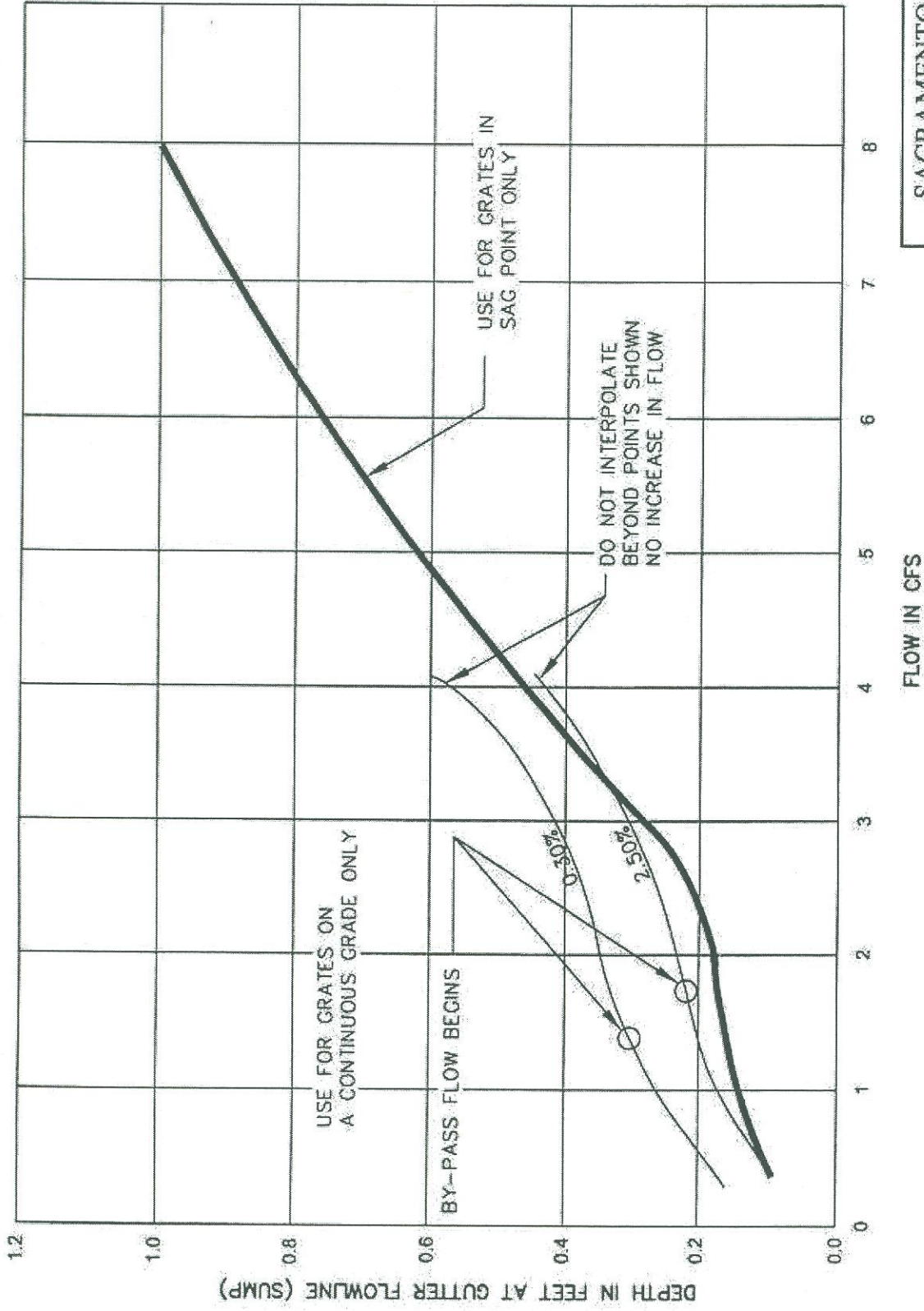
STAMP MESSAGES
AND SYMBOLS

DIMENSIONS MAY VARY AMONG THE STAMP DESIGNS SHOWN BELOW, BUT SHALL NOT EXCEED THE MAXIMUM DIMENSIONS.



DIRECTOR

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
STORMWATER QUALITY DROP INLET CONCRETE STAMP	
SCALE: NONE DATE: JANUARY 5, 1995 DRAWN BY: SLP	11-10B



SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**FLOW CAPACITY
TYPE B GRATE**

DRAWN BY: TRU PHAN
SCALE: NONE
DATE: 7/98

Robert J. Hand

DIRECTOR

9-12

LIST OF DRAWINGS

Title

Drawing

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NOLTE METHOD HYDROLOGY ZONE MAP	2-4
DESIGN RUNOFF NOLTE METHOD CURVES.....	2-5 TO 2-10
LOSS IN JUNCTION DUE TO CHANGE IN DIRECTION OF FLOW IN LATERAL	9-6
FLOW CAPACITY TYPE B GRATE.....	9-12
TYPICAL RAMP AND TRANSITION DETAIL.....	9-25
STORMWATER QUALITY DROP INLET CONCRETE STAMP	11-10A
STORMWATER QUALITY DROP INLET CONCRETE STAMP	11-10B
SACRAMENTO CITY AND COUNTY RAINFALL ZONES SACRAMENTO METHOD	2-11
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 1 <80 ACRES	2-18
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 1 80-640 ACRES	2-19
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 2 <80 ACRES	2-20
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 2 80-640 ACRES	2-21
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 3 <80 ACRES	2-22
100-YEAR PEAK FLOW SACRAMENTO METHOD RAINFALL ZONE 3 80-640 ACRES	2-23
MIN. THICKNESS OF METAL PIPE FOR 50-YR SERVICE LIFE.....	FIGURE 854.3B

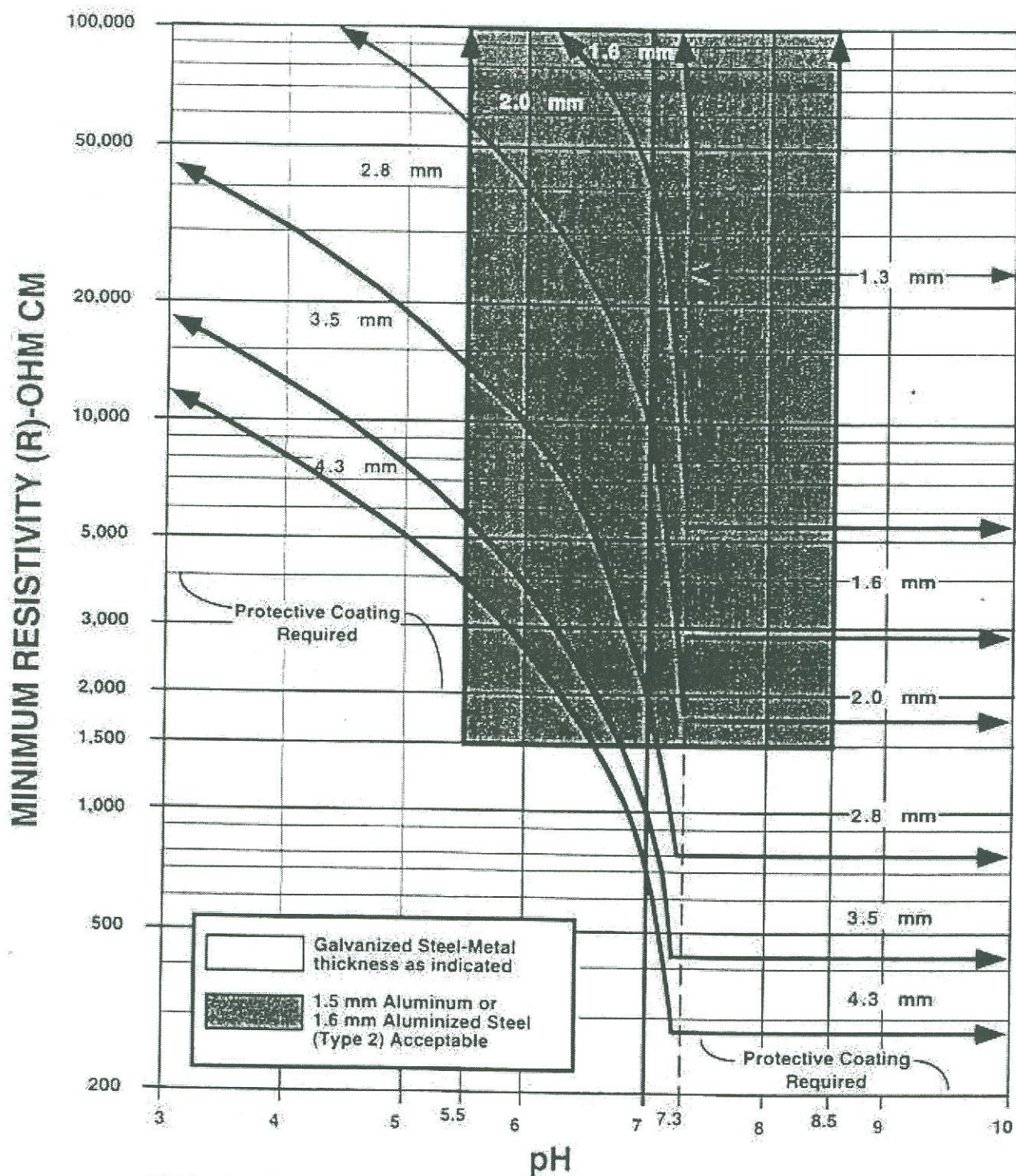
NOTES: THE CONSTRUCTION SPECIFICATIONS CONTAIN DRAWINGS NOT INCLUDED IN THESE STANDARDS.

Drawings numbers beginning with “2” are from the Hydrology Standards.

9-25

Figure 854.3B

Minimum Thickness of Metal Pipe for 50 Year Maintenance Free Service Life



Notes: 1. For pH and minimum resistivity levels not shown refer to California Test 643.

2. Refer to CULVERT 3 computer program for service life estimate due to various corrosive conditions.

SECTION 10

GRADING

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10-1 General requirements	10-1
10-2 Plan Sheet Details	10-1
10-3 Rolling Terrain Grading	10-2
10-4 Boundary Grading	10-2
10-5 Interior Grading	10-3
10-6 Retaining Walls	10-4
10-7 Grading at Trees	10-4
10-8 Certifying Pad Elevations & Geotechnical Statement	10-6
10-9 Maintenance of Access to Utility Facilities	10-6

SECTION 10 GRADING

10-1 GENERAL REQUIREMENTS: Grading shall conform to Sacramento County Code Chapter 16.04 and 16.44, except as modified by these Improvement Standards.

10-2 PLAN SHEET DETAILS: In addition to the requirements of Section 3, the following items shall be included on grading plans:

- A. Slope symbols for 3:1 slopes or steeper, where grade difference exceeds one foot.
- B. Ridge and/or valley delineation.
- C. Typical lot grading details.
- D. Proposed spot and/or pad elevations.
- E. Flow directional arrows (off-site, around perimeter of development when adjacent to developed areas) and perimeter elevations at the property line.
- F. Existing spot elevations and/or contour lines on-site and off-site around perimeter of development. Where the existing terrain is not relatively flat, contour lines shall be mandatory. The spot elevations or contour lines shall be extended off-site for a minimum distance of 50 feet (flat terrain – 100 feet minimum) when adjacent to undeveloped areas.
- G. Existing trees (variety, size and elevation at base of all trees nine inches or larger).
- H. Retaining wall details (symbols, construction details, limits, and top and bottom of wall elevations).
- I. Back of sidewalk or curb elevations.
- J. Location and grate elevation storm drainage inlets.
- K. Typical sections across side yard property lines where the difference in finish pad elevations exceeds two feet. Delineated on the section shall be the side yard drainage swale and minimum distance between the proposed building and the side yard property line.

- L. Names of adjacent subdivisions and Assessor's Parcel Numbers of adjacent lots.
- M. Off-site intersection property lines.
- N. Signature block for certification of pad elevations and geotechnical statement stating that the grading was performed in substantial conformance with the geotechnical report, and subsequent updates, by Consulting Engineer for subdivision projects.
- O. For all export projects:
 - 1. Location of spoiled disposal
 - 2. Spoil slopes to be 3;1 or flatter
 - 3. Finish spoil heights of 3 feet or less
 - 4. No spoil within 5' of property lines
 - 5. Spoil shall not block drainage
 - 6. Spoil shall be leveled and stabilized prior to acceptance of project
- P. Erosion control details as required in Section 11.
- Q. Overland release paths, grades and details.

10-3 ROLLING TERRAIN GRADING: Grading or rolling terrain shall be accomplished in a manner whereby the profile of the rolling terrain is maintained as close to that which exists as practically possible. Interior cuts and fills shall be no greater than 5 feet unless permitted by conditions of approval or approved by the director.

10-4 BOUNDARY GRADING: Special attention shall be given to grading adjacent to the exterior perimeter property line of a development. All adverse effects to off-site properties adjacent to new developments shall be reduced to an absolute minimum. Fills and cuts adjacent to the exterior perimeter property line shall be designed in accordance with the following:

- A. Fills - Fills in excess of 2 foot shall not be allowed unless permitted by conditions of approval. When fills are unavoidable, they shall conform to Standard Drawing 10-1. If possible, fill slopes shall be constructed off-site, with the property line being situated at the top of the fill. A right of entry shall be required for all off-site fills prior to plan approval. A note shall be placed on the plans listing the name of the grantor and the date obtained. Suggested rights of entry forms are available at LDSIR.

- B. Cuts - Cuts shall be constructed in accordance with Standard Drawing 10-2, except that the slope setback from the property line to the slope hinge point shall be a minimum of 2 feet for all slopes steeper than 5:1.
- C. Fences - When fences are required, they shall be placed within one foot of the property line. The height of a fence shall be measured from the highest ground adjacent to the fence, regardless of the side that is developing.

10-5 INTERIOR GRADING: Grading at interior property lines within shall conform to Standard Drawing 10-2 and the following:

- A. Property Lines - Property lines shall be situated at the top of fill and cut slopes. Grading shall be such that surface runoff will not be allowed to sheet flow at the top of slopes, but will be allowed to sheet flow down the slopes. Property lines shall be situated at the top sides of retaining walls with a minimum setback of 1.0 foot from the property line to the retaining wall. See Standard Drawing 10-3.
- B. Slopes - The maximum earth slopes allowed shall be 2:1 (horizontal to vertical) and the minimum shall be 1 percent. Minimum asphalt concrete surface slopes shall be 1 percent and minimum cement concrete slopes shall be 0.25 percent. All proposed slopes that are 3:1 or steeper shall be shown on the plans by some type of slope symbol delineation.
- C. Cross Lot Surface Flow - Grading of residential or duplex lots shall be such that surface flow shall be restricted to a maximum of one lot flowing across another lot. Developments with situations that mandate grading which allows more than one lot to drain across another lot shall be required to provide a pipe system to maintain the one-lot rule. Any deviation from the above shall receive specific approval by the Director.
- D. Lots on the low side of streets at sag points shall be graded in such a manner as to preclude flooding of the building pad area in the event of malfunction or overloading of the street drainage system. All building pad grades shall be a minimum of 1 foot above the overland release elevation.
- E. Commercial developments shall not be allowed to "sheet drain" more than fifty feet of site frontage to a public street. Area outside the 25-foot strip shall be graded to drain into an on-site drainage system.

10-6 RETAINING WALLS: Retaining walls shall be in accordance with the following:

- A. Redwood retaining walls for interior property lines shall conform to Standard Drawing 10-3 as a minimum design. Construction details of redwood retaining walls on the plans shall not be required when reference to Standard Drawing 10-3 is made. When fences are to be constructed atop redwood retaining walls, 4" x 6" posts at 4' centers shall extend above the retaining wall and act as fence posts.
- B. Masonry or concrete retaining walls for boundary or phase lines shall conform to Standard Drawing 10-4 as a minimum design. Construction details of redwood retaining walls on the plans shall not be required when reference to Standard Drawing 10-4 is made.
- C. Design calculations stamped and signed by the Consulting Engineer shall be required for all walls exceeding 24 inches in height (excluding footing height) or when a fence is greater than 6 feet high is an integral part of the wall.
- D. All retaining wall within 8 feet of the boundary, phase, or right of way lines shall be either concrete or masonry.
- E. Grading shall be such that on-site runoff will not flow over retaining walls.
- F. Where pads on adjacent lots are 10 feet apart or less and the difference in elevation exceeds 2.5 feet, a retaining wall will required as per Standard Drawing 10-3 or 10-4.

10-7 GRADING AT TREES: Grading near trees shall be in accordance with the following:

- A. Grading under trees with a 6-inch diameter trunk or larger, measured 4-1/2 feet above the ground, in healthy condition, and all oak trees) shall be given special attention. Every reasonable effort shall be made to avoid removing trees or creating conditions adverse to the tree's health.
- B. The natural ground within the drip line of trees, especially oak trees, shall remain as undisturbed as possible. Grading within the drip line of oak trees requires a tree permit.
- C. Trees with 6-inch or larger trunk diameters that are questionable as to health, safety, or aesthetic value shall be reviewed by the County Tree

coordinator. If a tree is found to be not worthy of saving, the Director can approve its removal.

- D. Cross sections may be required where trees are located adjacent to roadways, new slopes or critical areas. In addition, a dimension from the face of a tree to some critical point or line may be required.
- E. The following comments regarding oak trees shall be included on all improvement plans where oak trees are to be saved;
 - 1. Only those oak trees marked with an "X" are to be removed during construction. (A Tree Removal permit and/or environmental document are required for removal of any oak tree with a 6-inch diameter trunk or larger, measured at 4-1/2 feet above the ground.)
 - 2. During construction, there shall be not grading, trenching, earth removal or addition, building pad formation or earth alteration of any kind within the drip line of any oak tree not marked with an "X".
 - 3. Prior to the construction phase of the project, a physical barricade shall be erected and maintained coincidental to the drip lines of all oak trees not marked with an "X". Within this barrier no construction related activities shall be allowed including, but not limited to, vehicular parking or material storage. The physical barricade shall be T-bars and 4-foot high hogwire fencing or orange fabric mesh.
 - 4. No trenching whatsoever shall be allowed within the driplines of oak trees. If it is absolutely necessary to install underground utilities within the driplines of an oak tree, they shall be either bored or drilled.
 - 5. Paving within the driplines of oak trees shall be stringently minimized. When it is absolutely necessary, porous paving material such as turfstone, interlocking pavers, or others material specifically approved by the Director shall be used and no paving shall occur within 5 feet of their trunks. When asphalt or concrete paving is installed within 6 feet of the original ground elevation. The piped aeration systems shall not be installed any deeper than 1 foot, from the original ground elevation. The County Tree Coordinator shall approve the piped aeration system prior to construction. No aeration systems shall be constructed within the County right of way.

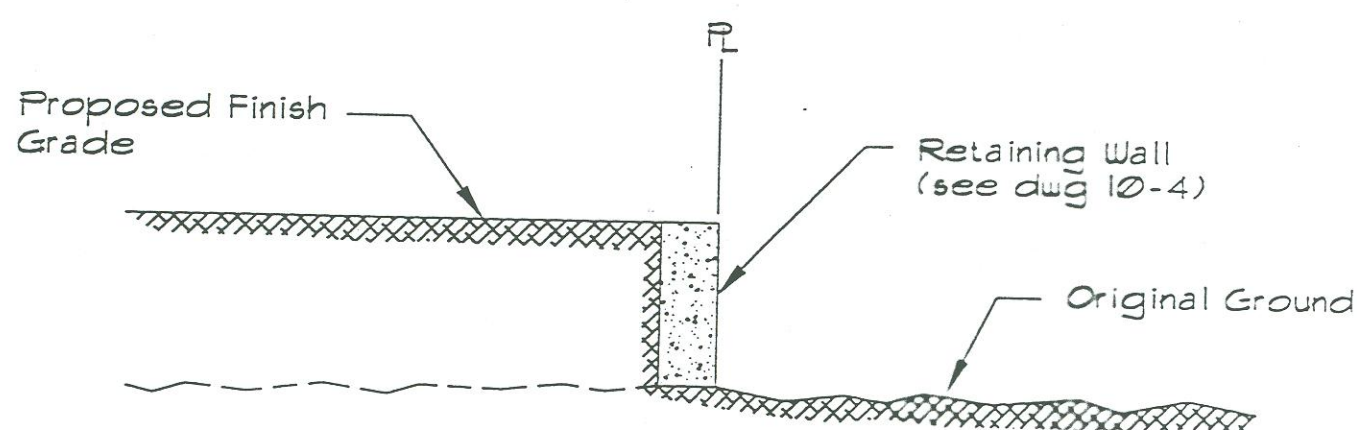
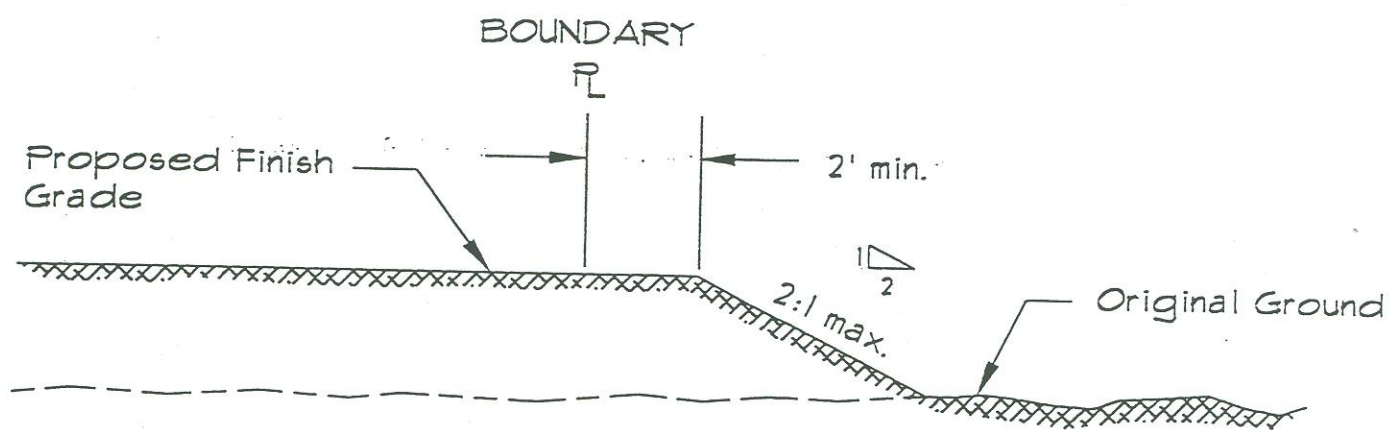
10-8 CERTIFYING PAD ELEVATIONS & GEOTECHNICAL STATEMENT:

Upon completion of the grading and prior to acceptance of the subdivision improvements by the County, the Consulting Engineer shall verify and final pad elevations. The elevations shall be verified at the center and the corner of each pad. Elevation deviations or more than 0.20 feet shall be noted on the tracings.

A signature block, certifying that final graded elevations in the field are the same as those shown on the plans, shall be included on the tracings of the subdivision grading plans. Also a signature block, stating that the subdivision was graded in substantial conformance with the geotechnical report and subsequent updates, shall be included on the tracings of the subdivision grading plans. The Consulting Engineer shall sign the signature block, certifying to the above, and shall provide three sets of record (as-built) grading plans to the Director.

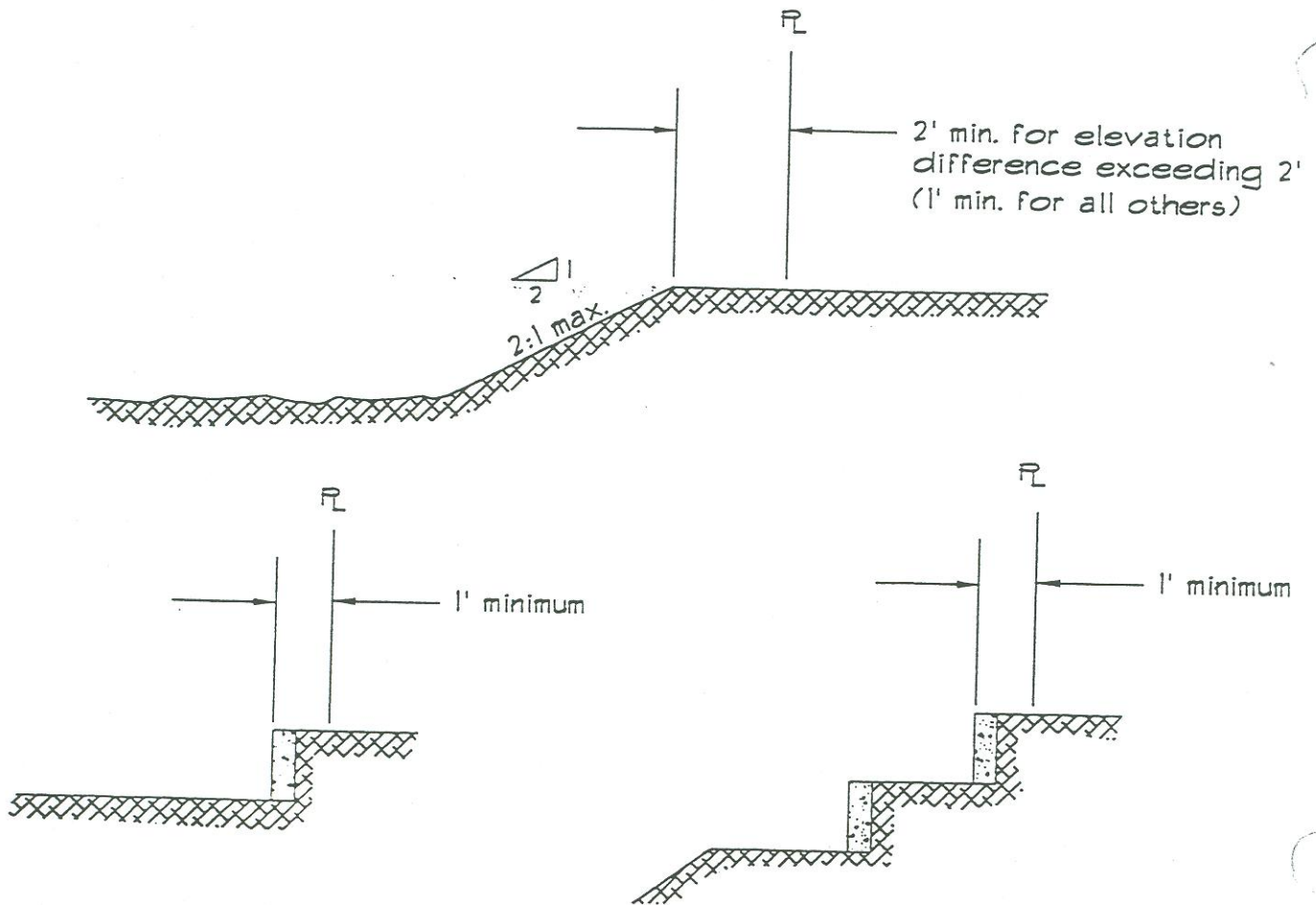
10-9 MAINTENANCE OF ACCESS TO UTILITY FACILITIES:

Continuous, suitable access shall be maintained during all stages of construction of any facility owned or operated by a utility/district providing essential services, i.e. sanitary sewer, water, drainage, electricity, gas, telephone, etc.



Cheryl Creson
Director

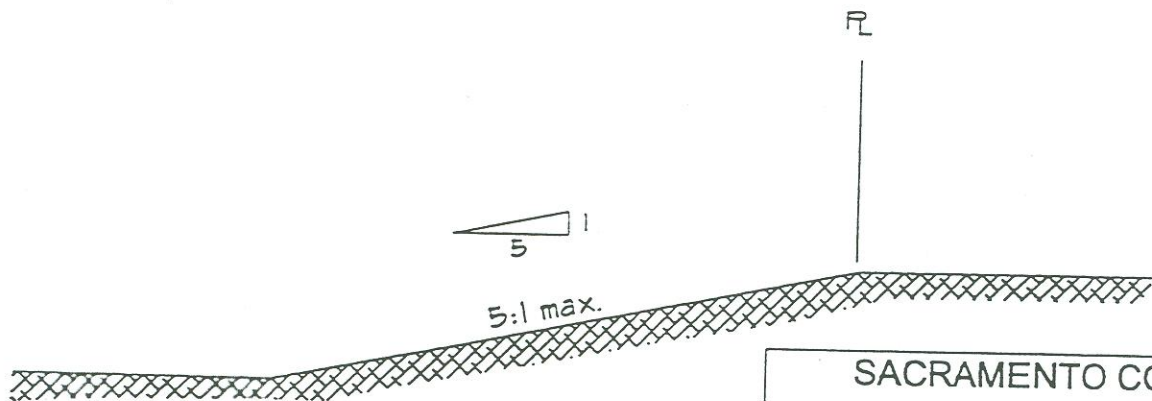
SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
Exterior Perimeter Property Line Grading for Fill Areas	
Dec-98	10-1



RETAINING WALL

(see dwg 10-3 and 10-4)

NOTE: No double retaining walls shall be constructed on side yards



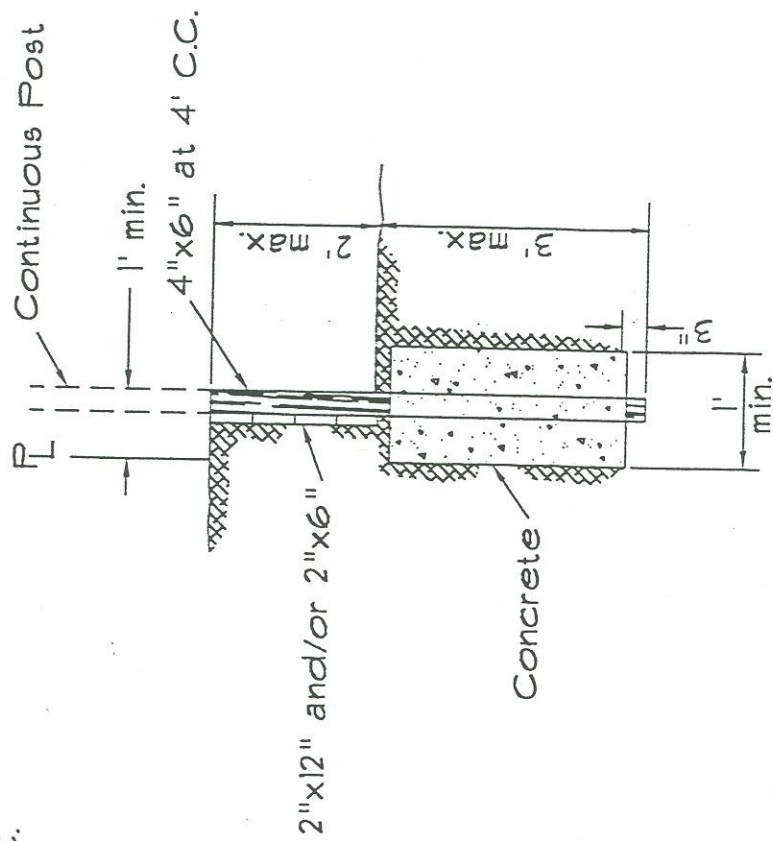
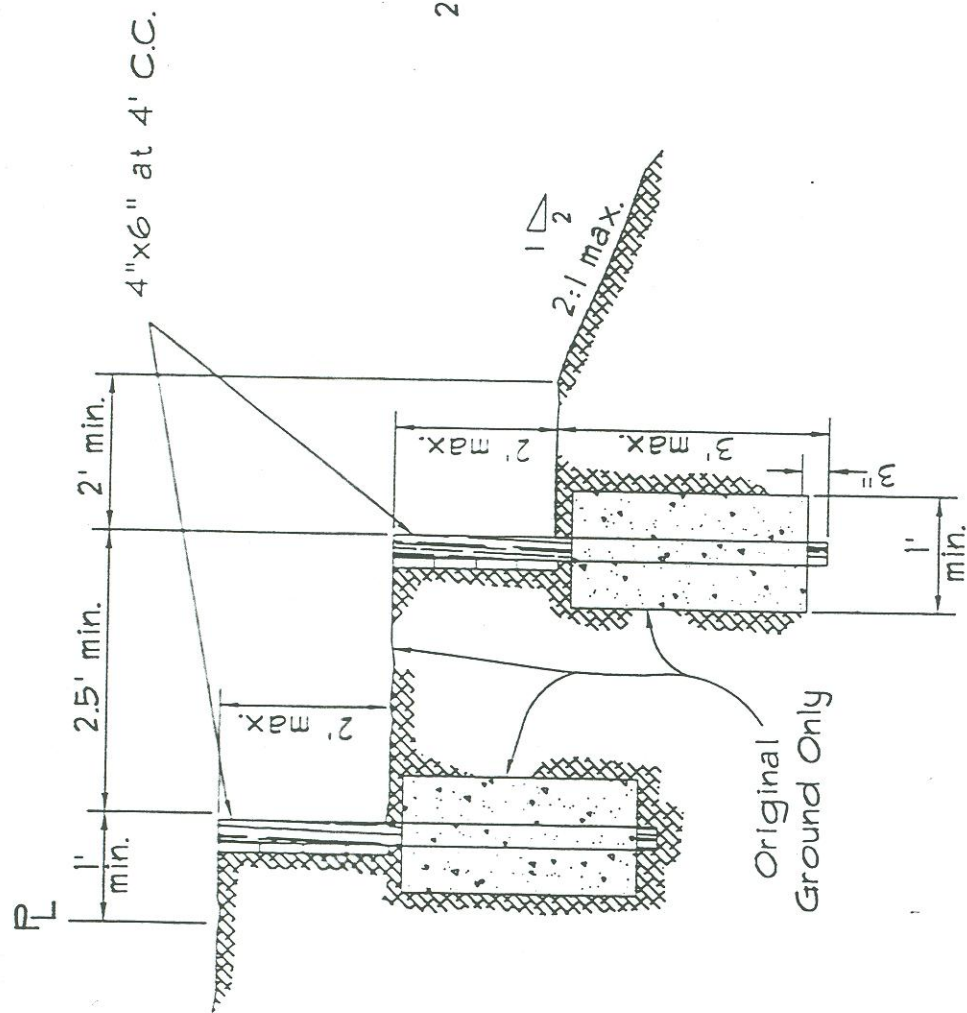
Cheryl Creson
Director

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

Grading for Interior Property
Lines and Perimeter Property
Lines in Cut Areas

Dec-98

10-2



NOTES:

1. Material for walls shall be grade No. 2 or better redwood with no open grain material
2. Wood walls shall not be used adjacent to public rights of way.
3. All walls within 8 feet of a boundary or project phase line shall be constructed with masonry or concrete.
4. 4-inch by 6-inch posts at 4-foot on center shall be used as fence posts when fences are attached to retaining walls.
5. No double retaining walls shall be constructed on side yards.

Charles Brown
Director

**SACRAMENTO COUNTY
PUBLIC WORKS AGENCY**

**Wood Retaining
Wall Details
For Interior Property Lines**

Dec-98

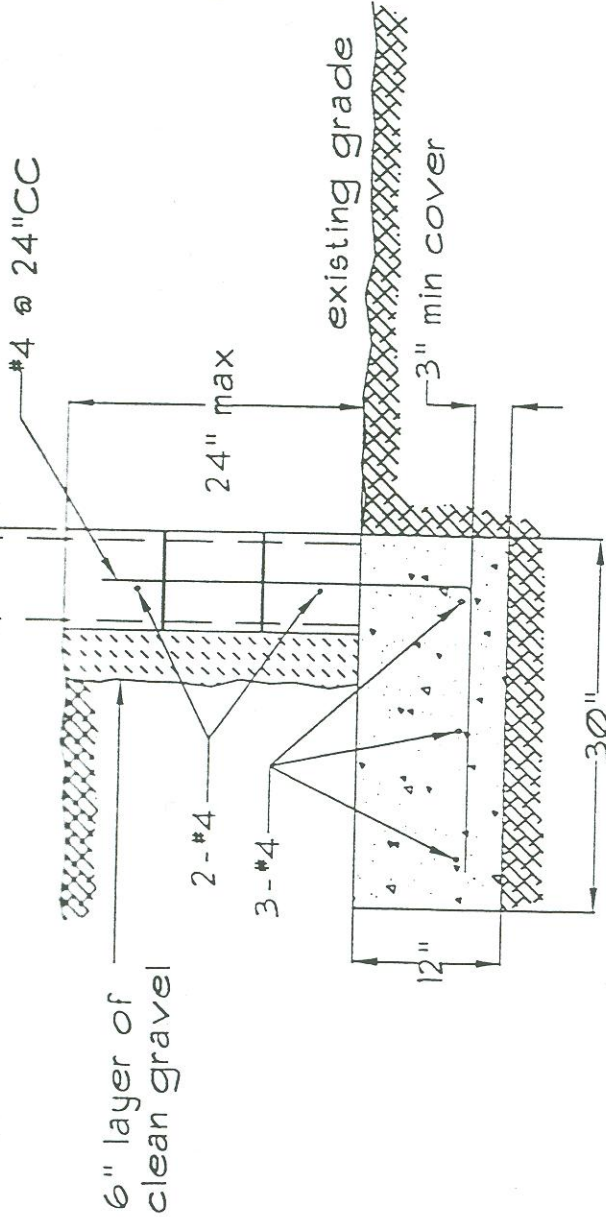
10-3

Fences up to 6' high
may be attached.
Set fence posts to
top of footing. Grout
or cast in place

$$f'_c = 2000 \text{ psi}$$

$$f'_m = 1500 \text{ psi}$$

$$f'_y = 60,000 \text{ psi}$$



Notes

1. 8-inch, normal weight block with full grouting required
2. A 6-inch wide cast-in-place concrete stem wall may be used in lieu of masonry
3. Special inspection is not required
4. A building permit is required for walls exceeding 24-inches in height when construction details are not shown on approved improvement plans

Cheryl Green
Director

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
Masonry/Concrete Retaining Wall Detail for Fill Areas at Boundary and Project Phase Lines	
Jan-99	104

SECTION 11

EROSION AND SEDIMENT CONTROL

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SECTION 11

EROSION AND SEDIMENT CONTROL

11-1 DEFINITIONS / ACRONYMS:

BMP – Best Management Practice

NOI – Notice of Intent

NPDES – National Pollutant Discharge Elimination System

RWQCB – Regional Water Quality Control Board

SWPPP – Storm Water Pollution Prevention Plan

SWRCB – State Water Resources Control Board

Wet Season – October 1st through April 30th.

WPCP – Water Pollution Control Program

11-2 EROSION AND SEDIMENT CONTROL PLAN:

Improvement Plans shall include an Erosion and Sediment Control Plan, which shall be prepared and approved per the requirements of Chapter 16.44 of Title 16 of the Sacramento County Code, Land Grading and Erosion Control Ordinance.

Erosion and Sediment Control Plans shall include erosion controls and sediment controls from this chapter to minimize erosion and the transport of sediments. These plans may be incorporated into the Grading Plans or on separate sheets for clarity.

Additionally, landowners meeting the project area disturbance threshold shall obtain coverage under the SWRCB General Permit for Storm Water Discharges Associated with Construction Activity (Construction General Permit), prior to commencing construction activities. Coverage may be obtained by filing an NOI with a vicinity map and the appropriate fee with the SWRCB.

Projects covered by the State's General Permit shall have an adequate SWPPP prepared, prior to commencing construction. SWPPPs may be submitted to the County Department of Water Resources for review and compliance assistance.

11-3 REQUIRED BMPS:

The following BMPs shall be required on all projects:

- A. Access points to the construction site shall have a Stabilized Construction Access (Section 11-7).

- B. The preservation of existing vegetation shall be done in accordance with Preservation of Existing Vegetation (Section 11-5), and Silt Fence (Section 11-11).
- C. Perimeter protection along property lines shall have Preservation of Existing Vegetation (Section 11-5), or Silt Fence (Section 11-11).
- D. Slopes greater than 3 percent shall be temporarily seeded and slopes greater 3:1 (H:V) shall have Hydroseeding (Section 11-4) and Straw Mulch Stabilizers, Geotextiles, Plastic Covers, Straw Mulch Stabilizer, or Erosion Control Blankets (Section 11-10) installed.
- E. The toe of all slopes shall have Silt Fence (Section 11-11) and/or Fiber Roll (Section 11-16).
- F. Disturbed soil areas behind the curb or back of walk (or curb) shall have Straw Mulch (Section 11-15), Soil Binders (Section 11-6) or Geotextiles, Plastic Covers, and Erosion Control Blankets/Mats (Section 11-10) in conjunction with Hydroseeding (Section 11-4). Surface treatments shall extend to the greater of 20 feet or to the top of slope.
- G. Roadway Subgrades shall have Fiber Roll (Section 11-16), Silt Fence (Section 11-11), or Sediment Trap (Section 11-8).
- H. Dead end streets, to be extended in the future, shall have Preservation of Existing Vegetation (Section 11-5), Hydroseeding (Section 11-4), Sediment Trap (Section 11-8) or other applicable BMP to minimize the transport of sediment onto or from the improved surface.
- I. Projects that include detention basins shall have a Sediment Basin (Section 11-9).
- J. Place drainage inlet sediment BMPs at all storm drain inlets. BMPs shall include Inlet Sediment Control Barrier (Section 11-13), Inlet Filter Bag (Section 11-14) and concrete stamps or expoxied plaquards (Detail 9-35A).
- K. Each construction site shall provide designated, paint and waste disposal locations as necessary.
- L. A BMP installation schedule shall be included on the improvement plans. The schedule shall include the BMPs for both the wet season and the dry season.

Design information is available in Section 5 of the Erosion and Sediment Control Guidelines, latest edition.

11-4 HYDROSEEDING:

- A. Definition – The application of a mixture of fiber, seed, fertilizer, and stabilizing product with hydro-mulch equipment, which temporarily protects exposed soils from erosion by wind and water.
- B. Applicability – Hydroseeding shall be applied in the following conditions:
 - 1. Graded or cleared areas subject to erosion from wind or water.
 - 2. Install in six-meter (20-foot) wide buffer strips at the back of walk or back of curb where sidewalks are detached or omitted, or to the top of slope at the pad.
 - 3. As perimeter control along property lines where existing vegetation does not exist.

If slopes to be hydroseeded are steeper than 3:1 (H:V), hydroseeding shall be used in combination with matting, mulch, or other soil stabilizer.

- C. Design – Areas to be hydroseeded shall be clearly identified on the plans.

Application shall conform to the following:

- 1. Timing – Hydroseeding shall be implemented in advance of the time when there is risk of erosion. To protect areas by October 1, hydroseeding shall be implemented no later than September 15. Hydroseeding applied after October 1 and before April 30 shall be covered with straw mulch, soil binder, or erosion control blanket/mat.
 - 2. Adjacent to wetlands and environmentally sensitive areas, the minimum width of a vegetated area draining into the affected area shall be 30 meters (100 feet) for slopes of 20:1 (H:V) or flatter. When slopes are steeper than 20:1 (H:V), additional measures shall be used as determined by the Director. Adjacent to improvements, the minimum width shall be 6 meters (20 feet).
- D. Maintenance
 - 1. All slopes shall be maintained to prevent erosion.
 - 2. Seeded areas shall be inspected for failures and re-seeded, fertilized, and mulched within the planting season. Any temporary revegetation efforts that do not provide adequate cover must be revegetated as required by the Director.

11-5 PRESERVATION OF EXISTING VEGETATION

- A. Definition – The maintaining of areas of existing vegetation to utilize stable vegetated areas to reduce the amount of sediment in sheet flow runoff and to minimize the extent of disturbed area.

- B. Applicability – Preservation of existing vegetation shall be used when currently vegetated areas can be integrated into the proposed project. Examples where existing vegetation shall be applicable include:
 - 1. Buffer strips adjacent to wetlands and other sensitive areas.
 - 2. As perimeter protection along property lines.
 - 3. Undeveloped portions of a job site.
- C. Design
 - 1. Areas of vegetation to be preserved shall be clearly marked on plans and fenced or flagged in the field.
 - 2. Traffic and stockpiles shall be located away from vegetated areas. Irrigation and maintenance shall be specified on the plans.
 - 3. For appropriate widths of vegetated areas, refer to the specifications for hydroseeding (Section 11-4).
- D. Maintenance – Irrigation and maintenance requirements shall be specified on the plans. Irrigation shall be provided as needed to maintain the vegetation year round.

11-6 SOIL BINDERS

- A. Definition – The application and maintaining of polymeric or lignin sulfonate stabilizers or emulsions. Soil binders are materials applied to the soil surface to temporarily prevent wind or water-induced erosion of exposed soils.
- B. Applicability – Soil binders are applied to disturbed areas requiring short-term temporary protection.
- C. Design
 - 1. Soil binders are temporary in nature and may need reapplication.
 - 2. Soil binders shall be applied a minimum of 24 hours prior to a rainfall. Applications during or immediately prior to a rainfall will not be permitted.
 - 3. Soil binders shall be environmentally friendly (non-toxic to plant and animal life) and shall not stain or discolor paved or painted surfaces.
 - 4. Selection and application of soil binders shall be in accordance with the manufacturer's recommendations and specifications.

D. Maintenance

1. Avoid vehicular and pedestrian traffic on treated areas.
2. Inspect high traffic areas daily. Low traffic areas should be inspected weekly. During wet weather inspections should be completed daily and logged in the SWPPP maintenance log.
3. Failed slopes shall be repaired immediately.
4. Reapply soil binder as necessary for proper maintenance.

11-7 STABILIZED CONSTRUCTION ACCESS

A. Definition – A stabilized access consisting of a pad of coarse aggregate underlain with filter cloth located where traffic enters or leaves a construction site to minimize tracking of sediment from a construction site onto paved streets.

B. Applicability – A stabilized construction access shall be applied at the following locations where construction traffic enters or leaves:

1. Paved public streets, sidewalks and rights-of-way.
2. Parking lots or other paved areas.

C. Design

1. Placement of stabilized construction access shall be clearly defined on the improvement plans.
2. The stabilized construction site access shall be constructed per detail 11-1.
3. This practice shall be supported by a tire wash area and street sweeping. The Director may require a tire wash area where site conditions necessitate BMP measures beyond the stabilized construction access.

D. Maintenance

1. Inspect stabilized construction access daily for damage and effectiveness of preventing soil, sediment, and construction debris from being tracked onto public streets. Streets adjacent to stabilized construction access areas shall be swept daily to remove loose materials.

11-8 SEDIMENT TRAP

- A. Definition – A small temporary basin formed by excavation to intercept and detain the sediment laden runoff to allow the sediment to settle. It is used to protect other drainage facilities and properties downstream of the sediment trap.
- B. Applicability – There are two types of sediment traps:
 - 1. Vegetated outlet traps suitable for drainage areas of less than 2 hectares (5 acres).
 - 2. Stabilized outlet traps, suitable for drainage areas from 2 to 4 hectares (5 to 10 acres).

Sediment traps shall *not* be applied in the following conditions:

 - 3. The drainage area is greater than 4 hectares (10 acres).
 - 4. In a creek or stream.
 - 5. Uphill from a street or utility trench.
 - 6. In areas subject to trespass.
- C. Design
 - 1. Placement of a sediment trap shall be clearly defined on the plans.
 - 2. Sediment traps shall be constructed as the first step when there is mass clearing or grading and shall be located at the point where drainage discharges from a site.
 - 3. Construction of sediment traps shall be per details 11-2 and 11-3.
 - 4. The trap storage volume shall be designed for 70 cubic meters per hectare (35 cubic yards per acre) of contributing drainage area.
 - 5. Side slopes shall be 3:1 (H:V) or flatter and the maximum depth shall be 1.1 meters (3.5 feet).
 - 6. The length of a sediment trap shall be 2 times (minimum) its width.
- D. Maintenance
 - 1. Trap maintenance shall be year round. Sediment material shall be removed from the bottom to retain one foot of capacity at all times.
 - 2. Trap slopes shall be kept in good repair. Slope failures or damage shall be repaired promptly.

11-9 SEDIMENT BASIN

- A. Definition – A temporary basin formed by excavation to intercept and detain sediment laden runoff to allow the sediment to settle. It is used to protect other drainage facilities and properties downstream of the sediment basin.
- B. Applicability – Sediment basins are suitable for incorporating into the construction of permanent facilities designed for flood control and water quality.

Sediment basins shall *not* be applied in the following conditions:

- 1. In a creek or stream.
 - 2. Where the project site can be broken up into small drainage areas (4 hectares (10 acres) or less) where sediment traps can be used.
 - 3. Where failure can cause property damage or loss of life.
 - 4. In areas subject to trespass unless they are secured.
- C. Design – Basins shall be located, sized and configured based on site-specific conditions. All basin designs are subject to approval by the Director. In addition to County Standards the sediment basins shall meet the minimum requirements of the State's General Construction Permit.

- 1. Basin sizing shall be in accordance with one of the three (3) following options:

- a. Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The length is determined by measuring the distance between the inlet and the outlet, and the depth must not be less than three feet nor greater than five feet for safety reasons and for maximum efficiency.
- b. Sediment basin(s) shall be designed using the standard equation:

$$As=1.2 Q/Vs$$

Where: AS is the minimum surface area for trapping soil particles of a certain size; Vs is the settling velocity of the design particle size chosen; and $Q=CxIx A$ where Q is the discharge rate measured in cubic feet per second; C is the runoff coefficient; I is the intensity for the 10-year, 6-hour rain event and A is the area draining into the sediment basin in acres. The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt

sized (0.01 mm) particle, and the Vs used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than three feet nor greater than five feet for safety reasons and for maximum efficiency (two feet of storage, two feet of capacity). The basin(s) shall be located on the site where it can be maintained on a year round basis and shall be maintained on a schedule to retain the two feet of capacity.

- c. The use of an equivalent surface area design or equation, provided that the design efficiency is as protective of water quality than option b.
2. Basins for drainage areas larger than 75 acres shall be approved by the director.
3. Sediment basins shall be fenced where safety (worker or public) is a concern, or as indicated by the director.

D. Maintenance

1. Basin maintenance shall be year round. Sediment material shall be removed from the bottom to retain two feet of capacity at all times.
2. Basin slopes shall be kept in good repair. Slope failures or damage shall be repaired promptly.
3. Basins shall have a means for dewatering within 7-calendar day following a storm event.

11-10 GEOTEXTILES, PLASTIC COVERS, AND EROSION CONTROL
BLANKETS/MATS

- A. Definition – This Best Management Practice (BMP) involves the placement of geotextiles, plastic covers, or erosion control blankets/mats to stabilize disturbed soil areas and protect soils from erosion by wind and water.
- B. Applicability – Use these surface BMPs when disturbed soils may be difficult to stabilize.
- C. Design
 1. Use on steep slopes, generally steeper than 3:1 (H:V).
 2. Cover material and soil stock piles during rainfall events.
 3. Use on channels to be vegetated.

4. Installation shall be in accordance with the manufacturers recommendation.
5. Geotextile material shall be woven polypropylene fabric with minimum thickness of 15 mm, minimum width of 3.7 m and shall have a minimum tensile strength of 0.67 kN (warp) and 0.36 kN (fill) in conformance with the requirements of ASTM Designation: D4632. The permittivity of the fabric shall be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation : D4491. The fabric shall have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355.
6. Geotextile blankets shall be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under Geotextile material.
7. Plastic cover material shall be polyethylene sheeting and shall have a minimum thickness of 6 mils. Plastic covers shall be anchored by sand bags placed no more than 3 m (10 ft.) apart and by keying into the tops of slopes to prevent infiltration of surface waters under the plastic. All seams shall be taped or weighted down their entire length, and there shall be at least a 300mm (12 in.) to 600 mm (24 in.) overlap of all seams.
8. Erosion control blankets/mats shall be either straw, coconut, straw/coconut or excelsior blanket. Grade and shape the area of installation. Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil. Blankets/mats shall be anchored with U-shaped wire staples, metal geotextile stake pins or triangular wooden stakes. Staples shall be made of 3.05 mm steel wire and shall be U-shaped with 200-mm legs and 50mm crown. Wire staples shall be minimum of 11 gauge. Metal stake pins shall be 5 mm (0.188 in.) diameter steel with a 40 mm (1.5 in.) steel washer at the head of the pin. Wire staples and metal pins shall be driven flush to the soil surface. All anchors shall be 150 mm (6 in.) to 450 mm (18 in.) long and have sufficient ground penetration to resist pullout.
9. Channels constructed during the wet season (October 1 through April 30) shall protect the channel sides and bottom with erosion control blankets/mats as shown in detail 11-9.
10. Channel bottoms shall be protected where the design channel flow exceeds 1m/sec (3 ft/sec).

D. Maintenance

1. All blankets shall be inspected periodically after installation.

2. Inspect installations after significant rainfalls to check for erosion and undermining. Repair failures immediately. Damage to slopes or channels shall be repaired prior to reinstalling blankets/mats.

11-11 SILT FENCE

- A. Definition – A barrier of extra strength filter fabric which has been entrenched and attached to supporting posts to reduce runoff velocity and detain sediment.
- B. Applicability – Silt fences are used near disturbed areas where sheet or rill flows occur and velocities are low. Silt fences are placed below the toe of exposed and erodible slopes, down-slope of exposed soil areas, around temporary stockpiles and along streams and channels. Silt fences shall not be applied in the following conditions:
 1. In the flowline of streams, channels, or anywhere flows are concentrated.
 2. Drainage areas of 0.4 hectares (1 acre) or more.
 3. Where the slope is steeper than 2:1 (H:V).
 4. Slopes that are subject to creep, slumping, or landslides.
 5. Mid-slope installations where slope exceeds 4:1 (H:V).
- C. Design
 1. Placement of a silt fence shall be clearly shown on the plans.
 2. Construction shall be per County of Sacramento Standard Construction Specifications Drawing 11-5.
 3. The maximum slope length above the fence shall be no more than 9 meters (30 feet) times the slope steepness expressed as a ratio. For example, a 4:1 (H:V) slope above a fence shall be no more than 36 meters (120 feet) long. The maximum slope distance between silt fences, regardless of slope, shall be 61 meters (200 feet).
 4. The depth of flow shall be evenly distributed across the fence.
 5. Silt fences shall be trenched in and the bottom of the fence fabric shall be keyed in.
 6. The fence shall be placed on the contour and configured in the shape of a shallow arc with the ends uphill of the arc's center. It shall be constructed in a length sufficient to extend across the expected flow path.
- D. Maintenance
 1. Repair or replace split, torn, slumping or weathered fabric.

2. Inspect silt fences when rain is forecast and again after rainfall events.
3. Sediment shall be removed from behind the silt fence when sediment accumulation is $\frac{1}{3}$ the height of the barrier or when sediment accumulation is causing the silt fence to fail.

11-12 CONCRETE WASHOUTS

- A. Definition – Procedures and practices that are implemented to minimize or eliminate the discharge of concrete waste materials to the storm drain system or to watercourses.
- B. Applicability – Concrete washouts are to be placed on project sites where concrete is used as a construction material, where slurries containing portland cement concrete (PCC) or asphalt concrete are generated, or where concrete trucks and other concrete-coated equipment are washed on site.
- C. Design
 1. Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses.
 2. A sign shall be installed adjacent to each washout facility to inform concrete equipment operators of its location. Signs shall be placed on construction sites providing direction to the concrete washout.
 3. Installation shall be per drawing 11-6.
 4. Plastic lining material shall be a minimum of 60 mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material.
 5. Concrete washouts constructed below grade shall have a minimum depth of 0.30 meters (12 inches) and have a surface area of 4.645 square meters (50 square feet).
- D. Maintenance
 1. Inspect concrete washouts daily.
 2. Concrete washouts shall be maintained to provide holding capacity with a minimum freeboard of 100mm (4 in). Hardened concrete shall be removed and deposited of properly and the washout facilities returned to a functional condition.
 3. Concrete washouts shall be cleaned when the waste volume in the washout reaches 75 percent of capacity.

11-13 INLET SEDIMENT CONTROL BARRIER

- A. Definition – A temporary sediment barrier placed in the gutter or on the surface adjacent to a drainage inlet to reduce the velocity of the storm water runoff prior to entering the inlet structure. Inlet sediment control devices shall cause the storm water to pond and provide sediment removal prior to entering the inlet.
- B. Applicability – Inlet sediment control devices shall be installed on the upstream side of drainage inlets. For inlets in gutter low points, inlet sediment control devices shall be installed on both sides of the inlet.
- C. Design
 - 1. Sediment control devices shall be designed to allow maintenance of the device and regular removal of trapped sediments.
 - 2. Within traveled ways, vehicular and pedestrian, devices shall be selected and installed so that they do not constitute a hazard.
 - 3. Inlet sediment control devices may consist of gravel bags or other approved sediment control device which provides effective sediment removal.
 - 4. Install per detail 11-7.
 - 5. Inlet sediment devices shall remain in place until soil disturbing activities are completed and adjacent areas are stabilized.
- D. Maintenance
 - 1. Inlet sediment control devices shall be kept in good repair. Material spilling from sediment control devices shall be cleaned up and device repaired or replaced immediately.
 - 2. Inspection of devices shall be weekly and prior to predicted rainfall and after the rainfall event. Sediment removed from sediment devices during maintenance operations shall be disposed of properly.

11-14 INLET FILTER BAG

- A. Definition – A temporary sediment barrier suspended within a storm drain drop inlet to prevent sediment and debris from entering the storm drainage system.
- B. Applicability – Inlet filter bags shall be installed at all drop inlets on new or existing streets within or down stream of the construction site.
- C. Design
 - 1. Installation shall be per drawing 11-8.

D. Maintenance

1. Trapped sediment and debris shall be removed from the inlet filter bag after each rainfall event.
2. Inlet filter bags having visible trapped water shall be maintained immediately.
3. Torn filter bags shall be removed and replaced.
4. Filter bags and frames shall be placed such that low flow surface water does not bypass the filter bag.

11-15 STRAW MULCH

- A. Definition – Placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a tackifier.
- B. Applicability – Straw mulch is used for temporary soil stabilization on disturbed areas until soils can be prepared for re-vegetation and permanent vegetation is established. Straw mulch is also used in temporary and permanent seeding strategies to enhance plant establishment.
- C. Design
1. Straw shall be derived from wheat, rice, or barley.
 2. Straw mulch with tackifier shall not be applied during or immediately prior to rainfall.
 3. Tackifier is the preferred method for anchoring straw mulch to the soil on slopes. Crimping, punch roller-type rollers, or track-walking may also be used.
 4. Apply loose straw at a minimum rate of 3,570 kg/ha (4,000 lb/ac).
 5. Apply tackifier at a minimum rate of 140 kg/ha (125 lb/ac).
- D. Maintenance
1. Reapplication of straw mulch and tackifier may be required by the Director to maintain effective soil stabilization over disturbed areas and slopes.
 2. Slopes shall be maintained and repaired immediately after any rainfall event.

11-16 FIBER ROLL

- A. Definition – A fiber roll consists of straw, flax, or other material that are rolled and bound into a tight tubular roll and placed on the face of slopes at regular intervals or behind curbs and walkways to intercept storm water

runoff, reduce its velocity, release the runoff as sheet flow, and provide some removal of sediment from the runoff.

B. Applicability – Fiber rolls may be used along the top, face and at grade breaks of exposed and erodible slopes, placed behind curbs or walkways, and used as check dams when properly anchored.

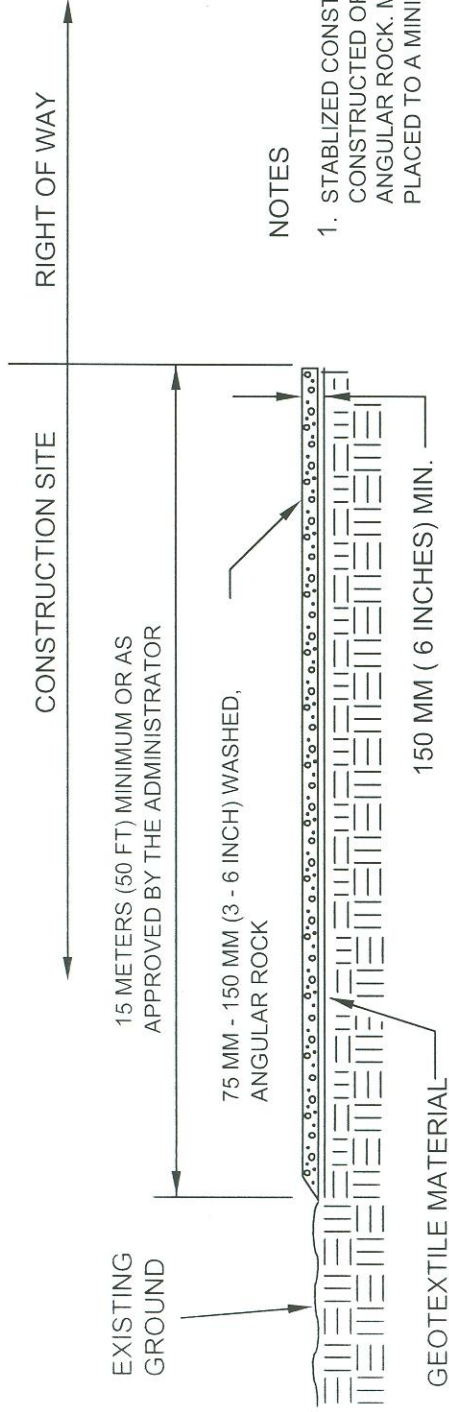
C. Design

1. On slopes fiber rolls shall be placed along the contour. At the ends of the row, the last two feet shall be turned up slope slightly.
2. Fiber rolls shall be manufactured and have a minimum density of 1.6 kg/m (1.1 lbs/lf). Use and installation of fiber rolls shall be in accordance the manufacturer's recommendation.
3. When more than one fiber roll is placed in a row, the ends of the rolls shall be butted together tightly, or overlapped a minimum of 300 mm (1 ft).
4. Fiber rolls used as check dams shall be trenched and staked such that water is not allowed to flow under the rolls.
5. Install per detail 11-4.

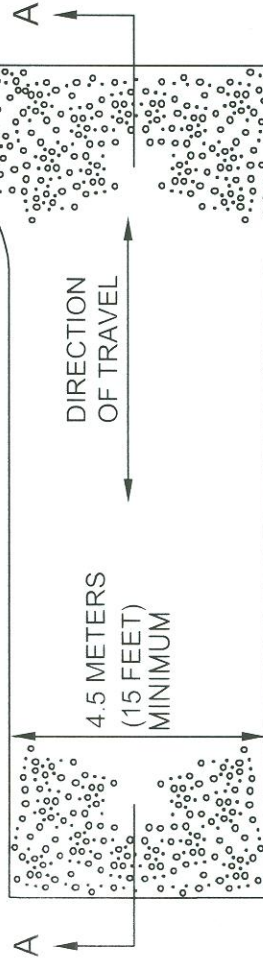
D. Maintenance

1. Repair or replace split, torn, unraveling, or slumping fiber rolls.
2. Inspect fiber rolls when rain is forecast.

In active construction areas where fiber rolls are removed during the work day, return or replace the fiber roll to its proper place and stake it down at the end of each workday during the wet season.



SECTION A-A



PLAN VIEW

[Signature]
DIRECTOR, COUNTY ENGINEERING

NOTES

1. STABILIZED CONSTRUCTION SITE ACCESS SHALL BE CONSTRUCTED OF 75-125 MM (3-6 INCH) WASHED, ANGULAR ROCK. MATERIAL SHALL BE PLACED TO A MINIMUM THICKNESS OF 150 MM (6 INCHES).
2. LENGTH OF ENTRANCE SHALL BE A MINIMUM OF 15 METERS (50 FEET). WIDTH SHALL BE A MINIMUM OF 4.5 METERS (15 FEET) OR GREATER IF NECESSARY TO COVER ALL VEHICULAR INGRESS AND EGRESS. PROVIDE AMPLE TURNING RADIUS.
3. THE ENTRANCE SHALL BE KEPT IN GOOD CONDITION BY OCCASIONAL TOP DRESSING WITH MATERIAL AS SPECIFIED IN NOTE 1.
4. ACCESSES SHALL BE INSPECTED WEEKLY DURING PERIODS OF HEAVY USAGE, MONTHLY DURING NORMAL USAGE, AND AFTER EACH RAINFALL, WITH MAINTENANCE PROVIDED AS NECESSARY. PERIODIC TOP DRESSING SHALL BE DONE AS NEEDED.

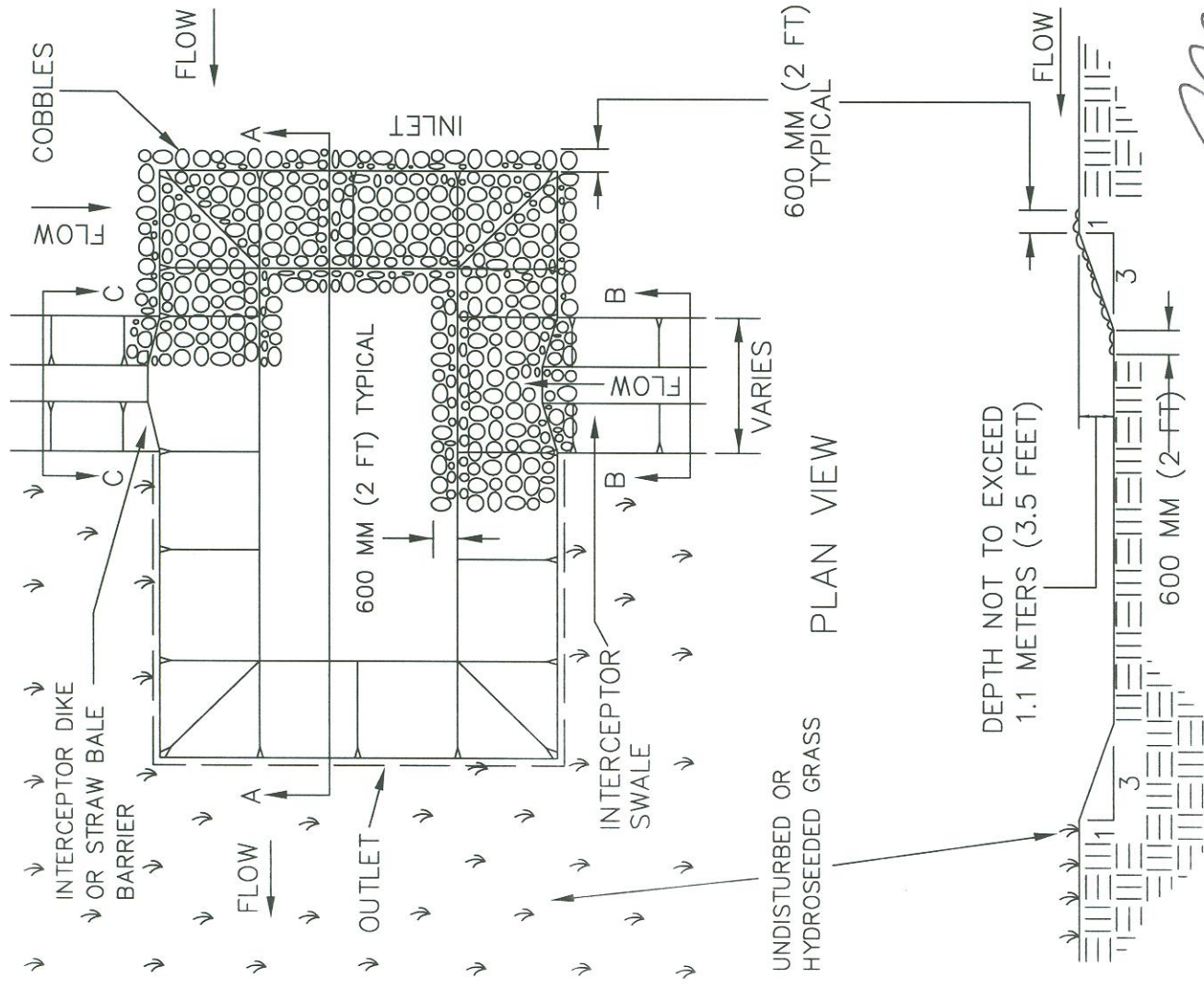
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

STABILIZED CONSTRUCTION
SITE ACCESS

SCALE: NONE
DATE DRAWN: REV SEPT 2006
DRAWN BY: SLP

11-1

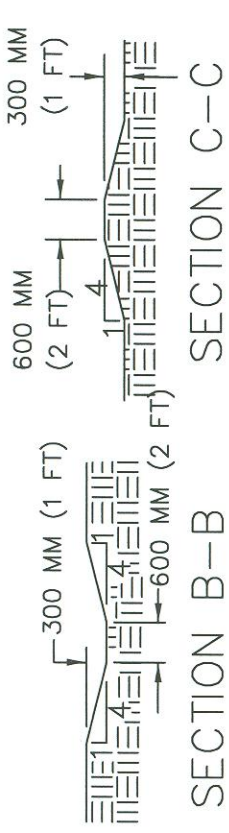
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SECTION A-A

DIRECTOR, COUNTY ENGINEERING

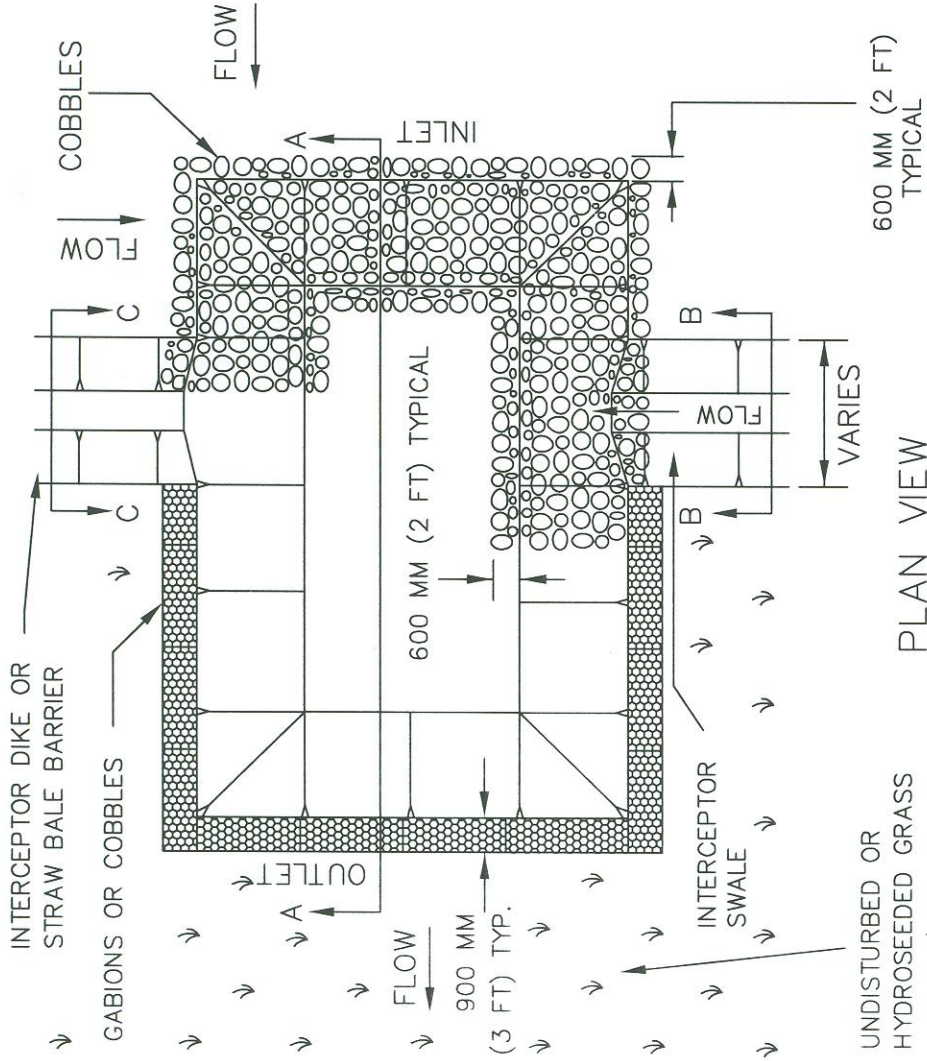
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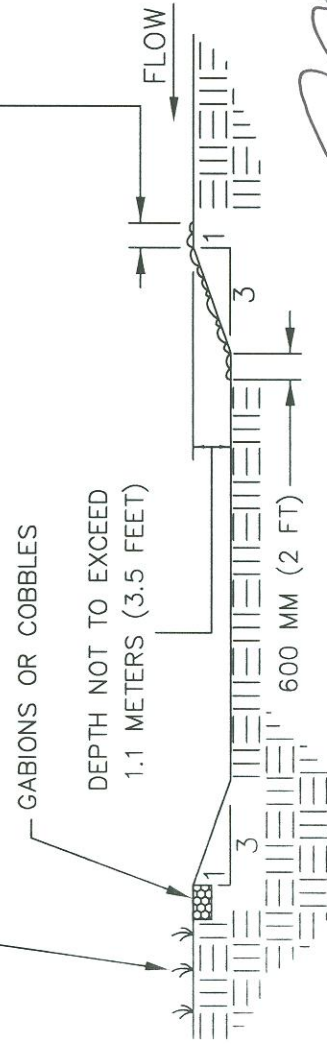
NOTES

1. DIMENSIONS OF SEDIMENT TRAPS, DIKES AND SWALES SHALL BE APPROVED BY THE ADMINISTRATOR.
2. INTERCEPTION DIKES AND SWALES SHALL BE CONSTRUCTED TO DRAIN SURFACE RUNOFF INTO SEDIMENT TRAPS.
3. TRAPS SHALL BE EXCAVATED WITH APPROPRIATE EQUIPMENT, TAKING CARE NOT TO DISTURB VEGETATION OR SOIL AT OUTLET CREST. SIDE SLOPES SHALL BE 3:1 OR FLATTER. MAXIMUM TRAP DEPTH SHALL BE 1.1 METERS (3.5 FEET).
4. COBBLES CONFORMING TO COUNTY STANDARD SPECIFICATIONS SHALL BE PLACED ON THE TOPS, SLOPES, AND BOTTOMS OF THE INLET SIDES. COBBLES SHALL EXTEND A MINIMUM OF 600 MM (2 FEET) BEYOND THE TOP AND TOE OF SLOPES.
5. PERIMETER OF THE SEDIMENT TRAP SHALL BE HYDROSEED 3 METERS (10 FEET) BEYOND EDGE OF EXCAVATION IF EXISTING VEGETATION IS THIN, DISTURBED, OR NONEXISTENT.
6. THE CONTRACTOR SHALL INSPECT SEDIMENT TRAPS WEEKLY AND AFTER EACH RAINFALL AND REPAIR AS NECESSARY. SEDIMENT SHALL BE REMOVED FROM THE BOTTOM OF THE TRAP WHEN 300MM (1 FOOT) DEEP OR LESS.

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
SEDIMENT TRAP VEGETATED OUTLET	
SCALE: NONE DATE : REV. SEPT 2006 DRAWN BY: SLP	11-2



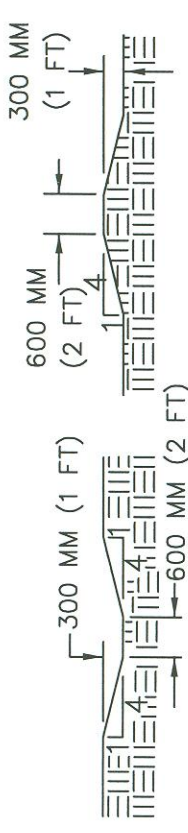
PLAN VIEW



SECTION A-A

[Signature]
DIRECTOR, COUNTY ENGINEERING

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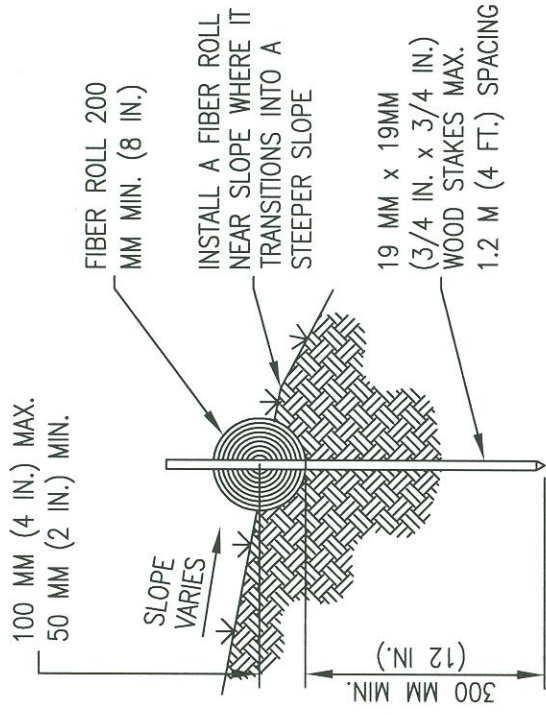
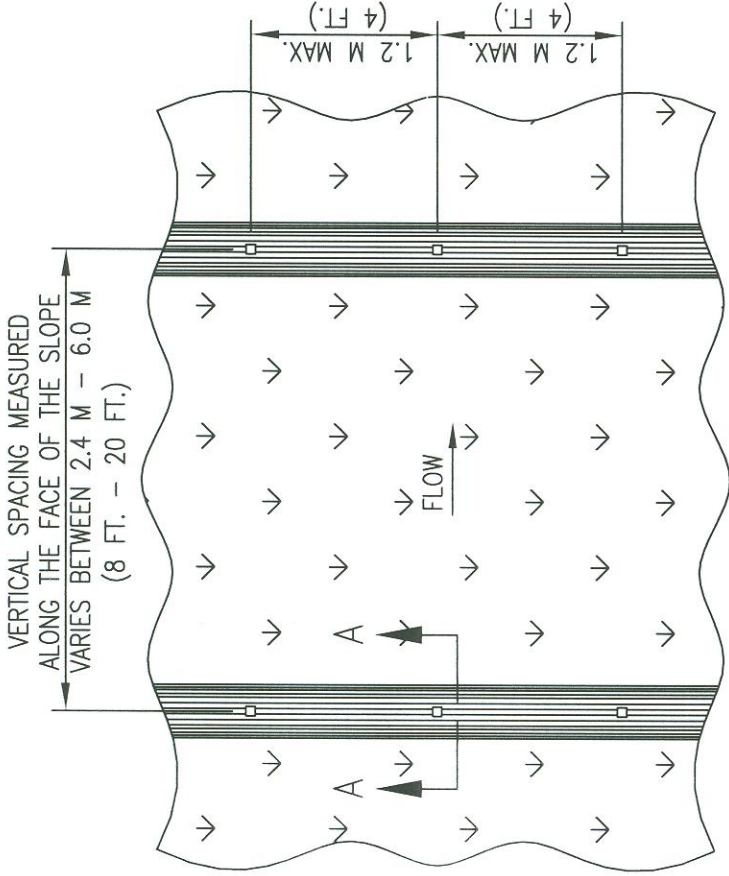
SECTION B-B

NOTES

1. DIMENSIONS OF SEDIMENT TRAPS, DIKES, AND SWALES SHALL BE APPROVED BY THE ADMINISTRATOR.
2. INTERCEPTION DIKES AND SWALES SHALL BE CONSTRUCTED TO DRAIN SURFACE RUNOFF INTO SEDIMENT TRAPS.
3. TRAPS SHALL BE EXCAVATED WITH APPROPRIATE EQUIPMENT, TAKING CARE NOT TO DISTURB VEGETATION OR SOIL AT OUTLET CREST. SIDE SLOPES SHALL BE 3:1 OR FLATTER. MAXIMUM TRAP DEPTH SHALL BE 1.1 METERS (3.5 FEET).
4. COBBLES CONFORMING TO COUNTY STANDARD SPECIFICATIONS SHALL BE PLACED ON THE TOPS, SLOPES, AND BOTTOMS OF THE INLET SIDES. COBBLES SHALL EXTEND A MINIMUM OF 600 MM (2 FEET) BEYOND THE TOP AND TOE OF SLOPES.
5. PERIMETER OF SEDIMENT TRAPS SHALL BE STABILIZED WITH GABIONS OR COBBLES AND HYDROSEEDED 3 METERS (10 FEET) BEYOND EDGE OF EXCAVATION IF EXISTING VEGETATION IS THIN, DISTURBED OR NONEXISTENT.
6. THE CONTRACTOR SHALL INSPECT SEDIMENT TRAPS WEEKLY AND AFTER EACH RAINFALL AND REPAIR AS NECESSARY. SEDIMENT SHALL BE REMOVED FROM THE BOTTOM OF THE TRAP WHEN 300 MM (1 FOOT) DEEP OR LESS.

SECTION C-C

SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
SEDIMENT TRAP STABILIZED OUTLET	
SCALE: NONE DATE : REV. SEPT 2006 DRAWN BY: SLP	11-3



TYPICAL FIBER ROLL INSTALLATION

SECTION A - A

NOTES:

- 1.) INSTALL FIBER ROLLS IN A ROW ALONG A LEVEL CONTOUR.
- 2.) AT ENDS OF A ROW TURN THE LAST TWO FEET UP SLOPE SLIGHTLY.
- 3.) FIBER ROLLS SHALL BE BUTTED TIGHTLY AT THE JOINTS.
- 4.) DO NOT OVERLAP JOINTS.

[Signature]
DIRECTOR, COUNTY ENGINEERING

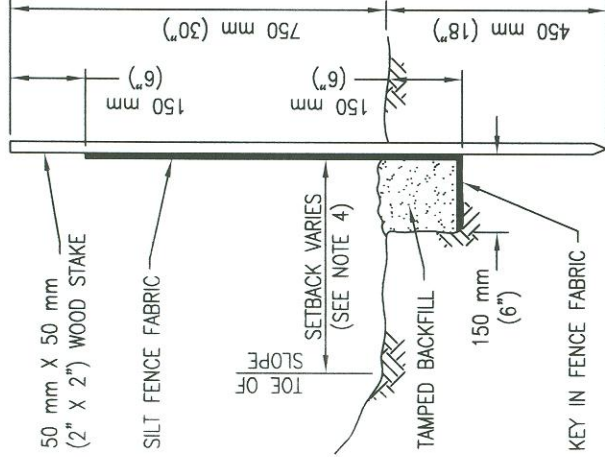
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

FIBER ROLLS

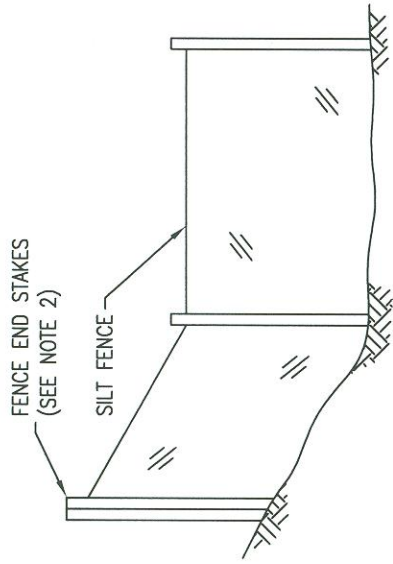
DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

NOTES:

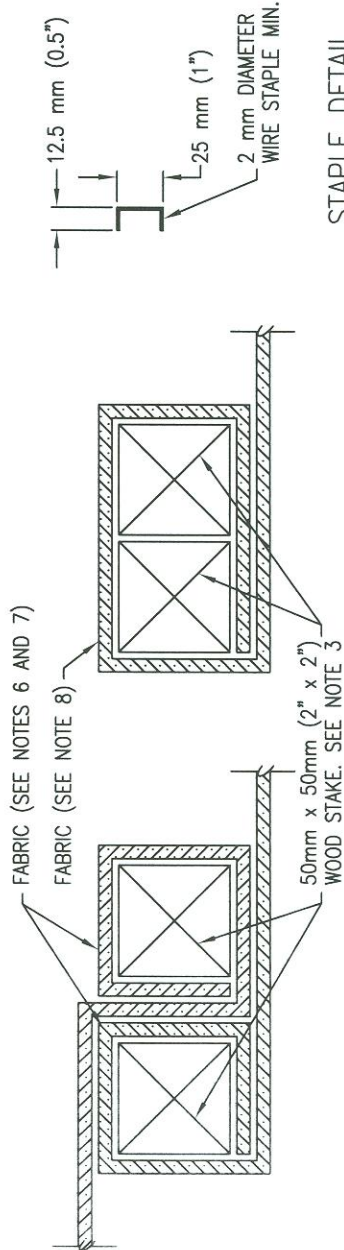
- 1.) CONSTRUCT THE LENGTH OF EACH REACH SO THAT THE CHANGE IN BASE ELEVATION ALONG THE REACH DOES NOT EXCEED 1/3 THE HEIGHT OF THE LINEAR BARRIER. IN NO CASE SHALL THE REACH LENGTH EXCEED 150M.
- 2.) THE LAST 8 FT. OF FENCE SHALL BE TURNED UP SLOPE.
- 3.) STAKE DIMENSIONS ARE NOMINAL.
- 4.) DIMENSIONS MAY VARY TO FIT FIELD CONDITION.
- 5.) STAKES SHALL BE SPACED AT 8 FT. MAXIMUM AND SHALL BE POSITIONED ON THE DOWNSTREAM SIDE OF THE FENCE.
- 6.) OVERLAP STAKES, AND FOLD FENCE FABRIC TO AROUND EACH STAKE ONE FULL TURN.
- 7.) STAKES SHALL BE DRIVEN TIGHTLY TOGETHER TO PREVENT POTENTIAL FLOW THROUGH OF SEDIMENT AT THE JOINT.
- 8.) FOR END STAKE CONDITION FOLD FENCE FABRIC AROUND (2) STAKES (1) FULL TURN AND SECURE WITH (4) STAPLES.
- 9.) MINIMUM (4) STAPLES PER STAKE.
- 10.) CROSS BARRIERS SHALL BE A MINIMUM OF 1/3 AND A MAXIMUM OF 1/2 THE HEIGHT OF THE LINEAR BARRIER.



FENCE END DETAIL



FENCE SECTION DETAIL



JOINT DETAIL

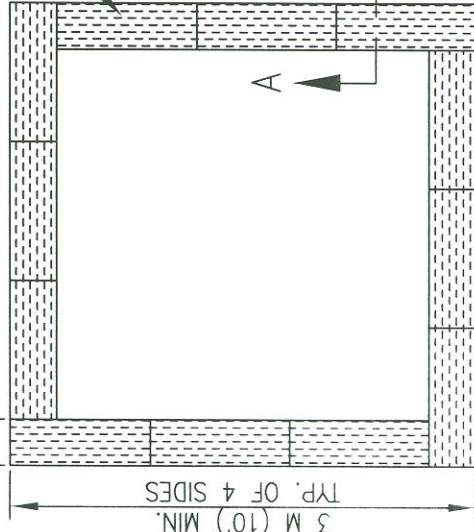
END STAKE DETAIL

STAPLE DETAIL

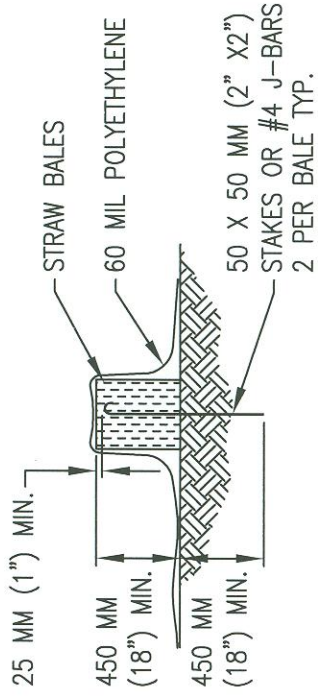

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SACRAMENTO COUNTY PUBLIC WORKS AGENCY	
SILT FENCE	
DRAWN BY: G.O. SCALE: NONE DATE: REV. SEPT 2006	11-5

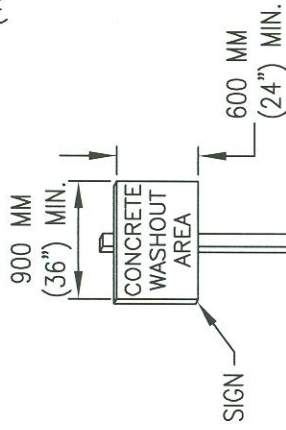
36 CM (14") MIN.



STRAW BALES

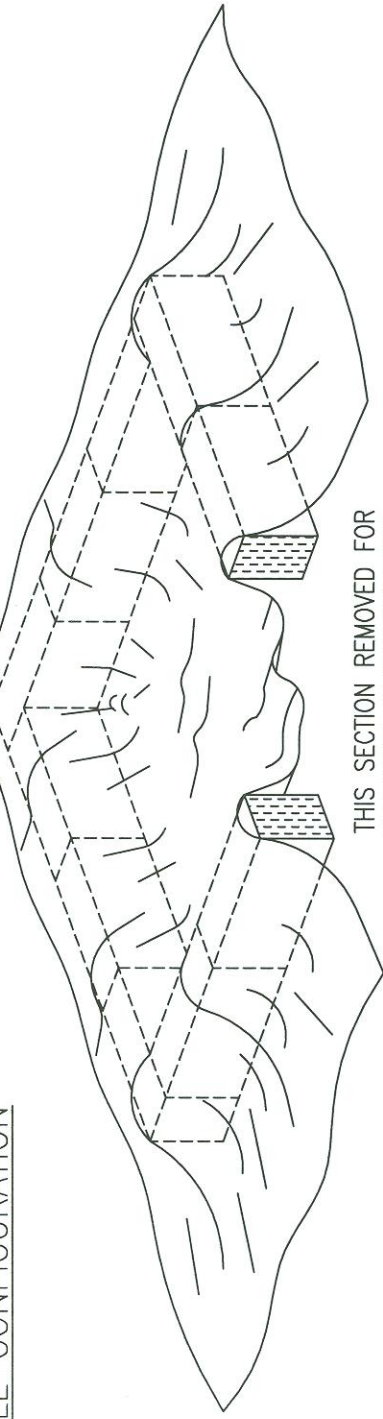


SECTION A - A



SIGN

BALE CONFIGURATION



THIS SECTION REMOVED FOR
GRAPHICAL REPRESENTATION
ONLY. STRAW BALE PERIMETER
SHALL BE CONTINUOUS.

NOTES:

- 1.) FACE SIGN TOWARD NEAREST STREET OR ACCESS POINT.
- 2.) CONCRETE WASHOUT SHALL BE LOCATED BEHIND THE CURB AND 15 M (50 FT.) MINIMUM FROM DRAINAGE INLETS OR WATERCOURSES

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PUBLIC WORKS AGENCY

CONCRETE WASHOUT

DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

11-6

[Signature]
DIRECTOR, COUNTY ENGINEERING

GRAVEL BAG(S) OR OTHER ACCEPTED
SEDIMENT CONTROL BMP. PLACE BAGS
TIGHT AGAINST FACE OF CURB.

BACK OF CURB

FACE OF CURB

SEE NOTE 2

FLOW

45°

LIP OF GUTTER

DRAINAGE INLET
WITH FILTER BAG

PLAN VIEW

NOTES:

- 1.) SEDIMENT TRAPPED UPSTREAM OF
SEDIMENT CONTROL BMP SHALL BE
REMOVED WEEKLY AND PRIOR TO A
RAINFALL EVENT.
- 2.) PLACE BMP'S TIGHTLY TOGETHER AT
JOINTS TO PREVENT OR MINIMIZE
SEEPAGE AT JOINTS.

SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

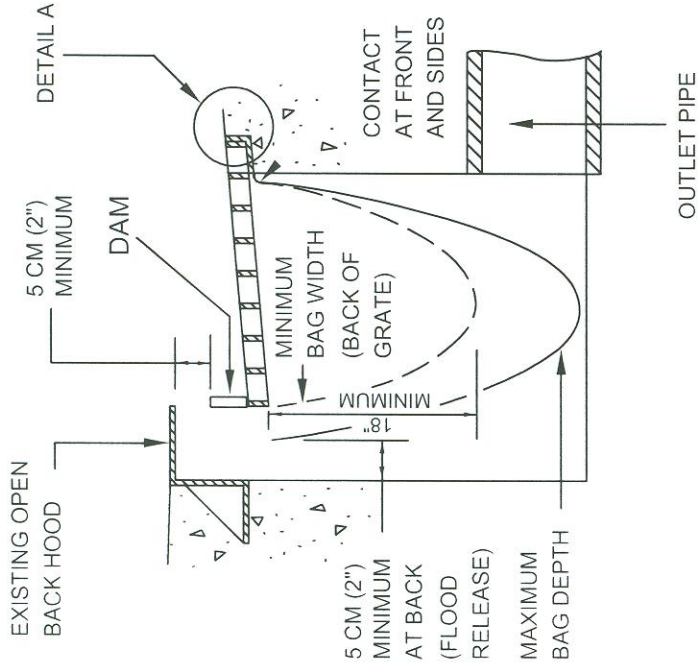
**INLET SEDIMENT
CONTROL**

DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

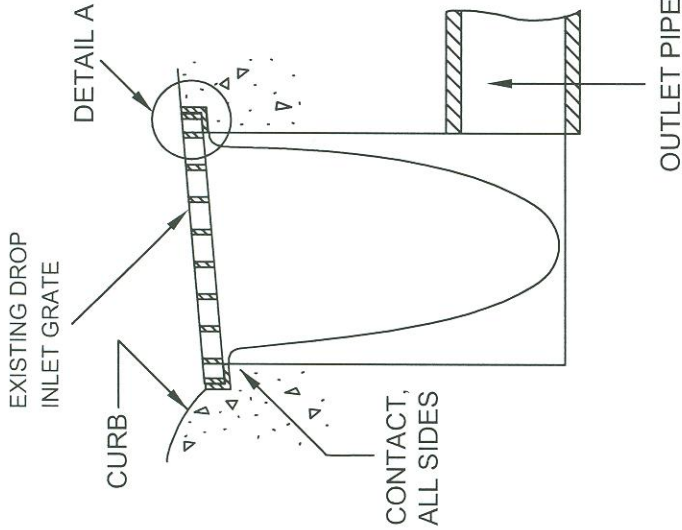
11-7


DIRECTOR, COUNTY ENGINEERING

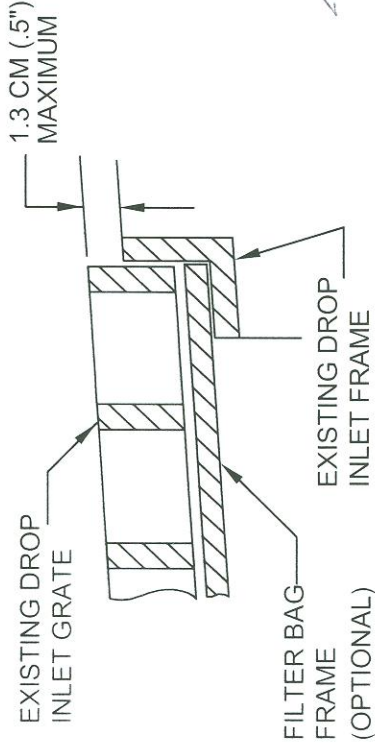
PLACEMENT AT TYPE
B AND E DROP INLETS



PLACEMENT AT TYPE
A, C, D, & F DROP INLETS
AND PARKING LOTS



DETAIL A



NOTES

1. THE MAXIMUM DRAINAGE AREA PER FILTER SHALL BE NO MORE THAN 0.8 HECTARES (2 ACRES).
2. THE FILTER BAG SHALL BE MANUFACTURED FROM UV RESISTANT POLYPROPYLENE, NYLON, POLYESTER, OR ETHYLENE FABRIC WITH A MINIMUM TENSILE STRENGTH OF 50 LBS PER LINEAL FOOT, AN EQUIVALENT OPENING SIZE NOT GREATER THAN 20 SIEVE AND WITH A MINIMUM FLOW RATE OF 40 GALLONS/MINUTE/SQ. FT.
3. THE FILTER BAG MAY BE SUSPENDED FROM OR HELD IN PLACE BY THE EXISTING INLET GRATE (OR OTHER APPROVED METHOD) PROVIDING NO MODIFICATION OR DAMAGE SHALL BE DONE TO THE INLET GRATE OR FRAME. THE INLET GRATE SHALL NOT BE CAUSED TO REST MORE THAN 13MM (.5") ABOVE THE INLET FRAME (SEE DETAIL A).
4. THE FILTER BAG MAY EXTEND TO THE BOTTOM OF THE INLET BOX PROVIDED THE OUTLET PIPE IS UNOBSTRUCTED.
5. FLOWS SHALL NOT BE ALLOWED TO BYPASS THE BAG. THE BAG OR ITS FRAME SHALL CATCH FLOWS AT ALL SIDES OF THE INLET, EXCEPT AS SHOWN FOR FLOOD RELEASE.
6. INLET FILTER BAGS SHALL BE INSPECTED WEEKLY AND AFTER EACH RAINFALL DURING THE WET SEASON AND MONTHLY DURING THE DRY SEASON. SEDIMENT AND DEBRIS SHALL BE REMOVED BEFORE ACCUMULATIONS HAVE REACHED ONE THIRD THE DEPTH OF THE BAG. BAGS SHALL BE REPAIRED OR REPLACED AS SOON AS DAMAGE OCCURS.

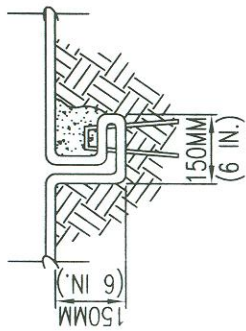
SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

STORM DRAIN INLET
FILTER BAG

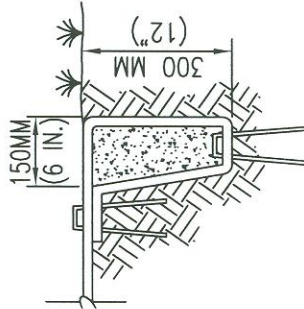
SCALE: NONE
DATE DRAWN: REV. SEPT 2006
DRAWN BY: SLP

DIRECTOR, COUNTY ENGINEERING

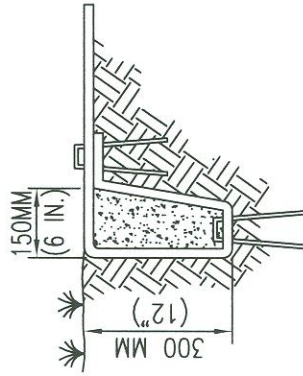
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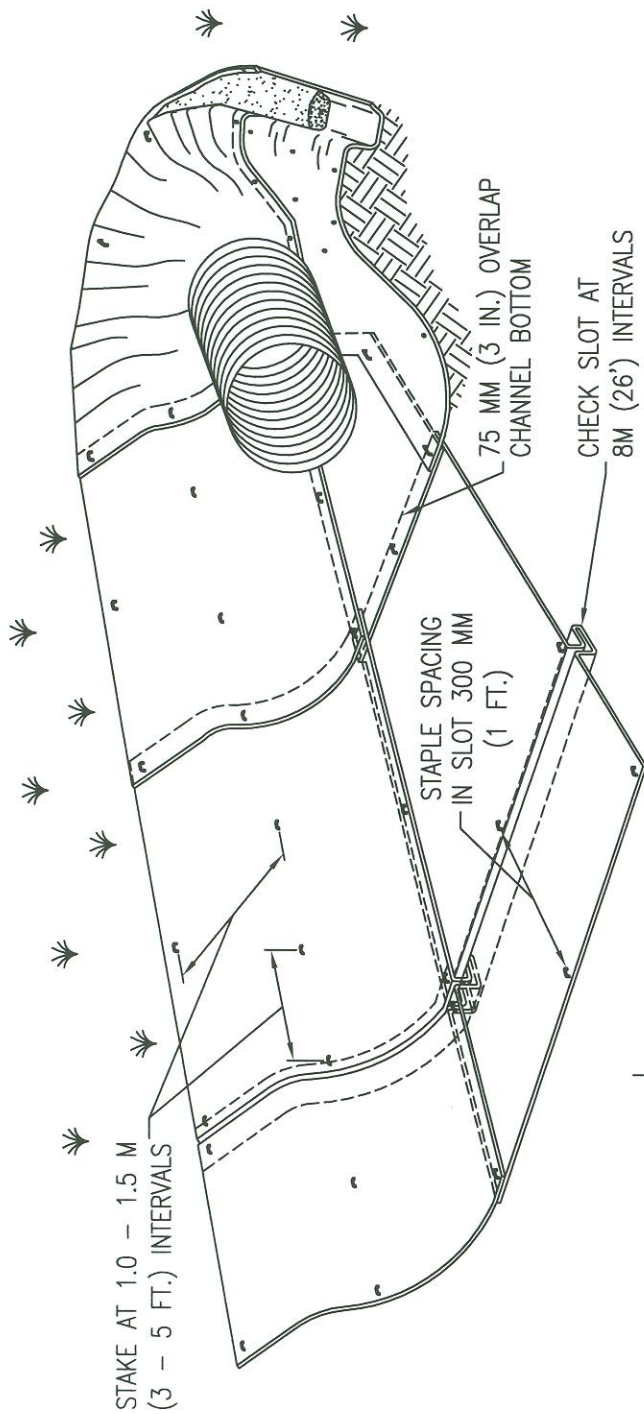
CHECK SLOT



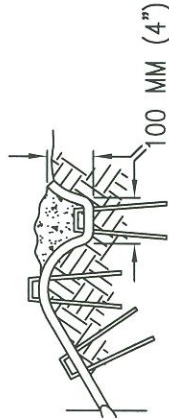
INITIAL CHANNEL ANCHOR TRENCH



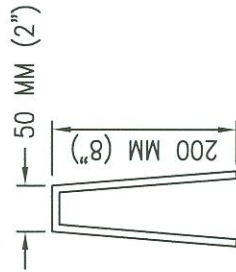
TERMINAL SLOPE AND CHANNEL ANCHOR TRENCH



TYPICAL CHANNEL SOIL STABILIZATION



LONGITUDINAL ANCHOR TRENCH



WIRE STAPLES

NOTE:
1.) CONSTRUCTION OF CHECK SLOTS, STAKING, STAPLING LAYOUT, AND MAT INSTALLATION ALL TO BE DONE PER MANUFACTURER'S SPECIFICATIONS.

[Signature]
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SACRAMENTO COUNTY
PUBLIC WORKS AGENCY

**EROSION CONTROL
BLANKETS / MATS
CHANNEL INSTALLATION**

DRAWN BY: G.O.
SCALE: NONE
DATE: REV SEPT 2006

SECTION 12
SURVEY MONUMENTS

<u>Contents</u>	<u>Page</u>
12-1 Survey Monuments	12-1

SECTION 12 SURVEY MONUMENTS

12-1 SURVEY MONUMENTS:

- A. The Consulting Engineer shall place survey monuments at the following locations:
- At the intersections of all street centerlines;
 - At the beginning and end of all curves on street centerlines;
 - At all subdivision boundary corners designated by the Director and such other locations so as to enable any lot or portion of the improvement to be retraced or located; and
 - All section corners, quarter corners and centers of section within the project improvement, and off-site as required by the County Surveyor due to deed dependency.

All such monuments shall be referenced to permanent objects located nearby and all ties shall be furnished to the Director for general public use. Final approval of the subdivision will not be made until such ties have been furnished to the Director.

- B. Survey monuments placed within the public right-of-way shall conform to the requirements of Sections 46-1, 46-2 and 46-3 of the County of Sacramento's Standard Construction Specifications.

Survey monuments placed for subdivision boundary monuments out of the public right-of-way shall consist of Class "B" concrete, poured in place, with minimum dimensions of eight inches in diameter and thirty inches deep. Centered in the concrete shall be a galvanized iron pipe, thirty inches in length and a minimum of one and one-quarter inches in nominal diameter.

Survey monuments placed for section corners, one-quarter corners and center of section etc., out of the public right-of-way shall consist of Class "B" concrete, poured in place, with minimum dimensions of ten inches in diameter and thirty inches deep. Centered in the concrete shall be a galvanized iron pipe, thirty inches in length and two and one-half inches outside diameter. Centered in the galvanized iron pipe shall be a brass disc conforming to the requirements of Section 46-2 of the County of Sacramento Standard Construction Specifications and stamped with

appropriate markings in accordance with the 1973 "Manual of Instructions for the Survey of the Public Lands of the United States".

All survey monuments referred to herein shall be permanently and visibly marked or tagged with the certificate number of the surveyor or civil engineer setting such monument.

- C. The Consulting Engineer shall show the location and character of all known survey monuments within the construction area and place a note on all construction plans stating that the contractor is responsible for the protection of all existing monuments and other survey markers in accordance with section 8771 of the Land Surveyor's Act.