County of Sacramento

Municipal Services Agency

Paul Hahn, Administrator

STANDARD CONSTRUCTION SPECIFICATIONS

September 2001
Revised March 2004
Revised January 2008

COUNTY OF SACRAMENTO

MUNICIPAL SERVICES AGENCY

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September 2001
Revised March 2004
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Price: $30.00 plus tax

These revised specifications will become effective for contracts approved for advertisement for bids on and after January 1, 2008. For any contract approved for advertisement prior to March 15, 2004, the September 2001 version of the Specifications shall apply unless otherwise stated in the Special Provisions. For any contract approved for advertisement after March 15, 2004, but prior to January 1, 2008, the March 2004 version of the Specifications shall apply unless otherwise stated in the Special Provisions. All addenda or variances issued relative to the September 2001 Specifications shall remain in effect for projects subject to the September 2001 Specifications. All addenda or variances issued relative to the March 2004 Specifications shall remain in effect for projects subject to the March 2004 Specifications

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PREFACE

All portions of these County of Sacramento Standard Construction Specifications, including the General Provisions, Sections 1 through 10, inclusive, of these Standard Construction Specifications, which place any duty or responsibility upon personnel or agencies of the County of Sacramento or other public entity, are intended for use in those contracts entered into by public entities and administered by the Municipal Services Agency, County of Sacramento. Any use of these Standard Construction Specifications by any other person, persons, or entity shall not create or imply the assumption of any liability or responsibility by the County of Sacramento or any public entity authorized to use these Standard Construction Specifications.

Unless otherwise excluded, the Technical Provisions, Sections 11 through 50, inclusive, of these Standard Specifications, shall apply to all construction projects administered and/or inspected by the Sacramento County Municipal Services Agency, and to construction of private development within public rights of way or easements and for dedication or incorporation into Sacramento County facilities.

Standard Construction Specifications
General Provisions

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GENERAL PROVISIONS

SECTION 1 TERMS AND DEFINITIONS

1-1 GENERAL

Whenever the following terms, titles, or abbreviations are used in these Specifications, or in any document or instrument where these Specifications govern, the intent and meaning shall be as herein defined. Working titles having a masculine gender, such as "workman" and "journeyman" and the pronoun "he", are utilized in the specifications for the sake of brevity, and are intended to refer to persons of either gender.

1-2 ABBREVIATIONS

AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
APA	American Plywood Association
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American Wire Gage
AWS	American Welding Society
AWWA	American Water Works Association
Cal-OSHA	California Occupational Safety and Health Administration
Caltrans	California Department of Transportation
CL	Centerline
CSI	Construction Specifications Institute
CY	Cubic Yards
DI	Drop Inlet
EA	Each
EP	Edge of Pavement
FS	Federal Specifications
Inv	Invert
ISA	International Society of Arboriculture
LB	Pound
LF	Linear Feet
LS	Lump Sum
NBFU	National Board of Fire Underwriters
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCC	Portland Cement Concrete
SD	Storm Drain
SF	Square Foot/Feet

SS	Sanitary Sewer
STA	Station
Title 8	Title 8 (Construction Safety Orders) of the California Code of Regulations
Title 19	Title 19 (Public Safety) of the California Code of Regulations
Title 24	Title 24 (Building Standards) of the California Code of Regulations
TOC	Top of Curb
Typ.	Typical
UL	Underwriters' Laboratories, Inc.
UBC	Uniform Building Code (latest edition adopted by Agency)
USBR	United States Bureau of Reclamation
UMC	Uniform Mechanical Code (latest edition adopted by Agency)
UPC	Uniform Plumbing Code (latest edition adopted by Agency)
WCLA	West Coast Lumbermen's Association
WIC	Woodwork Institute of California

1-3 DEFINITIONS

Agency -- Shall mean the County of Sacramento, or another agency or district that may adopt these Specifications, acting through its authorized representatives.

Allowance -- An amount of money set aside under the Contract for a special purpose identified in the Contract.

Architect and/or Consulting Engineer-- A person or persons, firm, partnership, joint venture, corporation, or combination thereof or authorized representative thereof, acting in the capacity of consultant to the Agency. The Architect or Consulting Engineer shall issue directions to the Contractor only through the Agency. When the Specifications require that approval be obtained from the Architect or Consulting Engineer, such approval shall be requested from and be given by the Agency.

As Shown, Etc. -- Where "as shown", "as latest indicated", "as detailed", or words of similar import are used, the reference is to the Contract unless specifically stated otherwise. Where "as directed", "as permitted", "approved", or words of similar import are used, they shall mean the direction, permission, or approval of the Agency.

Bid -- When submitted on the prescribed bid form, properly signed and guaranteed, the Bid constitutes the offer of the Bidder to complete the Work at the price shown on the Bidder's bid form.

Bidder -- Any person, persons, firm, partnership, joint venture, corporation, or combination thereof, submitting a Bid for the Work, acting directly or through a duly authorized representative.

Bid Documents -- The sum of the documents that comprise the Bid by a Bidder to perform the Work.

Bid Opening -- The event conducted by the Agency during which the sealed Proposals submitted by Bidders to perform the Work are opened and publicly read.

Board Of Supervisors -- The Board of Supervisors of the County of Sacramento, a political subdivision of the State of California. Also referred to as "Board".

Board of Directors -- The Board of Directors of the special district or agency named in the Notice to Contractors. Also referred to as "Board".

Calendar Day -- Every day shown on the calendar, including weekends and legal holidays. When the Contract Time is stated in Calendar Days, every day will be charged toward the Contract Time. See section 7-17 for the sole exception.

Contract -- The written Agreement signed by the Agency and the Contractor covering the Work and the furnishing of labor, materials, tools, and equipment in the construction of the Work. The Contract shall include the Notice to Contractors, Bid, Plans, Specifications, Special Provisions, contract bonds, and any project-specific specifications or documents; also any and all supplemental agreements amending or extending the Work contemplated and which may be required to complete the Work in a substantial and acceptable manner. Supplemental agreements are written agreements covering alterations, amendments, or extensions to the Contract and include Contract Change Orders.

Contract Change Order -- A Contract amendment approved by the Agency or by the Board that includes, but is not limited to, alterations, deviations, additions to, or deletions from, the Contract which are required for the proper completion of the Work.

Contract Documents – The documents that describe the Work to be performed, including these Standard Construction Specifications, the Special Provisions, the Contract drawings, all addenda, the Notice to Contractors, the Proposal, all required bonds, and all supplemental Agreements covering alterations, amendments, or extensions to the Contract, including, but not limited to, Field Instructions or other written directives, responses to Requests for Information, and executed Contract Change Orders. Also reference Section 4-1, "Intent of Contract Documents", of these Specifications.

Contractor -- The person or persons, firm, partnership, joint venture, corporation, or combination thereof, private or municipal, who (that) has (have) entered into a Contract, as defined in these Specifications, with the Agency.

Contract Time – The time stated in the Contract for completion of the Work. The Contract Time may be a single allotment of time, a group of times specific to portions of the Work, or a combination of the two.

County -- The County of Sacramento, a political subdivision of the State of California.

Engineer -- The County Engineer of Sacramento County, or Agency Engineer of the district or agency for which work will be done under these Specifications, acting personally or through agents or assistants duly authorized by the Engineer.

Estimated Quantities -- The list of items of work and the estimated quantities associated with the Work. The Estimated Quantities provide the basis for the Bid.

Final Completion - Completion of all Work including work directed by Field Instructions, written directives, or Change Orders, punchlists, correcting defective work and submittal of O&M manuals, as-builts and test reports. Also, reference Section 7-22, "Final Acceptance and Notice of Completion", of these Specifications.

Inspector -- The person or persons authorized to act as agent(s) for the Agency in the inspection of the Work.

Legal Holidays -- The following days are recognized as "legal holidays" by the Agency:

New Year's Day	January First
Martin Luther King, Jr. Day	Third Monday in January
Lincoln's Birthday	February Twelfth
Washington's Birthday	Third Monday in February
Memorial Day	Last Monday in May
Independence Day	July Fourth
Labor Day	First Monday in September
Columbus Day	Second Monday in October
Veterans' Day	November Eleventh
Thanksgiving Day	Fourth Thursday in November
Thanksgiving Friday	Friday after Thanksgiving
Christmas	December Twenty-fifth

Notice To Contractors -- The written notice whereby interested parties are informed of the date, location, and time of the Bid Opening of a proposed Agency Project and the terms and conditions of submitting Bids to perform the Work.

Notice To Proceed -- The written authorization by the Agency to the Contractor specifying the date the Work may begin and any conditions regarding the beginning of the Work.

Plans -- The plans, drawings, profiles, cross sections, Working Drawings, and Supplemental Drawings, or reproductions thereof, approved by the Agency, which show the locations, character, dimensions, and details of the Work.

Project -- Shall mean the Work.

Proposal – Shall mean "Bid".

Record Drawings -- Drawings prepared by the Contractor that document changes to, additions to, or deductions from the Plans, and which represent the Work as constructed. Final Record Drawings are the final set for permanent record and archiving by the Agency.

Schedule of Values -- A statement furnished by the Contractor to the Agency reflecting the portions of the Total Contract Price allotted for the various parts of the Work for each work activity contained on the project schedule. Unless otherwise indicated in the Specifications, the total of the Schedule of Values shall equal the full cost of the Work, including all labor, material, equipment, overhead, and profit. For lump sum contracts, the Schedule of Values is the basis for reviewing the Contractor's application for progress payments.

Special Provisions -- The Special Provisions are specific clauses setting forth conditions or requirements peculiar to the Work and supplementary to these Standard Construction Specifications.

Standard Construction Specifications -- The directions, provisions, and requirements contained herein. When the term “Standard Specifications" or "these Specifications" is used, it means the provisions as set forth herein, together with any amendments or revisions that may be set forth in the Special Provisions. The Standard Specifications are comprised of “General Provisions” and “Technical Provisions”.

Standard Drawings -- The Standard Drawings of the Agency, which are incorporated into the Standard Construction Specifications, and made a part of the Plans by reference to one or more specific Standard Drawings.

State -- The State of California.

State Specifications -- The version of the State of California Standard Specifications for Construction of Local Streets and Roads, issued by the California Department of Transportation, in effect at the time of Notice to Contractors.

State Plans -- The version of the State of California Standard Plans for Construction of Local Streets and Roads, issued by the California Department of Transportation, in effect at the time of Notice to Contractors.

Subcontractor -- A properly licensed party under contract to and responsible to the Contractor for performing a specified part of the Work; or a properly licensed party under contract and responsible to a Subcontractor of the Contractor.

Supplemental Drawing -- Supplemental Drawings define the Plans or Specifications in greater detail by providing additional information that may have not been specifically or clearly shown or called out on the Plans or in the Specifications.

Technical Provisions – The provisions of the Standard Construction Specifications that describe the technical aspects of the Work.

Total Contract Price – The total price for the Work as bid by the Contractor, including any additions or subtractions made via Contract Change Orders.

Work -- All actions which the Contractor is contractually required to do as specified, indicated, shown, contemplated, or implied in the Contract to construct the Work, including all alterations, amendments, or extensions made by Contract Change Order or other written orders or directives of the Agency. Unless specified otherwise in the Contract, the Work includes furnishing all materials, supplies, equipment, tools, labor, transportation, supervision, and all incidentals necessary to complete the Work.

Working Day -- Any day except: (a) Saturdays, Sundays, and legal holidays; (b) days on which the Contractor is specifically required by the Special Provisions or by law to suspend construction operations; or (c) days on which the Contractor is prevented from proceeding with the current controlling operation or operations of the Work for at least five (5) hours per day due to inclement weather, or conditions resulting immediately therefrom. See Section 7-8.06, “Lane and Road Closures During November/December Holiday Season”, of these Specifications, regarding Contract Time during the November-December holiday season.

Working Drawing -- Working Drawings detail a particular item of work and the manner in which it is to be accomplished or performed. Working Drawings are prepared by the Contractor as a submittal or a portion of a submittal and may be specifically requested by the Agency or required in the Contract or a Field Instruction or other written directive.

SECTION 2 BID REQUIREMENTS AND CONDITIONS

2-1 BID FORM

The Agency will furnish to each prospective Bidder a bid form which, when properly completed and executed, must be submitted as the Bidder's Bid for the Work. All Bids must be submitted on the Agency-furnished bid form to be valid and accepted. Bids that are not submitted on the Agency-furnished bid form will be rejected. The completed bid form shall be in English and legible, and shall be properly signed in longhand by the Bidder, if an individual, by a member of a partnership, by an officer of a corporation authorized to sign contracts on behalf of the corporation, or by an agent of the Bidder. If submitted by a corporation, the Bid shall show the name of the state under the laws of which the corporation is chartered or organized.

The Bid shall be made on the bid form in clearly legible figures as follows:

2-1.01 Unit Price Bid

Where the bid for an item of work is to be submitted on a unit price basis, the Bidder shall bid a unit price as total compensation for completion of one unit of the work described under that item. This price shall be multiplied by the Estimated Quantity included in the bid form to derive a total bid price for that item. The total amount bid for a unit price contract shall be entered on the space provided on the bid form as a grand total of all individual items.

The Estimated Quantities included on the bid form are approximate and are only included in the bid form as a basis for comparison of Bids. The Agency does not, expressly or by implication, represent or agree that the actual amount of work will equal the approximate Estimated Quantities. Payment will be made for the actual quantity of Work performed in accordance with the Contract. The Agency reserves the right to increase or decrease the amount of any class or portion of the Work, or to omit portions of the Work, as may be deemed necessary or advisable in the sole discretion of the Agency. If the final quantity of any item of work required under the Contract varies from the Engineer's Estimate by twenty-five percent (25%) or more, compensation will be adjusted in accordance with State Specification Section 4-1.03B, "Increased or Decreased Quantities". For compensation for alterations in quantities of work, including deviations greater than twenty-five percent (25%), see Section 9-8.02, "Payment for Changes – Unit Prices", of these Specifications.

2-1.02 Lump Sum Bid

Where the bid for an item of work is to be submitted on a "Lump Sum" or "Job" basis, a single lump-sum price shall be submitted in the appropriate place on the bid form. Items bid on a lump-sum basis shall result in a complete structure, operating plant, or system, in satisfactory working condition with respect to the functional purposes of the installation, as described in the Contract, and no extra compensation will be paid for anything omitted but fairly implied.

2-1.03 Allowances

Where specific allowance items have been entered on the bid form by the Agency, the total amount entered on the bid form shall be included in the Total Bid Price. However, the total amount to be paid for the Work included in the Allowance shall be the amount of the Allowance actually utilized in the course of completing the Work.

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2-2 PREPARATION AND SUBMISSION OF BIDS

By submission of a Bid, the Bidder acknowledges acceptance of the nature and location of the Work, the general and local conditions, conditions of the site, the character, quality and scope of work to be performed, the availability of labor, electric power, water, the kind of surface and subsurface materials on the site, the materials and equipment to be furnished, and all

requirements of the Contract or other matters which may affect the Work or the cost. Any failure of a Bidder to become acquainted with all of the available information concerning conditions will not relieve the Bidder from the responsibility for estimating properly the difficulties or cost of the Work. Bidder agrees to inform the Agency of any errors or oversight by Agency it perceives in the Bid documents prior to submission of its bid.

The Bidder declares by the submission of a Bid that the Bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the Bid is genuine and not collusive or a sham; that the Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham Bid, and has not directly or indirectly colluded or agreed with any Bidder or anyone else to put in a sham Bid or to refrain from bidding; that the Bidder has not directly or indirectly sought by agreement, communication, or conference with anyone to fix the Bid price or the Bid price of any other Bidder, or to fix any overhead, profit, or cost element of such Bid price or that of any other Bidder, or to secure any advantage against the Agency, anyone interested in the Bid as principal, or those named within the Bid; that all statements contained in the Bid are true; that the Bidder has not directly or indirectly submitted a Bid price or any breakdown thereof or the contents thereof, or divulged information or data relative thereto, to any other person, partnership, corporation or association, except to person or persons as have a direct financial interest in the Bidder's general business.

Bid prices shall include everything necessary for the completion of the Work and fulfillment of the Contract, including but not limited to furnishing all materials, equipment, tools, excavation sheeting, bracing and supports, plant, labor and services, except as may be provided otherwise in the Contract. Bid prices shall also include labor and material escalation and all Federal, State, and local taxes, and all other fees and costs not expressly paid for by the Agency as stated in the Special Provisions.

The Bid shall be submitted in a sealed envelope as directed in the Notice to Contractors. The Bidder shall plainly mark the exterior of the envelope in which the Bid is submitted to indicate that it contains a Bid for the project for which the Bid is submitted, and the date of the Bid opening therefor.

Bids submitted in envelopes that are not properly marked will be rejected.

2-3 EXAMINATIONS OF PLANS, SPECIFICATIONS, AND SITE OF WORK

The Bidder shall examine carefully the site of the proposed Work and the Plans, Specifications and Bid Documents, and shall be satisfied as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. The submission of a Bid shall be conclusive evidence that the Bidder is satisfied through the Bidder's own investigation as to the conditions to be encountered; the character, quality, quantity and scope of work to be performed; and the materials and equipment to be furnished.

If material discrepancies or apparent material errors are found in the Plans and Specifications prior to the date of bid opening, an Addendum may be issued (see Section 2-9, "Addenda", in this Section of these Specifications). Otherwise, in figuring the Work, Bidders shall consider that any discrepancies or conflict between Plans and Specifications will be governed by Section 4-1, "Intent of Contract Documents".

2-4 SUBSURFACE CONDITIONS

Where investigations of subsurface conditions have been made by the Agency with respect to subsurface conditions, utilities, foundation, or other structural designs, and that information is shown in the Plans, it represents only a statement by the Agency as to the character of materials which have actually been encountered by the Agency's investigation. This information is only included for the convenience of Bidders.

Investigations of subsurface conditions are made for the purpose of design only. The Agency assumes no responsibility with respect to the sufficiency or accuracy of borings or of the log of test borings or other preliminary investigations or of the interpretation thereof. There is no guaranty, either expressed or implied, that the conditions indicated are representative of those existing throughout the Work, or any part of it, or that unanticipated conditions may not occur. When a log of test borings is included in the Plans, it is expressly understood and agreed that said log of test borings does not constitute a part of the Contract. The log of test borings represents only an opinion of the Agency as to the character of the materials to be encountered, and is included in the Plans only for the convenience of the Bidders. Making information available to Bidders is not to be construed in any way as a waiver of the provisions of the first paragraph of this Section, and Bidders must satisfy themselves through their own investigations as to conditions to be encountered.

2-5 CONTRACTORS/SUBCONTRACTORS REQUIRED TO BE LICENSED

The Bidder shall be licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code to do the type of work contemplated in the project, and shall be skilled and regularly engaged in the general class or type of work called for under the contract. The specific type of license required will be indicated in the "Notice to Contractors". Unless specified otherwise in the Special Provisions, the Bidder shall indicate the license number and class in the space provided for that purpose on the bid form.

All Subcontractors engaged to perform portions of the Work shall be licensed under the provisions of Chapter 9, Division 3, of the Business and Professions Code to do the type of work for which they are subcontracted, and shall be skilled and regularly engaged in the general class or type of work called for under their subcontracts. If requested by the Agency, Subcontractor license numbers must be provided to the Agency within 24 hours of the request.

Attention is also directed to the provisions of Public Contract Code Section 20103.5, which addresses Contractor licensing requirements. The Agency may not award the Contract if it cannot be verified that the low Bidder is an appropriately licensed Contractor at the time of Contract award.

2-6 COMPETENCY OF BIDDERS

It is the intention of the Agency to award a Contract only to a Bidder who furnishes satisfactory evidence that the Bidder has the requisite experience and ability, and has sufficient capital, facilities, and plant to enable the Contractor to prosecute the Work successfully and promptly, and to complete the Work within the time stated in the Contract.

If required by the Special Provisions, a statement of experience and business standing, together with that of all Subcontractors that were designated in the Bid, shall be submitted on an Agency-provided form by the three (3) apparent low Bidders within seven (7) days after the opening of Bids. To determine the experience of a Bidder, any relevant evidence will be considered that the Bidder, or personnel, has satisfactorily performed on other contracts of similar nature and magnitude or difficulty.

2-7 JOINT VENTURE BIDS

If two or more prospective Bidders desire to bid jointly as a joint venture on a single project, the joint venture Bid must be accompanied by a notarized copy of a valid license issued to the joint venture by the Contractor's State License Board. If a copy of the joint venture license is not filed with the Bid, the Bid will be rejected.

2-8 SUBCONTRACTORS

Except as noted in the Special Provisions, the Contractor shall perform, with the Contractor's own organization and with workers under the Contractor's immediate supervision, work of a value not less than fifty percent (50%) of the value of original Total Contract Price less "Specialty Items". "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract as a whole. In general, "Specialty Items" are to be limited to minor components of the overall contract. "Specialty Items" may be performed by subcontract and the cost of any "Specialty Items" so performed may be deducted from the original Total Contract Price before computing the amount of work required to be performed by the Contractor. Where an entire item is subcontracted, the value of work subcontracted will be based on the Contract item bid price. When a portion of an item is subcontracted, the value of work subcontracted will be based on the estimated percentage of the contract item bid price, determined from information submitted by the Contractor, subject to approval by the Agency. In accordance with the Subletting and Subcontracting Fair Practices Act, of the Public Contract Code, Section 4100 et seq., each Bidder shall list in the bid form:

- The name and the location of the place of business of each Subcontractor whom the Bidder proposes to perform work or labor or render service to the prime Contractor in or about the construction of the Work, or a Subcontractor licensed by the State of California who, under subcontract to the prime Contractor, is proposed by the Bidder to specially fabricate and install a portion of the Work according to detailed drawings contained in the Contract, in an amount in excess of one-half of one percent (0.5%) of the Total Bid or, in the case of a Bid for the construction of streets or highways, including bridges, in excess of one-half of one percent (0.5%) of the Bidder's Total Bid or ten thousand dollars ($10,000), whichever is greater.
- The portion of the Work [type of work and percentage if not one hundred percent (100%) that will be done by each Subcontractor. The Bidder shall list only one Subcontractor for each portion as is defined by the Bidder in the Bid.

If a Bidder fails to specify a Subcontractor for any portion of the Work to be performed under the Contract (or specifies more than one Subcontractor for the same work), the Bidder agrees that the Bidder is fully qualified and shall perform that portion of the Work. If after the award of the Contract, the Contractor subcontracts any portion of the Work, except as provided in Section 4107 or 4109 of the Act, the Contractor shall be subject to the penalties specified in Section 4111 of the Act.

A listed Subcontractor shall perform with the Subcontractor's own organization and with workers under the Subcontractor's immediate supervision, work of a value of not less than seventy-five percent (75%) of the value of each item of work for which the Subcontractor is listed.

Pursuant to Public Contract Code Section 6109, a Contractor may not perform work with a Subcontractor who is ineligible to perform work on public works projects pursuant to Labor Code Sections 1777.1 and 1777.7.

The apparent low Bidder shall submit the license numbers of all Subcontractors to the Agency within three (3) days, not counting Saturdays, Sundays, and holidays, of Bid opening. If the low Bidder is not the apparent low Bidder, the low Bidder shall submit the license numbers of all listed subcontractors to the Agency within three (3) days, not counting Saturdays, Sundays, and holidays, of the date notified.

The Contractor shall include provisions in every Subcontract that the Contract between the Contractor and the Agency is part of the Subcontract, and that all terms and provisions of the Contract are incorporated in the Subcontract. Copies of all Subcontracts shall be available to the Agency upon written request.

2-9 ADDENDA

The correction of any material discrepancies in, or material additions to/omissions from, the Plans, Specifications, or other Contract, or any interpretation thereof, during the bidding period will be made only by an Addendum issued by the Agency. A copy of each Addendum issued by the Agency will be mailed or delivered to each planholder listed on the Agency planholder list and is a part of the Contract. Any interpretation or explanation not included in the addenda will not be considered binding.

2-10 ASSIGNMENT OF ANTITRUST ACTIONS

The Bidder is required to comply with Public Contract Code Section 7103.5(b), which addresses assignment of antitrust actions.

2-11 BID GUARANTEE

The Bid shall be accompanied by a Bid Guarantee in the form of cash, a certified check, a cashier's check, or a bidder's bond. The Bid Guarantee shall be executed by an admitted surety insurer in favor of the Agency, the amount of which shall be not less than ten percent (10%) of the Base Bid amount, or other security acceptable to the Agency. No Bid will be considered unless accompanied by a Bid Guarantee.

The Agency is authorized to forfeit as necessary sums of such Bid Guarantee as specified in Section 3-8 of these Specifications.

2-12 WITHDRAWAL OF BID

A Bid may be withdrawn at any time prior to the hour fixed in the Notice to Contractors for the submission of Bids by a written request of the Bidder filed with the Agency at the location where the Bid was submitted. The withdrawal of a Bid will not prejudice the right of a Bidder to file a new Bid within the time prescribed.

2-13 PUBLIC OPENING OF BIDS

Bids will be opened and read publicly at the time and place indicated in the Notice to Contractors or in a subsequent Addendum. Bidders or their authorized representatives and other interested parties are invited to be present.

2-14 REJECTION OF BIDS

The Agency reserves the right to reject any and all Bids. The Agency reserves the right to waive irregularities in a Bid and to make an award in the best interest of the Agency.

Bids containing omissions, erasures, alterations, conditions, or additions not called for may be rejected.

2-15 RELIEF OF BIDDERS

Attention is directed to Public Contract Code Sections 5100 through 5107, concerning relief of Bidders and in particular to the requirement therein that if the Bidder claims a material mistake was made in its Bid, the Bidder shall give the Agency written notice within five (5) days after the opening of the Bids (excluding Saturdays, Sundays, or legal holidays) of the alleged mistake, explaining in the notice in detail how the mistake occurred.

SECTION 3 AWARD AND EXECUTION OF CONTRACT

3-1 AWARD OF CONTRACT

The award of the Contract, if the Contract is to be awarded, will be to the lowest responsive, responsible Bidder. In addition to price in determining the lowest responsive, responsible Bidder, consideration will be given to:

- the ability, capacity and skill of the Bidder to perform the Work;
- the ability of the Bidder to perform the Work within the time specified, without delay;
- the ability of the Bidder to perform the Work in a safe manner;
- the character, integrity, reputation, judgment, experience and efficiency of the Bidder; and
- the quality of the Bidder's performance on previous work with the Agency.

If an alternate or alternates are selected by the County, award will be based on the lowest total price for the sum of the base bid price plus the bid prices of the selected alternate or alternates.

Alternates will be taken in order from a list of those items, depending on available funds as identified in the bid solicitation.

3-2 TIME OF AWARD

The award, if made, will be made within thirty (30) days after the Bid Opening. If the lowest responsive, responsible Bidder refuses or fails to execute the Contract, the Agency may award the Contract to the second lowest responsive, responsible Bidder. The specified period of time within which the award of the Contract may be made may be subject to extension for further periods as agreed upon in writing by the Agency and the Bidder.

Protests must be filed in writing with the Clerk of the Board within five (5) working days of opening of bids.

3-3 CONSIDERATION OF BIDS

After the Bids have been opened and read, they will be checked for accuracy and compliance with the Specifications.

In the event that the product of a unit price and an estimated quantity does not equal the extended amount quoted, the unit price shall govern and the correct product of the unit price and the estimated quantity shall be deemed to be the amount bid. If the sum of two or more items in a bidding schedule or the sum of two or more bidding schedules does not equal the total amounts quoted, the individual item or schedule amounts shall govern and the correct total shall be deemed to be the amount bid. If the Bid is missing the unit price, then it may be deemed incomplete and the Bid may be rejected.

After the Agency has made any necessary corrections in mathematical errors appearing on the face of the Bid, all Bids will be compared based on the bid form.

3-4 PERFORMANCE AND PAYMENT BONDS

The format of the Performance Bond and Payment Bond forms shall be those contained in these Specifications.

As part of the execution of the Contract, the successful Bidder shall furnish the following corporate surety bonds to the benefit of the Agency. Bonds shall be executed by a surety company authorized to do business in the State of California and listed in the current Federal

Department of Treasury Circular 570. When the amount to be paid to the Contractor is based upon units of work to be performed or items to be provided, the term "Total Contract Price" as used below for the purpose of posting Performance and Payment Bonds shall be computed on the basis of the unit price bid multiplied by the Estimated Quantities of work to be performed.

3-4.01 Performance Bond

The Performance Bond, to guarantee the performance of all covenants and stipulations of the Contract, shall be on a form approved by the Agency and shall be in a sum not less than one hundred percent (100%) of the original Total Contract Price as set forth in the Contract.

3-4.02 Payment Bond

The Payment Bond, to guarantee the payment of wages and of bills contracted for materials, supplies, or equipment used in the performance of the Contract, shall be on the form provided by the Agency and shall be in a sum not less than one hundred percent (100%) of the original Total Contract Price as set forth in the Contract.

3-5 NOTIFICATION OF SURETY COMPANIES

The surety company shall be familiar with all the provisions and conditions of the Contract. It is understood and agreed that the surety company waives notice of change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or to the specifications accompanying the same, or any other act or acts by the Agency or the Agency's authorized agents under the terms of the Contract; and failure to so notify the surety company of changes shall in no way relieve the surety company of its obligations under the Contract.

3-6 RETURN OF BID GUARANTEES

After Bids have been received and reviewed by the Agency, Bid Guarantees will be returned to the respective Bidders except those submitted by the three lowest responsive, responsible Bidders.

Bid Guarantees for Bids not to be further considered in executing the Contract will be returned within ten (10) days after the award of the Contract. The Bid Guarantees of the three lowest responsive, responsible Bidders will be returned, except as noted otherwise in Section 3-8, "Failure to Execute Contract", of these Specifications, within ten (10) days after the successful Bidder has filed satisfactory bonds and proof of insurance as specified and the Bidder and the Agency have executed the Contract.

If all Bids are rejected and no award is made, all Bid Guarantees will be returned within ten (10) days of the decision of the Board to not award the Contract.

3-7 EXECUTION OF CONTRACT

Upon approval from the Agency's governing Board to award the Contract to the apparent low bidder, the Contract shall be signed by the successful Bidder and returned to the Agency, together with the Performance Bond, Payment Bond and certificates of insurance within ten (10) days of the Bidder's receipt of the documents. Receipt by the Agency of the signed documents from the Contractor is deemed to constitute "execution" of the Contract. Insurance certificates shall be signed by a person authorized by the insurer to bind coverage on its behalf and shall be accompanied by copies of all endorsements required by Section 3-9, "Insurance", of these Specifications. The successful bidder shall furnish complete, certified copies of all required bonds and insurance policies, including endorsements specifically required by Section 3-9, "Insurance". After execution by the Agency, one copy of the executed Contract, bonds, and certificates of insurance will be returned to the Contractor.

3-8 FAILURE TO EXECUTE CONTRACT

If the Bidder to whom the Contract is awarded fails to execute the Contract and file acceptable bonds and insurance certificates as provided herein within ten (10) days from the time the Contract forms are received by the Bidder, the award may be annulled and the Bidder's Bid Guarantee forfeited to the Agency up to the full amount of the Bidder's Bid Guarantee. At the Agency's discretion, the Contract may then be awarded to the next lowest responsive, responsible Bidder.

If the Agency awards the Contract to the second lowest responsive, responsible Bidder, the lowest responsive, responsible Bidder's Bid Guarantee shall be applied by the Agency to the difference between the lowest Bid and the Bid of the second lowest responsive, responsible Bidder.

On refusal or failure of the second lowest responsive, responsible Bidder to execute the Contract, the Agency may award it to the third lowest responsive, responsible Bidder. If the Agency awards the Contract to the third lowest responsive, responsible Bidder, in addition to application of the lowest Bidder's Bid Guarantee as aforesaid, the second lowest responsive, responsible Bidder's Bid Guarantee shall be applied by the Agency to the difference between the Bid of the second lowest responsive, responsible Bidder and the Bid of the third lowest responsive, responsible Bidder.

Additionally, any forfeited Bid Guarantee shall be applied as necessary to reimburse for costs incurred for failure of the successful Bidder(s) to enter into a contract. The surplus, if any, will be returned the defaulting Bidder(s), if a check or cash is used, or credited to the surety on the Bidder's Bond, if a bond is used.

The amount of the Bid Guarantee shall not be deemed to constitute a penalty or liquidated damages. The Agency is not precluded by a Bid Guarantee from recovering from the defaulting Bidder damages in excess of the amount of said Bid Guarantee.

3-9 INSURANCE

The Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, the following insurance:

3-9.01 General Liability

General Liability insurance including, but not limited to, protection for claims of bodily injury and property damage liability, personal and advertising injury liability, contractual and products and completed operations liability. Coverage shall be at least as broad as "Insurance Services Office Commercial General Liability Coverage Form CG 0001" (occurrence). The limits of liability shall be not less than:

Each Occurrence	One Million Dollars ($1,000,000)
Personal & Advertising Injury	One Million Dollars ($1,000,000)
Products and Completed Operations Aggregate	Two Million Dollars ($2,000,000)
General Aggregate	Two Million Dollars ($2,000,000)
Fire Damage	One Hundred Thousand Dollars ($100,000)

The Products and Completed Operations coverage shall be maintained for at least two years after completion of the Contract.

3-9.02 Automobile Liability

Automobile Liability insurance providing protection against claims of bodily injury and property damage arising out of ownership, operation, maintenance, or use of owned, hired, and

non-owned automobiles. Coverage shall be at least as broad as "Insurance Services Office Business Auto Coverage Form CA 0001," symbol 1 (any auto). Use of any symbols other than symbol 1 for liability for corporate/business owned vehicles must be declared to and approved by the Agency. If there are no owned or leased vehicles, symbols 8 and 9 for non-owned and hired autos shall apply. Personal automobile insurance shall apply if vehicles are individually owned.

The limits of liability shall not be less than:

> Corporate/business owned or commercially insured vehicles, including non-owned and hired, $1,000,000 Combined Single Limit. Individually owned vehicles, $500,000 Combined Single Limit or, if split limits are used, $250,000 per person, $500,000 each accident, $100,000 property damage.

3-9.03 Workers' Compensation

Workers' Compensation insurance, with coverage as required by the State of California (unless the Contractor is a qualified self-insurer with the State of California), and Employers' Liability coverage. The limits of Employers' Liability shall not be less than:

Each Accident	One Million Dollars ($1,000,000)
Disease Each Employee	One Million Dollars ($1,000,000)
Disease Policy Limit	One Million Dollars ($1,000,000)

The Workers' Compensation policy required hereunder shall be endorsed to state that the Workers' Compensation carrier waives its right of subrogation against the Agency, its governing Board, officials, directors, agents, employees and volunteers.

In the event the Contractor is self-insured, the Contractor shall furnish a Certificate of Permission to Self-Insure by the Department of Industrial Relations Administration of Self-Insurance, Sacramento.

3-9.04 Excess or Umbrella Liability

If the Special Provisions require limits of general liability insurance of more than one million dollars ($1,000,000) per occurrence, the Contractor shall carry excess or umbrella liability insurance providing excess coverage at least as broad as the underlying coverage for general liability, automobile and employer's liability with a limit equal to the amount stated in the Special Provisions per occurrence and aggregate.

3-9.04.A Contractor's Equipment

The Contractor, and each of its Subcontractors, shall separately insure its own equipment for loss and damage. The Contractor's Property and Inland Marine policies shall include, or be endorsed to include, a waiver of subrogation against the Agency, its governing Board, officers, directors, agents, employees and volunteers which might arise by reason of damage to the Contractor's property or equipment (owned, leased, hired or borrowed) in connection with work performed under this Contract by the Contractor.

3-9.04.B Railroad Protective Liability

When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, Railroad Protective Liability insurance with limits of liability as set forth in the Special Provisions.

3-9.04.C Builder's Risk Insurance

When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract and until the date of transfer of the insurable interest to and acceptance by the Agency, at the Contractor's sole expense, Builder's Risk insurance with limits of liability equal to one hundred percent (100%) of the contract value of the Work. Valuation shall include the cost of materials and the cost of labor to install materials.

a. Coverage shall be written on a completed value, non-reporting form, on a replacement cost basis, and shall cover the property against all risks of physical loss or damage including:
   i. land movement and flood
   ii. loss that ensues from design error, defective materials, or faulty workmanship
   iii. mechanical breakdown or electrical damage including testing, magnetic disturbance and changes in temperature or humidity.

The property covered shall include the Work, including any materials, equipment, or other items to be incorporated therein while the same are located at the construction site, stored off site, while in transit or at the place of manufacture. The policy shall contain a provision that the interests of the Agency, the Contractor, and its Subcontractors are covered and that any loss shall be payable to the Agency, the Contractor, and its Subcontractors as their interests may appear.

When stated as a requirement in the Special Provisions, Builders Risk insurance shall include Delay in Opening coverage with limits of liability, and for the period of time, as set forth in the Special Provisions. Coverage shall include debt service, expense, loss of earnings or rental income or other loss incurred by the Agency, without deduction, due to the failure of the project being completed on schedule.

b. The maximum deductible for land movement and flood allowable under this policy shall be five percent (5%) of replacement value at the time of loss per occurrence and in the aggregate (if commercially available and at a reasonable cost) or, five percent (5%) of the contract value of the Work per occurrence and in the aggregate. The maximum deductible for all other perils allowable under this policy shall be ten thousand dollars ($10,000) unless approved by the Agency. All deductibles shall be borne solely by the Contractor, and the Agency shall not be responsible to pay any deductible, in whole or in part.
c. The Agency and the Contractor waive all rights against each other and against all other contractors and their subcontractors for loss or damage to the extent reimbursed by Builders' Risk insurance or any other property or equipment insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance. If the policies of insurance referred to in this section require an endorsement or consent of the insurance company to provide for continued coverage where there is a waiver of subrogation, the owners of such policies will cause them to be so endorsed to obtain such consent.
d. If not covered by Builders' Risk insurance or any other property or equipment insurance required by this Contract, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, property insurance for portions of the Contractor's work and/or equipment to be incorporated therein stored offsite or in transit.

3-9.04.D Environmental Liability Insurance

When stated as a requirement in the Special Provisions, the Contractor shall procure, maintain, and keep in force at all times during the term of the Contract, at the Contractor's sole expense, Environmental Liability insurance which includes coverage for sudden and accidental

pollution arising out of the handling of hazardous materials or hazardous wastes, and coverage for liability arising out of the handling of asbestos. If coverage for Environmental Liability insurance is written on a claims-made form, the following provisions apply:

1. The "Retro Date" must be shown, and must be on or before the date of the Contract or the beginning of the Work.
2. Insurance must be maintained and evidence of insurance must be provided for at least one (1) year after completion of the Contract.
3. If coverage is cancelled or non-renewed, and not replaced with another claims-made policy form with a "Retro Date" prior to the Contract effective date, the Contractor must purchase "extended reporting" coverage for a minimum of one (1) year after completion of the Contract.

3-9.04.E Other Provisions

1. The Contractor's General Liability, policy shall contain the following provisions:
   a. The Agency, its governing Board, officers, directors, agents, employees, and volunteers shall be covered as additional insureds as respects liability arising out of the acts or omissions by or on behalf of the Contractor, or premises owned, occupied, or used by the Contractor. The policy shall contain no special limitations on the scope of coverage afforded to the Agency, its governing Board, officers, directors, agents, employees and volunteers.
   b. The Contractor's General Liability policy shall be specifically endorsed to name the Agency, its governing Board, officers, directors, agents, employees and volunteers as additional insureds utilizing ISO form CG 20 10 11/85 or its equivalent to provide additional insured coverage, including completed operations. If the additional insured form does not include completed operations, the General Liability policy shall be endorsed to add completed operations using ISO form CG 20 37 07/04 or its equivalent – if commercially available and at a reasonable cost. If the Contractor's General Liability policy utilizes blanket or automatic additional insured coverage, the coverage shall include or be endorsed to include completed operations.
   c. The Contractor's General Liability policy shall be endorsed to include a waiver of subrogation in favor of the Agency as named on the "Additional Insured" endorsement. Such waiver of subrogation shall be on ISO Form CG 24 04 10/93 "Waiver of Transfer of Rights of Recovery Against Others to Us" or its equivalent.
   d. For any claims related to this Contract, the Contractor's insurance coverage shall be primary insurance as respects the Agency, its governing Board, officers, directors, agents, employees and volunteers. Any insurance or self-insurance maintained by the Agency, its officers, officials, employees, agents, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.
   e. The Contractor's General Liability insurance policies shall contain an endorsement stating that any aggregate limits shall apply separately to the Work.
   f. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
2. The Contractor's Automobile Liability policy shall name the Agency, its governing Board, officers, directors, agents, employees and volunteers as additional insureds utilizing ISO form CA 20 48 02/99 Designated Insured, or its equivalent.
3. Each insurance policy shall state that coverage shall not be cancelled by the Contractor or the Agency, reduced in scope of coverage or in limits, non-renewed, or otherwise materially changed unless the insurer(s) provide thirty (30) days written notice to the Agency prior to such change. Ten (10) days prior written notice shall be given to the Agency in the event of cancellation due to nonpayment of premium.

4. All of the Contractor's insurance coverage, except as noted below, shall be placed with insurance companies with a current A.M. Best rating of at least A-:VII.
   Exceptions:
   a. Underwriters at Lloyd's of London, which are not rated by A.M. Best.
   b. Workers' Compensation which is provided through a State Compensation Insurance Fund or a qualified self-insurer for Workers' Compensation under California law.
   c. For liability insurance required under Section 3-9.04D (Environmental Liability insurance), insurance requirements shall be placed with insurance companies with a current A.M. Best rating of at least B+:VII.
5. The Contractor shall sign and file with the Agency the following certification prior to commencing performance of the work of the Contract:
   "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of the Code, and I will comply with such provisions before commencing the performance of the Work of this Contract."
   Said certification is included in the Contract, and signature and return of the Contract shall constitute signing and filing of the said certification.
6. The Agency, at its discretion, may require new types of insurance coverage or increase the limits of insurance coverage required hereunder at any time during the term of the Contract by giving thirty (30) days written notice to the Contractor. Contractor shall immediately procure such insurance or increase the limits of coverage and provide certificates of insurance, including copies of all required endorsements, to the Agency within thirty (30) days of receipt of the Agency's request.
7. The required insurance coverage shall be subject to the approval of the Agency, but any acceptance of insurance certificates by the Agency shall in no way limit or relieve the Contractor of its duties and responsibilities in this Contract.
8. If the Contractor fails to procure or maintain insurance as required by this Section and any Special Provisions, or fails to furnish the Agency with proof of such insurance, the Agency, at its discretion, may procure any or all such insurance. Premiums for such insurance procured by the Agency shall be deducted and retained from any sums due the Contractor under the Contract. Failure of the Agency to obtain such insurance shall in no way relieve the Contractor from any of the Contractor's responsibilities under the Contract. Any failure of the Contractor to maintain any item of the required insurance is sufficient cause for termination of the Contract.
9. The making of progress payments to the Contractor shall not be construed as relieving the Contractor of responsibility for loss or damage, or destruction occurring prior to final acceptance by the Agency.
10. The Agency is authorized to execute amendments and waivers, with or without conditions, to the insurance requirements of the Contract. The Agency will provide such amendments or waivers in writing to the Contractor.
11. Contractor is responsible for the acts and omissions of all its subcontractors and shall require all its subcontractors to maintain adequate insurance.

The failure of the Agency to enforce in a timely manner any of the provisions of this Section shall not act as a waiver to enforcement of any of these provisions at any time during the term of the Contract.

3-9.04.F Deductibles and Self-Insured Retention

Any deductible or self-insured retention that applies to Commercial General Liability or Automobile Liability must be declared to and approved by the Agency.

3-9.05 Tracking and Reporting Job-Related Incidents

The Contractor shall report by telephone to the Agency within twenty-four (24) hours and also provide a written report to the Agency within fifteen (15) days after the Contractor or any subcontractors or agents have knowledge of any incident involving death of or injury to any person or persons, or damage in excess of ten thousand dollars ($10,000) to the Work, property of the Agency or others, arising out of any work done by or on behalf of the Contractor as part of the Contract. Such report shall contain:

1. the date and time of the incident,
2. the names and addresses of all persons involved, and
3. a description of the incident and the nature and extent of injuries and/or damages.

The Contractor and all Subcontractors shall cooperate with the Agency's independent investigatory efforts and provide the Agency with related documentation when requested (excluding confidential information restricted by law).

If requested, the Contractor shall report to the Agency their Recordable Incidence Rate (RIR) and Lost Time Incidence Rate (LTIR) at the end of each project.

The Contractors' incidence rates shall be calculated in accordance with the following:

- Recordable Incidence Rate (RIR)

$$\frac{\text{Number of OSHA Recordable Cases X 200,000*}}{\text{Total hours worked by all employees for the Contract}}$$

- Lost Time Incidence Rate (LTIR)

$$\frac{\text{Number of Lost Time injuries and illnesses X 200,000*}}{\text{Total hours worked by all employees for the Contract}}$$

Note: A fatality shall not be considered a Lost Time Case (LTC) and shall not be included in the rate. Furthermore, all work-related fatalities, and all other serious injuries meeting the legal criteria for "reporting", shall be reported immediately to Cal/OSHA as required by law and reported immediately to the Agency as indicated above.

** 200,000 is equivalent to the number of work hours worked by 100 full time employees at 40 hours per week/50 weeks per year.*

3-9.06 Notification of Claim or Lawsuit

If any claim for damages is filed with the Contractor or any Subcontractor, or if any lawsuit is instituted against the Contractor or any Subcontractor that arises out of or is in any way connected to the Contractor's or Subcontractor's performance under the Contract, and in any way, directly or indirectly, contingently or otherwise, affects or might reasonably affect the Agency, the Contractor shall give prompt and timely (within thirty (30) days following the date of receipt of a claim or ten (10) days following the date of service of process of a lawsuit) written notice thereof to Agency.

SECTION 4 SCOPE OF WORK

4-1 INTENT OF CONTRACT DOCUMENTS

The Work shall be performed and completed according to the Contract documents. The Contract documents provide the details for completing the Work in accordance with the terms of the Contract. Each Contract document is an integral part of the Contract, and a requirement occurring in one is as binding as though occurring in all. The Contract documents shall be interpreted as being explanatory and complementary in requiring complete work ready for use and occupancy or operation in satisfactory working condition with respect to the functional purposes of the installation.

The Contractor shall do all of the work and furnish all labor, materials, tools, equipment, and appliances, except as otherwise herein expressly stipulated, necessary or proper for performing and completing the work herein required, including any Change Order work or disputed work directed by the Agency in conformity with the true meaning and intent of the Contract drawings, Specifications, and all provisions of the Contract, within the time specified.

All work shown on the Plans, the dimensions of which are not figured, shall be accurately followed to the scale to which the drawings are made; however, figured dimensions shall in all cases be followed, even if they differ from scaled measurements. Full-size drawings shall be followed in the execution of the Work.

If the Contract does not specifically allow the Contractor a choice of quality or cost of items to be furnished, but could be interpreted to permit such a choice, the Contractor shall furnish the highest quality under current industry standards, regardless of the cost of the item.

Unless otherwise specified, the Contractor agrees to furnish all tools, equipment, apparatus, facilities, labor, material, and transportation necessary to perform and complete the Work in a good and workmanlike manner to the satisfaction of the Agency, in the manner designated, and in strict conformity to the Contract. When portions of the Work are described in general terms, but not in complete detail, it is understood that the Contractor will employ only the best general practice and incorporate only the best quality materials and workmanship in the Work.

No extra compensation will be allowed for anything omitted but fairly implied. The prices paid for the various items will include full compensation for furnishing all labor, materials, tools, equipment, overhead, and incidentals and doing all work necessary to complete the Work as provided in the Contract. The prices paid include all markups and profit.

If the Contractor discovers any discrepancies during the course of the Work between the Contract drawings and conditions in the field, or any errors or omissions in the Contract drawings and conditions in the field, or any errors or omissions in the Contract drawings, the Specifications, or in the layout given by stakes, points, or instructions, it shall be the Contractor's duty to inform the Agency immediately, and the Agency shall promptly verify the same. Any work done after such discovery, until authorized by the Agency, will be done at the Contractor's risk.

4-2 PLANS AND SPECIFICATIONS FURNISHED

The Agency will provide, at no cost to the Contractor, copies of Project Plans (except Standard Drawings or State Plans), Project Specifications (except these Standard Construction Specifications or the State Specifications), and Special Provisions, and the fully executed Contract for the Contractor’s use in prosecuting the Work. The total number of copies of the Plans, Specifications, and Special Provisions provided shall equal the total of the prime Contractor plus the number of Subcontractors listed in the Bid. The Contractor may purchase additional copies of Plans, Specifications, and Special Provisions at cost.

The Contractor shall retain an approved set of Contract documents on the job during the progress of the Work. This set shall be used by the Contractor as the Record Drawings as described in Section 11-3, "Record Drawings", of these Specifications.

4-3 CONFORMANCE WITH CODES AND STANDARDS

The Work shall be in full compliance with the latest adopted edition of the following applicable standards and regulations:

- the State Fire Marshal
- the UBC
- Title 8
- Title 24
- the NEC
- the UPC
- other codes, laws or regulations applicable to the Work or the Contract.

Nothing in the Contract is to be construed to permit work not conforming to these requirements. When the work detailed in the Plans and Specifications differs from governing codes, the Contractor shall complete the Work in accordance with the higher standard. If the higher standard is more expensive than the work detailed in the Plans and Specifications, the Contractor will be compensated for the Contractor's additional costs by Contract Change Order as provided in Section 9, "Changes and Claims", of these Specifications.

4-4 SUPPLEMENTAL DRAWINGS

In addition to the Plans incorporated in the Contract at the time of signing, the Agency may furnish Supplemental Drawings as necessary to clarify or define in greater detail the intent of the Contract. In furnishing such Supplemental Drawings, the Agency may make minor changes in the Work, not involving extra cost and not inconsistent with the nature of the Work. The Supplemental Drawings shall become a part of the Contract.

4-5 FIELD INSTRUCTIONS OR OTHER WRITTEN DIRECTIVES

The Agency may issue Field Instructions or other written directives during the course of the Work, and the Contractor shall comply with the Field Instruction or other written directive. A Field Instruction or other written directive may be used to add, delete, modify, or reject work, to note deficiencies in work, to clarify the Contract or to order work to be performed. Work required by a Field Instruction or other written directive shall be in accordance with the Contract and any previously executed Contract Change Orders, except as delineated otherwise in the Field Instruction or other written directive. Drawings included with Field Instructions or other written directives are part of the Contract and shall be incorporated into the Record Drawings.

If the Contractor neglects to comply with or make progress in the execution of any Field Instruction or other written directive, the Agency may employ any person or persons to perform such work and the Contractor shall not interfere with the person or persons so employed.

Field Instructions and other written directives that alter the Contract will be grouped to form a Contract Change Order as described in Section 9, "Changes and Claims", of these Specifications.

4-6 DOCUMENT PRECEDENCE

The component Contract documents are intended to provide explanation for each other. Any work shown on the Plans and not in the Specifications, or vice versa, is to be executed as if

indicated in both. In case of conflict in the Contract, the following order of precedence will govern interpretation of the Contract:

1. Field Instructions or other written directives
2. Special Provisions and Project-specific Specifications
3. Project Plans
4. County Standard Drawings
5. County Standard Specifications
6. State Standard Plans
7. State Standard Specifications

Any work for which there are no provisions in these Specifications, the Special or Technical Provisions, or on the Contract drawings, shall be performed in accordance with the provisions of the State Specifications.

4-7 REQUESTS FOR INFORMATION

4-7.01 General

Contractor shall prepare a Request for Information (RFI) when additional information, clarification, or interpretation of the Contract is required. RFI's may also be used for apparent conflicts, inconsistencies, ambiguities, or omissions.

RFI's shall be submitted to the Agency sufficiently in advance of the work to permit time for investigation and preparation of a response. Any work undertaken prior to receipt of a response to an RFI will be at the Contractor's risk. Contract time extensions will not be granted due to the Contractors failure to submit an RFI sufficiently in advance of the work to permit a response by the Agency in accordance with Section 4-7.03, "Response", of these Specifications.

RFI's shall not be used for submittals or for substitution of material or equipment, or for waiving of requirements.

4-7.02 Procedure

An RFI shall be submitted on an approved form as defined at the preconstruction meeting, and shall be numbered consecutively. A status log shall be prepared and updated by the Contractor and reviewed with the Agency at each progress meeting. Each RFI shall deal with only one topic, item, issue, or system.

The RFI shall clearly describe and specifically state what is being requested. Relevant portions of the Contract shall be cited, marked-up, and attached.

The Contractor shall review each RFI before submittal and compare it with the Contract to verify that a response is required. RFI's will only be accepted from the Contractor and not from Subcontractors or suppliers.

A recommendation or proposed solution may be included when appropriate or expedient.

RFI's that are not clear or RFI's for which a response is clearly identified in the Contract will not be accepted.

4-7.03 Response

The Agency will respond within fifteen (15) Working Days of receipt of the RFI. The Agency will provide a written response, and that response shall control.

The Contractor shall indicate a priority for responses to RFI's if more than five (5) RFI's are pending at the same time. In case of a dispute between the Contractor and the Agency, protest may be made as provided in Section 9-16, "Dispute Regarding Contract Requirements", of these Specifications.

Subsequent resubmittals of an RFI shall be identified with the same RFI number and a letter designation. Resubmittals shall clearly state the reason for the resubmittal. The Agency will respond to each resubmittal within fifteen (15) Working Days of receipt of the resubmitted RFI.

Responses to RFI's shall be recorded by the Contractor on the Record Documents in accordance with Section 11-3, “Record Drawings”, of these Specifications.

4-8 DELETED ITEMS

The Agency may delete from the Work any item of work. The Contractor will be paid for all work done toward the completion of the item prior to such omission, as provided in Section 9, “Changes and Claims”, of these Specifications but in no event will the amount paid exceed the Bid or Schedule of Values amount less the value of the deleted work.

The Contractor shall make no claim, nor receive any compensation for profits, for loss of profit, for damages, or for any extra payment whatever because of any deleted items of work.

4-9 EXTRA WORK

Work not covered by the Contract but necessary for the proper completion of the Project will be classed as extra work and shall be performed by the Contractor when directed in writing by the Agency. Extra work shall be performed in accordance with the Contract and as directed by the Agency.

Extra work must be authorized in writing by the Agency before the work is started. Payment for extra work will not be made unless such prior written authorization is obtained.

In the event of an emergency or other situation that endangers the Work or endangers public safety, the Agency will direct the Contractor to perform such extra work necessary to protect the Work or the public.

4-10 USE OF COMPLETED PORTIONS

The Agency has the right during the progress of the Work to take over and place in service any completed or partially completed portion of the Work. Taking possession shall not be deemed acceptance of any other portions of the Work, nor work on those portions not completed in accordance with the Contract.

4-11 LANDS AND RIGHTS-OF-WAY

The Agency shall provide the lands, rights-of-way, and easements upon which the Work is to be done, and such other lands as may be designated on the Plans for the use of the Contractor. The Contractor shall confine his operations to within these limits.

The Contractor shall provide at the Contractor's own expense any additional land and access that is required for temporary construction facilities or storage of materials. The Contractor shall obtain all required permissions for use of private property prior to taking possession or use. The permission shall be obtained in writing and a copy forwarded to the Agency prior to the Contractor taking possession of said property.

4-12 WARRANTY

The Performance Bond furnished by the Contractor as part of the execution of the Contract shall define the terms and time period of the Warranty of the Contractor’s work unless otherwise specified in the Special Provisions. If no time period is specified in the Bond, the time period will be one year after field acceptance of Work (see Section 7-21, “Final Inspection and Field Acceptance”, of these Specifications).

If required by the Special Provisions, the Contractor shall enter into and sign Warranty statements in the form provided to warranty various segments of the Work for the time specified.

If failure of any portion of the Work can be attributed to faulty materials, poor workmanship, defective equipment, or any other reason that can be attributed to Contractor’s performance, and occurs within the specified warranty period, the Contractor shall promptly make the needed repairs at the Contractor's expense.

The Agency is hereby authorized to make such needed repairs if the Contractor fails to undertake, with due diligence, the needed repairs within ten (10) Calendar Days after the Contractor is given written notice of such failure and without notice to the surety; provided, however, that in case of emergency where, in the opinion of the Agency, delay would cause serious loss or damages or a serious hazard to the public, the repairs may be made or lights, signs, and barricades erected without prior notice to the Contractor or surety, and the Contractor shall pay the entire costs.

SECTION 5 CONTROL OF WORK AND MATERIALS

5-1 AUTHORITY OF AGENCY

The Agency will decide all questions regarding the quality and acceptability of materials furnished, work performed, and rate of progress of the Work. The Agency will decide all questions regarding the interpretation and fulfillment of the Contract on the part of the Contractor, and all questions as to the rights of different contractors involved with the Work. The Agency will determine the amount and quality of the Work performed and materials furnished for which payment is to be made under the Contract.

The Agency will administer its authority through a duly designated representative identified at the preconstruction meeting. The Contractor and the Agency representative shall make good faith attempts to resolve disputes that arise during the performance of the Work.

Any order given by the Agency not otherwise required by the Contract to be in writing will be given or confirmed by the Agency in writing at the Contractor's request. Such request shall state the specific subject of the decision, order, instruction, or notice and, if it has been given orally, its date, time, place, author and recipient.

5-2 ATTENTION AND COOPERATION OF CONTRACTOR

The Contractor shall comply with any written or verbal instruction delivered to the Contractor or the Contractor's authorized representative. See Sections 4-5, "Field Instructions or Other Written Directives", and 5-1, "Authority Of Agency".

5-3 SUGGESTIONS TO CONTRACTOR

Any plan or method suggested to the Contractor by the Agency, but not specified or required in writing, if adopted or followed in whole or in part by the Contractor, shall be used at the risk and responsibility of the Contractor. The Agency assumes no responsibility.

5-4 SEPARATE CONTRACTS

The Agency reserves the right to award other Contracts in connection with the Work. The Contractor shall afford other contractors reasonable opportunity for the delivery and storage of their materials and the execution of their work and shall properly connect and coordinate their work with the other contractors.

If any part of the Contractor's work depends upon the work of any other contractor for proper execution or results, the Contractor shall inspect and promptly report to the Agency any defects in such work that render it unsuitable for proper execution and results. The Contractor's failure to so inspect and promptly report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the Contractor's work, unless defects develop in the other contractor's work after the execution of the Contractor's work.

5-5 COOPERATION WITH OTHER CONTRACTORS

The Agency or adjacent property owners may perform work adjacent to or within the Work area concurrent with the Contractor's operations. The Contractor shall conduct operations to minimize interference with the work of other forces or contractors.

Any disputes or conflicts between the Contractor and other forces or contractors retained by the Agency which create delays or hindrance to each other shall be referred to the Agency for resolution. If the Contractor's work is delayed because of the acts or omissions of any other

force or contractor, the Contractor shall have no claim against the Agency other than for an extension of time (see Section 7-18, "Extension of Time", of these Specifications).

5-6 CONTRACTOR'S DISMISSAL OF UNSATISFACTORY EMPLOYEES

If any person employed by the Contractor or any Subcontractor shall fail or refuse to carry out the directions of the Agency or the provisions of the Contract, or is, in the opinion of the Agency, incompetent, unfaithful, intemperate, or disorderly; or uses threatening or abusive language to any person on or associated with the Work; or is acting or working in a manner that compromises the safety of the Work or persons or property involved with the Work, or is otherwise unsatisfactory, the Contractor shall, when requested by the Agency, remove the worker from the Work immediately, and shall not again employ the removed worker on the Work except with the written consent of the Agency.

5-7 CONTRACTOR'S EQUIPMENT

The Contractor shall provide adequate and suitable equipment, labor, and means of construction to meet all the requirements of the Work, including completion within the Contract Time. Only equipment suitable to produce the quality of work required will be permitted to operate on the Project. Specific types of equipment may be requested by the Agency on component parts of the Work.

The Agency may, at the Agency's option, permit the use of new or improved equipment. If such permission is granted, it is understood that it is granted for the purpose of testing the quality and continuous attainment of work produced by the equipment, and the Agency shall have the right to withdraw such permission at any time that the Agency determines that the alternative equipment is not producing work that is equal in all respects to that specified, or will not complete the Work in the time specified in the Contract.

In any case where the use of a particular type or piece of equipment has been banned, or in cases where the Agency has condemned for use on the Work any piece or pieces of equipment, the Contractor shall promptly remove such equipment from the site of the work. Failure to do so within a reasonable time may be considered a breach of contract.

5-8 CONTRACTOR'S SUBMITTALS

5-8.01 Submittals - General

The Contractor shall furnish all working drawings, plans, specifications, descriptive data, certificates, samples, tests, methods, schedules, and manufacturer's instructions as required in the Contract, and any other information required to demonstrate that the materials and equipment to be furnished and the methods of work comply with the provisions and intent of the Contract. Submittals shall be submitted by the dates specified in the Contract or a per diem fine will be levied until the appropriate submittals are properly submitted.

Submittals for systems shall be bound together and include all information for the system.

Six (6) copies of all submittals shall be furnished, two (2) of which will be returned after review. Depending on the complexity of the submittal, the number of submittals, and the express needs of the Contractor, the submittal will be returned to the Contractor within twenty (20) Working Days, exclusive of any time awaiting clarification or further information. Submittals shall be transmitted using submittal transmittal forms provided by the Agency. Unless otherwise agreed to by the Contractor and the Agency, the Contractor will make all submittals using an electronic submittal transmittal form. The Agency will provide the Contractor with an electronic copy of its submittal-logging database, including the "submittal transmittal form". In order to utilize this database and form, the Contractor must have access to the latest version of Microsoft Access. Where any item of the work is required to be installed in accordance with the

manufacturer's recommendations, the Contractor shall furnish six (6) complete sets of the manufacturer's installation recommendations to the Agency prior to starting the installation. These submittals will be retained by the Agency, and shall consist of hard copies, digital or electronic versions, as directed by the Agency.

If the information furnished in a submittal shows any deviation from the Contract requirements, the Contractor shall, by a statement in writing accompanying the information, advise the Agency of the deviation and state the reasons. It shall be the Contractor's responsibility to ensure there is no conflict with other submittals and to notify the Agency in any case where the Contractor's submittal may concern work by another contractor or the Agency. The Contractor is solely responsible for coordination of submittals among all related crafts performing the Work. The Contractor shall verify that its Subcontractors' submittals are complete in every way and meet the requirements of the Contract.

The approval of the Contractor's submittals shall not relieve the Contractor of responsibility for any error or of any obligation for accuracy of dimensions and details, for agreement with and conformity to the Contract, or responsibility to fulfill the Contract as prescribed. Nor shall such approval be considered as approval of any deviation or conflict unless the Agency has been expressly advised of the same as set forth immediately above, and the Agency has expressly approved such deviation or conflict.

The Contractor shall make no changes to any submittal after it has been approved, and the equipment or materials shall not deviate in any way except with written approval by the Agency. Fabrication or other work performed in advance of approval shall be done entirely at the Contractor's risk.

Minimum requirements for submittals are contained in these Specifications. Additional and/or project-specific requirements may be contained in the Contract. The Contractor is responsible for identifying and providing all required submittals.

5-8.02 Resubmittals

Resubmittals shall address all comments from the Agency. The Agency will return the reviewed resubmittal to the Contractor within fifteen (15) Working Days. Partial resubmittals may be returned "REJECTED". The Contractor is responsible for the Agency's review costs for each resubmittal in excess of the first resubmittal. These costs will be back charged to the Contractor and will be deducted from progress payments.

5-8.03 NOT USED

5-8.04 Submittals Containing Proprietary Information

All required information shall be provided even though some or all of such information may be considered proprietary. If any of the information required herein is considered proprietary, a Proprietary Information Agreement (see sample Agreement in Appendix A) shall be executed between the Agency and the Contractor, stipulating that all such information will be supplied by the Contractor and kept confidential by the Agency. All proprietary data shall be identified as part of the Contractor's Bid and the Agency's standard proprietary agreement shall be executed before award of the Contract. Proprietary information is defined as any information or data describing or defining a product, process or system which 1) was developed at the expense of the Contractor, a Subcontractor or supplier; 2) is not generally available in the industry; and 3) is kept secret by its owner for purposes of preventing its use by others. Application software and all other documentation, or any other product, prepared by the Contractor, Subcontractor, or supplier at the expense of the Agency for specific use on the facility being constructed under the Contract shall not be considered proprietary.

All submitted proprietary information shall describe the final record Work. No part of the Work covered by the proprietary agreement shall be modified after proprietary submittal acceptance until updated proprietary information has been submitted by the Contractor and

accepted by the Agency. Updated proprietary information shall fully document all modifications to be implemented. All proprietary data shall be marked "PROPRIETARY" by the Contractor.

5-8.05 Electrical, Instrumentation, Control, and Communication Systems

Electrical, instrumentation, control, and communication system drawings shall include elementary and loop diagram drawings, functional single line system layout drawings, connection drawings, interconnection drawings, panel/cabinet fabrication drawings, and detailed circuit board and component drawings. Detailed circuit schematics and circuit board layout drawings shall clearly show, locate, and identify all components and wiring. Each circuit board component shall be identified by the component's original manufacturer name and part number. Industry standard part numbers shall be used. Component values, voltage/current levels, setpoints, and timing values shall be defined. Drawings shall be in the latest version of AutoCAD or other electronic reproducible medium specified by the Agency.

Complete annotated software/firmware source code listings and program documentation shall be provided for all electronic/electrical systems, subsystems, assemblies, parts, components, and equipment that incorporate programmable devices. All instructions and hardware necessary to load, store, modify, and activate software/firmware source codes and programs shall be provided.

Not more than seventy percent (70%) of all electronic/electrical work shall be paid for until all proprietary information has been submitted and approved. All submitted proprietary information shall be that which describes the final as-built work. No part of the work covered by the proprietary agreement shall be modified after proprietary submittal acceptance until after updated proprietary information has been submitted by the Contractor and accepted by the Agency. Updated proprietary information shall fully document all modifications to be implemented. All proprietary data shall be marked "PROPRIETARY" by the Contractor.

5-8.06 Maintenance and Operations (M&O) Submittals

For use in subsequent maintenance and operations the Contractor shall furnish, unless otherwise provided for in the Special Provisions, one (1) original and five (5) copies, all bound and indexed, of maintenance and operation information, including all the highest level of factory maintenance manuals that are available to factory representatives with a three-year subscription to newsletters and updates supplied by the manufacturer covering all equipment and systems included in the Contract. The Agency may withhold up to thirty percent (30%) of the Total Contract Price until M&O submittals have been submitted and approved. Documentation shall be provided in hard copy form and where available in native format such as Word, Excel, AutoCAD R14 (min.) or *.pdf. The submittal shall include at a minimum:

- Drawings
- As-Builts
  - Electrical
  - Mechanical
  - Site
- Detail drawings of structures on the site
- Dimensions
- Site Layout
- Underground lines including:
  - Existing underground lines (plumbing, electrical, gas, etc.)
  - Incoming and outgoing underground lines (plumbing, electrical, gas, etc.)
  - Pre-existing underground lines (plumbing, electrical, gas, etc.)
  - Underground Conduit (Electrical Wiring, Rigid, PVC)
- Wiring Diagrams for equipment located on-site (Generator, RTU, Hoist, etc.)
- Wiring Diagrams for structures

- Wiring Diagrams of systems
- Parts List
- Illustrations
- Internal wiring diagrams and circuit board schematics and layout drawings
- Manufacturer's recommended spare parts lists
- Name, address and phone number of nearest parts and service agency
- Systems balance data
- Maintenance and service instructions
- Operations instructions
- Software including annotated source lists and programs
- Calibration Instructions
- Calibration Reports
- Diagnostic Manuals

The submittal of maintenance and operation information is required for all mechanical, electrical, instrumentation, control, communications, sound, or special equipment and systems. The Contractor shall submit the required data for review at least thirty (30) Calendar Days prior to any required training or the final inspection date. Corrections, additions, and/or resubmittal of data shall be made as directed by the Agency.

The Agency, and such representatives as the Agency may designate, shall receive complete maintenance and operating instructions for all items included above prior to final inspection of the Work.

5-9 SURVEYS

5-9.01 Agency-Furnished Surveys

Unless otherwise noted in the Project Specifications or Special Provisions, construction stakes or marks will be set by the Agency. The Resident Engineer in consultation with the Project Surveyor will determine necessary lines and grades required for the completion of the work specified in these specifications, on the plans and in the Special Provisions. From Agency-furnished line and grade stakes, the Contractor shall layout the Work and set working stakes as required for completion of the Work. The Contractor shall be responsible for the accuracy of the Contractor's own layout work.

The Contractor shall notify the Agency in writing at least two (2) Working Days in advance of starting operations that require stakes or marks. Staking requests shall take into consideration the level of effort required to provide the controlling stakes and priorities established as necessary. Advance notice shall provide sufficient time to complete at least the first priority requested. Unless authorized by the Agency, any work done without line and grade will be done at the Contractor's risk.

The Contractor shall be responsible for carefully preserving Agency-provided construction stakes and marks. If the stakes or marks are destroyed, damaged or rendered unusable, whether or not the Contractor is directly responsible for the damage or destruction, they will be re-set at the Agency's earliest convenience. Additionally, the Contractor will be responsible for the cost of replacement or restoration of stakes and marks that, in the judgment of the Agency, were carelessly or willfully destroyed, damaged or rendered unusable by the Contractor's operations.

The Agency will typically provide the following stakes:

1. Clearing Stakes - Spaced to provide intervisibility but not less than one hundred feet (100').

2. Rough Grade Stakes - One line of stakes spaced every fifty feet (50') on each side of construction to control cut/fill slopes in areas of heavier grading, large channels or embankments.
3. Final Grade Stakes -
   a. One line of stakes spaced every fifty feet (50') for each edge of pavement, offset from edge of pavement, back of sidewalk or curb. Final grade stakes shall be used to control all elements of the structural section (subgrade, base and pavement).
   b. Where leveling courses are required, one set of stakes per lane of traffic spaced every fifty feet (50') or as determined necessary by the Resident Engineer and the Project Surveyor.
4. Traffic Signals/Lighting -
   a. One offset to back of sidewalk (with either a line stake or radius point) with cut or fill to back of sidewalk where signal bases are located within the sidewalk.
   b. Where no curb, gutter and sidewalk (C. G. & S.W.) are to be constructed, two offset stakes (in line or at approximate right angles) to center of base with cut or fill to top of base
5. Sewer, Water and Drainage Pipe Lines - One line of stakes spaced every fifty feet (50') offset to the center line of the pipe line with cut to flow line of pipe.
6. Drainage channels – One line of slope stakes spaced every fifty feet (50') on each side of construction, except on channels with a width of twelve feet (12') or less at the top of bank slope stakes will only be set on one side of construction.
7. Drainage/Miscellaneous structures -
   a. One or two stakes as necessary to locate structure offset to center of structure with cut to flow line of pipe, grate, side opening or other necessary feature (where not controlled by other improvements such as C. G. & S.W.).
   b. Offset to lip or back of curb (with line stake as necessary) with cut or fill to lip or back of curb and flow line of pipe.
8. Bridges/Major Structures - Agency-furnished stakes will vary depending on the type and complexity of the structure. Generally, two stakes will be set for abutments, bents, wingwalls etc., offset along the layout line with a cut or fill to finish grade. Stakes will not be set by the Agency for the location of individual piles, pile cutoff elevations, or falsework.
9. Wall Stakes - One line of stakes (line stakes may be set where necessary) spaced every fifty feet (50'), at the beginning and end of curves, angle points, changes in wall height, and changes in footing, offset from the layout line, with a cut or fill to the top of the footing.

Note: At the discretion of the Agency, in consultation with the Project Surveyor, one set of stakes may be used for several purposes, such as slopes, final grades and curbs.

5-9.02 Survey Monuments

The Agency shall, to the best of its knowledge, show the location and character of survey monuments located within the construction area on the construction plans. The Contractor shall provide the Agency a minimum of two (2) weeks notice prior to commencing any work that could damage or destroy any survey monuments. When construction surveys are provided by the Agency, the Agency will reference the monuments in advance of construction activity in accordance with the Land Surveyors Act (Business & Professions Code 8700 et seq.). Prior to field acceptance, all damaged or destroyed survey monuments shall be reset by the Contractor in the positions specified by the Agency and to the dimensions and character as shown on the State of California 2006 Revised Standard Plan RSP A74 or substitute approved by the County Surveyor.

5-9.03 Contractor Surveys

When set forth in the Contract Documents or Special Provisions, the Contractor shall be responsible for performing all necessary surveys to lay out and control the Work to the locations, elevations, lines, and dimensions shown or specified in the Contract. Any deviations must receive prior written approval of the Agency. All surveys affecting the line or elevation of underground drainage, sewers, or utilities, and all other work within public rights-of-way or easements, shall be performed by or under the direction and supervision of a California Registered Civil Engineer authorized to practice land surveying or a California Licensed Land Surveyor.

The Contractor shall be responsible for protecting and perpetuating survey monuments affected by construction activities in accordance with Business and Professions Code Section 8771(b). It is the Contractor's responsibility to arrange and pay for a diligent and thorough search for survey monuments, performed by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice Land Surveying, prior to the beginning of construction or maintenance work that could disturb or destroy a survey monument. All monuments found shall be referenced and reset by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice Land Surveying in accordance with Business and Professions Code Section 8771. On thin surface treatments, such as chip seals, the monuments can be covered in advance of the maintenance treatment with a suitable material, which must then be removed to expose the monument. Any damaged or destroyed survey monuments shall be reset and corner records filed in accordance with the Land Surveyors Act (Business & Professions Code 8700 et seq.).

5-9.04 Traffic Control

Traffic control to set Agency-provided construction staking shall be provided by the Contractor at no additional cost to the Agency. To decrease inconvenience to the traveling public and enhance the safety of all workers, to the extent feasible, the Contractor shall request construction staking in areas requiring traffic controls during a period of time when the Contractor has work area traffic controls in place.

5-10 RESPONSIBILITY FOR ACCURACY

The Contractor shall be responsible for the accuracy of the Contractor's own layout work, and shall be liable for the preservation of all established lines and grades. The Contractor shall obtain all necessary measurements for and from the Work, and shall check dimensions, elevations, and grades for all layout and construction work and shall supervise such work; the accuracy for all of which the Contractor shall be responsible. The Contractor is responsible for adjusting, correcting, and coordinating the work of all Subcontractors so that no discrepancies result.

5-11 DUTIES AND POWERS OF INSPECTORS

Inspectors are the authorized representatives of the Agency. Their duty is to inspect materials and workmanship of those portions of the Work to which they are assigned, either individually or collectively, under instructions of the Agency, and to report all deviations from the Contract.

5-12 INSPECTION

The inspection of the Work does not relieve the Contractor of the obligation to fulfill all Contract requirements. Any work, materials, or equipment not meeting the requirements and intent of the Contract will be rejected, and unsuitable work or materials shall be made good,

notwithstanding the fact that such work or materials may have previously been inspected or approved and payment may have been made.

Reexamination of any part of the Work may be ordered by the Agency, and such part of the Work shall be uncovered by the Contractor. The Contractor shall pay the entire cost of such uncovering, reexamination, and replacement if the reexamined work does not conform to the Contract.

All work and materials furnished pursuant to the Contract shall be subject to inspection and approval by the Agency. The Contractor shall provide the Agency and Inspectors with access to the Work during construction and shall furnish every reasonable facility and assistance for ascertaining that the materials and the workmanship are in accordance with the requirements and intent of the Contract.

Unless authorized in writing by the Agency, any work done in the absence of an Inspector, whether completed or in progress, shall be subject to inspection. The Contractor shall furnish all tools, labor, materials, access facilities, and other facilities necessary to allow such inspection, even to the extent of uncovering or taking down completed portions of the Work. The Contractor shall pay all costs incurred, whether or not any defective work is discovered. The Contractor shall also be solely responsible for any costs associated with the removal of any defective work discovered during the inspection and the complete cost of reconstruction.

The Contractor shall notify the Agency of the time and place of any factory tests and submit test procedures for approval thirty (30) Calendar Days in advance for any tests that are required by the Contract. The Contractor shall report the time and place of preparation, manufacture or construction of any material for the Work, or any part of the Work, that the Agency wishes to inspect. The Contractor shall give five (5) Working Days notice in advance of the beginning of work on any such material or of the beginning of any such test to allow the Agency to make arrangements for inspecting and testing or witnessing.

5-13 QUALITY OF MATERIALS AND WORKMANSHIP

Unless otherwise allowed or required by the Special Provisions, all materials shall be new and of a quality at least equal to that specified. When the Contractor is required to furnish materials or manufactured articles or shall do work for which no detailed specifications are set forth, the materials or manufactured articles shall be of the best grade in quality and workmanship obtainable in the market. If not ordinarily carried in stock, the articles shall conform to the usual standards for first-class materials or articles of the kind required. The work performed shall secure the best standard of construction and equipment of the work as a whole or in part. At a minimum, all work and materials shall be of the quality called for in Sections 11 through 50 of these Specifications, the contract documents, and any pertinent or current industry standards or guidelines.

Materials shall be furnished in sufficient quantities and at such times to ensure uninterrupted progress of the Work. All required spare parts shall be delivered in new condition, not in a used or unknown condition, and with any certificates required. Materials, supplies, and equipment shall be stored properly and protected as required. The Contractor shall be entirely responsible for damage or loss by weather or other causes.

Any trench, fill, or roadway settlement occurring during the life of the contract, including the warranty period, shall be considered a workmanship defect and shall be reconstructed or replaced by the Contractor, not withstanding any previous acceptance or approval by the Agency.

5-14 SUBSTITUTIONS

Certain materials, articles, or equipment may be designated in the Contract by brand or trade name or manufacturer together with catalog designation or other identifying information.

Substitute material, article, or equipment which is of equal quality and of required characteristics for the intended purpose may be proposed for use, provided the Contractor complies with the requirements of the following paragraphs.

The Contractor shall submit any request for substitution in writing within 30 (thirty) Calendar Days after the award of the Contract.

5-14.01 NOT USED

5-14.02 Documentation

If requested by the Agency, a proposal for substitution must be accompanied by complete information and descriptive data, including cost of operation, cost of maintenance, and physical requirements necessary to determine the equality of offered materials, articles, or equipment. The Contractor shall also submit such shop drawings, descriptive data, and samples as requested. The burden of proof of comparative quality, suitability, and performance of the offered proposal shall be upon the Contractor. The determination of equal quality suitability, and performance shall be at the sole discretion of the Agency. The Agency will examine such submittals with reasonable promptness. If the Agency rejects the request for such substitution, then one of the particular products designated by brand name in the Contract shall be furnished. Acceptance of substitution by the Agency shall not relieve the Contractor from responsibility for deviations from the Plans and Specifications or from responsibility for errors in submittals. Failure by the Contractor to identify deviations in the request material from the Plans and Specifications shall void the submittal and any action taken thereon by the Agency.

If mechanical, electrical, structural or other changes are required for proper installation and fit of substitute materials, articles or equipment, or because of deviations from the Contract, such changes shall not be made without the written consent of the Agency and shall be made by the Contractor without additional cost to the Agency. The Contractor shall pay the costs of design, drafting, architectural or engineering services and building alterations of the construction required to accommodate any Contractor substitution or construction error to maintain the original function and design.

5-15 PREPARATION FOR TESTING

The Contractor shall maintain proper facilities and provide safe access for inspection by the Agency to all parts of the Work and to the shops wherein parts of the Work are in preparation. Where the Contract requires work to be tested or approved, such work shall not be tested or covered up without at least a five (5) Working Day notice to the Agency of its readiness for inspection, unless the written approval of the Agency for such testing or covering is first obtained.

5-16 MATERIALS SAMPLING AND TESTING

Materials to be used in the Work will be subject to sampling and tests by the Agency. The Contractor shall furnish the Agency with a list of the Contractor's sources of materials and the locations at which such materials will be available for inspection. The list shall be submitted on an Agency form and shall be furnished to the Agency in time to permit the inspection and testing of materials in advance of their use.

Testing shall be done to such standards as set forth in the Plans, Specifications, or Special Provisions. References made in these documents to standard methods of testing materials shall make such standards a part of the Specifications.

Whenever a reference is made in the Specifications to a specification or test designation of any recognized national organization or State of California agency, and the number or other identification representing the year of adoption or the latest revision is omitted, it shall mean the

specification or test designation in effect on the date of the original Notice to Contractors for the Work.

When requested by the Agency, samples or test specimens of the proposed materials shall be prepared at the expense of the Contractor and furnished by the Contractor in such quantities and sizes required for proper examination and tests, and with complete information describing type, kind, or size of material, and its source. All samples shall be submitted in time to permit the making of proper tests, analyses, or examinations before incorporating the materials into the Work. No material shall be used in the Work unless or until it has been approved by the Agency. All material tests shall be made by the Agency in accordance with recognized standard practice. The Contractor shall pay the cost of the second retest and any subsequent retest of any area or material. The Agency will secure and test samples whenever necessary.

5-17 APPROVAL OF MATERIALS

5-17.01 Sources Of Supply

The Agency's approval at the source of supply may be required prior to procurement. Such approval shall not prevent subsequent disapproval or rejection of materials by the Agency if the quality is less then required by the Contract.

Sand, gravel, or other minerals incorporated into Agency work must comply with Public Contract Code Section 20676. The Agency may request written documentation of compliance.

5-17.02 Plant Inspection

The Agency assumes no obligation to inspect materials at the source of supply. The Contractor is responsible for incorporating satisfactory materials into the Work, notwithstanding any prior inspections or tests.

The Agency will inspect materials at the source if the Contractor submits a written request and if the Agency deems the inspection necessary. The Contractor and the supplier will cooperate with and assist the Agency while performing the inspection. The Agency shall have access to all production areas of the plant.

5-18 PROVISIONS FOR EMERGENCIES

The Agency may provide necessary labor, material and equipment to correct any emergency resulting from the Contractor's operation including noncompliance with the Contract, public convenience, safety, traffic control, and protection of work, persons and property. The nature of the emergency may prevent the Agency from notifying the Contractor prior to taking action. The costs of such labor, material, and equipment will be deducted from progress payments.

The performance of such emergency work under the direction of the Agency shall not relieve the Contractor from any damages resulting from the emergency.

5-19 RIGHT TO RETAIN IMPERFECT WORK

If any portion of the work done or materials furnished under the Contract shall prove defective or not in accordance with the Contract, and if the defect in the work or materials is not of sufficient magnitude or importance to make the work dangerous or undesirable, or if the removal of such work or materials is impracticable or will create conditions which are dangerous or undesirable, the Agency shall have the right and authority to retain the work or materials instead of requiring it to be removed and reconstructed or replaced. Progress payment deductions will be made as described in Section 8-9, "Deductions for Imperfect Work", of these Specifications, and a deductive Contract Change Order will be issued in accordance with Section 9, "Changes and Claims", of these Specifications.

5-20 REMOVAL OF REJECTED MATERIALS OR WORK

The Contractor shall remove all rejected or condemned materials or structures brought to or incorporated in the Work within two (2) Working Days of the Agency's written order. No such rejected or condemned materials shall again be offered for use in the Work. The Contractor shall, at the Contractor's expense, bring into Contract compliance all rejected material or work in a manner acceptable to the Agency.

The Agency may bring into Contract compliance the rejected material if the Contractor fails to comply with this Section. All costs will be deducted from the Progress Payment.

5-21 TEMPORARY SUSPENSION OR DELAY OF WORK

The Agency has the authority to suspend or delay the Work, wholly or in part, for any period the Agency deems necessary. The Contractor shall immediately comply with the Agency's written order to suspend or delay the Work. The suspended or delayed work shall be resumed only when conditions are favorable or methods are corrected, as ordered or approved in writing by the Agency. Public safety and convenience must be maintained throughout the suspension or delay in accordance with Sections 6-12, "Public Convenience and Safety", and 6-13, "Public Safety and Traffic Control", of these Specifications.

Delays due to suspension of work shall be classified as Avoidable or Unavoidable Delays in accordance with Section 7-12, "Delays", of these Specifications.

Such suspension shall not relieve the Contractor of the Contractor's responsibilities as described in the Contract.

5-22 TERMINATION OF CONTRACT

5-22.01 Reasons for Termination

The Board reserves the right to terminate the Contract for any of the reasons listed below:

5-22.01.A Contractor Bankrupt

If the Contractor is adjudged bankrupt or makes an assignment for the benefit of the Contractor's creditors, or if a receiver is appointed because of the Contractor's insolvency, the Board may terminate the Contractor's control over the Work and so notify the Contractor and the Contractor's sureties.

5-22.01.B Completion Delay

The Board may terminate the Contract if the Contractor has not completed the Work on or before the completion date adjusted by Contract Change Order. The Contractor is not entitled to any compensation and is liable to the Agency for liquidated damages for all time beyond such Contract completion date until the Work is completed, if the Agency chooses to complete the Work.

5-22.01.C Abandonment and Unsatisfactory Performance

The Board may give the Contractor and the Contractor's surety written notice that the Contract will be terminated if the following breaches are not corrected:

- The Contractor abandons the Work.
- The Work or any portion is sublet or assigned without the Agency's consent.
- The rate of progress is not in accordance with the Contract.
- Any portion of the Work is unnecessarily delayed.
- The Contractor willingly violates any terms or conditions of the Contract.
- The Contractor does not supply sufficient materials or properly skilled labor.
- The Contractor fails to promptly pay its Subcontractors.

- The Contractor disregards laws, ordinances, or Agency orders.
- The Contractor fails to respond to defective work notices.

The Contractor shall cease and terminate the Work if satisfactory arrangement for correction is not made within ten (10) Calendar Days from such notification.

5-22.01.D Termination of Contract for Convenience

The Board may terminate the performance of work in whole or in part for any of the following reasons:

- Issuance of an order of a court or other public authority having jurisdiction.
- An act of government, such as a declaration of national emergency, causing material to be unavailable.
- Conditions encountered during the Work make it impossible or impractical to proceed.
- Such termination is in the best interest of the Agency.

5-22.02 Notice of Termination

The Board may give written Notice of Termination of at least five (5) Calendar Days to the Contractor and the Contractor's sureties that the Contractor's control over the Work will be terminated for the reasons stated in the Notice of Termination. The surety shall have the right to take over and perform the Work. The Agency may take over the Work at the Contractor's expense if the surety does not commence performance within thirty (30) Calendar Days from the date of mailing the Notice of Termination. The Contractor shall be liable for any excess cost incurred by the Agency.

Immediately upon receipt of a Notice of Termination, except as otherwise directed in writing by the Agency, the Contractor shall:

1. Stop work under the Contract on the date and to the extent specified in the Notice of Termination.
2. Place no further orders or subcontracts for materials, services, or facilities except as necessary to complete the portion of the Work that is not terminated.
3. Terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination.
4. Assign to the Agency, in the manner, at the times, and to the extent directed by the Agency, all of the rights, titles, and interests of the Contractor under the orders and subcontracts so terminated. The Agency shall have the right, at its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts.
5. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts with the approval or ratification of the Agency. The Agency's approval or ratification shall be final.
6. Transfer title to the Agency, and deliver in the manner, at the times, and to the extent directed by the Agency, fabricated or unfabricated parts, work in process, completed work, supplies, other material produced as a part of, or acquired in connection with, the terminated work, and the completed or partially completed drawings, information, and other property that, if the Contract had been completed, would have been submitted to the Agency.
7. Sell, in the manner, at the times, to the extent, and at the price that the Agency directs or authorizes, any property of the types referred to in Item 6 of this Section (Section 5-22.02). The Contractor is not required to extend credit to any purchaser, and may acquire any such property under the conditions prescribed and at a price approved by the Agency. The proceeds of any such transfer or disposition shall be used to reduce any payments made to the Contractor under the Contract or be

credited to the cost of the work covered by the Contract or paid as the Agency directs.

8. Complete performance of the Work not terminated by the Notice of Termination.
9. Take necessary action, or as the Agency directs, to protect and preserve the property related to the Contract in which the Agency has an interest.

5-22.03 Payments to Contractor Upon Termination of Contract

The Contractor and the Agency may agree upon the amount paid to the Contractor for the total or partial termination of the Work. The amount may include those items specified in Section 9, "Changes and Claims", of these Specifications. However, such agreed amount shall not exceed the Total Contract Price, reduced by the amount of payments already made and the Contract price of work not terminated. The Contract shall be amended accordingly, and the Contractor shall be paid the agreed amount.

If the Contractor and the Agency fail to agree on the amount to pay the Contractor because of the termination of work under this Section, the Agency shall determine the amount due the Contractor.

If the work is completed as provided in Section 5-22.02 in this Section of these Specifications, the Contractor is not entitled to receive any portion of the amount to be paid under the Contract until it is fully completed. After completion, if the unpaid balance exceeds the sum of the amount expended by the Agency in finishing the work, plus all damages sustained or to be sustained by the Agency, plus any unpaid claims on account of labor, materials, tools, equipment, or supplies contracted for by the Contractor for the Work, provided that sworn statements of said claims shall have been filed as required by Section 9, "Changes and Claims", of these Specifications, the excess not otherwise required by these Specifications to be retained shall be paid to the Contractor. If the sum so expended exceeds the unpaid balance of the Total Contract Price, the Contractor and the Contractor's surety are liable to the Agency for the amount of such excess. If the surety completes the Work as provided above, such surety shall be subrogated to money due under the Contract and to money which shall become due in the course of completion by the surety.

The Contractor shall submit to the Agency any termination claim in the form and with the certification that the Agency prescribes. Such claim shall be submitted no later than ninety (90) Calendar Days from the effective date of termination unless the Agency grants one or more extensions, in writing, upon Contractor's written request transmitted within such ninety (90) day period or authorized extension. If the Contractor fails to submit a termination claim within the time allowed, the Agency may determine the amount, if any, due the Contractor because of the termination. The Agency will then pay the Contractor that amount.

5-22.04 Agency Completion

In the event of termination of the Contract, the Agency may take possession of and use all or any part of the Contractor's materials, tools, equipment, and appliances on the premises to complete the Work. The Agency assumes the responsibility for returning such equipment in as good condition as when it was taken over, reasonable wear and tear excepted. The items shall be returned when the Work is complete or sooner, at the Agency's discretion. The Agency agrees to pay a reasonable amount for the use of such materials and equipment.

The Agency may direct all or any part of the Work be completed by day labor and/or other contractors.

5-22.04.A Payment for Agency Completion

If the Agency completes the Work, no payment will be made to the Contractor until the Work is complete. All costs of completing the Work, including, but not limited to, legal expenses, Agency forces, administration and management, direct and indirect, shall be deducted from any sum due the Contractor. If the cost of completing the Work exceeds sums due the Contractor,

the Contractor and the Contractor's surety shall, upon demand, pay the Agency a sum equal to the difference. If the Agency completes the Work and there is a sum due the Contractor after the Agency deducts the costs of completing the Work, the Agency will pay such sum to the Contractor and/or the Contractor's surety, as appropriate.

5-22.04.B Agency Completion Not a Waiver of Agency Rights

No act by the Agency before the Work is finally accepted shall operate as a waiver or estop the Agency from acting upon any subsequent event, occurrence or failure by the Contractor to fulfill the terms and conditions of the Contract. The rights of the Agency pursuant to this Section are in addition to all other rights of the Agency pursuant to the Contract, and at law or in equity.

5-23 TERMINATION OF UNSATISFACTORY SUBCONTRACTS

When any portion of the Work subcontracted by the Contractor is not prosecuted in a satisfactory manner, the Contractor shall immediately terminate the subcontract upon written notice from the Agency. The Subcontractor shall not again be employed for any portion of the work on which the Subcontractor's performance was unsatisfactory.

SECTION 6 LEGAL RELATIONS AND RESPONSIBILITIES

6-1 COMPLIANCE WITH LAWS AND REGULATIONS

The Contractor shall be familiar and comply with all Federal, State, and local laws, ordinances, codes and regulations which in any manner affect the Work, those engaged or employed in the Work or the material or equipment used in or upon the Work, or in any way affect the conduct of the Work. No pleas of misunderstanding of such laws, ordinances, codes, or regulations or of ignorance of the same on the part of the Contractor shall modify the provisions of the Contract. The Contractor and the Contractor's surety shall indemnify and save harmless the Agency, its governing Board, officials, directors, agents, employees, volunteers members, affiliates and their duly authorized representatives against any claim for liability arising from, or based upon, the violation of any such law, ordinance, regulation, decree, or order, whether by the Contractor or by the Contractor's employees.

The attention of the Contractor is directed to certain laws that affect the Contract. The listing of these laws in this Section is not to be construed as a listing of all applicable laws. The Contractor is solely responsible for familiarity and compliance with all applicable laws. Particular attention is called to the following:

6-1.01 Hours of Labor

Eight (8) hours of labor shall constitute a legal day's work and the Contractor or any Subcontractor under the Contractor, in the execution of the Contract, shall not require more than eight (8) hours of labor in any Calendar Day, and forty (40) hours of labor in any calendar week, from any person employed by the Contractor in the performance of the Work under the Contract, except as permitted under the provisions of Labor Code Sections 1810 to 1815 of the Labor Code of the State of California. The Contractor shall forfeit, as penalty to the Agency, twenty-five dollars ($25) for each worker employed by the Contractor or any Subcontractor under the Contractor in the execution of the Contract for each Calendar Day during which any worker is required or permitted to labor more than eight (8) hours and for each calendar week during which any worker is required or permitted to labor more than forty (40) hours, in violation of the provisions of such Labor Code.

Overtime and shift work may be established by the Contractor with reasonable notice and the written permission of the Agency. No work other than overtime and shift work shall be done between the hours of 6:00 p.m. and 7:00 a.m., except such work as is necessary for the proper care and protection of work already performed or except in case of an emergency. Failure of the Contractor to perform the Work in accordance with this policy shall be cause for termination under Section 5-22, "Termination of Contract", of these Specifications.

6-1.02 Prevailing Wage

Pursuant to Labor Code Section 1770, the Contractor and the Contractor's Subcontractors shall pay not less than the prevailing rate of per diem wages, including, but not limited to, overtime, Saturday, Sunday, and holiday work, travel and subsistence, as determined by the Director of the California Department of Industrial Relations pursuant to Labor Code Section 1773. Copies of such prevailing rate of per diem wages are available upon request at the office of the Clerk of the Board of Supervisors, Suite 2450, 700 'H' Street, Sacramento, California 95814. The prevailing wage determinations are also available on the internet at http://www.dir.ca.gov/DLSR/PWD.

The wage rates determined by the Director of the California Department of Industrial Relations refer to expiration dates. Prevailing wage determinations with a single asterisk (*) after the expiration date that are in effect on the date of Notice to Contractors remain in effect for the duration of the project. Prevailing wage determinations with double asterisks (**) after

the expiration date indicate that the basic hourly wage rate, overtime and holiday wage rates, and employer payments to be paid for work performed after this date have been determined. If work extends past this date, the new rate shall be paid and should be incorporated in contracts entered. The Contractor should contact the Department of Industrial Relations as indicated in the prevailing wage determinations to obtain predetermined wage changes. All determinations that do not have double asterisks (**) after the expiration date remain in effect for the duration of the project.

The Contractor and the Contractor's Subcontractors shall forfeit, as penalty to the Agency, not more than fifty dollars ($50) per Calendar Day or portion thereof, for each worker paid less than the prevailing wage rates for any work done under the Contract by the Contractor or by any Subcontractor. The Contractor and all Subcontractors shall comply with the provisions of Labor Code Sections 1774 and 1775. In addition to said penalty, the Contractor or Subcontractor shall pay each worker the difference between the prevailing wage and the amount paid for every hour the worker was paid less than the prevailing wage.

6-1.03 Payroll Records

Contractor shall comply with Labor Code Section 1776. Regulations implementing Section 1776 are located in Section 16000 and Sections 16401 through 16403 of California Code of Regulations, California Code of Regulations, Title 8. The Contractor shall be responsible for compliance by the Contractor's Subcontractors.

The Contractor and the Contractor's Subcontractors shall keep accurate payroll records, showing the name, address, Social Security number, labor classification, straight time and overtime hours worked each day and week, and the actual wages paid to each journeyman, apprentice, worker, or other employee employed in connection with the Work. Such records shall be certified and available for inspection at all reasonable hours at the principal offices of the Contractor and the Contractor's Subcontractors in a manner set forth in Labor Code Section 1776. The Contractor and the Contractor's Subcontractors shall file a certified copy of the records enumerated above with the Agency within ten (10) Calendar Days after receipt of a written request. The Contractor shall be held responsible for all Subcontractors' compliance with this requirement.

The non-compliance penalties specified in subdivision (g) of Labor Code Section 1776 may be deducted from progress payments to the Contractor.

6-1.04 Nondiscrimination

Attention is directed to Labor Code Section 1735, which prohibits discrimination in the employment of persons upon public works because of race, religious creed, color, national origin, ancestry, physical handicap, medical condition, marital status, or sex of such persons, and provides for penalties.

6-1.05 Apprentices

The Contractor shall comply with Labor Code Section 1777.5, concerning the employment of apprentices. The Contractor shall be responsible for compliance by all Subcontractors.

6-1.06 Workers' Compensation

Pursuant to Labor Code Section 1860, in accordance with the provisions of Section 3700 of the Labor Code, the Contractor is required to secure the payment of compensation to his employees.

6-1.07 Fair Labor Standards

The Contractor shall comply with the Fair Labor Standards Act of 1938 as amended (29 U.S.C. 3201 et seq.) as applicable.

6-1.08 Contractors License

The Contractor shall comply with Chapter 9 of Division 3 of the Business & Professions Code.

6-1.09 Use of Pesticides

The Contractor shall comply with all rules and regulations that govern the use of pesticides required in the performance of the Work, including any certifications that may be required for purchase, use, storage or application.

Pesticides include, but are not limited to, herbicides, insecticides, fungicides, rodenticides, germicides, nematocides, bactericides, inhibitors, fumigants, defoliants, desiccants, soil sterilants, and repellants.

Any substance or mixture of substances intended for preventing, repelling, mitigating, or destroying weeds, insects, diseases, rodents, or nematodes and any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant shall be considered a pesticide.

6-1.10 Reporting Requirements and Sanctions

Failure to provide specific information, records, reports, certifications, or any other documents required for compliance with the Contract will be considered noncompliance. At a minimum, documents required include:

1. Form SCLC-0001 - List Of Subcontractors

   Form SCLC-0001 is required from the Contractor and each Subcontractor. This form is due within ten (10) Calendar Days after the date of the preconstruction conference or within ten (10) Calendar Days after the date of award of the subcontract. The later of the two dates will apply.
2. Form SCLC-347 - Certified Payroll Reports

   Form SCLC-347 is required from the Contractor and each Subcontractor, regardless of the subcontract amount or the type of procurement, for every payroll period in which work is performed. These reports are due within ten (10) Working Days of the ending date of the payroll period. The payroll shall be accompanied by a "Statement of Compliance" signed by the employer or the employer's agent indicating that all of the information in the payroll is true, correct and complete, and the wage rates contained therein are not less than those required by the Contract. The "Statement of Compliance" shall be on forms furnished by the Agency or on any form with identical wording. The Contractor shall be responsible for the submission of copies of payrolls of all subcontractors.
3. Form SCLC-0002 - Fringe Benefit Statement

   Form SCLC-0002 is required from the Contractor and each Subcontractor if fringe benefits are paid to an approved plan, fund, or program. The statement is due with first certified payroll report and any time the fringe benefit amounts change. The statement is not required if the fringe benefits are paid in cash to the employees.
4. Other Documentation

   Other reporting documentation may be required depending on the source of funding for the project.

If the Contractor fails to comply with the provisions of this Section, the Contractor will be advised of the specific deficiencies and requested to make immediate corrections. The Contractor will also be advised that monetary deductions will be made for failure to effect corrections or delinquencies.

If the Contractor fails to correct a deficiency in the reporting requirements within fifteen (15) Calendar Days after notification, a deduction may be made. In such cases, the deduction will be ten percent (10%) of the estimated value of the work done during the month, except that the deduction will not exceed ten thousand dollars ($10,000), nor be less than one thousand dollars ($1,000), and will be deducted from the next progress payment.

Deductions for non-compliance will be in addition to all other deductions provided for in the Contract and will apply irrespective of the number of instances of noncompliance. Deductions will be made separately and cumulate for each estimate period in which a new deficiency appears. When all deficiencies for a period have been corrected, the deduction covering that

period will be released on the next progress payment. Otherwise, the deduction will be retained.

6-1.11 Subcontracting

The Contractor must comply with Section 4101 to Section 4113, inclusive, of the Public Contract Code.

6-1.12 Occupational Safety and Health

The Agency is committed to providing a safe and healthy workplace for employees and the public and eliminating any conditions or hazards that could result in personal injury or ill health. The Contractor and all Subcontractors must comply with all directives given by the Agency to abate a hazard and/or stop a work activity. Failure to comply with such a directive may result in the dismissal of the related Contractor/Subcontractor employee(s) as indicated in Section 5 of these Specifications or other sanctions as indicated in the project special provisions. Repeat safety violations of a similar nature and/or a single serious, willful safety violation by a Contractor may warrant review and termination of the contract.

The Contractor must comply with all applicable provisions of the California Occupational Safety and Health Act (Labor Code Sections 6300 et seq.). The foregoing includes, but is not limited to, all applicable California Code of Regulations, California Code of Regulations, Title 8 Safety Orders issued by the State of California Occupational Safety and Health Administration (Cal/OSHA). Failure of the Agency to suspend the work or notify the Contractor of the inadequacy of the Contractor's safety precautions or non-compliance with existing laws and regulations shall not relieve the Contractor or any Subcontractor of this responsibility.

6-1.13 Sacramento County Residents

Pursuant to Article V, Section 15 (i), of the Charter of the County of Sacramento, preference shall be given in the employment of labor to citizens who shall have resided in Sacramento County for at least six (6) months.

6-2 INDEMNIFICATION

6-2.01 Contractor's Performance

To the fullest extent permitted by law, Contractor shall indemnify, defend, and hold harmless Agency, its governing Board, officers, directors, agents, employees and volunteers from and against any and all claims, demands, actions, losses, liabilities, damages, and all costs incidental thereto, including cost of defense, settlement, arbitration, and reasonable attorneys' fees arising out of, pertaining to, or resulting from the acts or omissions of the Contractor, its officers, agents or employees, or the acts or omissions of anyone else directly or indirectly acting on behalf of the Contractor, or for which the Contractor is legally liable under law, regardless of whether caused in part by a party indemnified hereunder.

6-2.02 No Limitation of Liability for Indemnification

The indemnities set forth in this Section shall not be limited by the insurance requirements set forth in the Contract.

6-3 CONTRACTOR'S LEGAL ADDRESS

Both the address given in the Bid and the Contractor's office in the vicinity of the Work are designated as places that samples, notices, letters, or other articles or communications to the Contractor may be mailed or delivered. The delivery to either of these places shall be deemed sufficient service to the Contractor and the date of such service shall be the date of delivery. The address named in the Bid may be changed at any time by written notice from the Contractor to the Agency. Nothing herein shall be deemed to preclude or render inoperative the service of any drawing, sample, notice, letter or other article or communication to the Contractor.

6-4 CONTRACTOR NOT AN AGENT OF AGENCY

The Contractor shall be an independent contractor and not an employee, agent, or other representative of the Agency. Nothing in the Contract shall be construed to create any relationship of joint venture, partnership or any other association of any nature whatsoever between the Agency and the Contractor other than that of owner and independent contractor. The Agency shall have the right to direct the Contractor as provided in the Contract. The aforementioned right of supervision shall not reduce or abrogate the Contractor's liability of all damage or injury to persons, public property, or private property that may arise directly or indirectly from the Contractor's execution of the Work.

6-5 SUBSTITUTION OF SUBCONTRACTORS

The Contractor shall not, without the written consent of the Agency: (a) substitute any party as Subcontractor in place of the Subcontractor designated in the original bid; (b) permit any such subcontract to be assigned or transferred; or (c) allow the subcontracted work to be performed by anyone other than the original Subcontractor listed on the bid. Consent for substitution or subletting shall only be given when:

1. The Subcontractor listed in the bid, after having reasonable opportunity to do so, fails or refuses to execute a written contract that is based upon the Plans and Specifications for the project or the terms of such Subcontractor's written bid and is presented to the Subcontractor by the Contractor; or
2. The listed Subcontractor becomes bankrupt or insolvent; or
3. The listed Subcontractor fails or refuses to perform the subcontract; or
4. The listed Subcontractor fails or refuses to meet the bond requirements of the Contractor as set forth in California Public Contract Code Section 4108; or
5. The Contractor demonstrates to the Agency, subject to the further provisions set forth in California Public Contract Code Section 4107.5, that the name of the Subcontractor was listed as a result of an inadvertent clerical error; or
6. The listed Subcontractor is not licensed pursuant to the Contractor License Law as set forth in the Business and Professions Code; or
7. The Agency determines that the work performed by the listed Subcontractor is substantially unsatisfactory and not in substantial accordance with the Contract, or that the Subcontractor is substantially delaying or disrupting the progress of the work; or
8. The listed Subcontractor is ineligible to work on a public works project pursuant to Section 1777.1 and 1777.7 of the Labor Code.

In the event of such substitution, the Agency will give at least five (5) Working Days notice in writing to the listed Subcontractor, unless they have advised the Agency in writing that they have knowledge of the Contractor's request for the substitution.

6-6 ASSIGNMENT OF CONTRACT

The Contract or the performance of the Contract may be assigned by the Contractor, but only upon written consent of the Agency and the Contractor’s surety, unless the surety has waived its right of notice of assignment. No such assignment or subcontracting shall be permitted that would relieve the Contractor or the Contractor’s surety of their responsibilities under the Contract.

6-7 ASSIGNMENT OF MONIES

The Contractor may assign monies due the Contractor under the Contract, and such assignment will be recognized by the Agency, if given proper notice, to the extent permitted by law. Any assignment of monies shall be subject to all deductions provided for in the Contract.

All money withheld may be used by the Agency for the completion of the Work if the Contractor defaults.

6-8 PROTECTION OF AGENCY AGAINST PATENT CLAIMS

The Contractor shall assume all costs arising from the use of patented materials, equipment, devices, and processes on or incorporated in the Work and shall indemnify and hold harmless the Agency and the Agency's officers, officials, agents, employees, volunteers, members, affiliates and their duly authorized representatives from all actions for, or on account of, the use of any patented materials, equipment, devices, or processes in the construction of, or subsequent operation of, the Work. Before final payment, if requested by the Agency, the Contractor shall furnish acceptable proof of a proper release from all costs or claims arising from the use of patented materials, equipment, devices, or processes used on or incorporated in the Work.

6-9 RESPONSIBILITY OF THE CONTRACTOR

The Contractor shall be solely responsible for, and have exclusive control over, construction means, methods, techniques, sequences, procedures, and coordination of all portions of the Work under the Contract, unless otherwise provided in the Contract or in an emergency situation where specific direction regarding means, methods, techniques, sequences, procedures, and coordination is necessary to mitigate an imminent and serious health and safety hazard.

All Contractors, in coordination with the Agency and its duly authorized representatives, as appropriate, shall implement measures that will create safety awareness and promote safe work practices at the jobsites and shall pursue the Contract in the safest manner possible.

The Contractor shall take appropriate action, up to and including termination, against any Contractor employee who willfully or repeatedly violates workplace safety rules.

The Work shall be under the Contractor's responsible care and charge until completion and final acceptance, and the Contractor shall bear the entire risk of injury, loss, or damage to any part by any cause. The Contractor shall rebuild, repair, restore, and make good all injuries, losses or damage to any portion of the Work or the materials occasioned by any cause, and shall bear the entire expense.

In no case shall the Contractor's use of Subcontractors in any way alter the position of the Contractor or the Contractor's sureties with relation to the Contract. When a Subcontractor is used, the responsibility for every portion of the Work shall remain with the Contractor. No Subcontractor will be recognized as having a direct contractual relationship with the Agency. All persons engaged in the Work under the Contract will be considered as employees of the Contractor and their work shall be subject to all the provisions of the Contract. The Agency will deal only with the Contractor who is responsible for the proper execution of the Work. The Contractor shall pay when due all valid claims of Subcontractors, suppliers, and workmen with respect to the Work.

The mention herein of any specific duty or responsibility imposed upon the Contractor shall not be construed as a limitation or restriction of any other responsibility or duty imposed upon the Contractor by the Contract, said reference being made herein merely for the purpose of explaining the specific duty or responsibility.

6-10 PERMITS AND LICENSES

The Contractor shall, at the Contractor's sole expense, obtain all necessary permits and licenses for the construction of the Work, give all necessary notices, pay all fees required by law, and comply with all laws, ordinances, rules and regulations relating to the Work and to the preservation of the public health and safety. The Contractor shall also procure all permits and

licenses necessary for the normal conduct of the Contractor's business and construction operations.

Unless otherwise noted in the Special Provisions, building, plumbing, heating, electrical, and similar permits that the Contractor is required to obtain from the County Building Inspection Division for County-owned projects are fee exempt and will be obtained by the Agency.

The California Environmental Quality Act of 1970 (CEQA) may be applicable to permits, licenses, and other authorizations that the Contractor shall obtain from local agencies in connection with performing the Work. The Contractor shall comply with the provisions of CEQA in obtaining such permits, licenses, and other authorizations, which will be obtained in time to prevent delays to the Work.

The Contractor shall comply with permits, licenses, or other authorizations applicable to the Work obtained by the Agency in conformance with the requirements in CEQA.

6-11 SAFETY

6-11.01 Safety Plans and Documents

Safety is a prime consideration in all Agency contracts. The Contractor shall conform to all applicable occupational safety and health standards, rules, regulations, and orders established by the State of California or Federal Government. The Contractor, and all Subcontractors, shall, upon request, submit to the Agency a copy of their Injury Illness Prevention Program (IIPP), Code of Safe Work Practices (CSP), Contract Specific Safety Plan (CSSP), and Task Specific Safety Plan (TSSP) for review by the Agency. The Contractor is required to fulfill the requirements of these programs during the prosecution of the Work. No work shall be started unless otherwise authorized by the Agency until the Agency has completed its review of all required safety documents and provided written authorization to proceed.

All plans shall be formatted in a logical and orderly fashion, including tabs and section dividers for ease of navigation and review. The Contractor and all Subcontractors are required to comply with the requirements of the TSSP during the prosecution of the Work.

The agency has full authority to enforce, make exceptions to, or waive requirements of any of the required safety plans or documents on a case-by-case basis. Exceptions and or waivers will be provided in writing to the Contractor. Use of all or part of any safety and health manual or plan does not relieve the Contractor of the responsibility to comply with prevailing local, state, and federal laws and regulations.

6-11.01.A Injury Illness Prevention Program (IIPP) and Code of Safe Work Practices (CSP)

The IIPP and CSP shall be prepared in accordance with California Code of Regulations, California Code of Regulations, Title 8, Section 1509.

6-11.01.B Contract Specific Safety Plan (CSSP)

The CSSP shall state the nature of the Work and the anticipated hazards, and shall describe how those hazards will be mitigated to protect workers and the public. The CSSP shall cover the notification of employees, subcontractors, and others working on or visiting the jobsite of foreseeable hazards and provisions for protective equipment. The CSSP shall certify that all employees have received or will receive appropriate site-specific safety and health training particular to the unique hazards of the Work.

6-11.01.C Task Specific Safety Plan (TSSP)

A TSSP shall be prepared for high-hazard activities including, but not limited to, excavations, permit-required confined spaces, traffic safety, tunneling, hazardous energy, critical crane lifts, lead or asbestos work, and use of radioactive materials or radiation generating devices. Specific requirements for TSSP's may be indicated in the Special Provisions. At a minimum, the TSSP shall include the following elements:

1. A detailed description of and step-by-step procedures for each high-hazard activity, including engineering and administrative hazard control measures;
2. Designation of responsibilities and authority for all key personnel;
3. Names of and training records for all Competent Persons and for all employees performing critical tasks;
4. Employee medical and equipment test records pertinent to the specific task such as respirator fit test records and medical evaluations;
5. List of all construction, safety and personal protective equipment (PPE) to be used;
6. Illustrations and calculations relevant to the mitigation of related hazards;
7. Copies of all forms and checklists to be used;
8. Copies of Material Safety Data Sheets (MSDSs) for all substances to be used; and
9. Emergency response and rescue procedures.

6-11.02 24-Hour Contact Information

The Contractor shall have on record with the Agency the following twenty-four (24) hour emergency contact numbers:

- Traffic Control Device Supplier: Supplier of barricades, steel plates, delineators, channelizers, construction signs, and other traffic control equipment to be used during construction.
- Contractor Representative: An employee of the Contractor having the authority to make decisions and the ability to respond to an emergency on the project at any time.
- Safety Representative: The Contractor's Safety Representative shall have the authority to make decisions regarding safety and health concerns on the project and to direct the Contractor's personnel to abate any hazard identified by the Agency. The Contractor's Safety Representative shall be properly trained in all workplace hazards to be encountered on the project.

6-11.03 Illumination

Work by the Contractor during the hours of darkness or in locations where natural light is inadequate shall be illuminated to conform to the applicable minimum illumination intensities established by the California Occupational Safety and Health Administration (CAL/OSHA) in California Code of Regulations, Title 8, Sections 1523, 3317, 8415, and the approved Traffic Control Plan (TCP).

6-11.04 Personal Protective Equipment (PPE).

Cal/OSHA standards for PPE shall be adhered to. The Contractor must provide the required PPE to employees and must ensure that it is used and maintained in a sanitary and reliable condition.

6-11.05 Confined Spaces

6-11.05.A Contractor Responsibilities and Qualifications

Attention is directed to the provisions of Article 108 of the General Industry Safety Orders (GISO), California Code of Regulations, Title 8, and Article 4 of the Construction Safety Orders (CSO), California Code of Regulations, Title 8.

A confined space is defined as an area:

- Large enough and configured in such a way that an individual can bodily enter and perform assigned work;
- With limited or restricted means for entry or exit; and
- Not designed for continuous occupancy.

Confined spaces include, but are not limited to: storage tanks, vessels, manholes, bins, boilers, sewers, storm drains, utility vaults, tunnels, pipes, pits, vaults, and in some instances, excavations.

A permit-required confined space is defined as a confined space that has or has the potential for one or more of the following:

1. A hazardous atmosphere
2. Material that has the potential to engulf the entrant
3. An internal configuration that might cause an entrant to be trapped or asphyxiated
4. Any other recognized serious safety or health hazards.

Prior to any permit-required confined space entry, the Contractor shall submit the following for Agency review and acceptance:

1. The Contractor's general procedures for confined space entry
2. A detailed description of and step-by-step procedure for the proposed work
3. A list of names of all employees involved in the permit-required entry and each person's responsibilities and authority in conjunction with the entry
4. A list of all equipment to be used including but not limited to respiratory, atmospheric monitoring, chemical analysis, communication, life line, safety harness, lifting hoist, ventilation, lighting, power tools, or other supporting systems and equipment.
5. Copies of all forms to be used (e.g., entry permit)
6. Rescue procedures, including notification procedures, name and contact information of the emergency response agency, and method of communication with an outside rescue source.
7. Employee training records pertaining to confined spaces
8. Employee records pertaining to the use of respiratory equipment (i.e. medical approval).
9. Material Safety Data Sheets (MSDS) for all applicable chemicals and products
10. Hot work procedures (if applicable)
11. Lock-out/tag-out procedures (if applicable)
12. Other applicable planning and safety information

The Contractor's submittal shall be made a minimum of thirty (30) calendar days prior to any confined space entry in accordance with Section 5-8, "Contractor's Submittals", of these Specifications.

The Contractor will not be allowed to make a permit-required confined space entry until the Agency has reviewed and accepted the Contractor's qualifications and proposed methods.

The Contractor shall conform to the procedures established by the Contractor's submittal during all confined space operations. Contractor shall provide all monitoring and safety equipment necessary to perform pre-entry checks of confined spaces. The Contractor shall also provide all monitoring, safety, and communications equipment required for confined space operations.

Tests for the presence of combustible or dangerous gases and/or oxygen excess or deficiency shall be performed from outside the confined space with an approved device immediately prior to a worker entering the confined space, and continuously during entry. Care shall be taken to ensure that the atmosphere is tested throughout the confined space. Testing equipment shall be fitted with the appropriate sensors for accurately detecting anticipated atmospheric hazards (relevant chemical analysis). The results of the tests shall be recorded on the Entry Permit along with the equipment or method(s) that were used in performing the tests. No employee shall be permitted to enter or remain within a confined space where tests indicate the presence of a hazardous atmosphere, unless the employee is wearing suitable and approved respiratory protective equipment (non-combustible atmosphere only).

Mechanical ventilation shall be used to augment natural air circulation where necessary and must be used to purge the atmosphere of any Permit-Required Confined Space (PRCS) or Alternate Entry Procedures (C5) space. Mechanical ventilation and its use shall meet the following minimum requirements:

- Before ventilation is initiated, information such as restricted areas within the confined space, voids, the nature of the contaminants present, the size of the space, the capacity needs of the blower(s), the type of work to be performed, and the number of people involved must be considered.

- Blowers shall function continuously and correctly throughout all entry activities. If a blower fails, all employees must leave the space immediately.
- A warning system must be in place to immediately notify employees in the event of a hazard or a failure in the ventilation equipment.
- Although the time required to purge the space will depend on the volume of the space and the air volume capacity of the blower, the space shall be purged sufficient to achieve a minimum of six (6) air exchanges per hour. The Contractor shall increase this air exchange rate as necessary.
- The space shall be purged for a minimum of fifteen (15) minutes before entry.
- Ventilation equipment shall be set up such that it blows 100% outside air into the space rather than exhausting air from the space.
- Blowers shall be located outside of the space so they will not pick up exhaust gases and/or other atmospheric hazards. Where a portable gasoline powered generator is used to power the blower(s), the generator shall be located as far as possible from the blower air intake. Motor vehicles and other internal combustion engines should not be allowed to operate with their exhaust pipes located near the blower air intake(s).
- Blowers shall be located so that the fresh air enters the space as near as possible to where employees will be located.
- Open as many of the adjacent entry points as possible to improve airflow.
- Oxygen may not be used to substitute for fresh air.
- Use of mechanical ventilation shall be noted on the entry permit.

Note: Atmospheric testing shall be conducted following purging, before entry, and continuously during entry. Entry may not begin until testing has demonstrated that the hazardous atmosphere has been effectively eliminated or controlled.

6-11.05.B Agency Responsibilities for Permit Confined Spaces

The Contractor shall be provided with information regarding known hazards and known or potential permit spaces.

After the Agency has reviewed the Contractor's submittal to perform permit-required confined space entry work, the Contractor will be provided with the following:

1. Notification of the location, physical characteristics, known hazards, etc. regarding the permit-required confined space the Contractor anticipates entering.
2. Information regarding safety items (e.g. nearby emergency equipment), precautions, procedures, safeguards, etc. installed or implemented and that may be available to the Contractor's employees in or near the permit-required confined space.

A debriefing session will be held with the Contractor at the conclusion of the entry operation if any hazards were encountered or created and remain.

The Agency's failure to identify a confined space does not relieve the Contractor of the responsibility for compliance with the requirements of Articles 4 and 108 of the California Code of Regulations and these Specifications.

6-11.05.C Existing Sewers and Storm Drains

Because of the potential danger of solvents, gasoline, and other hazardous material in existing sewers and storm drain pipes, these areas shall be treated as permit-required confined spaces unless it has been proven, through appropriate testing, that no hazards exist or are expected to develop.

6-11.05.D Joint Agency – Contractor Entries

Unless otherwise directed in writing by the Agency, when Agency employees work along side the Contractor in a permit-required confined space, the permit procedures for both the Agency and the Contractor shall be used. The Entry Supervisor shall coordinate the requirements of both permit procedures prior to entry.

6-11.06 Respiratory Protection

The Contractor is required to evaluate job tasks to determine if the task will result in exposure to gases, vapors, fumes, dust, mists, specific regulated substances (e.g., asbestos, lead) above legally established limits. In these cases, the Contractor must institute administrative or engineering controls to achieve compliance. When these controls are infeasible, respiratory protection must be used. When the Contractor intends to use respiratory protective equipment they must be in full compliance with California Code of Regulations, Title 8, Section §5144 "Respiratory Protection" and any other applicable regulation(s). At a minimum, this includes:

- A written plan with worksite-specific procedures
- Hazard evaluations to characterize respiratory conditions of the work
- Medical evaluations to determine the ability of workers to wear respirators
- Fit testing to verify that the selected make, model and size of the respirator facepiece will achieve the anticipated protection during use
- Respirator selection, maintenance and care
- A training program for affected employees
- Periodic program evaluations

6-11.07 Hazard Communication

The Contractor is required to develop, implement and maintain a Hazard Communication Program in order to protect employees who may use or be exposed to hazardous substances during the course of construction. The Contractor's Hazard Communication Program will define responsibilities for the following activities:

- Maintaining a written hazard communication plan
- Maintaining a current inventory of hazardous chemicals at the work site
- Maintaining a current Material Safety Data Sheet (MSDS) for each hazardous chemical or chemical compound at the work site
- Labeling chemical containers properly
- Training employees

The Contractor shall provide copies of MSDS's to the Agency upon request.

6-11.08 Control Of Hazardous Energy (Lockout/Tagout)

Before a Contractor or any of its subcontractors performs any work on a system where the unexpected energizing, start up, or release of kinetic or stored energy could occur and cause injury or damage, the energy source shall be isolated in accordance with the requirements of Section 3314 of the General Industry Safety Orders (GISO), Subchapter 5 of the Electrical Safety Orders (ESO), and these Specifications.

When the Contractor is planning the use of hazardous energy control procedures, they shall submit a Hazardous Energy Control Plan (HECP) to the Agency for review and acceptance. Implementation of hazardous energy control procedures shall not be initiated until the HECP has been accepted by the Agency. The HECP shall clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be used for the control of hazardous energy, including, but not limited to, the following:

1. A statement of the intended use of the procedure
2. Means of coordinating and communicating hazardous energy control activities including coordination with the facility owner and maintenance personnel
3. Procedural steps and responsibilities for shutting down, isolating, blocking, and securing systems to control hazardous energy
4. Procedural steps and responsibilities for the placement, removal, and transfer of lockout and tagout devices
5. Procedural steps and responsibilities for placing and tagging, and moving or removing tags and protective grounds

6. Requirements for testing the system to verify the effectiveness of isolation and lockout and tagout devices
7. A description of any emergencies that may occur during system lockout or tagout and procedures for safely responding to those emergencies
8. Requirements when authority for removal of hazardous energy control devices must be transferred from the authorized employee to another individual, and the names of the individuals qualified for receiving such transfer
9. The means to enforce compliance with the procedures

The Agency and the Contractor shall fully coordinate all hazardous energy control activities, including coordination with the facility owner and maintenance personnel, throughout the planning and implementation of these activities. Each shall inform the other of their energy control procedures, ensure that their own personnel understand and comply with rules and restrictions of their procedures, and ensure that all employees affected by the hazardous energy control activity are notified when the procedural steps outlined in the HECP are to be initiated.

A preparatory inspection with the Agency and Contractor shall be conducted to ensure that all affected personnel understand the energy hazards and the procedures for their control.

Daily inspections shall be conducted by a qualified person to ensure that all requirements of the hazardous energy control procedures are being followed.

Training shall be provided to ensure that the purpose and function of the hazardous energy control procedures are understood by employees and that employees possess the knowledge and skills required for the safe application, usage, and removal of energy controls.

In addition to the above, the Contractor shall comply with the following requirements with respect to lockout/tagout safety equipment and devices:

1. Work shall not be performed on any equipment until all sources of power are locked out and/or tagged to protect against unexpected or inadvertent operation.
2. All employees affected by the lockout and/or tagout procedures, including but not limited to Contractor, Agency, and Owner and maintenance personnel, shall be notified, before and upon completion of, the application and removal of lockout and/or tagout devices.
3. The operation of equipment is prohibited when any valves, switches or other energy isolating devices have been locked and/or tagged.
4. After checking the equipment area to see that no one is exposed, lockout devices and accident prevention tags may be removed only by the individual(s) who attached them.
5. Systems with energy isolating devices that are capable of being locked out shall use locking devices to control hazardous energy unless the Contractor's designated authority has demonstrated and documented all of the following:
   a. The use of locking devices would entail burdens that exceed any advantage to the use of lockout over the use of tagout devices,
   b. The use of tagout devices will provide full personnel protection, and
   c. All affected employees can and will be informed that tagout is being used in lieu of lockout (posted or otherwise provide documentation to all affected personnel).
6. Lockout devices shall be used for no other purpose than lock out, and shall be substantial enough to prevent removal without the use of excessive force or unusual techniques.
7. Tag out devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal.
8. Supply and use Contractor-owned locks, tags, and other energy control devices, and have a sufficient supply on hand to effectively meet the needs of the HECP.
9. Provide all necessary and requisite tools and equipment (e.g., rubber insulating gloves, blankets, protective footwear, safety glasses, and appropriate hazard/risk category flame resistant clothing and PPE when working within arc flash protection boundaries).

6-11.09 Control Of Fugitive Emissions

The Contractor shall take precautions necessary to control fugitive emissions from the job site. Fugitive emissions include, but are not limited to: nuisance dust, chemical odors/vapors/gases, noise, hazardous materials (such as lead or asbestos), and Aerosol Transmittable Diseases (ATDs).

Where the product(s) or material(s) to be used by the Contractor has a permissible exposure limit (PEL) established by Cal/OSHA, and where Agency employees or the public may be exposed to the product or material, the Contractor shall maintain exposure levels below the PEL where an exposure condition during use exceeding the PEL could reasonably be anticipated. In such instances, the Contractor shall monitor, or shall contract to have monitored, work area exposure conditions. Monitoring shall occur, at a minimum, during the start of work and whenever there is a change in procedure, process, or chemicals or materials used. When requested, copies of air monitoring data shall be provided to the Agency and to the building owner (where applicable) and shared with building occupants. If it is deemed unfeasible to maintain exposures below the PEL, the Contractor shall restrict access to all areas where exposures exceed the PEL to authorized personnel only.

6-11.09.A Noise

The Contractor must comply with applicable regulatory requirements for noise and Sacramento County Code (SCC), Title 6, Chapter 6.68. The Special Provisions may contain specific or additional requirements. If the Contractor's employees are exposed to a time weighted average noise level of 90 decibels or more, then the Contractor must implement a hearing conservation program as required by California Code of Regulations, Title 8, General Industry Safety Orders (GISO), Article 105, "Control of Noise Exposure". Internal combustion engines used for any purpose on the Work must be equipped with a muffler recommended by the manufacturer.

6-11.09.B Asbestos Containing Material (ACM)

All work shall be performed in compliance with current federal and state regulations, including U.S. EPA and California Code of Regulations, Title 8, Sections 1529 and 5208, "Asbestos", the Special Provisions, Section 10-7.01 "Contaminated or Hazardous Materials", of these specifications, and the requirements contained herein.

No ACM shall be disturbed unless all required documentation has been received and reviewed by the Agency. When requested by the Agency, the Contractor shall provide a detailed Asbestos Abatement Plan (AAP). The plan shall include the location and layout of decontamination areas, the sequencing of asbestos work and methods to be used to assure the safety of building occupants, workers, and visitors to the site, methods for controlling visible emissions in the work area and the containerization of asbestos debris, and the following:

1. Current (no more than 12 months old at the end of the project) medical examination reports for each employee of the Contractor who will be on site
2. Documentation that the Contractor is currently licensed by the State of California to perform asbestos abatement
3. Documentation of timely notification to the State Department of Industrial Relations (DIR) and documentation of project fees paid
4. Current (no more than 12 months old at the end of the project) certificates of asbestos training for each employee of the Contractor who will be on site.
5. Current (no more than 6 months old at the end of the project) documentation of respirator training and fit testing for each employee of the contractor who will be on the site.
6. Letter from EPA indicating approved disposal site for Asbestos Containing Material (ACM)
7. A listing of authorized personnel to be granted access to the work area.
8. All necessary permits, licenses, and insurance

9. Documentation of the Contractor's notifications to businesses and residents regarding the abatement project schedule.
10. The names and numbers of person(s) to be contacted on behalf of the Contractor in cases of an emergency.
11. Material Safety Data Sheets (MSDSs) for all chemicals that will be used or that will be present at the job site. MSDSs must be provided to building occupants if chemicals or other hazardous substances are to be used in a facility or in areas where vapors or fumes could enter air intakes.

6-11.09.C Removal and Disposal of Asbestos Concrete Pipe (ACP)

The disturbance of ACP is regulated under California Code of Regulations, Title 8, Section 1529. Any disturbance of any quantity, or potential for exposure, is subject to this regulation. In addition, the following shall apply:

1. No ACP shall be disturbed unless first approved by the Agency.
2. The Contractor is responsible to employ those means, methods, techniques and sequences to ensure that all ACP is removed in a manner such that it remains intact and non-friable. When it is a impractical to remove the ACP without creating a friable material, the Contractor shall submit an AAP plan for review and approval by the Agency.
3. Any disturbance of greater than 100 sq. ft. of ACP requires the Contractor to be registered for asbestos-related work. Exception: Contractors with employees and supervisors who have received the prescribed 4-hour ACP training by a Cal-OSHA certified training provider may non-destructively impact greater than 100 sq. ft. without the asbestos-related work registration. Employees must have a current (within one calendar year) certificate of training from an accredited training provider.
4. Wet-cutting, snap cutting or a “clean break” of the pipe by an excavator is considered non-destructive. The abrasive sawing of ACP is a specifically "prohibited activity".
5. Any operation that crushes or otherwise renders the ACP friable requires that the work be done by a registered contractor (regardless of the 100 sq. ft. regulatory requirement).
6. If more than 260 linear feet of ACP is to be removed, which on removal will become friable, a National Emission Standards for Hazardous Air Pollutants (NESHAPS) notification must be filed.
7. All non-friable ACP waste shall be packaged (6-mil waste bags or wrapped in 6-mil poly sheeting and taped to be leak proof) and disposed of at a classified landfill that accepts asbestos waste. The Contractor shall submit to the Agency a certificate of disposal to verify that the waste was legally disposed of. If underground sections of ACP are to be abandoned in place, they shall be intact and non-friable.

6-11.09.D Lead

The Contractor is responsible for complying with all applicable federal, state, and local regulations and requirements for lead that may have jurisdiction over their work. This includes, but is not limited to the Environmental Protection Agency (EPA), Identification of Dangerous Levels of Lead, Final Rule (40 CFR Part 745 Subpart D), Housing and Urban Development (HUD) Federal requirements (24 CFR Part 35), California Department of Health Services (DHS) Accreditation, Certification, and Work Practices For Lead-Based Paint And Lead Hazards (Title 17, California Code of Regulations, Division 1, Chapter 8, Sections 35000-361000), and California Occupational Safety and Health Administration (Cal/OSHA) Lead Standard for the Construction Industry (California Code of Regulations, Title 8, Section 1532.1)

6-11.09.E Aerosol Transmittable Disease (ATD) Control

The Contractor shall comply with all regulatory requirements for the protection of employees from Aerosol Transmittable Diseases (ATD) in the workplace. This includes compliance with California Code of Regulations, Title 8, Article 109, Hazardous Substances and Processes of the General Industry Safety Orders (GISO), and with all established procedures to protect

employees and the public from ATD exposure in and around facilities owned and operated by the Agency.

6-11.10 Mining and Tunnel Safety

The Contractor must be aware of any Work that may be under the jurisdiction of either the Tunneling Safety Orders (TSO), California Code of Regulations, Title 8, Sections 8400 through 8568 or the Mine Safety Orders (MSO), California Code of Regulations, Title 8, Sections 6950 through 7283. It is the Contractor's responsibility to apply for and obtain any permits and licenses and to comply with all applicable laws and regulations.

6-12 PUBLIC CONVENIENCE AND SAFETY

6-12.01 Public Convenience

All work within public streets and/or roadway rights-of-way shall be done in an expeditious manner and cause as little inconvenience to the traveling public as possible. Vehicles, bicycles, and pedestrians must be allowed to pass at all times except during an emergency closure. See Section 7-8, "Peak Hours, Hours of Darkness, Holidays and Weekends", of these Specifications for time limitations. See Section 7-8, "Emergency Repairs", for the criteria of what constitutes an emergency.

The surface of roadways open to the public shall be kept in a smooth, even condition free of humps and depressions, satisfactory for the use of public traffic at all times as determined by the Agency.

Temporary facilities used by the Contractor to perform the Work or store or stage material or equipment shall not be installed or placed where they will interfere with the free and safe passage of public vehicular, bicycle, or pedestrian traffic.

6-12.02 Pedestrian and Bicyclist Access

The Contractor shall not block the movement of pedestrian or bicycle traffic. The Contractor shall provide for pedestrian and bicycle traffic by phasing construction operations and/or by providing alternative pedestrian and bicyclist access through or adjacent to construction areas. Proper advance notice signage with reasonable detours shall be installed and maintained through all phases of construction. Access to pedestrian and bicycle devices at traffic signals shall be maintained at all times. At no time shall pedestrians be diverted into a portion of the street used for vehicular traffic or on to private property unless proper barriers, delineation, and adequate signage is in place. Pedestrian and bicycle access shall consist of five-foot (5') wide bridges across trenches and five-foot (5') wide passageways through construction areas. Hand railings for pedestrians shall be provided when required by Cal/OSHA Regulations or the Americans with Disabilities Act (ADA) on each side of each bridge or passageway to protect pedestrians from hazards caused by construction operations or adjacent vehicular traffic.

Railings or barriers, which border passageways located in roadway areas, shall be retro-reflectorized on the side facing oncoming traffic.

6-12.02.A Pedestrians (Temporary Alternate Circulation Path)

When crosswalk or other pedestrian facilities are temporarily closed or relocated, temporary alternate circulation paths are required to be provided by the Contractor to achieve the maximum accessibility feasible under existing conditions.

6-12.02.A(1) Components

A Temporary Alternate Circulation Path (hereafter referred to as "path" or "pathway") shall consist of one or more of the following components: walkways, ramps, curb ramps (excluding flared sides) and landings, blended transitions, crosswalks, and pedestrian overpasses and underpasses. Elevators, platform lifts, stairways and escalators shall not be part of a path. All components of a path shall comply with the applicable portions of these Specifications.

6-12.02.A(2) Continuous Width

Unless otherwise approved by the Agency, the minimum continuous and unobstructed clear width of a path shall be five feet (5'), exclusive of the width of the pedestrian barricades and channelizing devices. If the alignment of the temporary path does not allow for a minimum continuous and unobstructed clear width of five feet (5'), the width may be reduced to four feet (4') upon the written approval of the Agency. Where a path turns or changes direction, it shall accommodate the continuous passage of a wheelchair or scooter. As with street or highway design for vehicles, additional maneuvering width or length may be needed along curved or angled routings, particularly where the grade exceeds five percent (5%). Individual segments of paths shall have a minimum straight length of four feet (4').

California Code of Regulations, Title 24, Part 2, Chapter 11B, Section 1133B.8.6, and Americans with Disabilities Act Accessibility Guidelines (ADAAG) 4.4 "Provisions for Protruding Objects" apply across the entire width of the path.

6-12.02.A(3) Width at Passing Spaces

Paths that are less than five feet (5') in clear width shall provide passing spaces at intervals of two hundred feet (200') maximum. Paths at passing spaces shall be five feet (5') wide for a distance of five feet (5').

6-12.02.A(4) Walkway Grade and Cross Slope

Unless otherwise approved by the Agency, the pathway surface shall be level and navigable and shall not have a slope greater than twelve to one (12:1) or a cross slope greater than two percent (2%). Where the walkway of a pedestrian access route is contained within a street or highway border, its grade shall not exceed the general grade established for the adjacent street or highway.

6-12.02.A(5) Surface

Unless otherwise approved by the Agency there shall be no surface discontinuities. Additionally, the installation of gratings in the surface of the pathway is not acceptable. All non-slip surfaces shall have a surface static coefficient of friction of 0.50 per ASTM C 1028.

The surface of the path shall be firm, stable, and slip resistant. The pathway shall be constructed of concrete, asphalt, non-slip plywood or non-slip steel plate. Non-slip plywood used for a walkway surface shall have a minimum thickness of one and one-eighth inch (1-1/8") and shall be thoroughly supported to provide a firm stable surface. Compacted soil or aggregate base material is not considered an acceptable surface.

Surface discontinuities shall not exceed one-half inch (½") maximum. Changes in level up to one-quarter inch (¼") may be vertical and without edge treatment. Vertical discontinuities between one-quarter inch (¼") and one-half inch (½") maximum shall be beveled at one to two (1:2) minimum. The bevel shall be applied across the entire level change. Changes in level greater than one-half inch (½") shall be accomplished by means of a ramp that complies with California Code of Regulations, Title 24, Part 2, Chapter 11B, Section 1127B.5 and ADAAG 4.7.

6-12.02.A(6) Location

Sidewalks at the construction location may be closed with adequate detours. Detours shall not increase the path of travel by more than five hundred feet (500'). Detour routes shall be limited to existing sidewalks, private properties (see above requirements) and crossings at roadway intersections. To the maximum extent feasible, the alternate circulation path shall be provided on the same side of the street as the disrupted route. Where it is feasible to provide a same-side alternate circulation path and pedestrians will be detoured, Section 6D.02 of the current California Manual on Uniform Traffic Control Devices (CA/MUTCD) specifies that the alternate path provide a similar level of accessibility to that of the existing disrupted route. This may require the installation of temporary accessible pedestrian signals (APS), curb ramps, or other accessibility features.

Pedestrians may be detoured onto private property only if written permission from the property owner is obtained along with documentation indicating that the County would not be liable in the event of an accident.

6-12.02.A(7) Protection

Where the temporary alternate circulation path is exposed to adjacent construction, excavation drop-offs, traffic, or other hazards, it shall be protected with a pedestrian barricades, channelizing devices, concrete barriers, or other TTB devices necessary to provide clear guidance for pedestrians.

When it is necessary to block travel at the departure curb to close a crosswalk that is disrupted by excavation, construction, or construction activity, care must be taken to preserve curb ramp access to the perpendicular crosswalk. This may require additional pedestrian channelization if only a single diagonal curb ramp serves the corner.

Figures 6H-28 and 6H-29 of the CA/MUTCD specify notification signage for pedestrian closings and detours. Audible signage triggered by proximity switches should be used whenever possible to provide information to pedestrians who are unable to properly see print signs, such as the blind and visually impaired.

Pedestrians routed into normal bicycle or automobile traffic lanes must be protected from traffic via pedestrian barricades channelizing devices, concrete barriers, or other TTB devices that are continuous, immovable, stable, rigid, and visible and free of splintered, jagged, and sharp surfaces/edges. Caution tapes, cones, drums, sawhorses, and A-frames are not considered effective substitutions for this purpose.

Pedestrians routed onto the roadway shoulder at locations not normally traveled by bicycles or locations where bicycle traffic has been relocated must be protected with a continuous, immovable, stable, rigid, and visible barrier that is free of splintered, jagged, and sharp surfaces/edges. Pedestrian barricades and channelizing devices shall consist of a wall, fence, or enclosures specified in section 6F-58, 6F-63, and 6F-66 of the CA/MUTCD. Caution tape, cones, drums, sawhorses, and A-frames are not allowed for this purpose. Barriers shall have a bottom or lower continuous rail two-inches by six-inches (2”x6”) secured in a vertical orientation and a two-inch by six-inch (2”x6”) minimum upper rail at least thirty-six inches (36”) above the ground or walkway surface. Barrier support members shall not protrude beyond the barricade face into the pedestrian access route or alternate circulation path.

The pathways shall be well marked with retroreflective materials to assist both visually impaired pedestrians and vehicles traveling at times when visibility may be limited. The retroreflective materials shall be color yellow conforming to Federal Color No. 33538, as shown in Table IV of Federal Standard No. 595B, “Colors Used in Government Procurement”.

During working hours, at least one worker shall be assigned the responsibility to escort elderly, disabled or any other pedestrians in need of assistance through and/or around the construction site. The worker assigned this responsibility may also participate in other construction activities; however, the assigned worker shall be aware of his or her primary responsibilities for providing this assistance.

6-12.02.A(8) Lighting

The pathway is to be continuously and uniformly illuminated at all times. When existing artificial lighting does not continuously and uniformly illuminate the path or there is no artificial lighting, there shall be temporary lights installed. Minimum illumination shall be ten (10) foot candles. The Contractor shall employ means to distinguish the path from its surroundings. Factors such as shadows cast by lighting sources, surface reflectance, and the uniformity of the color and texture of the materials making up the walking surface must be considered.

6-12.02.A(9) Holes in the Permanent Path of Travel

When there is a hole or opening, e.g. manhole cover, within the permanent pathway of travel, there shall be a continuous, immovable, stable, rigid, and visible pedestrian barrier surrounding the boundary of the opening that is free of splintered, jagged, and sharp

surfaces/edges. Unless otherwise approved by the Agency, there shall be a five-foot (5') clear pathway around the pedestrian barrier. The pedestrian barrier/pathway must also meet all requirements as listed above.

6-12.03 Written Notification To Residences and Businesses

The Contractor shall notify, in writing, residents and business establishments along the route of the Work at least ten (10) Working Days prior to road closures and at least three (3) Working Days prior to disruption of ingress and egress. The notice provided to the residences or businesses shall include, at a minimum, schedule of closures with estimated closure times, closure location, alternate route or detour, and name and twenty-four (24) hour phone number of a contact person employed by the Contractor.

The Contractor shall notify, in writing, residents and business establishments along the route of the Work at least three (3) Working Days prior to placing parking restrictions within the County right-of-way. The notice provided to the residences or businesses shall include, at a minimum, schedule of parking restrictions with estimated times, location, and a name and twenty-four (24) hour phone number of a contact person employed by the Contractor.

6-12.04 Access To Driveways, Houses and Buildings

Access and passable grades shall be maintained at all times for business establishments during construction. Safe and passable pedestrian, bicyclist, and vehicular access shall be provided and maintained to fire hydrants, homes, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, hospitals, and establishments of similar nature. Access to these facilities shall be continuous and unobstructed unless otherwise approved. Ramps and driveways shall not have "lips" or elevation differences greater than three-eighths of an inch (3/8") or one (1) cm.

When abutting property owner's access across the right-of-way line is to be eliminated, repaired, or replaced under the Contract, the existing access shall not be closed until the replacement access facilities are completed and functional.

6-12.05 Property Damage

Any property damage caused by the Contractor shall be repaired at the Contractor's expense to the satisfaction of the Agency.

6-12.06 Erection of Signs To Facilitate Passage of Vehicles

The Contractor shall erect such warning and directional signs as necessary or as directed by the Agency for facilitating the passage of public traffic through or around the Work and the approaches. All warning and directional signs shall comply with Section 6-13, "Public Safety and Traffic Control", in this Section of these Specifications; Section 12, "Construction Area Traffic Control", of these Specifications; and the California Manual of Uniform Traffic Control Devices (CA/MUTCD).

6-12.07 Traffic Obstructions, Delays and Inconveniences

All public traffic shall be permitted to pass through the Work and the Contractor shall conduct operations that offer the least possible obstruction, delay, and inconvenience to the public, except where authorized by the Agency or in an emergency situation where access may endanger the public. See Section 7-8 Emergency Repairs for criteria on what constitutes an emergency.

6-12.08 Work On Private Property

The Contractor must obtain written permission from the owner of any privately owned property prior to beginning any work, storing materials or otherwise conducting any operations on said property. The written approval from the property owner must be on file with the Agency before any operations will be permitted on said property.

6-12.09 Hazardous Conditions Created

Whenever the Contractor's operations create a condition hazardous to pedestrians, bicyclists, or the traveling public, the Contractor shall, at the Contractor's own expense, furnish, erect and maintain any fences, covers, temporary traffic barriers, barricades, lights, signs and other devices necessary or as directed by the Agency to prevent accidents or damage or injury to the public or property.

6-13 PUBLIC SAFETY AND TRAFFIC CONTROL

6-13.01 General

All traffic controls shall be installed in accordance with the latest edition of the "California Manual of Uniform Traffic Control Devices" (CA/MUTCD), NCHRP Report 476 (nighttime traffic controls), the approved Traffic Control Plan (TCP), the project special provisions, these standard specifications, and all other supporting or referenced standards, documents or manuals.

6-13.02 Responsibility For Safety

It is the Contractor's responsibility to provide for public safety and traffic control. The Agency may review the Contractor's operations and inform the Contractor if an unsafe or hazardous condition is observed. The Contractor may be directed verbally or via Field Instruction, letter, or other means to abate the hazard. The Contractor must comply with all directives for hazard abatement immediately and within the timeframe imposed by the Agency.

6-13.03 Passage of Emergency Vehicles

The Contractor shall provide for the uninterrupted passage of emergency vehicles through the Work zone at all times regardless of the controlled traffic conditions in place at the time.

6-13.04 Furnishing, Installing, and Maintaining Traffic Controls

Signs, lights, barriers, fences, barricades, and other facilities shall be furnished, erected and maintained by the Contractor to provide an adequate warning to the public of dangerous conditions to be encountered during construction at all hours of the day or night. Warning and directional signs shall be erected and maintained as required by the Agency and by law. All traffic controls shall be installed as required by this Section and Section 12, "Construction Area Traffic Controls", of these Specifications and as required by the CA/MUTCD.

6-13.04.A Temporary Traffic Barriers (TTB)

Temporary traffic barriers (TTB) are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and are designed to protect workers, bicyclists, and pedestrians. The four primary functions of temporary traffic barriers are:

- To keep vehicular traffic from entering work areas, such as excavations or material storage sites;
- To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
- To separate opposing directions of vehicular traffic; and
- To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

A Barrier is required when any of the following conditions exist:

A. Excavations – The near edge of an excavation is 15 feet or less from the edge of the traveled way, except:
    1. Excavations covered with steel plates or concrete covers of adequate thickness to prevent accidental entry by traffic or the public
    2. Excavations less than 1' deep
    3. Excavations with side slopes, where the slope is shallower than 4:1 (horizontal: vertical)
    4. Excavations protected by existing barrier or railing

B. Unprotected Unyielding Obstacles – Whenever the work includes the installation of a fixed obstacle together with a protective system, such as bridge falsework or a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or whenever the Contractor, for their convenience and with permission of the Agency, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day. Or, whenever the roadway alignment changes and subsequently encroaches onto an existing fixed obstacle such that it creates a significant hazard to the traveling public.

C. Storage Areas - Whenever unyielding material or equipment is stored within 15 feet of the traveled way and such storage is not otherwise prohibited by the Special Provisions or the Agency.

Barriers shall be installed in full compliance with the following:

1. Barrier segments must be approved by the Agency through a Certificate of Compliance before being placed in the public right-of-way.
2. Barrier segments shall meet the requirements of NCHRP Report 350, Test Level 3 (TL-3) criteria, unless otherwise approved by the Agency.
3. The Barrier System shall be of sufficient length to completely shield the entire drop-off area or obstacle
4. Exposed surfaces of new and used Barrier segments shall be freshly coated with white paint prior to their first use on the project and periodically repainted to remove marks from vehicle strikes and graffiti when requested by the agency.
5. Barrier segments shall be in new or like-new condition free of chips, cracks, or structural steel deformation or loss that may compromise the designed characteristics of the segment. Connecting eyes shall be straight and undamaged. Rejection of Barrier segments is at the sole discretion of the Agency.
6. Maintain a minimum 2 foot offset between the traveled lane and the Barrier and between the excavation and the Barrier. If the excavation/barrier minimum separation is not possible, and lateral movement of the Barrier cannot be tolerated, the Barrier shall be anchored to the road surface as indicated in Detail T3 of the Caltrans Standard Plans. Note: Placing the Barrier on a grout bed can provide a mechanical interlock to prevent movement and may be used as an alternative method for anchoring if approved by the Agency.
7. Barriers shall be set on a firm, stable foundation graded to provide a uniform bearing throughout the entire length of the segment.
8. Abutting Barrier ends shall be placed and maintained in alignment without substantial offset to one another.
9. Adjacent Barrier segments shall be properly connected as indicated on Detail T3 of the Caltrans Standard Plans.
10. Where a Barrier is placed on curves and radii that are too sever to properly connect panels, the Barrier shall be backed continuously with earth fill as indicated on Detail T3 of the Caltrans Standard Plans.
11. The approach end of the Barrier shall be tapered away from the road at a 15:1 or flatter flare and shielded from traffic through one of the following methods:
    I. Bury the end of the Barrier in a cut slope
    II. Extend the end of the Barrier to a point 15 feet or more beyond the edge of the traveled way (ETW)
    III. Install a crash cushion array at the approach end of the Barrier meeting the requirements of Section 6-13.04.B of these Standard Construction Specifications.
12. If a Barrier is to be placed within 10 feet of the traveled way the contractor must provide Barrier reflectors fastened to each segment and evenly spaced using one of the following methods:

I. High strength, two component, quick-set bonding epoxy
II. A mechanical system (stainless steel, galvanized or zinc plated) consisting of an internal thread flush anchor, hex bolt, lock and flat washers.

The retro-reflective sheeting shall be white (silver) or yellow (amber) in color and applied to one or both sides of the reflector as necessary based on Barrier application (traffic separation). The number and placement of reflectors may vary depending on site conditions.

13. A Caltrans Type P Marker shall be installed at each end of the Barrier system, and the front of the crash cushion array, where installed adjacent to a two-lane, two-way highway and at the end facing traffic, or the front of the crash cushion array, of a Barrier system installed adjacent to a one-way roadbed. If the Barrier is placed on a skew, a Type P Marker shall also be installed at the end of each skew point nearest the traveled way.
14. The Barrier System shall be removed from the right-of-way when no longer required on the project.

6-13.04.B Temporary Vehicle Impact Attenuators (Crash Cushions)

Temporary Vehicular Impact Attenuators (TVIA, crash cushions, crash cushion array), shall be accepted as crashworthy devices by the FHWA and shall meet the requirements of NCHRP Report 350, Test Level 3 (TL-3) criteria.

Unless otherwise approved by the Agency, the Caltrans TS-14 array shall be used. Manufacturer-designed arrays may be permitted if approved in advance by the Agency.

A crash cushion array shall be furnished, installed and maintained as shown on the project plans and/or TCP, the Caltrans Standard Plans, and in conformance with the manufacturer's recommendations and the following:

1. If a fixed object or the approach end of a Temporary Traffic Barrier (TTB) is less than fifteen feet (15') from the traveled way, a temporary crash cushion array is required unless otherwise approved by the Agency.
2. Prior to installation, the Contractor shall provide the Agency with:
   a. Three copies of the manufacturer's most current product manuals covering installation and maintenance of the modules.
   b. Certification that the TTB complies with these Standard Specifications and any Special Provisions.
   c. Additional hardware, tools, or documentation supplied by the manufacturer.
3. All crash cushions shall be in new or like new condition when installed.
4. Any crash cushion that becomes crushed or otherwise damaged so that it will not perform its intended purpose shall be immediately repaired or replaced by the Contractor within 24 hours after the damage occurs. The Contractor shall furnish adequate means, acceptable to the Agency, to provide safe control of traffic until the crash cushion has been repaired or replaced.
5. All modules shall be filled to the proper level (based on placement within the array) and with the appropriate material (generally ASTM C-33 Concrete Sand). Any module found to be improperly filled or filled with unacceptable material (e.g., cobbles, aggregate base, trash or other non-approved materials) shall be immediately removed from the roadway and/or refilled with the appropriate material.
6. Cone inserts, where required, shall be placed in each module and in the proper orientation.
7. Lids shall be correctly fastened and maintained and water and other elements shall not be allowed to enter the module.
8. When a temporary crash cushion array is no longer required, all modules shall be removed from the right-of-way and become the property of the Contractor. When a crash cushion array is required after the final stage of a project, or where designed as permanent, the crash cushion array will remain in place and become the property of the Agency.

9. The surface on which a crash cushion array is installed shall be smooth, flat, and compacted (usually asphalt). Grading work, if required, shall be completed prior to installation.
10. The approach end of a temporary crash cushion array shall have a Caltrans P-marker installed to delineate the approach end to oncoming traffic.
11. Temporary crash cushion arrays shall not encroach into the traveled way.
12. The Contractor shall repair any pavement damaged by the installation or removal of a crash cushion array.

6-13.05 Inadequate Traffic Controls and After-Hour Maintenance and Repairs

Should the Contractor appear negligent in furnishing and maintaining sufficient traffic control devices or protective measures or fail to provide flaggers as necessary to control traffic, the Agency may direct the Contractor, at the Contractor's expense, to abate the hazard. See Section 4-5, "Field Instructions or Other Written Directives", of these Specifications regarding requirements for compliance with directives.

Should the Agency point out the inadequacy of warning devices and protective measures, that action shall not relieve the Contractor from responsibility for public safety or abrogate the obligation to furnish and pay for these devices and measures.

Should the Contractor fail to properly furnish or maintain traffic controls, or correct a hazard caused by inadequate or inappropriate traffic control, the Agency will abate the hazard. All Agency costs to abate the hazard shall be reimbursed by the Contractor or deducted from the progress payment. If the Contractor is not available to perform after-hour maintenance and repair to traffic control devices, the Agency will correct the situation and deduct all costs from the progress payment.

6-13.06 Competent Flaggers

The Contractor shall provide flaggers to control traffic when necessary or requested by the Agency. All flaggers shall be trained as required by Cal/OSHA regulations and shall be prepared to provide verification of such training to the Agency when requested. See Section 12-2, "Flagging", of these Specifications for additional information. If in the opinion of the Agency a flagger is not operating in a manner that is conducive to the safe passage of vehicles, bicyclists and/or pedestrians, the Contractor will be directed to immediately replace such flagger.

6-13.07 Construction Signs

The Contractor is responsible for supplying, installing and maintaining all construction signs and posts. Regulatory signs or guide signs will be supplied, erected and maintained by the Agency, but must be protected from damage from construction activities by the Contractor through the duration of the project. See Section 12-3.08, "Construction Area Signs", of these Specifications for additional information.

6-13.08 Temporary Bridging of Excavations and Trenches

1. The use of steel plates shall be approved by the Agency prior to installation.
2. Steel plates, in the roadway, shall have the name and 24 hour emergency telephone number of the contractor responsible for maintaining the plates stenciled on the roadway pavement adjacent to the plates. Painted text shall be in white lettering, using chalk based paint. The text shall be neatly stenciled lettering, a minimum five inches (5") in height and shall be maintained in a neat and legible condition for the duration of plate placement.
3. Steel plate width and thickness requirements:
    a. 18" or less in width - minimum thickness of ¾"
    b. > 18" in width to 72" in width - minimum thickness of 1".
    c. The thickness of steel plates for trench widths exceeding 72" shall be established through an analysis completed by a licensed professional engineer.

4. Whenever steel plates are used to cover an excavation where the related work is to take place for longer than two (2) weeks, the steel plates must be inlayed or recessed into the existing pavement, milling out the pavement surface to ensure that the top of plate elevation matches the existing elevations of the adjacent pavement surface. Steel plates must be large enough to allow a minimum of one foot (1') of bearing on all sides of the trench.
5. Whenever steel plates are used to cover an excavation where the related work is to take place for less than two (2) weeks they may be placed on top of the asphalt with transitional ramps of MC250 asphalt mix (cutback) against all vertical edges of the plates. All ramping must be accomplished to provide a minimum angle of approach of twelve to one (12:1), providing a smooth, gradual transition between the pavement and the plate. Steel plates shall be anchored to the roadway surface with pins or spikes on the four (4) outermost corners. Additional pins shall be placed as necessary to assure the steel plates are secured. Pins shall be installed such that they do not protrude above the plate surface any more than is necessary to anchor the plate and shall not create a hazard for the motoring or pedestrian public. Steel plates should be welded together to prevent shifting/bouncing where necessary. The steel plates shall extend beyond the edge of the trench a minimum of 18", but no more than 30" on all sides. No corner of any steel plate shall protrude into the traveled way as to create a hazard to the motoring public.
6. Steel plates shall have a nonskid surface static coefficient of friction of 0.35 per California Test 342 for all steel plates within traveled roadway, and 0.50 per ASTM C 1028 for those steel plates in pedestrian crosswalks or accessible areas. When required by the Agency, the Contractor shall certify in writing to the Agency that steel plates to be used in the Work meet the required static coefficient of friction.
7. The length of a series of plates running parallel to traffic wheel paths shall not exceed 30' unless approved by the Agency or noted in the TCP or contract drawings.
8. Trench walls and adjacent soils shall be sufficiently stabilized prior to the use of steel plates for bridging.
9. For conditions that require a support structure (wide excavation with multiple plates), the system must be designed by a registered professional engineer and submitted to the Agency for approval before use.
10. Where the Street surface is uneven, plates shall be bedded on MC250 asphalt mix (cutback).
11. Steel plates shall be installed to operate with minimum noise levels as indicated in Sacramento County Code, Section 6.68, "Noise Control".
12. All steel plates within the right-of-way, whether used in or out of the traveled way, shall be without deformation (e.g., chains, attachments, weldments, or irregularities that can constitute a hazard).
13. Steel plates shall not remain on the roadway for longer than seven (7) calendar days, unless otherwise approved by the Agency.
14. BUMP (W8-1) warning signs shall be properly posted and maintained in advance of all roadway plates placed on the surface of the pavement. ROUGH ROAD (W8-8) warning signs shall be properly posted and maintained in advance of all steelplates that are inlaid.
15. The Contractor is responsible for maintaining the steel plates until the roadway is properly back-filled and patched to allow for the safe passage of vehicles.
16. The Contractor shall be responsible for any damages or injuries which may occur as a result of the plates being placed in the roadway. The Contractor must reimburse the Agency any cost for emergency repairs.

In sidewalk areas, one and one-eighth inch (1-1/8") plywood with a nonskid surface with a static coefficient of friction of 0.50 per ASTM C 1028 may be substituted for steel plating where

the excavation is less than two (2) feet deep and when authorized by the Agency. Transitional ramps of MC250 asphalt mix (cutback) shall be installed against vertical edges in the direction of pedestrian traffic (both up and down-stream). All ramping must be accomplished to provide a minimum angle of approach of twelve to one (12:1), providing a smooth, gradual transition between the sidewalk and the plate. Plywood shall extend beyond the edge of the trench and any overlap of pieces shall be a minimum of 18". The plywood shall not protrude past the sidewalk edge.

Vehicular travel over backfilled but unpaved excavations will not be allowed The Contractor shall provide a temporary surface suitable for driving consisting of at least two inches (2") of plant mix asphalt over six inches (6") of aggregate base, concrete slurry (completely cured), or traffic plates placed over the excavated area of sufficient width and thickness as indicated in this Section.

6-13.09 Entering and Leaving the Construction Zone

Construction equipment shall enter and leave the roadway by moving in the direction of public traffic. All movements of workmen and construction equipment on or across lanes open to public traffic shall be performed in a safe manner that will not endanger the workmen or the public. When leaving a work area and entering a roadway carrying public traffic, the Contractor's equipment operator shall yield to public traffic.

6-13.10 Existing Traffic Signal and Lighting Systems, Signs and Pavement Markings

Existing traffic signal and highway lighting systems shall be kept in operation during progress of the Work. When traffic signal shutdown is permitted by the Agency, the Contractor shall notify the Agency at least five (5) Working Days prior to shutdown. Traffic signal detectors accidentally cut or damaged during construction shall be repaired or replaced by the Contractor at the Contractor's expense and be operational within seventy-two (72) hours. When traffic signals are approved for shutdown, the Contractor shall control traffic by use of flaggers as directed by the Agency. "STOP" signs will not be permitted at these locations.

Existing signs and pavement markings shall be maintained by the Contractor and shall not be removed or altered without Agency approval.

6-13.11 Bus Stops

If construction operations will obstruct a bus stop, the Contractor shall notify Sacramento Regional Transit (RT) forty-eight (48) hours in advance of beginning that portion of the Work and make provisions agreeable to RT to provide an alternate location where people can safely board the bus.

6-13.12 Dust

Water or dust palliative shall be applied if ordered by the Agency for the alleviation or prevention of dust nuisance caused by the Contractor's operations as provided in Section 17, "Dust Control', of these Specifications.

6-13.13 Removal of Spillage From Roadway

The Contractor shall immediately remove any spillage resulting from hauling operations along or across any public traveled way.

6-13.14 Road Edge Drop-off

In all cases, construction operations shall be conducted to minimize the time, depth, and length of drop-offs to which motorists are exposed.

For drop-offs greater than fifteen hundredths of a foot (0.15') and within fifteen feet (15') of travel lanes, the Contractor shall provide traffic delineation, warning and protection in accordance with the treatments indicated in Table 6-1 and the following, unless otherwise shown in the Contract documents.

Delineation used for road edge drop-off applications (drop-offs greater than 0.15 feet deep) must be retro-reflective tubular markers or vertical panels. All delineators must comply with

Sections 6F.59-62 of the CA/MUTCD. Drums with retro-reflective banding may be used where adequate space is available. Delineation shall be "glue-down" type when requested by the Agency. Delineation shall be spaced as required by the CA/MUTCD and Table 6-1 of these Specifications. All delineators shall be located within twenty-four inches (24") of the traveled edge. Delineators used to separate opposing traffic flows shall be yellow with yellow retro-reflective banding.

Unless indicated otherwise in the plans or permitted in writing by the Agency, delineation and/or temporary traffic barriers used to protect drop-offs shall not protrude into the traveled way to the extent that they reduce the authorized lane width shown on the Traffic Control Plan or Contract Drawings.

Channelizing devices may be placed in the drop-off area for depths up to six inches (6"). For drop-offs greater than six inches (6"), the channelizing devices must be placed entirely on the paved surface.

For drop offs greater than one-tenth of a foot (0.10'), a transition ramp shall be used to mitigate edge drop-off conditions. The ramp shall be constructed from the pavement surface to the surface of the excavated area at a six to one (6:1) or flatter slope. Ramp material shall be erosion resistant, fully compacted, and compatible with the material in the excavated area. Where a ramp is used, the following requirements shall apply as an alternative to the requirements indicated in Table 6-1. The ramp shall be demarcated by placing delineators along the traffic side. LOW SHOULDER (W8-9) or UNEVEN LANES (W8-11) warning signs shall be erected and maintained by the Contractor. Spacing for delineation and warning signs shall be as indicated in the CA/MUTCD.

Whenever barrier protection is required by Table 6-1, the Contractor shall provide a Temporary Traffic Barrier (TTB) in full compliance with these Specifications.

When an edge drop-off treatment is required, and/or a ramp is selected as a mitigating measure, the thickness, type of material to be used and slope requirements and all other relevant details shall be indicated on the Contractor's submitted TCP.

TABLE 6-1
PAVEMENT EDGE DROP-OFF

CONDITIONS		TREATMENT		
Distance from edge of traveled way (D)*	**Edge Drop-off Depth (d)****	**Delineation**	**Warning Signs**	**Barrier Protection**
D ≤ 8 ft	0.15 ft < d ≤ 0.25 ft	Tubular Markers <100 ft spacing	W8-9 or W8-11 (as appropriate) < 2,000 ft spacing	Not Required
D ≤ 8 ft	d > 0.25 ft	Tubular Markers <100 ft spacing	C27 & C31A (alternately set) < 2,000 ft spacing	Required if excavation is ≥ 1 foot deep. (see Section 6-13.04.A)
8 ft < D ≤ 15 ft	0.25 ft < d ≤ 2.5 ft	Tubular Markers <100 ft spacing	C27 < 2,000 ft spacing	Required if excavation is ≥ 1 foot deep. (see Section 6-13.04.A)
D > 15 ft	0.5 ft < d ≤ 2.5 ft	Tubular Markers <200 ft spacing	C27 < 2,000 ft spacing	Not Required
D > 15 ft	d > 2.5 ft	Based on engineering judgment or studies	Based on engineering judgment or studies	Not Required

**The edge of the traveled way is defined as the actual road edge when not striped or the inside edge of lane limit line for striped roadways. In other words, the traveled way is the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, bike lanes, and parking lanes.*

***The edge drop-off depth is defined as the change in elevation when a shoulder is lower than the adjacent traveled lane at the edge of the lane, on the shoulder, or at the edge of the shoulder.*

WARNING SIGNS:

W8-9 (LOW SHOULDER) --- used to warn of a shoulder condition where there is an elevation difference of less than 3" between the shoulder and the travel lane.

W8-11 (UNEVEN LANES) --- used during operations that create a difference in elevation between adjacent lanes that are open to travel of 2" or more.

C-27 (OPEN TRENCH) --- used in advance of open trenches in/or adjacent to roadway.

C-31A (NO SHOULDER) --- used where no earth, gravel or paved shoulders are available for vehicles to pull off the roadway.

W8-4 (SOFT SHOULDER) --- used to warn of a soft shoulder condition.

W8-9a (SHOULDER DROP OFF) --- used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 3 inches in depth for a significant continuous length along the roadway.

6-14 TRAFFIC CONTROL PLANS (TCP)

6-14.01 Traffic Pattern Changes

The Contractor shall notify the Agency in advance of the Contractor's desire to change any existing traffic patterns. Traffic lanes for public use shall be at least ten feet (10') in width. Whenever feasible an additional four feet (4') shall be provided for a bicycle lane. If it is not feasible to provide a separate bicycle lane, the Contractor shall post signage before the construction area stating, "SHARE the Road with Bicyclists". Additionally, when the lane is shared, the Contractor shall post signage for a maximum speed limit of 25 MPH in the shared lane. For traffic pattern changes that do not require a road closure, the Contractor shall provide the Agency with a minimum of five (5) Working Days advance notification, unless otherwise approved or deemed an emergency lane closure by the Agency. For all road closures, the Contractor shall provide the Agency with a minimum of twenty (20) Working Days notice prior to the desired closure date, unless otherwise approved or deemed an emergency road closure by the Agency.

6-14.02 Traffic Control Plans (TCP)

A TCP is required for all work performed within the public right-of-way. Each TCP shall be developed in accordance with the California Manual on Uniform Traffic Control Devices (CA/MUTCD). The TCP must clearly depict sequencing of the Work, the portion of the Work to be performed during each phase, and the traveled way that will be utilized by all movements of both vehicular and pedestrian traffic during each phase.

If a TCP is included in the Contract documents, the Contractor may choose to submit that TCP if the submittal is signed and stamped by the Contractor's traffic control professional (as defined in Item 5 below) verifying that the TCP meets all of the required elements and is appropriate for the Contractor's means and methods of completing the Work.

The TCP shall be provided to the Agency for approval a minimum of five (5) Working Days in advance of rudimentary lane closures and twenty (20) Working Days in advance of complex lane closures and road closures. The Contractor shall be solely responsible for submitting any proposed TCP or modification and obtaining the Agency's approval. Copies of the approved TCP shall be onsite at all times.

Unless otherwise approved by the Agency, the TCP shall:

1. Be drawn on 24" x 36" or 11" x 17" sheets
2. Be legible, using either ink or computer generated graphics
3. Show all proposed construction signs, barricades, flaggers, delineation and other traffic control devices required to provide appropriate traffic control for the Work
4. Indicate the name, address and telephone number of the person responsible for development of the TCP
5. Be signed and stamped by a Registered Civil Engineer, Registered Traffic Engineer, ATSSA certified Traffic Control Supervisor, C-31 Licensed Contractor, or other qualified individual
6. Include the name and telephone number of the 24-hour contact person representing the Contractor
7. Indicate the Contract number, encroachment permit number, or the name of the improvement project
8. Indicate the duration of the construction work (calendar days) and the requested work hours (example -- 8:00am to 3:30pm)
9. Indicate a north arrow and scale
10. Show and label all streets in the vicinity
11. Show all existing traffic signals and traffic control signs and indicate any proposed operational changes (e.g., placing signal lights on flash, or covering signal lights temporarily)

12. Show existing striping, pavement markings, painted crosswalks and bike lanes. Include total roadway widths, individual lane widths, bike lane widths, median dimensions, etc.
13. Show existing curbs, gutters, sidewalks, driveways and intersections in the construction work zone including areas affected by taper transition
14. Indicate posted speed limits
15. Show location and dimensions of the construction work zone
16. Show staging area and materials storage area, as appropriate
17. Label all taper lengths and widths, delineator spacing and sign spacing
18. Include a legend to define all symbols and designate them with CALTRANS nomenclature
19. Show all parking restriction zones and signs, as appropriate, and
20. Indicate bicycle and pedestrian routes and detours, including any signs and barricades to be used to direct pedestrians or bicyclists through or around the Work.

6-15 BARRICADING OPEN TRENCHES

Any excavation permitted by the Agency to be left open shall be barricaded with Type I, Type II, or Type III barricades with retro-reflective tape and flashers, as approved or directed by the Agency. Signs stating "OPEN TRENCH" shall be posted when requested by the Agency. All open excavated areas shall be barricaded with at least two (2) Type III barricades at the end of the excavation that faces oncoming traffic. Any excavation within eight feet (8') of the traveled way, not protected by a barrier approved by the Agency, as indicated in Section 6-13.14 “Road Edge Drop-off” of these Standard Specifications, shall be backfilled at the end of the work shift provided with a transitional ramp meeting the requirements of Section 6-13.14, or plated in accordance with Section 6-13.08, "Temporary Bridging of Excavations and Trenches”, in this Section of these Specifications.

6-16 EXISTING UTILITIES

6-16.01 General

The Contractor shall coordinate and fully cooperate with the Agency and utility owners for the location, relocation, and protection of utilities. The Contractor’s attention is directed to the existence of utilities, underground and overhead, necessary for all buildings in the Work area. It is the responsibility of Contractor to arrange for all utilities necessary for the Work site. The Contractor shall arrange with utility owners for the location of service lines serving these buildings in advance of the actual construction and for the relocation of such facilities, if necessary, by the utility owner or the Contractor.

Coordination activities shall include communication with all utilities with facilities potentially in conflict with the Work, and working cooperatively with those utilities to schedule any required relocation work by the utilities or their contractors. The Contractor shall provide schedule updates of any change to the schedule of the Work to all utilities every two weeks. Copies of all communications between the Contractor or Subcontractors and the utilities shall be provided to the Agency if requested.

Section 4216.4 of the Government Code REQUIRES that the excavator expose marked underground utilities by hand BEFORE using power equipment, UNLESS documented notice is provided to the facility owner AND the facility owner agrees to allow power-operated or power-driven equipment, as specified in said Section 4216.4 of the Government Code. Within two weeks of the Notice to Proceed, the Contractor shall perform the following work:

- Mark the entire area to be excavated, as defined in Section 6-16.04, “Underground Service Alert (USA North)”, of these Specifications.
- Contact USA North to mark all existing utilities within the area marked to be excavated
- Pothole by hand (except as allowed in Section 4216.4 of the Government Code as referenced above) to locate all existing facilities, including existing utility services,

laterals, or appurtenances whenever their presence can be inferred from other visible facilities such as buildings, meters, junction boxes, valves, service facilities, identification markings, and other indicators on or adjacent to the Work. Utility facilities that are aligned with the proposed location of contract excavation work, such that the marked location of the existing utility facilities lies within twenty four inches from the outside edge of the facility for a longitudinal distance of fifty feet or more, shall be potholed at fifty-foot intervals, unless otherwise directed by the Agency

Upon determination of the existence of any conflicting utility, the Contractor shall promptly coordinate any necessary utility relocation work as required herein. The Contractor shall provide a written statement to the Agency as to the existence of any conflicting utility facilities and information about utility coordination and schedules for utility relocations both above and below the surface of the ground, if any, within three weeks of the Notice to Proceed.

6-16.02 Maintenance and Protection

Unless otherwise shown or specified in the Contract, the Contractor shall maintain in service all drainage, water, gas, sewer lines, power, lighting, telephone conduits, and any other surface or subsurface utility structure that may be affected by the Work. However, the Contractor, for convenience, may arrange with individual owners to temporarily disconnect service lines or other facilities along the line of the Work. The cost of disconnecting and restoring such utilities shall be borne by the Contractor.

Unless otherwise specified in the Special Provisions, the Contractor shall protect all existing utilities on all projects being constructed, whether inside or outside of highway rights-of-way. The utility owner in these cases may elect to provide the necessary protective measures and bill the Contractor for the cost. "Existing utilities" includes traffic control devices, conduits, streetlights, and related appurtenances.

Existing utility facilities that are to be relocated, including traffic signals and light poles, shall be relocated prior to paving. No paving shall be performed around existing utility facilities that are to be relocated.

6-16.03 Exact Locations Unknown

The locations of existing utility facilities shown on the Plans are approximate and represent the best information obtainable from utility maps and other information furnished by the various utility owners involved. The Agency warrants neither the accuracy nor the extent of actual installations as shown on the Plans. There may be additional utilities on the property unknown to either party to the Contract. If, during the course of the Work, additional subsurface utilities are discovered, the Agency may make adjustments to the Work. Compensation for such adjustments will be in accordance with Section 9, "Changes and Claims", of these Specifications.

In accordance with Government Code Section 4215, the Agency will compensate the Contractor for the costs of locating, repairing damage not due to the failure of the Contractor to exercise reasonable care, removing, relocating or protecting existing main or trunk line utility facilities not indicated in the Plans and Specifications with reasonable accuracy, and for equipment on the Work necessarily idled during such work. In no event shall the Agency be liable for any further or additional costs resulting directly or indirectly from any such occurrence. Compensation will be in accordance with Section 9, "Changes and Claims", of these Specifications.

If the Contractor discovers utilities not identified in the Plans or Specifications, the Contractor shall immediately notify the Agency and the utility owner by the most expeditious means available and later confirm in writing. If the completion of the Work is delayed by failure of the Agency or the utility owner to remove, repair, or relocate the utility, such delay may be an unavoidable delay as defined and provided for in Section 7-12.02, "Unavoidable Delays", of these Specifications. Nothing herein shall preclude the Agency from pursuing any appropriate remedy against the utility for delays that are the responsibility of the utility. The Contractor shall

not be assessed liquidated damages for delay in completion of the Work for that portion of such delay as is caused by failure of the Agency or the owner of a utility to provide for the removal or relocation of existing utilities.

6-16.04 Underground Service Alert (USA North)

The Agency is a member of the Underground Service Alert (USA North) One-Call program. The provisions of Government Code Sections 4216 through 4216.9, inclusive, shall be followed.

Except in an emergency, the excavator (as defined by Government Code Section 4216) shall notify USA North at least two (2) Working Days, but no earlier than fourteen (14) Calendar Days, in advance of performing excavation work, as defined by Government Code Section 4216(b), including potholing, tree removals, earthwork, installation of underground facilities, trench excavation, roadway excavation, structural excavation, piling, installation of foundations, pole installations, boring and jacking, earth saw trenching, planting of trees, and exposing subsurface installation with hand tools before using any power-operated or power driven equipment. USA North can be reached by calling 811 or (toll free) 1-800-227-2600. For emergency repairs the excavator must contact USA North and the County operator at 916-875-6900.

Each phase of a project shall be called into USA North and continuing excavation reported every twenty-eight (28) Calendar Days. The excavator shall not call in to USA North the entire project boundaries or, on road construction projects, the entire length of the project. The excavator shall only request the marking of facilities within the area to be excavated within twenty-eight (28) Calendar Days of the call. USA North will provide an inquiry identification ("ticket") number to the person contacting the center. The USA North ticket number shall be available to the Inspector at the job site along with the date USA North was called. If the USA North notifications are not kept up-to-date, the excavation will be stopped, and a new two (2) Working Day notice will be required before continuing the excavation. If, at any time during an excavation for which there is a valid ticket number the field markings are no longer reasonably visible, the excavator shall contact USA North to have the area re-marked. The excavator shall allow two (2) Working Days for re-marking of facilities.

Prior to calling USA North, the excavator shall clearly mark the excavation site with white, water-soluble or spray chalk paint in paved areas or place flags, stakes, whiskers, or some other approved method in unpaved areas. The excavator shall determine the approximate location (twenty-four inches (24") from outside edge on either side of the facility) of utilities in conflict with the proposed excavation by exposing the subsurface installation with hand tools before using any power-operated or power-driven equipment. The excavator is responsible for preserving operators' markings or markers until they are removed.

Prior to Field Acceptance, all USA North markings shall be removed by the Contractor to the satisfaction of the Agency. During the progress of the Work, markings or markers shall be removed within two (2) months of the date the markings or markers are no longer needed or upon completion of the work, whichever is sooner. The Agency will accept natural weathering of markings if the markings disappear within the two-month period or prior to Field Acceptance. If the markings are in brick pavers or concrete areas and if, by natural weathering or other approved removal methods, the markings still remain, the Contractor must replace the concrete or the brick pavers in-kind, unless the utility operator has failed to use chalk-based paint or other non-permanent marking materials. Excavators and utility operators are encouraged to avoid marking in these areas by using offset markings. Removal methods shall be non-destructive and residual shadowing shall not remain.

Removal of markings shall comply with requirements of the National Pollutant Discharge Elimination System (NPDES), the Regional Water Quality Control Board (RWQCB), and any other applicable federal, state, and local laws, rules, or regulations.

USA North markings not removed by the required time lines may be removed and the sidewalk or street repaired/replaced by the Agency at its discretion. The Agency will charge the excavator a service fee equal to the actual costs of removal for removing the markings and

making any repairs and/or replacements. This fee will include the cost to comply with NPDES, the RWQCB, and any other applicable federal, state, and local laws, rules, or regulations.

6-16.05 Damage to Existing Utilities

The excavator shall notify the affected utility of any contact, scrape, dent, nick, or damage to their facility. Any operator or excavator who negligently violates Government Code Section 4216 through 4216.9, inclusive, is subject to a civil penalty in an amount not to exceed ten thousand dollars ($10,000). Any operator or excavator who knowingly and willfully violates Government Code Section 4216 through 4216.9, inclusive, is subject to a civil penalty in an amount not to exceed fifty thousand dollars ($50,000).

Table 6-2 designates color codes and abbreviations that shall be used by the Contractor and the utility owners to identify utilities.

6-17 APPROVAL OF CONTRACTOR'S PLANS NO RELEASE FROM LIABILITY

The review or approval by the Agency of any working drawing or any method of work proposed by the Contractor shall not relieve the Contractor of any of the Contractor's responsibility for any errors and shall not be regarded as any assumption of risk or liability by the Agency or any officer, official, agent, employee, member, volunteer, affiliate, or their duly authorized representatives. The Contractor shall have no claim under the Contract because of the failure or partial failure or inefficiency of any reviewed or approved plan or method. Agency review or approval means that the Agency has no objection to the Contractor using the proposed plan or method at the Contractor's responsibility and risk.

TABLE 6-2
FIELD MARKINGS - COLOR CODES AND SYMBOLS

Color	Typical Abbreviation	Typical Utility
White	USA	Proposed Excavation
Pink	TSM	Temporary Survey
Red	SL E TS	Street Lighting Electric Traffic Signals
Yellow	G PP STM CH Company Name	Gas Oil Steam Chemical
Blue	W	Water
Purple	RW IRR	Reclaimed Water Irrigation
Green	SS SD	Slurry Sewer Storm Drain

COMMON ABBREVIATIONS			
Facility Identifiers			
CH	Chemical	SL	Street Lighting
E	Electric	STM	Steam
FO	Fiber Optic	SP	Slurry System
G	Gas	TEL	Telephone
LPG	Liquefied Petroleum Gas	TS	Traffic Signal
PP	Petroleum Products	TV	Television
RR	Railroad Signal	W	Water
SS	Sewer	RW	Reclaimed, Recycled, Non-Potable Water
SD	Storm Drain		

Underground Construction Descriptions			
C	Conduit	HH	Hand Hole
CDR	Corridor	MH	Manhole
D	Distribution Facility	PB	Pull Box
DB	Direct Buried	R	Radius
DE	Dead End	STR	Structure
JT	Joint Trench	T	Transmission Facility
HP	High Pressure		

6-18 CONTRACTOR SHALL NOT MORTGAGE EQUIPMENT

The Contractor shall not mortgage or otherwise convey the title of the plant, machinery, tools, appliances, supplies, or materials that may at any time be in use, or further required or useful, in the prosecution of the Work, without prior written consent of the Agency.

6-19 PROPERTY RIGHTS IN MATERIALS

Nothing in the Contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been installed, attached or affixed to the Work, and on which partial payments have been made by the Agency. All such materials shall be the property of the Contractor and the Agency jointly as their interests may appear, and shall not be removed from the Work by the Contractor without the Agency's consent.

6-20 EXCAVATION AND TRENCH SAFETY

Contractors that plan to excavate four (4) or more feet below grade must follow the requirements of the California Code of Regulations, Title 8, California Code of Regulations, Section 1541 and this Standard Specification. Trenching and excavation activities present hazards such as underground utilities, access and egress limitations, hazardous atmospheres, water accumulation, stability of adjacent structures, fall protection concerns, and cave-ins. In addition to addressing these hazards, California Code of Regulations, Title 8, California Code of Regulations, Section 1541 also sets forth the requirements for protecting employees form moving ground. Specifically, all excavations 5-feet or more in depth must be shored, sloped, benched or otherwise supported to prevent a cave-in.

6-20.01 Permit

The Contractor must obtain a permit from the Division of Industrial Relations per Labor Code Section 6500, as specified in California Code of Regulations, California Code of Regulations, Title 8, Article 6, Section 1539 “Permits” of the Construction Safety Orders, for all excavations five feet (5’) or deeper to which an employee is required to descend. The permit shall be kept at the construction site at all times.

6-20.02 Shoring, Bracing, Shielding and Sheeting

In accordance with Labor Code Section 6705, at least five (5) Working Days in advance of excavation of any trench or trenches five feet (5’) or more in depth, with a total value of twenty-five thousand dollars ($25,000) or more, the Contractor shall submit to the Agency a detailed plan showing the design of shoring, bracing, sloping, or other provisions for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards, the plan shall be prepared by a California registered civil or structural engineer. A signed copy of the detailed plan shall be on the site at the time of the excavation. Nothing in this Section shall be deemed to allow the use of a shoring, sloping, or protective system less effective than that required by the Construction Safety Orders. Nothing in this Section shall be construed to impose tort liability on the Agency or any of its employees. These systems must support the sides of the excavation and prevent soil movement that could cause injury to any person or structure. Any damage resulting from a lack of adequate shoring, bracing, shielding or sheeting shall be repaired at the Contractor's expense.

The Contractor shall immediately replace or repair any unsafe ladder, scaffolding, shoring, or bracing, or correct any other dangerous or hazardous situation that exists.

A Competent Person, as defined in California Code of Regulations, Title 8, Construction Safety Orders, Section 1504, “Definitions”, shall be on site at all times when the Contractor's employees are working within the trench. A "Competent Person" is one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

The price bid for work that will require an excavation of five feet (5’) or deeper (or less if conditions warrant) shall include the cost of adequate sheeting, shoring and bracing, or equivalent method conforming to applicable safety orders, unless a separate bid item for such work is included in the bid form.

6-20.03 Contaminated Soil Management

If the Contractor is performing excavation work at a site where there is evidence of or historical data to indicate that the soil is contaminated with oil, fuel, or other such hazardous materials, the Contractor is required to adhere to the regulatory requirements that govern the excavation and disposal of contaminated soil. These requirements include provisions for work zone delineation and control, handling of contaminated debris, storage of excavated soil, personal protective equipment, equipment decontamination, and air monitoring. See Section 10-7 Contaminated and Hazardous Materials or Environments of these Standard Specifications for additional information.

The Contractor is required to stop work and implement the appropriate emergency response procedures in the event that field observation (e.g. odor, discoloration/staining, oily sheen) indicates that contaminated soil has been encountered. If the Contractor fails to stop work and implement appropriate emergency response procedures, the Agency may stop the work and the Contractor is responsible for impacts to the Work due to the Agency stoppage.

To ensure that construction activities do not increase the risk of a release of hazardous materials, the Contractor is required to have and implement a Spill Prevention Control and Countermeasure (SPCC) Plan. The Contractor’s SPCC Plan will describe the procedures and equipment in place to minimize spills, leaks or releases of oil or hazardous materials. In

addition, the plan will address the reporting and response procedures in the event of an incident.

6-21 PRESERVATION OF PROPERTY

Roadside trees and shrubbery that are to remain, pole lines, fences, signs, traffic control devices, striping, survey markers and monuments, buildings and structures, conduits, under- or above-ground pipelines, and any other improvements and facilities shall be protected from injury or damage. If ordered by the Agency, the Contractor shall provide and install suitable safeguards to protect such objects from injury or damage. If such objects are injured or damaged by reason of the Contractor's operations, said objects shall be replaced or restored at the Contractor's expense to a condition as good as when the Contractor entered upon the Work. The Contractor shall receive Agency approval before the removal of any road sign or permanent traffic control device that interferes with the Work.

6-22 OVERLOADING, PAVEMENT PROTECTION & REPAIR

The Contractor shall determine safe loading capacities and shall not overload any structure, equipment, pavement, or material beyond its safe capacity, or deteriorate any further the preconstruction condition of pavement during construction. Protection of pavement to prevent damage, cracking or scarring is the responsibility of the Contractor. The Contractor assumes full responsibility for any damage resulting from any such overloading or failure to adequately protect the existing pavement.

The Contractor shall request a pre-construction inspection prior to performing any work to validate the condition of all existing public facilities, including but not limited to, pavement, striping, curb and gutters, median curbing, sidewalks, median pavement and plantings, channelization islands, and traffic signal facilities. Following construction, and prior to field acceptance, a post-construction inspection shall be conducted to identify damage resulting from the Contractor's activities. Pre- and post- construction inspections shall include representatives from the Contractor and the Agency. Damage identified as a result of the pre- and post-construction inspections, and which was caused by the Contractor's activities, shall be repaired by the Contractor to the Agency's satisfaction at no additional cost to the Agency.

SECTION 7 PROSECUTION OF THE WORK

7-1 BEGINNING OF WORK

No work may take place prior to receipt of the executed Contract (as defined in Section 3-7, "Execution of Contract") and review and approval of the prescribed bonds and insurance. Following execution of the Contract by the Agency, and receipt and approval of the bonds and insurance by the Agency, a Notice to Proceed (NTP) will be issued, which shall constitute authorization to begin the Work. The NTP will state the date on which the counting of Contract Time will commence. The Contractor may commence the Work upon issuance of the NTP. See Section 1-2, "Definitions", of these Specifications for the definition of the Notice to Proceed.

The counting of Contract Time shall begin no later then thirty (30) Calendar Days from the time the Contractor receives the Contract forms for execution.

7-2 AMOUNT OF WORK UNDER CONSTRUCTION

The Contractor shall not have more work under construction than can be prosecuted properly with regard to the rights of the public.

7-3 PRECONSTRUCTION CONFERENCE AND PROGRESS MEETINGS

Prior to beginning work a preconstruction conference shall be held for the purpose of reviewing the Work. The Contractor must attend this preconstruction conference, and shall invite Subcontractors and others necessary to ensure all topics are adequately covered. Topics discussed include, but are not limited to, mobilization, access, temporary facilities, utilities, subcontractors, schedules, procedures, correspondence, progress payments, payroll records, Storm Water Pollution Prevention Plans (SWPPP), coordination, safety, after-hour contacts for Contractor and Agency personnel, quality control/quality assurance, personnel assignments, and other topics as appropriate.

Progress meetings, as stipulated in the Special Provisions or as required by the Agency, will be conducted throughout the duration of the Contract. The purpose of these meetings is to inform, discuss, and resolve issues related to the Work; the Contractor or the Contractor's agent shall attend. Topics discussed include, but are not limited to, progress, schedules, safety, SWPPP, Requests for Information, Change Orders, Field Instructions, field coordination, submittals, quality control/quality assurance, testing, startup, safety, and other topics related to the Work.

7-4 WORK TO BE PROSECUTED WITH ADEQUATE SUPERVISION, LABOR FORCE, EQUIPMENT AND METHODS

The Contractor shall prosecute the Work under the Contract with all materials, tools, machinery, apparatus, and labor necessary to complete the Work as described, shown, or reasonably implied under the Contract, or as directed by the Agency, on or before the scheduled completion date.

7-4.01 Superintendence

The Contractor shall keep on the Work, throughout its progress, a competent superintendent who shall have complete authority to represent and act for the Contractor. Such superintendent shall be capable of reading and understanding the Contract, and shall receive and follow any instruction given by the Agency.

Whenever the Contractor or the Contractor's superintendent is not present on a particular part of the Work where it may be desired to give direction, orders will be given by the Agency and shall be received and obeyed by the foreman or other representative who may have charge of the particular work in reference to which the orders are given, or the Agency may stop the work until the Contractor or the Contractor's superintendent arrives.

7-4.02 Labor

Workers, laborers, or mechanics skilled in each class of work shall accomplish every part of the Work.

7-4.03 Equipment and Methods

Only equipment and methods suitable to produce the quality required by the Contract will be permitted to operate on the Work. Except as specified in Section 5-7, "Contractor's Equipment", of these Specifications, equipment shall be that used in general practice for the work undertaken. If any part of the Contractor's plant, equipment, or methods of executing the Work is unsafe, inefficient, or inadequate to ensure the required quality or rate of progress of the Work, the Agency may order the Contractor to modify the Contractor's facilities or methods. The Contractor shall promptly comply with such orders at the Contractor's expense. However, neither compliance with such orders nor failure of the Agency to issue such orders shall relieve the Contractor from the obligation to secure the degree of safety, the quality of the Work, and the rate of progress required by the Contract. The Contractor is responsible for the safety, adequacy, and efficiency of his plant, equipment, and methods.

7-5 SCHEDULES

The Contractor shall submit a schedule, in accordance with this Section and Section 5-8, "Contractor's Submittals", of these Specifications, which illustrates the Contractor's plans for carrying out the Work. The Agency will review the schedule, and any updates or revisions, for conformance to the Contract. Agency review of a schedule, update, or revision does not relieve the Contractor of responsibility for the feasibility of the schedule or requirements for accomplishments of milestones and completion within Contract Time, nor does the Agency review warrant or acknowledge the reasonableness of the schedule's logic, durations, labor estimates, or equipment productivity.

If no separate item is provided in the Bid Form, payment for schedules shall be included in payments for mobilization. If no bid item for mobilization is included in the Bid Form, conformance with this provision is incidental to and included in the various bid items and no additional payment will be made. Updates and revisions of the schedules are included in the prices paid for other items of work.

Because the Agency places a high value on the importance and use of project scheduling information as a management tool in achieving the completion of the Work as planned, the Agency will deduct ten percent (10%) of the monthly Progress Payment, but not more than twenty-five thousand dollars ($25,000), for failure by the Contractor to submit the baseline and monthly updated schedule, as required by these specifications, with each monthly progress payment request. These deductions are cumulative, and will be made for each and every month that the Contractor fails to provide the required information. The monthly updated schedule and narrative shall be accurate, reflect actual events on the project, and meet all requirements of these specifications. If the contractor does not correct the deficiency by providing an acceptable schedule update within ten (10) days of the Agency's receipt of the monthly Progress Payment request, the deduction will become permanent via a deductive change order.

7-5.01 Progress Schedule

A bar chart or similar form of baseline and progress schedule will be required for all contracts. Unless otherwise agreed to in writing by the Agency, the latest version of MS Project or Primavera shall be used. The Contractor shall submit three (3) copies, plus an electronic copy, of a complete baseline schedule at the preconstruction conference (see Section 7-3, "Preconstruction Conference and Progress Meetings", in this Section of these Specifications). The baseline schedule shall show all major portions of the Work, the estimated dates on which the Contractor shall start each portion of the Work, and the contemplated dates for completing each portion of the Work or the approximate percentage of the Work or portions of the Work scheduled for completion at any time and/or the planned duration for each portion of the Work identified on the schedule.

Unless agreed to by the Agency, progress schedules shall be updated and submitted to the Agency with each Progress Payment request or when requested by the Agency. . The Contractor shall submit three (3) copies, plus an electronic copy. All schedule updates or revisions shall show the effects of any occurrence upon which the Contractor will base a notice of potential claim or has based any claim (see Section 9, "Changes and Claims", of these Specifications), and shall expressly call the Agency's attention to those effects. A revised or updated schedule shall be submitted within ten (10) Working Days of an Agency request.

The Contractor shall carry out the various elements of the Work concurrently, as is practicable, and shall not defer construction of any portion of the Work in favor of any other portion, without the express written approval of the Agency.

Despite the submission of a progress schedule, the Contractor shall be governed by the direction of the Agency if, in the judgment of the Agency, it becomes necessary to accelerate the Work or any part thereof, or cease work at any particular point and concentrate the Contractor's forces at such other point or points, with the intent of preventing delays.

7-5.02 CPM Schedule

When required by the Special Provisions, in lieu of the baseline and progress schedules required by the previous Section (Section 7-5.01), the Contractor shall submit a practicable Critical Path Method (CPM) network schedule within thirty (30) days of receipt of the Contract. Unless otherwise agreed to by the Agency, the latest version of MS Project or Primavera shall be used. The CPM network diagram shall be time-scaled and include printouts showing the mathematical analysis of the CPM network diagram. Activities shall include, but not be limited to, construction activities, procurement activities, submittal activities, and any other activities by the Contractor, the Agency, or any other entity that may impact the Work. Submittal and procurement activities shall include falsework drawings, post tensioning drawings, test procedures, mix designs, long time lead items, etc. The following information shall be shown for each activity:

1. Unique number(s) for each activity
2. Activity description
3. Activity relationships and dependencies (logic)
4. Activity duration in Working Days
5. Early start, early finish, late start, late finish dates (calendar date, i.e. day, month, year)
6. Total float, free float
7. For completed activities: actual start dates, actual finish dates, duration, and logic
8. Interim milestone dates and completion dates
9. Detailed list of work contained within each activity
10. Manpower loading for each item of work for unit price contracts
11. Cost loading for each item of work for lump sum contracts

The Contractor shall submit three (3) full-size paper copies and an electronic copy of each CPM schedule. Updates to the CPM schedule shall be submitted with each Progress Payment request, when Contract events are changed, or within ten (10) Working Days of an Agency request. A narrative describing the general status of the Work and addressing any problem areas or delays shall be submitted with each revision or update, with impacts on critical path items of work highlighted. A corrective course of action shall also be included when problem areas or delays are encountered.

All schedule updates or revisions shall show on the critical path the effects of any occurrence upon which the Contractor has based a notice of potential claim or will base any claim (see Section 9, "Changes and Claims", of these Specifications) and shall expressly call the Agency's attention to the effects. A resource leveled/constrained schedule will not be accepted for the determination of critical path impacts.

7-5.03 Four-Week Rolling Schedule

A four-week rolling schedule shall be provided by the Contractor at each progress meeting. The schedule shall provide an accurate representation of the work performed the previous week and work planned for the current week and subsequent two (2) weeks.

The schedule shall be provided in a bar chart form with information derived from and consistent with the current project schedule. The schedule shall include activity ID number, activity description, start and finish dates (both scheduled and actual), and any other information requested by the Agency. Each activity shall be coded to note activities on the critical path and activities that are behind schedule.

7-5.04 Float

Float in any activity, milestone completion date, and/or Contract completion date is owned by the Project and, as such, is a resource available to both the Agency and the Contractor. Neither the Agency nor the Contractor owns the float time.

Unless otherwise provided herein, float is synonymous with total float. Total float is the period of time measured by the number of Working or Calendar Days (as specified in the Contract) each non-critical path activity may be delayed before it and its succeeding activities become part of the critical path. If a non-critical path activity is delayed beyond its float period, then that activity becomes part of the critical path and controls the end date of the work. Thus, delay of a non-critical path activity beyond its float period will cause delay to the project itself.

Acceptance of a Baseline Schedule, Monthly Update(s), or Revised Schedule, which is based on less time than the maximum time allowed for milestone or Contract completion, does not serve to change any Contract duration, nor does it serve as a waiver of either the Contractor's or Agency's right to utilize the full amount of time specified in the Contract. As such, liability for delay of the project completion date rests with the party actually causing delay to the project completion date. For example, if Party A uses some, but not all, of the float time and Party B later uses the remainder of the float time as well as additional time beyond the float time, Party B shall be liable for the costs associated with the time that represents a delay to the project's completion date. Party A would not be responsible for any costs since it did not consume all of the float time and additional float time remained, and the Project or milestone completion date was unaffected.

7-6 UNUSUAL SITE CONDITIONS

The Contractor shall promptly, and before the following conditions are disturbed, notify the Agency, in writing, of any:

1. Material that the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code, which is required to be removed to a Class I, Class II, or Class III disposal site in accordance with provisions of existing law.

2. Subsurface or latent physical conditions at the site differing from those indicated in the Contract.
3. Unknown physical conditions at the site of any unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract.

The Contractor shall follow up the prompt notification with written documentation of the unusual site condition within five (5) Working Days. The Agency will investigate the condition and arrange for any modification to the condition it deems appropriate, or issue a Contract Change Order per Section 9, "Changes and Claims", of these Specifications if it finds that the conditions do materially differ or involve hazardous waste.

7-7 PURSUANCE OF WORK DURING INCLEMENT WEATHER

During inclement or unsuitable weather or other unfavorable conditions, the Contractor shall pursue only such portions of the Work that will not be damaged by the weather or unfavorable conditions. When the weather or unfavorable conditions creates hazardous travel or working conditions, as determined by the Agency, the Contractor may be directed to stop that portion of the Work, in accordance with Section 5-21, "Temporary Suspension or Delay of Work", of these Specifications, until the weather clears or the conditions are no longer unfavorable.

The Contractor must keep roads safe and inspect and maintain stormwater pollution prevention and erosion control devices during inclement weather or unfavorable conditions. Lane and road closures may not be allowed if the Agency determines that the traffic controls will create unnecessary risk to the traveling public, the Contractor, and/or Agency employees.

7-8 PEAK HOURS, HOURS OF DARKNESS, HOLIDAYS, AND WEEKENDS

7-8.01 Allowable Times and Hours of Work

Unless otherwise noted in the Special Provisions, directed or approved by the Agency, no work shall be done between the hours of 6 p.m. and 6:30 a.m., or on Saturdays, Sundays, or Legal Holidays. Unless otherwise noted in the Special Provisions, directed or approved by the Agency, no lane of traffic shall be closed to the public during the peak hours of 6:30 a.m. to 8:00 a.m. and 3:30 p.m. to 6:00 p.m., except as necessary for the proper care and protection of work already performed or in case of an emergency repair as defined below. These exceptions are allowed only with the Agency's written permission.

Unless otherwise noted in the Contract documents, no lane or road closures will be permitted between the hours of 7:00 a.m. and 9:00 p.m. at the following locations:

- Watt Avenue between Folsom Boulevard and Fair Oaks Boulevard
- Sunrise Boulevard between Folsom Boulevard and Fair Oaks Boulevard
- Hazel Avenue between Folsom Boulevard and Winding Way

Lane or road closures at these locations during the times indicated will only be allowed in emergency situations or with the express written approval of the Director of the Department of Transportation or his/her designee.

Liquidated Damages (see Section 8-10, "Liquidated Damages for Delay", of these Specifications) of fifty dollars ($50) per minute may be assessed to Contractors who fail to comply with the prescribed lane closure hours noted above, in the Special Provisions, or as otherwise directed by the Agency. These liquidated damages are based on the estimated Agency costs to enforce the Contract restrictions for allowable times and hours of work.

7-8.02 Off-Period Work

A written request to work between 6 p.m. and 7 a.m. or on Saturdays, Sundays, or legal holidays, or to close a lane of traffic during peak hours must be submitted at least two (2) Working Days in advance of the intended work. The Agency will evaluate the Contractor's

request to determine if there is a benefit to the Agency, a nuisance or a hazard to the public, the project, or the area surrounding the site, and if the Contractor should pay any Agency overtime costs related to the off-period work. The Agency may place conditions on any approval of off-period work based on this analysis.

7-8.03 Emergency Repairs

An emergency repair is a repair to the Work (including traffic controls, barricades, or temporary signs) required as a result of an unforeseen event that poses a danger to the public or jeopardizes the integrity of the Work, whether completed or not. The Contractor may be allowed to close a lane of traffic or work at night, on Saturdays, Sundays, or legal holidays for an emergency repair. The Contractor must notify the Agency within one (1) hour of dispatch of the Contractor's repair crews, and give their name, an emergency contact number, the location of the emergency repair, and a tentative completion date and time. The Contractor shall notify the Agency when the emergency repair is completed and the road is clear, or, if an extension of time is required, the Contractor must provide a revised tentative completion date and time.

7-8.04 Revocation of Permission For Off-Period Work

The Agency may revoke permission for off-period work if the Contractor endangers the public, an employee, or themselves by violating a safety and health regulation, or fails to maintain an adequate work force and equipment for reasonable prosecution and inspection of such work.

7-8.05 Working Shifts

Two- or three-shift operations may be established as a regular procedure by the Contractor upon written permission from the Agency. If the multiple shift operations create or occur during off-period work as defined in Section 7-8.02 "Off-Period Work" of these Specifications, the requirements stated in said Section 7-8.02 shall apply. Such permission may be revoked if the Contractor fails to comply with applicable safety and health regulations, fails to maintain adequate force and equipment for reasonable prosecution and inspection of the Work, or fails to provide sufficient artificial light to permit the Work to be carried out safely and appropriately and to permit proper inspection.

7-8.06 Lane and Road Closures During November/December Holiday Season

Except as provided in the Special Provisions or approved by the Agency, construction will be suspended and no activities that interfere with public traffic shall be conducted on designated streets during the holiday season (defined as the four-day Thanksgiving weekend and December 8 through January 1). A map showing designated streets is included as Appendix B. Changes to this map may be done by the Department of Transportation before the start of the holiday season. Contact the Department of Transportation Right-of-Way Management Section at 4100 Traffic Way, Sacramento, CA 95827 to receive a copy of the latest map. All existing pits, excavations, trenches, and openings in the road surface shall be backfilled and paved to produce a level and smooth surface. All barricades and barriers shall be removed from all traffic lanes, unless authorized by the Agency as long-term traffic controls. Only emergency repairs as defined in Section 7-8.03, "Emergency Repairs", in this Section of these Specifications will be permitted during the holiday season. Unless otherwise stipulated in the Special Provisions, the holiday season as described above is accounted for in the original contract duration, and Contract Time will continue to be counted during this suspension period. The baseline and progress schedules must include this suspension period if applicable.

7-9 TEMPORARY FACILITIES AND SERVICES

Unless specified otherwise in the Special Provisions, the Contractor shall be responsible for providing and maintaining necessary material storage facilities, utilities, field offices, temporary

roads, fences, security, etc. for prosecuting the Work. The Contractor shall not connect to or draw construction water from fire hydrants without written approval from the utility owner and the Agency.

7-10 PROTECTION OF WORK, PERSONS AND PROPERTY

The Contractor shall protect the Work and materials from damage until completion and acceptance of the Work. Neither the Agency nor any of its agents assume any responsibility for collecting funds from any person or persons that damages the Contractor's work.

The Contractor shall store materials and equipment in accordance with manufacturer's recommendations and erect such temporary structures as required to protect them from damage.

The Contractor shall furnish guards, fences, warning signs, walks, and lights, and shall take all other necessary precautions to prevent damage or injury to persons or property.

7-11 NOT USED

7-12 DELAYS

The Contractor shall provide notification to the Agency for any delays, in accordance with Section 7-13, "Notice of Delays", in this Section of these Specifications.

7-12.01 Avoidable Delays

The Contractor shall not receive any time extensions or compensation for avoidable delays. Avoidable delays include, but are not limited to, the following:

1. Delays that affect only a portion of the work but do not prevent or delay the prosecution of controlling items of work nor the completion of the whole Work within the Contract Time.
2. Delays associated with the reasonable interference of other contractors employed by the Agency that do not necessarily prevent or delay the prosecution of controlling items of work or the completion of the whole Work within the Contract Time.
3. Delays associated with loss of time resulting from the necessity of submitting plans for Agency approval or from Agency surveys, measurements, inspections, and testing.
4. Delays that could have been avoided by the exercise of care, prudence, foresight, and diligence on the part of the Contractor or Subcontractors.
5. Any curtailment of the Contractor's operations due to any action of the Sacramento Metropolitan Air Quality Management District.

7-12.02 Unavoidable Delays

The Contractor may be granted an extension of Contract time for delays that are determined to be beyond the control of the Contractor, impact a controlling item of work at the time the delay was encountered, and could not be prevented by the exercise of care, prudence, foresight, and diligence. Unavoidable delays may include Agency acts, acts of God or of the public enemy, fire, floods, epidemics, and strikes. Material shortages and delays in utility company relocations may be classified as unavoidable if the Contractor produces satisfactory evidence of acting in a timely manner.

1. The Contractor shall not receive any additional compensation due to inclement or unsuitable weather or conditions resulting therefrom, acts of God or of the public enemy, fire, floods, epidemics, strikes, material or labor shortages, or utility relocations.

2. The Contractor may be entitled to additional compensation for unavoidable delays the Agency determined resulted from an Agency act or the discovery of cultural resources as specified in Section 10-12, “Archeological and Cultural Resources”, of these Specifications, except as modified below:
    a. Compensation for unavoidable delays shall not be granted when the Contractor could have reasonably anticipated the delay.
    b. When there are two (2) or more concurrent delays and at least one (1) is noncompensable, no compensation other than time extension shall be provided.
    c. Compensation for unavoidable delays shall be granted only if such unavoidable delay affects controlling operations that would prevent completion of the Work.

7-13 NOTICE OF DELAYS

The Contractor shall immediately notify the Agency in writing if the Contractor foresees any delay in the prosecution of the Work or immediately upon the occurrence of any unavoidable delay, but in no case shall the written notice be provided to the Agency later than two (2) Working Days after the occurrence of the unavoidable delay. The Contractor shall state the probability of the delay occurring and its cause so the Agency may take steps to prevent the occurrence or continuance of the delay and determine whether the delay is avoidable or unavoidable, its duration, and the extent.

The Agency will assume that all delays were avoidable unless the Agency was notified as indicated above and through its investigation found them unavoidable. No consideration for additional time or compensation will be given for any delay not called to the Agency’s attention at the time of its occurrence.

The Agency reserves the right to direct the Contractor to work overtime on base contract work to mitigate the effect of an unavoidable compensable delay or when it is determined to be in the best interest of the Agency, Public or Project. If the Contractor is so directed by the Agency, the Agency will compensate the Contractor via Contract Change Order the premium portion of the overtime without markup. Markups for Change Work are not applicable to these premium portion costs and will not be paid.

7-14 CARELESS DESTRUCTION OF STAKES AND MARKS NO CAUSE FOR DELAY

If the Contractor or Subcontractors carelessly destroy Agency-placed stakes and marks causing a delay in the Work, the Contractor shall have no claim for damages or time extensions. See also Section 5-9, “Surveys”, of these Specifications.

7-15 TIME OF COMPLETION

Time is of the essence on all Agency contracts. The Contractor shall complete all of the Work called for under the Contract within the Contract Time set forth in the Special Provisions.

The Agency will furnish the Contractor a weekly statement showing the number of days charged to the Contract for the preceding week, the number of days of time extensions approved or under consideration, the number of days originally specified for the completion of the Contract, and the extended date for completion. The Contractor will be allowed fifteen (15) days from the issuance of the weekly statement to file a written protest stating how the Contractor’s estimate of Contract days charged to the Contract differs from the Agency’s. If no protest is received, it shall be deemed by the Agency that the Contractor has accepted the statement as being correct.

7-16 EXTENSION OF TIME NOT A WAIVER

Time extensions granted for unavoidable delays or for the execution of extra or additional work shall not operate as a waiver of the Agency's rights under the Contract.

7-17 INCLEMENT WEATHER AND CONTRACT TIME

A Contract day on either Working Day or Calendar Day contracts will not be charged if, in the opinion of the Agency, inclement or unsuitable weather or its effects prevents working on the current controlling operation at the beginning of the shift for at least five (5) consecutive hours, or for at least (5) hours during the shift. A current controlling operation is any feature of the Work (e.g., an operation or activity including settlement, curing periods, and submittal activities) that if delayed or prolonged will delay the time of completion of the Contract.

7-18 EXTENSION OF TIME

The Contractor will be allowed a time extension to complete the Work equal to the sum of all unavoidable delays as determined in accordance with Section 7-12.02, "Unavoidable Delays", in this Section of these Specifications, plus any adjustments in Contract Time due to Contract Change Orders as outlined in Section 9-12, "Time Extensions for Changes", in these Specifications. During such time extension, the Contractor will not be charged for extra engineering and inspection or liquidated damages. Requests for a time extension must be submitted in writing to the Agency within ten (10) Calendar Days of the event that is the reason for the request for time extension and before the expiration of the Contract time.

7-19 SUBSTANTIAL COMPLETION

When the Contractor considers the entire Work, or a specific portion of the Work, substantially complete, the Contractor shall certify in writing to the Agency that the Work is substantially complete and request that the Agency grant substantial completion. Within five (5) Working Days, the Agency and the Contractor shall inspect the Work to determine the status of completion. If the Agency does not consider the entire Work, or a specific portion of the Work, substantially complete, the Agency will notify the Contractor in writing, giving the Agency's reasons. If the Agency considers the entire Work, or a specific portion of the Work, substantially complete, the Agency will grant substantial completion. The counting of time for liquidated damages will cease for the entire Work, or a specific portion of the Work, on the date substantial completion is granted, but shall not bind the Agency to formal acceptance nor relieve the Contractor from the responsibility of completing or correcting any work.

Unless otherwise specified in the Special Provisions, the entire Work, or a specific portion of the Work, will be considered substantially complete when all work depicted on the contract drawings and required by the Contract Documents has been performed. Only minor corrective work will be allowed to be considered as punch list work. The Agency will provide a list of items to be completed or corrected (punch list) before Final Acceptance and Final Payment. The contractor shall provide the level of effort and resources necessary to complete the defects or deficiencies (punchlist) within thirty (30) days. Unless otherwise agreed to by the Agency, the Agency is authorized to perform the work if the contractor fails to complete the punchlist within 30 days. All costs incurred by the Agency to correct the defects or deficiencies, including loss of use, inspection and administration costs, will be deducted from the final project payment via a deductive change order.

7-20 CLEANING UP

Throughout the construction period, the Contractor shall keep the site of the Work in a presentable condition, dispose of any surplus materials, keep roadways reasonably clear of dirt and debris, keep all sidewalk and other pedestrian areas clear of dirt, loose gravel, debris and any tripping hazards, clean out all drainage ditches and structures, and repair any fences or other property damaged during the progress of the Work, to the satisfaction of the Agency. The Contractor shall also keep the work site cleaned of all rubbish, excess material, and equipment. All portions of the work shall be left in a neat and orderly condition prior to requesting final inspection. Surplus material shall be disposed of in accordance with Section 18-7, "Surplus Material Disposal", of these Specifications.

The final inspection will not be made until final clean up has been accomplished.

7-21 FINAL INSPECTION AND FIELD ACCEPTANCE

The Contractor shall notify the Agency in writing of the completion of the punch list per Section 7-19, "Substantial Completion", of these Specifications, and the Agency shall promptly inspect the Work. The Contractor or the Contractor's representative shall be present at the final inspection. The Contractor will be notified in writing of any defects or deficiencies. The contractor shall provide the level of effort and resources necessary to complete the defects or deficiencies within thirty (30) days of such notification. Unless otherwise agreed to by the Agency, the Agency is authorized to perform the work if the contractor fails to complete the defects or deficiencies within thirty (30) days. All costs incurred by the Agency to correct the defects or deficiencies, including loss of use, inspection and administration costs will be deducted from the final project payment via a deductive change order. When notified that correction of the defective or deficient work is complete, the Agency will again inspect the Work to ascertain that the corrections are in accordance with the Contract. The Agency will issue a field acceptance letter and will recommend to the Board final acceptance of the Work if it finds all the corrections acceptable. Field acceptance by the Agency shall cause the commencement of warranty periods, but shall not bind the Board to final acceptance nor relieve the Contractor from the responsibility of completing or correcting any work.

7-22 FINAL ACCEPTANCE AND NOTICE OF COMPLETION

Upon Final Completion of the Work, including training, acceptance of M&O manuals, Record Drawings, and test reports, the Agency will recommend to the Board that it accept the Work as complete. Upon acceptance by the Board, a Notice of Completion will be filed with the County Recorder and a thirty-five (35) day lien period begins. (See Section 8-11, "Final Estimate and Payment", of these Specifications.)

SECTION 8 MEASUREMENT AND PAYMENT

8-1 BASIS AND MEASUREMENT OF PAYMENT QUANTITIES

It is the Contractor's responsibility to measure and/or compute the quantities of work completed, subject to verification by the Agency, under the terms of the Contract. In computing quantities, the length, area, solid contents, number, weight, or time as specified in the Contract or the Schedule of Values shall be used.

8-1.01 Unit Price Contracts

Payment for all work bid at a price per unit of measurement will be based upon the actual quantities of work as measured upon completion. The Estimated Quantities provided in the Bid Documents are for comparative bidding only. The Agency does not express or imply that the actual amount of work or materials will correspond to the Estimated Quantities. The Contractor shall make no claim nor receive any compensation for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amount of work actually completed, or materials or equipment furnished, and the Estimated Quantities. See also Section 9-14, "Contract Change Order (CCO)", of these Specifications.

8-1.02 Lump Sum or Job Contracts

Progress Payments will be based on the Schedule of Values prepared by the Contractor and approved by the Agency prior to acceptance of the first Progress Payment request (see Section 8-5, "Progress Payment Procedures", in this Section of these Specifications). If requested by the Agency, the Contractor shall furnish full copies of Subcontracts showing actual costs. The Schedule of Values shall be consistent with the baseline progress schedule prepared by the Contractor pursuant to Section 7-5.01, "Progress Schedule", of these Specifications.

8-1.03 Payment for Mobilization

Mobilization shall consist of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all offices, buildings, and other facilities necessary for the Work; and for all other work and operations which must be performed, or costs incurred, prior to beginning the Work.

Payment for mobilization will be as follows:

8-1.03.A Mobilization Not a Pay Item

When the Contract does not include a separate pay item for mobilization, full compensation for mobilization will be included in the Contract lump sum price or in the prices paid for the various items of work in a unit price contract, and no additional compensation will be paid.

8-1.03.B Mobilization a Pay Item

When the Contract or proposed Schedule of Values includes a separate item for mobilization, payment for mobilization will include full compensation for the furnishing of all labor, materials, tools, equipment, administrative costs, and incidentals for mobilization.

1. Unless otherwise noted in the Special Provisions, the Agency will pay no greater than five percent (5%) of the Total Contract Price as a separate pay item for mobilization. In the event the Contractor submits a mobilization pay item greater than five percent (5%) of the Total Contract Price, the Agency will pay any excess mobilization amount with the final Progress Payment.

2. Payment for mobilization will be prorated as follows:
   a. When the Progress Payment request is five percent (5%) or more of the original Total Contract Price (excluding mobilization), fifty percent (50%) of the contract item price for mobilization or two and one-half percent (2.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
   b. When the Progress Payment request is ten percent (10%) or more of the original Total Contract Price (excluding mobilization), seventy percent (70%) of the contract item price for mobilization or three and one-half percent (3.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
   c. When the Progress Payment request is twenty percent (20%) or more of the original Total Contract Price (excluding mobilization), ninety percent (90%) of the contract item price for mobilization or four and one-half percent (4.5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
   d. When the Progress Payment request is fifty percent (50%) or more of the original Total Contract Price (excluding mobilization), one hundred percent (100%) of the contract item price for mobilization or five percent (5%) of the Total Contract Price, whichever is less, will be paid for mobilization.
   e. After final acceptance of the Contract, the amount, if any, of the Contract item price for mobilization in excess of five percent (5%) of the original Total Contract Price will be included for payment in the final estimate made in accordance with Section 8-11, "Final Estimate and Payment", in this Section of these Specifications.
3. The Agency will not pay additional mobilization compensation for work under a Contract Change Order. Payment for mobilization shall be subject to retention per Section 8-7, "Retention", in this Section of these Specifications.

8-2 SCOPE OF PAYMENT

8-2.01 General

Compensation under the terms of the Contract shall be full payment for the Work, including loss or damage arising from the nature of the Work, action of the elements, or unforeseen difficulties encountered during the prosecution of the Work and until its final acceptance; and all risks connected with the prosecution of the Work.

8-2.02 Unit Price Contract

Progress Payments will be made based on the unit price bid and measured quantities for work completed, plus work completed on approved Change Orders. For compensation for alterations in quantities of work, including deviations greater than twenty-five percent (25%), see Section 9-8.02, "Payment for Changes – Unit Prices", in these Specifications.

8-2.03 Lump Sum or Job Contract

Progress Payments will be based on the approved Schedule of Values for work completed, plus work completed on approved Change Orders.

8-2.04 Final Pay Items

An item designated as a Final Pay Item in the Contract shall be paid for as specified in Section 9-1.015, "Final Pay Items", of the State Specifications.

8-2.05 Allowances

Allowances may be included in the Bid Form for materials and/or work that may be added during the course of the Contract. The Allowance may be used in whole, in part, or not at all as determined by the Agency. Whenever costs of the Work included in the Allowance item are more or less than the specified Allowance amount, the Total Contract Price will be adjusted accordingly by Contract Change Order. The Contractor shall make no claim nor receive any

compensation for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amount of work actually completed, or materials or equipment furnished, and the Estimated Quantities for the Allowance.

8-2.06 Payment for Material Not Incorporated in the Work

No Progress Payments will be made for materials and equipment not incorporated in the Work, unless specifically set forth in the Special Provisions or authorized by the Agency.

8-3 WORK TO BE DONE WITHOUT DIRECT PAYMENT

Compensation for any portion of the Work not specifically identified in the Bid Form or Schedule of Values is understood to be included in the price for other items, unless specified in the Special Provisions as extra work. No additional compensation is allowed for additional shifts or premium pay necessary to ensure that the Work is completed within the time limits specified in the Contract.

8-4 PAYMENT FOR USE OF COMPLETED PORTIONS OF WORK

If the Agency accepts a completed or partially completed portion of the Work under Section 4-10, “Use of Completed Portions”, of these Specifications, the Contractor will be compensated in accordance with Sections 8-11, “Final Estimate and Payment”, and 8-12, “Final Payment to Terminate Liability of Agency”, in this Section of these Specifications. When the Agency accepts a completed or partially completed portion of the Work, the warranty period for that portion commences and the Contractor will be relieved of any further maintenance and protection of that portion. The Contractor will not be relieved of the Contract requirements for repairing or replacing defective work and materials.

8-5 PROGRESS PAYMENT PROCEDURES

No Progress Payment will be made when, in the judgment of the Agency, the Work is not proceeding in accordance with the provisions of the Contract or when the total work done since the last Progress Payment amounts to less than one thousand dollars ($1,000). Unless otherwise agreed to at the preconstruction meeting or identified in the Special Provisions, on the 20th of each month the Contractor shall submit in writing for Agency review an estimate of the total amount and value of work done, including that done under approved Change Orders, and the acceptable materials furnished and incorporated in the work through the 20th day of the month. The Bid Form or Schedule of Values shall be used to prepare a Progress Payment request for the items, or portions of items, of the Work completed during the monthly progress period. After deducting all previous payments, the retention as described in Section 8-7, “Retention”, in this Section of these Specifications, and other withholdings as specified in the Contract from the estimated total value, the Agency will pay the Contractor the balance.

The payment of a Progress Payment or the acceptance thereof by the Contractor does not constitute acceptance of any portion of the Work, and does not reduce the Contractor’s liability to replace unsatisfactory work, material, or equipment. An inadvertence or error in an approved Progress Payment request will not release the Contractor or the Contractor's surety from damages arising from the work covered by the approved payment request or from enforcement of every provision of the Contract. The Agency has the right to correct any error made in any Progress Payment.

8-6 INSPECTION AND PROGRESS PAYMENTS NOT A WAIVER OF CONTRACT PROVISIONS

No inspection, order, measurement, approval modification, payment, acceptance of work or material (including, but not limited to, acceptance of the entire Work), time extension, or possession of the Work or any part thereof shall be a waiver of any of the terms and conditions of the Contract, the powers reserved by the Agency, or any right of the Agency to damages or to reject the Work in whole or part. No breach of this Contract shall be construed a waiver of any other or subsequent breach. All remedies provided in the Contract shall be cumulative and shall be in addition to all other rights and remedies that may exist at law or in equity.

8-7 RETENTION

8-7.01 Retention to Ensure Performance

Ten percent (10%) of each progress payment will be retained until the Work has been completed and accepted by the Board (see Section 7-22, "Final Acceptance and Notice of Completion", of these Specifications). After fifty percent (50%) of the Work has been completed, including approved change orders, the Contractor may request that remaining progress payments be made in full and not subject to further withholding of retention. The Agency will review the progress to date and the remaining work. If it appears that the work will be successfully completed and is progressing on schedule, the Agency will process subsequent progress payments in full. However, the Agency reserves the right to withhold 10% retention on any subsequent progress payment if in the opinion of the Agency the work is no longer progressing on schedule

8-7.02 Non-Compliance

The Agency may also retain portions of a Progress or Final Payment for Contract non-compliance in an amount deemed appropriate by the Agency.

8-7.03 Substitution Of Securities

At the request and expense of the Contractor, in accordance with California Public Contract Code Section 22300, in lieu of the Agency withholding the ten percent (10%) retention defined in Section 8-7.01, "Retention to Ensure Performance", in this Section of these Specifications, the Contractor may: 1) substitute a deposit of securities at least equivalent to the retention to be paid, or 2) request the Agency pay retention directly to an escrow agent.

The Contractor and Agency shall enter an escrow agreement in the exact form set forth in Public Contract Code Section 22300. All forms or correspondence pertaining to Security Deposit in Lieu of Withhold shall be addressed to:

Sacramento County Department of County Engineering and Administration
Accounting and Fiscal Services – Contract Desk
827 Seventh Street, Room 304
Sacramento, CA 95814

8-7.04 Earnest Deposit

An Earnest Deposit may be held from the final release of retention as described in Section 8-7.01 above for any of the reasons included in Section 8-8, "Withholdings/Denial of Progress Payment Request", of these Specifications. In the event of a dispute between the Agency and the Contractor, the Agency may include in the Earnest Deposit one hundred and fifty percent (150%) of the disputed amount. All or a portion of the monies held in Earnest Deposit will be released upon satisfactory resolution.

8-8 WITHHOLDINGS/DENIAL OF PROGRESS PAYMENT REQUEST

The Agency may deny a Progress Payment request and/or withhold money from any Progress Payment to:

- cover any unpaid claims filed pursuant to Civil Code Sections 3179 et seq.;
- protect the Agency's interest; and/or
- pay any fines levied against the Work by the Agency or other entities.

The Agency may also deny a Progress Payment request and/or withhold money, or modify any previous Progress Payment, as necessary to protect the Agency from loss due to or affecting enforcement of:

- Defective work not remedied.
- Stop notices filed.
- Failure of the Contractor to make payments properly to Subcontractors for labor, materials, or equipment.
- Evidence that the Work cannot be completed for the unpaid balance of the Contract sum.
- Evidence that the Work will not be completed within the Contract time.
- Damage to the Agency or another contractor.
- Failure to carry out the Work in accordance with the Contract.
- Any violation or non-compliance with Contractor's legal responsibilities (see Section 6, "Legal Relations and Responsibilities", of these Specifications), including withholds for wages adjustments in accordance with California Labor Code Section 1727 and any fines incurred by the Agency as a result of the Contractor's actions.

When, under the provisions of the Contract, the Agency charges any sum of money against the Contractor, the Agency will deduct and retain the amount of such charge from a Progress or Final Payment. If, on completion or termination of the Contract, sums due the Contractor are insufficient to pay the Agency charges against the Contractor, the Agency has the right to recover the balance from the Contractor or the Contractor's surety.

8-9 DEDUCTIONS FOR IMPERFECT WORK

For any portion of the Work retained in accordance with Section 5-19, "Right to Retain Imperfect Work", of these Specifications, the Agency will deduct from a Progress Payment a just and reasonable amount. A deductive Contract Change Order for the defective work will be issued in accordance with Section 9-14, "Contract Change Order (CCO)", of these Specifications.

8-10 LIQUIDATED DAMAGES FOR DELAY

All parties to the Contract agree that time is of the essence, and that the Work shall be completed within the time stated in the Special Provisions, plus any time extensions as provided in Section 7-18, "Extension of Time", of these Specifications. The Contractor's failure to complete the Work within the time allowed will result in damages to the Agency. Because it is impracticable to determine the actual amount of damage by reason of such delay, the Contractor agrees that the sum(s) set forth in the Special Provisions is (are) a reasonable amount to be charged for liquidated damages. It is agreed that the Contractor shall pay to the Agency the sum set forth in the Special Provisions for each and every day's delay beyond the time prescribed in the Contract, and the Contractor further agrees that the Agency may deduct and retain the amount thereof from any monies due or to become due the Contractor under the Contract.

8-11 FINAL ESTIMATE AND PAYMENT

Subsequent to Field Acceptance as detailed in Section 7-21, "Final Inspection and Field Acceptance", of these Specifications, the Contractor shall provide a proposed Final Payment request, segregated as to Contract item and Contract Change Order work.

The Agency will review the proposed Final Payment request and, after deducting all previous payments and all amounts to be deducted, withheld, and/or retained under the provisions of the Contract and Public Contract Code Section 7107, shall create the Final Payment request. All Progress Payments shall be subject to correction in the Final Payment.

Within fifteen (15) Calendar Days after the proposed Final Payment request is returned to the Contractor, the Contractor shall submit to the Agency a written approval of said request or a written statement of exceptions. The Contractor's statement of exceptions shall be in sufficient detail for the Agency to ascertain the basis and amount of the exceptions; failure to provide the detail shall be sufficient cause for denial of the exceptions. Any claim of the Contractor or the Contractor's Subcontractors or suppliers with respect to the performance or breach of the Contract or any alterations thereof (except for payment of the balance of the Contract price as set forth in the Final Payment request) not specifically set forth in the statement of exceptions, is waived by the Contractor. If the Contractor fails to file a statement of exceptions within the time allowed, the Agency will infer acceptance of the final Progress Payment request as submitted to the Contractor.

If no liens or claims have been filed against the Contractor after thirty-five (35) days from the filing of Notice of Completion, the Agency will approve for payment the entire sum due, including the release of any retention.

8-12 FINAL PAYMENT TO TERMINATE LIABILITY OF AGENCY

Payment of the final amount due under the Contract shall release the Agency, and the Agency's officers, officials, agents, employees, members, volunteers, affiliates, and their duly authorized representatives from all claims or liability on account of work performed under the Contract. Tender of this payment shall constitute denial by the Agency of any unresolved claim of the Contractor not specifically excepted in writing by the Contractor. The Contractor's acceptance of the Final Payment shall release the Agency and the Agency's officers, officials, agents, employees, members, volunteers, affiliates, and their duly authorized representatives from all claims or liability on account of work performed under the Contract or any alterations thereof, except unresolved items set forth in the statement of exceptions.

8-13 DISPUTED PAYMENTS

The Agency will decide disputes regarding payments under the Contract according to the procedures set forth in Section 9, "Changes and Claims", of these Specifications. The decision of the Agency will be final.

SECTION 9 CHANGES AND CLAIMS

9-1 AUTHORITY FOR CHANGES

The Agency reserves the right to order corrections, alterations, additions, modifications, deletions or other changes as required for the proper completion of the Work. The order may be made prior to the final acceptance of the Contract without voiding the Contract, without notice to the Contractor's sureties, and in accordance with the provisions of Section 9-2, "Ordering of Changes", in this Section of these Specifications.

The Contractor shall not perform corrections, alterations, additions, modifications, deletions, or other changes to the Work without a written order from the Agency, in accordance with Section 9-2, "Ordering of Changes", in this Section of these Specifications.

Payment for changed or extra work will not be made without the Agency's written authorization for the changed or extra work.

9-2 ORDERING OF CHANGES

The Agency may order a change, in writing, during the course of the Work, and the Contractor shall comply with the order. Changes to the Work shall in no way affect, vitiate, or make void the Contract or any part thereof, except that which is necessarily affected by such changes and is clearly the evident intention of the parties to the Contract.

Changes to the Work may be initiated as described in Section 4-5, "Field Instructions or Other Written Directives", of these Specifications. Changes that require an adjustment to the total Contract Price or the Contract Time will be formalized in a Contract Change Order, in accordance with Section 9-14, "Contract Change Order (CCO)", in this Section of these Specifications. Failure of the Agency and Contractor to agree to terms of any order for change shall not relieve the Contractor of his obligation to complete all work specified in the order.

9-3 CONSTRUCTION INCENTIVE CHANGE PROPOSAL (CICP)

9-3.01 General

The Construction Incentive Change Proposal (CICP) Program provides a program for the Contractor to use his expertise to improve Contract performance to create an overall reduction in the Total Contract Price. Proposing to delete work is not a CICP. Deleted work is addressed in Section 4-8, "Deleted Items", in these Specifications. The CICP Program shall not apply to Agency contracts of less than one hundred thousand dollars ($100,000). The Contractor and Subcontractors may participate in the CICP Program. Participation of Subcontractors shall be through the Contractor, and the Contractor and his Subcontractor must agree upon the sharing arrangement; written evidence of such agreement must be submitted with the CICP.

While a CICP is being considered or processed, the Contractor shall proceed with the Work as scheduled.

9-3.02 Description

A CICP is a formally written proposal for a Contract Change Order. A CICP must be initiated, developed, and identified as such by the Contractor or his Subcontractor. A CICP must result in a net capital cost reduction while causing no increase in the total life cycle cost of the project and shall comply with the following conditions:

- Required function, reliability, and safety of the project will be maintained without detracting from the life expectancy or increasing maintenance requirements.

- The proposed change shall not cause undue interruption of the Work, nor shall it extend the Contract Time.
- The proposed change shall comply with all applicable permits, regulations, and code requirements, and any other requirements as set forth in the Contract. The proposed change shall not involve payment of royalties by the Agency to the Contractor.

9-3.03 Submittal

The Contractor shall submit a brief description of the proposed CICP prior to preparing the detailed submittal as outlined below.

A CICP submittal must contain pertinent information in supporting documents for Agency evaluation. As a minimum, the following information shall be submitted:

1. Name of individuals associated with the development and preparation of the CICP.
2. A detailed description and duly signed plans and specifications showing work as presently designed and the proposed changes.
3. A clear identification of all advantages and disadvantages for each proposed change.
4. A detailed procedure and schedule for implementing the proposed change. This detailed procedure and schedule shall include all necessary Contract amendments. Also indicated must be the latest date that the CICP can be approved for implementation.
5. A summary of estimated costs, including the following:
    a. Project construction costs before and after the CICP. This shall be a detailed estimate identifying the following items for each trade involved in the CICP:
        - Quantities of material and equipment
        - Unit prices of materials and equipment
        - Labor hours and rates for installation
        - Subcontractor and prime Contractor mark ups
        - Operation and maintenance costs before and after the CICP
        - Cost for implementing the CICP not included elsewhere
    b. Contractor's share of the savings based on the sharing provision in Section 9-3.05, “Sharing Provisions and Formula”, in this Section of these Specifications.
    c. Other data as required by local permits and regulations and code requirements as set forth in the Contract.
6. Time required for execution of the proposed change.

To the extent indicated herein, the Contractor may restrict the Agency's use of any CICP or the supporting data submitted pursuant to this program. Suggested wording for inclusion in CICP's is as follows:

> "This data furnished pursuant to the construction incentive clause of the Contract shall not be disclosed or duplicated in whole or in part beyond what is necessary to accomplish the review. This restriction does not limit the Agency's right to use the information if it is available from any source without limitations. The Agency has the right to duplicate, use and disclose any information if the CICP is accepted."

The Agency may modify, accept, or reject the CICP. However, if the CICP is modified or not acted upon within the time allotted in the proposal, the Agency will not be liable for the Contractor's cost of developing the CICP if it is withdrawn or rejected.

9-3.04 Acceptance

The Agency will use the processing procedure specified for Change Orders in Section 9-14, "Contract Change Order (CCO)", in this Section of these Specifications, if a CICP is accepted. The Agency's written approval of the CICP is required. If the CICP is rejected, the Contractor shall not appeal the decision.

9-3.05 Sharing Provisions and Formula

Upon acceptance of the CICP, the Contractor will receive fifty percent (50%) of the Net Capital Savings based on the following formula:

> Net Capital Savings = Contract Cost Prior to CICP - (Revised Contract Cost After CICP + CICP Development Cost + CICP Implementation Cost)

The Contractor's development cost is limited to that directly associated with the preparation of the CICP package. Development costs will be reimbursed after approval. However, the Agency will reject costs that cannot be satisfactorily substantiated.

The CICP implementation costs include, when appropriate, engineering costs for reviewing and redesigning the changes. However, Agency costs for processing the CICP are excluded.

9-4 CHANGES TO THE CONTRACT

If directed by the Agency, within fourteen (14) Calendar Days of issuance of an order for a change or a Notice of Potential Claim, the Contractor shall provide a cost and time proposal prepared in accordance with the requirements of Sections 9-8, "Payment for Changes", and 9-12, "Time Extensions for Changes", in this Section of these Specifications. The Contractor's proposal shall indicate the amount to be added or deducted from the Total Contract Price, supported by complete details of all Contractor, Subcontractor, vendor or supplier costs per Section 9-6, "Cost and Pricing Data", in this Section of these Specifications. A proposal for additional cost and/or time resulting from a Notice of Potential Claim must also include an explanation of why the Contractor believes there is entitlement to the additional cost and/or time. In the event the Agency, for whatever reason, opts to not proceed with the change, the Agency will reimburse the Contractor for the actual costs associated with the preparation of the proposal. Contractor shall submit an invoice prepared in accordance with Section 9-8.03 of these Specifications.

If the Contractor does not submit a proposal within fourteen (14) Calendar Days, and unless the Agency is otherwise notified within fourteen (14) Calendar Days of a potential cost impact, the Contractor agrees to perform the work described in the order for change with no additional compensation. If the order for change is issued on a force account basis, the Contractor must immediately begin keeping records in accordance with Section 9-8.03, "Force Account", in this Section of these Specifications.

9-5 PROSECUTION OF CHANGES TO THE CONTRACT

The Contractor shall comply with and prosecute all portions of the order for change with the same diligence and manner as if the changes were originally included in the Contract, except as otherwise provided in the order.

If agreement is reached regarding payment, but not a time adjustment, the Agency shall have the right to direct the Contractor to proceed with the change at the agreed price. The impact of the changed work on the project schedule will be considered by the Agency in accordance with Section 9-12, "Time Extensions for Changes", in this Section of these Specifications.

When the Agency and Contractor cannot agree on the credit for deleted work, the Agency's estimate will be deducted from the Total Contract Price, unless the Contractor presents proof prior to the Final Payment that the Agency's estimate is in error.

9-6 COST AND PRICING DATA

Cost and pricing data submitted by the Contractor shall be true, complete, accurate, and current. The Agency may require a formal certification by a corporate officer to verify Contractor-submitted cost and pricing data. Additional requirements for cost and pricing data may also be included in the Special Provisions. The Agency shall have access to the records supporting such cost and pricing data in accordance with the following Section (Section 9-7, "Access to Records").

9-7 ACCESS TO RECORDS

Upon reasonable notice and during normal business hours, the Agency shall have access to the Contractor's and Subcontractors' records for the purpose of verifying and evaluating the Agreement and the Work, including the accuracy of cost and pricing data submitted by the Contractor. "Records" as used in this Section shall include, but not be limited to: original estimates, subcontract agreements, purchase orders, books, documents, accounting records, papers, project correspondence, project files, and scheduling information necessary to determine the direct and indirect costs, job site, area and home office overhead, delay and impact costs. Records shall include the original Bid and all documents related to the Bid and its preparation, the as-planned construction schedule and all related documents. Such access shall include the right to examine and audit such records and make excerpts, transcriptions, and photocopies at the Agency's cost.

9-8 PAYMENT FOR CHANGES

The method of payment agreed upon by the Contractor and the Agency, or selected by the Agency in the absence of agreement, shall be set forth in the order for change.

The three methods of payment are as follows:

9-8.01 Lump Sum Price

The Contractor shall submit a lump sum price proposal. The proposal shall include an estimate of labor, material, equipment, Subcontractor, and material supplier costs. The proposal shall include labor surcharges of twenty-six percent (26%), sales tax, and markups as stipulated in Section 9-9, "Markups for Changed Work", in this Section of these Specifications.

9-8.02 Unit Prices

If payment for Contract work is based on unit prices, payment for changed work will be made based on actual quantities of work done at the unit prices contained in the Contract or unit prices otherwise agreed upon by the Agency and Contractor if none are contained in the Contract. Payment for changed work based on Contract or agreed upon unit prices includes the full cost of the item of work including profit and overhead; and no additional payment or adjustment will be allowed.

If an ordered change in the plans or specifications materially changes the character of the work of a Contract item from that on which the Contractor based the bid price, and if the change increases or decreases the actual unit cost of the changed item as compared to the actual or estimated actual unit cost of performing the work of that item in accordance with the plans and specifications originally applicable thereto, in the absence of an executed Contract Change

Order specifying the compensation payable, an adjustment in compensation therefore will be made in accordance with the following:

The basis of the adjustment in compensation will be the difference between the actual unit cost to perform the work of that item or portion thereof involved in the change as originally planned and the actual unit cost of performing the work of the item or portion thereof involved in the change, as changed. Actual unit costs will be determined by the Agency in the same manner as if the work were to be paid for on a force account basis as provided in Section 9-8.03, "Force Account", of these Specifications, or the adjustment will be as agreed to by the Contractor and the Agency. The adjustment will apply only to the portion of the work of the item actually changed in character. At the option of the Agency, the work of the item or portion of item which is changed in character will be paid for by force account as provided in Section 9-8.03, "Force Account", of these Specifications.

9-8.03 Force Account

In the absence of either an agreed lump sum price or unit prices for the change, the Agency may direct the Contractor to proceed with the changed work on a force account basis. The Contractor shall keep and present, in a form acceptable to the Agency, a complete and correct accounting of all costs associated with the change, including all pay records, vouchers, invoices, etc. The Contractor will be paid for labor, materials, and equipment actually used during the performance of the changed work as specified in this Section of these Specifications in Sections 9-8.03.A, "Labor", 9-8.03.B, "Materials", and 9-8.03.C, "Equipment"; plus the percentages stipulated in Section 9-9, "Markups for Changed Work".

To facilitate agreement on direct craft labor hours, construction equipment hours, and material quantities, the Contractor shall notify the Agency not less than four (4) hours prior to starting force account work. The Contractor shall submit Daily Work Reports (DWR's) for signature not later than 9:00 a.m. the day following performance of any force account work. DWR's shall list names of all Contractor's staff, the staff person's craft or trade, all craft or trade labor hours, and all material and construction equipment used. The Contractor shall use the Agency's DWR's in preparing billings for force account work.

All documentation supporting the Force Account work must be priced out and turned in to the Agency no later than thirty (30) calendar days after the work is completed. Failure by the Contractor to notify the Agency of the beginning of the extra work, submit the DWR's as required, or turn in the support documentation may result in the Agency denying the costs of the extra work.

9-8.03.A Labor

The Contractor will be paid the cost of direct labor (foreperson and below) used in the actual and direct performance of the changed work including working foreman when authorized by the Agency. Except as otherwise provided, the Contractor will receive no additional compensation for overtime work without prior written authorization from the Agency. The cost of labor will be the sum of the following:

9-8.03.A.(1) Actual Wages

Charges for labor will be the Contractor's actual payroll costs for labor of any classification, including employer payments to or on behalf of the workers for health and welfare, pension, vacation, and similar purposes.

9-8.03.A.(2) Labor Surcharge

A twenty-six percent (26%) surcharge for taxes, insurance, and all other payments made to or on the behalf of the employee shall be added to the actual wages.

9-8.03.A.(3) Subsistence and Travel

The Agency will pay the Contractor for actual subsistence and travel allowance costs associated with the changed work required by labor agreements or acceptable to the Agency. Documentation must be provided to the Agency.

9-8.03.B Materials

Payment will be for the purchaser's actual cost of supplier or vendor furnished materials. If the Contractor does not furnish satisfactory evidence of the cost of such materials, the cost will be the lowest current wholesale price at which such quantities of materials are available and delivered to the job site. The Agency reserves the right to purchase materials for the changed work; the Contractor shall have no claims for costs or profit on such materials.

9-8.03.C Equipment

The prices paid for equipment directly and solely required for performance of the changed work will be those listed in the current edition of the Caltrans publication, "Labor Surcharge and Equipment Rental Rates". If the equipment is not shown in this publication, the Contractor shall be paid such hourly rental rates as are agreed upon by the Contractor and the Agency prior to use of the equipment, plus thirty-three and one-third percent (33-1/3%) for the cost of fuel, oil, lubrication, and field repairs and maintenance. In no case shall the hourly rental rates exceed those of established distributors or equipment rental agencies serving the area.

The rate paid for the use of equipment constitutes full compensation to the Contractor for all costs, including fuel, power, oil, lubrication, supplies, small tools, small equipment, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, labor (except for equipment operators) and any and all costs to the Contractor incidental to the use of such equipment for the changed work.

Payment will not be made for the equipment while it is inoperative due to breakdowns or for time in which no changed work was performed. Payment for rentals will include time required to move equipment to the changed work from the nearest available rental source and to return it to the source. However, no moving, loading, or transportation costs will be paid if the equipment is used for any other portion of the Work.

Individual pieces of equipment having replacement value of five hundred dollars ($500) or less shall be considered tools or small equipment and no payment will be made for those pieces of equipment.

9-8.03.D Subcontracts

Subcontract costs shall be the actual cost to the Contractor for work performed by a Subcontractor. The provisions of Section 9-8.03, "Force Account", in this Section of these Specifications, apply to the computation of subcontract costs. Subcontractors shall compute markups per the following Section (Section 9-9, "Markups for Changed Work").

9-9 MARKUPS FOR CHANGED WORK

Only the direct costs directly attributable to the performance of the changed work shall be allowed. All other costs shall be included in the allowed markups, including, but not limited to, profit, home office overhead, jobsite indirect costs, jobsite office personnel, general field superintendence, general engineering, supervision of labor, bond and insurance premiums, and general field expense, and shall constitute full compensation for all costs not included as actual

labor, materials, equipment, or Subcontractor costs. Markups for changed work shall not exceed the following:

Labor	25%
Materials	15%
Equipment Rental	15%
Bonds and Insurance	2%

The Contractor or Subcontractor, whoever actually performs the changed work, may add the markups to the total of allowable costs. When a Subcontractor performs work, the Contractor and any higher tiered Subcontractor may add as mark-up to the total of allowable costs an amount not to exceed five percent (5%), subject to the limitations of this Section. The 2% for Bonds and Insurance is to be added to the TOTAL of Labor, Materials, and Equipment Rental, and associated markups, INCLUDING all subcontractor costs. The Agency only requires bonds and insurance on the prime contractor and therefore will only pay these costs once. When the Agency is entitled to credit for deleted work, a ten percent (10%) credit for deleted overhead of the Contractor or Subcontractor, as applicable, will be added to such credit.

9-10 COMPENSABLE UNAVOIDABLE DELAYS

Payments will be made as follows for compensable unavoidable delays, as defined in Section 7-12.02, "Unavoidable Delays", in these Specifications.

9-10.01 Construction Equipment

Compensation will be paid for construction equipment idle as a result of a compensable unavoidable delay to the extent costs are incurred. The prices paid for equipment will be those in the current edition of the Caltrans publication, "Labor Surcharge and Equipment Rental Rates", with the following modifications:

- The right-of-way delay factor for each classification of equipment will be applied to the rental rate.
- Compensation will be provided for the actual time of the delay, but not more than eight (8) hours per day.
- Compensation will only be paid for equipment that was actually idle; Agency shall not compensate for any equipment that was removed from the jobsite during the idle period.
- Compensation will be provided for each day or portion of a day, excluding Saturdays, Sundays and holidays, for the duration of the delay.

9-10.02 Jobsite Indirect Costs

Indirect costs shall be limited to the following:

1. Actual payroll costs for field office staff incurred as a result of the delay, including management, supervision, safety, estimating, engineering, drafting, clerical, secretarial and accounting. A twenty-six percent (26%) surcharge for taxes, insurance, and all other payments made to or on the behalf of the employee may be added to the payroll costs.
2. Actual cost for third-party services provided for the field office, such as management, supervision, safety, estimating, engineering, drafting, clerical, secretarial, and accounting utilized in lieu of employees.
3. Applicable field office expenses for rent and utilities that are substantiated by invoices. Compensation for on-site plant, incidentals, and facilities for non-field

office personnel including branch office and home office personnel will not be provided. Compensation for these items and other incidentals is included in the following Section (Section 9-10.03, "Markup for Compensable Unavoidable Delays").

9-10.03 Markup for Compensable Unavoidable Delays

Except for compensable unavoidable delays associated with archeological and cultural resources as described in Section 10-12, "Archeological and Cultural Resources", of these Specifications and right-of-way delays, fifteen percent (15%) shall be added to job-site indirect costs for onsite plant, incidentals, overhead, home and branch office costs, bonds, insurance, and profit. The Contractor shall determine the distribution of the markup among the Contractor, Subcontractors, and suppliers.

9-10.04 Duplicated Overhead Costs

If the Contractor is compensated for delays in accordance with this Section, and the delay is attributable to direct cost changes to which markups were added, in accordance with Section 9-9, "Markups For Changed Work", of these Specifications, those markups will be adjusted to five percent (5%) for profit only as all overhead costs are compensated in accordance with sections 9-10.02 and 9-10.03 of these Specifications.

9-11 LIMITATIONS ON PAYMENTS FOR CHANGED WORK

The Agency will not pay the Contractor for costs in excess of prevailing market values, unless the Contractor can establish, to the satisfaction of the Agency, that the Contractor has investigated all possible means of providing the work and that the excess costs could not be avoided. The Agency will be the sole judge of the necessity of incurring costs in excess of market value and whether the excess costs are directly required for performance of changed work. The Agency's determination will be final.

9-12 TIME EXTENSIONS FOR CHANGES

The Contractor is entitled only to adjustment in Contract Time if completion of the entire Work is extended due to the change impacting the controlling item of work. Each proposal submitted by the Contractor in accordance with Section 9-4, "Changes to the Contract", in this Section of these Specifications shall state the amount of extra time the Contractor believes the change added to the overall project schedule. Failure to request a time extension within the time allowed constitutes a waiver of the Contractor's right to subsequently claim an adjustment in Contract Time.

9-13 EFFECT ON SURETIES OF CHANGES TO THE WORK

No alterations, time extensions, extra or additional work or other changes authorized by these conditions or any part of the Contract shall affect the sureties' obligations under the Contract.

9-14 CONTRACT CHANGE ORDER (CCO)

The Agency will issue a Contract Change Order (CCO) for approval if a change to the Total Contract Price or Contract Time is necessary. The Contractor shall not be entitled to any adjustments in either Contract Time or Total Contract Price for changes performed without written direction from the Agency. Adjustments in Contract Time or Total Contract Price for changes performed will not be made until a Contract Change Order is approved. A Contract Change Order is comprised of one or more Field Instructions or other written directives, and contains a summary of each change and changes to the Contract Time or Total Contract Price.

9-15 ACCEPTANCE OF ORDERS FOR CHANGES

The Contractor's written agreement of a Contract Change Order, Field Instruction, or other written directive will constitute his final and binding agreement to the provisions of the Contract Change Order, Field Instruction, or other written directive, and a waiver of all claims in connection therewith, whether direct or consequential in nature, including those of any Subcontractors or suppliers. If the Contractor disagrees with any Contract Change Order, Field Instruction, or other written directive, the Contractor may submit a notice of potential claim to the Agency in accordance with Section 9-17, "Notice of Potential Claim", in this Section of these Specifications. Disagreement with the provisions of a Change Order, Field Instruction, or other written directive will not relieve the Contractor of the Contractor's obligations under the Contract.

9-16 DISPUTE REGARDING CONTRACT REQUIREMENTS

If the Contractor and Agency fail to agree whether or not any work or other matter is within the scope of the Contract, the Contractor shall nevertheless immediately perform such work upon receipt of a written Field Instruction or other written directive. Within fourteen (14) Calendar Days after receipt of the Field Instruction or other written directive, the Contractor may submit a written protest detailing the Contract requirements exceeded and the approximate cost and/or time change. Failure to submit a protest within the specified period constitutes a waiver of the Contractor's rights to adjustments in the Total Contract Price or Contract Time for the disputed Contract requirement.

The Contractor shall not stop performing the Work pending resolution of a dispute, unless ordered in writing by the Agency.

If the Agency agrees with the Contractor's written protest, the Total Contract Price and/or Contract Time will be adjusted through a Contract Change Order. Protests and claims denied by the Agency will be so stated in writing.

9-17 NOTICE AND MITIGATION OF POTENTIAL CLAIM

9-17.01 Notice of Potential Claim (NOPC)

The Contractor shall not be entitled to payment of any additional compensation for any cause, including any disagreement, protest, or change, any act or failure to act by the Agency, or the happening of any event, thing or occurrence, unless the Contractor has given the Agency advance written notice of potential claim (NOPC) as hereinafter specified. The NOPC shall set forth the reasons for which the Contractor believes additional compensation and/or time will or may be due, the nature of the costs and/or time involved, insofar as possible, the amount of the potential claim, a request for equitable adjustment, and written and verifiable documentation and support.

Except as required below in Section 9-18, "Submission of Claims", of these Specifications, the Contractor shall promptly provide written notification to the Agency upon discovery of concealed or unknown conditions or any disagreement, protest, situation, event, or occurrence that may result in a claim. This notice shall be submitted no more than seven (7) Calendar Days after the discovery or occurrence of any event that may be the basis for a claim for additional compensation or time; failure to do so waives the claim.

If costs or time can not be reasonably determined at the time the notice of potential claim is provided, the contractor shall amend its notice of potential to include cost and/or time within seven (7) days of identifying said cost and/or time but not later than thirty (30) days after work has ceased on the event that caused the notice of potential claim; failure to do so waives the claim. For notice of potential claim events that extend more than thirty (30) days the contractor

shall provide a monthly accounting of on going costs and/or time it believes it is due no later than the fifth (5^{th}) day of the succeeding month; failure to do so waives the claim.

9-17.02 Duty to Mitigate Damages

The Contractor is required to take all reasonable and practical efforts to mitigate the damaging effects of any potential current or future claim it perceives as a result of any act or failure to act on the part of the Agency, or as a result of any event, thing or occurrence. Written notice by the Contractor of a potential claim shall not excuse the Contractor from pursuing the mitigation of any claim in good faith and with due diligence. Where possible, or if directed by the Agency, the Contractor must be prepared to discuss various methods of mitigation with the Agency prior to actual mitigation.

The obligation to minimize foreseeable damages requires that the Contractor use reasonable care and diligence to prevent an unwarranted incurrence of damages from a delay caused by the other party or an unforeseen event. In evaluating a delay, if the delay could have been avoided by due care of the Contractor, the Contractor is responsible for the additional costs attributed to the failure to mitigate

9-18 SUBMISSION OF CLAIMS

9-18.01 Claims Less Than $375,000

Claims for three hundred seventy-five thousand dollars ($375,000) or less shall be in accordance with Section 20104 of the Public Contract Code.

9-18.02 Claims Greater Than $375,000

For claims greater than three hundred seventy-five thousand dollars ($375,000), the Contractor shall furnish claim documentation as herein specified.

Contractor shall submit three (3) certified copies of all claim documentation. All claim documentation shall be complete when submitted. The evaluation of the Contractor's claim will be based on Agency's records and the claim documentation submitted by Contractor.

Claim documentation shall conform to generally accepted auditing standards and shall be in the following format:

1. Introduction and background
2. Issues
    a. Index of issues
    b. For each issue:
        - Background
        - Chronology
        - Contractor's position (reason for County’s potential liability)
        - Supporting documentation of merit
        - Supporting documentation of damages
3. Critical path method schedules, as-planned versus as-built, and delay analysis
4. Productivity and damages exhibits
5. Summary of issues and damages

Supporting documentation of merit for each issue shall be cited by reference, photocopies, or explained. Supporting documentation may include, but not be limited to, general conditions, technical specifications, drawings, correspondence, conference notes, shop drawing logs, survey books, inspection reports, delivery schedules, test reports, daily reports, subcontracts, fragmentary critical path method schedules, photographs, technical reports, requests for information, field instructions, and other related records.

Supporting documentation of damages for each issue shall be cited, photocopied, or explained. Supporting documentation may include, but not be limited to, certified detailed labor, materials, equipment, and construction equipment and services costs; purchase orders; invoices; project as-planned and as-built costs; subcontractor payment releases; quantity reports; other related records; general ledger and any other accounting materials.

Each copy of claim documentation shall include the following certification, signed in the same manner as the Contract was signed:

> "I, _____, being the *(must be an officer)* of *(general contractor)*, declare under penalty of perjury under the laws of the State of California, and do personally certify and attest that: I have thoroughly reviewed the attached claim for additional compensation and/or extension of time, and know its contents, and said claim is made in good faith; the supporting data is truthful and accurate; that the amount requested accurately reflects the Contract adjustment for which the Contractor believes the Agency is liable; and, further, that I am familiar with California Penal Code Section 72 and California Government Code Section 12650, et seq., pertaining to false claims, and further know and understand that submission or certification of a false claim may lead to fines, imprisonment and/or other severe legal consequences.
>
> (Signature of officer) (Date) "

If the Contractor is unable to support any part of a claim and it is determined that such inability is attributable to falsity of such certification or misrepresentation of fact or fraud by the Contractor**,** the Contractor shall be liable to the Agency for three (3) times the amount of damages which the Agency sustains, plus the cost of civil action, and may be liable to the Agency for a civil penalty of up to ten thousand dollars ($10,000) for each false claim.

9-19 ENGINEER'S DECISION

The Engineer may be requested to consider a dispute or claim if the Agency and Contractor representatives reach an impasse. A request for an Engineer's Decision shall be made by the Contractor, in writing, within fourteen (14) days of the date of impasse. In requesting an Engineer's Decision, each party shall provide a detailed description of their position and state the objections to the position of the other party. Evidence, records, and supporting information shall be included. Copies of all correspondence and information shall be provided to both parties.

The Engineer will review the facts of the dispute and may request additional information, evidence, or testimony. The Engineer will render a fair, impartial decision based on the Contract, and the evidence submitted by the Agency and Contractor representatives.

The Engineer may decline to consider a dispute. The Engineer's Decision process is non-binding.

9-20 ALTERNATIVE DISPUTE RESOLUTION

After all remedies and provisions of the Contract are exhausted, any dispute related to the Work or Contract may be resolved by Mediation if the Contractor and the Agency agree in writing. The Contractor shall submit a written request for Mediation no later than thirty (30) days after the Agency issues the final written decision.

Said Mediation is voluntary, non-binding, and intended to provide an opportunity for the parties to evaluate each other's cases and arrive at a mutually agreeable solution. These

provisions relating to voluntary Mediation shall not be construed or interpreted as mandatory arbitration.

9-20.01 Initiation of Mediation

Any party to a dispute or claim may initiate Mediation by notifying the other party or parties in writing.

9-20.02 Request for Mediation

A Request for Mediation shall contain a brief statement of the nature of the dispute or claim, and the names, addresses, and phone numbers of all parties to the dispute or claim, and those who will represent them, if any, in the Mediation.

9-20.03 Selection Of Mediator

Upon receipt of a Request for Mediation, within thirty (30) days, the parties will meet and confer to select an appropriate Mediator agreeable to all parties. If the parties cannot agree on a Mediator, they hereby agree to accept a Mediator appointed by a recognized association such as the American Arbitration Association.

9-20.04 Qualifications Of A Mediator

Any Mediator selected shall have expertise in the area of the dispute and be knowledgeable in the Mediation process. No person shall serve as a Mediator in any dispute in which that person has any financial or personal interest in the result of the Mediation. Before accepting an appointment, the prospective Mediator shall disclose any circumstances likely to create a presumption of bias or prevent a prompt meeting with the parties. Upon receipt of such information, the parties shall meet and confer and decide whether to select another Mediator.

9-20.05 Vacancies

If any Mediator shall become unwilling or unable to serve, another Mediator shall be selected unless the parties agree otherwise.

9-20.06 Representation

Any party may be represented by persons of their choice, who shall have full authority to negotiate. The names and addresses of such persons shall be communicated in writing to all parties and to the Mediator.

9-20.07 Time and Place Of Mediation

The Mediator shall set the time of each Mediation session. The Mediation shall be held at any convenient location agreeable to the Mediator and the parties, as the Mediator shall determine. All reasonable efforts will be made by the parties and the Mediator to schedule the first session within thirty (30) days after selection of the Mediator.

9-20.08 Identification Of Matters In Dispute

At least ten (10) days before the first scheduled Mediation session, each party shall provide the Mediator with a brief memorandum setting forth its position with regard to the issues that need to be resolved. Such memoranda shall be mutually exchanged by the parties. At the first session, the parties will be expected to produce all information reasonably required for the Mediator to understand the issue presented. The Mediator may require each party to supplement such information.

9-20.09 Authority Of Mediator

The Mediator does not have authority to impose a settlement upon the parties but will attempt to help the parties reach a satisfactory resolution of their dispute. The Mediator is authorized to conduct joint and separate meetings with the parties and to make oral and written recommendations for settlement. Whenever necessary, the Mediator may also obtain expert

advice concerning technical aspects of the dispute, provided the parties agree and assume the expenses of obtaining such advice. Arrangements for obtaining such advice shall be made by the Mediator or the parties, as the Mediator shall determine. The Mediator is authorized to end the Mediation whenever, in the Mediator's judgment, further efforts at Mediation would not contribute to a resolution of the dispute between the parties.

9-20.10 Privacy

Mediation sessions are private. The parties and their representatives may attend Mediation sessions. Other persons may attend only with the permission of the parties and with the consent of the Mediator.

9-20.11 Confidentiality

Confidential information disclosed to a Mediator by the parties or by witnesses in the course of the Mediation shall not be divulged by the Mediator. All records, reports, or other documents received by a Mediator while serving as Mediator shall be confidential. The Mediator shall not be compelled to divulge such records or to testify in regard to the Mediation in any adversary proceeding or judicial forum. The parties shall maintain the confidentiality of the Mediation and shall not rely on, or introduce as evidence in any arbitration, judicial or other proceedings or any of the following: (a) Views expressed or suggestions made by the other party with respect to a possible settlement of the dispute; (b) Statements made by the other party in the course of the Mediation proceedings; (c) Proposals made or views expressed by the Mediator; or (d) Whether the other party had or had not indicated willingness to accept a proposal for settlement made by the Mediator.

9-20.12 No Stenographic Record

There shall be no stenographic record of the Mediation.

9-20.13 Termination Of Mediation

The Mediation shall be terminated (a) by the execution of a settlement agreement by the parties; (b) by a written declaration of the Mediator to the effect that further efforts at Mediation are no longer worthwhile; or (c) by a written declaration of a party or parties to the effect that the Mediation proceedings are terminated.

9-20.14 Exclusion Of Liability

No Mediator shall be a necessary party in judicial proceedings related to the Mediation. No Mediator shall be liable to any party for any act or omission in connection with any Mediation conducted hereunder.

9-20.15 Interpretation and Application Of These Mediation Provisions

The Mediator shall interpret and apply these Mediation provisions insofar as they relate to the Mediator's duties and responsibility.

9-20.16 Expenses

The expenses of witnesses for either side shall be paid by the party producing the witnesses. All other expenses of the Mediation, including required traveling and other expenses of the Mediator, the expenses of any witness called by the Mediator, and the cost of any proofs or expert advice produced at the request of the Mediator, shall be split equally between the parties.

9-21 NO ALTERNATIVE CLAIMS PROCEDURE

Nothing in the Contract constitutes an agreement for an alternative claim procedure under the provisions of Government Code Section 930.2, nor relieves the Contractor of the

requirements of Government Code, Part 3, Chapters 1 and 2 and Title 1, Division 3.6, Chapters 1, 2, 3, and 4.

9-22 ASSIGNMENT OF CLAIMS

The Contractor shall not assign any portion of the moneys due the Contractor without written Agency approval. No person other than the party signing the Contract has any claim under the Contract, except as provided in the Contract.

SECTION 10 ENVIRONMENTAL CONTROLS AT WORK SITE

10-1 DUST CONTROL

Dust control shall conform to Section 17, “Dust Control”, of these Specifications.

10-2 AIR POLLUTION CONTROL

The Contractor shall comply with all Federal, State, Agency, and local air pollution control rules, regulations, ordinances, and statutes that apply to the Work. The Contractor shall also comply with the requirements of any permits issued to the Agency as noted in the Special Provisions.

10-3 BURNING

Unless otherwise provided in the Special Provisions or approved by the Agency in writing, material shall not be burned on site.

10-4 EROSION, SEDIMENT, AND WATER POLLUTION CONTROL

10-4.01 General

The Federal Clean Water Act requires construction sites to prevent pollutants from entering storm drain systems. Storm drain systems include both constructed and natural facilities, including streams, waterways, and other bodies of water. The Contractor shall protect the local storm drain system from pollution, and shall conduct and schedule operations to avoid erosion and sediments. Where erosion from the Work or the Contractor’s operations might cause water pollution, the Contractor's operations shall be scheduled so temporary or permanent erosion control features are installed concurrently with, or immediately following, grading operations. In no case shall erodable surfaces be left exposed after September 30.

The Contractor is responsible for organizing and scheduling the Work to prevent, control, and/or abate water pollution. In order to provide effective and continuous control of water pollution, it may be necessary for the Contractor to perform the Work in small or multiple units, on an out-of-phase schedule, and/or with modified construction procedures. The Contractor shall coordinate water pollution control work with all other Contract work.

The Agency may stop all other work and direct the installation of erosion control features or the organizing and scheduling of work, at the Contractor’s expense, if the Contractor does not take measures to prevent pollutants from entering storm drain systems. In accordance with Section 5-21, “Temporary Suspension or Delay of Work”, of these Specifications, the Contractor may not resume work until such time as the Agency’s directive has been complied with to the satisfaction of the Agency.

10-4.02 Regulations, Ordinances, Permits, and Specifications

The Contractor must comply with all Federal, State, Agency and local permits, rules, regulations, ordinances, statutes, and Agency directions that apply to erosion, sediment, and water pollution control. The Contractor must comply with the most stringent regulation, ordinance, permit, or specification of the following applicable to the Work:

- This Section or the Special Provisions
- The County of Sacramento Land Grading and Erosion Control Ordinance,
- The County of Sacramento Stormwater Management and Discharge Control Ordinance,”
- The County of Sacramento Municipal Separate Storm Sewer System (MS4) Permit
- The State of California General Permit for Storm Water Discharges Associated with Construction Activity (General Permit)

- Specific or general National Pollution Discharge Elimination System (NPDES) or other permits that cover the Work or are specific to the area of the Work

The Contractor's responsibility to provide water pollution control under this Section ends at Field Acceptance of the Work. (See Section 7-21, "Final Inspection and Field Acceptance", of these Specifications.)

10-4.03 Agency Requirements

All construction projects in the County of Sacramento must have and implement one of the following types of water pollution control programs:

Construction projects disturbing more than the threshold number of acres as defined in the State General Construction Permit [one (1) acre as of March 10, 2003] must have a Stormwater Pollution Prevention Plan (SWPPP). (See Section 10-4.04 in this Section of these Specifications.)

Construction involving the grading, filling, excavating, storage, or disposal of three hundred fifty (350) cubic yards or more of soil, or the clearing or grubbing of one (1) acre or more must have an Erosion and Sediment Control Plan (ESCP). (See Section 10-4.05 in this Section of these Specifications.)

All other construction must have a Water Pollution Control Program. (See Section 10-4.06 in this Section of these Specifications.)

The Contractor may opt to implement a more restrictive program than that which is required. The Contractor must then conform to all requirements of both the minimum applicable program and the more restrictive program. Before starting the Work, the Contractor must develop a program for the control of water pollution during the Work. The Contractor shall not perform any clearing, grubbing or disturbances to the ground on the project, other than that specifically authorized in writing by the Agency, without a program to control water pollution. When requested by the Agency, the Contractor shall submit the program for review and acceptance prior to performing any work.

The program must indicate how the Contractor proposes to effectively control water pollution during the Work. The program must also describe how the Contractor will monitor the effectiveness of the program. The program must show erosion control work and all water pollution control measures/best management practices (BMP's) the Contractor will implement in connection with the Work. The BMP's must be implemented in accordance with Standard Drawings 11-1 through 11-10.

The Contractor must update the program on a regular (at least weekly) basis to address the current stage of construction, whenever there is a change in construction activities or operations which may affect the discharge of pollutants to surface waters, ground waters, municipal storm drain systems, or when directed to do so by the Agency. The program must be adjusted if it has not effectively achieved the objective of reducing pollutants in discharges. Updates and adjustments to the program must show additional control measures or revised operations, including those in areas not shown in the initially approved program, which are required on the project to control water pollution effectively. Amendments to the program shall be submitted to the Agency for review and acceptance. Upon approval of the amendment, the Contractor shall implement the additional control measures or revised operations.

The Agency is not liable to the Contractor for any portion of the water pollution control program or subsequent revisions nor for any delays to the Work due to the Contractor's failure to prepare and implement a program nor for any delays as a result of Agency review.

10-4.04 Stormwater Pollution Prevention Plan (SWPPP)

Construction projects disturbing more than the threshold number of acres [one (1) acre as of March 10, 2003] are covered under the State Water Resources Control Board (SWRCB) General Permit for Storm Water Discharges Associated with Construction Activity (General Permit). The General Permit is issued by the SWRCB (State Board) and is enforced by the

Agency and the Central Valley Regional Water Quality Control Board (Regional Board). Failure to comply with the requirements of the General Permit could result in significant daily fines. General Permit coverage is obtained by certifying and filing a Notice of Intent (NOI) with the State Board. The owner of the project will be responsible for filing the NOI unless specified otherwise in the Special Provisions. The General Permit also requires inspection of erosion and sediment control measures before, during, and after storm events.

The SWPPP shall be prepared in accordance with the General Permit or other permit specified in the Special Provisions, regardless of whether or not the Work is subject to said permit. The SWPPP must be prepared by an individual knowledgeable about storm water pollution prevention methods and requirements, and shall be signed by the preparer of the SWPPP. SWPPP's not prepared by a qualified individual may not be acceptable to the Agency, and the Agency may require that the Contractor obtain the services of a qualified preparer at the Contractor's expense.

The SWPPP shall be submitted to the Agency for review and acceptance, and implemented by the Contractor before Work commences. The Contractor will not be allowed to mobilize until the plan is accepted. The SWPPP must be kept onsite at all times, updated for the various phases of the project, and made immediately available for Agency and Regional Board Inspectors upon request. Updates shall be submitted to the Agency immediately for review.

Individuals responsible for the implementation of the SWPPP shall be appropriately trained, and the SWPPP shall document all training. This includes those personnel responsible for the use, installation, inspection, maintenance, and repair of Best Management Practices (BMP's). Mandatory project-specific storm water training for all affected project personnel, inspectors, consultants and contractors is required on all County projects (see Section 10-4.09, 10-4.08, "Required Stormwater Regulatory Compliance Training", of these Specifications.

By June 15th of each year, the Contractor shall submit an annual certification to the Engineer stating conformance with the requirements governing the Permit. If the project is in non-compliance at any time, the Contractor shall make a written report to the Engineer within 15 days of identification of non-compliance.

10-4.05 Erosion and Sediment Control Plan (ESCP)

Contractor shall prepare an Erosion and Sediment Control Plan (ESCP) for any project that involves the grading, filling, excavating, storage, or disposal of three hundred fifty (350) cubic yards or more of soil, or the clearing or grubbing of one (1) acre or more. At a minimum, the ESCP shall include the following information:

A. A vicinity map indicating the site location and significant geographic features;

B. A site delineation map indicating boundary lines of the property and each lot or parcel into which the site is proposed to be divided;

C. The location of on-site and surrounding watercourses and wetlands, existing and proposed drainage systems, and drainage area boundaries and acreages. Additional hydrologic analysis shall be provided as required by the Administrator;

D. The location of existing and proposed roads and structures on the site, and on adjacent property;

E. Accurate contours at two foot intervals for slopes up to ten percent and five foot intervals for slopes over ten percent showing topography of existing ground and locations of existing vegetation, including all oak trees, all other trees over six inches in diameter measured at four and one-half feet above the ground, groves of trees, and natural features such as rock outcroppings. Spot elevations will be required where relatively flat conditions exist. The spot elevations or contour lines shall be extended off-site for a minimum distance of fifty (50) feet, or one hundred (100) feet in flat terrain;

F. Elevations, location, extent and slope of all proposed grading shown by contours, cross-sections or other means, and location of any disposal areas, fills or other special features to be included in the work;

G. A statement of the quantity of material to be excavated, the quantity of material to be filled, whether such excavation or fill is permanent or temporary, and the amount of such material to be imported to or exported from the site;

H. A delineation of the area to be cleared and grubbed;

I. A statement of the estimated starting date, grading completion date, and when site improvements will be completed;

J. The location, implementation schedule, and maintenance schedule of all erosion control measures and sediment control measures to be implemented or constructed prior to, during or after the proposed activity;

K. A description of measures designed to control dust and stabilize the construction site road and entrance;

L. A description of the location and methods of storage and disposal of construction materials;

M. Any additional plans required by the Agency.

The ESCP shall be reviewed and accepted by the Agency before work commences. If the Contractor's methods fail to prevent erosion or siltation, the Contractor shall revise and adjust the control measures to provide effective control, and shall be responsible for any damage resulting from erosion or siltation originating from on the Work site and any other site the Contractor controls or passes through.

10-4.06 Water Pollution Control Program (WPCP)

If the Work does not fall under Sections 10-4.04 or 10-4.05 in this Section of these Specifications, the Contractor, prior to commencing work, must prepare a Water Pollution Control Program (WPCP) detailing the following:

- Location of soil stockpiles and solid waste containers
- Vehicle and equipment fueling, servicing, cleaning and storage areas
- Material storage areas
- Chemicals, potential pollutants and hazardous materials to be used and methods for safekeeping
- Site drainage during execution of the Work
- Stabilization of vehicle access to site
- De-watering operations
- Methods for spill prevention and control
- Secondary containment
- Handling and disposal of solid waste
- Storage and dispensing of fuel and lubricants
- Clean out and disposal of ready mix concrete
- Sanitation provisions
- Construction BMP Maintenance, Inspection and Repair procedures

The WPCP shall be submitted to the Agency for review and acceptance prior to the beginning of work.

10-4.07 Compliance

Compliance with the provisions in this Section does not relieve the Contractor of the responsibility for compliance with other Contract provisions.

The Contractor shall perform routine inspections and maintenance of BMP's. Inspections shall be done prior to, during, and after each rain event. The Contractor is solely responsible for

preparing and maintaining inspection and monitoring records; and for including those records in the SWPPP, WPCP or, in the case of Erosion and Sediment Control Plans, the site or project Maintenance Log, copies of which shall be available to the Agency upon request.

The Contractor shall immediately correct or replace any ineffective BMP. If the measures taken by the Contractor are inadequate to effectively control water pollution, the Agency may direct the Contractor to revise the operations and/or water pollution control program. The Agency may restrict work from being performed until the water pollution control measures are adequate and, if required, a revised water pollution control program is in place. Continued non-compliance may result in the Agency suspending the Work in accordance with Section 5-21, "Temporary Suspension or Delay of Work", of these Specifications. The Agency reserves the right to take corrective action and withhold Agency costs for corrective action from progress payments or final payment in accordance with Section 8-8, "Withholdings/Denial of Progress Payment Request", of these Specifications.

Any fines, including third-party claims, levied against the Agency as a result of Contractor's non-compliance are the Contractor's sole responsibility and will be withheld from progress payments or final payment in accordance with Section 8-8, "Withholdings/Denial of Progress Payment Request", of these Specifications.

10-4.08 Required Stormwater Regulatory Compliance Training

The Contractor and all Subcontractors are required to attend a Stormwater Regulatory Compliance training conducted by the County before construction activities begin. This training is mandatory for all construction personnel, including subcontractors and vendors, involved in construction activities that may have an impact on stormwater management.

The training will be provided at no cost to the Contractor or Subcontractors. The date and time for the training will be discussed at the preconstruction conference. The training will last up to three hours. Full compensation for attending this training shall be included in the prices paid for the various items of work and no separate payment will be made.

10-4.09 Payment

Except as otherwise provided in the Special Provisions, full compensation for compliance with all applicable erosion and sediment control and storm water pollution and prevention requirements will be included in the prices paid for the various Contract items of work and no additional compensation will be paid.

10-5 CONTROL OF WATER IN THE WORK

All water encountered during construction shall be disposed of by the Contractor in such a manner as not to damage public or private property or create a nuisance or health menace. The Contractor shall furnish, install, and operate pumps, pipes, appliances, and equipment of sufficient capacity to keep all excavations and accesses free from water until the excavation is backfilled to subgrade, unless otherwise authorized by the Agency. The Contractor shall provide all means or facilities necessary to transfer water to the pumps. Water shall be discharged in a manner approved by the Agency and in compliance with all NPDES requirements. The Contractor is not allowed to dispose of any water that contains sediment or other contaminants. The Contractor is responsible for providing filtration, settlement, or disposal facilities as required to comply with the requirements of Section 10-4, "Erosion, Sediment, and Water Pollution Control", in this Section of these Specifications.

10-6 NOT USED

10-7 CONTAMINATED OR HAZARDOUS MATERIALS

The Contractor shall comply with all Federal, State and local rules, regulations, ordinances, and statutes that apply to the handling, storage, and disposal of contaminated and hazardous materials. In the event hazardous or contaminated materials are encountered, the Contractor shall stop work in the affected area and notify the Engineer immediately. The Agency will provide direction on how the contractor is to proceed. Unless otherwise directed in the Special Provisions, no work is to be done in the area of the contaminated or hazardous materials without written direction from the Agency.

Unless otherwise provided for in the Apecial Provisions, payment for handling, removal and disposal of hazardous or contaminated materials shall be in accordance with Section 9 of these Specifications.

10-8 USE OF EXPLOSIVES

The Contractor shall not use explosives on the Work unless the Agency grants permission in writing or the use of explosives is specified in the Contract Documents, and then only under such conditions as the Agency prescribes.

10-9 SANITARY REGULATIONS

The Contractor shall comply with all Federal, State and local rules, regulations, ordinances, and statutes with respect to sanitation. The Contractor shall obey and enforce such sanitary requirements, and shall take precautions against contagious or infectious diseases.

Sanitary conveniences for the use of the workers shall be obscured from the public and constructed or installed and maintained by the Contractor. The Contractor shall strictly enforce use of such facilities.

10-10 NOT USED

10-11 CLEANING UP

The Contractor shall keep the site in a neat and presentable condition. The Contractor shall dispose of surplus materials, clean out all drainage ditches and structures, and repair any fences or other property damaged during the progress of the Work. When material is disposed of outside of an easement, street, or highway right-of-way, or other Agency-owned properties, the Contractor shall do so in accordance with the Contract Documents.

10-12 ARCHEOLOGICAL AND CULTURAL RESOURCES

If archeological or cultural resources are discovered during the Work, the Contractor shall cease all construction operations in the vicinity of the discovery until a qualified archeologist can assess the value of these resources and make recommendations to the State Historic Preservation Officer. Archeological and cultural resources include artifacts, large amounts of bone, shell, or flaked stone, and other evidence of human activity. If the State Historic Preservation Officer or the Agency directs that work be temporarily ceased at the location of an archeological or cultural find, the Contractor shall temporarily suspend work at the location.

If the Agency or the State Historic Preservation Officer temporarily suspends a portion of the Work for cultural purposes, any associated delays are considered unavoidable in accordance with Section 7-12.02, “Unavoidable Delays”, of these Specifications.

10-13 PROTECTION OF EXISTING TREES

Special attention shall be given to protection of certain native and ornamental trees or shrubs, landmark trees, and all native oak trees in the County of Sacramento. Additional requirements for specific trees may be shown on the Plans, or designated in the Special Provisions or by the Agency. No native oak trees shall be removed or disturbed unless specifically designated for removal on the Plans or by the Agency. Every reasonable effort shall be made to avoid creating conditions adverse to the tree's health. The natural ground within the dripline of protected trees shall remain as undisturbed as possible. The dripline area shall be identified on the ground by a circle with a radius measurement from the trunk of the tree to the tip of its longest limb. The limb cannot be cut back in order to change the dripline. The area within the dripline is a critical portion of the root zone and defines the minimum protected area of each tree. Removing limbs within the dripline does not change the originally protected root zone. Measures required for protection of existing trees shall include, but are not limited to, the following:

- Temporary protective barrier fencing, with a minimum height of four feet (4'-0") shall be installed continuously around the dripline perimeter of the protected trees prior to beginning the Work.
- No signs, ropes, cables, or any other items shall be attached to a protected tree, except those cables recommended by a Certified Arborist for limb support.
- No vehicles, construction equipment, temporary or mobile buildings, supplies, materials, or facilities shall be driven, parked, stockpiled, or located within the dripline of protected trees.
- Unauthorized grade cuts or fills are not permitted within the dripline of protected trees. Cuts or fills necessary beyond the dripline but near the protected trees shall be contoured to drain away from the protected tree's dripline.
- No utility line trenching will be permitted within the driplines of protected trees. If it is necessary to install underground utilities within the dripline of a protected tree, the utility line shall be either bored or drilled to avoid damaging roots. If the Agency determines boring or drilling is inappropriate, the utility line trench may be hand dug under the direct supervision of a Certified Arborist to avoid damaging roots.
- Roots approved by a Certified Arborist to be severed or that fall within the structural section of the facility to be constructed, including building foundations or wall footings, shall be pruned cleanly and covered with moist earth as soon as possible. If, due to the construction, the roots must be unearthed for more than two (2) hours, they must be kept moist and covered with wet burlap or an approved equal until they are covered by moist earth. Supporting structural buttress roots that provide stability to the tree or keep it from toppling shall be protected in place. The Contractor shall hand-dig in the dripline of protected trees to prevent root cutting and mangling. Roots one inch (1") or greater in diameter encountered within the tree's dripline shall not be cut without the Agency's approval, and shall be kept moist, as approved by the Agency, and covered with earth within forty-eight (48) hours.
- Where required by the Agency, a piped aeration system and/or a post and grade beam foundation shall be installed beneath that portion of the paving, foundation, or concrete slab that encroaches into the dripline of a protected tree. The piped aeration system shall be installed under the direct supervision of a Certified Arborist.
- Only drought resistant plant species, tolerant of the natural and semi-arid environment of the native oak understory, shall be planted within the driplines of native oak trees.
- No sprinkler systems that will irrigate or require trenching within the dripline of a native oak tree will be permitted. An above ground drip irrigation system, which allows for

controlled application rates, may be installed to irrigate native or semi-arid plants within the dripline of a native oak tree.

All protected trees within the Work area that require pruning for construction clearance shall be pruned prior to commencement of construction. Native oak trees that require pruning of branches larger than two inches (2”) in diameter shall be pruned by a Certified Arborist.

TECHNICAL PROVISIONS

SECTION 11 PRECONSTRUCTION PHOTOGRAPHS AND RECORD DRAWINGS

11-1 GENERAL

Preconstruction photographs will only be required when specified in the Special Provisions. Record Drawings are required on all Agency Work, unless directed otherwise in writing by the Agency.

11-2 PRECONSTRUCTION PHOTOGRAPHS

Preconstruction photographs shall be taken by the Contractor at one-hundred foot (100') intervals along the route of the Work before any construction begins. The view in each photograph shall include a sign showing the date, name of the Project, lateral or street, and applicable station designation. The sign shall not block the important areas of the view and shall be legible in a three and one-half inch by five inch (3-1/2" x 5") print. Each photograph shall be taken from a point between four feet (4') and eight feet (8') above the ground. All prints shall show good details in both shadow and sunlit areas. Negatives may be of any size provided minimum negative resolution throughout the major area of the negative is one hundred (100) lines per inch multiplied by the enlargement factor necessary to produce an eight inch by ten inch (8" x 10") print. As an alternative to negatives as described above, the Contractor may substitute digital photography files. Such photographs shall be .TIF or uncompressed .JPEG raster files with a minimum resolution of four (4) megapixels.

The views in preconstruction photographs shall include the entire construction zone and, in particular, show the interface between the right-of-way and construction zone, and abutting property features such as, but not limited to, condition of existing streets, sidewalks, driveways, fences, landscaping, buildings abutting work site, and existing surface utility facilities on and close to the Work.

All essential features of the project area shall be shown accurately. The Agency may order additional photographs showing additional features or orientations, if the Agency determines that all essential features are not accurately or adequately shown.

A sample of twenty-four (24) photographs shall be submitted to the Agency for approval before proceeding with the remaining photographs. All photographs which do not conform to these Specifications, as determined by the Agency, shall be retaken.

The Contractor shall submit to the Agency one (1) three and one-half inch by five inch (3-1/2" x 5") color glossy print, and the negative, of each photograph taken. If the Contractor elects to use the digital photography option described above, the Contractor shall submit one (1) three and one-half inch by five inch (3-1/2" x 5") color glossy print and the image file, of each photograph taken. The image files for digital photographs shall be submitted on a read-only memory compact disk (CD-ROM).

Prints shall be submitted in a three-ring photo album binder with clear plastic covered fillers, four (4) photos each side, grouped according to street, lateral or line, and in sequence. The name and number of the Contract and Contractor's name shall appear on the binder cover. Each group of prints shall be identified by a label which projects beyond the edge of filler and is easily recognized. Negatives may be placed within the filler sleeves or submitted separately.

At the Contractor's option, a DVD or a video tape in a VHS format may be submitted in lieu of photographs. Additionally, an AVI or raw Quick Time file shall be provided. The content and quality requirements for the photographs shall apply to the video tape.

11-3 RECORD DRAWINGS

The Contractor shall maintain a neat and accurately marked set of Record Drawings, which shall be provided to the Agency for review and approval prior to Final Acceptance of the Work. The Record Drawings shall represent the Work as constructed and document changes to the Work shown on the Project Plans, and shall show the actual as-constructed conditions of installed or modified systems, equipment, and material.

Record Drawings shall be produced by marking a full size copy of the Project Plans as follows:

Red - Additions including notes and dimensions.

Green - Deletions (by hash marks or appropriate lines through the deletion.)

Graphite (gray) - General comments and notes used by Contractor or Agency and not required on the as-built.

Yellow - Work completed as shown and used by Agency in field review of the as-built, during the submittal phase.

Blue - Agency verification and notes required to be added and noted by Agency in review of the as-built, during submittal phase.

The Record Drawings shall show, by field measured dimensions, the exact locations of all underground work, including all sprinkler system piping and components, and the final elevations and locations of all improvements constructed, modified or adjusted. Record Drawings shall be available for inspection by the Agency at all times and shall be updated at least weekly with all Field Instructions and other written directives, Contract Change Orders, and Contract adjustments shown thereon and initialed by the Agency. Progress payments or portions thereof may be withheld if Record Drawings are not kept up to date.

Unless otherwise specified in the Special Provisions, or directed by the Agency, the Contractor shall submit a minimum of two (2) sets of Record Drawings to the Agency at the final inspection. These Record Drawings shall include certification by the Contractor that the Record Drawings are a true representation of the Work as actually constructed. The Work will not be formally accepted until the Record Drawings are provided to and approved by the Agency. Final payment or a portion thereof may be withheld if final Record Drawings are not provided.

11-4 MEASUREMENT AND PAYMENT

When the Contract includes an item for preconstruction photographs, preconstruction photographs will be paid for at a lump sum price.

The lump sum price paid for preconstruction photographs includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in taking and submitting preconstruction photographs, or optional video tape, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

When the Contract does not include an item for preconstruction photographs, full compensation for preconstruction photographs is included in the prices paid for the various items of work and no separate payment will be made.

Full compensation for Record Drawings is included in the prices paid for the various items of work and no separate payment will be made.

SECTION 12 CONSTRUCTION AREA TRAFFIC CONTROL

12-1 GENERAL

Construction area traffic controls and devices shall conform to the requirements in the following Sections of these Specifications: Section 6-11, "General Safety Requirements"; Section 6-12, "Public Convenience and Safety"; Section 6-13, "Public Safety and Traffic Control"; Section 6-14, "Traffic Control Plans (TCP)"; Section 7-8, "Peak Hours, Hours of Darkness, Holidays, and Weekends"; and this Section (Section 12). Attention is directed to the latest version of the California Manual of Uniform Traffic Control Devices (CA/MUTCD) (hereafter referred to as the "Manual"). All traffic controls and devices shall be as specified in the Manual unless otherwise indicated herein or in the Contract. At no time shall the requirements in these Specifications be construed as to reduce the minimum standards of the Manual. Copies of the Manual may be purchased from the California Department of Transportation, 1900 Royal Oaks Drive, Sacramento, California 95815.

All traffic control devices including, but not limited to, traffic cones or portable delineators, telescoping flag trees, arrow boards, barricades, and signs shall be placed before beginning work and shall be removed from the right-of-way at the end of each day or shift, or, for long-term closures, when no longer needed, and shall be placed so as to not obstruct bicycle lanes and pedestrian facilities. All traffic control devices left in the right-of-way by the Contractor are subject to removal by the Agency. The Contractor shall be required to pay any costs incurred by the Agency associated with the removal of these devices.

No equipment shall be parked within any traffic lanes, medians, or within the public right-of-way at any time of day or night, including holidays and weekends, without an approved lane or road closure. The Contractor shall notify the Agency a minimum of three (3) Working Days in advance of any lane closure and twenty (20) Working Days in advance of any road closure. Attention is directed to Sections 6 and 7 of these Specifications for additional information.

12-2 FLAGGING

12-2.01 Flaggers

Flaggers shall perform their duties and shall be provided with the necessary equipment in accordance with Manual and the current "Flagging Handbook" published by the American Traffic Safety Services Association (ATSSA). The equipment shall be furnished and kept clean and in good repair by the Contractor at the Contractor's expense. All flaggers shall be trained as required by Cal/OSHA Title 8, Section 1599, and proof of such training shall be made available by the Contractor upon request by the Agency. Any flagger, in the opinion of the Agency, not performing in a safe manner or in a manner conducive to public safety must be removed and replaced by the Contractor immediately.

Flaggers shall be used where necessary to control the flow of traffic through the construction site and shall be used in all cases where traffic is being routed through the construction zone under one-lane, two-way traffic controls, or when ordered by the Agency.

12-2.02 Flagging Costs

Unless specified otherwise in the Special Provisions, the cost of furnishing all flaggers, including transporting flaggers to provide for passage of public traffic through the construction site in accordance with the provisions in Sections 6-12, "Public Convenience and Safety", and 6-13, "Public Safety and Traffic Control", of these Specifications shall be considered included in other items of work and no additional compensation will be made.

12-3 TRAFFIC-HANDLING EQUIPMENT AND DEVICES

12-3.01 General

In addition to the requirements in the Manual, all devices used by the Contractor in the performance of the Work shall conform to the requirements in this Section (Section 12).

Traffic-handling equipment and devices damaged from any cause during the progress of the Work shall be repaired or replaced by the Contractor at the Contractor's expense.

12-3.02 Cones

Traffic cones shall be of good commercial quality, flexible material suitable for the purpose intended. Reflective bands shall be used with cones when lane or road closures are conducted at night. The outer section of the portion above the base of the cone shall be a highly pigmented fluorescent orange polyvinyl compound. The overall height of the cone shall be at least twenty-eight inches (28”). The base shall be of sufficient weight and size or shall be anchored in a manner such that the traffic cone will remain in an upright position.

If the traffic cones are damaged, displaced, or are not in an upright position, they shall immediately be replaced or restored to their original location and position by the Contractor.

The traffic cones shall be placed at intervals as shown in the Manual, or as directed by the Agency.

When no longer required for delineation, all portable cones shall be removed from the work site.

12-3.03 Portable Channelizers

Portable channelizers shall be fabricated from materials having sufficient rigidity to remain upright when unattended, but shall be flexible enough to collapse upon impact by a vehicle. The base shall be of such shape as to prevent roll after impact. The base shall be of sufficient mass or shall be anchored in a manner such that the channelizer shall remain in an upright position. Ballast, if used for the bases of portable channelizers, shall be sand or water. On long-term closures, channelizers shall be affixed to the pavement as required by the Agency.

If the portable channelizers are displaced or are not in an upright position, the channelizers shall immediately be replaced or restored to their original location and position by the Contractor.

The vertical portion of the portable channelizer shall be of a fluorescent orange or predominantly orange color. Reflective bands shall be affixed to all channelizers used for night operations. The posts shall be not less than three and one-half inches (3-1/2”) in diameter. The minimum height shall be three feet (3’) above the road surface. When no longer required for delineation, all portable channelizers shall be removed from the work site immediately.

12-3.04 Telescoping Flag Trees

Telescoping flag trees shall be of good commercial quality material, clean and intelligible, suitable for the purpose intended, and capable of maintaining an upright position at all times while in use.

12-3.05 Portable Flashing Beacons

Portable flashing beacons shall comply with Section 12-3.05 of the State Specifications. Portable flashing beacons shall be assembled to form a complete, self-contained, flashing beacon that can be delivered to the worksite and placed into immediate operation. Beacons shall be checked periodically to insure functionality. Any beacons found to be in a condition that would prevent them from providing adequate warning at night shall be promptly removed from service and replaced with an operational unit.

12-3.06 Barricades

Barricades are designated by type according to function and physical characteristics. Type I, II and III barricades are portable construction barricades; Type IV barricades are intended for

permanent installation. Type I, II, and III barricades shall conform to the provisions, details and dimensions as specified in the Manual. Type IV barricades shall conform to the Contract.

12-3.06.A Materials

Materials for Type I, II and III barricades shall conform to provisions of the Manual.

Type IV barricades shall be constructed of materials as follows:

- Posts shall be four inches by four inches (4”x4”), nominal size, highway post grade redwood or No. 2 heart structural grade redwood (1000f).
- Rails shall be two inches by six inches (2”x6”), nominal size light framing construction grade Douglas fir, free of heart center.
- Object markers for mounting on each post between the rails shall be red reflectorized sheeting, tape or plates, [three inches by five inches (3”x5”) minimum size]. Where called for on the Plans, object markers shall be Type N markers (9-spot) conforming to the provisions of the Manual.
- Paint for posts and rails shall consist of a minimum of one coat of wood primer and two coats of white exterior latex enamel, conforming to the provisions of Section 50-45, "Paint", of these Specifications.

Barricade warning lights shall conform to the provisions as specified in the Manual. Unless otherwise specified in the Contract, Type A Barricade Warning Lights (flashers) shall be used.

The Contractor shall establish the necessary quality control to assure compliance with these Specifications. No Certificate of Compliance, as such, will be required for Type IV barricades. A Certificate of Compliance may be required for Type I, II and III barricades for warning lights to assure compliance with these Specifications.

12-3.06.B Installation and Maintenance

12-3.06.B.(1) Construction Barricades

Construction barricades of the type specified in the Special Provisions shall be furnished and set at locations as required by the Manual and as directed by the Agency. The barricades shall be maintained for as long as necessary and shall be checked for proper positioning at the close of each day's activity and more often as necessary.

The batteries of warning lights shall be maintained at a high rate of charge at all times.

12-3.07 Flashing Arrow Sign (FAS)

The use of a Flashing Arrow Sign (FAS) is required on major streets for lane closures during hours of darkness and for all lane closures lasting more than two (2) hours, or as specified in the Contract or as directed by Agency. An exception may be allowed in situations where it is determined by the Agency that the amount of traffic does not warrant the use of a FAS.

FAS face shall be finished with commercial quality flat black enamel and shall be equipped with yellow or amber lamps that form arrows. Each lamp shall be provided with a visor and the lamps shall be controlled by an electronic circuit. The control shall be capable of dimming the lamps by reducing the voltage to fifty percent plus or minus five percent (50% ± 5%) for nighttime use.

Each FAS shall be mounted on a truck or on a trailer and shall be capable of operating while the vehicle is moving and being placed and when the FAS is operating in place or being maintained. The trailer on which the FAS is mounted shall be equipped so that it can be leveled and plumbed.

Power to operate the sign shall be obtained from the vehicle on which the sign is mounted or from a generating plant mounted on the vehicle. The power supply shall be monitored by the Contractor and, if failure is observed, a replacement FAS shall be put in use immediately either by the Contractor or the Agency. If the Agency provides and places the replacement FAS, the Contractor is responsible for reimbursement of the Agency’s costs.

12-3.08 Construction Area Signs

12-3.08.A General Requirements

The Contractor is responsible for informing the public of traffic conditions existing within the construction area at all times by placing warning and advisory signs. The term "Construction Area Signs" shall include all temporary signs required for the direction of public traffic through or around the Work during construction. These signs are shown in or referred to in the current Manual. All construction area signs shall be installed at the locations shown on the Plans and as directed by the Agency.

All construction area signs shall conform to the dimensions, color, and legend requirements of the Plans, the current Manual, and these Specifications. All sign panels shall be the product of a commercial sign manufacturer, and shall be as specified in these Specifications.

12-3.08.B Covering Signs

The Contractor may be required to cover certain signs during the progress of the Work. Covers for construction area signs shall be of sufficient size and density to completely block out the message so that it is not visible either during the day or at night. Covers shall be fastened securely to prevent movement caused by wind.

12-3.08.C Cleaning Signs

The Contractor shall clean all construction area sign panels at the time of installation and as often thereafter as the Agency determines to be necessary, but at least once every month.

12-3.08.D Used Signs

Used signs will be considered satisfactory for use if approved by the Agency before placement.

12-3.08.E Replacement and Backup Signs

To properly provide for changing traffic conditions and damage caused by public traffic or otherwise, the Contractor shall be prepared to furnish additional construction area sign panels, posts, and mounting hardware or portable sign mounts on short notice. The Contractor shall maintain an inventory of the commonly required items at the jobsite or shall make arrangements with a supplier who is able, on a daily basis, to furnish the items on short notice.

12-3.08.F Stopping or Parking Prohibition (Tow-Away Zone)

The Contractor may install "Tow-Away" or "No Parking, No Stopping" signs in critical areas to provide traffic lanes or work areas. Prohibition of stopping or parking, or the installation of tow-away signs, requires the approval of and issuance of a permit from the Agency. The Contractor shall notify the Agency three (3) Working Days in advance of the placement of the signs. After approval of the stopping or parking restrictions or tow-away signs, the Contractor shall furnish and place approved "NO STOPPING" or "NO PARKING" signs where directed. The messages on the signs must include the dates and times of the required prohibition. Article 22651(1) of the California State Vehicle Code requires a sign to be in place twenty-four (24) hours before it becomes legally enforceable.

12-3.08.G Protection, Maintenance, Removal, Storage, and Resetting of Signs

The protection and maintenance of existing signs and the removal, protection, storage, and resetting of traffic signs that are affected by the Work is the responsibility of the Contractor, as directed by the Agency or as specified in the Special Provisions. The Contractor shall inventory all existing signs prior to the start of work. The Agency will confirm the inventory in writing prior to the start of work.

12-3.08.H Movement of Traffic Signs and Traffic Control Facilities

Existing traffic signs and traffic control facilities within the limits of the Work shall not be moved except as necessary to prevent them from being damaged by construction operations or

as directed in writing by the Agency. When a sign needs to be removed because it interferes with the Contractor's work, it shall be done only with the written permission of the Agency.

12-3.08.I "Road Construction Ahead (C-18)" and "End of Construction (C-13)" Signs

All scheduled road construction within the right-of-way lasting longer than twenty-four (24) hours shall have permanent construction signs installed. W-20 "Road Work Ahead" signs shall be installed at the approaches to the Work and G-20 "End Road Construction" signs shall be installed at the egresses of the Work. Each sign shall be permanently placed on a four-inch by four-inch (4" x 4") post and shall remain in place until the Work has been completed, or until directed by the Agency in writing. Exact placement of the signs will be determined in the field by the Agency.

12-3.08.J Contractor Furnished Signs

The size, wording, and location of all signs furnished and erected by the Contractor must be approved by the Agency prior to placement.

12-3.08.K Obscuring Visibility and Conflicting With Meaning

Signs or other protective devices furnished and erected by the Contractor shall not obscure the visibility of, nor conflict in intent, meaning, and/or function with existing signs, lights, or traffic control devices, or any construction area signs, lights, and traffic control devices.

12-3.08.L Permanent Construction Signs

Permanent construction signs shall be installed on wood posts in the same manner shown on the Plans for installation of roadside signs.

Post sizes and numbers of posts shall be as shown on the Plans, except that when stationary mounted signs are installed and the type of sign installation is not shown on the Plans, post size and the number of posts will be determined by the Agency. Posts shall be good, sound, wood posts, suitable for the purpose intended.

Sign panels for stationary signs shall consist of Type IIIA reflective sheeting applied to a sign substrate. Sign panels shall conform to the requirements specified for aluminum signs in the Caltrans "Specifications for Aluminum Signs". Copies of the Caltrans "Specifications for Reflective Sheeting Aluminum Signs and Framing Details for Sheet Aluminum Signs" may be obtained from the Caltrans Office of Business Management, Materiel Operations Branch, 1900 Royal Oaks Drive, Sacramento, CA 95815.

Sign panels shall also conform to the following:

- Type IIIA reflective sheeting and aluminum substrates shall be as specified in the "Specifications for Reflective Sheeting Aluminum Signs". Sign substrates fabricated from materials other than aluminum shall be as specified in the Special Provisions.
- Legend and border may be applied by a screening process or by use of pressure sensitive cut-out sheeting. Size and spacing of letters and symbols shall be as depicted on the sign specification sheets published by Caltrans. Copies of the sign specifications may be purchased from the Caltrans Publication Unit, 1900 Royal Oaks Drive, Sacramento, CA 95815.
- All rectangular sheet aluminum signs over 1375 mm measured along the horizontal axis, and all diamond-shaped sheet aluminum signs 1500 mm and larger shall be framed unless otherwise specified. Frames shall be constructed in accordance with "Framing Details for Sheet Aluminum Signs", Sheets 1 through 4 and Table 1 on Sheet 5, as published by Caltrans.
- Sign panel fastening hardware shall be commercial quality.

12-3.08.M Removal of Permanent Traffic Control Signs

For existing permanent traffic control signs that are to be removed and not relocated, the Contractor shall remove all sign faces, hardware, and posts. The Contractor shall deliver the

removed items to the Agency facility designated in the Special Provisions. The Contractor shall replace any sign faces, hardware, or posts damaged during removal and transport.

12-3.08.N Regulatory Sign Placement and Removal

The temporary relocation of each "STOP" or other regulatory traffic sign shall be done immediately upon its removal, and to a location as close as possible to the original position of sign or as directed by the Agency.

Stop signs and other traffic control signs and facilities necessary for the control of traffic during the project shall be maintained in their original positions, as noted in the Agency's inventory, except for temporary repositioning necessitated by the Work. No signs may be moved from their original positions without prior written approval of the Agency. Temporary sign positions must be equivalent to the original positions. The standard sign position is seven to ten feet (7' to 10') from the edge of pavement. Stop signs should not be located more than thirty feet (30') from the painted roadway centerline, unless they are supplemental signs, more than forty feet (40') in advance of the limit line, or more than twenty feet (20') beyond the limit line. When the intersection approach width for one direction of traffic is thirty feet (30') or more, the Agency may require that stop signs be erected on both the left and right sides of that approach.

Temporary traffic control signs may be mounted on portable supports only during working hours when the Contractor's workers are available to maintain the signs in proper position at all times. The position and mounting devices for temporary signs shall be subject to the approval of the Agency.

Outside of working hours, and at all other times when the Contractor is not available to maintain signs on portable temporary supports, all temporary stop signs and other traffic control signs must be mounted on their original or equivalent posts. The posts must be set in the ground with compacted backfill to a depth of at least thirty-two inches (32") in the same way that permanent signs are installed. The bottom of the sign face must be at least five feet (5') but not more than seven feet (7') above the edge of traveled way, and must be seven feet (7') above the edge of traveled way if adjacent to a pedestrian or bicycle pathway. When temporary sign post holes must be dug in completed pavement surfaces, the Agency shall review the temporary position with respect to the proper final position.

12-3.08.O Sign Posts

When the Work will change traffic patterns, require relocation, removal, or installation of permanent regulatory traffic control and other signs, the Contractor shall relocate, remove, or install sign posts as shown on the Plans, or as directed by the Agency.

12-4 MEASUREMENT AND PAYMENT

Except as otherwise provided in these Specifications or the Special Provisions, full compensation for conforming to the requirements in the following Sections of these Specifications—this Section (Section 12); Section 6-11, "General Safety Requirements"; Section 6-12, "Public Convenience and Safety"; Section 6-13, "Public Safety and Traffic Control"; Section 6-14, "Traffic Control Plans (TCP)"; and Section 7-8, "Peak Hours, Hours of Darkness, Holidays, and Weekends"—is included in the prices paid for the various items of work and no additional compensation will be paid.

Full compensation for repairing damage to detours caused by public traffic is included in the prices paid for the various items of work and no additional compensation will be paid.

SECTION 13 EXISTING FACILITIES

13-1 GENERAL

This work shall conform to Section 15, “Existing Highway Facilities,” of the State Specifications, and these Specifications.

Facilities subject to these Specifications include existing facilities that interfere with planned construction as shown or specified in the Contract. The removal of existing utilities shall be by the utility owner, unless otherwise shown or specified in the Contract.

Attention is directed to Section 6-21, “Preservation of Property”, of these Specifications. Existing facilities within the rights-of-way and construction areas that do not interfere with the Work shall be protected from damage. Unless otherwise shown or specified in the Contract, the minimum cover requirements during construction for temporary construction vehicle loading shall be as follows:

- For metal and plastic pipes, place at least four feet (4') of cover over the top of the pipe at construction crossings.
- For reinforced concrete pipe, place at least three feet (3') of cover over the top of the pipe at construction crossings.

Attention is directed to Section 14, “Restoration of Surfaces”, and Section 15, “Clearing and Grubbing”, of these Specifications for additional requirements.

13-2 REMOVING EXISTING FACILITIES

Existing facilities that interfere with the Work shall be removed, reset, relocated, adjusted, or otherwise modified as specified herein, as shown on the Plans, as specified in the Special Provisions, or as directed by the Agency.

Trenches, holes, depressions and pits resulting from the removal of existing facilities shall be backfilled with embankment material as provided in Section 18, “Earthwork”, of these Specifications. Such trenches, holes, depressions and pits that are in surfaced areas, otherwise to remain undisturbed, shall be backfilled with materials equal to or better in quality and to the same thicknesses as the surrounding materials.

13-2.01 Mailboxes

Existing mailboxes and newspaper tubes shall be removed and reset where shown on the Plans or as directed by the Agency. All mailboxes shall be maintained in an upright position adjacent to the construction area between the time the mailbox is removed and reset in its final location.

Mailboxes shall be reset on four-inch by four-inch (4" x 4") Douglas fir or redwood posts S4S, conforming to the provisions of Section 56-2.02B, “Wood Posts,” of the State Specifications, unless otherwise noted on the Plans. Posts shall be set a minimum of twenty-four inches (24”) in concrete bases. Concrete shall be Class “C” portland cement concrete as defined in Section 50-5, ”Portland Cement Concrete”, of these Specifications. Mailboxes that can be salvaged intact, including ornamental or iron supports, shall be salvaged and reset. The bottom of mailboxes shall be set at a height of three-feet six-inches (3'6") above the back of curb or edge of shoulder.

For projects in the County of Sacramento, the face of the mailbox shall be set one foot (1’) behind the back of sidewalk on Class "A" streets, one foot (1’) behind the back of curb on Class "B" streets, and one foot (1’) behind the outside shoulder line on Class "C" streets, or as shown on the Plans or directed by the Agency. The classes of streets are as defined in the Improvement Standards of the County of Sacramento, Public Works Agency.

13-2.02 Signs

Attention is directed to Section 12, "Construction Area Traffic Control", of these Specifications regarding the maintenance of existing traffic control signs.

13-2.03 Survey Monuments

Existing survey monuments and markers shown on the Plans or found during progress of the Work shall be preserved. (See Section 5-9.02, "Survey Monuments", of these Specifications.) Survey monuments and markers are hereinafter referred to as "monuments." The Contractor shall notify the Agency of any monument encountered, and shall not remove or damage said monument until the monument can be cross referenced and surveyed by the Agency. The Contractor shall allow a minimum of one (1) Working Day for such referencing to be accomplished. When notified by the Agency that the cross-referencing has been completed, the monument may then be removed. The Contractor is not responsible for the replacement of any monument that has been cross-referenced and surveyed by the Agency, as specified above. If the Contractor fails to notify the Agency as specified above, or removes or damages any monument that is not in direct conflict with the Work, all referencing, resurvey, and replacement of the monument shall be at the Contractor's expense.

13-2.04 Landscaping Improvements

Existing landscape improvements and appurtenances including irrigation pipes, gate valves, remote control valves, sprinkler heads, hose bibs, automatic irrigation controllers, and yard lighting systems that interfere with the Work shall be removed. Irrigation pipes shall be capped at the right-of-way line or easement line, unless otherwise shown or specified in the Contract. Irrigation systems that are affected by the Work that provide irrigation to existing landscaping that is not to be removed as part of the Work shall be replumbed and rewired, when necessary, to be operational within five (5) Working Days of being affected by the Work. Care shall be taken to guarantee that the system is plumbed consistent with appropriate design pressure and flow. All irrigation lines shall be flushed and free of dirt and debris prior to re-plumbing. The Contractor shall make arrangements with the abutting property owner to salvage and stockpile any materials removed during the Contractor's operations. On projects for underground construction of sewer, drainage, or water facilities in public utility easements or other easements, existing landscape improvements and appurtenances shall be reconstructed to their original location and condition, unless otherwise shown or specified in the Contract.

Existing plant material (i.e. trees, shrubs, ground cover and lawn) within the area affected by the Work and designated for removal shall be removed per Section 15, "Clearing and Grubbing", of these Specifications.

13-2.05 Abandoned Underground Facilities

All abandoned pipes, conduits, and other abandoned structures within two feet (2') below the roadway subgrade shall be removed and disposed of. Pipes that are lower than two feet (2') below the roadway subgrade shall either be removed or the ends plugged with concrete, at the option of the Contractor, unless specified otherwise in the Contract. Pipe ends shall be plugged in accordance with Section 15-1.04, "Abandonment of Pipes and Manholes", of these Specifications.

13-2.06 Drainage Facilities

The Contractor shall maintain existing drainage facilities, including ditches, during the Work. Except where otherwise shown on the Plans, the Contractor shall re-establish the drainage facilities to their original locations and in working condition as soon as possible after completing work in the area. For remedial maintenance projects or improvement projects in established areas, the Contractor shall coordinate the work so that storm drain systems are fully operational at the end of each Working Day. No runoff shall be allowed to flow unconfined through any trenches or excavations without approval of the Agency.

13-2.07 Fences

All fence material and gates to be relocated or reset shall be removed with care to prevent any damage to the material. All adhering concrete footings shall be removed from fence posts and braces that are to be relocated or reset.

Relocated or reset fences shall provide two feet (2') minimum clearance from relocated or new fire hydrants.

Temporary fencing shall be furnished and erected where the removed existing fencing is for security of property or containment, as shown on the Plans and as directed by the Agency.

Materials removed from existing fences that, in the opinion of the Agency, are unsuitable for reuse shall become the property of the Contractor and shall be disposed of. The unsuitable material shall be replaced with material of a kind and quality equal to the best of the material in the existing facility. Furnishing of material to replace material that has been damaged by the Contractor's operations will be at the Contractor's expense. Furnishing of material to replace unsuitable material as ordered by the Agency will be paid for as extra work as provided in Section 9, "Changes and Claims", of these Specifications.

13-2.08 Concrete

Where a portion of a concrete structure, slab, or curb is to be removed, the concrete shall be cut with a concrete saw so that the visible edge of the remaining concrete shall form a neat, straight line. Where concrete slabs, curbs, ornamental walls, brick work, or similar items are encountered in the course of the construction of underground facilities, except drainage facilities within road right-of-way, the structure or facility shall be reconstructed to match the existing portion of the facility. On roadway projects and drainage construction in highway rights-of-way, the facility shall be removed to the right-of-way line and the end of the facility shall be reconstructed to provide a neat appearance.

13-2.09 Removal of Traffic Stripes and Pavement Markings

Removal of traffic stripes and pavement markings is required for all areas of slurry seal and other areas specifically indicated for stripe removal as shown on the Plans. Removal of painted traffic stripes and pavement markings shall comply with the requirements of Section 15-2.02B, "Traffic Stripes and Pavement Markings", of the State Specifications. Traffic stripe removal shall be completed no more than two (2) Calendar Days prior to placement of slurry seal.

Traffic stripes and pavement markings shall be removed by sandblasting or approved grinding method. When sandblasting is performed within ten feet (10') of a lane occupied by vehicular traffic, the sandblast equipment shall be equipped with a shield to protect the public, and a vacuum attachment operating concurrently with the pressure equipment to immediately remove grindings and sand from the surface of the roadway. The Contractor shall immediately remove all remaining sand and grindings from the roadway.

The Contractor's attention is directed to Sections 6-1 and 10-7.01 of these Specifications. Handling and disposal of hazardous materials associated with the removal of traffic stripes and pavement markings shall comply with all applicable Federal, State, and local laws, rules, regulations, ordinances and statutes. Contractor will be responsible for all costs associated with non-compliance, including any fines levied.

Placement of permanent or temporary pavement striping, as detailed in Section 48-5 "Placement", of these Specifications, is required prior to opening the subject portion of roadway to traffic.

13-3 MEASUREMENT AND PAYMENT

Full compensation for protecting existing facilities shall be considered as included in the prices paid for the various items of work and no additional compensation will be allowed.

Payment for removing, resetting, relocating, adjusting, or otherwise working on existing facilities will be made at the prices for the various items of work in the Contract, and will be payment for all work involved including disposal and salvaging.

Full compensation for conforming to the provisions in this Section (Section 13), not otherwise provided for, is included in the prices paid for the various items of work involved and no additional compensation will be allowed.

The Contract price paid per linear foot for relocating existing fence, or resetting existing fence includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and doing all the work involved in removing existing fence materials and gates, and relocating or resetting existing fences, complete in place, as specified in these Specifications, as shown or specified in the Contract, and as directed by the Agency.

Full compensation for clearing fence lines and disposing of the resulting material, excavating high points in the existing ground between posts, excavating holes, disposing of surplus excavated material, furnishing and placing portland cement concrete footings, connecting the fences to structures and existing cross fences, and constructing temporary fences, is included in the price paid for relocating or resetting existing fences and no additional compensation will be paid.

If there is no item in the Contract for relocating or resetting fences, full compensation for conforming to the provisions in this Section (Section 13), not otherwise provided for, is included in the prices paid for the various items of work involved, and no separate payment will be made.

Removal of traffic stripes and pavement markings shall be measured by the linear foot for removal of four-inch traffic stripes. Stripes of widths other than four inches shall be converted to an equivalent length of four-inch stripe for determination of quantities. Traffic stripes with gaps, or skipped striping, shall only be measured along portions with traffic striping, gaps without striping shall not be measured for payment. Traffic stripe shall be defined as paint, thermoplastic or any other stripe material. The unit price bid for stripe removal shall include full compensation for all material, tools, labor, and equipment to remove the traffic stripes and pavement markings, remove all debris from the roadway and disposal of all waste as specified herein.

SECTION 14 RESTORATION OF SURFACES

14-1 GENERAL

All existing curbs, gutters, sidewalks, driveways, road shoulders, pavement, and similar items removed, damaged or displaced during the Work shall be restored by the Contractor. Restoration shall be done using the same types of materials as in the original construction, and to not less than the original dimensions, subject to minimum requirements specified herein, as shown or as specified in the Contract, or as directed by Agency. All work shall be constructed to match current standards and shall match the appearance of the existing improvements.

14-2 PRIVATE ROADS

Trench compaction shall conform to the requirements in Section 19, "Trench Excavation, Bedding and Backfill", of these Specifications. Where asphalt surfacing exists, the surface restoration shall be a minimum of four inches (4") of aggregate base and two inches (2") of asphalt concrete, but in no case shall the thickness of either the asphalt or the thickness of the aggregate base be less than the thickness of the corresponding portions of the existing private road. Aggregate base and asphalt concrete shall be as specified in Section 14-3, "Streets and Parking Lots", in this Section of these Specifications. Where gravel, stone, or crushed rock surfacing exists, surface restoration shall consist of a minimum of four inches (4") of aggregate base, but in no case shall the thickness of the aggregate base be less than the thickness of the existing surface of the private road. The remaining gravel or stone roadway shall be reshaped to preconstruction cross section and given an application of a minimum of two inches (2") of three-quarter inch (3/4") maximum size gravel or crushed rock compacted into place. The restored surface of a private road shall be at least equivalent to the preconstruction surface condition.

14-3 STREETS AND PARKING LOTS

Attention is directed to the requirements specified in Section 12, "Construction Area Traffic Control", of these Specifications.

Repaving of trench areas in bituminous pavement shall be in accordance with Standard Drawing 4-31. The asphalt concrete shall be placed as specified in Section 23, "Asphalt Concrete", of these Specifications.

14-3.01 Aggregate Base

The aggregate base materials and placement shall meet the requirements of Section 22, "Base Material", of these Specifications.

14-3.02 Asphalt Concrete

Immediately prior to placing asphalt concrete pavement, the top four inches (4") of base material, or more where greater depth of paving is shown on the Plans, shall be recompacted to a minimum relative compaction of ninety-five percent (95%). Base or underlying material that is wet, loose, or otherwise unsuitable for supporting the new paving shall be removed, to a maximum of twelve inches (12"), and replaced with aggregate base material and compacted in layers not exceeding six inches (6") in depth to a minimum relative compaction of ninety-five percent (95%). If unsuitable material is evident, see Section 18-5, "Unsuitable Material Excavation", of these Specifications. Edges of trenches that are broken or damaged shall be removed and neatly trimmed back to stable and undisturbed base and surface materials.

The edges of the existing pavement shall be given a tack coat of asphaltic emulsion. The trench shall then be filled and compacted, in layers not to exceed two inches (2”), with asphalt concrete, Type "A", conforming to Section 23, “Asphalt Concrete”, of these Specifications until the trench has been brought to approximately three-quarter inch (3/4”) below the finish grade and cross section of the street. The Contractor shall immediately repair any settlement more than one inch (1”) below finish grade.

Prior to placement of the second lift, the surface of the first lift of pavement and the edges of the existing pavement shall be given a tack coat of asphaltic emulsion. The trench shall then be filled and compacted with asphalt concrete Type "A", one-half inch (1/2”) maximum gradation, as specified above, until the pavement has been brought to the final grade and cross section of the street.

Unless otherwise noted, a single seal coat (see Section 14-3.03.A) shall be applied after placement of the final lift of asphalt concrete.

Final pavement surface for trenches greater than three feet (3’) in width that are mostly parallel to the centerline of the street shall not vary from the edge of a 10-foot straight edge (placed parallel and perpendicular to the trench) by more than 3/8-inch, except at intersections or changes in grade.

Final pavement surface for trenches three feet (3’) or less in width, bore holes having an area less than fifty (50) square feet, and trenches of any width that are not mostly parallel to the centerline of the street shall match the smoothness of the existing pavement, except final pavement surface grade shall not exceed three-eighths of an inch (3/8”) above a line between the existing pavement surface at each edge of the excavation. Final pavement below this line is not acceptable.

Pavement not meeting the above requirements shall be removed and replaced to a minimum depth of one and one-half inches (1-1/2”) for the full width of the trench. The minimum length of removal along the trench shall extend to four feet (4’) beyond the ends of the non-conforming areas, but in no case shall the removal and replacement exceed the limits of the original excavation.

Density of compacted asphalt concrete may be tested at the discretion of the inspector. Core samples taken for testing compaction of asphalt concrete shall be tested in accordance with ASTM D2726-89 and shall be ninety-two percent (92%) or greater of the maximum Theoretical Density as determined by ASTM D-2041 (based on the full depth of the asphalt section).

14-3.03 Seal Coats

Seal coat treatment shall be applied at locations specified, as shown on the Plans or as directed by the Agency. Seal coat shall not be placed until at least seventy-two (72) hours after placement of the final paving lift.

14-3.03.A Single Seal

Alternate 1 - Slurry seal shall be furnished and placed as specified in Section 37-2, “Slurry Seal”, of the State Specifications, with the exception that the fifth paragraph of Section 37-2.06, "Placing", shall be modified to provide that the thickness of application of slurry seal shall be adjusted to provide one (1) layer not less than one-eighth inch (1/8”) thick nor greater than one-quarter inch (1/4”) thick. The requirement for wetting surface prior to placement of slurry seal is waived.

Alternate 2 - Sand seal shall be furnished and placed as specified in Section 37-1, "Seal Coats”, of the State Specifications with the exception of the requirements for the asphaltic binder and aggregate. Asphaltic binder and aggregate shall be as follows:

- The asphaltic materials for the construction of sand seal shall conform to the requirements in Section 50-17, “Asphalt, Liquid Asphalt, and Asphaltic Emulsion”, of these Specifications. The asphaltic materials shall be CRS 1.

- The rate of application of CRS 1 shall vary between 0.08 and 0.15 gallons per square yard as directed by the Agency, depending upon the surface condition and weather.
- Aggregate for sand seal shall conform to Section 37-2.02C, "Aggregate", of the State Specifications and shall be spread at the rate of six (6) to ten (10) pounds per square yard, or as directed by the Agency.

Preparation of seal coat, applying bituminous binder, spreading, and finishing shall be in accordance with Section 37, "Bituminous Seals", of the State Specifications, with the exception that steel wheeled rollers for sand seal may be eliminated and the pneumatic roller used for all seal operations.

All bituminous pavement replacements and seal shoulders sealed under one of the above alternates shall receive the seal coat for the full width of the trench or pavement replacement, plus a minimum of twenty-four inches (24") on each side of the trench, except that seals shall not overlap concrete curb and gutter.

14-3.03.B Double Seal

The areas shown on the Plans or directed by the Agency shall receive a double seal coat treatment. The first seal coat of the double seal shall be the course seal coat specified in Section 37, "Bituminous Seals", of the State Specifications. The final seal shall be as specified in Section 14-3.03.A, "Single Seal", in this Section of these Specifications, for a single seal.

14-3.04 Shoulders

Surface restoration of trenches located in a shoulder within six feet (6') of the traveled way shall consist of a structural section equal to the original, or as shown on the Plans, but having a minimum of five inches (5") of aggregate base compacted to a relative compaction of ninety-five percent (95%). This aggregate base shall then receive a double seal coat treatment as specified in Section 14-3.03.B, in this Section of these Specifications unless otherwise specified in the Special Provisions or directed by the Agency.

14-3.05 Cuts in New Pavement

Cuts in pavement that has been constructed or overlayed with asphalt concrete greater than one inch (1") in depth within the last three to five (3 to 5)years shall be treated as follows:

The existing pavement around the cut shall be planed to a depth of one and one-half inches (1-1/2") in accordance with the requirements of Section 26, "Cold Plane Asphalt Concrete Pavement", of these Specifications. The planed area shall extend on each side of the cut as shown on Standard Drawing 4-31. The planed area shall be given a tack coat of asphaltic emulsion and paved with one and one-half inches (1-1/2") of asphalt concrete, Type A, and compacted as specified in these Specifications. A seal coat is not required.

Cuts in pavement less than three (3) years old shall not be made without the approval of the Director of Transportation and may require special mitigation measures beyond those indicated above.

14-4 CONCRETE

Repairs to concrete curbs, gutters, sidewalks, driveways, and other concrete surfaces shall be made by removing and replacing the entire portions between joints or scores, except as follows:

- Curb and gutter shall be replaced between saw cuts so that the remaining or new curb and gutter will not be less than four feet (4') in length, measured from the saw cut to the nearest score mark, expansion joint, construction joint or weakened plane joint.

- The entire width of sidewalk shall be replaced between saw cuts for a length of not less than four feet (4') providing the remaining sidewalk shall not be less than four feet (4') in length, measured from the saw cut to the nearest score mark, expansion joint, construction joint or weakened plane joint.
- Driveways shall be replaced as directed by the Agency, either completely or partially by saw cutting in the middle of the driveway.

Replacement shall be in accordance with the applicable requirements, including the placement of Aggregate Base Class 2 under the new concrete as specified in Section 27, "Curbs, Gutters, Sidewalks, and Drainage Structures", of these Specifications, except provisions for payment, for the type and classification of work set forth in other Sections of these Specifications. Pedestrian access shall be maintained in accordance with Section 6-12.02, "Pedestrian Access", of these Specifications.

14-5 PAVEMENT MARKINGS

Except where specified otherwise in these Specifications or the Special Provisions, the Contractor will replace all crosswalks and other permanent pavement markings and raised markers that have been disturbed, destroyed, or covered by the Work. If the Special Provisions indicate that the Agency will replace pavement markings, the Contractor shall pay the current prices per square foot for pavement markings or unit price per marker to the Agency, and Agency forces will replace the markers or markings on the completed surface. The current prices per square foot for pavement markings or unit price per marker are specified in the Contract.

14-6 TEMPORARY PAVING

Temporary paving shall be placed at locations and maintained at locations wherever excavation is made through pavement, sidewalk or driveways, as shown on the Plans, or as directed by the Agency. Temporary paving shall be placed as soon as the condition of the backfill is suitable to receive it and shall remain in place until the condition of the backfill is suitable for permanent resurfacing. Asphalt concrete Type "A", conforming to Section 23, "Asphalt Concrete", of these Specifications, shall be used as temporary paving on all major streets. Temporary paving in all other paved areas may be asphalt plant-mix cutback, unless otherwise directed by the Agency. Thickness of temporary paving shall be one and one-half inches (1-1/2") unless otherwise shown on the Plans. In sidewalk areas, the temporary bituminous surface shall be at least one inch (1") thick. Temporary paving shall be maintained at the same level as the existing pavement until the permanent surfacing is placed. In no case shall temporary pavement be allowed to remain for a period greater than thirty (30) calendar days unless approved in writing by the Agency.

All temporary paving shall be identified by painting the words "TEMPORARY PAVEMENT" along with the name of the contractor responsible for maintaining the temporary paving material and the date in which the material was placed. Painted text shall be in white lettering at the beginning, ending, and along the length of the temporary paving at maximum intervals of five hundred feet (500'). The text shall be neatly stenciled a minimum five inches (5") in height and shall be maintained in a neat and legible condition.

Temporary pavement and/or portions of temporary pavement totaling one thousand feet (1000') or greater in length shall also be identified with a construction sign placed along the edge of the roadway and constructed in accordance with Section 34-3 of these specifications. Temporary pavement signs shall be thirty inches by thirty inches (30" X 30") in a diamond configuration and shall be orange with five-inch (5") black lettering. Signs shall be installed at the beginning, ending and at maximum intervals of one thousand feet (1000') and shall be installed within the road right of way whenever possible. Signs shall not be installed in a location

that would obstruct visibility or create an obstacle for pedestrians. The property owner's permission must be obtained if signs are placed on private property.

14-7 MEASUREMENT AND PAYMENT

The lump sum price paid for items of work included in the Contract for restoration of surfaces removed, damaged, or displaced by the Work includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved, complete in place, as shown or as specified in the Contract, specified in these Specifications, and as directed by the Agency.

If no item is included in the Contract for restoration of surfaces, full compensation for conforming to the provisions in this Section (Section 14), not otherwise provided for, is included in the prices paid for the various items of work involved, and no separate payment will be made.

Temporary paving will be measured for payment by weight of asphalt concrete placed in the Work, in accordance with Section 39-8.01, "Measurement", of the State Specifications.

The price paid per ton for temporary paving includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in temporary paving, complete in place, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

If there is no item in the Contract for temporary paving, full compensation for conforming to the provisions in this Section, not otherwise provided for, is included in the prices paid for the various items of work involved, and no separate payment will be made.

SECTION 15 CLEARING AND GRUBBING

15-1 GENERAL

Clearing and grubbing shall consist of removing all objectionable material, and material as designated in these Specifications, from within the work site, or other areas as shown on the Plans or specified in the Special Provisions.

The methods of removing existing facilities shall conform to Section 13, "Existing Facilities", of these Specifications.

Attention is directed to Section 10, "Environmental Controls at Work Site", of these Specifications for additional requirements.

Removal of existing trees shall include removal of tree stumps and tree roots two inches or larger in diameter to a minimum depth of twelve inches below the grading plane. Removed trees, stumps and roots shall become the property of the Contractor and shall be removed from the project site. All debris resulting from tree removal work, including broken branches, fallen leaves, wood chips, and sawdust produced from stump and root removal work, shall be promptly removed from the work site. If the tree to be removed is within the drip line of any other tree that is to remain, the tree removal work shall be done under the direction of a Certified Arborist. The holes resulting from tree stump and tree root removal activities shall be backfilled as provided in Section 18, "Earthwork", of these Specifications. If the tree removal work is in a lawn area that is to remain, the area of tree removal shall be repaired and replanted with turf sod as specified in Section 20, "Landscaping", of these Specifications. Payment for Tree Removal shall be as specified in Section 15-2 of these Specifications.

Clearing and grubbing operations must not cause more than minimal damage to public and private property, and improvements, including existing trees, shrubbery and lawns, outside of the work site, or other areas as shown or specified in the Contract.

15-1.01 Vegetation and Debris

Vegetation designated for removal, such as weeds, grass, shrubbery, roots, and stumps, and debris, such as broken concrete and trash, shall be removed from the right-of-way or construction areas and disposed of by the Contractor. Vegetation to remain shall be protected in place.

15-1.02 Trees, Shrubs, Ground Cover, and Lawns

For the purpose of these Specifications, trees shall be defined as having a trunk diameter (DBH = diameter at breast height) of three inches (3") and greater measured at a height of four and one-half feet (4-1/2') above the ground. Shrubs shall be defined as single or multi-stem individual plants, not of tree size. Ground cover shall be defined as multiple spreading and matting plant material of a density to cover bare ground, including turf lawn.

Only plant material shown on the Plans to be removed and disposed of shall be removed and disposed of. Prior to the clearing and grubbing operations on a particular property or portion of the work site, the Agency will mark and designate the trees, shrubs, and ground cover areas to be removed and disposed of.

Trees, shrubs and ground cover that are not to be removed shall be protected from injury or damage. Attention is directed to Section 10-13, "Protection of Existing Trees", of these Specifications for protection of certain existing trees within the County of Sacramento.

Trees, shrubs and ground cover designated to be relocated, and not specifically designated for disposal, shall be preserved by removing an adequate and substantial root mass of native soil and roots with the rootball wrapped in burlap and kept moist until the Work has progressed to permit the replanting. The removal and replanting shall be performed in a careful and professional manner at the direction of an Arborist certified by the International Society of

Arborists, hereinafter designated as a "Certified Arborist". The tree trimming shall be limited to tree limbs required to be removed to allow for minimum required vehicular clearance. Tree root cutting shall be limited to that which is required for earthwork operations, so as to minimize impact on existing trees. All roots one-half inch (1/2") in diameter or greater shall be cut cleanly and sealed as directed by the Certified Arborist or by the Certified Arborist's staff. Any root cutting on trees to remain which, in the opinion of the Certified Arborist, will jeopardize the health or stability of the tree shall be brought to the attention of the Agency for specific instructions prior to the cutting of the roots.

The Contractor shall submit the name of the Certified Arborist to the Agency, in writing, a minimum of four (4) Working Days prior to the start of clearing and grubbing operations.

Tree branches or portions of shrubs which extend over a roadway shall be trimmed to provide a minimum clearance of fourteen feet (14') above the shoulder point of the roadbed, unless specifically permitted otherwise in writing by the Agency. The tree or shrub branches to be removed shall be removed by a tree trimmer certified by the International Society of Arborists.

Lawns which are disrupted during the Work shall be regraded and replaced or repaired to match the existing lawn. Unless shown or specified otherwise in the Contract or directed otherwise by the Agency, lawns that are damaged shall be replanted with new sod. The resulting lawn shall be left in a condition equal to or better than the condition of the lawn prior to the start of the work.

15-1.03 Disposal and Salvage

All materials removed become the property of the Contractor and shall be disposed of off the rights-of-way or easement, unless otherwise shown or specified in the Contract. Existing public or private improvements that are designated in the Contract to be salvaged shall be carefully removed and stockpiled in the right-of-way or easement for later removal by the Agency or the adjacent property owner, as specified.

15-1.04 Abandonment of Conduits and Structures

When a sanitary sewer or storm drain is to be abandoned within specified limits, all structures and appurtenances within said limits shall also be abandoned.

When sanitary sewer or storm drain conduits have been or are to be abandoned and, in the opinion of the Agency, are found to interfere with construction, the interfering portion shall be removed and the remaining open portion securely sealed. Where the greatest internal dimension of the conduit is three feet (3') or less, the seal shall consist of a wall of concrete not less than six inches (6") thick or an eight-inch (8") thick wall of brick and mortar. For larger openings, details of the seal will be as shown on the Plans or as directed by the Agency.

When catch basins, drain inlets, or manholes are to be abandoned, the upper portion shall be removed to a depth of at least one foot (1') below street subgrade and the conduits connected to the structure shall be sealed as provided herein. The bottom of such structures shall be perforated or broken to prevent the entrapment of water.

Structures designated on the Plans to be removed shall be removed to the full depth of the structure, including its foundation. Voids resulting from abandoned or removed structures shall be filled with suitable material, in accordance with Section 18-5.02, "Backfill", of these Specifications, and compacted to a relative compaction of ninety percent (90%). If the voids are in surfaced areas otherwise to remain undisturbed, they shall be backfilled with materials equal to or better in quality and to the same thicknesses as the surrounding materials, as directed by the Agency.

All costs for this work shall be included in the prices bid for the items involved.

15-1.05 Silt Control

to the Contractor must comply with Section 10-4, "Erosion, Sediment, and Water Pollution Control", of these Specifications during all clearing and grubbing operations.

15-1.06 Miscellaneous

Clearing and grubbing includes the removal and proper disposal of existing barricades as shown on the Plans for removal, and removal of pavement markers prior to asphalt overlays and application of slurry seal as directed by the Agency. Unless otherwise provided for in the Special Provisions, all concrete removal shown on the Plans, or otherwise directed by the Agency, shall be in accordance with Section 13, "Existing Facilities", of these Specifications and included in the price paid for clearing and grubbing with no additional payment allowed. Actual limit of concrete removal shall extend to nearest score mark or joint, if nearest score mark or joint is within three feet (3') of limit of removal as indicated on the Plans. Adjacent to all areas of removal of curb and gutter, a two-foot (2') minimum width, six-inch (6") minimum depth wide bank of existing roadway pavement shall be saw cut and removed. Unless otherwise provided for in the Special Provisions, clearing and grubbing shall also include removal of existing storm drainage facilities as shown on the Plans. Removal shall be in accordance with Section 13, "Existing Facilities", of these Specifications and included in the price paid for clearing and grubbing and no additional payment will be made.

15-2 PAYMENT

All work associated with the removal of trees shall be paid for per each for the various categories of trees based on the specified ranges of trunk diameters listed in the Proposal. The trunk diameter of trees to be removed shall be measured at a height of four and one-half feet (4-1/2') above the ground surface. Payment for tree removal shall include all labor, tools and equipment required for the removal and disposal of the tree, stump, roots and all debris, all required services of a Certified Arborist, the backfilling of all resulting removals and the repair and replanting of all disturbed landscaping, and all incidentals.

Should there be no bid item or bid items for tree removals, all tree removal work including removals, disposals, required services of a Certified Arborist, earthwork and landscaping shall be included in the lump sum price paid for Clearing and Grubbing and no additional compensation will be paid.

The lump sum price paid for clearing and grubbing includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals necessary to perform the work, and for doing all the work involved in clearing and grubbing, including protection of existing trees, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency, including the removal and disposal of all the resulting material.

When the Contract does not include an item for clearing and grubbing, full compensation for clearing and grubbing required to perform the Work is included in the prices paid for the items of work requiring clearing and grubbing, and no additional compensation will be paid.

SECTION 16 WATER USED IN CONSTRUCTION

16-1 GENERAL

Water used in construction shall conform to Section 17, “Watering”, of the State Specifications, and these Specifications.

The application of water shall be under the control of the Agency at all times and shall be applied in the amounts and at the locations designated by the Agency or as specified in the Special Provisions.

At the option of the Contractor, areas to be excavated may be watered prior to excavation. Excess water is the responsibility of the Contractor.

Unless otherwise permitted by the Agency, at least one mobile unit with a minimum capacity of one thousand (1,000) gallons shall be available for applying water on the project at all times.

The Contractor may use chemical additives in water used for compaction upon approval by Agency. If such additives are used, furnishing and applying the additives is at the Contractor's expense. The Agency reserves the right to prohibit the use of a particular type of additive, to designate the locations where a particular type of additive may be used, or both if the Agency has reasonable grounds for believing that such use will be detrimental to the Work.

Arrangements for obtaining water for use in construction shall be made by the Contractor. Proof of such arrangement, including method of payment, shall be subject to review and approval by the Agency.

Unless otherwise approved by the Agency, connections to an Agency owned or operated water supply to fill tank trucks or other such equipment shall include an air gap to separate the water supply from the equipment to be filled. The air-gap separation shall be at least double (2x) the diameter of the supply pipe, measured vertically from the flood rim of the receiving vessel to the supply pipe. In no case shall the air-gap separation be less than one inch (1”). Direct connection to the Agency's water supply will not be permitted.

Before drawing any water from a Sacramento County owned or operated water system, the Contractor shall obtain a permit from the Water Maintenance District.

The Contractor must adhere to all stormwater pollution control requirements, including those in Section 10-4, “Erosion, Sediment, and Water Pollution Control”, of these Specifications to prevent sediment from entering the stormwater collection and conveyance system.

16-2 PAYMENT

Full compensation for water used in construction is included in the prices paid for the various items of work involving the use of water and no separate payment will be made.

SECTION 17 DUST CONTROL

17-1 GENERAL

Dust control shall consist of applying water or dust palliative to alleviate or prevent dust nuisance resulting from the Contractor's operations, either within or outside the Work right-of-way. All dust control activities must comply with Section 10-4, “Erosion, Sediment, and Water Pollution Control”, of these Specifications.

Dust control shall be performed by the Contractor at any time dust, resulting from the Contractor’s operations, becomes a nuisance or visual impediment, or as directed by the Agency. Failure to adequately control dust will be cause for the Agency to direct the Contractor to suspend operations or for the Agency to perform such activity with all costs to be borne by the Contractor.

The application of water for dust control may be performed by the Contractor for the Contractor’s convenience. Water shall be applied as provided in Section 16, “Water Used in Construction”, of these Specifications.

17-2 DUST PALLIATIVE

Dust palliative shall be applied when, in the opinion of the Agency, this type of dust control is required. Dust palliative shall consist of an asphaltic emulsion binder as specified in Section 18-1.02, “Materials”, of the State Specifications. Dust palliative shall be applied as specified in Section 18-1.03, “Application”, of the State Specifications, or as directed by Agency.

17-3 MEASUREMENT AND PAYMENT

Full compensation for applying water for dust control is included in the prices paid for the various items of work involved and no additional compensation will be paid.

When asphaltic emulsion binder for dust palliative is to be paid for as an item of work, the unit of measurement shall be a ton. Quantities of asphaltic emulsion binder for dust palliative to be paid for will be determined prior to the addition of water as provided in Section 94-1.07, “Measurement”, of the State Specifications. The price paid per ton for asphaltic emulsion binder for dust palliative includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in adding water, mixing, and applying the dust palliative as shown or specified in the Contract, as specified in these Specifications, and as directed by the Agency.

When the Contract does not include a pay item for asphaltic emulsion binder for dust palliative and the Agency directs the Contractor to apply dust palliative, furnishing and applying dust palliative will be paid for as extra work as provided in Section 9, “Changes and Claims”, of these Specifications.

SECTION 18 EARTHWORK

18-1 GENERAL

Earthwork shall conform to Section 19, “Earthwork”, of the State Specifications, and these Specifications. All references to the “roadway prism”, “roadway facilities”, “roadway”, and “highway” shall be considered to mean the applicable project features, shown on the Plans or referenced in the Special Provisions.

The method and rate of applying water for earthwork and dust control shall conform to Section 16, “Water Used in Construction”, and Section 17, “Dust Control”, of these Specifications.

Attention is directed to Section 10, “Environmental Controls at Work Site”, of these Specifications for additional requirements.

18-2 ROADWAY EXCAVATION

18-2.01 General

Roadway excavation shall conform to Section 19-2, “Roadway Excavation”, of the State Specifications, and these Specifications.

Roadway excavation shall include removal of existing pavement sections, ditches and channels in the median area, between roadway and frontage roads and side ditches contiguous to the roadway and other locations as shown on the Plans. Excavation and embankment side slopes shall be adjusted by the Contractor to clear existing utility poles, vegetation, and other improvements, as directed by the Agency.

Roadway excavation shall also include excavation of waterway channels as necessary to create a grading plane for the placement of slope protection.

18-2.02 Unsuitable Roadway Excavation and Backfill

Any unsuitable material encountered shall be removed and backfilled in accordance with Section 18-5, “Unsuitable Material Excavation”, in this Section of these Specifications.

18-2.03 Surplus Material

Unless otherwise specified in the Special Provisions, surplus excavated material shall become the property of the Contractor and shall be disposed of away from the project site in accordance with the provisions in Section 18-7, “Surplus Material Disposal”, in this Section of these Specifications.

18-2.04 Unsuitable Material in Embankments

Unsuitable material excavated as roadway excavation which, in the opinion of the Agency, can be used for roadway embankment shall be placed in the embankment below a plane thirty inches (30”) below the finished grade and compacted to a minimum relative compaction of ninety percent (90%).

Unsuitable material excavated as roadway excavation which, in the opinion of the Agency, cannot be worked into the roadway embankment shall be considered as surplus material and removed from the work site or wasted within the right-of-way as directed by the Agency.

18-2.05 Subgrade Preparation

Subgrade preparation shall be as specified in Section 19-5, “Compaction”, of these Specifications, and Section 19-6, “Embankment Construction”, of the State Specifications.

Organics that exist within the roadway prism prior to grading shall be stripped from the ground surface. Stripping should extend to between two inches (2”) to three inches (3”) below the existing surface or as directed by the Agency. Strippings are the property of the Contractor and shall be removed from the job site. After removal of strippings, areas to receive fill material

or new structural sections shall be scarified to a depth of at least eight inches (8") and recompacted to a relative compaction of not less than ninety-five percent (95%).

Relative compaction of not less than ninety-five percent (95%) shall be obtained for a minimum depth of one-half foot (0.5') below the subgrade grading plane for the width between the outer edges of shoulders, whether in excavation, embankment, or at original ground level. All other material shall be compacted to a relative compaction of ninety percent (90%), including subgrade under meandering sidewalks not adjacent to curb and gutter. Embankment under bridge and retaining wall footings shall be compacted as specified in Section 19-5.03, "Relative Compaction (95 Percent)", of the State Specifications.

When the next layer of material to be placed on the subgrade is an asphalt concrete pavement, asphalt concrete base, or asphalt concrete subbase, the subgrade grading plane at any point shall not vary more than five-hundredths of a foot (0.05') above or below the grade established by the Agency.

Subgrade or aggregate base shall be stable prior to paving. The Agency may require the Contractor to proof roll the area prior to placing asphaltic concrete. The equipment used for the proof rolling shall be subject to the approval of the Agency.

For roadway construction, material encountered at the subgrade grading plane, as shown on the Plans, that the Agency determines unacceptable for roadway foundation shall be removed. Should the depth of removal of unacceptable material be less than twelve inches (12"), the area shall be filled with roadway excavation material, if available, or as approved by the Agency. Should no roadway excavation material be available, the area of unacceptable material removal less than twelve inches (12") in depth shall be filled with Class 2 aggregate base. Should the depth of unsuitable material encountered within the roadway prism extend to a depth of more than twelve inches (12") below the grading plane as shown on the Plans, removal of unsuitable material shall extend to twelve inches (12") below said grading plane. The area from which the unacceptable material has been removed shall then be compacted to a relative compaction of as close as possible to ninety-five percent (95%) as determined by the Agency. Fill for areas of unsuitable material removed to a depth of twelve inches (12") below the grading plane for roadway construction shown on the Plans shall consist of placement of geotextile fabric as specified in Section 18-5.03, "Geotextile Fabric", in this Section of these Specifications and backfilled with Class 2 aggregate base.

For roadway construction, if there are insufficient quantities of native material to make subgrade, recycled asphalt concrete from project removals shall be used. Removed asphalt concrete shall be processed to three-inch (3") maximum size and thoroughly mixed with local native material and placed in the lower lifts of roadway fills as necessary to achieve subgrade.

Subgrade preparation requirements will be waived where the width of the subgrade to be prepared is less than four feet (4') and the Agency determines that the existing undisturbed subgrade is firm and stable. The Agency may order mechanical tamping to obtain the desired firmness and stability. The Agency may order removal of soft and unstable material below the grading plane and backfill with acceptable import materials if the subgrade (grading plane) is unsuitable to place the next layer of the structural section.

18-2.06 Relative Compaction

Whenever relative compaction is specified in these Specifications or the Special Provisions, the relative compaction will be determined by California Test Method No. 231, "Method of Test for Relative Compaction of Untreated and Treated Soils and Aggregates by the Area Concept Utilizing Nuclear Gages", with the exception that an individual test result may not be reported as a representative test result.

18-2.07 Measurement and Payment

Measurement and payment for roadway excavation will be as set forth in Section 19-2.08, "Measurement", and Section 19-2.09, "Payment", of the State Specifications, except that the

Contract price paid per cubic yard for roadway excavation will include full compensation for compacting natural and original ground, for subgrade preparation, for all haul and overhaul, for excavation, for placing earth embankment as shown on the Plans and as directed by the Agency, and for furnishing all water necessary for the compaction of the material and subgrade preparation. The Contract price paid also includes shaping and trimming slopes to solid material and to the lines and elevations shown on the Plans.

The removal of material within the areas of new landscaped median construction to a depth of two feet (2') below the new pavement elevation, to allow for fill with imported topsoil for landscaping, shall be measured and paid for as roadway excavation. Material to be removed may include existing pavement, existing base material, existing soil and new fill material up to the elevation of the new roadway surface placed to construct the new roadway.

No additional compensation will be allowed for proof rolling subgrade as directed by the Agency.

No additional compensation will be allowed for removing unsuitable material from the work site.

No additional compensation will be allowed for placing unsuitable material in the roadway embankment.

Payment for geotextile fabric used in the backfill of unacceptable material encountered during roadway excavation for roadway construction will be paid for as detailed in Section 18-5.05, "Unsuitable Material Excavation – Payment", in this Section of these Specifications.

Payment for Class 2 aggregate base used in the backfill of unacceptable material encountered during roadway excavation for roadway construction will be paid for as detailed in Section 22-4, "Base and Subbase Material – Measurement and Payment", of these Specifications.

18-3 STRUCTURE EXCAVATION AND BACKFILL

18-3.01 General

Structure excavation and backfill shall conform to Section 19-3, "Structure Excavation and Backfill", of the State Specifications, and these Specifications. Structure excavation and backfill shall include all necessary excavation, structure backfill, and pervious backfill within the limits set forth on the Plans, Standard Drawings, and in the Special Provisions. Structure and pervious backfill shall conform to Section 19-3.06, "Structure Backfill", of the State Specifications.

Unless otherwise specified in the Special Provisions, jetting of structure backfill will not be permitted.

18-3.02 Control Density Backfill

Control density backfill will only be permitted when specified in the Special Provisions. Where permitted, control density backfill shall conform to the requirements of Section 50-15, "Control Density Backfill", of these Specifications.

18-3.03 Final Quantity

The quantity of structure excavation shown on the Plans and in the Estimated Quantities will be the final quantity for which payment will be made as provided in Section 9-1.015, "Final Pay Items", of the State Specifications.

18-3.04 Measurement and Payment

Measurement and payment for structure excavation and backfill will be as set forth in Section 19-3.07, "Measurement", and Section 19-3.08, "Payment", of the State Specifications, and these Specifications.

The Contract price per cubic yard for structure excavation includes full compensation for all necessary excavation, structure backfill, and pervious backfill within the limits set forth on the Plans, Standard Drawings, and in the Special Provisions.

When removing an existing structure which is to be replaced with a new structure, no payment will be made under this item for the area occupied by the existing structure.

18-4 DITCH AND CHANNEL EXCAVATION

18-4.01 General

Ditch and channel excavation shall conform to Section 19-4, "Ditch Excavation", of the State Specifications, and these Specifications. Ditches and channels shall be excavated to line and grade and sections as shown on the Plans. Material resulting from excavating ditches and channels shall be used in fill and embankment areas as shown on the Plans.

18-4.02 Grade Control - Lined Channels

The Contractor shall place grade control points at twenty-five-foot (25') intervals along the invert of the shaped channel. For channels greater than twelve feet (12') wide, the Contractor shall place grade control points at twenty-five-foot (25') intervals along each edge of the bottom. Care shall be taken to prevent excavating below the channel grade line or beyond the slope lines. Areas excavated below grade or beyond the slope shall be filled with suitable materials, as determined by the Agency, and compacted to ninety percent (90%) relative compaction by the Contractor at the Contractor's expense.

18-4.03 Unsuitable Ditch and Channel Excavation and Backfill

Any unsuitable material encountered shall be removed and backfilled in accordance with Section 18-5, "Unsuitable Material Excavation", in this Section of these Specifications.

18-4.04 Unsuitable or Surplus Material Disposal

Unsuitable or surplus material excavated as channel excavation which, in the opinion of the Agency, cannot be worked into the required embankments, shall become the property of the Contractor and shall be disposed of as specified in Section 18-7, "Surplus Material Disposal", in this Section of these Specifications, unless otherwise specified in the Special Provisions.

18-4.05 Channel Backfill

In those areas where the bottom of the existing channel is below the proposed grade or beyond the slope lines, the Contractor shall fill and compact these areas to a minimum 90 percent (90%) relative compaction with suitable material, as determined by the Agency. No additional payment will be made for this work, as it shall be considered as included in the Contract price for channel excavation.

18-4.06 Channel Embankments

Embankments shall be placed as shown on the Plans. Embankment areas shall be filled with suitable material, as determined by the Agency, resulting from channel excavation. The fill shall be placed in a neat and uniform manner, and shall be spread uniformly to the grades as shown on the Plans. Where embankment is made on the existing channel or on other slopes, the existing slope shall be plowed or cut into as the embankment is constructed so as to tie the new embankment to the existing slope. All fill slopes shall be trimmed for a uniform appearance. Fill areas in unlined channels shall be compacted to a minimum relative compaction of ninety percent (90%), unless otherwise shown on the Plans.

In lined channels, fill areas shall be compacted to a minimum relative compaction of ninety percent (90%) to an elevation one foot (1') above the top of the channel lining, unless otherwise shown on the Plans.

Localized erosion, sloughing or other slight irregularities in the existing channel which may occur between cross-sections, may not be shown on the Plans or cross-sections. Where the localized erosion, sloughing or irregularities extend beyond the limits of the channel cross-section, these areas shall be filled and compacted to conform to the design channel cross-section. No additional payment will be made for these fills.

18-4.07 Pipe Adjustments

Side drain pipes without racks or flap gates shall be extended or shortened as required to discharge into the new channel so that the pipe outlet is flush with the channel slope in conformance with Standard Drawing 9-26A. The pipe used for extending existing side drains shall be of the same diameter as the existing pipe, and shall conform to one of the options specified in these Specifications.

Side drain pipes with access control racks or flap gates shall be extended or shortened to conform with Standard Drawing 9-26B. Access control racks shall conform to Standard Drawings 9-26D, 9-26E, and 9-26G.

The method of placing pipe extensions shall conform to these Specifications and the Standard Drawings. Existing side drain pipes to be shortened shall be neatly cut off parallel to the slope of the channel.

18-4.08 Payment

The unit price paid for ditch and channel excavation will be as specified in Section 19-4.03, "Ditch Excavation - Payment", of the State Specifications.

18-4.09 Final Pay Quantities

When the Estimated Quantities for a specific portion of the Work are designated on the Plans as Final Pay Quantities, said Estimated Quantities will be the final quantities for which payment for such specific portion of the Work will be made, unless the dimensions of said portions of the Work shown on the Plans are revised by the Agency. If such dimensions are revised, and such revisions result in an increase or decrease in the Estimated Quantities of such portions of the Work, the final quantities for payment will be revised in the amount represented by the changes in the dimensions. The Estimated Quantities for such specific portion of the Work shall be considered as approximate only and no guarantee is made that the quantities which can be determined by computations, based on the details and dimensions shown on the Plans, will equal the Estimated Quantities. No allowance will be made in the event that the quantities based on computations do not equal the Estimated Quantities.

When portions of an item have been designated on the Plans as Final Pay Quantities, portions not so designated will be measured and paid for in accordance with the applicable provisions of these Specifications and the Special Provisions.

In case of any discrepancy as to final pay quantities, the Final Pay Quantities shown on the Plans will govern.

18-5 UNSUITABLE MATERIAL EXCAVATION

18-5.01 General

Unsuitable or unacceptable material encountered in the construction of roadways shall be removed as roadway excavation and backfilled as detailed in Section 18-2.05, “Subgrade Preparation”, in this Section of these Specifications.

Unsuitable material is that material determined by the Agency to be unsuitable in its natural location and condition for roadway, channel, or structural foundation. Unsuitable material shall be that material below a horizontal plane located two feet (2’) below subgrade for channel or foundation of structure as determined by the structural section, flow line or foundation, or located two feet (2’) below original ground, whichever is lower.

The Contractor’s method of excavating unsuitable material shall not undermine the existing base material. If, in the opinion of the Agency, the Contractor’s method of excavating is increasing the amount of unsuitable material required to be excavated, the Agency will require the Contractor to take the necessary steps to correct the condition at the Contractor’s expense.

18-5.02 Backfill

Backfill to replace unsuitable materials shall be placed and compacted to a minimum relative compaction of ninety-five percent (95%) within thirty inches (30") of finished grade on roadways and structural foundations. Below thirty inches (30") of finished grade on roadways and below subgrade in channels, compaction shall be not less than ninety percent (90%).

Suitable backfill material shall be one of the following:

1. Pit run materials as specified in Section 50-8, "Pit Run Base (Graded)", of these Specifications.
2. Roadway excavation, structural excavation, or channel excavation material approved by the Agency.
3. Imported borrow as specified in Section 18-6, "Imported Borrow", in this Section of these Specifications.
4. Cobbles as specified in Section 50-9, "Cobbles", of these Specifications.
5. Geotextile fabric as specified in Section 50-10.01, "Nonwoven Geotextile Fabric", of these Specifications, and backfilled with Class 2 aggregate base.
6. Any approved combination of 1, 2, 3 and 4 above.

18-5.03 Geotextile Fabric

The need for this item is contingent upon the need to stabilize unsuitable basement material encountered during construction and may be extended or deleted at the discretion of the Agency. The fabric shall be nonwoven as specified in Section 50-10.01 "Nonwoven Geotextile Fabric", of these Specifications.

Geotextile fabric at the overlap shall be either lapped a minimum of eighteen inches (18") or sewn or glued. If lapped, the fabric shall be placed so that the preceding roll overlaps the following roll in the direction the fill material is being spread. If sewn or glued, the seam strength shall not be less than ninety percent (90%) of the required tensile strength of the unaged fabric. The surface to receive the fabric shall be prepared to a smooth condition free of obstructions and debris that may damage the fabric during installation. Geotextile fabric shall be furnished in a protective wrapping that shall protect the fabric from ultraviolet radiation and from abrasion due to shipping and handling. The geotextile fabric shall be covered with the fill material within two (2) Calendar Days of its placement. Should the fabric be damaged during construction, the torn or punctured section shall be repaired by placing a piece of fabric that is large enough to cover the damaged area and to meet the overlap requirement.

18-5.04 Approximate Quantity

Where a quantity is shown in the Contract for unsuitable material excavation, the quantity shall be considered as approximate and is indicated for bid comparison only. No guarantee is made or implied that the quantity shown will not be reduced or increased or deleted, as may be required by the Agency. See Section 9-8.02, "Payment for Changes – Unit Prices", of these Specifications.

18-5.05 Payment

The additional excavation greater than that required for preparation of original ground or subgrade will be paid for at the Contract unit price per cubic yard for the various types of excavation involved. Unsuitable material excavated more than two feet (2') below subgrade shall be paid for as extra work as provided in Section 9, "Changes and Claims", of these Specifications if no item for unsuitable material excavation appears in the Contract.

Backfill, when made with material excavated from the work site, will be paid for at the same Contract unit price paid for roadway excavation or channel excavation, whichever applies. The pay quantity will be the same as that quantity computed for unsuitable material excavated.

Imported borrow, pit run material and cobbles, and the placing of such materials, will be paid for as specified in these Specifications for those items.

The quantity of geotextile fabric to be paid for will be measured by the square yard of area covered, not including additional fabric for overlap. The Contract price paid per square yard for the geotextile includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals. The price per yard also includes doing all work involved in placing the geotextile, complete in place, as directed by the Agency. The need for this item is contingent upon the need to stabilize unsuitable base material encountered during construction and may be extended or deleted without limit at the discretion of the Agency with no change in the Contract unit price.

Should the Contractor elect to place cobbles or other material in the channel bottom to provide a working surface, in lieu of de-watering the channel, the cost of furnishing and placing such material shall be at the Contractor's sole expense.

18-6 IMPORTED BORROW

18-6.01 General

Imported borrow shall consist of material required for the construction of embankments and shall be obtained from sources listed in the Special Provisions or, if no sources are listed, from sources the Contractor may elect. The Contractor's sources shall be approved in advance by the Agency. Imported borrow shall be free of roots, vegetable matter, and other unsatisfactory material, and be of such character that it will readily bind to form a firm and stable embankment when compacted.

The imported borrow material shall have a sand equivalent of not less than the average sand equivalent of the native material that is adjacent to the existing roadbed, and an R-value of not less than 20, or as otherwise specified in the Special Provisions. Clayey soils shall not be used. Imported borrow material shall be tested prior to being transported to the project site. Testing of imported fill shall be the responsibility of the Contractor.

If no item for imported borrow appears in the Contract, the earthwork shall be considered balanced with no imported material required. If the Agency deems it necessary to place imported borrow due to field conditions, shrinkage, or swell factors experienced, the imported material shall be furnished and placed as extra work, as provided in Section 9, "Changes and Claims", of these Specifications.

18-6.02 Agreements

The Contractor shall enter into an agreement with the property owner of any privately owned material site to hold said owner harmless from any claims for injury to persons or damage to property resulting from the Contractor's operations on said property. The agreement shall contain provisions to relieve the Agency of any obligation to the property owner or claims for injury or damage of persons or property. A copy of the agreement shall be furnished by the Contractor to the Agency a minimum of two (2) Working Days prior to commencing operations at the material site. The Contractor's attention is directed to Section 6-2, "Local Materials", of the State Specifications regarding local materials and their sources.

18-6.03 Placement

The imported borrow material shall be placed and compacted as specified for roadway embankment.

18-7 SURPLUS MATERIAL DISPOSAL

18-7.01 General

Surplus materials, resulting from excavations that are not required for backfill or embankment construction or to satisfy right-of-way agreements as set forth on the Plans and in the Special Provisions, shall become the property of the Contractor, and the Contractor shall

dispose of the surplus materials off the rights-of-way or easements, unless permitted by the Agency to be disposed of on the work site.

18-7.02 Agreement

When any materials are to be disposed of outside the rights-of-way or easements, the Contractor shall obtain written permission from the property owner upon whose property the disposal is to be made. The Contractor shall also enter into an agreement with the property owner to hold said owner harmless from any claims for injury to persons or damage to property resulting from the Contractor's operations on said property. The agreement shall contain provisions to relieve the Agency of any obligation to the property owner for any injury or damage to persons or property. The agreement shall also include a sketch showing the location where the material is to be deposited. A copy of the permission obtained from the property owner and the agreement shall be furnished by the Contractor to the Agency a minimum of two (2) Working Days prior to commencing disposal operations. Excess materials shall not be deposited in any location that will block or restrict a natural or artificial drain. No material shall be deposited within the dripline of certain ornamental, landmark, and native oak trees, as specified in Section 10-13, "Protection of Existing Trees", of these Specifications.

18-7.03 Permits

If copies of all required permits are not provided to the Agency immediately upon request, the Contractor's operations may be stopped in accordance with Section 5-21, "Temporary Suspension or Delay of Work", until such copies of permits are provided to the Agency.

The Contractor or owner of the property where excess material is to be deposited shall be responsible for obtaining all required permits from any agency which may have jurisdiction over the proposed disposal site.

When any materials are to be disposed of outside the right-of-way or easements which would affect any waterway as set forth in Ordinance No. 1 of the Sacramento County Water Agency, the Contractor shall obtain a permit from that agency, in addition to the property owner agreement as set forth above.

In addition to any permit required by the Sacramento County Water Agency, disposed of material shall also conform to the applicable Agency grading ordinances. The Contractor or the owner of property on which material is to be disposed of shall obtain a grading permit, if required, prior to disposal of any excess excavated material.

Copies of any required permits shall be furnished to the Agency. No permits will be required if disposal sites are shown on the Plans unless otherwise specified on the Plans or in the Special Provisions.

Prior to placing any material within the 100-year floodplain of any of the 13 natural streams as adopted by the Board of Supervisors, the Contractor or property owner shall first obtain a Use Permit from the Planning and Community Development Department.

18-7.04 Payment

No separate payment will be made for disposal of surplus material and all compensation therefor is included in payment for other earthwork items.

18-8 CLASS "C" SUBGRADE

18-8.01 General

Those areas of existing pavement as shown on the Plans or as directed by the Agency to receive an overlay of asphalt concrete shall be prepared as Class "C" subgrade. Class "C" subgrade shall apply to subgrade prepared on an existing roadbed, subbase, base, surfacing or pavement which was not constructed by the Contractor, and on which a layer of subbase, base, surfacing, pavement, or other specified material is to be placed.

18-8.02 Preparation

In advance of spreading new subbase, base, surfacing or pavement material, the existing roadbed, subbase, base, surfacing or pavement shall be cleaned of all dirt and loose material.

If ordered by the Agency, a leveling course of material to be placed shall be spread upon the existing roadbed, subbase, base, surfacing, or pavement, in accordance with the specifications for the type of material being placed.

Where shown on the Plans or specified or directed by the Agency, the existing roadbed, subbase, base, surfacing or pavement shall be scarified, watered, and rolled in advance of placing new material thereon.

Broken, failed or other unsatisfactory portions of the existing roadbed, subbase, base, surfacing or pavement, and sections interfering with new construction shall be removed and disposed of. The areas and depths to be removed shall be as ordered by the Agency. The area in the exposed spaces shall be watered and compacted, after which the space shall be filled with subbase, base, surfacing or pavement material as directed by the Agency.

18-8.03 Payment

Unless otherwise specified in the Special Provisions, the excavation and disposal of existing pavement other than that shown on the Plans to be excavated as a part of, or adjacent to, an area to be excavated to provide a new structural section, will be paid for as extra work as provided in Section 9, “Changes and Claims”, of these Specifications.

Excavation of pavement and materials shown on the Plans necessary for preparation of Class "C" subgrade will be paid for as roadway excavation as set forth in Section 18-2.07 “Roadway Excavation - Measurement and Payment”, in this Section of these Specifications.

Full compensation for furnishing all labor, material, tools, equipment, and incidentals and for doing all the work involved in preparing Class "C" subgrade, including the leveling course, excluding excavation, as shown on the Plans, specified in these Specifications or the Special Provisions, or as directed by the Agency, is included in the Contract prices paid for the materials, in place on the subgrade as shown on the Plans, or directed by the Agency.

SECTION 19 TRENCH EXCAVATION, BEDDING AND BACKFILL

19-1 TRENCH EXCAVATION

Trench excavation shall include the removal of all materials or obstructions and the control of water as necessary to construct the Work as shown or specified in the Contract. Unless otherwise shown or specified in the Contract, excavation shall be by open cut or as directed by the Agency.

Attention is directed to Section 10-5, "Control of Water in the Work", and Section 14, "Restoration of Surfaces", of these Specifications, for additional requirements. Surface water shall not be allowed to enter any pipe trench and shall not be permitted to enter the existing downstream pipe system.

Section 18-2.03, "Surplus Material" and Section 18-7, "Surplus Material Disposal", of these Specifications also applies to excess material from trench excavations.

19-1.01 Exploratory Excavation

An encroachment permit shall be obtained from the Agency prior to any exploratory excavation within highway rights-of-way or other public easements. Prior to the end of each Working Day, exploratory excavations made outside the paved surface during that Working Day shall be backfilled with sand or native excavated materials as directed by Agency and mechanically compacted to prevent subsequent settlement. Excavations made within the paved surface shall be permanently restored per Standard Drawing 4-31.

19-1.02 Trench Width

Minimum and maximum trench widths at the top of the pipe shall be as shown or specified in the Contract Documents or as specified in these Standard Specifications.

19-1.02.A Storm Drain Pipe

Unless otherwise shown or specified in the Contract, for storm drain pipe the minimum and maximum trench width shall be as shown on Standard Drawing 9-1. If trench widths at the top of the pipe are exceeded by any amount, the Contractor shall provide stronger pipe or improved bedding and backfill conditions, as approved by the Agency to meet the changed load requirements. If the trench width is exceeded for any reason within the Contractor's control, the stronger pipe or improved bedding and backfill shall be provided at the Contractor's expense.

19-1.02.B Sewer Pipe

Unless otherwise shown or specified in the Contract, minimum trench widths at the top of the pipe shall be as shown or in the table below, and the maximum widths shall be as shown on Standard Drawings 7-4 and 7-15. For rigid pipes <12", refer to Standard Drawing 7-15. For semi-rigid pipe, the Agency will provide trench and pipe design calculations.

Pipe Size (Inches)	Minimum Trench Width (Inches)
12	OD+12
15	OD+13
18	OD+15
21	OD+16
24	OD+17
27	OD+18
30	OD+19
33	OD+20
36	OD+22
Based on Minimum Working Space	

If maximum trench widths at the top of the pipe are exceeded by any amount, the Contractor shall provide stronger pipe or improved bedding and backfill conditions, as approved or directed by the Agency, to meet the changed load requirements. The stronger pipe or improved bedding and backfill shall be provided at no additional expense to the Agency.

19-1.02.C Water Pipe

Water pipe minimum and maximum trench widths shall be as shown on Standard Drawing 8-17 unless otherwise shown or specified in the Contract. If trench widths at the top of the pipe are exceeded by any amount, the Contractor shall provide stronger pipe or improved bedding and backfill conditions, as approved by the Agency to meet the changed load requirements. If the trench width is exceeded for any reason within the Contractor's control, the stronger pipe or improved bedding and backfill shall be provided at the Contractor's expense.

19-1.03 Pavement Cutting

When the trench is in an existing paved area, the pavement shall be saw cut on neat lines parallel and equidistant from the trench centerline. The width of the saw cut shall not be any greater than is required to properly install the pipe and not damage the edges of the pavement left in place, or as directed by the Agency. Pavement between the lines shall be broken and removed as directed by the Agency immediately ahead of the trenching operations. The existing pavement shall be removed in conformance with Standard Drawing 4-31. Top backfill in existing paved areas shall conform to Standard Drawing 4-31.

Pavement shall not be cut until the respective utility companies have marked the location of their underground facilities and the Agency has given final approval of the trench alignment.

19-1.04 Maximum Length of Open Trench

Unless otherwise specified in these Specifications or the Special Provisions, or approved by the Agency in writing, at the end of each Working Day, there shall be no more than three hundred feet (300') of trench at any one location allowed to remain open, including excavation, pipe laying and appurtenant construction and backfill which has not been temporarily resurfaced, but excluding manhole excavations . The remainder of the trench shall be backfilled and compacted, and when in streets, opened to traffic as soon as possible. The maximum length of trench open for cast-in-place concrete pipe shall be as specified in Section 36-3, "Trench Excavation", of these Specifications.

Failure by the Contractor to comply with the limitations specified herein may result in a temporary suspension of work in accordance with Section 5-21, "Temporary Suspension or Delay of Work", of these Specifications.

19-1.05 Control of Water

Control of water shall conform to the requirements in Section 10-5, "Control of Water in the Work", of these Specifications.

19-1.06 Shoring and Bracing

The Contractor shall furnish and install sufficient shoring and bracing to insure the safety of personnel and public, protect the Work, and protect adjacent improvements. Contractor must comply with all of the requirements of Section 6-20, "Excavation and Trench Safety", of these Specifications.

Sheeting shall not extend below the bottom of the pipe barrel. The contractor shall take care to prevent damage to existing surface or subsurface improvements, both public and private, during drilling and driving operations. Unless otherwise specified in the Special Provisions or required by the Agency, all sheeting, timbering, lagging, and bracing shall be removed during backfilling, and in such a manner to prevent any movement of the ground or damage to the pipe or to other structures. When the Agency requires that sheet piling, lagging, and bracing be left in place, such materials shall be cut off where designated and the upper part withdrawn. If steel piling is used, it may be removed simultaneously with placing and compacting of backfill.

When using movable trench supports, care shall be exercised to prevent disturbing the pipe location, jointing, or embedment. Removal of any trench protection below the top of the pipe and within two and one-half (2-1/2) pipe diameters of each side of the pipe will be prohibited after the pipe embedment has been placed and compacted. Movable trench supports shall only be used in either wide trench construction where supports extend below the top of the pipe or on a shelf above the pipe with the pipe installed in a narrow, vertical wall subditch. Any voids left in the trench wall or embedment materials by support removal shall be carefully filled with bedding material and compacted. Removal of bracing between sheeting shall only be done where backfilling proceeds and bracing is removed in a manner that does not relax trench support.

19-1.07 Special Foundation Treatment

Whenever the bottom of the trench is soft, spongy, unstable, rocky, or, in the opinion of the Agency, otherwise unsuitable as a foundation for pipe bedding, the unsuitable material shall be removed to a minimum depth of six inches (6"), or to a depth designated by the Agency, and replaced with compacted crushed rock, gravel, or sand as directed by the Agency. When the trench bottom is cobbled or of any other material which might, in the opinion of the Agency, allow loss of sand backfill, the backfill material shall be crushed rock or gravel graduated so that one hundred percent (100%) will pass the three-quarter inch (3/4") sieve and not more than fifteen percent (15%) will pass the number 8 sieve. Crushed rock or gravel shall conform to Section 50-16, "Clean Crushed Rock", of these Specifications. Sand backfill, when permitted by the Agency, shall conform to the requirements in Section 50-13.01, "River Sand", of these Specifications. Such backfill material shall be compacted to a non-yielding condition. Jetting is not permitted. As an alternate to the bedding materials specified above, the Agency may direct the Contractor to furnish and place geotextile fabric below the bedding materials. The geotextile material shall be a woven fabric in accordance with Section 50-10.02, "Woven Geotextile Fabric", of these Specifications. Furnishing and placing of geotextile fabric will be paid for as extra work as provided in Section 9, "Changes and Claims", of these Specifications.

If material more than twelve inches (12") below the typical trench bottom is ordered removed by the Agency, the excavation below that point and the imported material required to backfill the trench to that elevation will be paid for as extra work as provided in Section 9, "Changes and Claims", of these Specifications unless otherwise specified in the Special Provisions. Before excavation of the pipe trench in fill areas or roadway embankments, the fill area or embankment shall be completed to a height above the pipe invert grade line of not less than twice the internal pipe diameter or to final fill or embankment subgrade, whichever is lower, but in no case less than twelve inches (12") above the top of the pipe. Such embankment shall be compacted to a minimum relative compaction of ninety percent (90%) for a distance on each side of the pipe

equal to at least two (2) pipe diameters. The remainder of the embankment shall be compacted to the minimum relative compaction specified elsewhere in these Specifications for the type of construction being done, or as specified in the Special Provisions or on the Plans. Special foundation treatment for cast-in-place concrete pipe shall be as specified in Section 36-4, "Cast-In-Place Concrete Pipe (CIPCP) - Special Foundation Treatment", of these Specifications.

19-1.08 Excavation Method

Methods used in excavation shall not cause damage to surrounding property or damage remaining pavement and other existing improvements that are to remain. Outriggers for excavation equipment, and other heavy equipment, shall be fitted with street pads to prevent pavement damage.

19-1.09 Payment

Full compensation for trench excavation, including all equipment, labor, materials, control of water, shoring and bracing, and other safety measures required, is included in the prices paid per linear foot of the respective sizes, grades, and types of pipes listed in the Contract, and no additional compensation will be paid.

Additional bedding material used to stabilize the foundation if required, over the amount required by the Contract, will be paid for as provided in the Special Provisions. If the necessity for such additional bedding material has been caused by an act or failure to act on the part of the Contractor or is required for the control of groundwater, the Contractor shall bear the expense of the additional excavation and material.

19-2 PIPE BEDDING AND BACKFILLING OF TRENCHES

19-2.01 Pipe Bedding

Pipe bedding shall be furnished and placed as shown on the Plans and in accordance with the requirements in these Specifications. Pipe shall be placed on a firm layer of bedding material, and shall be bedded uniformly throughout its length. Pipe bedding material for water distribution systems shall conform to the requirements in Section 50-13.02, "Graded Sand", of these Specifications.

19-2.01.A Sewer

Pipe bedding material for sewer construction shall conform to the requirements as detailed on Standard Drawing 7-4, and in conformance with these Specifications. Bedding material shall be placed on a firm and unyielding foundation such that the pipe is supported for the full length of the barrel. There shall be at least five inches (5") of bedding material placed beneath the pipe. An additional minimum three inches (3") of bedding material shall be placed in contact with and beneath all pipe joint and couplings and one inch (1") minimum clearance below a projecting bell. Pipe bedding shall be vibratory compacted to a stable, non-yielding condition. Bell or coupling holes shall be carefully excavated so that no part is supported by the bell or coupling. Consolidation of the material around and under the bell and couplings during backfilling shall be avoided.

19-2.01.B Storm Drain

Unless otherwise indicated in the Contract, storm drain pipe bedding shall be furnished and placed as detailed in Standard Drawing 9-1 and in conformance with these Specifications. Storm drain pipe bedding material shall conform to Section 50-16, "Clean Crushed Rock", of these Specifications.

The Pipe shall be bedded uniformly throughout its length. The bearing shall be achieved by shaping the bedding or by lightly "bouncing" the pipe to set it into the bedding. Pipe bedding material shall be placed at a minimum thickness meeting the greater of the following criteria:

1. The minimum bedding thickness shall be three inches (3”) for pipe with internal diameter ten inches (10”) or less, and four inches (4”) for pipe with internal diameter twelve inches (12”) and greater; or
2. The minimum bedding thickness shall be equal to the difference between the outside diameter of the pipe barrel and bell plus one and one-half inches (1-1/2”); or
3. When soil conditions in the trench bottom are unstable, rocky, or otherwise unsuitable as a foundation for pipe bedding, the minimum bedding thickness shall conform to Section 19-1.07, "Trench Excavation - Special Foundation Treatment", in this Section.

19-2.01.C Water Distribution Systems

Polyvinyl Chloride (PVC) water distribution mains shall have four inches (4”) of sand bedding material that conforms to the requirements of Section 50-13.02, “Graded Sand”, of these Specifications. If existing soil is too porous to hold sand, four inches (4”) of crushed aggregate or a geotextile fabric placed on the trench bottom and covered with four inches (4”) of sand may be used. The Agency must approve the use and type of geotextile, and crushed aggregate.

Ductile Iron water distribution mains shall have six inches (6”) of sand bedding material that conforms to the requirements of Section 50-13.02, “Graded Sand”, of these Specifications. If existing soil is too porous to hold sand, a geotextile fabric placed on the trench bottom and covered with six inches (6”) of sand may be used. The use and type of geotextile must be approved by the Agency. The Ductile Iron distribution main, fittings, and cast iron fittings shall be encased in eight– (8) mil polyethylene encasement in accordance with AWWA C105.

19-2.02 Initial Backfill

Initial backfill shall be furnished and placed as shown or specified in the Contract, and in accordance with the requirements in these Specifications.

19-2.02.A Sewer

Unless otherwise specified in the Special Provisions, initial backfill for gravity sewer construction shall be as detailed on Standard Drawing 7-4. Initial backfill shall be the material between the top of the bedding material and twelve inches (12”) above the top of the pipe. Initial backfill material in the pipe haunch area shall be shovel-sliced to fill the voids and consolidate the material thus providing uniform and consistent support of the pipe. Shovel-slicing shall be performed along the pipe barrel and not adjacent to the bell hole. Shovel-slicing shall occur when the initial backfill is no higher than about one-fourth of the pipe diameter. The maximum lift shall not exceed eight inches (8”) thickness. Particular compaction effort shall be applied to all wye’s and tee’s.

19-2.02.B Storm Drain

Unless otherwise specified in the Special Provisions, the following initial backfill requirements shall apply. For cast-in-place concrete pipe, initial backfill shall conform to Section 36-14, “Cast-in-Place Concrete Pipe (CIPCP) – Backfill”, of these Specifications and Standard Drawing 9-1. For all other pipes initial backfill for storm drain construction shall conform to this Section 19 and Standard Drawing 9-1.

Granular materials shall conform to Section 50-16, "Clean Crushed Rock”, of these Specifications. For field conditions requiring control density backfill the material shall conform to Section 50-15, "Control Density Backfill", of these Specifications. For field conditions requiring portland cement concrete backfill the material shall conform to Section 50-5.01, "Portland Cement Concrete - Composition”, Class "B-2”, of these Specifications.

After placement of bedding, the Contractor shall place initial backfill material to the spring line of the pipe, thoroughly compacting it by vibratory drum roller, vibrating surface plate, insertion vibrator, shovel slicing or light tamping to provide proper support under the pipe haunches. The remaining initial backfill material shall be placed per Standard Drawing 9-1. To

reduce impact damage, there shall be at least twelve inches (12") of cover over pipe before using hand-held or walk-behind compaction equipment, and at least three feet (3') of cover before using ride-on equipment. Care shall be used not to disturb or displace the pipe. When using control density or concrete backfill, the Contractor shall anchor the pipe to prevent floating or displacement of the pipe. The anchors shall be spaced to insure a continuous even grade in the flow line of the pipe.

19-2.02.C Water Distribution Systems

Initial backfill for water distribution systems shall conform to the requirements of Standard Drawing 8-17. Unless otherwise specified in the Special Provisions, initial backfill for water distribution systems, including water mains, fire hydrant branch leads, and water services, shall be sand conforming to the requirements in Section 50-13.02, "Graded Sand", of these Specifications. Ductile iron distribution mains shall have sand backfill to eight inches (8") above the top of the distribution main. Initial backfill for PVC water distribution pipe may be of native material or sand. Initial backfill for ductile iron or cast iron fittings used with PVC pipe shall be sand to eight inches (8") above the top of the fittings.

Initial backfill shall be placed immediately after pipe joints have been completed and inspected by the Agency. The material shall be carefully placed so as not to disturb or damage the pipe, and shall be brought up evenly on both sides. Initial backfill material shall be placed in layers not exceeding eight inches (8") in depth before compaction at or near optimum moisture content. Compaction shall be by mechanical pneumatic or vibratory compaction equipment approved by the Agency. Ponding and jetting methods will not be permitted, although water may be sprayed from a two-inch (2") truck hose onto initial and final sand backfill. The compacted material must achieve a relative compaction of at least ninety percent (90%) as determined by ASTM Designation: D 698. If steel piling is used, it may be removed simultaneously with placement and compaction of intermediate backfill. Trench jacks or other shoring shall not be removed before completion of initial backfill.

19-2.03 Trench Backfill

Trench backfill shall consist of material placed between the initial backfill and subgrade in paved areas or to the top of the trench in unpaved areas, unless otherwise shown or specified in the Contract.

The trench backfill material may be native material excavated at the work site if the trench depth is greater than four feet (4') measured from the top pipe to the finished road surface. Such material must be free of organic or other unsuitable materials as determined by the Agency that may cause voids or depressions to develop during or after placement of the backfill. Rocks, stones and solid earth chunks exceeding three inches (3") in greatest dimension shall be removed from the trench backfill material.

Trench backfill material shall be placed in layers not exceeding eight inches (8") in depth before compaction at or near optimum moisture content. Until the total backfill above the top of the pipe exceeds three feet (3'), machine-placed backfill material shall not be allowed to "freefall" more than two feet (2'). Compaction effort shall be applied parallel to the pipeline starting at the trench wall and proceeding to the center of the trench.

The backfill material for trench depths less than four feet (4') measured from the top pipe to the finished road surface shall be imported granular material, uniformly graded Class 2 aggregate base conforming to the requirements in Section 50-7, "Aggregate Bases", of these Specifications. The imported granular material shall be placed in lifts not to exceed six inches (6") after compaction. Compaction requirements for imported granular material shall be the same as required for compaction of job excavated native material.

Unless otherwise shown or specified in the Contract, compaction of all backfill material shall be by mechanical pneumatic or vibratory compaction equipment appropriate to the existing

conditions that will not result in damage to adjacent ground, existing improvements or the Work. Ponding and jetting methods will not be permitted, except by written permission of the Agency.

Unless otherwise shown or specified in the Contract, trench backfill material shall be compacted to a relative compaction of not less than ninety percent (90%), as determined by ASTM Designation: D 1557. The top six inches (6") below the subgrade shall be compacted to a relative compaction of ninety-five percent (95%), except that trenches in easements outside the street rights-of-way may be compacted to ninety percent (90%) relative compaction throughout the depth. Compaction testing will be performed by the Owner and the cost thereof will be borne by the Agency, except that retests of areas which fail to meet the required compaction will be charged to the Contractor and deducted from any payment due the Contractor.

Unless otherwise specified in the Special Provisions, the Contractor has the option to use imported granular material for trench backfill in place of native material excavated at the work site. The imported granular material shall be uniformly graded Class 2 aggregate base conforming to the requirements in Section 50-7, "Aggregate Bases", of these Specifications. The imported granular material shall be placed in lifts not to exceed six inches (6") after compaction. Compaction requirements for imported granular material shall be the same as required for compaction of job excavated native material. Unless otherwise specified in the Special Provisions, the optional use of imported granular material for trench backfill will be at the Contractor's expense.

19-2.04 Payment

Full compensation for furnishing, placing, and compacting pipe bedding and trench backfill materials is included in the prices paid per linear foot of the respective sizes, grades, and types of pipes listed in the Contract, and no additional compensation will be paid.

Actual excavation quantities to be paid for will be calculated based on the maximum width of trench shown on the plan and measured at the top of the pipe.

Actual trench resurfacing quantities to be paid for will be calculated based upon the maximum width of trench as specified herein.

SECTION 20 LANDSCAPING

20-1 GENERAL

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

20-2 MATERIALS

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

20-2.01 Root Control Barrier

Root control barrier shall be installed prior to topsoil placement or by means of trenching against existing surfaces. Root control barriers shall be injection molded or extruded. The material shall have a minimum thickness of 0.08 (2.03 mm) and shall be made of either high density polyethylene or polypropylene. Barrier material shall have ultraviolet inhibitors. The barrier shall have 1/2 inch to 3/4-inch high raised vertical ribs on one side not more than 8 inches apart and shall have horizontal ground locking strips not more than 6 inches apart between the raised vertical ribs. The top of the barrier shall have a horizontal rib or edge to deflect roots growing over the top of the barrier. Root control barrier panels shall be joined with locking strips or integral self side locks. Locking strips or integral self side locks shall have a close tolerance to restrict any slippage between panels. Panel depth shall be 24 inches or as specified and panel shall have a minimum width of 24 inches.

Panels shall be installed slightly higher than finish grade [one inch (1")], flush against edge of pavement or headerboard, and joined with locking strips or integral male/female sliding locks. . Barrier shall be installed with root deflectors facing inward and shall provide a continuous barrier around the perimeter of each median, tree well, sidewalk or other hardscape surface.

20-2.02 Topsoil

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

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

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

20-2.03 Soil Amendment

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

20-2.04 Liquid Green Dye

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

20-2.05 Mulch

Mulch shall be top dressed, where specified, to a minimum depth of three inches (3") over soil level. Taper mulch away from the crowns of all newly planted and existing trees.

20-3 EROSION CONTROL

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

20-3.01 Seeding and Fertilizing

Seeding and fertilizing shall conform to the Special Provisions and these Specifications.

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

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

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

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

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

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

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

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

20-3.02 Measurement and Payment

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

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

20-4 PLANTING

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

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

20-4.01 Pesticides

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

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

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

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

20-4.02 Preparing Planting Areas

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

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

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

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

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

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

After cultivation, the surface shall be raked, rolled, or otherwise smoothed to remove ridges and fill depressions. The finished surface shall be uniform, evenly graded, and reasonably firm. The grades of the finished surface shall be approximately two inches (2") below the top of adjacent curbs or pavement, unless otherwise shown on the plans and except for those areas designated to receive topsoil, where the grade shall be six inches (6") below planned finish grade.

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

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

Cultivation shall be performed until the soil is in a loose condition to a minimum depth of four inches (4"). Soil clods shall not be larger than two inches (2") in any dimension after cultivation.

Areas to receive a pre-emergent weed control shall be treated prior to planting as shown in the Plans or specified in the Special Provisions.

Planting areas that have been cultivated and become compacted for any reason shall be recultivated by the Contractor at his expense.

20-4.03 Header Boards

Header boards shall conform to Section 50-43.11, "Lumber", of these Specifications and shall be installed in accordance with Standard Drawing L-27.

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

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

20-4.04 Planting

Plant material shall conform to Section 50-43.14, "Plants", of these Specifications and shall be installed in accordance with Standard Drawings L-1 and L-2.

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

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

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

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

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

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

Each tree and shrub location shall be as shown on the Plans, or as approved by the Agency. Plants shall be spaced as indicated on the Plans or in the Special Provisions. Plants in adjacent rows shall be staggered. Tree and shrub locations shall not conflict with any existing utilities, utility boxes, or other improvements. Plants improperly located shall be replanted by the Contractor in the proper location at no additional cost to the Agency.

Planting shall be performed in accordance with the details shown on the Plans and Standard Drawings. Each plant shall be placed in the planting excavation in an upright position in the center of the hole, and the space around it backfilled with planting mix so that amended soil of a thickness equal to at least half the diameter of the root ball is around the sides of the root ball. Organic matter shall not be placed beneath the plant's root ball. Plants shall be set in the backfill material in flat bottomed holes to such depth that after the soil has settled, the top of the plant ball will be one inch (1") above the bottom of the basin or even with surrounding soil where there is no basin. Plants shall be planted in such a manner that the roots will not be restricted or distorted. Soil shall not be compacted around the roots or ball of the plant during or after planting operations. The plant shall be set so that the root crown is one-half inch (1/2”) or three-quarter-inch (3/4”) higher than average surrounding grade. The ground around the plant shall be shaped to drain water away from the root crown or trunk of plant. Any plants that have settled deeper or stand higher than specified shall either be raised back to the required level or replaced, at the option of the Contractor.

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

20-4.04.A Preparation for Ground Covers

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

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

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

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

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

The spacing of ground cover plants shall be as shown on the Plans and in the Plant List. Plants shall be planted in neat, evenly spaced rows with staggered triangular spacing. Ground cover shall be planted around shrubs to within one foot (1’), and around trees to within eighteen inches (18”). Ground cover in one (1) gallon containers shall not be planted closer than two feet (2’) to curbs, dikes, paved areas, walls, and fences, unless otherwise shown on the Plans or specified in the Special Provisions. Ground cover from flats shall not be planted closer than six inches (6”) to curbs, dikes, paved areas, walls, and fences, unless otherwise shown or specified in the Contract.

20-4.04.B Preparation for Trees and Shrubs

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

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

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

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

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

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

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

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

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

20-4.04.C Preparation for Turf

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

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

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

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

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

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

The sod shall be installed to the smooth finish grade with tight edges and no gaps. Sod pieces shall be placed with ends staggered. Sod shall not be stretched.

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

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

20-4.05 Watering

Water from facilities within the limits of the project may be obtained free of charge.

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

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

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

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

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

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

20-4.06 Plant Replacement

Plants that show signs of failure to grow at any time during the warranty period, or which have been injured, damaged, vandalized, or stolen as to render them unsuitable for the purpose intended, as determined by the Agency, shall be removed and replaced. Replacement plants shall be furnished and planted by the Contractor at the Contractor's expense. The Contractor and Landscape Architect may agree to the substitution of alternative species of plants to be used as replacements. Any damage to the finish grading caused by replanting operations and/or vandalism shall be repaired and replanted by the Contractor at the Contractor's expense.

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

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

20-4.07 Plant Establishment Work

The plant establishment period shall begin after all landscape work has been completed and shall continue until final acceptance of the Work. The number of Calendar Days for the plant establishment period shall be designated in the Special Provisions.

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

During the plant establishment period, electric automatic irrigation systems shall be operated in the automatic mode, unless otherwise permitted by the Agency. Plants shall be watered to provide optimum growth conditions. The Contractor shall provide equipment and means for the proper applications of water to planted areas not provided with an irrigation system.

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

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

As part of the plant establishment work, five (5) Working Days prior to completion of the plant establishment period instructions shall be given to designated Agency maintenance personnel by a qualified person from the Contractor's personnel on the use and adjustment of the irrigation controllers installed.

During the plant establishment period, trees, shrubs, vines, and ground cover plants, planted as part of the Contract, shall be pruned by the Contractor at the Contractor’s expense, as directed by the Agency.

Trees and shrubs shall be watered, cultivated, and sprayed as required to assure a vigorous, thriving condition from day of planting to end of plant establishment period. Weeds shall be removed during this period. During the plant establishment period, the Contractor shall not water between the hours of 7:00 a.m. and 7:00 p.m.

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

Turf shall be watered, reseeded, edged, weeded, and mowed as required to assure a neat appearance and a healthy and vigorous growth from the day of seeding to the end of plant establishment period. The first mowing shall not be done until the grass is generally at least two inches (2”) but less than three inches (3”) high. For the first mowing and all subsequent mowing, the mower shall be set to cut at a height of one and one-half inches (1-1/2”). Subsequent mowings, as required, shall be done before the grass is three inches (3”) high. Grass clippings for all mowings shall not be allowed to lie after mowing. A catcher shall be used on the mower, and grass clippings shall be removed and discarded off site. Immediately following the first mowing of the turf, turf areas shall be fertilized at the rate of eight (8) lbs. per one thousand (1,000) square feet or as otherwise specified in the Special Provisions. Reapplication of fertilizer shall take place as directed by the Agency during the plant establishment period.

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

At the end of the plant establishment period, all plant material shall be in a healthy, growing condition.

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

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

Following the plant establishment period, the Contractor shall provide a warranty that guarantees all trees for one (1) year from date of Final Acceptance. The Contractor shall replace any tree that dies during the warranty period and the replacement shall be the same size container as originally designated on the Plans.

20-4.08 Inspection for Plant Establishment Work

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

20-4.09 Measurement and Payment

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

20-5 IRRIGATION SYSTEMS

Irrigation system materials shall be as specified in Section 50-43, “Landscaping Materials” of these Specifications.

20-5.01 Maintain Existing Water Supply

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

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

20-5.02 Remove Existing Plants for Trenching

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

Where trenching for new irrigation facilities is performed in existing ground cover or turf, sufficient plant material shall be removed to permit the proper installation of such facilities, but in no case shall the removal width exceed five feet (5’). All turf repair or ground cover replacement

planting shall be performed before the start of the plant establishment period, or at least fourteen (14) Calendar Days prior to the acceptance of the Contract if there is no plant establishment period.

20-5.03 Electrical Service for Electric Automatic Irrigation Systems

Electrical service for electric automatic irrigation systems shall conform to Section 49, "Signals, Lighting and Electrical Systems", of these Specifications and Standard Drawing 5-8, "Signal, Lighting and Electrical Systems Metered Service Can", of the County Improvement Standards.

20-5.03.A Components

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

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

20-5.03.B Controllers

Controllers shall conform to Section 50-43.20, "Automatic Irrigation Controllers", of these Specifications and shall be installed in accordance with Standard Drawing L-17.

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

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

All controller locations are essentially diagrammatic and shall be specifically located by the owner, or his representative.

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

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

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

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

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

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

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

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

Conductors shall be run continuous without splices from controller enclosure to the valve boxes. Splices shall be made only in pull boxes or valve boxes. Splices shall be clamped and sealed with waterproof connectors. When splices are necessary, the wire color shall not change along the wire run. Conductors from controllers to valves shall be wrapped together

with electrical tape at ten-foot (10') intervals. An eighteen-inch (18”) wire loop shall be provided at each valve.

Pullboxes shall be installed at the following locations:

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

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

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

20-5.03.D Testing

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

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

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

20-5.04 Installation

20-5.04.A General

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

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

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

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

20-5.04.B Irrigation Sleeving

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

Control wire, water supply line or lateral line pipe crossovers shall be installed in conduits or as shown on the Plans. After completing conduit backfill and prior to performing the pressure test on a water line crossover, the Contractor shall demonstrate that the water line crossover can be moved longitudinally within the conduit. Where water line crossovers are installed for future use, the ends of such crossovers shall be capped immediately after testing. Conduits shall extend twelve inches (12”) beyond edge of paving unless otherwise noted on the Plans. At perpendicular crossings, the Contractor shall install a No. 5 pull box at each end of the conduit, with eighteen-inch (18”) wire loop

The location of each conduit shall be designated by cementing a Type A pavement marker to the paved shoulder near each end and over the centerline of the conduit using a standard set type adhesive. Type A pavement markers and adhesive shall conform to the provisions in Section 85, "Pavement Markers”, of the State Specifications and shall not conflict with existing markers within the project site.

20-5.04.C Water Line Crossovers

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

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

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

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

20-5.04.D Trenching and Backfilling

Trenching and backfilling shall be in accordance with Standard Drawing L-18. Trenches shall be excavated only as far in advance of pipe laying as is permitted by the Agency. Excavated material shall be piled in a manner that will not endanger the Work and will avoid obstructing sidewalks and driveways. Open trenches and piles of dirt shall be marked and lighted as to provide safety to all pedestrians and to vehicular traffic.

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

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

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

Trenches for pipe and electrical conductors may be excavated manually or with mechanical trenching equipment. Trenching equipment shall be essentially vertical so that a minimum of

surface is disturbed. Blades of road graders shall not be used to excavate trenches. Trenches for pipe shall be excavated to the depths shown on the Plans.

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

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

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

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

20-5.05 Pipe

Plastic pipe supply lines, plastic pipe irrigation lines, and fittings shall be installed in accordance with the pipe and fitting manufacturers' printed instructions and these Specifications.

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

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

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

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

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

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

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

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

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

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

The Contractor shall make solvent weld joints with nonsynthetic bristle brush in the following sequence:

1. Apply a liberal, even coat of purple PVC primer to the pipe and fitting immediately before applying the solvent.
2. Apply a liberal even coat of solvent to the inside of the fitting and then to the outside of the pipe, making sure that the coated area is equal to the depth of the fitting socket.
3. Insert the pipe quickly into the fitting and turn the pipe approximately one-quarter (1/4) turn to distribute the solvent and remove air bubbles. Hold the joint for approximately fifteen (15) seconds so the fitting does not push off the pipe.
4. Use a clean rag and wipe off all excess solvent.
5. To prevent disturbing the last completed joint, the pipe shall not be twisted when making subsequent joints.

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

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

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

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

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

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

20-5.05.A Subsurface Dripperline

Subsurface dripperline shall conform to Section 50-43.17, “Subsurface Dripperline”, of these Specifications and shall be installed in accordance with Standard Drawings L-13, L-14, and L-15.

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

Dripperlines shall be installed using barbed fittings only. Subsurface dripperline systems shall be installed with flush valves and air vacuum relief valves.

20-5.05.B Valves and Valve Boxes

Irrigation control valves and valve boxes shall be of the type shown on the Plans or specified in the Special Provisions and shall conform to Sections 50-43.22, “Control Valves,” and 50-43.24, “Valve Boxes”, of these Specifications. Irrigation control valves shall be installed in accordance with Standard Drawings L-3 and L-4.

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

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

Valves shall be placed in groupings for ease of maintenance.

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

Valve boxes shall be identified by labels attached to the covers that contain the appropriate abbreviations. Remote control valves shall be labeled with the controller station. Quick coupling valves shall be labeled “QC”. Gate valves shall be labeled “GV”. Labels for valve boxes shall consist of either one of the following:

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

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

20-5.05.C Quick Coupling Valve

Quick coupling valves shall conform to Section 50-43.21, “Quick Coupling Valves”, of these Specifications and shall be installed in accordance with Standard Drawing L-5. Quick coupling valves shall be installed with Sch. 80 PVC fittings and swing joint assemblies.

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

20-5.05.D Backflow Preventers

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

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

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

Backflow preventer installations shall include a backflow device protection blanket.

20-5.05.E Master Valve/Flow Meter Assembly

Assembly shall conform to Section 50-43.23, “Master Control Valve/Flow Sensor Assembly”, of these Specifications and be installed in accordance with Standard Drawing L-6. Assembly shall be installed after the water meter and the backflow preventer at the irrigation point of connection. Unit shall be installed above grade either on downstream leg of backflow unit or as

an isolated installation, as shown on the Plans. Assembly shall be as shown or specified in the Contract, and shall conform to Section 50-43.23, "Master Control Valve/Flow Sensor Assembly", of these Specifications.

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

20-5.05.F Air Vacuum Relief Valve

Air vacuum relief valve shall conform to Section 50-43.30, "Air Vacuum Relief Valve", of these Specifications and shall be installed in accordance with Standard Drawing L-8.

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

20-5.05.G Flush Valve

Flush valve shall conform to Section 50-43.31, "Flush Valve Assembly", of these Specifications and shall be installed in accordance with Standard Drawing L-7.

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

20-5.05.H Sprinklers and Emitters

Sprinklers and emitters shall conform to Section 50-43.19, "Sprinklers and Emitters", of these Specifications and shall be installed in accordance with Standard Drawings L-9, L-10, L-11, and L-12.

20-5.05.I Pressure Testing

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

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

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

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

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

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

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

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

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

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

Contractor shall disinfect potable water lines according to AWWA standards.

20-5.05.J Repairs and Coverage

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

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

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

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

20-5.06 Measurement and Payment

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

20-6 RECORD DRAWINGS AND CONTROLLER CHARTS

The Contractor shall maintain record drawings and controller drawings in conformance with the requirements in Section 11, "Preconstruction Photographs and Record Drawings", of these Specifications and this Section (Section 20).

Prior to the final inspection, the Contractor shall submit to the Agency, for review and comment by the Landscape Architect, one (1) set of Record Drawings. The work will not be formally accepted until the Record Drawings are accepted by the Landscape Architect. Upon approval by the Landscape Architect, these records shall be delivered to the Agency, in reproducible form, and in good and acceptable condition prior to final acceptance of the Work.

The Contractor shall provide two (2) reduced (original 11" x 17") charts for each controller. One copy shall be placed on the inside of the controller enclosure door. The second copy shall be provided to Agency maintenance personnel. Record Drawings shall be approved by the Landscape Architect prior to preparing the charts.

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

1. Connections to existing water lines (point-of-connections);
2. Routing of pressure lines (Show typical station offset and/or dimensions on record drawings);
3. Routing of control valves;
4. Locations of remote control valves, gate valves, and quick coupling valves (Show station offset and/or dimensions on record drawings); and
5. Other items as directed by the Agency.

The chart shall be a black line or blue line print and shall be colored or otherwise coded to indicate the area of coverage for each station.

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

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

SECTION 21 FINISHING ROADWAY

21-1 GENERAL

Upon completion of all construction operations, the entire roadway or roadways shall be finished as specified in Section 22, “Finishing Roadway” of the State Specifications, and these Specifications.

References to “highway” or “right-of-way” shall be construed as references to any earthwork or grading operation.

21-2 PAYMENT

Full compensation for any necessary finishing is included in the prices paid for the various items of work and no additional compensation will be paid.

SECTION 22 BASE MATERIAL

22-1 LIME TREATED BASE

Road-mixed lime treated base shall be constructed in accordance with Section 24, “Lime Stabilization”, of the State Specifications.

Lime to be mixed with the existing material shall conform to the requirements of Section 24-1.02, “Materials”, of the State Specifications.

The percentage of hydrated lime to be added by weight shall be as specified in the Special Provisions.

Lime treated base shall be compacted to a minimum relative compaction of ninety-five percent (95%).

22-2 AGGREGATE BASE

Aggregate base shall conform to Section 26, “Aggregate Bases”, of the State Specifications, and these Specifications.

The Contractor may propose the use of recycled portland cement concrete or asphalt concrete materials for aggregate base. The amount of reclaimed material shall not exceed fifty percent (50%) of the total volume of the aggregate used. The Contractor shall submit to the Agency material samples and laboratory test data certifying that the proposed materials meet all the quality requirements of Section 26 of the State Specifications, and these Specifications. The Contractor may not propose to use recycled asphalt concrete, generated from asphalt concrete removed from within the area of work, for aggregate base unless the recycled material is surplus material from the Work. Proposed recycled materials shall not be used in the Work unless approved in writing by the Agency. Data and samples shall be submitted at least thirty (30) days prior to expected use of the proposed materials in the Work.

The material shall be deposited on the roadbed in such a manner as to provide a uniform section of material within five percent (5%) tolerance of the predetermined required volume. Deposition shall be by methods that prevent segregation of the material. The deposited material shall contain sufficient moisture to prevent segregation. Aggregate base material shall be immediately spread to its planned grade and cross section. Segregation or excessive drifting or spotting of material will not be permitted. Any material determined by the Agency to be unsuitably segregated, shall be removed from the roadbed or completely reworked to provide the desired uniformity of the material.

The Contractor is responsible for maintaining the required moisture content until the next successive layer of material is placed. No additional compensation will be paid for water applied to the aggregate base after the material has been weighed.

Aggregate bases shall be compacted to a minimum relative compaction of ninety-five percent (95%) as determined by California Test Method No. 231.

The surface of the finished aggregate base at any point shall not vary more than 0.05-foot above or below the grade established by the Agency.

22-3 CEMENT TREATED BASES

Road-mixed and plant-mixed cement treated bases shall be in accordance with Section 27, “Cement Treated Bases”, of the State Specifications.

22-4 MEASUREMENT AND PAYMENT

Lime stabilization will be measured by the square yard in accordance with Section 24-1.10, “Measurement”, of the State Specifications. The price paid per square yard for lime treated base includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing lime treated base, complete in place, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency. Full compensation for removal of rocks and solids greater than two and one-half inches (2-1/2”) in size is included in the price paid per square yard for lime treated base and no additional compensation will be allowed.

The quantity of aggregate base to be paid for will be measured either by the ton or cubic yard, as designated in the Contract. The quantity to be paid for will be calculated using the dimensions shown on the Plans adjusted by the amount of any change ordered by the Agency. No allowance will be made for any aggregate base placed outside said dimensions unless otherwise directed by the Agency.

The price paid per ton or cubic yard for aggregate base includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and placing aggregate base, complete in place, including applying water, compacting the material, and finishing the surface, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 23 - ASPHALT CONCRETE

23-1 GENERAL

Asphalt concrete shall conform to Section 39 of the State Specifications, May 2006 edition, and these Specifications. This reference to 2006 State Specifications applies only to this Section 23.

Asphalt concrete is designated as Type A, Type B, Type C, or Open Graded. Type C asphalt concrete shall be as specified in the Special Provisions. Asphalt concrete is also designated by gradation, according to percentage of crushed particles and sand equivalent of the aggregate (for dense graded mixtures) or according to intended use (for open graded mixes) and by class, according to texture of the mixture.

The Contractor's operations shall be conducted in a manner that will not harm or damage existing facilities or improvements.

At locations where public traffic is routed over the base grade, the Contractor shall plan the paving operations to minimize the delay of traffic.

The Contractor, when required to provide for the passage of public traffic through the work, shall do so in accordance with the provisions of Section 12, "Construction Area Traffic Control", of these Specifications.

23-2 MIX FORMULA AND DESIGN

The Contractor shall submit to the Agency for approval a job mix formula and mix design. Mix designs shall be accompanied by current test results that indicate compliance with these Specifications and the Special Provisions. A job mix formula shall be submitted by the Contractor for each designation of asphalt concrete, based on samples of conforming aggregate materials supplied for each source or supplier proposed by the Contractor, with optimum binder content determined per California Test Method 367 with the exception that CKE test shall be waived and Caltrans Test Method 309 shall be used to determine the Maximum Theoretical Density of the mixture. The job mix formula shall establish a single percentage of aggregate passing each required sieve size, a percentage of asphalt binder to be added to the aggregate. The ASPHALT CONCRETE binder content shall be based on 4.0% air voids.

Where more than one source or supplier is designated to supply asphalt concrete, those mixes will be kept separated. The mixes shall not be intermixed in the same lift or section of pavement. The Contractor shall submit paving plans showing, in advance, where the mixes from each source will be used. This plan will be subject to approval by the Agency.

23-3 AGGREGATES AND BINDERS

23-3.01 Aggregates

The aggregate gradation shall conform to the following:

Aggregate Gradation
(Percentage Passing)
Asphalt Concrete Types A and B

3/4–inch AC Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
1"	100	—
3/4"	90 - 100	TV ±5
1/2"	70 - 90	TV ±6
No. 4	45 - 55	TV ±7
No. 8	32 - 40	TV ±5
No. 30	12 - 21	TV ±4
No. 200	2 - 7	TV ±2

1/2–inch AC Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	95 - 99	TV ±6
3/8"	75 - 95	TV ±6
No. 4	55 - 66	TV ±7
No. 8	38 - 49	TV ±5
No. 30	15 - 27	TV ±4
No. 200	2 - 8	TV ±2

3/8–inch AC Types A and B

Sieve Sizes	Target Value Limits	Allowable Tolerance
1/2"	100	—
3/8"	95 - 100	TV ±6
No. 4	58 - 72	TV ±7
No. 8	34 - 48	TV ±6
No. 30	18 - 32	TV ±5
No. 200	2 - 9	TV ±2

Aggregate size selection shall be as follows:

Aggregate Selection Requirements	
AC Lift Thickness	Aggregate Size
Less than 2 ¼”	1/2”
Greater than or equal to 2¼” where total AC section is less than or equal to 3”	1/2”
Greater than or equal to 2¼” where total AC section is greater than 3”	¾”

23-3.02 Binders

The asphalt binder grade shall comply with Section 92, “Asphalts” of the State Specifications and the following:

Conventional dense graded asphalt used on on-ramps, off-ramps, arterial streets and thoroughfare streets shall use PG 70-10 binder

Conventional dense graded asphalt used on residential and collector streets shall use PG 64-10 binder.

Rubberized asphalt shall use PG 64-16 base.

23-3.03 Quality Control Testing

Quality control testing shall be performed in a timely manner. Quality control test results shall be provided to the Agency upon request. For the purpose of quality control, the Contractor shall perform the following tests:

TABLE 23-1. QUALITY CONTROL TESTING

Quality Characteristic	Action Limit	Test Method	Testing Frequency	Point of Sampling
Gradation	Per Specified Tolerance	Cal. Test 202	1/500 tons (1)	Composite cold feed or hot bins (2)
Mix Asphalt Content	± .5 %	Cal. Test 379 or 382	1/1000 tons(1)	From truck, windrow, or behind paver

(1) One per day minimum

(2) At continuous mix plants from composite cold feed belt. At batch plants from hot bins.

23-4 RECYCLED ASPHALT PAVEMENT

At the option of the Contractor, reclaimed asphalt pavement (RAP) may be substituted for the virgin aggregate at a rate of up to fifteen percent (15%) by total weight of aggregate in the asphalt concrete.

RAP stockpiles may be from a single source or multiple sources and shall consist solely of RAP material. Stockpiling and processing of RAP shall be performed in a manner that will prevent contamination and segregation, resulting in a uniformly blended and homogenous material. Stockpiles shall be located on surfaces that are smooth and free of debris and organic material. The Agency shall be given unrestricted access to stockpiles for inspection and testing as deemed necessary.

The amount of virgin asphalt binder to be mixed with the combined virgin aggregate and RAP will be determined by the Contractor in conformance with California Test Method 367, with the exception that the C.K.E. test shall be waived and Caltrans Test Method 309 shall be used to determine the Maximum Theoretical Density. In lieu of historical data, the approximate asphalt demand may be calculated in accordance with the Asphalt Institute Handbook MS-4.

The percentage of RAP and the mixture gradation Target Values shall be designated at the time of the asphalt mix design. Subsequent changes in the Target Values of the aggregate grading and design asphalt content will not be permitted without additional testing to verify compliance with the requirements for stability and air voids. Changes will not be allowed without the approval of the Agency.

The proposed mix design shall be submitted to the Agency for review and approval. In addition to the requirements of Section 39 of the State Specifications, the Contractor shall provide the Agency with the following information:

Location of RAP stockpile

The individual and average asphalt content test results representative of the proposed RAP stockpile based on a minimum of one (1) test per 5,000 tons of material in the RAP stockpile. The asphalt content shall be determined in accordance with ASTM D 2172, Method B.

The individual and average asphalt-free gradations of the RAP material derived from the samples used to determine the asphalt content.

Asphalt concrete shall be produced in conformance with the requirements of Section 39 of the State Specifications, except that the requirement for storing and drying shall not apply to the RAP material. Ingredient proportioning shall comply with the requirements of Section 39 of the State Specifications. ASPHALT CONCRETE with or without RAP shall not exceed 325 degrees F. When the recycled asphalt pavement mixture is produced by batch mixing, the time of mixing shall not be less than thirty-five (35) seconds. When combined mathematically, the virgin aggregate and the asphalt-free RAP aggregates shall conform to the design gradation as required by these Specifications.

The Contractor's mixing equipment shall be equipped with a suitable, safe sampling device, or locations, capable of providing representative samples of virgin aggregates and RAP production materials being incorporated into the recycled asphalt pavement mixture. Should a continuous mixing plant be used, the RAP material shall be protected from direct contact with the burner flame by means of a shield, separator, secondary drum or other method approved by the Agency.

The binder shall be introduced into the mixer after the virgin aggregate and RAP material have been combined. Should a batch mixing plant be used, the RAP material shall be kept separate from the virgin aggregate until both ingredients enter the weigh hopper and/or pugmill.

23-5 HAULING EQUIPMENT

Vehicles used for hauling asphalt concrete mixtures shall have tight, smooth, metal beds, and shall be free from dust, screenings, excessive petroleum oils, volatiles, or other mineral spirits that may affect the mix being hauled. Trucks shall be provided with tarpaulins or cargo covers of sufficient size and weight to protect the entire load. Loads shall be covered when necessary to achieve the specified density and finish quality.

23-6 NOT USED

23-7 NOT USED

23-8 ASPHALT CONCRETE PLACEMENT METHOD

23-8.01 General

Unless otherwise specified in the Special Provisions, asphalt concrete shall be placed as specified in this Section.

For asphalt concrete placed on minor streets, asphalt concrete may be placed in a single lift up to three inches (3") thick. For major streets, the top layer of asphalt concrete shall be placed in a lift no less than one and one-half inches (1-1/2") and no greater than two and one-half inches (2-1/2") in compacted thickness. The next lower layer of asphalt concrete shall be placed in a lift no less than one and one-half inches (1-1/2") and no greater than three inches (3") in compacted thickness. All other lower layers shall be placed in lifts no greater than four inches (4") in compacted thickness.

The total thickness of asphalt concrete shall be as shown on the plans with the following exception for asphalt concrete paving in the vicinity of sidewalk ramps. For the area of pavement that is no greater than twelve feet wide and adjoins the lip of gutter of a sidewalk ramp, new asphalt concrete paving shall be allowed to be constructed with a pavement thickness that is up to three-quarters of an inch (3/4") less than the thickness of the asphalt concrete pavement section shown on the plans (see Standard Drawing 4-23C).

Paving work shall be a continuous non-stop operation with delivery trucks arriving in a uniform manner. The Agency will meet daily with the Contractor to evaluate the Contractor's operations relative to the work time restrictions.

The asphalt concrete shall be delivered to the site in a thoroughly blended condition and shall be spread by a self-propelled asphalt paving machine in such a manner as to avoid segregation during the placing operations. Initial rolling shall be performed immediately after placement. No asphalt concrete shall be placed when the atmospheric temperature is below 50°F, except as follows:

When asphalt concrete is placed as a base course, the asphalt concrete may be placed when the ambient temperature is 40°F and rising, if the material is deposited directly into the hopper of the paving machine.

No paving work whatsoever shall be allowed when the roadway is moist or damp. No paving work whatsoever shall be allowed when it is raining. For the purpose of this provision, "raining" shall mean any weather condition that causes the roadway to become moist or damp. In the case of sudden precipitation, all paving work must stop immediately, all asphalt concrete on site not yet placed and all asphalt concrete in transit from the plant shall be rejected and no payment will be allowed.

Any time new asphalt concrete is to be placed in contact with existing asphalt concrete, the surface shall be cleaned and a tack coat of asphaltic emulsion shall be applied to ensure proper bond. Asphaltic emulsion shall be applied to vertical edges of any existing pavement, curbs, and gutters adjoining the area to be paved. Asphaltic emulsion shall be of the high viscosity type subject to the approval of the Agency, and shall conform to Sections 39 and 94 of the State Specifications.

Unless otherwise specified in the Special Provisions or these Specifications, the minimum compacted thickness of asphalt concrete shall be the thickness shown on the Plans. The tolerance for minimum thickness for all operations shall be 0.01 feet. The tolerance for maximum thickness for asphalt concrete structural sections less than 0.35 feet thick shall be 0.02 feet, and for sections more than 0.35 feet thick shall be 0.03 feet.

At the end of the Working Day, the distance between the ends of the adjacent improved lanes shall be between five feet (5') and ten feet (10'), unless otherwise approved by the Agency.

23-8.02 Pre-Overlay Preparation

Existing asphalt concrete roadways to be overlaid with asphalt concrete shall be prepared as follows:

A leveling course may be required. Leveling courses shall be Type "A" asphalt concrete with three-eighths inch (3/8") inch aggregate gradation. A leveling course shall be required for all locations for which the difference in elevation between the existing pavement surface and the finished pavement surface, as indicated on the Plans, exceeds the thickness of the overlay designated for the associated areas of roadway by more than 0.02 feet. The total thickness for asphalt concrete leveling course varies. At locations where the leveling course thickness exceeds three inches (3"), the leveling course shall be placed in lifts not exceeding three inches (3"). For projects with pavement reinforcing fabric, leveling course material shall be placed prior to the placement of the fabric.

The Contractor is responsible for removing all vegetation from the edge of pavement and sweeping and washing the pavement, if required, in advance of the overlay operation. It is recommended that a power water wash be used in the deceleration zones of intersections for the complete removal of dust that may cause overlay slippage.

The Contractor shall remove and dispose of all pavement markers, temporary Type "B" Detector Handhole protection devices, and temporary traffic stripe (tape), if any, prior to the

overlay. In addition, the Contractor shall remove and dispose of existing traffic bars as required by the Agency.

All thermoplastic limit lines, crosswalks, and legends existing on the road surface shall be scarified prior to placing the overlay. Scarification shall be performed by grinding such that a minimum fifty percent (50%) of the underlying pavement is exposed. All areas of thermoplastic shall show evidence of scarification. All material resulting from the grinding operation shall be removed immediately from the right-of-way and shall become the property of the Contractor and properly disposed of.

Striping removal shall occur no sooner than one Calendar Day prior to the scheduled date for the placement of asphalt concrete overlay. If the stripe removal is performed on a day other than the day of the pavement overlay, the Contractor shall supply and install temporary pavement markings. Temporary pavement markings shall be flush mounted reflectorized tape squares, 4" x 4" #M "Staymark" with backing liners, detour grade, #6350 yellow and #6351 white, or approved equal. Right turn barrier lines, edge lines, and shoulder lane lines shall not be delineated with temporary pavement markings. The spacing of the temporary pavement markings shall be as follows:

Line Type	Color	Spacing
Centerline (straight roadway portions)	Yellow	48' O.C.
Centerline (tapered or curving portions)	Yellow	24' O.C.
Stop Lines	White	6' O.C.
Channelizing Line	White	24' O.C.

The Contractor shall be responsible for the removal of the temporary pavement markings prior to the placement of the overlay.

All manhole and other utility covers encountered in the area to be overlaid with asphalt concrete shall be carefully referenced out by the Contractor and the locations of the cover painted on the surface immediately after paving. All storm drain and sewer manhole and monitoring well box adjustments are the responsibility of the Contractor. Adjustment to grade of other utility covers will be by others.

The Contractor is responsible for furnishing and placing an asphalt emulsion tack coat in advance of the overlay as provided in Sections 37, 39, and 94 of the State Specifications.

23-8.03 Spreading

All mixtures shall be spread at a temperature of not less than 260°F.

23-8.03.A Hand Spreading

Areas inaccessible to spreading and compaction equipment may be paved by such methods as approved by the Agency. In limited areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the asphalt concrete mixture may be spread, raked, and luted by hand tools. The mixture shall be thoroughly compacted by means of pneumatic tampers or other methods. Asphalt concrete paving placed by hand as defined above is exempt from the pay reduction factors included in Section 23-9.02, "Pay Factors", in these Standard Construction Specifications When hand spreading is permitted, the mixture shall be dumped either on the grade or on dump sheets outside the area upon which it is to be spread, and then distributed into place using hot shovels, and spread with hot rakes in a uniformly loose layer to the full width required, and at a depth that, when the Work is completed, will have the required thickness and will conform to the grade and surface tolerance specified.

Whenever hand spreading or backwork is required behind the paving spread, the paving machine shall be stopped until such hand spreading or backwork is completed.

23-8.03.B Mechanical Spreading Equipment

In addition to the requirements in Section 39-5.01, "Spreading Equipment", of the State Specifications, asphalt equipment shall be equipped with automatic screed controls and a sensing device or devices. A twelve-foot (12') long straightedge shall be required on all paving machines.

Asphalt pavers shall be self-propelled mechanical spreading and finishing equipment, provided with a screed or strike-off assembly capable of distributing the material to not less than twelve feet (12') in width. Screed actions shall include any cutting, crowding, or other practical action which is effective on the mixture without tearing, shoving, or gouging, and which produces a surface texture of uniform appearance. The screed shall be adjustable to the required section and thickness. Pavers shall not leave ridges, indentations, or other marks that cannot be eliminated by rolling or prevented by adjustment of operation.

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The paver shall be equipped with distributing screws to place the mixture uniformly in front of the screed.

The screed shall be equipped with a controlled heating device for use when required. The screed shall strike off the mix to the depth and cross-section specified.

The material being placed in the abutting lanes shall be tightly crowded against the face of the previously placed lane. The paving machine shall be positioned to overlap the existing mat only to the extent that the material placed against the joint is tightly crowded against the vertical face at the joint and that the conform raking leaves no ridges or depressions. Before compacting or pinching the joint, the coarse aggregate in the overlapped material that has dislodged through raking shall be removed from the pavement surface and discarded.

When placing asphalt concrete to lines and grades established by the Agency, the automatic controls shall control the longitudinal grade. Grade and slope references shall be furnished, installed, and maintained by the Contractor. A ski device shall be used on roadways with two or more lanes in any one direction, or if required by the Special Provisions. The minimum length of the ski device shall be twenty-seven feet (27'), and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device. When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 0.01-foot tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same manner as when placing the initial mat.

Should the automatic screed controls fail to operate properly during any day's work, the Contractor may use manual control of spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the requirements in this Section before starting another day's work.

23-8.04 Joints

Lines for the paver to follow in placing individual lanes shall be parallel to the centerline of the roadway or to a baseline established by the Agency. Longitudinal pavement joints shall be within six inches (6") of the lane lines shown on the Plans or as specified in the Special Provisions.

Transverse construction joints and temporary runoff tapers shall be constructed so that no gradual ramping down of the mat occurs back from the joint. Bond breaking paper may be required under the runoff taper for later removal if specified by the Special Provisions.

23-8.05 Compacting

The Contractor shall furnish equipment capable of producing the required compaction. For vibratory rollers, the vibratory mode shall automatically shut off when machine direction is changed.

All asphalt concrete paving shall be constructed to produce material with a density of not less than 92%, nor greater than 97% (CTM 309) except for base course paving. Asphalt placed directly on subgrade or aggregate base (base course paving) shall be not less than 90%, nor greater than 97% (CTM 309).

23-8.05.A Density requirements - Minor Streets

Density on minor streets shall be determined by nuclear gage testing or approved non-destructive testing method. For all such paving, the Contractor shall provide quality control testing at locations based on a random sampling plan with not less than one test per five hundred (500) tons. If the density does not fall within the density range, the Contractor may test at two additional locations within the same 500 tons and average the results of all of the three tests. This averaged result shall fall within the above-specified range. The Contractor shall notify the County inspector prior to paving and provide contact information for Contractor's testing personnel. The Agency reserves the right to conduct parallel quality assurance testing at its discretion in accordance with Caltrans test methods, 308, 309, and 375.

23-8.05.B Density Requirements - Major Streets

Density of asphalt concrete paving placed on major streets shall be measured as specified in Section 23-9.

23-9 ASPHALT CONCRETE PLACEMENT ACCEPTANCE TESTING

Except as detailed above for minor streets, materials testing necessary to determine conformance with the requirements of this Section, excluding bituminous distributor testing, will be performed by the Agency and the cost thereof will be borne by the Agency.

23-9.01 Pavement Density Testing

Pavement density will be determined by comparing the average density of cores taken from the compacted pavement to the Maximum Theoretical Density as determined by California Test 309 (CT 309).

23-9.01.A Lot Sizes

The pavement will be accepted for density on a lot basis. A lot will consist of five hundred (500) tons or portions thereof.

23-9.01.B Maximum Theoretical Density (Rice)

Bituminous mixture for Maximum Theoretical Density shall be randomly sampled on a lot basis.

23-9.01.C Core Density

Cores for determining the density of the compacted pavement shall be taken on a lot basis, a minimum of three (3) cores per lot, on a random basis, and in the presence of the Inspector. The lot size shall be as indicated in Section 23-9.01.A in this Section of these Specifications. The cores shall be taken in accordance with the Special Provisions and as directed by the Agency. The density of each core shall be determined per CTM 308.

Core samples for determination of the density of completed pavements shall be obtained by the Contractor at the Contractor's expense, and no additional compensation will be paid. The core samples shall be four inches (4") in diameter. The Contractor may utilize a nuclear density gauge for preliminary testing. Dry ice may be used for cooling the pavement prior to coring. The number and locations of the samples will be as agreed upon in the field by the Agency and

the Contractor. Samples shall be neatly cut with a saw, core drill, or other approved equipment. The Contractor shall provide the core samples to the Agency within two (2) hours after final compaction. Special arrangements must be made with the Agency Material Testing Laboratory if the Contractor wishes test results within less than twelve (12) hours for night paving or normal work performed late in the day.

The Agency will meet in the field with the Contractor and mutually agree on several locations for compaction testing for the given lot and provide a reference marker to the sidewalk or side of the road. The actual test location will be randomly selected from the several agreed-upon locations.

23-9.02 Pay Factors

Asphalt concrete paving placed on minor streets and base course paving as defined in Section 23-8.05 are exempt from the pay reduction factors.

For all asphalt concrete pavement subject to acceptance testing, the finished asphalt concrete pavements that do not conform to the specified relative compaction requirements will be paid for using the following pay factors:

Reduced Payment Factors for Percent of Maximum Theoretical Density

AC Type A and B and ARHM-GG Percent of Maximum Theoretical Density	Reduced Payment Factor	AC Type A and B and ARHM-GG Percent of Maximum Theoretical Density	Reduced Payment Factor
92.0	0.0000	97.0	0.0000
91.9	0.0125	97.1	0.0125
91.8	0.0250	97.2	0.0250
91.7	0.0375	97.3	0.0375
91.6	0.0500	97.4	0.0500
91.5	0.0625	97.5	0.0625
91.4	0.0750	97.6	0.0750
91.3	0.0875	97.7	0.0875
91.2	0.1000	97.8	0.1000
91.1	0.1125	97.9	0.1125
91.0	0.1250	98.0	0.1250
90.9	0.1375	98.1	0.1375
90.8	0.1500	98.2	0.1500
90.7	0.1625	98.3	0.1625
90.6	0.1750	98.4	0.1750
90.5	0.1875	98.5	0.1875
90.4	0.2000	98.6	0.2000
90.3	0.2125	98.7	0.2125
90.2	0.2250	98.8	0.2250
90.1	0.2375	98.9	0.2375
90.0	0.2500	99.0	0.2500
< 90.0	Remove and Replace	> 99.0	Remove and Replace

23-10 ASPHALT RUBBER HOT MIX-GAP GRADED (ARHM-GG)

Where specified in the Special Provisions, Asphalt Rubber Hot Mix-Gap Graded (ARHM-GG) shall be used. Asphalt Rubber Hot Mix-Gap Graded shall conform to the provisions for Type A asphalt concrete in Section 39, "Asphalt Concrete", of the 2006 State Specifications, and these Specifications.

Binder for ARHM-GG shall be, at the Contractor's option, Type 1 or Type 2 asphalt-rubber binder as specified in Sections 23-10.01 and 23-10.02 respectively, in this Section of these Specifications.

The asphalt used in asphalt-rubber binder shall be PG 64-16 per Section 92 of the State Specifications.

The amount of asphalt used in asphalt-rubber binder to be added to the aggregate shall be between six and seven-tenths percent (6.7%) and eight and seven-tenths percent (8.7%) by dry weight of the aggregate. The amount used shall be in accordance with Section 23-2 of these Specifications. The temperature of the aggregate at the time the asphalt-rubber binder is added shall be not more than 350°F.

Rubber for use in asphalt-rubber binder shall be free of loose fabric, wire, and other contaminants, except that up to four percent (4%) (by weight of rubber) calcium carbonate or talc may be added to prevent rubber particles from sticking together. The rubber shall be sufficiently dry to be free flowing and not produce foaming when blended with the hot asphalt. The Contractor shall furnish a "Certificate of Compliance" as outlined in Section 6-1.07, "Certificates of Compliance", of the State Specifications.

A sample of the asphalt-rubber binder proposed for use on the project, consisting of four (4) one-quarter (1/4) cans, together with the proposed formulation of the binder, shall be furnished to the Agency at least two weeks before ARHM-GG pavement construction is scheduled to begin. These samples will be held at the Agency Lab for comparison to material in the field, if necessary.

The method and equipment for combining the rubber and asphalt shall be so designed and accessible that the Agency can readily determine the percentage by weight for each material being incorporated into the mixture.

Equipment utilized in the production and proportioning of the asphalt-rubber binder shall include the following:

An asphalt heating tank (per Section 23-10.04.B in this Section)

A mechanical blender (per Section 23-10.04.C in this Section)

A supply system (per Section 23-10.04.E in this Section)

The swell, moisture vapor susceptibility, and the stabilometer value requirement in Section 39-2.02, "Aggregate", of the State Specifications shall not apply to ARHM-GG.

Traffic shall not be allowed on the ARHM-GG for at least one hour after final rolling operations have been completed. Before opening a traffic lane to public traffic, the Agency may direct a sand cover be spread uniformly over areas where ARHM-GG has been placed.

Sand shall be free from clay or organic material and shall be of such size that from ninety to one hundred percent (90 to 100%) will pass a No. 4 sieve and not more than five percent (5%) will pass a No. 200 sieve. Sand shall be spread at the approximate rate of one (1) to two (2) pounds per square yard.

It is important that the breakdown roller compact the mat while the ARHM-GG is within the proper temperature zone. A cool mat will be resistant to compaction. It is recommended that two (2) vibratory rollers be used to insure timely compaction. Pneumatic tired rollers shall not be used to compact ARHM-GG.

The asphalt-rubber mixture shall not be used as a binder after it has been retained for more than forty-eight (48) hours.

23-10.01 Type 1 Asphalt-Rubber Binder

Type 1 asphalt-rubber binder shall be a uniform reacted mixture of compatible paving grade asphalt and reclaimed vulcanized rubber.

The reclaimed vulcanized rubber shall be produced primarily from the processing of automobile and truck tires. The rubber shall be produced by ambient temperature grinding process only.

The specific gravity of the rubber shall be between 1.10 and 1.20 and shall conform to the following gradation when tested in accordance with ASTM C 136:

Sieve Size	Percentage Passing
No. 10	100%

The length of the individual rubber particles shall not exceed three-sixteenths inch (3/16").

The asphalt-rubber mixture shall contain between fourteen percent (14%) and twenty percent (20%) rubber by weight of the total asphalt-rubber mixture.

The temperature of the asphalt shall be between 350°F and 425°F at the time the rubber is blended with the asphalt. The asphalt and rubber shall be combined and mixed together in a blender unit, pumped into the agitated storage tank, and then reacted for a minimum of forty-five (45) minutes from the time the rubber is added to the asphalt. The temperature of the asphalt-rubber mixture shall be maintained between 325°F and 375°F during the reaction period and shall possess the following physical property after the reaction period:

Viscosity, 350°F (ASTM D 2196) (Brookfield)	1500 cp minimum

After the material has reacted for at least thirty (30) minutes, the asphalt-rubber shall be metered into the mixing chamber of the asphalt concrete production plant at the percentage specified or designated by the Agency.

After reaching the desired consistency, the asphalt-rubber mixture shall not be held at temperatures over 325°F for more than four (4) hours.

The Contractor shall provide to the Agency confirmation of viscosity test results from the asphalt-rubber tank. The test shall be, in the opinion of the Agency, sufficient to verify that the viscosity of the entire tank is homogenous during the asphalt concrete production.

23-10.02 Type 2 Asphalt-Rubber Binder

Type 2 asphalt-rubber binder shall be a uniform reacted mixture of compatible paving grade asphalt, extender oil, and granulated reclaimed vulcanized rubber.

Extender oil shall be resinous, high flash point aromatic hydrocarbon conforming to the following:

Test Parameter	Requirement
Viscosity, SUS @ 100°F (ASTM D 88)	2500. min
Flash Point, COC, °F (ASTM D 92)	390. min
Molecular Analysis (ASTM D 2007)	
Asphaltness, % by weight	0.1 max
Aromatics, % by weight	55.0 min

The asphalt and extender oil, when combined, shall form a material that is chemically compatible with the rubber.

The rubber used in Type 2 asphalt-rubber binder shall be reclaimed vulcanized rubber and shall contain between twenty percent (20%) and thirty percent (30%), by weight, natural rubber when tested in accordance with ASTM D 297. The rubber shall conform to the following grading when tested in accordance with ASTM C 136:

Sieve Size	Percentage Passing
No. 8	100

The rubber shall contain no particles longer than one-quarter inch (1/4") in length.

The extender oil shall be added to the asphalt at a rate between two percent (2%) and six percent (6%) by weight of the asphalt. The exact amount shall be determined by the asphalt-rubber supplier. The asphalt shall be at a temperature of not less than 350°F nor more than 425°F when the extender oil is added.

The asphalt-extender oil blend and rubber shall be combined and mixed together in the blender unit to produce a homogeneous mixture.

The amount of rubber to be added to the asphalt-extender oil blend shall be between seventeen percent (17%) and twenty-three percent (23%) by weight of the total combined mixture of asphalt, extender oil, and rubber. The exact amount shall be determined by the asphalt-rubber supplier. The asphalt-extender oil blend shall be at a temperature of not less than 350°F nor more than 425°F when the rubber is added. After the material has reacted for at least thirty (30) minutes, the asphalt-rubber shall be metered into the mixing chamber of the asphalt concrete production plant at the percentage specified or ordered.

The asphalt-rubber mixture shall be reacted for a minimum of thirty (30) minutes from the time the rubber is added to the asphalt-extender oil blend. The temperature of the asphalt-rubber mixture shall be maintained between 375°F and 425°F during the reaction period.

The asphalt-rubber mixture shall possess the following physical property after the reaction period:

Viscosity at 400°F (ASTM D 2196) (Brookfield) 600 to 2,000 cp

The asphalt-rubber mixture, after reaching the desired consistency, shall not be held at temperatures over 375°F for more than four (4) hours.

The Contractor shall provide the Agency viscosity test results from the asphalt-rubber tank, which shall be, in the opinion of the Agency, sufficient to verify that the viscosity of the entire tank is homogenous during the asphalt concrete production.

23-10.03 Aggregate

The aggregate for ARHM-GG shall conform to the following gradation and shall meet the quality requirements for "Type A" as specified in Section 39-2.02, "Aggregate", of the State Specifications.

Asphalt Rubber Hot Mix-Gap Graded (ARHM-GG)

1/2–inch ARHM-GG

Sieve Sizes	Target Value Limits	Allowable Tolerance
3/4"	100	—
1/2"	90 - 100	TV ±6
3/8"	83 - 87	TV ±6
No. 4	28 - 42	TV ±7
No. 8	14 - 22	TV ±5
No. 200	0 - 6	TV ±2

The stabilometer value requirement in Section 39-2.02, "Aggregate", of the State Specifications, shall not apply to ARHM-GG.

The Los Angeles Rattler requirement in Section 39-2.02, "Aggregate", of the State Specifications shall be amended to read "forty percent (40%) maximum loss at five-hundred (500) revolutions".

23-10.04 Equipment

23-10.04.A Haulers

All trucks hauling asphalt concrete shall have tarps available and the loads shall be covered from the plant to the paving machine, unless the ambient air temperature exceeds 75°F or the haul distance is less than 10 miles.

23-10.04.B Asphalt Heating Tank

The asphalt heating tank shall be equipped with a hot oil heat transfer system or retort heating system capable of heating asphalt cement to the necessary temperature for blending with granulated rubber. This unit shall be equipped with a thermostatic heat control device and capable of heating a minimum of twenty-five hundred (2,500) gallons of asphalt cement.

23-10.04.C Mechanical Blender

The asphalt-rubber mechanical blender shall be capable of proper proportioning and thorough mixing of the asphalt and rubber, and have a two (2) stage continuous mixing process capable of producing a homogenous mixture of asphalt cement and granulated rubber at the mix design specified ratios as directed by the Agency. This unit shall be equipped with a granulated rubber feed system capable of supplying the asphalt cement feed system so the continuity of the blending process is not interrupted. The maximum capacity of the primary blending vessel shall be five hundred (500) gallons. Both the primary and secondary blenders shall be equipped with an agitation device oriented horizontally in the blending vessel. The blending unit shall be capable of fully blending the individual rubber particles with the asphalt cement. A separate asphalt cement feed pump and finished product pump are required. This unit shall have both an asphalt cement totaling meter (gallons or liters) and a flow rate meter (gallons per minute or liters per minute).

23-10.04.D Storage/Reaction Tank

The asphalt-rubber storage/reaction tank shall be equipped with a heating system capable of maintaining a temperature of 300°F to 375°F for reacting, pumping, and for adding the binder to the aggregate. The storage/reaction tank shall be separate from the primary blender and secondary blender of the blending unit. The maximum capacity of the storage/reaction unit shall be eight-hundred (800) gallons. This unit shall have an internal mixing device capable of maintaining a uniform mixture of asphalt cement and granulated rubber. The internal mixing device shall be oriented horizontally in the tank.

23-10.04.E Supply System

The asphalt-rubber supply system shall be equipped with a pump and a direct interlock metering device capable of adding the binder by volume to the aggregate at the percentage required by the mix design.

23-10.04.F Temperature Gage

An armored thermometer of adequate range in temperature reading shall be fixed in the asphalt-rubber feed line at a suitable location near the mixing unit.

23-10.05 Placement

ARHM-GG is particularly temperature sensitive and shall be spread at a temperature of not less than 285°F and not more than 325°F, measured in the hopper of the paving machine. See

Section 23-8.02, “Pre–Overlay Preparation”, in this Section of these Specifications for additional placement requirements.

23-11 MEASUREMENT AND PAYMENT

Measurement and payment for asphalt concrete shall be as specified in Section 39-8, “Measurement and Payment”, of the State Specifications, and these Specifications.

When acceptance testing is required for asphalt concrete placement, full compensation for placement of the test section shall be considered as included in the price paid per ton for asphalt concrete and no additional compensation will be paid.

ARHM-GG will be measured by the ton as specified for asphalt concrete in Section 39-8.01, "Measurement”, of the State Specifications.

The unit price paid per ton for ARHM-GG includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved in placing ARHM-GG complete in place, including furnishing and spreading sand cover if directed by the Agency, as shown on the Plan, as specified in the State Specifications, these Specifications, and the Special Provisions, and as directed by the Agency, except that Type "A" asphalt concrete leveling courses shall be paid per ton of Type "A" asphalt concrete, and no additional compensation will be paid.

Type A asphalt concrete leveling courses will be measured and paid for by the ton as asphalt concrete.

23-12 COMPENSATION ADJUSTMENTS FOR PRICE INDEX FLUCTUATIONS

The provisions of this section shall apply only to Asphalt Concrete and Asphaltic Emulsion (Paint Binder).

The compensation payable for paving asphalt used in asphalt concrete and asphaltic emulsion (paint binder) will be increased or decreased in conformance with the provisions of this section for paving asphalt price fluctuations exceeding 10 percent (Iu/Ib is greater than 1.10 or less than 0.90) which occur during performance of the work.

The quantity of paving asphalt used in asphaltic emulsion (paint binder) will be determined by multiplying the item quantity for asphaltic emulsion (paint binder) included in a monthly estimate by the minimum percent residual specified in Section 94, "Asphaltic Emulsions," of the Staate Specifications. The asphaltic emulsion minimum percent residual obtained from Section 94, "Asphaltic Emulsions," of the State Specifications will be based on the type of emulsion used by the Contractor.

At the Contractor’s option, the Contractor may provide actual daily test results for paving asphalt residual for the asphaltic emulsion (paint binder) used. Test results provided by the Contractor shall be from an independent testing laboratory that participates in the AASHTO Proficiency Sample Program. The Contractor shall take samples of asphaltic emulsion from the distributor truck at mid-load from a sampling tap or thief. Two separate 2-liter samples shall be taken in the presence of the Engineer. The Contractor shall provide one sample to the Contractor’s independent testing laboratory, with 24 hours of sampling. The second sample shall be given to the Engineer. The test results from the Contractor’s independent testing laboratory shall be delivered to the Engineer within 10 days from sample date.

The adjustment in compensation will be determined in conformance with the following formulae when the item of asphalt concrete and/or asphaltic emulsion (paint binder) (or both) is included in a monthly estimate:

A. Total monthly adjustment = AQ
B. For an increase in paving asphalt price index exceeding 10 percent:

A = 0.90 (1.1023) (Iu/Ib - 1.10) Ib

C. For a decrease in paving asphalt price index exceeding 10 percent:

A = 0.90 (1.1023) (Iu/Ib - 0.90) Ib

D. Where:

A = Adjustment in dollars per tonne of paving asphalt used to produce asphalt concrete and asphaltic emulsion residual used as paint binder rounded to the nearest $0.01.

Iu = The California Statewide Paving Asphalt Price Index which is in effect on the first business day of the month within the pay period in which the quantity subject to adjustment was included in the estimate.

Ib = The California Statewide Paving Asphalt Price Index for the month in which the bid opening for the project occurred.

Q = Quantity in tons of paving asphalt that was used in producing the quantity of asphalt concrete shown under "This Estimate" on the monthly estimate using the amount of asphalt determined by the Engineer plus the quantity in tons of paving asphalt that would have been used as residual in the asphaltic emulsion (paint binder) shown under "This Estimate" on the monthly estimate.

The adjustment in compensation will also be subject to the following:

A. The Contractor shall be liable to the Agency for decreased compensation adjustments and the Agency may deduct the amount thereof from moneys due or that may become due the Contractor.

B. Compensation adjustments made under this section will be taken into account in making adjustments in conformance with the provisions in Section 4-1.03B, "Increased or Decreased Quantities," of the Standard Specifications.

C. In the event of an overrun of contract time, adjustment in compensation for paving asphalt included in estimates during the overrun period will be determined using the California Statewide Paving Asphalt Price Index in effect on the first business day of the month within the pay period in which the overrun began.

The California Statewide Paving Asphalt Price Index is available at the Division of Engineering Services website: http://www.dot.ca.gov/hq/ese/oe/asphalt_index/astable.html

SECTION 24 SIDE FORMS AND HEADERS

24-1 GENERAL

Side forms and headers for portland cement concrete pavement or asphalt concrete pavement shall be furnished and placed upon an approved subgrade as prepared in conformance with the requirements of Section 18, “Earthwork”, of these Specifications. All requirements specified in this Section for forms shall also apply to headers. All forms shall be mortar tight.

Side forms of timber or metal shall be straight, free from warps, bends, indentations, or other defects. The top edge of each individual section of form shall not vary more than one quarter inch (1/4”) from a true, straight line in the length of the form, and shall be placed to the required grade and alignment of the edge of the finished pavement. Side forms shall not deflect during placing, tamping and finishing of the pavement. Side forms shall not deviate laterally more than one-quarter inch (1/4”) or vertically more than one-eighth inch (1/8”) from proper line and grade. Defective forms shall be removed from the Work.

All forms, whether timber or metal, shall be thoroughly cleaned and oiled before each time they are used throughout the Work.

24-2 FORM JOINTS

Form joints shall be so designed that a perfect support is obtained, and in case joints do not furnish such support, the Contractor will be required either to substitute acceptable forms or, with the approval of the Agency, to wedge the forms with wood and provide double supporting stakes underneath the form ends. There shall be a one-quarter inch (1/4”) expansion gap between the ends of the frame.

24-3 TIMBER SIDE FORMS

Timber side forms shall be Construction Grade Douglas Fir, in accordance with Standard Grading Rules of the Western Wood Products Association, and shall consist of at least two-inch (2”) material, surfaced on one edge and on the side which is placed next to the pavement. The depth of timber forms shall equal the specified depth of the edge of the pavement, but shall not be less than four inches (4”), except where placed on existing pavements. Timbers with rounded edges, ends, corners, or split ends shall not be used.

Timber side forms shall be secured by nailing to side stakes spaced not more than 4 feet (4’) apart and driven vertically in such a manner that their tops are one inch (1”) below the top edge of the side form. Stake dimensions shall not be less than three inches (3”) wide, one and one-half inches (1-1/2”) thick, and eighteen inches (18”) long. Stake length shall be increased when the character of the soil does not permit sufficient bearing to an eighteen-inch (18”) stake.

Side form joints shall be spliced with a section of timber four feet (4’) long, one inch (1”) thick and six inches (6”) wide. The splice section shall be nailed lengthwise, lapping the joints.

Timber side forms shall be supported on two-inch by three-inch (2" x 3") stakes, spaced not more than four feet (4’) apart and driven with their tops to the line and grade for the bottom of the side form. These stakes shall be of adequate length to rigidly support the forms, but in no case shall they be less than eight inches (8”) long.

24-4 METAL SIDE FORMS

Metal side forms shall have sufficient rigidity to prevent springing during the placing, tamping and finishing of the pavement. The depth of the metal side forms shall equal the

specified depth of the edge of the pavement. Forms shall be of the full depth required, in one piece. Splicing of forms by the addition of a wooden base will not be permitted.

Metal side forms shall be supported at each end on a two-inch by three-inch (2" x 3") stake. Stakes shall be of adequate length to rigidly support the form, but in no case shall they be less than eight inches (8”) long. The stakes shall be driven with their tops to the line and grade for the bottom of the side form.

Metal forms shall be staked firmly by means of steel stakes, placed not more than five feet (5’) apart, and shall be so designed that stakes may be driven through the base of the form and locked in position.

24-5 FORM MAINTENANCE

Side forms of either wood or metal shall be furnished, installed, and maintained to the required line and grade at least one day ahead of the placing of portland cement concrete or asphaltic concrete. When side forms do not conform to the correct line and grade, or have become loose, this shall be considered sufficient cause to stop work until the side forms are corrected by the Contractor, to the satisfaction of the Agency.

24-6 PAYMENT

Full compensation for furnishing and placing side forms and headers is included in the prices paid for the various items of work involving the use of side forms and headers and no separate payment will be made.

SECTION 25 PORTLAND CEMENT CONCRETE PAVEMENT

25-1 GENERAL

Portland cement concrete pavement shall conform to Section 40, “Portland Cement Concrete Pavement”, of the State Specifications, and these Specifications.

Portland cement concrete pavement shall be constructed to the dimensions, lines and grades shown on the Plans. Unless otherwise provided in the Special Provisions, the pavement shall be constructed of Class “A” or "B" concrete, at the Contractor’s option, conforming to the requirements of Section 50-5, “Portland Cement Concrete”, of these Specifications. Unless otherwise specified in the Special Provisions, the portland cement used in the concrete shall be Type II as described in said Section 50-5, “Portland Cement Concrete”.

25-2 SUBGRADE

Subgrade for concrete pavement shall be prepared as specified in Section 18-2.05, “Subgrade Preparation”, of these Specifications. Subgrade shall be free of all loose or deleterious material when concrete is placed thereon and shall be uniformly moist. Any excess water on subgrade surface shall be removed prior to placing concrete, as directed by the Agency.

25-3 SIDE FORMS

Side forms shall be furnished and installed in accordance with Section 24, “Side Forms and Headers”, of these Specifications.

25-4 CONCRETE CUTTING

Where new concrete is to join existing concrete, the existing concrete shall be cut to a true line to a minimum depth of one and one-half inches (1-1/2”) with a power driven abrasive type saw.

25-5 EXPANSION JOINTS IN ALLEY PAVEMENT

An expansion joint shall be placed ten feet (10’) from each end of the work and every twenty feet (20’) therefrom, and at other places shown or specified in the Contract. The expansion joint material shall be not less than three-eighths-inch (3/8”) in thickness and shall conform to Section 50-4, “Premoulded Expansion Joint Filler”, of these Specifications.

25-6 PLACING CONCRETE PAVEMENT

The Contractor shall make adequate advance arrangements to prevent delay in delivery and placing of the concrete. An interval of more than forty-five (45) minutes between placing of any two (2) consecutive batches or loads shall constitute cause for stopping paving operations, and the Contractor shall make a contact joint, in the concrete already placed, at the location and of the type directed by the Agency. Such contact joint shall be made at the Contractor’s expense.

Slip-form paving and finishing equipment shall be properly adjusted and in satisfactory operating condition. Prior to placing concrete, the Contractor shall demonstrate proper adjustment of all screeds and floats on slip-form pavers by measurements from grade stakes driven to known elevations. Satisfactory operation and adjustment of all propulsion and control equipment, including pre-erected grade and alignment lines, shall be demonstrated by moving

slip-form pavers and finishing machines over a five-hundred-foot (500') length of prepared subgrade, with all propulsion and control equipment fully operational.

Unless otherwise required by these Specifications or the Contract, concrete pavement shall be constructed in twelve-foot (12') traffic lane widths separated by contact joints, or monolithically in multiples of twelve-foot (12') traffic lane widths with a longitudinal weakened plane joint at each traffic lane line.

All pavement concrete shall be placed while fresh. The use of water for retempering any concrete will not be permitted. The temperature of the concrete mix at the time of placement shall not exceed 90°F.

25-7 FINISHING CONCRETE PAVEMENT

The surface of concrete pavement shall be finished smooth and true to grade with wooden floats. Floats shall be operated from the end of the pavement and parallel with the centerline of the pavement.

High areas of concrete pavement shall be cut down using the edge of a float while the concrete is workable. Material removed by the float shall be worked into depressions by the float until a true surface is obtained.

Finishing and floating of the concrete pavement shall continue after concrete placement has stopped, until the concrete has achieved initial set.

25-8 CURING PORTLAND CEMENT CONCRETE PAVEMENT

The curing of portland cement concrete pavement shall be with a pigmented curing compound as specified in Section 50-6, "Curing Compounds for Concrete", of these Specifications.

25-9 PROTECTION OF PAVEMENT

The Contractor shall protect the surface of the concrete pavement from damage and markings, both from pedestrian and other traffic. Barriers shall be placed as necessary to protect the concrete from traffic.

The concrete pavement shall be maintained at a temperature of not less than 45°F for seventy-two (72) hours after placement. When required by the Agency, the Contractor shall submit a written outline of the proposed methods for protecting the concrete pavement and maintaining the required temperature.

When required by the Special Provisions, bridges or other devices shown on the Plans, or approved by the Agency, shall be furnished and installed by the Contractor across the pavement to provide crossing for the public and private traffic. The Contractor shall maintain the crossing devices throughout the period of their use at any location. When no longer required, the crossing devices shall be removed and disposed of by the Contractor.

After the Agency has ordered the pavement opened to traffic, the Contractor will not be held responsible for damage resulting from its use by public traffic. The Contractor is liable for any damage to newly laid pavement caused by the Contractor's operations.

25-10 PAVEMENT DAMAGE AND REPAIR

All damage done to concrete pavement, or openings cut in concrete pavement or alley crossings during the progress of the Work, shall be repaired by the Contractor under the direction of the Agency. Materials for all repairs shall conform to these Specifications.

25-11 MEASUREMENT

Earthwork and subgrade preparation shall be measured in accordance with Section 18, “Earthwork”, of these Specifications.

The quantity of portland cement concrete pavement to be paid for will be measured by the cubic yard. The volume to be paid for will be calculated on the basis of the lines, grade and thickness shown on the Plans. Should the subgrade be low or irregular, thus requiring additional yardage above that computed from the dimensions shown on the Plans, no allowance shall be made for such additional concrete pavement, unless otherwise ordered by the Agency.

25-12 PAYMENT

Earthwork and subgrade preparation shall be paid for in accordance with Section 18, “Earthwork”, of these Specifications.

The price paid per cubic yard for portland cement concrete pavement includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the portland cement concrete pavement complete in place, including furnishing and placing expansion joint material, finishing concrete surface, furnishing and applying curing compound, protecting the pavement and repairing any damage, as shown or specified in the Contract, in these Specifications, and directed by the Agency.

SECTION 26 COLD PLANE ASPHALT CONCRETE PAVEMENT

26-1 GENERAL

Existing asphalt concrete pavement shall be cold planed at the locations shown or specified in the Contract and in accordance with these Specifications, unless directed otherwise by the Agency.

Cold planing machines shall have a cutter head not less than thirty inches (30") in width and shall be operated so as not to produce fumes or smoke. The cold planing machine shall be capable of planing the pavement without requiring the use of a heating device to soften the pavement during or prior to the planing operation.

The depth, width and shape of the cut shall be as shown or specified in the Contract or as directed by the Agency. The final cut shall result in a uniform surface conforming to the details shown or specified in the Contract. The outside lines of the planed area shall be neat and uniform.

The Contractor shall remove existing asphalt concrete from the top of the gutter pan and from the face of gutter lip as directed by the Agency. The Contractor shall not damage the surfacing to remain in place or the gutter lips during the planing operation. The Contractor shall replace damaged gutter lips with spalls in excess of one inch (1") deep by five inches (5") long at the Contractor's expense.

Streets being planed shall be swept with a mechanical type pickup machine throughout the course of planing operations and shall be left clean of all planing debris at the end of each Working Day. Planing debris shall not be spilled into drain inlets and rail tracks, and the Contractor shall clean up any spillage immediately. All vegetation shall be removed from the gutter lip and other street areas to be resurfaced.

The planed material shall remain the property of the Contractor, unless otherwise specified in the Special Provisions. If specified, the Contractor shall transport the material to the Agency's stockpile location, located at the County yard at the intersection of Roseville Road and Watt Avenue. The Contractor shall coordinate deliveries of the material to the County's stockpile location through the Agency. The Contractor shall notify the Agency a minimum of two (2) Working Days prior to the proposed transport and delivery of material to the County's stockpile location.

At the option of the Contractor, planed material may be used as fill material within the balance of the project and shall be considered as included in the price paid for Imported Borrow.

26-2 PAVEMENT KEYCUTTING

Pavement keycutting shall consist of cold planing asphalt concrete pavement adjacent to the lip of gutters and across street intersections, as shown on the Plans. Cold planing for pavement keycutting shall be to a minimum depth of one and one-half inches (1-1/2") adjacent to the gutter lip and shall be tapered to the existing pavement grade over a distance of approximately twelve feet (12') from the gutter lip, as shown or specified in the Contract or as otherwise directed by the Agency.

At cross-streets within the limits of the Work, pavement keycutting shall continue in a straight line from curb line to curb line parallel to the direction of work. Elevation differences between the pavement keycutting and cross-streets shall be lessened with temporary asphalt concrete tapers. The slope of the temporary asphalt concrete tapers shall not be greater than one inch (1") vertical in twelve inches (12") horizontal. Asphalt concrete for tapers shall be commercial quality and may be spread and compacted by any method that will produce a

smooth riding surface. Temporary asphalt concrete tapers and all loose material from the underlying surface shall be completely removed before placing the permanent surfacing.

At the beginning and ending limits of the planing work, a planed pavement conform shall be constructed as specified in Section 26-4, “Planed Pavement Conforms”, in this Section of these Specifications.

26-3 PAVEMENT PLANING

Pavement planing shall consist of cold planing a continuous width of asphalt concrete pavement, to the limits shown or specified in the Contract. The depth of planing below gutter lips shall equal the specified thickness of asphalt concrete overlay as shown or specified in the Contract. The depth of planing at the street centerline shall equal the specified thickness of asphalt concrete to be placed on the street, and shall slope smoothly from the lip of gutter to the street centerline.

Planed widths of pavement shall be continuous except for special treatment at traffic signal detector loops and at manhole rims as shown or specified in the Contract or as directed by the Agency. In areas where full width planing is not possible because of traffic signal detector loops, separation shall be maintained from traffic signal detector saw cuts and loops. Pavement planing shall be to within one foot (1’) horizontally of manhole rim on all sides, unless width of grinding falls below five feet (5’) wide. The planing may be omitted in the areas where a less than five-foot (5’) width can be obtained.

At cross streets with traffic signals, the planing shall be carried around the corner to the center crosswalk and limit line of the adjacent intersection, unless otherwise directed by the Agency.

At cross streets without traffic signals, the planing shall be carried around the corner to the mid-point of the curb radius of the adjacent side street, unless otherwise directed by the Agency.

At the end of each Working Day there shall not be any elevation difference between planed and unplaned pavement in the traveled vehicle lanes. Any differences that parallel the centerline of the street shall be sloped by either temporary asphalt concrete tapers or additional planing to produce a bevel within the planed pavement. The slope of either the temporary asphalt concrete tapers or the bevel shall not be greater than one inch (1”) vertical in twelve inches (12”) horizontal. When temporary asphalt concrete tapers are used, asphalt concrete for tapers shall be commercial quality and may be spread and compacted by any method that will produce a smooth riding surface. Temporary asphalt concrete tapers and all loose material from the underlying surface shall be completely removed before placing the permanent surfacing. Elevation differences between planed pavement and lips of gutters are not required to be sloped.

Elevation differences perpendicular to the centerline of the street or elevation differences between the planed street and cross-streets shall be lessened with temporary asphalt concrete tapers, as specified above. Temporary asphalt concrete tapers and all loose material from the underlying surface shall be completely removed before placing the permanent surfacing.

At the limits of the planing work, a planed pavement conform shall be constructed as specified in Section 26-4, “Planed Pavement Conforms”, in this Section of these Specifications, or as directed by Agency.

Contractor shall provide a means for temporary lane delineation, including centerline (yellow) and lane lines (white), between the time of planing operations and roadway paving, as specified in Section 6-13, “Public Safety and Traffic Control”, of these Specifications.

26-4 PLANED PAVEMENT CONFORMS

Planed pavement conforms shall be constructed at the limits of the Work as shown or specified in the Contract and as directed by the Agency.

Except on residential streets or where otherwise shown or specified in the Contract, where the beginning or ending limit is a cross street, a fifty-foot (50') planed conform extending to the round corner of the cross street shall be constructed to the dimensions and depths of cut shown or specified in the Contract. On residential streets, an eighteen-foot (18') planed pavement conform shall be constructed. The slope of the temporary asphalt concrete tapers at the limits shall not be greater than one inch (1") vertical to thirty-six inches (36") horizontal.

Where the beginning or ending limit is not at a cross street, or where a cross street or other such feature that is not to be resurfaced causes a discontinuity in the Work, a planed pavement conform shall be constructed. The conform shall span the full width of the street for a distance of fifty feet (50') back from the limit line or feature causing the discontinuity in the work. At bridge decks the conform shall span the full width of the street for a distance of fifty feet (50'). The depth of cut shall be one and one-half inches (1-1/2") at the limit of work and shall be progressively decreased to zero (0") over the conform length.

Planed pavement conforms shall also be constructed at freeway entrance and exit ramps and at right and left long-radius turn lanes which diverge from or converge onto the street to be resurfaced. These conforms shall span the full width of the ramp or turn lane for a distance of eighteen feet (18') and shall be constructed where shown on the Plans or directed by the Agency.

26-5 PAVEMENT REINFORCING FABRIC

Pavement reinforcing fabric shall be installed in conformance with the provisions in Sections 39-4.03 and 88-1.02 of the State Standard Specifications, the manufacturer's recommendations, and the Contract.

Pavement fabric shall be used in pavement overlay areas where shown or specified in the Contract and shall extend at least two feet (2') beyond any joints between the new pavement section and the overlay section. When installed, the fabric shall be a minimum of twenty-four inches (24") away from the lip of gutter and from the edge of pavement.

After thoroughly cleaning the surface to receive fabric, all cracks greater than one-quarter inch (1/4") in width shall be filled with a hot asphaltic crack filler and allowed to cure. Crack filler shall not extend above the existing pavement surface. Crack filler material shall be paid for under the unit price bid per pound for crack filler, and no additional payment will be made. If a leveling course is used, crack sealing is not required. Type "A" three-eighths inch (3/8") maximum gradation leveling course material shall be placed prior to pavement reinforcing fabric. Leveling course material shall be placed as shown on the Plans and paid for under the unit price bid per ton for asphalt concrete, and no additional payment will be made.

Pavement fabric binder shall be AR4000. The minimum asphalt binder temperature shall be 290 degrees F, with a distributor tank temperature not to exceed 324 degrees F. The asphalt binder shall be placed at a rate of one-quarter gallon (0.25 gal.) per square yard, or as directed by the Agency.

If mechanical laydown equipment is used, it must be capable of handling full rolls of fabric and be capable of laying the fabric smoothly without excessive wrinkles and/or folds.

26-6 MEASUREMENT

Cold planing asphalt concrete for pavement keycutting will be measured by the linear foot for the pavement keycutting width shown or specified in the Contract. The quantity to be paid for will be the actual length of pavement cold planed, irrespective of the number of passes required to obtain the specified depth.

Cold planing asphalt concrete for pavement planing of continuous widths of asphalt concrete pavement will be measured by the square yard. The quantity to be paid for will be the actual area of pavement cold planed, irrespective of the number of passes required to obtain the specified depth.

Planed pavement conforms will be measured by the square yard. The quantity to be paid for will be the actual area of pavement conforms planed, irrespective of the number of passes required to obtain the specified depth.

Quantities of pavement reinforcing fabric, including binder, will be measured by the area of roadway covered with pavement fabric, not the area or quantity of fabric installed. Placement of pavement fabric beyond the limits shown or specified in the Contract, without written direction from the Agency, shall not be allowed and no payment will be made.

26-7 PAYMENT

The price paid per linear foot for pavement keycutting for the width shown on the Plans includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in pavement keycutting, complete in place, including disposal or transport of planed material, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

The price paid per square foot for pavement planing includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in pavement planing, complete in place, including disposal or transport of planed material, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

The price paid per square foot for planed pavement conforms includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in planed pavement conforms, complete in place, including disposal or transport, and processing for fill of planed material, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

Full compensation for furnishing asphalt concrete for temporary tapers and for constructing, maintaining, removing, and disposing of the tapers is included in the prices paid for the various items of work involved in cold planning asphalt concrete pavement, and no additional compensation will be paid.

Full compensation for furnishing and applying the pavement reinforcing fabric, the AR4000 binder, and for furnishing and spreading sand to cover exposed binder material, as necessary, or as directed by Agency, and all preparation activities, including, but not limited to, street cleaning and crack sealing, is incidental and included in the unit price paid for reinforcing fabric and no additional compensation will be paid.

SECTION 27 CURBS, GUTTERS, SIDEWALKS, AND DRAINAGE STRUCTURES

27-1 GENERAL

Concrete curbs, gutters, sidewalks, and drainage structures shall be constructed as shown on the Plans and as specified in these Specifications.

27-2 FORMS

Forms shall conform to the requirements in Section 24, “Side Forms and Headers”, and this Section (Section 27), of these Specifications.

Forms for curb and gutter shall be wood with a smooth upper edge, having a width equal to the full depth of the curb and gutter and a nominal thickness of two inches (2”). Warped forms and forms not having a straight upper edge shall not be used. Benders, or thin plank forms, rigidly placed, may be used for returns and other curves. All forms shall be carefully set to proper alignment and grades and shall be rigidly held in place by the use of not less than five (5) pairs of stakes to every twenty-foot (20’) section, and other sections in proportion. Clamps, spreaders, and braces shall be used where required or as directed by the Agency.

Sidewalk forms shall be surfaced wood with a smooth upper edge, having a width equal to the full depth of the finished sidewalk and a nominal thickness of two inches (2”). Warped forms and forms not having a straight upper edge shall not be used. Sidewalk forms shall be set with the upper edge true to line and grade and shall be rigidly held in place by stakes placed on the outside of the forms and set flush with the top edge of the form. The side forms shall not be removed for at least twelve (12) hours after the finishing has been completed.

Curbs, gutters, and sidewalks may be placed by using an extrusion machine as provided in Section 27-7, “Extruded Construction”, in this Section of these Specifications in lieu of using forms.

27-3 CONCRETE IN CURBS, GUTTERS, AND SIDEWALKS

Concrete in curbs, gutters, and sidewalks shall be Class "B-2”, as specified in Section 50-5, “Portland Cement Concrete”, of these Specifications.

Subgrade shall be prepared as specified in Section 18-2.05, “Subgrade Preparation”, of these Specifications. Relative compaction of not less than ninety-five percent (95%) shall be obtained for a minimum depth of one-half foot (0.5’) below the subgrade grading plane for driveways, V-ditches, cross gutters, or as directed by Agency. A six-inch (6”) thick Class 2 aggregate base section shall be required under all curbs, gutters, and sidewalks. The requirement to excavate for and place the six-inch (6”) thick Class II aggregate base section shall apply to both construction of new curbs, gutters, and sidewalks, and to the replacement of existing curbs, gutters, and sidewalks.

Before placing concrete, the subgrade shall be well dampened. A joint shall be constructed at the end of concrete placement, each day, or whenever the concrete placement work is terminated. The joint shall be vertical and square ended, and shall be placed at the point of an expansion joint, as defined in the following Section (27-3.01).

27-3.01 Expansion Joints, Weakened Plane Joints, and Score Marks

In curbs, gutters, and sidewalks, an expansion joint shall be placed at the end of round corners and at major structures such as utility vaults, at portions of sidewalk that include a manhole, and at other as shown on the Plans or as directed by the Agency. In addition, expansion joints shall be placed at sixty-foot (60’) intervals of all curbs, including median curbs,

gutters, sidewalks, and concrete median pavement.. At all expansion joints, dowels shall be placed as shown on Standard Drawing 4-43. For expansion joints in curbing that has longitudinal reinforcing such as Type 4 curbs, Type 6 curbs and curbs along bus stops, the curb reinforcing shall be discontinuous at the expansion joint with the curb reinforcing held back two inches from the expansion joint and the curb reinforcing shall overlap the expansion joint dowels. Expansion joint material shall be one-half inch (1/2") thick, be shaped to fit the geometry of the curbs, gutters, and/or sidewalks and extend for the full depth of the curbs, gutters and/or sidewalks. Expansion joint material shall conform to Section 50-4, "Premoulded Expansion Joint Filler", of these Specifications. Expansion joints shall be at right angles to the line of the work. Sealant shall be placed over the expansion joint material if directed by the Agency.

All four-foot (4') wide sidewalks shall be scored at four-foot (4') intervals. In lieu of every third score mark, at twelve foot (12') intervals, weakened plane joints shall be constructed. In lieu of every fifth weakened plane joint, at sixty-foot (60') intervals, expansion joints shall be constructed as detailed above.

All six-foot (6') sidewalks shall be scored at five-foot (5') intervals. In lieu of every other score mark, at ten-foot (10') intervals, weakened plane joints shall be constructed. In lieu of every sixth weakened plane joint, at sixty-foot (60') intervals, expansion joints shall be constructed as detailed above.

Weakened plane joints shall extend through both the sidewalk and the curb and gutter when constructed at the same time and monolithically. Curb and gutter constructed without monolithic sidewalk construction shall be constructed with weakened plane joints at ten-foot (10') intervals and expansion joints at sixty-foot (60') intervals.

27-3.02 Finishing Concrete Surfaces

The top and exposed surface of the concrete curb shall be finished as follows:

- A direct finishing method, whereby the curb concrete shall be placed to exact form, double screeded, floated, troweled and smoothly finished, after which it shall be broomed with a fine hair push broom drawn over the surface transverse to the line of work. Water may be applied to the surface immediately in advance of brooming.
- Surfaces of sidewalks shall be finished by double screeding, which shall include working the concrete until the coarse aggregate is forced down into the body of the concrete and a layer of mortar is thus forced to the top for floating, and troweling. The surface shall then be marked as directed by the Agency, and broomed as described above.

All exposed surfaces of sidewalks, curbs, and gutters shall be free from rock pockets, discoloration, graffiti, and blemishes. Surfaces shall have a uniform texture and appearance free of bulges, depressions, or other imperfections. Surfaces shall not vary by more than one-quarter of an inch (1/4") from a ten-foot (10') straight edge except at grade changes.

27-3.03 Curing of Concrete

Curing of concrete in curbs, gutters, and sidewalks shall be with pigmented compound as specified in Section 50-6, "Curing Compounds for Concrete", of these Specifications. The curing compound shall be applied as recommended by the manufacturer. Curing compound is to be completely and uniformly applied to the exposed surfaces of the concrete such that the compound leaves a neat appearance. Median islands shall have white-pigmented compound. The Contractor shall take care that the pigmented compound is contained within the intended area of work and does not discolor asphalt concrete or other adjoining improvements.

27-3.04 Median Openings and Allowance for Sign Placement on Ends of Medians and Traffic Islands

Gaps in medians shall be provided where called for on the plans to allow for roadway surface drainage and for the installation of pull boxes as shown on Standard Drawing 4-44. For the purposes of measurement and payment for medians, no deduction in the length of the median shall be made at median openings of less than four feet in length.

At each end of all new medians and traffic islands the cross slope of the final two feet of the median or island shall be 1.0%, as shown on Standard Drawing 4-44 and as required by these Specifications. For these final two feet the height of the lower of the two curbs on either side of the median or island shall be increased as needed to achieve the required cross slope. Conforms from the revised height for the curb on the lower side of the median or island shall be achieved in a distance of one foot (1'), from two feet (2') from the end of the curb to three feet (3') from the end of the curb. For purposes of measurement and payment, the modification in the curb height for the final three feet (3') of the median or traffic island shall be considered incidental and included in the bid price paid for the various items of work.

27-3.05 Minor Curb and Gutter and Sidewalk Replacement

For minor curb and gutter and sidewalk replacement (single location only), the Contractor may use a portable concrete mixer, or a one (1) yard transit-mix truck. Pre-mixed "buggy" concrete is not acceptable. The amount of concrete placed by this method shall not exceed twelve (12) cubic feet. A 50-50 mixture of concrete mix (fine and coarse aggregate) may be used. The mix shall be proportioned (aggregate and cement approximately 4:1) such that an equivalent five (5) sack mix is obtained. The County inspector may make concrete test cylinders in order to verify the mix. Test cylinders should attain strength of twenty-five hundred (2500) psi in twenty-eight (28) days.

Minor concrete that does not attain twenty-five hundred (2500) psi in twenty-eight (28) days shall be removed and replaced with transit mix concrete at the Contractor's expense.

This method of mixing and placing concrete applies only to minor curb and gutter and sidewalk replacement.

27-4 DAMAGE REPAIRS

All damage done or openings cut in concrete walks, curbs, or gutters during the progress of the Work shall be repaired by the Contractor to the satisfaction of the Agency. Patching of damaged areas shall not be allowed. Partial removal and replacement of flags of sidewalk or portions of curbs and/or gutters less than four feet (4') in length will not be allowed. All removal of damaged sidewalk and/or curbing and gutter sections shall extend to the nearest score mark, weakened plane joint, construction joint or expansion joint if within four feet (4') of the limit of damaged concrete. A dowelled joint shall be used as shown on Standard Drawing 4-43 at all connections of new sidewalk to existing sidewalk, new sidewalk to existing curbing, new curbing to existing curbing, and new curb and gutter to existing curb and gutter. Damaged areas shall be removed per detail and replaced to the satisfaction of the Agency without additional cost to the Agency.

27-5 SIDEWALKS

27-5.01 Widening of Existing Sidewalk

If the Work includes widening an existing sidewalk, the existing sidewalk shall be removed and replaced. A dowelled joint shall be used as shown on Standard Drawing 4-43 at the connection of new sidewalk to existing curb and to existing sidewalk.

Payment for sidewalk removal shall be made per square foot and shall include saw cutting of the existing sidewalk, removal, disposal and all incidentals, providing all labor, tools and equipment required to remove the existing sidewalk and no additional payment will be allowed. Should there be no bid item for sidewalk removal, the saw cutting, removal and disposal of the existing sidewalk in the area of sidewalk widening shall be considered incidental and included in the bid prices for the various items of work and no additional compensation shall be made. Payment for sidewalk construction shall be made per square foot of sidewalk installed as specified in Sections 27-14 and 27-15 of these Specifications and shall include the supply and installation of dowels for the connection of the new sidewalk to existing curb and sidewalk.

27-5.02 Slope of Sidewalks

Unless otherwise shown or specified in the Contract, sidewalks and planting strips between curb and sidewalk shall slope uniformly toward the street at a rate of 1.5%. At no place shall the cross slope of sidewalk be greater than two percent (2.0%). The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.01 foot are present when tested with a ten-foot (10') straightedge laid in a direction transverse to the centerline and extending across the width of the sidewalk.

27-6 CURB DOWELS AND REINFORCEMENT

Curb dowels and reinforcement shall be installed as shown on Standard Drawings 4-21, 4-22, 4-25, 4-26 and 4-43, and as shown or specified in the Contract,

27-7 EXTRUDED CONSTRUCTION

At the Contractor's option, subject to the Agency's approval, curbs, gutters, and sidewalks may be constructed using an approved extrusion or slipform machine and method. The Contractor shall provide the Agency with a written proposal and a test section if requested by the Agency. Except as noted otherwise, all extruded construction must comply with all requirements of this Section 27 and Standard Drawings 4-25, and 4-43. Curb, gutter and sidewalk may be constructed monolithically if approved by the Agancy.

Concrete for extruded construction shall be Class "B-2", as specified in Section 50-1, "Portland Cement Concrete", of these Specifications. The grading limits shall be restricted if necessary to produce concrete that, after extrusion, has well defined web marks of water on the surface and is free from surface pits larger than three-sixteenths-inch (3/16") in diameter.

The consistency of the concrete shall be such that it will maintain the shape of the section without support after extrusion.

Except as noted otherwise in the Contract documents, extruded concrete curbs shall be anchored to existing pavement either by placing dowels or by using an approved adhesive. If an adhesive is used, in advance of placing the curbs on the existing pavement, the surface of the pavement shall be thoroughly cleaned and the adhesive shall be applied. The pavement shall be cleaned either by wire brushing or by blast cleaning. The cleaned surface shall be free from dust, loose material, or oil.

The adhesive shall be an epoxy resin adhesive conforming to Section 95-2.03, "Epoxy Resin Adhesive for Bonding New Concrete to Old Concrete", of the State Specifications. Such adhesive may also be used for bonding new Portland cement concrete to existing asphalt concrete.

The top and face of the finished curbs shall be true and straight and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. Grade tolerance of the gutter flowline, back of curb and gutter, and back of sidewalk shall not exceed ± 0.05 foot in any twenty-five-foot (25') length.

Concrete shall be fed to the machine at a uniform rate. The machine shall be operated under sufficient uniform restraint to forward motion to produce a well compacted mass of concrete free from surface pits and requiring no further finishing, other than light brooming with a broom filled with water only. Finishing with a brush application of grout will not be permitted.

27-8 CURB RAMPS AND DRIVEWAYS

Curb ramps and driveways shall be constructed to the dimensions, lines, grades, and details shown or specified in the Contract. Curb ramps and driveways shall conform to all requirements in these Specifications, including the requirement for excavating for and placing the six-inch (6") thick Class II aggregate base section. No utility pull box, utility pole, traffic signal pull box, traffic signal pole foundation, or any other facility that is visible on or above the surface of a curb ramp may be located within the area of a curb ramp. For the purpose of this Section, the area of the curb ramp shall be the area including and bounded by the one-foot (1') wide tactile strip on either side of the inclined portion of the ramp, the gutter section and the curb along the back of sidewalk.

27-9 RECONSTRUCTION OF CURBS, GUTTER, AND SIDEWALK TO ACCOMMODATE DRIVEWAYS

Where curb and gutter and/or sidewalk are to be removed for the purpose of constructing a driveway, a sidewalk ramp, utility relocation or construction of utility facilities, or to replace cracked, broken, heaved or otherwise unacceptable concrete, the entire curb and gutter and/or sidewalk shall be removed and reconstructed. Actual limit of concrete removal shall extend to nearest score mark or joint, if nearest score mark or joint is within four feet (4') of limit of removal as indicated on the Plans. Adjacent to all areas of removal of curb and gutter, a two-foot (2') minimum width, four-inch (4") minimum depth bank of existing roadway pavement shall be saw cut and removed and replaced with permanent asphalt concrete pavement. A dowelled joint shall be used as shown on standard drawing 4-43 at the connection of new driveway construction to existing sidewalk and curb and gutter. Removed materials shall be disposed by the Contractor outside of the road right-of-way. Unless otherwise directed in the Special Provisions, payment for removals shall be considered to be included in the price paid for clearing and grubbing and no additional payment shall be allowed.

27-10 RECONSTRUCTION OF CURBS, GUTTER, AND CURB AND GUTTER TO ACCOMMODATE SEWER AND STORM DRAIN SERVICE INSTALLATION

Where curbs, gutters, or curb and gutter are to be removed for the purpose of constructing a sewer service or storm drain service, the entire curb, gutter, or curb and gutter shall be removed and reconstructed. Actual limit of concrete removal shall extend to nearest score mark or joint, if nearest score mark or joint is within three feet (3') of limit of removal as indicated on the Plans. A dowelled joint shall be used as shown on standard drawing 4-43 at the connection of

new sidewalk, and curb and gutter to existing sidewalk, and curb and gutter. Adjacent to all areas of removal of curb and gutter, a two-foot (2') minimum width, six-inch (6") minimum depth bank of existing roadway pavement shall be saw cut and removed. Removed materials shall be disposed of by the Contractor. Portland cement concrete for the replacement shall be Class "A-2" in accordance with Section 50-5, "Portland Cement Concrete", of these Specifications.

27-11 CURB AND GUTTER TESTING AND TOLERANCE

The finished surface of curb and gutter shall be free from humps, sags, or other irregularities. The surface shall be uniform to a degree such that no depressions greater than 0.02 foot are present when tested with a ten-foot (10') straightedge, except at grade changes. Curb and gutter shall be tested by the application of water in the presence of the Agency. No standing water will be permitted.

27-12 EXISTING INLET DESIGNS, DISCONTINUED FOR USE IN NEW CONSTRUCTION

The following previous inlet designs are no longer approved for use in new construction for public use unless approved by the Agency:

- Type A, Standard Drawing 9-13A
- Type D, Standard Drawing 9-13D
- Type E, Standard Drawing 9-13E
- Gutter Drain, Standard Drawing 9-13GD

These drawings are provided in these Specifications for identification, repair, analysis, and construction when approved by the Agency. Other inlet designs not shown in these Specifications may be identified as Types 1, 2, 3, 4, 5, 5A, and 6 by reference to the Construction Specifications as amended January 19, 1970 and prior.

27-13 DROP INLETS AND CATCH BASINS

Drop inlets, catch basins, grates, and frame types shall conform to the Standard Drawings and Section 50-34, "Sewer and Storm Drain Castings", of these Specifications.

Concrete for drop inlets and/or catch basins shall be either Class "A" or "B", and shall conform to Section 50-5, "Portland Cement Concrete", of these Specifications. The concrete box portion of the drop inlet and/or catch basin shall be cast to the proper grade in a maximum of two (2) placements of concrete. Use of grout to adjust the drop inlet and/or catch basin frame to the proper grade will not be permitted without written approval of the Agency.

Grate and frame materials and method of placement shall conform to the requirements in Section 75-1.02, "Miscellaneous Iron and Steel", of the State Specifications. Reinforcing bar supports or other approved means shall be used to hold the frame at proper grade during final placement of concrete. Broken pieces of concrete, or other debris, shall not be used for this purpose.

At the option of the Contractor, drop inlets and/or catch basins may be furnished and installed as precast units, or the units may be combined precast and cast-in-place structures, provided the structures in place substantially conform to cast-in-place construction as specified in these Specifications.

All drop inlet and catch basin installations, whether new or reconstructions, shall include a permanent stormwater quality marking per the County of Sacramento Improvement Standards, or as directed by Agency.

Unless otherwise specified, exposed surfaces of the grates, frames and hoods with the parts assembled and disassembled shall be painted with commercial quality asphaltum paint after testing and assembly.

27-14 MEASUREMENT

Curb, gutter, and curb and gutter will be measured and paid for by the linear foot for the type of curb, gutter, or curb and gutter designated in the Contract.

Sidewalks will be measured and paid for by the square foot for the type of sidewalk designated in the Contract.

Curb ramps will be measured and paid for by the unit, as designated in the Contract. If curb ramps are not included as a separate pay item in the Contract, the curb and gutter portion of the curb ramp shall be measured and paid for by the linear foot as curb and gutter, and the sidewalk portion of the curb ramp shall be measured and paid for by the square foot as sidewalk.

Driveways will be measured and paid for by the square foot or by the unit, as designated in the Contract. If driveways are not included as a separate pay item in the Contract, the curb and gutter portion of the driveway shall be measured and paid for by the linear foot as curb and gutter, and the sidewalk portion of the driveway shall be measured and paid for by the square foot as sidewalk.

Removal of sidewalk, curbs, gutters, or curb and gutters will be measured and paid for by the linear foot as designated in the Contract. If removal of sidewalks, curbs, gutters, or curb and gutters are not designated as separate pay items in the Contract, the removal of said facilities is included in the various items of work and no additional payment will be made.

Gutter drains, drop inlets, and/or catch basins will be measured and paid for by the unit for the types of gutter drains, drop inlets, and/or catch basins designated in the Contract.

27-15 PAYMENT

The price paid per linear foot for curb, gutter, or curb and gutter includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing curb, gutter, or curb and gutter, complete in place, including preparing the subgrade, all form work, finishing and curing the concrete, furnishing and placing expansion joint material, furnishing and placing dowels and reinforcement, curb and gutter testing, and repairing any damage, as shown on the Plans, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

The price paid per square foot for sidewalk includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing sidewalk complete in place, including all form work, finishing and curing the concrete, furnishing and placing expansion joint material, and repairing any damage, as shown on the Plans, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

The unit price paid for curb ramps includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing curb ramps complete in place, including all form work, finishing and curing the concrete, furnishing and placing expansion joint material, and repairing any damage, as shown on the Plans, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

The unit price paid for driveways includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing

driveway complete in place, including all form work, finishing and curing the concrete, furnishing and placing expansion joint material, and repairing any damage, as shown on the Plans, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

The price paid for drop inlets and catch basins includes full compensation for the cost of removal and replacement of adjacent curb, gutter, and sidewalk to the limits required in Section 27-10, “Reconstruction of Curbs, Gutter, and Curb and Gutter to Accommodate Sewer and Storm Drain Service Installation”, of these Specifications and no additional or separate payment will be made.

The unit price paid for gutter drains includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in gutter drains, complete in place, including excavation, furnishing and installing the cast iron drain and vitrified clay or PVC elbow, and the concrete pad foundation and elbow encasement, as shown on the Plans, as specified in these Specifications and the Special Provisions, and as directed by the Agency.

Excavation for aggregate base beneath sidewalk, curb ramps, driveways, and curb and gutter sections shall be included in the bid item for roadway excavation if the Contract includes such an item. If there is no item for roadway excavation, the excavation for the aggregate base beneath sidewalk, curb ramps, driveways, and curb and gutter sections shall be considered incidental and included in the various pay items and no additional payment will be made. Supply and placement of aggregate base material shall be measured and paid for as detailed in Section 22-3, “Aggregate Base”, of these Specifications.

SECTION 28 PILING

28-1 GENERAL

Piling shall conform to Section 49, “Piling”, of the State Specifications, and these Specifications.

The pile fabricator shall furnish a Certificate of Compliance to the Agency, stamped and signed by an engineer, registered as a Civil Engineer in the State of California, with experience in pile fabrication. Said Certificate of Compliance shall conform to the provisions in Section 6-1.07, "Certificates of Compliance”, of the State Specifications and shall certify conformance to the Contract.

28-2 PAYMENT

Payment will conform to Section 49-6.02, ” Payment”, of the State Specifications, and these Specifications. No deduction will be made for pile fabrication outside of Sacramento County.

SECTION 29 PRESTRESSING CONCRETE

29-1 GENERAL

Prestressing concrete shall conform to Section 50, “Prestressing Concrete”, of the State Specifications.

SECTION 30 CONCRETE STRUCTURES

30-1 GENERAL

Concrete structures shall conform to Section 51, “Concrete Structures”, of the State Specifications, and these Specifications.

Work under this Section shall include constructing culverts, headwalls, retaining walls, slabs, foundations, and similar concrete structures. Concrete pavement, curbs, gutters, sidewalks, and drainage structures shall be as specified elsewhere in these Specifications.

30-2 FOOTINGS

The elevations of the bottoms of footings shown on the Plans shall be considered as approximate only and the Agency may order, in writing, such changes in dimensions or elevations of footings as may be necessary for a satisfactory foundation. Additional structure excavation and structure backfill resulting from such changes will be measured and paid for as specified in Section 18-3, “Structure Excavation and Backfill”, of these Specifications.

If the Contractor elects to fabricate materials or do other work prior to the final determination of footing elevations, the Contractor is responsible for additional costs incurred.

30-3 FORMS

Forms shall be smooth and mortar tight, true to the required lines and grade, and of sufficient strength and supported in such a manner that no springing out of shape or sagging occurs between form supports during the placing of concrete. All dirt, chips, sawdust, nails and other foreign matter shall be completely removed from forms before any concrete is deposited. Forms shall be thoroughly coated with form oil, which shall be of high penetrating qualities leaving no film on the surface of the forms that can be absorbed by the concrete.

Forms for all surfaces that will be exposed to view shall be made of surfaced lumber or of other material that will provide a smooth and satisfactory surface. Lumber which is warped, badly checked, or contains loose knots or knot holes shall not be used on any surface form.

All sharp edges shall be chamfered with three-quarter inch by three-quarter inch (3/4" x 3/4") triangular fillets, unless the Plans specify that they not be used. Curved surfaces shall be formed in a manner that will give accurate and true surfaces. The Agency shall approve the construction methods of curved forms before such forms are placed.

Forms shall be constructed so that form marks conform to the general lines of the structure.

Only approved form clamps, ties, or bolts shall be used to fasten forms. Twisted wire ties will not be permitted.

The strength of the forms and the supporting structure for forms are the responsibility of the Contractor and permission by the Agency to place concrete in forms does not relieve the Contractor of this responsibility. If sagging or appreciable deflection or movement of the forms occurs as the concrete is being placed, the Agency may reject the work. Rejected work shall be removed and replaced at the expense of the Contractor.

30-4 REMOVAL OF FORMS

In general, forms for columns and piers may be removed before those for beams and decks. Form removal should be based on the resulting effect on the concrete. That is, there must be no deflection, distortion or damage to the concrete. Supporting forms must not be removed from beams, floors and walls until they are able to carry their own weight and any approved live load. Unless otherwise specified in the Contract, no forms shall be removed until at least

twenty-four (24) hours after the concrete has been placed, and until the concrete has sufficient strength to prevent damage to the surface.

In no case should supporting forms be removed from horizontal members before concrete is eighty percent (80%) of design strength. When high-early strength concrete is used, removal time may be reduced at the discretion of the Agency. When retarding agents are used, removal time should be increased at the discretion of the Agency.

30-5 REINFORCEMENT

Reinforcement in concrete structures shall be as shown on the Plans and conform to Section 31, “Reinforcement”, of these Specifications.

30-6 MIXING AND TRANSPORTING

Mixing and transporting of concrete shall be in accordance with Section 90 of the State Specifications. All concrete shall be mixed in mechanically operated mixers except when permitted by the Contract. Concrete being transported must maintain consistency and workability; no additional mixing water shall be incorporated unless authorized by the Agency.

The use of admixtures in concrete for structures will be subject to the written approval of the Agency, or as otherwise specified in the Special Provisions.

Unless otherwise shown or specified in the Contract, concrete in structures shall be Class 1 as specified in Section 90-1.01 of the State Specifications.

30-7 PLACING CONCRETE

30-7.01 General

No concrete shall be placed in forms until the forms have been approved by the Agency.

Concrete shall not be placed on frozen or ice-coated ground or subgrade, or on ice-coated forms, reinforcing steel, structural steel, conduits, precast members, or construction joints.

Under rainy conditions, placing of concrete shall be stopped before the quantity of surface water is sufficient to damage surface mortar or cause a flow or wash of the concrete surface, unless the Contractor provides adequate protection against damage, as determined by the Agency.

All concrete shall be fresh and shall be placed before it has taken an initial set. Retempering with additional water to make concrete more workable after it has partially hardened will not be permitted. The temperature of the concrete at the time of placement shall not fall below fifty-five degrees (55°) or exceed ninety degrees (90°) F, per ACI Manual of Concrete Practice Table 3.1.

Existing concrete surfaces to be connected to new concrete shall be thoroughly cleaned as directed by the Inspector, and the surface shall be roughened to approximately ¼-inch depth. Irregular voids or surface stones may be left in place if sound, free of laitance, and firmly embedded.

30-7.02 Placement

When the Contract shows or specifies a concrete placement sequence or schedule, such a sequence or schedule shall not be varied without written approval of the Agency.

Fresh concrete shall be placed in horizontal layers no deeper than can be satisfactorily consolidated with the vibrators. The concrete shall be placed at or near its final position; the use of vibrators for extensive shifting of fresh concrete will not be permitted. Fresh concrete shall not be permitted to fall from a height greater than six feet (6’). Tremies or "elephant trunks" shall be used if the concrete is to be placed in a deep or hard to reach area.

After being deposited, the fresh concrete shall be consolidated by mechanical vibration until voids are filled and free mortar appears on the surface.

The use of additional water in mixing the concrete to promote free flow will not be permitted.

30-7.03 Vibrating

The location, manner, and duration of the application of the vibrators shall be such as to secure maximum consolidation of the concrete without causing segregation of the mortar and coarse aggregate. Vibrators shall not be attached to or held against the forms or the reinforcing steel. The use of external form vibrators will only be permitted with written approval of the Agency when the concrete is inaccessible for adequate internal consolidation, and the forms are constructed sufficiently rigid to resist displacement or damage from external vibration.

Concrete in structures shall be tamped and consolidated by means of high frequency internal vibrators of a size, type, and number as approved by the Agency. The number of vibrators shall be sufficient to consolidate the incoming concrete within fifteen (15) minutes after it is deposited in the forms. No less than two (2) serviceable vibrators shall be available at all times. Surfaces shall be smooth and free from voids caused by rock pockets. Where necessary, vibration shall be supplemented by hand spading to secure these results.

30-8 BONDING

Non-epoxy bonding compounds shall be used for dry areas and epoxy resin bonding compounds shall be used for areas exposed to moisture. Bonding compounds shall be applied in accordance with the manufacturer's instructions.

Epoxy resins may be used for grouting dowels in concrete, crack injection, adhesive for bonding fresh and hardened concrete, as a binder for epoxy mortar in making concrete repairs, and under water. Some epoxies are not suitable for temperature extremes such as freeze-thaw environments; placing shall be done within manufacturer’s allowable parameters. Epoxies may be fast-setting when approved by the Agency. The epoxy binder and adhesive shall be two-component mixture conforming to Section 95-2.01, "Binder (Adhesive), Epoxy Resin Base”, of the State Specifications, and shall be mixed at the work site. Safety, proportioning, mixing, and temperature are critical and shall be done according to manufacturer’s instructions. Aggregate shall conform to Section 90-2.02, "Aggregates”, of the State Specifications. When using epoxy as a binder to make mortar, the two components shall be thoroughly mixed to a uniform gray color before the aggregate is added. Unless otherwise specified, the mix proportions shall be one (1) part epoxy binder to four (4) parts aggregate by volume. When fine aggregate (sand) is used, the mix shall be one (1) part epoxy binder to six (6) parts aggregate, by volume. The aggregate shall have a moisture content of not more than one-half of one percent (0.50%) when mixed with binder. The aggregate size and proportions shall be determined by the Contractor, subject to the approval of the Agency.

Appropriate uses of epoxy resin shall conform to Section 95, “Epoxy”, of the State Specifications.

30-9 CONCRETE PLACED UNDER WATER

Unless specifically shown or specified in the Contract, no concrete may be placed underwater without written direction from the Agency.

When underwater placement of concrete is directed, the placement shall be by approved tremie or bottom dump bucket. The consistency of the concrete shall be appropriate for underwater placement and must be approved in writing by the Agency. Underwater placement shall be continuous until completed. Placing concrete in running water will not be permitted.

30-10 EXPANSION JOINTS

When premolded joint filler is shown or specified in the Contract, the filler shall be anchored in the correct position before concrete is placed. The edges of the concrete at the joint shall be finished with a one-quarter inch (1/4") radius edging tool. Unless otherwise specified in the Contract, expansion joint material shall be as specified in Section 50-4, "Premolded Expansion Joint Filler", of these Specifications, except that partial depth expansion joint filler material with a minimum penetration of two inches (2") will be permitted in minor concrete structures, slope paving, sidewalk, curb, and gutter applications as specified in Section 90-10, "Minor Concrete", of the State Specifications.

30-11 CONSTRUCTION JOINTS

Construction joints are required when sequencing concrete placement of large areas.

Construction joints shall be made only where shown or specified in the Contract or authorized or directed by the Agency. When it is necessary to make a joint because of an emergency, as determined by the Agency, reinforcing steel shall be placed through the joint as directed by the Agency. Furnishing and placing such reinforcing steel shall be at the Contractor's expense and no additional compensation will be paid.

After the concrete in a poured segment has hardened, the entire surface of the joint shall be thoroughly cleaned of surface laitance, and aggregate shall be exposed by abrasive blast cleaning. Wire brushing, air, or water blasting may be used while the concrete is fresh, provided results equal to abrasive blast cleaning are obtained.

Construction joints shall be keyed. Keyways shall be formed by beveled strips or boards placed at right angles to the direction of shear or as directed by the Agency. Except where otherwise shown or specified in the Contract, keyways shall be at least one and one-half inches (1-1/2") deep over at least twenty-five percent (25%) of the area of the section.

When new concrete is to be joined to existing concrete, holes shall be drilled in the existing concrete and bar reinforcing steel dowels shall be grouted in, as specified in Section 51-1.13, "Bonding", of the State Specifications.

30-12 WATERSTOPS

Waterstops, when shown or specified in the Contract, shall conform to the requirements of Section 51-1.14, "Waterstops", of the State Specifications.

30-13 CURING

Curing of concrete is essential for development of specified strength and durability. When not curing by forms-in-place, then exposed surfaces shall be cured by one or more of the following methods: burlap or rugs kept continuously wet, waterproof membranes such as paper or plastic, or spraying liquid-membrane curing compound applied as soon as free water on the surface has disappeared but before surface drying begins. Unless otherwise shown or specified in the Contract, curing compounds shall conform to the requirements in Section 50-6, "Curing Compounds for Concrete", of these Specifications.

Curing practices for concrete placed in extreme weather conditions must prevent too-rapid hydration or cold-weather freeze-thaw damage as specified in ACI Manual of Concrete Practice (most recent) or Section 90-7 of the State Specifications.

30-14 PROTECTING CONCRETE

In addition to the requirements of Section 5, "Control of Work and Materials", of these Specifications, the Contractor shall protect concrete as provided in this Section 30.

All concrete that has been frozen or damaged by other causes, as determined by the Agency, shall be removed and replaced by the Contractor at the Contractor's expense.

All concrete in structures shall be maintained at a temperature of not less than forty-five degrees (45°) F for seventy-two (72) hours after placement, and at not less than forty degrees (40°) F for an additional four (4) days. When required by the Agency, the Contractor shall submit a written outline of the proposed methods for protecting the concrete.

30-15 SURFACE FINISH

30-15.01 General

All exposed surfaces of structures shall have a smooth form finish as specified in the ACI Manual of Concrete Practice 301.5.3.3, "Finishing Formed Surfaces", unless otherwise shown or specified in the Contract. All other surfaces shall have an ordinary surface finish unless otherwise shown or specified in the Contract.

Immediately after forms have been removed, all form bolts shall be cut off one inch (1") below the finished surface of the structure and the holes remaining shall be filled with cement mortar using one (1) part cement to two (2) parts sand. Add white cement as needed to match surrounding concrete on all exposed surfaces.

Any defects in the concrete surface caused by poor material in the forms, poor form construction, or by voids or pockets in the concrete, shall be repaired and finished to make the surface finish uniform. The Agency may direct the Contractor to correct such defects at the Contractor's expense.

30-15.02 Smooth Form Finish (Sacking)

A smooth form surface for exposed surfaces or preparation for coating shall consist of finishing the surfaces of the structure as necessary to produce smooth, even surfaces of uniform texture and appearance, free of unsightly bulges, depressions and other imperfections. The degree of care in building forms and character of materials used in form work will be a contributing factor in the amount of additional finishing required to produce smooth, even surfaces of uniform texture and appearance, free of unsightly bulges, depressions and other imperfections, and the Agency shall be the sole judge in this respect. The use of power carborundum stones or disks may be required to remove bulges and other imperfections. The grout-cleaned finish (sacking) requires a sound, clean, dry substrate. Grind surfaces, including seams, bumps, and imperfections smooth and flat. Remove form release agent, laitance, and cure, if present. If coating is required, provide a profile for coating adherence by whip-blasting or acid-etching. Wet a small area of concrete to be sacked and rub a slurry of gray concrete, white concrete (to match existing color), and fine sand into the surface with a sponge float, filling all holes. Non-epoxy acrylic bonding compound may be used in the slurry or in the water. Scrape off excess slurry and rub area lightly with a burlap sack until uniform in appearance. If approved by the Agency, a cementitious mortar may be troweled on the concrete surface after achieving a smooth and flat surface by grinding, including seams, bumps, and imperfections.

30-15.03 Ordinary Surface Finish

The ordinary surface finish required on non-exposed concrete structures shall be minimized by careful forming, use of quality materials, and proper concrete placement procedures. Ordinary surface finish shall consist of removing snap ties and bolts to a minimum depth of one inch (1") and filling the holes. Holes or depressions three-eighths inch (3/8") or larger shall be filled, all rock pockets shall be repaired, and all fins shall be removed.

30-15.04 Tolerance on Concrete Paving

All concrete structures having a roadway deck shall have a smooth riding surface. The finished surface shall be tested with a twelve-foot (12') straight edge. The surface shall not vary

more than 0.01 foot from a plane defined by the lower edge of the straight edge. All areas higher than 0.01 foot above the test plane shall be removed by abrasive means. All areas lower than 0.01 foot below the test plane shall be cut out to a depth of one inch (1") below the test plane and patched with epoxy concrete.

30-15.05 Concrete Repair

30-15.05.A General

Evaluate the unsuitable concrete area to determine whether the concrete repair should be made with concrete, mortar (dry pack), shotcrete, or topped with an overlay.

30-15.05.B Replacement with Concrete

When there are extensive honeycombs or large voids in new construction, or extensive deterioration of existing concrete, the affected area shall be removed to sound concrete (a minimum one-inch (1")) and the area cleaned of deleterious material. All sides shall be square ; forming may be required. Concrete for the repair shall be similar to the original in cement-water ratio and aggregate size.

30-15.05.C Mortar (Dry Pack)

This method is suitable for snap-tie holes, spalls, and cavities (rock pockets) with a relatively high ratio of depth to width. Unsuitable concrete must be chipped by hand or mechanical means to sound and clean concrete. Flush the patch area with water and allow to dry. Coat surface with epoxy compound or acrylic bonding compound and allow to dry until tacky to the touch. Mix mortar composed of portland cement, sand, and water. White cement shall be added when matching the color of the surrounding concrete is required. Proportion of cement to sand, by volume, shall be no more than 1:2. Add only enough water to permit placing and packing. The mortar shall be rammed into place in thin layers and leveled to the plane of the surrounding concrete. Cure with liquid-membrane cure, wet burlap, or water. Fast-setting, cementitious, pre-mixed packing materials may be used when approved by the Agency and shall be applied per manufacturer's instructions.

30-15.05.D Shotcrete

Shotcrete is suitable for repairs to overhead or vertical surfaces and shall be placed according to procedures in ACI Manual of Concrete Practice, 506R.

30-15.05.E Topping

Topping may be placed with or without surface hardener on a pre-existing base slab. Prior to placing, the entire area to be topped shall be cleaned and free of all loose and unsound materials by abrasive blasting or machine scarifying, and clean aggregate exposed. The cleaned base shall be kept wet for a period of 24 hours prior to the application of topping. Excess water shall be removed and a neat cement bonding grout shall be applied. It shall be of equal parts cement and sand and enough water to make a creamy mixture. The cement bonding grout shall not be allowed to dry or set before topping placement. Bonding agents other than cement grout may be used with prior Agency approval. The topping shall then be placed to grade, compacted, and floated. The Contractor shall check for trueness of surface with a 12-foot straightedge. Surface hardener, when used, shall be applied according to manufacturer's instructions. Trowel or broom finish as specified in Contract.

30-16 MEASUREMENT AND PAYMENT

Except as otherwise provided, pay quantities of concrete in structures will be measured by the cubic yard in accordance with the dimensions shown or specified in the Contract, or as ordered in writing by the Agency. No deduction will be made for volume of reinforcing steel.

The price paid per cubic yard for concrete in structures includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in constructing concrete structures, complete in place, including furnishing and building all necessary forms and falsework, furnishing and placing all concrete, reinforcing steel, expansion joint material and waterstops, curing the concrete, providing weep holes in walls, and finishing all concrete surfaces, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 31 REINFORCEMENT

31-1 GENERAL

Steel reinforcement shall conform to Section 52, “Reinforcement”, of the State Specifications, and Section 50-32, “Reinforcing Steel”, of these Specifications.

Reinforcing steel lists showing lengths and bending details shall be prepared by the Contractor and submitted to the Agency for approval. Such approval is intended only as an additional precaution against error, and does not relieve the Contractor of the responsibility for the accuracy of the steel reinforcement.

Existing reinforcing to be incorporated into new concrete shall be mechanically cleaned as directed by the Inspector. A minimum of one-inch (1”) of existing rebar shall be exposed and cleaned, as directed by the Inspector, prior to incorporation into the new concrete.

31-2 MEASUREMENT AND PAYMENT

Unless otherwise specified in the Special Provisions, reinforcement will not be measured or paid for separately.

Full compensation for furnishing and placing reinforcement as specified in these Specifications, including preparing and submitting reinforcing steel lists, is included in the prices paid for the various items of work involved, and no separate payment will be made.

SECTION 32 WATERPROOFING

32-1 GENERAL

Waterproofing shall conform to Section 54, “Waterproofing”, of the State Specifications.

SECTION 33 STEEL STRUCTURES

33-1 GENERAL

Steel Structures shall conform to Section 55, “Steel Structures”, of the State Specifications, and these Specifications.

The fabricator shall furnish a Certificate of Compliance to the Agency, stamped and signed by an engineer, registered as a Civil Engineer in the State of California, with experience in structural steel fabrication. Said Certificate of Compliance shall conform to the provisions in Section 6-1.07, "Certificates of Compliance”, of the State Specifications and shall certify conformance with the Contract.

33-2 PAYMENT

Payment will conform to Section 55-4.02, “Payment”, of the State Specifications, and these Specifications. No deduction will be made for pile fabrication outside of Sacramento County.

SECTION 34 SIGNS

34-1 GENERAL

Signs shall conform to Section 56, “Signs”, of the State Specifications, and these Specifications.

34-2 OVERHEAD SIGN STRUCTURES

Overhead sign structures shall conform to Section 56-1, “Overhead Sign Structures”, of the State Specifications, and these Specifications.

Welding of overhead sign structures shall conform to Section 56-1.04, “Welding”, of the State Specifications, and these Specifications. The Contractor is responsible for welder certification.

34-3 ROADSIDE SIGNS

Roadside signs shall conform to Section 56-2, “Roadside Signs”, of the State Specifications, and these Specifications. Unless otherwise shown or specified in the Contract, all sign panels for permanent installation as standard roadside signs will be furnished and installed by the Agency. Construction signs, including sign panels, shall be furnished and installed by the Contractor. This work shall also include park signs, as specified in this Section, which will be furnished by the Agency.

Construction signs shall conform to the provisions of the Caltrans "Traffic Manual" and the U.S. Department of Transportation, Federal Highway Administration, "Manual on Uniform Traffic Control Devices".

34-3.01 Traffic Sign Types

Traffic signs are classified by general types as follows, according to the information or traffic control required:

- **Warning Signs**—Call attention to conditions on or adjacent to a traveled way that are potentially hazardous to traffic.
- **Regulatory Signs**—Give notice of traffic laws or regulations.
- **Guide Signs**—Show route designation, guidance and directional information.
- **Construction Signs**—Give guidance, regulate, and warn traffic through construction zones. Construction signs include warning, regulatory, and guide signs as well as specific instructional signs.

Traffic signs will be identified by codes. Warning, regulatory, guide, and construction signs are identified with a number preceded by one of the letters W, R, G, or C, which indicate the type of sign.

Installation and mounting of traffic signs, designated by type, shall be according to the sign schedule or details shown on the Plans.

34-3.02 Sign Panel Fastening Hardware

Sign panel fastening hardware shall conform to Section 56-2.02D, “Sign Panel Fastening Hardware”, of the State Specifications, and these Specifications. Lag screws, bolts, metal washers, and nuts may be cadmium-plated steel instead of commercial quality galvanized steel.

34-3.03 Park Signs

Signs with "Park Rules and Regulations" and "Park Hours" will be furnished by the Agency. The posts for park signs shall be furnished by the Contractor and shall be two and three-eighths inches (2-3/8") outside diameter galvanized steel pipe, fourteen feet (14') in length, with a minimum wall thickness of 0.116 inches (0.116"). Posts for park signs shall be placed in a three-foot six-inch (3'-6") deep x ten inch (10") diameter portland cement concrete footing, leaving a ten foot-six inch (10'-6") height from top of grade. Footing concrete shall be Class "C" in accordance with Section 50-5, "Portland Cement Concrete", of these Specifications.

34-3.04 Construction

Construction shall conform to Section 56-2.03, "Construction", of the State Specifications, and these Specifications. After the post holes are backfilled, wood posts installed in traffic islands shall be wedged in place at the surface with redwood wedges. For posts installed in sidewalk areas, the space around the wood posts shall be capped with concrete and finished to be level with the surrounding surface after the posts holes are backfilled.

34-3.05 Sign Panel Installation

Sign panel installation shall conform to Section 56-2.04, "Sign Panel Installation", of the State Specifications, and these Specifications. Sign panels, blind rivets, and closure inserts shall be furnished by the Contractor and shall be fabricated of materials as specified in this Section.

The exposed portion of fastening hardware on the face of signs shall be painted using touch-up enamel that matches the background color exactly.

Park rules sign panels shall be mounted flush with top of the post, with park hours sign panels mounted directly under. The bottom of the lowest sign panel shall be no less than seven feet (7') above the ground.

34-4 MEASUREMENT AND PAYMENT

Measurement and payment for overhead sign structures shall conform to Sections 56-1.09, "Measurement", and 56-1.10, "Payment", of the State Specifications, and these Specifications. No deduction will be made for fabrication outside of Sacramento County.

Signs will be measured by the unit from actual count, complete in place, of the type or types of signs designated in the Contract.

The unit price paid for each sign of the type or types designated in the Contract includes full compensation for furnishing all labor, materials (except Agency-furnished materials), tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing roadside signs, complete in place, including the installation of sign panels, shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 35 TIMBER STRUCTURES

35-1 GENERAL

Timber structures shall conform to Section 57, “Timber Structures”, of the State Specifications.

SECTION 36 CAST-IN-PLACE CONCRETE PIPE (CIPCP)

36-1 GENERAL

Construction of cast-in-place concrete pipe will be permitted when shown or specified in the Contract. Cast-in-place concrete pipe shall consist of portland cement concrete placed in a prepared trench at the locations shown and specified in the Contract and these Specifications. The Agency may deny the use of cast-in-place concrete pipe if, in the Agency's judgment, local conditions make the use of such pipe undesirable.

Unless otherwise specified herein, the placement of cast-in-place concrete pipe shall conform to the requirements of Section 38, "Sewer and Drain Construction", of these Specifications.

It is the Contractor's responsibility to determine the suitability of the excavated trench for the placement of cast-in-place concrete pipe. The Contractor shall determine whether the trench walls will provide sufficient lateral support to prevent deflection and cracking of the pipe due to backfill and live loads, and that the trench width at the top of the pipe will be sufficiently narrow to preclude additional loading on the pipe.

If, after examining the sides of the trench, the Contractor elects to place cast-in-place concrete pipe, and the pipe subsequently develops longitudinal cracks exceeding five feet (5') in length, the Contractor, at the Contractor's expense, shall repair or replace the pipe as directed by the Agency.

Should the Contractor decide not to place cast-in-place concrete pipe after examination of the trench sidewalls, alternative pipe conforming to the requirements in Section 38, "Sewer and Drain Construction", of these Specifications shall be furnished and placed, and no additional payment will be made.

36-2 PIPEMAKING EQUIPMENT

The pipe shall be constructed with equipment specially designed for constructing cast-in-place concrete pipe, as approved by the Agency. The Contractor shall furnish evidence of successful operation of the proposed equipment on other work. Equipment not suitable to produce the quality of work required for the pipeline will not be permitted to operate on the Work.

36-3 TRENCH EXCAVATION

Trench excavation shall conform to Section 19, "Trench Excavation, Bedding and Backfill", of these Specifications. The trench shall be excavated to the lines and grades of the completed pipe as shown on the Plans and within the tolerance specified in these Specifications. The trench shall be of the proper width and the bottom of the trench shall be shaped to the external diameter of the pipe to be constructed. The bottom of the trench shall be prepared to provide full, firm, uniform support by undisturbed earth or compacted fill over a minimum of the bottom one hundred eighty degrees (180°) of the outside of the pipe. Trench width at the top of pipe shall not exceed the outside diameter of the pipe at the spring line.

Unless otherwise directed by Agency or specified in the Special Provisions, the trench in which pipe was placed during the previous 24 hours, plus the trench required for the next day's work, plus additional trench one half the length of the trench required for the next day's work, is the total maximum allowable length of trench on any one portion of the Work that may remain open at the end of each Working Day. The remainder of the trench shall be backfilled and compacted, and when in streets or highways, opened to traffic as soon as practicable.

36-4 SPECIAL FOUNDATION TREATMENT

Whenever the bottom of the trench is soft, rocky or in the opinion of the Agency otherwise unsuitable as a foundation for the pipe, the unsuitable material shall be removed to a depth such that when replaced with a suitable material, it will provide a stable and satisfactory foundation. Suitable materials for backfilling the trench below the pipe shall consist of select material approved by the Agency compacted to a relative compaction of not less than ninety percent (90%). Alternate backfill materials and methods may be used with the approval of the Agency.

36-5 CONCRETE

Concrete shall be Class "A-1" portland cement concrete conforming to Section 50-5, "Portland Cement Concrete", and these Specifications.

The maximum aggregate size shall be determined by the size of cast-in-place concrete pipe constructed, and shall be as follows:

Pipe Size	Maximum Aggregate
48" or less	1"
Over 48"	1-1/2"

Gradation for combined aggregates shall conform to Section 90-3.04, "Combined Aggregate Gradings", of the State Specifications.

Slump shall not exceed two inches (2") as determined by the slump cone method of ASTM Designation: C 143 or an equivalent slump as determined by California Test Method 533, unless otherwise permitted or directed by the Agency.

The minimum wall thicknesses for the various sizes of pipe shall conform to the following table:

Internal Diameter	Minimum Wall Thickness
24” through 30”	3”
33” and 36”	3-1/2”
42”	4”
48”	5”
54”	5-1/2”
60”	6”
66”	6-1/2”
72”	7”
78”	7-1/2”
84”	8”
90”	8-1/2”
96”	9”
108”	10”
120”	12”
132”	14”
144”	15”

The compressive strength of the concrete shall be not less than seven hundred pounds per square inch (700 psi) at one day, not less than fourteen hundred pounds per square inch (1400 psi) at three (3) days, not less than twenty-one hundred pounds per square inch (2100 psi) at seven (7) days, and not less than thirty-five hundred pounds per square inch (3500 psi) at twenty-eight (28) days, as determined by moist-cured test cylinders.

36-6 PLACING CONCRETE

Prior to placing any pipe, the Contractor shall secure the Agency’s written approval of the excavated trench. Concrete placement shall conform to the provisions of Section 51-1.09, “Placing Concrete”, of the State Specifications. All surfaces against which concrete is to be placed shall be free from standing water, mud, and debris, and shall be firm enough to prevent contamination of the concrete by earth or other foreign material. Absorptive surfaces against which concrete is to be placed shall be moistened thoroughly so that the moisture will not be drawn from the freshly placed concrete.

An approved method or device shall be used when placing invert concrete to insure that thickness is maintained at not less than minimum wall thickness at any point. Written approval of this method or device shall be obtained from the Agency prior to beginning concrete placement.

The cast-in-place concrete pipe shall be constructed in one placement around the complete periphery.

The temperature of the concrete when it is being placed shall be not more than 90°F and not less than 40°F in moderate weather, or not less than 50°F in weather during which the mean

daily temperature in the vicinity of the work site falls below 40°F. Whenever the mean daily temperature in the vicinity of the work falls below 40°F for more than one day, the concrete shall be maintained at a temperature not lower than 50°F for at least seventy-two (72) hours after it is placed. Concrete shall be protected against freezing temperatures for three (3) days immediately following the seventy-two (72) hours of protection at 50°F. Where artificial heat is employed, special care shall be taken to prevent the concrete from drying. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90°F, the Contractor shall employ effective means, such as precooling of aggregates and mixing water and placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90°F.

36-7 START AND CLOSE SECTIONS

A starter section may be used at the beginning of each run of cast-in-place concrete pipe, such as beginning from an existing structure, or from a manhole, at a change in size or from a manhole at an angle point. Starter sections shall be approximately six feet (6') in length and of the same inside diameter as the cast-in-place concrete pipe, unless otherwise approved by the Agency. The strength of the reinforced concrete starter section shall be as shown on the Plans and shall be placed in accordance with the requirements of these Specifications.

A closing section shall be used when directed by the Agency or where it is not possible to complete a run of cast-in-place concrete pipe because of lack of clearance ahead in the trench.

Starting and closing sections may be either concrete pipe or corrugated steel pipe meeting the strength requirements indicated on the Plans. However, if the combined length of the starting and closing sections exceeds twelve feet (12') in one reach between manholes, concrete pipe shall be used.

36-8 CONSTRUCTION JOINTS

If construction of the pipe stops short of a manhole or for a period exceeding twenty (20) minutes, the resulting construction joint shall be reinforced with a concrete collar. This collar shall extend one foot (1') either side of the joint and shall be a minimum thickness equal to that of the pipe. The resulting end of pipe shall be securely closed by a heavy canvas or equal to prevent excessive dehydration of the concrete already placed.

Joints shall be clean and damp when covered with fresh concrete or mortar. Cleaning of construction joints shall consist of removing all laitance, loose or defective concrete, coating, and foreign material.

36-9 FINISH

Flowline elevations of the completed pipe shall not vary more than 0.05 feet from the design grade shown on the Plans. Variations in the internal diameter shall not exceed one thirty-second inch (1/32") per diameter inch. (For example, for 24-inch pipe, 1/32" x 24" = 3/4" variation). Offsets at form laps shall not exceed the limits specified in the following table:

Pipe Diameter	Maximum Offset
24” through 30”	3/8”
33” through 42”	1/2”
48” through 66”	5/8”
72” through 90”	7/8”
96” through 108”	1”
120” and larger	1-1/8”

The finished surface of the concrete pipe shall be substantially free of fractures, cracks and interior surface roughness.

The Contractor shall hand trowel the bottom ninety degrees (90°) of the inside of the pipe unless alternate provisions are made to provide a smooth interior surface satisfactory to the Agency. The remaining interior surface of the pipe not covered by forms shall be equivalent to a steel screeded finish. All extraneous concrete shall be removed from the interior surface as soon as possible after placing. Any additional finish work or repair work required to be done on the pipe shall be completed within five (5) days after the pipe is placed.

If obvious segregation or honeycombing or inadequate wall thickness is found by the Agency, the pipe may be rejected.

36-10 FORMS

Forms shall be strong enough to permit the placement and vibrating of the concrete without causing distortion at any point. Form support systems shall be constructed so that previously placed concrete will not be damaged. Form structure bearing plate indentations shall not exceed one-eighth inch (1/8”) and care shall be taken when removing the forms to prevent damage to the pipe. After removal of the forms, the inside of the pipe will be inspected by the Agency and any repairs made promptly by the Contractor, at the Contractor’s expense.

The surfaces of the forms against which concrete is to be placed shall be cleaned of all dirt, mortar, and foreign material. Forms shall be thoroughly coated with form oil prior to use. The form oil shall be a commercial quality form oil or other equivalent coating that will permit the ready release of the forms.

36-11 CURING

Immediately after finishing exposed exterior surfaces, the curing of these surfaces shall be undertaken by any one or a combination of the following methods:

- Pigmented curing compound, blanketing, cotton mat, polyethylene film or spraying methods as specified in Section 90-7.01, “Methods of Curing”, of the State Specifications.
- A six-inch layer of moist earth backfilled over the pipe. Care shall be taken to avoid damage to the fresh concrete while placing the backfill. This backfill shall be kept moist for not less than seven (7) days.

During the curing period, the ends of the pipeline shall be securely closed with heavy canvas, or by other methods approved by the Agency, to maintain a humid condition within the pipe for a minimum of seven (7) days, except during periods when repair work is actually in progress on the inside of the pipe.

36-12 FIELD QUALITY CONTROL

36-12.01 Placement Tests

The Agency will be present for testing and inspection at all times during construction of a cast-in-place concrete pipe. No cast-in-place concrete pipe may be constructed without the presence of the Agency.

A slump test of each truckload of concrete will be made by the Agency before the concrete will be permitted to be placed in the pipe casting machine.

Any concrete having a slump that exceeds the specified slump by more than one-half inch (1/2") will be rejected. At least three (3) compressive test cylinders will be cast from representative portions of each load of concrete. Each cylinder shall have recorded the line, station number, date and batch ticket number. Compression tests will be made at the Agency's expense. Concrete compressive strength shall be determined from six-inch by twelve-inch (6" x 12") cylinders conforming to ASTM Designation: C 31, tested in conformance with ASTM Designation: C 39.

One (1) cylinder of each set will be tested after curing for two (2) days and seven (7) days, at the option of the Agency. The other cylinder of the set will be held for testing in the event that the Agency wishes to retest any batch.

If more than two (2) cylinders tested in any day's concrete placement fall more than ten percent (10%) below the minimum specified compressive strength, cores will be taken from the pipe and tested for compressive strength at the expense of the Contractor. If cores indicate concrete strength more than twenty percent (20%) below the minimum specified compressive strength, that portion of pipe shall be removed and replaced with precast concrete pipe, at the expense of the Contractor.

36-12.02 Crack Repair

After completion of entire backfill and compaction, all cracks shall be repaired as follows: Crack width shall be determined by penetration to more than 0.25 inch (6.4mm) of a standard machinist gage leaf defined in AASHTO T 280.

Where the pipe function requires repair, circumferential cracks greater than 0.01 inch (0.3mm) and less than 0.06 inches (1.5mm) in width shall be cleaned and filled with mortar. Circumferential cracks 0.06 inches or more in width shall be cleaned and filled to a depth of 0.38 inches (9.5mm) with an elastomeric sealant.

Longitudinal cracks with a width of more than 0.01 inches (0.3mm) and a length less less than that determined by the formula 0.0005 times the outside pipe diameter shall be cleaned and filled to a depth of 0.38 inches (9.5mm) with an elastomeric sealant.

Longitudinal cracks having displacement greater than 0.08 inches (2.0mm) or width greater than that determined by the formula 0.0005 times the outside pipe diameter shall be repaired by full depth epoxy pressure grouting.

36-13 REIMBURSEMENT FOR FIELD QUALITY CONTROL

The Agency has determined that there is an additional cost to the Agency for field quality control of cast-in-place concrete pipe over and above that required for other types of underground construction. This additional cost is fixed at the amount specified in the Special Provisions and shall be reimbursed to the Agency in order that bids received for various pipe materials and methods of construction will be comparable in total cost. Reimbursement will be deducted from the prices paid per linear foot for each size of cast-in-place concrete pipe.

36-14 BACKFILL

Initial backfill shall be the material placed between the top of the pipe shoulder in contact with the trench and a point twelve inches (12") above the top of the pipe. Initial backfill selected

from job excavated material must be finely divided and free from debris, organic matter and pieces larger than one inch (1”). The material shall be placed immediately after the pipe has been completed, inspected and accepted by the Agency and permission to backfill has been obtained in writing from the Agency. The material shall be carefully placed so as not to disturb or damage the pipe and shall be brought up evenly on both sides.

The material shall be compacted to a relative compaction of at least ninety percent (90%) as determined by ASTM Designation: D 1557. Jetting will not be permitted during placement of initial backfill.

Jetting may be permitted for backfill above twelve inches (12”) over the pipe, if approved by the Agency.

As an alternative to job excavated material, initial backfill may consist of imported three-quarter inch (3/4”) clean crushed rock conforming to ASTM D 448 sieve size number 6 or 7 and to Section 50-16, "Clean Crushed Rock", of these Specifications.

Intermediate and final trench backfill shall conform to Section 19, “Trench Excavation, Bedding and Backfill”, of these Specifications.

36-15 LOADING DURING CURING

No backfill other than a six-inch (6”) layer permitted for curing purposes shall be placed until the tests designated have been made and permission to backfill has been obtained from the Agency. Depth of backfill over the top of the pipe shall not exceed twelve inches (12”) until the concrete compressive strength reaches seven hundred pounds per square inch (700 psi) or the pipe has been in place twenty-four (24) hours, whichever is longer. Light traffic [axle load less than six thousand (6000) pounds] may be routed over the pipe when loosely backfilled and prior to jetting. Unrestricted traffic will be permitted over the pipe when the concrete strength reaches fourteen hundred pounds per square inch (1400 psi) or the pipe has been in place for seventy-two (72) hours, whichever is longer. In all cases, the Contractor is responsible for correcting any damage to cast-in-place concrete pipe caused by premature or excessive loading prior to the end of a seven (7) day curing period.

36-16 MEASUREMENT AND PAYMENT

The length of cast-in-place concrete pipe to be paid for will be the slope length designated by the Agency. Pipe placed in excess of the length designated will not be paid for. The price paid per linear foot for cast-in-place concrete pipe includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the pipeline, complete in place, including excavation, bedding material, special foundation treatment, backfill, and construction joints, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 37 BORING AND JACKING

37-1 GENERAL

At locations shown or specified in the Contract, conductor pipe and associated carrier pipe shall be jacked into place between the limits shown or specified, in accordance with Section 65-1.05, "Jacking Pipe", of the State Specifications, and these Specifications. All boring and jacking operations shall comply with Cal OSHA Tunnel Safety Orders.

The Contractor shall provide a boring and jacking plan to the Agency prior to beginning the boring and jacking operations. The boring and jacking plan shall describe the equipment, method, and construction sequence for boring and jacking. The Plan shall identify the location of all potential conflicting public and private utilities and address any conflicts with their systems. The Plan shall also identify the location of nearby trees and address any conflicts with their root systems. Work associated with boring and jacking shall not begin until the Agency has reviewed the Contractor's boring and jacking plan.

Excavation of boring and receiving pits shall be the minimum size necessary to complete the Work. Shoring and bracing for the boring and receiving pits shall conform to the requirements in Section 19-1.06, "Shoring and Bracing", of these Specifications. Unless otherwise specified in the Special Provisions, backfill of the area excavated for the boring operation shall conform to the requirements for structure excavation in Section 18-3, "Structure Excavation and Backfill", of these Specifications.

Unless otherwise specified in the Special Provisions, the Contractor may elect to either jack reinforced concrete pipe, vitrified clay microtunneling pipe, or ductile iron pipe, directly or place it in a conductor in conformance with these Specifications. If surface obstructions exist, sanitary sewer pipelines shall be placed within a conductor.

Auger bore and jack, pilot tube (guided bore), or microtunneling may be acceptable methods. If a specific method is not stated in the Contract Documents, the method must be approved by the Agency prior to implementation. Microtunneling shall be used in all areas where tunneling operations may occur below the groundwater table.

37-2 DIRECT JACKING REINFORCED CONCRETE PIPE

Reinforced concrete pipe or reinforced concrete sewer pipe may be jacked directly. Only pipe using double-rubber gasket, fiberglass reinforced collar, or approved equal type joints may be jacked directly. Guide rails shall be accurately set to line and grade to insure installation within permitted tolerances. Unless otherwise shown or specified in the Contract, the maximum length of direct jacking shall be one hundred feet (100'). The diameter of the bored hole shall be not more than one-tenth foot (0.1') greater than the outside diameter of the reinforced concrete pipe or reinforced concrete sewer pipe.

37-3 INSTALLATION OF CONDUCTOR PIPE

The diameter of the bored hole shall be not more than one-tenth foot (0.1') greater than the outside diameter of the conductor pipe. Guide rails shall be accurately set to line and grade to insure installation of the conductor pipe within permitted tolerances. The conductor pipe diameter shall be sufficient to allow adjustment of line and grade of the carrier pipe to meet allowable tolerances and to allow sand to be placed between the conductor pipe and the carrier pipe. Conductor pipe sizes shall be as shown or specified in the Contract, but in no case shall the inside diameter of the conductor pipe be less than six inches (6") greater than the outside diameter of the carrier pipe.

For sanitary sewer pipe installations, cathodic protection shall be installed per Standard Drawing 7-19A.

37-4 INSTALLING CARRIER PIPE INSIDE CONDUCTOR PIPE

Except for water pipe, carrier pipe having any part of a joint larger in diameter than the barrel of the pipe shall be fitted with two (2) twenty-four-inch (24") long polyurethane skids. The polyurethane skids shall be attached to the carrier pipe as recommended by the manufacturer. The polyurethane skids shall be located near the center of each carrier pipe section, and shall be large enough to prevent any part of a joint from bearing on the conductor pipe.

Each joint of carrier pipe for water shall be strapped according to the manufacturer's recommendations to two (2) pairs of twenty-four-inch (24") long polyurethane skids. The polyurethane skids shall be located at approximately one-fifth (1/5) of the pipe length from each end of each carrier pipe section.

Refer to Standard Drawing 7-8 for installation of sanitary sewer pipe in conductor casing.

Carrier pipe with joints not larger than the pipe barrel shall be slid into place on two (2) polyurethane skids which have been securely fastened to the invert of the conductor pipe, or strapped to the barrel of the carrier pipe as specified above.

Carrier pipe sections shall be joined outside the conductor pipe and then slid into place. The space between the carrier pipe and the conductor pipe shall be completely filled with clean, dry sand. The method of placing sand shall be as approved by the Agency. Except for water pipe, necessary adjustments in grade shall be made by adjusting the height of the skids. Adjustment in grades for water pipe shall be as shown or specified in the Contract, or directed by Agency.

37-5 VOIDS

When material tends to cave in from outside the permitted diameter of the bored hole, a shield shall be used ahead of the first section of conductor pipe or the face of excavation shall not extend beyond the end of pipe more than one and one-half feet (1-1/2'), unless permitted by the Agency. The shield shall cover the upper two-thirds (2/3) of the conductor pipe and project not more than one-half inch (1/2") beyond the conductor pipe's outer surface. Excavation shall not project beyond the shield.

Voids larger than those permitted by these Specifications shall be filled with sand or mortar, as directed by the Agency.

To assist in the detection of voids, a settlement monitoring grid will be established by the Agency. A minimum number of monitoring points will be quarter stations along the centerline of the pipe alignment plus wing points twenty-five feet (25') on either side of the centerline points.

The Contractor shall run levels over these points, and record their elevations, before either the boring or receiving pit is constructed, and subsequently each day that material is removed from the excavation. A final set of elevations shall be recorded two (2) weeks after the conductor pipe is filled with sand and the bulkheads are in place. A copy of the elevation records shall be provided to the Agency at the end of each day. Any settlement over one-quarter-inch (1/4") shall be corrected by the Contractor to the satisfaction of the Agency, at the Contractor's expense.

37-6 TOLERANCES

The maximum deviation of conductor pipe from the line and grade shown on the Plans shall be such that line and grade of the carrier pipe can be adjusted within the conductor pipe and maintain the line and grade along its full length.

Unless otherwise shown or specified in the Contract, directly jacked pipe shall not deviate more than three inches (3") per one hundred feet (100') from the line and grade shown on the Plans.

37-7 DRY BORING UNDER CURB, GUTTER AND SIDEWALK

Unless otherwise specified in the Special Provisions, portions of sanitary sewers, service sewers, drainage lines, irrigation lines, water mains, and services that pass beneath curbs, gutters, sidewalks, and other obstructions may be installed by dry boring. For such locations, the bore shall begin at the edge of the street pavement, or as directed by Agency, and continue to six inches (6") beyond the property line. For sewer services, the end of the pipe shall then be capped or plugged and the pipe pushed into the bored hole. To determine final line and grade for a service sewer, and to install the cleanout or the location post, the end of the bore at the property line shall be exposed.

If the pipe material is vitrified clay, the pipe shall be plain end connected with compression-type couplings. The bore shall be just large enough to pass the couplings and need not be backfilled. Unless otherwise shown or specified in the Contract, the maximum length of bore shall be fifteen feet (15').

Boring shall not be used on service sewers when the required slope is such that probable deviation of the bore from the intended line and grade would result in a final slope of less than one-quarter inch per foot (1/4" per 1').

37-8 WET BORING OF SMALL DIAMETER PIPELINES

When specified in the Special Provisions, pipelines that are six inches (6") and smaller may be installed by wet boring. Pipe shall be either ductile iron pipe conforming to Section 50-25, "Ductile Iron Pipe (DIP), and Cast Iron Pipe and Ductile Iron Fittings", of these Specifications or polyvinyl chloride (PVC) pressure Class 200 pipe conforming to the requirements of AWWA Standard C900.

If the diameter of the boring hole is more than one-tenth of a foot (0.1') greater than the outside diameter of the pipe to be installed, the void shall be filled with sand or mortar, as directed by the Agency.

37-9 MEASUREMENT AND PAYMENT

Boring and jacking will be measured by the unit for each location for the size and type of pipe to be placed by boring and jacking as designated in the Contract.

The unit price paid for boring and jacking for each location for the size and type of pipe includes full compensation for furnishing all labor, materials (including conductor pipe when specified), tools, equipment, and incidentals, and for doing all the work involved in boring and jacking pipe, complete in place, including the excavation and backfill, as shown or specified in the Contract, as specified in these Specifications, and directed by the Agency.

SECTION 38 SEWER AND STORM DRAIN CONSTRUCTION

38-1 GENERAL

Sewer and storm drain construction shall conform to the details shown on the Plans and these Specifications. The Contractor shall furnish and install sanitary sewer and drain pipe of the materials shown or specified in the Contract. Where alternate pipe materials are listed in the Bid, the Contractor shall bid only one of the alternates shown. Substitution of alternate pipe material after bid is not permitted.

38-2 MATERIALS

Sewer and storm drain pipe shall be of the type, class and size as shown or specified in the Contract, and shall conform to the requirements of Section 50, "Construction Materials", of these Specifications for each respective type and class of pipe.

38-3 EXCAVATION AND BEDDING

Trench excavation and bedding for all sewer and storm drain pipe construction shall conform to Section 19, "Trench Excavation, Bedding and Backfill", of these Specifications.

The Contractor shall expose the end of existing pipe to be extended, for verification of alignment and elevation by the Agency, prior to trenching for any pipe that may be affected.

38-4 LAYING PIPE

38-4.01 Placement

Pipe laying shall proceed after the trench has been excavated to the proper depth and the foundation soils are found to be firm and non-yielding, and bedding has been placed and compacted to a non-yielding condition. Pipe laying shall proceed upgrade with the bell end of the pipe placed upstream. Each section of pipe shall be laid to plan line and grade, with uniform bearin gunder the full length of th ebarrel of the pipe. Suitable excavation shall be made to receive the bell, which shall not bear on the subgrade or bedding. Any pipe which is not in true alignment or shows any undue settlement after laying shall be taken up and re-laid at the Contractor's expense. Pipe sections shall be laid and jointed in such a manner that the offset of the inside of the pipe at any joint will be held to a minimum at the invert. The maximum offset shall be as follows:

Pipe Diameter	Allowable Offset Joint
Less than 12 inches	3/8 inch
12 inch to 18 inch	½ inch
21 inch to 42 inch	5/8 inch

For joints that are polyurethane compression type, the mating surfaces shall be clean, and lubricated with a lubricant recommended by the pipe manufacturer. The pipe shall be joined spigot into socket. For joints that are shielded rubber coupling the surface of the rubber sleeve shall be thoroughly wetted with a silicone base lubricant as recommended by the manufacturer. Joints installed shall have compression bands torqued to 70 inch-pounds, minimum and shall provide uniform tension.

. The interior of the pipe shall be cleared of all dirt and debris as the work progresses. Pipe shall not be laid when the condition of the trench or the weather is unsuitable, in the opinion of

the Agency. Dewatering of the trench shall be maintained as described in Section 10-5, "Contorl of Water in the Work", of these Specifications. All open ends of pipe and fittings shall be closed whenever the work is discontinued. For remedial maintenance or improvement projects in established areas, the Contractor shall coordinate the work so that storm drain and sewer systems are fully operational at the end of each Working Day. No runoff shall be allowed to flow uncontained through any trenches or excavations.

Circular reinforced concrete pipe with elliptical reinforcement shall be placed with the minor axis of the reinforcement in a vertical position.

38-4.02 Lines and Grades

All pipe shall be laid in strict conformity to the prescribed line and grade with grade bars set and each pipe length checked to the top grade line. Three consecutive points on the same grade of slope shall be used at all times to detect any variation from a straight grade. In case any discrepancy exists, the work shall be stopped and the discrepancy immediately reported to the Agency. In addition, when requested by the Agency, a string line shall be used in the bottom of the trench to insure a straight grade and alignment of the pipe.

The Contractor may elect to furnish a laser beam system for grade and alignment control. Such laser beam shall have a minimum accuracy of ± 0.01 foot per one hundred feet (100') on line; and a minimum visible range of one thousand feet (1000'), and shall comply with OSHA requirements. The laser system shall have good visibility when used with suitable target material. The laser system shall be of the self-leveling type so that the laser beam is automatically compensated for small grade disturbances. The laser system shall also have an early warning system that warns when the laser is off grade.

38-4.03 Grade Tolerance - Sewer

Grade tolerance of the flow line of gravity sewer pipe shall not exceed ± 0.05 feet and there shall be no deviation in any 12 foot section greater than 0.05 feet The allowable sag tolerance,., the total variation (plus or minus) from flow line grade shall not exceed the following:

1. one-quarter of an inch (0.25") in four inch (4") or smaller pipe
2. three-quarters of an inch (0.75") in six- through twelve-inch (6"-12")pipe
3. one inch (1") in fifteen- through forty-two-inch (15"-4236") pipe.
4. Grade and total variation tolerance for pipe greater than forty-two inches (42") shall be as required in the Special Provisions.Grade tolerance of the flow line of sewer force main pipe shall not exceed ± 0.05 feet and there shall be no deviation in any 20 foot section greater than 0.05 feet.

38-4.04 Grade Tolerance – Storm Drain

Grade tolerance of the flow line of storm drain pipe shall not exceed ± 0.10 feet. In any twenty-five-foot (25') length, the total variation (plus or minus) from design grade shall not exceed the following:

1. one inch (1") in twenty-one inch (21") or smaller pipe
2. one and a half inches (1.5") in twenty-four- through thirty-six-inch (24"-36") pipe
3. two inches (2") in forty-two-inch (42") or larger pipe.

38-4.05 Existing Utilities and Facilities

For any entry or connection to the existing sanitary sewer system, a CSD-1 Access Request (AR) shall be submitted and approved prior to commencement of construction. Review and approval of the AR will be completed with five (5) working days if all required information is included in the AR form. Required information includes, but is not limited to, actual locations of existing facilities, description of the proposed work, date and time of the proposed work, tools to be used for the work, and safety precautions. Additional information may be required by the Agency to insure a safe entry or connection.

Mortar or brick plugs shall be installed in existing manholes as directed by the Agency in order to prevent surface water, ground water, and debris from entering existing sewer or storm drain systems during construction. Inflatable plugs will not be permitted. Care shall be exercised in installing plugs to avoid interrupting service to existing sewer or storm drain services. Plugs shall be removed upon completion of testing as provided in Section 38-10, "Testing of Pipe", in this Section of these Specifications.

The Contractor is responsible for avoiding all utility, service, or other conflicting lines that are not in direct physical conflict with the facility under construction. The Contractor may arrange with the owner of the utility to temporarily disconnect house service lines or other facilities along the line of work for the Contractor's convenience. The Contractor is responsible for all costs for disconnecting and restoring such utilities.

Utility or other lines which are in direct physical conflict with the structural section of the facility being constructed or appurtenant structures, and which cannot be avoided by rerouting the facility being constructed, or for which relocation is not provided in the Plans and Specifications, will be relocated by the owner of the utility prior to or during construction in accordance with Section 42, "Relocation and Maintenance of Utility Facilities", of these Specifications.

Should it become necessary to reroute the facility being constructed to avoid an existing utility or other obstruction and such rerouting is ordered by the Agency, compensation for the installation of such rerouted line shall be made at the unit price bid for the installation of said facility and no additional compensation will be made except as provided in Section 9, "Changes and Claims", of these Specifications. Reroute sewer service in accordance with Standard Drawing 7-13.

When indicated on the Plans or directed by the Agency, storm drain pipes and structures shall be abandoned in conformance with Section 15-1.04, "Abandonment of Pipes and Manholes", of these Specifications.

If existing facilites are damaged due to adjacent construction the Agency or Utility shall be responsible for notifying the affected homeowner and/or Agency. The Agency or Utility causing the damage shall be responsible for replacement or repair of the pipeline and any damage resulting due to their actions.

38-4.06 Flusher Branches

A flusher branch or manhole shall be constructed at the end of all sewer pipelines. A flusher branch may be used in lieu of a manhole at the end of any collector less than 120 feet in length. A flusher branch may also be used at the end of a collector less than 200 feet in length in the collector extends to a subdivision boundary and there are definite plans for its extension. Pipeline stubs are not permitted. Flusher branches shall be used at the end of pipelines that are designated to be extended with future development. Sewer services into the flusher branch are not allowed. Flusher branches shall conform to Standard Drawings 7-6, 7-6A, and 7-6B.

38-5 SEWER SERVICES

Construction of the cleanout to grade for all sewer services is required. Construction of the top one foot (1') of the cleanout riser may be delayed until installation of the building sewer at the option of the Contractor, except where the water main is to be installed at the back of the sidewalk (refer to Standard Drawing 7-5). If construction of the top one foot (1') of the riser is delayed, the location of the service shall be accurately staked with a four-inch by four-inch (4"x4") post, which extends a minimum of three feet (3') above the finished grade and is painted dark green with permanent, non-degrading paint.

In addition, where curb and gutter exists, or is to be constructed concurrently with sewer facilities, the location of each sewer service shall be permanently indicated by inscribing the letter "S" two inches (2") in height in the curb directly above the line when the service is

perpendicular to the street centerline. Otherwise, the "S" marks for skewed or angling services shall be placed at a right angle to the end of the service. When sewer services are installed in an existing street, the curb mark shall be placed at the time the service is installed to assure proper location.

In new subdivisions when the sewer services are installed before the curb is constructed, it is the Contractor's responsibility to establish the exact location of each sewer service and to record this information on the Record Drawings..

In all alley improvements where a main is being replaced, all services to that main shall be replaced and a clean-out installed as shown or specified in the Contract.

Service sewers shall be installed as detailed on Standard Drawing 7-5 and at the locations shown on the Plans. Unless otherwise specified, service sewers shall be four-inch (4") diameter in residential areas and six-inch (6") diameter in commercial and industrial areas and constructed to the property line or easement line. Except as otherwise specified herein, service sewers shall be of the same material as the lateral sewer to which it connects. In residential areas only the following exceptions are allowed:

- ABS-DWV (Schedule 40, ASTM D 2661) pipe may be connected to a VCP "Tee" or "Wye" as shown on Standard Drawing 7-5.
- A manufactured "Tee" or "Wye" fitting of the same materials as the collector sewer shall be used in the collector sewer and shall be inclined upwards at a minimum angle of twenty-five degrees (25°) and a maximum of forty-five degrees (45°) from the horizontal. The ends of all service sewers shall be securely sealed a solvent-cemented or jointed watertight cap. Unless otherwise shown on the Plans, the depth of cover of the service sewer at the easement or property line shall be a minimum of four feet (4') and a maximum of five feet (5') below finished grade or edge of adjacent roadway, whichever is at the lower elevation, except that the minimum depth of cover shall be five feet-six inches (5'-6") and the maximum six feet (6') where a water main is to be installed at back of sidewalk as part of subdivision improvements. In such cases, as detailed in Standard Drawing 7-5, the service shall also be extended to the back of the 12.5 foot PUE or a minimum of ten feet (10'). The cleanout to grade, however, shall remain a maximum of two feet (2') behind the sidewalk, and a second cleanout installed at the end of the extension. Any elevation given shall be a maximum allowable elevation, and the minimum slope of the service shall be one-quarter inch per foot (1/4" per 1'). If the service is to be bored, the tolerance of the operation must be within these limits.

If the service sewer will have less than three feet (3') of cover as measured from the top of the finished subgrade, Class 200 cast or ductile iron pipe, or PVC (DR-14) pipe conforming to the requirements of AWWA C900, or other high strength pipe approved by the Agency shall be used.

Service sewers entering a manhole shall be set to an invert to crown match with the outgoing pipe, or internal drops conforming to Standard Drawing 7-3, except at the ends of cul-de-sacs see Standard Drawing 7-1. Unless otherwise shown on or specified in the Contract, cleanouts shall be provided for all service sewers that do not require a manhole at property or easement line. The cleanout shall be installed three feet (3') maximum back of the sidewalk or easement line if the service is located within a side or back of lot easement. A concrete or PVC box shall be set to finish grade of the property. The cleanout and service shall be of like material and diameter, and shall be installed as shown on Standard Drawing 7-9 or 7-10, as required for the particular situation.

38-5.01 Service Sewer Relocations and Reconnections

Service sewer relocations and reconnections shall be constructed in conformance with these Specifications and as directed by the Agency. Ductile iron sewer pipe or PVC Pressure Class 200 (DR-14) pipe conforming to the requirements of AWWA C900 shall be used when the

minimum depth of cover of the reconnected or relocated service sewer is three feet (3') or less from the top of the finished subgrade, or if located beneath the drain pipe and the clearance between the pipes is one-half foot (0.5') or less. Details for service sewer relocations and reconnections shall be as shown on Standard Drawing 7-13.

38-5.02 Connections to Existing Sewers

Where a new or relocated service sewer requires that a tap be made to an existing collector or trunk sewer, such tap will be made by the Agency. An application for such tap shall be made to the Agency, and the required fees paid, at least ten (10) Working Days in advance of the date the tap is desired. All excavation, shoring and bracing is the responsibility of the Contractor and must be in conformance with all OSHA and other applicable safety standards. All shoring and bracing shall be in place before Agency personnel will install the tap. Installation of the service sewer shall be completed by the Contractor in accordance with these Specifications.

38-5.03 Connections to Manholes

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. For manholes located at the end of a cul-de-sac the invert of any service stubs shall be a minimum of one inch (1") above the invert of the exit pipe. Internal drop connections shall have a minimum length of three feet (3') and be installed using a drop bowl in accordance with Standard Drawing 7-3.

38-6 STORM DRAIN INLET LATERALS

Unless otherwise indicated on the Plans or in the Special Provisions, storm drain inlet laterals shall be a minimum of twelve inches (12") in diameter. Unless otherwise indicated in the Contract, materials for inlet laterals shall conform to requirements of Section 50, "Construction Materials", of these Specifications for each respective type and class of pipe.

Connections of laterals to manholes and inlets shall be water and soil tight, and shall conform to Section 39, "Manholes", and Section 27-13, "Drop Inlets and Catch Basins", of these Specifications.

All inlet laterals shall be inspected by lamping conforming to Section 38-10.05, "Lamping of Storm Drain Inlet Laterals", in this Section of these Specifications or TVI. When the radius or length of the lateral precludes the effective use of lamping methods, a TVI is required conforming to Section 38-10.04, "Television Inspection (TVI)", in this Section of these Specifications. Other proposed methods of inspection may be approved by the Agency.

38-7 PIPE JOINTS

Joints in pipe shall conform to the requirements of Section 50, "Construction Materials", of these Specifications and the manufacturer's recommendations for the type of pipe being installed.

38-8 PROTECTIVE COVERING

38-8.01 Sewer Pipe

Unless otherwise specified in the Special Provisions, sewer laid in trenches at such an elevation that the top of the pipe bell is less than eighteen inches (18") below subgrade of the street, the pipe shall be covered with a protective covering as shown on the Plans.

38-8.02 Storm Drain Pipe

Unless otherwise shown in the Contract, storm drain pipe laid in trenches at such an elevation that the top of the pipe bell has less than the minimum cover indicated in Table 38-1

shall be protected with a concrete cap, as shown on Standard Drawing 9-1, "Storm Drain Pipe Bedding and Initial Backfill". Unless otherwise shown in the Contract, the concrete used in making the cap shall be Class "B" concrete conforming to Section 50-5, "Portland Cement Concrete", of these Specifications.

Table 38-1 Minimum Pipe Cover Requirements

Pipe Material Type and Location	Minimum Cover Requirement
Corrugated Metal	Span/8 but not less than 12 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 and under flexible pavements	1/8 the diameter or rise (the greater of) but not less than twelve inches (12”)
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 plus twenty-four inches (24”)
Cast-in-Place-Concrete-Pipes in unpaved areas	Twenty-four inches (24”)
Polyvinyl Chloride - D2241, D3034, F679, F789, F949, F1803, C900, C905, C909	Eighteen inches (18”)

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.

38-9 BACKFILLING PIPE TRENCHES

Backfill of all sewer and storm drain pipes shall conform to the requirements in Section 19, “Trench Excavation, Bedding and Backfill”, of these Specifications.

38-10 TESTING OF PIPE

Unless otherwise specified in the Contract, after laying, backfilling, and compacting of sewer and drain pipe, and before placing the roadway aggregate base, the Contractor shall clean the pipe system, test for obstructions and leakage, and perform the television inspection (TVI). The Agency may require pipes to be re-tested prior to the completion of the one-year warranty. The Contractor shall be responsible for the costs associated with this re-testing.

38-10.01 Tests for Obstructions

Unless otherwise shown or specified in the Contract, all sanitary sewer pipes shall be tested for obstructions and cleaned by balling and flushing or approved method in accordance with Section 43, "Cleaning Pipelines", of these Specifications. For balling and flushing an approved commercial sewer cleaning ball shall be used, which shall be controlled by a tag line or rope, or sewer rods, and permitted to move slowly through the pipe. Any obstructions or irregularities shall be removed or repaired by the Contractor. All testing, cleaning and repairing shall be done to the satisfaction of the Agency. The Contractor shall provide all necessary materials and

utilities for the tests and shall dispose of all waste, including water, at the Contractor's expense. The water shall not be allowed to enter the existing sanitary sewer system.

Unless otherwise indicated in the Contract, balling and flushing or other approved methods for cleaning storm drains shall not be required unless visual inspection by television or lamping indicates obstructions in the line.

38-10.02 Tests for Leakage

All leakage tests shall be completed and approved at finished subgrade and prior to placing the aggregate base.

When leakage or infiltration exceeds the amount allowed by the Specifications, the Contractor shall locate the leaks and make necessary repairs or replacements in accordance with the Specifications to reduce the leakage or infiltration to the specified limits, at the Contractor's expense. Any individually detectable leaks shall be repaired, regardless of the results of the tests.

All sections of sewer lines and storm drains shall be tested by the Contractor by either of the following methods:

38-10.02.A Air Test for Leakage - Sewer

The air test for leakage for gravity sewer shall be in accordance with ASTM C 828. The installer may use this test as a presumptive test to determine the condition of the line prior to backfilling, however, only lines tested after backfilling to final grade will be considered for acceptance. The air test for leakage for sanitary forcemains shall be performed as stated in Section 38-10.02.A.(1)

The Contractor shall furnish all necessary equipment and is responsible for conducting all low-pressure air tests. The Contractor shall perform any necessary repair work on pipeline segments that do not pass any or all of the tests, at no additional cost to the Agency. All testing for acceptance shall be witnessed by the Inspector.

38-10.02.A.(1) *Procedure*

Air tests for leakage for gravity sewers shall follow the procedures outlined in Sections 38-10.02.D.(1) through 38-10.02.D.(5)(d).

38-10.02.A.(2) *Test Time*

Table 38-2 shows the required test time, *T*, in minutes per one hundred feet of pipe for each nominal pipe size. Test times are for a 1.0-psi (7 kPa) pressure drop from 3.5 to 2.5 psi (24 to 17 kPa). In areas where groundwater elevation is above the crown of the pipe; add 1.0 psi to the test pressures for every foot of groundwater above the crown of the pipe. The total pressure of the test shall not exceed 8.5 psi. The criteria in Table 38-2 were calculated using the following formulas:

Minimum test time (T) at a given allowable air loss (Q):

$$T = K \times D^2 L / Q$$

Air loss (Q) with a timed (T) pressure drop:

$$Q = K \times D^2 L / T$$

Where:
D = nominal size, in. (mm),
$K = 0.370 \times 10^{-3}$ for inch-pound units,
$K = 0.564 \times 10^{-7}$ for S.I. units,
L = length of line of one pipe size, ft (m)
Q = air loss, ft^3/min (m^3/min), and
T = time for pressure to drop 1.0 psi (7 kPa), min./100'

38-10.02.A.(3) ***Testing Sewer Collectors With Service Connections***

If service connections are included in the test, the lengths of the service connections may be ignored when computing required test times, unless otherwise specified in the Contract or directed by the Agency.

Should the section of line include more than one pipe size, determine the minimum test time for each size and add the test times to arrive at the total test time for the section.

38-10.02.A.(4) ***Pipeline Acceptance Criteria***

If the test time shown in Table 38-2 elapses before the air pressure drops one pound per square inch (1 psi) gauge, the section undergoing the test shall be deemed to have passed the test.

38-10.02.A.(5) ***Determination Of Line Failure***

If the pressure drop is more than one pound per square inch (1 psi) gauge before the time shown in Table 38-2 has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

Table 38-2

Nominal Pipe Size, D in. (mm)	Minimum Test Time, T (Min:sec/100 ft)	Allowable Air Loss, Q (ft^3/min)
4 (100)	0:18	2.0
6 (150)	0:42	2.0
8 (205)	1:12	2.0
10 (255)	1:30	2.5
12 (305)	1:48	3.0
15 (380)	2:06	4.0
18 (455)	2:24	5.0
21 (535)	3:00	5.5
24 (610)	3:36	6.0
27 (685)	4:12	6.5
30 (760)	4:48	7.0
33 (840)	5:24	7.5
36 (915)	6:00	8.0
39 (990)	6:36	8.5
42	7:18	9.0

38-10.02.B Hydrostatic Test for Leakage - Sewer

A section of pipe shall be prepared for testing by plugging the upper side of the downstream manhole and all openings in the upstream manhole except the downstream opening. Care shall be exercised in installing plugs to avoid interrupting service to existing sewer services. Where grades are slight, two (2) or more sections between manholes may be tested at once. Where grades are steep and excessive heads would result by testing from one manhole to another, test tees, the same size as the main, shall be installed at intermediate points so the maximum head on any section under test shall not exceed twelve feet (12').

A section of line prepared as above shall be tested by filling with water to an elevation five feet (5') above the top of pipe at the upstream end of the test section, or five feet (5') above the existing ground water elevation, whichever is greater. The water shall be introduced into the test section at least four (4) hours in advance of the test period to allow the pipe and joint material to become saturated with water. The water level should then again be brought to the five-foot (5') mark. At the beginning of the test, the elevation of the water in the upper manhole shall be carefully measured from a point on the manhole rim or test tee. After a period of four (4) hours, or less with the approval of the Agency, the water elevation shall be measured from the same point on the manhole rim and the loss of water during the test period calculated. If this calculation is difficult, enough water shall be measured into the upper manhole to restore the water to the level existing at the beginning of the test, and the amount added taken as the total leakage.

Unless otherwise specified in the Special Provisions, the allowable leakage in the test section shall not exceed fifty (50) gallons per mile per day per inch diameter of pipe tested at the five-foot (5') test head. If it is necessary or desirable to increase the test head above five feet (5'), the allowable leakage will be increased at the daily rate of fifty (50) gallons for each foot of increase in head.

Test sections showing leakage in excess of that allowed shall be repaired or reconstructed as necessary to reduce the leakage to that specified above.

Water used in testing shall be disposed as directed by Agency. No testing water shall be allowed to enter the existing sanitary sewer system.

38-10.02.C Water Infiltration Test - Sewer

If, in the opinion of the Engineer, excessive groundwater is encountred in the construction section of the sewer, the exfiltration test for leakage shall not be used. The end of the sewer at the upper structure shall be closed sufficiently to prevent the entrance of water, and pumping of groundwater shall be discontinued for at least 3 days, after which the section shall be tested for infiltration. The infiltration into each individual reach of sewer between adjoining manholes shall not exceed that allowed by the formula $E = 0.00002LD\sqrt{H}$ for all non-mortarted joints. Where:

L = Length of sewer and house connection tested, in feet

E = the allowable leakage in gallons per minute of sewer tested.

D = the internal diameter of the pipe in inches

H = the difference in elevation feet between the water surface in the upper manhole and the invert of the pipe at the lower manhole; or if groundwater is present above the invert of the pipe in the lower manhole, the difference in elevation between the water surface int eh upper manhole and the groundwater at the lower manhole.

The Contractor shall, at its expense, furnish all water, materials and labor for making the required tests. All tests shall be made in the presence of the inspector.

38-10.02.D Air Test for Leakage - Storm Drain

The installer may use this test as a presumptive test to determine the condition of the line prior to backfilling, however, only lines tested after backfilling to final grade will be considered for acceptance.

The Contractor shall furnish all the necessary equipment and be responsible for conducting all low-pressure air tests. In addition, the Contractor is responsible for any necessary repair work on sections that do not pass the test. No sealant shall be used in any newly installed storm drain without the prior approval of the Agency. Using sealant in a storm drain is not the equivalent of a sound storm drain pipe. Proper structural repair work may be required by the Agency.

The Agency will witness all low-pressure air tests and verify the accuracy and acceptability of the equipment utilized.

38-10.02.D.(1) *Plug Restraint*

Restraints must be provided for plug to prevent blowouts of the plug. Sudden expulsion of a poorly installed plug or of a plug that is partially deflated before the pipe pressure is released can be very dangerous. For this reason, it is recommended that every plug be positively braced against the manhole walls, and that no one be allowed in the manhole adjoining a line being tested so long as pressure is maintained in the line

38-10.02.D.(2) *Relief Valve*

All pressurizing equipment used for low-pressure air testing shall include a regulator or relief valve set no higher than nine pounds per square inch, gauge (9 psig) to avoid over-pressurizing and displacing temporary or permanent plugs. As an added safety precaution, the pressure in the test section should be continuously monitored to make certain that it does not at any time exceed nine pounds per square inch, gauge (9 psig). (Note: It may be necessary to apply higher pressure at the control panel to overcome friction in the air supply hose during pressurization.)

38-10.02.D.(3) *Equipment*

38-10.02.D.(3)(a) Plug Design

Either mechanical or pneumatic plugs may be used. The Contractor shall internally restrain or externally brace the plugs to the manhole wall as a safety precaution throughout the test. Prior to any air pressure testing, all pipe plugs shall be checked with a soap solution to detect any air leakage. If any leaks are found, the air pressure shall be released, the leaks eliminated, and the test procedure started over again.

38-10.02.D.(3)(b) Singular Control Panel

To facilitate test verification by the Agency, all air used shall pass through a single, above ground control panel.

38-10.02.D.(3)(c) Equipment Controls

The above ground air control equipment shall include a shut-off valve, pressure regulating valve, pressure relief valve, input pressure gauge and a continuous monitoring pressure gauge having a pressure range from zero (0) to a maximum of at least fifteen (15) pounds per square inch (psi). The continuous monitoring gauge shall be no less than four inches (4”) in diameter with minimum divisions of 0.10 psi and an accuracy of ± 0.04 psi.

38-10.02.D.(3)(d) Separate Hoses

Two separate hoses shall be used: (1) to connect the control panel to the sealed line for introducing low-pressure air, and (2) a separate hose connection for constant monitoring of air pressure build-up in the line. This requirement greatly diminishes any chance for over-pressurizing the line.

38-10.02.D.(3)(e) Pneumatic Plugs

If pneumatic plugs are utilized, a separate hose shall also be required to inflate the pneumatic plugs from the above ground control panel.

38-10.02.D.(4) *Line Preparation*

38-10.02.D.(4)(a) Laterals, Stubs and Fittings

All laterals, stubs and fittings into the storm drain test section shall be properly capped or plugged so as not to allow for air loss that could cause an erroneous air test result. It may be necessary and is always advisable to restrain gasketed caps, plugs or short pipe lengths with bracing stakes, clamps and tie-rods, thrust blocks or wire harnesses over the pipe bells.

38-10.02.D.(4)(b) Pipe Wetting

Air may pass through some porous pipe materials. If such materials are used, the pipe walls may be wetted to temporarily reduce the porosity of the material. Non-porous pipe materials need not be wetted.

38-10.02.D.(5) *Test Procedure*

38-10.02.D.(5)(a) Plug Installation and Testing

After a manhole-to-manhole reach of pipe has been backfilled to final grade and prepared for testing, the plugs shall be placed in the line at each manhole and secured.

All plugs must be tested for leakage before use. It is advisable to plug the upstream end of the line first to prevent any upstream water from collecting in the test line.

When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, therefore the plug shall be put past the first joint outside of the manhole t.

It is extremely important to install and brace the plug to prevent blowouts. The amount of back pressure on the plug should be calculated to be certain the plug being used is designed to withstand this pressure. Always use a pressure gauge and regulator when inflating a sewer plug. Under-inflated plugs will not be able to withstand the required back pressure. Over-inflated plugs can rupture causing possible damage and injury.

38-10.02.D.(5)(b) Line Pressurization

Low pressure air shall be slowly introduced into the sealed line. The internal air pressure shall not exceed 5 psi for areas without groundwater located above the crown of the pipe. In areas with groundwater 1 psi shall be added for every foot of groundwater above the crown of th epipe to a maximum of 8.5 psi. If groundwater is present, refer to Section 38-10.02.D.(6), "Determination of Ground Water Elevation and Air Pressure Adjustment", in this Section of these Specifications.

38-10.02.D.(5)(c) Pressure Stabilization

The air supply may be throttled to maintain internal pressure until the temperature stabilizes.

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38-10.02.D.(5)(d) Timing Pressure Loss

When temperatures have been equalized and the pressure stabilized, the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than three and one-half pounds per square inch, gauge (3.5 psig) greater than the average back pressure of any groundwater over the pipe. At a reading of three and one-half pounds per square inch, gauge (3.5 psig), or any convenient observed pressure reading between three and one-half pounds per square inch, gauge (3.5 psig) and four pounds per square inch, gauge, (4.0 psig)

greater than the average groundwater back pressure, timing shall commence with a stopwatch or other timing device Determination Of Line Acceptance

If the time shown in Table 38-3 for the designated pipe size and length elapses before the air pressure drops one pound per square inch, gauge (1 psig); the section undergoing test shall have passed. The test may be discontinued once the prescribed time has elapsed even though the one pound per square inch, gauge (1 psig) drop has not occurred.

38-10.02.D.(5)(e) Determination Of Line Failure

If the pressure drops one pound per square inch, gauge (1 psig) before the appropriate time shown in Table 38-3 has elapsed, the air loss rate is considered excessive and the section of pipe has failed the test.

38-10.02.D.(5)(f) Line Repair Or Replacement

If the section fails to meet these requirements, the Contractor shall, at his own expense, determine the source, or sources, of leakage, and repair or replace all defective materials and/or workmanship to the satisfaction of the Agency. The extent and type of repair that may be allowed, as well as results, shall be subject to the approval of the Agency. The completed pipe installation shall then be retested and required to meet the requirements of this test.

38-10.02.D.(6) *Determination Of Groundwater Elevation and Air Pressure Adjustment for Storm Drain Pipes*

38-10.02.D.(6)(a) Applicability

The requirements of this Section shall only apply where groundwater is known to exist or is anticipated above the storm drain to be tested.

38-10.02.D.(6)(b) Pipe Nipple Installation

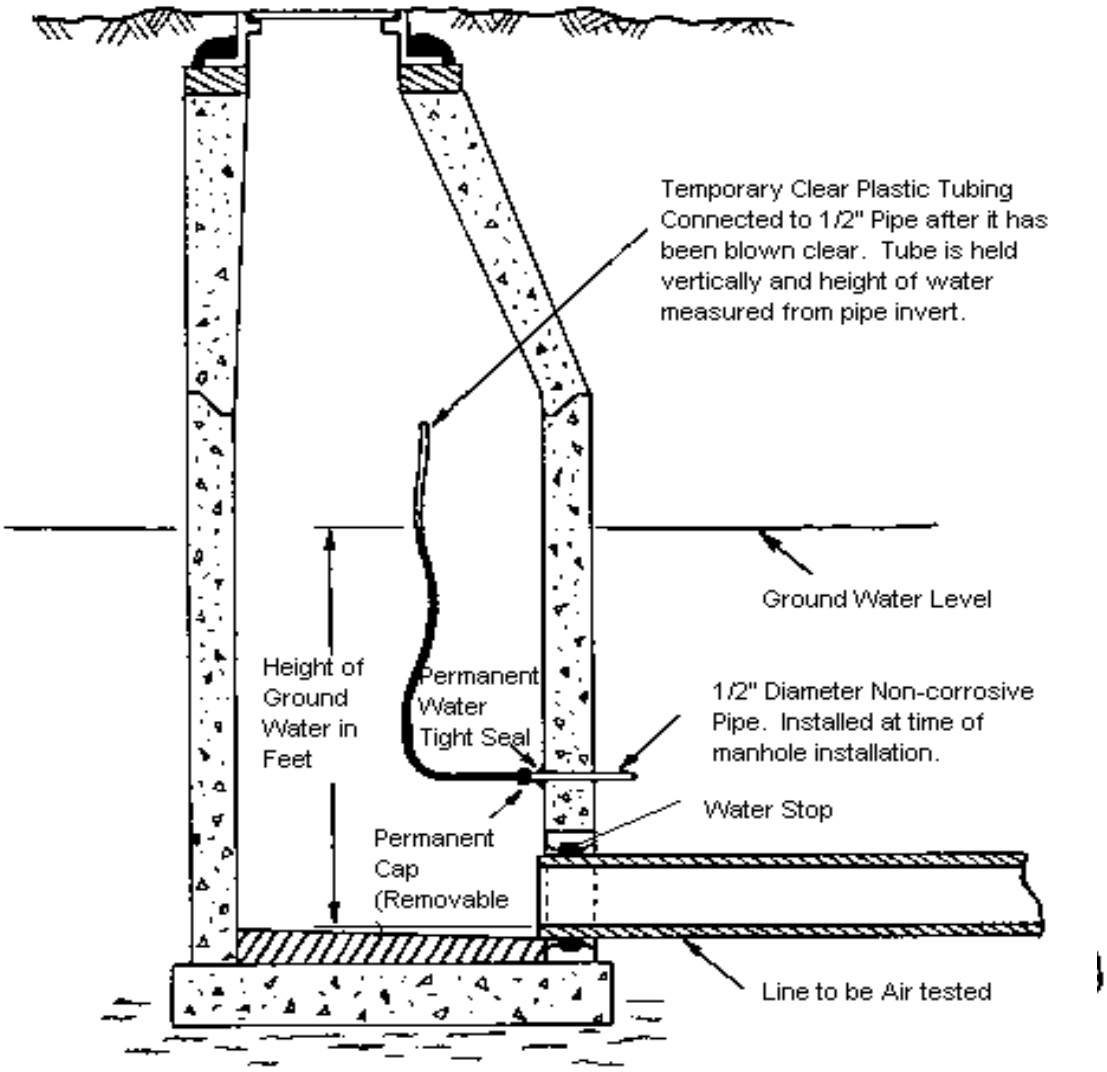
During manhole installation, a one-half inch (1/2”) diameter threaded pipe nipple shall be installed through the manhole wall directly on top of one (1) of the storm drain pipes entering the manhole. The threaded end of the nipple shall extend no more than two inches (2”) on the inside of the manhole. The total length of the nipple shall exceed the manhole wall thickness by no less than four inches (4”). The pipe nipple shall be non-corrosive and resistant to chemicals common in domestic sewage. Special attention shall be given to providing a permanent, watertight seal around the pipe nipple at the manhole wall. The pipe nipple shall be sealed with a threaded one-half inch (1/2”) cap. Not every manhole need have a pipe nipple. A few key manhole locations should be sufficient to establish a groundwater profile for the test area. The Agency will assist the Contractor in selecting appropriate manholes for pipe nipple installation.

38-10.02.D.(6)(c) Groundwater Elevation

Immediately before air testing, the groundwater level shall be determined by removing the threaded cap(s) from the nipple(s) nearest the section to be tested, blowing air through the pipe nipple(s) to remove any obstructions, and then connecting clear plastic tube(s) to the pipe nipple(s). Each plastic tube shall be held vertically to allow groundwater to rise in it. After the water level in the tube has stopped rising, a measurement of the height in feet of water over the invert of the storm drain pipe shall be taken. (See Figure 38A below.) If the section to be tested is not immediately adjacent to an installed pipe nipple, the groundwater height shall be estimated based upon nearby height readings and the pipe's invert elevation.

FIGURE 38A

MANHOLE CROSS-SECTIONAL VIEW OF THE PROPER METHOD FOR DETERMINING GROUND WATER HEIGHT



38-10.02.D.(6)(d) Air Pressure Adjustment

The air pressure correction for storm drains, which must be added to the three and one-half pounds per square inch, gauge (3.5 psig) normal test starting pressure, shall be calculated as follows:

(Average vertical height, in feet, of groundwater above the invert of the storm drain pipe to be tested) ÷ 2.31

The result gives the air pressure correction in pounds per square inch to be added. (For example, if the average vertical height of groundwater above the pipe invert is 2.8 feet, the additional air pressure required is 2.8 divided by 2.31, or 1.2 psig. This requires a minimum starting pressure of 3.5 plus 1.2, or 4.7 psig.). The allowable pressure drop of one pound per square inch, gauge (1.0 psig) and the times in Table 38-3 are not affected and shall remain the same.

38-10.02.D.(6)(e) Maximum Test Pressure

In no case should the starting test pressure exceed nine pounds per square inch, gauge (9 psig). If the average vertical height of groundwater above the pipe invert is more than twelve and seven tenths feet (12.7'), the section so submerged may be tested using nine pounds per square inch, gauge (9 psig) as the starting test pressure. The nine pounds per square inch, gauge (9 psig) limit is intended to further ensure worker safety and falls within the range of the pressure monitoring gauges normally used.

38-10.02.D.(6)(f) Re-sealing Of Pipe Nipples

After the groundwater height has been determined, each pipe nipple shall be recapped and sealed to prevent any future infiltration.

38-10.02.D.(7) *Test Times for Storm Drains*

38-10.02.D.(7)(a) Test Time Criteria

The test time criteria requires that no test section shall be accepted if it loses more than 0.0015 cubic feet per minute per square foot of internal pipe surface area for any portion containing less than six hundred twenty-five (625) square feet internal pipe surface area. The total leakage from any test section shall not exceed 0.9375 cubic feet per minute.

38-10.02.D.(7)(b) Test Time Calculation

All test times shall be calculated using the following equation:

$$T = 0.085(DK/Q)$$

Where:

T = Shortest time, in seconds, allowed for the air pressure to drop 1.0 psig,
K = 0.000419 DL, but not less than 1.0,
Q = 0.0015 cubic feet/minute/ square feet of internal surface,
D = Nominal pipe diameter in inches, and
L = Length of pipe being tested in feet.

For more efficient testing of long test sections and/or sections of larger diameter pipes, a timed pressure drop of one-half pound per square inch, gauge (0.5 psig) may be used in lieu of the one pound per square inch, gauge (1.0 psig) timed pressure drop. If a one-half pound per square inch, gauge (0.5 psig) pressure drop is used, the appropriate required test times shall be exactly half as long as those obtained using the equation for T cited above.

38-10.02.D.(7)(c) Testing Main Storm Drains With Lateral Connectors

It is often convenient to include connected lateral storm drains when testing storm drain mains having lateral connectors. If lateral storm drains are included in the test, their lengths may generally be ignored for computing required test times. This can be done because in practice, ignoring the branch or lateral storm drains will normally increase the severity of the air test whenever the tested surface area is less than six hundred twenty-five (625) square feet so that the total rate of rejection may only be increased about two percent (2%). If the total tested surface area is greater than six hundred twenty-five (625) square feet, ignoring the lateral storm drains will only slightly decrease the severity of the test.

In the event a test section, having a total internal surface area less than six hundred twenty-five (625) square feet, fails to pass the air test when lateral storm drains have been ignored; the test time shall be recomputed to include all lateral storm drains using the following formula:

$$T = \frac{0.085\,[D_1L_1 + D_2L_2 + \ldots + D_nL_n\,](K / Q)}{D_1L_1 + D_2L_2 + \ldots + D_nL_n}$$

Where:
T = Shortest time, in seconds, allowed for the air pressure to drop 1.0 psig,
K = 0.000419 ($D_1L_1 + D_2L_2 + \ldots + D_nL_n$), but not less than 1.0,
Q = 0.0015 cu.ft./min./sq.ft. of internal surface,
D_1, D_2, etc. = Nominal diameters of the different size pipes being tested, and
L_1, L_2, etc. = Respective lengths of the different size pipes being tested.

If the recomputed test time is short enough to allow the section tested to pass, then the section shall be presumed to be free of defects and comply with this Specification.

38-10.02.D.(7)(d) Specified Time Table

To facilitate the proper use of this recommended practice for air testing, Table 38-3 is provided, which contains the specified minimum times required for a one pound per square inch, gauge (1 psig) pressure drop from a starting pressure of at least three and one-half pounds per square inch, gauge (3.5 psig) greater than the average back pressure of any groundwater above the pipe's invert. The table also includes easy-to-use formulas for calculating required test times for various pipe sizes and odd lengths. All costs for this work are to be included in the prices paid for the items involved.

TABLE 38-3
MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

Pipe Dia. (in.)	Minimum Time (min)	Length For Minimum Time (ft)	Time For Longer-Length (sec)	Specified Time For Length (L) Shown (min: sec)							
				100	150	200	250	300	350	400	450
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

38-10.02.E Hydrostatic Test for Leakage – Storm Drain

If, in the opinion of the Inspector, excessive groundwater is encountered in the construction of a section of the storm drain, the exfiltration test for leakage shall not be used.

The end of the storm drain at the upper structure shall be closed sufficiently to prevent the entrance of water, and pumping of groundwater shall be discontinued for at least three (3) Calendar Days, after which the section shall be tested for infiltration.

The infiltration into each individual reach of storm drain between adjoining manholes shall not exceed five hundred (500) gallons per inch of internal diameter per mile per day.

The allowable infiltration for any portion of the storm drain system shall be measured by a weir or current meter placed in the appropriate manhole.

38-10.02.E.(1) *Water Exfiltration Test*

The allowable water exfiltration for any length of the storm drain pipe between manholes shall be measured and shall not exceed five hundred (500) gallons per inch of internal pipe diameter per mile of pipe per day. The maximum testing pressure at any joint shall be five pounds per square inch (5 psi) or eleven and one-half feet (11.5') of head. If it is not possible to test the pipe to five pounds per square inch (5 psi), the system shall be tested to the surface of the lowest manhole or inlet rim in the section tested. In lieu of water exfiltration testing, the Contractor may perform air testing as described below.

The Contractor is responsible for providing all equipment, materials, water and labor for performing infiltration and exfiltration tests and making measurements. Payment for these items will be included in the bid items for pipes and manholes. All tests shall be made in the presence of the Inspector.

38-10.03 Tests for Deflection

38-10.03.A Sewer

Unless otherwise shown or specified in these Specifications or in the Contract, where PVC, ABS, or HDPE pipe are installed as sewer a deflection test shall be made by the Contractor upon completion and acceptance by the Agency of all backfill operations and prior to the placement of the aggregate base, if any. Deflection testing shall be conducted no sooner than thirty (30) Calendar Days following completion and acceptance of all backfill operations, unless otherwise approved by the Agency.

The deflection testing will be witnessed by the Agency and shall be conducted by the Contractor at the Contractor's expense. One-hundred percent (100%) of all mainline PVC, ABS, or HDPE sewer installed shall be deflection tested for excessive vertical deflection using a pre-sized, rigid mandrel or "Go-No-Go" device approved by the Agency. The mandrel size shall be clearly labeled and shall be sized so as to provide a diameter of at least ninety-seven percent (97%) of the base internal diameter as specified in ASTM Designations: D 3034 or D 2680 for PVC, and ABS or AASHTO Designations: M294 or MP7-97 Type S or Type D for HDPE. The mandrel shall be drawn through the pipe using only the force that can be exerted by one man on the end of a rope, using no mechanical advantage. Under no conditions shall the mandrel device be attached to the cleaning ball.

The Contractor shall remove, replace, and retest any pipe section through which the mandrel is unable to pass. The use of any rerounding device or similar method to correct or reduce over deflection will not be permitted. Re-tests for deflections shall be made at the Contractor's expense.

38-10.03.B Storm Drain

When indicated in the Contract, or when inferior products or construction methods are used or visual inspection by television or lamping indicates a potential for excessive deflection, the following test method shall be used:

Where PVC pipe is installed as drain pipe, a deflection test shall be made by the Contractor upon completion and acceptance of all backfill operations and prior to placement of the finished surface, if any. Deflection testing shall be conducted no sooner than thirty (30) Calendar Days following completion and acceptance of all backfill operations, unless otherwise approved by the Agency.

The deflection testing shall be witnessed by the Inspector and shall be conducted by the Contractor at the Contractor's expense. Unless otherwise shown on the Plans or in the Special Provisions, one-hundred percent (100%) of all mainline PVC drain pipe installed shall be deflection tested for excessive vertical deflection using a pre-sized, rigid mandrel or "Go-No-Go" device approved by the Agency. The mandrel size shall be clearly labeled and shall be sized so as to provide a diameter of at least 92.5% of the "Base Internal Diameter" per ASTM D 3034 for PVC. Base inside diameters for larger diameters of PVC pipe may be found in ASTM F 679.

The Contractor shall remove, replace, and retest any pipe section through which the mandrel is unable to pass. The use of any rerounding device or similar method to correct or reduce over deflection will not be permitted. Re-tests for deflections shall be made at the Contractor's expense.

38-10.04 Television Inspection (TVI)

A closed circuit television inspection (TVI) shall be conducted prior to new sewer or storm drain pipeline acceptance and prior to and after completion of pipeline rehabilitation projects. The TVI shall document and verify:

1. The condition of the pipeline,
2. The location of service taps,
3. Line and grade,
4. Cleanliness, and
5. That post-installation inspection per the Contract has taken place.

In addition, TVI documentation shall indicate:

1. Consistent use of standard forms and codes
2. Uniform compliance with setup and inspection procedures
3. Quality pictures and audible records
4. Suitable camera speed, lighting, and panning
5. Accuracy when recording file names and electronic data.

The TVI shall be documented in an electronic report (TVI Report) and digital video recording as specified herein. Contractors shall comply with the County of Sacramento Department of Water Quality Television Inspection Manual Draft 2001, or most current edition (Television Inspection Manual), available at the Water Quality Department Customer Service office at 10545 Armstrong Ave., Suite 101, Mather, CA. 95655, phone (916) 876-6100. The Television Inspection Manual contains the requirements for collection and documentation of TVI data. It is the Contractor's responsibility to verify that electronic documentation is in the latest, most up-to-date format required by the Agency. TVI of new construction shall be performed after all required testing specified in the Contract and/or this Section is satisfactorily completed. The cleaning of sanitary sewers or storm drains shall be performed prior to the TVI in a separate operation, unless otherwise specified. Unless otherwise shown or specified in the Contract, the Contractor shall perform a TVI on all sewers between manholes or manhole to flusher branch/stub or to existing manholes, as necessary, to video a complete segment, all storm drains between manholes or to existing manholes, as necessary, to video a complete segment, and all storm drain inlet laterals where the radius of the pipe alignment or the length of the pipe precludes the use of the methods in Section 38-10.05, "Lamping of Storm Drain Inlet Laterals".

38-10.04.A Safety

Safety and traffic control procedures shall be maintained at all times in accordance with the requirements of Sections 6-11, “General Safety Requirements”; 6-12, “Public Convenience and Safety”; 6-13, “Public Safety and Traffic Control”; and 10-10, “Confined Space Entry”, of these Specifications, and any other applicable procedures or requirements.

The TVI shall be conducted from above ground. Prior to opening a manhole cover or a confined space area, a gas monitor shall be used to detect the oxygen level, presence of explosive or flammable gases, vapors, or mist in excess of 10% of the (LEL/LFL), and toxic gases in excess of the permissible exposure levels (Hydrogen Sulfide, Carbon Monoxide.)

Manhole entry, if required, shall be conducted in strict accordance with permit required confined space entry regulations as specified in Section 10-10, “Confined Space Entry”, of these Specifications.

38-10.04.B Sample Video and TVI Report Submittal

Prior to any TVI, the Contractor shall submit a sample video and TVI Report to the Agency for review in accordance with Section 5-8, “Contractor’s Submittals”, of these Specifications. The sample video and TVI Report shall represent the quality of video inspection and electronic data to be provided by the Contractor in compliance with the Contract.

38-10.04.C TVI Equipment Submittal

TVI equipment shall include video cameras, a color monitor, digital recording equipment, sound and voice recording capabilities, gauging tool, cables, power sources, and all equipment necessary to perform a TVI in accordance with this Section and the Contract. The Contractor shall submit a complete list of equipment and operational information to be used for TVI’s, in accordance with Section 5-8, “Contractor’s Submittals”, of these Specifications.

38-10.04.C.(1) *Camera*

The camera shall be a pan and tilt camera system with pipe grade verification system (inclinometer), and shall be specifically designed and constructed for sewer and storm drain environments. The camera shall include: a solid state color TV camera with a panning and rotational camera head, remote adjustable optical focus and automatic light compensation iris with remote override, camera controller with remote focus, iris and auto centering control and camera lighting system.

There shall be no geometrical distortion of the image. The camera and monitor shall be able to produce a minimum 460 lines of horizontal resolution and 400 lines of vertical resolution. Focal distance shall be adjustable through a range of one inch (1”) to infinity. The camera shall be mounted on skids or a tractor suitably sized for each pipe diameter to be inspected. The camera shall move through the pipeline in a downstream direction whenever possible at a maximum uniform rate of thirty feet per minute (30 fpm). Maximum allowable error for all the TV footage counters shall not exceed 0.5% (6 inches per 100 feet.).

38-10.04.C.(2) *Inclinometer System and Data Output*

The inclinometer shall detect and record variations in pipe grade angle and distance from true horizontal. The inclinometer shall be capable of detecting pipe grade variations of $\pm$ 5 degrees from true horizontal ($\pm$ 8.7% grade) with a maximum error of $\pm$ 0.1 degree with readings taken at minimum intervals of two feet. The inclinometer shall include a vertical sensing, single axis, precision sensor mounted internally to the camera and shall be a capacitive or fluid based type or equivalent as determined by the Agency. Inclinometer data shall be capable of being displayed in both numerical and graphical formats that can be printed or exported to an external database. Inclinometers with external electronic modules towed behind the camera will not be allowed.

The inclinometer data submitted shall allow easy identification of any high and/or low sections throughout a segment, correlated with the proper footage, that vary in distance from

the design grade by more than the maximum allowed in Sections 38-4.03, “Grade Tolerance – Sewer,and 38-4.04, “Grade Tolerance – Storm Drain” of these Specifications.

38-10.04.C.(3) *Computer System*

The computer system shall be capable of digitally recording an MPEG file, a JPEG file, use Agency-defined codes, compile data in a standard database format, and print TVI Reports and graphics in accordance with these Specifications and the Contract. The system shall also be capable of recording, storing, and playing video and images of defects and other related significant visual information using Agency-defined codes.

The electronic data shall be in a standard database format and shall use Agency-defined field names, field types and information as referenced in the Television Inspection Manual. The Contractor may submit the TVI report on either a compact disc (CD) or digital video disc (DVD) in MPEG-1 or MPEG-2 format, or as specified by the Agency. The CD/DVD shall be in a format that is readable by the Agency’s current computer system. A list of the Agency’s current CD/DVD readers is available at the Water Quality Department Customer Service office at 10545 Armstrong Ave., Suite 101, Mather, CA. 95655, phone (916) 876-6100. The CD/DVD shall be of such quality that all videos, graphics, and reports are high-resolution. The disc(s) shall be presented in a hard plastic protective case. The computer system shall be able to produce tabular and graphical inclination data in an intuitive and useful format, as determined by the Agency, for sag identification. All tabular and graphical reports shall be recorded and printed in color to match the Agency’s defect severity codes.

38-10.04.C.(4) *Lighting*

Illumination sensitivity shall be 3 lux or less. During inspection, lighting intensity shall be adjusted to minimize glare. Lighting and picture quality shall be adjusted to provide a clear, in-focus picture of the entire periphery of the pipeline for all conditions encountered. Lighting shall be adjusted according to the size of the pipe.

38-10.04.D Procedure

Mainlines shall be televised from upstream manholes to downstream manholes whenever possible, except for flusher branches/stub lines/drain inlets. All lines televised against the flow direction shall be noted “Reverse Set-up” on the TVI Report. The recording shall begin at the street surface. Manhole barrels, drop inlets, and service taps shall be videoed from the center of the manhole (footage counter set at 0.0). The focal point of the camera shall be the point to which all footages are measured.

The Contractor shall verify footage counter accuracy prior to the start of the TVI and calibrate the counter every two weeks during the TVI. The camera set point (footage counter set point) shall be from the center of the manhole to the focal point in the direction of camera travel. The camera shall travel at a maximum speed of thirty feet per minute (30 fpm) with slow downs at joints. The camera shall stop at all service connections, significant observations, and possible defects, and the picture shall be clear and bright enough to allow for clear identification of any defects. The footage counter shall appear on the screen at all times. Agency-defined codes shall be placed at each of the following observation points and the camera shall stop, pan, and tilt at each of the following:

Inside each service connection (tap)
Inside each drain lateral connection
Joint separation
Offset joints
Alignment problems and elbows
Cracked or damaged pipe, including lined or point repaired pipe
Debris in the line
Identifiable sags or high points in the line
Root intrusion
In-flow or infiltration

Grease
Corrosion

38-10.04.D.(1) *Scheduling a TVI*

The Contractor shall coordinate with an Agency Inspector to be on site and witness the entire TVI. If an Agency Inspector is not available, the Contractor may perform the TVI without an Agency Inspector and submit two copies of the TVI Report, unless otherwise directed by the Agency, to the Agency for review as specified in Section 38-10.06.

If an Agency Inspector is not available to witness the TVI, the Contractor shall verify on the TVI video the introduction of water into the pipe system (per Section 38-10.04.F, "New Construction Sewer and Storm Drain TVI", of these Specifications), and verify the target size with a tape measure.

For new construction, the TVI may proceed only after compaction of street subgrade and prior to placement of the AB roadbase. Prior to any TVI, the following items must be completed:

1. All underground facilities, utility piping, conduits, and access structures are installed, backfilled, and trench backfill compacted.
2. Final air or water test has been completed and accepted.
3. The pipelines have been sufficiently cleaned to allow for a good TVI.

38-10.04.D.(2) *Manhole Numbers*

The Agency has assigned or will assign numbers to each manhole and drain inlet, which will be shown on an overall plan, and the televised segments shall be tied to these assigned numbers. Manhole numbers will not be assigned until the facilities are in the ground. For new construction, the Contractor shall submit two (2) complete sets of drawings, including the plan and profile sheets, reflecting the actual installation to the appropriate office as follows:

Sanitary Sewer manhole numbers can be obtained at the Water Quality Department Customer Service Counter at 10545 Armstrong Ave., Suite 101, Mather, CA 95655, phone (916) 876-6100.

Storm Drain manhole/inlet numbers can be obtained at the Water Resources Drainage Operations and Maintenance Office at 3847 Branch Center Road, Trailer No. 4, Sacramento, CA 95827, phone (916) 875-7159.

Private systems will not be assigned manhole numbers or be reviewed for electronic compliance by the Agency.

38-10.04.D.(3) *Initial Screen Text*

Reference the Television Inspection Manual.

38-10.04.D.(4) *Audio Information*

Reference the Television Inspection Manual.

38-10.04.D.(5) *Running Screen Text*

Reference the Television Inspection Manual.

38-10.04.D.(6) *CD/DVD Labels*

Reference the Television Inspection Manual.

Each CD/DVD shall contain a label with the catalog number as follows:

"(plan number)-TV (disk number) of (total number of disks)" (example, for plan number 2-707, first disk of four disks, the catalog number would be "2-707-TV 1 of 4", etc.)

The plan and manhole numbers will be assigned at the same time and are to be recorded on the same plan sheet.

38-10.04.E Pre- and Post Rehabilitation TVI

38-10.04.E.(1) *Pre-Rehabilitation TVI*

A pre-rehabilitation TVI shall document a minimum of 75% of the pipe wall and all "significant observations" to provide a clear record of the pipe condition prior to rehabilitation. "Significant observations", includes, but is not limited to: taps, blockages, medium to large cracks, medium to large roots, medium to heavy grease, medium to large offsets, inflow or infiltration, changes of material, and any significant structural decay. The TVI shall be done from center of manhole to center of manhole.

If the camera cannot pass through the entire section of pipeline (blockage, etc.), the Contractor shall reset the equipment at the downstream manhole and attempt to inspect the section of pipe from the opposite direction. If the camera again fails to pass through the blocked section, the video inspection shall be temporarily suspended and the Agency notified. The Contractor shall clear the obstruction as directed by the Agency, and then resume the inspection.

38-10.04.E.(2) *Pre-lining Video*

A TVI shall be performed which documents 100% of the pipe wall and focuses on conditions that may prevent a successful lining of the pipe, including sources of possible inflow and infiltration. Each service connection shall be panned and viewed in detail. Prior to performing a pre-lining TVI, the Contractor shall:

1. Remove all sand, debris, grease and roots from the line,
2. Install and monitor a plug at the upstream location, or construct a bypass to ensure that no upstream flow is present at the time of inspection. Extreme care shall be taken to avoid flooding any upstream property. In case of any overflow, the Contractor shall immediately notify the Agency. The Contractor is financially responsible for all costs incurred due to the overflow, including any fines.

38-10.04.E.(3) *Post Rehabilitation TVI*

A TVI shall be performed to document that the rehabilitation was performed per the Contract, and all live laterals and service connections have been re-established The TVI shall show a clear view of a minimum of seventy-five percent (75%) of the pipe wall. The camera shall stop at all significant observations to ensure a clear and complete view of the pipe condition. Each significant observation shall be documented by coded text and voice recording to the video. The observations shall also be noted on the TVI Report for each segment. A video capture picture (JPEG) shall be taken of every significant observation, which shall be described as large, heavy or severe. If there is movement (inflow and/or infiltration) or the camera needs to be moved or panning is required to capture the observation, a video clip shall also be taken. The screen text shall not obscure the critical portions of the video clips or captured images. Each service connection shall be panned and viewed in detail and an inclinometer survey shall be performed. If an obstruction (debris, collapse, etc.) is encountered during the TVI, the Contractor shall remove the obstruction or repair the pipe (at the Contractor's cost) prior to final TVI.

38-10.04.E.(4) *Pre- and Post Rehabilitation TVI Report and Video*

1. The Contractor shall provide the Agency with a TVI Report, clearly labeled as "Pre-Rehabilitation TVI " or "Post Rehabilitation TVI", as appropriate (each type of report shall be presented on a separate CD/DVD). The report shall be prepared in accordance with the Television Inspection Manual and shall contain,at a minimum:A summary list of all pipeline segments inspected (i.e. manhole to manhole, stub, flusher branch or drain inlet).
2. A title page (header information) for each segment
3. A schematic plot of each segment showing observation codes and footages

4. MPEG video.
5. JPEG pictures of major defects for each segment.
6. An inclinometer survey of each segment.
7. A list of "significant observations", using codes from the Television Inspection Manual

The TVI Report shall be indexed and coded (per the Television Inspection Manual) for easy location of each segment, video clip, captured image, and inclinometer survey. Videos and captured images shall be clear and sharp. Voice recordings shall be clear, complete, and distinct. A vocal description shall be recorded at the beginning of each inspection while the "Initial Screen Text" is displayed. A voice recording shall also be performed during each observation and at the conclusion of each inspection. Poor picture quality, extended periods of inactivity, inappropriate language or idle chatter are not acceptable and will be grounds for rejection by the Agency.

The TVI Report will become the property of the Agency upon completion of the televised inspection. The TVI Report shall be given to the Agency Inspector by the Contractor upon completion of televising and evaluation or as requested by the Inspector.**New Construction Sewer and Storm Drain TVI**

A TVI shall be performed to document that the the new system was installed per the Contract. The TVI shall be performed after all testing has been completed to the satisfaction of the Agency, and before placement of AB road base. Prior to the TVI, the pipeline, including all appurtenances, shall be sufficiently cleaned, as directed by the Agency, to allow for complete visual inspection of the pipe.

Prior to performing the TVI, the Contractor shall introduce enough water in the pipe segment(s) to fill all low sections and flow through the downstream manhole. A 2" target for storm drain and a ¾" target for sewer shall be used, unless otherwise specified or directed by the Agency. If any section of the pipe segment appears to be dry, additional water shall be introduced as described above. An Agency Inspector shall verify the adequacy of water and target size before any TVI is performed. The TVI shall begin within thirty (30) minutes of introducing water into the pipe segment, unless otherwise directed by the Agency.

If an Agency Inspector is not available to witness the TVI, the Contractor shall verify on the TVI the introduction of water into the pipe system, and verify the target size with a tape measure.

38-10.04.F.(1) ***New Construction TVI Report and Video***

Upon completion of the TVI, the Contractor shall provide the Agency with a final TVI Report prepared in accordance with the Television Inspection Manual. The report is to include only data from pipe segments meeting all acceptance criteria. The final TVI Report shall be submitted to the Agency within five (5) Working Days of the pipe installation being found to be in compliance with these Specifications and the Contract documents.

The final TVI Report shall include, at a minimum:

1. A title page (header information) for each segment.
2. A schematic plot of each segment showing observation codes and footages.
3. MPEG video of each segment.
4. Inclinometer survey data for each segment.
5. A map of the pipeline which shows manhole numbers
6. A completed TVI Form or written certification (per Section 7-11, "Proof of Compliance with the Contract", of these Specifications) that the installation meets the acceptance criteria of these Specifications and the Contract documents.
7. Printed records or reports as detailed elsewhere in these Specifications or as directed by Agency.

Poor picture quality, extended periods of inactivity, inappropriate language or idle chatter are not acceptable and will be grounds for rejection by the Agency.

The final TVI Report will become the property of the Agency upon acceptance.

38-10.04.G Non-Conforming TVI

If the quality of the TVI Report and/or video recording are not in compliance with these Specifications and the Contract, the pipeline shall be re-inspected (TVI) or the TVI Report revised at the Contractor's expense.

38-10.05 Lamping of Storm Drain Inlet Laterals

Each storm drain inlet lateral shall be inspected for obstructions, cracks, grade consistency, joint continuity, alignment, and other defects by lamping. If the radius of the alignment or the length of the lateral precludes the effective use of lamping, a TVI is required conforming to Section 38-10.04, "Television Inspection (TVI)".

Lamping shall be accomplished by using an appropriate bright light source and a mirror. After the manhole lid is removed, the light source shall be directed onto a mirror that is held at the end of the lateral within the manhole or inlet at an angle that allows the Inspector to see the length of the pipe. The mirror may be mounted on a pole to avoid entering the inlet or manhole to carry out this procedure. The light source and mirror shall be rotated to inspect the entire inside circumference of the pipe for its entire length. Defects detectable by lamping include offset joints, poor grade, poor alignment, excessive deflection, obstructions, and other irregularities.

A record of each lateral shall be made by the Inspector. The record shall include the following information:

Date
Name
Company Name
Inlet Type
Inlet Location
Manhole Type
Manhole Location
Lateral Diameter
Lateral Material
Lateral Length
Description of defects (pass or fail)
Corrective action (if needed)
Follow up inspection results (if corrective action required)

Any defects or obstructions detected by lamping shall be corrected at the Contractor's expense.

38-10.06 Pipeline and Electronic Data Acceptance Criteria

Unless otherwise specified in the Contract, all new sewer and storm drain pipelines shall be inspected in accordance with the requirements of Section 38-10.4, "Television Inspection (TVI)". The final TVI Report shall be delivered to the Agency no later than five (5) Working Days after completion of the TVI. The TVI Report will become the property of the Agency upon acceptance. The Agency will review the TVI Report within ten (10) Working Days and will notify the Contractor whether or not the report is acceptable and, if so, whether or not the review revealed a satisfactory installation or deficiencies. The following types of deficiencies shall be corrected by the Contractor at no cost to the Agency:

1. Joint separation equal to or greater than one-half inch (1/2").
2. Offset mainline joints equal to or greater than one-half the pipe wall thickness.

3. Joint deflection of more than seventy-five percent (75%) of manufacturer's recommended maximum.
4. Cracked or damaged pipe, including liner pipe.
5. Debris in the line.
6. Identifiable sags or high points (i.e. out of tolerance grades per Sections 38-4.03 and 38-4.04).
7. Offset service joints (ABS to clay) equal to or greater than one pipe wall thickness of the ABS.
8. All necessary easements shall be recorded prior to pipeline acceptance.
9. Non-compliance with any other requirements of these Specifications or the Contract Documents.

The Contractor will be notified in writing of any deficiencies. The Contractor may request to review the TVI Report and/or video with the Agency. Deficiencies in electronic data shall be corrected and re-submitted to the Agency within ten (10) Working Days, and shall reflect current coding and labeling procedures as referenced in the most current edition of the Television Inspection Manual.

Upon completion of all required corrective actions, the sewer or storm drain shall be cleaned and re-inspected (TVI) in accordance with this Section 38-10.04 and submitted within five (5) Working Days after completion of the TVI. This process shall be repeated until an Agency review of the final TVI Report indicates that the pipe installation, cleaning, and electronic data meet all requirements of these Specifications and the Contract.

38-11 NOT USED

38-12 MEASUREMENT AND PAYMENT

The quantity of sewer and storm drain construction of the sizes, grades, and types of pipes listed in the Contract is the slope length designated by the Agency, measured along the centerline of the pipe from manhole to manhole, and includes the straight run of all wyes and tees where used. The length is measured from the inside face of the structures and does not include the inside diameter of manholes and other structures. The prices paid per linear foot for the sizes, grades, and types of pipes listed in the Contract include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in sewer and storm drain construction, complete in place, including furnishing pipe, excavation and backfill, removing obstructions, removing and replacing utilities, bedding, placing and jointing the pipe, testing pipe lines, connecting to existing manholes or pipes, as shown or specified in the Contract, in these Specifications, and as directed by the Agency. Full compensation for wye or tee fittings placed in a main sewer or storm drain in connection with sewer or storm drain services is included in the price paid per linear foot for the main sewer or storm drain pipe and no additional compensation will be paid.

The quantity of sewer or storm drain services of the sizes, grades, and types of pipes listed in the Contract will be measured by the unit constructed in place. The unit prices paid for the sewer or storm drain services of the respective sizes, grades, and types of pipes listed in the Contract include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in furnishing and placing all service pipe from the wye or the fitting in the main sewer or storm drain to the property line, complete in place, including furnishing and placing other necessary bends and stoppers to construct the service, as shown or specified in the Contract, as specified in these Specifications, and directed by the Agency.

The cost of each TVI and inspection shall be all-inclusive and shall be included in the price paid per linear foot of pipe, or as specified in the Contract.

SECTION 39 MANHOLES

39-1 GENERAL

Sewer and storm drain manholes, consisting of precast concrete manholes or saddle manholes as shown on the Plans, shall be in accordance with these Specifications.

For any entry or connection to the existing sanitary sewer system, a CSD-1 Access Request shall be submitted and approved prior to commencement of construction

39-2 CONCRETE MANHOLES

39-2.01 Precast Concrete Sewer Manholes

Precast sewer manhole barrels, risers, cones, flat tops, and grade rings shall conform to ASTM Designation: C 478 with the additional requirement that the cement used shall be Type II. Sewer manhole sections shall be manufactured without the provision for ladders or steps.

Flat slab tops shall be constructed of Class "A" concrete conforming to Section 50-5, "Portland Cement Concrete", of these Specifications and shall conform to either Standard Drawing 7-1F or Standard Drawing 7-2B.

Sewer manhole bases shall be precast . Sewer manhole bases shall be placed on a minimum of ten inches (10") of three-quarter-inch (3/4") maximum size crushed rock. Stubs or couplings provided in precast bases shall be of the same material as the pipe to which they connect, unless otherwise approved by the Agency. Connections shall be made to sewer manholes using a Cast in Place – VCP Bell with Polyurethane Joint per ASTM C425 or a resilient connector conforming to ASTM Designation: C 923 such as Kor-N-Seal, 306 Series, or approved equal. Mortar used in finishing the sewer manhole and the method of placement shall conform to Section 51-1.135, "Mortar", of the State Specifications. The surface finish shall conform to Section 51-1.18A, "Ordinary Surface Finish", of the State Specifications. TV channels conforming to Standard Drawing 7-1A, 7-1B and 7-1C are required for all eight inch (8") and ten inch (10") collector lines.

Precast sewer manholes shall be constructed as shown in the Standard Drawings. Four-way precast sewer manholes shall not be used in lieu of three-way manholes, unless the four-way manhole is modified at the manfucturing facility in a manner that is acceptable to the Agency. The Contractor must request, in writing, the Agency's approval of the method and materials used to modify the manholes.

The use of a precast base with six-inch (6") stubs for the connection of four-inch (4") service sewers is not allowed. Sewer manholes located at the end of a cul-de-sac shall be manufactured with four-inch (4") stubs for the service sewers with the invert of the service sewers a minimum of one inch (1") above the invert of the exit pipe.

Standard concentric cones conforming to ASTM Designation: C 478 shall be used on all sewer manholes unless otherwise specified. Where depth is insufficient for cones, flat slab tops shall be used. Eccentric cones shall only be used where shown on the Plans. An eighteen-inch (18") high cone, as shown on Standard Drawing 7-1, may be used for standard forty-eight inch (48") sanitary sewer manholes where the depth is less than six feet eleven inches (6'-11"). If the depth is less than four feet (4') on cul-de-sac manholes or five feet eight inches (5'-8") on through lines, a flat slab top shall be used. Lifting holes on precast cones and grade rings shall be sealed with non-metallic, non-shrink grout.

Joints in precast sewer manhole sections shall be sealed with Gulf States Pre-Extruded Concrete Joint Sealant or approved equal. If a leak occurs, the shafts shall be sealed by buttering them with a non-metallic, non-shrink grout during vacuum testing, or shall be sealed with preformed plastic sealing compound conforming to Federal Specifications SS-S-0021A and installed as recommended by the manufacturer. All joint surfaces shall be thoroughly cleaned prior to placing the sealing compound. The inside and outside of sealed joints shall be plastered with non-metallic, non-shrink grout and the inside brushed to a smooth finish with a wet brush. Special precautions shall be taken to see that the entire joint space is filled with grout and is watertight.

Sewer manhole frames and covers shall be of the type and size shown on the Plans and shall conform to Section 50-34, “Sewer and Storm Drain Castings”, Standard Drawings 7-11 through 7-12B, and this Section 39 of these Specifications unless otherwise shown or specified in the Contract. The CSD-1 logo covers (see Standard Drawings 7-11 and 7-12) shall be used on all County Sanitation District 1 sewer lines. Sewer manholes located in easements shall use the locking type frame and cover per Standard Drawing 7-11 or 7-12 unless otherwise specified. The joint between the sewer manhole frame and the cone or grade ring shall also be sealed by buttering the joint space with non-metallic, non-shrink grout.

All castings for sewer manhole frames, covers, and other purposes shall be tough gray iron or ductile iron free from cracks, holes, swells and cold sheets, be of workmanlike finish, and conform to the details shown on the Plans. The cast iron shall conform to ASTM Designation: A 48, Class 35B; the ductile iron shall conform to ASTM A 536-80.

All castings shall be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers shall have machined bearing surfaces. All sewer manhole covers that do not fit neatly and bear firmly in the ring will be rejected.

Unless the sewer manhole is cast around the pipe, connections shall be packed with Class “A” concrete conforming to Section 50-5, “Portland Cement Concrete”, of these Specifications. Aggregate grading of the fine aggregate shall be No. 16 sieve size conforming to Section 90-3.03, “Fine Aggregate Grading”, of the State Specifications, or as directed by the Agency. Connections may also be made using a resilient connector conforming to ASTM Designation: C 923.

Inside drop connections shall be as detailed on Standard Drawing 7-3.

39-2.02 Concrete Storm Drain Manholes

All manholes shall be precast unless specified as Cast-In-Place in the project plans. If a Cast-In-Place manhole is specified, but a precast manhole can be constructed per specifications, the precast manhole shall be installed. The substitution of manhole types (Precast/Cast-In-Place) will not warrant additional compensation.

Precast manhole barrels, risers, cones, flat tops, and grade rings shall conform to ASTM Designation: C 478 with the additional requirement that the cement used shall be Type II. Manhole sections shall be manufactured without the provision for steps.

Manhole bases shall be precast when the internal diameter of the largest pipe is less than thirty-three inches (33”). Precast manhole bases shall be placed on a minimum of four inches (4”) of three-quarter-inch (3/4”) crushed rock conforming to Section 50-16, "Clean Crushed Rock", of these Specifications. Pipe connections to manholes shall be made using a resilient connector conforming to ASTM Designation: C 923. For precast bases the connection shall be made with a flexible compression gasket, which is set during the precast process, or a boot connector. For cast in place bases the connection shall be made with a water stop. All

connections shall be water and soil tight. Mortar used in finishing the manhole and the method of placement shall conform to Section 51-1.135, "Mortar", of the State Specifications. The surface finish shall conform to Section 51-1.8A, "Ordinary Surface Finish", of the State Specifications.

When the inside diameter of the largest pipe is thirty-three inches (33") or greater, the manhole base may be cast-in-place. The base shall not be cast higher than six inches (6") above the outside top of the main incoming or outgoing pipe. Concrete used shall be Class "A" conforming to Section 50-5, "Portland Cement Concrete", of these Specifications. Slump shall not exceed two inches (2") as determined by the slump cone method of ASTM Designation: C 143, or an equivalent slump as determined by Test Method No. California 533. Minimum and maximum wall thickness for the cast-in-place sections shall conform to the following Table 39-1 and shall be strictly adhered to:

TABLE 39-1
MINIMUM/MAXIMUM WALL THICKNESSES
FOR CAST-IN-PLACE SECTIONS

Manhole Diameter (inches)	Minimum Wall Thickness (inches)	Maximum Wall Thickness (inches)
48	5	7
60	6	8
72	7	9
84	8	10
96	9	11

Inside diameters of the cast-in-place portions shall equal the diameter of the manhole specified. Standard precast manhole riser sections and other components as specified in this Section shall be used above the cast-in-place base to bring the manhole rim to grade. Manholes with cast-in-place bases and all of the associated connections and joints shall be capable of passing the leakage test as specified in this Section.

Cast-In-Place manholes shall maintain the specified internal diameter throughout the manhole base and riser sections. The internal diameter should not be decreased until the cone section or flat slab top is placed. Cast-In-Place manhole bases shall be eight inches (8") thick with #4 steel reinforcing bars placed at twelve inches (12") on center each way. The reinforcing shall be centered between the manhole invert and bedding. The wall thickness for Cast-In-Place manholes shall adhere to Table 39-1 of Section 39-2.02 of these Specifications.

Concrete on the cast portion may be placed against undisturbed earth provided wall thickness requirements are met; otherwise outside forms shall be required. Forms shall be removed and the structure visually inspected prior to backfill. All rock pockets, cracks, or other defects shall be patched in conformance with Section 51-1.135, "Mortar", of the State Specifications or, as an alternate, Section 30-15.05, "Concrete Repair", of these Specifications.

Standard concentric cones conforming to ASTM Designation: C 478 shall be used on all manholes shown on the Plans unless otherwise specified. Where depth is insufficient for cones, concentric flat slab tops shall be used.

Joints in precast manhole shafts shall be sealed by buttering the joint space of the previously laid barrel section or base with mortar, or shall be sealed with preformed plastic

sealing compound conforming to Federal Specifications SS-S-0021A and installed as recommended by the manufacturer. All joint surfaces shall be thoroughly cleaned prior to placing the sealing compound or buttering with mortar. The inside and outside of mortared joints shall be plastered with mortar and the inside brushed to a smooth finish with a wet brush. Special precautions shall be taken to see that the entire joint space is filled with mortar and is watertight.

Manhole frames and covers shall be of the type and size shown on the Plans and shall conform to Section 50-34, “Sewer and Storm Drain Castings”, of these Specifications, Standard Drawing 9-9 or 9-10 in paved areas or Standard Drawing 9-11 in unpaved areas, and these Specifications, unless otherwise shown on the Plans or specified in the Special Provisions. The joint between the manhole frame and the cone or grade ring shall be sealed by buttering the joint space with mortar, or the joint shall be sealed using an epoxy adhesive. The adhesive shall be as described in Section 95-2.05, "Standard Set Epoxy Adhesive for Pavement Markers”, of the State Specifications. A concrete collar shall be placed on all manhole frames per Standard Drawing 9-7A. The concrete collar shall be Class "A-2" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The in-place depth of the twenty-four-inch (24”) manhole opening shall not exceed eighteen inches (18”) from the top of the frame to the top of the cone. If the manhole is a flat slab top, or if the depth of the opening must exceed eighteen inches (18”), a thirty-six inch (36”) frame and cover with the corresponding thirty-six inch (36”) manhole components shall be used. The depth of a thirty-six inch (36”) opening as described above shall not exceed twenty-four inches (24”). Components for construction of manholes shall be selected to provide the least achievable vertical dimension between the finished frame surface and the top of the cone or soffit of the flat slab top. The depth of precast grade rings or cast-in-place grade rings shall not exceed eight inches (8”) on new or reconstructed manholes.

At the Contractor’s option, the manhole frame and cover size may be increased from twenty-four inches (24”) to thirty-six inches (36”) if necessary to facilitate testing of the storm drain system. No additional compensation will be paid to the contractor if the contractor elects to increase the size, and the manhole frame and cover will be paid for at the unit price bid for the twenty-four inch (24”) frame and cover. If the contractor elects to install a thirty-six inch (36”) frame and cover, it shall remain as a permanent part of the improvements (i.e. it shall not be replaced with a twenty-four inch (24”) frame and cover after testing).

All castings shall be manufactured true to pattern and with satisfactory fit of all component parts. Round frames and covers shall have machined bearing surfaces. All manhole covers which do not fit neatly and bear firmly in the ring will be rejected.

Unless otherwise specified, exposed surfaces of the castings with the parts assembled and disassembled shall be painted with commercial quality asphaltum paint after testing and assembly.

39-3 SADDLE SEWER MANHOLES

39-3.01 Saddle Sewer Manholes

Saddle sewer manholes are not allowed.

39-3.02 Saddle Storm Drain Manholes

Saddle storm drain manholes shall be constructed in accordance with either Standard Drawings 9-8A (for cast-in-place pipe) or 9-8B (for all other pipe). The concrete shall be Class

"A" in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. Reinforcing steel shall conform to Section 50-26, "Reinforcing Steel", of these Specifications. Manhole frames and covers, risers, cones, grade rings, flat tops, and other features of the manholes shall be constructed in accordance with Section 39-2.02 in this Section of these Specifications.

39-4 MANHOLE TESTING

39-4.01 Sanitary Sewer Manholes

All sanitary sewer manholes shall be tested and meet the requirements of ASTM Designation: C 1244 prior to acceptance.

Sewer manholes shall be tested after assembly of the manhole and installation of the pipe entering or exiting the manhole, but prior to backfill. If the sewer manhole fails the test, the manhole shall be repaired by the Contractor and retested. This procedure shall be repeated until the sewer manhole passes the required test. The Agency may also require a sewer manhole to be tested using this method after backfilling if there is reason to suspect that the sewer manhole has been disturbed during the backfilling operation, or at other times during construction.

In order to prepare a sewer manhole for this test, the following shall be accomplished:

- All lift holes shall be plugged with non-shrink grout.
- All pipes entering the sewer manhole shall be temporarily plugged, and the pipes and plugs must be securely braced to prevent them from being drawn into the sewer manhole. Plugs shall be placed on the flex joint outside of the manhole base.
- Unused channels shall be grouted per Standard Drawing Detail 7-1D, 7-1E.

The test procedure shall be as follows:

1. The test head shall be placed at the top of the sewer manhole in accordance with the manufacturer's recommendations.
2. A vacuum of ten inches (10") of mercury shall be drawn on the sewer manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to nine inches (9") of mercury.
3. The sewer manhole will pass the test if the time for the vacuum to drop from ten inches (10") to nine inches (9") of mercury meets or exceeds the values indicated in Table 1 of ASTM Designation: C 1244 with the following constraint: a minimum of nine inches (9") of mercury shall be held for a minimum of one (1) minute.

The vacuum gauge used for this test shall be supplied by the Contractor and have maximum scale divisions of 0.1 psi and an accuracy of 0.04 psi. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six (6) month intervals, or when requested by the Agency. In addition, the Agency may compare the Contractor's gauge with an Agency-owned gauge at any time. During testing, the vacuum gauge shall be located such that it is readily visible.

39-4.02 Storm Drain Manholes

All new manholes shall be tested for leakage after assembly but prior to back-filling around the manhole. The contractor shall furnish all labor, tools, and equipment necessary to make the test and to perform any work incidental thereto. The Contractor shall correct any excess leakage, and repair any damage to the manhole and its appurtenances at the Contractor's own expense.

The manholes shall be tested for leakage by the following method:

39-4.02.A Manhole Vacuum Test

All lift holes, connections, and inside and outside joints shall be sealed as described in this Section. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole. Plugs and the ends of pipes connected by flexible boots shall be blocked to prevent their movement during the vacuum test. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations. In the case of flat top manholes, the test head shall be placed at the top surface of the flat top. A vacuum of ten inches (10") of mercury [approximately five pounds per square inch (5 psi)] shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches (9"). The manhole shall pass if the time is greater than the times listed in the following Table 39-2 for the particular manhole size.

TABLE 39-2
MINIMUM VACUUM PASS TIMES

Manhole Size (inches)	Minimum time (seconds) to drop to 9" Hg
48	60
54	67
60	75
72	90
84	105
96	120

If the manhole fails the initial test, necessary repairs shall be made while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

39-4.02.B Test by the Exfiltration Method

At the discretion of the Engineer or designated representative, the Contractor may substitute the Exfiltration Method of testing for the Vacuum test described in Section 39-4.02.A above. This method may only be used when ground water is not present. If ground water is present a Vacuum Test shall be used unless otherwise directed by the Engineer or designated representative. All backfilling and compaction shall be completed prior to the commencement of testing.

The procedures for the test shall include the following:

1. Manhole section interiors shall be carefully inspected; units found to have through-wall lift holes, or any penetration of the interior surface by inserts provided to facilitate handling, will not be accepted. Coating shall be applied after the testing unless coating is applied before field assembly, or at the factory. All lift holes and exterior joints shall be plugged with an acceptable non-shrink grout. No grout shall be placed in horizontal joints. Tests shall be performed before grouting the invert or around pipe penetrations and before coating the interior surfaces of the manhole or junction box.

2. After cleaning the interior surface of the manhole, the Contractor shall place and inflate pneumatic plugs in all of the connecting pipes to isolate the manhole; sealing pressure within the plugs shall be as recommended by the plug manufacturer.
3. Concrete manholes shall be filled with water or otherwise thoroughly wetted for a period of 24 hours prior to testing.
4. At the start of the test, the manhole shall be filled to the top with water. The test time shall be 1 hour. The Construction Inspector must be present for observation during the entire time of the test. Permissible loss of water in the 1-hour test time is 0.025 gallons per diameter foot, per foot of manhole depth . For a 4-foot diameter manhole, this quantity converts to a maximum permissible drop in the water level (from the top of the manhole cone) of 0.05 inches per foot of manhole depth or 0.5 inches for a 10-foot deep manhole.

39-4.02.C Failure to Pass the Test - Records of Tests

If the manhole fails to pass the initial test method as described in (A) Test by the Vacuum Method and, if allowed, (B) Test by the Exfiltration Method, or if visible groundwater leakage into the manhole is observed, the Contractor shall locate the leak, if necessary by disassembly of the manhole. The Contractor shall check the gaskets and replace them if necessary. The Contractor may re-lubricate the joints and re-assemble the manhole, or the Contractor may install an acceptable exterior joint sealing product on all joints and then retest the manhole. If the Contractor chooses to attempt to repair the manhole rather than replace it, the manhole must be retested until it passes. In no case shall cold applied preformed plastic gaskets be used for repair. Records of all manhole testing shall be made available to the Engineer or designated representative at the close of each working day, or as otherwise directed by the Engineer or designated representative. Any damaged or visually defective products or any products out of acceptable tolerance shall be removed from the site.

39-4.02.D Inspection

The Engineer or designated representative shall make a visual inspection of each manhole after it has passed the testing requirements and is considered to be in its final condition. The inspection shall determine the completeness of the manhole; any defects shall be corrected to the satisfaction of Engineer or designated representative.

39-5 ADJUST STORM DRAIN MANHOLES TO GRADE

Existing manholes shall be adjusted to grade of elevation as indicated on the Plans and shall conform to Section 15-2.05A of the State Specifications. Should an expanding ring raising device be used, the mechanism for ring expansion shall be a turnbuckle linkage that has pivoting connections at both ends. Expanding ring raising devices shall not be allowed for areas where the roadway is to be raised by a non-uniform thickness over the area of the manhole structure. Cast-in-place rings shall be Class "A-2", in conformance with Section 50-5, "Portland Cement Concrete", of these Specifications. The cast-in-place rings shall have a minimum height of three inches (3") and a maximum of six inches (6"). The concrete pour shall extend to one inch (1") below the top of the frame.

Adjusting manholes to grade within publicly used traffic lanes shall be completed, including placing paving material around and to the level of the frame and cover, by the end of the same day on which work is started. If permanent pavement backfill cannot be completed by the end of the work day, the Contractor shall place temporary paving material to the finished grade level

of the frame and cover. The Contractor shall maintain the temporary paving smooth and level with the frame and cover until such time as the permanent paving is placed.

39-6 RECONSTRUCT STORM DRAIN MANHOLES

The Contractor shall reconstruct storm drain manholes as shown or specified in the Contract.

In order to access and maintain storm drain facilities, the maximum depth of a twenty-four inch (24") manhole opening is eighteen inches (18") and the maximum depth of a thirty-six inch (36") manhole opening is twenty-four inches (24"). The depth of the opening is measured from the top of the finished grade of the frame to the top of the cone or to the soffit of the flat slab top. When the depth of the opening exceeds this requirement, it is necessary to reconstruct the manhole by placing additional barrel sections to bring the top of the cone or soffit of the flat slab top to within eighteen inches (18") of the finished surface.

The Contractor shall remove and dispose of the existing frame and cover and demolish the remaining structure down to the elevation where a standard precast barrel section or combination of barrel sections will bring the top of the cone or soffit of the flat slab top to within a maximum of eighteen inches (18") of the finished surface or as indicated on the Plans. The resulting debris and hardware become the property of the Contractor. Standard precast barrel sections are available in depths of twelve, eighteen, twenty-four, thirty-six, and forty-eight inches (12", 18", 24", 36", and 48"). The top of the remaining structure shall be trimmed to provide a suitable foundation for the new barrel components. The joint between the existing structure and the new component shall be sealed in conformance with Section 39-2.02, "Precast Concrete Storm Drain Manholes" in this Section of these Specifications. The remaining structure shall be constructed in conformance with Sections 39-2.02 or 39-3.02. If not called out on the Plan, it is the responsibility of the Contractor to determine whether the existing structure is precast, cast-in-place, or a precast structure with a cast-in-place base.

39-7 ABANDON STORM DRAIN MANHOLES

When indicated on the Plans or directed by the Agency, storm drain pipes, manholes, and other structures shall be abandoned in conformance with Section 15-1.04, "Abandonment of Pipes and Manholes", of these Specifications.

39-8 MEASUREMENT AND PAYMENT

The quantity of each type of manhole will be measured by the unit.

The unit price paid for each manhole includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing manholes, complete in place, including excavation and backfill, manhole bases, mortar, concrete, reinforcement, and acceptance testing, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

Payment for adjusting drain manholes shall conform to Section 15-2.07 of the State Specifications, with the following exceptions: 1) the unit price paid includes all necessary excavation, backfill, sealing, and concrete; and 2) the unit price paid will be the average of all depths and limits of adjustment required.

The unit price paid for manhole reconstruction includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work involved in

reconstructing manholes, complete in place, including excavation and backfill, demolition, disposal, mortar, concrete, and reinforcement as shown or specified in the Contract, in these Specifications, and as directed by the Agency.

SECTION 40 MISCELLANEOUS FACILITIES

40-1 STREET BARRICADES

40-1.01 General

Street barricades shall conform to the Standard Drawings and to these Specifications. The barricades shall be placed where shown on the Plans or as designated by the Agency.

Wood members shall be either Redwood or Douglas Fir. Douglas Fir shall be treated with a wood preservative in conformance with Section 58, "Preservative Treatment of Lumber, Timber and Piling", of the State Specifications.

A fully reflectorized sign, as shown in Standard Drawing 4-38, shall be placed on the barricade with bolts, nuts, and washers, and shall face oncoming traffic to designate dead end streets. All barricades shall be painted white, with two (2) applications of a latex base paint formulated for use on exterior wood.

40-1.02 Measurement and Payment

Street barricades will be measured by the unit from the actual count of street barricades complete in place.

The unit price paid for street barricades includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in furnishing and installing street barricades, complete in place, including furnishing and installing reflectorized signs, as shown or specified in the Contract, as specified in these Specifications, and as directed by the Agency.

SECTION 41 WATER DISTRIBUTION SYSTEMS

41-1 GENERAL

This section shall apply to all potable and non-potable water distribution systems. Specific requirements for non-potable water distribution systems shall comply with Section 41-22, "Recycled Water", of these Specifications.

All water pipe, fittings, gate valves, fire hydrants, blow-offs, and other appurtenances shall be installed in accordance with the requirements of the Plans and Specifications, these Specifications, the American Water Works Association (AWWA), and as recommended by the manufacturer.

Pipe for water mains shall be placed along the horizontal alignment shown on the Plans. The depth of placement of the pipe shall be as specified in Section 41-3, "Excavation", of these Specifications.

All metallic parts shall be encased with eight (8) mil polyethylene. Encasement shall be performed such that no soil is in direct contact with the metallic parts.

41-2 WATER PIPE

Pipe used for water mains, four inches (4") through twelve inches (12") in diameter shall be made of either ductile iron, or polyvinyl chloride as shown on the Plans. Pipe materials used for water services shall conform to Section 50-40, "Water Service Connection Materials", of these Specifications. All pipe shall be the regular product of a firm that has successfully manufactured comparable pipe for at least three (3) years, and shall be certified by the manufacturer. The Contract may indicate a particular type of pipe to be used for water mains or water services. In this case, the use of an alternate type of pipe will not be permitted.

Pipes located between residential homes shall be AWWA C151 Class 350 Ductile Iron Pipe installed with six inches (6") of sand bedding and eight (8) mils of polyethylene encasement. Backfill with sand to eight inches (8") above the top of the pipe and a six-inch (6") wide warning tape shall be placed eighteen inches (18") above the pipe. The pipe shall be centered within a fifteen-foot (15') wide easement.

41-3 EXCAVATION

Unless otherwise shown or specified in the Contract, trench excavation for water pipe, including water distribution mains, fire hydrant branch leads, and water services shall be as specified in Section 19-1, "Trench Excavation", and these Specifications.

Unless otherwise shown or specified in the Contract, water mains constructed in fully improved streets with curb, gutter, and sidewalk, and a right-of-way width of fifty feet (50') or greater shall be installed with a minimum cover of thirty-six inches (36") and a maximum cover of fifty-four inches (54"), measured from the flowline of the gutter to the top of the pipe. Unless otherwise shown or specified in the Contract, if the right-of-way width of the fully improved street is less than fifty feet (50'), the minimum depth of cover is thirty inches (30") measured from the flowline of the gutter to the top of the pipe.

Unless otherwise shown or specified in the Contract, water mains constructed in unimproved areas or in existing streets lacking curb, gutter and sidewalk shall be installed with a minimum cover of fifty-four inches (54") and a maximum cover of sixty inches (60"), measured from the top of the pipe to the existing ground or pavement surface at the centerline of the pipe.

The width of the trench shall be as specified in Section 19-1.02, “Trench Width”, of these Specifications.

Trenches for water mains shall be excavated to a depth of at least six inches (6”) below the outside diameter of the pipe. At locations of joints or couplings the depth of over excavation shall be measured from the outside diameter of the pipe joint or couplings.

Unless otherwise specified in the Special Provisions, trenches shall be excavated only as far in advance of pipe laying as permitted by the Agency and in conformance with the requirements in Section 19-1.04, “Maximum Length of Open Trench”, of these Specifications.

All cut and abandoned pipes within the area of the trench, including existing water mains, that are not removed in accordance with Section 13-2.05, “Abandoned Underground Facilities”, shall be plugged in accordance with Section 15-1.04, “Abandonment of Conduits and Structures”, of these Specifications.

Isolated lengths of pipe may also be filled with sand or other free flowing granular material, as approved by the Agency.

41-4 LAYING WATER PIPES

The Contractor is responsible for sealing open pipe ends at the end of each workday to secure the end of the pipe from animal and human intruders. The seal shall be watertight. At a minimum, the end of the pipe shall be covered with eight (8) mil thick plastic and then plywood placed against the plastic. The trench at the pipe end shall then be temporarily backfilled by completely covering the pipe seal. Contractor may use a manufactured pipe end plug approved by the Agency to seal pipe instead of plastic and plywood.

Pipe shall be placed in trenches as specified in Section 19, ”Trench Excavation, Bedding and Backfill”, of these Specifications.

Pipe for water mains shall not be placed during inclement weather or when the conditions in the trench will interfere with proper jointing of the pipe. All open ends of water main pipe and fittings shall be adequately and securely closed with watertight plugs whenever the work of placing the water main is discontinued.

All pipes, valves, fittings, and appurtenances shall be installed in accordance with the manufacturer’s recommendations and according to accepted water works practice. Each section of pipe and each fitting shall be thoroughly cleaned out before it is installed. All pipes, valves, fittings, and appurtenances shall be lowered into the trench in such a manner as to prevent any damage, particularly to the pipe lining and coating. When required by the Agency, approved slings shall be used to lower the pipe. Under no circumstances shall pipe or accessories be dropped into the trench.

The pipe shall be laid true and uniform to line and grade, with no visible change in alignment at any joint unless a curved alignment is shown on the Plans. The maximum deflection at any joint shall not exceed the limits described in Standard Drawing 8-9A or one-half of the manufacturer's recommended deflection, whichever is less. Deflection and bending of polyvinyl chloride pipe shall not exceed the limits described in Standard Drawing 8-9B. The maximum allowable horizontal installation tolerance shall be 6” and as necessary to comply with statutory separation distances, whichever is less. The maximum allowable vertical installation tolerance shall be 0.10 foot and as necessary to maintain an unbroken slope direction as indicated on the plans, whichever is less.

Where necessary to properly locate valves and fittings, the pipe shall be neatly and squarely cut to length, using methods recommended by the manufacturer.

When field cuts are made in polyvinyl chloride pipe, the cut ends shall be cut square and all burrs removed from the pipe interior. The beveling of the pipe ends shall be as specified by the manufacturer. Guide marks for jointing the pipe, after cutting, shall be made on the pipe in accordance with the manufacturer’s specifications.

On water systems, except for water systems being installed for a new subdivision, no more than three thousand linear feet (3,000 l.f.) of water main shall be installed before starting installation of the water services, with this approximate sequence maintained throughout the Work.

Testing, flushing, placement of first lift of backfill and cleanup shall follow pipe laying and service line construction as a continual operation, or as approved by the Agency, with the provision that these phases of the Work shall be completed no later than fifteen (15) Working Days after starting construction in any portion of the Work.

41-5 UNDERGROUND WARNING TAPE AND LOCATING WIRE

Underground warning tape shall be installed above all water mains, water services, and other buried water lines of any type..

Underground warning tape shall be twelve inches (12”) wide, minimum four (4) mil thickness low density polyethylene formulated for extended use underground, minimum tensile strength 4100 MD and 3650 TD in accordance with ASTM D882. Tape elongation shall be greater than 550% at break point. Underground marking tape shall be placed eighteen inches (18”) above the top of the water pipe along the length of the pipe. Unless otherwise directed by the Agency, all lettering shall be BLACK on the following background colors:

- Marking tape for potable water mains shall be BLUE and marked “WATER MAIN BURIED BELOW.”
- Marking tape for potable transmission mains shall be BLUE and marked “WATER TRANSMISSION MAIN BURIED BELOW.”
- Marking tape for raw water transmission mains shall be GREEN and marked “RAW WATER MAIN BURIED BELOW.”
- Marking tape for nonpotable and recycled water mains shall be PURPLE and marked “RECYCLED/RECLAIMED WATER MAIN BURIED BELOW.”

All water pipes shall be equipped with a locating wire installed on top of the pipe. The locating wire shall be an insulated ten (10) gauge solid, single strand, soft drawn copper locating wire with one-sixteenth-inch (1/16”) PVC insulation along the entire length of the pipe. Locating wire shall extend into each valve box and each service box, and be installed in accordance with Standard Drawings 8-4A. All splices shall be soldered, then shrink-wrapped or taped, and installed on top of the water main along its length in accordance with Standard Drawing 8-4A. A continuity test shall be conducted on each splice location and after all other utilities are installed prior to paving.

When pipe runs exceed six hundred feet (600') between valves, a locating wire station shall be installed midway between the valves in accordance with Standard Drawing 8-4B. The maximum distance from valve to station or from station to station shall be six hundred feet (600'). The spacing shall be equidistant between valves and stations when two or more stations are required. The locating wire station shall be constructed with a traffic-rated valve box. For nonpotable and recycled water lines, the cover shall be painted purple per the manufacturer’s recommendations.

41-6 THRUST BLOCKS AND RESTRAINED JOINTS

Thrust blocks or pipe-restraining devices shall be supplied for and installed at all pipe deflections greater than five degrees (5°) in accordance with Standard Drawings 8-3A and 8-3B and the Plans.

41-7 SETTING FIRE HYDRANTS

Fire hydrants shall conform to material requirements of Section 50-37, "Fire Hydrants", of these Specifications.

Only ductile iron or polyvinyl chloride pipe shall be used as branch leads that connect fire hydrants to water mains.

For fire hydrant installation details, see Standard Drawings 8-2A and 8-2B. In no case shall a fire hydrant be installed within three feet (3') of a building or any other structure that would limit access. Fire hydrants shall stand plumb with the hex nut for the pumper outlet a minimum of twenty inches (20") above the sidewalk or concrete pad surrounding the hydrant.

- In streets where the sidewalk is contiguous with curb and gutter, fire hydrants shall be placed behind the sidewalk within the public utility easement.
- In streets where the sidewalk is separated from the curb and gutter by a planter or park strip, or at locations where there are to be curbs and gutters but no sidewalks, fire hydrants shall be placed three feet (3') behind the curb and gutter. A two-foot (2') square by four-inch (4") thick concrete pad shall be placed surrounding the fire hydrant.
- In streets that are paved but lack curbs, gutters and sidewalks, new and relocated fire hydrants shall be placed at a location not to exceed ten feet (10') from the edge of pavement. A two-foot (2') wide by four-inch (4") thick concrete pad shall be placed between the back of curb and the two-foot (2') square concrete pad surrounding the fire hydrant.
- Fire hydrants placed at street intersections shall be installed at the beginning or end of curb returns.

All fire hydrants shall be set such that:

- On standard hydrants, the four and one-half-inch (4-1/2") nozzle or outlet shall lie on a line perpendicular to the centerline of the street.
- On double pumper hydrants, a line bisecting the angle between the two (2) four-and-one-half-inch (4-1/2") nozzles or outlets shall be perpendicular to the centerline of the street.

Where the Plans indicate that existing fire hydrants are to be removed and salvaged, the salvaged hydrants shall be removed intact and delivered undamaged to the Agency Corporation Yard location as directed by the Agency.

41-8 SETTING GATE VALVES

All gate valves shall meet the requirements of Section 50-38.01, "Gate Valves", in these Specifications.

Gate valves at elbows, tees, or cross fittings shall be provided with flanged joints and bolted directly to flanged fittings.

41-9 BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention devices shall conform and be installed in accordance with Standard Drawings 8-8A, 8-8B or 8-8C, depending on the size of the assembly.

Backflow prevention devices shall be installed in lawn or planter areas or as shown on the Plans. If conflicts occur, location must be approved by Agency personnel prior to installation.

The Reduced Pressure, Double Check Detector, or Reduced Pressure Detector Assemblies shall be tested by a certified backflow prevention assembly tester at the time of installation.

All backflow prevention device installations shall include an insulated, UV resistant, protective cover (bag), appropriate for the assembly, and properly placed over the assembly.

41-10 FIRE PROTECTION SERVICE ASSEMBLY

Fire protection service assemblies shall conform to and be installed in accordance with Standard Drawing 8-7, and shall include a double detector check valve assembly with by-pass meterand piping. Fire protection service assembly piping shall be flanged ductile iron Class 53 conforming to Section 50-25, "Ductile Iron Pipe (DIP), and Cast Iron Pipe and Ductile Iron Fittings", of these Specifications.

Buried water valves shall be as specified in Section 50-38, "Valves", of these Specifications. Except for water check valves, all valves shall be furnished with flanged ends.

Double detector check valves shall be listed by Underwriters Laboratories, Incorporated and approved by Associated Factory Mutual.

By-pass water meter shall be five-eighths-inch (5/8") by three-quarter-inch (3/4"), all copper alloy body conforming to AWWA C700. A bronze check valve shall be installed downstream of the by-pass meter. Bronze ball or gate valves shall be installed to allow removal of the by-pass meter without affecting the fire protection system. All piping shall be Type "K" copper.

Fire protection service vaults shall be installed in lawn or planter areas. If conflicts occur, location must be approved by Agency personnel prior to installation.

41-11 BLOW-OFFS

Four-inch (4") blow-offs shall conform to and be installed in accordance with Standard Drawings 8-13A, 8-13B or 8-13C. Temporary two-inch (2") blow-offs shall conform to and be installed in accordance with Standard Drawing 8-12.

41-12 PIPE BEDDING AND BACKFILLING OF TRENCHES

Pipe bedding and backfill for water mains, fire hydrant branch leads, and water services shall be furnished and placed according to the requirements in Section 19-2, "Pipe Bedding and Backfilling of Trenches", of these Specifications.

41-13 REPAVING WATER PIPE TRENCHES

Repaving of trenches for water mains, fire hydrant branch leads, and water services shall be as specified in Section 14, "Restoration of Surfaces", of these Specifications.

41-14 WATER SERVICES

Materials for services shall meet the requirements specified in Sections 50-40, "Water Service Connection Materials", and 50-38, "Valves", of these Specifications, and shall be installed in accordance with Standard Drawings 8-1, and 8-6A, 8-6B, or 8-6C depending on the size and type of service.

Gate valves for water services three inches (3") through twelve inches (12") in diameter shall be installed within a box and riser. Boxes and risers shall be as specified in and installed in accordance with Standard Drawing 8-5.

Service saddles shall be bronze.

No fitting (tee, ell, etc.) shall be tapped to accommodate a service.

Water Service Lines shall be one inch (1") in diameter unless otherwise specified. All underground copper services shall be protected from corrosion by wrapping or sleeving in eight (8) mil polyethylene.

Where the curb and gutter exists, or is to be constructed concurrently with the improvements, the location of each service shall be permanently indicated by inscribing the letter "W" in the curb directly above the line when the service is perpendicular to the street centerline. Otherwise, the "W" mark for a skewed or angling service shall be placed at a right angle to the end of the service. When water services are installed in a street with existing curb,

the curb mark shall be placed at the time the services are installed to assure proper location. In new subdivisions when the services are installed before the curb is constructed, it is the Contractor's responsibility to establish the exact location of each service and to ensure that the "W" is placed in the curb after it is poured. In no case shall the "W" be placed more than six inches (6") from the service.

41-15 WATER METERS AND METER BOXES

Immediately prior to water meter installation, the water service line shall be thoroughly flushed.

A meter box at the property line or easement line is required for all services.

Water meters and appurtenances shall be installed in accordance with and of the material, type and brand described in Standard Drawings 8-6A, 8-6B, or 8-6C, depending on the size of the water meter. The size of meter shall be as shown on the Plans.

Water meter boxes shall be installed in lawn or planter areas. If conflicts occur, location must be approved by Agency personnel prior to installation.

41-16 DISINFECTION OF WATER MAINS

Newly constructed water mains and water distribution systems shall be disinfected following these procedures:

- Prevent contaminating materials from entering the water mains during construction, and flush the water mains after construction to remove any contaminants that may have entered the water mains.
- Disinfect any residual contamination that may remain.
- Determine the bacteriological quality by laboratory testing after disinfection.

Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination during the construction of the water distribution system.

Water distribution mains up to and including twelve inches (12”) in diameter shall be disinfected using the Tablet Method. The Tablet Method shall employ the use of a sufficient number of five (5) gram calcium hypochlorite tablets as a disinfectant to yield an average chlorine dose of approximately twenty-five (25) milligrams per liter. The five (5) gram calcium hypochlorite tablets shall contain at least sixty-five percent (65%) available chlorine by weight. The tablets, six to eight (6 to 8) to the ounce, are designed to dissolve slowly in water. These tablets shall meet the requirements of AWWA B-300 standard for hypochlorites.

Because preliminary flushing cannot be performed when tablets are used, cleanliness must be exercised during construction of the water main.

The calcium hypochlorite tablets shall be placed in each section of pipe and in hydrants, hydrant branches, and other appurtenances. They shall be attached by an adhesive at the top of the pipe. If the tablets are fastened before the pipe section is placed in the trench, their position shall be marked on the section to assist in keeping the tablet's position at the top of the pipe.

The adhesive shall be Permatex No. 1, or approved equal. There shall be no adhesive on the tablet except on the broad side next to the surface to which the tablet is attached. The tablets shall be fastened to the pipe to prevent washing to the pipe end.

The number of calcium hypochlorite tablets required for main disinfection is shown in the following Table 41-1.

TABLE 41-1

REQUIRED 5 GRAM CALCIUM HYPOCHLORITE TABLETS*

Pipe Diameter (inches)	Length of Pipe Section (feet)				
	13 or less	18	20	30	40
4	1	1	1	1	1
6	1	1	1	2	2
8	1	2	2	3	4
10	2	3	3	4	5
12	3	4	4	6	7
16	4	6	7	10	13

*Based on 3.25 grams of available chlorine per tablet. Any portion of tablet rounded to next higher number.

When the installation of the water distribution system has been completed, the water mains shall be filled with water at a velocity of less than one foot per second (1 fps). During filling, air shall be released from all high points in the line. The Contractor shall provide a corporation stop at high points to provide air vents and insure that all air is released.

In addition, as the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.

The chlorinated water shall be allowed to stand in the pipeline at least twenty-four (24) hours. At the end of this period the chlorinated water shall be flushed from the pipeline until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the existing distribution system, or less than one mg/l total residual chlorine.

Before the water main is placed in service as part of the existing distribution system, the Contractor shall take the number of samples required by Agency personnel. Bacteriological examination of the samples shall meet the following criteria:

1. Total Coliform less than 1 per 100 milliliters
2. Total Plate Count less than 500 bacteria per milliliter
3. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated as directed by the Agency.

The water shall also meet State and Federal drinking water standards; Title 22, California Administrative Code, and the 1986 Amendments to the Safe Drinking Water Act of 1974, as issued by the United States Environmental Protection Agency (EPA).

New water mains shall not be connected to the existing system until the Agency has determined that the new water main has been disinfected.

41-17 PRESSURE TESTING WATER MAIN INSTALLATIONS

After disinfection of the system and prior to making connections, the entire system shall be pressure tested by the Contractor independent of the existing system or systems to be connected.

In no case shall there be placement of permanent pavement prior to successful completion of the test. Joints and fittings must be backfilled to the horizontal diameter of the pipe and the pipe between joints backfilled to a depth necessary to hold the line securely during the test, but in no case less than eighteen inches (18”). Thrust blocks shall have been in place for at least

thirty-six (36) hours if high-early-strength cement was used or at least seven (7) days if standard cement was utilized.

Each section of the pipe to be tested shall be slowly filled with water, and all air shall be expelled from the pipe. The release of the air can be accomplished by opening fire hydrants and service line cocks at the high points of the system and blow-offs at all dead ends. The valve controlling the admission of water into the section of pipe to be tested should be opened wide before shutting the hydrants or blow-offs. After the system has been filled with water and all air expelled, all the valves controlling the section to be tested shall be closed and the line remain in this condition for a period of not less than twenty-four (24) hours. This twenty-four (24) hour period shall follow guidelines as set forth in Section 41-16, "Disinfection of Water Mains", in this Section of these Specifications.

The pipe shall be refilled, if necessary and a pressure test of one hundred fifty pounds per square inch (150 psi) shall be applied and held for a period of one (1) hour for each section of the system to be tested. If possible, pressure testing should take place prior to flushing of chlorinated water and sample testing as outlined in Section 41-16, "Disinfection of Water Mains". The Contractor shall provide the necessary pump and a clean calibrated container for measurement of make-up water required to replace leakage during this one (1) hour period.

For acceptance of the water system, each test section shall not exceed the allowable make-up water as determined in accordance with the following formula:

$$L=SDT/10,876$$

Where:

L = the maximum allowable make-up water in gallons
S = the length of the test section in feet
D = the diameter of the pipe in inches
T = the test time period in hours

No leakage is allowed for welded steel pipe with welded joints.

All defective items discovered during the pressure test shall be repaired or replaced. The test shall be repeated after any repair until the system meets the above leakage requirement. Even if the leakage is less than the allowable, all observed leaks shall be repaired. The test will be witnessed by the Agency.

The Contractor shall take all necessary precautions to prevent any joints from drawing while the pipe lines and their appurtenances are being tested. Any damage to the pipes and their appurtenances, or to any other structures, resulting from or caused by these tests, shall be repaired by the Contractor at the Contractor's expense.

41-18 CONNECTIONS TO EXISTING WATER MAINS

All opening and closing of valves on Agency water systems will be performed by representatives of the Agency.

All tapping sleeves shall be approved by the Agency prior to beginning work. All work shall be done by the Contractor.

In general, shutdowns will be made only at times when there will be the least interference with consumer service. Connections shall be made only after complete and satisfactory preparation for such work has been made, in order that the shutdown may be of as short duration as possible. Unless otherwise specified in the Special Provisions, the Agency will notify affected Fire Districts and consumers concerning the interruption of water service.

41-19 REGULATIONS RELATING TO SANITARY HAZARDS

All water system construction (including nonpotable and recycled water systems) shall conform to applicable regulations relative to safeguarding the public health, particularly the regulations relating to cross connections as established by the California Code of Regulations, Title 17 Public Health, Chapter 5 Sanitation (Environmental), Sections 7583-7622, and the latest California Department of Health Services criteria. The Contractor must maintain a ten-foot (10') minimum horizontal distance (O.D. to O.D.) between parallel water and sanitary sewer lines and services, and the water main must be installed at least twelve inches (12") (O.D. to O.D.) above the sanitary sewer. No field changes shall be made that conflict with this requirement without the prior written approval of the Agency. When crossing a sanitary sewer force main, the water distribution main shall be ductile iron with a minimum rated working pressure of 200 psi, installed a minimum of three feet (3') (O.D. to O.D.) above the sewer line as close to perpendicular as possible.

41-20 SETTING, ADJUSTING AND LOCATING VALVE BOXES

Prior to construction, the Contractor shall furnish reference points or swing ties to all existing valves within the streets to be resurfaced. A copy of the valve location measurements shall be provided for the Agency prior to any street construction or resurfacing.

For all new water valves installed, the Contractor shall furnish and install valve boxes, covers, drop caps, and risers in accordance with Standard Drawing 8-5. Unless otherwise shown or specified in the Contract, in construction areas involving elevation changes or where existing valve boxes or risers are disturbed, or as indicated on the Plans, the Contractor shall furnish and adjust to final grade all existing valve boxes in accordance with Standard Drawing 8-5. Existing valve boxes that comply with Standard Drawing 8-5 in undamaged condition may be reused by the Contractor when approved by the Agency.

All water valve boxes removed for subsequent reinstallation to allow reconstruction of existing streets shall be temporarily replaced with a protective metal container such as five (5) gallon bucket or pail. The temporary metal container shall cover the riser over the valve and will assist in keeping the location of the valves visible during street reconstruction activities. The risers at each valve shall be kept free of debris and the valve operating nut left exposed.

41-21 ADJUSTING AIR RELEASE VALVES

The Contractor shall install new, or adjust to grade existing, air release valve boxes or manholes and covers in accordance with Standard Drawing 8-14A or 8-14B.

41-22 RECYCLED WATER

41-22.01 General

The County has a recycled water system and nonpotable water system used for irrigation purposes. The terms "recycled water", "reclaimed water", and "nonpotable water" are considered interchangeable for the purposes of these Specifications. The requirements for recycled water systems are the same as for potable water systems as discussed in this Section 41 and Section 20, "Landscaping", of these Specifications, except as discussed in the latest edition of "Rules and Regulations for Recycled Water Use and Distribution, County of Sacramento" (Recycled Regulations) and the latest edition of the "County of Sacramento Public Works Agency Improvement Standards" (Standards). The latest edition of Recycled Water Notes required to be shown on Plans using recycled water is available from the Sacramento County Water Agency (SCWA).

The disinfection of recycled water pipes is required unless specifically called out in the Contract. The standard pressure test is required as discussed in this Section.

41-22.02 Offsite

Offsite facilities include all recycled water pipes and associated appurtenances upstream of and including the water meter.

41-22.03 Pipes

The use of purple colored pipe, with the words "CAUTION: RECYCLED WATER – DO NOT DRINK" or "CAUTION: RECLAIMED WATER - DO NOT DRINK" and "PELIGRO: AGUA IMPURA – NO BEBER" or "PELIGRO: AGUA IMPURA – NO TOMAR" embossed or integrally stamped/marked on the pipe is the preferred method of identification. Adhesive tape or continuous sleeves are not acceptable alternatives to the colored pipe. The warning should be stamped on opposite sides of the pipe, repeated every three feet (3').

A warning tape with non-metallic backing shall be installed with all new recycled water pipe. The tape shall have black printing on a purple field with the words, "CAUTION: RECYCLED WATER - DO NOT DRINK" or "CAUTION: RECLAIMED WATER - DO NOT DRINK" and "PELIGRO: AGUA IMPURA – NO BEBER" or "PELIGRO: AGUA IMPURA – NO TOMAR". The overall width shall be a minimum of three inches (3"). The tape shall be installed eighteen inches (18") above and shall run continuously along the entire length of the pipe. All valve risers shall be installed within eight inch (8") C900 purple colored pipe.

If the horizontal separation required by Section 41-19, "Regulations Relating to Sanitary Hazards", is not possible, written approval for deviations shall be obtained from the SCWA and the State Department of Health Services prior to commencement of construction. Common trench construction shall not be permitted. On new systems, potable water, recycled water, and sewer should be located from the ground surface in order of descending quality at all times. Potable water shall be above recycled water, which should be above the sewer. Minimum vertical separation should be one foot (1') between the top and bottom surfaces of pipes.

41-22.04 Valve Boxes and Covers in Non-Traffic Areas

Valve boxes shall have a purple polyethylene face. The face shall be etched, have an ultraviolet inhibitor, and be anchored in the concrete.

Valve box covers shall be cast iron with the words "NONPOTABLE WATER" or "RECLAIMED WATER" or "RECYCLED WATER" stamped or welded into the face. Cover does not need to be purple.

41-22.05 Valve Boxes and Covers in Traffic Areas

Valve boxes and covers within traffic areas shall be painted purple according to the manufacturer's recommendations and as stated in Section 41-22.04, "Valve Boxes and Covers in Non-Traffic Areas".

41-22.06 Meter Boxes and Meter Box Covers

Meter boxes shall be reinforced concrete and have a purple polyethylene face. The face shall be etched, have an ultraviolet inhibitor, and be anchored in the concrete.

Meter box covers shall be reinforced concrete with a hinged cast iron lid and a one and three-quarter inch (1-3/4") pre-cast hole located opposite the identification label. The identification label shall state "NONPOTABLE WATER" or "RECLAIMED WATER" or "RECYCLED WATER". Covers do not need to be purple.

41-22.07 Blow-Off and ARV Boxes and Covers

Blow-off and ARV boxes and covers shall be painted purple according to the manufacturer's recommendations and shall conform to Standard Drawing 8-16.

41-22.08 NOT USED

41-22.09 Onsite (Non County)

Onsite facilities include all pipe, pumps, and any other associated appurtenances with recycled water downstream of the water meter.

41-22.10 Backflow Devices

Backflow devices are not required for recycled water irrigation systems except for unusual circumstances as outlined in the Recycled Regulations. If a backflow device is required, it shall meet the requirements of Section 41-9, "Backflow Prevention Assemblies", in this Section of these Specifications.

41-22.11 Valves

Valves shall have visible identifying purple tags mechanically attached to the valve body by wire or snap tie or other approved device and have the words "WARNING Reclaimed Water Do Not Drink" and "AVISO AGUA IMPURA NO TOMAR" (T. Christy RC1P2 or equal).

41-22.12 Valve Boxes and Covers

41-22.12.A Concrete Boxes and Covers

Valve boxes made of reinforced concrete shall have a purple polyethylene face. The face shall be etched, have an ultraviolet inhibitor, and be anchored in the concrete. Valve box covers made of reinforced concrete shall have the words "NONPOTABLE WATER" or "RECLAIMED WATER" or "RECYCLED WATER" stamped into the face. The cover is not required to be purple.

41-22.12.B Rigid Plastic or Composite Boxes and Covers

Rigid plastic or composite valve boxes discussed in Section 50-39, "Valve Boxes, Covers, Drop Caps, and Service Valve Boxes", of these Specifications shall be purple. Valve box covers shall be made of the same material as the valve box, may be purple, and shall have the words "NONPOTABLE WATER" or "RECLAIMED WATER" or "RECYCLED WATER" stamped into the face. The valve box covers shall not be blue.

41-22.13 Hose Bibs

Hose bibs are prohibited under any circumstances to be connected to the recycled water system.

41-22.14 Quick Coupling Valves

See Section 50-43.21, "Quick Coupling Valves", of these Specifications.

41-22.15 Sprinklers

All sprinklers shall have manufacturer-recommended purple identifiers approved by SCWA.

41-22.16 Warning Signs

Warning signs shall meet the requirements of Standard Drawing 8-16 of these Specifications. Placement of signs shall meet the requirements outlined in the Recycled Regulations and as directed by SCWA.

41-22.17 Special Cross Connection Test

A special cross connection test is required for any site using recycled water. The cross connection test will be performed by a SCWA or Sacramento County Environmental Management Department (EMD) representative after the recycled water, potable water, and fire systems are completely installed and have passed the required pressure testing and disinfection testing. The site shall complete and pass the test prior to site occupancy. The test may require the domestic system to be shut down for twelve (12) hours and the irrigation system shut down for twenty-four (24) hours.

41-23 PAYMENT

Unless otherwise specified in the Special Provisions, payment for the water distribution system will be by lump sum.

The lump sum price paid for water distribution system includes full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the water distribution system, including cutting, trenching, laying, blocking, making connections, disinfecting, testing, backfilling, as shown or specified in the Contract, in these Specifications, and as directed by the Agency.

The unit price paid for fire hydrants includes excavation, furnishing and placing the tee in the main, the six-inch (6”) lateral to the hydrant, the gate valve, the fittings, and the hydrant, all as detailed on the Plans. Also included in the unit price are blocking, backfill, restoration of street surfaces, and all other labor, equipment and material necessary for installing the fire hydrant in accordance with the Contract.

SECTION 42 RELOCATION AND MAINTENANCE OF UTILITY FACILITIES

42-1 RELOCATION OF UTILITY FACILITIES

When shown or specified in the Contract, existing utility facilities will be relocated during the Work. The Contractor shall notify the Agency in writing prior to doing any work in the vicinity of the affected facilities. The utility facility will be relocated by the owner of the facility within the Working Days listed in the Special Provisions, after said notification is received by the Agency. The Contractor shall not interfere with such utility facility until after the expiration of the time specified, and then only with the permission of the Agency.

In the event that the utility facilities mentioned above are not removed or relocated by the times specified and if, in the opinion of the Agency, the Contractor's operations are delayed or interfered with by reason of the utility facilities not being removed or relocated by said times, the Agency will compensate the Contractor for such delays to the extent provided in Section 7-12.02, “Unavoidable Delays”, of these Specifications.

The right is reserved by the Agency and the owners of utility facilities, or their authorized agents, to enter the work site to make such changes as are necessary for the rearrangement of their facilities. The Contractor shall cooperate with forces engaged in such work. The Contractor’s operations shall be conducted in such a manner as to avoid any unnecessary delay or hindrance to the work being performed by other forces.

42-2 MEASUREMENT AND PAYMENT

Full compensation for conforming to the provisions in this Section, not otherwise provided for, is incidental to other items of work and no additional compensation will be paid.

SECTION 43 CLEANING PIPELINES

43-1 GENERAL

Upon completion of construction and prior to final inspection, the Contractor shall clean new pipelines of all dirt and debris. Pipeline installation will not be accepted as complete until the cleaning is complete and acceptable to the Agency.

Pipelines with a diameter of twenty-four inches (24") or less shall be cleaned by the controlled balling method, or other alternative method if approved in writing by the Agency. Pipelines greater than twenty-four inches (24") in diameter shall be cleaned as approved in writing by the Agency.

Temporary plugs shall be installed and maintained during cleaning operations at points of connection to existing facilities to prevent water, dirt, and debris from entering the existing facility. The temporary plugs shall be as approved by the Agency and shall remain in place until the completion of the balling and flushing operation. The plugs shall be installed and removed in the presence of the Agency.

43-2 MEASUREMENT AND PAYMENT

Full compensation for cleaning pipelines, including all equipment, labor, materials, is included in the prices paid per linear foot of the respective sizes, grades, and types of pipes listed in the Contract, and no additional compensation will be paid.

SECTION 44 SHOTCRETE, CAST CONCRETE CHANNEL LINING, AND GROUTED COBBLE

44-1 SHOTCRETE

44-1.01 Description

This work shall consist of lining ditches and channels, embankment protection, and constructing warped sections and other similar features with shotcrete in accordance with the details and dimensions shown or specified in the Contract and as specified in these Specifications.

Shotcrete shall consist of concrete or mortar pneumatically applied onto a surface. Shotcrete shall be applied by the dry-mix process. The dry-mix process shall consist of delivering dry mixed aggregate and cement pneumatically to the nozzle body, and adding water and mixing the materials in the nozzle body.

The resulting surface shall be uniform and free from humps or depressions.

44-1.02 Materials

Portland cement shall conform to the requirements of Section 50-5, “Portland Cement”, of these Specifications.

Sand shall be clean, sharp, and free from clay, silt and loam. Sand shall be well graded and suitable for the purpose intended with no particles larger than three-eighths inch (3/8”).

The sand shall contain not less than three percent (3%) nor more than five percent (5%) moisture by weight.

44-1.03 Proportions

The proportion of cement to sand shall be based on dry and loose volume and shall not be less than one (1) part portland cement to four and one-half (4-1/2) parts sand. The water content shall be maintained at a practical minimum and not in excess of three (3) gallons per ninety-four (94) pounds of cement as placed.

44-1.04 Mixing

Before being charged into the machine, the cement and sand shall be thoroughly mixed dry in an approved power batch mixer equipped with a device for accurately measuring the quantity of sand and timing the mixing operation. The mixture shall be mixed for at least one and a half (1-1/2) minutes during which time the mixer shall rotate at a peripheral speed of two hundred (200) feet per minute. The dry mixed materials shall be used promptly after their preparation and any material that has been mixed for more than forty-five (45) minutes shall not be used. Rebound shall not be used on any portion of the Work.

44-1.05 Surface Preparation

When shotcrete is to be placed on an earth slope for embankment protection, the earth surface shall be cleaned of grass, roots, and other deleterious matter. The surface shall be made smooth and shall be well watered and compacted. Header board shall be placed as shown on the Plans. All surfaces shall be damp, but not wet to the extent that free water may exist at the time of application.

When shotcrete is applied to steel or concrete structures, the surface shall be cleaned of all loose material and be damp, as above specified, at the time of application of the material.

44-1.06 Placing

The velocity of the material as it leaves the nozzle shall be such that minimum rebound occurs. Velocities of the material shall be constant. The nozzle shall be held in such position

and at such distance that the stream of flowing material will impinge at approximately right angles to the surface being covered and that excessive impact will be avoided.

Pneumatic pressure at the machine shall not be less than thirty pounds per square inch (30 psi) when the length of hose does not exceed one hundred feet (100'). Pressure shall be increased five pounds per square inch (5 psi) for each additional fifty feet (50') of hose or fraction thereof. Water used for hydration at the nozzle shall be supplied at pressure of not less than fifteen pounds per square inch (15 psi) greater than the air pressure. The shotcrete shall have uniform consistency at all times.

After the shotcrete has been applied to the surface as nearly as practicable to finished grade, the surface of the shotcrete shall be checked with a minimum ten-foot (10') length straightedge. Low spots shall be raised by additional application of shotcrete. The final surface of the shotcrete shall be finished with a wood float.

44-1.07 Curing and Protection

Curing shall be as specified in Section 30-13, "Curing"; protection shall be as specified in Section 30-14, "Protecting Concrete", of these Specifications.

44-1.08 Reinforcement

Reinforcement shall be as shown on the Plans and shall conform to Section 31, "Reinforcement" of these Specifications. Reinforcement shall be placed in the shotcrete as it is applied. Reinforcement shall be not less than one-quarter inch (1/4") from unexposed faces and three-quarters inch (3/4") from exposed faces.

44-1.09 Expansion Joints

When premoulded joint filler is shown or specified in the Contract, the filler shall be placed in correct position before shotcrete is placed. The edges of the shotcrete at the joint shall have a finished edge, edged with a one-quarter-inch (1/4") radius edging tool. Unless otherwise specified in the Special Provisions, expansion joint material shall be as specified in Section 50-4, "Premoulded Expansion Joint Filler", of these Specifications.

44-1.10 Measurement and Payment

Unless otherwise specified in the Special Provisions, quantities of shotcrete in lining ditches and channels, embankment protection, and constructing warped sections and other similar features will be measured by the square foot, computed from measurements along the slope of actual areas placed. Shotcrete placed outside the dimensions shown on the Plans or to fill low foundations will not be paid for. The price paid per square foot for shotcrete shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in placing shotcrete, including surface preparation, reinforcement, joint filling material, and finishing, as shown or specified in the Contract, as specified in these Specifications, and as directed by the Agency. No additional compensation will be allowed for rebound.

44-2 CAST CONCRETE CHANNEL LINING

44-2.01 Description

This work shall consist of lining channels with cast-in-place concrete in accordance with the details and dimensions shown or specified in the Contract and as specified in these Specifications.

44-2.02 Materials

Materials for cast-in-place concrete lining shall be Class "B" concrete as specified in Section 50-5, "Portland Cement Concrete", of these Specifications. Slump for concrete channel lining shall not exceed four inches (4") as determined by the slump cone method of ASTM

Designation: C 143 or an equivalent slump as determined by California Test Method 533. Lesser slumps may be required by the Agency if the concrete begins to develop surface cracks. At the Contractor's option, shotcrete conforming to Section 44-1, "Shotcrete", in this Section of these Specifications may be used for side lining only.

When shown or specified in the Contract, grouted cobbles conforming to Section 44-3, "Grouted Cobbles", in this Section of these Specifications shall be used for side or bottom lining.

44-2.03 Placement and Thickness

The thickness of the bottom lining in channels shall not be less than four inches (4"). The thickness of the side lining in channels shall not be less than three inches (3").

Lining shall be placed as shown on the Plans and Standard Drawing 9-24, and as directed by the Agency.

The appearance of the lining shall be neat and uniform conforming to the lines shown on the Plans or as directed by the Agency. A two-inch by four-inch (2" x 4") header board placed along the top of the lining or other method approved by the Agency shall be used as a control while placing the lining.

The surfaces of those areas to be lined shall be evenly graded to the lines and grade and sections as shown on the Plans. The surfaces shall be moistened thoroughly. All surfaces on which lining is to be placed shall be free from standing water, mud, and debris and shall be firm enough to prevent contamination of the fresh lining by earth or other foreign material. The excavated channel must be approved by the Agency before the Contractor may begin concrete placement.

Grade control points shall be placed in accordance with Section 18-4.02, "Grade Control - Lined Channels", of these Specifications.

After the concrete has been placed, the surface shall be checked with a minimum ten-foot (10') length straightedge. Low spots shall be filled to finish grade. The finished concrete surface shall be smooth and uniformly constructed to the design finish grade.

44-2.04 Reinforcement

The channel lining shall be reinforced with 6" x 6" – W6 x W6 welded wire fabric conforming to ASTM Designation: A 185. The welded wire fabric reinforcement shall be embedded in the concrete so that it will be a minimum of one inch (1") clear from either face of the concrete, unless otherwise shown on the Plans. The wire fabric shall be maintained at the required minimum clear distance from the soil through the use of dobies or other methods approved by the Agency before and during concrete placement.

44-2.05 Joints

Joints in cast concrete channel lining shall consist of construction joints, transverse expansion joints, and transverse contraction joints. All joints shall be true to a uniform line and neat in appearance.

Construction joints shall be square, and shall have a finished edge, edged with a one-quarter-inch (1/4") radius edging tool. The edge shall be thoroughly wetted before the next section of lining is placed. Construction joints shall be constructed whenever the operation is halted for a period exceeding thirty (30) minutes. Reinforcement shall extend through the construction joints.

Transverse expansion joints shall be constructed at intervals of not more than fifty feet (50') and shall be filled with premoulded expansion joint filler material, unless otherwise shown on the Plans. The material shall have a minimum thickness of three-eighths inch (3/8"). The edges of the concrete at the joint shall have a finished edge, edged with a one-quarter-inch (1/4") radius edging tool. Unless otherwise specified in the Special Provisions, expansion joint material shall be as specified in Section 50-4, "Premoulded Expansion Joint Filler", of these Specifications.

Transverse contraction joints shall be constructed at intervals of ten feet (10') and shall be scored by troweling a five-eighths-inch (5/8") deep groove, one-quarter inch (1/4") wide, unless otherwise shown on the Plans .

44-2.06 Weep Holes

On channels with side lining extending more that eighteen inches (18") vertically above the channel toe, weep holes shall be constructed at intervals of ten feet (10') midway between contraction joints on each side of the channel. Weep holes shall be constructed using perforated two-inch (2") diameter, schedule 40, polyvinyl chloride (PVC) or acrylonitrite butadine-styrene (ABS) pipe. The pipe shall be cut to fit the channel slope and shall be placed at an elevation of one foot (1') above the toe of slope. The pipe perforations shall be a minimum of one (1) square inch per linear foot of pipe. The weep holes shall be backed by a minimum of one cubic foot of aggregate material tied in a burlap bag. The aggregate shall extend at least six inches (6") above and below and to each side of the weep hole, and at least ten inches (10") into the side slope. The side and back of the burlap bag shall be protected from being coated by concrete during the placing operation by a suitable means approved by the Agency. On the day following concrete placement, each weep hole shall be rodded to assure that it has not been blocked.

44-2.07 Cutoff Walls

Cutoff walls shall be constructed around the perimeter at each end of the channel lining and at all locations where the new lining meets structures or an existing lining, and in other locations as shown on the Plans. The cutoff walls shall be a minimum of six inches (6") thick and eighteen inches (18") deep measured from the surface of the lining. The channel lining reinforcement shall be bent down into the cutoff walls.

44-2.08 Finishing

Cast-in-place concrete channel lining shall be placed and tamped until it is thoroughly compacted and mortar flushes to the surface. After striking off to grade, the concrete shall be hand floated with wooden floats. The entire surface shall then be broomed with a fine hair push broom to produce a uniform surface. Brooming shall be done when the surface is sufficiently set to prevent deep scarring, and shall be accomplished by drawing the broom parallel to the expansion and construction joints.

44-2.09 Curing and Protection

Curing shall be as specified in Section 30-13, "Curing"; protection shall be as specified in Section 30-14, "Protecting Concrete", of these Specifications.

44-2.10 Measurement and Payment

Unless otherwise specified in the Special Provisions, quantities of cast-in-place concrete channel lining will be measured by the square foot computed from measurements, along the slope, of actual areas placed. The vertical legs of cutoff walls will not be considered surface area. The price paid per square foot for cast-in-place concrete channel lining includes full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in cast-in-place concrete channel lining, including surface preparation, reinforcement, joint filling material, finishing, and constructing cutoff walls, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

44-3 GROUTED COBBLES

44-3.01 Description

This work shall consist of furnishing and placing grouted cobbles in the side or bottom of cast-in-place concrete channel lining. Grouted cobbles shall be in accordance with the details

shown or specified in the Contract, and these Specifications. Cast-in-place concrete channel lining shall conform to Section 44-2, "Cast Concrete Channel Lining", in this Section of these Specifications.

Reinforcement and expansion joints will not be required in grouted cobble channel lining.

44-3.02 Materials and Placement

Cobbles shall be clean river rock cobbles having a maximum size of ten inches (10") and shall conform to the following grading:

Sieve Sizes	Percentage Passing
Greater than 4"	40 - 100
4"	0 - 40
1-1/2"	0

Grout shall conform to the requirements for Class "B" concrete as specified in Section 50-5 "Portland Cement Concrete", and these Specifications. Aggregate size shall be limited to that necessary to obtain the required penetration into the interstices of the cobbles, as specified below. The water content of the grout shall be such as to permit gravity flow of the grout into the interstices of the cobbles.

The cobbles shall be uniformly placed to a thickness of approximately twelve inches (12"). Minimum penetration of the grout into the interstices of the cobbles shall be four inches (4") measured from the outer surface of the cobbles.

The surfaces of the cobbles shall be cleaned of any adhering soil and then moistened. Grout shall be uniformly placed over the cobbles. In no case shall grout be permitted to flow across the cobbles a distance in excess of ten feet (10'). The temperature of the grout at the time of placement shall not exceed 90°F.

Immediately after placement, the grout shall be spaded or rodded into place until the minimum penetration is obtained.

After the grout has been placed, the cobbles shall be thoroughly brushed to expose their top surfaces. The outer cobbles shall project one-quarter to one-third (1/4 to 1/3) of their diameter above the grout surface. After completion of any ten-foot (10') strip of grouted cobbles, no personnel or equipment shall be permitted on the surface for a period of twenty-four (24) hours. Grouted cobbles shall be cured as specified in Section 30-13, "Curing", of these Specifications.

44-3.03 Measurement and Payment

Unless otherwise specified in the Special Provisions, quantities of grouted cobbles will be measured by the square foot computed from measurements, along the slope, of actual areas placed. The vertical legs of cutoff walls will not be considered surface area. The price paid per square foot for grouted cobbles includes full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in grouted cobbles, including surface preparation, and finishing, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 45 CHAIN LINK FENCE

45-1 GENERAL

Fences shall conform to Section 80, “Fences”, of the State Specifications, and these Specifications.

Temporary fencing, for the control, safety or convenience of traffic, or the preservation of property required during the course of construction, shall conform to these Specifications or the Special Provisions.

45-2 MATERIALS

Chain link fence and gate materials shall conform to Section 80, “Fences”, of the State Specifications.

45-3 CONSTRUCTION

Unless otherwise shown or specified in the Contract, chain link fences and gates shall be constructed as shown on State Plan A85, and in accordance with these Specifications. Concrete for post foundations shall be Class “4” concrete as specified in Section 90, “Portland Cement Concrete”, of the State Specifications. Concrete bases for terminal, gate and line posts shall cure for not less than seventy-two (72) hours before chain link fence fabric is placed. Allow bases to cure for five (5) days before any tensioning devices (gates, guy wires, etc.) are installed.

Unless otherwise specified in the Special Provisions, all fence shall be constructed with a top rail and a bottom tension wire.

Fabric shall be fastened to line posts with fabric bands spaced approximately fourteen inches (14”) apart, and to top rail and bottom tension wire with nine (9) gauge galvanized tie wires spaced approximately twenty-four inches (24”) apart.

At locations where breaks in a run of fencing are required for gates, or at intersections with existing fences, adjustments in post spacing shall be made to conform to the requirements for the type of closure indicated.

Unless otherwise directed by the Agency, temporary guys or bracing shall be installed to hold posts in proper position until the concrete has set.

45-4 MEASUREMENT AND PAYMENT

Quantities of chain link fence to be paid for will be determined by the linear foot from actual measurements of the completed fence, such measurements to be made parallel to the ground slope along the line of completed fence, deducting the widths of openings. Chain link fence will be paid for at the price per linear foot for chain link fence of the type designated in the Contract.

Quantities of gates will be determined from actual count. When more than one gate is placed in an opening, each single unit placed will be counted as a gate. A gate unit complete in place shall include one gate with all necessary fittings, hardware, and gate and latch posts with braces. Gates will be paid for at the unit price per chain link gate. The size and type of gate will be designated in the Contract.

The above prices and payments include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing chain link fences and gates, complete in place, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 46 SURVEY MONUMENTS

46-1 GENERAL

This work shall consist of constructing cast-in-place portland cement concrete survey monuments at the locations shown on the Plans or directed by the Agency. Survey monuments shall conform to the requirements in Section 81, “Monuments”, of the State Specifications, these Specifications, and the Special Provisions.

The Agency shall show the location and character of all existing survey monuments within the construction area on the construction plans.

Whenever a survey monument not shown on the plan is discovered, the Contractor shall immediately bring it to the attention of the Agency and shall take all precautions necessary to avoid damaging it.

When set forth in the Special Provisions that the Contractor is to provide all surveys, the Contractor shall be responsible for referencing, re-setting, and filing of corner records for all survey monuments disturbed or destroyed by construction activities in accordance with Section 8771 of the Land Surveyors Act.

All survey monuments and references shall be set or re-set by or under the direction of a California Licensed Land Surveyor or a California Registered Civil Engineer authorized to practice Land Surveying.

46-2 MATERIALS

Unless otherwise specified in the Contract, survey monuments shall be Type D, Alternative 1, as detailed on the State Plan A74, except for those to be installed in new bridge deck construction. Survey monuments placed in new bridge deck construction shall be modified Type A, as detailed on State Plan A74, and shall consist of a marker disc placed on the surface of the concrete bridge deck without specific concrete depth, reinforcing or chamfer.

Concrete shall be Class "B-2" concrete as specified in Section 50-5, “Portland Cement Concrete”, of these Specifications.

Unless otherwise specified in the Special Provisions, survey marker discs shall be furnished by the Contractor and shall be leaded red or semi-red brass conforming to ASTM Designation: B 584, Copper Alloy UNS No. C84400. The disc shall be two and one-half inches (2-1/2”) in diameter and not less than two and one-half inches (2-1/2”) long.

Mortar shall be as specified in Section 51-1.135, “Mortar”, of the State Specifications.

46-3 CONSTRUCTION

The brass disc shall be imbedded in fresh concrete and centered within the cross ties of the survey point.

Finished monument cases shall be flush with the surrounding area and shall be secured by a concrete or mortar collar as detailed on the State Plan A74. Survey monuments on new deck construction do not have monument cases.

It is essential that the survey monuments be placed in the correct locations. Survey monuments placed in locations unacceptable to the County’s Surveyor shall be removed and replaced at the Contractor’s expense.

The Contractor shall be responsible for installation of the marker disc in fresh concrete so that it is properly centered within the cross ties of the survey point.

46-4 MEASUREMENT AND PAYMENT

The quantities of each type of survey monument will be paid for as survey monuments by units, in place, determined from actual count. The unit prices paid for survey monuments include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the survey monuments, complete in place, including monument cases, granular material, excavating and backfilling holes, and disposing of surplus excavated material, as shown or specified in the Contract, specified in these Specifications, and directed by the Agency.

SECTION 47 RAILINGS AND BARRIERS

47-1 GENERAL

Railings and barriers shall conform to Section 83, “Railings and Barriers”, of the State Specifications.

SECTION 48 TRAFFIC STRIPES AND PAVEMENT MARKINGS

48-1 GENERAL

Traffic stripes and pavement markings shall be as shown on the Plans and shall conform to these Specifications.

The traffic stripes and pavement markings shall conform to the standards, dimensions, and details as specified in the latest edition of the California Manual on Uniform Traffic Control Devices for Streets and Highways (FHWA's MUTCD as amended for use in California). In addition, the traffic stripes and pavement markings shall conform to County standard drawing 4-45.

48-2 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS

Thermoplastic traffic stripes and pavement markings shall conform to Section 84-2, "Thermoplastic Traffic Stripes and Pavement Markings", of the State Specifications, and to these Specifications. Thermoplastic shall be Alkyd type for extrusion application, and shall produce an adherent reflectorized strip capable of resisting deformation by traffic.

The thermoplastic material shall be one hundred percent (100%) solids. The binder shall consist of synthetic alkyd resins, and shall be homogeneously incorporated with all the necessary prime pigments, fillers and glass beads to produce a coating that meets the requirements specified in the following table:

REQUIRED THERMOPLASTIC CHARACTERISTICS		
Requirement	**Color**	
	White	Yellow
• Glass Beads, AASHTO M-247, Type I, percent by weight, min. (California Test Method 423)	30	30
• Titanium Dioxide (Ti02), percent by weight, min. (AASHTO T250)	10	
• Lead Chromate, Medium Heat Stability, percent by weight, min.		2.5
• Specific Gravity, max. (California Test Method 423)	2.15	2.15
• Binder, percent by weight, min. (California Test Method)	18	18
• Ring & Ball Softening Point, °F (ASTM E28)	200 - 240	200 - 240
Tests on Material after 4 hours heat with stirring at 425°F+ 2°F, which includes 1 hour for meltdown and temperature stabilization:		
• Bond Strength to Concrete, 0.125-inch thick film drawdown at 425°F test at 75°+ 2°F, psi, min. (California Test Method 423)	180	180
• Brookfield Thermosel Viscosity, Spindle SC4-27, 20 RPM at 425°F, Poise (California Test Method 423)	30 - 45	30 - 45
• Impact Resistance, Falling Ball Method, 0.125 inch thick film drawdown at 425°F on concrete. Test at 75+2°F, inch-lbs., (ASTM D2794)	10	10
• Daylight Luminous Reflectance, min. (ASTM E97)	75	40
• Yellowness Index, max., (ASTM E313)	0.15	
• Hardness, Shore A-2 Durometer with 2 kilogram weight at 115°F. (California Test Method 423)	60 - 80	60 - 80
• Low Temperature Stress Cracking, Resistance at 25°F, (AASHTO T250)	No Crack	No Crack
• Color Match, Federal Std. No. 595a, Color No. 33538		Passes

The thermoplastic material shall be applied in a single, uniform layer by extrusion methods.

Stencils shall be used when applying thermoplastic material for pavement markings. Stencils may be new or used if in good condition. If stencils are bent or damaged they shall be replaced.

The pavement surface to which thermoplastic material is applied shall be completely coated by the material and the voids of the pavement surface shall be filled.

Unless otherwise specified in the Special Provisions, the thermoplastic material for traffic stripes shall be applied at a minimum thickness of .075 inch. Thermoplastic material for pavement markings shall be applied at a thickness of 0.125 inch. Glass beads shall be applied immediately to the surface of the molten thermoplastic material at rate of not less than eight (8) pounds per one hundred (100) square feet. The amount of glass beads applied shall be measured by stabbing the glass beads tank with a calibrated rod.

48-3 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS

Painted traffic stripes and pavement markings shall conform to Section 84-3, "Painted Traffic Stripes and Pavement Markings", of the State Specifications, and to these Specifications.

Self-sticking traffic marking tape, vinyl or otherwise, developed for such use shall be used for temporary striping as required, unless otherwise shown or specified in the Contract.

48-4 PREFORMED TRAFFIC STRIPES AND PAVEMENT MARKINGS

48-4.01 General

Preformed traffic stripes and pavement markings shall be furnished and placed in accordance with these Specifications and as directed by the Agency. All pavement markings shall be in conformance with the State of California Traffic Manual.

The preformed stripes and pavement markings shall consist of white or yellow film with pigments blended to conform to standard highway marking colors. The pigments shall be thoroughly blended to produce long lasting colors resistant to the effects of weather exposure and to last through the expected life of the film.

The preformed tapes shall consist of a pressure sensitive adhesive that is capable of adhering to clean and dry bituminous or portland cement surfaces. All surfaces shall be prepared and tape applied as indicated by the manufacturer's specifications.

The Contractor shall post-inlay all traffic stripes and markings on new asphalt surfaces in accordance with the manufacturer's recommendations and these Specifications. The Contractor shall post-inlay within twenty-four (24) hours of the placement of an asphalt overlay.

The Contractor shall not apply tape without assistance of a manufacturer's factory service representative, who shall be present during tape application.

The Contractor shall provide manual or automatic application equipment as required. The application equipment shall be capable of simultaneously applying two (2) parallel four-inch (4") lines spaced three-inches (3") apart. The application equipment shall also be capable of applying unlinered, pre-coated, pressure-sensitive, adhesive pavement marking tape.

The manual unit shall have a manually actuated product feed advance system and a foot operated product cutting mechanism.

The automatic unit shall have the capability of advancing, applying, and cutting the pavement marking tape at specific pre-programmed lengths, at speeds up to six and one half miles per hour (6.5 mph) when towed by an appropriate vehicle.

Additional supplemental equipment for manual application of required primers, or for manual tamping of the applied markings shall also be provided.

Prior to installation, the Contractor shall submit to the Agency for approval the method the Contractor proposes to use to install traffic stripes and markings, including a list of equipment to be used in the installation.

The completed traffic stripes and markings shall have clean, well-defined edges, without deformations, and be free of tears or other disfigurements. Improperly placed, defective, or disfigured traffic stripes and markings shall, at the Contractor's expense, be immediately removed from the pavement surface by methods approved by the Agency.

Completed traffic stripes shall be uniform, straight on tangent alignment, and on a true arc on curved alignment. On tangent alignment, when a one-hundred-foot (100') string line is stretched taut and placed directly on the outer edge of the completed traffic stripe, the distance between the string and the edge of the traffic stripe shall not exceed three-quarters of an inch (3/4"), measured anywhere along any one hundred-foot (100') interval of the tangent alignment. On curved alignment, the outer edge of the traffic stripe shall not deviate more than three-quarters of an inch (3/4") from the true arc. The lengths of the gaps and individual stripes that form broken traffic stripes shall not deviate more than two inches (2") from the lengths required to produce a uniformly repeating, broken-stripe pattern.

48-4.02 High Reflective Preformed Traffic Striping

Preformed striping material shall be durable retroreflective preformed patterned pavement tape (#380) with ceramic beads as manufactured by the 3M Company or equivalent if approved in writing by the Agency.

The preformed tape shall have the following minimum retroreflective values measured in accordance with ASTM Designation: D 4061:

Requirement	Color	
	White	Yellow
Entrance Angle	86.0° - 86.5°	86.0° - 86.5°
Observation Angle	0.2° - 1.0°	0.2° - 1.0°
Specific Luminance [(mcd·ft)·fc]	1,100 - 700	800 - 500

48-4.03 Preformed Traffic Stripes

Preformed striping material shall be durable retroreflective preformed pavement tape (#5730) with glass beads as manufactured by the 3M Company or equivalent if approved in writing by the Agency.

The preformed tape shall have the following minimum reflective values measured in accordance with ASTM Designation: D 4061:

Requirement	Color	
	White	Yellow
Observation Angle	0.2° - 0.5°	0.2° - 0.5°
Specific Luminance [(mcd·ft)·fc]	550 - 380	410 - 250

48-4.04 Twelve-Inch Preformed Traffic Striping (White and Yellow) and Markings

Twelve-inch (12”) preformed traffic striping (white and yellow) and markings shall be furnished and placed in accordance with these Specifications and as directed by the Agency.

Preformed traffic stripes shall be installed on all newly resurfaced streets.

Preformed striping material shall be durable retroreflective preformed pavement tape (#420) with glass beads as manufactured by the 3M Company or equivalent product as approved by the Agency.

The preformed tape shall have the following minimum reflective values as measured in accordance with ASTM Designation: D 4061:

Requirement	White		
Entrance Angle	86.0°	86.0°	86.5°
Observation Angle	0.2°	0.5°	1.0°
Specific Luminance [(mcd·ft)·fc]	700	500	400

48-5 PLACEMENT

New traffic striping of the roadway centerline shall be installed on each segment of roadway construction on the same day that the final lift of asphalt concrete pavement is placed on that roadway segment.

New traffic striping of lane lines, crosswalks, and stop bars (skip white and solid white) shall be installed on each segment of roadway construction within one Calendar Day of the final lift of asphalt concrete pavement placed on that roadway segment.

If application of lane line striping, crosswalks, and/or stop bars is not completed on the required day, the Contractor shall supply and install temporary pavement markings as detailed below:

> Temporary pavement markings shall be flush mounted reflectorized tape squares, four inch by four inch (4" x 4") 3M "Staymark" with backing liners, detour grade, #6350 yellow and #6351 white, or approved equal. Right turn barrier lines, edge lines, and shoulder lane lines shall not be delineated with temporary pavement markings. The spacing of the temporary pavement markings shall be as follows:
>
> | **Line Type** | **Color** | **Spacing** |
> |---|---|---|
> | Centerline (straight roadway portions) | Yellow | 48' O.C. |
> | Centerline (tapered or curving portions) | Yellow | 24' O.C. |
> | Stop Lines | White | 6' O.C. |
> | Channelizing Line | White | 24' O.C. |
>
> The Contractor shall remove the temporary pavement markings prior to the installation of new striping.

All other required new striping (e.g. bicycle lane stripes, edge lines, pavement markings, etc., not listed above) shall be installed on each roadway segment within two (2) Working Days of the day the final lift of asphalt concrete pavement is placed on that roadway segment.

48-6 MEASUREMENT AND PAYMENT

Thermoplastic traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. Unless otherwise indicated in the Contract, measurement of thermoplastic traffic stripes shall not include the supply and installation of reflective pavement markers.

If the Contract includes a separate pay item for two-direction, no passing zone striping, as depicted in Details 15, 16, 18, 19, 21 or 22 of State Standard Plan A20A, both stripes of the double traffic stripe are measured together by the linear foot such that one foot of measurement for payment shall include two stripes each one foot long. If the Contract does not have a separate pay item for two-direction, no passing zone striping, each stripe of a double traffic stripe shall be measured separately.

If the Contract includes a separate pay item for median island and/or two-way left turn striping as depicted in Details 28, 29, 31 or 32 of State Plan A20B, all four stripes of the quadruple traffic striping shall be measured together by the linear foot such that one foot of measurement for ayment shall include four stripes each one foot long. If the Contract does not have a separate pay item for median island and/or two-way left turn striping, each stripe of a quadruple traffic stripe shall be measured separately.

If the Contract includes a separate pay item for channelizing striping, as depicted in Details 38 or 38A of State Standard Plan A20D an eight-inch (8") wide stripe shall be measured by the linear foot. If the Contract does not include a separate pay item for channelizing striping, each linear foot of eight-inch (8") wide striping installed shall be measured as two feet (2') of traffic striping.

If the Contract includes a separate pay item for bicycle lane striping, as depicted in Detail 39 or 39A of State Plan A20D, a six-inch (6") wide stripe shall be measured by the linear foot. If the Contract does not include a separate pay item for bicycle lane striping, each linear foot of six-inch (6") wide striping installed shall be measured as one and one-half feet (1-½') of traffic striping.

Thermoplastic pavement markings, including crosswalk lines and stop bars, will be measured by the square foot for the actual area covered. The prices paid per linear foot for thermoplastic traffic stripes of the widths and patterns designated in the Contract and per square foot for thermoplastic pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying thermoplastic traffic stripes and pavement markings, complete in place, including establishing alignment for stripes, and layout work, as shown or specified in the Contract, these Specifications, and directed by the Agency.

Painted traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two (2) four-inch (4") wide yellow stripes separated by a three-inch (3") wide black stripe, will be measured as one (1) traffic stripe. Painted pavement markings will be measured by the square foot for the actual area painted. The prices paid per linear foot for painted traffic stripes and per square foot for painted pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals involved in painting traffic stripes. Compensation shall include establishing alignment for stripes and layout work as shown or specified in the Contract, these Specifications, and directed by the Agency. All exposed surfaces of asphalt concrete dike used around corner returns at intersections shall be painted with two coats of traffic white paint. The supply and painting of the asphalt concrete dikes shall be considered incidental and included in the unit prices of the various bid items and no additional compensation shall be allowed.

Preformed traffic stripes will be measured by the linear foot along the line of the traffic stripes, without deductions for gaps in broken traffic stripes. A double traffic stripe, consisting of two (2) four-inch (4") wide yellow stripes, will be measured as two (2) traffic stripes. Undulation striping will be paid for under this item. Preformed pavement markings will be measured by the square foot for the actual area covered. Parking stall brackets shall be considered markings for payment purposes. The prices paid per linear foot for preformed traffic stripes of the widths and patterns designated in the Contract and per square foot for preformed pavement markings include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in applying preformed traffic stripes and pavement markings, complete in place, including establishing alignment for stripes, and layout work, as shown or specified in the Contract, these Specifications, and directed by the Agency.

SECTION 49 SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS

49-1 GENERAL

Signals, lighting and electrical systems shall be constructed or installed as shown or specified in the Contract, these Specifications, the applicable State Plans, and the applicable provisions of Section 86, “Signals, Lighting and Electrical Systems”, of the State Specifications, except that the provisions of Section 86-1.03, "Cost Break-Down" shall not apply.

49-1.01 Definitions

Definitions for signals, lighting and electrical systems shall be as specified in Section 86-1.015, “Definitions”, of the State Specifications, and the following:

Programmed Visibility Signal Head—A type of signal head that can be optically programmed to restrict visibility of indication(s) to only those areas or lanes designated.

Signal Standard—Any pole which supports signal head(s).

Street Light Standard—The pole, and mast arm if required, which supports the luminaire.

49-1.02 Abbreviations

Abbreviations for signals, lighting and electrical systems shall be as specified on page ES-1A of the State Plans, and the following:

EVD—Emergency Vehicle Detector
I/C—Interconnect Cable
L.C.—Lower Case
PG&E—Pacific Gas & Electric Company
SMUD—Sacramento Municipal Utility District
U.C.—Upper Case

49-1.03 Regulation and Code

Electrical equipment shall conform to the following standards wherever applicable: the International Municipal Signal Association (IMSA) and The National Electrical Code (NEC), as amended by the County, and the standards cited in the first sentence of Section 86-1.02, “Regulations and Code”, of the State Specifications.

49-1.04 Equipment List and Drawings

If requested by the Agency, the Contractor shall submit for review sample articles of the material proposed for use. After review, said sample articles will be returned. The Contractor shall include on the equipment list and on the equipment itself the installation location of material supplied. This shall be done by the use of street names, the alphabetical letter designation used on the Plans, or a location as otherwise noted on the Plans. Equipment lists and drawings shall conform to Section 86-1.04, "Equipment List and Drawings”, of the State Specifications.

The equipment and materials proposed for use on any project shall be approved by the Agency before starting work.

In conformance with the requirements in Section 11-3, “Record Drawings”, of these Specifications, the Contractor shall maintain record drawings that shall show in detail the construction changes of all traffic signal and streetlight wiring, conduits, standards, and associated equipment. In particular, the record drawings shall accurately depict the location

and depth of conduits, location of standards, pull boxes, wiring changes, and all applicable manufacturer's operation and maintenance information.

49-1.05 Ordering of Signal and Lighting Equipment

The Contractor shall place the order for long lead-time signal and lighting equipment not provided by the Agency within five (5) Calendar Days after the date of the Notice to Proceed or within five (5) Calendar Days after the start of the Contract Time, whichever comes first. The Contractor shall submit a copy of the equipment order to the Agency. Liquidated damages, as set forth in Section 8-10, "Liquidated Damages for Delay", of these Specifications, shall apply in case of failure to comply. No extension of time will be allowed for delay in delivery of traffic signal poles, street light standards, luminaries, or traffic signal equipment. The Agency hereby guarantees payment for long lead-time equipment ordered prior to execution of the Contract.

The Contractor shall furnish the Agency with a statement from the vendor(s) that the order for the electrical material required for the contract has been received and accepted by said vendor(s). Said statement shall be furnished within ten (10) days after receiving notice that the Contract has been executed for the Agency. Said statement shall give the date that the electrical equipment will be shipped.

49-1.06 Maintaining Existing and Temporary Electrical Systems

Maintaining existing and temporary electrical systems shall conform to Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems", of the State Specifications, except that paragraphs 11, 12, and 13 shall not apply.

Existing electrical systems, including traffic signals, traffic signal vehicle and pedestrian detection facilities, traffic signal communication and monitoring facilities, street lighting facilities, flashing beacons and sign illumination facilities, or approved temporary replacements thereof, shall be kept in effective operation for the benefit of the traveling public during the progress of the Work, except when shutdown is permitted to allow for alterations or final removal of the systems.

The Contractor shall notify the Agency at least two (2) Working Days prior to performing any work on existing systems, including any work that may take vehicle detectors out of service or may reroute traffic off of existing vehicle detectors.

The Contractor shall notify the Agency at least two (2) Working Days prior to any operational shutdown of traffic signals, street lighting or other electrical systems or facilities.

Traffic control to direct traffic during the shutdown of a traffic signal system shall be provided by the Contractor at the Contractor's expense. The Contractor shall submit a traffic control plan to the Agency for review and approval a minimum of five (5) Working Days prior to a shutdown of a traffic signal. Traffic signal shutdowns shall be limited to Monday through Thursday, excluding holidays, from 9:00 a.m. to 3:00 p.m., or as specified in the Special Provisions.

Where a facility requires continuous lighting, the shutdown time shall be limited to one-half (1/2) hour as scheduled by the Agency, unless otherwise specified in the Special Provisions or permitted by the Agency. The shutdown of lighting systems shall not interfere with the regular lighting schedule, unless otherwise permitted by the Agency.

Vehicle detectors and pedestrian push buttons shall remain in operation at all times during the progress of the Work on an existing actuated traffic signal system, except as otherwise specified in the Special Provisions or as provided herein.

Vehicle detectors taken out of service shall be repaired or replaced within seventy-two (72) hours. New vehicle detectors for rerouted traffic shall be installed within seventy-two (72) hours. Where work site conditions do not permit the installation of permanent vehicle detectors within seventy-two (72) hours, temporary vehicle detectors shall be installed, at the Contractor's expense, as directed by the Agency. Permanent vehicle detectors shall be installed as soon as work site conditions permit.

49-1.07 Scheduling of Work

Scheduling of work shall conform to Section 86-1.07, “Scheduling of Work”, of the State Specifications, except that paragraph 9 shall not apply.

Functional tests shall start on any Working Day except Monday, Friday, or the day preceding or following a legal holiday.

49-1.08 Safety Precautions

Attention is directed to Section 6, "Legal Relations and Responsibilities”, of these Specifications. Before starting work on existing series street-lighting circuits, the Contractor shall obtain daily a safety circuit clearance from SMUD. By-pass switch plugs shall be pulled, "Men at Work" and other required construction signs posted, and lockouts installed at switch boxes before any work is done.

49-1.09 Inspection

Prior to backfilling conduit trenches or placing concrete foundations, the Contractor shall notify the Agency and request inspection of all conduits and foundation forms.

All conduits, conduit couplings, conduit bends and ground bushings shall be in place and properly tightened and secured, and all anchor rods, anchor bolts and ground rods shall be in place in the foundation form prior to the request for inspection. Wire shall not be pulled in conduits until inspection, backfilling and foundation concrete placement are completed. Stub ends of all conduits shall have approved caps and ground bushings installed prior to backfilling or placing concrete for foundations.

The Contractor shall not backfill, enclose, or otherwise cover up any electrical work prior to inspection or testing. Should any of the work be backfilled, enclosed or covered up, the work shall be exposed by the Contractor, at the Contractor’s expense, for such inspection or testing.

49-1.10 Signal Turn-On

Traffic signals shall not be turned on until all signal heads, pedestrian heads, backplates, luminaries, detectors, push buttons, signs, and striping have been installed. The Contractor shall give written notice of intentions of signal turn-on at least three (3) Working Days prior to actual turn-on time so that Agency forces can accomplish the proper signing. The written notice shall be given to both the Traffic Signal and Street Light Manager (875-5327) and the Signs and Markings Manager (875-5133), and is to allow for a review of the signal prior to turn-on. These Agency personnel may request, and shall be granted, a new turn-on date and review, pending the results of their initial review.

Prior to actual turn-on time, the Contractor shall uncover all Agency-installed signs that have been installed prior to signal turn-on and are covered. Turn-ons shall take place between 11:00 a.m. and 2:00 p.m., Monday through Thursday. No signal turn-on shall be scheduled for the day before a holiday. No two-signal turn-ons on the same Contract shall be scheduled for the same day. All work done by the Contractor to accomplish these objectives is included in the price paid for the intersection, and no additional compensation will be allowed.

49-1.11 Contractor Supplied Equipment

The Contractor shall supply all traffic signal poles, the service can with battery backup, all detector equipment external to the wired traffic signal cabinet and all other material and equipment not specifically identified as “County Supplied” on the contract plans or in the Special Provisions. The Contractor shall supply all of the equipment specified in Section 49-5.02, “Emergency Vehicle Detector Cable, Detectors, and Phase Selectors” of these Specifications.

49-2 MATERIALS AND INSTALLATION

49-2.01 Trench Excavation and Backfill

Unless otherwise shown or specified in the Contract, trench excavation and backfill shall conform to Section 19, "Trench Excavation, Bedding, and Backfill", of these Specifications, and restoration of surfaces shall conform to Section 14, "Restoration of Surfaces", of these Specifications. Trenching for signals, lighting and electrical systems may be made by earth saw trenching in accordance with the provision of Section 49-2.02, "Earth Saw Trenching", in this Section of these Specifications.

Unless otherwise permitted in writing by the Agency, all surplus excavated material shall be removed and disposed of the same day the surplus material is excavated.

The Contractor must contact Underground Service Alert a minimum of forty-eight (48) hours before any excavation work begins. The Contractor shall outline the excavation area in white.

49-2.02 Earth Saw Trenching

Trenching for signals, lighting, and electrical systems may be made by earth saw trenching. Trenches to be made by this method shall be cut by a machine that will produce smooth edge cuts in the pavement and will move at a speed in excess of four feet (4') per minute while cutting pavement. The trenching machine shall be shielded to prevent loose material from being thrown away from the machine.

The minimum trench depth shall be that which is necessary to provide for nine inches (9") minimum cover between the top of the conduit and the finished pavement grade and extend through the pavement structural section. The trench section shall conform to Standard Drawing 4-31.

Loose material deposited on the pavement behind the cutting machine shall be removed from the pavement immediately and the pavement cleared to allow the passage of traffic. Only those traffic lanes occupied by the cutting machine and the cleanup operation shall be closed and they shall be opened as soon as the work has moved sufficiently to clear them.

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with portland cement concrete to match the existing pavement surface within areas that are to receive an asphalt concrete overlay as part of the same contract, and to within one inch (1") of the pavement surface of existing pavements that are not to receive an asphalt concrete overlay as part of the same contract.

The concrete shall be Class "C" concrete conforming to Section 50-5, "Portland Cement Concrete", of these Specifications, with one-inch (1") maximum size aggregate and one-inch (1") slump, and shall contain calcium chloride in an amount not to exceed three percent (3%) of the cement content. For electrical work, concrete shall be Class "B" concrete conforming to said Section 50-5, "Portland Cement Concrete", of these Specifications. The concrete shall be tamped or vibrated to provide a dense material free from voids and rock pockets.

The sides of the trench above the concrete backfill shall be coated with an asphaltic emulsion and the remaining depth of the trench shall be backfilled with asphalt concrete placed in one layer. The asphalt concrete shall conform to Section 23, "Asphalt Concrete", of these Specifications, and shall be manufactured with one-half inch (1/2") maximum-sized rock. The asphalt concrete shall be compacted to produce a uniform dense mixture with a surface elevation slightly higher than the adjacent pavement.

Once work is started on a trench, all work necessary to complete that trench, with the exception of the one-inch (1") permanent asphalt concrete surfacing, shall be performed during the same day. This includes cutting, placing of conduit or cable, removing all spoils from work site, barricades, maintaining a clean road surface for the safety of vehicular and pedestrian traffic, and backfilling trench with concrete.

The permanent asphalt concrete pavement replacement shall be completed no later than one Working Day following placement of the concrete backfill. Seal coats in accordance with Section 14-3.03, "Seal Coats", of these Specifications shall be placed to the full width of the pavement replacement plus twelve inches (12") on each side of trench, except that seals shall not overlap concrete curb and gutter.

Trenching in the medians shall be as specified above, except that the requirement to complete the trench on the same day shall not apply. In addition, median trenches may be backfilled to the surface of the median with concrete colored to match the color of the median surface.

49-2.03 Removing and Replacing Improvements

Sidewalks, sprinklers and irrigation systems, curbs, gutters, portland cement concrete and asphalt concrete pavement, underlying material, lawns and plants, and any other improvements removed, broken or damaged by the Contractor's operations, shall be replaced or reconstructed with the same kind of material as found on the Work or with materials of equal quality. The new work shall be left in a serviceable condition.

Whenever a part of a square or slab of existing concrete sidewalk, curb, gutter, or driveway is broken or damaged, the entire square, section, or slab shall be removed or as directed by the Agency and the concrete reconstructed as above specified or as directed by the Agency.

The outline of all areas to be removed in portland cement concrete sidewalks, curbing, and driveways shall be cut to a minimum depth of two inches (2") with an abrasive type saw prior to removing the material. Cuts shall be neat and true along score lines or constructed joints, with no shatter outside the removal area. Cuts shall not extend beyond the limits of the removal area.

49-2.04 Foundations

Foundations shall conform to Section 86-2.03, "Foundations", of the State Specifications, and these Specifications. Foundations shall conform to the size(s) and shape(s) shown on the Plans, the Standard Drawings, or the State Plans, or as otherwise detailed in the Contract, as applicable. The Contractor shall provide anchor bolts for all foundations unless otherwise specified in the Special Provisions. Anchor bolts shall be positioned so that a minimum of two (2) to a maximum of four (4) threads will be visible above the top nuts after the pole has been erected and plumbed. Rigid non-metallic conduit shall be allowed in traffic signal and street light foundations.

All traffic signal poles and street light poles and pull boxes shall be located outside the limits of sidewalk ramps, unless shown on the plans to be located on a wider than standard curb incorporated into the rear portion of the sidewalk ramp. All traffic signal pole and street light foundations shall be located such that no existing conduit, pipe or other underground utility facility conflicts with the entire volume of the pole foundation. If a conflict with an existing street light conduit or an existing traffic signal conduit exists, the Contractor shall relocate the existing conduit out of the area of conflict. If a potential conflict with any underground utility facility other than street light or traffic signal conduit exists, the Contractor shall bring the potential conflict to the attention of the Agency. The Agency may direct the adjustment of the signal foundation location in accordance with Section 49-2.05 of these Specifications. Conformance with these provisions as required to complete the Work, including relocation of existing street light and/or traffic signal conduits, shall be considered incidental to and included in the payment for traffic signal or street light installation and no additional compensation will be made.

All traffic signal poles with pedestrian push buttons shall be located in sidewalk or pedestrian pad areas. Poles located in sidewalk areas shall be located such that the back of the pole's base flange shall be within the sidewalk area and within one inch of the back of the sidewalk.

All traffic signal and street light poles and pull boxes shall be located outside the limits of sidewalk ramps.

49-2.05 Standards, Steel Pedestals and Posts

Standards, steel pedestals, and posts shall conform to Section 86-2.04, "Standards, Steel Pedestals and Posts", of the State Specifications, and these Specifications. Standards with an outside diameter greater than twelve inches (12") shall be round. Street light standards shall be galvanized steel and shall conform to Standard Drawing 5-16 (Type B) or 5-17 (Type A). The type of street light standard shall be as shown on the Plans or in the Special Provisions.

49-2.05.A NOT USED

49-2.05.B Placement of Standards, Enclosures, Posts and Associated Devices

The Contractor is advised that traffic signal and pedestrian facilities in corner rounding areas are difficult to describe accurately on the Plans. These traffic signal and pedestrian facilities shall be field adjusted to conform to the following rules:

1. Pedestrian heads and crosswalks shall be located such that pedestrian heads are **not** located behind the respective stop bar.
2. Pedestrian push buttons shall be located within five feet (5') of their respective crosswalks, measured perpendicular to the crosswalk lines.
3. Sidewalk ramps and crosswalks shall be located such that the ramp pan falls entirely within the crosswalk lines.
4. Poles, push button posts, controller cabinets, interconnect terminal cabinets, and service enclosures shall be located such as to leave a minimum of four feet (4') of clear sidewalk width.
5. High (mast arm mounted) signal heads with all-left arrow indications shall be located at least two feet (2') into the controlled left turn only lane. If field conditions make this impossible, a programmed visibility head may be used and the extra cost compensable.

Any field adjustment needed to meet the above described criteria of location of crosswalks, signal poles, ramps, and pull boxes shall be considered incidental and no additional payment will be made. All field adjustments shall be coordinated with the Agency in the field.

49-2.05.C Final Location of Traffic Signal Poles

The Contractor shall pothole the pole location area for utility conflicts. If the site is found to be unsuitable, the Contractor shall re-pothole in the vicinity, as approved by the Agency, until a suitable location is found. Unused pothole areas shall be restored to their original or better conditions. The pothole and restoration work shall be considered as included in the contract lump sum price paid for individual traffic signal and no additional compensation will be allowed therefor.

49-2.06 Conduit

Conduit shall conform to Section 86-2.05, "Conduit", of the State Specifications, and these Specifications. Unless otherwise shown or specified in the Contract, conduit shall be rigid non-metallic. Rigid non-metallic conduit shall be electrical grade and be Schedule 40 or better.

Traffic signal conduits, including traffic interconnect conduits, are shown on the Contract Plans to scale, unless otherwise noted on said Plans. Conduit shown to be installed out of paved areas shall be installed out of paved areas. Any conduit shown on the plans to be placed at a specific location, either by dimensions, offsets, or by other means, shall be installed at the specified location. Conduits shown to be installed across any street, or across any portion of any street, shall be installed such that the alignment of the conduit between the pull boxes and/or cabinets at either end of the conduit run shall be a straight line.

Pole risers shall be two-inch (2") Schedule 80 rigid non-metallic conduit unless otherwise specified.

Schedule 40 rigid non-metallic conduit shall be used in signal, street light, controller, and service enclosure foundations. Install end bell fittings on all non-metallic conduits of one inch (1") and larger trade size.

All conduit systems, new or existing, shall be blown out with compressed air.

Conduits terminating in standards or enclosures shall emerge from the foundation vertically, ± 5° in any direction.

A solid No. 10 THW copper wire with green insulation shall be installed in all conduits which are to receive future conductors. All wires placed in conduits for future use at any one traffic signal location and for any traffic signal interconnect system shall be spliced to be electrically continuous.

All rigid non-metallic conduit shall be connected with the appropriate adhesive.

After conductors have been installed, the ends of conduits terminating in pull boxes, interconnect cabinets, controller cabinets, and service enclosures shall be sealed with an approved type of sealing compound.

All empty conduits shall be identified with their destination/termination point, and sealed with plugs approved for the purpose.

Conduit placed under sidewalks may have six inches (6") of cover, if the conduit trench is backfilled with concrete.

Conduit may be installed in paved areas of streets as specified in Section 49-2.02, "Earth Saw Trenching", in this Section of these Specifications. Conduit placed in existing paved areas shall be placed in a trench approximately two inches (2") wider than the outside diameter of the conduit to be installed. The trench shall not exceed six inches (6") in width. Conduit depth shall not exceed fourteen inches (14") or conduit trade diameter plus ten inches (10"), whichever is greater, except that at pull boxes the trench may be hand dug to a required depth. The top of the installed conduit shall be a minimum of nine inches (9") below finish grade. Provide four-inch (4") minimum width warning tape at least six inches (6") above buried conduit.

49-2.07 Pull Boxes

Pull boxes shall conform to Section 86-2.06, "Pull Boxes", of the State Specifications (paragraph 8 of Section 86-2.06A shall not apply except to traffic-rated pull boxes with steel traffic lids), these Specifications, and the Standard Drawings.

As required on Standard Drawings 5-20A and 5-20B, covers shall be factory-marked to indicate the contents of the pull box. Metal covers shall be marked by method "c" as described in Section 86-2.06B, "Cover Marking", of the State Specifications

Pull boxes shall be installed at the locations shown on the Plans and as required by these Specifications. With the exception of traffic signal interconnect conduit for conduit runs exceeding two hundred feet (200'), pull boxes shall be spaced at not over two hundred-foot (200') intervals unless indicated otherwise. The maximum spacing of pull boxes for traffic signal interconnect conduit shall be five hundred feet (500'). The Contractor, at the Contractor's expense, may install additional pull boxes to facilitate the Work.

The bottom of pull boxes installed in unimproved areas or in sidewalk areas shall be bedded on six inches (6") minimum layer of three-quarter inch (3/4") crushed rock.

The maximum depth of pull boxes shall be twenty-six inches (26") as shown on Standard Drawings 5-20A and 5-20B.

49-2.08 Conductors

Conductors shall conform to Section 86-2.08, "Conductors", of the State Specifications, and these Specifications. Section 86-2.08A, "Conductor Identification", of the State Specifications is amended to require the Contractor to use a different color-coded wire for each street lighting

circuit with continuous color maintained throughout each circuit. The "Conductor Table" of said Section 82-2.08A shall be amended to include the following:

CONDUCTOR TABLE

Conductor Use	Signal Phase Or Function	Identification			
		Insulation Color		Label Designation	Conductor Size
		Base	Stripe		
Irrigation Control	Underground-Line 1	Black	None	IR1	As Req'd.
	Neutral	White	None	IRN	As Req'd.
Neutral	Traffic Signals	White	None	TSN	As Req'd.
Neutral	Street Lighting	White	None	None	As Req'd.
Traffic Signal Communications	As Required	As Req'd.	As Req'd.	Per Special Provisions	As Req'd.
Highway (Street) Lighting Pull Box to Luminaire	As Required	As Req'd.	As Req'd.	None	As Req'd.
Multiple Highway (Street) Lighting	As Required	As Req'd.	As Req'd.	None	As Req'd.
Emergency Vehicle Preemption	As Required	Black or As Req'd.	As Req'd.	Per Special Provisions	As Req'd.
Inductive Loop Detector Circuits	Vehicle Detection	As Req'd.	None	Per Section 86-5.01A of State Specifications	As Req'd.

The second paragraph of Section 86-208B, "Multiple Circuit Conductors" of the State Standard Specifications shall be deleted and replaced with the following:

At any point, the minimum thickness of any TW, THW, USE, RHH or RHW insulation shall conform to the requirements of the latest edition of the National Electrical Code.

49-2.08.A Signal Interconnect Cable

Signal interconnect cable shall conform to the "International Municipal Signal Association, Specification No. 20-2, Polyethylene-Insulated, Polyethylene Jacketed Communication Cable", except that the signal interconnect cable shall be supplied without electrical shielding. The cable shall consist of twenty (20) twisted pairs of No. 20 AWG solid copper conductors.

Prior to delivery of the cable, the Contractor shall furnish the Agency with a certified report, in an Agency-approved form, of the tests made on the cable to show compliance with the Contract. In addition, the Agency may request samples for testing upon delivery of the cable to the work site, and, at Agency expense, test the samples for compliance with the Contract.

Cables shall only be installed under dry conditions. Each end of the cable shall be properly sealed against moisture intrusion and shall be protected against damage.

Cable shall be installed in conduit between termination points. Termination points are identified as controller cabinets, interconnect terminal cabinets, or master controller building. A minimum of five feet (5') of slack cable shall be left coiled at each termination point and in each pull box. The ends of all cables shall be taped and made waterproof by dipping in an approved sealer prior to being installed in conduit and prior to being left overnight. Unless otherwise specified or directed by the Agency, splicing of interconnect cable shall not be allowed.

After field testing of the cable by the Contractor, termination of cable will be made by Agency forces unless otherwise specified.

49-2.08.B Interconnect Cable Testing After Installation

Signal interconnect cable shall be tested in accordance with these Specifications.

The interconnect cable shall be installed and ready for cable testing twenty (20) Working Days prior to anticipated use of said cable.

Each insulated conductor in each length of completed cable, with all other insulated conductors grounded, shall have an insulation resistance of not less than the following:

Cable Lengths, feet	500	1000	1500	2000
Megohms	500	250	160	125

The tests shall be made using a 500-volt megohm meter applied for one (1) minute. The test may be terminated as soon as the measurement demonstrates that the specified value has been met or exceeded for a period of one (1) minute.

The direct current (D.C.) resistance of each pair shall be measured by connecting each pair together at one end of the cable and measuring loop resistance at the other end. The maximum resistance shall be 0.01012 OHMS per linear foot ±10 percent for a single #20 AWG conductor.

If the cable being tested fails any one or more of the above tests, the Contractor shall replace the defective cable. No extension of time or compensation will be allowed for replacement of cable. All tests and corrections of failures shall be documented and shall be available for future reference.

All electrical tests shall be made after the cable has been installed in the conduit. The conduit shall also be filled with water.

49-2.09 Wiring

Wiring shall conform to Section 86-2.09, "Wiring", of the State Specifications, except that the first sentence of the last paragraph of Section 86-2.09D, "Splicing", and the first paragraph of Section 86-2.095, "Fused Splice Connectors", shall not apply, and these Specifications.

Conductors shall not be pulled into and through conduits until after pull boxes are set to grade, drain rock sumps installed, and the conduits bonded and cleaned out with the appropriate size swab or blown out with compressed air.

On 600-volt conductor splices of solid or stranded conductor sizes #14 AWG to #6 AWG, the Contractor has the option to use either crimp-type connectors or spring-type connectors of three-part construction. The three-part construction shall consist of a zinc-coated free expanding steel spring enclosed in a steel shell, with an outer jacket of polyvinyl chloride. The outer jacket shall have a flared skirt, be flexible, and be able to withstand 105°C temperature continuously. Each splice shall have the spring connector sized in accordance with the manufacturer's recommendations for the number of conductors and gages being spliced. Wire strip lengths shall also be in accordance with the manufacturer's recommendations. After the spring connector has been applied to the connection, the splice shall be coated by submersion with a corrosive-resistant, solvent-resistant, sealing, bonding and flexible electrical coating, having at least 100-volt/mil electrical strength. Upon coating of the splice, the flared skirt end

shall be positioned in an upright alignment and maintained in place until the electrical coating is dry.

The use of heat shrinkable tubing will only be permitted for splicing of detector loop conductors and detector lead-in cables in accordance with Section 49-5.01.C, “Splicing Details”, in this Section of these Specifications.

In the handhole section of each luminaire pole, a fused disconnect splice connector shall be installed in each ungrounded conductor between the line and the ballast.

Luminaires with up to 200-watt bulbs shall have six-amp (6A) fuses installed. Luminaires with 250 to 400 watt bulbs shall have ten-amp (10A) fuses installed. All fuses shall be midget ferrule type, rated at 600 volts, and fast blowing.

49-2.10 Bonding and Grounding

Bonding and grounding shall conform to Section 86-2.10, “Bonding and Grounding”, of the State Specifications, except that paragraph 6 shall not apply, and these Specifications.

For bonding purposes in all non-metallic type conduits, a No. 6 copper wire shall be run continuously in circuits used for series lighting, and a No. 10 copper wire shall be run continuously in all other circuits. Where non-metallic conduit is to be installed for future conductors, a green No. 10 THW copper wire shall be installed in these conduits. Equipment bonding and grounding conductors are not required in conduits which contain only loop lead-in cable or signal interconnect cable or both.

Grounding jumper shall be attached by a three-sixteenths inch (3/16”) or larger brass bolt in the standard or pedestal and shall be run to the metallic conduit, ground rod, or bonding wire in the adjacent pull box. The grounding jumper shall be visible and accessible after the cap has been poured on the foundation.

49-2.11 Service

Electrical service installation and materials shall conform to these Specifications.

Each service enclosure (or “can”) shall be fabricated from 14 gauge Type 304D stainless steel and shall conform to the requirements for cabinets fabricated from stainless steel as specified in Section 86-3.07A, "Cabinet Construction”, of the State Specifications, and these Specifications.

The mounting brackets shall be 10 gauge Type 304D stainless steel. All welds shall be of highest quality and ground smooth and finished so that grind marks are not visible.

The enclosure shall be rain-tight and dust-tight. For new construction, anchor bolts shall be inside the service enclosure. For modification construction, anchor bolts shall be inside or outside the service enclosure as shown on the Plans.

A hinged dead front plate with cutouts for the handles of the breakers and the switch shall be provided. A hinged outside door equipped with a heavy duty draw latch and two (2) heavy duty hasps suitable for padlocking shall be provided for the service section. The dead front panel on the service enclosure shall have a continuous stainless steel piano hinge.

The enclosure shall have no screws, nuts, or bolts on the exterior, except utility sealing screws. All screws, nuts, bolts, and washers shall be stainless steel. All hinges and hinge pins shall be stainless steel.

No surface of the enclosure shall be deflected inward or outward more than one-sixteenth inch (1/16”), measured from the intended plane of the surface.

Service enclosures shall be factory wired and conform to NEMA Standards. All control wiring shall be stranded copper, No. 14 AWG THHN/THWN rated for 600 volts. Wiring shall be arranged so that any piece of equipment can be removed without disconnecting any wiring other than the leads to the equipment being removed. All wiring shall be marked with permanent clip sleeve wire markers. Felt, pencil, or stick back markers will not be acceptable. A copy of the

wiring diagram for the service enclosure and a typewritten circuit directory shall be enclosed in plastic and mounted on the inside of the front door.

All circuit breakers, contactors, and wire shall be listed by UL or ETL. The enclosure shall conform to the NEMA 3-R standard.

The terminal lugs or strips shall be copper or alloyed aluminum. All terminals shall be compatible with either aluminum or copper conductors.

The service enclosure shall have provisions for the installation of up to a total of sixteen (16) single-pole circuit breakers, including brass links and mounting hardware. Branch circuit panel shall use loop wiring rated for 125 amperes with THHN/THWN insulation. All copper wiring used for main bussing shall be No. 2 AWG THHN/THWN and rated for 125 amperes.

Nameplates of a reasonable size identifying the control unit therein shall be installed on the dead front panel. Nameplates shall be black laminated plastic with white characters, and shall be fastened by screws.

The entire service enclosure shall be constructed with the highest quality workmanship and shall meet all applicable codes, and shall bear a factory applied label of approval by a recognized testing laboratory.

Complete shop drawings on all substitutions shall be submitted to the Agency for approval prior to fabrication. If the proposed substitute is rejected or if the submittal is not made within a reasonable time, the specified equipment shall be furnished.

The Contractor shall protect and lock the service enclosure during construction. When the Work has been accepted for maintenance, each enclosure shall be locked with a Contractor-supplied master lock that will accept a Type 2214 key.

Street light "ON" and "OFF" control will be by photoelectric cell. All conduits and wires shall be furnished and installed by the Contractor.

49-2.11.A Metered Service (120/208 Volt, 120/240 Volt)

The metered electrical service will be served from SMUD facilities as shown on the Plans. Unless otherwise specified, service shall be wired for 120/208 volts or 120/240 volts, three-wire and single phase as shown on the Plans.

New service enclosures shall be supplied and installed as shown on the Plans.

The service enclosure shall consist of a separate metering section and a service section. The metering section shall be complete with SMUD approved meter socket, steel socket cover, and manual circuit closing device.

The meter section shall have a removable cover with the top and front sections welded together so that it is rain-tight and padlockable. The meter section shall include provisions to allow SMUD to lock and seal the meter section.

The service enclosure shall be fabricated in accordance with the dimensions shown on Standard Drawing 5-8.

Mounted in each metered service enclosure shall be the following equipment:

1. Two 2-pole, 120-volt alternating current main breakers with 100-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Each main breaker shall have an internal common trip. Each pole shall have individual "ON-OFF" control and handle tie for common operation. Breakers shall be Westinghouse Quicklag C or approved equal.
2. One single-pole, 120-volt alternating current branch circuit breaker for control circuit with 15-ampere trip and a rating of 10,000-amperes AIC at 120/240 volts. Breaker shall be Westinghouse Quicklag C or approved equal.
3. Two single-pole, 120-volt alternating current branch circuit breakers for traffic signals, each with 60-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Breakers shall be Westinghouse Quicklag C or approved equal.

4. Minimum six, single-pole, 120-volt alternating current branch circuit breakers for street lighting, each sized per the Special Provisions and the Standard Drawings (minimum 30-ampere trip), and with a rating of 10,000 amperes AIC at 120/240 volts. Breakers shall be Westinghouse Quicklag C or approved equal.
5. Minimum two, 3-pole, normally open, 60-ampere mercury displacement lighting contactors. Coil voltage shall be 120 VAC, 60 cycle. Mercury displacement lighting contactors shall be Dayton Electric Manufacturing Co., Model Number 3X753E, or approved equal.
6. One oil tight "Hand-Off-Auto" selector switch.
7. One solid copper neutral bus.
8. Incoming terminals (landing lugs).
9. Solid neutral terminal strip.
10. Terminal strips for conductors within the cabinet.

49-2.11.B Metered Service with Encapsulated Step-Down Transformer (277/480 Volt to 120-240 Volt)

The metered electrical service will be served from SMUD facilities as shown on the Plans. Unless otherwise specified, service shall be wired for 277/480 volts, four-wire and three phase as shown on the Plans.

New service enclosures shall be supplied and installed as shown on the Plans.

The service enclosures shall consist of a separate metering section and a service section. The metering section shall be complete with SMUD-approved three-phase meter socket, steel socket cover and manual circuit closing device.

The meter section shall have a removeable cover with the top and front sections welded together so that it is rain tight and padlockable. The meter section shall include provisions to allow SMUD to lock and seal the meter section.

The service enclosure shall be fabricated in accordance with the dimensions shown on Standard Drawing 5-9.

Mounted in each metered service enclosure shall be the following equipment:

1. One 2-pole, 277/480-volt alternating current main breaker with 100-ampere trip and a rating of 14,000 amperes AIC at 277/480 volts. The main breaker shall have an internal common trip. Each pole shall have individual "ON-OFF" control and handle tie for common operation. Breaker shall be Westinghouse Quicklag GHC or approved equal.
2. Minimum six, single-pole, 277/480-volt alternating current branch circuit breakers for street lighting, each sized per the Special Provisions and the Standard Drawings (minimum 30-ampere trip), and with a rating of 14,000 amperes AIC at 277/480 volts. Breakers shall be Westinghouse Quicklag GHC or approved equal.
3. One single-pole, 120-volt alternating current branch circuit breaker for control circuit with 15-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Breaker shall be Westinghouse Quicklag C or approved equal.
4. One single-pole, 120-volt alternating current branch circuit breaker for traffic signals, with 50-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. The breaker shall be Westinghouse Quicklag C or approved equal.
5. One 2-pole, 120-volt alternating current branch circuit breaker for intersection safety lighting, with 15-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. The breaker shall have an internal common trip. Each pole shall have individual “ON-OFF” control and handle tie for common operation. The breaker shall be Westinghouse Quicklag C or appproved equal.

6. Minimum three, 3-pole, normally open, 60-ampere mercury displacement lighting contactors. Coil voltage shall be 120 VAC, 60 cycle. Mercury displacement lighting contactors shall be Dayton Electric Manufacturing Co., Model Number 3X753E, or approved equal.
7. One oil tight "Hand-Off-Auto" selector switch.
8. One solid copper neutral bus.
9. Incoming terminals (landing lugs).
10. Solid neutral terminal strip.
11. Terminal strips for conductors within the cabinet.
12. One single-phase transformer rated at 5KVA. Primary shall be 277 volts and secondary shall be 120volts. This transformer to be metered and shall supply the traffic signal power.
13. One single phase transformer rated at 2 KVA. Primary shall be 480 volts and secondary shall be 120/240 volts. This transformer to be unmetered and shall provide the power for intersection safety lighting and the control circuit.
14. Provide primary transformer protection per the NEC.

49-2.11.C Unmetered Service (120/208 Volt, 120/240 Volt)

The unmetered electrical service will be served from SMUD facilities as shown on the Plans. Service shall be wired for 120/208 volts or 120/240 volts, three-wire and single phase as shown on the Plans. The Contractor shall connect the luminaires to the circuits shown on the Plans.

New service enclosures shall be supplied and installed as shown on the Plans.

The service enclosures shall be fabricated in accordance with the dimensions shown on Standard Drawing 5-10.

Mounted in each unmetered service enclosure shall be the following equipment:

1. One, 2-pole, 120-volt alternating current main breaker with 100-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. The main breaker shall have an internal common trip. Each pole shall have individual "ON-OFF" control and handle tie for common operation. Breaker shall be Westinghouse Quicklag C or approved equal.
2. One single-pole, 120-volt alternating current branch circuit breaker for control circuit with 15-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Breaker shall be Westinghouse Quicklag C or approved equal.
3. Minimum six single-pole, 120-volt alternating current branch circuit breakers for street lighting, each sized per the Special Provisions and the Standard Drawings (minimum 30-ampere trip), and with a rating of 10,000 amperes AIC at 120/240 volts. Breakers shall be Westinghouse Quicklag C or approved equal.
4. Minimum two 3-pole, normally open, 60-ampere mercury displacement lighting contactors. Coil voltage shall be 120 VAC, 60 cycle. Mercury displacement lighting contactors shall be Dayton Electric Manufacturing Co., Model Number 3X753E, or approved equal.
5. One oil tight "Hand-Off-Auto" selector switch.
6. One solid copper neutral bus.
7. Incoming terminals (landing lugs).
8. Solid neutral terminal strip.
9. Terminal strips for conductors within the cabinet.

49-2.11.D Unmetered Service (277/480 Volt)

The unmetered electrical service will be served from SMUD facilities as shown on the Plans. Service shall be wired for 277/480 volt, four-wire and three phase as shown on the Plans. The Contractor shall connect the luminaires to the circuits shown on the Plans.

New service enclosures shall be supplied and installed as shown on the Plans.

The service enclosures shall be fabricated in accordance with the dimensions shown on Standard Drawing 5-10.

Mounted in each unmetered service enclosure shall be the following equipment:

1. One 2-pole, 277/480-volt alternating current main breaker with 100-ampere trip and a rating of 14,000 amperes AIC at 277/480 volts. The breaker shall have an internal common trip. Each pole shall have individual "ON-OFF" control and handle tie for common operation. Breaker shall be Westinghouse Quicklag GHC or approved equal.
2. One single-pole, 277-volt alternating current branch circuit breaker for control circuit with 15-ampere trip and a rating of 14,000 amperes AIC at 277/480 volts. Breaker shall be Westinghouse Quicklag GHC or approved equal.
3. Minimum six single-pole, 277-volt alternating current branch circuit breakers for street lighting, each sized per the Special Provisions and the Standard Drawings (minimum 30-ampere trip), and with a rating of 14,000 amperes AIC at 277/480 volts. Breakers shall be Westinghouse Quicklag GHC or approved equal.
4. Minimum two 3-pole, normally open, 60-ampere mercury displacement lighting contactors. Coil voltage shall be 277 VAC, 60 cycle. Mercury displacement lighting contactors shall be Mercury Displacement Industries (MDI), Part Number 360NO-277V, or approved equal.
5. One oil tight "Hand-Off-Auto" selector switch.
6. One solid copper neutral bus.
7. Incoming terminals (landing lugs).
8. Solid neutral terminal strip.
9. Terminal strips for conductors within the cabinet.

49-2.11.E Unmetered Service with Encapsulated Step-Down Transformer (277/480 Volt to 120/240 Volt)

The unmetered electrical service will be served from SMUD facilities as shown on the Plans. Unless otherwise specified, service shall be wired for 277/480 volts, four-wire and three phase as shown on the Plans.

New service enclosures shall be supplied and installed as shown on the Plans.

The service enclosure shall be fabricated in accordance with the dimensions shown on Standard Drawing 5-11.

Mounted in each unmetered service enclosure shall be the following equipment:

1. One 2-pole, 277/480-volt alternating current main breaker with 100-ampere trip and a rating of 14,000 amperes AIC at 277/480 volts. The main breaker shall have an internal common trip. Each pole shall have individual "ON-OFF" control and handle tie for common operation. Breaker shall be Westinghouse Quicklag GHC or approved equal.
2. One single-pole, 120-volt alternating current branch circuit breaker for control circuit with 15-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Breaker shall be Westinghouse Quicklag C or approved equal.
3. Minimum ten (10) single-pole, 120-volt alternating current branch circuit breakers for street lighting, each sized per the Special Provisions and the Standard Drawings (minimum 30-ampere trip) and with a rating of 10,000 amperes AIC at 120/240 volts. Breakers shall be Westinghouse Quicklag C or approved equal.
4. One single-pole, 120-volt alternating current branch circuit breaker for receptacle with 20-ampere trip and a rating of 10,000 amperes AIC at 120/240 volts. Breaker shall be Westinghouse Quicklag C or approved equal.

5. Minimum three, 3-pole, normally open, 60-ampere mercury displacement lighting contactors. Coil voltage shall be 120 VAC, 60 cycle. Mercury displacement lighting contactors shall be Dayton Electric Manufacturing Co., Model Number 3X753E, or approved equal.
6. One oil tight "Hand-Off-Auto" selector switch.
7. One solid copper neutral bus.
8. Incoming terminals (landing lugs).
9. Solid neutral terminal strip.
10. Terminal strips for conductors within the cabinet.
11. One single-phase transformer rated at 10KVA. Primary shall be 480 volts and secondary shall be 120/240 volts.
12. Provide primary and secondary transformer protection per the NEC.

49-2.11.F Service Can and Battery Backup Unit (BBU)

At each location for which a new traffic signal service can is shown to be installed, the Contractor shall supply and install a Metered Service Enclosure with Battery Backup (120/240 V) in accordance with Standard Drawing 5-29 and as specified in this section.

49-2.11.F.(1) Enclosure Specifications:

Anodized 1/8" aluminum, weatherproof enclosure shall house Uninterrupted Power Supply (UPS) and batteries. Enclosure shall be TIG welded construction with welding materials specifically designed for the material to be welded. Enclosure shall have fully framed side hinged outer doors with swaged close tolerance sides for flush fit with drip lip and closed cell neoprene flange compressed gaskets. Front door shall incorporate a full-length piano hinge, pad-lockable draw latch (center area on door-latch side), and two pad lockable welded-in place vandal-proof tabs (one upper area, one lower area on door-latch side, rated at 2000 lbs. each). There shall be no exposed nut, bolts, screws, rivets or other fasteners on the exterior of the enclosure. Maximum cabinet dimensions 46" H x 20" W x 9" D. Weight 250 lbs with batteries. UPS shall be mounted in an interior tilt out housing with 800 lb rated stops. Battery connectors shall be Anderson Connectors with silver plated contacts. Batteries shall be installed in fixed position framed trays for seismic safety and be readily accessible for maintenance. Batteries shall be mounted allowing airflow front and back. Enclosure can include two transfer bypass switches, one for UPS bypass the second for auxiliary generator (optional). All switches must be panel mounted on interior dead front panel board. UV resistant plastic laminated nameplates shall identify all controls and major components. A plastic covered wiring diagram will be attached to the inside of the front door. All components shall be factory wired and conform to required NEMA, NEC, and UL standards. A chassis ground point shall be provided. Panel shall be UL 508 Industrial Control Panel rated.

49-2.11.F.(2) UPS Panel Minimum Features:

- The UPS system shall be a Tesco 27-000/22-000BBS1400Xl-22UPS or approved equal.
- UPS bypass and UPS isolation switch.
- Deadfront safety panel board with all switches, indicating fuses, plugs, and isolation fuses for each battery pre-wired with phenolic nameplates.
- All nameplates shall be screwed on phenolic engraved type.
- All wire terminating lugs shall be full wrap around type.
- All batteries shall be captive spaced from external captive sides in earthquake proof buckets.
- Cabinet ventilation shall be by (qty. 4) 4" x ¼" louvers top and bottom with encapsulated bug screens, cleanable filters and a 100cfm fan to completely exchange air 25 time minimum per minute.

- All DC terminals and connections shall incorporate safety covers such that the safety covers are in place for every normal maintenance mode.
- Event Counters & Total Run Time Counter.

49-2.11.F.(3) UPS Unit Minimum Specifications:

UPS unit shall provide a true sine-wave output with minimum 1400 Volt-Amp continuous capacity. UPS must provide for utility service isolation when in operation. The minimum rating for wattage output will be 950 watts. The UPS shall be capable of running an intersection with LED lights (for Run Time consult manufacturer). The unit shall operate off-line, with transfer time of 2 ms or less, with battery condition indicator, with automatic test provisions, and with hot-swappable batteries (all batteries in system). UPS will automatically recharge batteries from full discharge to 95% capacity within 6 hours. UPS will provide on-line operation for a minimum input of 92 to 145 VAC, provide full load output of 120VAC – 10% / +4% at 60 Hz +/- 0.05% over a temperature range of -37° C (optional adder) to +74° C and be a UL Approved Design. The UPS unit will be delivered with maintenance manuals and schematic diagrams.

49-2.11.F.(4) UPS Unit Minimum Features:

- 1400VA 950 Watts
- Surge energy withstand 480 Joules, 6.5kA
- Common mode clamping 0 ns < 5ns typical UL 1449
- Conditioned power – Computer quality
- Transient lighting protection – 160 Joules
- Transfer to battery time – 2 ms
- Retransfer to utility – 2 ms
- Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs and isolated fused (deadfront panel mounted 30 amp) connections to the UPS for greater system reliability and ease of maintenance. Series wiring is unacceptable.
- Fan cooling shall be fused for locked rotor current.
- Cooling air shall be ducted to cool the front and back of each battery with air space on all four sides and top of battery.
- UPS covers shall be 60% open on both sides to diminish the environmental effects of extreme temperatures.
- Includes a RS232, DB9 Computer Interface Port.
- Low voltage safety design at 24v DC. (Higher voltage DC systems are unacceptable).

49-2.11.F.(5) UPS Communications Module:

Smart Slot Relay I/O Module:

Input #1 Turn the UPS on.
Input #2 Turn the UPS off.
Input #3 Start the UPS self-test.
Input #4 Shut down the UPS (when on battery).

Output #1 The UPS is on-battery (during a power failure, self-test or run time calibration).
Output #2 UPS has a low battery – Programmable.
Output #3 The protected load is not receiving power from the UPS.
Output #4 Replace the UPS batteries.
Output #5 The UPS is overloaded.
Output #6 Any UPS fault or self-test failure.

49-2.11.F.(6) Batteries:

Batteries shall be maintenance-free, type AGM/VRLA (Absorbed Glass Mat / Valve Regulated Lead Acid), such as APC Smart-UPS RMXL or approved equal. Batteries shall be independently pre-wired and individually fused. Batteries shall be furnished with heavy-duty 50-amp rated silver-plated Anderson connectors. Batteries shall be equipped with a 100-amp internal fuse. Batteries shall be lightweight for personnel safety and protection plus ease of installation and maintenance. Batteries with a weight of over 26lbs are not acceptable.

49-2.11.F.(7) Enclosure Temperature Compensation:

Operating temperature shall be a minimum -37° C to +74° C.

49-2.11.F.(8) Power System Analyzer and Conflict Resolution Module:

The UPS shall incorporate an integrated Power System Analyzer and Conflict Resolution Module. The Analyzer will evaluate and make limited adjustments to the incoming utility power and will automatically transfer load to the UPS battery back-up power if utility power is lost. When utility power becomes available, the system will provide automatic UPS failure detection and automatically isolate the failed UPS and transfer the load back to utility power. Once the failure has been corrected, the system will return to the normal operation. This system shall include the following as a minimum:

Triple Bypass System for Offline UPS:

1. SPACT – Smart Power Analyzer with Conflict Monitor Isolation and Transfer Module.
2. PCM – Power Conflict Monitor
3. The PCM is a totally redundant failsafe system. The PCM monitors load bus power available continuously. If load bus power fails for 5ms the PCM will transfer and isolate the UPS and guarantee that commercial power will be locked on.
4. Watchdog Timer – Redundant 5 ms delay and hard transfer to utility power.
5. The outboard Smart Transfer Switch shall not interrupt the normal controller function. Transfer time shall be 2ms.
6. Onboard Smart I/O module will execute lockout of battery back up system upon Smart detection of any inverter UPS fault. If UPS resets itself, it will automatically be available for backup.

Smart Battery Charger:

Shall charge from shut off discharge to 95% fully charged in less than 6 hours. Batteries shall be ambient enclosure compensated to less than 120°F. The battery charger shall utilize Smart Cell Technology to extend battery life.

49-2.11.F.(9) Warranty:

Manufacturers shall provide a two (2) year factory-replacement parts warranty on the Battery Backup System. Batteries shall be warranted for full replacement for two (2) years. The warranty shall be included in the total lump sum price paid for the traffic signal modification.

Supply and installation of service can with battery back up unit shall be included in the lump sum price paid for traffic signal installation and no additional payment will be made.

49-2.12 <u>Testing</u>

Testing shall conform to Section 86-2.14, “Testing”, of the State Specifications, except that the second sentence in paragraph one and all of paragraph four of Section 86-2.14A, "Materials Testing”, and the third paragraph of Section 86-2.14C, “Functional Testing”, shall not apply. Testing shall also conform to these Specifications.

Any fault in any material or in any part of the installation revealed by testing shall be replaced or repaired by the Contractor, at the Contractor’s expense, in a manner approved by the Agency, and the same test shall be repeated until no fault appears.

Attention is directed to the additional requirements in the Special Provisions with regard to notifications, scheduling, and approval of testing for traffic signal and street lighting work.

New or modified street lighting work shall be tested with lamps being energized for 24 hours continuously. The tests of the street lighting shall be for the purpose of identifying the light distribution patterns, determining the acceptability of the ballasts, fixtures and lamps for electrical and noise standards, verifying that all connections are electrically and mechanically sufficient, and for other purposes as directed by the Agency or in the Special Provisions. The Contractor shall furnish all material and equipment for such testing at the Contractor's expense.

49-2.13 Painting

Unless otherwise specified or shown in the Contract Documents, painting shall conform to Section 86-2.16, "Painting", of the State Specifications and these Specifications. Painting of existing steel street light poles, decorative street light poles, signal appurtenances, and bridges shall conform to the Special Provisions.

Painting of newly installed decorative street lights consisting of a steel pole and cast iron decorative base cover shall conform to the following specifications.

A. Painting shall conform to Section 59, "Painting", of the current edition of the State Specifications, with the following additions and modifications:

1. Paint materials, unless otherwise specified, shall conform to Section 91, "Paint", of the State Specifications.

2. A Certificate of Compliance shall be furnished in conformance with the provisions in Section 6-1.07, "Certificates of Compliance", of the State Specifications, certifying that the coating system furnished complies in all respects with these requirements. Coatings may be applied before Certificates of Compliance have been received. The Certificates of Compliance shall accompany the order when shipped and be supplied to the Agency.

3. The steel street light pole, cast iron base, and light fixture shall all be painted and fully cured at the time of manufacture and shipped to the job site ready for installation.

4. Light fixtures shall be powder coated. Surface preparation and coating application shall be in conformance with both light fixture manufacturer's specifications and coating manufacturer's recommendations. Color shall be a Federal Standard 595B color number as specified in the Special Provisions or indicated on the Plans.

B. Surface Preparation (steel pole & cast iron base)

1. All surfaces to be painted shall be cleaned in conformance with the requirements in Surface Preparation Specification No. 6, "Commercial Blast Cleaning", of the Steel Structures Painting Council (SSPC-SP6).

2. Cleaning shall leave all surfaces with a blast profile consisting of a dense, uniform, angular anchor pattern of 1.5 to 2.5 mils as measured in conformance with the requirements in ASTM Designation: D 4417.

3. All burrs and weld splatter shall be completely removed.

4. All surfaces shall be clean, dry, and free of any dirt, chalk, dust, oil, grease, salts, curing compounds, release agents, preservatives and other detrimental foreign matter before coating application is performed.

C. Coating Application (steel pole & cast iron base)

1. All paint shall be applied in accordance with the manufacturer's recommendations and these Specifications. Manufacturer's recoat windows shall be adhered to.

2. Apply one prime coat of an epoxy coating. Coating manufacturer and product identification shall be indicated in the Special Provisions or on the Plans, and approved by the Sacramento County Department of Transportation Street Light Operations Section. Dry film thickness shall be 4 to 8 mils.

3. Apply one intermediate color coat of a polyurethane. Coating manufacturer and product identification shall be indicated in the Special Provisions or on the Plans, and

approved by the Sacramento County Department of Transportation Street Light Operations Section. Dry film thickness shall be 2 to 3 mils.

4. Apply one finish clear coat of a polyurethane. Coating manufacturer and product identification shall be indicated in the Special Provisions or on the Plans, and approved by the Sacramento County Department of Transportation Street Light Operations Section. Dry film thickness shall be 2 to 3 mils.

5. Total system dry film thickness shall be 9 mils minimum.

6. The bottom of the base plate and the interior of the steel street light pole up to the handhole shall be coated with one coat of the epoxy primer (6 to 8 mils dry film thickness). The top and edges of the base plate and the exterior of the pole shall be multi-coated as detailed above.

7. The interior of the cast iron base, including the access doors, shall be coated with one coat of the epoxy primer (6 to 8 mils dry film thickness). The exterior and edges of the cast iron base, including the access doors, shall be multi-coated as detailed above.

8. The access doors on the cast iron base shall be removed during the painting process.

9. The color coat polyurethane shall be a Federal Standard 595B color number as indicated in the Special Provisions or on the Plans, or as directed by Agency.

D. All coatings shall comply with Proposition 65 regarding cancer-causing agents.

E. All street light components shall be packaged for shipping so as to prevent damage to the coatings during loading, transport, and unloading.

F. An appropriate quantity of touch–up paint (epoxy primer, color polyurethane, and clear polyurethane) shall be supplied with each shipment.

G. After installation of the street light (pole, decorative base cover, and fixture), any damaged coatings shall be repaired with the supplied touch-up paint. Clean and prepare the damaged area by abrading with 100 grit sandpaper.

49-3 CONTROLLER ASSEMBLIES

All controller assemblies will be furnished by the Agency unless otherwise shown or specified in the Contract.

The controller assemblies shall be installed complete by the Contractor. The Contractor shall construct the foundation and install the controller cabinet on the constructed foundation as shown on the Plans and as designated by the Agency. Seams where the controller cabinet rests on the foundation shall be sealed with an approved joint sealing compound. The Contractor shall make all wire connections to the appropriate terminals in the cabinet. All detector equipment external to the wired cabinet shall be furnished and installed by the Contractor. The Contractor shall provide anchor bolts for each controller cabinet.

Upon the receipt of a written request to the Agency at least two (2) Working Days in advance, equipment and materials will be made available to the Contractor for pick up. The Contractor shall be responsible for the safe pickup and delivery of the Traffic Controller Assemblies to the work site. Traffic Controller Assemblies shall be delivered directly to the work site and installed the same day they are acquired by the Contractor. See Section 49-7, “Agency-Supplied Equipment”, in this Section of these Specifications for time, place, and person to contact for pick up arrangements.

49-4 TRAFFIC SIGNAL FACES AND FITTINGS

Traffic signal faces and fittings shall conform to Section 86-4, “Traffic Signal Faces and Fittings”, of the State Specifications, and these Specifications.

49-4.01 Vehicle Signal Faces

All vehicle signal sections, housings, and visors shall be metal.The Contractor shall remove all manufacturing labels from the traffic signal head lenses prior to installation.

All vehicle signal heads supplied by the Contractor shall have 12" (300mm) signal faces. All vehicle signal heads shall be illuminated by light emitting diode (LED) units that are Caltrans-approved. The LED modules shall be Gelcore or Dialight or County approved equal.

49-4.02 Programmable Directional Louvers

Plastic programmable directional louvers will be permitted where shown or specified in the Contract. When permitted, plastic programmable directional louvers shall be Pelco Brand GPL (Geometrically Programmed Louver) or approved equal.

49-4.03 Backplates

Backplates shall be furnished and installed on all vehicle signal faces. All backplates shall be metal.

49-4.04 Pedestrian Signal Faces

Pedestrian signal heads shall be of the "countdown" variety and shall conform to the following specifications:

1. The design of pedestrian signal heads shall conform to Sections 4E.04, "Size, Design, and Illumination of Pedestrian Signal Head Indications" and 4E.07, "Countdown Pedestrian Signals", of the current edition of the Federal Highway Administration Manual on Uniform Traffic Control Devices (MUTCD), including approved errata, revisions, and California supplements; Section 86-4.06, "Pedestrian Signal Faces", of the State Specifications; and these Specifications.
2. The housing, finish, control, and terminal blocks of pedestrian signal heads shall conform to Section 86-4.06 of the State Specifications, except that the housing shall be metal.
3. The display of pedestrian signal heads shall consist of integrated WALKING PERSON and UPRAISED HAND symbols on the left side and a countdown timer display on the right side. The integrated WALKING PERSON and UPRAISED HAND symbols portion of the display shall conform to the documents listed in item 1 above. In addition, the WALKING PERSON and UPRAISED HAND symbols shall be Caltrans-approved LED type and shall be solid. Outline style symbols shall not be used. The countdown timer portion of the display shall conform to the documents listed in item 1 above and the specifications in item 4 below.
4. The countdown timer portion of the display shall consist of Portland orange numbers which are nine (9) inches in height on a black opaque background. The display shall be capable of indicating the numbers zero (0) through ninety-nine (99) inclusive. The numbers zero (0) through (9) inclusive shall be displayed as a single digit (i.e. without a leading zero, the left digit dark). The display shall be high-intensity LED type in conformance with Caltrans specifications for LED modules. The display shall be legible, day or night, from a minimum distance of one hundred twenty (120) feet from the signal. The timer shall calculate and display the appropriate Flashing Don't Walk time, as programmed on the signal controller, after one cycle of Flashing Don't Walk operation. The timer shall continuously recalculate Flashing Don't Walk time each cycle so that the unit will display the proper Flashing Don't Walk time after any change in the settings for that phase on the traffic signal controller. If the Flashing Don't Walk timing is interrupted or shortened (e.g. transition into a preemption sequence or transition to flashing mode), then the countdown timer portion of the display shall be discontinued and go dark immediately.

5. Each pedestrian signal head shall have an egg crate or Z-crate type screen as specified under number 2 of Section 86-4.06B, "Front Screen", of the State Specifications, modified as follows:
6. The screen shall be fabricated from aluminum anodized flat black or finished with lusterless black exterior grade latex paint formulated for application to properly prepared metal surfaces, or shall be fabricated from flat black plastic.
7. The frame for the screen shall be aluminum alloy; polycarbonate will not be allowed.
8. The only alternate method of screening allowed shall be to eliminate the screen completely and design the pedestrian signal head display such that the results are at least equal to those obtained with the use of the egg crate or Z-crate type screen as determined by the Agency.
9. Visors will not be required for pedestrian signal faces.

The Contractor shall mount the framework for all pedestrian signals such that the terminal section is positioned on the back side of the associated traffic signal poles, i.e., the side furthest from the public roadway.

The following meet the standards for Pedestrian Signal Heads and are approved for use on Sacramento County signals:

- Countdown module model LEDP-HMC-001 manufactured by US Traffic;
- Gelcore countdown module PS7-CFF1-01; and
- Signal housing model 4302OG, painted olive green, manufactured by US Traffic.

49-4.05 Audible Pedestrian Signals

In addition to each standard pedestrian signal shown on the Plan, the Contractor shall supply and install audible pedestrian signals. One audible pedestrian signal unit shall be supplied and installed for each standard pedestrian signal head installed as shown on the Plans. Audible pedestrian signal units shall be model APS-10 by Indicator Controls Corporation, or approved equal. Unit output volume shall be field adjustable and shall be capable of output of not less than 90db at 1 watt / 1 meter. Units shall be capable of automatic self-adjustment of output volume depending on ambient noise conditions. The type of signal output shall be field-selectable, with each unit capable of emitting both a "cuckoo" signal and a "peep-peep" signal.

Audible pedestrian signal units shall be mounted on top of the standard pedestrian signal heads with the face of the units tipped downward such that they are directed toward a point five feet (5') above the roadway surface in the center of the crosswalk at the edge of pavement on the opposite side of the associated crosswalk. Mounting of audible pedestrian signal units shall conform to manufacturer's recommendations and as directed by the Agency in the field.

49-5 DETECTORS

Detectors shall conform to Section 86-5, "Detectors", of the State Specifications, and to these Specifications.

Traffic signal loop detectors shall be installed as shown on the plans and as detailed on standard drawing 5-24.

At locations where existing loop detectors are damaged, the Contractor shall replace the damaged loop detectors with new loop detectors meeting the Agency's current standards. At advanced detector locations, those loop detectors that are more than one hundred feet from the associated stop bar at the signalized intersection, the Contractor shall replace any damaged loop detector with a new Type A loop detector (one per lane). If there is no existing detector handhole in the vicinity of the new loop detector, a new detector handhole and conduit connecting to the associated pull box shall be supplied and installed. At presence detection locations, those loop detectors that are less than one hundred feet from the associated stop bar

at the signalized intersection, the Contractor shall replace any damaged loop detector with one or more Type A loop detectors as needed such that the final result shall be four working loop detectors per lane spaced as shown on Standard Drawing 5-24. If there is no existing detector handhole in the same lane as the new loop detector(s), a new detector handhole and conduit connecting to the associated pull box shall be supplied and installed. Unless otherwise indicated on the plans, all costs associated with the replacement of damaged loop detectors, including the supply and installation of detector handholes and connecting conduits, shall be borne by the Contractor.

49-5.01 Vehicle Detectors

Unless otherwise specified in the Special Provisions, all vehicle detector sensor units in the controller cabinet will be provided by the Agency.

Splices shall be insulated as specified in these Specifications.

Detector lead-in cables shall be continuous, without splices, from the controller cabinet detector panel terminal block to the loop termination pull box unless otherwise shown on the Plans.

49-5.01.A Construction Materials

Each inductive detector loop conductor shall be continuous, unspliced, Type RHW-USE neoprene-jacketed or Type USE crosslinked polyethylene insulated No. 12 stranded copper wire. Conductor insulation thickness shall be forty (40) mils minimum.

Loop detector lead-in cable shall consist of four (4) No. 18 AWG stranded copper conductors insulated with nine (9) mils minimum of polypropylene, color coded, parallel laid, twisted together with four (4) to six (6) turns per foot. An amorphous interior moisture penetration barrier shall be provided to prevent hosing, siphoning, or capillary absorption of water along cable interstices. Aluminum-polyester shielding shall be applied around the conductors. The outer jacket shall be thirty-two (32) mils minimum in thickness, high density polyethylene conforming to ASTM Designation: D 1248, 65T for Dielectric Material, Type I, Class C, Grade 5, J3. The diameter of the lead-in cable shall be approximately one-quarter inch (0.25”).

49-5.01.B Installation Details

Installation and testing shall conform to the details and notes shown in the Standard Drawings and these Specifications.

Unless otherwise shown on the plans or specified in the Special Provisions, loop detectors shall be installed after the construction of all lower lifts of paving and after construction of pavement leveling courses but prior to the placement of the final lift of asphalt concrete for the affected portion of the roadway. Inductive loop detectors shall be installed as shown on standard drawing 5-24 and as specified in these Specifications. The Contractor shall located all loop detectors in left turn lanes that adjoin a through traffic lane such that the loop detectors are 3.5 feet from the channelizing stripe that separates the left turn lane from the through traffic lane. Detector handholes shall be centered in the associated vehicle lane and shall be located approximately four feet clear of the nearest traffic signal loop detector. Loop detectors that are installed in the vehicle lane closes to the edge of pavement, either with our without curbs and gutters, shall be constructed such that the wires connecting the loops to the associated detector handhole run on the side of the loops further from the edge of pavement.

Unless otherwise shown or specified in the Contract or directed by the Agency in the field, each new detector loop shall be five feet by five feet (5' x 5') and shall be centered in the traveled lane. All detector loops shall be field marked by the Contractor and their location approved by the Agency prior to pavement cutting. For installations that will serve lanes that

are not parallel or concentric to lane markings existing at the time of loop installation, the Contractor shall accurately mark the future lane lines prior to pavement cutting.

Sawcut slots shall be cut into the pavement to the depth and width shown on the Standard Drawings. Slots cut in the pavement shall be blown out with compressed air, then dried and inspected for any sharp objects or corners, which shall be removed prior to installation of loop conductors. All conductors and conductor loops installed in the traveled way shall be installed so that the top of the conductor is a minimum of five-eighths inch (5/8") below the surface grade of the street.

Unless specified otherwise, each loop shall consist of the three (3) turns of conductors for each detector loop. All detector loops located two hundred fifty feet (250') or farther from the stop line shall consist of four (4) turns of conductors for each detector loop.

The loop conductors shall be installed in the slots using a five-sixteenths inch (5/16") to one-quarter inch (1/4") wooden paddle. As it is installed, the wire shall be kept under slight tension and shall be kept in the slots with suitable cardboard wedges. The cardboard wedges shall not be removed until the loop sealant operation requires removal.

Loop conductors shall be installed without splices and shall terminate in the nearest pull box. Detector loops shall be joined, in series, in the nearest pull box. See the Standard Drawings for typical loop connection details.

Each detector loop shall be identified and tagged by loop number, start (S), and finish (F). Loop lead-ins shall be individually identified as shown on the Plans. Identification shall be by means of bands placed on the lead-in cable.

Each detector loop circuit shall be tested for continuity, circuit resistance, and insulation resistance at the controller location. The loop circuit resistance shall not exceed 0.50 ohms plus 0.35 ohms per one hundred feet (100') of lead-in cable. The insulation resistance shall be performed between each circuit conductor and ground. The meggared insulation resistance shall not be less than two hundred (200) megohms. The Contractor shall replace any detector loop that fails this requirement at the Contractor's expense. All test results and corrections of failures shall be documented. Test documentation shall be provided to the Agency to become a permanent record for future reference. All testing shall be completed to the satisfaction of the Agency prior to traffic signal turn-on.

All loop conductors shall be spliced to a lead-in cable, which shall be run from the pull box adjacent to the loop detector to a sensor unit mounted in the controller cabinet. All splices between loops and the lead-in cable shall be soldered.

If the conduit is not dry, the ends of all lead-in cable shall be taped and waterproofed prior to installation. If splicing is not done immediately after installation, the ends of both the loop conductors and lead-in cable shall be taped and waterproofed with an electrical insulating coating. The insulating coating shall be fast drying, resistant to oils, acids, alkalis and corrosive atmospheric conditions and shall be compatible with the insulations used in the conductors and cables.

Sealant for inductive loop detectors shall be supplied and installed by the Contractor in accordance with Section 86-5.01A(5), "Installation Details", of the State Specifications, with these Specifications, and with the following:

Sealant for loop detectors shall be as specified for Elastomeric Sealant.

Epoxy sealant will not be permitted.

The Agency may allow the use of Asphaltic Emulsion Sealant in areas scheduled for asphalt concrete overlay.

Detector handholes shall be type "B." Detector handholes shall be installed at the locations shown on the Plans, in the center of the lanes and in conformance with the Standard Drawings. The cement used to joint the ABS sweep "Y" to the PVC conduit shall be capable of providing a solvent type weld between the two materials.

49-5.01.C Splicing Details

All splicing shall be made in a dry environment. The splice between the lead-in cable and the loop conductors in the adjacent pull box shall be a soldered waterproof type. This shall be accomplished by stripping and cleaning ends of wires, twisting ends together, dipping twisted ends in flux, then soldering. Open flame soldering will not be permitted. Wire insulation shall not be damaged while soldering. The soldered splice shall then be protected with an electrical spring connector of three- (3) part construction.

The 3-part construction spring connector shall consist of a zinc-coated, free-expanding steel spring enclosed in a steel shell with a jacket of polyvinyl chloride. The outer jacket shall have a flared skirt, be flexible, and be able to withstand 105°C temperature continuously. Each splice shall have the spring connector sized in accordance with the manufacturer's recommendations for the number of conductors and gauges being spliced. Wire strip lengths shall also be in accordance with the manufacturer's recommendations.

After the spring connector has been applied to the splice, the Contractor shall apply tape sealant to the splice. The tape sealant shall be applied over the entire area of the splice and overlap the spring connector and detector lead-in cable at least one and one-half inches (1-1/2”). The tape sealant shall be Thomas and Betts Catalog No. HSTS25 or approved equal.

The Contractor shall then apply heat-shrink tubing over the splice. Heat shrink tubing shall be medium or heavy wall thickness irradiated polyolefin tubing containing an adhesive mastic inner wall. Minimum wall thickness prior to contraction shall be 0.04 inch. When heated, the inner wall shall melt and fill all crevices and interstices of the object being covered while the outer wall shrinks to form a waterproof insulation. Each end of the heat-shrink tube or the open end of the end cap of heat-shrink tubing shall, after contraction, overlap the conductor insulation at least one and one-half inches (1-1/2”). Heat shrink tubing shall conform to the requirements of UL Standard 468D and ANSI C119.1, for extended insulated tubing at 600 volts. The Contractor shall use the appropriate size heat-shrink tubing from the following Thomas and Betts Catalog Numbers HS6-1, HS6-1L, HS4-30, HS40-400 or equal product if approved by the Agency.

All heat shrink tubing shall meet the following requirements:

Shrinkage Ratio:	33 percent, maximum, of supplied diameter when heated to 125°C and allowed to cool to 25°C
Dielectric Strength:	350 kilovolts per inch, minimum
Resistivity:	10^{14} ohms - centimeter, minimum
Tensile Strength:	2,000 lbs. per square inch, minimum
Operating Temperature:	-40°C to 90°C (135°C Emergency)
Water Absorption:	0.5 percent, maximum

When three (3) or more conductors are to be enclosed within a single splice using heat-shrink tubing, mastic shall be placed around each conductor, prior to being placed inside the heat-shrink tubing. The mastic shall be the type recommended by the manufacturer of the heat-shrink tubing.

Heat-shrink tubing shall not be heated with an open flame. A heating device designed for the purpose is required. Immediately after heating the splice and while the internally-applied sealant is still liquid, the open end of the splice shall be clamped together until the sealant dries.

If any detector lead-in splice fails within one (1) year due to poor workmanship, the Contractor shall replace all detector lead-in splices made by the Contractor within said intersection.

Where shown on the Plans, detector loops shall be sawcut into detector handholes. Detector handholes shall be installed in accordance with these Specifications and as shown on the Standard Drawings unless otherwise specified or directed by the Agency. No splicing will be permitted in the detector handholes.

Conduit from the detector handhole to the adjacent pull box shall be sized as shown below:

Conduit Size	Loop Conductors
1-1/2" minimum	1-4 pairs
2" minimum	5 or more pairs

49-5.01.D Video Detector System

A video detection system shall be supplied and installed for those locations shown on the plans and as specified in the Special Provisions. Unless there is a bid item for video detection system, the video detection system, including but not limited to specified hardware, software, warranty, maintenance, and support, shall be included in the lump sum price paid for the traffic signal installation, and no additional payment shall be allowed.

This video detection specification is intended to set forth the minimum requirements for a system that detects vehicles on the roadway using monochrome or color video images of the vehicle traffic and provides detector outputs to a traffic signal controller. The system shall consist of one or two video cameras, a video detection processor (VDP), extension module/s (EM) appropriate for the installation, and a pointing device. The VDP and EM/s shall be designed to function in a standard Detector Input File. The VDP and EM shall meet the Type 170, 170E, 2070, NEMA TS1 and TS2, and ATC environmental specifications. The system shall be Iteris' Vantage Edge II ™, or Traficon VIP3D.2 ™, or approved equivalent.

49-5.01.D.(1) Functional Capability:

The system shall use NTSC or PAL composite video from a camera/s to detect vehicles on the roadway. The video signal shall be digitized and analyzed in real time. The dual camera VDP shall process the video from two cameras simultaneously. The VDP shall support a minimum of 24 detection zones within a camera field-of-view (FOV). Each zone shall be individually capable of detecting a licensed motor vehicle, bicycles, or pedestrians. Supported detection types shall include pulse, presence count extend and delay. Logical operations of 'AND' and 'OR' shall be supported. The VDP shall also support delay inhibit inputs. The VDP shall provide a 'failsafe' output in the event of loss of video or internal failure. System programming shall be accomplished via a standard pointing device using a menu overlaid on the monitor screen. No computer shall be required for system setup or operation.

49-5.01.D.(2) VDP and EM Hardware:

The system shall employ plug-in based units compatible with a standard Type 170/332, 2070, NEMA TS1 and TS2, and ATC systems. The VDP shall be 2 units wide. The EM shall be available in both single unit wide (2 Channel) and two unit wide (4 Channel) forms. EM shall be automatically recognized and addressed by the VDP when connected. The VDP shall support sufficient EM's to provide a minimum of 24 outputs per camera input. Both the VDP and EM will provide front panel LED indicators for each output channel and a miniature 3-position switch to provide temporary detection activation. Video input and output shall be by means of standard BNC type connectors. Provision for input video impedance matching shall be provided by means of a simple jumper arrangement. The units shall be addressable and capable of multi-drop communications.

49-5.01.D.(3) Video Detection Camera:

The camera shall be housed in a sealed environmental enclosure with integral thermostatically controller heater. The enclosure shall be provided with an adjustable sunshield. The camera bracket shall be included and provide for full 360-degree pan adjustment using simple hand tools. The enclosure shall provide for separate connectors for the power and video signal. Video surge suppression should be provided for each video input.

49-5.01.D.(4) Video Camera Cabling:

Video camera cable shall be per the Manufacturer's Specifications and shall be provided by the contractor for each camera between the camera mounting location and the controller cabinet.

49-5.01.D.(5) Firmware:

The detection algorithms shall be stored in FLASH memory and be upgradeable by using a manufacturer supplied floppy disc or CD ROM. Upgrading shall be by means of a laptop computer connected directly to the front panel RS-232 connector. Upgrades shall be provided on a periodic basis at no cost to the user.

49-5.01.D.(6) Remote Access Software:

Included at no additional cost shall be full-function remote access system software, which will support both local and remote configuration.

49-5.01.D.(7) Installation:

The product supplier of the video detection system shall supervise the installation and the testing of the video equipment. A factory certified representative from the manufacturer shall be on-site during installation, and is responsible for determining the final locations of the video detection cameras. The factory representative shall install, make fully operational, and test they system as indicated on the intersection drawings and these Special Provisions.

49-5.01.D.(8) Warranty:

The supplier shall provide a limited two-year warranty of the video detection system. During this period technical support shall be available from factory-certified supplier personnel via telephone with in 4 hours of receipt of your request.

49-5.02 Emergency Vehicle Detector Cable, Detectors, and Phase Selectors

The Contractor shall supply and install 3M Opticom cable model 138, or approved equal, where emergency vehicle detector (EVD) conductors are shown on the Plans. Opticom cable shall be installed to the EVD installed on the traffic signal mast arms, as shown on the Plans.

The Contractor shall supply and install EVD's for each mast arm signal installation and at locations shown on the Plans. Unless otherwise shown on the Plans, EVD's shall be 3M Opticom model 721, or approved equal. EVD's shall be installed on the top of the signal mast arm at the locations indicated on the Plans or at the location on the mast arm as directed by the Agency in the field. For each EVD installation, the associated cable shall be continuous and unspliced from the detector to the controller cabinet. The Contractor shall provide for five feet (5') of conductor slack in the pull box at the base of each pole with an EVD installation.

Unless otherwise shown or specified in the Contract, the Contractor shall supply two (2) EVD phase selectors for each new traffic signal controller cabinet installed under the Contract. EVD phase selector(s) shall be 3M Opticom model 752 or approved equal. The Contractor shall supply the phase selector(s) to the Agency a minimum of two weeks prior to the date of traffic signal controller cabinet installation.

49-5.03 Pedestrian Push Buttons

Pedestrian and bicycle push buttons shall be Type B. Types A and C shall not be used. Housings shall be either die-cast or permanent mold cast aluminum.

All pedestrian and bicycle push buttons shall be the large A.D.A. type with a two-inch (2") diameter button. The manufacturer and model of pedestrian and bicycle push button shall be chosen from the list of Sacramento County Department of Transportation (SACDOT) approved pedestrian and bicycle push buttons, or approved equal. The list may be obtained from the Traffic Signal Maintenance Section of the SACDOT Operations and Maintenance Division (916-875-5171).

Pedestrian push button signs shall be 5" by 7-3/4" metal as manufactured by Pelco Products Inc., model SF-1017-05 (left arrow) and model SF-1018-05 (right arrow), or approved equal, and shall be mounted at a height of thirty-six inches (36") above the walkway surface.

Bicycle push button units shall conform to all of the above requirements for pedestrian push buttons except that the signs shall conform to R62C (CA code) of the California MUTCD dated September 26, 2006. Bicycle push buttons shall be mounted at a height of forty-two inches above the bikeway surface. Posts for bicycle push buttons shall be located as close as possible to the associated stop bar striping while being out of any sidewalk ramp. Posts that are to be located in sidewalk shall be located within one inch of the back of the associated curb.

49-6 LIGHTING

Lighting shall conform to Section 86-6, "Lighting", of the State Specifications, and these Specifications.

49-6.01 High Pressure Sodium Luminaires

High pressure sodium luminaires shall conform to Section 86-6.01, "High Pressure Sodium Luminaires", of the State Specifications, and these Specifications. Isofootcandle diagrams are not required to be shown on the Plans. The light distribution pattern for each luminaire shall be ANSI Type III.

Type A street light luminaires, including those at signalized intersections, shall be high pressure sodium horizontal burning type and shall have internal ballasts. The clamping brackets of the slip-fitter shall have four (4) bolts. The luminaires shall be cut-off type unless otherwise specified by the Agency.

Type B street light luminaires shall be high pressure sodium vertical burning type. The luminaire housing shall be die-cast aluminum with a removable access door providing direct exposure to all electrical components, and shall be equipped with a slipfitter mounting unit for attachment to a three inch (3") tenon with a 2-7/8 inch to 3 inch tenon diameter. The housing shall contain the ballast, capacitor assembly, a terminal block for the necessary wires, and a porcelain lamp socket. The hood shall be spun or formed aluminum, with a twenty-two inch (22") minimum diameter. The refractor shall be acrylic plastic. All gaskets shall be composed of material capable of withstanding the temperature involved and they shall be securely held in place. All parts of the luminaire shall be manufactured from corrosion-resistant materials. Ballasts shall be integral to the housing. Color shall be aluminum baked enamel finish and shall resist heat, abrasion and weathering.

49-6.02 Lamps and Ballasts

Lamps shall conform to Section 86-6.01B, "High Pressure Sodium Lamps", of the State Specifications, and these Specifications. Each high pressure sodium luminaire shall be furnished with a high pressure sodium lamp of wattage as shown on the Plans. In addition to the high pressure sodium lamps specified in the State Specifications, the following high pressure sodium lamps shall be used when shown on the Plans:

Lamp ANSI Code No.	Lamp Wattage
S68	50
S62	70
S54	100

The Contractor shall, as part of the guarantee, replace with the Contractor's forces at the Contractor's expense any and all lamps that fail within a one-year period following final job acceptance. If the Contractor fails to respond within two (2) Working Days after notification, the Agency reserves the right to replace the lamp and the Contractor shall pay the Agency fifty dollars ($50) for each lamp replaced for such failure.

Ballasts shall conform to Section 86-6.01A, "High Pressure Sodium Lamp Ballasts", of the State Specifications, except that Section 86-6.01A(2), "Autotransformer or Reactor Type Ballasts", shall not apply, and to these Specifications. The ballast for high pressure sodium luminaires greater than one hundred (100) watts shall have an input voltage which matches the service voltage as shown on the Plans. The ballast for one hundred (100) watt high pressure sodium luminaires shall be energy efficient as in the American Electric luminaires 1) model C245-014 with a photoelectric unit receptacle and 2) model S450-314 without a photoelectric receptacle unit, or approved equal. Multi-tap ballasts with variable voltage input shall not be allowed.

49-6.03 Internally Illuminated Street Name Signs

Internally illuminated street name signs shall be Type "A", double faced in accordance with State Plan ES-33 and Section 86-6.065, "Internally Illuminated Street Name Signs," of the State Specifications. Signs shall have standard clamps and mounts per the State Specifications, with the following exceptions: a) the top nut will be a one-half inch (1/2") stainless steel hex nut, "Nylock" self locking or approved equal, and b) the cotter pin will be stainless steel, three-thirty secondths inch by one inch (3/32" x 1") per mount. The internally illuminated street name signs shall be mounted on a separate support arm between the signal mast arm and the street light arm, as shown on the Standard Drawings. Internally illuminated street name signs that are shown to display two street names on any face of the sign shall be double deep signs.

The sign faces shall be fabricated from 1/8-inch wide, flexible, colored, wide-angle prismatic retroreflective sheeting, tape and related processing materials designed to enhance the visibility of the street name signs. The retroreflective sheeting for sign faces/finished signs shall have a smooth surface with a distinctive interlocking diamond seal pattern and orientation marks visible from the face. The sheeting shall be precoated with a pressure sensitive adhesive backing protected by a removable liner. The adhesive shall require no heat for proper bonding when applied in accordance with the manufacturer's recommendations to substrates sixty-five degrees (65°) F or above. The retroreflective sheeting shall be 3M, "Scotchlite", Diamond Grade Series 3970G or approved equal.

Formatted letters shall conform to standard lettering font Clearview 5-W-R and shall be 10-inch upper case and 8-inch lower case letters. If necessary, the width of each letter and the spacing between letters may be reduced for the legend to fit on an eight foot long sign.

Internally illuminated street name sign conductors shall be terminated in a "condulet" on the mast arm, one-half inch (1/2") rain tight fitting, "Crouse-Hinds" or approved equal. Separate conductors shall be continued from the fitting to the sign panel. The street name sign circuit shall be spliced in the pull box at the pole base. A six-amp fuse shall be provided in the handhole access between the splice and the sign panel and shall be clearly labeled

The power supply for the light source shall carry a seven-year non prorated warranty. The power supply shall be UL Class 2 limited output voltage and current for safe operation and UL outdoor damp location rated. The power supply shall be mounted inside the sign frame.

The light source for the signs shall be panel mounted light emitting diodes (LEDs). The LED panels shall carry an eight-year non prorated warranty. The total power consumption shall not exceed two watts per square foot for single sided signs and shall not exceed four watts per square foot for double sided signs. The LED panels must be painted white. Paint must meet GM4901 specifications. The sign and power supply shall be able to withstand and operate at temperature extremes of -40 degrees F to +140 degrees F. The LED light engine must be able to operate in a damp environment without failure. The LED light engine panel shall consist of adequate LEDs to provide a minimum of 200 nits or an equivalent surface luminance of 1000 lux over a -40 degrees F to +140 degrees F ambient temperature range. There shall be a sufficient quantity of white LEDs to illuminate the sign panel uniformly. The failure of one LED shall not reduce the light output by more than eight percent per foot of sign face. The light engine shall be an Energy Star Qualified Product and ISO 9001 certified. All LED panels shall be burned-in for 24 hours and certified for compliance by the manufacturer. The manufacturer's name and date of manufacture, along with a Quality Control tracking sticker shall be mounted on the inside of the LED light engine panel.

49-6.04 Photoelectric Controls

The control circuit wiring between the photoelectric unit and the contactor shall be installed as shown on the Standard Drawings. The photoelectric unit will be supplied by the Agency.

Unless otherwise shown or specified in the Contract, the photoelectric controls shall be Type II as modified herein. Type II photoelectric control shall consist of a luminaire mounted EEI-NEMA twist-lock type photoelectric unit in a weatherproof housing, a separate contactor and a test switch located in the service enclosure.

Switches shall be furnished with an indicating nameplate reading "Hand-Off-Auto" and shall be connected as specified in Section 49-2.11, "Service", in this Section of these Specifications and as shown on the Standard Drawings. Test switch shall have an "OFF" position.

49-6.04.A Photoelectric Unit

The photoelectric unit will be supplied by the Agency. The photoelectric unit receptacle shall be an EEI-NEMA twist-lock type and shall be provided on the luminaire(s) as shown on the Plans. If approved by the Agency, mounting brackets shall be used where luminaire mounting is not possible.

49-6.04.B Contactors

Contactors shall be as specified in Section 49-2.11, "Service", in this Section of these Specifications and as shown on the Standard Drawings.

49-6.04.C Contactor and Test Switch Housing

Contactor and test switch housing shall be as specified in Section 49-2.11, "Service", in this Section of these Specifications and as shown on the Standard Drawings.

49-6.04.D Wiring

Wiring shall be as specified in Section 49-2.11, "Service", in this Section of these Specifications and as shown on the Standard Drawings.

49-7 AGENCY-SUPPLIED EQUIPMENT

All equipment and materials supplied by the Agency will be available to the Contractor at the County Corporation Yard at 4135 Traffic Way near the intersection of Bradshaw Road and Kiefer Boulevard. The Contractor shall inform the Agency and the Traffic Signal and Street

Light Manager (875-5327) at least two (2) Working Days in advance of date equipment pickup is required. The hours for pickup are 9:00 a.m. to 3:00 p.m. Monday through Thursday. Full compensation for pick-up and transport to the job site shall be considered as included in the lump sum price for the traffic signal work.

49-8 REMOVING AND SALVAGING ELECTRICAL EQUIPMENT

All traffic signal and street lighting equipment shown on the Plans as "Salvaged to the County", including but not limited to such items as controller units, cabinets, signal heads, luminaires, standards, mast arms, ballasts, service equipment, conduit, conductors, cables, and detector contact items, shall be delivered, in the same condition as before removal, by the Contractor to the County Corporation Yard located at 4135 Traffic Way.

All poles, signal arms, luminaire arms, tie rods, and appurtenances shall be tagged with a suitable waterproof tab and marking pen before removal from the work site. The tag shall give the date, the intersection name, corner, and location from which the equipment was removed as shown on the Plans.

The Contractor shall inform the County Traffic Signal Shop (875-5327) at least two (2) Working Days in advance of the date equipment drop-off is required. The hours for drop-off are 9:00 a.m. to 3:00 p.m., Monday through Thursday. The Contractor shall be responsible for unloading the equipment at the County Corporation Yard, including providing any necessary cranes or other lifting devices. Full compensation for transport to and drop-off at the County yard shall be considered included in the lump sum price paid for the traffic signal work. All other traffic signal and street lighting equipment shown on the Plans as salvaged shall become the property of the Contractor and shall be removed from the right-of-way by the Contractor.

49-9 PAYMENT

The lump sum price or prices paid for signal, lighting, electrical system, or combinations thereof; for modifying or removing such systems; for temporary systems; or the lump sum or unit prices paid for various units of said systems include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in furnishing and installing, modifying, or removing the systems, combinations or units thereof, as shown or specified in the Contract, these Specifications, and directed by the Agency. The price also includes pull boxes; excavation and backfill; concrete foundations (except when shown as a separate contract item); pedestrian barricades; furnishing and installing illuminated street name signs; installing Agency-furnished sign panels and equipment; salvaging existing materials; and performing required tests.

Full compensation for all additional materials and labor, not shown or specified in the Contract or these Specifications, which are necessary to complete the installation of the various systems, is included in the prices paid for the systems, or units thereof, and no additional compensation will be paid.

Full compensation for pick up and safe and direct transport of controller assemblies and other Agency-furnished materials and equipment to the Work is included in the price paid for the various items of work and no additional compensation will be paid.

Full compensation for loading and transporting the salvaged equipment to the stockpile location is included in the price paid for the various items of work and no additional compensation will be paid.

SECTION 50 CONSTRUCTION MATERIALS

This Section indicates the requirements for various classes and types of materials used in construction. Materials not included in this Section shall be as described and specified in other Sections of these Specifications or in the Special Provisions.

50-1 PORTLAND CEMENT

Unless otherwise specified in the Special Provisions, all cement used in concrete shall conform to ASTM Designation: C 150, Type II.

Type III portland cement may be substituted for Type II when Special Provisions require high early strength.

All portland cements shall be "low alkali", containing not more than 0.60 percent by weight of alkalis, calculated as the percentage of Na_2O plus 0.658 times the percentage of K_2O.

Unless otherwise specified in the Special Provisions, calcium chloride shall not be used in any concrete containing steel reinforcement or other embedded metals.

When directed by the Agency, the Contractor shall furnish certificates of compliance stating that the cement delivered to the work complies with these Specifications.

50-2 CONCRETE AGGREGATES

Unless otherwise specified in the Special Provisions, concrete aggregates shall conform to ASTM Designation: C 33, except that grading requirements shall be as specified in Section 90-3, “Aggregate Gradings”, of the State Specifications.

50-3 WATER FOR CONCRETE

Water used for mixing and curing concrete shall be clean, free from oil, acid, alkalis, vegetable matter, or other deleterious matter. No water containing excessive amounts of salts, sulfates, or chlorides shall be used.

50-4 PREMOULDED EXPANSION JOINT FILLER

Unless otherwise specified in the Special Provisions, premoulded expansion joint filler material shall conform to ASTM Designation: D 1751.

50-5 PORTLAND CEMENT CONCRETE

50-5.01 Composition

Portland cement concrete shall be composed of portland cement, fine aggregate, coarse aggregate, admixtures (if used) and water; and shall be designated as one of the following classes:

Class "A-1" Concrete—Shall contain six (6) sacks (564 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of either one inch (1”) or one and one-half inches (1-1/2”).

Class "A-2" Concrete—Shall contain six (6) sacks (564 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of three-quarters inch (3/4”).

Class "B-1" Concrete—Shall contain five (5) sacks (470 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of either one inch (1") or one and one-half inches (1-1/2").

Class"B-2" Concrete—Shall contain five (5) sacks (470 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of three-quarters inch (3/4").

Class "C" Concrete—Shall contain four (4) sacks (376 pounds) of portland cement per cubic yard and shall have a maximum size of coarse aggregate of either one inch (1") or one and one-half inches (1-1/2").

Should the quantity of ingredients designed to produce a cubic yard of finished concrete result in a yield greater than one (1) cubic yard, the relative proportions of fine and coarse aggregates shall be adjusted as necessary to maintain a consistent quantity of portland cement in each cubic yard of concrete.

A mix design for each class of portland cement concrete used in the Work shall be submitted to the Agency for approval at least seven (7) days prior to the proposed portland cement concrete being incorporated into the Work.

50-5.02 Proportioning

The Contractor shall determine the mix proportions for all portland cement concrete to be used in the Work. The coarse and fine aggregates shall be combined in such proportions that the percentage composition by weight of the individual and primary aggregate sizes, as determined by laboratory screens and sieves, conforms to Section 90-3, "Aggregate Gradings", of the State Specifications.

Exact proportions of primary aggregate sizes used in the concrete mix shall be as designated or approved by the Agency. The Agency may adjust the mix to accommodate changes in aggregate and moisture contents, to improve mixing and placing characteristics and to secure maximum quality of the finished concrete.

50-5.03 Mixing

Concrete shall be from an approved plant. All concrete mixing shall be done in machine batch mixers of an approved type, having a capacity of not less than that which utilizes a full sack of cement, unless, in the opinion of the Agency, the quantity to be mixed is too small to justify the use of a batch mixer. Sacks of cement shall be completely emptied by dumping directly upon other materials previously measured into the mixer. No splitting of sacks of cement will be allowed. The cement may be weighed into the batch from bulk storage if the Contractor provides suitable equipment approved by the Agency.

Mixing shall continue for a minimum of one (1) minute. In mixers larger than one (1) cubic yard capacity the mixing time shall be increased so minimum mixing time is not less than one (1) minute for each cubic yard, or part thereof, of the mixer capacity. Where transit mixers are used, the mixing period shall conform to the requirements of ASTM Designation: C 94.

The total volume of material mixed per batch shall not exceed the rated capacity of the mixer as determined by the standard requirements of the Associated General Contractors of America. Mixing equipment not indicated in this Section shall be operated at the speeds recommended by the manufacturer. Revolving drum mixers, except on transit mixers, shall not make less than fourteen (14) nor more than eighteen (18) revolutions per minute. The rotation rate of transit mixers shall produce a peripheral speed of approximately two hundred (200) feet per minute.

Each paving mixer or stationary mixer shall be equipped with an acceptable timing device.

Should the Contractor elect to utilize transit-mixing equipment, the Contractor shall make adequate advance arrangements for preventing delays in delivery and placing of the concrete. If there is an interval of more than forty-five (45) minutes between any two (2) consecutive batches or loads, or a delivery and placing rate of less than eight (8) cubic yards of concrete per

hour, the Agency may shut down the work for the remainder of the day. If the work is shut down, the Contractor, at the Contractor's expense, shall make a construction joint in the concrete already placed at the location and of the type directed by the Agency.

Transit-mixed concrete shall be delivered to the site of the Work and discharge shall be completed within ninety (90) minutes after the addition of the cement to the aggregates or before the drum has been revolved two hundred fifty (250) revolutions, whichever comes first. In hot weather or under conditions contributing to quick stiffening of the concrete or when the temperature of the concrete is eighty-five degrees (85°) F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed forty-five (45) minutes.

Batch or transit-mixed concrete delivered to the Work shall be accompanied by a ticket showing the volume of the concrete, the weight of cement in pounds, and the total weight of all ingredients in pounds. The ticket shall also show the time of day the materials were batched.

The Agency may stop concrete pouring if the placing of the concrete is causing separation of constituent materials of the concrete.

Transporting of concrete in non-mixing trucks or trailers will not be permitted.

50-5.04 Water Control

Within the limits hereinafter specified, the amount of water required for the proper consistency of concrete shall be determined by the slump test, in accordance with ASTM Designation: C 143.

The Allowance for slump, unless otherwise directed by the Agency, shall be as follows:

Concrete paving and unreinforced structures—Not more than three inches (3")

Reinforced structures and columns—Not more than four inches (4")

Concrete placed under water—Not less than six inches (6") nor more than eight inches (8")

No additional mixing water shall be incorporated into the concrete during hauling or after arrival at the delivery point, unless authorized by the Agency. If the Agency authorizes additional water to be incorporated into the concrete, the drum shall be revolved not less than thirty (30) revolutions at mixing speed after the water is added and before discharge is commenced.

If the concrete is mixed in transit, the control equipment shall be at the proportioning plant and there shall be no water added after the mixture leaves the plant, unless directed by the Agency.

The Contractor shall furnish, without charge, such materials as may be required for making tests of concrete during the progress of the Work. Such tests will be made at the Agency's expense.

50-6 CURING COMPOUNDS FOR CONCRETE

Concrete curing compounds shall be used where specified in these Specifications and the Special Provisions.

The compounds shall meet the requirements of Section 90-7.01B, "Curing Compound Method", of the State Specifications.

50-7 AGGREGATE BASES

Aggregate bases shall conform to the requirements of Section 26, "Aggregate Bases", of the State Specifications, and these Specifications.

The combined aggregate shall conform to the gradation requirements specified for the 3/4-inch maximum aggregate for Class 2 aggregate base, unless otherwise specified in the Special Provisions.

50-8 PIT RUN BASE (GRADED)

Pit run base is a processed pit run material from local sources which may be specified on the Plans or in the Special Provisions for work where ordinary earth fill may not be satisfactory.

Pit run material shall have a minimum sand equivalent of 25, as determined by California Test Method 217.

Pit run base shall have the following limits of gradation:

Sieve Size	Percentage Passing
2-1/2"	100
2"	75-100
1"	50-75
No.4	20-50
No. 200	0-10

50-9 COBBLES

Cobbles shall measure a minimum four inches (4") in the least dimension and a maximum of twelve inches (12") in the greatest dimension.

50-10 GEOTEXTILE FABRIC

50-10.01 Nonwoven Geotextile Fabric

Nonwoven geotextile fabric shall be of nonwoven construction and consist of long-chain polymeric fibers composed of polypropylene, polyethylene, or polyamide. The fibers shall be oriented into a random web and stabilize so they retain their relative positions. The geotextile shall be free of any chemical treatment or coating and shall be inert to chemicals commonly found in soil.

The geotextile shall conform to the physical property requirements listed in the table below:

TABLE 50-1
REQUIRED NONWOVEN GEOTEXTILE PROPERTIES

Physical Property	Test Method	Acceptable Minimum Test Results
Tensile strength, lb	ASTM D 4632	200 lbs.
Elongation, %	ASTM D 4632	50%
Permittivity, sec^{-1}	ASTM D 4491	1.5 sec^{-1}
Puncture strength, lb	ASTM D 4833	120 lbs.
Mullen Burst strength, psi	ASTM D 3786	380 psi

Note: Tension testing machine with ring clamp, steel ball replaced with a 5/16-inch-diameter solid steel cylinder, with flat tip and beveled edges, centered within the ring clamp.

Propex 4553 as manufactured by Propex Fabrics Inc. meets these specifications.

50-10.02 Woven Geotextile Fabric

The woven geotextile fabric shall be a high modulus woven fabric consisting of long chain polymeric monofilaments, slit film tapes, or multifilaments of tape and nonwoven yarn of polypropylene, polyester or nylon, and shall be inert to commonly encountered chemicals, rot-proof and resistant to ultraviolet light exposures, insects, and rodents. The fabric shall be woven into a stable network and the edges of the fabric shall be selvedged or surged in such a way that fabric will not unravel or fray during installation or usage. The geotextile fabric shall have a minimum grab tensile strength of two hundred pounds (200 lbs.) in any direction as measured in accordance with ASTM D 4632, a Mullen burst strength of at least four hundred pounds (400 lbs.) per square inch per ASTM D 3786, a weight of 6.0 oz/yd^3 in accordance with ASTM D5261, a Permittivity of 0.05 sec^{-1} per ASTM D 4491, and an Equivalent Opening Size no larger than U.S. Standard Sieve Number 50 as determined by U.S. Corps of Engineers Specification CW-02215. Geotextile fabric shall be Mirafi 600X, or equal. Each roll of fabric used shall be labeled in accordance with ASTM D 4873. Sampling and testing of geotextile fabric shall conform to the requirements ASTM D 4354. Specification conformance for geotextile fabric shall conform to the requirements for ASTM D 4759. Storage and handling of the geotextile fabric shall conform to the requirements of ASTM D 4873. Geotextile fabric shall be handled and placed in accordance with the manufacturer's recommendations.

50-11 CEMENT-TREATED BASES

Road-mixed and plant-mixed cement treated base shall comply with Section 27, "Cement Treated Bases", of the State Specifications.

50-12 LIME TREATED BASE

Lime treated base shall be constructed by mixing lime and water with existing subgrade materials. The lime to be mixed with the existing materials shall be a commercial hydrated lime conforming to the requirements of ASTM Designation: C 51. When sampled by the Agency at the point of delivery, the sample of hydrated lime shall contain not less than eighty-five percent (85%) of calcium hydroxide as determined by California Test Method 414.

A Certificate of Compliance and certified weight slips for each delivery shall be submitted to the Agency.

50-13 SAND

50-13.01 River Sand

River sand shall be free from vegetable matter, lumps, balls of clay, or adherent films of clay. The material shall not have more than twenty percent (20%) passing a two hundred (200) mesh screen.

50-13.02 Graded Sand

Graded sand shall be free from vegetable matter, lumps, balls of clay, or adherent films of clay, and shall have a minimum Cleanliness Value of 60 as determined by California Test Method 227. The percentage composition by weight of graded sand shall conform to the following gradations:

Sieve Size	Percentage Passing by Weight
9.5 mm (3/8")	100
4.75 mm (#4)	95-100
2.36 mm (#8)	90-100
1.18 mm (#16)	80-100
600 µm (#30)	65-100
300 µm (#50)	40-70
150 µm (#100)	0-30
75 µm (#200)	0-12

If approved in writing by the Agency, sand bedding in accordance with Section 19-3.025B of the State Specifications may be substituted for graded sand. Contractor must provide written notification in accordance with Section 5-14 of these Specifications. Such written notification must include documentation that the graded sand specified herein is not available at the time or in the quantities required to complete the Work. No additional payment will be made for the substitution.

50-14 CRUSHED ROCK

See Section 50-16.

50-15 CONTROL DENSITY BACKFILL/CONTROLLED LOW STRENGTH MATERIAL

50-15.01 Control Density Backfill

Control density backfill material shall consist of a workable mixture of aggregate, cementitious materials, and water.

Prior to excavation, the Contractor shall submit to the Agency for approval a mix design, and test data that demonstrate that the mix design complies with the following:

- Portland cement shall be Type II conforming to the requirements in Section 50-1, "Portland Cement", in this Section of these Specifications.
- Admixtures, including mineral admixtures (pozzalan), may be used in conformance with Section 90-4, "Admixtures", of the State Specifications. Chemical admixtures containing chlorides such as Cl in excess of one percent (1%) by mass of admixture, as determined by California Test Method 415, shall not be used. The amount of air-entraining admixture added shall be a minimum of eight percent (8%) and a maximum of twenty percent (20%).
- Course aggregate shall consist of a well-graded mixture of crushed rock with a maximum size aggregate of three-eighths inch (3/8"). One hundred percent (100%) shall pass the one-half-inch (1/2") sieve. Not more than thirty percent (30%) shall be retained by the three-eighths inch (3/8") sieve and not more than twelve percent (12%) shall pass the No. 200 sieve. All material shall be free from organic matter and not contain more alkali, sulfates, or salts than the native materials at the site of work.
- The minimum twenty-eight-day (28-day) compressive strength shall be one hundred pounds per square inch (100 psi) and the maximum shall be two hundred pounds per square inch (200 psi).

Water shall conform to Section 50-3, "Water for Concrete", in this Section of these Specifications.

Materials for control density backfill shall be thoroughly machine-mixed in a pugmill, rotary drum, or other approved mixer. Mixing shall continue until the cementitious material and water

are thoroughly mixed. Control density backfill shall be placed within ninety (90) minutes after introduction of the cement to the aggregates.

Control density backfill shall be placed in a uniform manner that will prevent voids in, or segregation of, the backfill. Foreign material that falls into the trench prior to or during placing of the control density backfill shall be immediately removed.

When control density backfill is to be placed within the traveled way or otherwise to be covered by paving, the material shall achieve a maximum indentation diameter of three inches (3") prior to covering and opening to traffic. Penetration resistance shall be as measured by ASTM Designation: C 6024.

50-15.02 Controlled Low Strength Material (CLSM)

All CLSM shall conform to American Concrete Institute (ACI) report 229R-99, and have a 28-day unconfined compressive strength of between 50-125 psi. Cement shall be Type I or Type II Portland cement conforming to ASTM C 150. Blended cements conforming to ASTM C 595 may be used with with the written approval of the Agency after submittal of test results. Fly Ash must be Class F per ASTM C 618 . Air-entraining admixtures and foaming agents are permitted. Water-quality shall conform to ASTM C 94. Aggregates shall comply with ASTM C 33. Aggregates shall be sand with no more than 10% passing a No. 200 sieve. If Fly Ash is not used in the mix design the amount passing the No. 200 sieve can be increased to 20%. Soils with clay fines are prohibited. The Contractor shall submit a mix design,, and test results if requested, to the Agency for approval prior to commencing excavation.

50-15.02.A Properties

Flowability: High flowabilty: greater than 8 inches and not greater than 10 inches, as measured using ASTM C 143 (slump cone) method

Segregation: The separation of constituents in the mixture during fluid movement is not permitted.

50-15.02.B Mixing, Transporting And Placing

The mixing, transporting and placing of CLSM shall be in accordance with the methods and procedures given in ACI 304 and ACI 304.6R.

Prior to placement of the CLSM:

- The trench shall be free of loose soil
- The trench bottom shall be stable and non-yielding
- There shall be no excess moisture present
- The pipe bells shall be supported such that they maintain a minimum three inche (3") separation from the bedding material
- All bedding material shall be removed from the pipe haunches

The CLSM shall be placed the full width and length of the trench, and shall cover the top of the pipe bell. The CLSM shall be placed on both sides of the pipe simultaneously to minimize the potential for lateral displacement of the pipeline

The pipe sections may need to be secured against floating during CLSM placement. The CLSM may be placed in lifts to reduce the potential for flotation to occur.

50-15.02.C Backfill

Backfill above the CLSM may commence only when placement and compaction of the backfill will not cause deformation of the CLSM, or at the direction of the Agency.

50-15.02.D Quality Control

Sampling shall be in accordance with ASTM D 5971. The testing of CLSM cylinders shall be per ASTM D 4832, "Preparation and testing of soil-cement slurry test cylinders"

If the Contractor uses CLSM the following warnings should be considered::

The need to protect the area where the CLSM has been placed. The liquid CLSM will have characteristics similar to quick sand, until solidification occurs.

50-16 CLEAN CRUSHED ROCK

Clean crushed rock of the type shown or specified in the Contract shall be the product of crushing rock or gravel. The percentage composition by weight of clean crushed rock shall conform to the following gradations for the Type specified:

Sieve Size	Type A (1/2" crushed)	Type B (3/4" crushed)	Type C (1" crushed)	Type D (1-1/2" crushed)
2"	--	--	--	100
1-1/2"	--	--	100	--
1"	--	100	90-100	--
3/4"	100	75-100	30-60	0-17
1/2"	75-100	5-55	0-20	--
3/8"	10-50	0-15	--	0-7
No.4	0-15	0-5	0-5	0-10
No.8	0-5	0-2	--	0-2

Clean crushed rock shall have a minimum Cleanliness Value of 60 as determined by California Test Method 227. Clean crushed rock shall contain at least seventy-five percent (75%) of particles having two (2) or more fracture faces.

50-17 ASPHALT, LIQUID ASPHALT, AND ASPHALTIC EMULSION

Asphalt, liquid asphalt, and asphaltic emulsion, as required by these Specifications or by the Special Provisions, shall mean the asphalts as specified in Section 92, “Asphalts”, of the State Specifications, liquid asphalts as specified in Section 93, “Liquid Asphalts”, of the State Specifications, and asphaltic emulsions as specified in Section 94, “Asphaltic Emulsions”, of the State Specifications.

50-18 VITRIFIED CLAY PIPE (VCP)

Vitrified clay bell and spigot pipe and fittings shall conform to ASTM: C700 and Section 207-8.5.3 of the latest version of the “Standard Specifications for Public Works Construction” (“Greenbook”). A Certificate of Compliance must be furnished by the pipe manufacturer.

Joints shall be factory-applied resilient-type, polyurethane, mechanical compression joints conforming to ASTMC425.

Vitrified clay sanitary sewer microtunneling pipe shall be manufactured in accordance with ASTM C1208. Pipe shall not deviate from straight by more than 0.05 inch per linear foot when the maximum offset is measured from the concave side of the pipe. Measurements shall be taken by placing a straightedge along the concave side of the full length of the pipe barrel, excluding the joint, and measuring the maximum distance between the straightedge and concave side of the pipe. The ends of the pipe shall be perpendicular to the theoretical longitudinal axis within 0.004 inch per inch of outside diameter. The sleeve is an element which bridges between the pipe sections and shall be made of non-corrosive materials which, in conjunction with the sealing element(s). Stainless steel sleeves shall be AISI Type 316. the compression disc is a flat disk that forms a continuous ring of contact with the ends of the pipe and which functions to distribute the jacking forces which develop during pipeline installation.

The width of the compression disc shall not exceed the maximum wall thickness of the pipe, not extend into the flow, nor inhibit the installation of the sleeve onto the joint of the pipe.

Field repair of vitrified clay pipe segments, joints and fittings shall be limited to removal and replacement of the unacceptable portions of the pipeline.

50-19 SUBSURFACE DRAINS

Subsurface drains shall comply with Section 68, "Subsurface Drains", of the State Specifications.

50-20 NONREINFORCED CONCRETE PIPE (CP)

Nonreinforced concrete pipe shall conform to ASTM Designation: C 14.

50-21 REINFORCED CONCRETE PIPE, DRAINAGE (RCPD)

Reinforced concrete pipe shall conform to ASTM Designation: C 76 for Class I, II, III, IV, or V. The class of pipe will be shown on the Plans or specified in the Special Provisions.

Sections of circular pipe with elliptical reinforcing shall have the location of the minor axis of the reinforcing indicated by three-inch (3") wide, waterproof, painted stripes on the inside and outside of the pipe at the top and bottom, at least twelve inches (12") long at each end of the pipe section.

Unless otherwise indicated on the Plans or in the Special Provisions, joints for concrete pipe shall be bell and spigot and shall be of a design that, when properly laid, shall have a smooth and uniform interior surface. Each joint shall be sealed to prevent leakage. Unless otherwise indicated on the Plans or in the Special Provisions, joints shall be sealed with a rubber O-ring gasket conforming to ASTM C443. Compression couplings capable of the same performance are also allowed where splices are needed.

50-22 REINFORCED CONCRETE PIPE, SEWER (RCPS)

Reinforced concrete sewer pipe shall conform to ASTM Designation: C 76, "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe", with the following exceptions, amendments, and additions:

Section 5, Basis of Acceptance.

Replace Section 5.1.1, "Acceptance on the Basis of Plant Load-Bearing Tests, Material Tests, and Inspection of Manufactured Pipe for Visual Defects and Imperfections", with:

Acceptance of pipe and materials shall be based on results obtained from the tests specified in Section 11 of ASTM Designation: C 76 as herein modified. Unless authorized in writing, only pipe marked at the plant by the Agency's representative will be acceptable.

Section 6, Materials.

Replace Section 6.2.1, "Cement", with:

Portland cement shall conform to Section 50-1, "Portland Cement", in this Section of these Specifications.

Replace Section 6.3, "Aggregates", with:

Aggregate shall be calcareous, unless otherwise specified, resulting in a concrete mix yielding a finished product with a total alkalinity equivalent (as $CaCO_3$) of at least eighty percent (80%) when tested in accordance with the procedure described herein.

Both coarse and fine aggregate, when tested for soundness by the sodium sulfate test (ASTM Designation: C 88) shall show a loss not exceeding eight percent (8%) at the end of five (5) cycles. Aggregate failing to comply with the

above specified soundness requirements may be used in the Work if specifically approved by the Agency, provided it contains less than two percent (2%) of shale and other deleterious particles and shows a loss of not more than ten percent (10%) by the above specified test.

Petrographic analysis of the aggregate source shall be furnished by an approved laboratory specializing in this type of work. Recommendation as to the acceptability of the source shall be presented, particularly with regard to the potential reactivity, if any, of the aggregate and the permissible alkalinity content of the cement.

Coarse aggregate shall consist of clean, hard, dense, tough, and durable natural gravel, crushed gravel, or crushed rock. It shall be free from oil, organic matter, or other deleterious substances.

When tested for abrasion in accordance with the method described in ASTM Designation: C 131, the coarse aggregate shall show a percentage of wear not exceeding the following limits, using the grading applicable to the coarse aggregate being used:

- 100 revolutions—15 percent
- 500 revolutions—50 percent

Aggregate that exceeds the fifty percent (50%) limit may be used provided it produces concrete of satisfactory strength, subject to approval of the Agency.

When sampled at the batching bin, coarse aggregate shall have a cleanness value of not less than 75 by California Test Method 227.

Fine aggregate shall be free from oil or other deleterious substances, and when tested in accordance with ASTM Designation: C 40, it shall show a color lighter than standard.

Coarse and fine aggregates shall be tested for reactivity in accordance with ASTM Designation: C 289 or ASTM Designation: C 227, and shall meet the "Innocuous Aggregate" requirement.

The testing of all aggregates, as specified above, shall be at the expense of the Contractor.

Section 7, Design.

Add to Section 7.2, "Modified and Special Designs":

Circumferential steel reinforcement shall have minimum cover of one and one-half inches (1-1/2") from the inside surface and shall have a minimum cover of one inch (1") from the outside surface of pipe except where additional cover is shown on the Plans. Conditions permitting less cover shall not apply to the above case.

Section 8, Reinforcement:

Add:

Steel area in bells shall conform to Table 2 of the USBR Specifications.

Section 9, Joints:

Replace entire section with:

The joints for the C76 reinforced concrete pipe shall be concrete joints of flared bell design and spigot ends with (a) contained O-ring neoprene gasket(s). The

joints shall be of a single or double rubber gasket type. The joints shall be similar to the Joint Type R-4 of USBR, except that joints for reinforced concrete pipe to be jacked in place may be double rubber gasket design similar to Joint Type R-1 of USBR. Unless otherwise specified, no other type of joint will be acceptable.

Joints and gaskets shall conform to and meet all of the requirements of ASTM Designation: C 443, except as modified or otherwise restricted in these Specifications. Each gasket shall be confined in a groove on the spigot end of the pipe so that movement of the pipe or hydrostatic pressure cannot displace the gasket(s). When the joint is assembled, the gasket(s) shall be compressed to substantially fill the groove(s) and effect a watertight seal.

The joint assemblies shall be so formed and accurately manufactured that when the pipes are drawn together in the trenches, the pipe shall form a continuous watertight conduit with smooth and uniform interior surface and shall provide for slight movements of any pipe in the pipeline due to expansion, contraction, settlement, or lateral displacement.

The shape and dimensions of the joint shall be such that it will be self-centering upon closure and so designed that the gasket will not be required to support the weight of the pipe. The rubber gasket shall be the sole element of the joint depended upon to provide watertightness. The ends of the pipe shall be placed at right angles to the longitudinal centerline of the pipe, except where a beveled end pipe for deflection up to five degrees (5°) is required. The ends of the pipe units shall be finished to regular smooth surfaces and no point on the surface of the spigot end of a pipe unit shall project beyond, or be more than one-fourth inch (1/4") short of the specified plane.

Section 10, <u>Manufacture</u>:

Add:

Pipe sections shall be made in nominal lengths of at least eight feet (8') except where shorter lengths are required to meet special conditions. Shorter lengths shall be used only where shown or accepted. To accommodate changes in alignment or curved alignments of the pipeline, pipe ends may be beveled. Pipe ends shall not be beveled more than five (5) degrees. Pipe shall be centrifugally spun, or vertically cast using a wet cast process utilizing inner and outer forms. Concrete with a minimum slump of two and one-half inches (2-1/2") shall be used for manufacture of the pipe using the vertical cast process.

Fittings may be fabricated from steel plate cement mortar-lined and coated, or from mitered end concrete pipe, provided the maximum angle of any miter cut is fifteen degrees (15°) and the maximum deflection for a mitered bend shall be thirty degrees (30°). Steel plate fitting shall conform to the dimensional requirements of AWWA C208 Table 2. Steel plate shall conform to AWWA C301. Minimum plate thickness shall be one-quarter inch (1/4") and shall be designed to limit deflection under full external design load to one percent (1%) of the diameter. Mortar lining and coating thicknesses shall be at least three-quarters inch (3/4"), except outlets less than ten inches (10") shall have three-eighths inch (3/8") thick lining. Cement mortar coating shall be reinforced with 2 by 4 by 13 gauge galvanized welded wire mesh of the sulfuring type. For noncentrifugally applied coating, the wire mesh shall be stud-welded to the cylinder. Bell adapters shall be fabricated from steel plate and shall be

accurately dimensioned for a rubber gasket joint. Cement and aggregates for fittings shall be the same as specified for pipe.

Replace Section 10.2, "Curing", with:

Curing shall be in accordance with AWWA C302, Section 3.7, except: a) Curing by steam for vertically cast pipe may be interrupted once during the twenty-four (24) hour period in addition to a period sufficient to remove the forms or supporting rings, and b) the actual curing period by steam for centrifugally spun pipe, not including the delay period, may be reduced to a minimum of 12 hours or until a minimum cylinder compressive strength of 4,000 psi is attained.

Section 11, Physical Requirements

Add to Section 11.1, "Testing Specimens":

The Contractor shall perform all testing and retesting of materials covered in the Testing Schedule and as hereinafter specified as part of the Work. The above includes materials, labor, products, equipment, certificates, and reports. Before use of materials and shipment of pipe, the Contractor shall furnish the Agency three certified copies of test results. Test results shall indicate the name and title of the person supervising the test, and the date of testing. The Agency shall be notified three days in advance of tests for pipe loading and pipe joints leakage, to enable the Agency to witness the testing.

Cored pipe shall be repaired by the Contractor as described in ASTM C 76 Section 13, Repairs.

In-plant inspection will be conducted by the Agency or a testing and inspection company employed by the Agency to determine conformance with these Specifications. Special attention will be given to the placement of reinforcement, manufacturing procedure, and curing. Dimensions and placement of reinforcement steel for completed pipe will be inspected by the Agency for compliance with approved design drawings and these Specifications. Testing by the Agency complements testing and quality control by the manufacturer, and does not replace manufacturer's quality control.

Replace Section 11.2, "Number and Type of Test Required for Various Delivery Schedules", with Table 50-2:

TABLE 50-2
TESTING SCHEDULE FOR RCPS

Item	Material	Test	Number Of Tests	Test Method (Standard)	When Tested
1	Cement	Compliance brand or source	Four for each	ASTM C150	Provide mill reports for duration of pipe manufacture
2	Cement	Percent alkali as specified	Same as Item 1	ASTM C114	Same as Item 1
3	Fine and coarse aggregate	Sodium sulfate soundness as specified	One for each 500 tons of pipe produced up to a maximum of four for each brand or source	ASTM C88	Before start of pipe manufacture and at 25%, 50% & 75% of pipe manufacture – or - before start of pipe manufacture and at every 500 tons of pipe produced
4	Fine and coarse aggregate	Petrographic analysis of aggregate source. Potential reactivity	One for each source Same as Item 1	ASTM C295	Before use of aggregates
5	Coarse aggregate	Abrasion	Same as Item 3	ASTM C131	Same as Item 3
6	Coarse aggregate	Cleanness	Same as Item 3	California Test Method No. 227	Same as Item 3
7	Fine aggregate	Impurities	Same as Item 3	ASTM C40	Same as Item 3
8	Joint gaskets	Compliance	Two for each pipe diameter, each gasket manufacturer, each order (certification with each shipment)	ASTM D412 ASTM D2240 ASTM D395 ASTM D573 ASTM D471 ASTM D1149 ASTM D1171	Before use of gaskets
9	Steel reinforce-ment	Compliance	One for each size of reinforcement	Per ASTM standard given in material spec.	Before use of material
10	Concrete	Compression	Minimum of 5 cylinders	ASTM C391 & ASTM C361	Before production for design acceptance
11	Concrete	Compression	Minimum of 5 for each day's production	ASTM C391 & ASTM C361	Before delivery of pipe
12	Concrete	Calcium carbonate equivalent	Minimum of 2 per day from different batches[2]	See specs. for details	Before pipe delivery

TABLE 50-2
TESTING SCHEDULE FOR RCPS *(continued)*

Item	Material	Test	Number Of Tests	Test Method (Standard)	When Tested
13	Pipe	D-load to 0.01 crack or to 120% of design	Minimum 3 sections each design[3]. All sections must pass.	ASTM C497	Before production for design acceptance
14	Pipe	D-load to design strength	2%[4] each size & each design produced with minimum of 1 for each size, design, production plant and each week	ASTM C497	Before delivery
15	Pipe	Absorption	Same as Item 14 with a minimum of 1 each day [5]	ASTM C497	Before delivery
16	Pipe & joints	Hydrostatic leakage test	Minimum of 1 assembled joint (2 pipe sections) for each size	ASTM C443	Before pipe production & after gasket testing
17	Pipe & joints	Hydrostatic leakage test	For each size test all of the first 10 pipes produced, test 5 of the next 10 pipes produced, thereafter test 2% of all pipes produced [6, 7]	See specs. for details	Before pipe delivery
18	Pipe	Bond	Same as Item 14 with a minimum of 1 set each day [7]	See specs. for details	Before pipe delivery

Notes:
1 USBR alternative method for stiff consistency (0" slump) may be used.
2 Additional tests will be required if concrete mix or source of aggregates changes. Samples will be taken from concrete cylinders.
3 A change in design is defined as involving a change in pipe wall thickness or change in steel placement configuration. Change in steel area to meet D-load requirements shall not be construed to be a change in design for purposes of this test.
4 Change to 1% for vertically cast or spun pipe.
5 Once per week for vertically cast or spun pipe.
6 In case of a failure, testing frequency shall be increased to test all of the subsequent 10 pipes produced, and 5 of the next 10 pipes produced.
7 Not required for vertically cast or spun pipe.

Amend Section 11.9, "Absorption":

For Method A, change nine percent (9%) to seven percent (7%).

Add:

Calcium Carbonate Equivalent - Titration tests for Calcium Carbonate Equivalent Test shall be run on representative samples of the calcareous aggregate concrete to determine if it complies with the minimum requirements for total alkalinity of eighty percent (80%), expressed as CaCO3. The tests shall be conducted by and at the cost of the Contractor.

The test specimen of concrete shall be analyzed seven (7) or more days after the date of concrete placement. The date of concrete placement as well as the date of testing shall be recorded. A representative specimen weighing least one kilogram shall be selected from the concrete cylinder broken to establish the seven-day compressive strength of the concrete. The sample shall be crushed until one hundred percent (100%) will pass a No. 4 screen. The sample shall be quartered to 125 grams and then dried in an oven for four (4) hours at a temperature of between one hundred (100) and one hundred ten (110) degrees Centigrade. After drying, the sample shall be ground so that it will all pass a 100-mesh screen.

About one (1) gram of the sample shall be weighed and placed into a five hundred (500) milliliter Erlenmeyer flask. Add one hundred (100) milliliters of water. Place a funnel in the neck of the flask to minimize spray losses, and slowly add forty (40) milliliters of standardized one normal hydrochloric acid. When effervescence has subsided, heat to the boiling point and boil for about one-half (1/2) minute. Cool, add fifty (50) to one hundred (100) milliliters of water, and titrate with standardized, carbonate-free, one normal NaOH solution.

The end point pH should be between 6.8 and 7.8. If the pH is first brought up to 7.8, it will sink to a lower value because of hydrolysis reactions in the mixture. More NaOH must be added until the pH stays above 6.8 for two (2) minutes, but not above 7.8. A pH meter equal to Orian Model 601 digital ioanalyzer (Cat. No. 34144-056) with combination electrode shall be used.

Calculate the net acid consumption in milliequivalents per gram, as follows:

$$\text{m.e./g.} = \frac{(\text{N of HC1} \times \text{ml of HC1}) - (\text{N of NaOH} \times \text{ml of NaOH})}{\text{Weight of sample in grams}}$$

Percentage calcium carbonate equivalent is five (5) x milliequivalents per gram.

Two (2) tests shall be run on each sample received, using the same ground and dried specimen for the source of material for each test. The results of each individual test shall be reported, but the final result of the sample of concrete shall be the average of the two (2) tests.

The nominal requirement for calcium carbonate equivalent shall be eighty percent (80%). The concrete will be considered acceptable if the average calcium carbonate equivalent for any period covering five (5) successive determinations (10 tests) is equal to or greater than eighty percent (80%) and if no individual determination is less than seventy-seven percent (77%). Once five (5) determinations have been run, the average for successive determinations shall be a running average, obtained by adding each new determination while

dropping the oldest. If the five (5)-determination average at any time falls below eighty percent (80%), the produced pipe shall be unacceptable on each day that the determination was below eighty percent (80%) but will be subject to acceptance by retesting. Similarly, if any single determination falls below seventy-seven percent (77%), regardless of the five (5)-determination average, the pipe produced on that day shall be unacceptable, subject to acceptance by retesting. The individual acceptance rules must be independently fulfilled. Rejection of pipe for any reason does not eliminate it from its proper inclusion in calculating each five (5)-determination average.

When any lot of pipe is declared unacceptable, the Contractor may cull the pipe, eliminating those sections the Contractor does not want to include as part of the Contract and suitably labeling them so that they will not be shipped to the job. Of the remainder, the Agency shall select three (3) representative sections from the pipe produced each day. The Contractor shall core drill a hole approximately two inches (2") in diameter through the interior wall to the depth of reinforcing of each selected section. These cores shall be crushed and tested for their calcium carbonate equivalent as specified. If the determinations on the three (3) cores representing one day's production average eighty percent (80%) or higher, the pipe produced on that day will be considered acceptable in respect to calcium carbonate equivalent; otherwise it will be considered unacceptable.

Hydrostatic Test - Hydrostatic tests on the pipe units shall be made by applying suitable bulkheads at each end of the pipe and filling the pipe with water. At the Contractor's option, the pipe may be soaked under a reduced pressure for a period of time not to exceed forty-eight (48) hours prior to testing.

Acceptance hydrostatic tests shall be made at fifteen pounds per square inch (15 psi) internal pressure. The pipe shall withstand the test pressure prescribed above for at least twenty (20) minutes without cracking and with no leakage appearing on the exterior surface. Moisture appearing on the surface of the pipe in the form of damp spots or beads adhering to the surface will not be considered as leakage. Slow forming beads of water that result in minor dripping which seal and dry up upon retesting of the individual pipe unit under the prescribed test pressure will be considered acceptable. At the Contractor's option, the pipe may be soaked under a reduced pressure prior to retesting. The maximum length of soaking after the initial test shall be ninety-six (96) hours.

Bond Test - Take one (1) one and one-half inch (1-1/2") core from near each end of the pipe and split the cores on the plane of the reinforcement steel. The Agency will make a visual judgment of the percent bond between the concrete and steel. A minimum of eighty-five percent (85%) bond for each cage shall be obtained. If any one core has less than eighty-five percent (85%) bond, two (2) additional pipes from the lot shall be tested as described. If the steel of any one of these cores has less than eighty-five percent (85%) bond, the entire lot will be rejected.

Section 14, Repairs:

Delete entire section and replace with:

Repairs shall be made in accordance with U.S. Bureau of Reclamation Concrete Manual, Eighth Edition, Chapter VII, Section 138, to insure the interior surface of the pipe shall be free from honeycombing or roughness and presents a finished, smooth, uniform, continuous surface.

Defects identified in Section 11 of the USBR Specifications will result in rejection of the pipe. In addition, any breaks or defects in the gasket bearing area of either the bell or spigot shall not extend over more than twenty-four inches (24") or ten percent (10%), whichever is smaller, of the circumference of the pipe. If the accumulated damage is detrimental to the use of the pipe, it will be rejected.

Repairs of damage during manufacture shall be made immediately and prior to the curing period without delaying the curing. All repairs, except for epoxy repairs, shall be water-cured a minimum of ten (10) days. Air holes over three-sixteenths inch (3/16") in any dimension shall be filled and sacked when more than six (6) occur in any square foot of the pipe interior surface. There shall be no holes greater than one-eighth inch (1/8") in any dimension in the gasket-bearing area. The Agency may require testing of repaired joints. All holes over three-sixteenths inch (3/16") deep or over three-eighths inch (3/8") wide shall be patched.

Add a new Section:

Shop Drawings - The Contractor shall submit to the Agency design calculations and detailed shop drawings showing details of the wall thickness, pipe joint, joint gasket, and reinforcement for each pipe size, pipe class and fittings. These details shall include the type of cage(s), the location of the cage(s) in the pipe wall, the size and spacing of circumferential and longitudinal reinforcing steel, and the cross-sectional area of reinforcing steel in each cage per lineal foot of pipe. The gasket details shall include the diameter of the cross-section and the unstretched diameter and volume. Pipeline layout drawings shall include pipe numbers, where applicable, stationing, manhole and structure locations, and all other pertinent details required to construct the pipeline. No pipe manufacturing will be allowed prior to acceptance of the calculations and drawings by the Agency.

50-23 CONCRETE CYLINDER PIPE (CCP) AND CEMENT MORTAR LINED AND COATED STEEL PIPE (CLCS)

Concrete cylinder pipe shall conform to Federal Specifications SS-P-381a and cement mortar lined and coated steel pipe shall conform to Federal Specifications SS-P-385a, each subject to the following modifications:

a. Minimum steel cylinder thickness shall be 0.109 inch.
b. Mortar coating shall provide a minimum of three-quarters inch (3/4") cover over all structural steel.
c. Cement mortar lining shall be of Type II portland cement and shall be centrifugally applied. Minimum lining thickness shall be one-half inch (1/2"). The finished inside diameter of the lined pipe shall be the diameter shown on the plans and shall match the inside diameter of the adjoining pipe sections to within one percent (1%), or one-quarter inch (1/4"), whichever is greater.
d. Pipe shall be Class 100, unless otherwise shown or specified in the Contract.
e. Deflection of the pipe cross section shall be limited to one percent (1%) of the inside diameter when the pipe is placed under full external design load.
f. Pipe sections of less than standard length may only be used with approval of the Agency.

Joints for concrete cylinder pipe and cement mortar lined and coated steel pipe shall be O-ring rubber gasket type with grout "diaper" finish, bolted flange type, "Dresser" or "Victaulic" couplings.

50-24 ACRYLONITRILE-BUTADIENE-STYRENE (ABS) PIPE

Four-inch (4") and six-inch (6") ABS gravity sewer pipe and fittings shall conform to ASTM Designation: D 2680.

Joints shall be solvent cemented in accordance with ASTM D2235. All service connections shall be installed with "Tee" or "Wye" fittings. Saddles are not approved. When the sewer main is of a material other than ABS, the connection joint near the sewer main shall be made with a FERNCO flexible adapter; or an approved equivalent product as approved by the Agency.

50-25 DUCTILE IRON PIPE (DIP), AND CAST IRON AND DUCTILE IRON FITTINGS

50-25.01 All Pipe Except Sanitary Sewers

Ductile iron pipe shall conform to ANSI A21.51 (AWWA C151) for a minimum working pressure of one hundred fifty (150) psi unless otherwise specified. Ductile iron casting shall conform to and be tested in accordance with ASTM Designation: A 536. Casting grade for pipe shall be 60-42-10. Laying length shall be the manufacturer's standard length, normally eighteen feet (18'). Shorter lengths may be used for closures and proper location of special sections.

The interior surface of all ductile iron pipe shall be cement-mortar lined and seal coated in conformance with AWWA C104 and the exterior surface shall have a bituminous coating of either coal tar or asphalt base, approximately 1 mil thick or as directed by the Agency or specified in the Special Provisions.

For gravity sanitary sewers, coat interior of ductile iron pipe with 40 mil (minimum) of two-component polyisocyanate, polyol-cured urethane coating equivalent to Corropipe II manufactured by Madison Chemical Industries. Wrap ductile iron pipe with two wraps of 8-mil HDPE wrapping sleeve. Secure sleeve with 3 wraps of 10 mil HDPE tape, overlapping each wrap one-half tape width.

Fittings shall have push-on, mechanical joints or flanged ends. Four-inch (4") through twelve-inch (12") fittings shall be ductile iron, fittings larger than twelve inches (12") shall be cast iron or ductile iron. All fittings shall conform to ANSI 21.10 (AWWA C110), ANSI 21.11 (AWWA C111), or AWWA C153 designed for a working pressure of two hundred fifty (250) or three hundred fifty (350) pounds per square inch (psi). Coating and lining requirements shall be the same as specified for the pipe.

Joints shall be push-on or mechanical type and shall conform to ANSI 21.11 (AWWA C111) with rubber gaskets unless otherwise specified. Gasket lubricant shall be minimum required plus ten percent (10%).

50-25.02 Sanitary Sewers

The pipe and gaskets shall be from the same manufacturer.

All damaged pipe shall be removed, field repairs will not be permitted.

All materials and craftsmanship shall comply with AWWA M41.

The ductile iron pipe and ductile iron fittings shall be polyethylene encased per ANSI/AWWA C105/A21.5 with one layer of 8-mil linear low-density polyethylene film. Installation of the polyethylene wrap and factory-marking of the film shall be per ANSI/AWWA C105/A21.5., method C. Wrap the DIP with two wraps of 8-mil HDPE wrapping sleeve. Secure sleeve with 3 wraps of 10 mil HDPE tape, overlapping each wrap one-half tape width

Install locating wire and test stations per Standard Drawings 8-4A and 8-4B. Provide heavy gauge, yellow plastic warning tape a minimum of six (6) inches wide with printed warning "Sewer Force Main" on tape. Tape shall be located where shown on the Plans. Warning tape shall be ITT Blackburn, Type YT or RT, Griffolyn Co, Terra Tape, or approved equal, and shall be placed 18" to 24" above crown of pipe.

50-25.02.A Pipe

Ductile iron pipe for gravity sewers shall be bell and spigot, conform to ANSI A21.51 (AWWA C151) and shall have a minimum thickness class of 52. Pipe class shall be per Table 5, per ANSI/AWWA C151/A21.51 for the project depth of bury and the laying condition specified. Ductile iron pipe for force main sewers shall conform to ANSI/AWWA C151/A21.51 for a minimum rated working pressure of two hundred (200) psi. Pipe class shall be per Table 5, per ANSI/AWWA C151/A21.51 for the project depth of bury and the laying condition specified.

Each section of pipe shall be clearly marked with the nominal pipe size, class, weight, and casting period. The manufacturer's mark, the year the pipe was produced, and the lettering "DI" or "DUCTILE" shall be cast or stamped on the pipe.

The interior of the pipe shall be lined with Protecto 401 from the bell gasket seat to within six (6) inches of the spigot end. Refer to the Protecto 401 supplement below. The Protecto 401 lining shall have a minimum thickness of 6 mils.

The exterior shall be coated with a bituminous material All ductile iron pipe and ductile iron fittings shall be asphaltic coated at the factory, approximately 1 mil, per ANSI/AWWA C151/A21.51, ANSI/AWWA C110/A21.10, and ANSI/AWWA C153/A21/53.

Non-buried pipe and piping in wet wells shall be either coated with a ceramic epoxy as specified above or as prescribed on the Drawings. An optional coating system for piping within vaults (excluding wet well) may consist of a field coating over bare or standard coated product with 10 mils minimum DFT of a 100% solids epoxy as approved by Agency. Piping in wet well shall be coated with ceramic epoxy as stated above.

50-25.02.B Sanitary Sewer Joints/Fittings

All joints for ductile iron pipe and ductile iron fittings shall conform to ANSI/AWWA C111/A21.11 with standard SBR gaskets unless specified otherwise. Restrained joints for ductile iron pipe and ductile iron fittings shall be externally restrained mechanical joints (such as EBBA Megalug, Sigma One-Lok, etc), manufacturer's push-on restrained joints (such as American FlexRing, American Field FlexRing, etc), or mechanical rodding. All restrained joints shall have a minimum rated working pressure of two hundred fifty (250) psi. Restrained joint design shall use the Ductile Iron Pipe Research Association (DIPRA) method. The approved restrained joints shall have been tested to withstand the thrust of a blind-end assembly at the rated working pressure of either the pipeline or the fitting on which the restrained joint is used with not less than a 2.0 safety factor. "Wedging" gaskets, such as American FastGrip, will not be permitted.

Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53. Fittings shall have push-on, push-on restrained, mechanical joint, or flanged ends. Ductile iron fittings shall have a minimum rated working pressure of two hundred fifty (250) psi.

Factory-produced welded-on outlets, both lateral and tangential, shall be allowed in lieu of tee and wye fittings. Welded-on outlets shall be fabricated by the pipe manufacturer at the same facility where the pipe is produced. The pipe manufacturer shall have a minimum of five years experience in the fabrication and testing of outlets of similar size and configuration.

50-25.02.C Protecto 401 supplemental specification:

The Protecto 401 material shall be an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the test results:

- A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.

- An abrasion resistance of no more than 3 mils (.075mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.
- The following tests must be run on coupons from factory lined ductile iron pipe:
  ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
  ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5mm undercutting after 30 days.
  Immersion Testing rated using ASTM D-714-87.
  20% Sulfuric Acid - No effect after two years.
  140°F 25% Sodium Hydroxide - No effect after two years.
  160°F Distilled Water - No effect after two years.
  120°F Tap Water (scribed panel) - 0.0 undercutting after two years with no effect.

50-25.02.C.(1) Surface Preparation

Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance which can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be reblasted.

All ductile pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. Because removal of old linings may not be possible, the intent of this specification is that the entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to the application of the specified lining material and no coating shall have been applied to the first six inches of the exterior of the spigot ends.

50-25.02.C.(2) Application

The lining shall be applied by a competent firm with a successful history of applying Protecto 401 or similar linings to the interior of ductile iron pipe and fittings.

After the surface preparation and within 8 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness of Protecto 401. No lining shall take place when the substrate or ambient temperature is below 40 degrees Fahrenheit. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

The gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Protecto Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely recoatable with itself without roughening of the surface.

50-25.02.C.(3) Washing

The use of high pressure washing to clean the inside diameter of Protecto 401 Ceramic Epoxy™ lined ductile iron pipe and/or fittings could possibly result in damage to the Protecto

401 Ceramic Epoxy™ lining. The aggressiveness of the pressure washing is dependent on water pressure, travel speed, water jets, water jet angle to the lining, distance of the water jets from the lining, diameter of the pipe, shape of cleaning heads or other apparatus contacting the pipe lining, material of which the cleaning heads and other apparatus are made, etc. Any attempt to do so is at the sole risk of the pressure cleaning operator.

50-26 POLYVINYL CHLORIDE (PVC) PIPE FOR SEWERS AND DRAINAGE

50-26.01 PVC Gravity Sanitary Sewers

All PVC pipe, fittings, couplings, and joints shall conform to the following except as otherwise modified by the Plans or the Specifications. Pipe sizes 4 through 15 inches shall comply with ASTM D 3034 and shall have a minimum wall thickness of SDR 26. Pipe sizes eighteen through 30 inches shall comply with ASTM F 679 and shall have a minimum wall thickness of "T-1" only.

The pipe manufacturer shall clearly mark all pipe, fittings, and couplings at intervals not to exceed 5 feet as follows:

- Nominal pipe diameter
- PVC Cell classification
- Company, plant, shift, ASTM, SDR, and date designation
- Service designation or legend.

For fittings and couplings, the SDR designation is not required.

Pipe shall be made of PVC plastic having a cell classification of 12454 or 13364, as defined in ASTM D 1784. The fittings shall be made of PVC plastic having a cell classification of 12454, or 13343. PVC compounds of other cell classifications shall be in conformance with Greenbook 207-17.5. Additives and fillers, including but not limited to stabilizers, antioxidants, lubricants, colorants, etc., shall not exceed 10 parts by weight per 100 of PVC resin in the compound.

Pipe, fittings, and couplings shall meet the requirements of the section titled "Requirements" of ASTM D 3033, D 3034, or F 679 ("T-1" wall only). During production of the pipe, the manufacturer shall perform the specified tests for each pipe marking. A certification by the manufacturer indicating compliance with specification requirements shall be delivered with the pipe.

Installed pipe shall be tested to ensure that vertical deflections for plastic pipe do not exceed the maximum allowable deflection. Maximum allowable deflections shall be governed by the mandrel requirements stated herein and shall nominally be 3 percent of the maximum average ID.

The maximum average ID shall be equal to the average OD per applicable ASTM Standard minus two minimum wall thicknesses per applicable ASTM Standards. Manufacturing and other tolerances shall be considered for determining the maximum allowable deflections.

Deflection tests shall be performed not sooner than 30 days after completion of placement and densification of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

For all pipes 24 inch ID or smaller, a mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. Prior to use, the mandrel shall be certified by the Agency. Use of an uncertified mandrel or a mandrel altered or modified after certification will invalidate the test. If the mandrel fails to pass, the pipe will be deemed to be over deflected.

Unless otherwise permitted by the Agency, any over deflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed from the work site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the work site, and replaced with new pipe.

The mandrel shall be a rigid, nonadjustable, odd-numbered leg (9 legs minimum) mandrel having an effective length not less than its nominal diameter and shall have a minimum diameter at any point along the full length as follows:

Pipe Material	Nominal Size (inches)	Minimum Mandrel Diameter (inches)
ASTM D 3034 SDR 26	6	5.503
	8	7.366
	10	9.207
	12	10.961
	15	13.559
ASTM F 679 (T-1 Wall)	18	16.924
	21	19.952
	24	22.446
	27	25.297
	30	28.502

PVC gravity sewer pipe and fittings shall be SDR 26 with elastomeric gasket joints providing a watertight seal. Minimum pipe stiffness at maximum allowable deflection shall be one hundred fifteen pounds per square inch (115 psi) according to ASTM Designation: D 2412.

All joints shall be integral wall bell and spigot end. All service connections shall be installed with "Tee" or "Wye" fittings, gaskets "Tee" saddles with stainless steel bands, or other approved tapping devices. Solvent welded "Wye" saddles are not approved.

All rubber rings shall conform to ASTM Designation: F679.

50-26.02 Small PVC Pressure Sanitary Sewers

PVC pressure sanitary sewer and drainage pipe, four-inch (4”) through twelve-inch (12”) diameter sizes, shall have a maximum dimension ratio (DR) of 18 (minimum pressure Class 200), unless otherwise specified, and shall conform to AWWA Standard C900. Outside diameter shall be manufactured to cast iron pipe (CIP) equivalents. Pipe shall be furnished in minimum standard lengths of twenty feet (20’).

50-26.03 Large PVC Pressure Sanitary Sewers

PVC pressure sanitary sewer and drainage pipe fourteen-inch (14”) through forty-eight inch (48”) diameter shall have a maximum dimension ratio (DR) of 26 (minimum pressure Class 200), unless otherwise specified, and shall conform to AWWA Standard C905. Outside diameter (OD) pipe dimensions shall be manufactured to cast iron pipe equivalents. Pipe shall be furnished in minimum standard lengths of twenty feet (20’).

Polyvinyl chloride pipe shall have integral wall-thickened bell ends designed for joint assembly using elastomeric gasket seals. The minimum wall thickness of the integral wall-thickened bell, at any point between the ring groove and the pipe barrel, shall conform to the DR requirements for the pipe barrel. The minimum wall thickness in the ring-groove and bell-entry sections shall equal or exceed the minimum wall thickness of the pipe barrel. The elastomeric gasket seals shall conform to ASTM Designation: F679.

The pipe shall have a pipe stop indicated on the barrel that will accurately position the pipe end within the joint. The pipe in place shall permit thermal expansion and contraction of the pipe ends.

50-26.04 PVC Pipe for Drainage

Polyvinyl Chloride Pipe for drainage shall conform to one of the following Standards:

Diameter (inches)	Standard Designation
12 – 36	ASTM D2241 SDR 32.
12 – 15	ASTM D3034 SDR 35
18 – 48 (Solid Wall)	ASTM F679
12 – 36 (Profile Wall)	ASTM F949
18 – 60 (Profile Wall)	ASTM F1803
12	AWWA C900 DR 25
14 - 48	AWWA C905 DR 25
12 - 24	AWWA C909

Substitution (at no extra cost to Agency) of a thicker walled pipe (lower SDR number) is acceptable.

Joints of PVC pipe shall consist of either an elastomeric gasket coupling or an integral bell and spigot with an elastomeric gasket. The assembly of joints shall be in accordance with the pipe manufacturer's recommendations and the requirements of ASTM Designation: D 3212. The quality of material and installation of all PVC pipe shall meet or exceed the requirements of Section 38-10, "Testing of Pipe", of these Specifications.

Use of PVC pipe downstream of the last manhole or junction structure to an open channel, detention facility or a daylight condition is not allowed.

50-27 CORRUGATED STEEL PIPE (CSP)

Corrugated steel pipe shall conform to the material and fabrication methods of Section 66, "Corrugated Metal Pipe", of the State Specifications, except as modified in these Specifications. Corrugated steel pipe shall only be used for driveway culverts and when specified in the Special Provisions. CSP may not be used for mainline drainage facilities. All corrugated steel pipe shall be fabricated with helical corrugations and with a continuous lock or weld seam extending from end to end of each length of pipe. Steel shall be zinc coated unless otherwise specified. Helically corrugated steel pipe shall be fabricated using corrugation profiles as shown in the following table:

TABLE 50-3
CORRUGATION PROFILE

Diameter (Inches)	Normal Pitch (Inches)	Maximum Pitch (Inches)	Minimum Depth (Inches)
8 and 10	1-1/2	1-7/8	1/4
12 through 96	2-2/3	2-3/4	1/2
48 through 120	3	3-1/4	1

Note: The corrugation profile of 2-2/3" x 1/2" shall be used for all pipes from twelve-inch (12") through ninety-six-inch (96") diameter, unless otherwise shown on or specified in the Contract.

Lock or welded seams shall develop the full strength of the pipe in accordance with the herein referenced Specifications.

Pipe that has been patched will be rejected.

The pipe shall have a minimum maintenance-free service life of fifty (50) years in accordance with the methods specified in Sections 854.3 and 854.4 of the latest version of the California Department of Transportation Highway Design Manual.

Corrugated steel products shall be shipped, handled, and placed in such a manner as to prevent scaling, bruising, or breaking of the galvanized surface or protective coating.

Couplings for corrugated steel pipe shall be of durable gasket design. Couplings shall consist of galvanized steel coupling bands fitted with gaskets fabricated from neoprene or butyl rubber or other durable resilient material approved by the Agency, and assembled in such a manner as to form a sealed joint. The Agency may require that the coupling design be submitted for approval prior to placing, and may require supporting data showing that the coupling is tight and durable. Heat-shrinkable plastic couplings will not be permitted.

Corrugated steel pipe fittings shall be constructed of the thickness of steel shown on the Plans.

The fittings shall conform to the details shown on the Plans or Standard Drawings.

Mitered joints shall be welded from the inside where practicable. Welded joints shall be as smooth and even as practicable. Welded joints shall be repaired according to Section 66-3.05, "Damaged Galvanizing", of the State Specifications.

All fabrication shall be done in accordance with generally accepted practice for good workmanship. The Contractor shall notify the Agency at least forty-eight (48) hours before delivery of the fittings so the Agency may inspect the fittings at the fabrication plant.

Diameter of fittings depends on the pipe option selected by the Contractor. Upstream diameter of fittings shall match upstream pipe diameter; downstream diameter of fittings shall match downstream pipe diameter.

If the size of the corrugated pipe fitting is too large to conveniently fabricate or transport in one (1) piece, the fitting may be fabricated in two (2) or more parts which will then be jointed at the site with couplings. The joint shall be located sufficiently distant from a welded joint so that there is no interference between the coupling and the welded joint.

50-28 RIBBED STEEL PIPE (RSP)

Ribbed steel pipe shall meet the requirements for corrugated steel pipe in Section 66, "Corrugated Metal Pipe", of the State Specifications, except as modified in these Specifications. Ribbed steel pipe shall only be used for driveway culverts and when specified in the Special Provisions. RSP may not be used for mainline drainage facilities. . Steel shall be zinc coated

unless otherwise specified. Ribbed steel pipe shall be fabricated to one of the following configurations:

a. The pipe shall be fabricated to meet the requirements for Type IR pipe as specified in ASTM Designation: A 760, Sections 4, 7, 8, and 10; or
b. The pipe shall consist of pipe with 3/4" x 3/4" inside dimension, outward projecting reinforcing ribs located on approximately 7-1/2" centers. These ribs shall be located symmetrically between lockseams, which shall be on approximately 22-1/2" centers. All ribs shall be helical and continuous.

Ribbed steel pipe shall be fabricated with a continuous helical lock seam in accordance with Section 66, “Corrugated Metal Pipe”, of the State Specifications. Lock seams shall develop the full strength of the pipe.

The pipe shall be furnished with re-rolled ends to produce a profile for connecting with the approved coupling band.

Any pipe that has been damaged during fabrication, handling, or construction shall be rejected or repaired to the satisfaction of the Agency.

Lateral field connections between metal pipes shall be welded and any galvanizing damaged by welding shall be repaired according to Section 66, “Corrugated Metal Pipe”, of the State Specifications.

The pipe shall have a minimum maintenance-free service life of fifty (50) years in accordance with the methods specified in Sections 854.3 and 854.4 of the latest version of the California Department of Transportation Highway Design Manual.

Ribbed steel pipe shall be shipped, handled, and laid in such a manner as to prevent bruising, scaling or breaking of the galvanized surface or protective coating.

Coupling bands for ribbed steel pipe shall be manufactured from 0.064 inch thick galvanized steel conforming to Section 66, “Corrugated Metal Pipe”, of the State Specifications. The coupling bands shall be either a hat shaped band, winged band, annular band, or other approved design and shall be fitted with gaskets fabricated from neoprene or butyl rubber or other durable, resilient material approved by the Agency, and assembled in such a manner as to form a sealed joint.

Hat shaped band and winged band couplers shall conform to the following table:

TABLE 50-4
BAND COUPLER/RIBBED STEEL PIPE
(Dimensions in Inches)

Pipe Size	Band Type	Band Minimum Thickness	Flange Height	Band Width	Bolt Diameter
24 - 36	Hat	0.064	5/8	2-3/4	1/2
42 - 90	Winged	0.064	5/8	7-1/2	1/2* *(2 required)

Ribbed steel pipe fittings shall conform to the requirements for corrugated steel pipe fittings specified in Section 50-27, “Corrugated Steel Pipe (CSP)”, in this Section of these Specifications, except material shall be ribbed steel.

50-29 CORRUGATED ALUMINUM PIPE (CAP)

Corrugated aluminum pipe shall conform to the material and fabrication methods of AASHTO Designation M196 and as modified herein. Corrugated aluminum pipe shall only be used when for driveway culverts and when specified in the Special Provisions. CAP may not be used for mainline drainage facilities. . All corrugated aluminum pipe shall be fabricated with helical corrugations and with a continuous lock seam extending from end to end of each length of pipe.

Helically corrugated aluminum pipe shall be fabricated using corrugation profiles as shown in the following table:

TABLE 50-5

CORRUGATION PROFILE

Diameter (Inches)	Normal Pitch (Inches)	Maximum Pitch (Inches)	Minimum Depth (Inches)
8 and 10	1-1/2	1-7/8	1/4
12 through 96	2-2/3	2-3/4	1/2
48 through 120	3	3-1/4	1

Note: The corrugation profile of 2-2/3" x 1/2" shall be used for all pipes from twelve-inch (12”) through ninety-six-inch (96”) diameter, unless otherwise shown on or specified in the Contract.

Couplings for corrugated aluminum pipe shall be of a durable, tight design. Couplings shall consist of aluminum coupling bands fitted with gaskets fabricated from neoprene or butyl rubber, or other durable resilient material approved by the Agency and assembled to form a tight joint. The Agency may require that the coupling design be submitted for approval prior to placing, and may require the supporting data showing that the coupling is tight and durable. Heat-shrinkable plastic couplings will not be permitted.

Corrugated aluminum pipe fittings shall be constructed of the gauge aluminum indicated on the Plans.

The fittings shall conform to the details shown on the Plans or Standard Drawings.

All fabrication shall be done in accordance with generally accepted practice for good workmanship. The Contractor shall notify the Agency at least forty-eight (48) hours before delivery of the fittings so that the Agency may inspect the fittings at the fabrication plant.

Diameter of the fittings will depend on the pipe option selected by the Contractor. Upstream diameter of the fittings shall match upstream pipe diameter; downstream diameter of fittings shall match downstream pipe diameter.

If the size of the corrugated pipe fitting is too large to conveniently fabricate or transport in one piece, the fitting may be fabricated in two (2) or more parts, which will then be jointed at the site with couplings. The joint shall be located sufficiently distant from a welded joint so that there is no interference between the coupling and the welded joint.

50-30 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

High Density Polyethylene Pipe (HDPE) shall conform to AASHTO M294 or MP7-97 Type S or Type D with inside diameters of twelve inches (12”) to sixty inches (60”). Pipe joints shall be bell and spigot or welded type, certified capable of watertight performance, with O-ring gaskets meeting ASTM Designation: F 477. High Density Polyethylene Pipe (HDPE) shall only be used for sanitary sewer force mains. Pipe joints shall be the welded type. The assembly of joints

shall be in accordance with the pipe manufacturer's recommendations and the requirements of ASTM Designation: D 3212. The quality of the material and installation shall meet or exceed the requirements of Section 38-10, "Testing of Pipe", of these Specifications. Pipe dimensions are nominal inside diameters. The average inside diameter shall not vary more than the following:

Pipe Diameter	**Maximum**
12" through 18"	1/4 inch
21" through 24"	3/8 inch
Over 24"	1/2 inch

The HDPE compounds shall conform to the following cell classifications as provided in ASTM Designation: D 3350:

Property	**Cell Classification**
Density	3
Melt Index	2 [(a)], 3 or 4
Flexural Modulus	4, 5 or 6
Tensile Strength	4, 5 or 6
Environmental Stress Crack Resistance	1, 2 or 3
Hydrostatic Design Basis	0, 1, 2, 3 or 4
Ultraviolet-Stabilizer	C [(b)]

[(a)] The Melt Index for Cell Classification 2 material used to manufacture pipe shall not be greater than 0.6. Rotationally molded couplings and end fittings may be produced from material compounds having a Melt Index Cell Classification of 1.

[(b)] HDPE resin shall contain not less than two percent plus or minus one-half percent (2% $\pm$ 1/2%) carbon black ultraviolet stabilizer.

Wall thickness of Type S corrugated polyethylene pipe shall be the thickness of the inner liner measured between corrugation valleys. The wall thickness of the polyethylene pipe, measured as specified above, shall equal or exceed the minimum wall thickness values in Table 50-6.

The pipe stiffness shall be determined in accordance with ASTM Designation: D 2412 at five percent (5%) deflection. Average pipe stiffness shall be determined for each manufactured run from three (3) test specimens. The length of test specimens shall be one pipe diameter or a maximum of thirty-six inches (36”), whichever is less. The average pipe stiffness shall equal or exceed the minimum pipe stiffness value for each size of HDPE pipe listed in Table 50-6 below.

The pipe unit weight for corrugated HDPE shall be computed as the average weight per foot of length determined from three (3) test specimens, taken from each manufactured run. Each test specimen for pipes twenty-four inches (24”) in diameter and less shall be a minimum length of two (2) pipe diameters. Test specimens for pipes larger than twenty-four inches (24”) in diameter shall be one (1) diameter or a maximum of thirty-six inches (36”), whichever is less. The weight of pipe specimens shall be determined with any suitable weighing device accurate to 0.10 pounds. The pipe unit weight for each size of polyethylene pipe shall equal or exceed the minimum unit weight value for each size of plastic pipe listed in Table 50-6.

TABLE 50-6 HDPE PIPE			
Nominal Diameter (inches)	**Minimum Wall Thickness (inches)**	**Minimum Pipe Stiffness (PSI)**	**Minimum Unit Weight (lbs. per linear foot)**
12	0.035	50	2.7
15	0.040	42	4.0
18	0.051	40	6.0
24	0.059	34	10.2
30	0.059	28	15.0
36	0.067	22	18.1
42	0.071	20	22.5
48	0.071	18	26.9
60	0.079	14	38.7

50-31 FIELD ASSEMBLED PLATE CULVERT

Field assembled plate culverts shall conform to Section 67, “Structural Metal Plate Pipe”, of the State Specifications. Field assembled plate culverts shall only be used for driveway culverts and when specified in the County of Sacramento Special Provisions. It may not be used for mainline drainage purposes.

50-32 REINFORCING STEEL

Reinforcing steel shall conform to Section 52, "Reinforcement”, of the State Specifications. Unless shown or specified in the Contract, bar reinforcement shall be deformed Grade 60 conforming to ASTM Designation: A 615.

Welded steel wire fabric for concrete reinforcement shall conform to ASTM Designation: A 185. The gauge of the wire and the dimensions of the mesh will be as shown or specified in the Contract.

50-33 CURB DOWEL AND TIE BARS

Dowel and tie bars for curbs shall be bar reinforcement conforming to Section 50-32, “Reinforcing Steel”, in this Section of these Specifications. At the Contractor's option, either Grade 60 or Grade 40 may be used.

50-34 SEWER AND STORM DRAIN CASTINGS

Castings for manhole frames and covers, drop inlet frames, gutter drain frames, open-back hoods, flushing branch frames and covers, or other purposes shall be tough gray iron, free from cracks, holes, swells, and cold sheets, and be of workmanlike finish. A "Certificate of Compliance" signed by an authorized agent of the manufacturer or supplier shall be required and shall be delivered to the Agency. Each certificate so furnished shall be accompanied by a copy of test results stating that the material has been sampled, tested, and inspected in accordance with the provisions of ASTM Designation: A 48, Gray Iron Castings Class 35B.

Test bars shall be cast and tested for the first lot of casting and every four (4) months thereafter. If production is interrupted for any period longer than four (4) months, test bars shall be cast and tested from the initial lot after production is resumed and every four (4) months thereafter. The first lot is defined as the first castings produced after January 1 every year. The tension tests specified shall be performed and the results certified by an independent testing laboratory.

The cast iron shall meet the requirements of ASTM Designation: A 48, Class 35. The seating faces of manhole covers and frames shall be machined as shown on the Standard Drawings or Plans to assure a tight fit and prevent rocking. The name of the manufacturer shall be cast on the manhole cover and frame. In addition, the day, month, and year of manufacture shall be cast on the frame and cover adjacent to the name of the manufacturer.

Twenty-four inch (24") diameter manhole frames and covers shall conform to Standard Drawings 9-9 and 9-11 for storm drain and Standard Drawings 7-11 through and 7-11A for sanitary sewer, unless otherwise shown on the Plans or specified in the Special Provisions.

Thirty-six inch (36") diameter manhole frames and covers shall conform to Standard Drawings 9-10 for storm drain and Standard Drawings 7-12, 7-12A, or 7-12B for sanitary sewers, unless otherwise shown on the Plans or in the Special Provisions.

The CSD-1 logo covers are required on all County Sanitation District 1 sewer lines.

When required by the Agency, proof-load tests shall be performed on manhole frames and covers in accordance with Section 3.3 of Federal Specification A-A-60005.

When locking type covers are specified for storm drain manholes, they shall be standard covers drilled and tapped on 120° centers and bolted to the frame with 7/16" x 1-1/4" brass hex head cap screws. When locking type covers are specified for sanitary sewer manholes, they shall conform to Standard Drawings 7-11A, 7-12, 7-12A or 7-12B, unless otherwise shown on the Plans or specified in the Special Provisions.

Exposed edges of castings shall be chamfered or rounded, and all exposed surfaces shall be smooth unless otherwise shown.

Manhole frames and covers shall be clearly marked with the country of origin as specified in the Trade of Tariff Act of 1984.

At the Contractor's option, drop inlet frames and open back hoods may be fabricated from steel plate as structural shapes in lieu of cast iron. If the Contractor elects to use fabricated steel drop inlet frames or open back hoods, the Contractor shall submit Working Drawings to the Agency for approval prior to fabrication. This submittal requirement does not apply to the drop inlet frame shown on Standard Drawing 9-14.

50-35 WATER PIPE

Water distribution system pipe shall be of the material type as shown or specified in the Contract and shall conform to the following requirements.

All pipes shall be the regular product of a firm which has successfully manufactured comparable pipe for at least three (3) years.

All pipe, valves, fittings, connections, and appurtenances shall conform to the provisions of these Specifications or as set forth in the Special Provisions. The Agency maintains a list of approved hydrants and water service material and fittings, and material used in the Work shall be limited to those listed. Alternative material items may be added to this list upon review and testing by the Agency.

All testing requirements of the ASTM and AWWA specifications shall be conducted by the pipe manufacturer or the manufacturer's representative within the State of California. The resulting tests shall be certified by an established reputable firm operating in the testing materials field. The certification shall accompany the delivery of the materials to the work site.

Joints shall be push-on or mechanical type and shall conform to ANSI 21.11 (AWWA C111) or ASTM D 3139 with elastomeric gaskets unless otherwise specified in the Contract. Gasket lubricant shall be minimum required plus ten percent (10%).

Ductile iron pipe shall conform to the requirements of Section 50-25, "Ductile Iron Pipe (DIP), and Cast Iron Pipe and Ductile Iron Fittings", in this Section of these Specifications, unless specified otherwise in the Contract. Ductile iron pipe shall be encased in 8-mil polyethylene in accordance with AWWA C105.

Polyvinyl Chloride (PVC) Pipe for water distribution systems shall conform to Section 50-26.02, "Small PVC Pressure Sanitary Sewers", in this Section of these Specifications, unless specified otherwise in the Contract.

50-36 WATER PIPE FITTINGS

Fittings shall have push-on, mechanical joint or flanged ends. Four-inch (4") through twelve-inch (12") fittings shall be ductile iron; fittings larger than twelve inches (12") shall be cast iron or ductile iron. All fittings shall conform to ANSI 21.4 (AWWA C104), ANSI 21.10 (AWWA C110), ANSI 21.11 (AWWA C111), or AWWA C153 designed for a working pressure of 250 or 350 psi. Coating and lining requirements shall be the same as specified for the pipe. Fittings shall be encased in 8-mil polyethylene in accordance with ANSI A21.5 (AWWA C105).

50-37 FIRE HYDRANTS

Fire hydrants shall conform to the requirements of Standard Drawings 8-2A and 8-2B. Fire hydrants shall be wet barrel type meeting the requirements of AWWA Standards C503. Wet barrel hydrants shall have a replaceable flanged spool "breakable" section to be installed two inches (2") above the ground. Use all solid bolts on "breakable" spool sections.

Delivery classification shall be two-hose and one-pumper nozzle, having "National Standard Fire Hose Coupling Screw Threads" conforming to NFPA 194 and ANSI B 26. Hose nozzles shall be for two and one-half inch (2-1/2") hose and pumper nozzle shall be for four and one-half inch (4-1/2") hose. The operating nuts and nozzle caps shall be National Standard pentagon dimensions, open left (counter clockwise).

Hydrants shall be furnished with two layers of factory-applied white coatings. Coatings shall be polyurethane epoxy, Alkyd, or epoxy base coat with Acrylic topcoat. Coating thickness shall be in accordance with coating manufacturer's requirements. Epoxy topcoats shall not be allowed.

Field touch-ups of damage to coating shall be done with coating sample provided by the manufacturer, and shall be the same type and color as the factory applied coating.

50-38 VALVES

Types of valves to be installed will be specified in the Contract. Unless otherwise shown on the Plans, valves provided shall open to the left (counter-clockwise), and be furnished with flange, mechanical or push-on joint. Valves shall bear the registered certification mark of the AWWA. All installed valves shall operate smoothly with no more than twenty-five (25) ft-lbs. torque. Valves operating at torques greater than twenty-five (25) ft-lbs. require approval by the Agency. Valves three inches (3") through eight inches (8") shall be gate valves. Ten-inch (10") valves may be gate or butterfly valves. Valves twelve inches (12") and larger shall be butterfly valves. All valves with an operating nut deeper than four feet (4') below grade shall be provided with an extension stem with operating nut and centering disk.

50-38.01 Gate Valves

Gate Valves shall be ductile iron body, with bronze stem nuts, glands and bushings, non-rising stem (NRS), working water pressure of two hundred (200) psi, conforming to the

requirements of AWWA Standard C509. Resilient-seated gate valves shall have resilient seats bonded or mechanically attached to the gate. The valve shall have a two-inch (2") square operating nut. Unless otherwise specified or shown on the Plans, valves shall be furnished with ends flanged or mechanical joint, using an elastomeric-gasket seal, and shall conform in dimensions and style to the pipe and/or fitting requirements. All gate valves shall be coated and lined with a two-part polyamide epoxy in accordance with AWWA Standard C550-90. Metal surfaces to be coated or lined shall be sandblasted in accordance with SSPC-SP10. Finished or bearing surfaces shall not be painted. Exposed machined surfaces shall be covered with slush grease or other readily removable protective coating before shipment.

50-38.02 Butterfly Valves

Butterfly valves shall meet AWWA Standard C504 Standard for Rubber-Seated Butterfly Valves, Class 150B, Short Body and the requirements of this Section. Butterfly valves shall be rated at one hundred fifty (150) psi working pressure and provide drip tight shut-off at one hundred fifty (150) psi of pressure. Butterfly valves shall have flanged ends that meet the requirements of AWWA C207 Class D flanges. All valves shall be provided with manual actuators, and shall open counter-clockwise.

Butterfly valves shall be constructed of the following materials:

Shaft—Type 304 Stainless Steel, ASTM A276
Disc—Cast Iron, ASTM A-126 Class B or ASTM A-48 Class 40
Disc Edge—Type 316 Stainless Steel
Rubber Seat—Neoprene or Buna-N
Body—Cast Iron, ASTM A126, Class B
Lining—Polyamide epoxy, minimum dry thickness six (6) mils, NSF approved for potable water

Valve body shall be a one-piece casting and shall include two integral B16.1 Class 125 flat-face flanges, two bearing trunnions and a pad for mounting bonnet with actuator. Raised marking plate shall be welded or riveted to the valve body showing the manufacturer's name or mark, the year of valve casting, the valve diameter and the AWWA class rating.

Valves seats shall be mechanically retained in or suitably cemented to the valve body so as to adhere without leakage under all conditions of service. Valve seats shall be Buna N rubber or Neoprene located on the valve body. For valve sizes twenty inches (20") and smaller, valves shall have bonded seats that must withstand a seventy (70) pound pull under ASTM Designation: D 429 test procedure. Bonded seats shall be located in recessed groove in the valve body. Seating edge shall be 316 stainless steel metal, ground smooth and polished. Seating edge shall be located on the valve disc.

Since the entire valve and actuator will be coated for corrosion resistance, a cast-iron spacer will be provided between the actuator and valve body, which will completely seal off their interconnecting shaft and the main valve shaft stuffing box, if present.

The valve shaft seals shall be self-adjusting, Chevron V-Type packing seals. Shaft seals shall be designed to allow replacement of the seals without having to remove the valve shaft.

Valve actuator shall be of the buried and submersible, permanently lubricated traveling nut type for valves twelve inches (12") and smaller terminating in a water works standard two inch (2") square operating nut marked for direction of opening. The manual actuator shall be designed to produce the required maximum torque at the operating nut of one hundred fifty (150) foot-pounds.

The valve actuator shall be fully greased-packed and have stops in the open/close position. The actuator shall have a mechanical stop that will withstand an input force of four hundred fifty (450) ft-lbs. The mechanism shall be inherently self-locking and shall hold the valve disc rigidly in position, free of flutter, for any degree of valve opening.

Machining and fitting of each part shall be held to a close tolerance to minimize backlash and lost motion. The mechanism shall be totally enclosed in a rugged lubricant tight and watertight case. The actuator shall have a bleed-off connection to protect against leakage past the shaft packing from entering the actuator housing. A gasketed removable cover plate shall be provided for maintenance purposes. All moving parts shall work completely submerged in a petroleum based grease. The case shall be filled with the proper lubricant and sealed before shipment.

The operating screw rod shall be high strength steel. All external bolts, and nuts on the actuator housing shall be cadmium plated high strength steel.

All butterfly valves shall be coated and lined with a two-part polyamide epoxy in accordance with AWWA Standard C550-90. Metal surfaces to be coated or lined shall be sandblasted in accordance with SSPC-SP10. Finished or bearing surfaces shall not be painted. Exposed machined surfaces shall be covered with slush grease or other readily removable protective coating before shipment.

50-38.03 Air Release/Vacuum Valves

Air valves shall be air release/vacuum type valves. The body and cover of the valve shall be cast iron unless otherwise approved by the Agency. All interior parts shall be stainless steel. Air release/vacuum valves shall be fully automatic and requiring no regular maintenance.

Air release/vacuum valves shall be capable of automatically releasing accumulated air from a water system while that system is in operation and under pressure. Also, the valve shall automatically allow air to reenter the pipeline when the internal pressure of the pipeline becomes negative due to draining of the pipeline, a power outage, pipeline break, etc.

Air release/vacuum valves shall be set plumb, and properly fitted to the high points on the water main. Air release/vacuum valves will be required at other locations on long stretches of pipe as shown on the plans. A vault with adequate venting and drainage shall be provided as required. The air release/vacuum valve and all appurtenances shall be of material listed and shall be installed as shown in Standard Details 8-14A or 8-14B.

50-39 VALVE BOXES, COVERS, DROP CAPS, AND SERVICE VALVE BOXES

Valve boxes for traffic service shall be of precast concrete, and shall have a cast iron face and a cast iron traffic lid. Valve boxes out of traffic areas shall be of precast concrete, with a cast iron lid. Covers shall be marked "WATER" or “SEWER” and shall have a loose fit in the box. Valve box risers shall be of PVC C900 (blue or white for potable water mains). Materials shall be provided and installed in accordance with Standard Drawing 8-5.

50-40 WATER SERVICE CONNECTION MATERIALS

50-40.01 General

Water services and meters shall conform to Standard Drawings 8-1 and 8-6A, 8-6B or 8-6C, depending on size and type of service. Residential water service lines shall be one inch (1”) in diameter unless otherwise specified.

Water service pipe material up to and including two inches (2”) in diameter shall be polyethylene pressure pipe meeting standards of AWWA C901, or copper water tubing, "Type K", soft tempered, meeting ASTM Designation: B 88 and AWWA C800. Polyethylene pipe shall be high density, ultra-high molecular weight and meet all applicable requirements, including testing, of Type III, Grade P33 or P34, Class C, designated as PE 3408 in ASTM D2239 and D1248. The polyethylene pipe shall have a minimum pressure rating of 200 psi, shall be homogeneous throughout and free of cracks, holes, foreign inclusions or other defects, shall be uniform in color, opacity, density and other physical properties. Polyethylene pipe shall be supplied with markings, at intervals of not more than five feet (5’), indicating nominal pipe size,

designation, pressure class, and manufacturer's name or trademark. Polyethylene shall be manufactured to iron pipe size (IPS).

Material for service lines three inches (3") in diameter or larger shall be shall be "Type K" copper or ductile iron. Material for service lines four inches (4") in diameter and larger shall be ductile iron or polyvinyl chloride (C900) meeting the applicable requirements of this Section 50. When the size of the tap exceeds the manufacturer's recommended limit for the size of the main, a special fitting shall be furnished. All underground copper services shall be protected from corrosion by wrapping or sleeving in eight (8) mil polyethylene.

The Agency maintains a listing of approved water service connection fittings that establish a standard of material quality. Fittings used shall be limited to those on the list. Alternative material may be added to this list upon review, test and acceptance by the Agency.

50-40.02 Water Meters and Meter Boxes

Water meters and appurtenances shall be installed in accordance with and of the material type and brand described in Standard Drawings 8-6A, 8-6B, or 8-6C, depending on the size of the water meter. The size and type of meter (positive displacement, turbine, or compound) shall be as described on the Plans.

50-41 JOINT MATERIALS FOR MANHOLES

Joint materials for precast reinforced concrete manhole sections shall conform to one of the following:

1. Mortar proportioned as one (1) cubic foot of portland cement to two (2) cubic feet of concrete sand. All mortar shall be used within thirty (30) minutes after the mixing water has been added.
2. Preformed plastic sealing compound shall conform to Type 1 - Rope Form, one and one-half inch (1-1/2") diameter, Federal Specification SS-S-210A.
3. Pre-Extruded concrete joint sealant per ASTM C-990 (RAM-NEK (K.T. Snyder), QUIKSEAL (Associated Concrete Products), or equal).
4. Rubber Gaskets, ASTM Designation: C 443

50-42 FENCING - CHAIN LINK

Chain link fence and gate materials shall conform to Section 80, "Fences", of the State Specifications, and these Specifications.

The carbon content of steel posts shall not exceed 0.82 percent.

Chain link fence fabric shall meet the requirements of zinc-coated steel chain link fence fabric, ASTM Designation: A 392 with Class 1 zinc coating. Unless otherwise shown on the Plans or specified in the Special Provisions, the fabric shall be a two-inch (2") mesh of nine (9) gauge wire, with a minimum breaking strength of one thousand two hundred ninety (1,290) pounds.

Vinyl coated chain link fence fabric, when shown on the Plans or specified in the Special Provisions, shall be black polyvinyl chloride coated steel link fabric and fittings. Polyvinyl chloride shall be applied by the thermal extrusion process.

Slats shall be as specified in the Special Provisions.

Base material for the manufacture of steel pipe used for posts, braces, rails and gate frames shall be commercial quality, or better, weldable steel, conforming to the specifications of ASTM Designation: A 120. At the option of the Contractor, and upon approval of the Agency; high-strength tubing fabricated by cold rolling and radio frequency welding from steel conforming to ASTM Designation: A 446, Grade D, may be used provided that the product of the yield strength and the section modules shall not be less than that of pipe conforming to ASTM Designation: A 120.

The base material for the manufacture of other steel sections used for posts and braces shall conform to ASTM Designation: A 572, Grade 45, with a minimum yield strength of forty thousand (40,000) pounds per square inch. All posts, braces, rails and gate frames shall be hot dipped galvanized in accordance with ASTM Designation: A 123, or ASTM Designation: A 525, Coating Designation G235 plus chromate conversion coating and 0.4 mils minimum thickness finish coat of clear, cross-linked acrylic.

Posts and rails for vinyl coated chain link fence shall be hot dipped galvanized and covered with two (2) coats of black metal paint applied over a metal primer.

Posts and rails shall be as specified in the following Table 50-7, unless otherwise shown or specified in the Contract. The Contractor shall have the option of section types to be used with the condition that the option exercised shall be uniform throughout the Work.

TABLE 50-7
CHAIN LINK FENCING – POSTS AND RAILS

Fence Member		Section Type	Dimension O.D.	Minimum Weight (Pounds Per Linear Foot)
Line Posts		C-Section	1.875"	2.15
		Sch. 40 pipe	2.375"	3.65
		Hi-Strength tubing	2.375"	3.12
Terminal, Corner & Latch Posts		Sch. 40 pipe'	2.875"	5.79
		Hi-Strength tubing	2.875"	4.64
Horizontal & Diagonal Braces, Top Rails		C-Section	1.825"	1.35
		Sch. 40 pipe	1.660"	2.27
		Hi-Strength tubing	1.660"	1.82
Gate Frames		Sch. 40 pipe	2.375"	3.65
		Hi-Strength tubing	2.375"	3.12
Gate Posts	Gate width up through 6’	Sch. 40 pipe	2.875"	5.79
	Gate width over 6’ through 12’	Sch. 40 pipe	4.500"	10.79
	Gate width over 12’ through 18’	Sch. 40 pipe	5.563"	14.62
	Gate width over 18’ to 24’ max	Sch. 40 pipe	6.625"	18.97

Fittings shall be hot-dip galvanized and shall be of malleable, cast iron, or pressed steel.

A Certificate of Compliance in accordance with the provisions of Section 6-1.07, "Certificates of Compliance”, of the State Specifications, shall be furnished to the Agency prior to the installation of any chain link fencing, gates or components.

50-43 LANDSCAPING MATERIALS

50-43.01 Topsoil

Topsoil shall be sandy loam of an even texture and shall pass through a one-half inch (1/2”) screen.

The topsoil shall be free from insects, animal life, or any toxic substances that may be detrimental to the growth of vegetation. Topsoil shall be capable of sustaining healthy plant life.

Soil sterilizers or weed killers shall permit growth of nursery stock planted three (3) weeks after application. Compounds containing cyanide or arsenic will not be allowed.

The Contractor shall provide a soils report to the Agency for approval prior to placement of topsoil. The report shall indicate conformance with these Specifications and the following:

SOIL ELEMENTS	ACCEPTABLE RANGE
pH	6.6 - 8.0
CEC (Cation Exchange Capacity)	12.00 - 35.00 meg/100g
SAR (Sodium Absorption Ratio)	less than 5.00
ESP (Exchangeable Sodium Percentage)	less than 5.00
EC (Electronic Conductivity)	Less than 2.0 mmho/cm
SP (Saturation Percentage)	less than 45%
Percentage Organic Matter	2% - 5%

Topsoil shall be delivered reasonably dry and in a workable condition.

Sandy loam of low fertility, even though mixed with leaf mold, manure, or other fertilizers, will not be acceptable unless prior approval has been granted by the Agency. The Contractor shall attach soil and plant Lab Report for the Agency's approval.

50-43.02 Commercial Fertilizer

Planting tablets for planting trees and shrubs shall be tightly compressed, non-burning, long lasting fertilizer, weighing between 5 and 12.5 grams of the following guaranteed analysis:

Nitrogen, water soluble	7.00%
Nitrogen, water insoluble	13.00%
Phosphoric Acid, available	10.00%
Potash, soluble	5.00%
Calcium combined	2.60%
Sulfur, combined	1.60%
Iron, expressed as Fe	0.35%

Quantity of planting tablets per plant shall be based on the manufacturer’s recommendation unless otherwise specified in the Special Provisions.

Fertilizer used for planting maintenance shall have a minimum guaranteed chemical analysis of twenty-one percent (21%) nitrogen, zero percent (0%) phosphoric acid, and zero percent (0%) soluble potash.

Fertilizer for turf installation, unless otherwise specified, shall have a minimum guaranteed chemical analysis of twenty-one percent (21%) nitrogen, ten percent (10%) phosphoric acid and ten percent (10%) soluble potash.

Fertilizer for tree, turf, and shrub plantings shall be in granular or pelleted form, shall conform to the standards of the Association of Official Agricultural Chemists, and shall provide the minimum percentage of available nutrients as specified in the Plans or Special Provisions. A liquid fertilizer may be used when specified in the Special Provisions.

Fertilizer used for erosion control work shall be in a form which will readily disperse into the slurry, and shall have a minimum guaranteed chemical analysis of six percent (6%) nitrogen, twenty percent (20%) phosphoric acid, and twenty percent (20%) soluble potash.

50-43.03 Soil Amendment

Soil amendment shall be a ground wood product such as bark or redwood fortified with nitrogen and treated to absorb water quickly, or a relatively dry organic compost derived from

sewage sludge. Soil amendment shall be friable and shall be free of weed seed, dust and other objectionable materials. Soil amendment shall pass a one-inch (1") sieve and shall comply with the requirements in the California Food and Agricultural Code.

50-43.04 Iron Sulfate

Iron sulfate shall be ferrous sulfate in pelleted or granular form containing not less than 18.5 percent iron expressed as metallic iron. Iron sulfate shall conform to the requirements of the California Food and Agricultural Code.

50-43.05 Straw

Straw shall be derived from wheat, rice or barley. The Contractor shall furnish to the Agency evidence that clearance has been obtained from the Sacramento County Agricultural Commissioner, as required by law, before straw obtained from outside the County is delivered to the site of the Work. Straw that has been used for stable bedding shall not be used.

50-43.06 Fiber

Fiber used for hydroseeding shall be produced from natural or recycled (pulp) fiber, such as wood chips or similar wood materials or from newsprint, chipboard, corrugated cardboard or a combination of these processed materials, and shall be free of synthetic or plastic materials. Fiber shall disperse uniformly into a slurry when mixed with water. Fiber shall be colored to contrast with the area on which the fiber is to be applied, and shall not stain concrete or painted surfaces. The slurry, when hydraulically applied to the ground, shall form an absorptive mat of mulch uniformly impregnated with seed and other ingredients. No materials that inhibit growth or germination shall be present in the mixture.

50-43.07 Mulch

Unless otherwise specified in the Special Provisions or shown on the Plans, mulch shall consist of wood chips, tree bark, or shredded bark, or any combination thereof, at the Contractor's option. Shredded redwood bark ("gorilla hair") shall not be used. Materials deemed highly flammable or a potential fire hazard by the Agency shall not be used.

Wood chips shall be manufactured from clean wood. The particle size of the chips shall be between one-half inch (1/2") and three inches (3") in length, and not less than three-eighths inch (3/8") in width and one-sixteenth inch (1/16") in thickness. At least 85 percent, by volume, of wood chips shall conform to the sizes specified.

Tree bark shall have a particle size between one-half inch (1/2") and one-and-one-half inches (1-1/2") and shall be free of salt and foreign materials such as clods, coarse objects, sticks, rocks, weeds or weed seeds.

Shredded bark shall be a mixture of shredded bark and wood; shall have a particle size between one-eighth inch (1/8") and one-and-one-half inches (1-1/2") in thickness and one inch (1") to eight inches (8") in length; and shall be free of salt and deleterious materials such as clods, coarse objects, and rocks. At least seventy-five percent (75%), by volume, of shredded bark shall conform to the sizes specified.

50-43.08 Planting Mix

Planting mix for backfilling planting holes shall consist of two (2) parts of soil excavated from the planting holes free of rocks over one-half inch (1/2") in diameter and one part soil amendment. The materials shall be thoroughly mixed.

50-43.09 Seed

Seed shall be furnished separately or in mixtures in standard sealed containers labeled with the seed name, lot number, net weight, percentage of purity, germination and hard seed, and percentage of maximum wildflower or grass seed content for each kind of seed furnished and, in the case of a mixture, the proportions of each kind of seed.

The Contractor shall furnish the Agency duplicate signed copies of a certificate of compliance by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. The testing shall be in conformance with test procedure standards of the Association of Official Seed Analysts and the provisions of the Agricultural Code of the State of California. The certificate of compliance shall include name and address of laboratory, date of test, lot number for each kind of seed, and results of tests as to name, percentages of purity and of germination, and percentage of wildflower or grass content for each kind of seed furnished and, in case of a mixture, the proportions of each kind of seed.

Seed with less than the specified purity or germination may be used under the following conditions:

a. The application rate for such seed shall be increased to compensate for the less than specified purity or germination.
b. Prior to using such seed, the Contractor shall submit to the Agency the purity and germination percentages, and the proposed increased application rate for such seed.
c. No such seed shall be used before the Agency has approved, in writing, the use of such seed and the increased application rate.
d. The additional seed required because of the increased application rate shall be furnished and applied at the Contractor's expense.

Seed specified without a purity or germination requirement shall be labeled to include the name, date (month and year) collected and name and address of the supplier. Said seed shall be, at the time of sowing, from the previous or current year's harvest.

Seeds that become wet, moldy, or otherwise damaged in transit or in storage will be subject to retest at the discretion of the Landscape Architect.

50-43.09.A Turf Seed

Turf seed or mixtures of seed are classified by type according to species or variety of grass. Types of seed or seed mixtures shall be as shown on the Plans or specified in the Special Provisions.

Lawn seed shall be true to species or variety for the type as specified and shall conform to the Agricultural Code of the State of California and the standards of the Association of Official Seed Analysts.

50-43.09.B Wildflower Seed for Hydroseeding

Wildflower seed type to be used for hydroseeding shall be as indicated in the Plans or Special Provisions.

Seed shall be labeled in accordance with the California Department of Agriculture, State Seed Law requirements, effective on the date of invitation for bids. The seed shall be supplied in unopened containers from a commercial seed dealer and may either be mixed or in separate containers for each lot. Tags shall be given to the Agency. Final acceptance will not be considered unless all tags are produced and verified.

50-43.10 Stabilizing Emulsion

Stabilizing emulsion (tackier or binder) shall be a concentrated liquid chemical that forms a plastic film upon drying and allows water and air to penetrate. The film shall be nonflammable and shall have an effective life of at least one year.

Stabilizing emulsion shall be nontoxic to plant or animal life and non-staining to concrete or painted surfaces. In the cured state, the stabilizing emulsion shall not be re-emulsifiable. Stabilizing emulsion shall be miscible with water at the time of mixing and application.

50-43.11 Lumber

Lumber shall be construction grade cedar, pressure treated Douglas fir, or heart redwood, rough cut, from sound timber. It shall be straight and free from loose or unsound knots, shakes

in excess of 1/3 the thickness of the lumber, splits longer than the thickness of the lumber, or other defect which would render the lumber unfit structurally for the purpose intended. Knots in all lumber shall be sound, tight, well spaced, and shall not exceed two inches (2") in size on any face. Sweep shall not exceed 0.08 foot in six feet (6').

50-43.12 Tree Stakes and Ties

Stakes for support of trees shall be lodge-pole pine, unless otherwise specified in the Special Provisions. Stakes for fifteen- (15) gallon trees or smaller shall be two-inch (2") diameter x ten feet (10') long. Stakes for twenty-four inch (24") box trees or larger shall be two-inch (2") diameter x twelve feet (12') long. The tree ties shall be black rubber cinch ties, unless otherwise specified in the Special Provisions.

50-43.13 Root Control Barrier

Root control barrier shall be an injection molded or extruded modular component made of high density polypropylene or polyethylene plastic. Panels shall have a minimum thickness of 0.080 inch (2.032 mm). Each panel shall have molded vertical ribs (four minimum) and locking strips or integral male/female sliding locks. Vertical root deflecting ribs or channels shall be one-half inch (1/2") high, perpendicular to the panel, and between six (6) and eight (8) inches apart. Panel shall be twenty-four inch x twenty-four inch (24" x 24") size unless otherwise specified in the Special Provisions.

50-43.14 Plants

Plants shall be of the variety and size shown on the Plans or specified in the Special Provisions and shall conform to the requirements of these Specifications.

Plants shall be vigorous, first class representations of the species and cultivars specified, and shall conform to State and local laws governing the sale and transportation of plant materials. Only plants of the size and type shown on the Plans or designated in these Specifications or the Special Provisions, and only plants with normal plant and root structures will be acceptable.

All plants shall be nursery grown in containers, unless otherwise shown on the Plans or designated in the Special Provisions, and shall have been grown in the specified containers for not less than six (6) months. They shall have straight, single trunks, unless otherwise specified on the Plans. No pruning shall be undertaken before planting. Plants specified as multi-trunk shall have at least three (3) main leaders from the base.

Any and all plants that have any encircling roots (not rootbound) shall have root balls lightly slashed on a minimum of three (3) sides to stop encircling root growth. Plants shall have well developed root systems and not be rootbound or show sunscald, injuries, abrasions or other objectionable disfigurements. Plants shall be free of disease, insects, pests, eggs, or larvae. Tree trunks shall be sturdy and well "hardened off". Plants not meeting these specifications shall be rejected.

Any plants delivered to the work site which are found to be not true to name or unsuitable in growth or conditions shall be removed from the site and replaced with acceptable plants. All plants shall be of the species, variety, size, age, and condition as specified herein or as shown on the Plans or described in the Special Provisions. Under no condition shall there by any substitution of plants or sizes for those listed on the Plans, except with the written consent of the Landscape Architect. In the event tags are not present, and/or tags and load slip do not match, Contractor shall provide written confirmation of species from the supplying nursery.

No plant shall be transported to the planting area that is not thoroughly wet throughout the root ball. Any plant that, in the opinion of the Agency, has a damaged root ball or is dry or in a wilted condition when delivered to the planting area will not be accepted, and shall be replaced by the Contractor at the Contractor's expense. Trucks used for transporting plants shall be equipped with covers to protect plants from windburn.

One plant of each bundle or lot shall be tagged with the name and size of the plant, in accordance with the standards of practice recommended by the American Association of Nurserymen.

All plant materials shall meet the specifications of Federal, State, and County laws requiring inspection for plant disease and insect infestations. Inspection certifications required by law shall accompany each shipment, invoice, or order for stock, and when such plants arrive at the site of the Work, the certificate of inspection shall be filed with the Agency.

Inspection of all plant material for acceptance shall be made at the project site at time of delivery. All plant material shall be approved by the Landscape Architect prior to installation. All rejected plant material shall be marked as such and removed from the project site immediately.

The Contractor shall notify the Agency at least two (2) days prior to the delivery of each shipment of plant materials. Plant materials shall be protected and maintained in good condition. Bare root and balled materials shall be watered regularly and placed in a cool area protected from sun and wind.

Plants shall be classified by type as to species, variety and genus and will be specified by scientific name conforming to the publication "Standard Plant Names" as adopted by the American Joint Committee on Horticultural Nomenclature. The plant materials to be planted will be shown on the Plans or specified in the Special Provisions.

50-43.14.A Turf

Grass sod shall be well established mown lawn grass turf and shall be free of weeds and any other harmful or deleterious matter.

At least eighty percent (80%) of the grass plants in the cut sod shall be composed of the species or varieties specified in the Special Provisions.

Grass sod shall be grown, inspected, and shipped in accordance with the provisions of the Agricultural Code of the State of California.

Sod shall be machine stripped or cut of a uniform soil thickness of one inch plus-or-minus one-quarter inch (1” ± 1/4”). The measurement for thickness shall exclude top growth and thatch and shall be determined at the time of cutting in the field.

Sod shall be rolled or folded prior to lifting. Handling of sod shall be done in a manner that will prevent tearing, breaking, drying, or any other damage.

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

50-43.14.B Trees

Trees are classified by type as to genus, species, and variety as well as common name. The tree varieties to be planted shall be as shown on the Plans or described in the Special Provisions.

Tree species shall meet minimum size requirements for caliper size of trunk and height of tree stock or they shall be rejected. Table 50-8 below indicates the height to caliper of trunk relationship. Trees shall be specified by container size in the Contract, and shall meet the minimum height and caliper of trunk indicated in the table. For shade trees of recognized slower growth, as identified by the Agency, the height and caliper shall be not less than two-thirds (2/3) the height and caliper indicated below:

TABLE 50-8 TREE CALIPER-HEIGHT RATIO		
Container Size (gallons)	**Caliper of Trunk (inches)**	**Average Height Range (feet)**
5	3/8 to 1/2	4 to 5
5	1/2 to 5/8	5 to 6
7	5/8 to 3/4	6 to 7
7	3/4 to 1	7 to 8
7	1 to 1-1/4	8 to 9
15	1-1/4 to 1-1/2	9 to 10
15	1-1/2 to 1-3/4	10 to 12
15	1-3/4 to 2	12 to 14

In size grading of container grown trees, caliper measurement shall take precedence over height measurement, unless otherwise specified in the Special Provisions.

Caliper measurement shall be taken five inches (5") above soil level. If the tree is budded or grafted to a root system, the measurement shall be taken two inches (2") above the bud or graft union.

Trees to be planted as street trees shall be free of branches for approximately the lower half of their height.

Trees shall have reasonably straight stems and shall be well branched and symmetrical in accordance with their natural habits of growth. The branch system shall be free from dead or dry wood or broken terminal growth.

If possible, container grown trees shall be capable of standing upright without staking and shall have been grown in the container sufficiently long for the fibrous roots to have developed so that the root mass will retain its shape and hold together when removed from the container.

Trees shall not be rootbound or show evidence of girdling or kinked root systems. Trees shall not exhibit co-dominant trunks or branching with included bark. Trees shall not be severely topped or headed. Trees shall not have surface roots larger than one-quarter-inch (¼") diameter. Trees shall not exhibit evidence of sunscald or pest infestation. Upon inspection, trees not meeting these requirements will be rejected.

The container shall be sufficiently rigid to protect the root mass during shipping.

At least one tree of each species or variety delivered to the work site shall be identified by scientific name and size on a legible waterproof label securely attached to the tree.

All trees shall be subject to inspection by the Agency at any time during the Project—at the place of growth, upon delivery, or during planting operations. However, such inspection shall not be construed as final acceptance or even conditional acceptance of such trees until completion of the Project.

The Contractor shall establish the necessary quality control and inspection practice to assure compliance with these specifications. The Contractor shall furnish a California Nursery Stock Certificate for each shipment of trees.

50-43.15 Water

Water shall be of such quality that it will promote germination of seeds and growth of plants.

50-43.16 Irrigation Pipe

Pipe and fittings for irrigation systems shall be as specified in these Specifications and the Special Provisions.

Unless otherwise shown on the Plans, risers and threaded nipples for irrigation systems shall be Schedule 80, PVC 1120 or PVC 1220, or PVC pipe conforming to the requirements of ASTM Designation: D 1785.

50-43.16.A Steel Pipe

For installation of backflow preventers, steel pipe and couplings and wrought iron couplings shall conform to AWWA standard C200 and the specifications of ASTM Designation: A 53, standard weight, galvanized, except that the weight of zinc coating shall be not less than ninety percent (90%) of the weight specified in said ASTM Designation. Fittings, except couplings, shall be galvanized malleable iron, banded and threaded, conforming to ANSI Standard: B16.3, 150 pound class.

Steel pipe below grade shall be wrapped with six (6) mil plastic tape.

50-43.16.B Plastic Pipe

Plastic pipe for irrigation systems will be shown on the Plans as main line and lateral line (non-pressure).

Solvent cement and primer for PVC plastic pipe and fittings shall be of commercial quality specifically manufactured for use with rigid PVC plastic pipe and fittings. The solvent cement and primer used shall be made by the same manufacturer. The color of the primer shall contrast with the color of the pipe and fittings.

The pipe shall be furnished in minimum standard lengths of twenty feet (20').

All plastic pipe shall be continuously and permanently marked with the following information—manufacturer's name, kind of pipe, material, size, NSF approved, and schedule or type.

The manufacturer shall also mark the date of extrusion on pipe. This dating shall be done in conjunction with records to be held by the manufacturer for two (2) years, covering quality control tests, raw material batch numbers, and any other information deemed necessary by the manufacturer.

50-43.16.B.(1) Main Line

Main line shall be PVC of the types and classifications shown or specified in the Contract. Main line shall be approved by the National Sanitation Foundation, and shall conform to the requirements of either ASTM Designation: D 2241 or D 2672, except that main line with a bell socket formed as an integral part of the pipe for use with rubber ring gaskets shall conform to the requirements of ASTM Designation: D 2241. The belled portion of said pipe for use with rubber ring gaskets shall conform to the requirements of ASTM Designation: D 3139 (except for the dimensional ratio), shall be formed to maintain uniformity in alignment and roundness and shall be free of irregularities and defects.

The wall thickness of the bell shall not be less than the specified minimum wall thickness of the pipe.

The wall thickness of the bell end of the pipe may exceed maximum allowable wall thickness of the pipe for a length not to exceed twenty-four inches (24") from the end of the pipe.

Main line and fittings on the pressure side of control valves that are two inches (2") or larger in diameter shall be either the rubber ring gasket type or the solvent cemented type, except that all pipe and fittings installed in conduits or sleeves shall be the solvent cemented type.

Threaded fittings and fittings to be solvent cemented to main line shall be injection molded PVC, Schedule 40. Fittings equipped with rubber ring gaskets for main line shall be either injection molded PVC plastic pipe fittings or machined pipestock fittings.

50-43.16.B.(2) Lateral Line

Lateral line shall be PVC of the type and classification shown on the Plans or specified in the Special Provisions. Lateral line shall be approved by the National Sanitation Foundation, and shall conform to the requirements of ASTM Designation: D 2241. PVC pipe shall be solvent weld, minimum Class 200, and shall be manufactured of Type 1, Grade I or II, 2000 psi design stress compound designated as PVC 1120 or 1220, and shall conform to ASTM Designation: D 1784 for rigid PVC compounds.

Fittings shall be molded fittings manufactured of the same material as the pipe and shall be suitable for either solvent weld or screwed connections. Solvent weld fittings shall be of a pressure rating equal to or greater than that of the pipe.

50-43.17 Subsurface Dripperline

Subsurface dripperline shall conform to Section 20-5.05A, “Subsurface Dripperline”, of these Specifications and the Special Provisions. The dripperline shall consist of one-half inch (1/2") low density linear polyethylene tubing, housing internal, pressure compensating, self-cleaning, integral drip emitters.

The dripperline emitter spacing and discharge rates shall be as specified on the Plans.

50-43.18 Irrigation Sleeving Conduit

Irrigation sleeving for irrigation line crossovers or control wire shall conform to Section 20—5.04B, “Irrigation Sleeving”, of these Specifications and the Special Provisions.

Conduit shall be Schedule 40 PVC pipe. Conduit shall extend a minimum of twelve inches (12”) beyond the back of all pavement.

50-43.19 Sprinklers and Emitters

Sprinklers and emitters shall be the type and model as noted on the Plans or as specified in the Special Provisions.

50-43.20 Automatic Irrigation Controllers

Automatic irrigation controllers shall be the type and model noted on the Plans or specified in the Special Provisions. Automatic irrigation controllers shall be fully automatic, with all solid state electronic components. The controller shall be rated for 117 volt, 60 cycle AC input and 26.5 volt, 2.2 amp output for continuous operation of 24 volt valves, with 14-day programming capability.

The controller shall have the following standard features: an electrical circuit to operate a master valve, a reset circuit breaker to protect the controller from damage due to excessive voltage surges and a master "on-off" switch for turning controller "off" during rainy weather while allowing day and hour clocks to continue operation.

Irrigation controllers shall be housed in pedestal or wall-mounted enclosures as specified in the Contract.

Irrigation controllers shall conform to NEC Class 2 requirements. The controller output shall be less than 110 volt-amps to qualify for direct burial of output wires.

The irrigation controller enclosure shall be constructed of stainless steel and shall be a minimum of thirty-six inches (36”) high and twenty-four inches (24”) wide and deep enough to house the components. Enclosure shall have a vented door and/or sides and shall be lockable. The enclosure shall be mounted on a concrete pad with a minimum dimension of thirty-six inches x thirty-six inches x six inches (36” x 36” x 6”).

50-43.21 Quick Coupling Valves

Quick coupling valves shall be of brass or bronze construction with one-inch (1”) IPS female pipe connections. The valve body shall be of two-piece construction, consisting of an upper and a lower piece body. The upper valve body shall be easily removable for replacement.

All quick coupling valves shall be marked with special "Do Not Drink" warnings. Quick coupling valves shall have a durable locking rubber or vinyl cover, yellow in color for potable systems and purple in color for non-potable or reclaimed water systems

All quick coupling valve keys shall be of the same manufacturer as the quick coupling valve, and shall be the proper size to fit the valves as specified. Valve key shall be of brass or bronze construction with a replaceable stainless steel lug.

50-43.22 Control Valves

Control valves shall be the electric remote control, battery-operated remote control or manual type straight or angle pattern globe valves, and shall be of glass filled nylon, plastic, brass, bronze, or cast iron construction as shown on the Plans or specified in the Special Provisions. All metal parts of glass filled nylon valves shall be stainless steel or brass. Valves shall be of the same size as the pipeline that said valves serve, unless otherwise shown on the Plans. Control valves shall be capable of withstanding a cold water working pressure of one hundred fifty (150) pounds per square inch.

Automatic valves shall have a manual flow control adjustment with shut-off provisions. The valves shall also have an external “bleed” to enable manual operation. Automatic actuation shall be by means of an encapsulated type solenoid with a minimum rating of 24 volts, 60 cycle and 2 to 5 watts.

50-43.23 Master Control Valve/Flow Sensor Assembly

Master Control Valve/Flow Sensor Assembly shall combine a turbine type (vertical impeller) water meter and a diaphragm actuated solenoid controlled valve mounted in a single globe style valve body. Master control valve shall be an electric normally open valve with a 24V solenoid. The main valve shall fully open and close drip tight in response to an electrical signal. The meter shall power a gear mechanism that activates a reed switch that transmits a pulse at a pre-determined amount of flow. Pulse transmitter shall be one pulse per ten (10) gallons through the master valve and flow sensor unit. The unit should include integral flow guides to eliminate the need for straight pipe allowances before and after the valve.

Maintenance operations on the valve and meter shall be feasible without removing the valve body from the line.

50-43.24 Valve Boxes

Valve boxes and valve box lids shall be precast portland cement concrete when installed in concrete or other paving. Valve boxes and valve box lids shall be reinforced plastic when installed in turf or planter areas. Concrete valve box lids shall be marked "IRRIGATION" in cast-in letters not less than one inch (1”) high.

Valve boxes for control valves shall be 17" x 11-3/4" x 12" depth (minimum size) with 3" x 4" knock outs and installed two inches (2”) above finished grade.

50-43.25 Backflow Preventers

Backflow preventers shall be reduced-pressure type as approved by the Sacramento County Environmental Health Division.

Backflow preventers shall have a bronze main valve body and relief valve body. Backflow preventers shall be factory-assembled and shall consist of two independently operating, center-guided, spring-loaded, “Y” pattern check valves, one hydraulically dependent differential relief valve, two (2) shut-off valves and four (4) test cocks. Pressure loss shall not exceed ten pounds per square inch (10 psi) at twenty (20) gpm.

Backflow preventers shall be the same size as the service line in which they are installed, unless otherwise shown on the Plans.

Protection blanket shall be provided for each device, and it shall be the appropriate size to fit the backflow prevention assembly specified. Fabric shall be a heavy-duty resin or vinyl coated 100% polyester plain weave. Fabric shall be water, mildew and flame resistant. Insulation shall

be a layer of Radiant Barrier Foil (BF) consisting of a layer of polyethylene bubbles bonded to and sandwiched between two industrial strength foil sheets with a minimum R-value of R-9. This material is impervious to moisture and is unsuitable for rodent nesting material. Blanket shall have a water repellent lining of nylon fabric to resist tearing from backflow parts. Blanket shall be machine stitched with metal grommet reinforcement for installation of an individual lock. Blanket shall be forest green in color and have a manufacturer's five-year warranty.

50-43.26 Concrete

Unless otherwise specified in the Special Provisions, concrete for irrigation facilities shall be Class “B” concrete as specified in Section 50-5, “Portland Cement Concrete”, in this Section of these Specifications. Hand mixing of the concrete will be permitted.

50-43.27 Filter Assembly Units

Filter assembly units shall be as specified in the Special Provisions.

50-43.28 IPS Flexible PVC Hose

IPS flexible PVC hose shall be nonrigid polyvinyl chloride (nonrigid PVC) hose conforming to the specifications of ASTM Designation: D 2287, Cell-type 66404006.

The hose shall provide leak-free, non-separating connections suitable for the purpose intended when connected to the fittings specified herein. Flexible hose shall be algae resistant.

Fittings for flexible hose shall be injection molded PVC, Schedule 40, conforming to the specifications of ASTM Designation: D 2466. Fittings shall be solvent cemented type.

Solvent cement and primer for flexible hose and fittings shall be of commercial quality as specified for use with rigid PVC pipe and plastic pipe fittings.

50-43.29 Gate Valves

Gate valves shall be either flanged, threaded or ring type, iron or bronze body, bronze trimmed valves with rising (internally threaded) or non-rising stem, and shall withstand a cold water working pressure of one hundred fifty (150) pounds per square inch (psi). Gate valves shall be of the same size as the pipeline that the valves serve, unless otherwise shown on the Plans.

Gate valves three inches (3”) and smaller shall be bronze or brass. Gate valves four inches (4”) and larger shall be cast iron.

Ball valves at control valve assemblies shall be plastic.

Valve boxes for gate valves shall be ten-inch (10") diameter with a bolt down lid and installed two inches (2”) above finished grade.

50-43.30 Air Vacuum Relief Valve

Air vacuum relief valve shall be non-corrosive plastic with one-half inch (1/2”) MPT threads. Maximum operating pressure of air vacuum relief valve shall be 140 psi. Valve shall eliminate negative pressure and vacuum within subsurface dripperline systems that may draw contaminants into the system.

50-43.31 Flush Valve Assembly

Flush valve shall be non-corrosive plastic with one-half inch (1/2”) MPT threads. Maximum operating pressure of flush valve at ends of dripperline shall be fifty-seven (57) pounds per square inch (psi). Valve shall flush approximately one (1) gallon per cycle. Valve shall reduce sediment build-up within the dripperline system.

50-43.32 Unions

Unions shall be brass or malleable iron. All unions shall withstand the working pressure range requirements of the pipes with which they are used.

50-43.33 Irrigation Control Wires

Control wire for automatic control valves shall be #10, #12, or #14 as necessary for operation, shall be UL rated for direct burial, and shall be underground feeder type identified as (UF). Control wire shall have 4/64 inch (56 mils) minimum thickness of TW grade polyvinyl chloride insulation. Control wire shall be able to withstand a crush test of five thousand (5000) psi. Common or neutral conductors shall be white. The control wires to the automatic control valves shall be red. The spare wires shall be yellow.

Splices for control wire shall be specifically designed to insure waterproof underground direct bury wire connection, and shall be UL listed "Water Resistant Wire Connector Rated 60c, 600v for PVC insulated copper wires". Each connector shall consist of a crimp sleeve, base socket, sealing plug, and inert sealer.

50-43.34 Pull Boxes

Pull boxes for irrigation control wiring shall be No. 5 or larger unless otherwise shown on the Plans, and shall conform to these Specifications.

Pull boxes shall be precast portland cement concrete boxes with concrete covers, unless otherwise noted.

Pull box covers for pull boxes used solely for irrigation control wiring shall be marked “IRRIGATION” or “IRRIGATION CONTROL” in cast-in letters. Cover markings shall be clearly defined and uniform in depth and may be placed parallel to either the long or the short sides of the cover. Marking letters shall be between one inch (1”) and three inches (3”) high.

50-43.35 Pressure Gauges

Pressure gauges shall be hermetically sealed, water tight, and dust proof. Gauge shall be a two-inch (2”) bottom-connected gauge with one-quarter-inch (¼”) brass standard pipe thread and shatterproof face. Gauge shall be rated for one hundred pounds per square inch (100 psi).

50-44 ENGINEERING FABRICS

Engineering fabrics shall conform to Section 88, “Engineering Fabrics”, of the State Specifications.

50-45 PAINT

Unless otherwise specified in the Special Provisions, paint shall conform to Section 91, “Paint”, of the State Specifications. Colors shall be as specified in the Contract.

50-46 LIQUID ASPHALT

Liquid asphalt shall conform to Section 93, “Liquid Asphalts”, of the State Specifications.

50-47 ASPHALTIC EMULSION

Asphaltic emulsion shall conform to Section 94, “Asphaltic Emulsions”, of the State Specifications and these Specifications.

Emulsified asphalt shall be Cationic type polymer modified grade PMCRS-2H.

The Contractor shall submit test results of the proposed emulsified asphalt, indicating compliance with these Specifications. Test results, including date of testing, of proposed emulsions and aggregate shall be submitted in writing to the Agency. Samples of the proposed emulsions and aggregate may also be requested by the Agency. The required tests shall conform to those specified in Section 94, “Asphaltic Emulsions”, of the State Specifications, and the following:

TEST	TEST METHOD	REQUIREMENT
Viscosity @ 122°F	AASHTO T-59	100-250 sec.
Demulsibility	AASHTO T-59	60% - 95%
Penetration @ 77°F (100g 5 sec)	AASHTO T-49	40-65
Ductility @ 77°F (5 cm/min.)	AASHTO T-51	60 cm/min.
Percent Residue	Cal Test 331	65% min.
Torsional Recovery	Cal Test 332	18% min.
Oil Distillate (by volume of emulsion)	AASHTO T-59	3% max.
Solid Polymer Content (by weight)	Cal Test 401	2.5%
Ring and Ball Softening Point	AASHTO T-53 1-2	125°F min.

The binder shall conform to the aggregate with a ten percent (10%) minimum film stripping as tested by California Test Method 302.

The laboratory used to develop the job mix formula and to perform quality control shall meet the requirements of ASTM Designation: D 3666. A certification signed by the manager of the laboratory stating that it meets these requirements shall be submitted to the Agency prior to the start of work.

At the option of the Contractor, polymer shall be Neoprene, Ultrapave, or SBR. The polymer shall be added to either the asphalt or the emulsion at their locations of manufacture. The temperature of the polymer modified asphaltic emulsion at the time of application shall be between 130°F and 180°F.

The Contractor shall maintain a quality control system that will provide reasonable assurance that all materials submitted for use conform to these Specifications. The Contractor shall perform two (2) random samples each day, to verify compliance with the operations quality control. Samples shall be taken from the spray bar of the distributor truck at mid-load. The tests shown above shall be performed on each sample taken. The Agency reserves the right to suspend Contractor activities and reject the material until it can be shown that the material is in compliance with these Specifications.

If a sample of asphaltic emulsion taken during a Working Day does not conform to these Specifications, the price paid per ton for that day's production of asphaltic emulsion will be subject to the penalties listed for the nonconformities in the following table:

TABLE 50-9

Nonconformity	Penalty
Viscosity is in excess of 75 seconds or less than 300 seconds.	5 percent deduction from the bid price per ton for emulsified asphalt
Torsional recovery exceeds 11 percent but is less than 18 percent.	5 percent deduction from the bid price per ton for emulsified asphalt
Torsional recovery is less than 11 percent.	10 percent deduction from the bid price per ton for emulsified asphalt

Test results shall be identified by the production date and time of sample and shall be submitted, in writing, to the Agency within two (2) Working Days of the sample date. The Agency reserves the right to witness the quality control testing performed by the testing lab and to test any material at any time during the course of the Work.

Each distributor truck shall be equipped, at all times, with the proper measuring stick and calibration card. On-site calibration of distributor trucks, for determining actual spread rate of asphaltic emulsion, shall be performed when directed by the Agency. The asphaltic emulsion shall be stored in heated circulation tanks at controlled temperatures, between 140°F and 180°F, for a period not to exceed seven (7) days. The temperatures of the asphaltic emulsion shall be between 130°F and 180°F at the time of application.

50-48 EPOXY

Epoxy shall conform to Section 95, “Epoxy”, of the State Specifications.

APPENDIX A
SAMPLE FORMS

AGREEMENT

Contract No.

THIS AGREEMENT made and entered into this day of , , between , a political subdivision of the State of California, hereinafter referred to as and , , hereinafter referred to as Contractor;

W I T N E S S E T H :

WHEREAS, the Governing Board of said heretofore caused plans and specifications for the work hereinafter mentioned to be prepared, and therefore did approve and adopt said plans and specifications; and

WHEREAS, the Governing Board of said did cause to be published for the time and in the manner required by law, a Notice inviting sealed bids for the performance of said work; and

WHEREAS, the Contractor, in response to such Notice, submitted to the Governing Board of said within the time specified in said Notice, and in the manner provided for therein, a sealed bid for the performance of the work specified in said plans and specifications, which said bid and proposal, and the other bids and proposals submitted in response to said Notice, the Governing Board of public opened and canvassed in the manner provided by law; and

WHEREAS, the Contractor was the lowest responsible bidder for the performance of said work, and said Governing Board of , as a result of the canvass of said bids, did determine and declare Contractor to be the lowest responsible bidder for said work and award to a contract therefor.

NOW, THEREFORE, in consideration of the promises herein, it is mutually agreed between the parties hereto as follows:

I. CONTRACT DOCUMENTS

The following documents are by this reference incorporated in and made a part of this Agreement: The Standard Construction Specifications adopted by the Sacramento County Board of Supervisors on by Resolution No. ; the Special Provisions; the contract drawings, all addenda; the Notice to Contractors; the Proposal; all required bonds; and all supplemental Agreements covering alterations, amendments, or extensions to the contract. The

SAMPLE

documents which describe the work to be performed are sometimes collectively referred to herein as the Plans and Specifications.

I. SCOPE OF WORK

That the Contractor will furnish all labor, materials, services, transportation, appliances, and mechanical workmanship required for Contract No. , , as provided for and set forth in said plans and specifications, or in either of them, which said plans and specifications are hereby referred to and by such reference incorporated herein and made a part of this Agreement.

All of the said work done under this Agreement shall be under the supervision of and performed to the satisfaction of of who shall have the right to reject any and all materials and supplies furnished by the Contractor which do not comply with said plans and specifications, together with the right to require the Contractor to replace any and all work furnished by the Contractor which shall not either in workmanship or material be in strict accordance with said plans and specifications.

II. COMPLETION

Said work shall be completed and ready for acceptance .

III. PAYMENT

Attached hereto as Exhibit “A” and by reference made a part hereof, is the bid and proposal of Contractor. Said bid and proposal containing, as required by the terms of said specifications, the full and complete schedule of the different items with the lump sums or unit prices as so specified. The agrees, in consideration of the work to be performed herein and subject to the terms and conditions thereof, to pay Contractor all sums of money which may become due to Contractor in accordance with the terms of the aforesaid bid and proposal, and this Agreement, to wit: (). Said sum shall be paid in accordance with Section 8 of the Standard Specifications. With respect to that portion of the above sum as is based upon the estimated quantities specified for the general scope of the work to be performed herein, actual payment will be based upon the quantities as measured upon completion. No

SAMPLE

payment made under this Agreement shall be construed to be an acceptance of defective work or improper materials.

IV. PREVAILING WAGES

Pursuant to the provisions of Articles 1 and 2 of Chapter 1, Part 7, Division II, of the Labor Code of the State of California, not less than the general prevailing rate of per diem wages, and not less than the general prevailing rate of per diem wages for holidays and overtime work, for each craft, classification or type of worker needed to execute the work contemplated under this Agreement shall be paid to all workers, laborers and mechanics employed in the execution of said work by Contractor, or by any subcontractor doing or contracting to do any part of said work. The appropriate determination of the Director of the California Department of Industrial Relations is filed with, and available for inspection at, the office of the Clerk of the Governing Board.

Contractor shall post, at each job site, a copy of such prevailing rate of per diem wages as determined by the Director for the California Department of Industrial Relations.

VI. INSURANCE

The Contractor shall carry and maintain during the life of this Agreement, such public liability, property damage and contractual liability, auto, workers' compensation and builders' risk insurance as required by the specifications.

VII. WORKERS' COMPENSATION CERTIFICATION

By execution of this Agreement, the Contractor certifies as follows:

> "I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract."

VIII. PERFORMANCE AND PAYMENT BONDS

The Contractor shall, before beginning said work, file two bonds with the , each made payable to the . These bonds shall be issued by a surety company authorized to do business in the State of California, and shall be maintained during the entire life of the Agreement at

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the expense of the Contractor. One bond shall be in the amount of one hundred percent (100%) of the Agreement and shall guarantee the faithful performance of the Agreement. The second bond shall be the payment bond required by California Civil Code Division 3, Part 4, Title 15, Chapter 7, and shall be in the amount of one hundred percent (100%) of the Agreement. Any alterations made in the specifications which are a part of this Agreement or in any provision of this Agreement shall not operate to release any surety from liability on any bond required hereunder and the consent to make such alterations is hereby given, and any surety on said bonds hereby waives the provisions of California Civil Code Sections 2819 and 2845.

IX. INDEMNIFICATION

The Contractor shall defend, indemnify and save harmless the (including their officers, agents, members, employees, affiliates, and representatives) as set forth in Section 6-2 of the Standard Specifications.

X. MISCELLANEOUS PROVISIONS

This Agreement shall bind and inure to the heirs, devisees, assignees, and successors in interest of Contractor and to the successors in interest of in the same manner as if such parties had been expressly named herein.

All times stated herein or in the contract documents are of the essence hereof.

As used in this instrument the singular includes the plural, and the masculine includes the feminine and the neuter.

This Agreement may create a possessory interest subject to property taxation, and Contractor may be subject to the payment of property taxes levied on such interest.

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IN WITNESS WHEREOF, and Contractor have caused this Agreement to be executed as of the day and year first above written.

a political subdivision of the
State of California

By_____

By_____
Authorized Representative

By_____
Authorized Representative

CONTRACTOR

Forms Approved by County Counsel
Documents Reviewed:

By _____
AFS - Contract Desk

SAMPLE

Cont. No. Escrow No. _____

ESCROW AGREEMENT FOR DEPOSIT OF
SECURITIES IN LIEU OF CASH RETENTION
ON PUBLIC WORKS PROJECT

THIS AGREEMENT, made this _____ day of _____
19____, by and between the

a political subdivision of the State of California (hereinafter referred to as Owner),

(hereinafter referred to as Contractor), and

_____,

a state or federally chartered bank (hereinafter referred to as Escrow Agent).

WHEREAS, California Public Contract Code, Section 22300 provides that a Contractor on a Public Works contract may deposit with an escrow agent securities having a value equivalent to or greater than the amount to be held by the public agency owner for retention payments, and, under appropriate circumstances, receive the withheld retention payments;

NOW, THEREFORE, in consideration of the mutual provisions herein contained, the parties hereto agree as follows:

1. Owner has let to Contractor Contract No. , for the construction of , said construction contract being dated . That said construction contract provides that the Owner shall retain from each progress payment a specified portion of the progress payment until the lapse of a specified period of time following acceptance by the Owner of the completed construction project. That said construction contract further provides that the Contractor may substitute a deposit of securities in lieu of the Owner withholding such monies from the total amount of the performance by the Contractor provided such deposit of securities complies with the terms of the construction contract and law. That said construction contract and law alternately provides that the owner may make payment of retentions earned directly to the Escrow Agent after Contractor request.

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2. Contractor may deposit with Escrow Agent securities eligible for investment under California Public Contract Code, Section 22300 as security in lieu of any monies withheld by the Owner to ensure performance under the aforesaid construction contract. Alternately, the Owner may make payment of retentions earned directly to the Escrow Agent after Contractor request. Such direct payment of retentions earned shall hereinafter be included in the term "securities."

3. Escrow Agent shall, upon deposit by the Contractor of eligible securities, determine the value of the securities so deposited and certify in the form attached as Exhibit "A" to the Public Works Agency, County of Sacramento, Contract Services Section, 827-7th Street, Room 304, Sacramento, California, 95814, that eligible securities have been deposited with the Escrow Agent by the Contractor on account for release of retention by the County of monies withheld to ensure performance of the aforesaid construction contract. Such certification shall state minimum value of the securities. The securities shall not be released by the Escrow Agent until the County Engineer (hereinafter referred to as Engineer) has instructed the Escrow Agent in writing that the said securities may be released to the Contractor. The form of such instruction in writing is annexed hereto as Exhibit "B."

4. Escrow Agent shall hold the aforesaid securities until such time Escrow Agent is instructed in writing by the Owner's Engineer that Escrow Agent may release the securities to the Contractor. In the event the Owner's Engineer submits a written demand and certification, in the form attached hereto as Exhibit "C," stating that the Contractor has failed to perform all or part of the construction agreement after notice and demanding the payment of a specified amount of cash to be delivered by the Escrow Agent to the Owner, the Escrow Agent shall, seven (7) days following receipt of such demand and certification, cause sufficient of the securities deposited by Contractor to be sold and shall immediately deliver to the Owner's Engineer the amount of cash specified in the said demand and certification. No proof or documents, other than the demand and certification, shall be required of

SAMPLE

the Engineer by the Escrow Agent in order to accomplish the sale and delivery as specified herein. Any excess cash or securities remaining after satisfaction of the Engineer's demand shall be retained by the Escrow Agent until further instructed by the Engineer.

5. Upon receipt by Owner of an appropriate certification as set forth in Paragraph 3 above, Owner shall release to Contractor all monies withheld by Owner to ensure performance of the aforesaid construction contract, but only to the extent that such monies have been earned by the Contractor and do not exceed the value of the securities deposited as set forth in the certification. Further, Owner shall not release to the Contractor any monies required to be withheld pursuant to a valid stop notice filed by any person so authorized and with respect to the said construction contract. Owner shall be the sole judge of the validity of all such stop notices and shall retain one hundred twenty-five percent (125%) of the amount claimed in the stop notice. At such time as in the opinion of the Owner's Engineer, the Contractor has filed to perform all or part of the construction agreement, the Engineer may give ten (10) day's written notice to the Contractor to adequately commence or complete such performance, or the Engineer shall make demand upon the Escrow Agent for sale of securities deposited by the Contractor and for the delivery of cash proceeds to the Engineer. Upon failure of the Contractor to adequately commence or complete performance within the time specified by the Engineer, the Engineer may submit to the Escrow Agent a written demand and certification in the form attached hereto as Exhibit "C," specifying the amount to be paid to the Owner, and the Escrow Agent shall comply with the terms thereof. The Owner's Engineer shall be the sole judge of the failure of performance by the Contractor, the adequacy of commencement or completion of performance by the Contractor and the value of the failure of performance by the Contractor.

6. This escrow agreement is a third party beneficiary contract to the extent that it provides security to the Owner. The Contractor shall be the beneficial owner of any securities substituted for monies withheld and shall receive any

SAMPLE

interest thereon. The Owner shall have the right to have any such securities sold by the Escrow Agent and the cash value thereof delivered to the Owner as set forth above. In the event the sale of the securities does not realize sufficient cash to pay the Owner the amount demanded by the Engineer, Contractor shall be obligated to immediately pay to the Owner any deficiency, and the Owner shall be further entitled to withhold any such deficiency from any payments then due from the Owner to the Contractor or to become due.

7. Contractor shall pay all fees and costs required to establish and maintain the escrow and to carry out the terms of this agreement.

8. The Escrow Agent shall indemnify and hold harmless the Owner from any loss suffered by the Owner as a result of any act or omission of Escrow Agent or any of its officers, employees, representatives, or agents. Further, the Contractor shall indemnify and hold harmless the Escrow Agent from any loss the Escrow Agent may suffer as a result of the acts or omissions of the Contractor or any of its officers, employees, representatives, or agents. further, Owner shall indemnify and hold harmless the Escrow Agent from any loss the Escrow Agent may suffer as a result of the acts or omissions of the Owner or any of its officers, employees, representatives, or agents.

SAMPLE

IN WITNESS WHEREOF, the parties hereto have executed this agreement the day and year first above stated.

,

a political subdivision of the
State of California

By _____
OWNER'S ENGINEER

_____
CONTRACTOR

_____
ESCROW AGENT

Name of Bank: _____

Address: _____

_____

_____

SAMPLE

Contract No. Escrow No. _____

EXHIBIT "A"

TO: COUNTY OF SACRAMENTO
DEPARTMENT OF PUBLIC WORKS ADMINISTRATION
AFS - Contract Desk
827-7TH Street, Room 304
Sacramento, California 95814

RE: CERTIFICATION OF DEPOSIT OF SECURITIES

_____, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works Project between the

a political subdivision of the State of California (referred to as Owner),

(referred to as Contractor) and

_____,

a state or federally chartered bank (referred to as Escrow Agent) dated _____, hereby certifies to the Owner that the said Escrow Agent has received from the specified Contractor, securities eligible for investment of not less than $_____. The said Escrow Agent agrees to hold said securities in accordance with the term of the aforesaid escrow agreement, and shall not release the said securities to the said Contractor until such time as the said Escrow Agent has received notification from the Owner's Engineer that the construction contract has been accepted and the Escrow Agent is authorized to release the securities. The Escrow Agent further certifies that upon written demand by the Owner's Engineer, the Escrow Agent shall cause sufficient securities to be sold from those so deposited by the said Contractor and shall pay to the County the amount specified in the demand, provided such demand does not exceed the amount specified as the minimum value of the securities herein.

Dated: _____ at _____, California.

By _____
ESCROW AGENT

_____
a state or federally chartered bank

Address of Bank _____
_____
_____

SAMPLE

Contract No. Escrow No. _____

EXHIBIT "B"

TO: Escrow Agent

RE: AUTHORIZATION TO RELEASE SECURITIES DEPOSITED BY CONTRACTOR

You, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works Project between the

a political subdivision of the State of California (referred to as Owner),

,

(referred to as Contractor), and

_____,

a state or federally chartered bank (referred to as Escrow Agent), dated _____, are hereby authorized to release to the aforesaid Contractor all securities deposited with you with respect to the aforesaid escrow agreement, except that you shall be required to retain as security and pursuant to the terms of the said escrow agreement securities having a value of not less than $ _____, until such time as you may be further notified by the Owner's Engineer as to further release or as to sale.

Dated: _____

a political subdivision of the
State of California

By _____
Owner's Engineer

SAMPLE

Contract No. Escrow No. _____

EXHIBIT "C"

RE: NOTIFICATION OF FAILURE OF PERFORMANCE, DEMAND FOR SALE OF SECURITIES AND DEMAND FOR PAYMENT

You, as Escrow Agent in that certain Escrow Agreement for Deposit of Securities in Lieu of Cash Retention on Public Works Project between the

a political subdivision of the State of California (referred to as Owner),

,

(referred to as Contractor), and

_____,

a state or federally chartered bank (referred to as Escrow Agent), dated _____, are hereby notified that the said Contractor has failed to perform all or part of that certain construction contract described in the said escrow agreement after having been given written notice of lack of performance. You are hereby directed to cause to be sold securities deposited by the said contractor with you in accordance with the escrow agreement, said securities having a minimum value of $_____, and to deliver forthwith to the Owner's Engineer the sum of $_____. Any remaining securities deposited pursuant to the terms of the said escrow agreement shall be retained by you pursuant to further written notice by the Owner's Engineer.

Dated: _____ at _____, California.

a political subdivision of the
State of California

By _____
Owner's Engineer

SAMPLE

P A Y M E N T B O N D

BOND NO. _____ PREMIUM _____

KNOW ALL PERSONS BY THESE PRESENTS, that

WHEREAS, the Governing Board of the _____ a political subdivision of the State of California, hereinafter designated as the "Obligee", has on _____, awarded to _____ hereinafter designated as the "Principal,"a contract for the construction of Contract No. - _____; and

WHEREAS, said Principal is required to furnish a bond in connection and with said contract, providing that if said Principal, or any of its subcontractors, shall fail to pay for any materials, provisions, or other supplies used in, upon, for, or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, the Surety on this bond will pay the same to the extent hereinafter set forth:

NOW, THEREFORE, WE, the Principal, and _____ _____ as Surety, are held and firmly bound unto the Obligee in the penal sum of _____ lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, or any of its subcontractors shall fail to pay any of the persons named in Section 3181 of the Civil Code of the State of California, or any amounts due under the Unemployment Insurance Code with respect to such work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department of the State of California, from the wages of employees of the Principal and subcontractors pursuant to Section 13020 of the Unemployment Insurance Code of the State of California with respect to such work or labor, as required by the provisions of Section 3225 and following of the Civil Code of the State of California, then said Surety will pay the same in or to an amount not exceeding the amount herein above set forth.

SAMPLE

P E R F O R M A N C E B O N D

BOND NO. _____ PREMIUM _____

KNOW ALL PERSONS BY THESE PRESENTS, that

WHEREAS, the Governing Board of the ,a political subdivision of the State of California, hereinafter designated as the "Obligee", has on , awarded to hereinafter designated as the "Principal," a contract for the construction of Contract No. -; and

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful performance of said contract:

NOW, THEREFORE, WE, the Principal, and _____

_____

as Surety, are held and firmly bound unto the Obligee in the penal sum of () lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bounden Principal, its heirs, executors, administrators, successors, or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions, and agreements in the said contract and any alterations made as therein provided, on their part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless, the Obligee, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise it shall be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the said contract, the above obligation in said amount shall hold good for a period of one (1) year after the completion and acceptance of the said work, during which time if the above bounden Principal, its heirs executors, administrators, successors or assigns shall fail to make full, complete and satisfactory repair and replacements or totally protect the said Obligee from loss or damage made evident during said period of one (1) year from the date of acceptance of the work, and resulting from or caused by defective materials of faulty workmanship in the prosecution of the work done, the above obligation in the said sum shall remain in full force and effect. However, anything in this paragraph to the contrary notwithstanding, the obligation of the Surety hereunder shall continue so long as any obligation of the Principal remains.

SAMPLE

P E R F O R M A N C E B O N D

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall, in any way, affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract or to the work or to the specifications. Said Surety hereby waives the provisions of Section 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____2000, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal

By _____
Signature for Principal

_____
Title of Signatory

(SEAL) _____

Surety Company

By _____
Signature for Surety

_____
Title of Signatory

(This bond must be submitted in sets of four, each bearing original signatures. The signature of the Attorney-in-Fact for the Surety must be acknowledged by a Notary Public. These bonds must be accompanied by a current power of attorney appointing such Attorney-in-Fact.)

SAMPLE

P A Y M E N T B O N D

This bond is issued pursuant to Civil Code Sections 3247 through 3252 of the State of California and shall insure to the benefit of any and all persons, companies, and corporation names in Section 3181 of said Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall, in any way, affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract or to the work or to the specifications. Said Surety hereby waives the provisions of Section 2819 and 2845 of the Civil Code of the State of California.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their seals this _____ day of _____ 2000, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Principal

By _____
Signature for Principal

_____
Title of Signatory

(SEAL)

_____

By _____
Signature for Surety

_____
Title of Signatory

(This bond must be submitted in sets of four, each bearing original signatures. The signature of the Attorney-in-Fact for the Surety must be acknowledged by a Notary Public. These bonds must be accompanied by a current power of attorney appointing such Attorney-in-Fact.)

SAMPLE

Project:

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

Contract No.
Fed. No. _____
Date:

Contract Change Order No.

To: , Contractor. You are hereby directed to make the herein described changes from the plans and specifications or do the following described work not included in the plans and specifications on this contract.

Description of work to be done, quantities and prices to be paid. Unless otherwise stated, rates for rental of equipment cover only such time as equipment is actually used and no allowance will be made for idle time.

Change requested by _____.

Item No. 1 Title (*In Title Case)* (F. I. # X)

Cost:

Contract Summation:
Original Contract: Change Order Totals: New Contract Cost Total

By reason of this order the time of completion will be adjusted as follows:

Submitted by: _____ Date: _____

Approval recommended: _____ Date: _____

Approved by: _____ Date: _____

Approved by: _____ Date: _____

We, the undersigned Contractor, have given careful consideration to the change proposed and all of its impacts, both direct and indirect, and hereby agree, if this proposal is approved, that we will provide all equipment, furnish all materials, except as may otherwise be noted above, and perform all services necessary for the work above specified, and will accept as full payment therefor the prices and time extensions shown above.

Acceptance Date: _____ Contractor:

By: _____ Title: _____

If the Contractor does not sign acceptance of this order, his attention is directed to the requirements of the specifications as to proceeding with the ordered work and filing a written protest within the time therein specified.

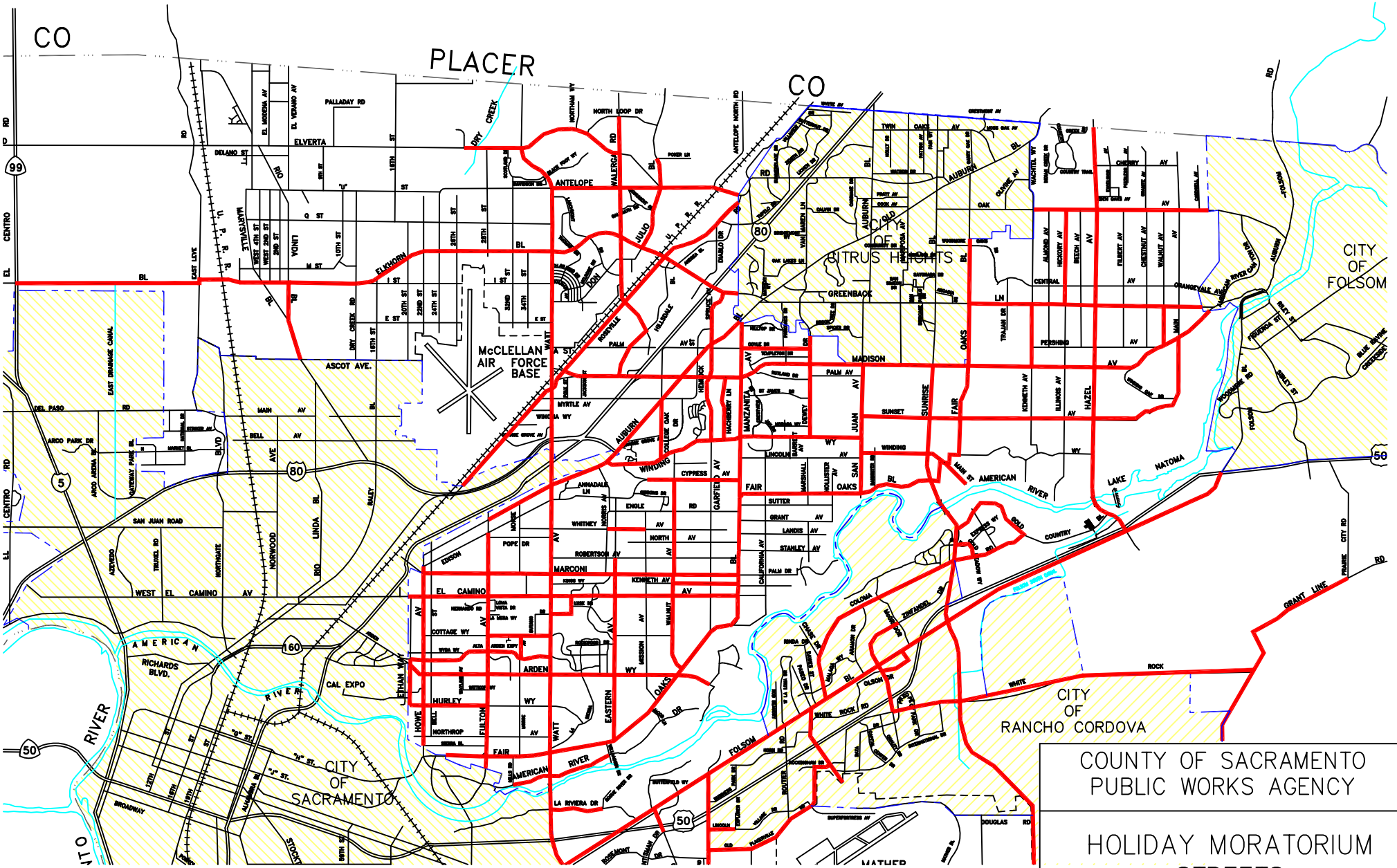
Original to: *Contractor*
Copies to: *Contract Desk*
Resident Engineer

Copies to: *Auditor's Office*
Board of Supervisors
Project Engineer

_____
Chairman, Board of Supervisors

SAMPLE

APPENDIX B
HOLIDAY MORITORIUM STREETS



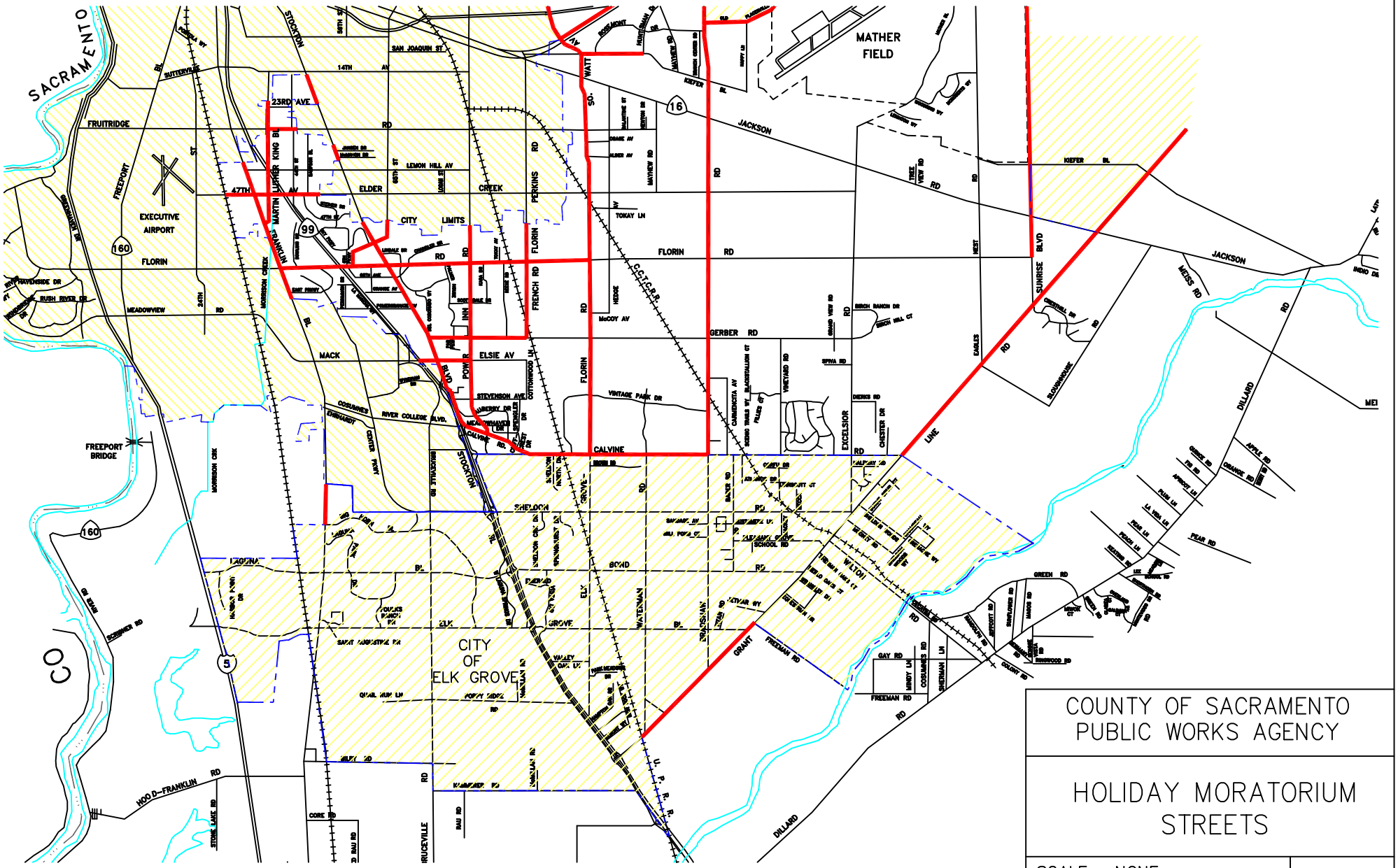
COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

HOLIDAY MORATORIUM STREETS

SCALE: NONE
DATE: 10/01/05
DRAWN BY: LP

1A

SEE FIGURE 1A FOR CONTINUATION NORTH



COUNTY OF SACRAMENTO
PUBLIC WORKS AGENCY

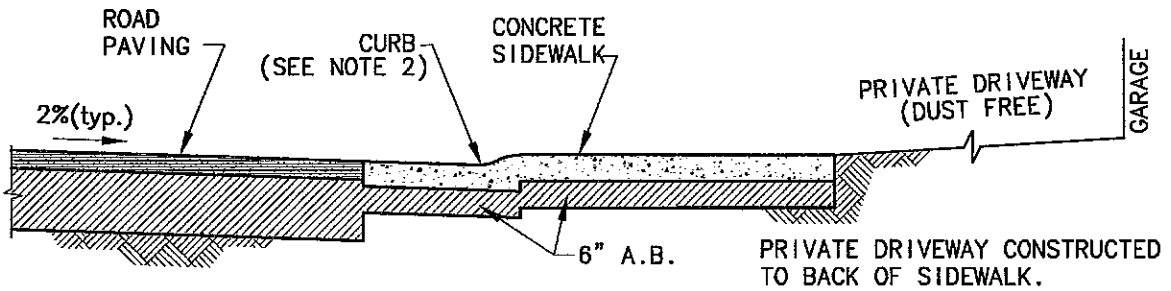
HOLIDAY MORATORIUM STREETS

SCALE: NONE
DATE: 10/01/05
DRAWN BY: LP

1B

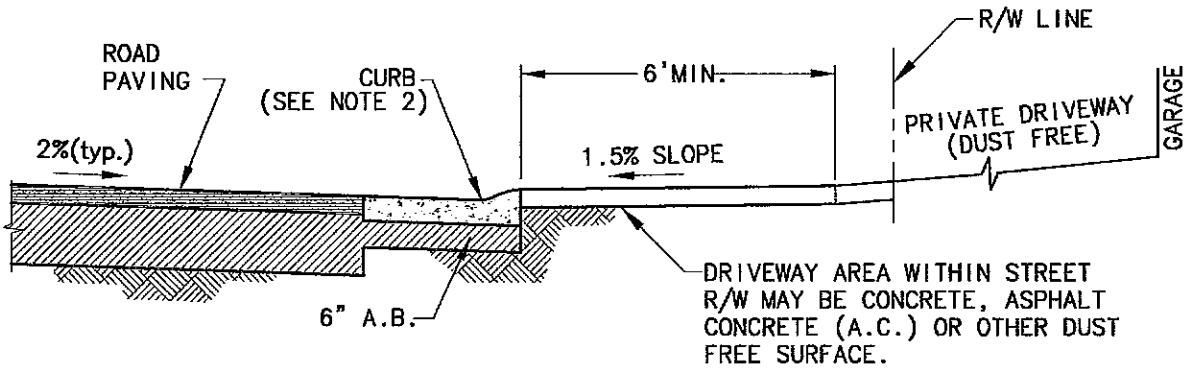
APPENDIX C
STANDARD DRAWINGS

DRAWING NUMBER	TITLE
4-13	TYPICAL STREET SECTIONS AT RESIDENTIAL DRIVEWAYS (3/05)
4-14	COMMERCIAL DRIVEWAYS TYPE A-6 (3/05)
4-15-A	SPECIAL COMMERCIAL FRONTAGE ENTRANCE TYPE A-7 (3/05)
4-15-B	SIDEWALK RAMP FOR A-7 DRIVEWAYS WITHOUT ADDITIONAL R/W (3/05)
4-21	BUS TURNOUTS (3/05)
4-22	BUS STOP DETAILS (3/05)
4-23-A	SIDEWALK RAMPS DETAIL (6/05)
4-23-B	SIDEWALK RAMP DETAIL FOR PLAZA AREAS (3/05)
4-23-C	A.C. CONFORMS TO NEW SIDEWALK RAMP CONSTRUCTION (3/05)
4-24	SIDEWALK RAMP PLACEMENT (8/05)
4-25	TYPICAL CURB AND GUTTER SECTIONS (11/07)
4-26	CROSS GUTTER (3/05)
4-27	BARRIER CURB DETAIL (3/05)
4-28	UNDER SIDEWALK DRAIN (3/05)
4-29	MEANDERING SIDEWALK STANDARDS (3/05)
4-31	TRENCH SECTIONS IN IMPROVED AREAS (3/05)
4-32	PAVEMENT WIDENING DETAIL (3/05)
4-33	STREET SIGN FULLY REFLECTORIZED (3/05)
4-34	STREET NAME SIGN PLACEMENT DETAILS (3/05)
4-35	STREET NAME SIGN ON STREET LIGHT POLE PLACEMENT DETAIL(3/05)
4-36	STREET NAME SIGN INSTALLATION ON STREET LIGHT POLE (3/05)
4-37	STREET NAME SIGN PLACEMENT DETAILS (3/05)
4-38	STREET CLOSURE TIMBER BARRICADE (3/05)
4-39	SIGNS AND BARRICADES AT ABRUPT CHANGE OF PAVEMENT WIDTH (3/05)
4-40	SIDEWALK BARRICADE (3/05)
4-41-A	UTILITY POLE PLACEMENT LOCATIONS (3/05)
4-41-B	UTILITY POLE PLACEMENT LOCATIONS (3/05)
4-42	A.C. SIDEWALK CONFORM (3/05)
4-43	STANDARD CONCRETE JOINT DETAILS (3/05)
4-44	MEDIAN DETAIL (6/07)
4-45	STRIPING AND PAVEMENT MARKING DETAILS (3/07)



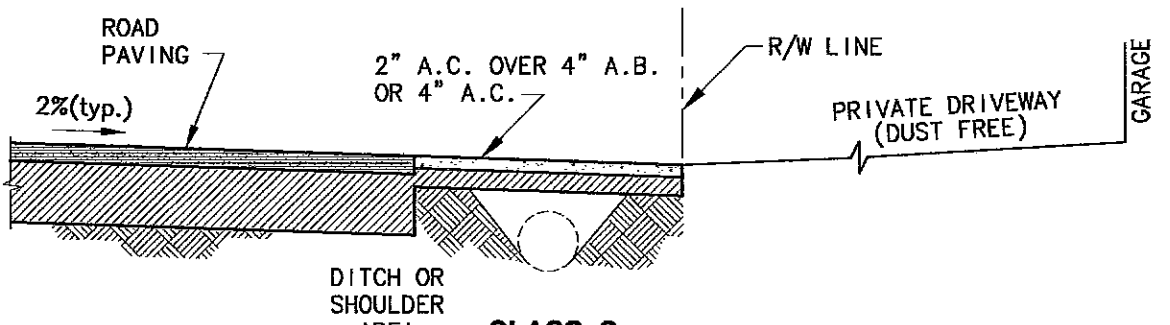
CLASS A

(CURB, GUTTER & SIDEWALK)



CLASS B

(CURB & GUTTER)



CLASS C

(DITCH OR SHOULDER)

1. *SEE SACRAMENTO COUNTY IMPROVEMENT STANDARDS SECTION 4-10 FOR DRIVEWAY REQUIREMENTS.*

2. *TYPE 1A CURB & GUTTER MAY BE USED ON 56' AND ON 60' STREETS THAT HAVE FRONT-ON DEVELOPEMENT OF SINGLE FAMILY RESIDENTIAL UNITS OR FRONT-ON DUPLEX RESIDENTIAL UNITS. ON ALL OTHER STREETS USE TYPE 2 CURB AND GUTTER WITH STANDARD A-6 OR A-7 DRIVEWAYS.*

CHIEF, DEPT. OF TRANSPORTATION

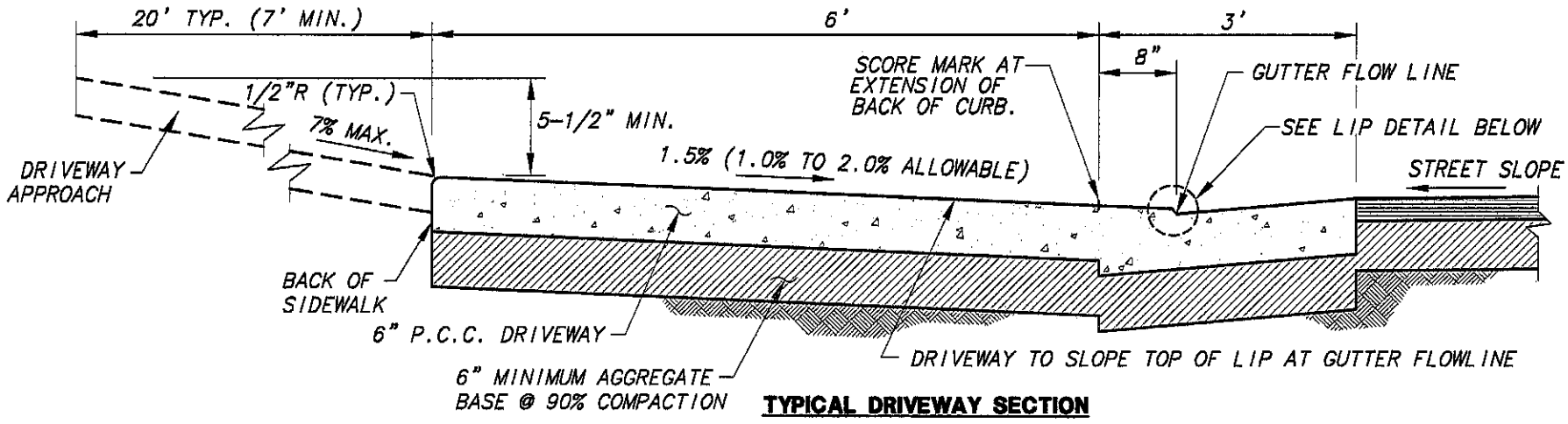
COUNTY OF SACRAMENTO

MUNICIPAL SERVICES AGENCY

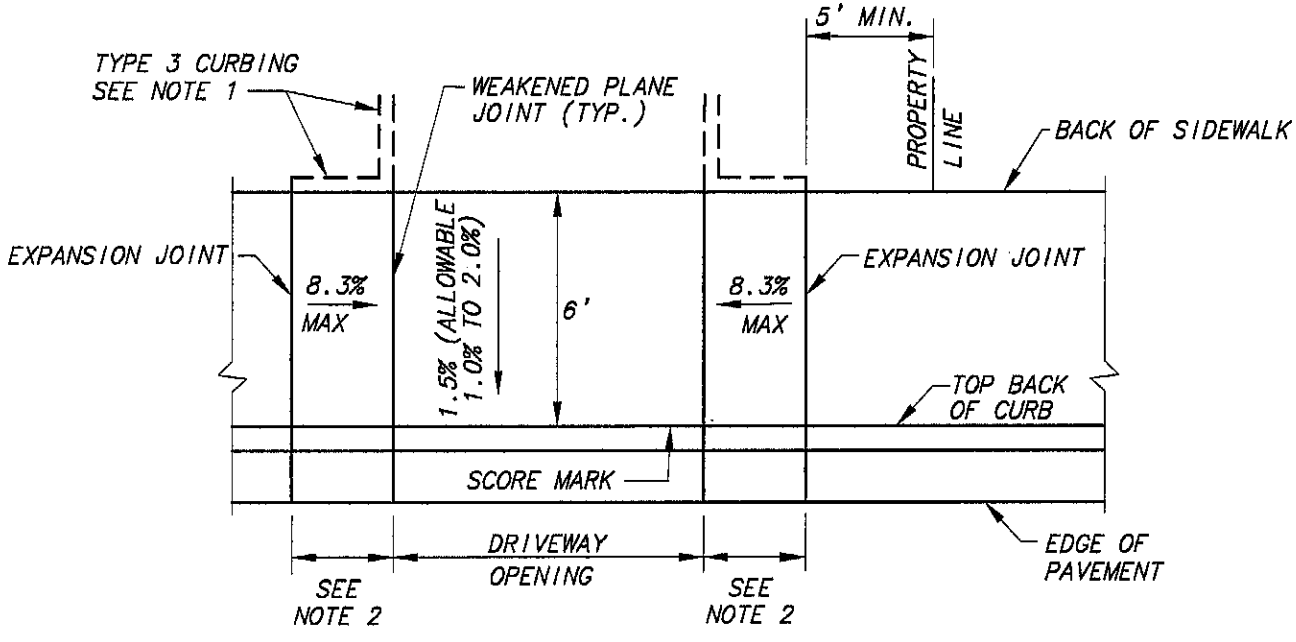
TYPICAL STREET SECTIONS AT RESIDENTIAL DRIVEWAYS

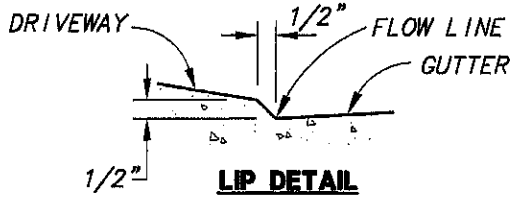
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

4-13



TYPICAL DRIVEWAY SECTION





LIP DETAIL

NOTES:

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 4-23-A FOR APPROX. LENGTH OF INCLINED PORTION OF DRIVEWAY.

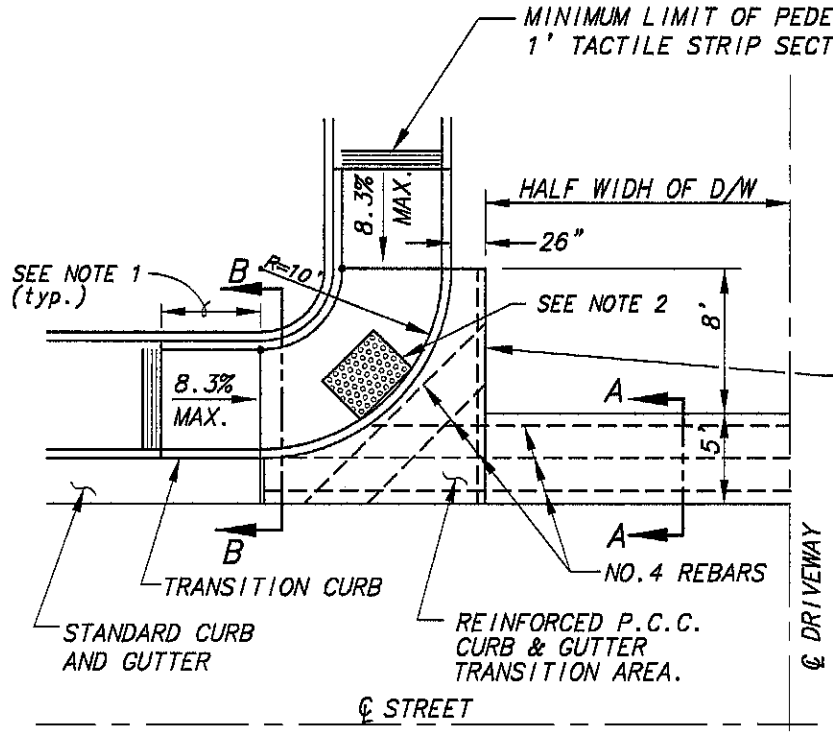
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

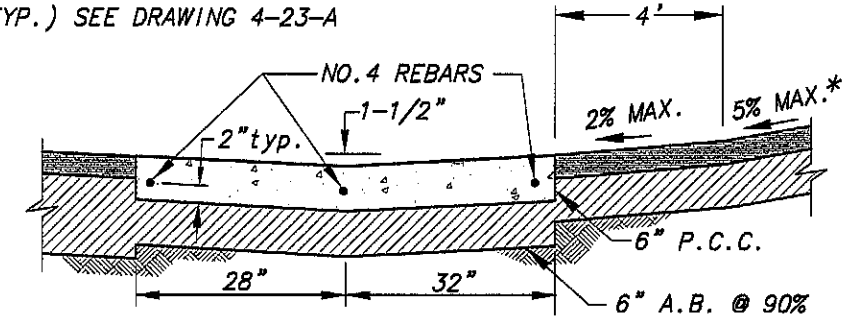
COMMERCIAL DRIVEWAYS TYPE A-6

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

4-14



PLAN VIEW

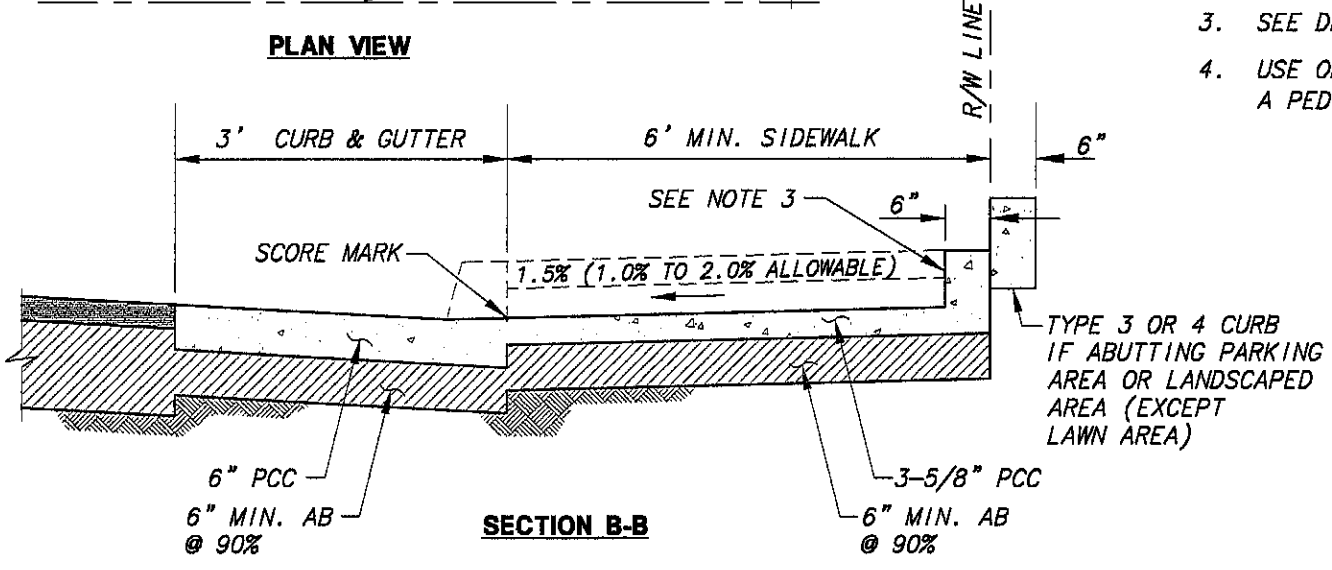


SECTION A-A

* 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 4-23-A
2. 4'x3' DETECTABLE WARNING MATERIAL LOCATED AT CENTER OF RETURN. SEE DRAWING 4-23-A
3. SEE DRAWING 4-23-A FOR RETAINING CURB
4. USE OF THIS DETAIL REQUIRES A PEDESTRIAN EASEMENT



SECTION B-B

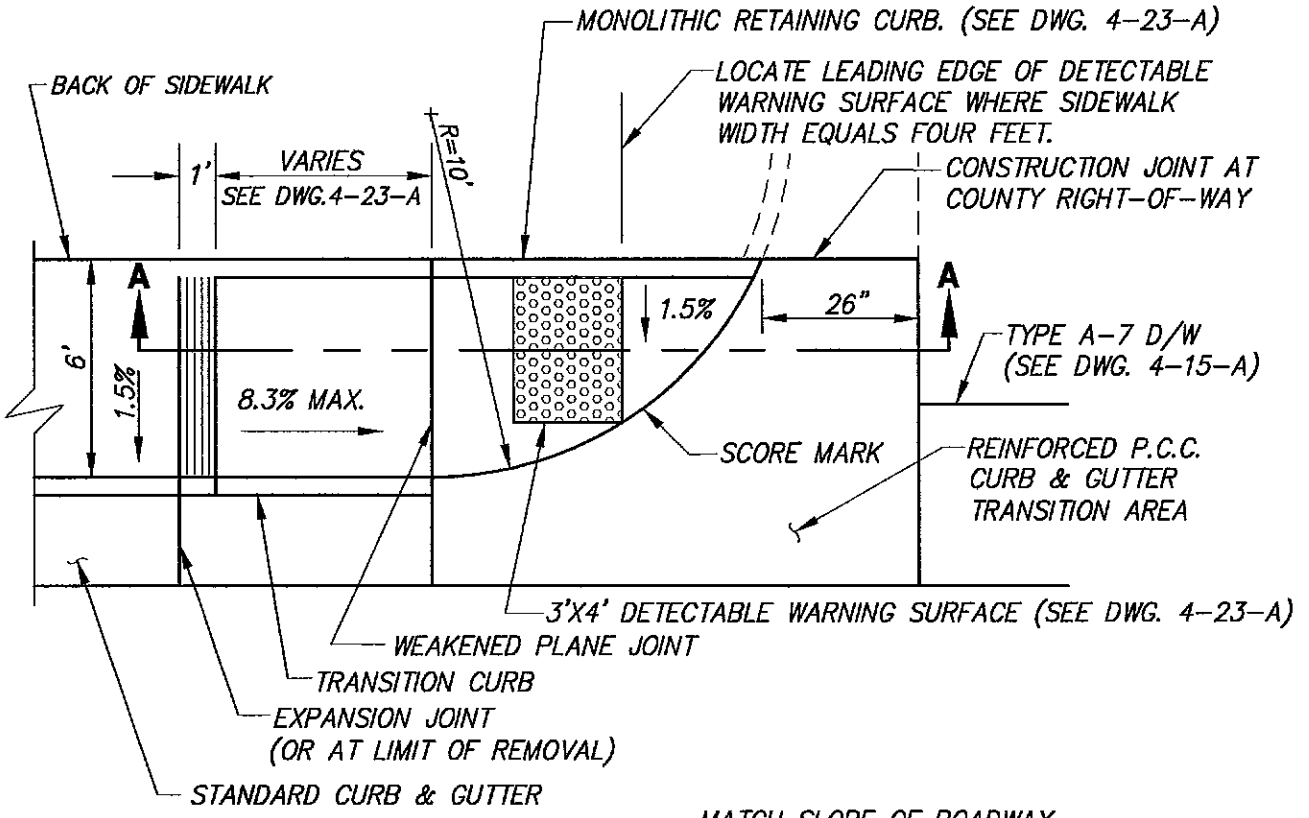
CHIEF, DEPT. OF TRANSPORTATION

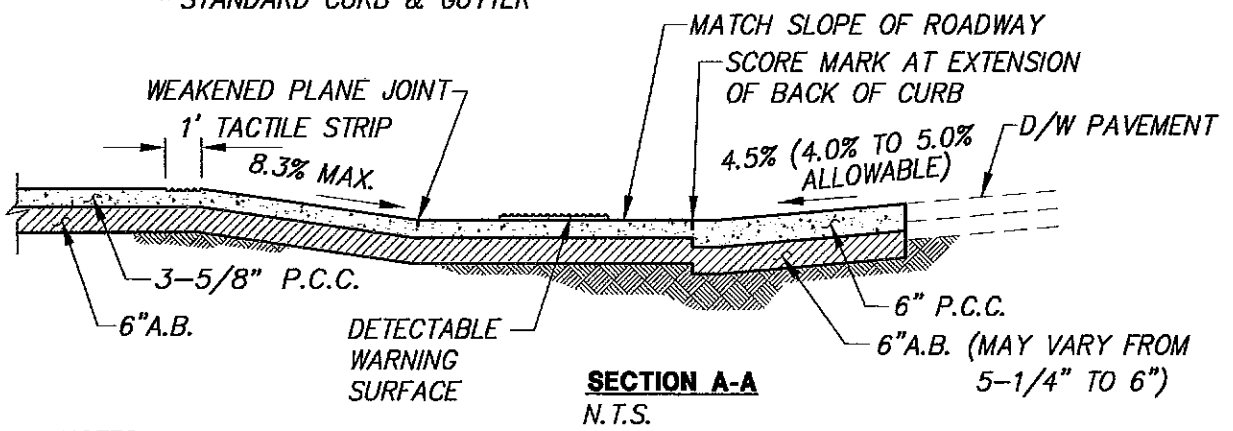
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SPECIAL COMMERCIAL FRONTAGE ENTRANCE TYPE A-7

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

4-15-A





SECTION A-A
N.T.S.

NOTES:

1. SEE DRAWING 4-15-A FOR REINFORCING & ADDITIONAL CONSTRUCTION NOTES.
2. THIS DETAIL IS NOT FOR NEW CONSTRUCTION. IT MAY BE USED FOR RECONSTRUCTION OF TYPE A-7 DRIVEWAYS IN AREAS WITHOUT SUFFICIENT RIGHT-OF-WAY FOR STANDARD TYPE A-7 DRIVEWAY CONSTRUCTION AND WITHOUT WALKWAY EXTENSION ON TO ABUTTING PROPERTY.
3. NO PULL BOX, UTILITY VAULT, UTILITY POLE, MANHOLE, TRAFFIC SIGNAL POLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
4. 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.

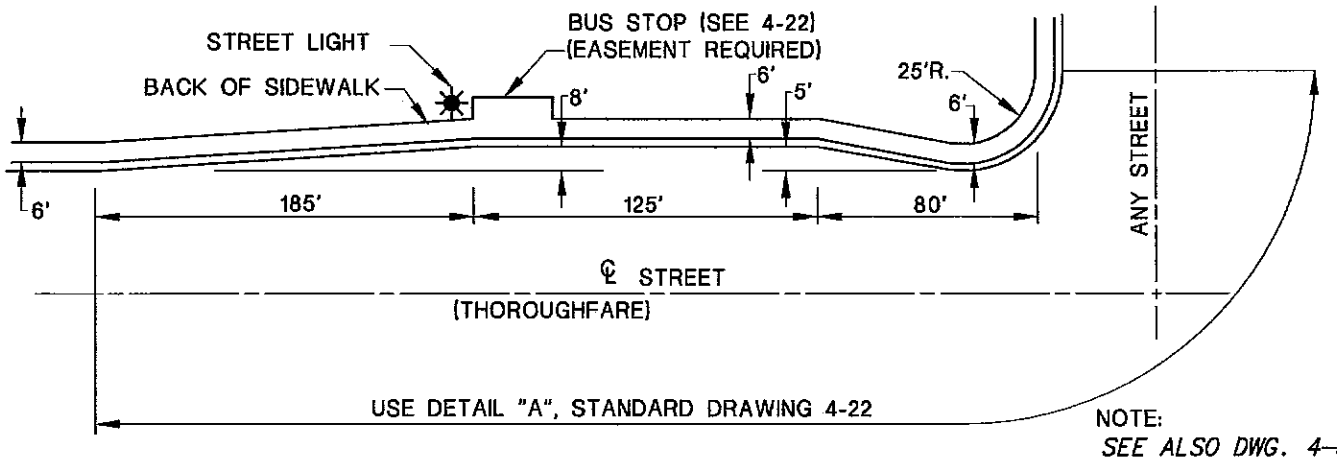
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK RAMP FOR A-7 DRIVEWAYS WITHOUT ADDITIONAL R/W

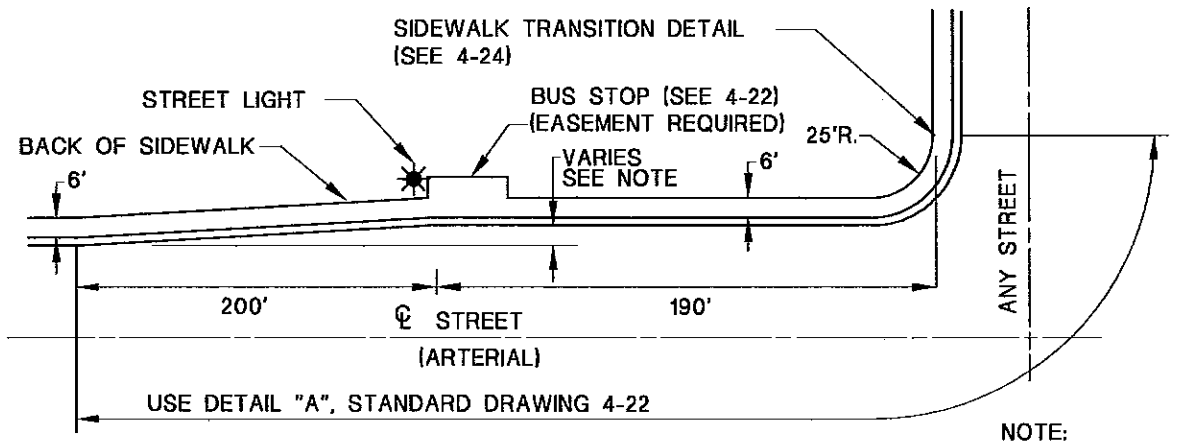
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

4-15-B



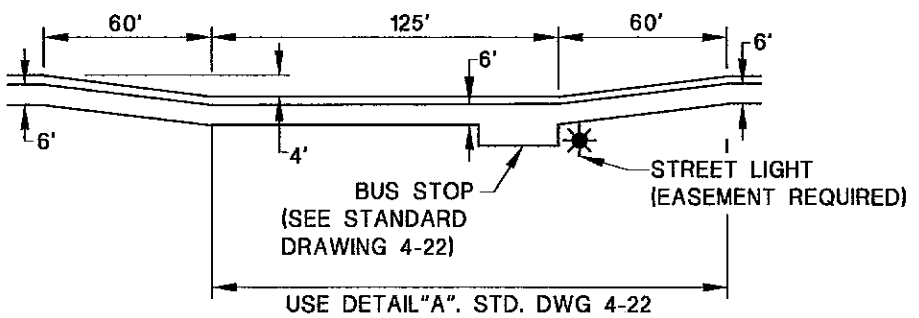
BUS TURNOUT ON THOROUGHFARE STREETS

NOTE:
SEE ALSO DWG. 4-5 AND 4-9-A FOR BUS TURNOUT GEOMETRY



BUS TURNOUT ON ARTERIAL STREETS

NOTE:
SEE ALSO DWG. 4-8-A AND 4-8-B FOR BUS TURNOUT GEOMETRY



TYPICAL MID-BLOCK BUS TURNOUT

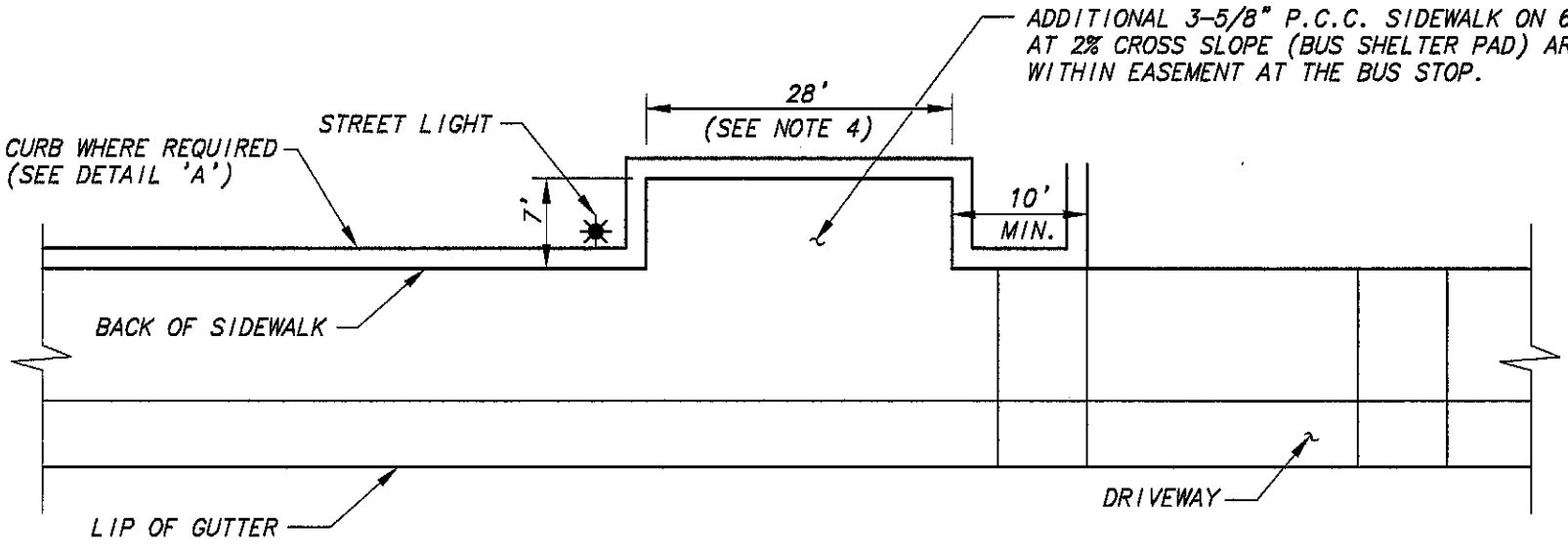
CHIEF, DEPT. OF TRANSPORTATION

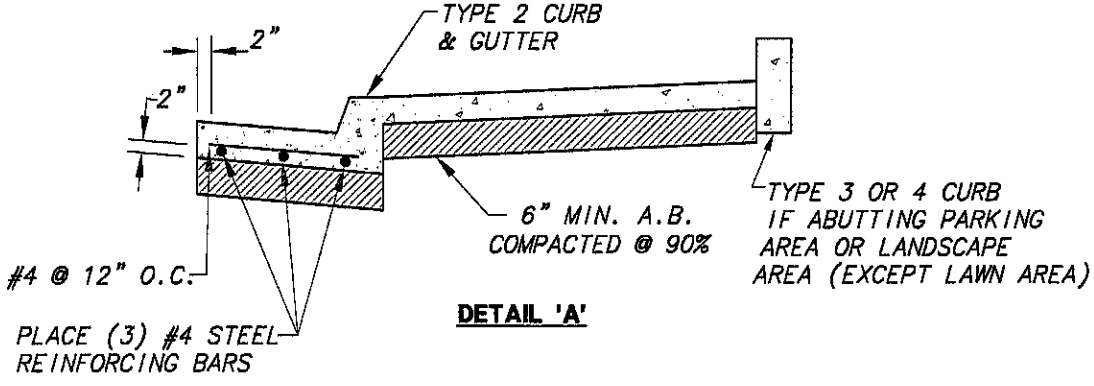
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BUS TURNOUTS

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

4-21





DETAIL 'A'

NOTES:

1. FOR BUS STOPS WITHOUT TURNOUTS, DETAIL 'A' SECTION SHALL BE USED FOR 100' EACH SIDE OF BUS STOP SIGN.
2. SEE STANDARD DRAWING 4-21 FOR APPLICATIONS OF DETAIL 'A' AT BUS STOP TURNOUTS.
3. TRANSITION FROM REINFORCED TYPE 2 CURB TO ABUTTING CURB AND GUTTER SECTION IN 5' BEYOND LIMITS OF BUS STOP AREA AS SHOWN ON DWG. 4-21.
4. PAD LENGTH MAY BE 14' AT MINOR STREET INTERSECTIONS & MID BLOCK LOCATIONS.

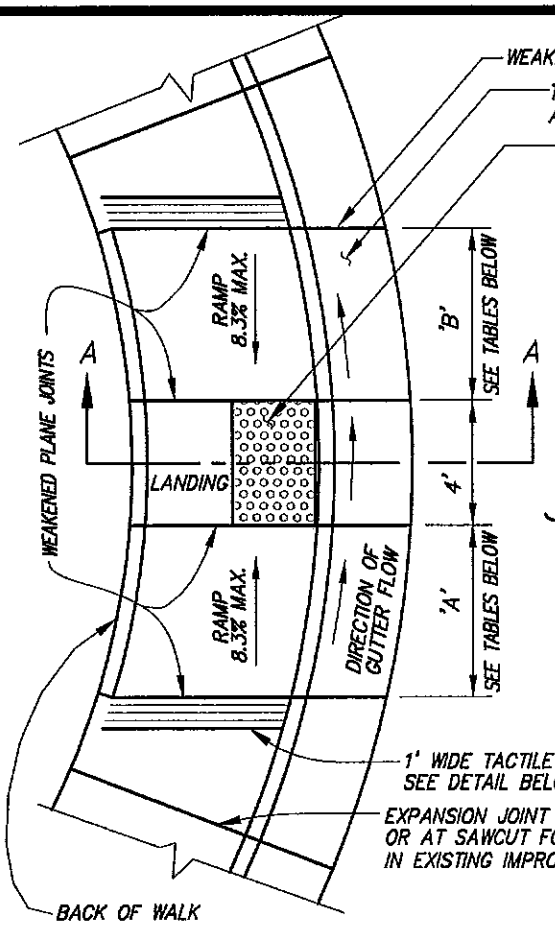
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

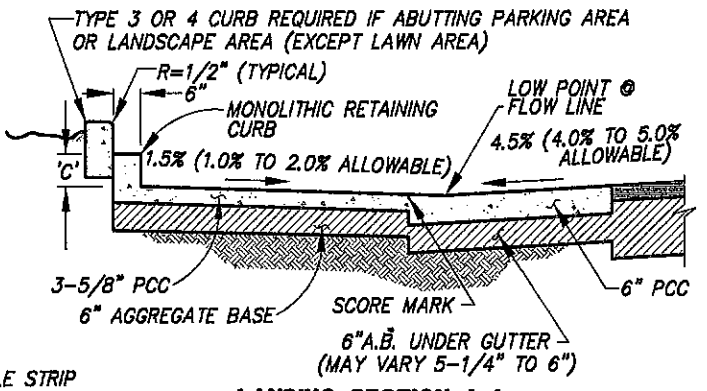
BUS STOP DETAILS

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

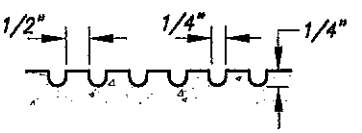
4-22



RAMP PLAN



LANDING SECTION A-A



TACTILE STRIP GROOVE DETAIL

Type 2 Curb	Approx. Ramp Length	
Slope Of Gutter	"A"	"B"
0.5% to 1.0%	7'-6"	6'-0"
> 1.0% to 1.5%	8'-0"	6'-0"
> 1.5% to 1.8%	8'-6"	5'-6"
> 1.8% to 2.1%	9'-0"	5'-6"
> 2.1% to 2.4%	9'-6"	5'-0"
> 2.4% to 3.0%	10'-0"	5'-0"
> 3.0%	SEE NOTE #4	

Type 1A Curb	Approx. Ramp Length	
Slope Of Gutter	"A"	"B"
0.5% to 1.0%	4'-6"	4'-0"
> 1.0% to 1.7%	5'-0"	3'-6"
> 1.7% to 2.2%	5'-6"	3'-6"
> 2.2% to 2.7%	6'-0"	3'-0"
> 2.7% to 3.1%	6'-6"	3'-0"
> 3.1% to 3.4%	7'-0"	3'-0"
> 3.4% to 3.7%	7'-6"	3'-0"
> 3.7% to 3.9%	8'-0"	3'-0"
> 3.9% to 4.3%	9'-0"	3'-0"
> 4.3% to 5.0%	10'-0"	2'-6"
> 5.0%	SEE NOTE #4	

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

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

NOTES:

1. DIMENSION 'A' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE SAME DIRECTION AS THE FLOW OF THE GUTTER.
2. DIMENSION 'B' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE OPPOSITE DIRECTION AS THE FLOW OF THE GUTTER.
3. RAMPS SHALL HAVE A HEAVY BROOM FINISH TRANSVERSE TO THEIR SLOPE.
4. REQUIRES SPECIAL DESIGN APPROVAL BY THE CHIEF OF THE DEPARTMENT OF TRANSPORTATION.
5. NO PULL BOX, UTILITY VAULT, UTILITY POLE, TRAFFIC SIGNAL POLE, MANHOLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
6. SEE NOTE 6 DWG 4-24 FOR RAMPS WITH 6' WIDE RAMP PANS.

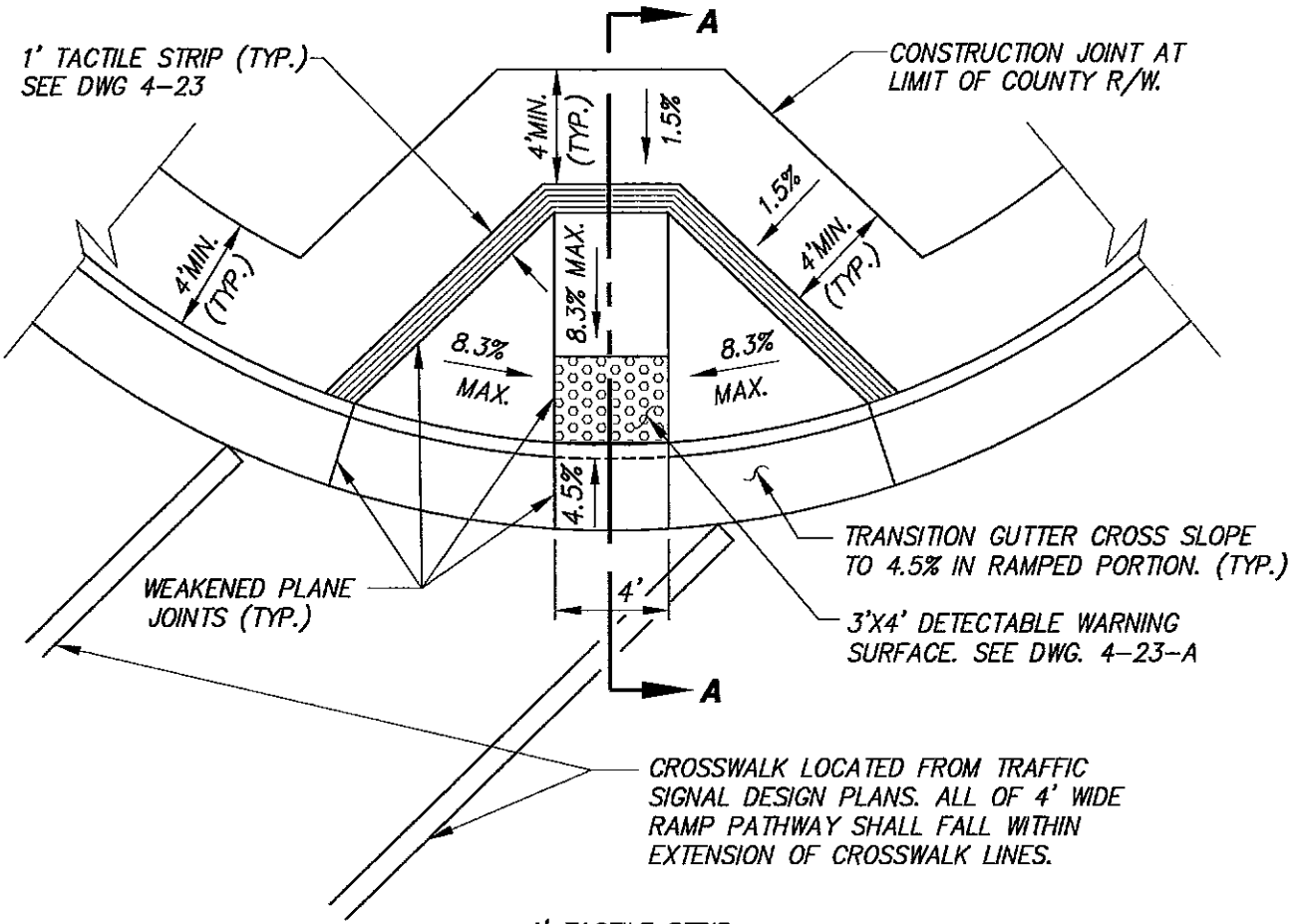
CHIEF, DEPT. OF TRANSPORTATION

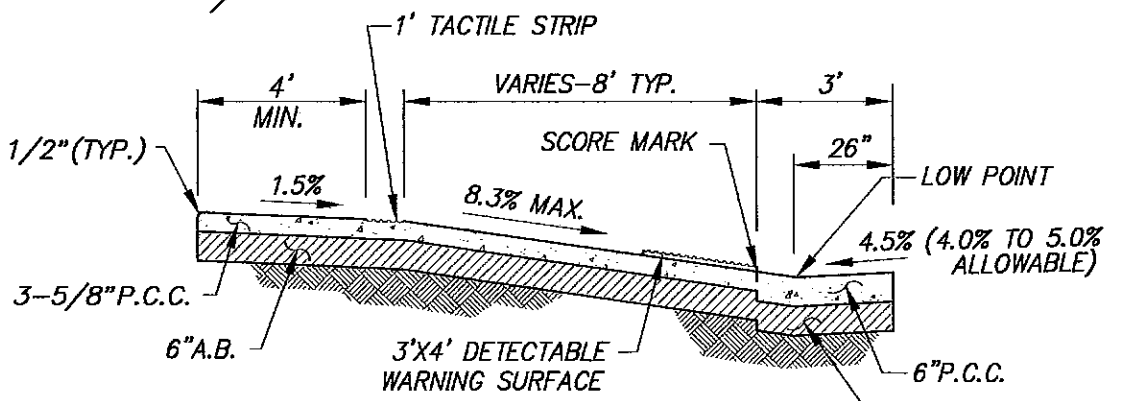
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK RAMPS DETAIL

SCALE: NONE
DATE: 06/05
DRAWN BY: TRU P.

4-23-A





SECTION A-A
N.T.S.

NOTES:

1. USE OF THIS DETAIL WITHIN COUNTY REQUIRES ADDITIONAL AREA OF COUNTY R/W OR SIDEWALK EASEMENT
2. SEE DWG. 4-23-A FOR FINISH & MATERIAL REQUIREMENTS.
3. SEE DWG. 4-24 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. 4-25 FOR SIDEWALK GRADE TOLERANCE.

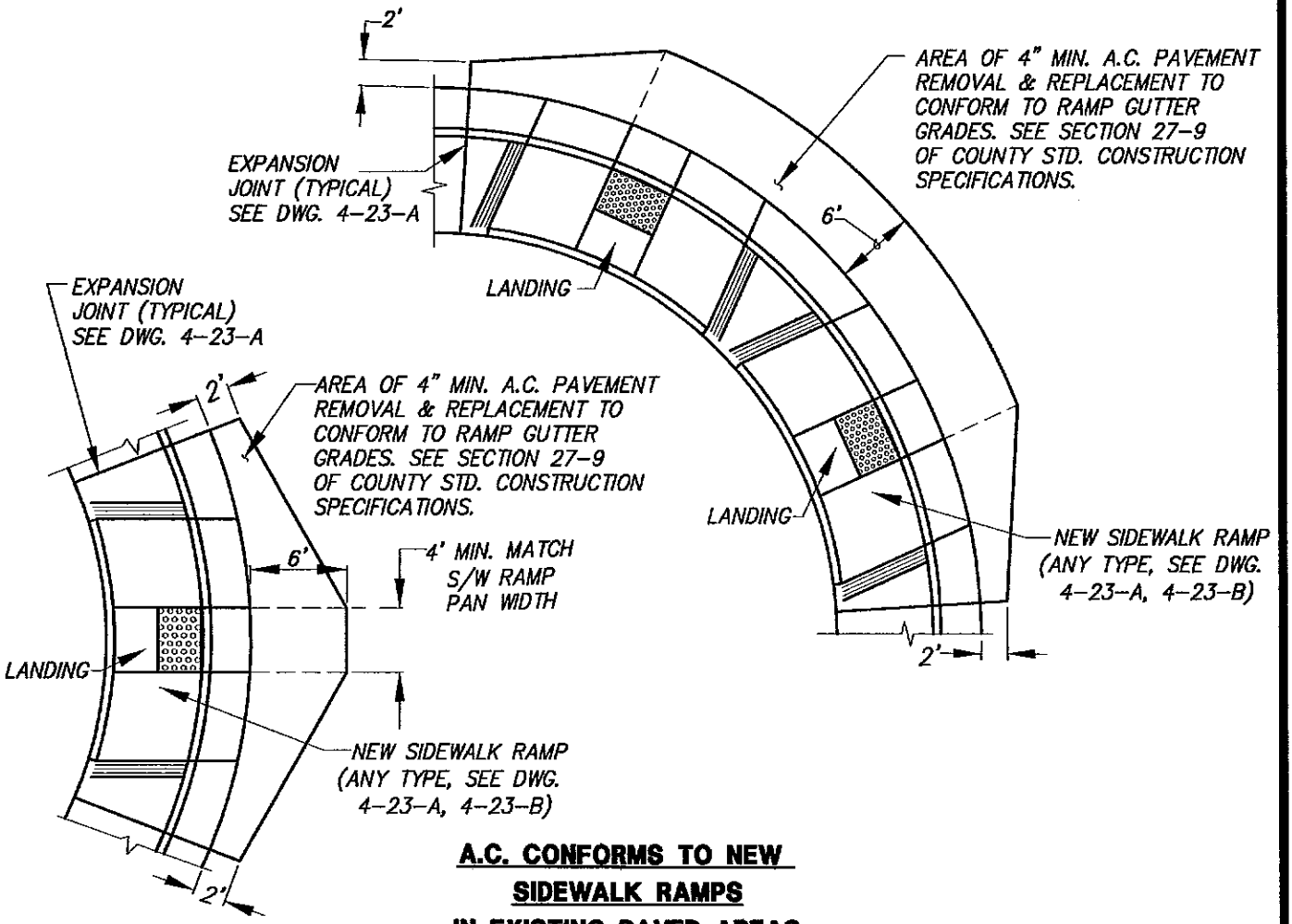
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

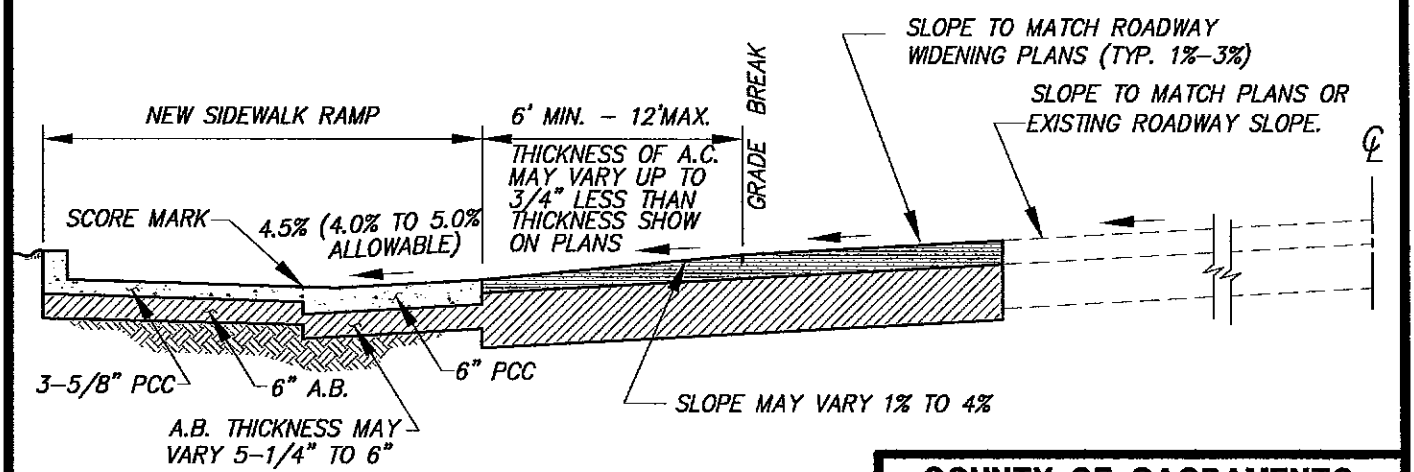
SIDEWALK RAMP DETAIL FOR PLAZA AREAS

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

4-23-B



A.C. CONFORMS TO NEW SIDEWALK RAMPS IN EXISTING PAVED AREAS.



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

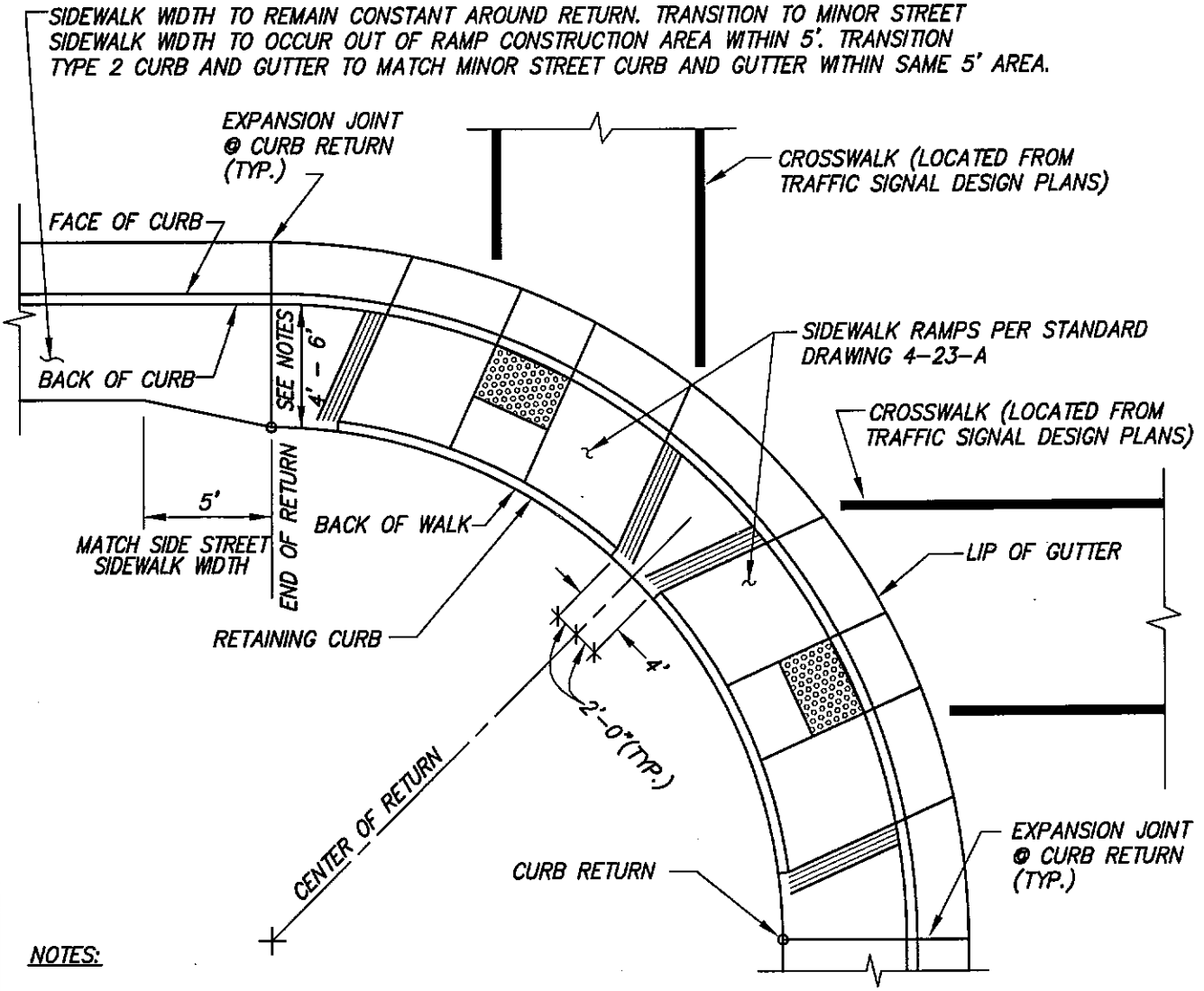
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

A.C. CONFORMS TO NEW SIDEWALK RAMPS

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

4-23-C



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 DEVELOPEMENT.
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.

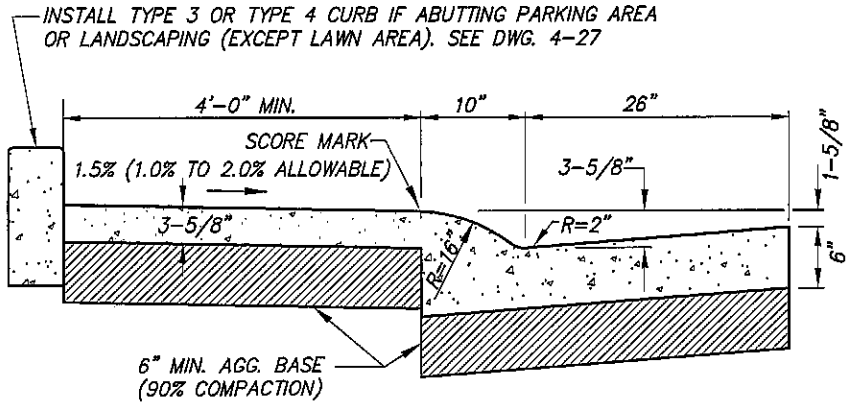
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

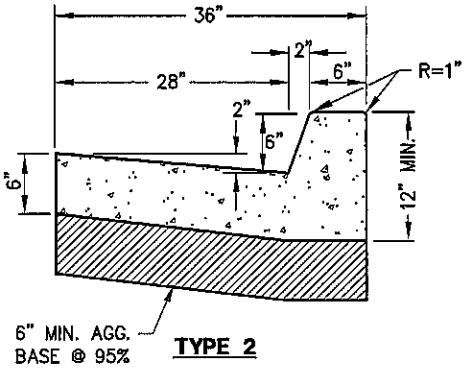
SIDEWALK RAMP PLACEMENT

SCALE: NONE
DATE: 08/05
DRAWN BY: TRU P.

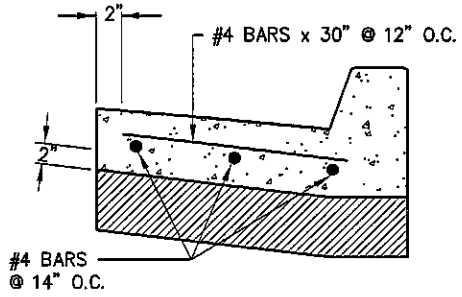
4-24



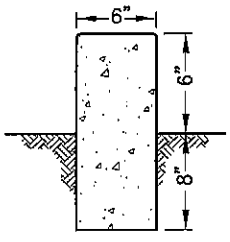
TYPE 1A & TYPICAL SIDEWALK



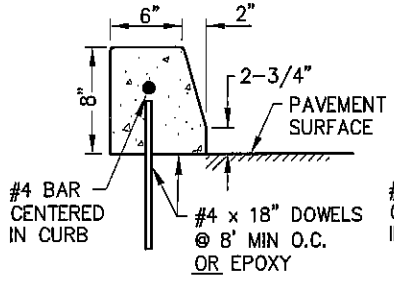
TYPE 2



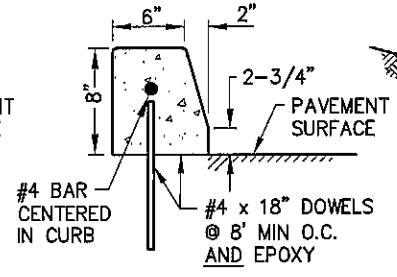
TYPE 2 REINFORCED



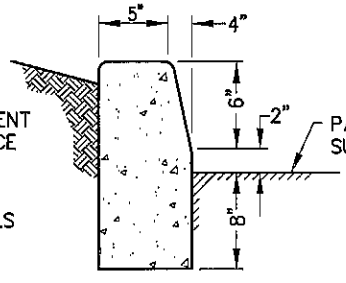
TYPE 3



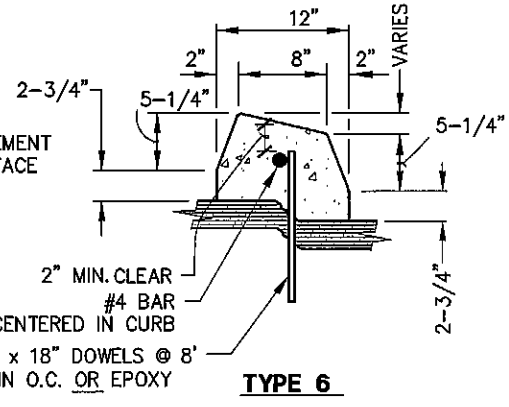
TYPE 4



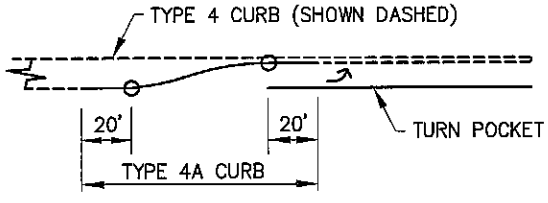
TYPE 4A



TYPE 5



TYPE 6



PLAN FOR TYPICAL PLACEMENT OF TYPE 4A CURB

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.

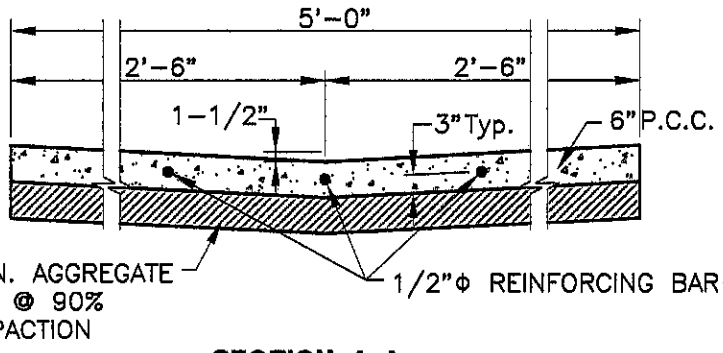
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

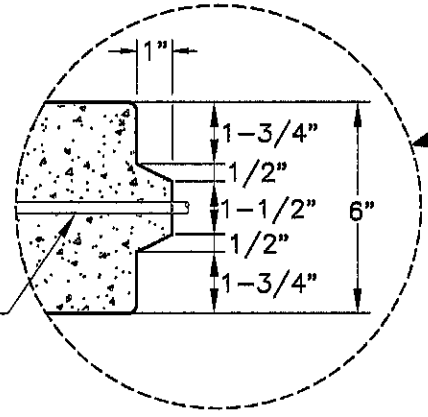
TYPICAL CURB & GUTTER SECTIONS

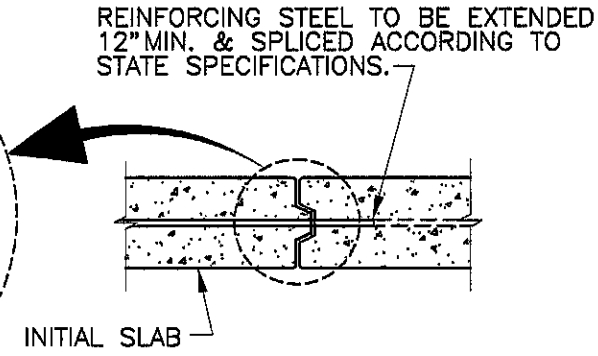
SCALE: NONE
DATE: 11/06/2007
DRAWN BY: TRU P.

4-25

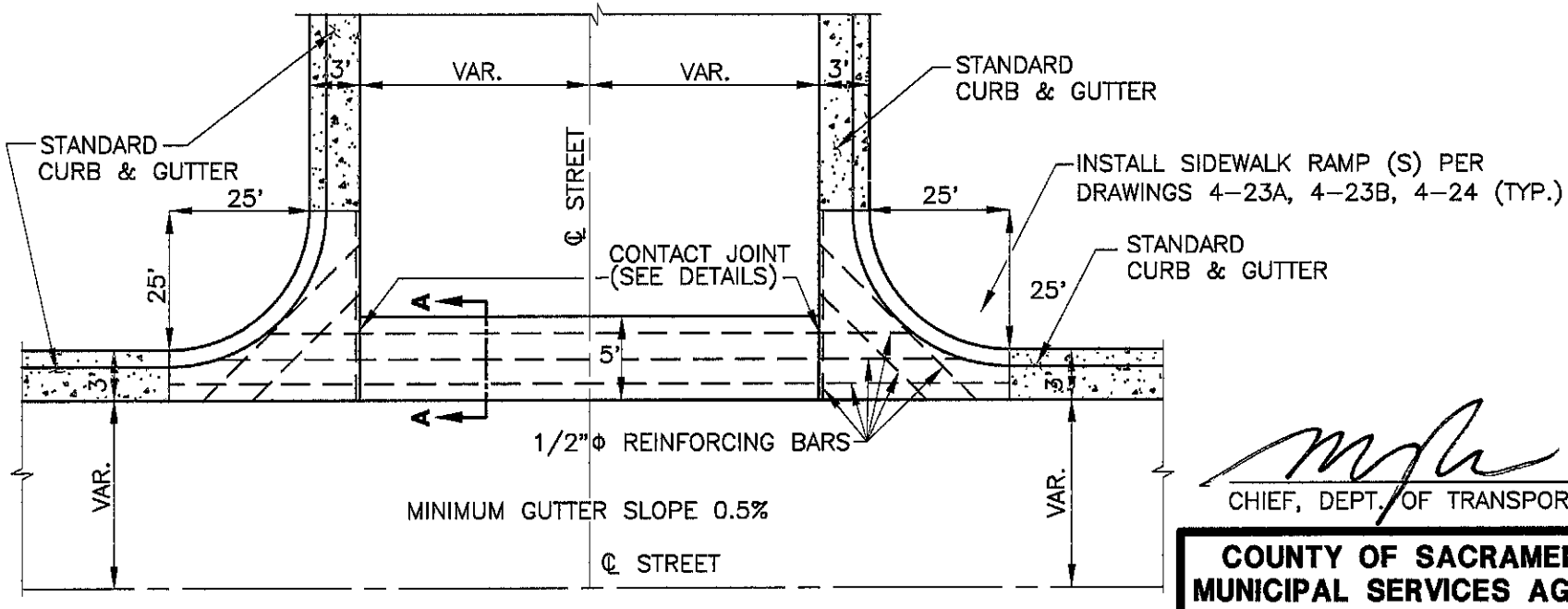


SECTION A-A





CONTACT JOINT DETAIL



PLAN

NOTE:

6" MIN AGGREGATE BASE TO BE PLACED WITHIN LIMITS OF CROSS GUTTER.

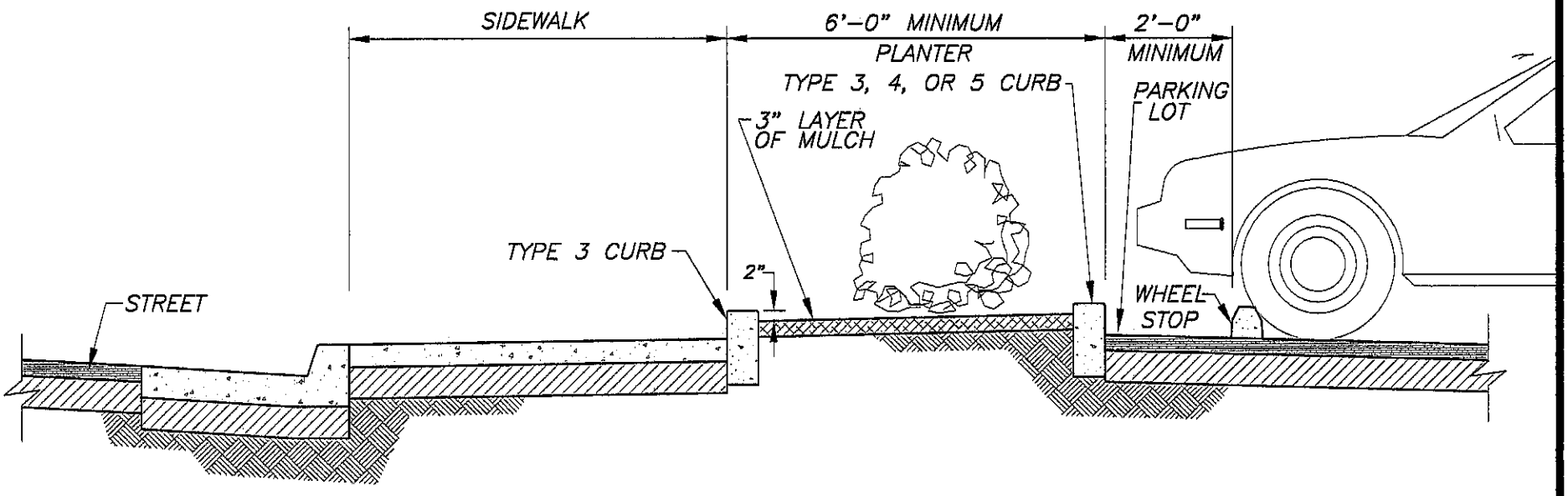
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

CROSS GUTTER

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

4-26



NOTES:

1. USE BARRIER CURB ADJACENT TO SIDEWALK ON ALL 84', 108' AND 130' STREET WIDTHS AND ON ALL COMMERCIAL DEVELOPMENT.
2. SEE SECTION 4–20 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.

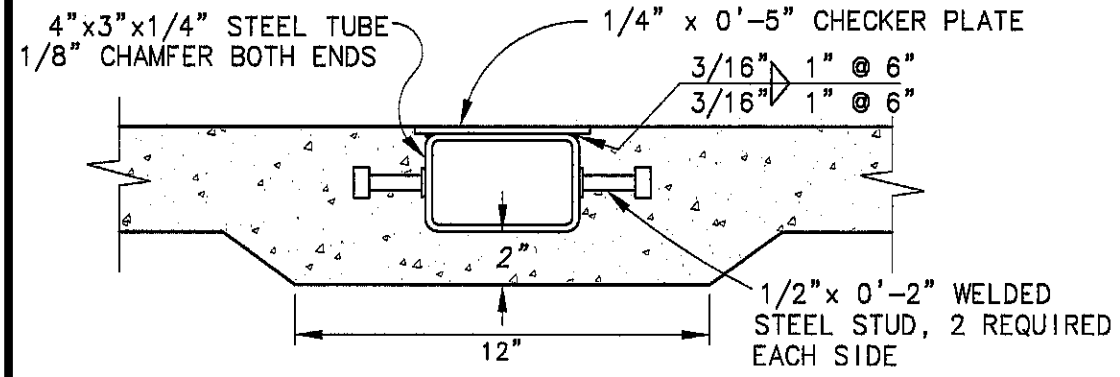
CHIEF, DEPT. OF TRANSPORTATION

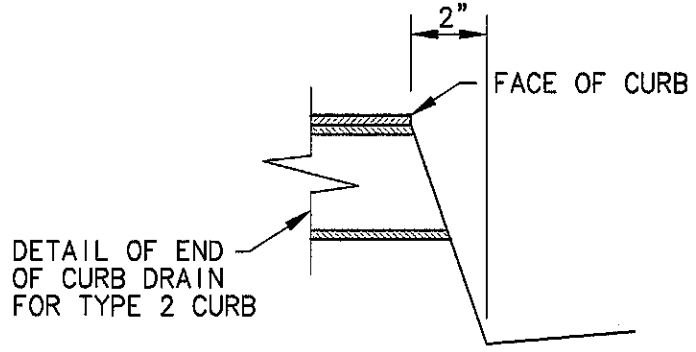
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BARRIER CURB DETAIL

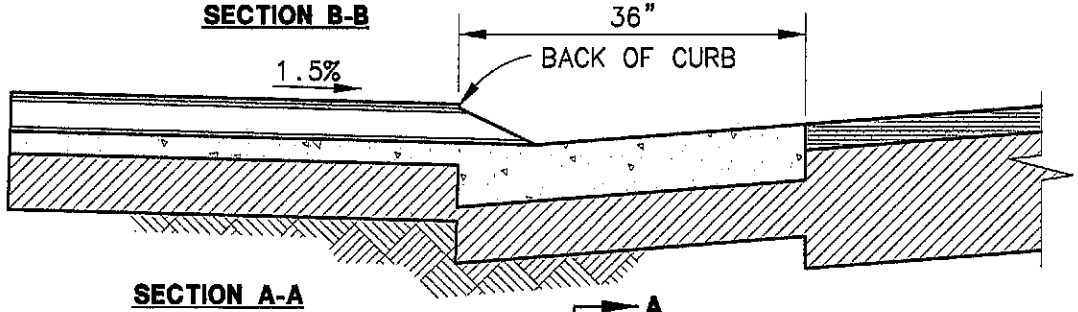
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

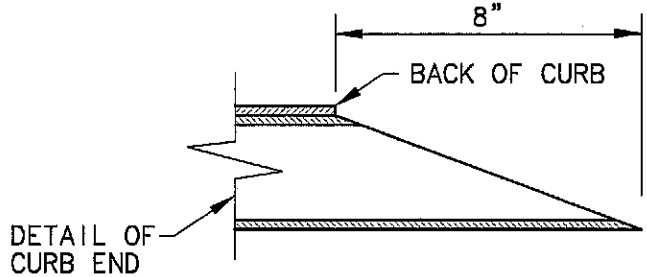
4-27





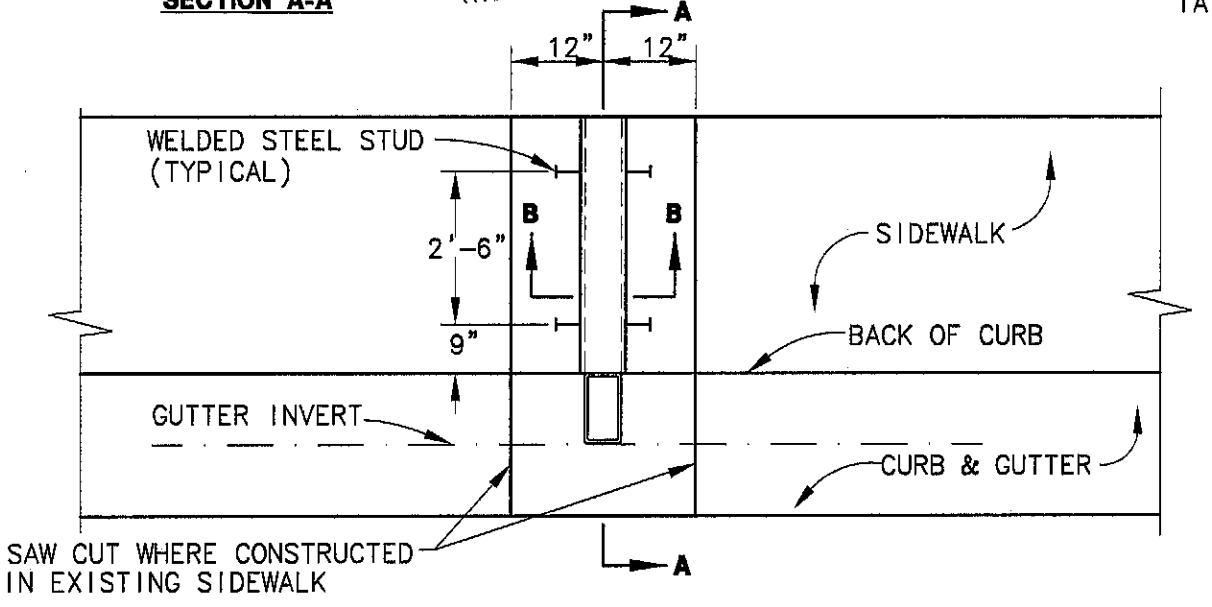
SECTION B-B





SECTION A-A

NOTE:
GALVANIZE AFTER FABRICATION



PLAN VIEW OF CURB, GUTTER & SIDEWALK

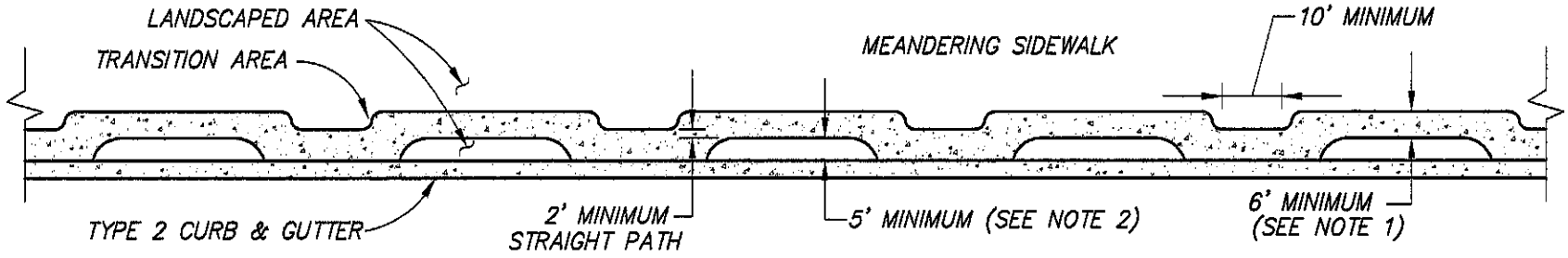
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

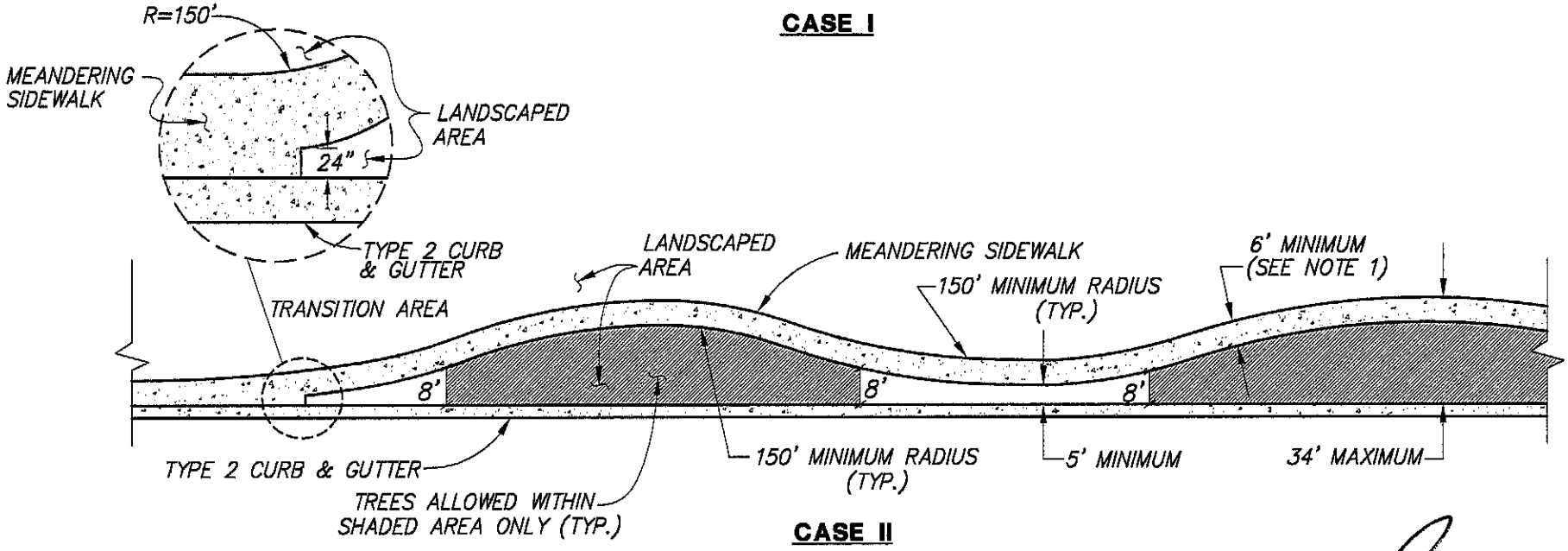
UNDER SIDEWALK DRAIN

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

4-28



CASE I



CASE II

NOTE:

1. 6' MINIMUM SIDEWALK WIDTH REQUIRED ON THOROUGHFARES, ARTERIALS, AND WHERE 6' SIDEWALKS ARE REQUIRED BY THE IMPROVEMENT STANDARDS. 4' MINIMUM ON ALL OTHER LOCATIONS EXCEPT AT SCHOOLS WHERE 8' SIDEWALKS ARE REQUIRED.
2. 8' MINIMUM IF TREES WILL BE PLANTED BETWEEN THE SIDEWALK AND THE CURB & GUTTER.
3. CROSS SLOPE OF MEANDERING SIDEWALK TO BE 1.5% (1.0% TO 2.0% ALLOWABLE). LONGITUDINAL GRADE NOT TO EXCEED 5%.
4. USE OF MEANDERING SIDEWALKS WILL REQUIRE STREET LIGHTING REVIEW IN RELATION TO THE LANDSCAPE PLAN, AND MAY REQUIRE ADDITIONAL SIDEWALK LIGHTING.

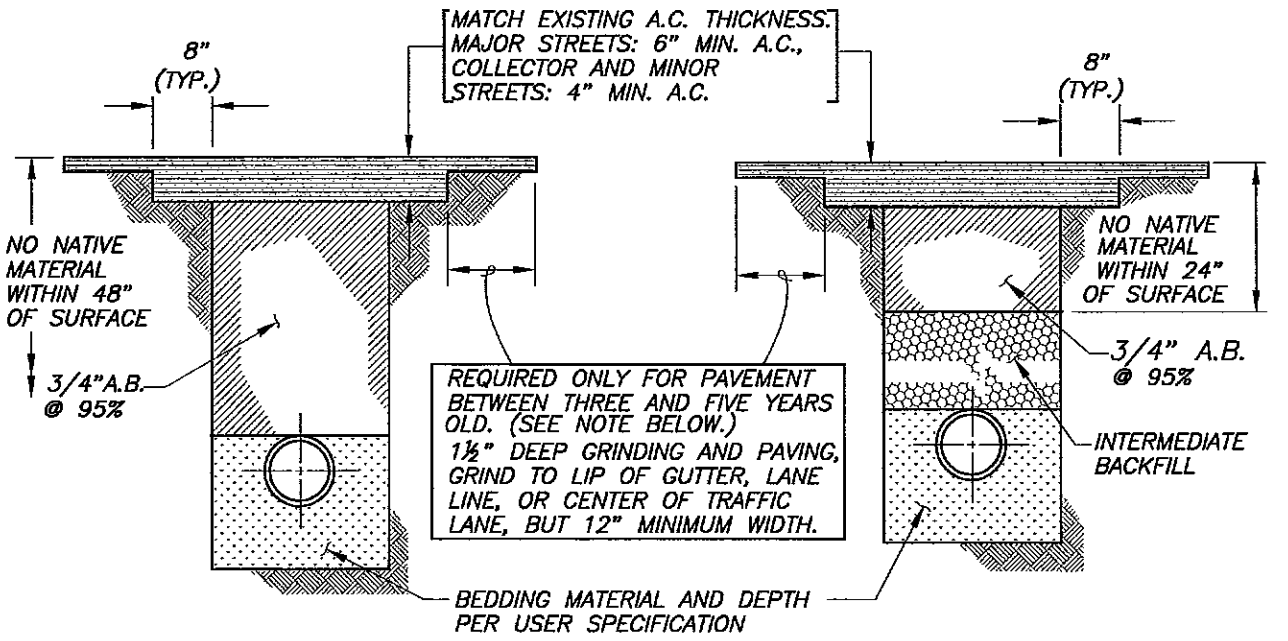
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

MEANDERING SIDEWALK STANDARDS

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

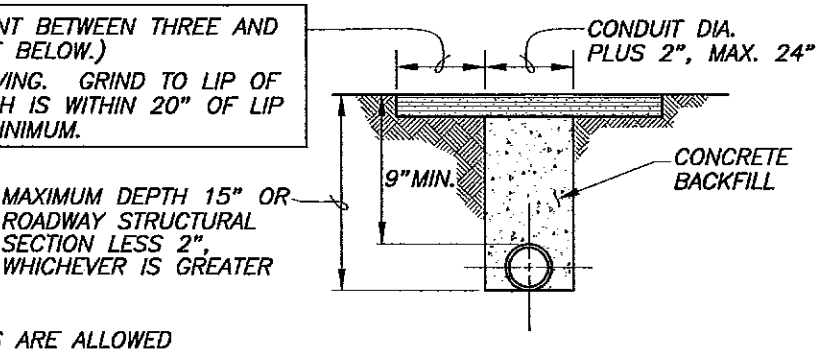
4-29



SHALLOW TRENCH
IN EXISTING PAVEMENT
(LESS THAN 4 FEET COVER)

DEEP TRENCH
IN EXISTING PAVED AREAS AND OTHER TRENCHING
(4 FEET OR MORE COVER)

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

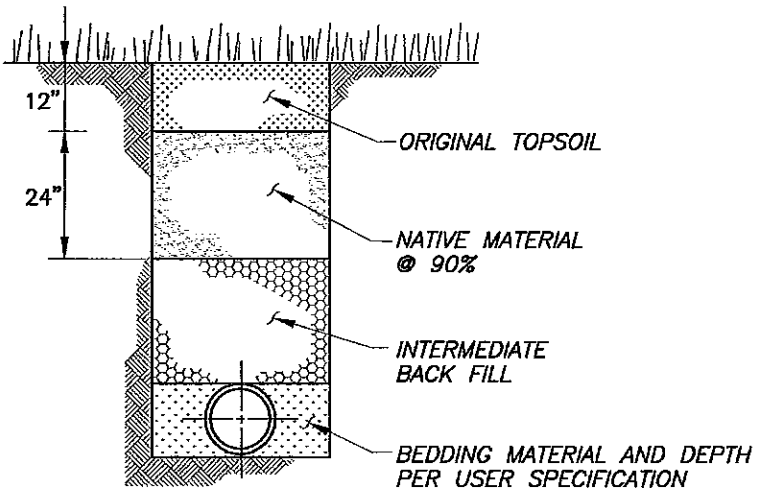


NOTE:

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

EARTH SAW TRENCH SECTION

(SEE SECTION 49–2.02)



HORTICULTURE, LAWN, OR CULTIVATED AREAS

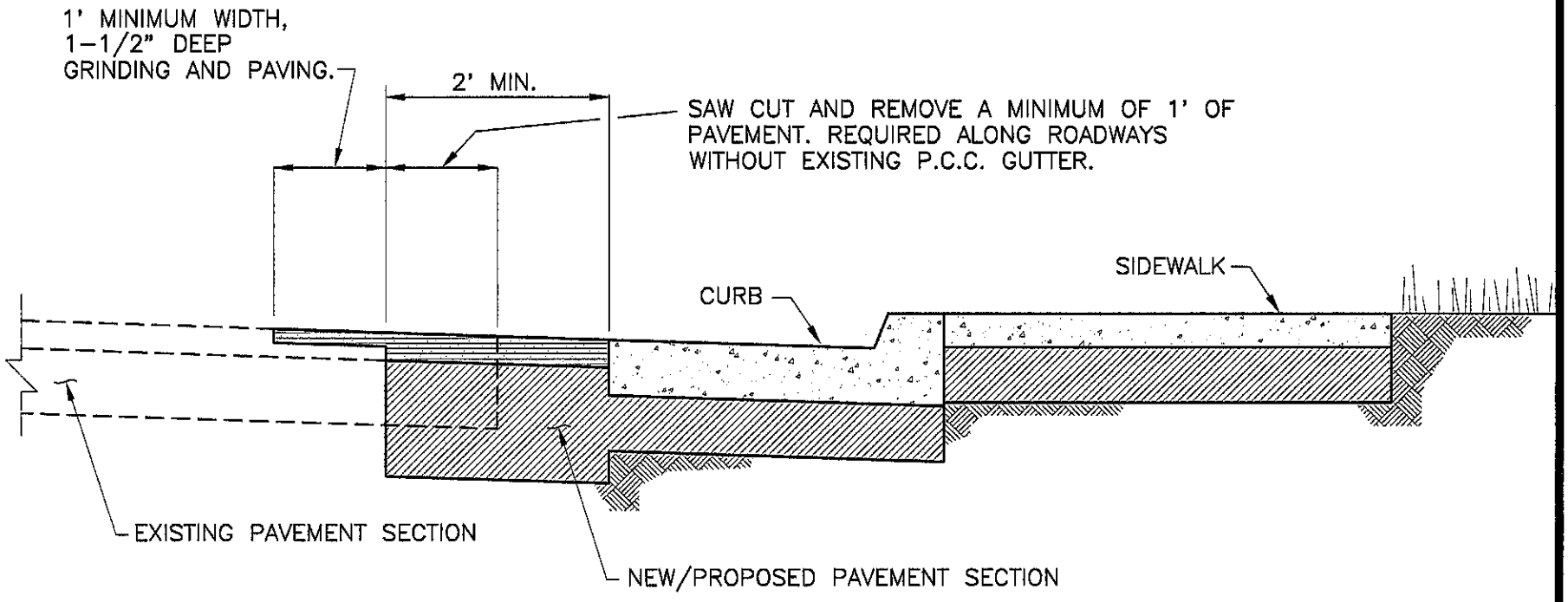
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TRENCH SECTIONS IN IMPROVED AREAS

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

4-31



NOTE:

THIS DETAIL IS APPLICABLE TO PAVEMENT WIDENING PROJECTS AND TO PAVEMENT EXTENSION PROJECTS (WHERE NEW ROAD CONNECTS TO EXISTING PAVEMENT).

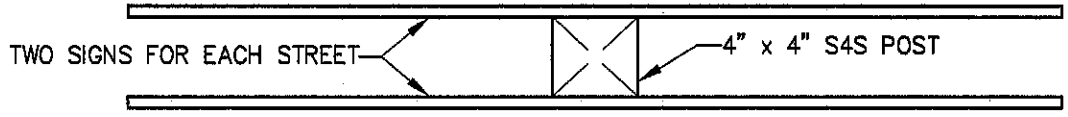
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

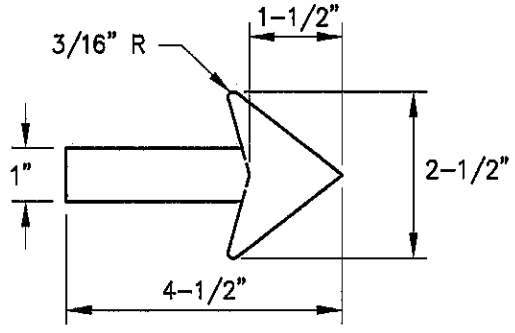
PAVEMENT WIDENING DETAIL

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

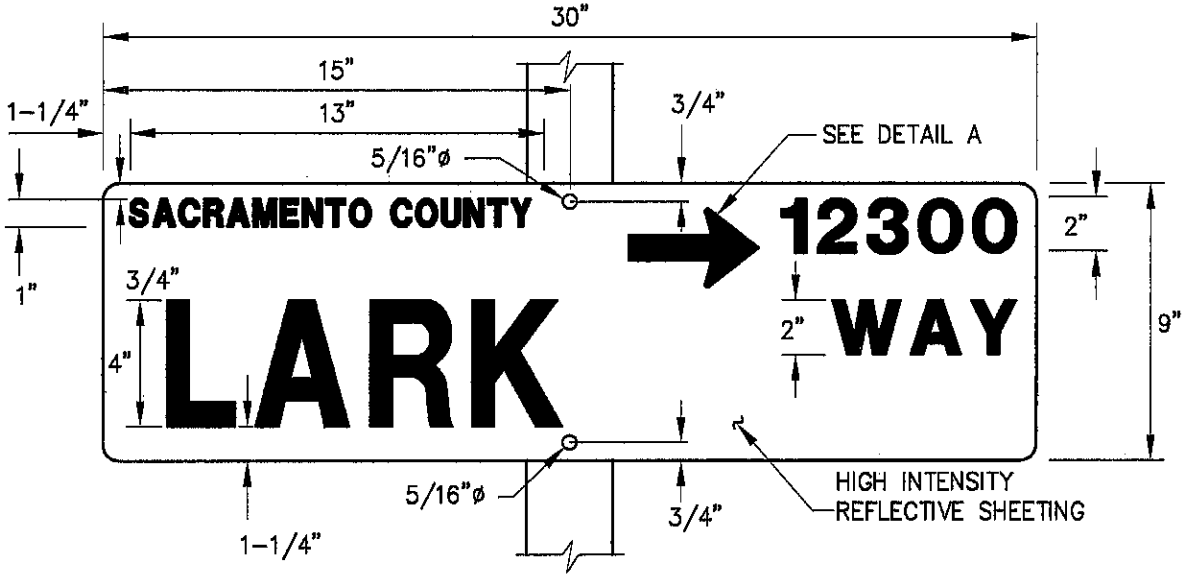
4-32



TOP VIEW



DETAIL A



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 AND AT 90° TO SIGNS AS SHOWN.*
3. *POSTS SHALL BE REDWOOD OR TREATED DOUGLAS FIR (STATE OF CALIFORNIA SPEC. NO. 56-2.02B).*
4. *BLOCK NUMBERS SHALL BE AS SHOWN ON THE PLAN IN 2" SERIES "C".*

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

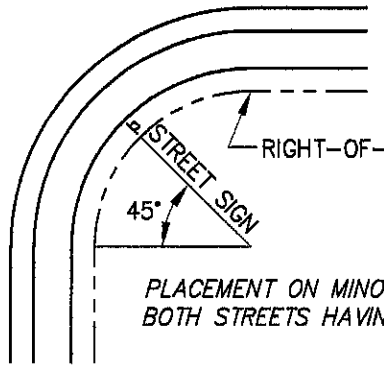
STREET SIGN
FULLY REFLECTORIZED

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

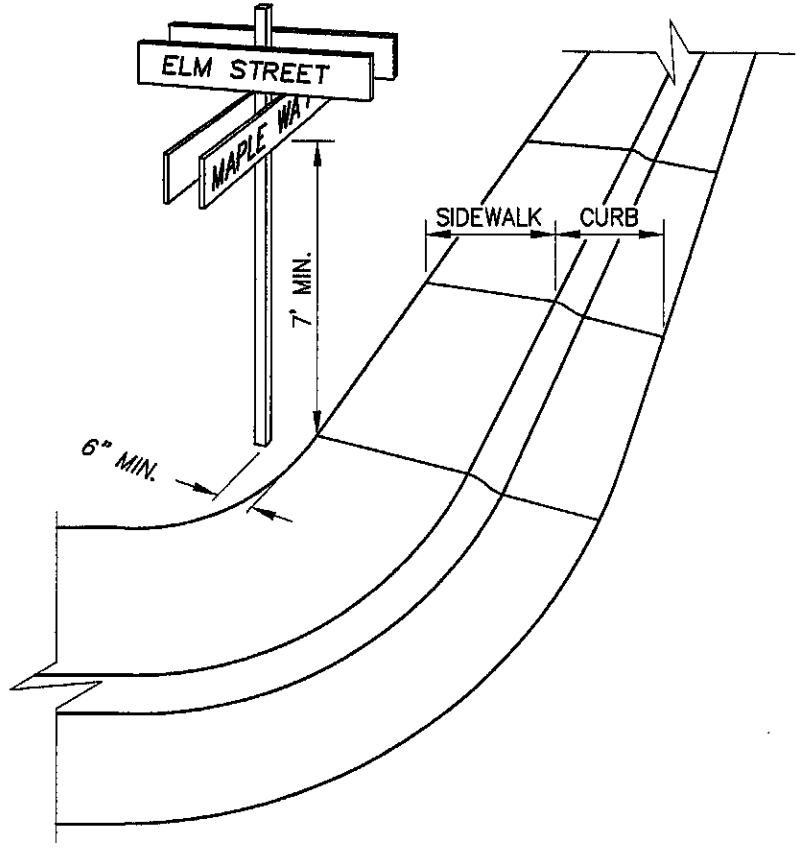
4-33

STREET W/ LESS THAN 80' R/W WIDTH

STREET W/ LESS THAN 80' R/W WIDTH

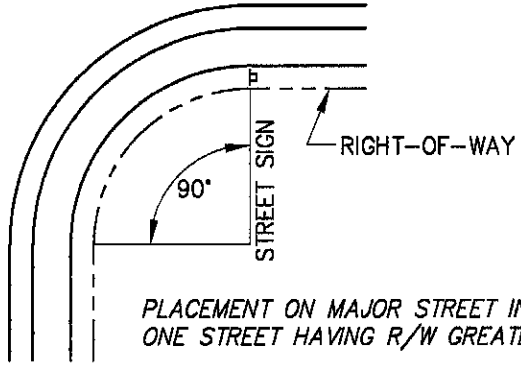


PLACEMENT ON MINOR STREET INTERSECTIONS WITH BOTH STREETS HAVING R/W LESS THAN 80'.



MAJOR STREET 80' OR GREATER R/W WIDTH

R/W WIDTH EQUAL TO OR LESS THAN MAJOR STREET



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. 4-35

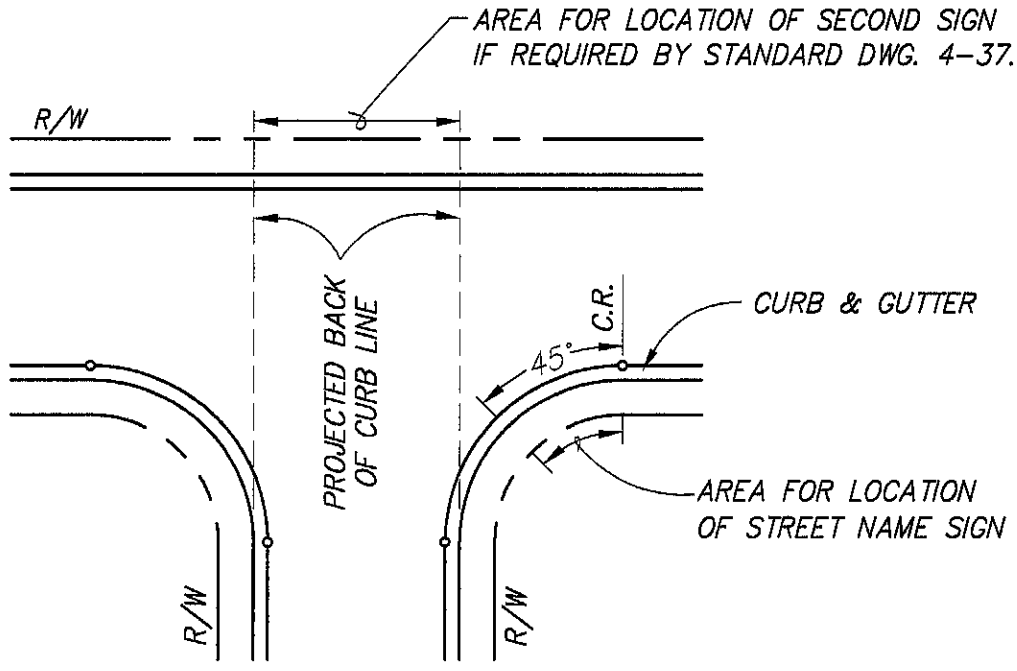
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET NAME SIGN PLACEMENT DETAILS

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

4-34



NOTES:

1. STREET NAME SIGNS SHALL BE INSTALLED ON STREET LIGHT POLES WHEN THEY ARE LOCATED WITHIN THE LOCATION LIMITS DEFINED ON THIS DETAIL.
3. ALL OTHER STREET NAME SIGN REQUIREMENTS IN SECT'S 4–26 & 4–27 AND IN DRAWINGS 4–33, 4–34, 4–36 & 4–37 OF THE SACRAMENTO COUNTY IMPROVEMENT STANDARDS SHALL APPLY.

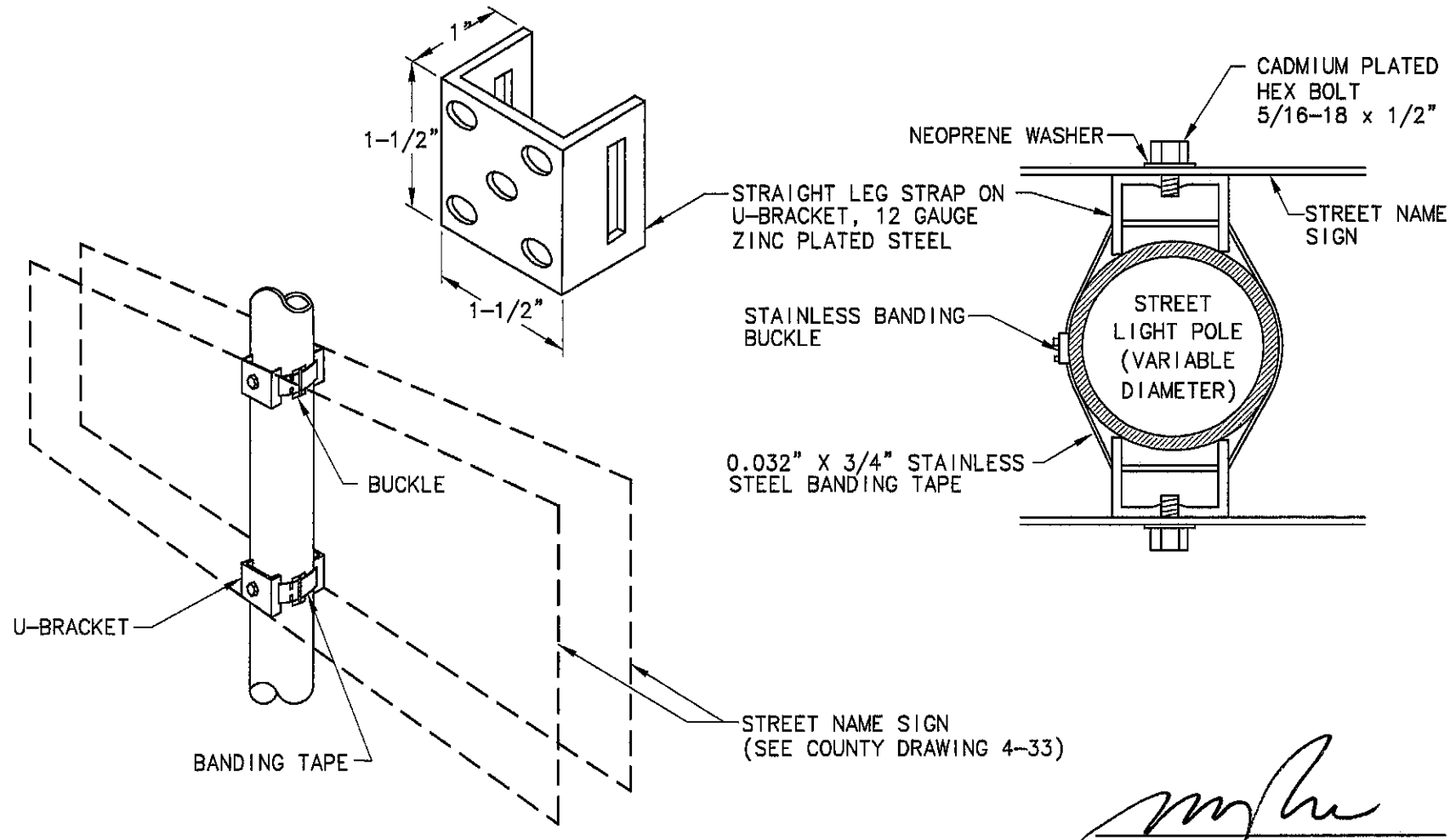
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET NAME SIGN ON STREET LIGHT POLE PLACEMENT DETAIL

SCALE: NONE
DATE: 03/05
DRAWN BY: COUNTY D.O.T.

4-35



CHIEF, DEPT. OF TRANSPORTATION

NOTE:

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.

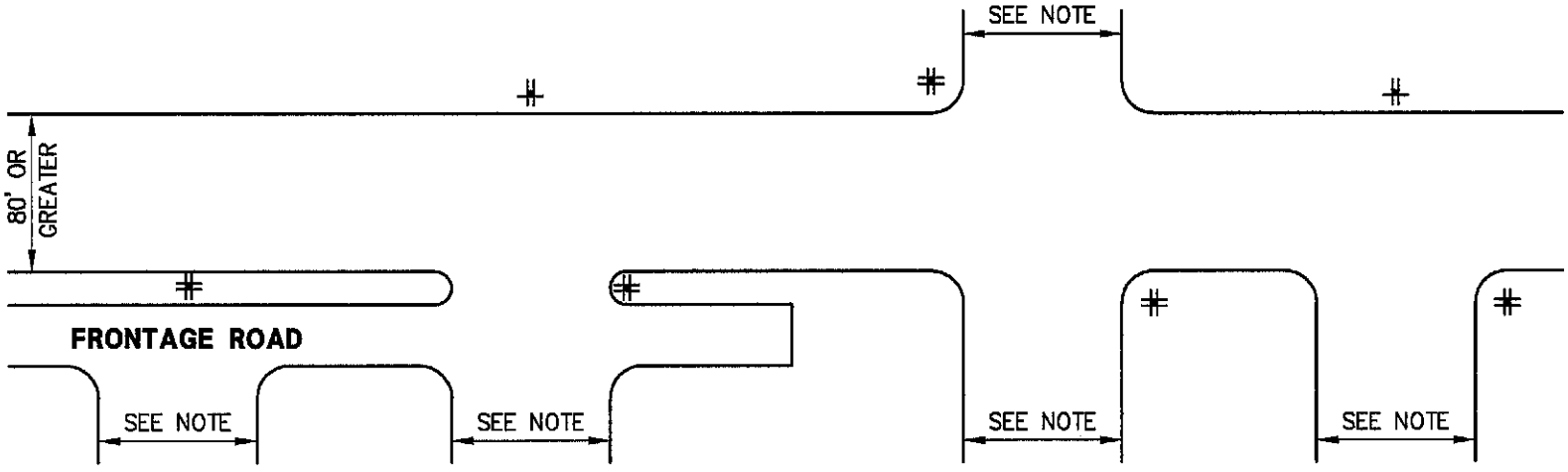
STANDARD CLEARANCE TO BOTTOM OF LOWEST SIGN IS 7 FEET MINIMUM.

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

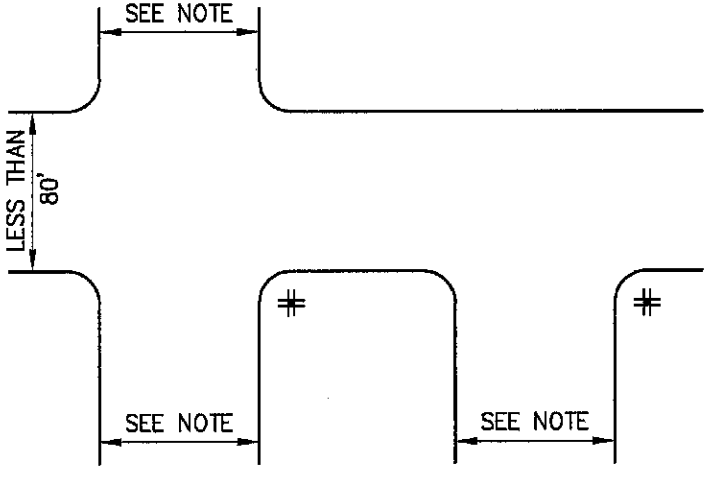
STREET NAME SIGN INSTALLATION ON STREET LIGHT POLE

SCALE: NONE
DATE: 03/05
DRAWN BY:

4-36



STREETS HAVING 80' OR GREATER R/W WIDTH



STREETS HAVING LESS THAN 80' R/W WIDTH

NOTE:
SIDE STREETS INDICATED ARE STREETS WITH R/W WIDTHS EQUAL TO OR LESS THEN R/W WIDTH FOR 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.

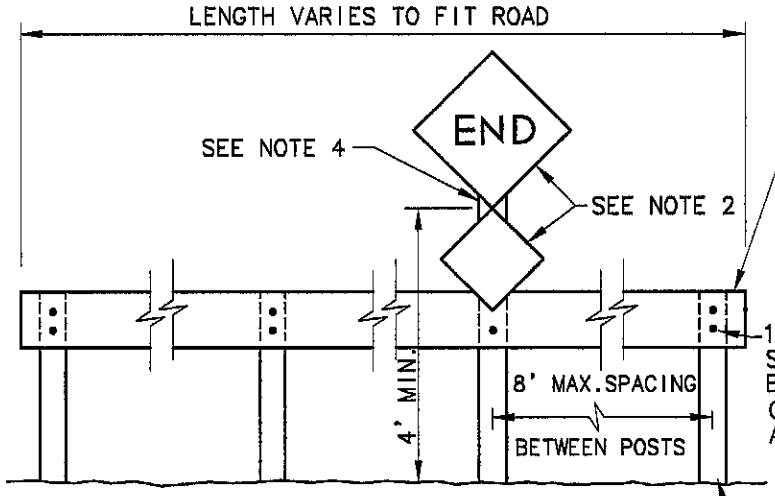
CHIEF, DEPT. OF TRANSPORTATION

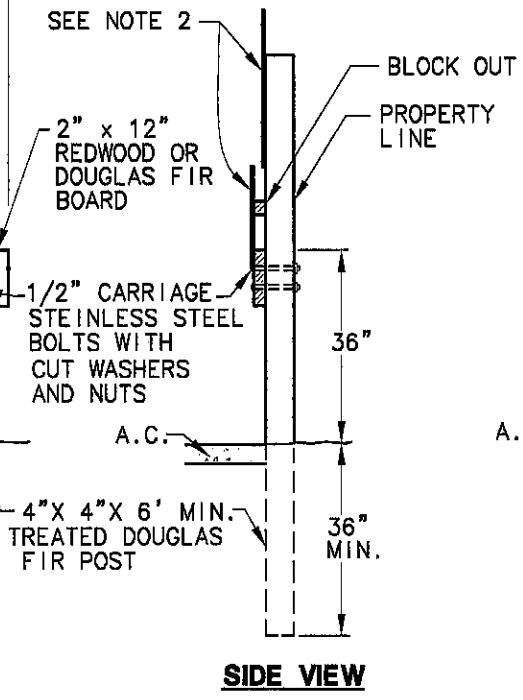
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET NAME SIGN PLACEMENT DETAILS

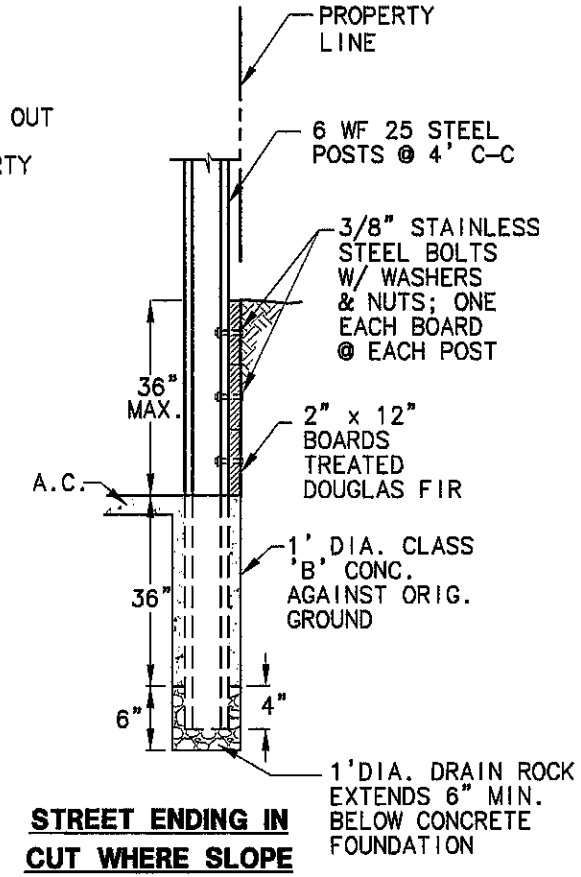
SCALE: NONE
DATE: 03/05
DRAWN BY:

4-37





SIDE VIEW



STREET ENDING IN CUT WHERE SLOPE NOT OBTAINABLE

NUMBER AND SIZE OF SIGNS

R/W WIDTH	W31(CA)		OM4-3		R11-2	
	SIZE	NO.	SIZE	NO.	SIZE	NO.
40' & 42'	24"	1	18"	1	36" x 24"	1
50', 56', 60', 66', 70', 74'	24"	1	18"	1	48" x 30"	1
80' & 84'	24"	2	18"	2	48" x 30"	1
108' & 130'	24"	3	18"	3	48" x 30"	1

NOTES:

1. *WHERE PERMISSION HAS BEEN GRANTED TO CLOSE AN EXISTING PUBLIC STREET, A R11-2 "ROAD CLOSED" SIGN WILL BE REQUIRED ON THE CENTERLINE OF THE ROAD IN ADDITION TO THE W31(CA) "END" SIGN.*
2. *24" x 24" 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.*
3. *ALL EXPOSED SURFACES OF BARRICADE SHALL BE PAINTED WITH WHITE PAINT CONFORMING TO STATE STANDARD SPECIFICATION 91-3.*
4. *POST AT CENTER OR NEAREST TO CENTER ON RIGHT HAND SIDE TO BE EXTENDED TO PROVIDE MOUNTING FOR SIGNS.*
5. *POSTS SHALL BE PRESSURE TREATED PER STATE SPECIFICATION 58-1.02*

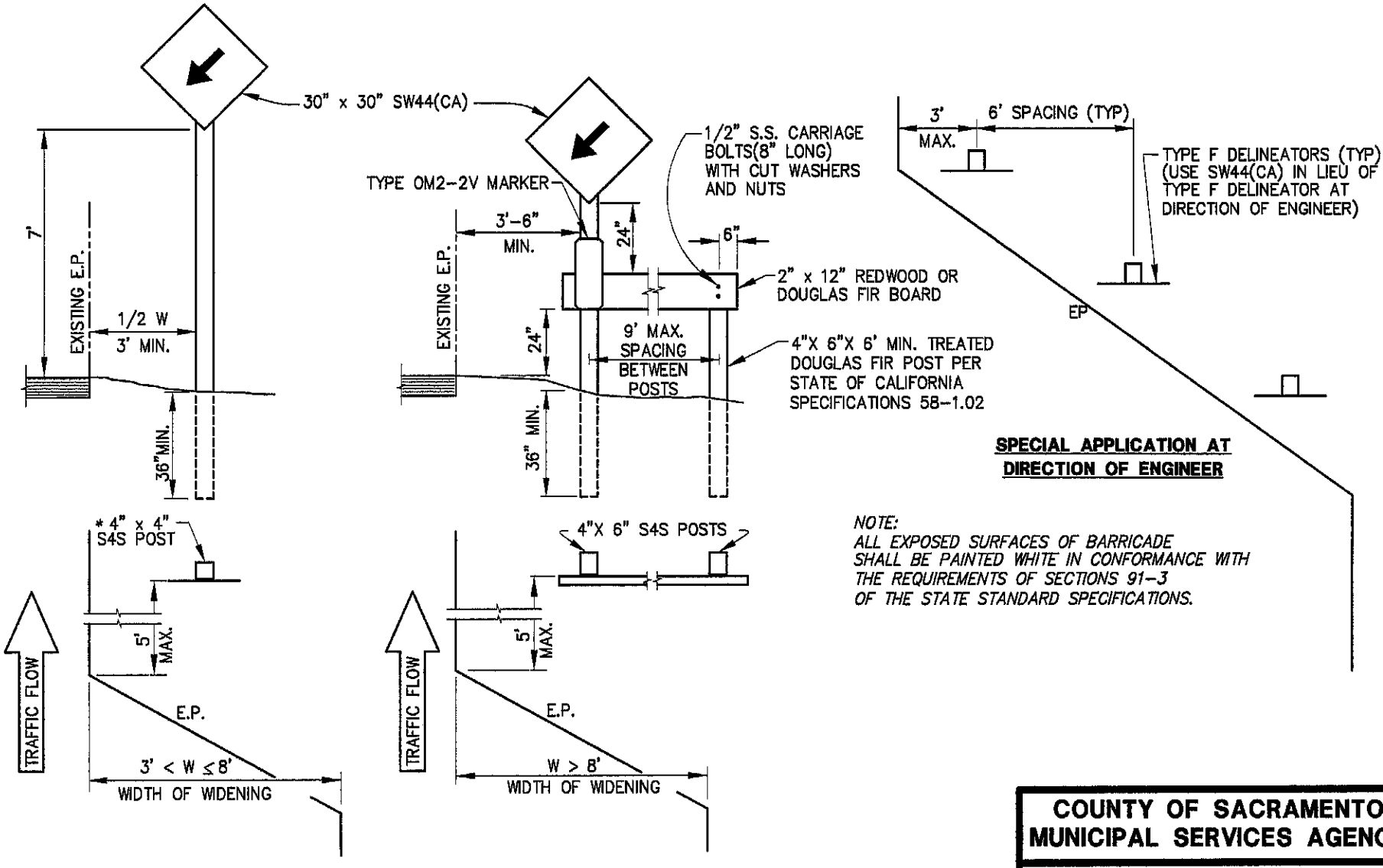
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STREET CLOSURE TIMBER BARRICADE

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

4-38



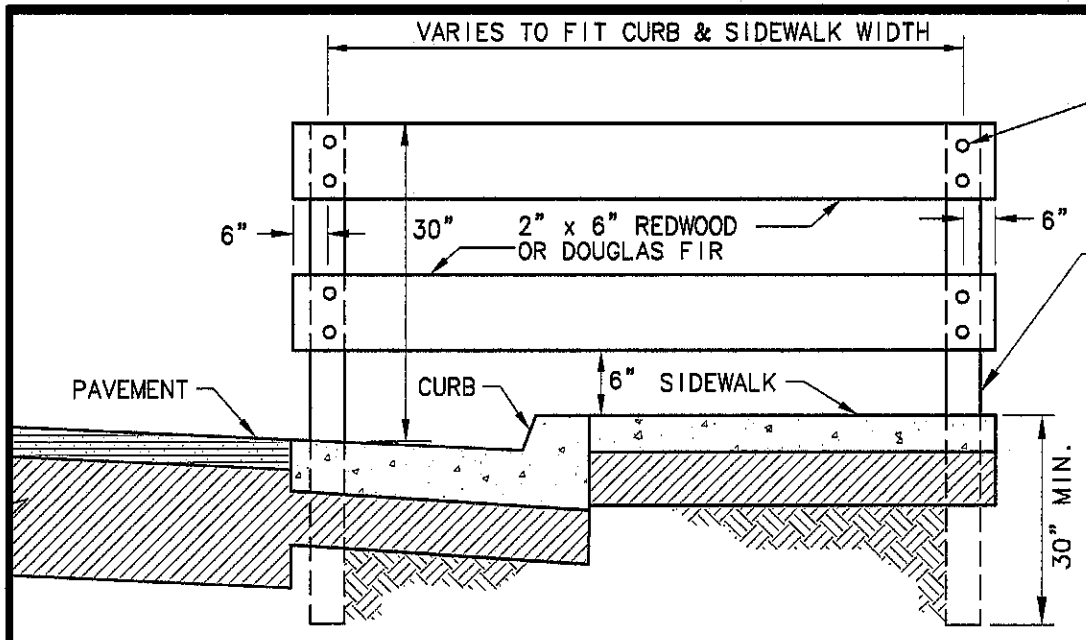
CHIEF, DEPT. OF TRANSPORTATION

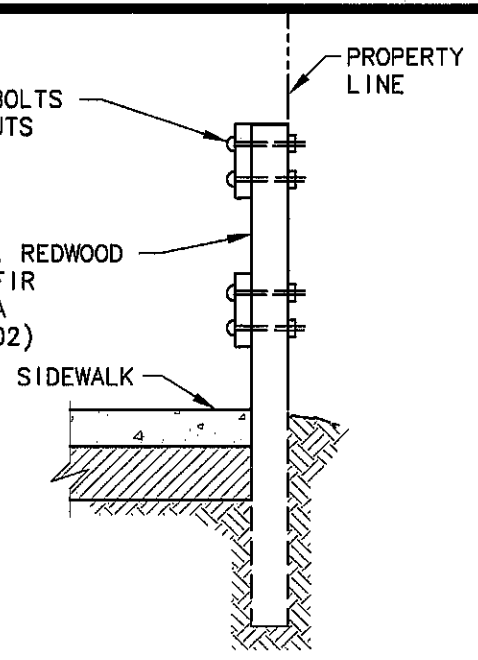
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

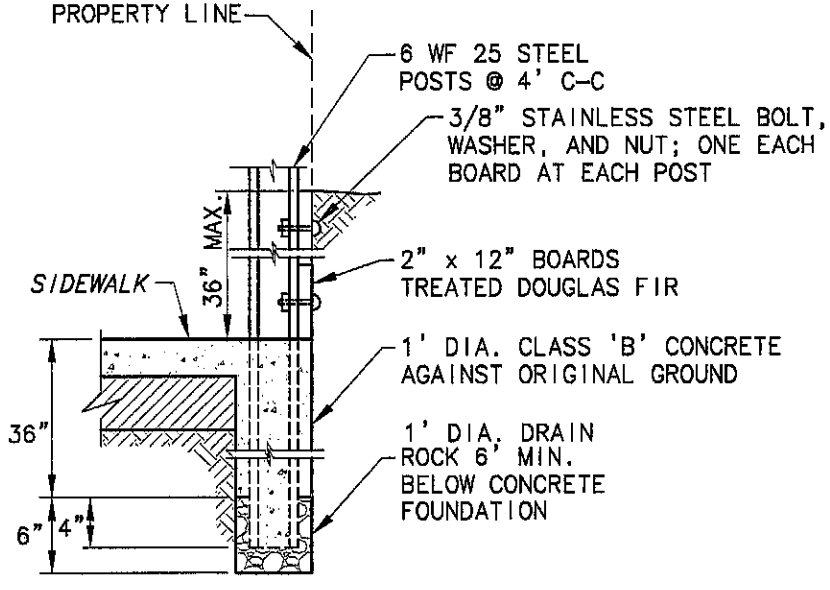
SIGNS AND BARRICADES AT ABRUPT CHANGE OF PAVEMENT WIDTH

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

4-39







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.*

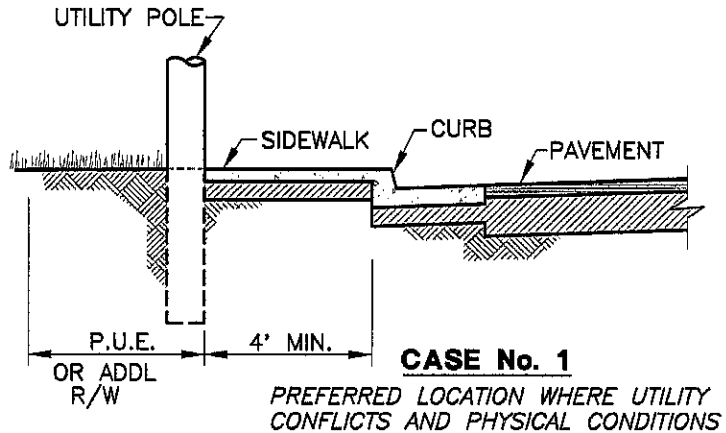
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIDEWALK BARRICADE

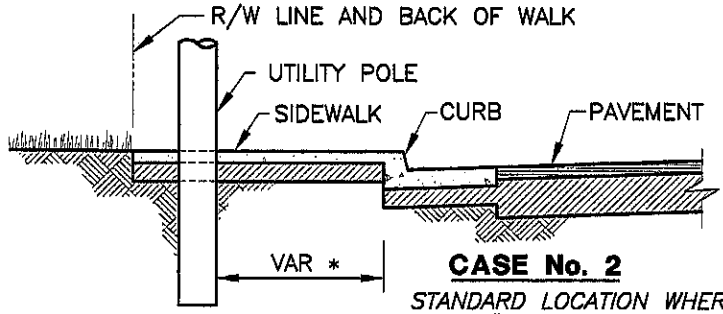
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

4-40



CASE No. 1

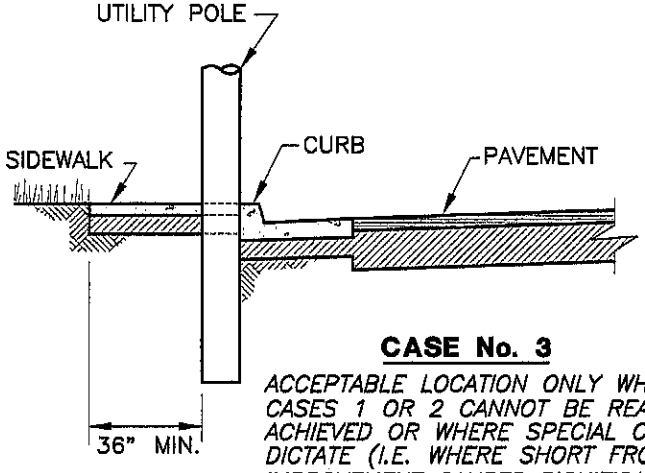
PREFERRED LOCATION WHERE UTILITY CONFLICTS AND PHYSICAL CONDITIONS ALLOW AND AN EASEMENT OR RIGHT OF WAY EXISTS BEHIND WALK.



CASE No. 2

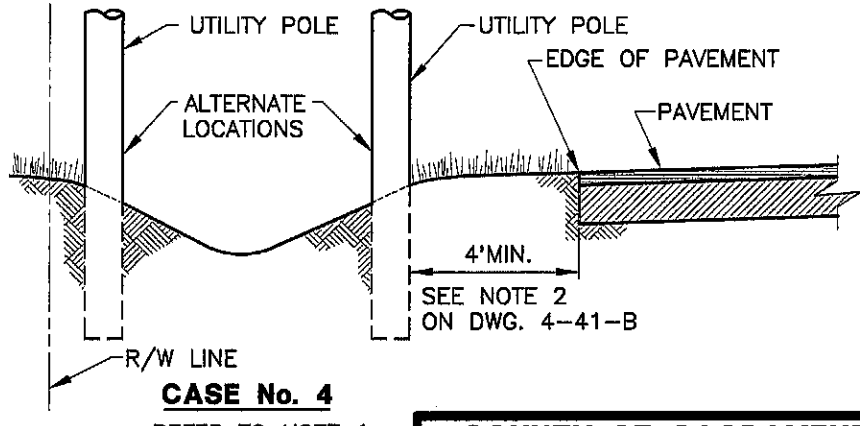
STANDARD LOCATION WHERE CASE #1 IS NOT REASONABLY ACHIEVABLE

* 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. 4-41-B

SEE 4-41-B FOR NOTES

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UTILITY POLE PLACEMENT LOCATIONS

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

4-41-A

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 4-20).

   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 DELINIATION 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.

CHIEF, DEPT. OF TRANSPORTATION

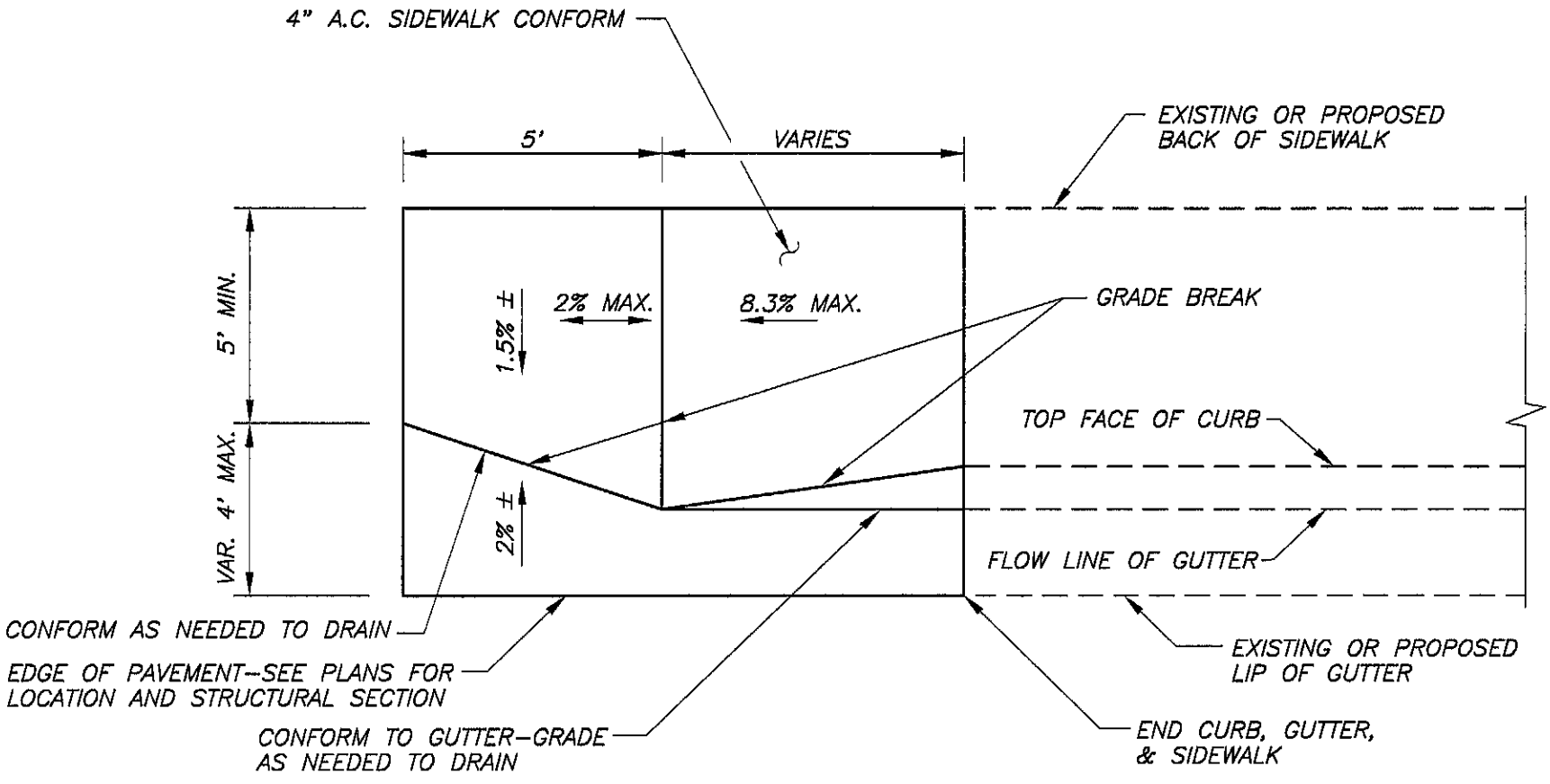
SEE 4-41-A FOR DETAILS

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UTILITY POLE PLACEMENT LOCATIONS

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

4-41-B



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.

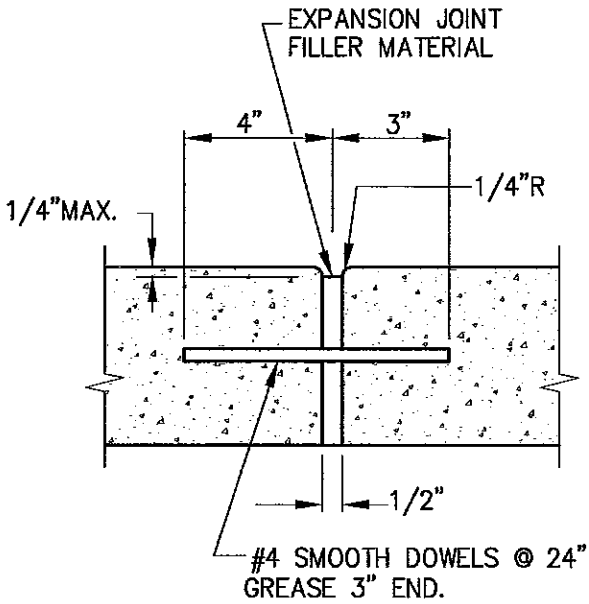
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

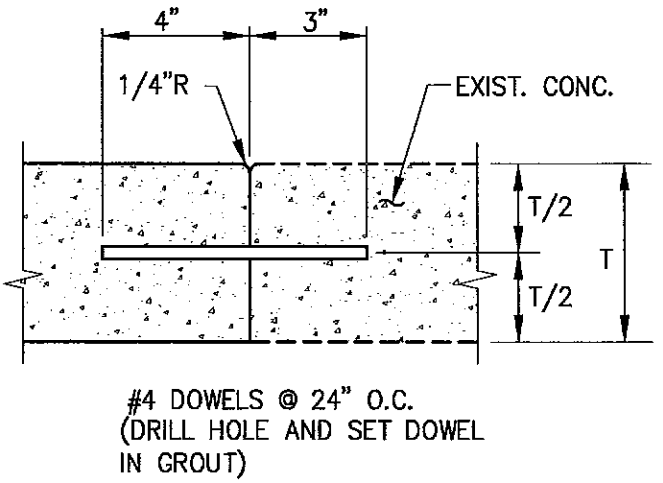
A.C. SIDEWALK CONFORM

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

4-42

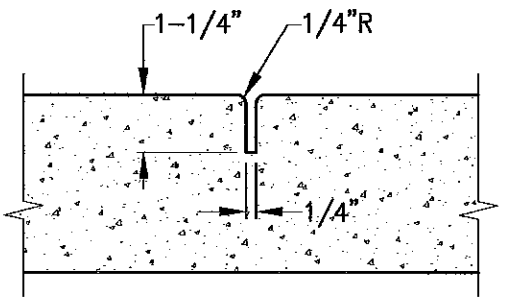


EXPANSION JOINT

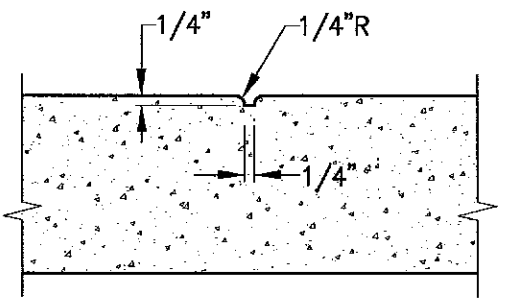


SIDEWALK CONTACT JOINT

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



WEAKENED PLANE JOINT



SCORE MARK

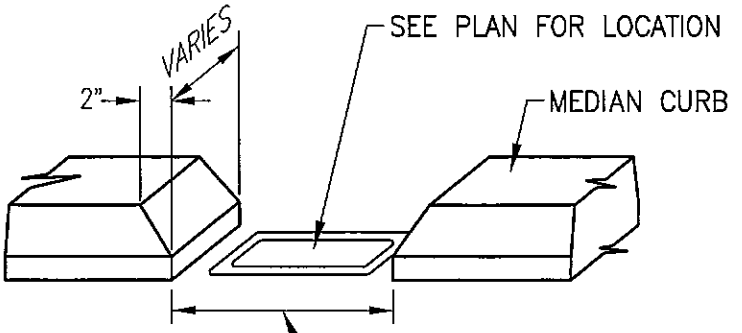
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STANDARD CONCRETE JOINT DETAILS

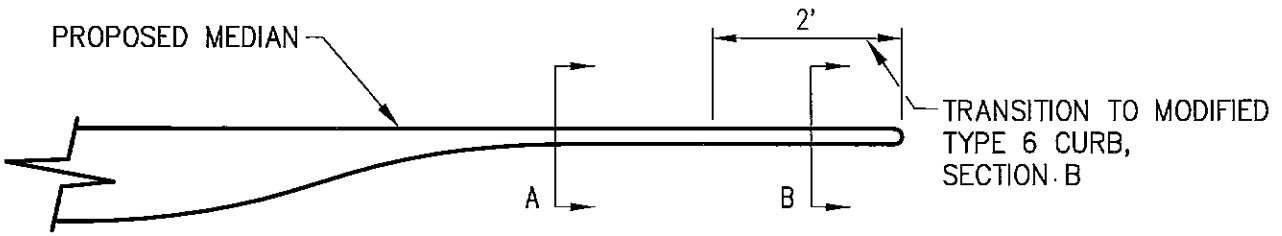
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

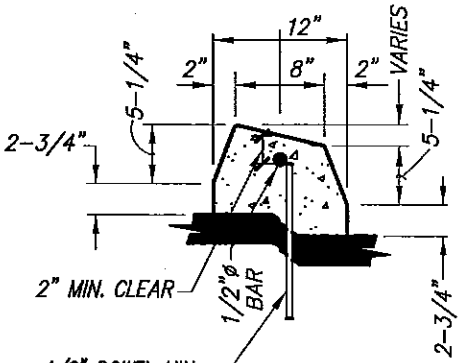
4-43



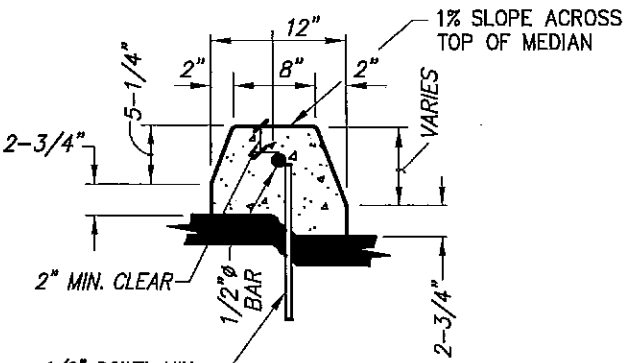
OPENING TYPE	OPENING WIDTH
DRAINAGE	1'-0"
PULL BOX – #3-1/2 OR #3-1/2(T)	2'-0"
PULL BOX – #5 OR #5(T)	3'-0"
PULL BOX – #6 OR #6(T)	3'-6"

OPENING IN MEDIAN TO PLACE PULL BOX AT GRADE





SECTION A
TYPE 6 CURB



SECTION B
MODIFIED TYPE 6 CURB
FOR TERMINATION OF MEDIAN

MEDIAN NOSE TRANSITION

NOTES:

1. *SEE PLAN FOR EXACT LOCATION OF OPENING.*
2. *SEE STANDARD DRAWING 4-25 FOR CURB DETAILS.*

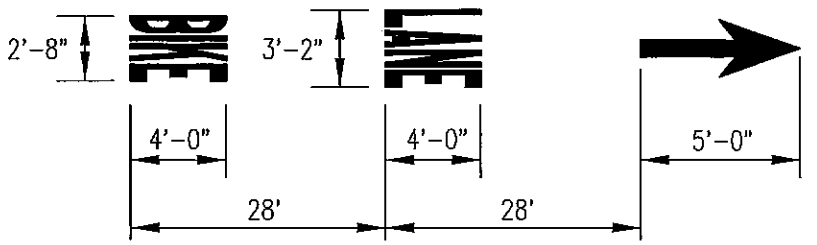
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

MEDIAN DETAIL

SCALE: NONE
DATE: 06/07
DRAWN BY: N.S.

4-44



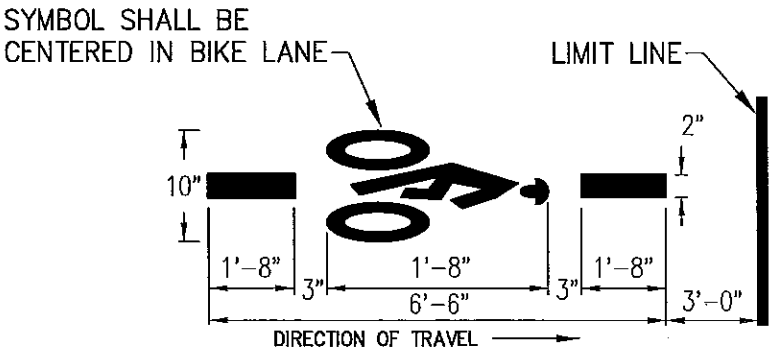
BIKE LANE LEGEND DETAIL

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

BIKE LANE LEGEND

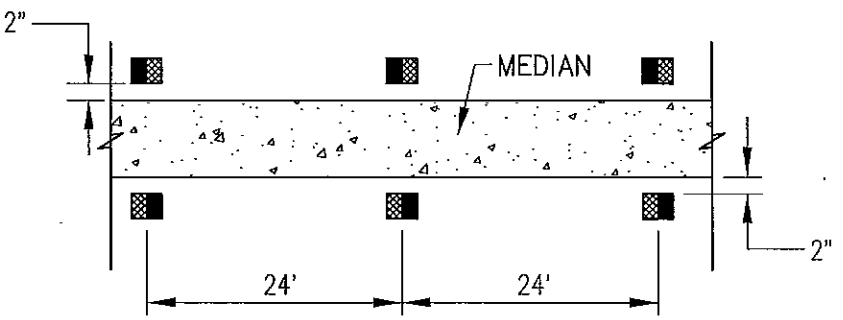
TYPICAL LOCATIONS:

– 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 26 – FOR USE ADJACENT TO MEDIANS

SEE CALTRANS STANDARD PLAN A20B FOR PAVEMENT MARKER TYPE.

CHIEF, DEPT. OF TRANSPORTATION

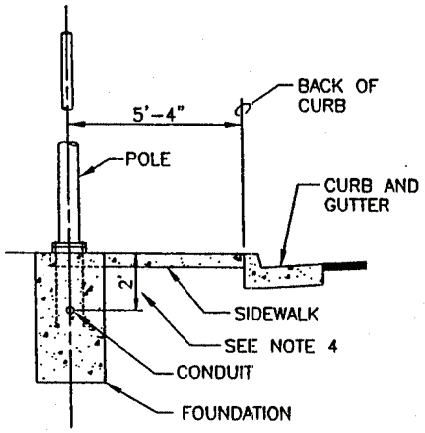
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STRIPING AND PAVEMENT MARKING DETAILS

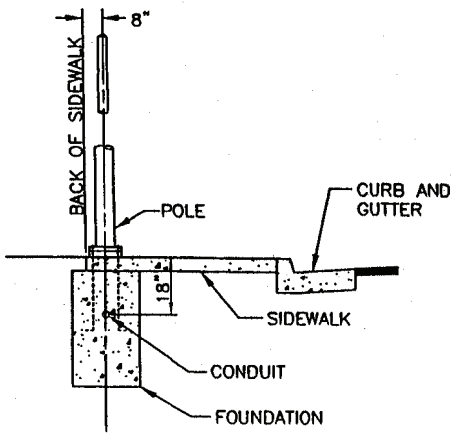
SCALE: NONE
DATE: 03/07
DRAWN BY: L. GHELFI

4-45

DRAWING NUMBER	TITLE
5-6	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS BASE LOCATION FOR STREET LIGHTS (1/01)
5-7	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS DIRECT SERVICE INSTALLATION TO STREET LIGHTING STANDARD (1/01)
5-8	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS METERED SERVICE ENCLOSURE (CAN) (120/208V, 120/240V) (1/01)
5-9	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS METERED SERVICE ENCLOSURE (CAN) WITH STEP-DOWN TRANSFORMER (277/480V to 120/240V) (1/01)
5-10	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS - UNMETERED SERVICE ENCLOSURE (CAN) (120/208V, 120/240V, 277/480V) (1/01)
5-11	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS - UNMETERED SERVICE ENCLOSURE (CAN) WITH STEP-DOWN TRANSFORMER (277/480V to 120/240V) (1/01)
5-12	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS DETAILS FOR DIRECT SERVICE INSTALLATION STREET LIGHTING POWER (1/01)
5-16	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS TYPE ‘B’ STREET LIGHT STANDARD (10/03)
5-17	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS TYPE ‘A’ STREET LIGHT STANDARD (1/01)
5-19	LOCAL SOLID STATE PEDESTRIAN CONTROLLER BASE DETAIL (5/01)
5-20A	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS PULL BOX (1/01)
5-20B	SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS TRAFFIC RATED PULL BOX WITH STEEL TRAFFIC COVER (1/01)
5-22	IISNS SUPPORT ARM TYPICAL CLAMP DETAIL (2/05)
5-23	IISNS SUPPORT ARM MOUNTING DETAIL (2/06)
5-24	INDUCTION DETECTORS (3/05)
5-25	TYPE “B” DETECTOR HANDHOLE DETAIL (12/07)
5-26	TRAFFIC SIGNAL CABINET DETAILS AND GUARD POST DETAIL (12/07)
5-27	TRAFFIC SIGNAL CONTROLLER CABINET & SERVICE CAN WITH BATTERY BACKUP FOUNDATIONS (12/07)
5-29	METERED SERVICE ENCLOSURE WITH BATTERY BACKUP (6/05)



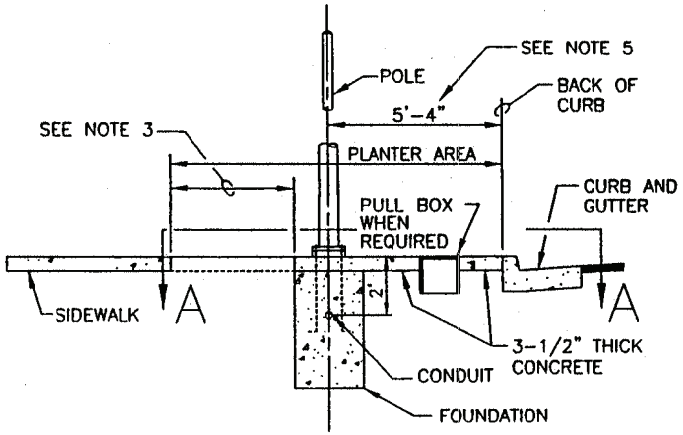
4' to 6' SIDEWALK



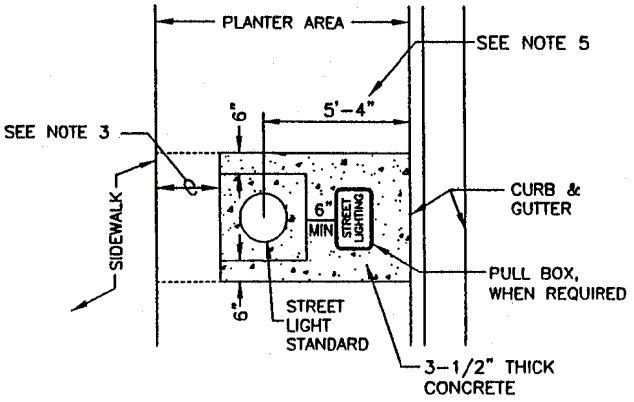
OVER 6' SIDEWALK

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.



SIDEWALK WITH PLANTER AREA



SECTION A-A

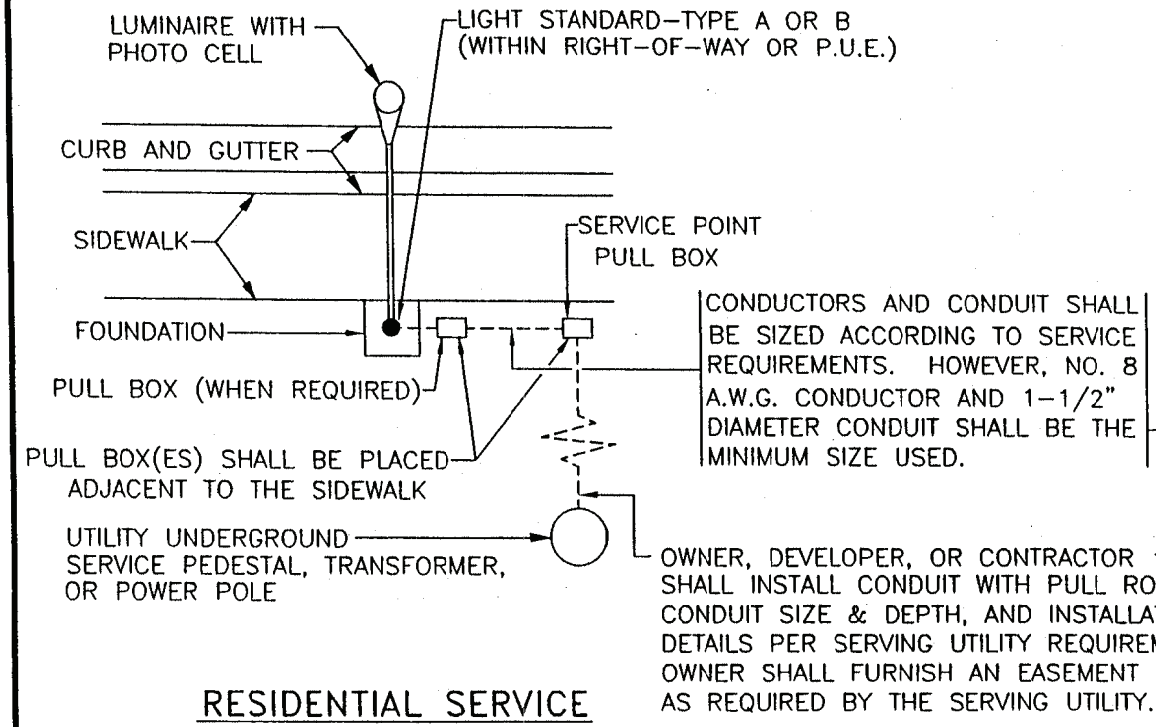
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

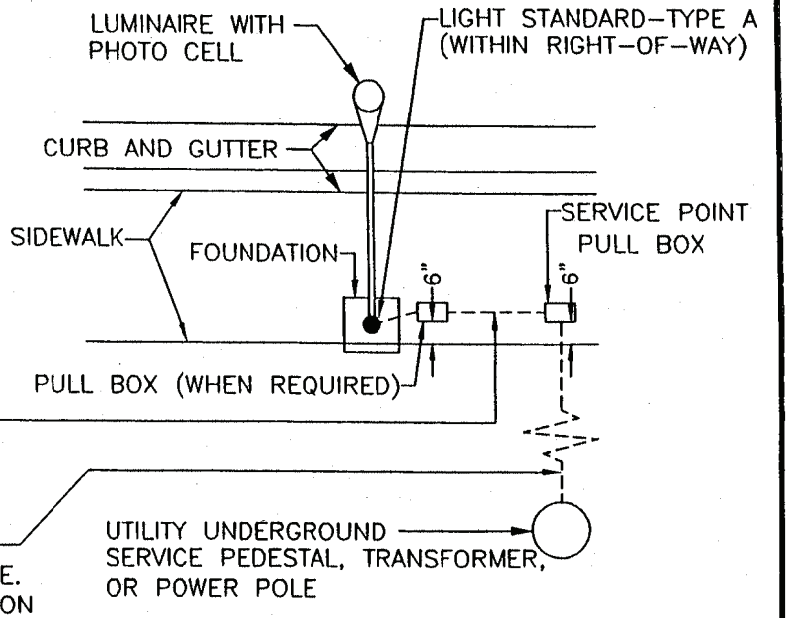
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
BASE LOCATION FOR STREET LIGHTS

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-6



RESIDENTIAL SERVICE



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.

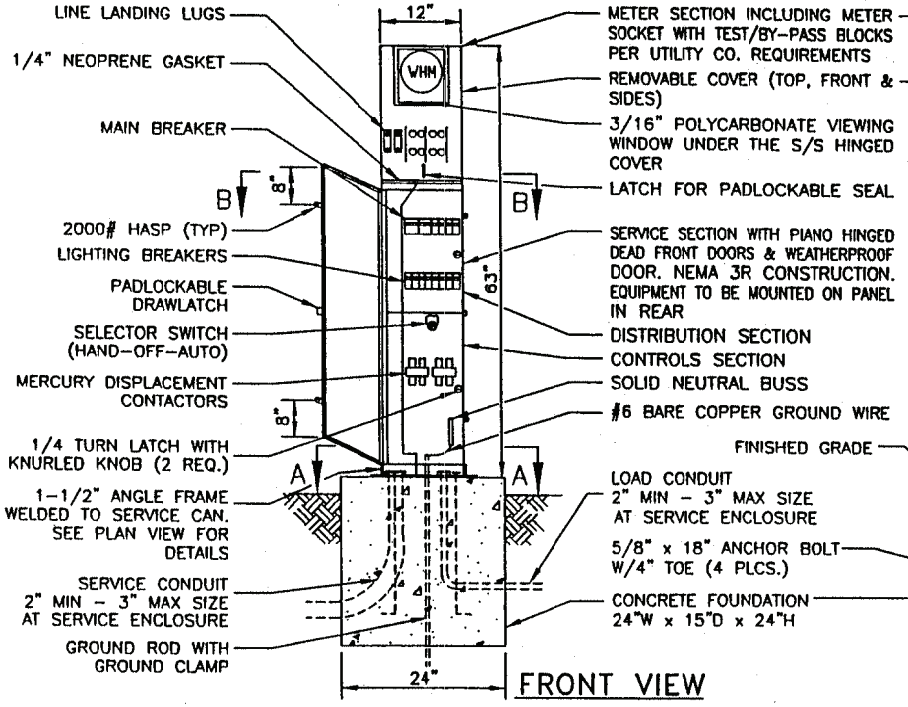
DIRECTOR

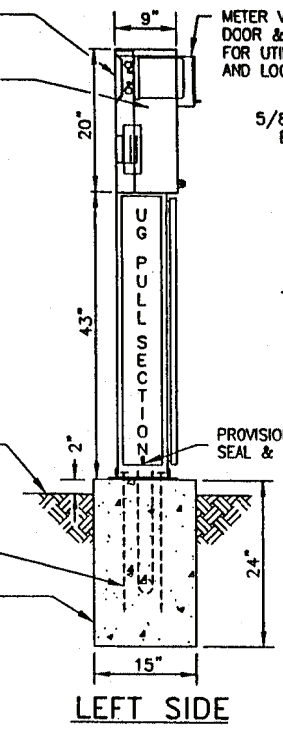
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

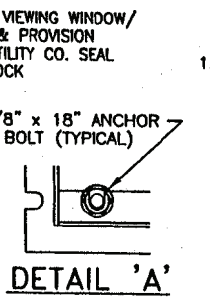
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
DIRECT SERVICE INSTALLATION TO STREET LIGHTING STANDARD

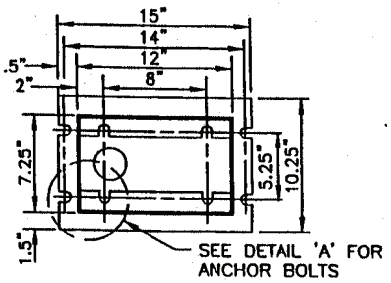
SCALE: NONE
DATE: 1/01
DRAWN BY:

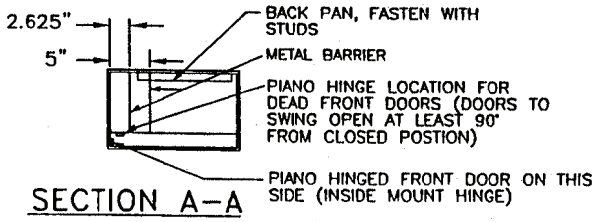
5-7

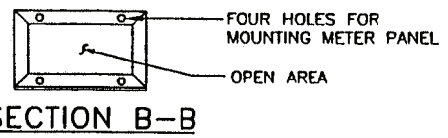


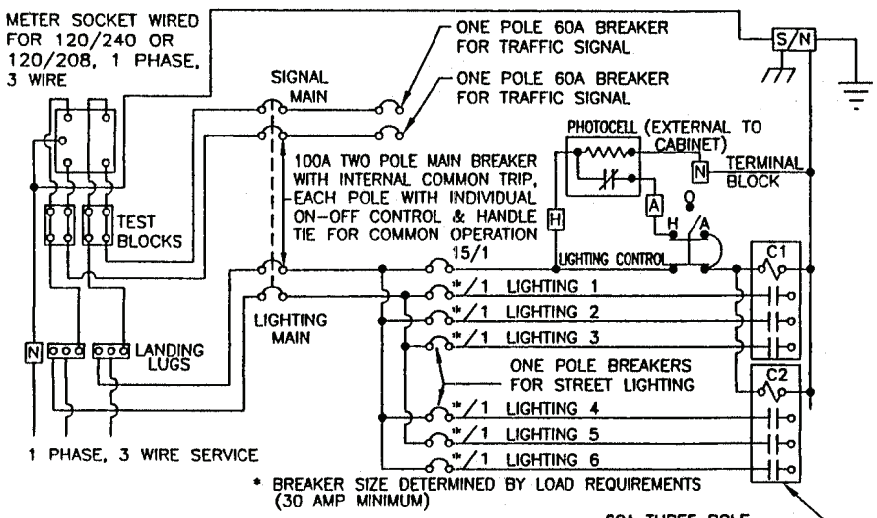












1. EXTERIOR SHALL BE 14 GAUGE #304D STAINLESS STEEL. INTERIOR DEAD FRONT PANEL AND BACK PAN SHALL BE 14 GAUGE STEEL, PAINTED WHITE. ENCLOSURE SHALL BE ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED.
2. CONSTRUCTION SHALL BE NEMA 3R AND 12, RAINTIGHT AND DUSTTIGHT.
3. ALL NUTS, BOLTS, SCREWS AND HINGES 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 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 THWN OR THHN 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 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.

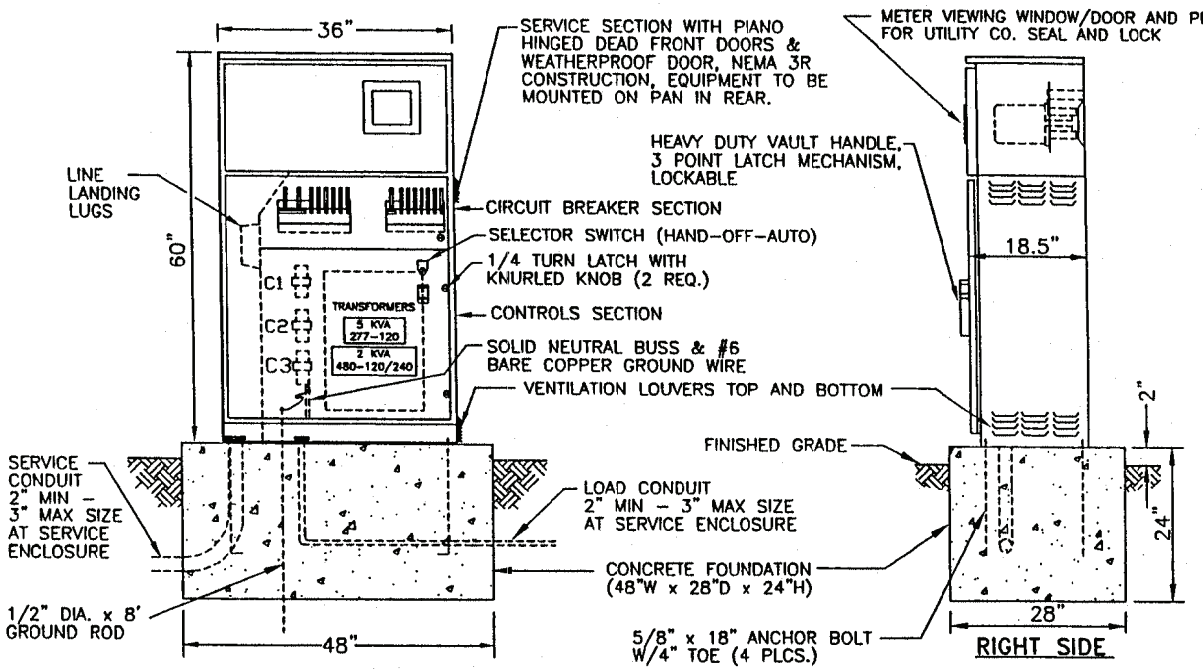
DIRECTOR

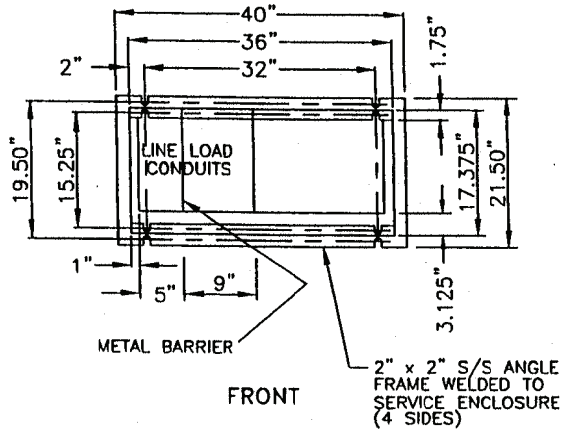
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
METERED SERVICE ENCLOSURE (CAN)
(120/208V, 120/240V)

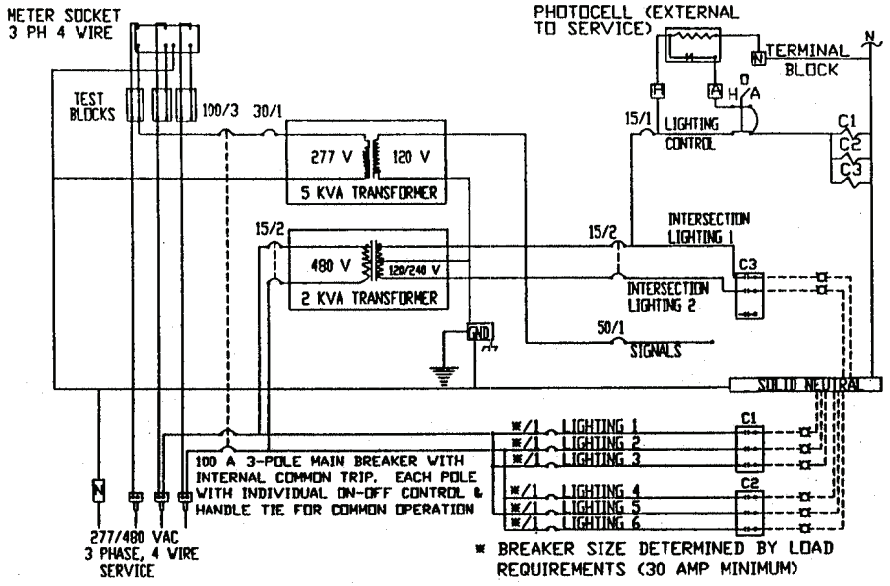
SCALE: NONE
DATE: 1/01
DRAWN BY:

5-8





BASE PLATE DETAIL



METERED SERVICE
WIRING SCHEMATIC DIAGRAM

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, RAINTIGHT AND DUSTTIGHT.
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 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 THWN OR THHN MINIMUM.
11. SIZE OF TRANSFORMER FOR SIGNALS SHALL BE 5 KVA. SIZE OF TRANSFORMER FOR 120 V INTERSECTION LIGHTING SHALL BE 2 KVA.
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 LOCATION WITHIN THE COUNTY R/W. 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 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.
14. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.

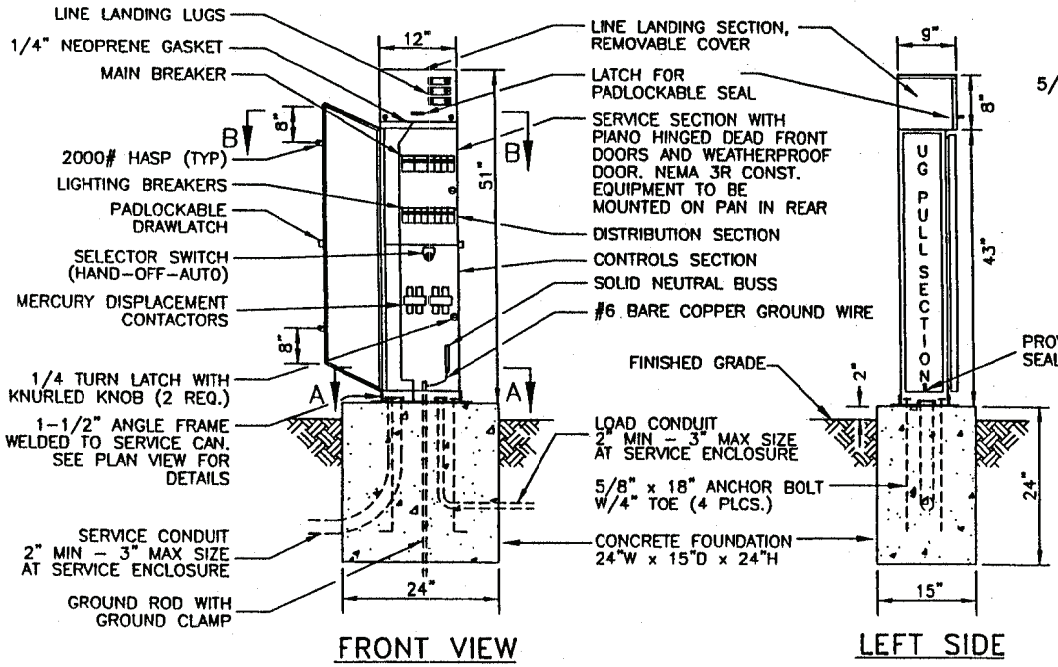
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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

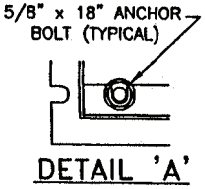
SCALE: NONE
DATE: 1/01
DRAWN BY:

5-9

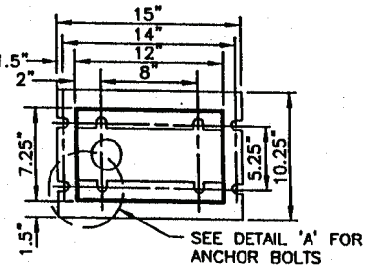


FRONT VIEW

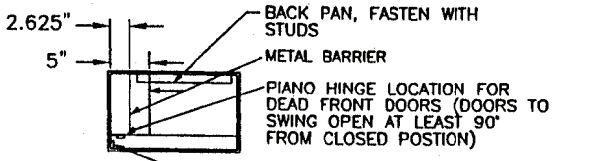
LEFT SIDE



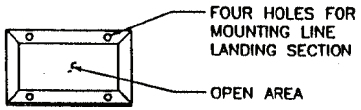
DETAIL 'A'



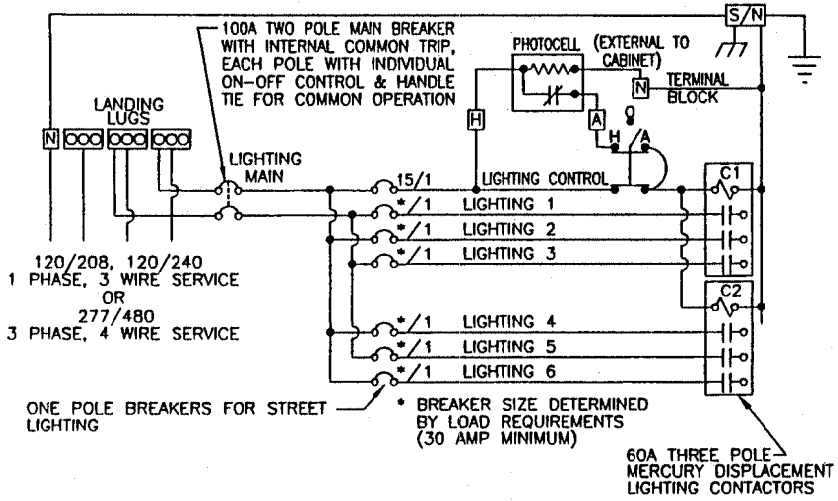
FRONT
BASE PLATE DETAIL



SECTION A-A



SECTION B-B



UNMETERED SERVICE
WIRING SCHEMATIC DIAGRAM

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, RAINTIGHT AND DUSTTIGHT.
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.
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13. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.

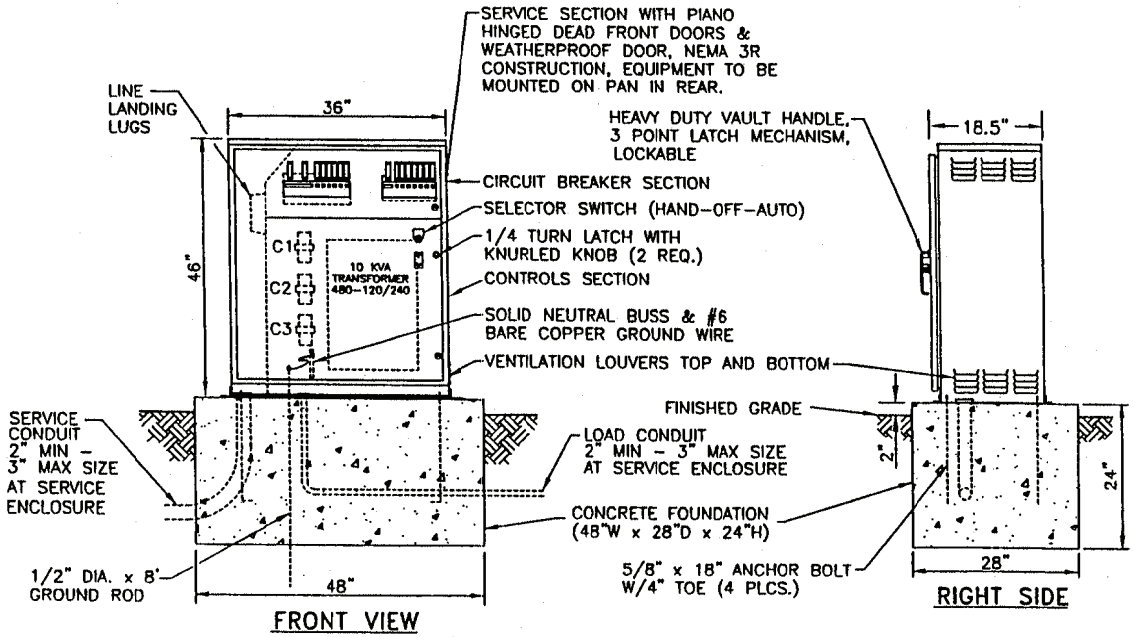
DIRECTOR

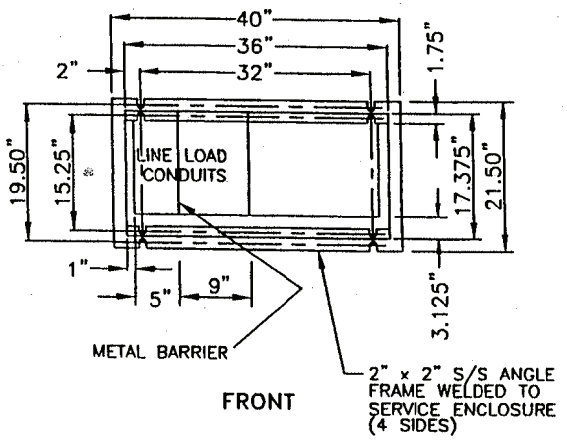
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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

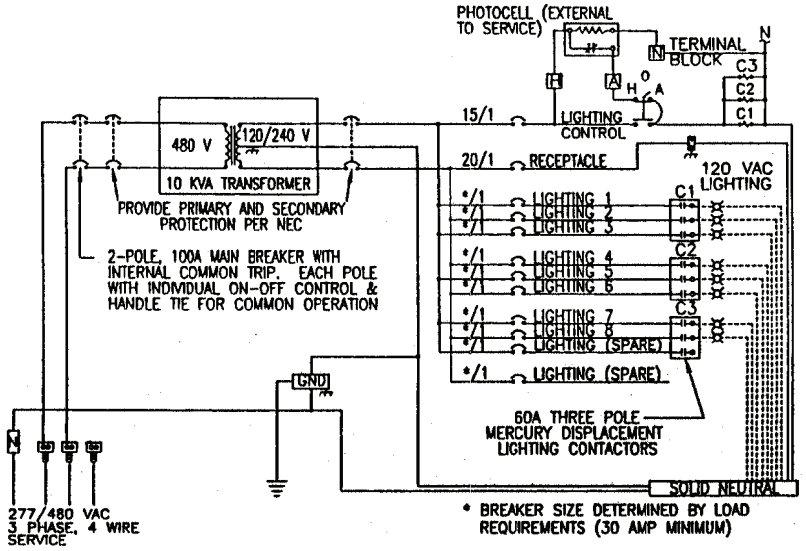
SCALE: NONE
DATE: 1/01
DRAWN BY:

5-10





BASE PLATE DETAIL



UNMETERED SERVICE
WIRING SCHEMATIC DIAGRAM

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2. CONSTRUCTION SHALL BE NEMA 3R AND 12, RAINTIGHT AND DUSTTIGHT.
3. ALL NUTS, BOLTS, SCREWS, AND HINGES SHALL BE STAINLESS STEEL.
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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 THWN OR THHN MINUMUM.
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/W. VOLTAGE OUTPUT FROM THE NEW SERVICE ENCLOSURE MAY BE CONNECTED INTO THE EXISTING CONDUIT SYSTEM.
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14. SEE STANDARD SPECIFICATIONS FOR ADDITIONAL DETAILS.

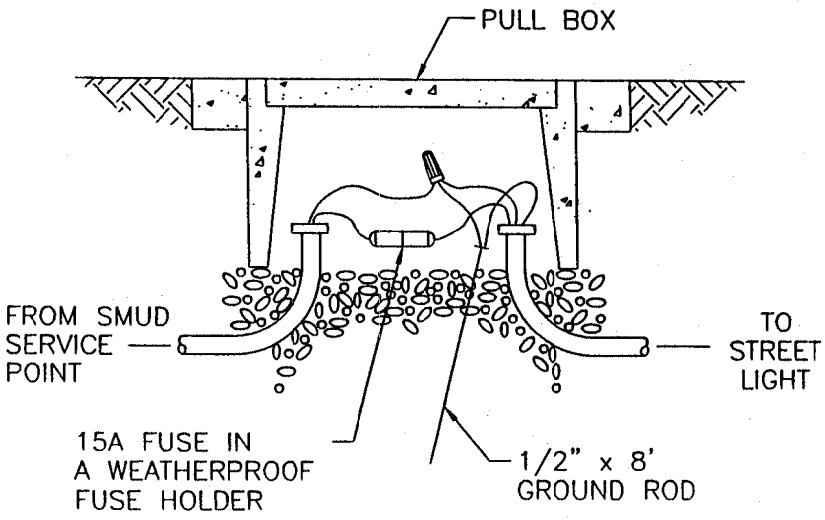
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-11

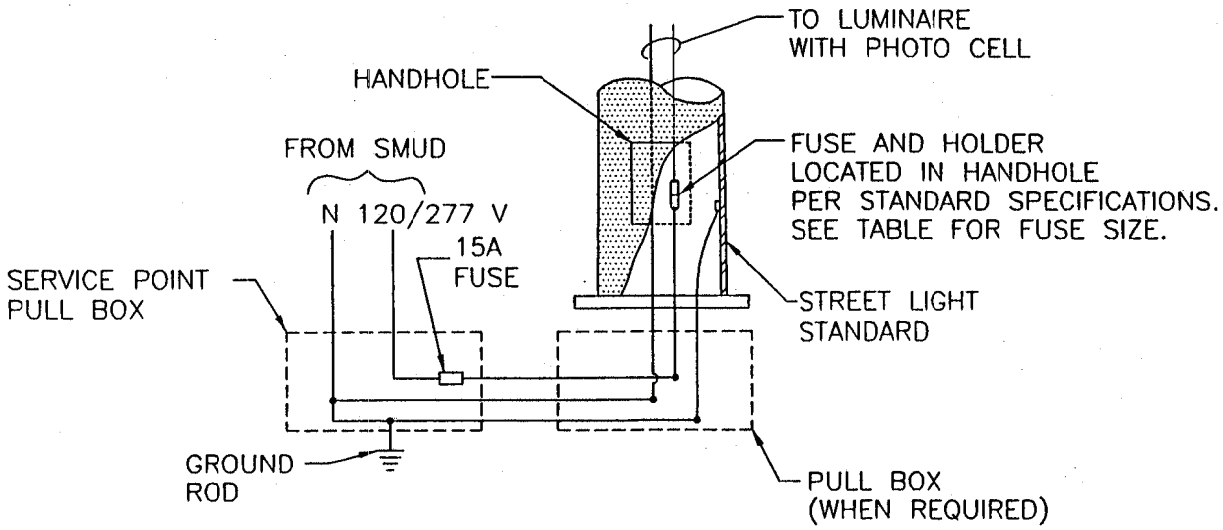


LAMP WATTAGE	FUSE SIZE
200 WATT OR LESS	6 AMP
250 WATT– 400 WATT	10 AMP

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.

SERVICE POINT PULL BOX DETAILS



WIRING DIAGRAM

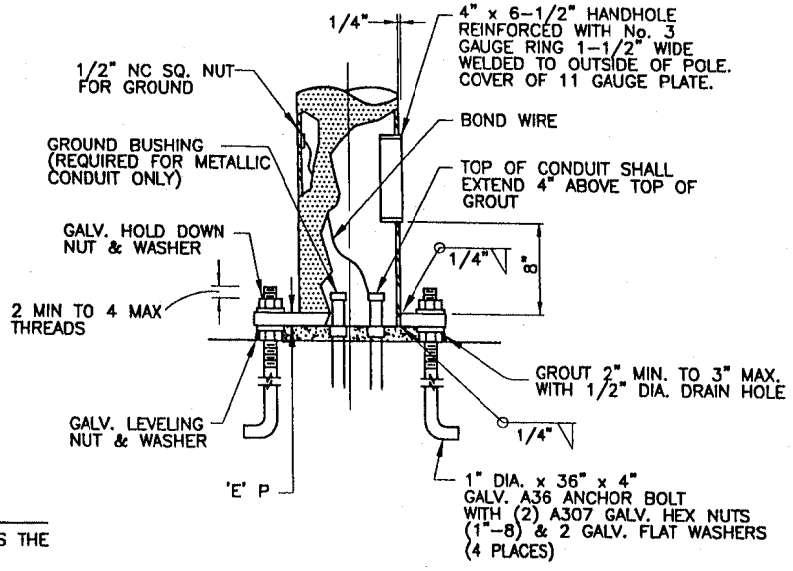
DIRECTOR

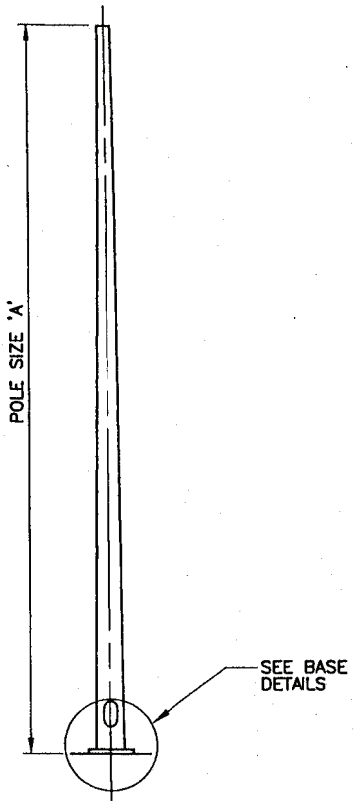
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
DETAILS FOR DIRECT SERVICE INSTALLATION
STREET LIGHTING POWER

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-12

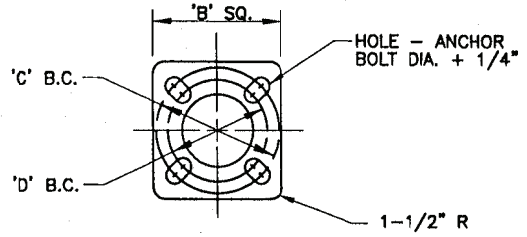




'B' SERIES

NOTES:

1. STANDARD SHALL BE INSTALLED SO HANDHOLE FACES THE STREET.



BASE DETAILS

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

'B' SERIES									
POLE DATA					BASE PLATE DATA				ANCHOR BOLTS
'A'	TOP OD	BASE OD		GAUGE	'B'	'C'	'D'	'E'	
		MIN	MAX						
20'-0"	2-7/8"	5.61"	5.85"	10	10"	9-1/2"	9"	1"	1" x 36" x 4"

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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

SCALE: NONE
DATE: 10/03
DRAWN BY:

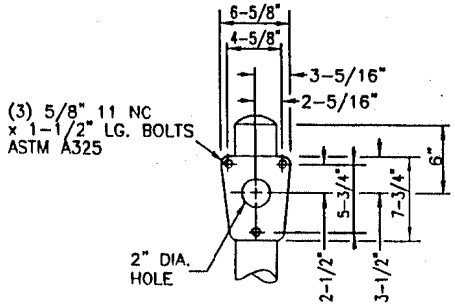
5-16

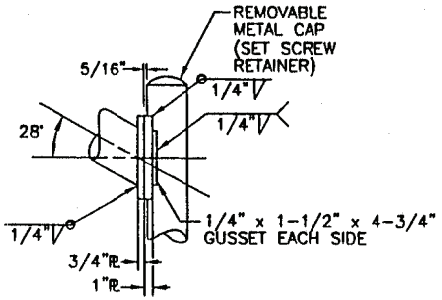
NOTES:

1. 'A' SERIES NUMBERING PROCEDURE

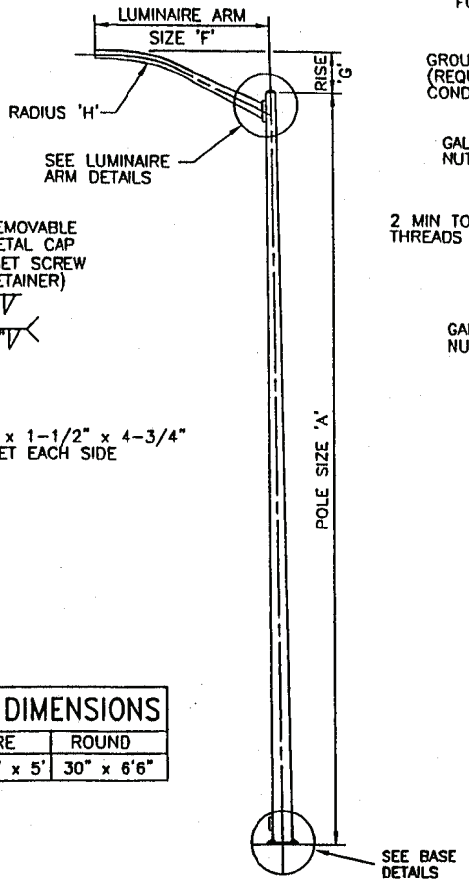
POLE SIZE 'A'
A-286-8
SERIES — LUMINAIRE ARM SIZE 'F'
(STANDARD UNLESS OTHERWISE SPECIFIED)

2. STANDARD SHALL BE INSTALLED SO HANDHOLE FACES THE STREET.

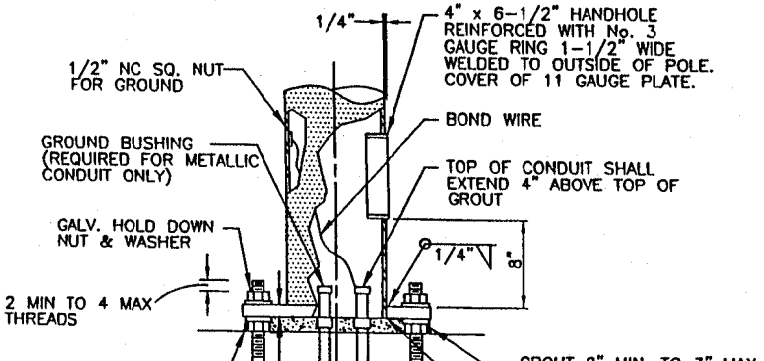


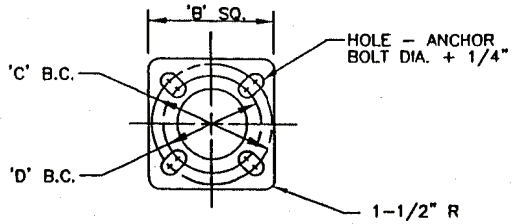


LUMINAIRE ARM DETAILS



'A' SERIES





BASE DETAILS

LUMINAIRE ARM DATA						
	'F'	END OD	BASE OD	GA	'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"	3-7/8"	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"

'A' SERIES									
	IDENTIFICATION NUMBER 1	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

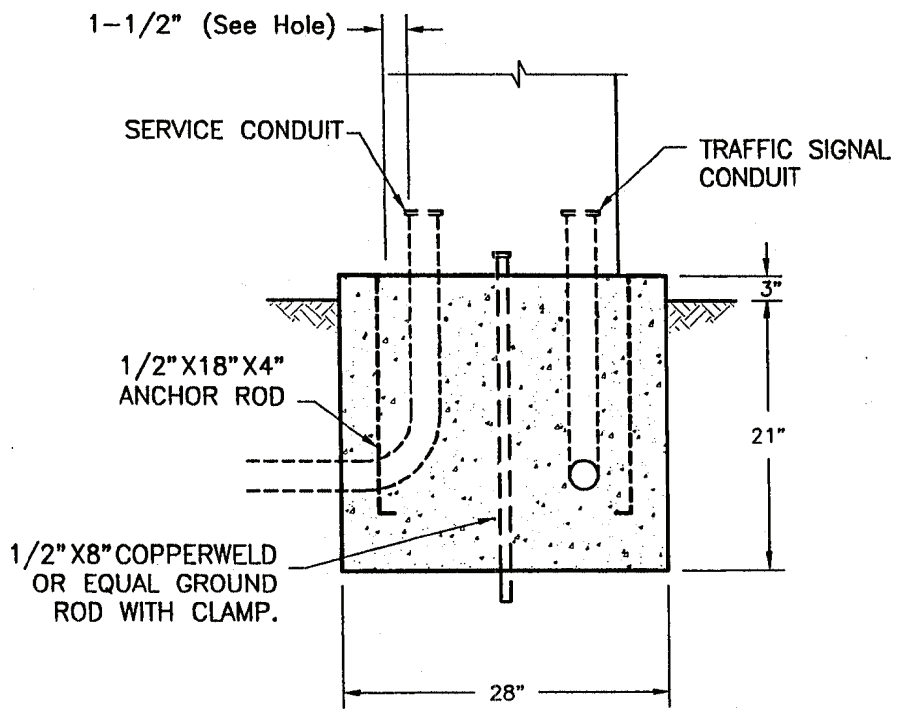
DIRECTOR

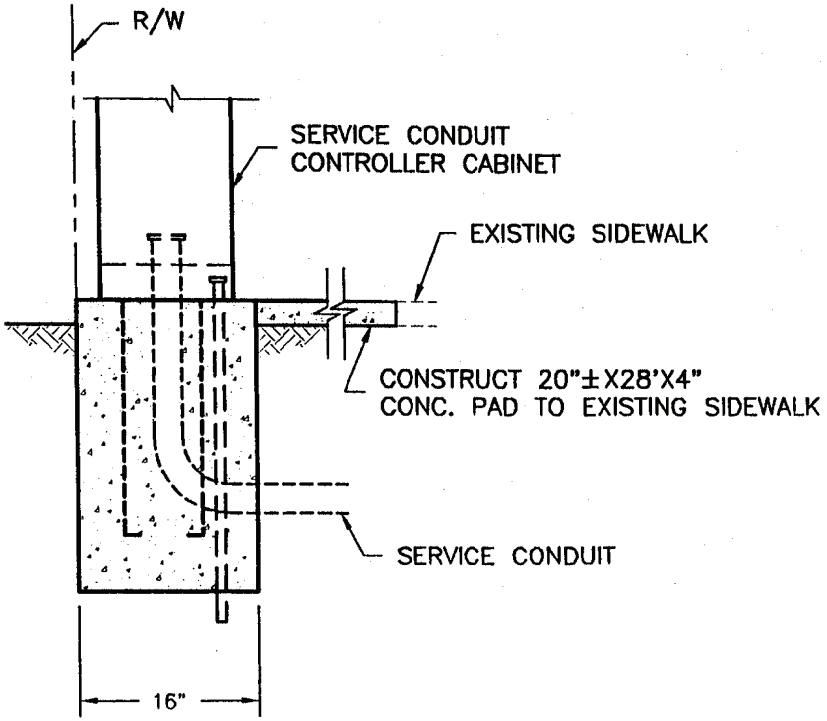
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

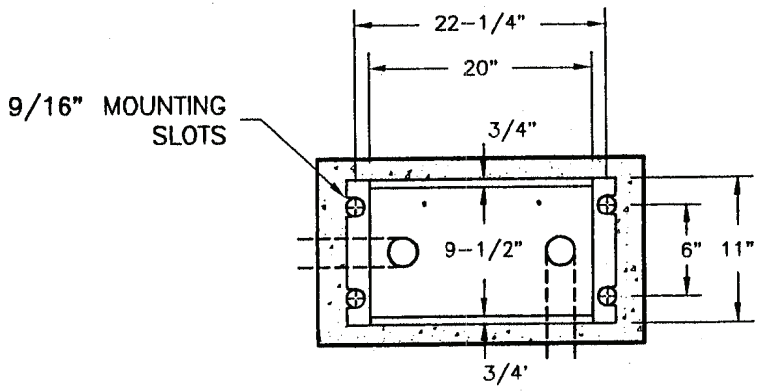
SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
TYPE 'A' STREET LIGHT STANDARD

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-17







NOTE: CONDUIT LOCATION IS CRITICAL TO PROPER CABINET INSTALATION.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

LOCAL SOLID STATE PEDESTRIAN CONTROLLER BASE DETAIL

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

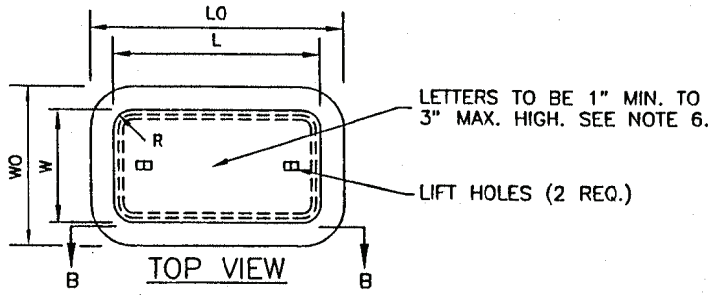
5-19

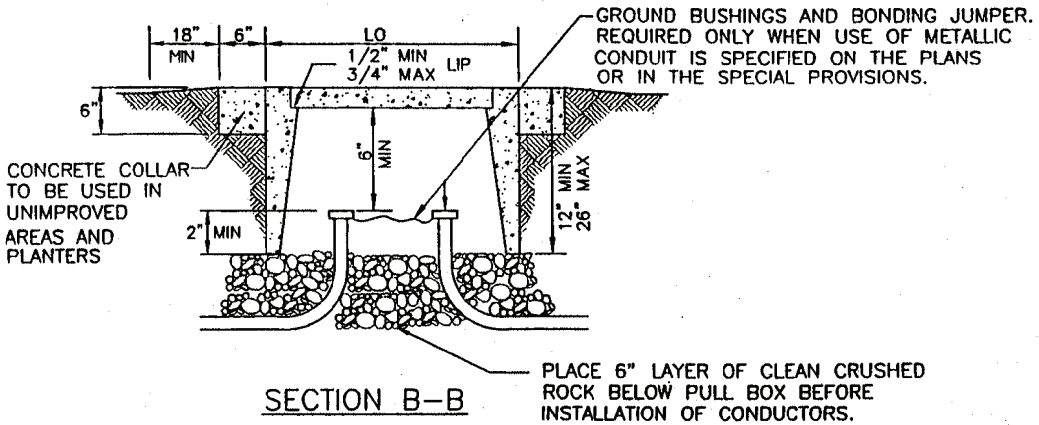
	REINFORCED CONCRETE BOX				COMPOSITE BOX		REINFORCED CONC. OR COMPOSITE COVER				
PULL BOX No.	MIN.** THICKNESS	MIN. DEPTH BOX AND EXTENSION	LO	WO	MIN.** THICKNESS	MIN. DEPTH BOX AND EXTENSION	L***	W***	R	EDGE THICKNESS	EDGE TAPER
3-1/2	1"	NO EXTENSION	20"	14"	5/16"	NO EXTENSION	15-3/8"	10-1/8"	1-1/8"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

** EXCLUDING CONDUIT WEB *** TOP DIMENSION

NOTES:

1. 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 ORTHERWISE 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 STANDARDS SHALL BE PLACED ON THE SIDE OF THE FOUNDATION FACING AWAY FROM TRAFFIC.
2. IN SIDEWALK AREAS, THE TOP OF PULL BOXES SHALL BE PLACED FLUSH WITH THE SIDEWALK GRADE.
3. 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.
4. PULL BOXES SHALL NOT BE PLACED WITHIN THE BOUNDARIES OF SIDEWALK RAMPS.
5. PULL BOXES SHOULD NOT BE PLACED WITHIN PLANTER AREAS WHENEVER POSSIBLE.
6. PULL BOX COVERS SHALL BE MARKED AS FOLLOWS:
   1) "TRAFFIC SIGNAL" TRAFFIC SIGNAL CIRCUITS WITH OR WITHOUT STREET LIGHTING CIRCUITS.
   2) "STREET LIGHTING" STREET LIGHTING CIRCUITS WHERE NO VOLTAGE IS ABOVE 600V.
   3) "STREET LIGHTING-HIGH VOLTAGE" STREET LIGHTING CIRCUITS WHERE VOLTAGE IS ABOVE 600V.
   4) "SERVICE" SERVICE CIRCUITS BETWEEN SERVICE POINT AND SERVICE DISCONNECT.
   5) "SPRINKLER CONTROL" SPRINKLER CONTROL CIRCUITS, 50 VOLTS OR LESS.
   6) "IRRGATION" CIRCUITS TO IRRIGATION CONTROLER, 120 VOLTS OR MORE.
   7) "RAMP METER" RAMP METER CIRCUITS.
   8) "COUNT STATION" COUNT AND/OR SPEED MONITOR CIRCUITS.
   9) "COMMUNICATION" COMMUNICATION CIRCUITS.
   10) "TELEPHONE" TELEPHONE SERVICE.
   11) "TOS COMMUNICATIONS" TOS COMMUNICATIONS TRUNK LINE.
   12) "TOS POWER" TOS POWER.
   13) "TDC POWER" TELEPHONE DEMARCATION CABINET POWER.
7. 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.
8. 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.
9. THE TOP EDGES OF ALL CONCRETE COVERS AND PULL BOXES SHALL HAVE A 1/4" MIN. RADIUS.
10. STACKING OF PULL BOXES IS PERMITTED (TWO PULL BOXES MAXIMUM).
11. STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.





DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SIGNALS, LIGHTING AND ELECTRICAL SYSTEMS
PULL BOX

SCALE: NONE
DATE: 1/01
DRAWN BY:

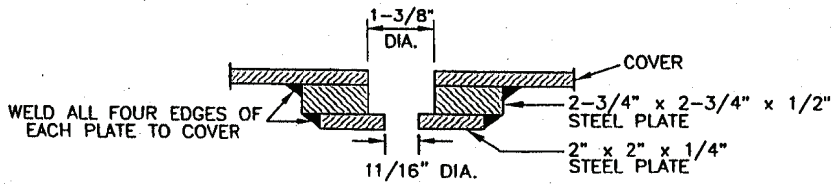
5-20A

NOTES:

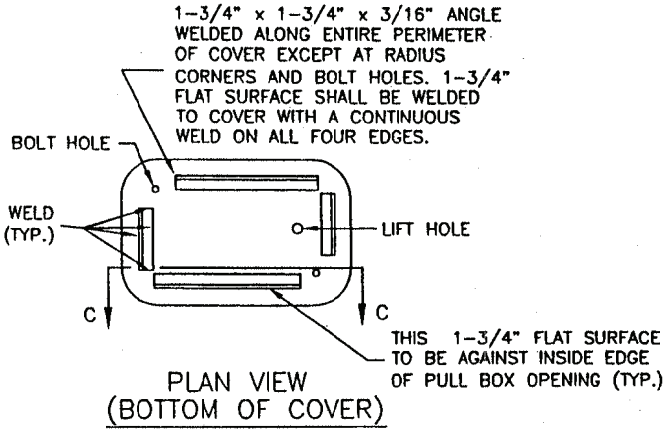
1. STEEL COVER SHALL HAVE EMBOSSED NON-SKID PATTERN.
2. STEEL REINFORCING SHALL BE AS REGULARLY USED IN THE STANDARD PRODUCTS OF THE RESPECTIVE MANUFACTURER.
3. PULL BOX COVERS SHALL BE MARKED AS DESCRIBED IN NOTE 6 ON STANDARD DRAWING 5-20A. MARKING SHALL BE APPLIED TO EACH COVER PRIOR TO GALVANIZING 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.

	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"±

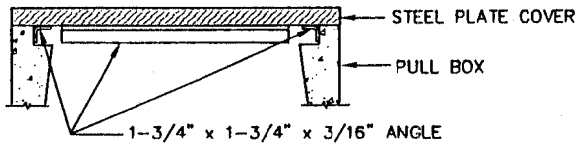
** EXCLUDING CONDUIT WEB



BOLT HOLE DETAIL

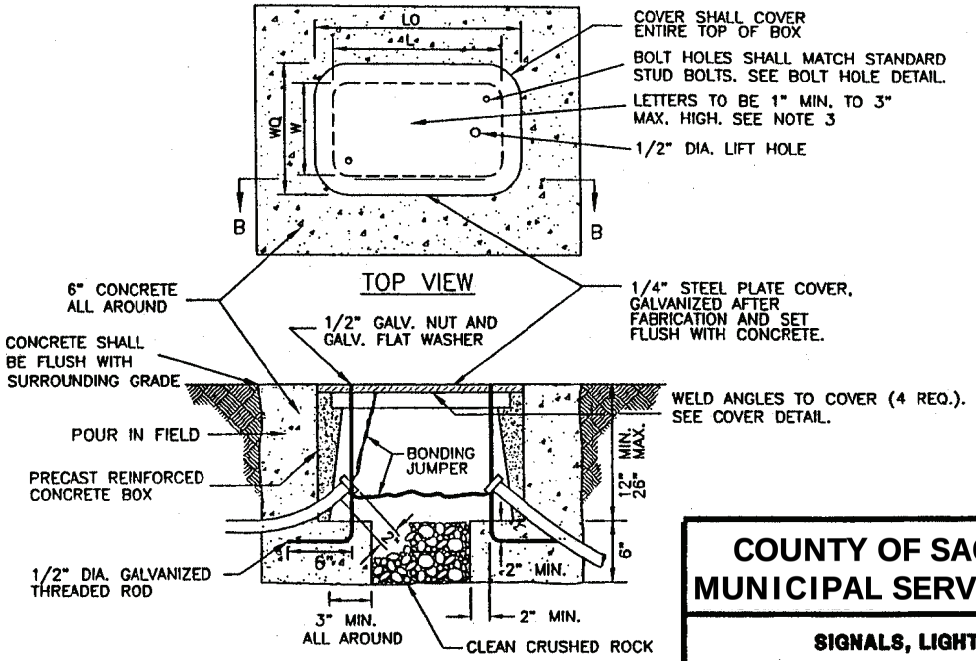


PLAN VIEW
(BOTTOM OF COVER)



SECTION C-C

COVER DETAIL



SECTION B-B

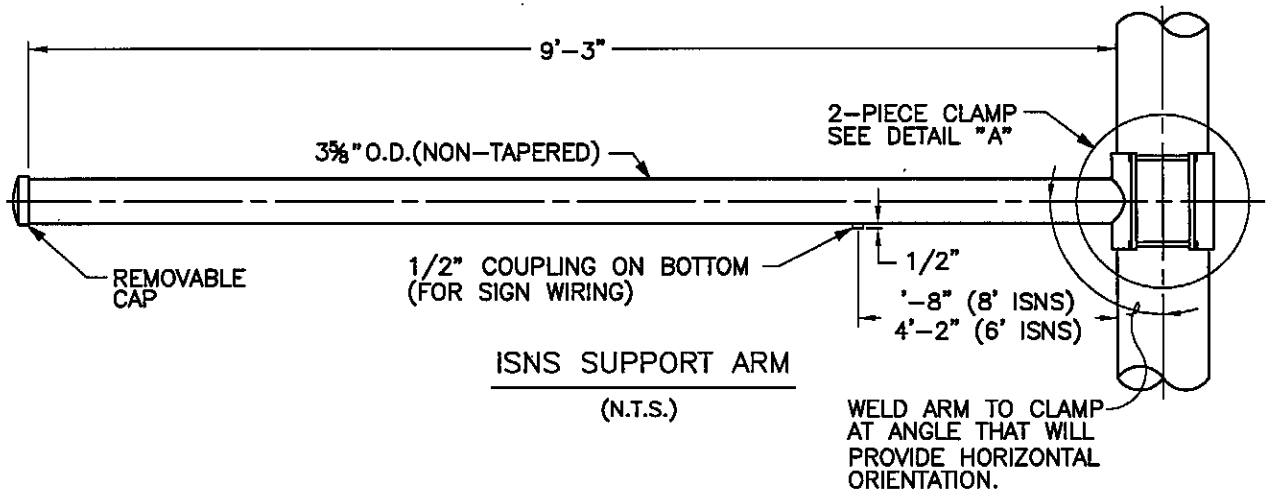
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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

SCALE: NONE
DATE: 1/01
DRAWN BY:

5-20B

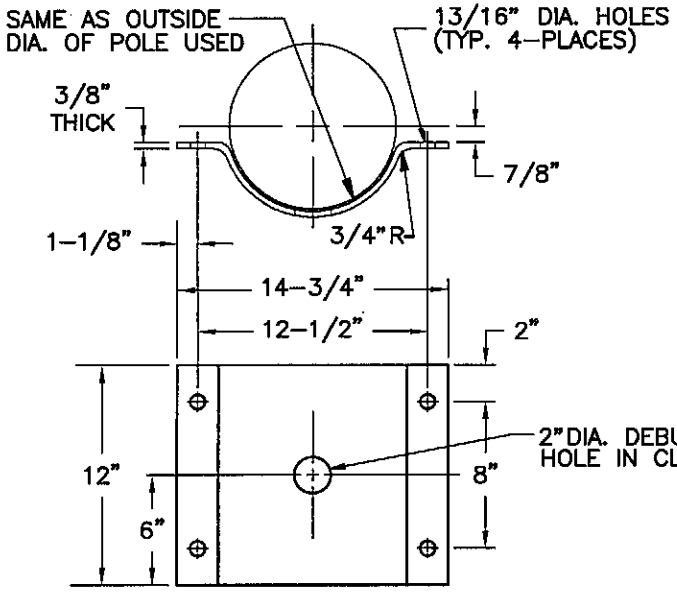


ISNS SUPPORT ARM

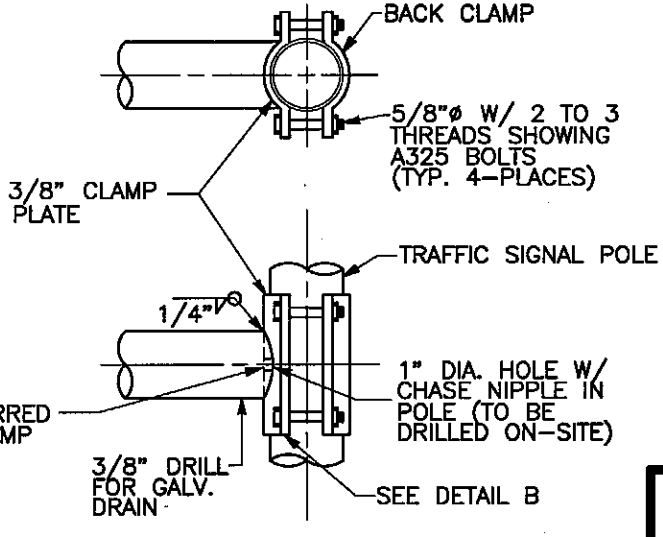
(N.T.S.)

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



DETAIL B



DETAIL A

CLAMP DETAILS

(N.T.S.)

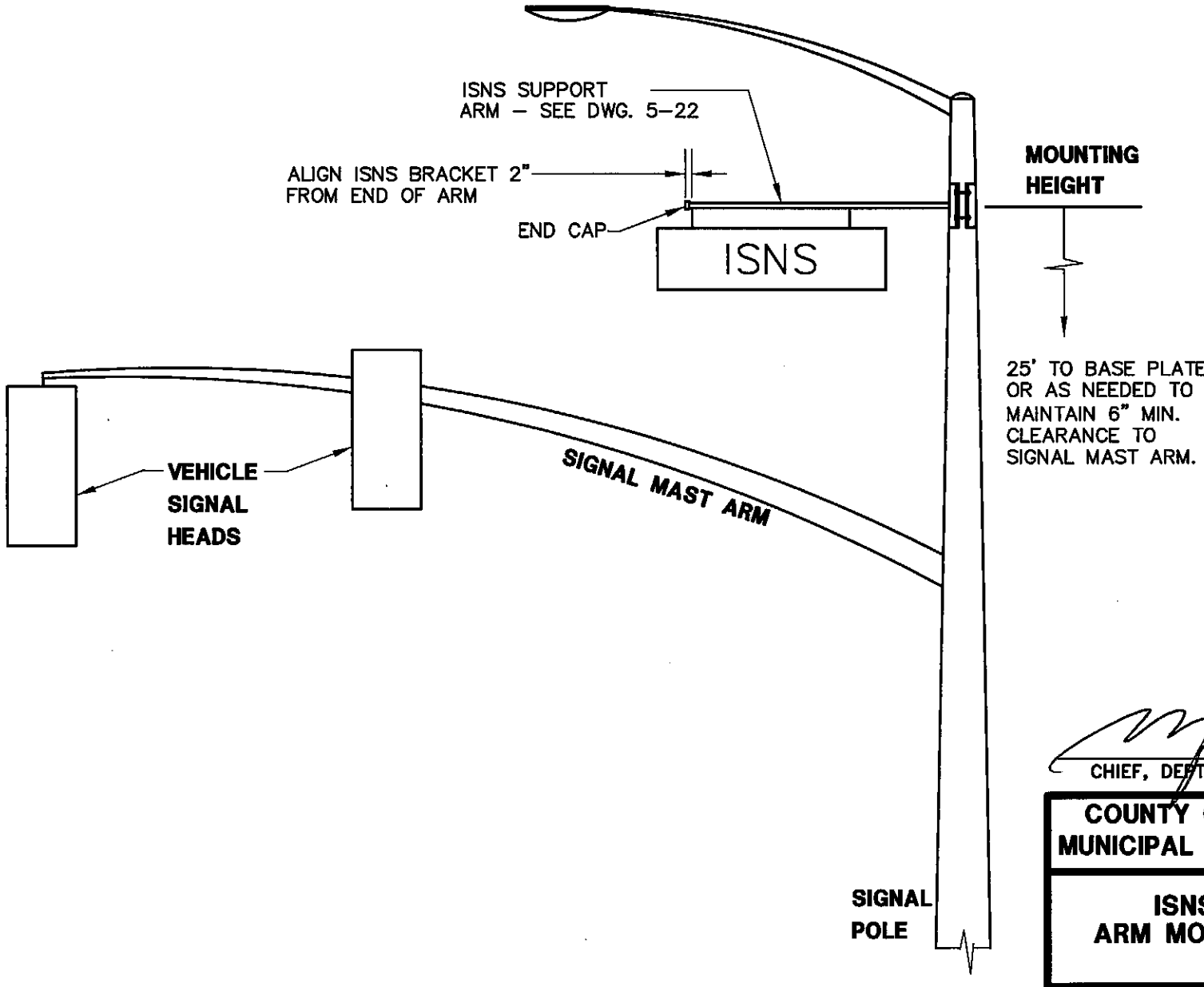
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

ISNS SUPPORT ARM TYPICAL CLAMP DETAIL

SCALE: NONE
DATE: 02/06
DRAWN BY: TRU P./ACS

5-22



CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

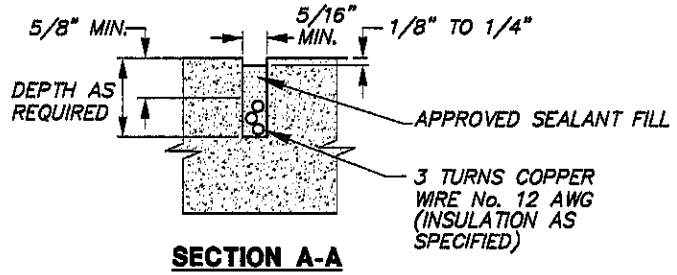
ISNS SUPPORT ARM MOUNTING DETAIL

SCALE: NONE
DATE: 02/06
DRAWN BY: TRU P.

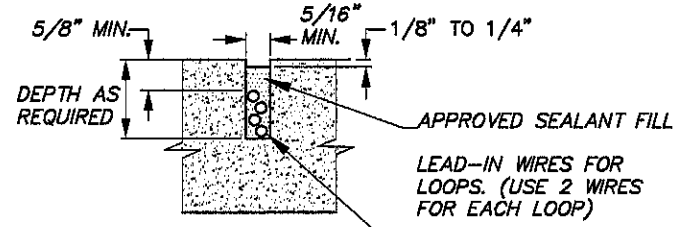
5-23

LOOP INSTALLATION PROCEDURE

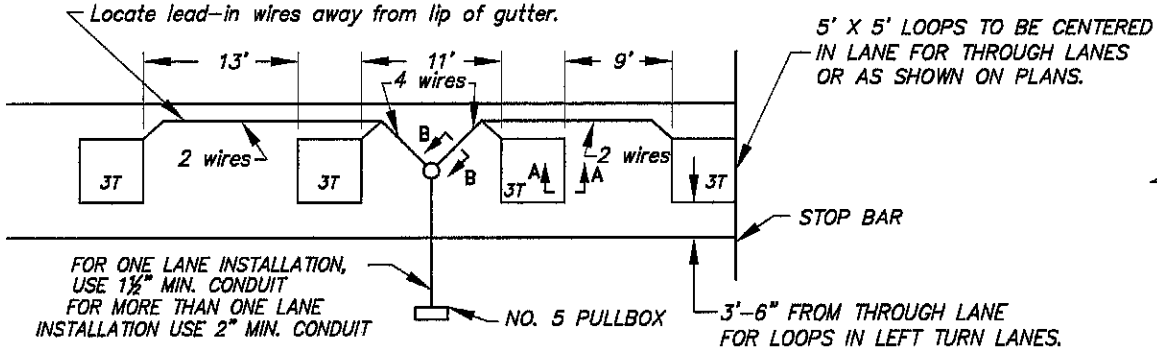
1. Test each loop circuit at controller cabinet (or, if these are not installed, test at termination pull box) before filling slots. Perform a resistance test between each circuit and ground. Insulation resistance shall not be less than 100 mega ohms. Test each loop circuit for continuity. Loop circuit resistance shall not exceed 0.5 ohms plus 0.35 ohms per 100 feet of lead-in cable.
2. Distance between side of loop and lead-in saw cut shall be 1'-0" minimum.
3. Width of saw cuts shall be 1/8" to 3/16" wider than thickness of the conductor.
4. Depth of saw cuts shall be such that the minimum sealant cover shall be 1/2" with an additional 1/8" to 1/4" gap between top of sealant and surface of pavement.
5. Loops and lead-in cuts shall be located a minimum of 2 feet from the nearest edge of manhole cover and valve boxes.
6. Loop installation 250' or more from stop bar shall have 4 turns.
7. See State Standard drawing ES - 5A for additional details.



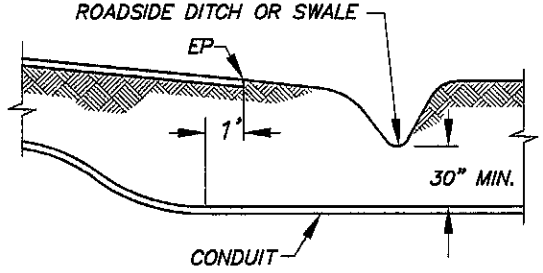
SECTION A-A



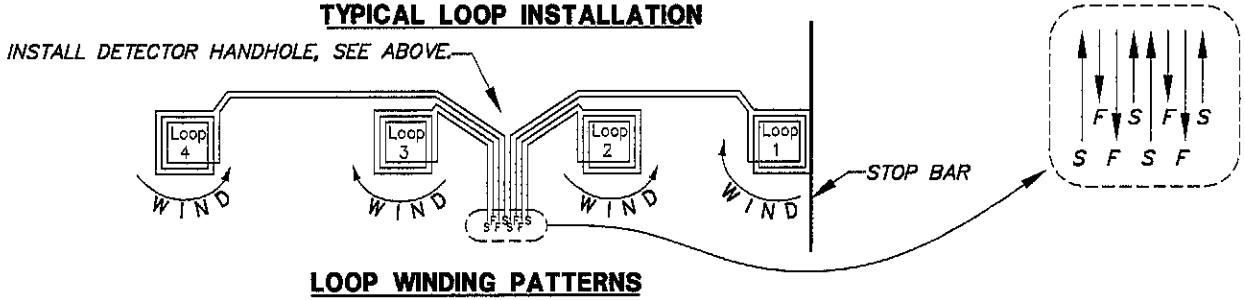
SECTION B-B



TYPICAL LOOP INSTALLATION



CONDUIT DETAIL FOR CLASS "C" STREET



LOOP WINDING PATTERNS

Conductor identification shall include the following:
1. Sensor number and phase 2. Loop number 3. Start (S) or finish (F)

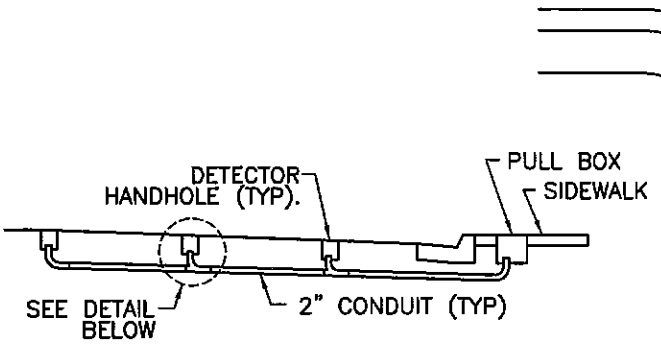
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

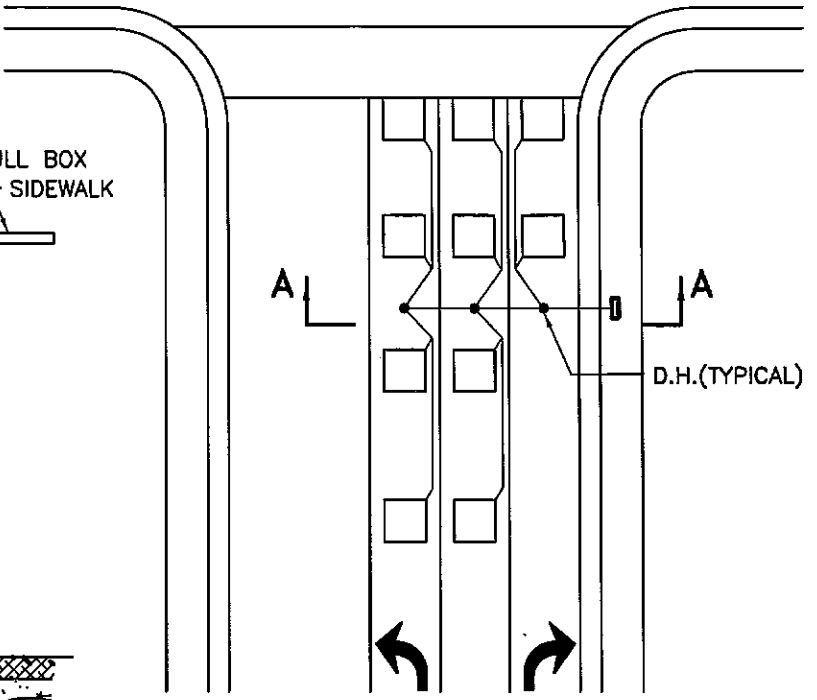
INDUCTION DETECTORS

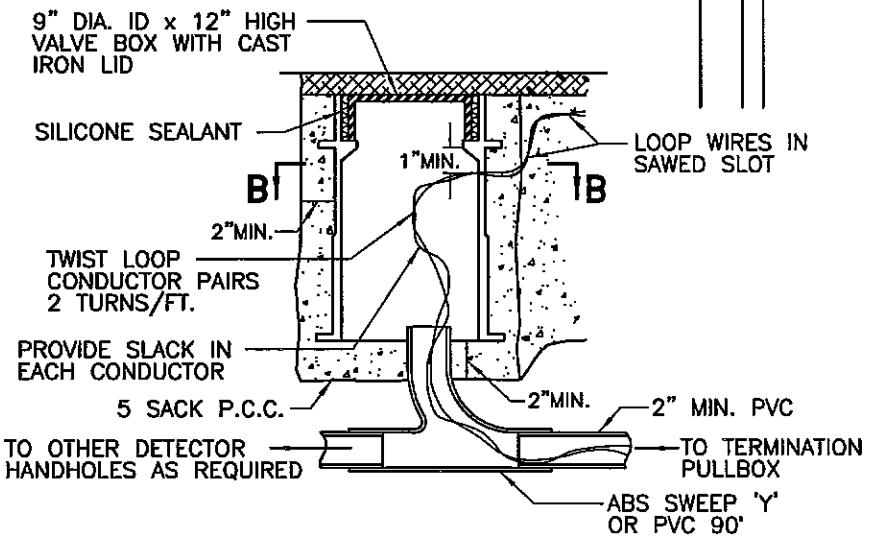
SCALE: NONE
DATE: 03/05
DRAWN BY: TRU P.

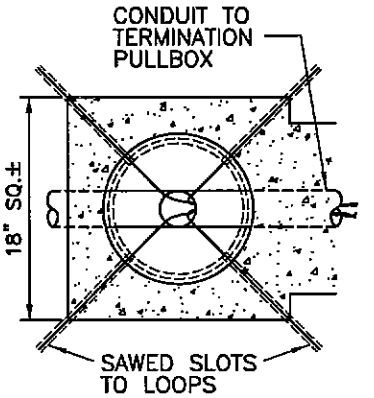
5-24



SECTION A–A







SECTION B–B

INSTALLATION REQUIREMENTS:

1. 18" SQ.± P.C.C. ENCASEMENT OUTLINE SHALL BE SAW CUT TO A MINIMUM DEPTH OF 3", EXCEPT WHERE AC OVERLAY IS TO BE PLACED.
2. THE PRECAST VALVE BOX WITH CAST IRON LID SHALL BE FABRICATED OF CALCIUM CARBONATE AND POLYESTER RESINS WITH FIBERGLASS REINFORCING AND DESIGNED FOR HEAVY TRAFFIC LOADS.
3. CAST IRON LID SHALL BE MARKED "DETECTOR" AND SHALL BE SECURED IN PLACE BY APPLYING WATERPROOF SILICONE SEALANT. VALVE BOX LOCATION SHALL BE AS SHOWN ON THE PLANS.
4. THE EXCAVATION AROUND THE HANDHOLE SHALL BE BACKFILLED WITH 5 SACK P.C.C.
5. THE HANDHOLE SHALL BE PROTECTED WITH COLD PATCH OR OTHER SUITABLE PROTECTION UNTIL PERMANENT AC BACKFILL IS PLACED.
6. THE CEMENT USED TO JOIN THE ABS SWEEP "Y" TO THE PVC CONDUIT SHALL BE CAPABLE OF PROVIDING A SOLVENT TYPE WELD BETWEEN THE TWO MATERIALS.

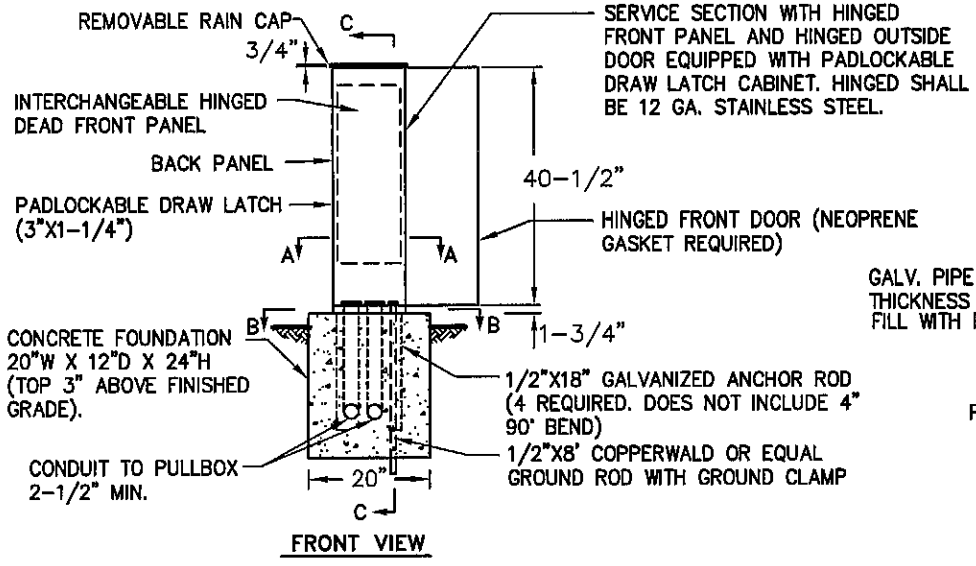
CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

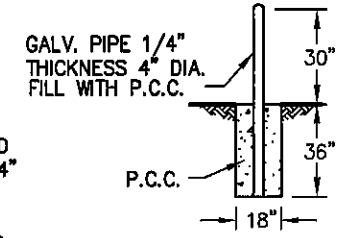
TYPE "B" DETECTOR HANDHOLE DETAIL

SCALE: NONE
DATE: 12/2007
DRAWN BY: COUNTY D.O.T.

5-25



FRONT VIEW

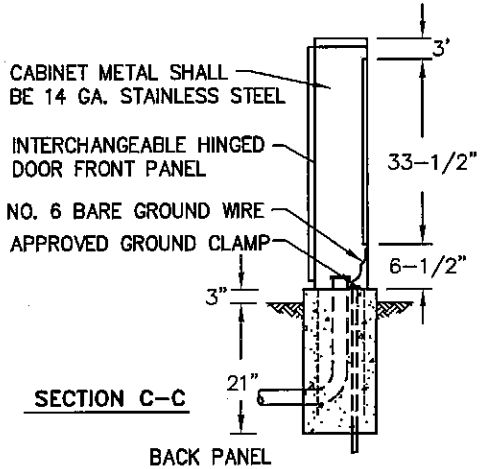


GUARD POST

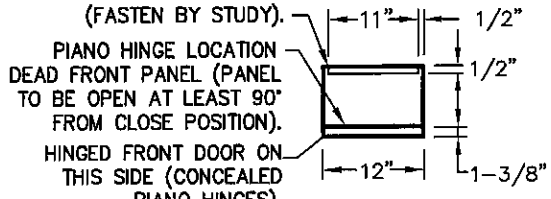
GENERAL INSTALLATION NOTES–ALL CABINETS

1. All Cabinet dimensions are nominal.
2. Foundation shall be located as shown on plans. Where installed in sidewalk place at back of walk and provide 48" minimum clearance between face of curb and front of cabinet.
3. One anchor bolt shall be bonded to conduit or ground wire.
4. Service Can Controller Cabinet, and Terminal Cabinet (if necessary) shall be on a common foundation with 6 inch spacing, unless otherwise directed by the Engineer. The Service Can shall be to the left of the Controller Cabinet so as to not be blocked by controller cabinet door when fully open.
5. Approved waterproof seal to be applied to base of cabinets and concrete foundation.
6. In unimproved areas a raised p.c.c. pad of 36"x 30" x 4" shall be placed in front of each cabinet.
7. In all unpaved areas top of foundation for cabinets shall be 6" above surrounding grade. In paved areas top of foundation shall be 3" above paved area.
8. Anchor bolts, nuts, and washers shall be galvanized.
9. All conduits shall be bounded together, in the cabinet.
10. Locations shown for equipment are typical only
11. A 1/2" diameter drain hole shall be formed in the cabinet base. All cabinets shall be leveled so that the cabinet door will open and close easily.

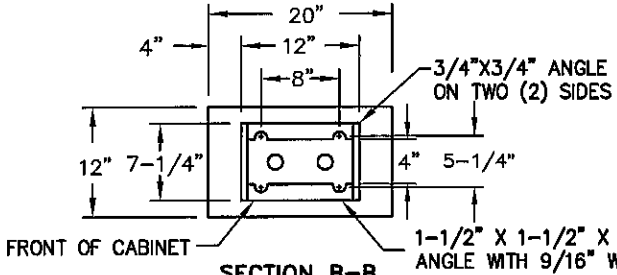
TRAFFIC SIGNAL INTERCONNECT TERMINAL CABINET OR PEDESTRIAN SIGNAL CONTROLER CABINET



SECTION C–C

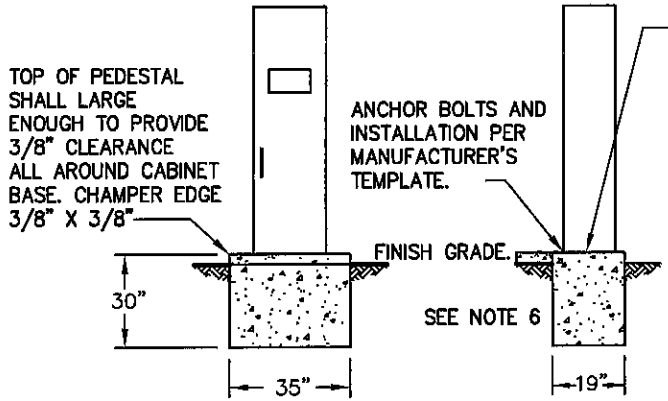


SECTION A–A



SECTION B–B

CHIEF, DEPT. OF TRANSPORTATION



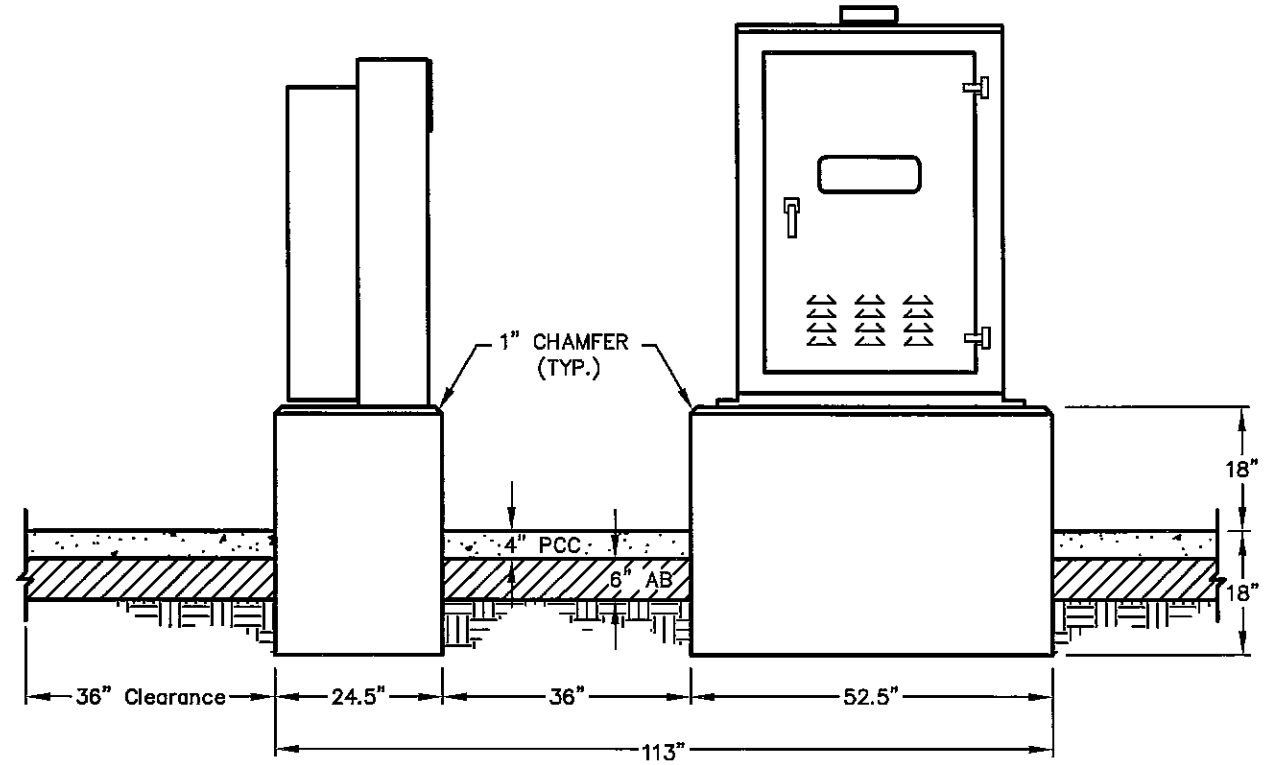
MODIFIED TYPE "M" CABINET BASE

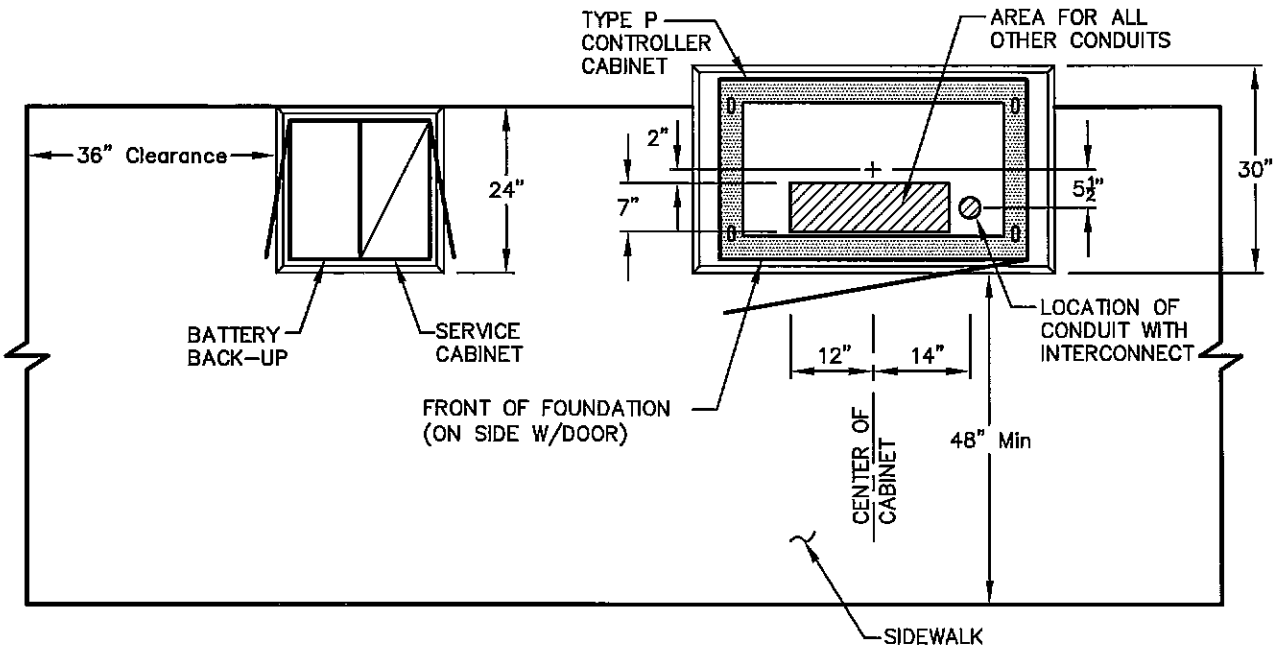
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TRAFFIC SIGNAL CABINET DETAILS AND GUARD POST DETAIL

SCALE: NONE
DATE: 12/2007
DRAWN BY: D.O.T.

5-26





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

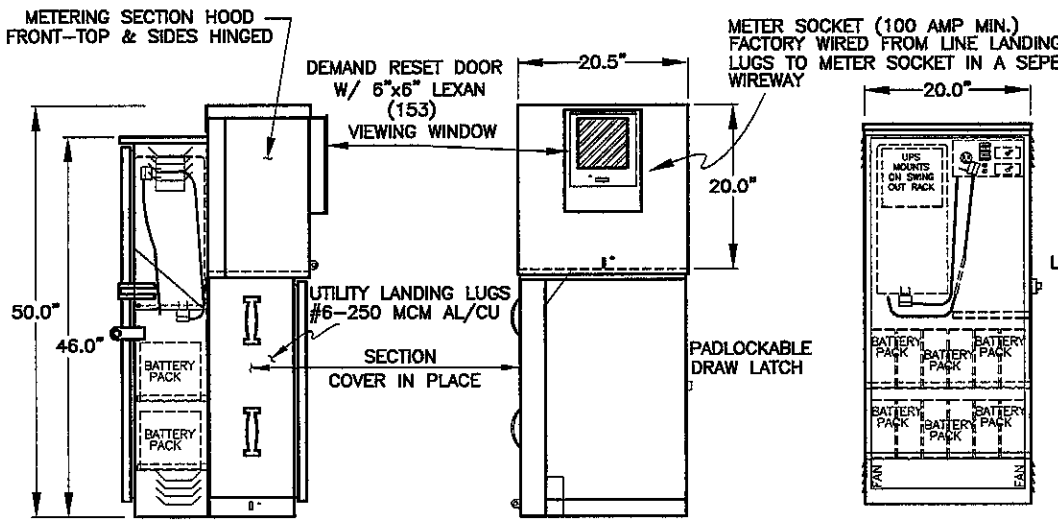
CHIEF, DEPT. OF TRANSPORTATION

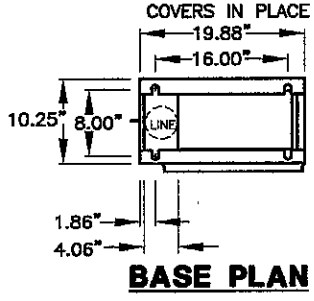
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

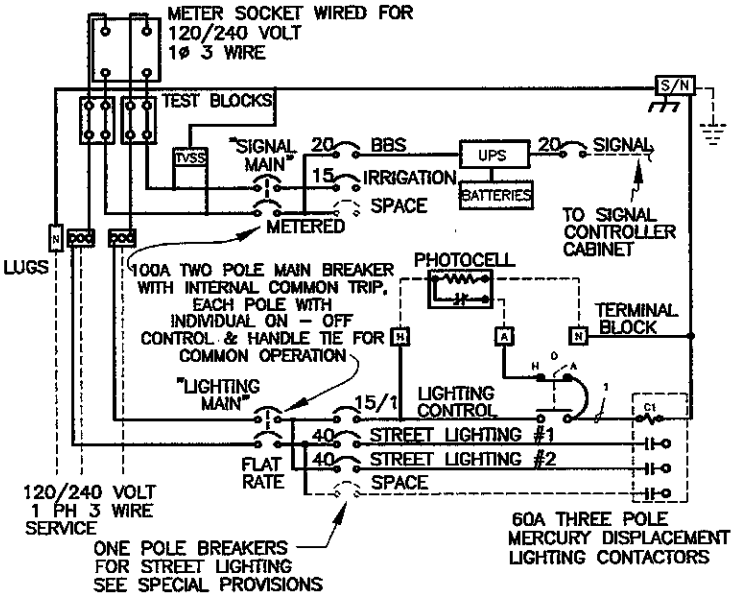
TRAFFIC SIGNAL CONTROLLER CABINET & SERVICE CAN WITH BATTERY BACKUP FOUNDATIONS

SCALE: NONE
DATE: 12/07
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, RAINTIGHT.*
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.*

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

DRAWING NUMBER	TITLE
7-4C-01	SIGNATURE BLOCKS (11/07)
7-4C-02	SEWER PIPE BEDDING AND INITIAL BACKFILL (11/07)
7-4C-03	MAXIMUM TRENCH WIDTH FOR EXTRA STRENGTH VITRIFIED CLAY PIPE (11/07)
7-4C-04	MANHOLE LOCATION RESTRICTION (11/07)
7-4C-10	MANHOLE CONNECTION TO EX. 6” COLLECTOR (11/07)
7-4C-11	SEWER SERVICE REPLACEMENT (11/07)
7-4C-12	UTILITY CROSSING (11/07)
7-4C-13A	SEWER SERVICES (11/07)
7-4C-13B	ALTERNATE ABS SEWER SERVICE WYE CONNECTION TOP VIEW (11/07)
7-4C-14A	VCP, ABS CLEANOUT TO GRADE (11/07)
7-4C-14B	MODIFIED VCP OR ABS CLEANOUT TO GRADE (11/07)
7-4C-15A	ABS/PVC BACKWATER VALVE TO GRADE (11/07)
7-4C-15B	ABS/PVC BACKWATER VALVE TO GRADE – MULTI-STORY STRUCTURE (11/07)
7-4C-16A	FLUSHER BRANCH FOR PIPE DIAMETERS 8” AND LESS (11/07)
7-4C-16B	FLUSHER BRANCH FOR PIPE DIAMETERS GREATER THAN 8” (11/07)
7-4C-20	CONDUCTOR CASING DETAIL (11/07)
7-4C-21	CATHODIC PROTECTION - STEEL CASING (11/07)
7-4C-30	STANDARD PRECAST 48” SEWER MANHOLES (11/07)
7-4C-31	STANDARD PRECAST 60” & 72” SEWER MANHOLES (11/07)
7-4C-40	4-WAY MANHOLE BASE (11/07)
7-4C-41	90° MANHOLE BASE CAMERA CHANNEL DETAIL (11/07)
7-4C-42	MANHOLE BASE GROUTING UNUSED CHANNEL AT 90° DETAIL (11/07)
7-4C-43	MANHOLE BASE GROUTING UNUSED CHANNEL AT 180° DETAIL (11/07)
7-4C-50	STANDARD PRECAST 48” MANHOLE FLAT SLAB TOP DETAIL (11/07)
7-4C-51	STANDARD PRECAST 60” AND 72” SLAB TOP DETAIL (11/07)
7-4C-52	INSIDE GRAVITY DROP CONNECTIONS (11/07)
7-4C-53	STAINLESS STELL ADJUSTABLE CLAMPING BRACKETS (11/07)
7-4C-70	STANDARD FLUSHER BRANCH FRAME AND COVER (11/07)
7-4C-71	FLAT SLAB TOP FRAME & COVER (11/07)
7-4C-72	GREY IRON STANDARD 24” MANHOLE FRAME & COVER (11/07)
7-4C-73	GREY IRON STANDARD 36” MANHOLE FRAME & COVER (11/07)

DRAWING NUMBER	TITLE
7-4C-74	DUCTILE IRON STANDARD 24” MANHOLE FRAME & COVER (11/07)
7-4C-75	DUCTILE IRON STANDARD 32” MANHOLE FRAME & COVER (11/07)
7-4C-80	TRENCH DAM DETAIL (11/07)
7-4C-81	SAMPLING VAULT (11/07)
7-4C-82	FLOW MEASURING MANHOLE (11/07)
7-4C-84	PACKAGED FLOW MEASURING VAULT (11/07)
7-5C-30	CATHODIC PROTECTION – DUCTILE IRON PIPE (11/07)
7-5C-40	THRUST BLOCK DETAILS (11/07)
7-5C-50	FORCE MAIN TIE-IN AT MANHOLE (11/07)
7-5C-51	FORCE MAIN TIE-IN DROP CONNECTIONS (11/07)
7-5C-70	STANDARD 60” AIR RELEASE VALVE SEWER MANHOLE (11/07)
7-5C-80	PIPE LOCATOR RIBBON AND LOCATOR BALL INSTALLATION (11/07)
7-6C-10	PUMP STATION SITE LAYOUT (11/07)
7-6C-11	PUMP STATION SITE LAYOUT CORNER LOT (11/07)
7-6C-12	COMMERCIAL DRIVEWAY (11/07)
7-6C-13	SIDEWALK RAMP DETAIL (11/07)
7-6C-14	TURN-AROUND & HAMMER-HEAD FOR ACCESS ROADS (11/07)
7-6C-20	CIRCULAR WETWELL (11/07)
7-6C-50	CANOPY SCHEMATIC (11/07)
7-6C-60	REDUCER PRESSURE PRINCIPAL ASSEMBLY (11/07)
7-6C-90	REMOVABLE BOLLARD DETAIL (11/07)
7-6E-10	ELECTRICAL PANEL LAYOUT (11/07)
7-6E-11	ELECTRICAL DETAIL #5 (11/07)
7-6E-12	JB MOUNTING DETAIL (11/07)
7-6E-13	CONDUIT RISER FROM GROUND & DUCT BANK SECTION (11/07)
7-6E-14	GROUNDING DETAILS (11/07)
7-6E-15	POLE BASE DETAIL WITH ANTENNA (11/07)
7-6E-20	SINGLE LINE DIAGRAM SMALL PUMP STATION (11/07)
7-6E-21	SINGLE LINE DIAGRAM MEDIUM PUMP STATION (11/07)
7-6E-22	SINGLE LINE DIAGRAM LARGE PUMP STATION (11/07)
7-6E-30	PUMP CONTROLS SMALL PUMP STATION (11/07)
7-6E-31	PUMP CONTROLS MEDIUM AND LARGE PUMP STATION (11/07)
7-6I-30	P&ID (11/07)
7-6I-31	BUBBLER PANEL SCHEMATIC (11/07)
7-6I-32	BUBBLER TUBE JUNCTION BOX & CAPTIVE AIR TUBE MOUNTING DETAILS (11/07)
7-6I-33	TYPICAL RTU LAYOUT DETAIL (11/07)
7-6I-34	TYPICAL RTU ELEVATION VIEW (11/07)

DRAWING NUMBER	TITLE
7-6I-35	TYPICAL DETAILS, BILL OF MATERIALS & NAME PLATE SCHEDULE (11/07)
7-6I-36	TYPICAL DIAGRAM CONTROL POWER DISTRIBUTION (11/07)
7-6I-37	TYPICAL RTU PLC LAYOUT (11/07)
7-6I-38	TYPICAL UPPER BOARD WIRING DIAGRAM (POWER CONNECTIONS) (11/07)
7-6I-39	TYPICAL LOWER BOARD WIRING DIAGRAM (DI 0-7) (11/07)
7-6I-40	TYPICAL LOWER BOARD WIRING DIAGRAM (DI 16-23) (11/07)
7-6I-41	TYPICAL LOWER BOARD WIRING DIAGRAM (DI 24-36) (11/07)
7-6I-42	TYPICAL LOWER BOARD WIRING DIAGRAM (AI) (11/07)
7-6I-43	TYPICAL LOWER BOARD WIRING DIAGRAM (DO 0-7) (11/07)
7-6I-44	TYPICAL RS 482 UPPER BOARD WIRING DIAGRAM (11/07)
7-6M-20	CIRCULAR WET WELL (11/07)
7-6M-30	VALVE VAULT (11/07)
7-6M-40	BYPASS VAULT (11/07)
7-6M-50	ODOR CONTROL PAD (11/07)

SACRAMENTO COUNTY SANITATION DISTRICT No.1

O.K. TO SUBMIT FOR MANHOLE NUMBERING

SEWER INSPECTOR **DATE**

FOR COLLECTOR PLANS IN UNINCORPORATED COUNTY

SACRAMENTO COUNTY SANITATION DISTRICT No.1

PLAN CHECKER **DATE**

O.K. TO SUBMIT FOR MANHOLE NUMBERING

SEWER INSPECTOR **DATE**

FOR ALL TRUNK AND COLLECTOR PLANS IN ANY CITY JURISDICTION

Mary K Snyder
DIRECTOR

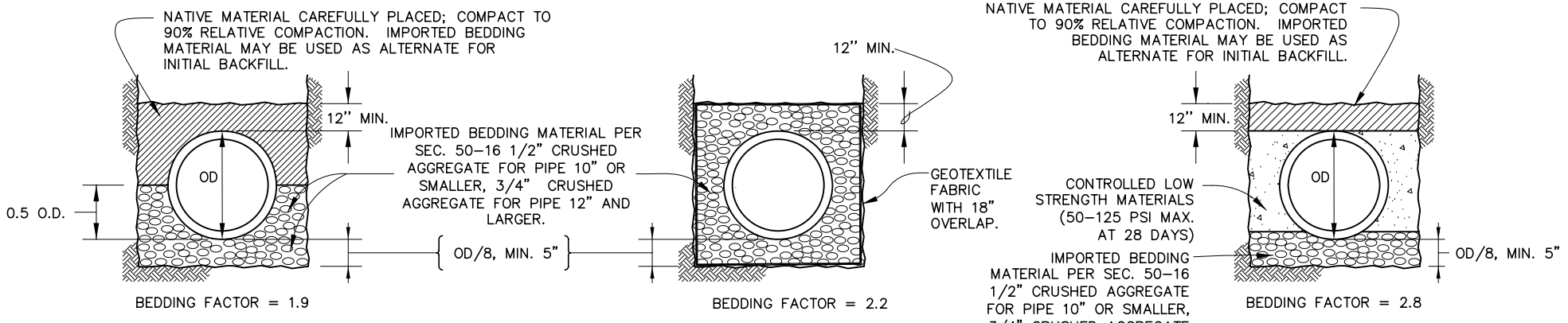
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SIGNATURE BLOCKS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-01

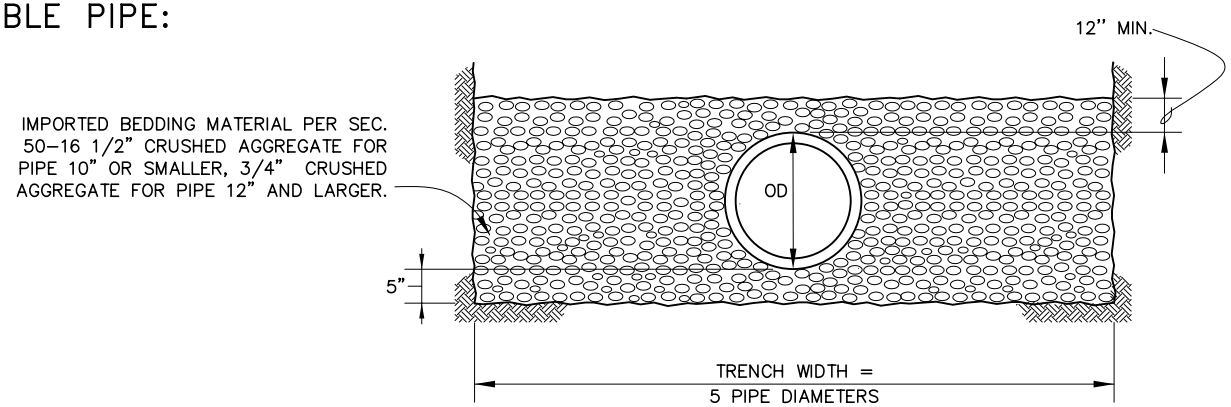
FOR RIGID & SEMI-RIGID PIPE:



NOTES:

1. SEE SECTIONS 19-2.02 AND 19-2.02A FOR INITIAL BACKFILL.
2. BEDDING FACTORS ARE PER NCPI.
3. IN AREAS WHERE TRENCHES ARE LOCATED IN FINE TO MEDIUM SANDS OR THERE IS PRESENCE OF GROUND WATER GEOTEXTILE FABRIC SHALL BE USED.
4. TYPE III BEDDING IS ONLY FOR VITRIFIED CLAY PIPE.

FOR FLEXIBLE PIPE:



NOTES:

1. PLACE AND WORK BY HAND TO ENSURE ALL EXCAVATED VOIDS AND HAUNCH AREAS ARE FILLED. INSTALL IN 6-INCH MAXIMUM LAYERS. WORK IN BY HAND TO PROVIDE UNIFORM SUPPORT.
2. IN AREAS WHERE TRENCHES ARE LOCATED IN FINE TO MEDIUM SANDS OR THERE IS PRESENCE OF GROUND WATER GEOTEXTILE FABRIC SHALL BE USED.

Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SEWER PIPE BEDDING & INITIAL BACKFILL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-02

SIZE	BEDDING	DEPTH OF COVER (FEET)																
		4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
8"	TYPE I																	
	TYPE II																	
	TYPE III																	
10"	TYPE I																← 35" →	
	TYPE II																	
	TYPE III																	
12"	TYPE I															39"	38"	37"
	TYPE II																	
	TYPE III																	

NO LIMIT ON TRENCH WIDTH

30" MAXIMUM TRENCH WIDTH MEASURED AT THE TOP OF THE PIPE.

ASSUMPTIONS:

Ku' = 0.11
130 PCF
SF = 1.25 MIN.
GREENBROOK HIGH STRENGTH PIPE
HS 20 LIVE LOAD, WITH 1.5 IP

BEDDING FACTORS:

Type I = 1.9
Type II = 2.2
Type III = 2.8

NOTE:

FOR INSTALLATION OF VCP HAVING DEPTHS OF BURY GREATER THAN 20' OR FOR USE OF TRENCH WIDTHS GREATER THAN SHOWN HEREIN, A CURRENT SITE SPECIFIC SOILS REPORT IS REQUIRED.

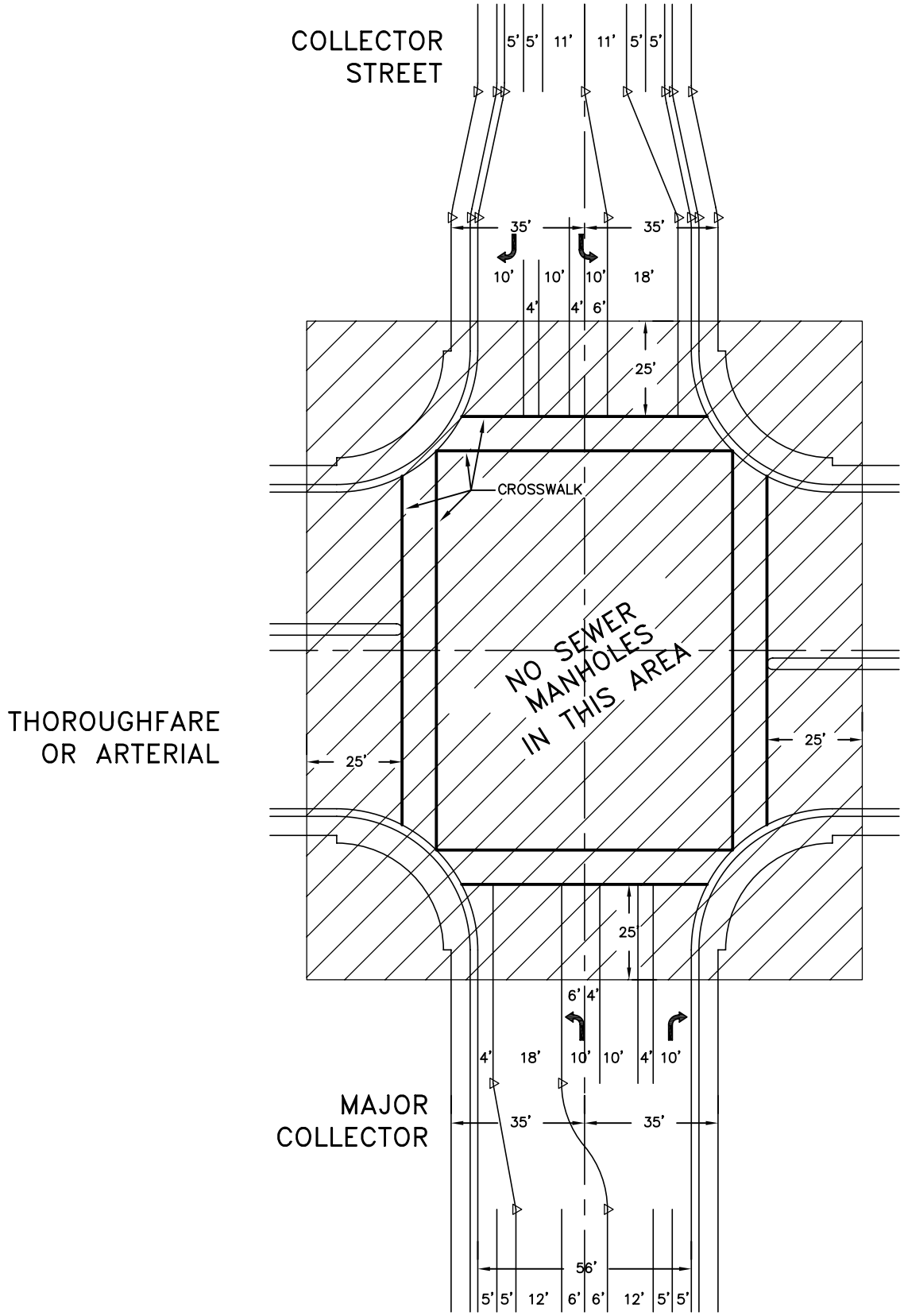
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

MAXIMUM TRENCH WIDTH FOR HIGH STRENGTH VITRIFIED CLAY PIPE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-03



NOTE

SEWER MANHOLES SHALL NOT BE LOCATED WITHIN 25 FEET OF ANY INTERSECTION WHERE EITHER STREET IS GREATER THAN RESIDENTIAL (TYP 50' MAX RIGHT-OF-WAY OR 36' MAX PAVEMENT WIDTH).

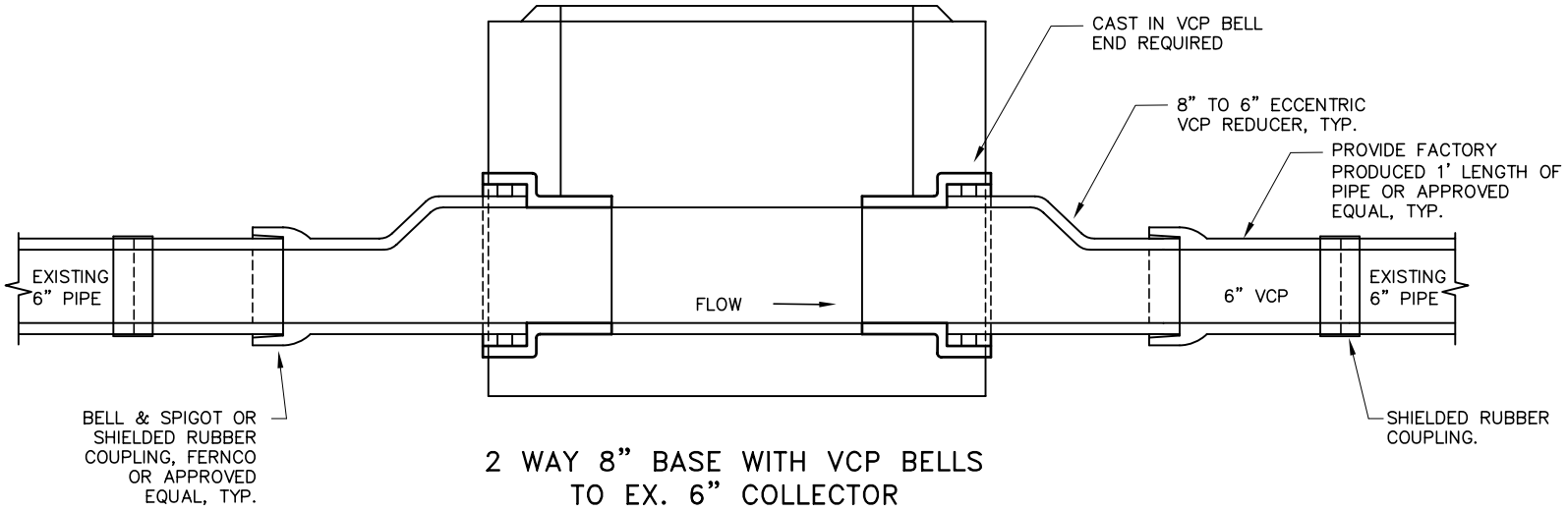
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

MANHOLE LOCATION RESTRICTION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-04



2 WAY 8" BASE WITH VCP BELLS
TO EX. 6" COLLECTOR

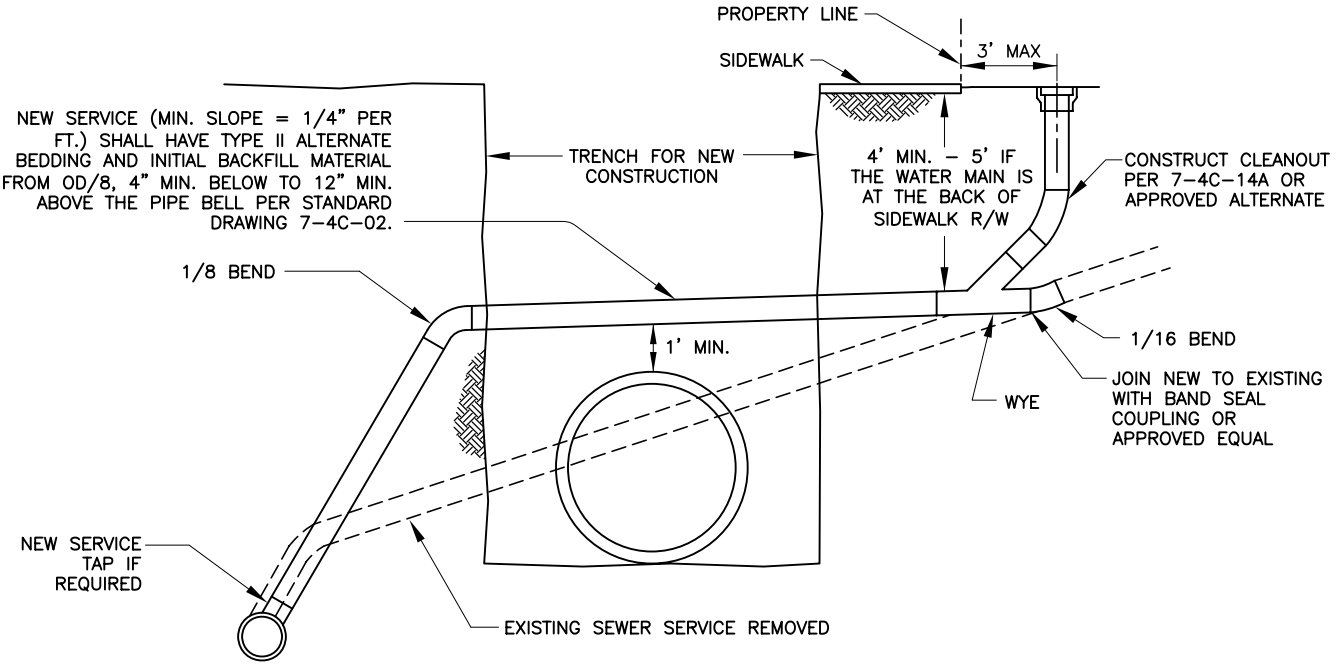
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

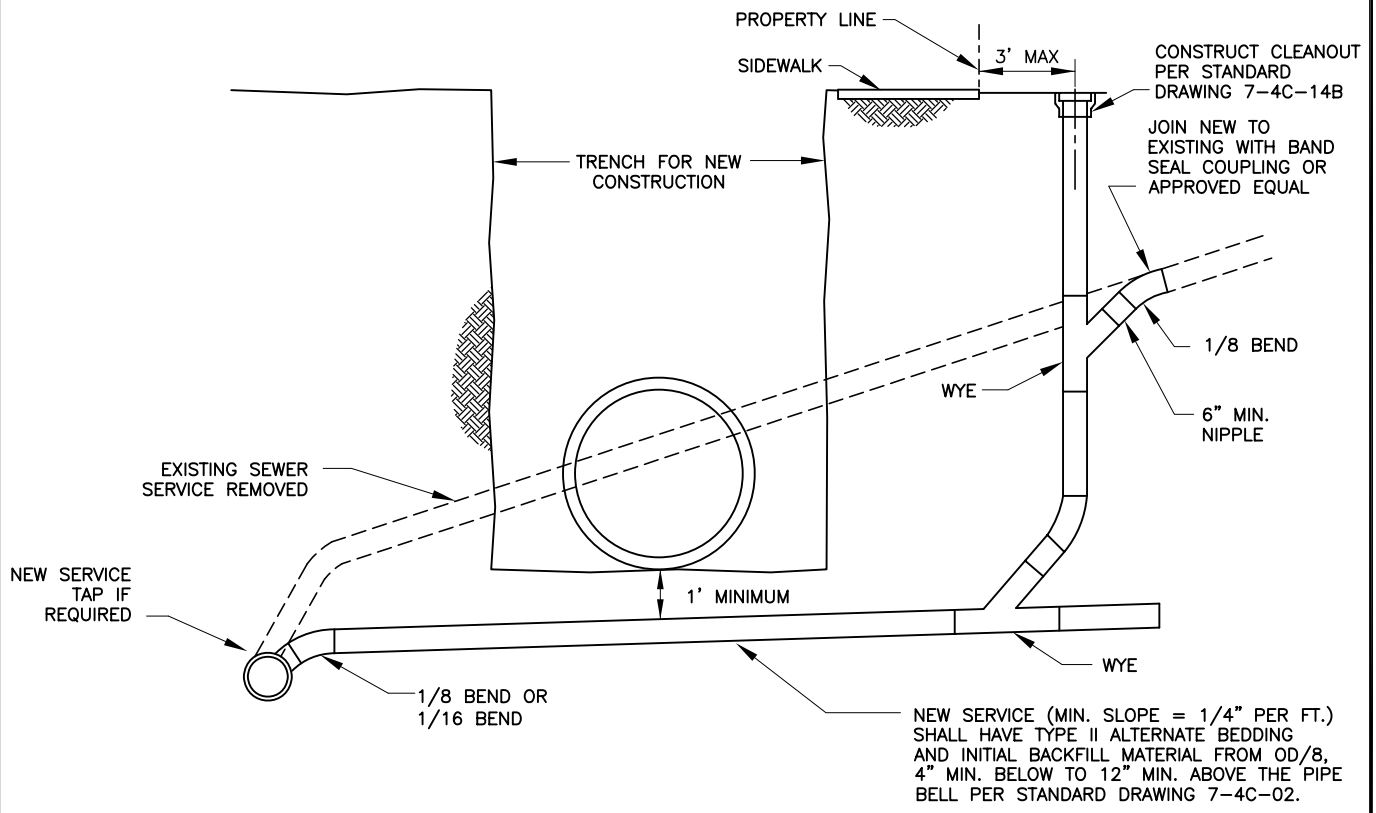
**MANHOLE CONNECTION
TO EX. 6" COLLECTOR**

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-10



EXISTING SEWER SERVICE RELOCATION OPTION OVER NEW CONSTRUCTION



EXISTING 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.

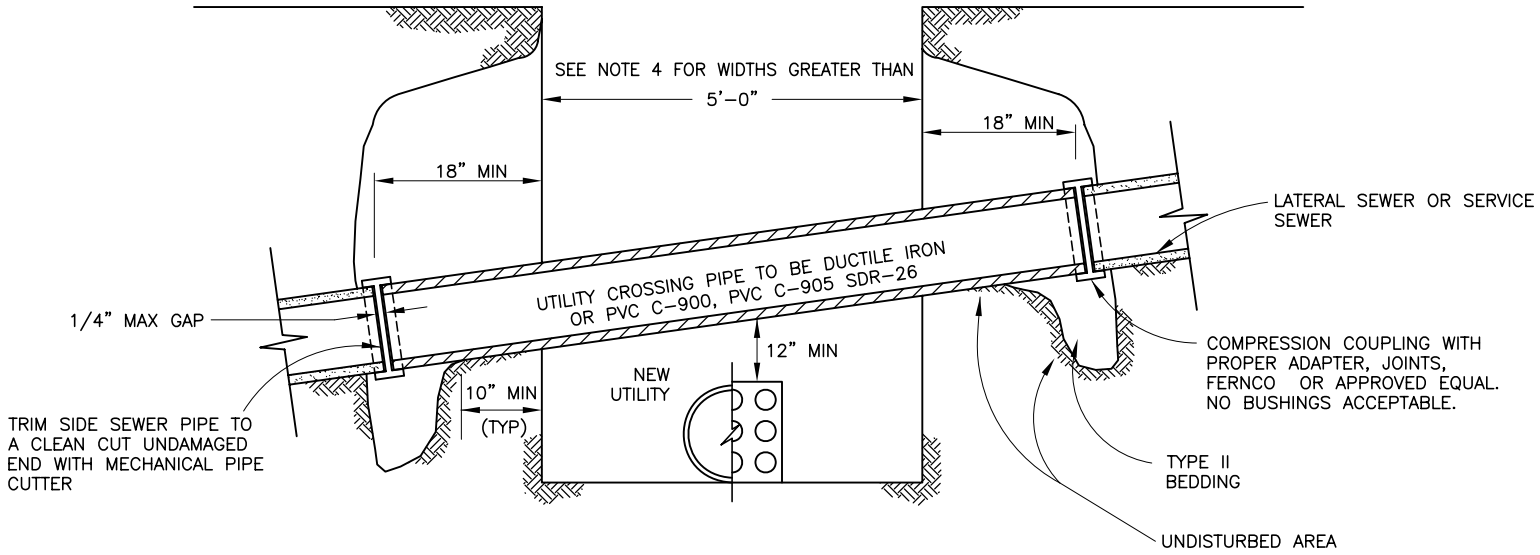
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SEWER SERVICE REPLACEMENT

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-11



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 CSD-1 DISTRICT 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 CSD-1.
4. WHENEVER THE SPAN, WHETHER CAUSED BY TRENCH WIDTH OR CROSSING ANGLE OF THE UTILITY CROSSING PIPE EXCEEDS 5'-0", PLACE TYPE II BEDDING TO 12" ABOVE THE NEW UTILITY AND 18" EACH SIDE OF ITS CENTER LINE.
5. ANY NEW UTILITY WITH 1 FOOT OR LESS CLEARANCE SHALL PLACE A COMPRESSIBLE MATERIAL (STYROFOAM OR EQUIVALENT) BETWEEN THE LINES.
6. UTILITY CROSSING PIPE TO HAVE THE SAME SLOPE AS ADJACENT PIPELINES.

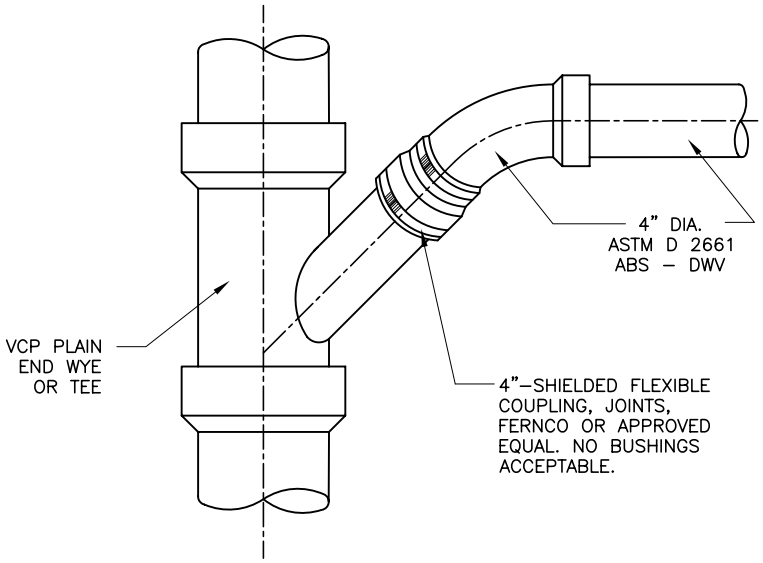
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

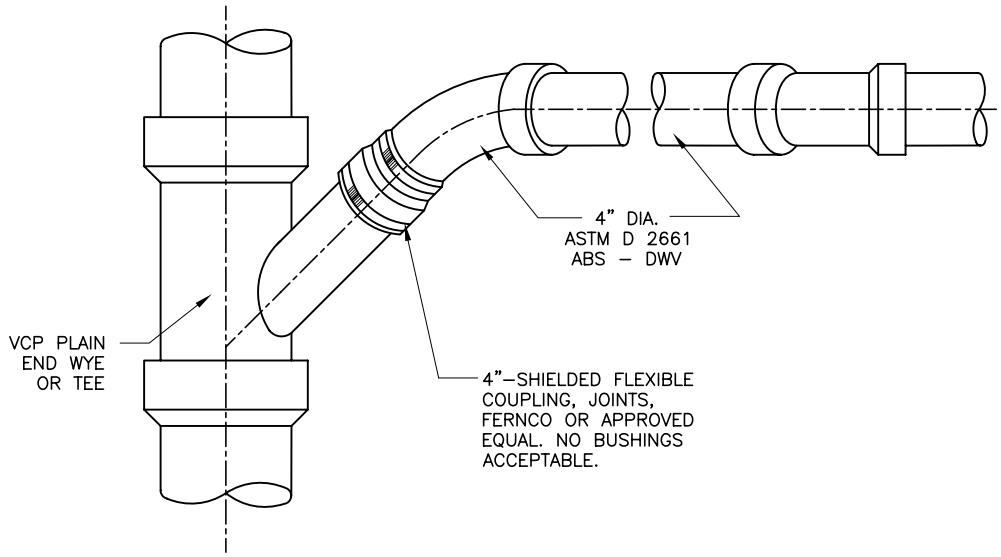
UTILITY CROSSING

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

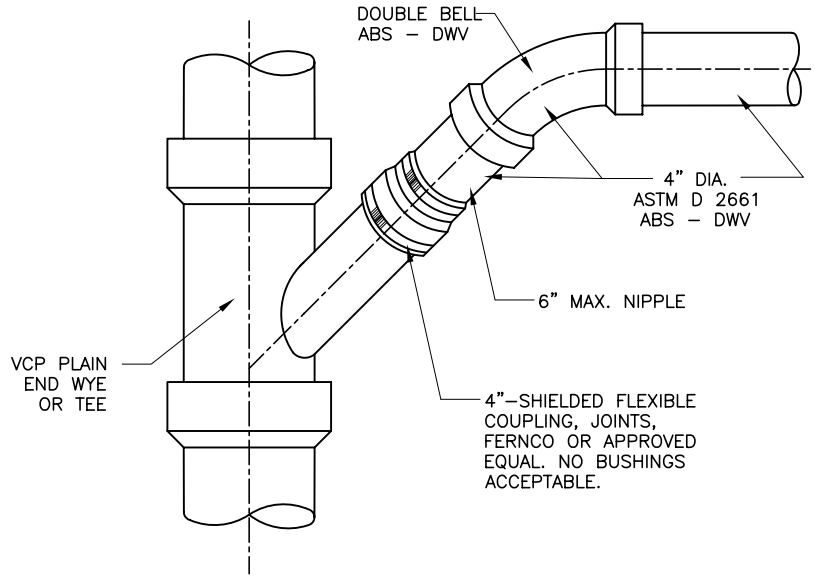
7-4C-12



TYPE "A" SERVICE



TYPE "B" SERVICE



"OPTIONAL" SERVICE CONNECTION (TYPE B)

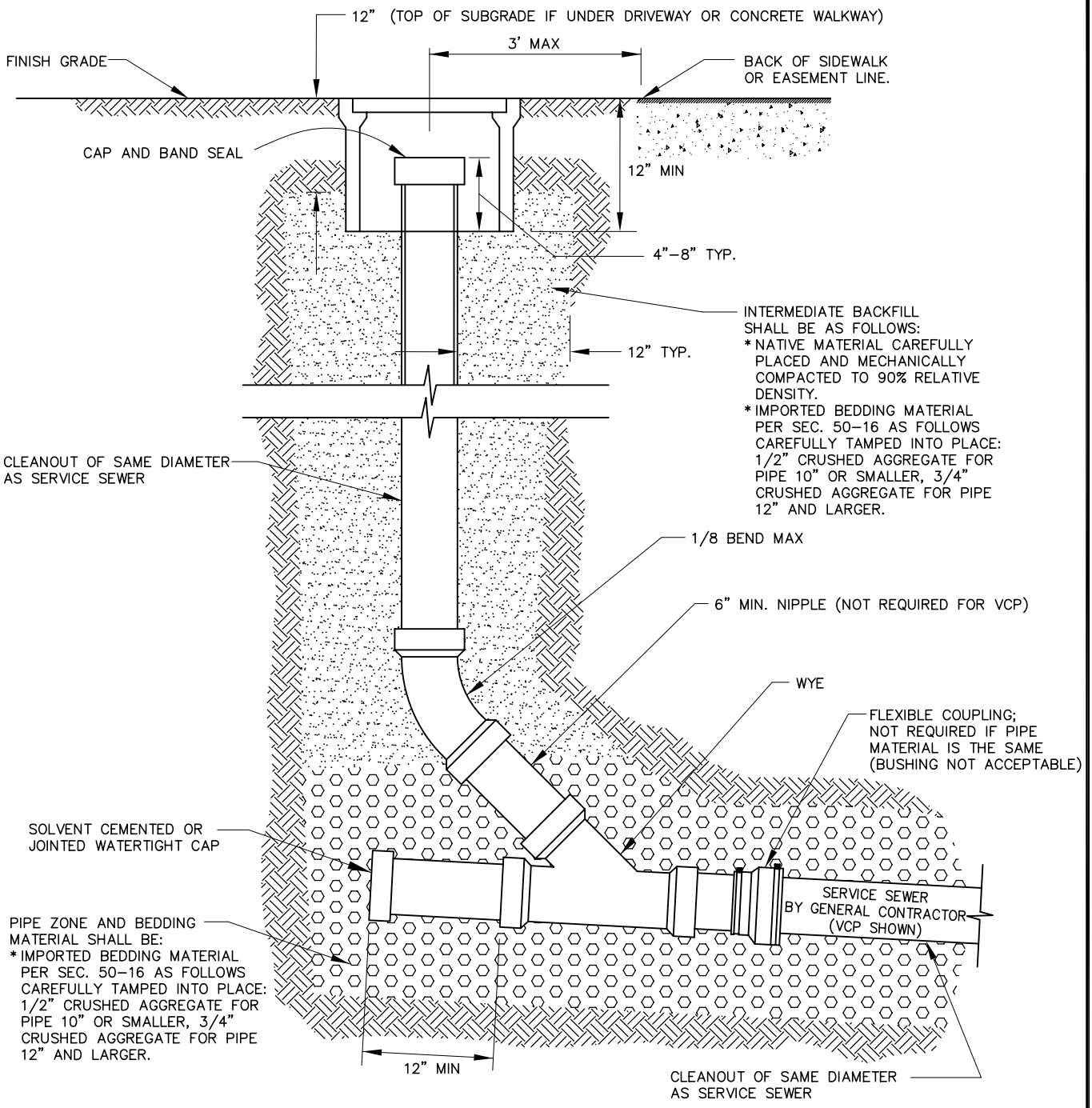
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

ALTERNATE ABS SEWER SERVICE WYE CONNECTION TOP VIEW

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-13B



NOTES:

1. CLEANOUT TO GRADE TO BE PVC OR ABS (ASTM D2661) WITH SOLVENT WELD JOINTS.
2. 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".
3. 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".
4. 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. SEE STANDARD DRAWING 7–4C–13A.
5. VCP SHALL BE BELL & SPIGOT WITH POLYURETHANE JOINT.

PLACE A MINIMUM OF 12" OF BACKFILL ALL AROUND THE OUTSIDE DIAMETER OF THE RISER AND MECHANICALLY COMPACTED TO 90% RELATIVE DENSITY. BACKFILL MATERIAL MATERIAL SHALL BE USED TO 12" FROM GRADE OR TO TOP OF SUBGRADE IF UNDER CONCRETE.

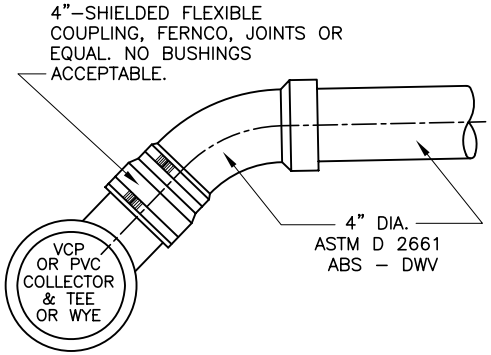
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

VCP, ABS
CLEANOUT TO GRADE

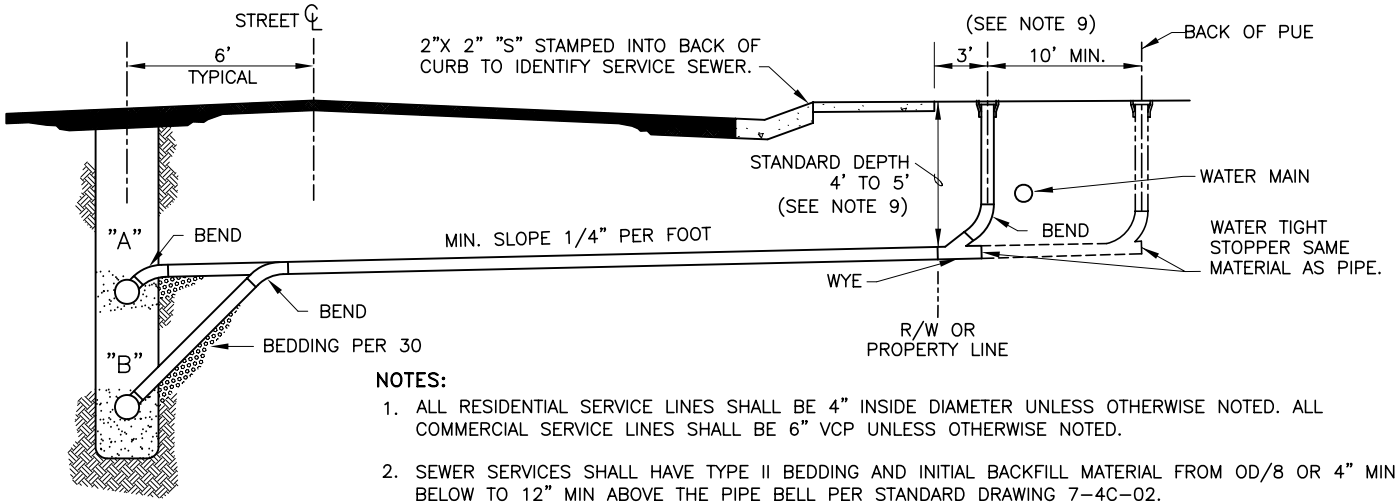
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-14A

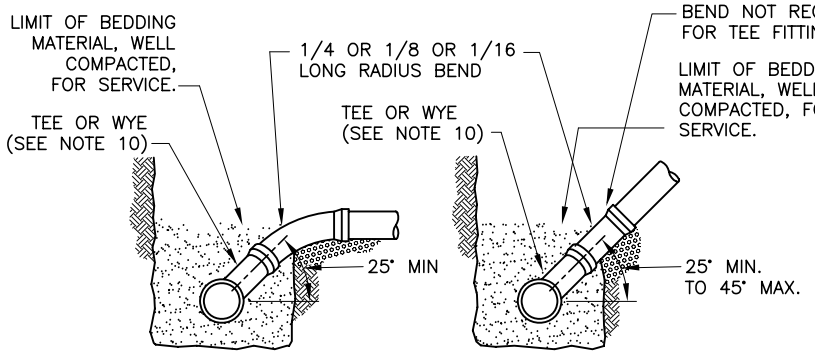


ALTERNATE RESIDENTIAL ABS SERVICE SEWER CONNECTION TO VCP OR PVC–SDR–26

SEE ALSO STANDARD DRAWING 34



ELEVATIONS



TYPE A TYPE B

CONNECTION DETAILS

NOTES:

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 BEDDING AND INITIAL BACKFILL MATERIAL FROM OD/8 OR 4" MIN BELOW TO 12" MIN ABOVE THE PIPE BELL PER STANDARD DRAWING 7–4C–02.
3. CONTRACTOR SHALL USE THE MOST APPROPRIATE TYPE CONNECTION (A OR B) 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 STANDARD DRAWING 4C–11. SEE NOTE 9 BELOW.
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. MINIMUM SPECIFIED COVER AT THE PROPERTY LINE SHALL BE MEASURED FROM EXISTING GROUND SURFACE OR EDGE OF ADJACENT ROADWAY, WHICHEVER IS LOWER.
7. A SPECIFIC ELEVATION AT THE PROPERTY LINE, WHEN SHOWN ON THE PLANS OR DESIGNATED BY THE ENGINEER, SHALL GOVERN.
8. ALL BENDS SHALL BE 25° MIN. TO 45° MAX.
9. 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.
10. 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.
11. VCP SHALL BE BELL & SPIGOT WITH POLYURETHANE JOINTS.

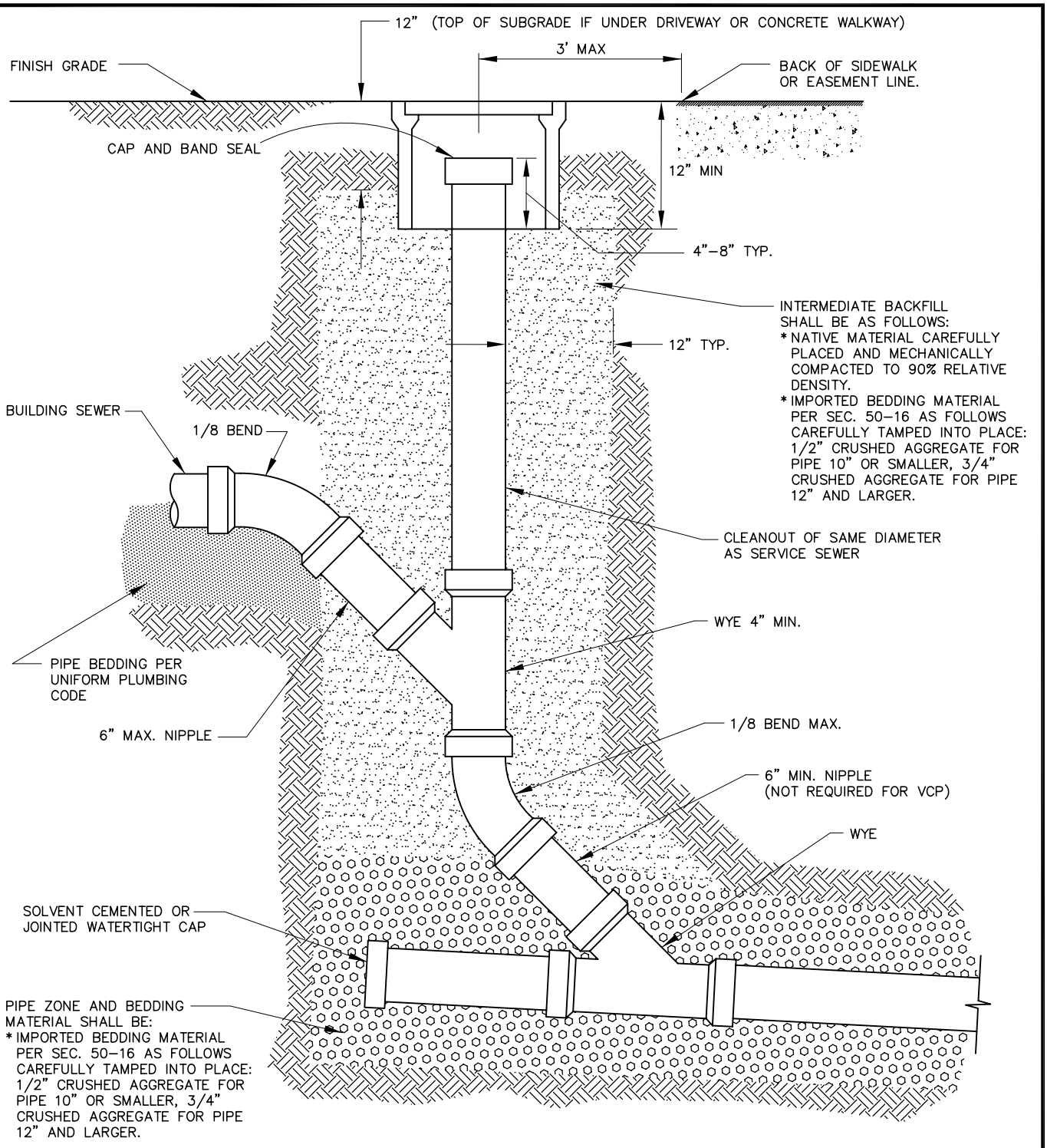
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

SERVICE SEWERS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-13A



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.

Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

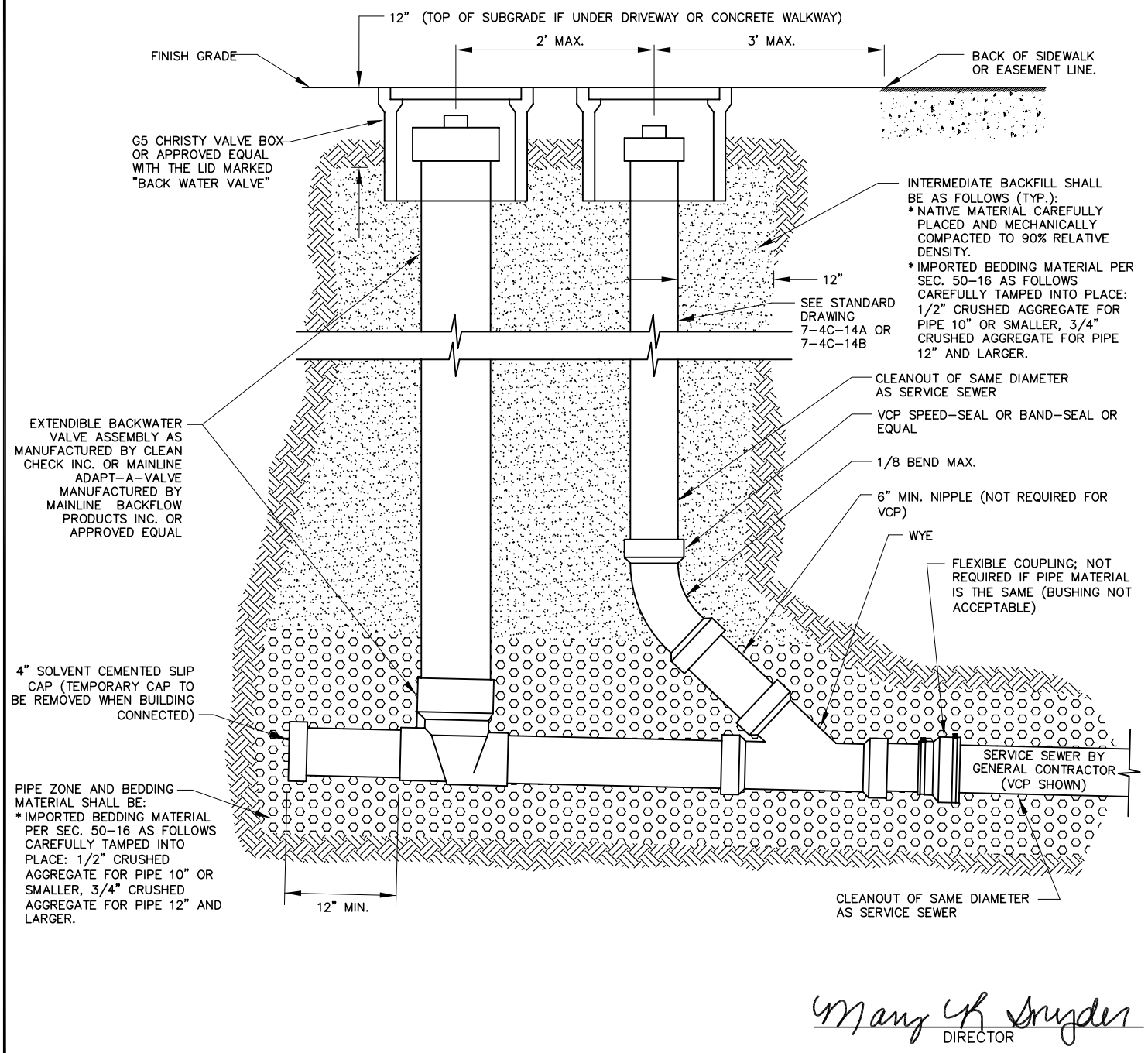
MODIFIED VCP or ABS
CLEANOUT TO GRADE

BUILDING SEWER CONNECTED TO RISER

(Not applicable when the water main is located behind the sidewalk.)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-14B



NOTES:

1. CLEANOUT TO GRADE TO BE PLASTIC OR ABS (ASTM D2661) WITH SOLVENT WELD JOINTS.
2. 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".
3. 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".
4. IF A WATER MAIN IS TO BE INSTALLED AT THE BACK OF SIDEWALK, CLEANOUT AND BACKWATER VALVE TO BE INSTALLED AS NEAR AS POSSIBLE TO THE BACK OF SIDEWALK. EXTEND THE SEWER SERVICE TO THE BACK OF THE P.U.E. (10' MIN) AND INSTALL A SECOND CLEANOUT TO GRADE.
5. MAINTENANCE OF THE BACKWATER VALVE TO BE PERFORMED BY THE PROPERTY OWNER OR OCCUPANT PER THE MANUFACTURES RECOMMENDATIONS. NEVER ROD THROUGH THE BACKWATER VALVE SEAT AREA. REMOVE THE VALVE ASSEMBLY BEFORE JETTING OR HYDRO CLEANING.
6. ANY MODIFICATION OR RELOCATION OF THE BACKWATER VALVE TO BE DONE PER THE MANUFACTORY'S RECOMMENDATIONS. A PLUMBING PERMIT AND INSPECTION IS REQUIRED BY BUILDING INSPECTION DIVISION. RELOCATION CLOSER TO THE STRUCTURE WILL REQUIRE INSTALLATION OF ONE-WAY CLEANOUTS ON EACH SIDE OF THE BACKWATER VALVE, EACH HEADED AWAY FROM THE VALVE SEAT AREA.

PLACE A MINIMUM OF 12" OF BACKFILL ALL AROUND THE OUTSIDE DIAMETER OF THE RISER AND MECHANICALLY COMPACTED TO 90% RELATIVE DENSITY. BACKFILL MATERIAL MATERIAL SHALL BE USED TO 12" FROM GRADE OR TO TOP OF SUBGRADE IF UNDER CONCRETE.

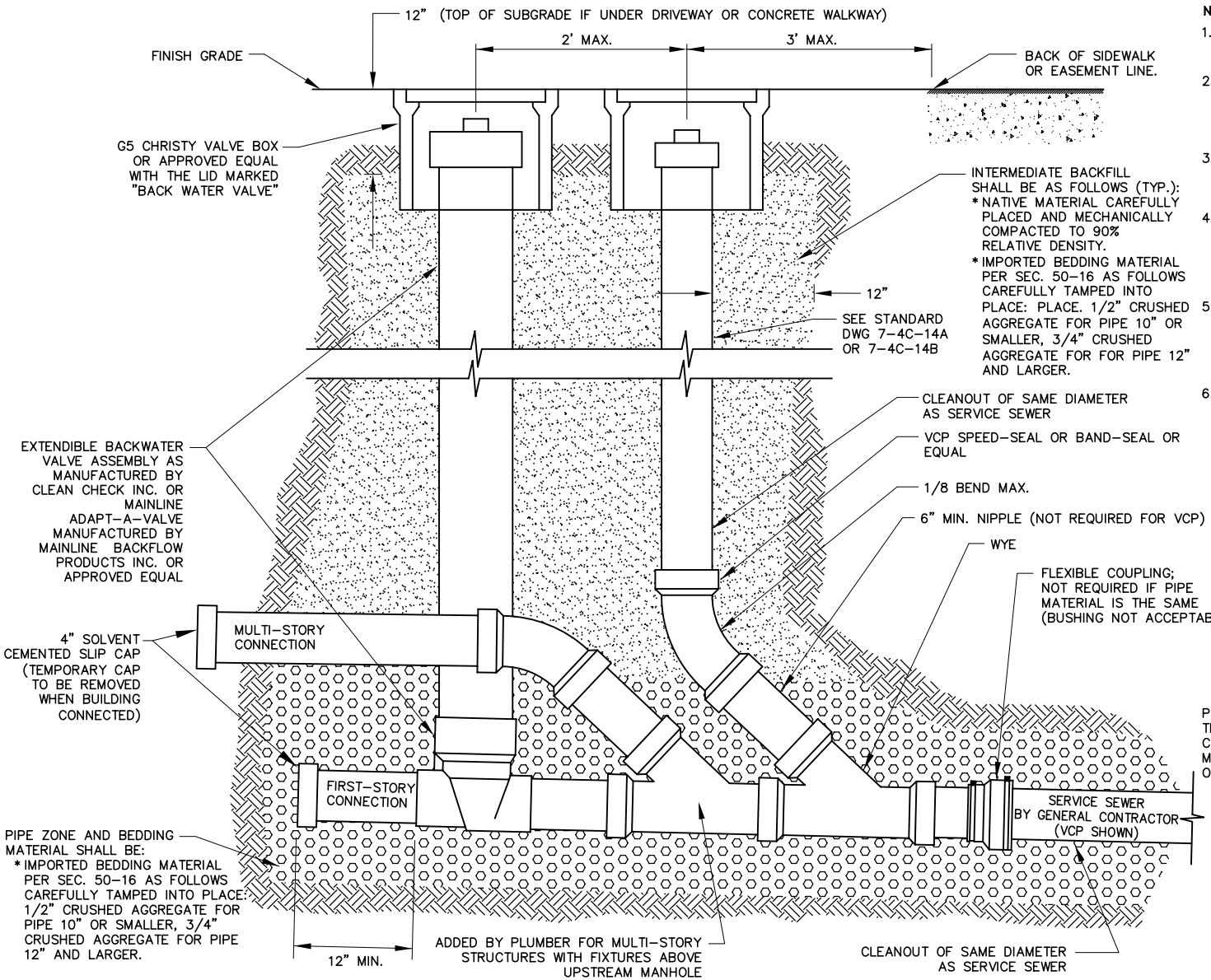
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

ABS / PVC
BACKWATER VALVE
TO GRADE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-15A



NOTES:

1. CLEANOUT TO GRADE TO BE PLASTIC DWV TYPE PVC (ASTM D2665) OR ABS (ASTM D2661) WITH SOLVENT WELD JOINTS.
2. 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".
3. 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".
4. IF A WATER MAIN IS TO BE INSTALLED AT THE BACK OF SIDEWALK, CLEANOUT AND BACKWATER VALVE TO BE INSTALLED AS NEAR AS POSSIBLE TO THE BACK OF SIDEWALK. EXTEND THE SEWER SERVICE TO THE BACK OF THE P.U.E. (10' MIN) AND INSTALL A SECOND CLEANOUT
5. TO GRADE.

   MAINTENANCE OF THE BACKWATER VALVE TO BE PERFORMED BY THE PROPERTY OWNER OR OCCUPANT PER THE MANUFACTURES RECOMMENDATIONS. NEVER ROD THROUGH THE BACKWATER VALVE SEAT AREA. REMOVE
6. THE VALVE ASSEMBLY BEFORE JETTING OR HYDRO CLEANING.

   ANY MODIFICATION OR RELOCATION OF THE BACKWATER VALVE TO BE DONE PER THE MANUFACTORY'S RECOMMENDATIONS. A PLUMBING PERMIT AND INSPECTION IS REQUIRED BY BUILDING INSPECTION DIVISION. RELOCATION CLOSER TO THE STRUCTURE WILL REQUIRE INSTALLATION OF ONE-WAY CLEANOUTS ON EACH SIDE OF THE BACKWATER VALVE, EACH HEADED AWAY FROM THE VALVE SEAT AREA.

PLACE A MINIMUM OF 12" OF BACKFILL ALL AROUND THE OUTSIDE DIAMETER OF THE RISER AND MECHANICALLY COMPACTED TO 90% RELATIVE DENSITY. BACKFILL MATERIAL MATERIAL SHALL BE USED TO 12" FROM GRADE OR TO TOP OF SUBGRADE IF UNDER CONCRETE.

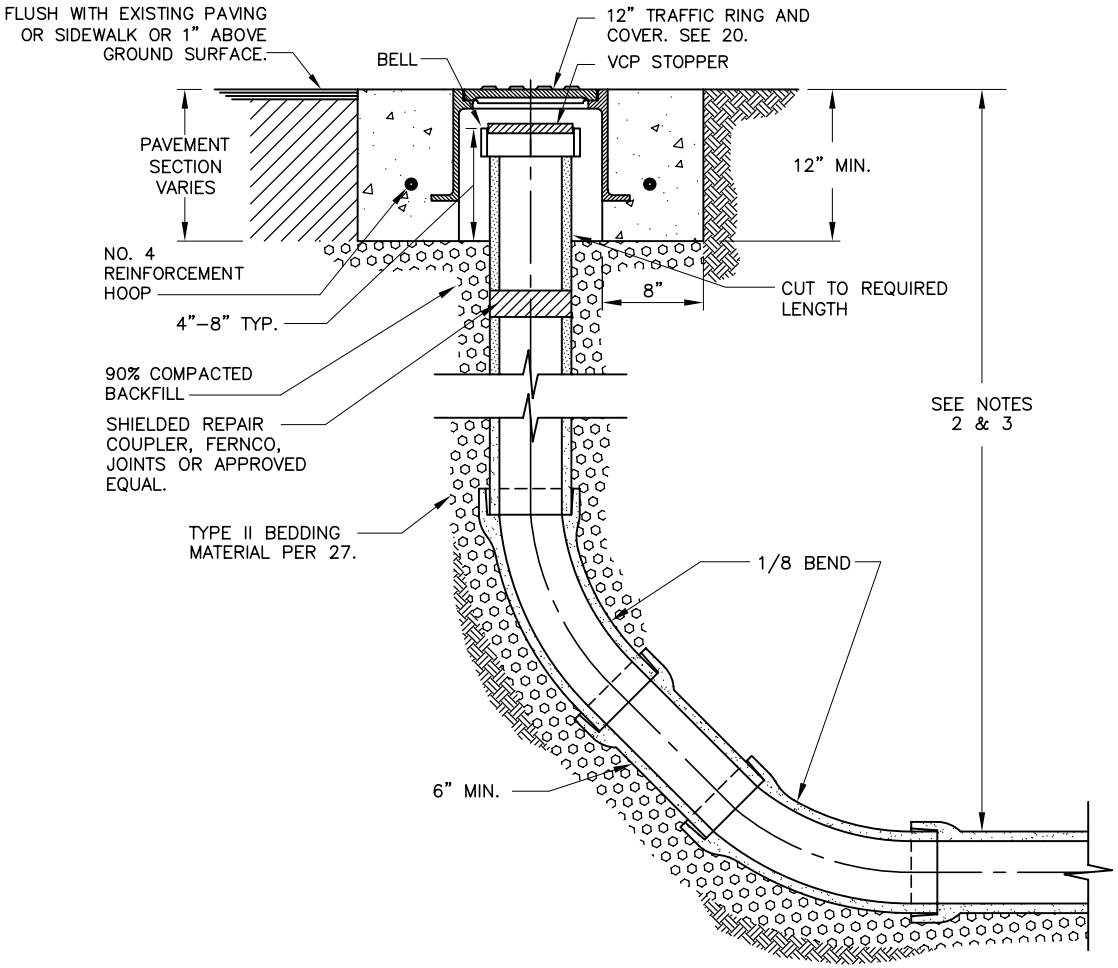
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

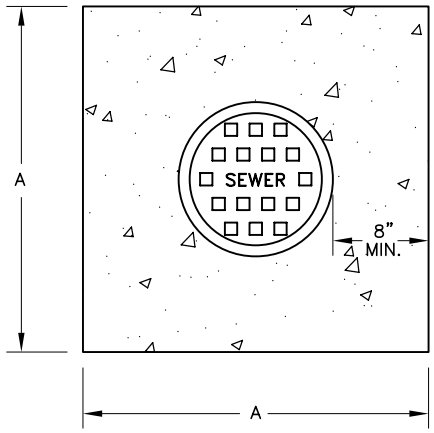
ABS / PVC BACKWATER VALVE TO GRADE - MULTI-STORY STRUCTURE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-15B



PROFILE



PLAN VIEW

NOTES:

1. 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.
2. 48" TOP OF PIPE TO FINISH GRADE IN NON–TRAVEL ROADS.
3. 48" TOP OF PIPE TO SUB GRADE IN TRAVEL ROADS.

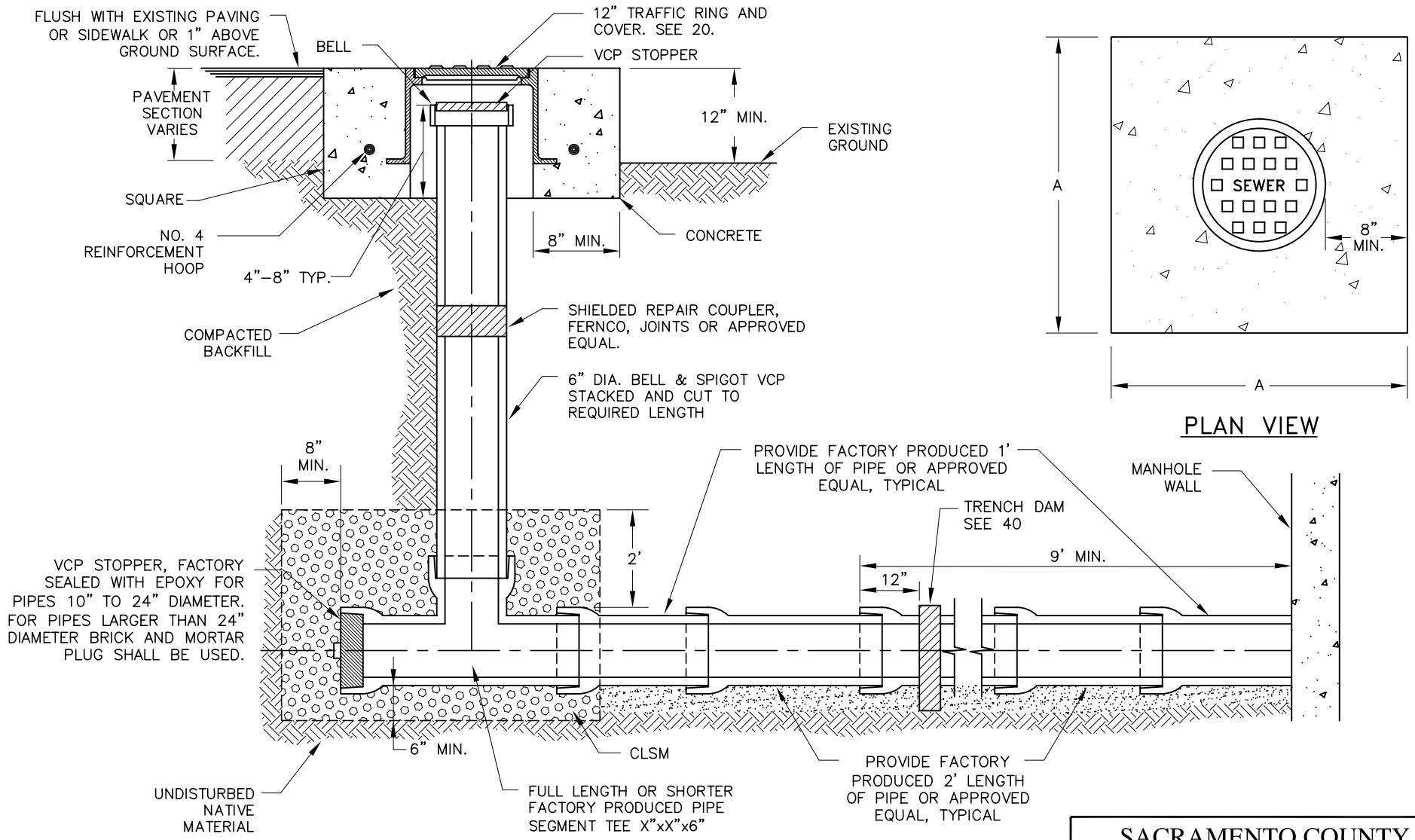
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FLUSHER BRANCH FOR PIPE DIAMETERS 8" AND LESS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-16A



NOTES:

1. EPOXY SHALL BE WYN–STK ES6323 OR APPROVED EQUAL.
2. CLSM SHALL HAVE A MAXIMUM COMPRESSIVE STRENGTH OF NOT MORE THAN 125 PSI 28 DAY STRENGTH.

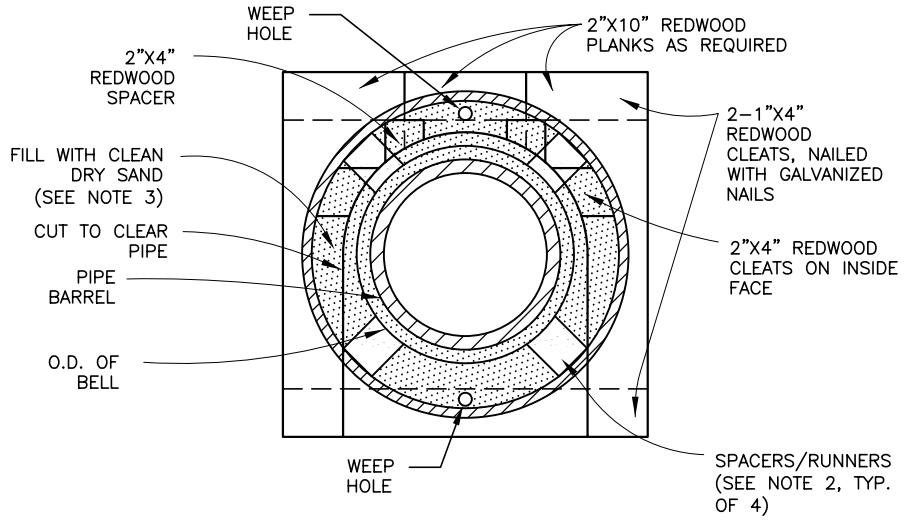
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FLUSHER BRANCH FOR PIPE DIAMETERS GREATER THAN 8"

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

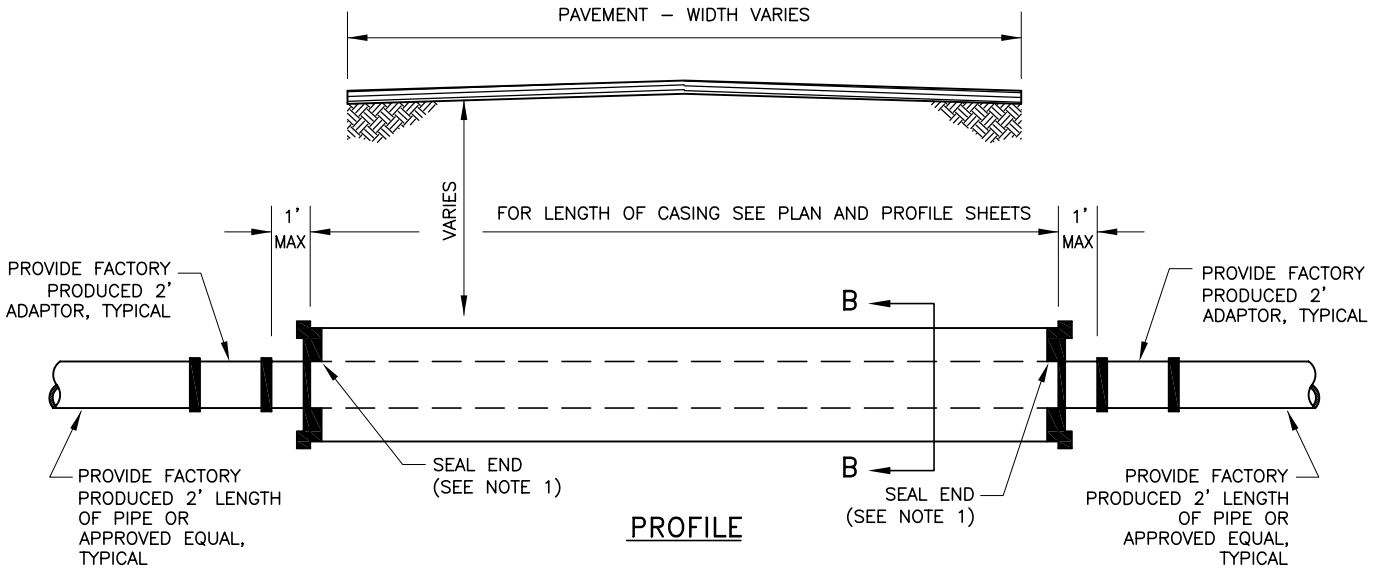
7-4C-16B



SECTION B–B

NOTE:

1. IN LIEU OF 3–2" REDWOOD PLANKS, BRICK AND MORTAR WITH A 1" DIAMETER WEEP HOLE AT CROWN AND INVERT MAY BE USED.
2. MANUFACTURED POLYURETHANE SPACERS/RUNNERS OR APPROVED EQUAL SHALL BE USED. MANUFACTURED POLYURETHANE SPACERS/RUNNERS OR APPROVED EQUAL SHALL BE INSTALLED PER MANUFACTURERS REQUIREMENTS.
3. SAND SHOULD MEET ASTM D448 TABLE 1 – SIZE 89.
4. CASING, SEE SPECIFICATIONS SECTION 37.
5. CENTER CARRIER PIPE IN CASING.



PROFILE

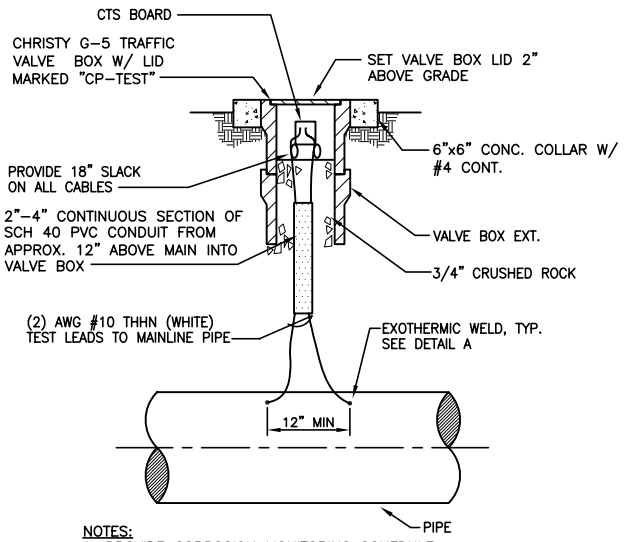
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CONDUCTOR CASING DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

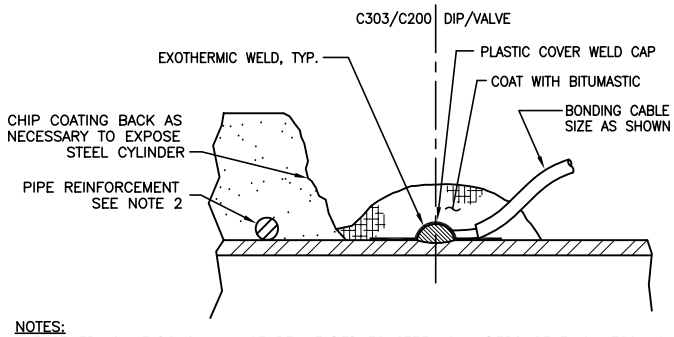
7-4C-20



NOTES:
1. PROVIDE CORROSION MONITORING SCHEDULE.
2. INSTALL TEST LEADS ON SPIGOT END OF PIPE.
3. WELD LEADS TO STEEL JOINT RING.

CORROSION TEST STATION (CTS)

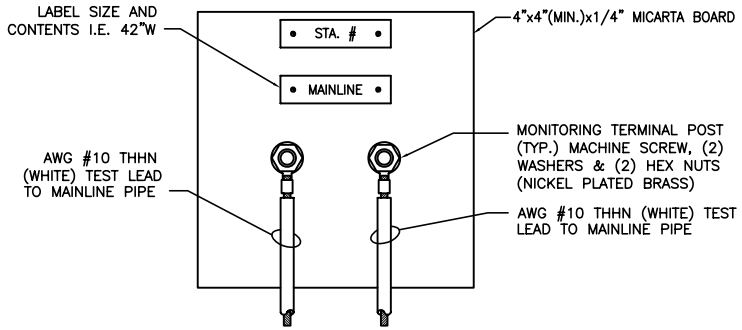
NTS



NOTES:
1. EXOTHERMIC WELDS SHALL NOT BE WELDED TO STEEL CYLINDERS OF THICKNESS 10 GA. OR LESS WITHOUT APPROVAL OF THE ENGINEER.
2. PIPE REINFORCEMENT BARS MAY BE PUSHED APART AS NECESSARY TO INSTALL EXOTHERMIC WELD. DO NOT CUT REINFORCEMENT BARS WITHOUT APPROVAL OF THE ENGINEER. IF REINFORCEMENT BARS ARE CUT, TACK WELD ALL CUT ENDS TO STEEL CYLINDER.
3. COAT ALL EXPOSED STEEL WITH BITUMASTIC AFTER EXOTHERMIC WELD.
4. WHERE INSTALLING EXOTHERMIC WELD ON EPOXY COATED STEEL, GRIND EPOXY COATING TO EXPOSE STEEL, COMPLETE WELD AND APPLY EPOXY TOUCH-UP TO EXPOSED STEEL.

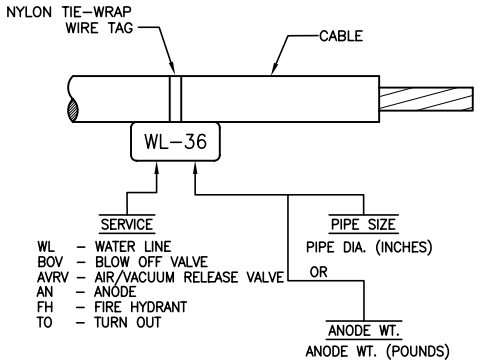
DETAIL A
EXOTHERMIC WELD

NTS



CTS BOARD

NTS



NOTE: MARK TAG WITH BLACK PERMANENT INK MARKER

CABLE ID TAG

NTS

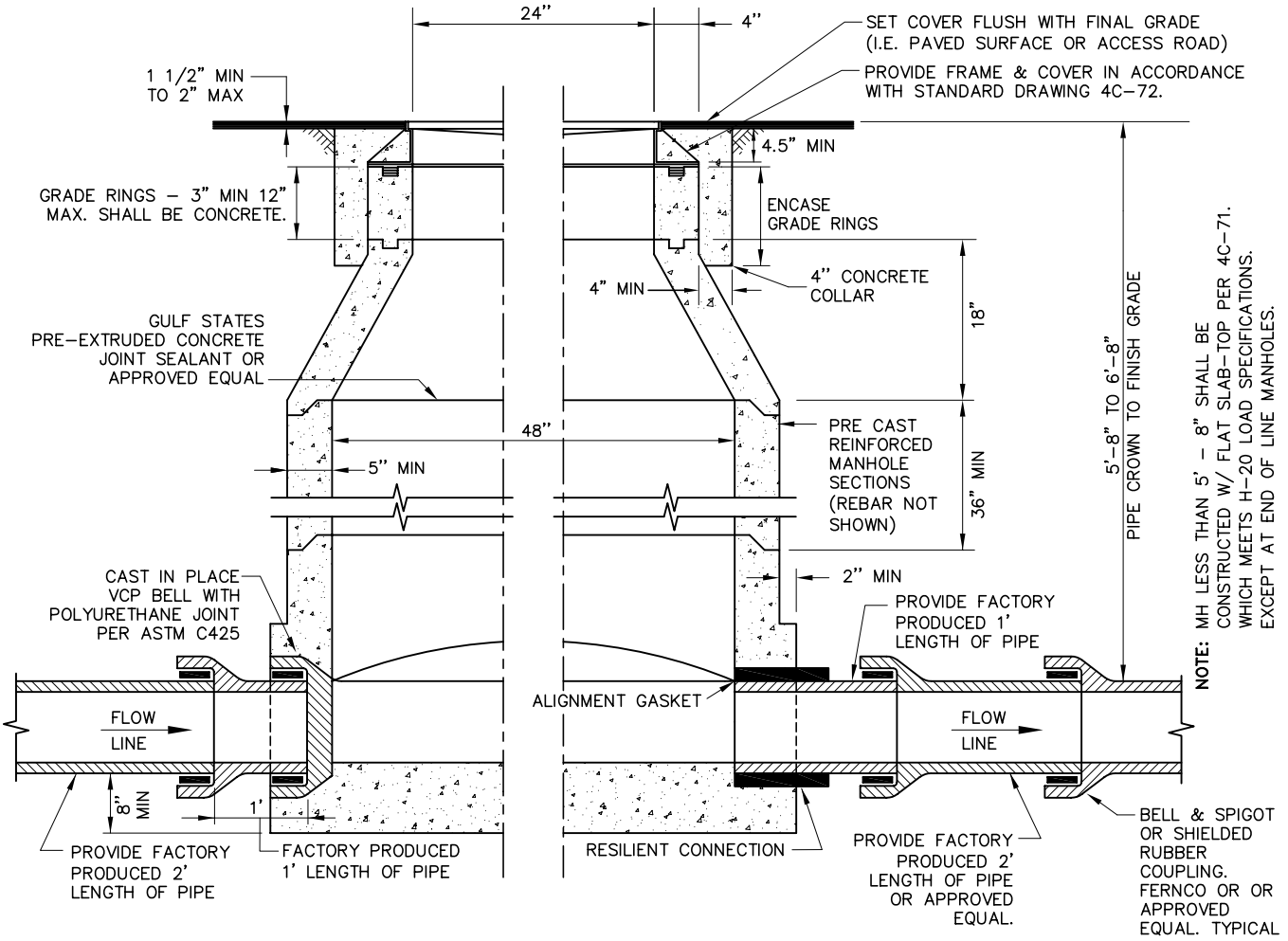
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CATHODIC PROTECTION - STEEL CASING

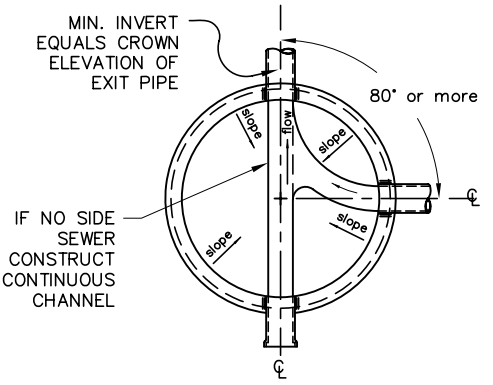
DRAWN BY: GT
SCALE: NONE
DATE: 11/07

7-4C-21



NOTES:

1. CLASS A CONCRETE SHALL BE USED FOR MANHOLE BASES.
2. PIPE SHALL STOP AT INSIDE FACE OF MANHOLE.
3. POURED IN PLACE MANHOLES SHALL NOT BE ALLOWED UNLESS APPROVED BY THE DIRECTOR, PRIOR TO CONSTRUCTION.
4. JOINTS FOR THE BARREL SECTION SHALL BE TONGUE AND GROOVE OR LAP JOINT, ALL LIFTING HOLES SHALL BE SEALED WITH NON METALLIC NON-SHRINK GROUT.
5. ALL MANHOLE BASES SHALL BE PRECAST BASES AND SHALL BE PLACED ON 10" MIN. OF CRUSHED ROCK PLACED OVER UNDISTURBED MATERIAL. CONNECTION OF THE PIPE TO THE MANHOLE SHALL USE A CAST IN PLACE VCP BELL WITH POLYURETHANE JOINT PER ASTM STANDARD C425 OR A RESILIENT CONNECTOR CONFORMING TO ASTM STANDARD C923 SUCH AS KOR-N-SEAL 306 SERIES OR APPROVED EQUAL. ALL MANHOLE BASES TO INCLUDE AN ANTI-FLOATATION RING PER STANDARD DRAWING 4C-40.
6. 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. FOR MANHOLES AT THE END OF A CUL-DE-SAC OR END OF LINE WITH NO EXTENSION 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. SEE SECTION 39-2.01 OF THE SPECIFICATIONS.
7. BEDDING FOR PRE CAST MANHOLE SHALL BE SELECT IMPORTED MATERIAL 3/4" CRUSHED ROCK.
8. ECCENTRIC CONES ARE NOT ALLOWED UNLESS APPROVED BY THE DIRECTOR, PRIOR TO CONSTRUCTION.
9. 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.
10. CUL-DE-SAC MANHOLES OR END OF LINE MANHOLES WITH A DEPTH OF 6'-8" OR LESS SHALL USE 18" CONES.
11. 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.
12. PIPE SHALL BE PLACED WITH THE BELLS UPSTREAM.
13. ALL SEWER MANHOLE AND APPURTENANCES SHALL HAVE 24 HOUR ALL WEATHER ACCESS. (I.E. PAVED SURFACE OR ACCESS ROAD).



PLAN VIEW OF 48" MANHOLE
SHOWING INTERSECTING SEWERS

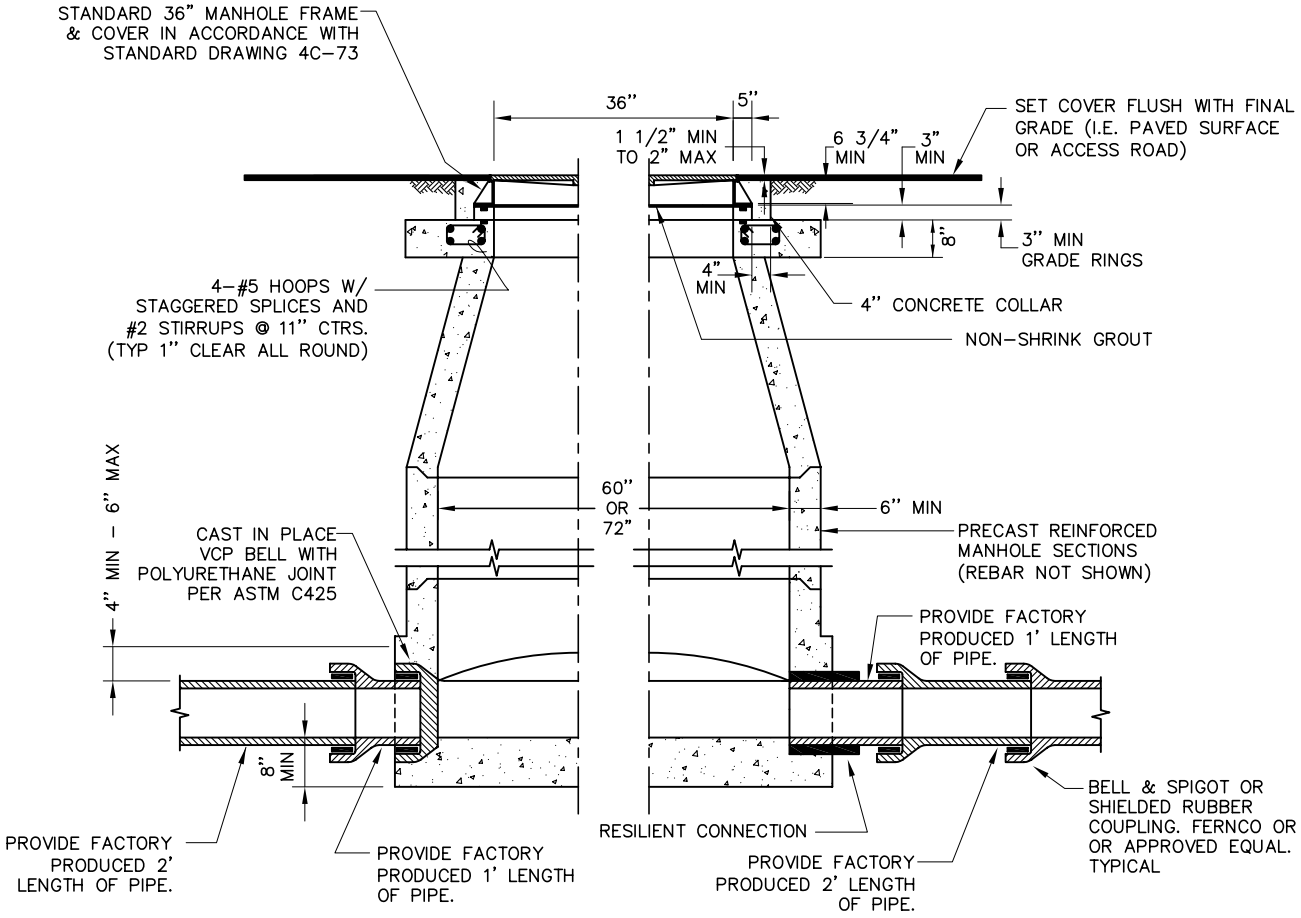
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

STANDARD PRECAST 48" SEWER MANHOLES

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-30



SEE DRAWING 7-4C-40 FOR REBAR

NOTES:

1. CLASS A CONCRETE SHALL BE USED FOR MANHOLE BASES.
2. PIPE SHALL STOP AT INSIDE FACE OF MANHOLE.
3. POURED IN PLACE MANHOLES SHALL NOT BE ALLOWED UNLESS APPROVED BY THE DISTRICT ENGINEER, PRIOR TO CONSTRUCTION.
4. JOINTS FOR THE BARREL SECTION SHALL BE TONGUE AND GROOVE OR LAP JOINT, ALL LIFTING HOLES SHALL BE SEALED WITH NON METALLIC NON-SHRINK GROUT.
5. ALL MANHOLE BASES SHALL BE PRECAST BASES AND SHALL BE PLACED ON 10" MIN. OF CRUSHED ROCK PLACED OVER UNDISTURBED MATERIAL. CONNECTION OF THE PIPE TO THE MANHOLE SHALL USE A CAST IN PLACE VCP BELL WITH POLYURETHANE JOINT PER ASTM STANDARD C425 OR A RESILIENT CONNECTOR CONFORMING TO ASTM STANDARD C923 SUCH AS KOR-N-SEAL 306 SERIES OR APPROVED EQUAL. ALL MANHOLE BASES TO INCLUDE AN ANTI-FLOATATION RING PER STANDARD DRAWING 7-4C-40.
6. 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. FOR MANHOLES AT THE END OF A CUL-DE-SAC OR END OF LINE WITH NO EXTENSION 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. SEE SECTION 39-2.01 OF THE SPECIFICATIONS.
7. BEDDING FOR PRE CAST MANHOLE SHALL BE SELECT IMPORTED MATERIAL 3/4" CRUSHED ROCK.
8. ECCENTRIC CONES ARE NOT ALLOWED UNLESS APPROVED BY THE DIRECTOR, PRIOR TO CONSTRUCTION.
9. 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.
10. CUL-DE-SAC MANHOLES OR END OF LINE MANHOLES WITH A DEPTH OF 6'11" OR LESS SHALL USE 18" CONES.
11. ANY COLLECTOR ENTERING A MANHOLE SHALL BE INSTALLED WITH THE INVERT ELEVATION OF THE ENTERING COLLECTOR MATCHING THE CROWN ELEVATION OF THE EXIT PIPE.
12. PIPE SHALL BE PLACED WITH THE BELLS UPSTREAM.
13. THE MINIMUM DISTANCE BETWEEN SIDE PENETRATIONS IS 1/2 OF THE SMALLEST PIPE OUTSIDE DIAMETER. THE MAXIMUM OUTSIDE DIAMETER OF ANY PENETRATION IS EQUAL TO 0.707 x THE MANHOLE INSIDE DIAMETER.
14. ALL SEWER MANHOLES AND APPURTENANCES SHALL HAVE 24 HOUR ALL WEATHER ACCESS (I.E. PAVED SURFACE OR ACCESS ROAD).

Mary K Snyder
DIRECTOR

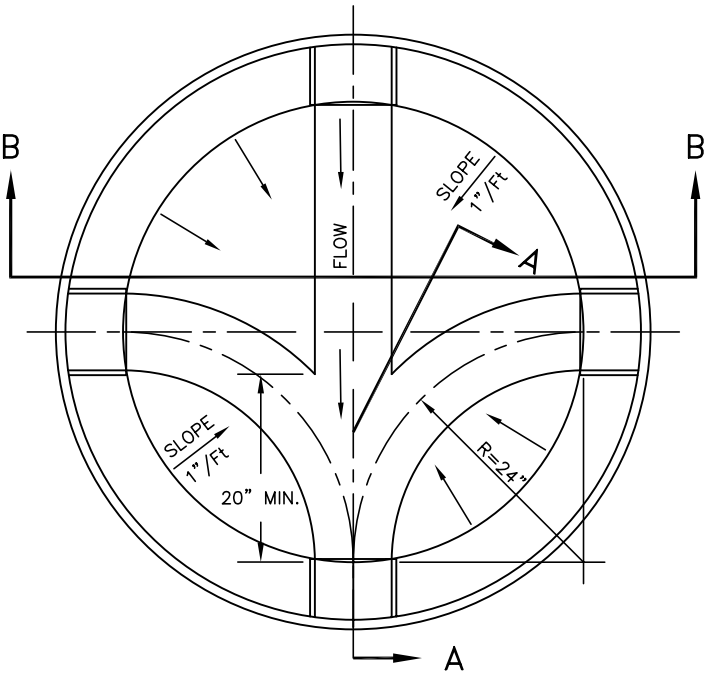
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

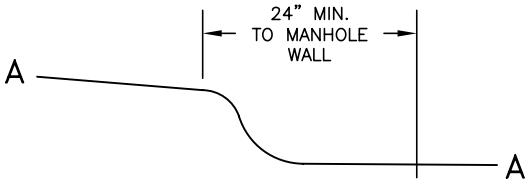
STANDARD PRECAST 60" & 72" SEWER MANHOLES

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

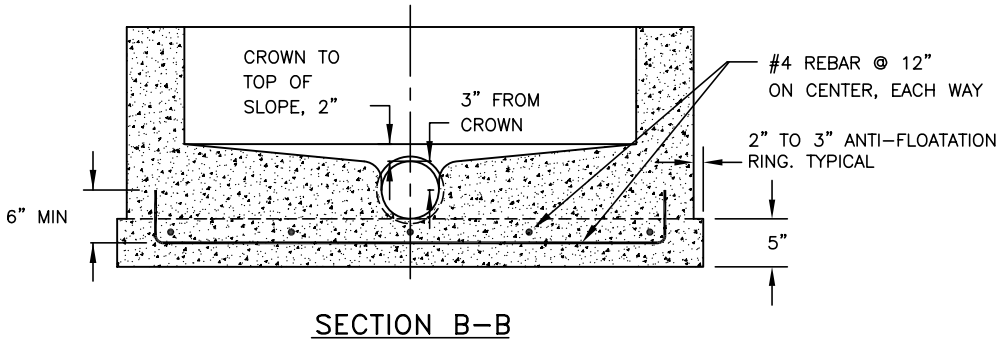
7-4C-31

CAMERA CHANNEL REQUIRED FOR
ALL 8" AND 10" LINES





SECTION A–A



SECTION B–B

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

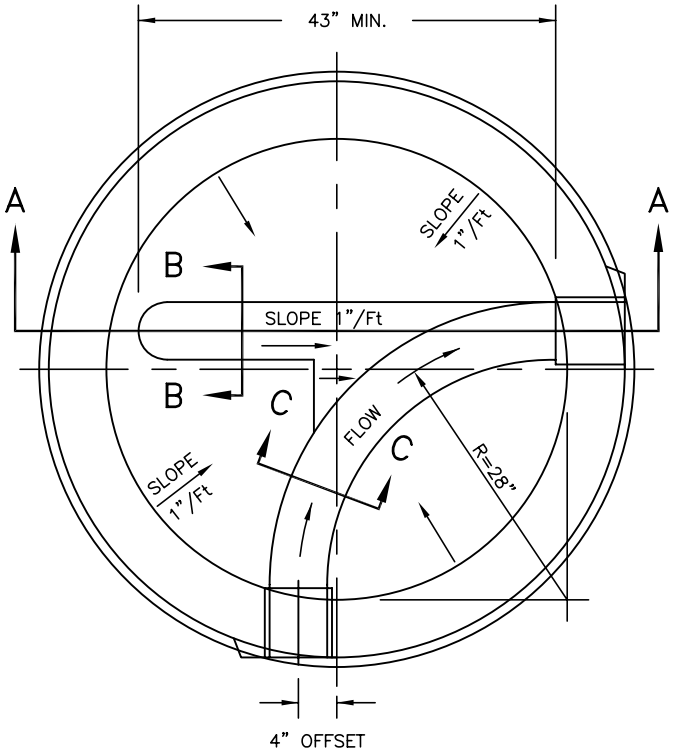
4-WAY MANHOLE BASE

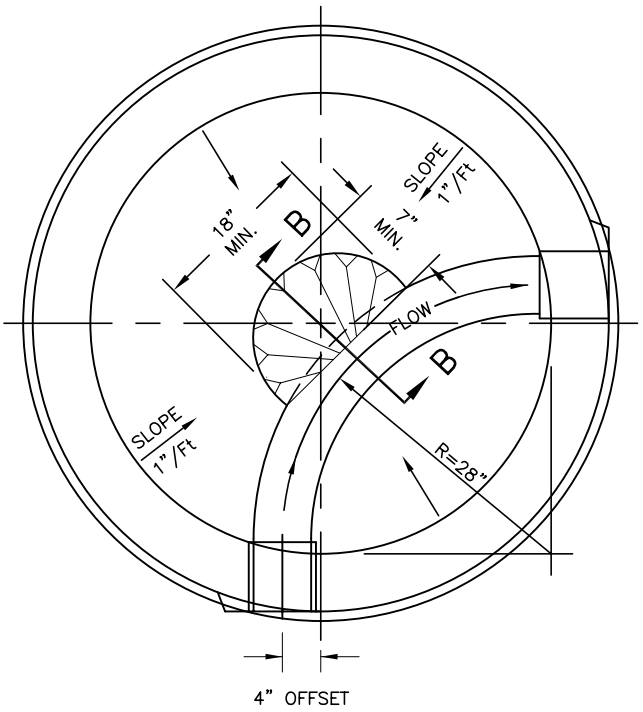
Mary K Snyder
DIRECTOR

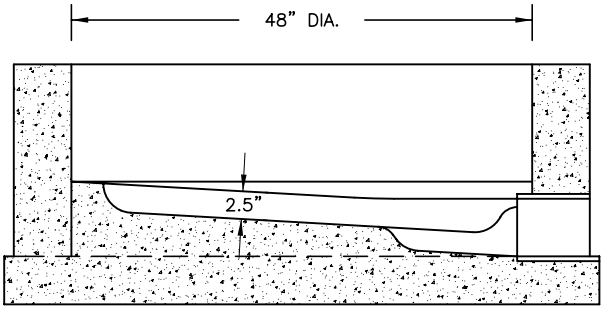
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-40

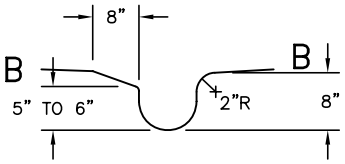
CAMERA CHANNEL REQUIRED FOR
ALL 8" AND 10" LINES



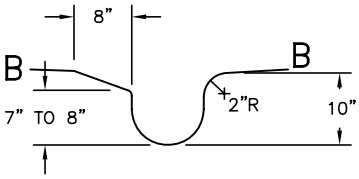




SECTION A–A

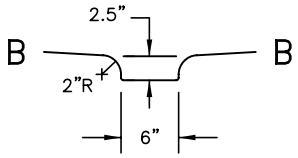


SECTION B–B
FOR 8" PIPE BASES



SECTION B–B
FOR 10" PIPE BASES

FOR 8" LINE ONLY



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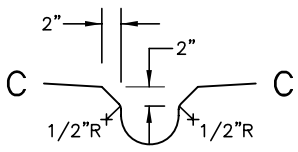


REBAR PATTERN PER 4, SECTION B–B

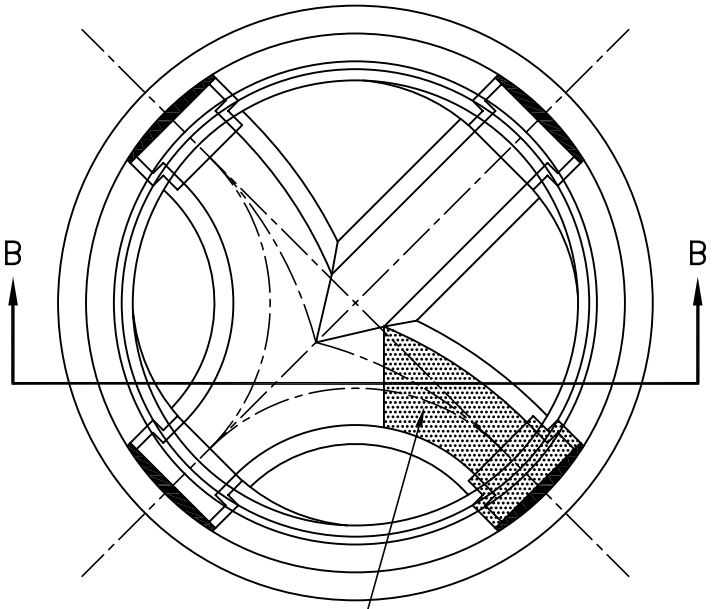
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

90° MANHOLE BASE
CAMERA CHANNEL
DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-41



NOTES:

SURFACE PREPARATION

1. COMPLETELY ROUGH THE ENTIRE CHANNEL AREA TO BE GROUTED WITH NONMECHANICAL DEVICE SUCH AS A WIRE / STEEL BRUSH.
2. CHANNEL SURFACE SHALL BE CLEANED OF ALL LOOSE OR FOREIGN MATERIAL THAT WOULD IN ANY WAY PREVENT BOND BETWEEN THE MORTAR AND THE CONCRETE SURFACES.
3. CHANNEL SURFACE SHALL BE FLUSHED OUT WITH WATER AND ALLOWED TO DRY TO A SURFACE DRY CONDITION IMMEDIATELY PRIOR TO PLACING THE BONDING AGENT.
4. INSTALL T–CONE PIPE PLUG (ETCO OR EQUAL) INTO CHANNEL OPENING TO BE GROUTED.

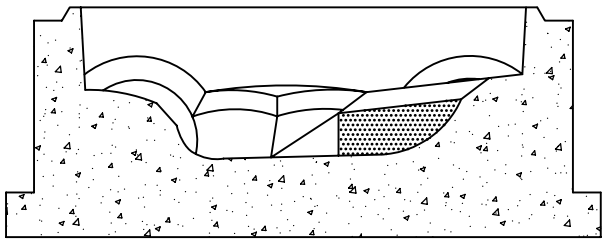
GROUT PLACEMENT

90 DEGREE CHANNEL

5. A BONDING AGENT (LATEX ACRYLIC BONDCRETE TYPE LL ASTM C–1059 OR EQUIVALENT) SHALL BE BRUSHED ONTO THE SURFACE OF THE CHANNEL TO BE GROUTED. THE GROUTING MATERIAL SHALL BE PLACED IMMEDIATELY THERE AFTER THE AGENT IS BRUSHED ON.
6. THE NON SHRINK GROUT SHALL FILL THE CHANNEL TO TOP OF SHELF AREA, AND BE TIGHTLY PACKED.
7. GROUTING OF CHANNEL MUST BE COMPLETED PRIOR TO THE TELEVISION INSPECTION PROCESS.

NON–SHRINK GROUT MATERIAL

8. NON–SHRINK GROUT SHALL BE A PREPACKAGED, INORGANIC, NON–GAS–LIBERATING, NON–METALLIC, CEMENT–BASED GROUT REQUIRING ONLY THE ADDITION OF WATER.
9. NON–SHRINK GROUT SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 2000 PSI AND SHALL HAVE NO SHRINKAGE AND A MAXIMUM 4.0 EXPANSION IN THE PLASTIC STATE WHEN TESTED IN ACCORDANCE WITH ASTM C 827; AND SHALL HAVE NO SHRINKAGE AND A MAXIMUM OF 0.2–PERCENT EXPANSION IN THE HARDENED STATE WHEN TESTED IN ACCORDANCE WITH CRD C621.



SECTION B–B

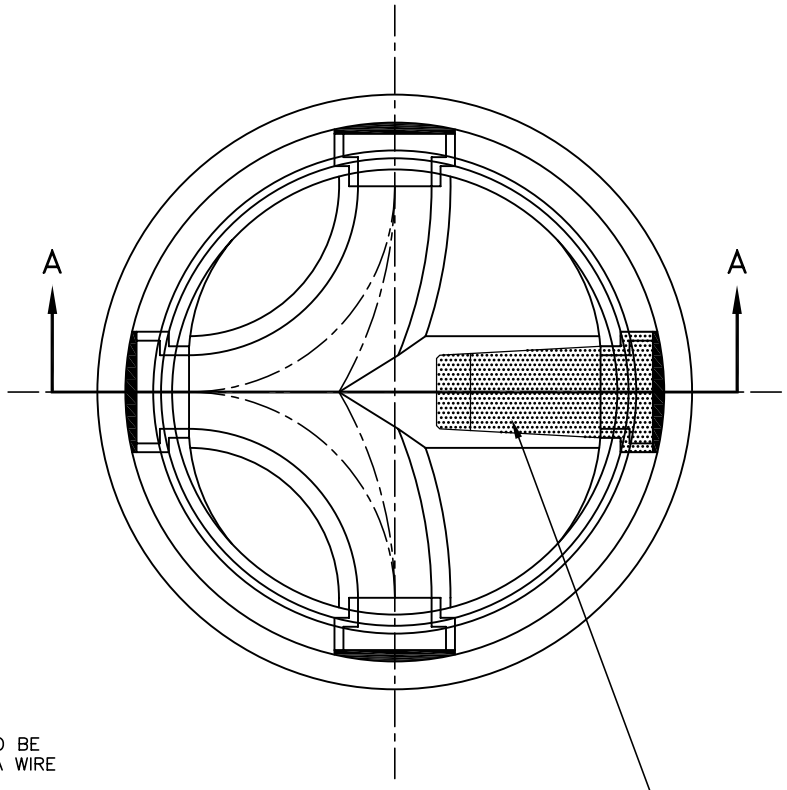
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

MANHOLE BASE
GROUTING UNUSED CHANNEL
AT 90° DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-42



NOTES:

SURFACE PREPARATION

1. COMPLETELY ROUGH THE ENTIRE CHANNEL AREA TO BE GROUTED WITH NONMECHANICAL DEVICE SUCH AS A WIRE / STEEL BRUSH.
2. CHANNEL SURFACE SHALL BE CLEANED OF ALL LOOSE OR FOREIGN MATERIAL THAT WOULD IN ANY WAY PREVENT BOND BETWEEN THE MORTAR AND THE CONCRETE SURFACES.
3. CHANNEL SURFACE SHALL BE FLUSHED OUT WITH WATER AND ALLOWED TO DRY TO A SURFACE DRY CONDITION IMMEDIATELY PRIOR TO PLACING THE BONDING AGENT.
4. INSTALL T–CONE PIPE PLUG (ETCO OR EQUAL) INTO CHANNEL OPENING TO BE GROUTED.

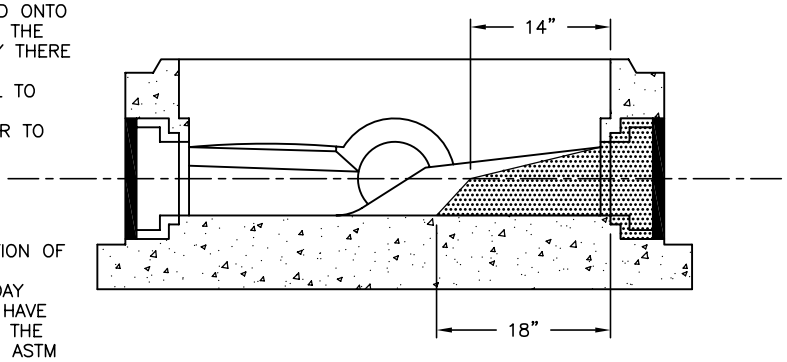
GROUT PLACEMENT

180° DEGREE CHANNEL

5. A BONDING AGENT (LATEX ACRYLIC BONDCRETE TYPE LL ASTM C–1059 OR EQUIVALENT) SHALL BE BRUSHED ONTO THE SURFACE OF THE CHANNEL TO BE GROUTED. THE GROUTING MATERIAL SHALL BE PLACED IMMEDIATELY THERE AFTER THE AGENT IS BRUSHED ON.
6. THE NON SHRINK GROUT SHALL FILL THE CHANNEL TO TOP OF SHELF AREA, AND BE TIGHTLY PACKED.
7. GROUTING OF CHANNEL MUST BE COMPLETED PRIOR TO THE TELEVISION INSPECTION PROCESS.

NON–SHRINK GROUT MATERIAL

8. NON–SHRINK GROUT SHALL BE A PREPACKAGED, INORGANIC, NON–GAS–LIBERATING, NON–METALLIC, CEMENT–BASED GROUT REQUIRING ONLY THE ADDITION OF WATER.
9. NON–SHRINK GROUT SHALL HAVE A MINIMUM 28–DAY COMPRESSIVE STRENGTH OF 2000 PSI AND SHALL HAVE NO SHRINKAGE AND A MAXIMUM 4.0 EXPANSION IN THE PLASTIC STATE WHEN TESTED IN ACCORDANCE WITH ASTM C 827; AND SHALL HAVE NO SHRINKAGE AND A MAXIMUM OF 0.2–PERCENT EXPANSION IN THE HARDENED STATE WHEN TESTED IN ACCORDANCE WITH CRD C621.



SECTION A–A

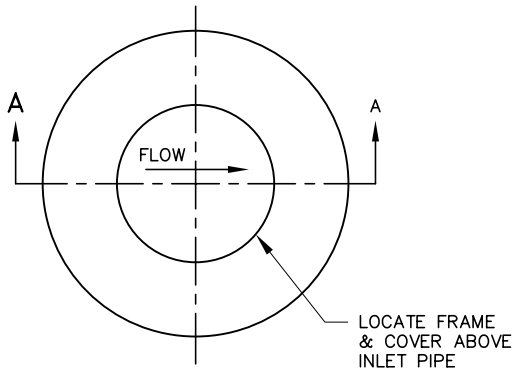
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

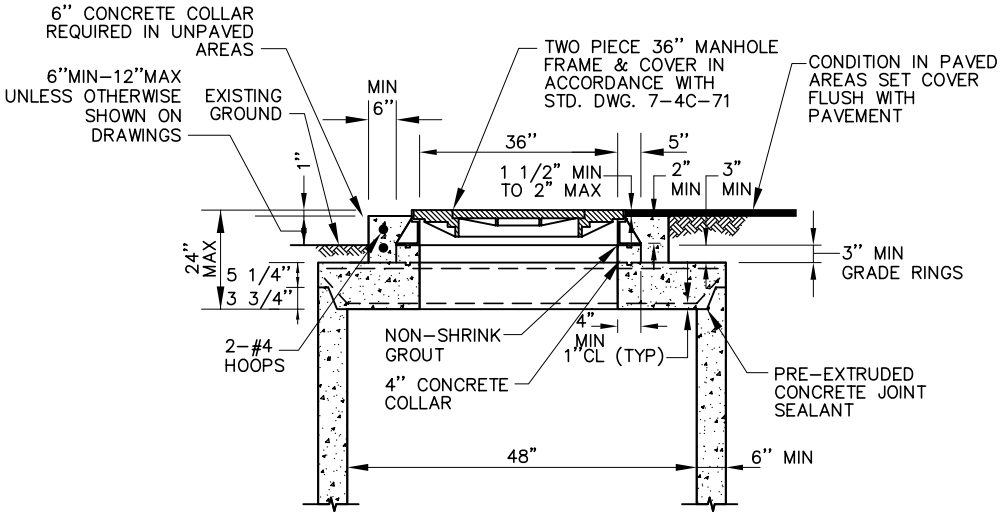
MANHOLE BASE
GROUTING UNUSED CHANNEL AT 180° DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-43



PLAN



SECTION A–A

NOTES:

1. JOINTS FOR THE BARREL SECTION SHALL BE TONGUE AND GROOVE OR LAP JOINT. ALL JOINTS MUST BE SEALED WITH GULF STATES PRE–EXTRUDED CONCRETE JOINT SEALANT OR APPROVED EQUAL.
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.

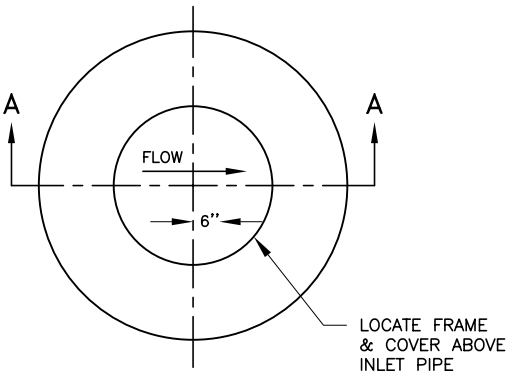
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

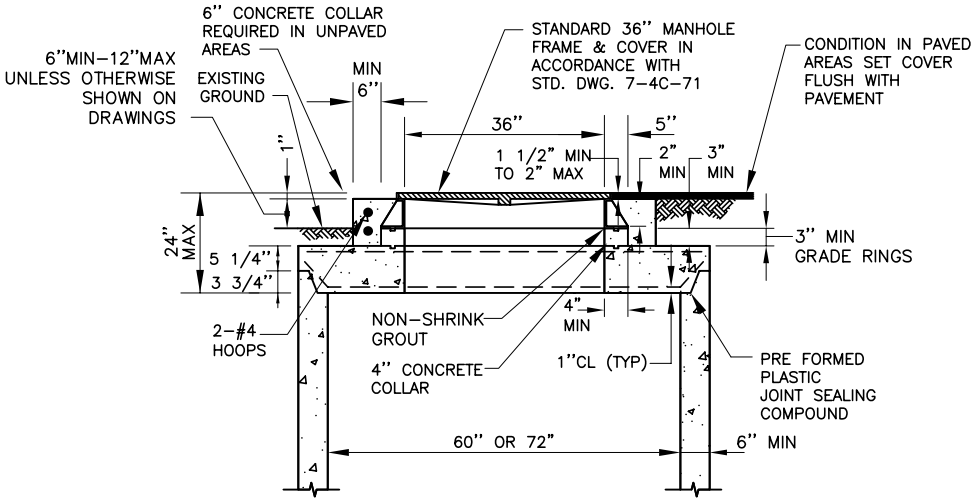
STANDARD PRECAST 48" MANHOLE FLAT SLAB TOP DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-50



PLAN



SECTION A–A

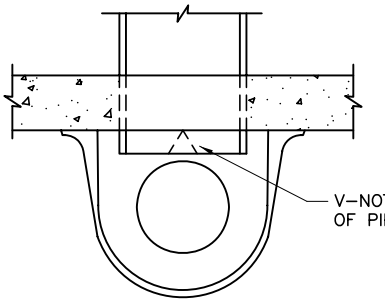
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

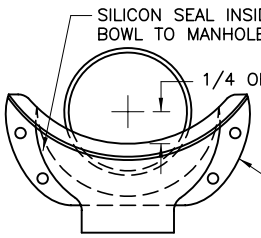
STANDARD
PRECAST 60" AND 72"
SLAB TOP DETAILS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

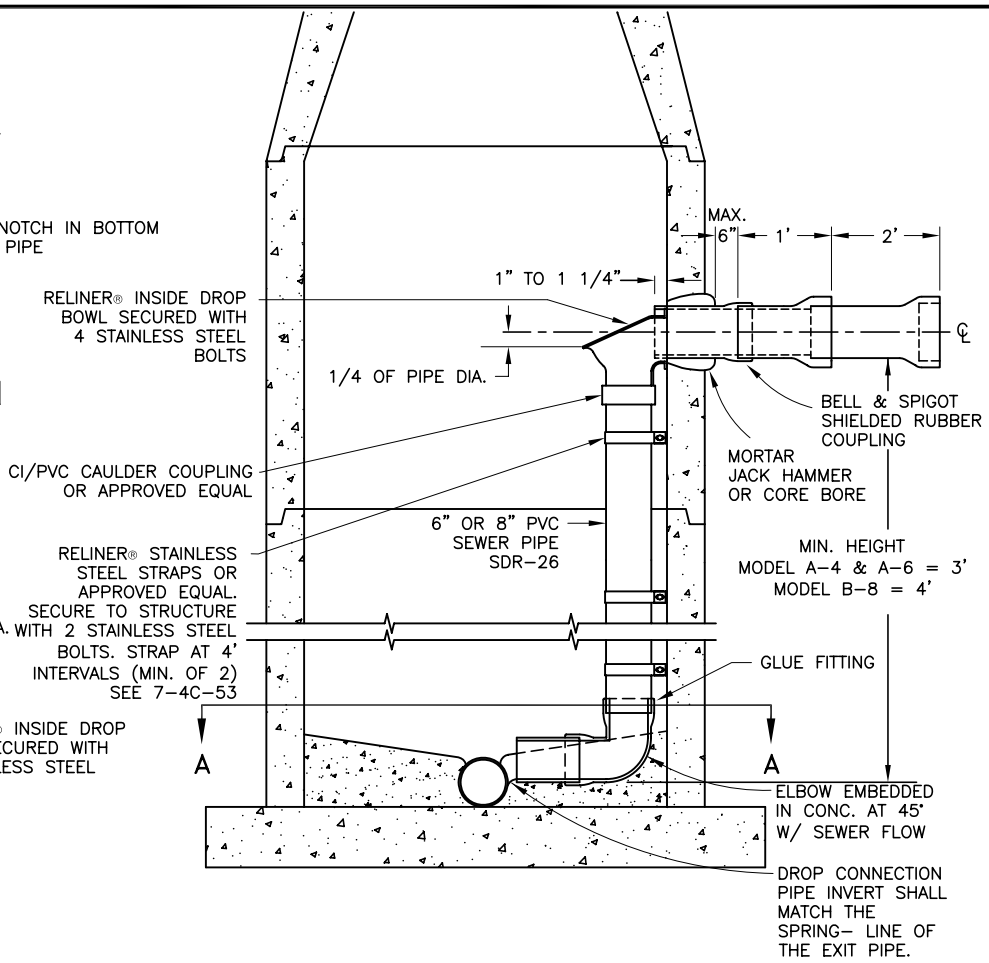
7-4C-51



DROP BOWL MOUNTING POSITION TOP VIEW



DROP BOWL MOUNTING POSITION FRONT VIEW



NOTES:

1. CREATING A HOLE IN THE MANHOLE WALL SHALL BE BY CORE BORE OR BY JACK HAMMER REQUIRING THE OUTSIDE DIAMETER BE PRE DRILLED NO MORE THAN 1" APART AT LEAST TO SPRING LINE OF NEW PIPE LOCATION, THEN ABOUT 2" APART ON THE TOP. EITHER METHOD MUST INSURE MANHOLE INTEGRITY. SEAL BOTH INSIDE AND OUTSIDE WITH MORTAR.

2. 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.

3. 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.

4. SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS OR APPROVED EQUAL (SEE STD. DWG. 7-4C-53).

5. ATTACH THE DROP BOWL & EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH STAINLESS STELL 3/8" X 3 3/4" RAMSET/RED HEAD BOLTS. PRE-ROTO DRILL AND SET BOLTS IN PLACE WITH EPOXY PASTE. EPOXY SHALL MEET THE FOLLOWING REQUIREMENTS:

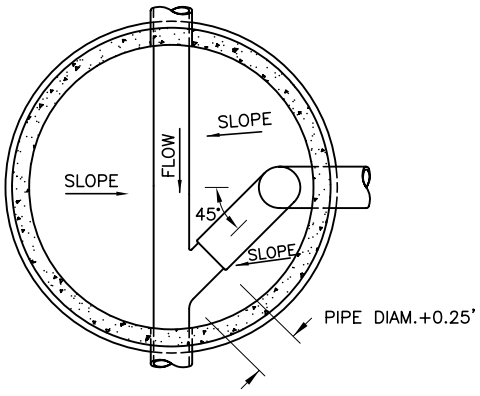
   A. EPOXY PASTE SHALL BE A TWO COMPONENT, 100% SOLID SYSTEM. EPOXY SHALL BE SIKADUR 31 HI-MOD GEL BY SIKA CORPORATION (PHONE 592/941-0231) OR EQUAL.

   B. 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.

   C. THE EPOXY PASTE SHALL DEVELOP A MINIMUM TENSILE STRENGTH OF 3,000 PSI IN 14 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D638.

   D. 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).

   E. MANUFACTURER'S INSTRUCTIONS SHALL BE PRINTED ON EACH CONTAINER IN WHICH THE MATERIALS ARE PACKAGED.



SECTION A-A
PLAN

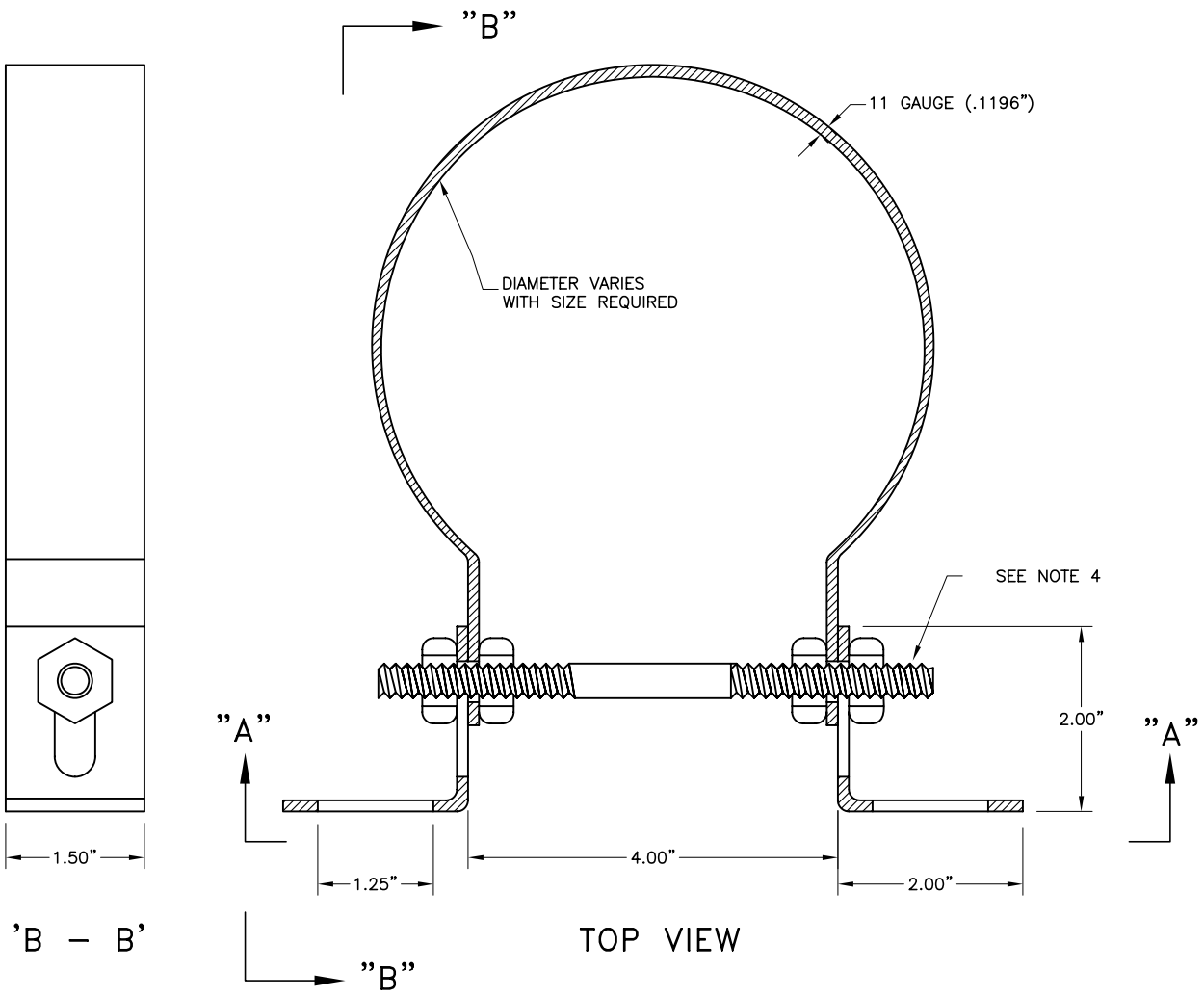
Mary K Snyder
DIRECTOR

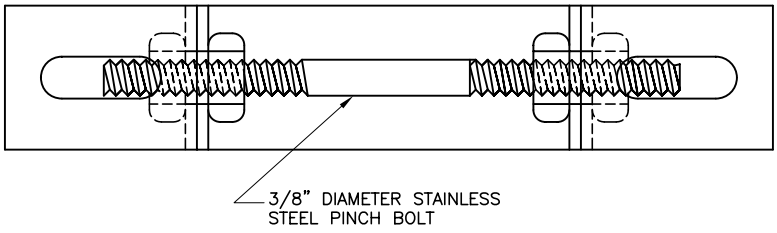
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

INSIDE GRAVITY DROP CONNECTIONS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-52





'A – A'

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" ø 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.
4. LIBERALLY COAT ALL THREADS WITH ANTI–SEIZE.

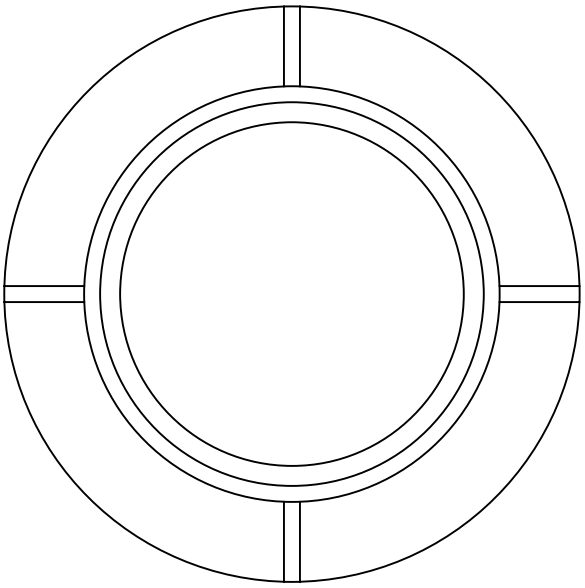
Mary K Snyder
DIRECTOR

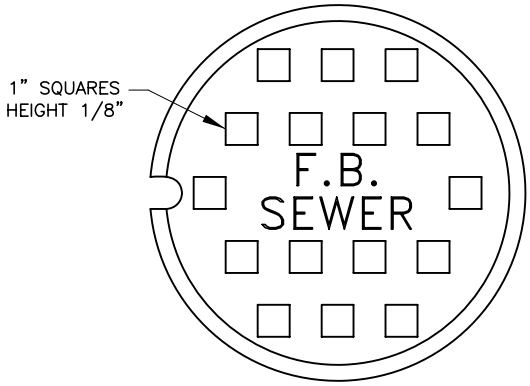
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

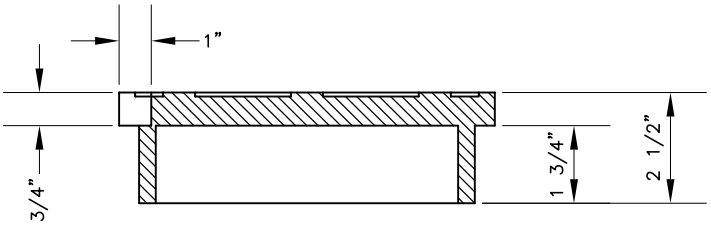
STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS

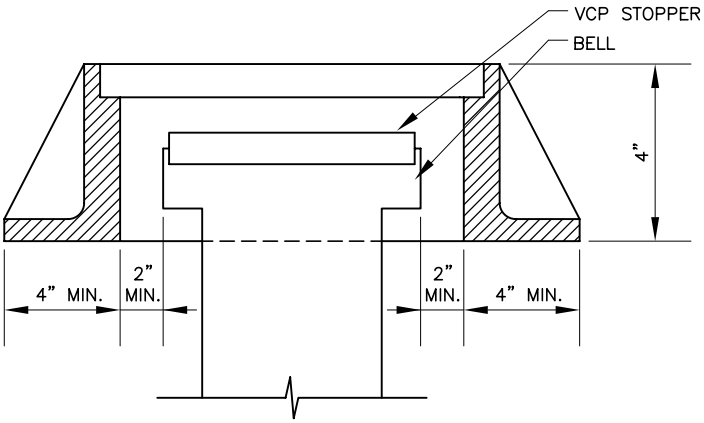
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-53









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.
4. LID SHALL READ "F.B. SEWER".

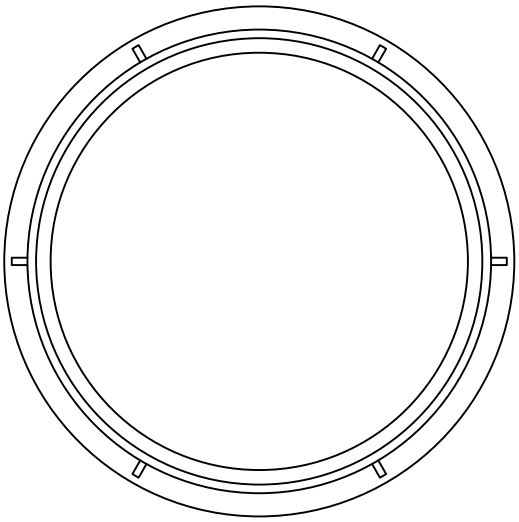
Mary K Snyder
DIRECTOR

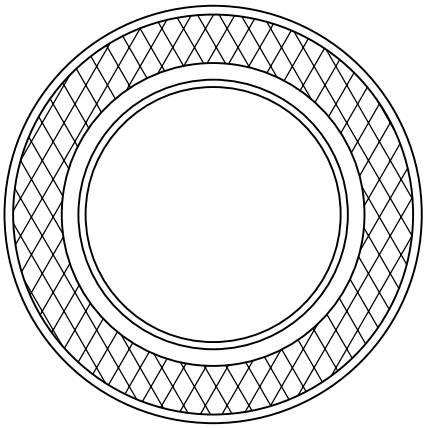
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

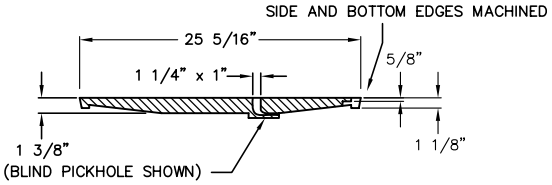
STANDARD
FLUSHER BRANCH
FRAME AND COVER

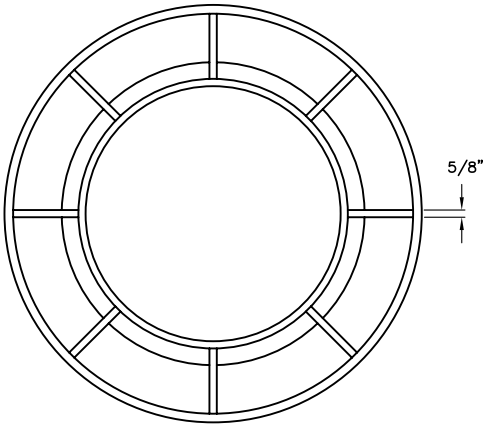
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

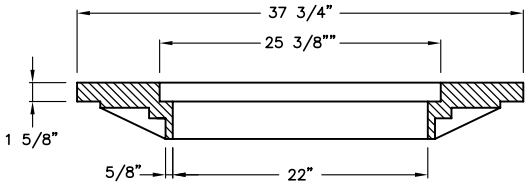
7-4C-70

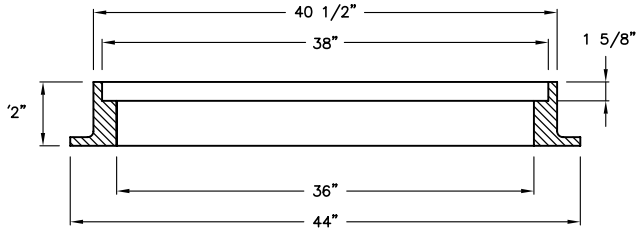


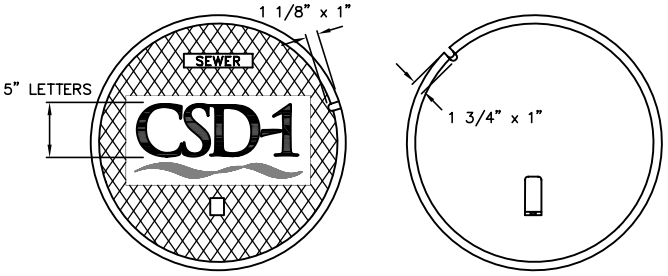












NOTES:

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.

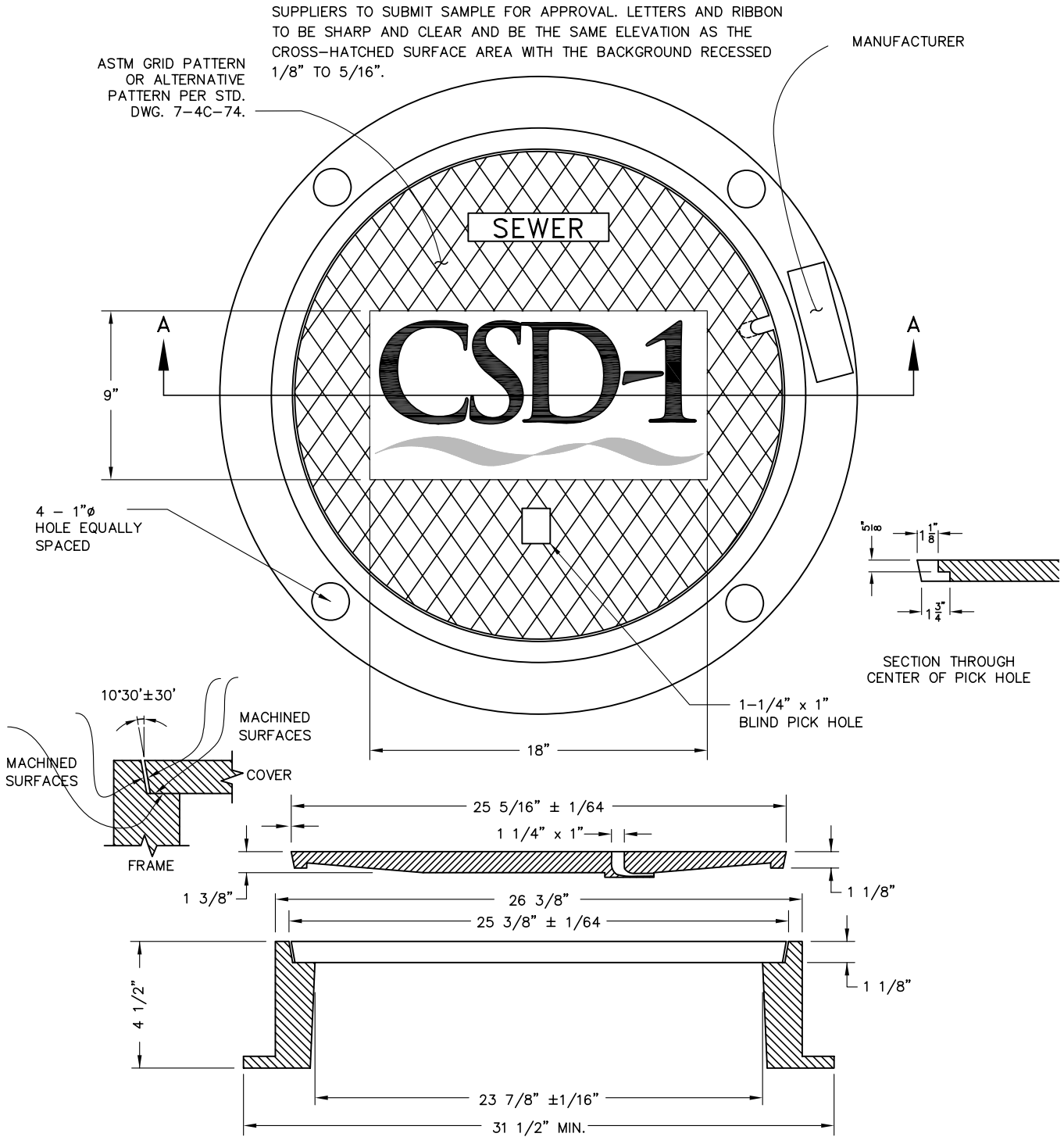
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FLAT SLAB
TOP FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-71



SECTION A-A

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 STD. DWG. 7-4C-74.
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

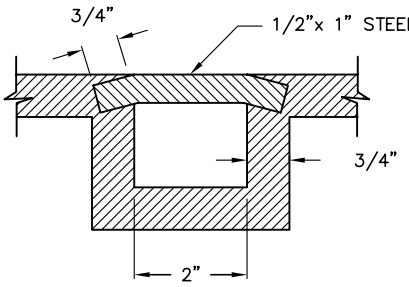
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

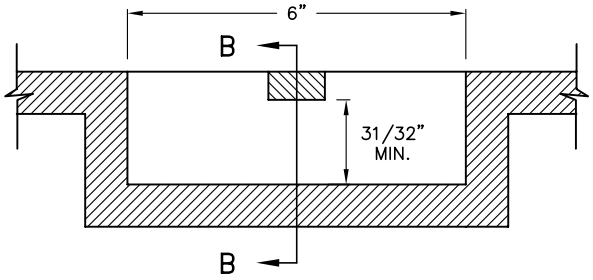
GREY IRON
STANDARD 24" MANHOLE FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-72

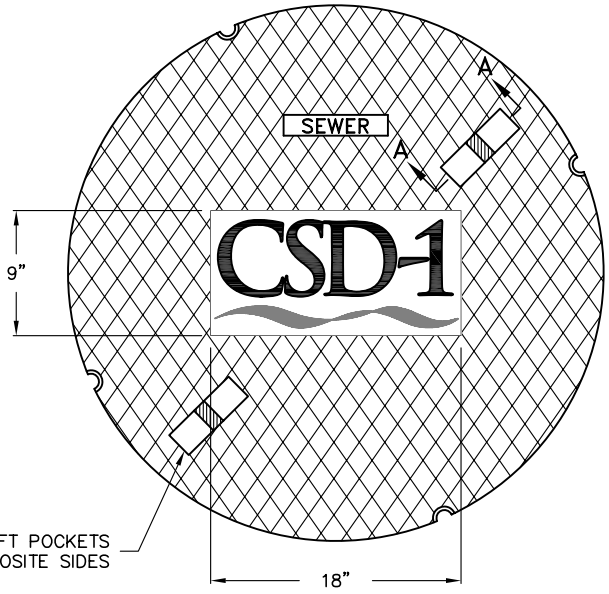


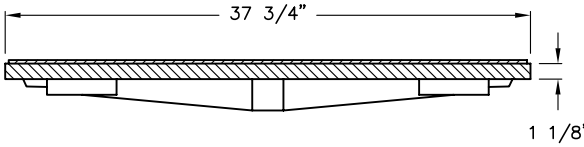
SECTION B–B

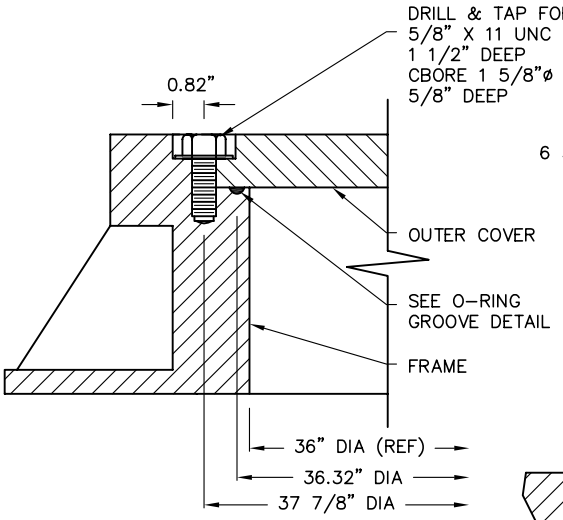


SECTION A–A

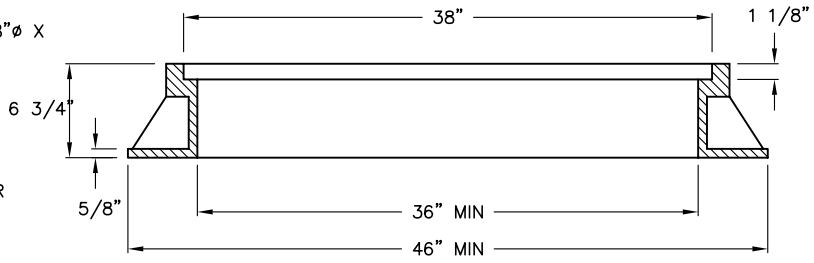
SUPPLIERS TO SUBMIT SAMPLE FOR APPROVAL. LETTERS AND RIBBON TO BE SHARP AND CLEAR AND BE THE SAME ELEVATION AS THE CROSS–HATCHED SURFACE AREA WITH THE BACKGROUND RECESSED 1/8" TO 5/16".

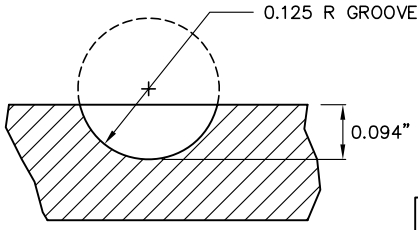






BOLT DOWN COVER DETAIL





O–RING GROOVE DETAIL

ITEM	APPROX. WT. (LBS)
FRAME	310 ± 5%
COVER	310 ± 5%

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.
6. 5/8" x 11 UNC THREAD, 304 STAINLESS STEEL SOCKET HEAD CAP SCREW AND 1 1/2" O.D. X 1 1/16" I.D. X 0.078 THICK 304 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)
8. LIBERALLY COAT ALL THREADS WITH ANTI–SIEZE.

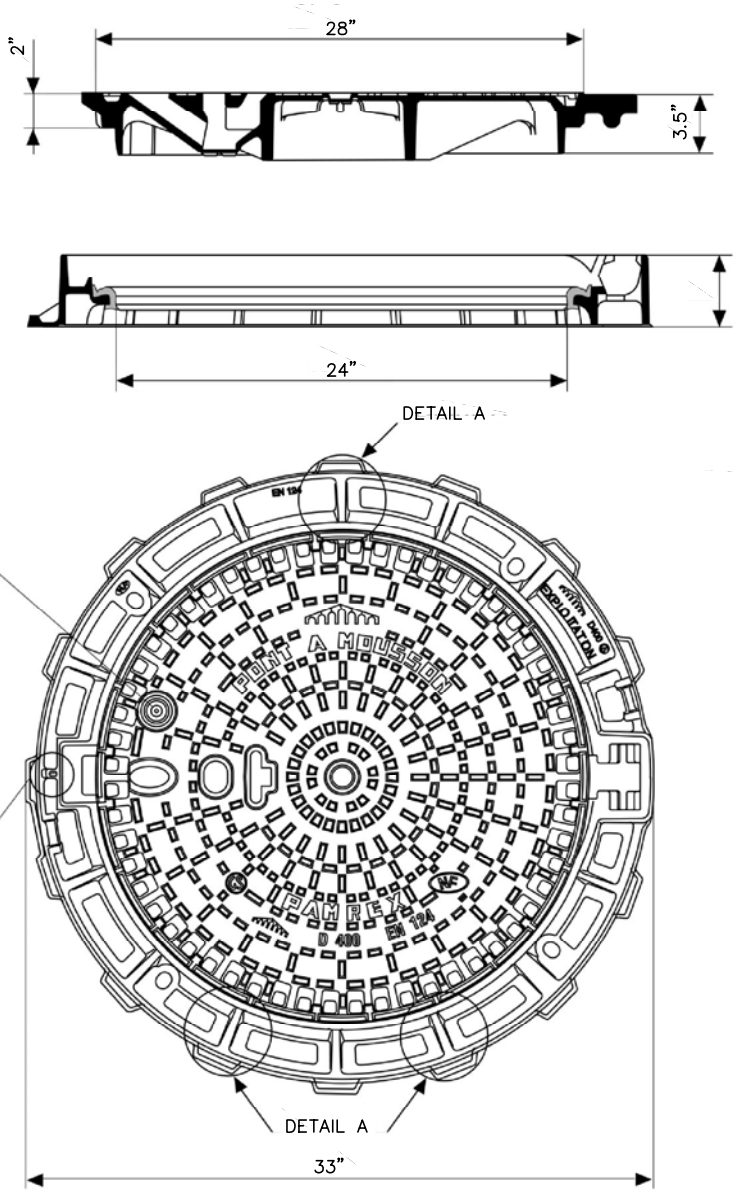
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

GREY IRON
STANDARD 36"
MANHOLE FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-73



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 PAMREX 600 24 INCH AS MANUFACTURED BY TITUS INDUSTRIAL GROUP 877–582–9899 WWW.NEVERLEEK.COM OR APPROVED EQUAL.

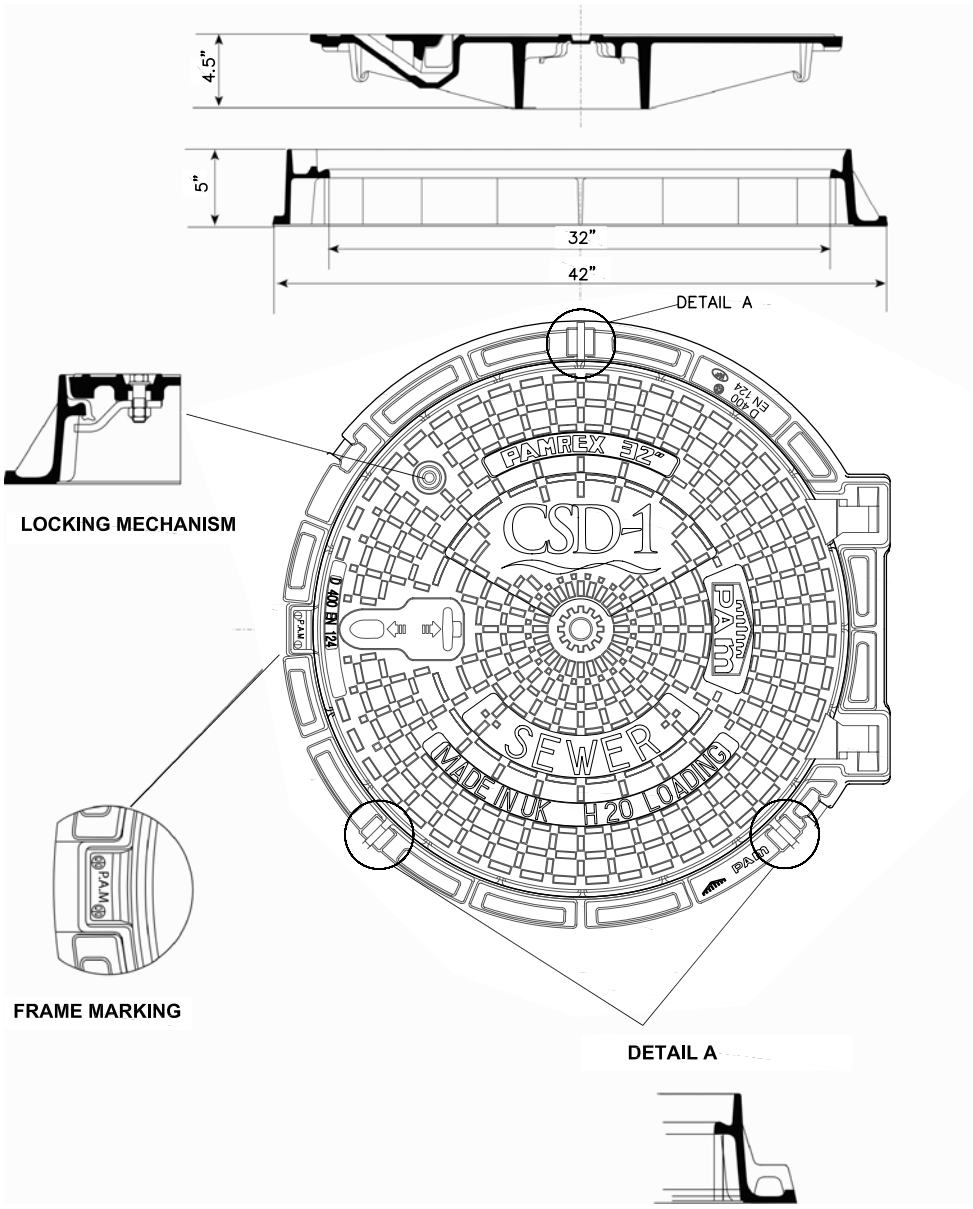
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

DUCTILE IRON 24" MANHOLE FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-74



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. AN ANTI–THEFT LOCKING KEY 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 PAMREX 600 24 INCH AS MANUFACTURED BY TITUS INDUSTRIAL GROUP 877–582–9899 WWW.NEVERLEEK.COM OR APPROVED EQUAL.

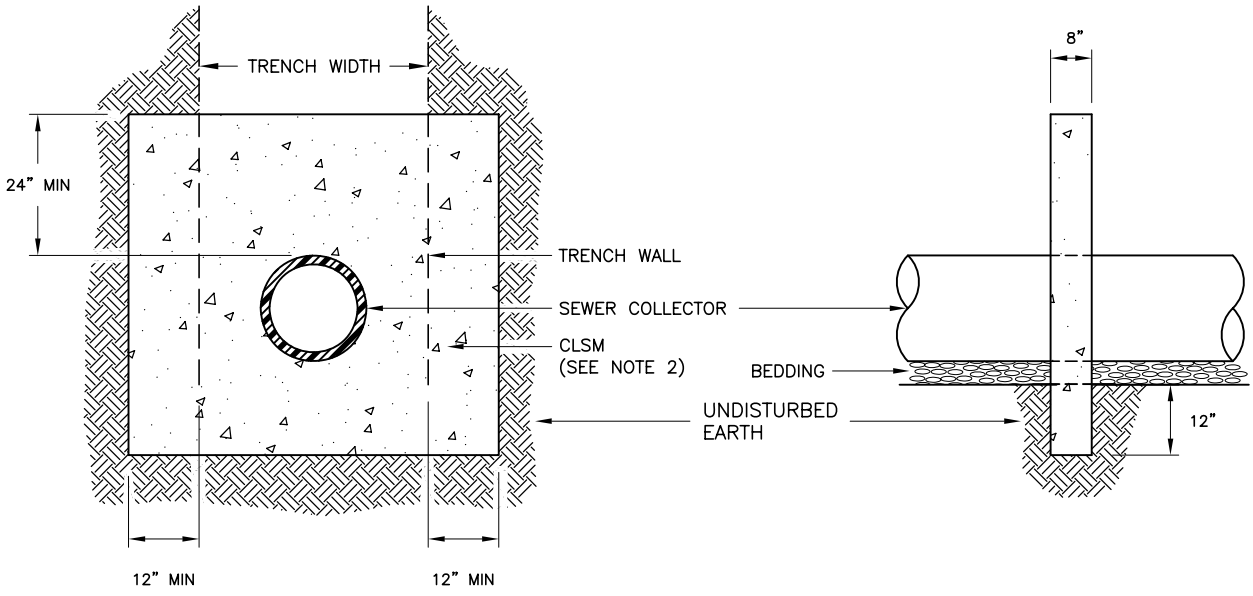
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

DUCTILE IRON 32" MANHOLE FRAME & COVER

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-75



NOTES:

1. TOP OF DAM TO EXTEND INTO INTERMEDIATE BACKFILL 12" MINIMUM OR TOP OF GROUND WATER HGL, WHICHEVER IS LESS.
2. CONTROLLED LOW STRENGTH MATERIALS (CLSM) (50–125 psi. MAX. AT 28 DAYS)

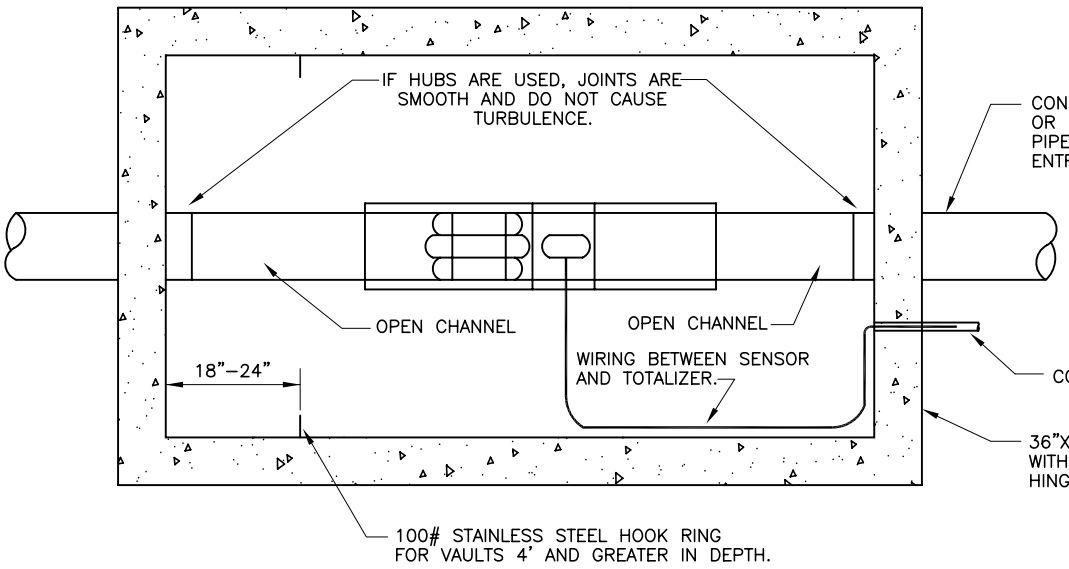
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TRENCH DAM DETAIL

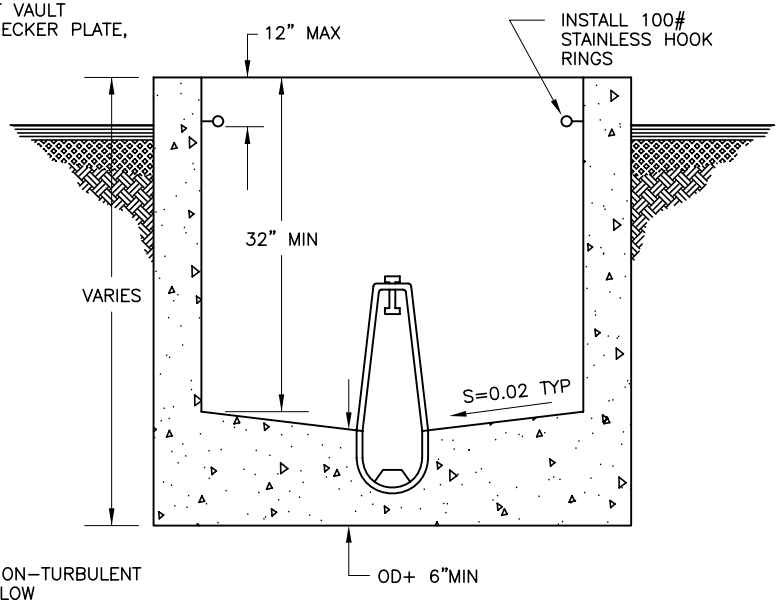
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

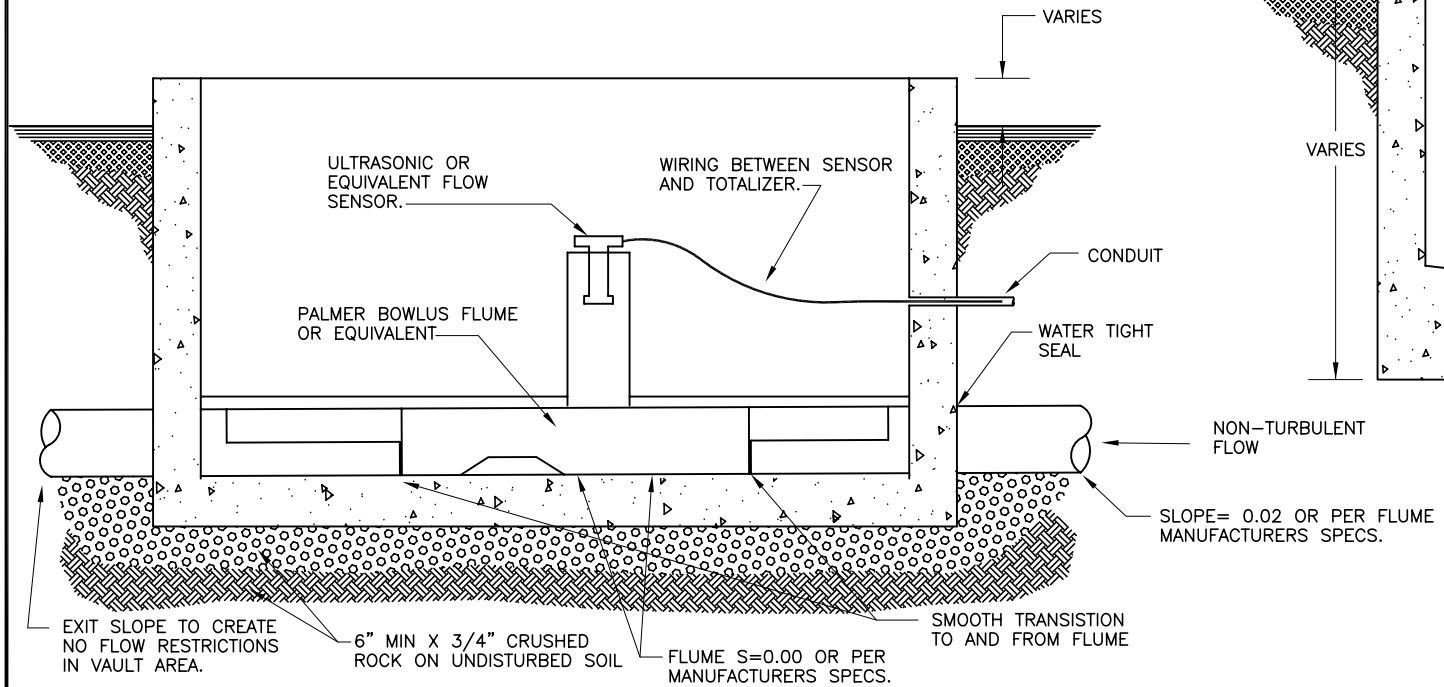
7-4C-80



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 ENVIROMENT IF NECESSARY (CAPS FOR PREVENTING CORROSION).
4. INSTALLATION INSPECTION SHALL BE PERFORMED BY WATER QUALITY INDUSTRIAL WASTE SECTION.





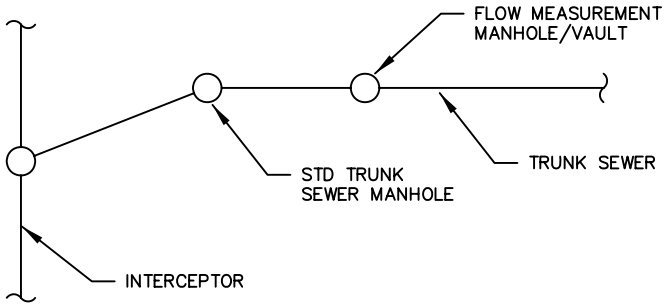
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

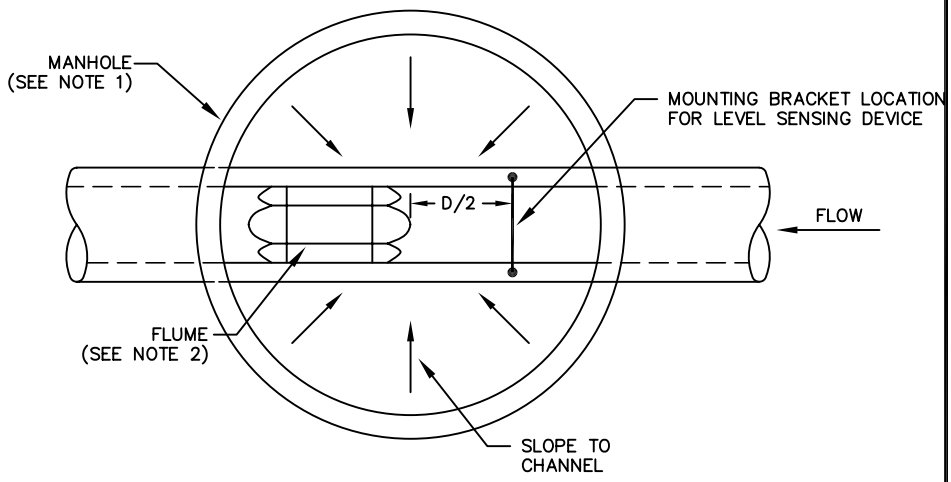
SAMPLING VAULT

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-81



SCHEMATIC – FLOW MEASUREMENT MANHOLE/VAULT LOCATION



PLAN

FLUME SELECTION TABLE

FLUME SIZE (INCHES)	MAX. HEAD (FT.)	MAX. FLOW (MGD)
12	0.70	1.08
15	0.90	1.99
18	1.05	2.98
21	1.25	4.55
24	1.40	6.12
27	1.60	8.46
30	1.75	10.70

NOTES:

1. MANHOLE SHALL BE 60 INCH DIAMETER FOR FLUME SIZE RANGE FROM 12 INCH THROUGH 21 INCH. MANHOLE SHALL BE 72 INCH DIAMETER FOR FLUME SIZE RANGE FROM 24 INCH THROUGH 30 INCH.
2. FLUME SHALL BE PERMANENT TYPE PALMER–BOWLUS FLUME BY BY PLASTI–FAB, OR EQUAL.
3. A FIBERGLASS PACKAGED METERING MANHOLE AS MANUFACTURED BY PLASTI–FAB, OR EQUAL, IS AN ACCEPTABLE ALTERNATIVE TO REINFORCED CONCRETE MANHOLE.
4. A PACKAGED FLOW MEASURING VAULT SHALL BE USED (FIG. T–2G) WHEN THE COMBINATION OF HEAD/FLOW CANNOT BE ACCOMMODATED.

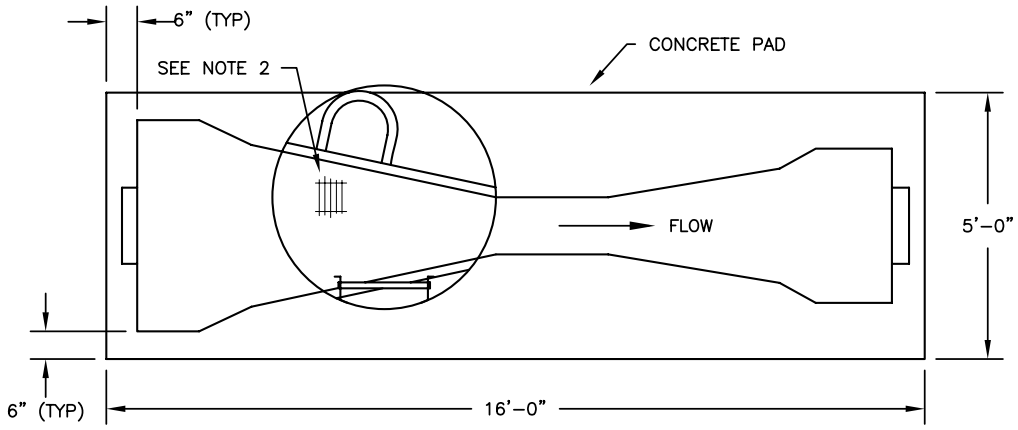
Mary K Snyder
DIRECTOR

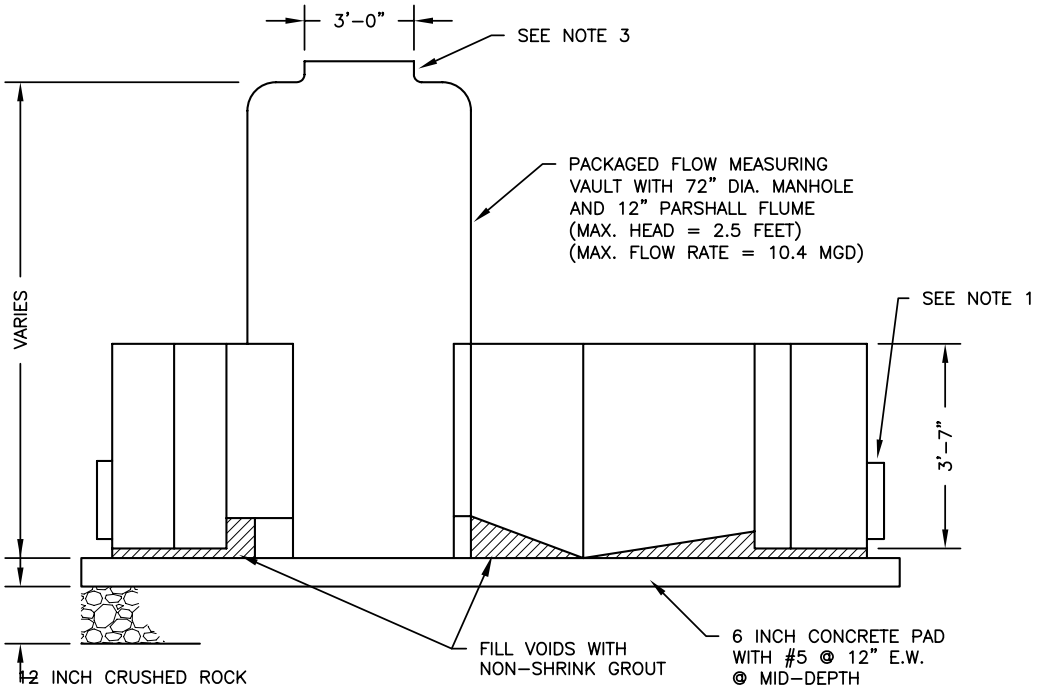
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FLOW MEASURING MANHOLE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-4C-82





NOTES:

1. INLET AND OUTLET SIZE SHALL MATCH CONNECTING PIPE INSIDE DIAMETER.
2. PROVIDE FIBERGLASS GRATING OVER FLUME.
3. PACKAGED FLOW METERING STRUCTURE SHALL BE AS FABRICATED BY PLASTI-FAB, OR EQUAL.

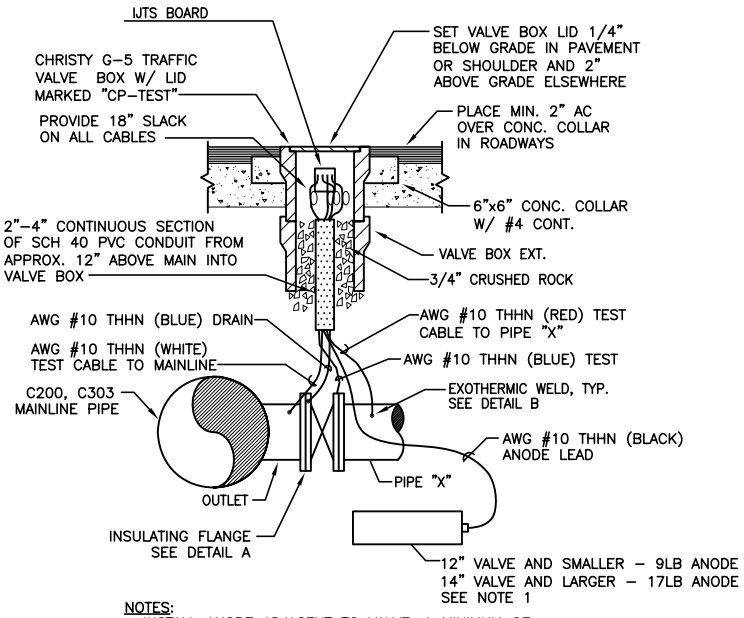
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

PACKAGED FLOW MEASURING VAULT

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

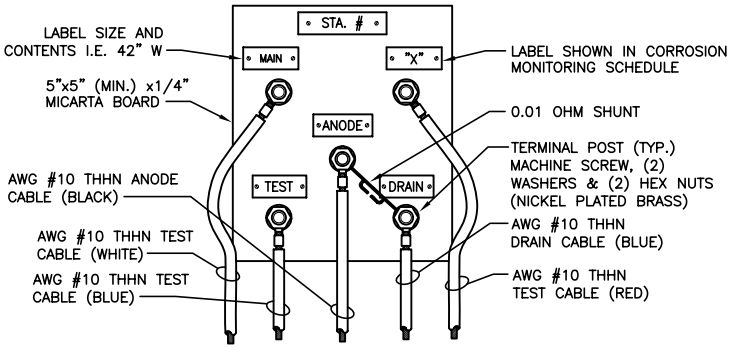
7-4C-84



NOTES:
1. INSTALL ANODE ADJACENT TO VALVE, A MINIMUM OF 5' AWAY, AT OR BELOW INVERT OF PIPELINE.
2. PROVIDE CORROSION MONITORING SCHEDULE.
3. PCWA STD. DETAIL SA026 DOES NOT APPLY.

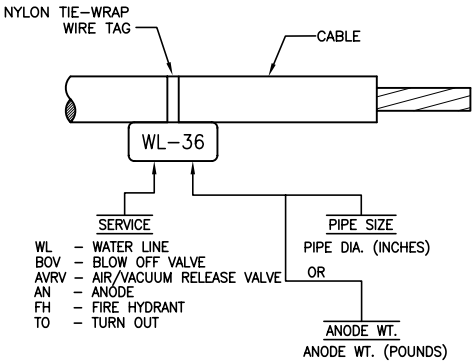
INSULATING JOINT TEST STATION (IJTS)

NTS



IJTS BOARD

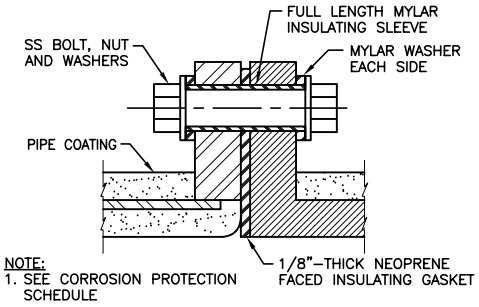
NTS



NOTE: MARK TAG WITH BLACK PERMANENT INK MARKER

CABLE ID TAG

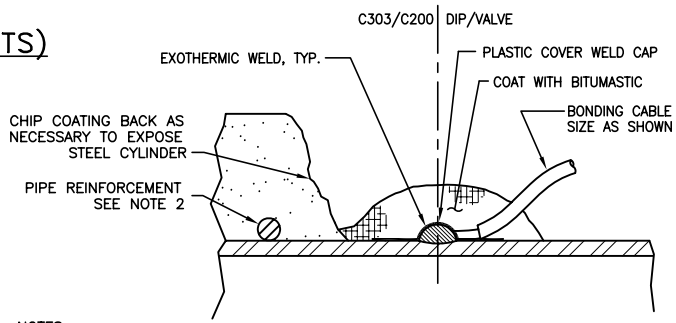
NTS



NOTE:
1. SEE CORROSION PROTECTION SCHEDULE

DETAIL A
INSULATING FLANGE

NTS



NOTES:
1. EXOTHERMIC WELDS SHALL NOT BE WELDED TO STEEL CYLINDERS OF THICKNESS 10 GA. OR LESS WITHOUT APPROVAL OF THE ENGINEER.
2. PIPE REINFORCEMENT BARS MAY BE PUSHED APART AS NECESSARY TO INSTALL EXOTHERMIC WELD. DO NOT CUT REINFORCEMENT BARS WITHOUT APPROVAL OF THE ENGINEER. IF REINFORCEMENT BARS ARE CUT, TACK WELD ALL CUT ENDS TO STEEL CYLINDER.
3. COAT ALL EXPOSED STEEL WITH BITUMASTIC AFTER EXOTHERMIC WELD.
4. WHERE INSTALLING EXOTHERMIC WELD ON EPOXY COATED STEEL, GRIND EPOXY COATING TO EXPOSE STEEL, COMPLETE WELD AND APPLY EPOXY TOUCH-UP TO EXPOSED STEEL.

DETAIL B
EXOTHERMIC WELD

NTS

Mary K Snyder

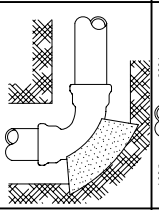
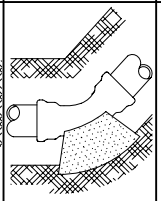
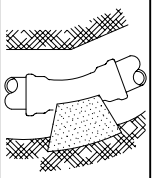
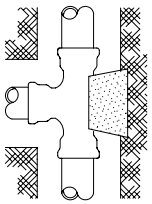
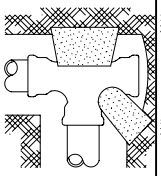
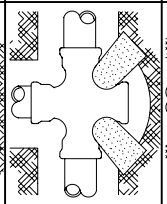
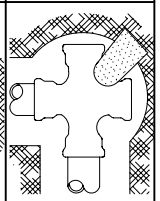
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CATHODIC PROTECTION - DUCTILE IRON PIPE

DRAWN BY: GT
SCALE: NONE
DATE: 11/07

7-5C-30

REQUIRED BEARING AREA – TOTAL SQUARE FEET								
TYPE OF FITTING		90° BEND	45° BEND	11 1/4" OR 22 1/2" BEND	TEE OR DEAD END	TEE W/PLUG	CROSS W/PLUG	CROSS W/PLUGS
TYPICAL INSTALLATION								
SIZE OF PIPE	4"	2	1	1	2	2	2	2
	6"	4	2	1	3	4	4	4
	8"	7	4	2	5	7	7	7
	10"	12	6	3	8	12	12	12
	12"	16	10	5	12	16	16	16

NOTES:

1. THRUST BLOCKS TO BE CONSTRUCTED OF CLASS "B" CONCRETE.
2. AREAS GIVEN ARE FOR CLASS 150 PIPE AT TEST PRESSURE OF 150 P.S.I. IN SOIL WITH MINIMUM 2,000 P.S.F. BEARING CAPACITY. INSTALLATIONS USING DIFFERENT PIPE, TEST PRSSURES, AND/OR SOIL TYPES SHOULD ADJUST AREAS ACCORDINGLY.
3. BLOCKS TO BE POURED AGAINST UNDISTURBED SOIL.
4. JOINTS AND FACE OF PLUGS TO BE KEPT CLEAR OF CONCRETE.
5. THRUST BLOCKS ARE REQUIRED AT EVERY ANGLE, TEE, AND CROSS ON PIPELINES 8" AND SMALLER.

THRUST BLOCK DETAILS

NOT TO SCALE

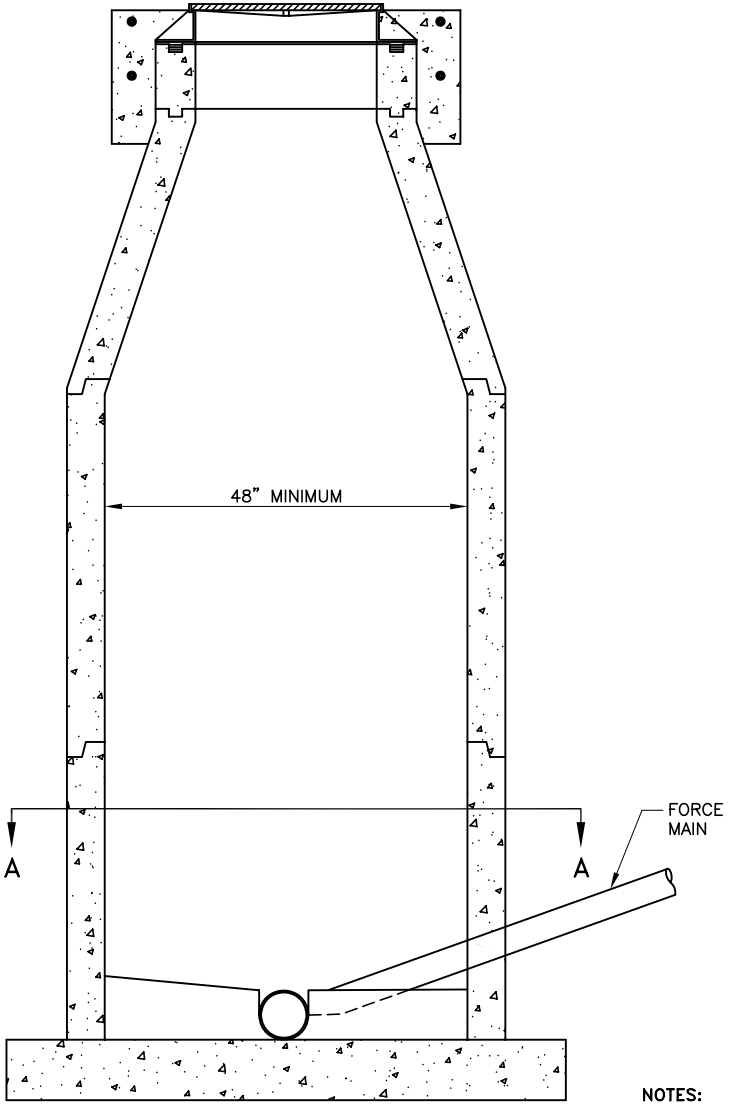
Mary K Snyder
DIRECTOR

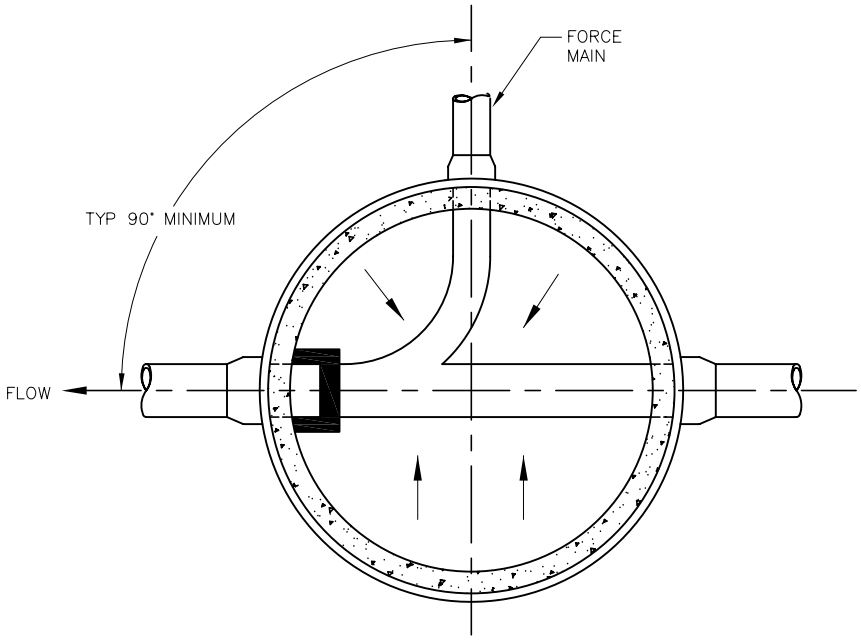
SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

THRUST BLOCK DETAILS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-5C-40





SECTION A–A
PLAN VIEW OF INVERT

NOTES:

1. COAT INTERIOR OF RECEIVING AND NEXT DOWNSTREAM MANHOLES WITH RAVEN EPOXY 405 PROTECTIVE LINER AT A MINIMUM OF 120 MILS THICKNESS OR APPROVED EQUAL.
2. INVERT ELEVATION OF FORCEMAIN SHALL MATCH THE SPRING LINE ELEVATION OF GRAVITY PIPE.

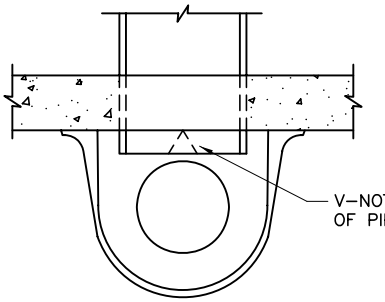
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

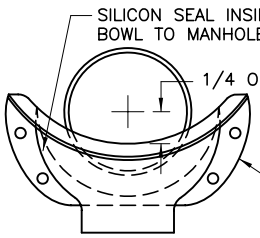
FORCE MAIN TIE-IN AT MANHOLE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

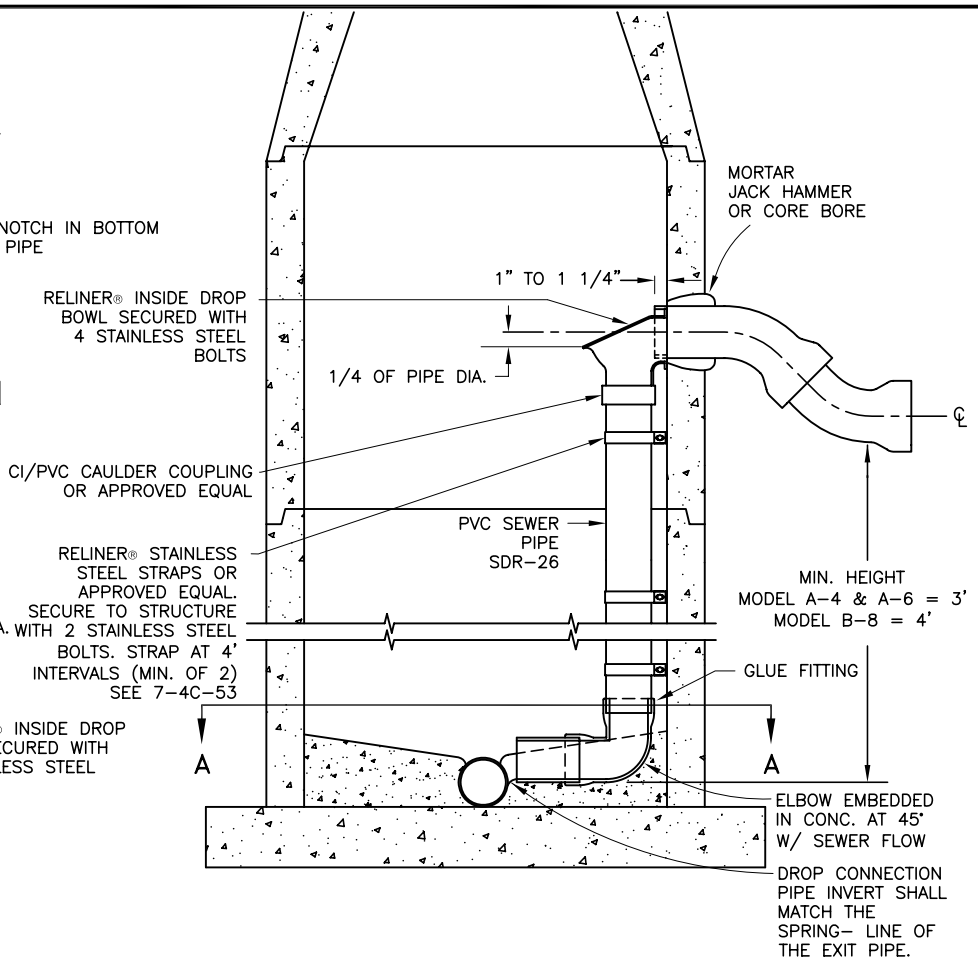
7-5C-50



DROP BOWL
MOUNTING POSITION
TOP VIEW



DROP BOWL
MOUNTING POSITION
FRONT VIEW



NOTES:

1. CREATING A HOLE IN THE MANHOLE WALL SHALL BE BY CORE BORE OR BY JACK HAMMER REQUIRING THE OUTSIDE DIAMETER BE PRE DRILLED NO MORE THAN 1" APART AT LEAST TO SPRING LINE OF NEW PIPE LOCATION, THEN ABOUT 2" APART ON THE TOP. EITHER METHOD MUST INSURE MANHOLE INTEGRITY. SEAL BOTH INSIDE AND OUTSIDE WITH MORTAR.

2. 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.

3. 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.

4. SECURE DROP PIPE TO MANHOLE WALL WITH RELINER-DURAN, INC STAINLESS STEEL ADJUSTABLE CLAMPING BRACKETS OR APPROVED EQUAL (SEE STD. DWG. 4C-53).

6. ATTACH THE DROP BOWL & EACH CLAMPING BRACKET TO THE MANHOLE WALL WITH STAINLESS STELL 3/8" X 3 3/4" RAMSET/RED HEAD BOLTS. PRE-ROTO DRILL AND SET BOLTS IN PLACE WITH EPOXY PASTE. EPOXY SHALL MEET THE FOLLOWING REQUIREMENTS:

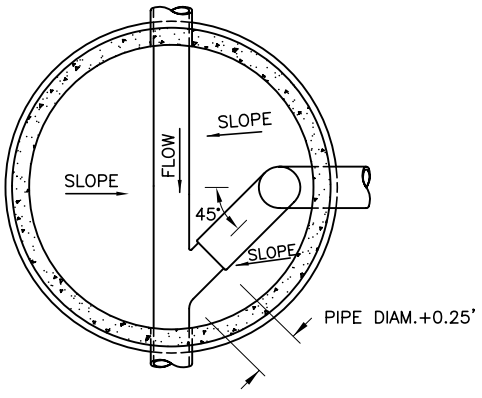
   A. EPOXY PASTE SHALL BE A TWO COMPONENT, 100% SOLID SYSTEM. EPOXY SHALL BE SIKADUR 31 HI-MOD GEL BY SIKA CORPORATION (PHONE 592/941-0231) OR EQUAL.

   B. 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.

   C. THE EPOXY PASTE SHALL DEVELOP A MINIMUM TENSILE STRENGTH OF 3,000 PSI IN 14 DAYS WHEN TESTED IN ACCORDANCE WITH ASTM D638.

   D. 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).

   E. MANUFACTURER'S INSTRUCTIONS SHALL BE PRINTED ON EACH CONTAINER IN WHICH THE MATERIALS ARE PACKAGED.



SECTION A-A
PLAN

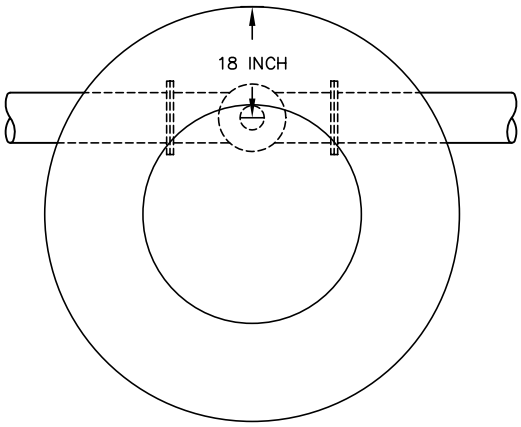
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

**FORCE MAIN TIE-IN
DROP CONNECTIONS**

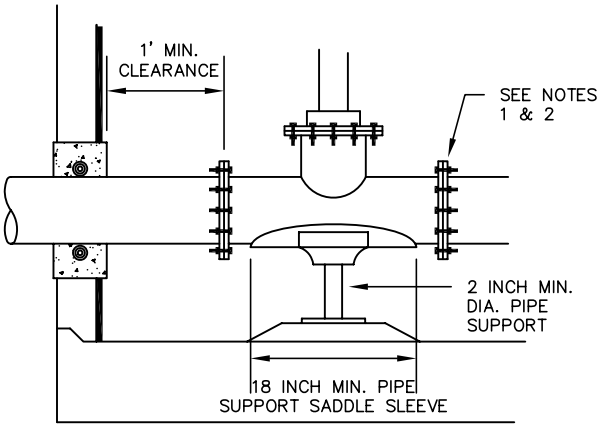
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-5C-51



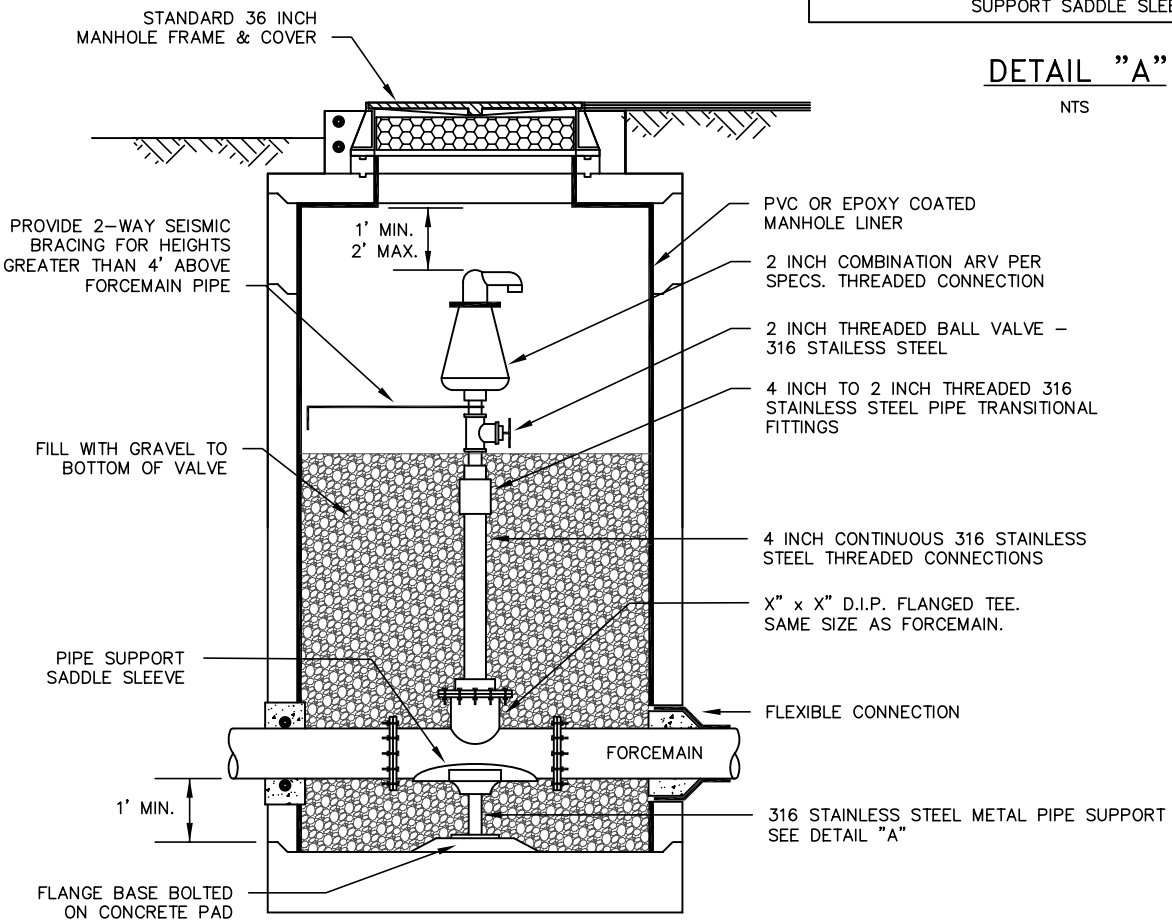
MANHOLE PLAN VIEW

SEE NOTE 4



DETAIL "A"

NTS



MANHOLE SECTION

NTS

Mary K Snyder

DIRECTOR

NOTES:

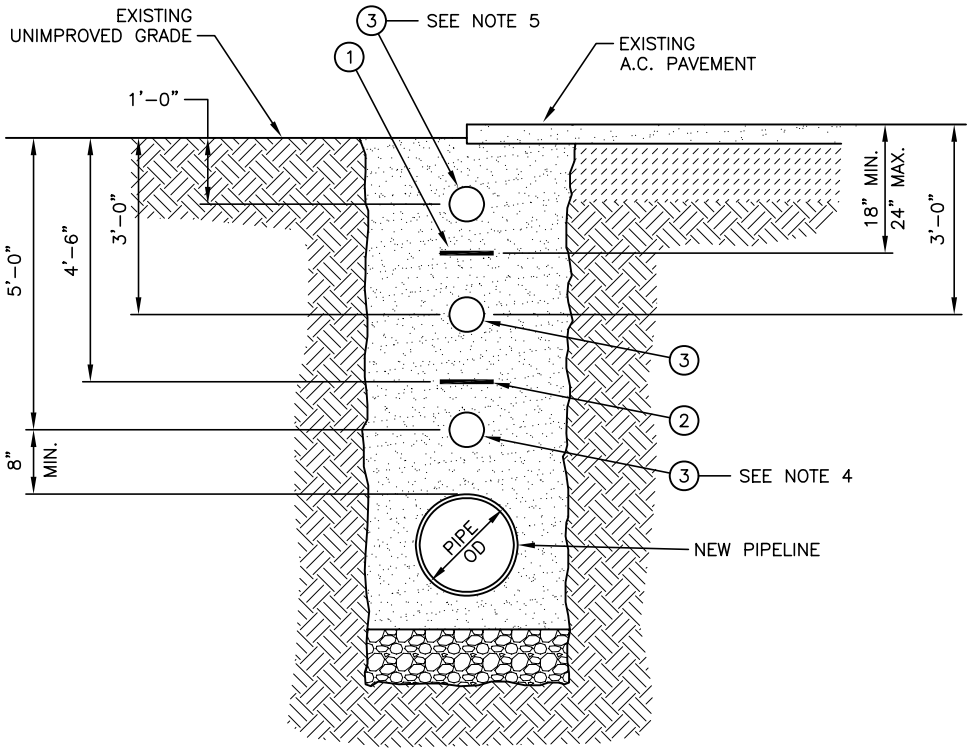
1. ALL HARDWARE AND FASTENERS SHALL BE 316 STAINLESS STEEL.
2. FLANGE CONNECTIONS SHALL USE NEOPRENE GASKETS BETWEEN FLANGES WITH STAINLESS STEEL WASHERS ON THE OUTSIDE.
3. PIPE PENETRATIONS THROUGH MANHOLE SHALL INCLUDE RESILIENT CONNECTORS.
4. FORCEMAIN OFFSET, NOT CENTERED, IN MANHOLE.

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

STANDARD 60" AIR RELEASE VALVE SEWER MANHOLE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-5C-70



1	PIPE LOCATOR RIBBON – 3" WIDTH
2	PIPE LOCATOR RIBBON – 3" WIDTH (INSTALLED WHEN COVER OF NEW PIPELINE IS 7'–0" OR GREATER)
3	LOCATOR BALL – SEE NOTES

NOTES:

1. CENTER PIPE LOCATOR RIBBON IN TRENCH AND PLACE OVER ENTIRE LENGTH OF ALL PIPE TYPES, MATERIALS, SIZES, AND LOCATIONS OF FORCE MAINS.
2. INSTALL LOCATOR BALLS AT THE BEGINNING AND START OF ALL: VERTICAL AND HORIZONTAL BENDS (INCLUDING DEFLECTED SECTIONS), WATER CROSSINGS, AND TRENCHING SECTIONS.
3. INSTALL LOCATOR BALLS A MINIMUM OF EVERY 350 FEET.
4. IF A.C. PAVEMENT EXISTS INSTALL LOCATOR BALL AT 3'–0" (TYP.).
5. IF A CUT TO FINISHED GRADE IS ANTICIPATED, INSTALL LOCATOR BALLS AT BOTH 3'–0" AND 5'–0" (TYP.).
6. IF A FILL TO FINISHED GRADE IS ANTICIPATED, INSTALL LOCATOR BALLS AT BOTH 1'–0" AND 3'–0" (TYP.).

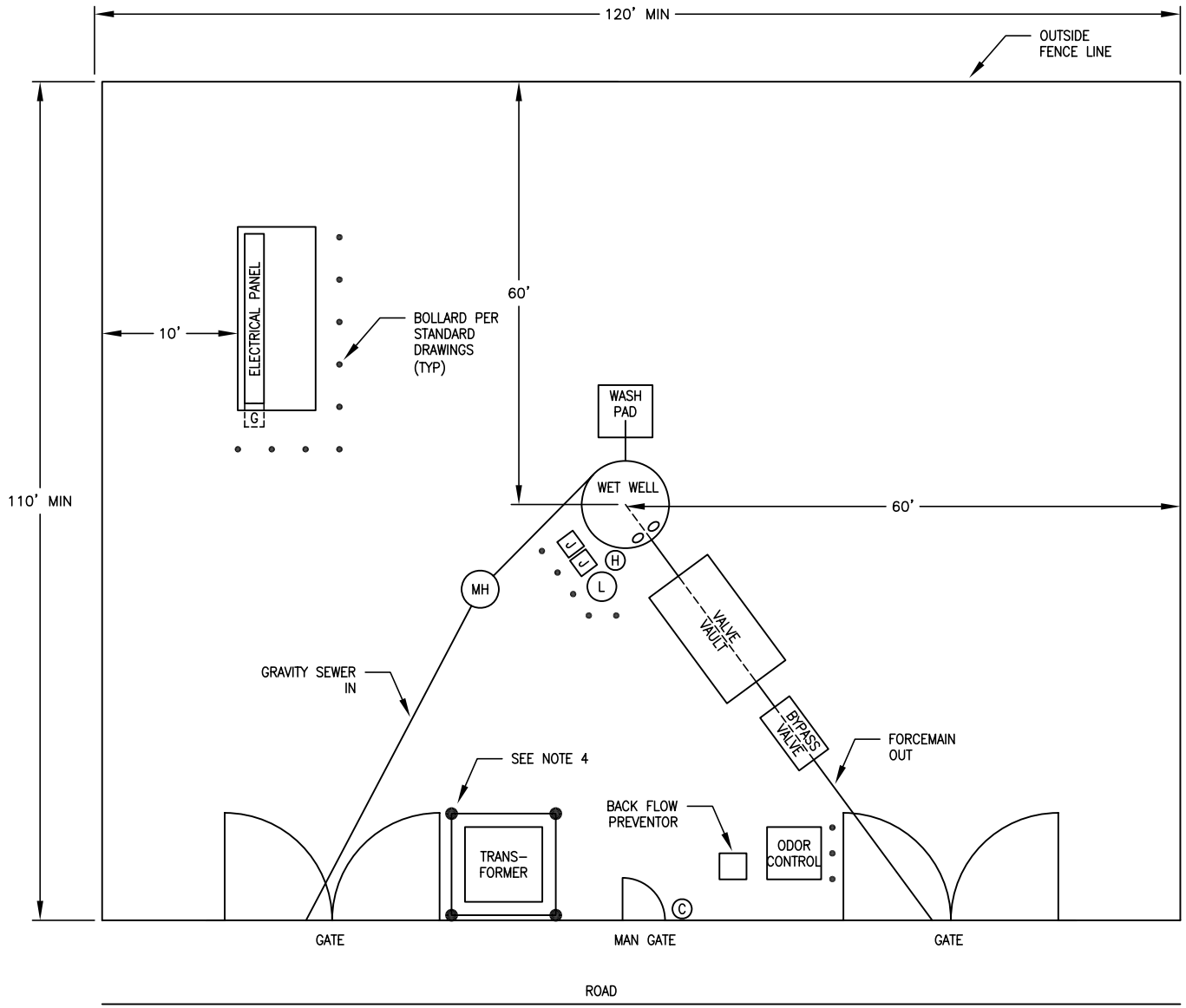
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

PIPE LOCATOR RIBBON AND LOCATOR BALL INSTALLATION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-5C-80



LEGEND:

MH – MANHOLE

L – LIGHTS

J – JUNCTION BOX

H – HOSE BIB

C – CHEMICAL HOOK–UP

G – GENERATOR HOOK–UP

NOTE

1. 5' SEPERATION FROM WET WELL TO VALVE VAULT TO BYPASS VAULT.
2. MIN 3' CLEARANCE IN FRONT OF JUNCTION BOX.
3. TRANSFORMER BOLLARDS PER SMUD DRAWINGS.
4. NO EQUIPMENT SHALL BE INSTALLED WITHIN 10 FEET OF FENCE LINE.

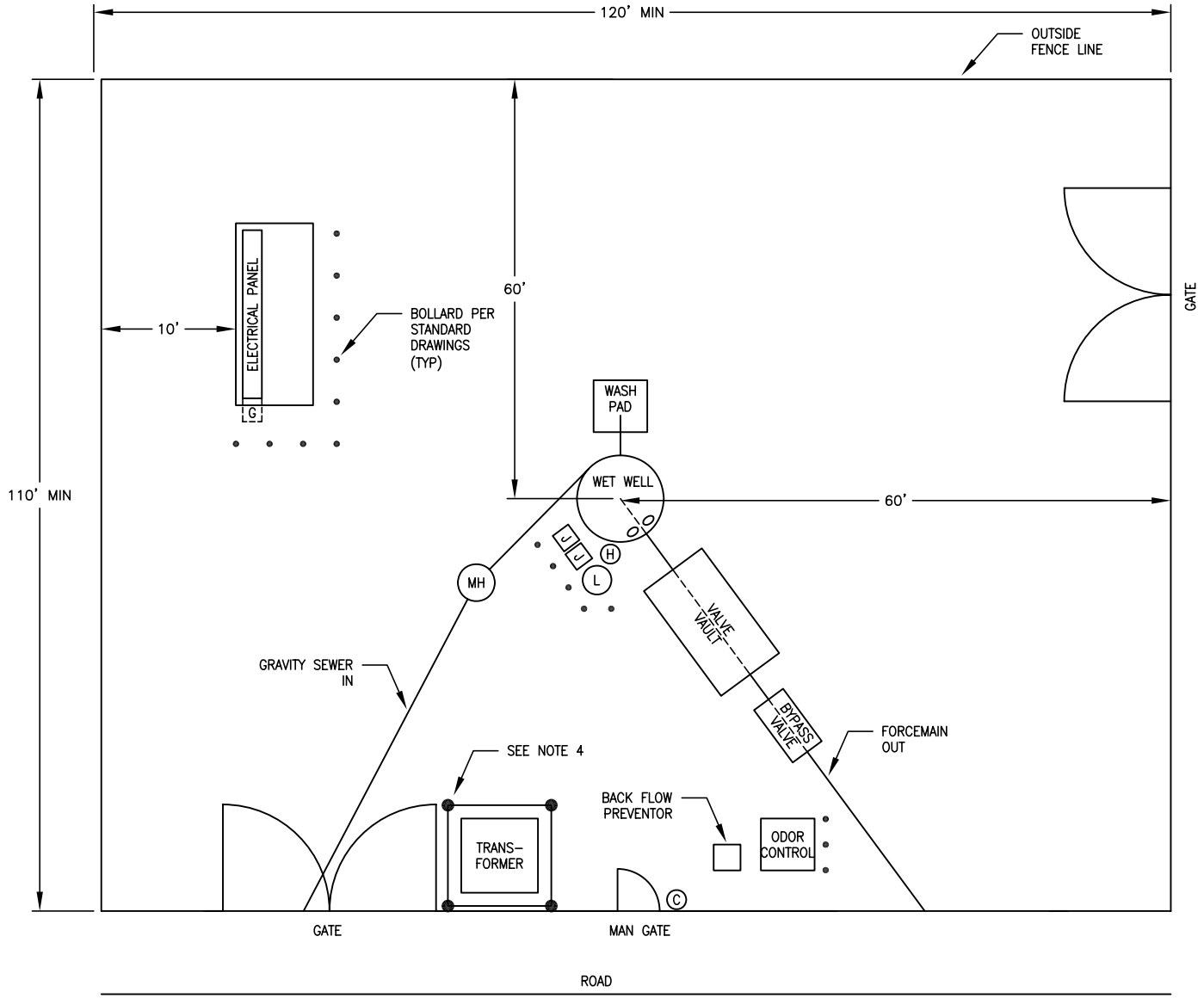
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

PUMP STATION SITE LAYOUT

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6C-10



LEGEND:

MH – MANHOLE

L – LIGHTS

J – JUNCTION BOX

H – HOSE BIB

C – CHEMICAL HOOK–UP

G – GENERATOR HOOK–UP

NOTE

1. 5' SEPERATION FROM WET WELL TO VALVE VAULT TO BYPASS VAULT.
2. MIN 3' CLEARANCE IN FRONT OF JUNCTION BOX.
3. TRANSFORMER BOLLARDS PER SMUD DRAWINGS.
4. NO EQUIPMENT SHALL BE INSTALLED WITHIN 10 FEET OF FENCE LINE.

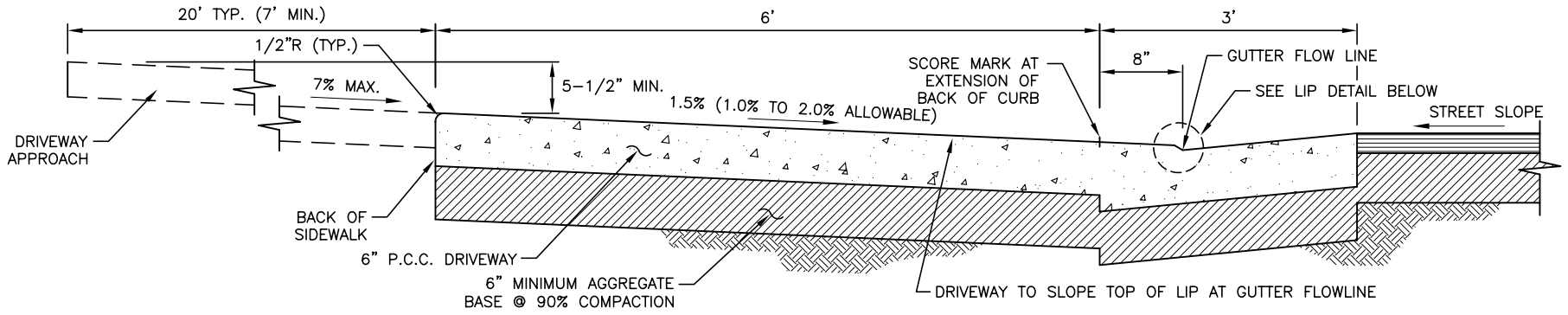
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

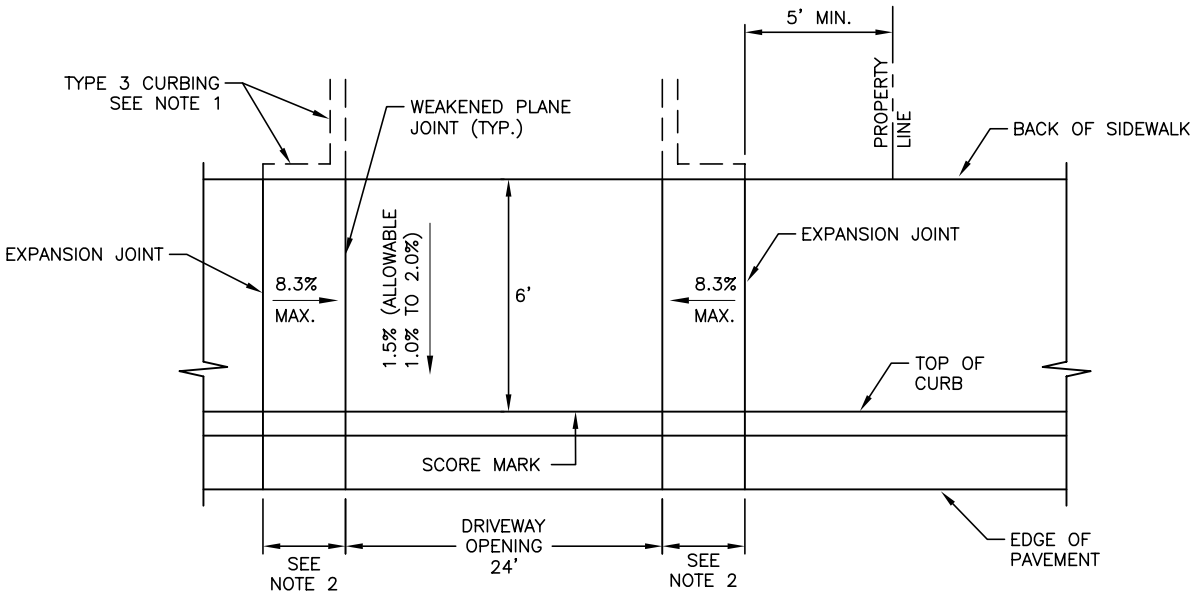
PUMP STATION SITE LAYOUT CORNER LOT

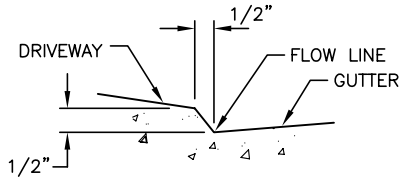
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6C-11



TYPICAL DRIVEWAY SECTION





LIP DETAIL

NOTES:

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 DRIVEWAY.
2. SEE SIDEWALK RAMPS DETAIL DRAWING 7-6C-13 FOR APPROX. LENGTH OF INCLINED PORTION OF DRIVEWAY.

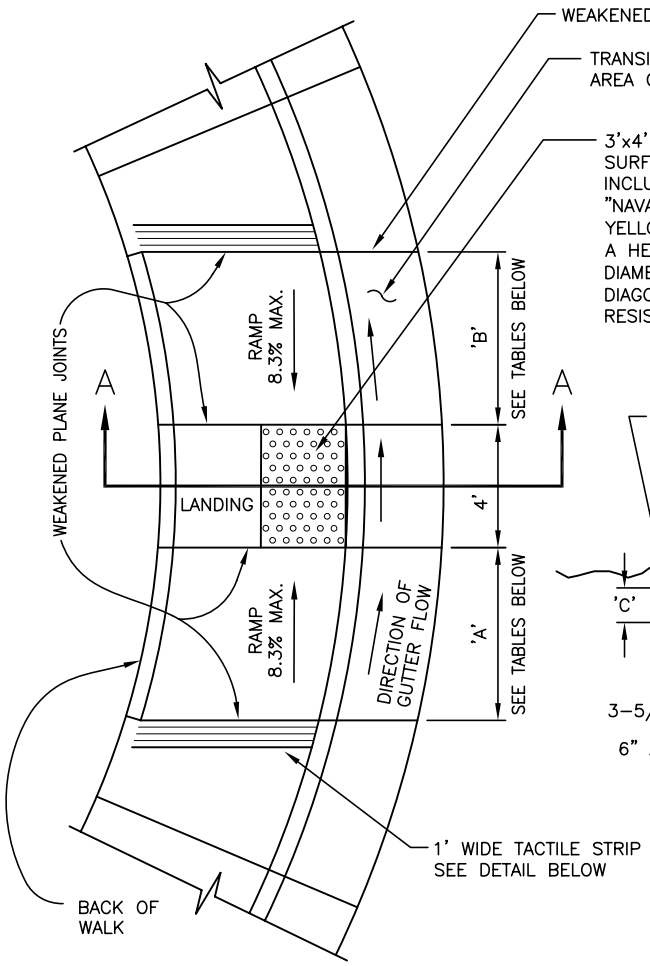
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

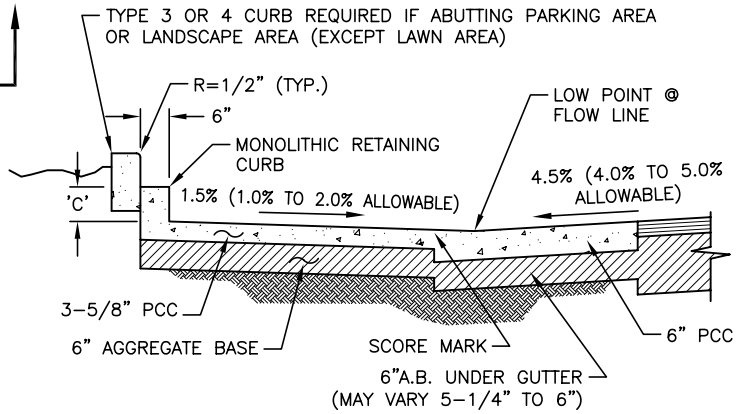
COMMERCIAL DRIVEWAY

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

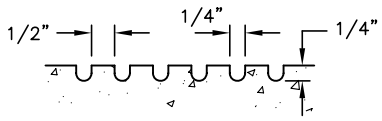
7-6C-12



RAMP PLAN



LANDING SECTION A-A



TACTILE STRIP GROOVE DETAIL

TYPE 2 CURB	APPROX. RAMP LENGTH	
SLOPE OF GUTTER	"A"	"B"
0.5% TO 1.0%	7'-6"	6'-0"
> 1.0% TO 1.5%	8'-0"	6'-0"
> 1.5% TO 1.8%	8'-6"	5'-6"
> 1.8% TO 2.1%	9'-0"	5'-6"
> 2.1% TO 2.4%	9'-6"	5'-0"
> 2.4% TO 3.0%	10'-0"	5'-0"
> 3.0%	SEE NOTE 4	

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

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

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

NOTES:

1. DIMENSION 'A' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE SAME DIRECTION AS THE FLOW OF THE GUTTER.
2. DIMENSION 'B' IS THE LENGTH OF THE INCLINED PORTION OF THE RAMP THAT SLOPES IN THE OPPOSITE DIRECTION AS THE FLOW OF THE GUTTER.
3. RAMPS SHALL HAVE A HEAVY BROOM FINISH TRANSVERSE TO THEIR SLOPE.
4. REQUIRES SPECIAL DESIGN APPROVAL BY THE CHIEF OF THE DEPARTMENT OF TRANSPORTATION.
5. NO PULL BOX, UTILITY BOX, UTILITY POLE, TRAFFIC SIGNAL POLE, MANHOLE, OR SIMILAR APPURTENANCE SHALL BE LOCATED WITHIN SIDEWALK RAMP AREA.
6. SEE NOTE 6 SACRAMENTO COUNTY STANDARD DRAWING 4-24 FOR RAMPS WITH 6' WIDE RAMP PANS.

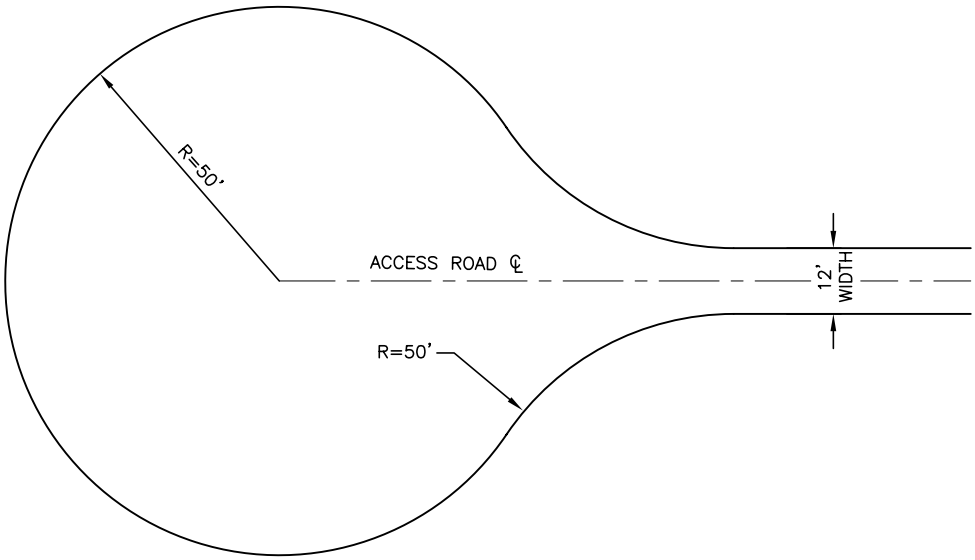
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

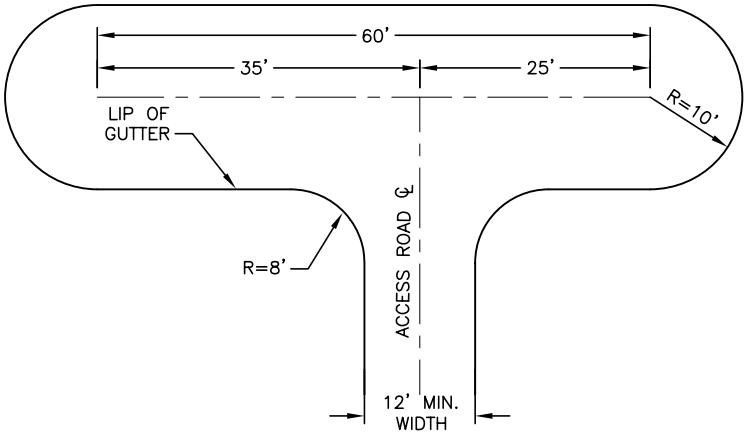
SIDEWALK RAMP DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6C-13



TURN–AROUND



HAMMER–HEAD

Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

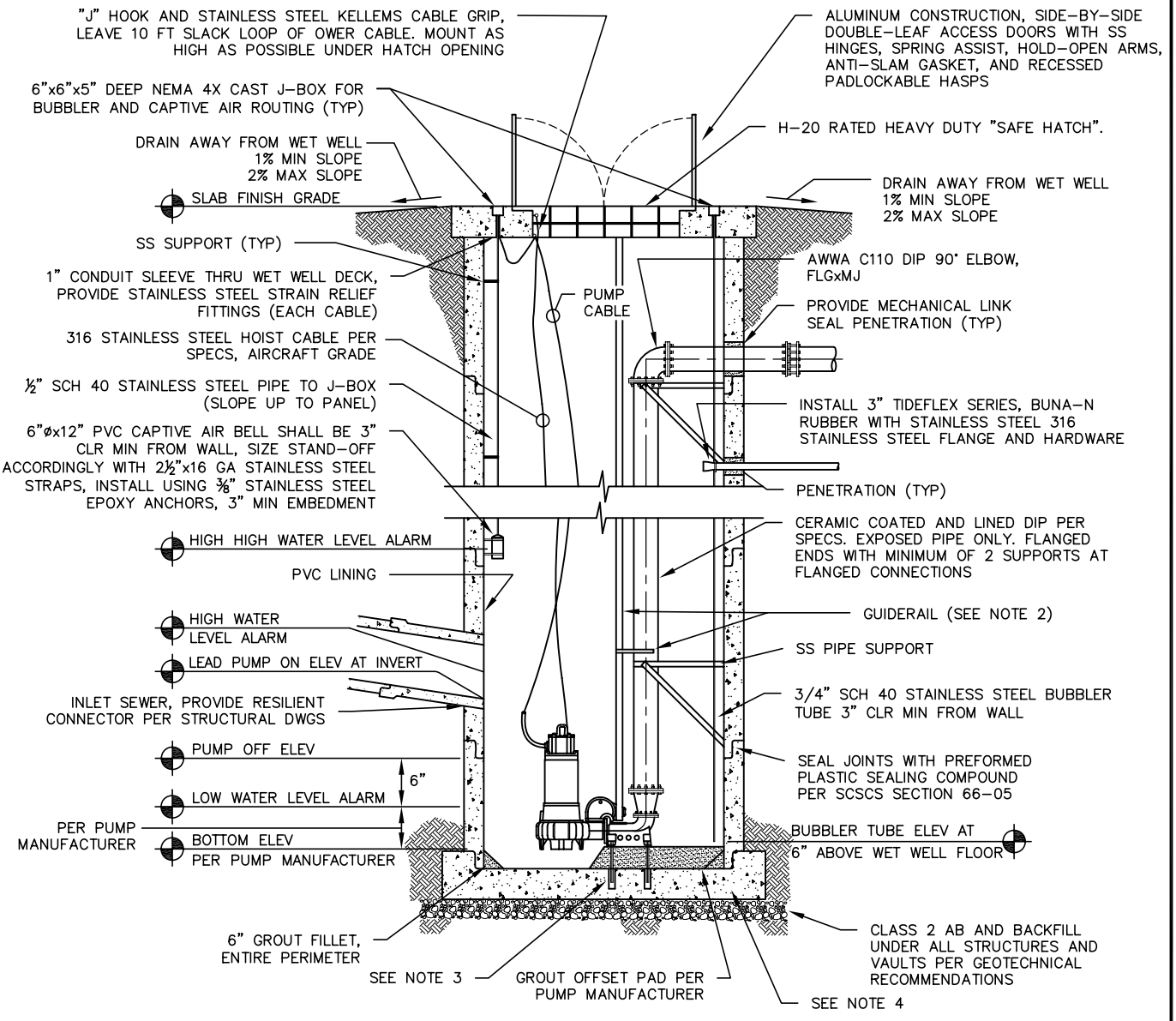
TURN-AROUND & HAMMER-HEAD FOR ACCESS ROADS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6C-14

NOTE:

STREET SECTION:
EITHER 2" AC OVER 4" OF AB
OR 12" OF AB OVER GEOFABRIC



SECTION A-A

NOTES:

1. GUIDERAIL SHALL BE MADE OF 316 STAINLESS STEEL AND SHALL BE SIZED PER PUMP MANUFACTURER WITH INTERMEDIATE SUPPORT.
2. MIN OPENING HATCH SHALL NOT INTERFERE WITH PUMP REMOVAL AND MAINTENANCE OPERATIONS.
3. PAD, STAINLESS STEEL ANCHOR BOLT ASSEMBLY, AND LOCATION SHALL BE DESIGNED PER MANUFACTURER REQUIREMENTS.
4. THICKNESS OF WET WELL FLOOR SHALL BE PER STRUCTURAL ENGINEER RECOMMENDATIONS.

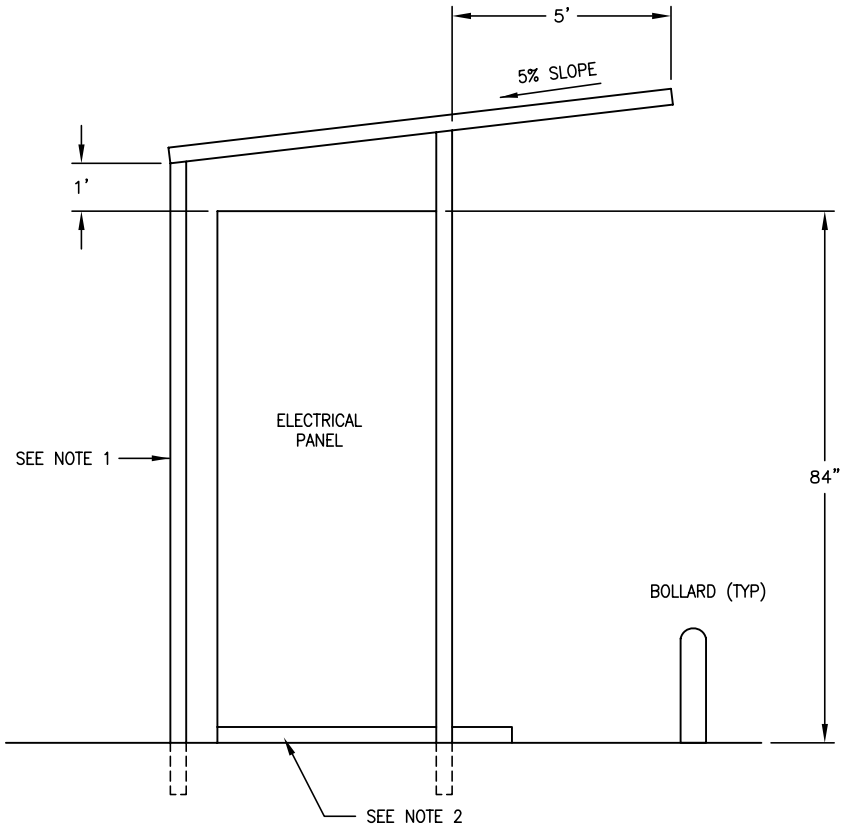
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

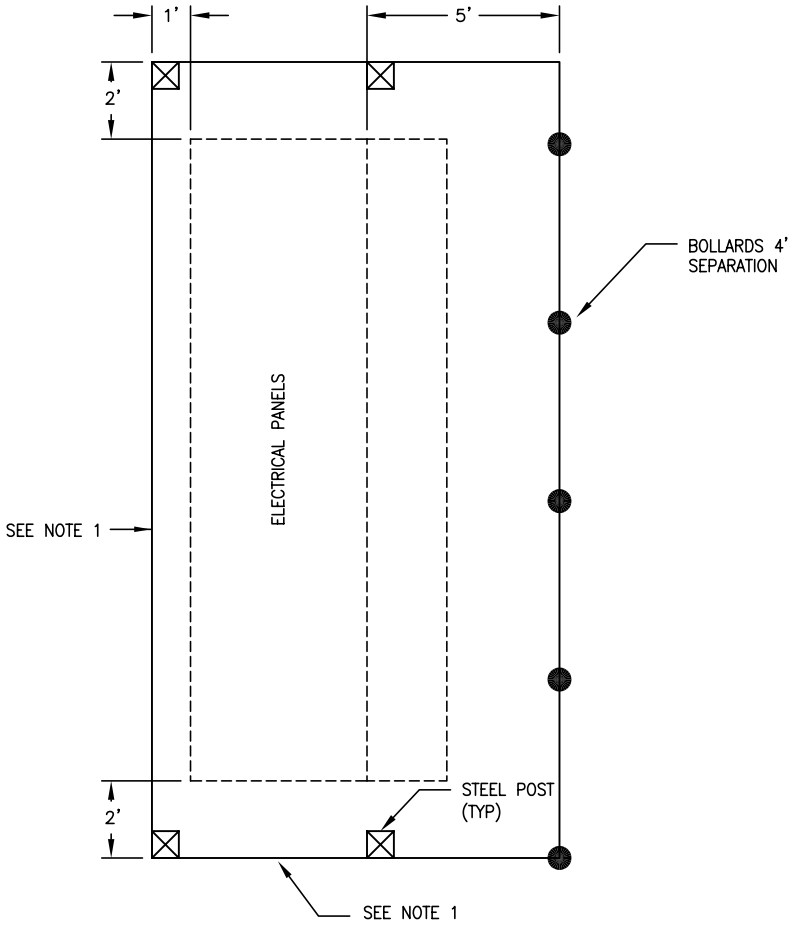
CIRCULAR WET WELL

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6C-20



SIDE VIEW
NTS



TOP VIEW
NTS

NOTES:

1. ATTACH SUNSHIELD TO CANOPY POSTS ON SOUTH AND WEST SIDES.
2. CONCRETE PAD EXTENDED 4 INCHES ABOVE SURROUNDING GRADE. TO BE DESIGNED BY ENGINEER.
3. CANOPY SHALL BE DESIGNED BY REGISTERED ENGINEER.

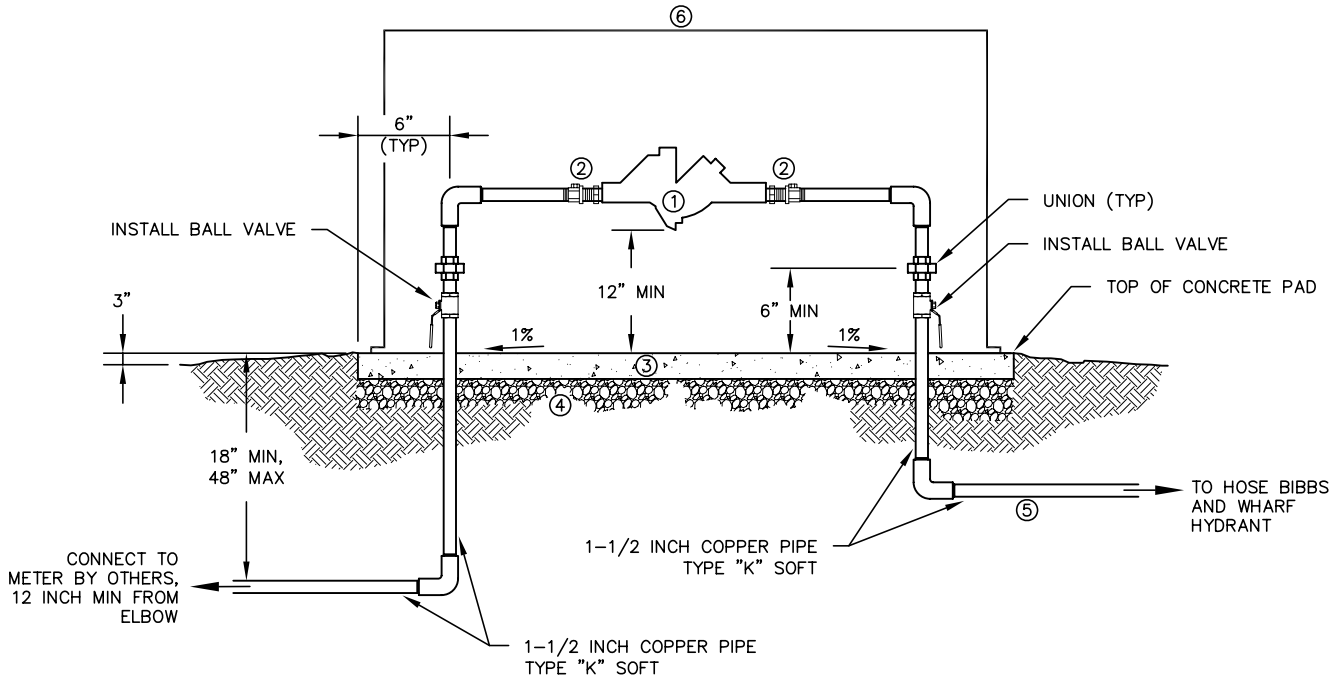
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CANOPY SCHEMATIC

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6C-50



REDUCER PRESSURE PRINCIPAL ASSEMBLY

KEY LEGEND

① REDUCED PRESSURE BACKFLOW PREVENTER.

② BRONZE BODY, RESILIENT SEATED BALL VALVE MINIMUM WORKING PRESSURE OF 175 PSI.

③ 3" SLAB, CONSTRUCT PER ENCLOSURE REQUIREMENTS.

④ 1/2" OR 3/4" CRUSHED ROCK, 4" MINIMUM THICKNESS, COMPACTED TO 95% RELATIVE DENSITY.

⑤ COPPER PIPE OR APPROVED EQUAL.

⑥ MODEL HB2 INSULATED LOK BOX AS MANUFACTURED BY HOT BOX, 250 LANE AVENUE NORTH, JACKSONVILLE, FLORIDA 32254. ANCHOR TO PAD USING MANUFACTURER BRACKETS. PROVIDE PADLOCK.

NOTES:

1. REDUCED PRESSURE BACKFLOW PREVENTER SHALL BE LISTED ON THE STATE OF CALIFORNIA'S DEPT OF HEALTH SERVICES MOST RECENT LIST OF APPROVED REDUCED PRESSURE BACKFLOW PREVENTERS.
2. ALL SERVICE PIPING SHALL BE TYPE K COPPER WHERE BURIED, GALVANIZED SCH 40 STEEL ABOVE GROUND.
3. ALL BURIED PIPES SHALL BE WRAPPED WITH 6 MIL POLYETHYLENE ENCASEMENT OR 10 MIL POLYETHYLENE TAPE,

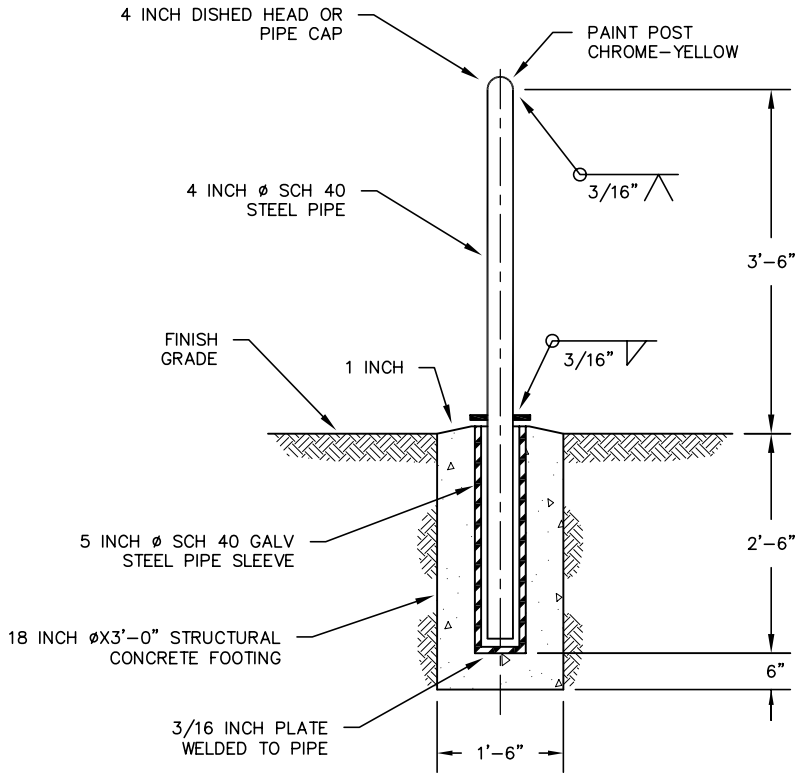
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

REDUCER PRESSURE PRINCIPAL ASSEMBLY

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6C-60



REMOVABLE BOLLARD DETAIL

NOTE:

SEE SCSCS DWG L–22 FOR ADDITIONAL DETAILS NOT SHOWN.

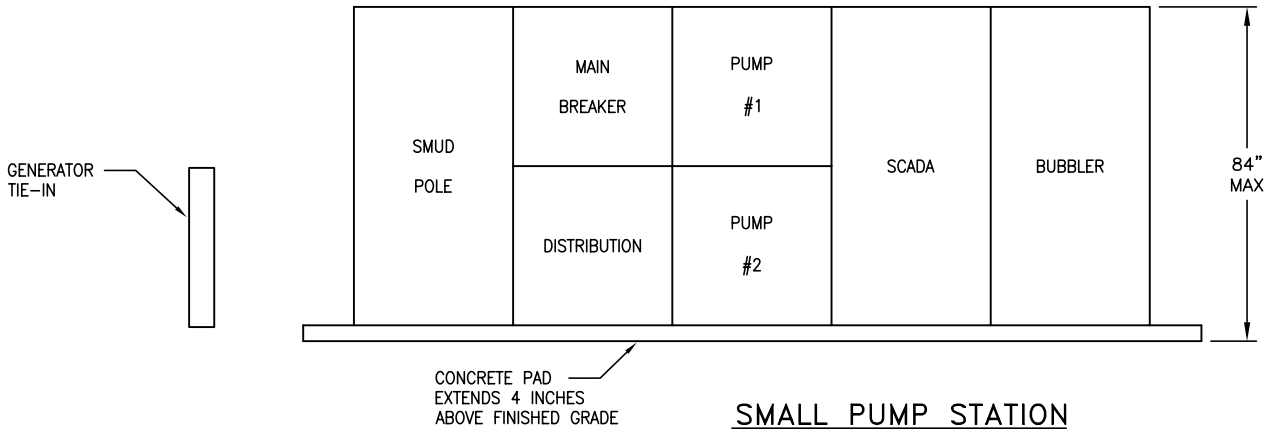
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

REMOVABLE BOLLARD DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6C-90



SMALL PUMP STATION

NTS

Mary K Snyder

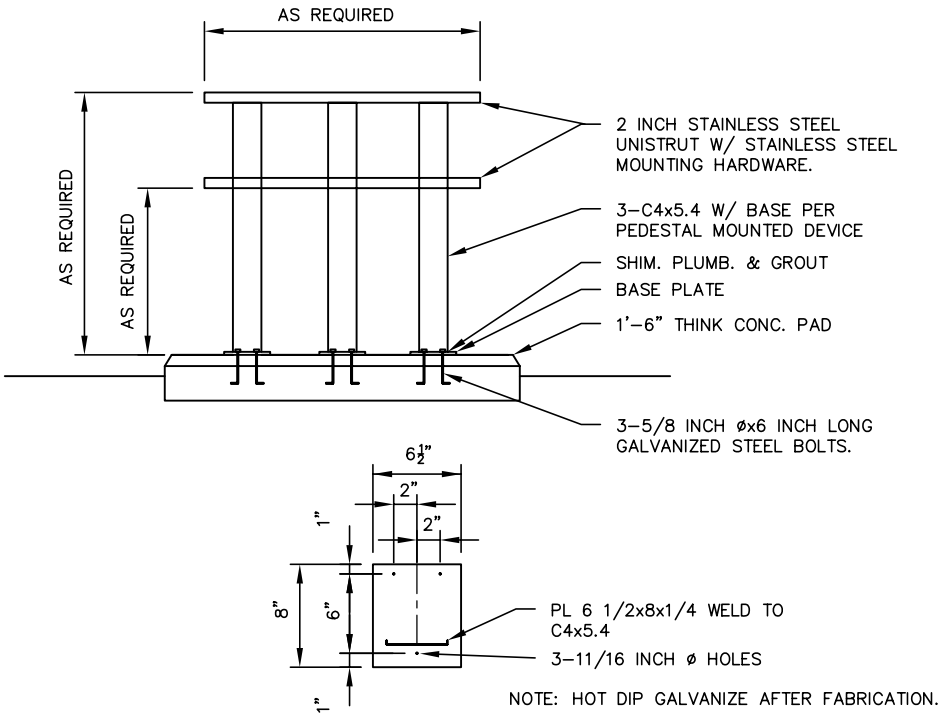
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

ELECTRICAL PANEL LAYOUT

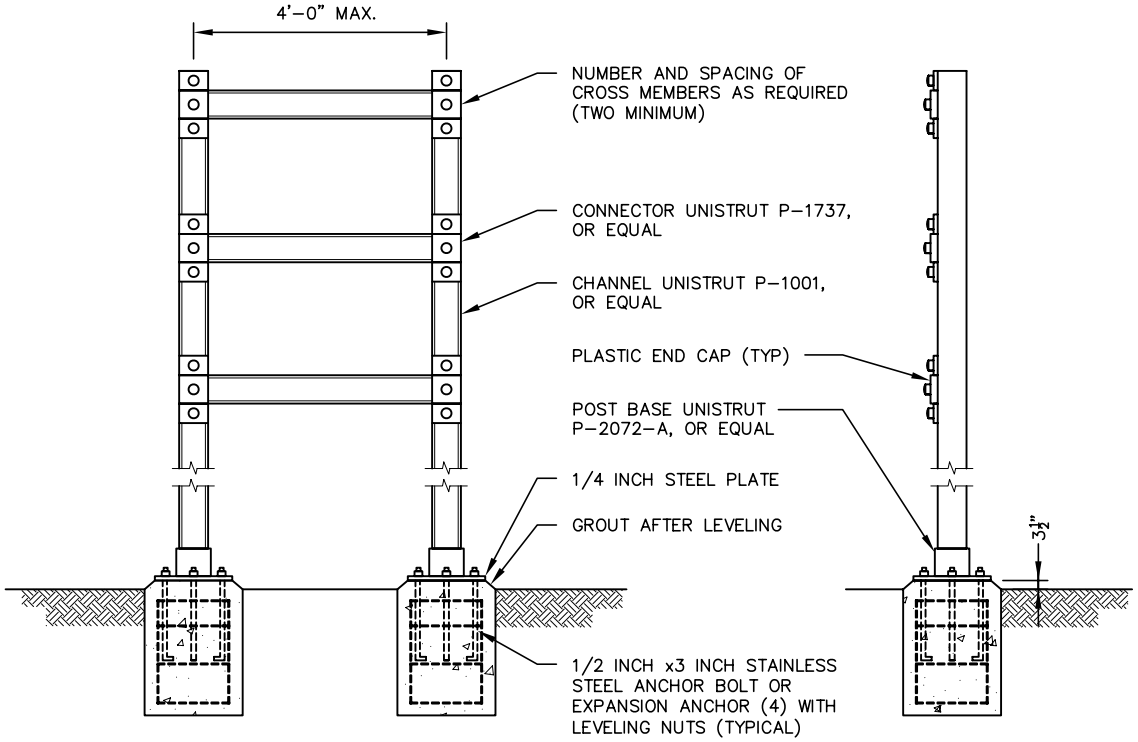
DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6E-10



A – LARGE PEDESTAL MOUNTING DETAIL

SCALE: NONE



NOTES:

1. INSTRUMENT RACK CHANNELS AND FITTINGS SHALL BE 316 STAINLESS STEEL.
2. HEIGHT AS REQUIRED SO MOUNTED INSTRUMENTS OR EQUIPMENT SHALL BE 60 INCHES TO TOP OF ENCLOSURE.

B – INSTRUMENT MOUNTING RACK

SCALE: NONE

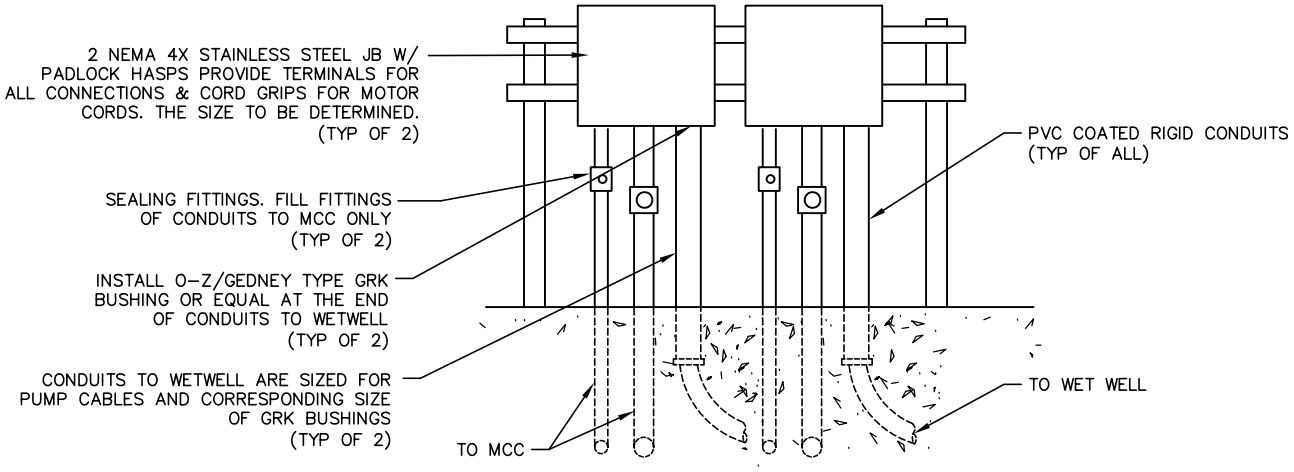
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

ELECTRICAL DETAIL #5

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6E-11



MOTOR JB MOUNTING DETAIL

NO SCALE

NOTES:

1. GROUND JB DOORS AND BOXES TO BE GROUND GRID.

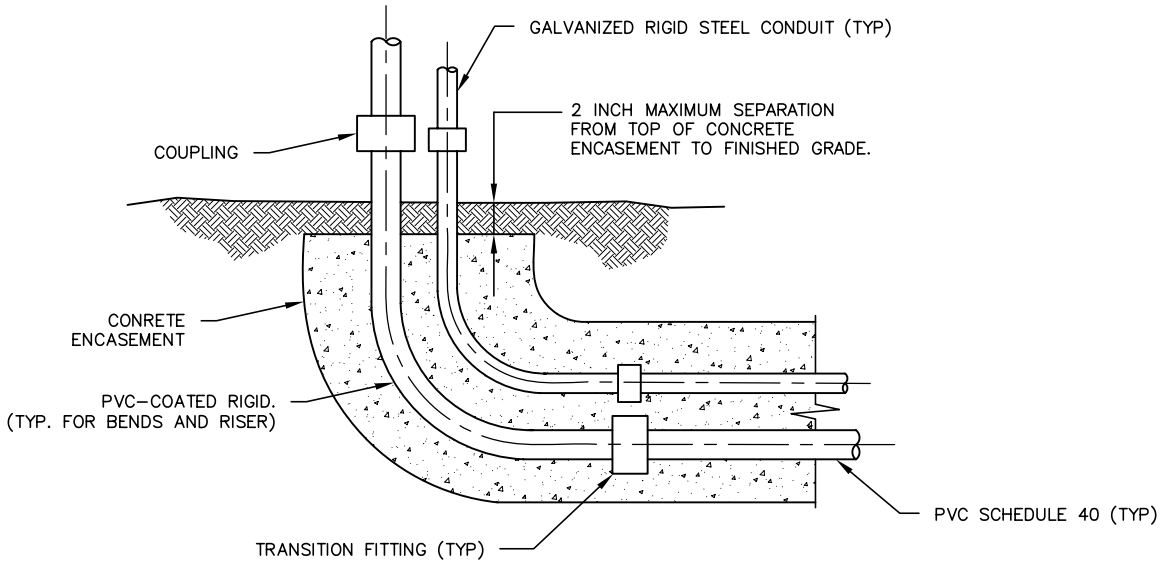
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

JB MOUNTING DETAIL

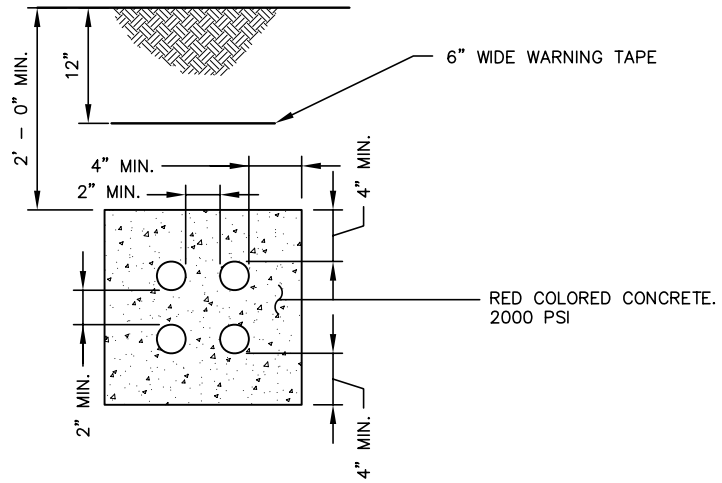
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-12



A – CONDUIT RISER FROM GROUND

SCALE: NONE



B – DUCT BANK SECTION

SCALE: NONE

Mary K Snyder

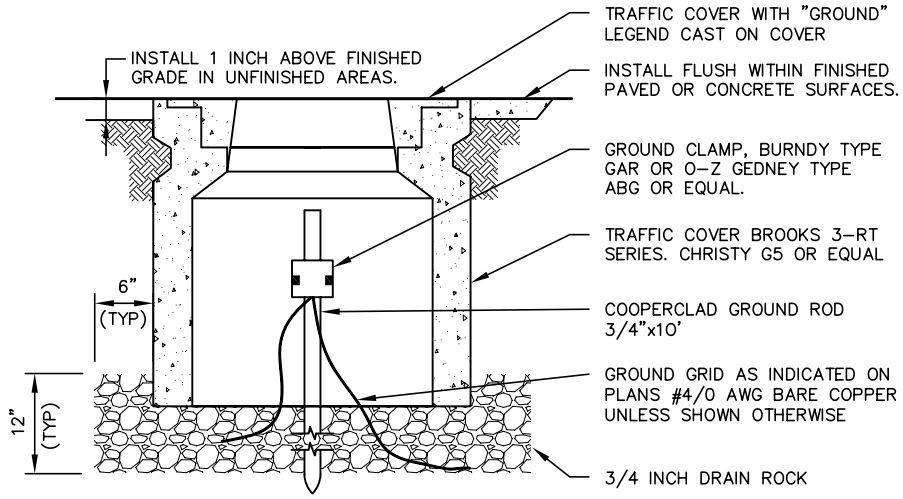
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

CONDUIT RISER FROM GROUND & DUCT BANK SECTION

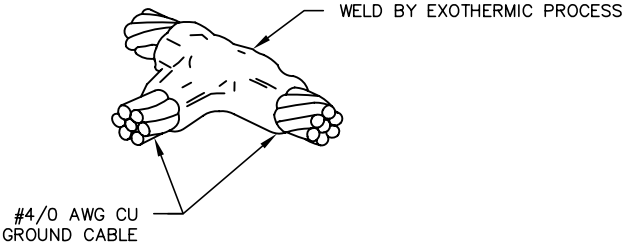
DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6E-13



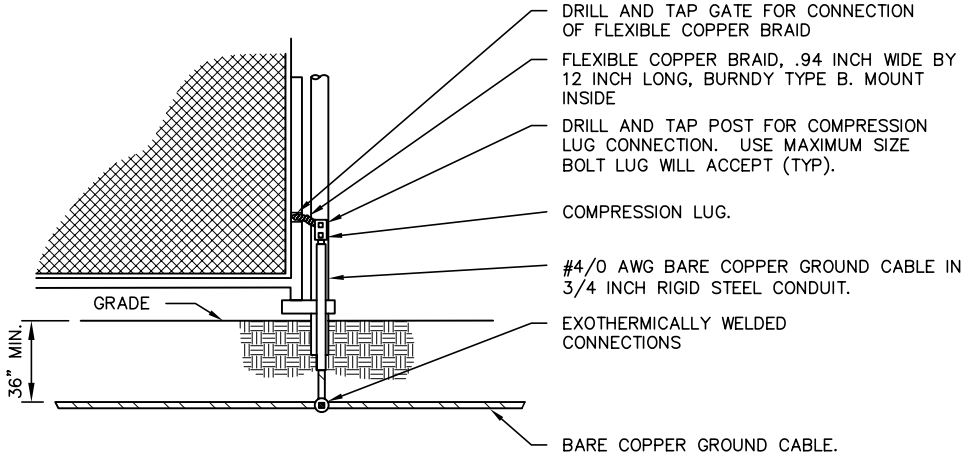
A – GROUND WELL

SCALE: NONE



B – GROUND GRID TEE CONNECTION DETAIL

SCALE: NONE



NOTE

GROUND EACH CORNER POST, GATE, GATE SUPPORT POST AND EVERY OTHER FENCE POST.

C – FENCE GROUNDING

SCALE: NONE

Mary K Snyder

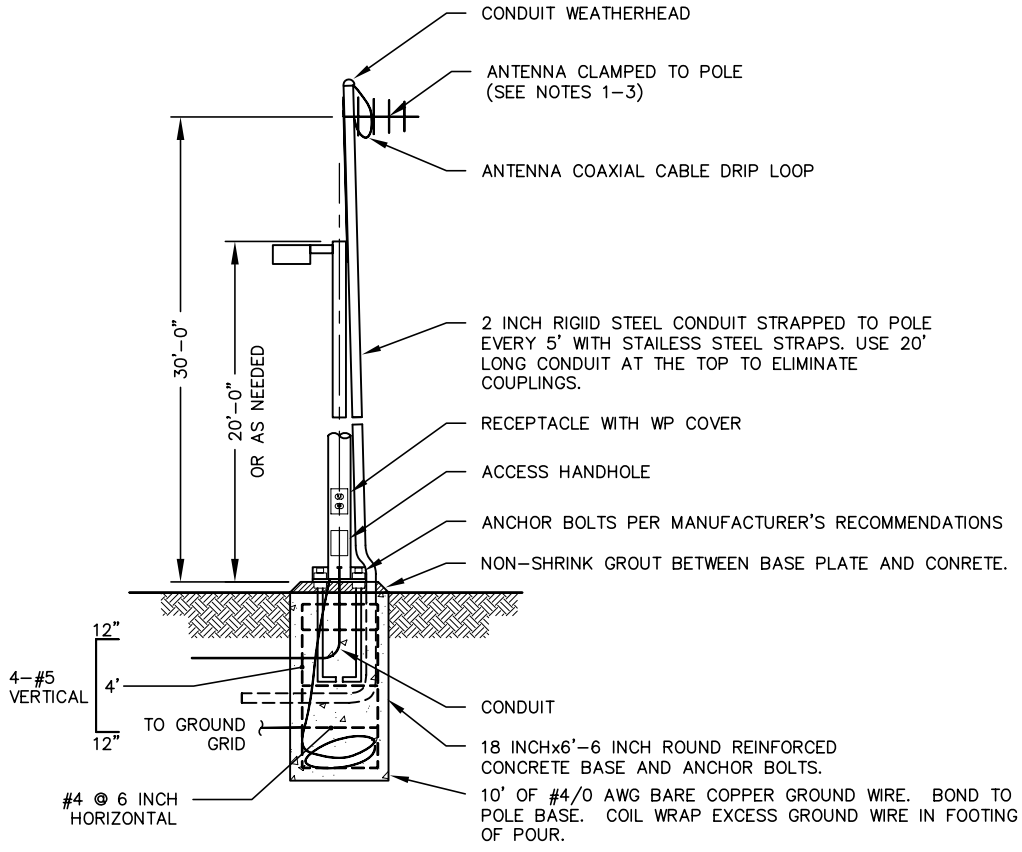
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

GROUNDING DETAILS

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6E-14



POLE BASE DETAIL W/ ANTENNA

SCALE: NONE

NOTES:

1. ANTENNA SHALL BE ANTENEX OR APPROVED EQUAL. PART NUMBER: TRAB 806/17103P.
2. MOUNTING BRACKET SHALL BE LARSEN OR APPROVED EQUAL PART NUMBER: FB3 BRACKET.
3. LIGHTING ARRESTER SHALL BE ALTELICON OR APPROVED EQUAL PART NUMBER: AL–NFNFB.

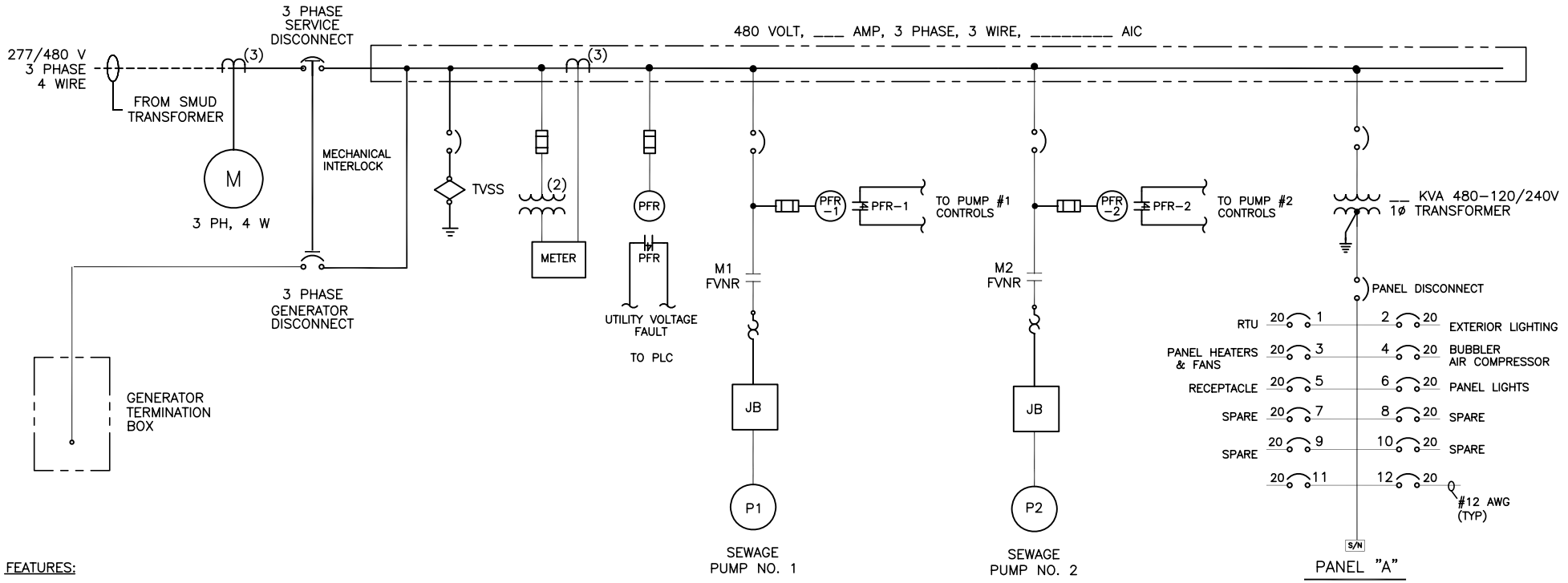
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

POLE BASE DETAIL WITH ANTENNA

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6E-15



FEATURES:

1. FULL CAPACITY LANDING LUGS FOR PORTABLE GEN. IN A NEW NEMA 3R ENCL.

SINGLE LINE DIAGRAM

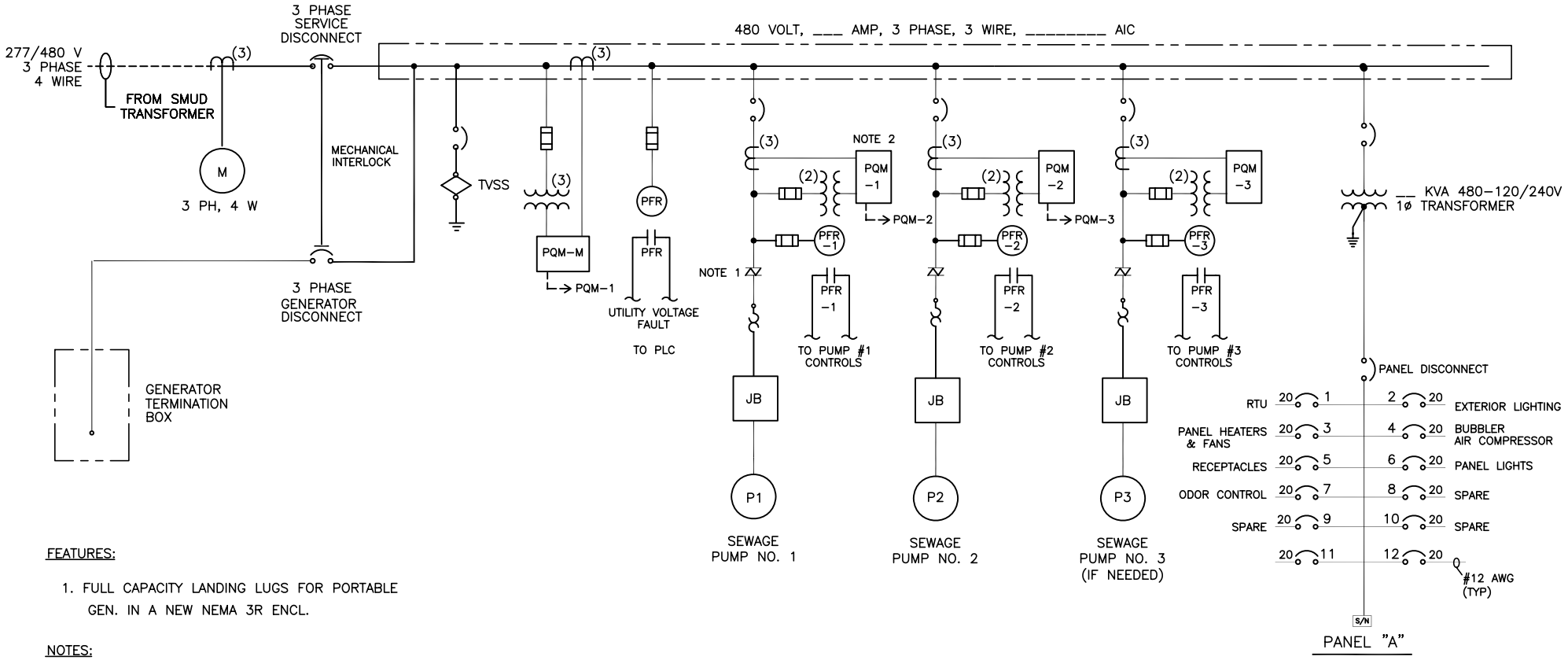
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SINGLE LINE DIAGRAM
SMALL PUMP STATION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-20



FEATURES:

1. FULL CAPACITY LANDING LUGS FOR PORTABLE GEN. IN A NEW NEMA 3R ENCL.

NOTES:

1. PROVIDE FVNR STARTER FOR MOTORS UNDER 30 HP
2. PROVIDE A PQM FOR EACH PUMP OVER 50 HP IN TRIPLEX STATIONS

SINGLE LINE DIAGRAM

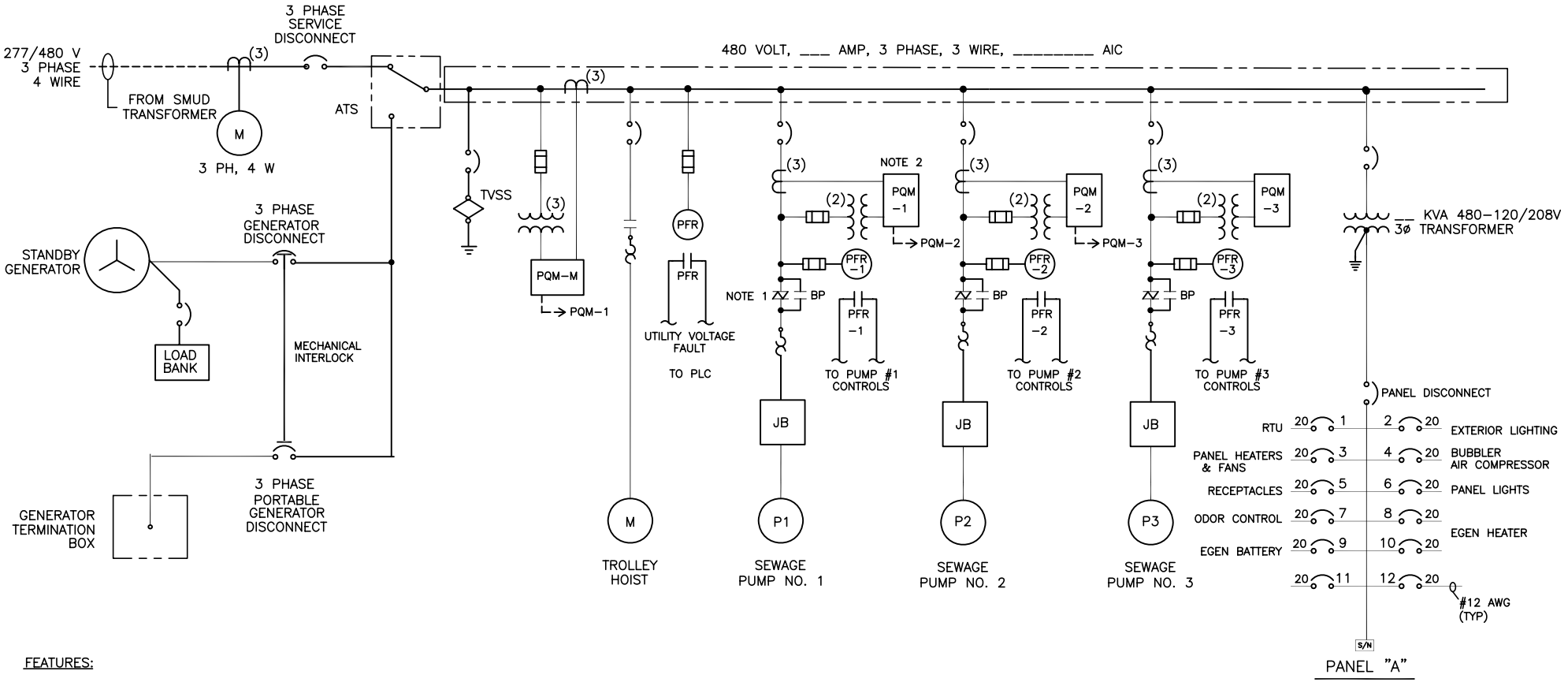
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SINGLE LINE DIAGRAM
MEDIUM PUMP STATION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-21



FEATURES:

1. FULL CAPACITY LANDING LUGS FOR PORTABLE GEN. IN A NEW NEMA 3R ENCL.
2. ONE FULL CAPACITY ATS WITH BYPASS
3. ONE FULL CAPACITY ENGINE GENERATOR AND LOAD BANK

NOTES:

1. NUMBER OF PUMPS: AS NEEDED.

SINGLE LINE DIAGRAM

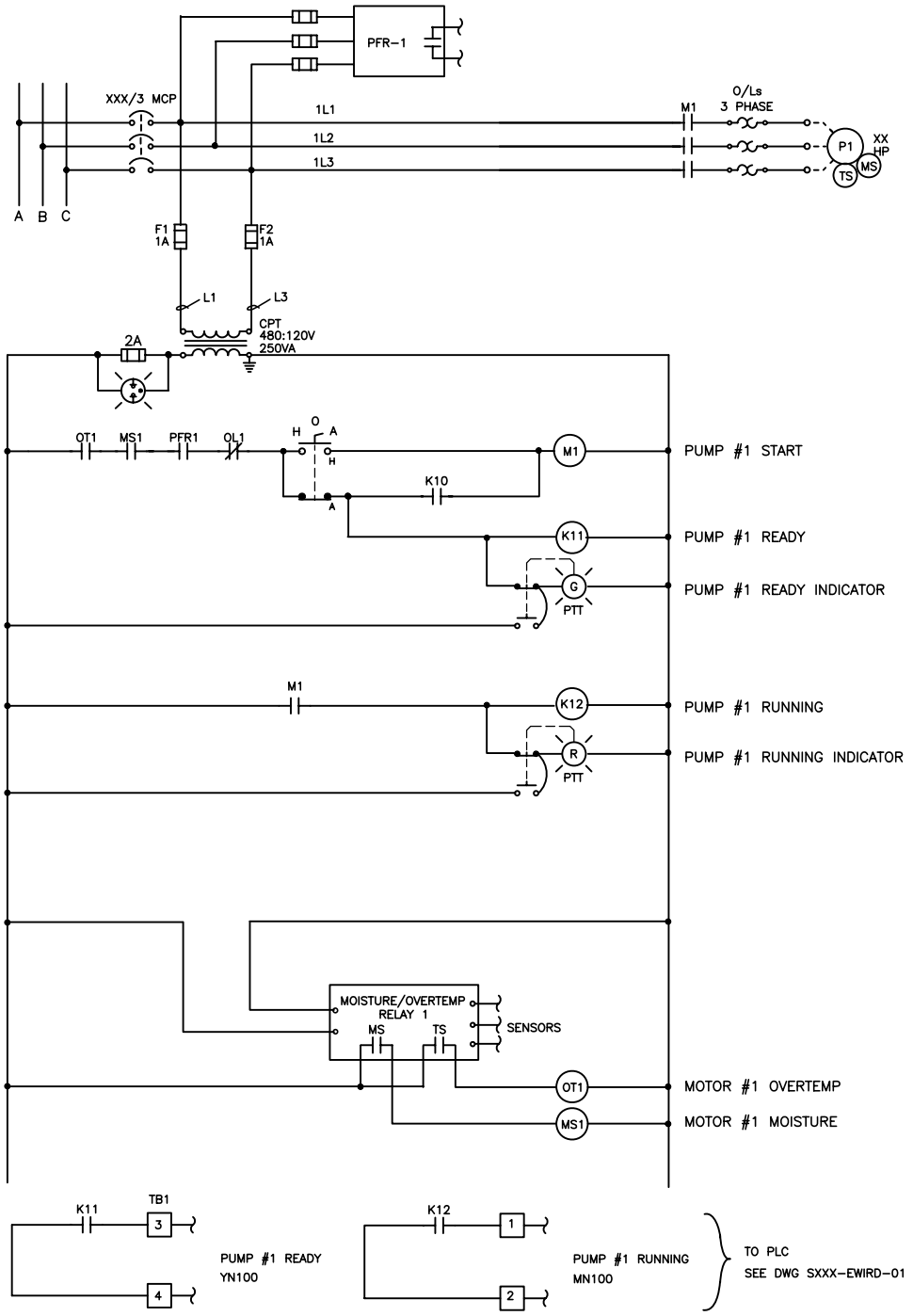
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

SINGLE LINE DIAGRAM
LARGE PUMP STATION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-22



PUMP P1 WIRING DIAGRAM

NOTES:

1. PUMP START/STOP COMMAND FROM INTERPOSING RELAY AT RTU PANEL
2. NUMBERING CONVENTION IS TYPICAL.
   USE K10, K11, K12, PFR-1, PQM-1, AND ETC. FOR PUMP 1.
   USE K20, K21, K22, PFR-2, PQM-2, AND ETC. FOR PUMP 2.

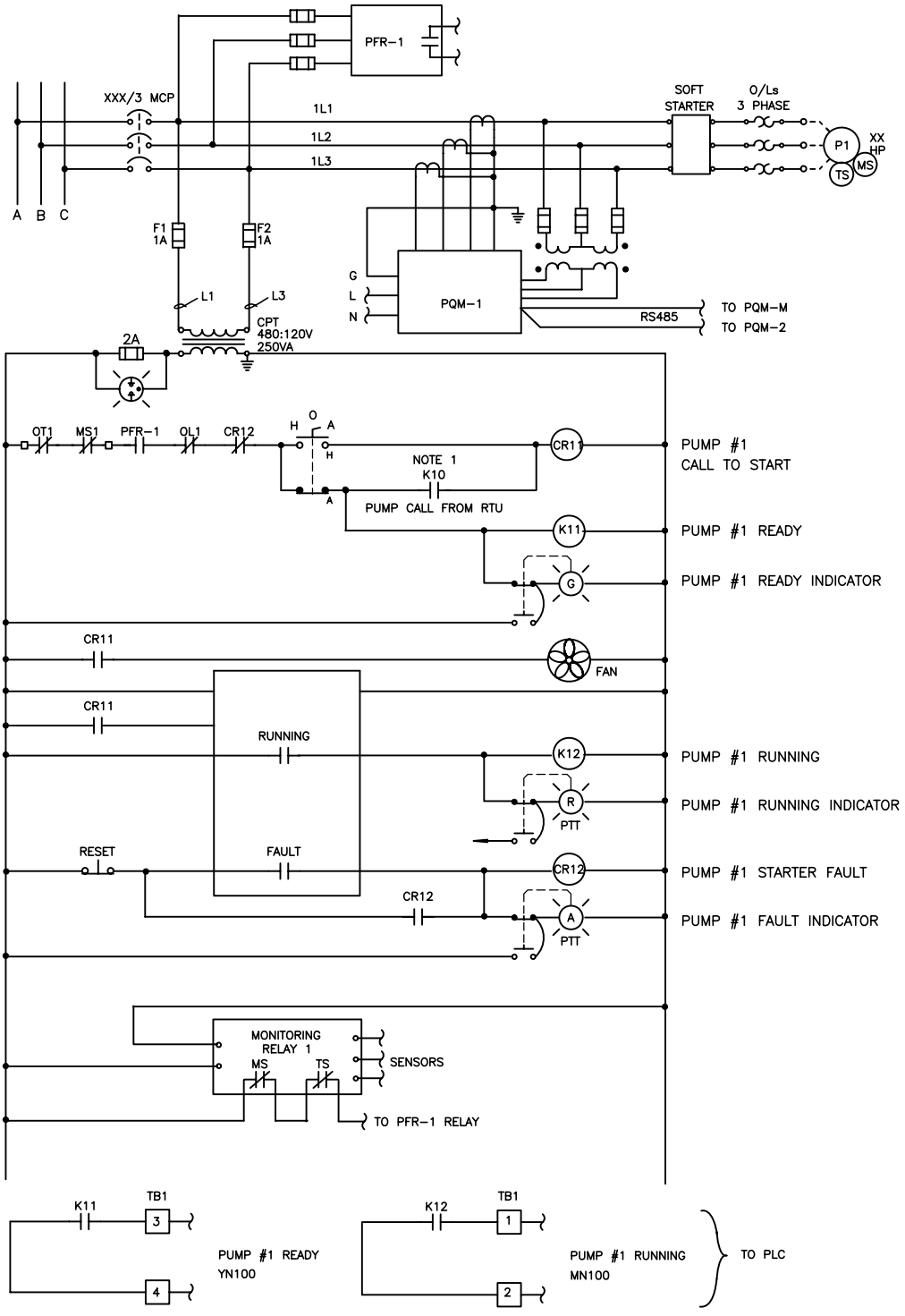
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

PUMP CONTROLS SMALL PUMP STATION

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-30



PUMP P1 WIRING DIAGRAM

NOTES:

1. PUMP START/STOP COMMAND FROM INTERPOSING RELAY AT RTU PANEL
2. NUMBERING CONVENTION IS TYPICAL.
   USE CR-11, CR-12, K10, K11, K12, PFR-1, PQM-1, AND ETC. FOR PUMP 1.
   USE CR-21, CR-22, K20, K21, K22, PFR-2, PQM-2, AND ETC. FOR PUMP 2.

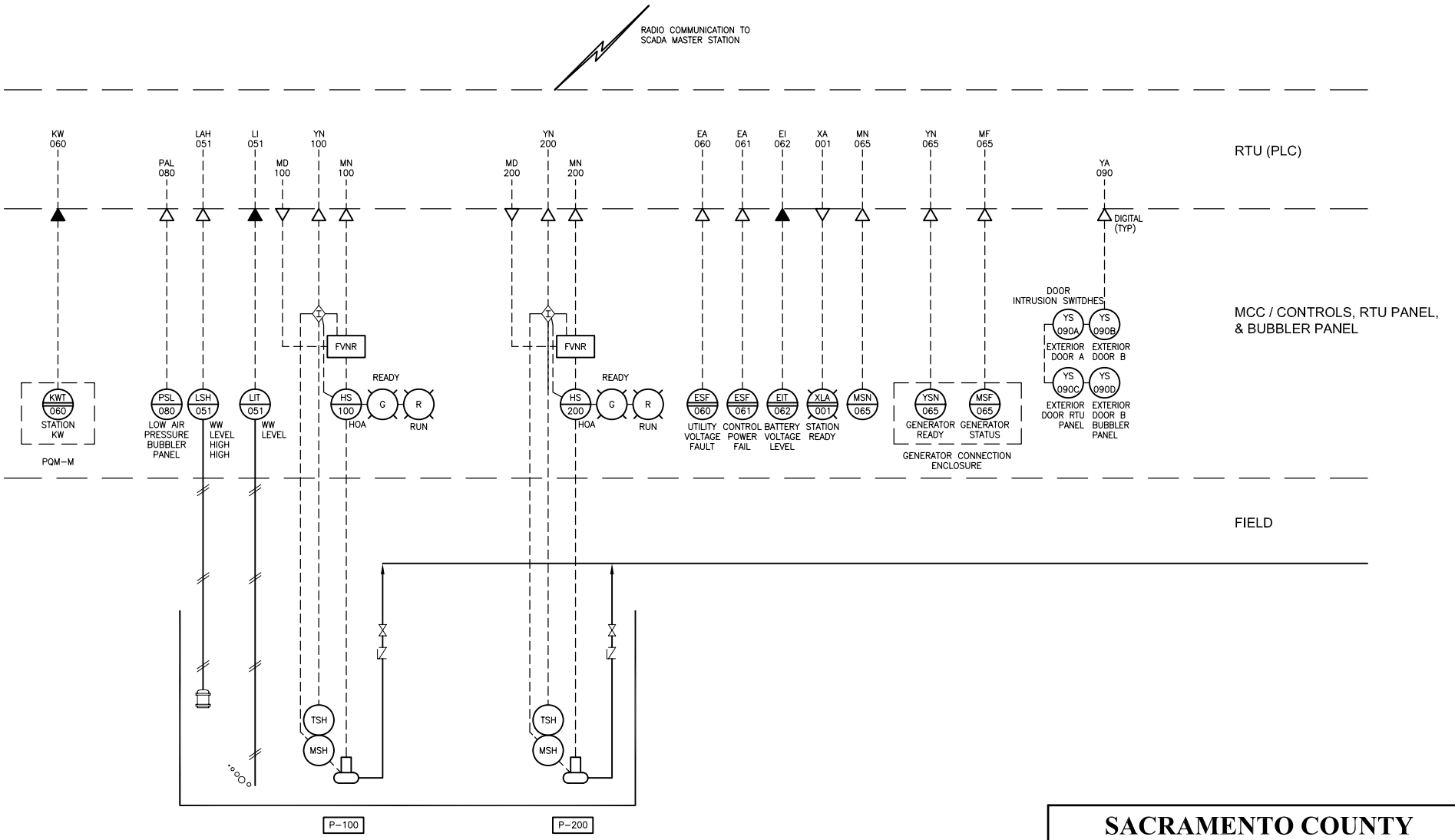
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

PUMP CONTROLS
LARGE AND MEDIUM
PUMP STATIONS

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6E-31



PROCESS & INSTRUMENTATION DIAGRAM

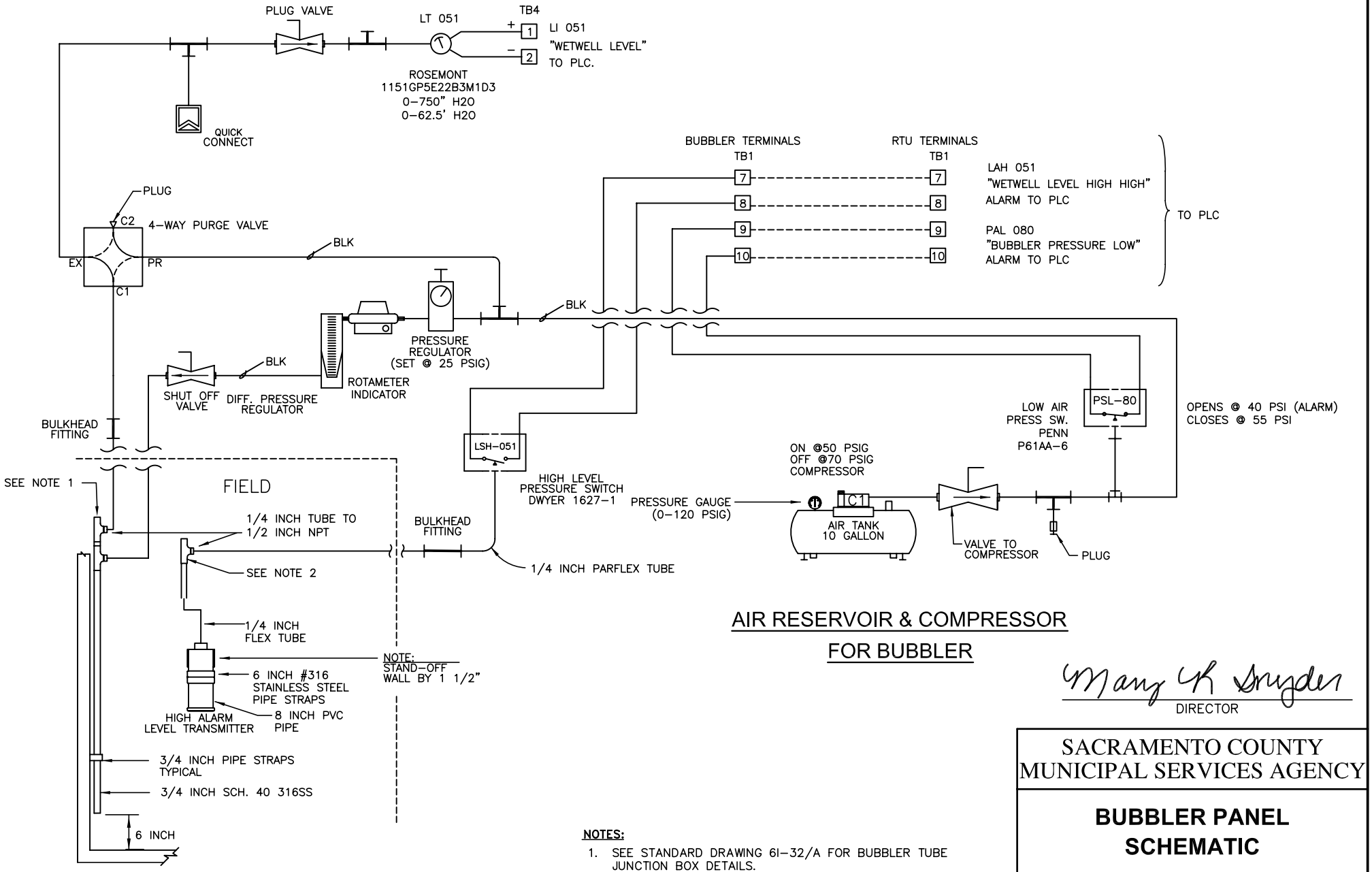
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

P & ID

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-30



LIQUID LEVEL CONTROL

AIR RESERVOIR & COMPRESSOR FOR BUBBLER

NOTES:

1. SEE STANDARD DRAWING 6I–32/A FOR BUBBLER TUBE JUNCTION BOX DETAILS.
2. SEE STANDARD DRAWING 6I–32/B FOR CAPTIVE AIR TUBE MOUNTING DETAILS.

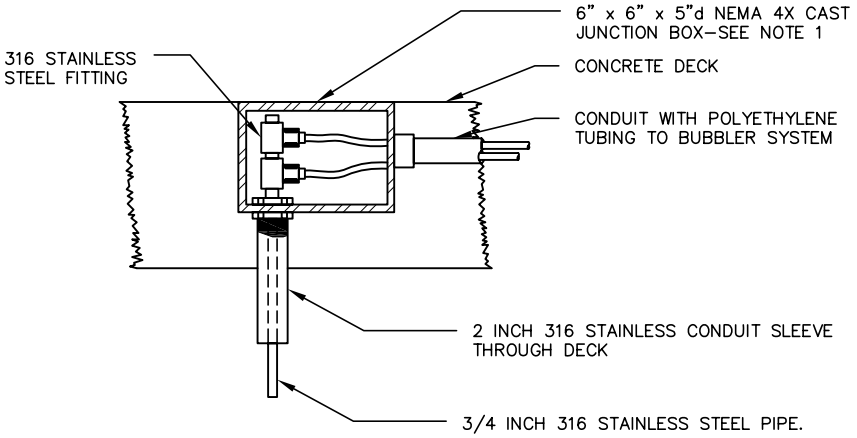
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

BUBBLER PANEL SCHEMATIC

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-31

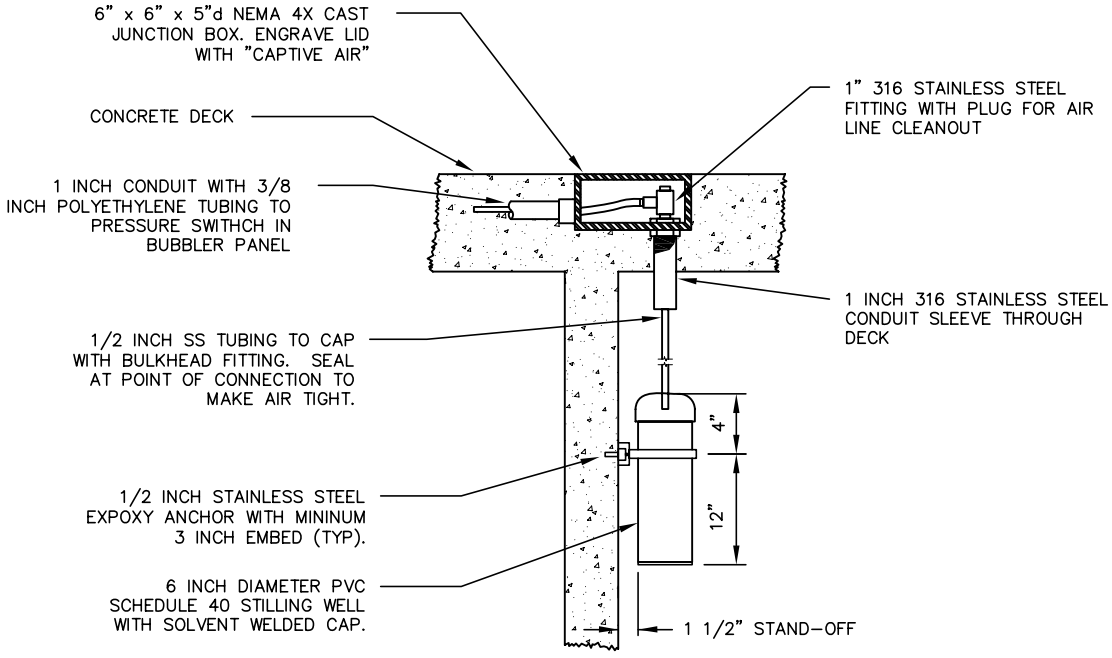


NOTE

1. EMBED J–BOX IN CONCRETE DECK ADJACENT TO WALL OF SUMP BELOW AND MOUNT DIP TUBE TO THE WALL WITH CLAMPS. NO BENDS OR ELBOWS ARE PREMITTED IN THE DIP TUBE IN ORDER TO ALLOW RODDING OF THE TUBE DURING CLEAN–OUT. ENGRAVE LID WITH "BUBBLER TUBE".

A – BUBBLER TUBE JUNCTION BOX

SCALE: NONE



B – CAPTIVE AIR TUBE MOUNTING DETAIL

SCALE: NONE

Mary K Snyder

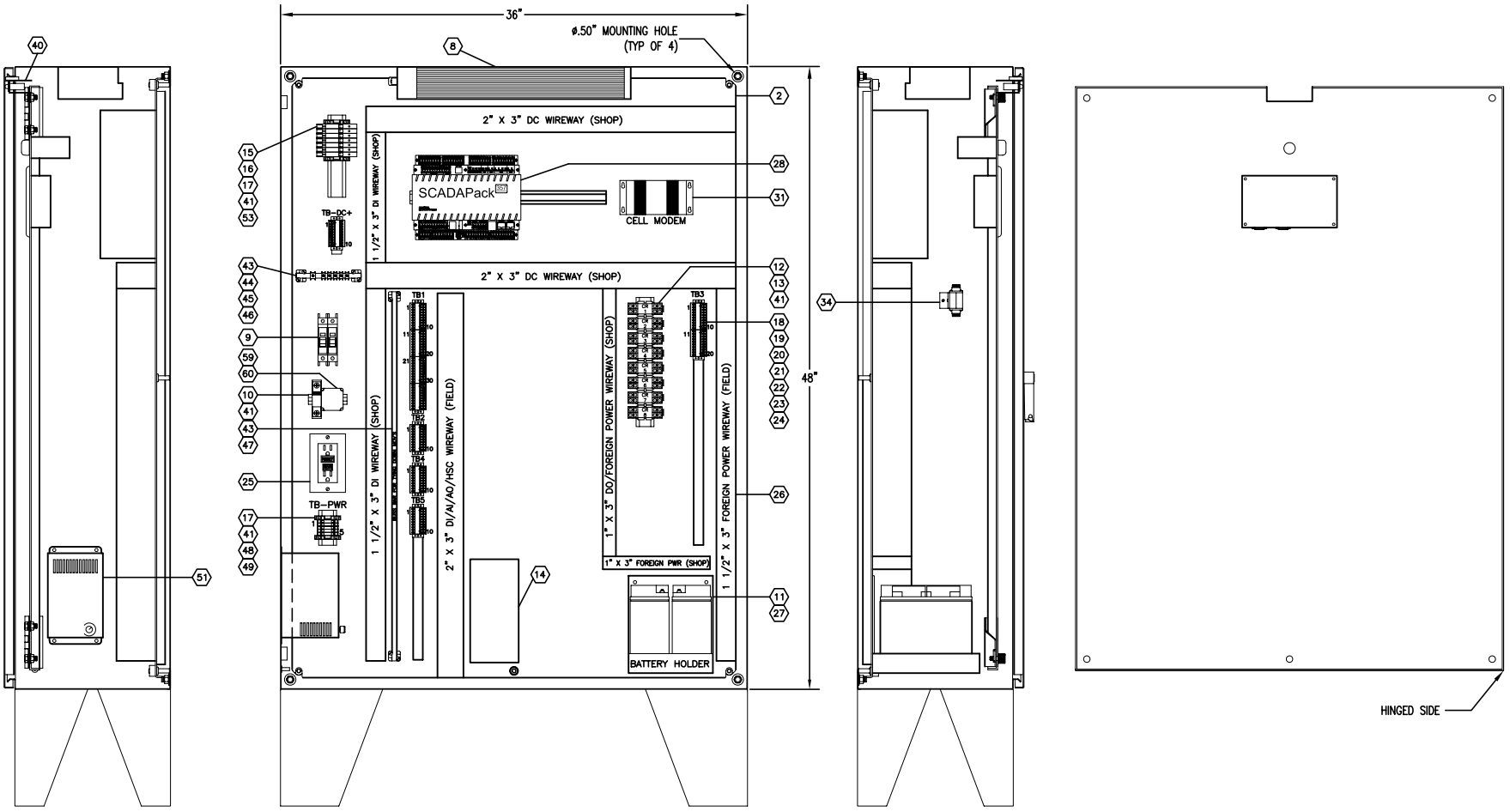
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

BUBBLER TUBE JUNCTION BOX & CAPTIVE AIR TUBE MOUNTING DETAILS

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6I-32



SECTION A–A

SECTION D–D (SHOWING BACK PAN)

SECTION B–B

REAR VIEW OF SWING PAN

NOTE:

SEE BILL OF MATERIALS SHEET FOR NUMBERED ITEMS.

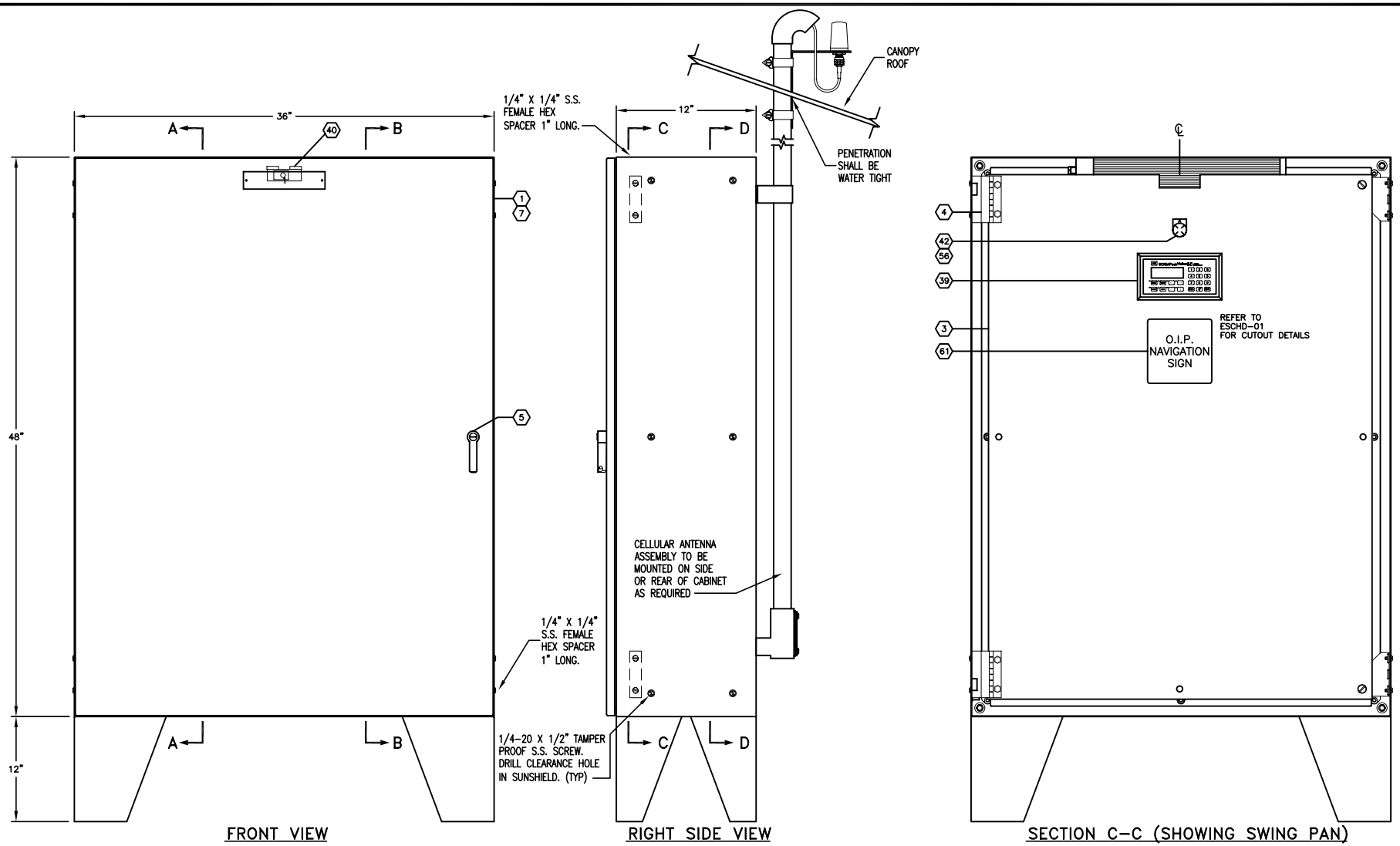
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL RTU LAYOUT DETAIL

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-33



NOTE:

SEE BILL OF MATERIALS SHEET FOR NUMBERED ITEMS.

Mary K Snyder

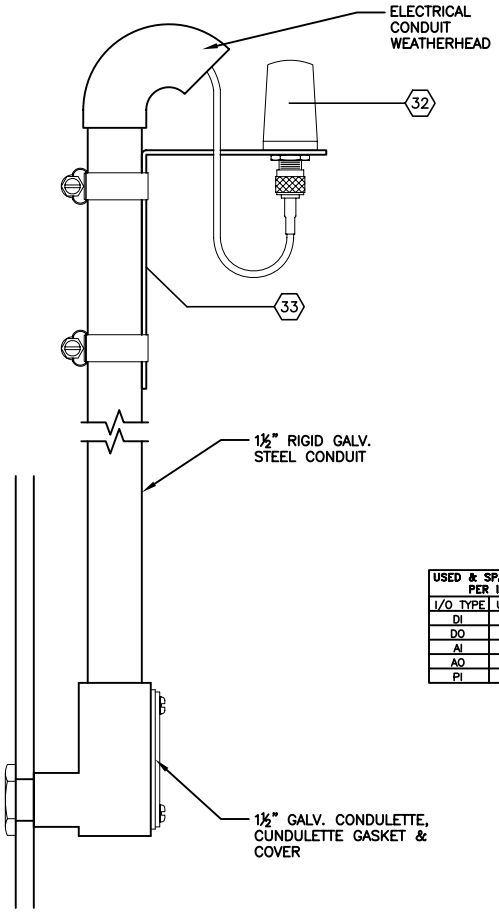
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL RTU ELEVATION VIEW

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-34



USED & SPARE TERMINALS PER I/O TYPE		
I/O TYPE	USED	SPARE
DI	20	20
DO	6	14
AI	4	6
AO	N/A	N/A
PI	N/A	N/A

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MFR	PART NO.
1	1	ENCLOSURE, 48" X 36" X 12"	HOFFMAN	C-SD483612
2	1	BACK PAN, 46 13/64" X 34 13/64"	HOFFMAN	C-P4836
3	1	SWING PAN, 45" X 33"	HOFFMAN	A-48P36
4	1	NEMA SWING OUT PANEL KIT	HOFFMAN	A-NADFK
5	1	PADLOCK HANDLE	HOFFMAN	C-WHPTO
6	A/R	14 GA. STEEL SUNSHIELD	SPECIAL	-----
7	2	STAINLESS STEEL HINGE PIN	HOFFMAN	64232-002
8	1	FLUORESCENT LIGHT	HOFFMAN	A-LF16M18
9	2	CIRCUIT BREAKER, 15 AMP	WESTINGHOUSE	QC1015
10	1	SURGE PROTECTOR	ENTRELEC	025 004.14
11	2	BATTERY	GNB	SP12V17F2
12	16	2PDT RELAY, 24VDC	IDEC	RH2B-UL-24VDC
13	16	RELAY BASE	IDEC	SH2B-05
14	1	POWER SUPPLY, 24VDC	TECHNOLOGY DYNAMICS	TCP-24-17 LVBD
15	7	FUSE BLOCK	ALLEN BRADLEY	1492-H6
16	1	FUSE BLOCK END SECTION	ALLEN BRADLEY	1492-N37
17	4	END ANCHOR	ALLEN BRADLEY	1492-EA35
18	8	PLUG IN, FREE-HANGING (PLUG), 10 TERMINALS PER PLUG	PHOENIX	1757093
19	40	CODING PROFILE (PLUG KEY), AVERAGE OF 5 PER PLUG	PHOENIX	1734634
20	40	CODING ELEMENT (HEADER KEY), AVERAGE OF 5 PER HEADER	PHOENIX	1734401
21	A/R	RAIL, NS15 (PERFORATED)	PHOENIX	1401682
22	10	END BRACKET	PHOENIX	1401637
23	8	PLUG-IN CONNECTION (HEADER), 10 TERMINALS PER HEADER	PHOENIX	1765030
24	A/R	DECADE MARKER CARDS (25 DECADES PER CARD)	PHOENIX	1401213
25	1	GFI RECEPTACLE W/PLATE & BOX	HUBBELL	GF5252IA
26	A/R	WIREWAY	PANDUIT	TYPE "E"
27	1	BATTERY HOLDER	SPECIAL	-----
28	1	SCADAPACK 357	CONTROL MICROSYSTEMS	P357
29	1	VISION 50	CONTROL MICROSYSTEMS	297305
30	2	DC INPUT MODULE	CONTROL MICROSYSTEMS	297237
31	2	AIRLINK RAVEN-X	AIRLINK	HSDPA
32	1	ANTENEX TRI-BAND	ANTENEX	TRAB 20G / 1710 3P
33	5	ANTENA BRACKET	LARSEN	FB3 BRACKET
34	1	SURGE ARRESTOR	ALTELEICON	AL-NFNFB-2

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	MFR	PART NO.
35				
36				
37				
38				
39				
40	1	INTRUSION SWITCH	HOFFMAN	A-LFSWD
41	A/R	DIN RAIL	IBOCO	OMEGA 3A
42	1	PILOT LIGHT FOR STATION READY	ALLEN BRADLEY	800EP-PM3D3G
43	A/R	BUSS BAR (TYPE NLS-CU 3/10)	PHOENIX	0402174
44	A/R	SUPPORT BLOCK (TYPE AB/SS)	PHOENIX	0404428
45	A/R	CONNECTING TERMINAL BLOCK (TYPE AK4)	PHOENIX	0404017
46	1	CONNECTING TERMINAL BLOCK (TYPE AK16)	PHOENIX	0404033
47	A/R	MOV'S (SERIES 10, TYPE D)	PANASONIC	ERZ-V10-D470
48	5	TERMINAL BLOCK	ALLEN BRADLEY	1492-W4
49	1	END SECTION	ALLEN BRADLEY	1492-EB3
50				
51	1	ELECTRIC HEATER	HOFFMAN	D-AH4001B
52				
53	7	TIME DELAY FUSE (7 AMP)	BUSS	MDL-7
54				
55				
56	1	30 X 40 mm LEGEND PLATE	ALLEN BRADLEY	800E-34BE100
57	1	MOUNTING FOOT KIT	HOFFMAN	C-MFKSS
58				
59	1	RELAY	OMRON	MK2PN-5 OR EQUIV.
60	1	RELAY BASE	IDEC	SR2P-05
61	1	O.I.P. NAVIGATION SIGN	SPECIAL	-----

NAMEPLATE SCHEDULE

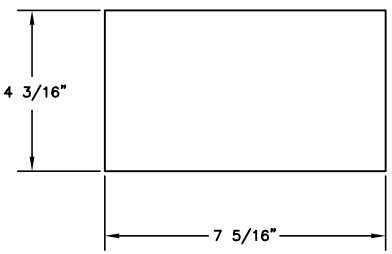
NO.	QTY	1ST LINE INSCRIPTION	2ND LINE INSCRIPTION	TYPE	LETTER SIZE	SIZE
1	1	RTU SITE XXXX	SITE NAME	BLK W/ WHT LETTERS	1/2"	1 1/2" X 7"

LEGEND PLATE SCHEDULE

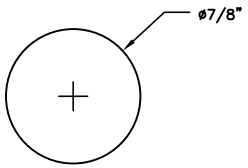
LTR.	QTY	1ST LINE INSCRIPTION
A	1	STATION READY

NOTE:

NAMEPLATE SHALL BE MOUNTED WITH 4-40 STAINLESS STEEL SCREWS.



OPERATOR INTERFACE CUTOUT DETAIL



STATION READY PILOT LIGHT CUTOUT DETAIL

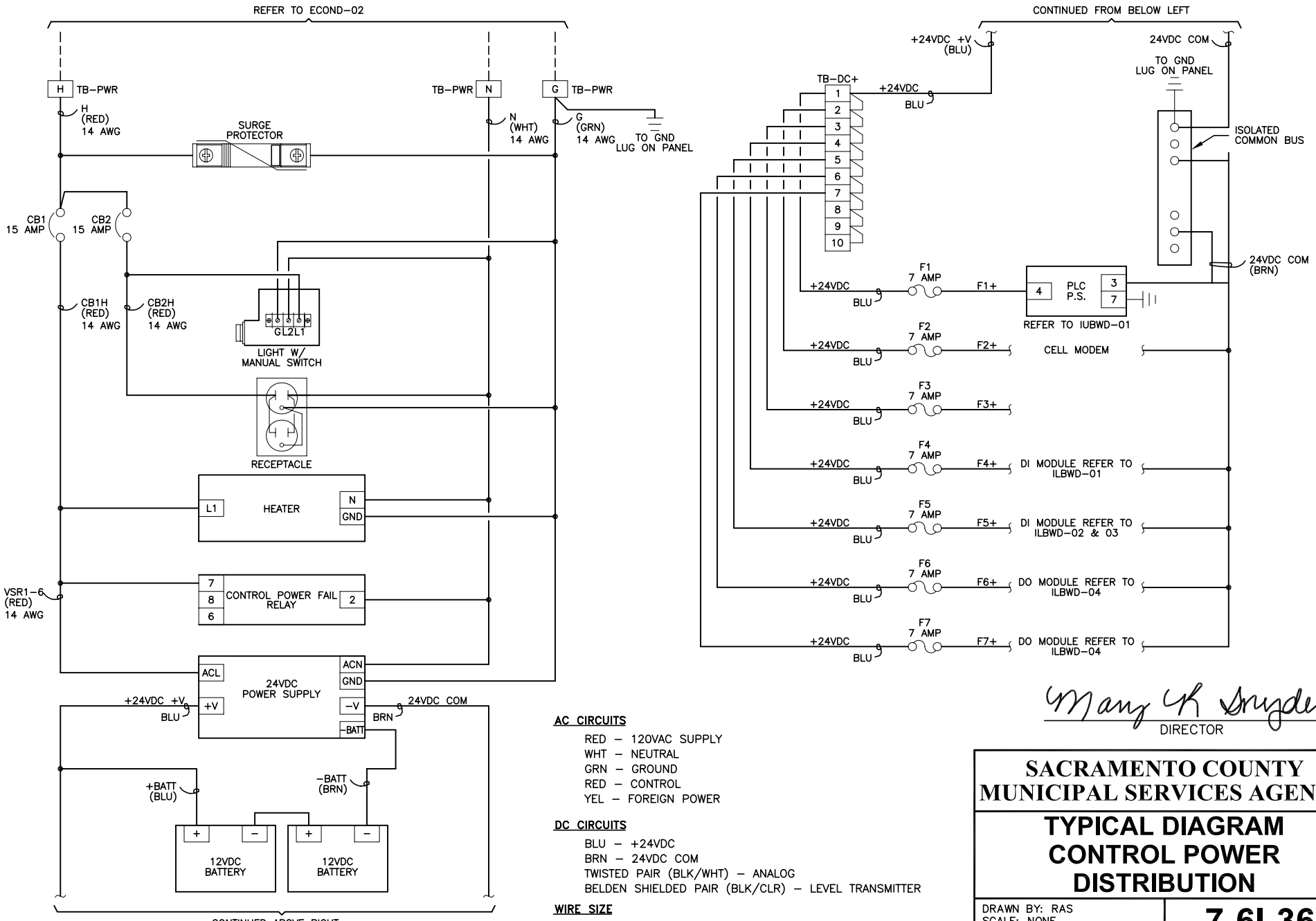
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

TYPICAL DETAILS, BILL OF MATERIALS & NAMEPLATE SCHEDULE

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-35



AC CIRCUITS

RED – 120VAC SUPPLY
WHT – NEUTRAL
GRN – GROUND
RED – CONTROL
YEL – FOREIGN POWER

DC CIRCUITS

BLU – +24VDC
BRN – 24VDC COM
TWISTED PAIR (BLK/WHT) – ANALOG
BELDEN SHIELDED PAIR (BLK/CLR) – LEVEL TRANSMITTER

WIRE SIZE

ALL WIRE SHALL BE #16 AWG UNLESS OTHERWISE NOTED.

Mary K Snyder
DIRECTOR

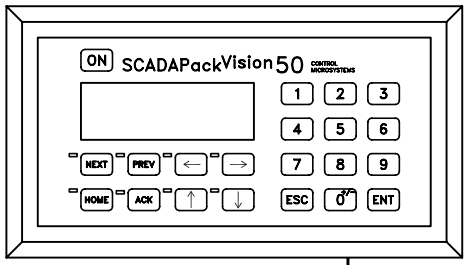
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL DIAGRAM CONTROL POWER DISTRIBUTION

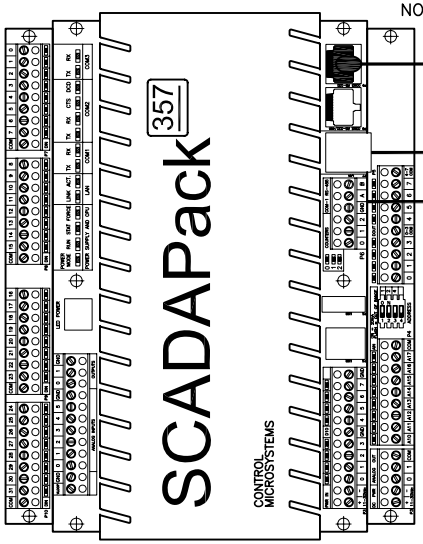
DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-36

CONTROL MICROSYSTEMS
SCADAPACK VISION 50
OPERATOR INTERFACE UNIT

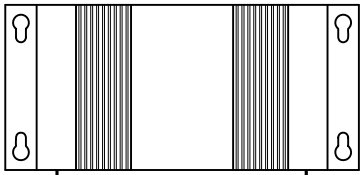


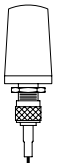
NOTE:
P6 REMOVED FROM LOWER
BOARD FOR CLARIFICACTION



ETHERNET CABLE

AIRLINK CELLULAR MODEM
MODEL# NSPDA





POWER
MONITOR

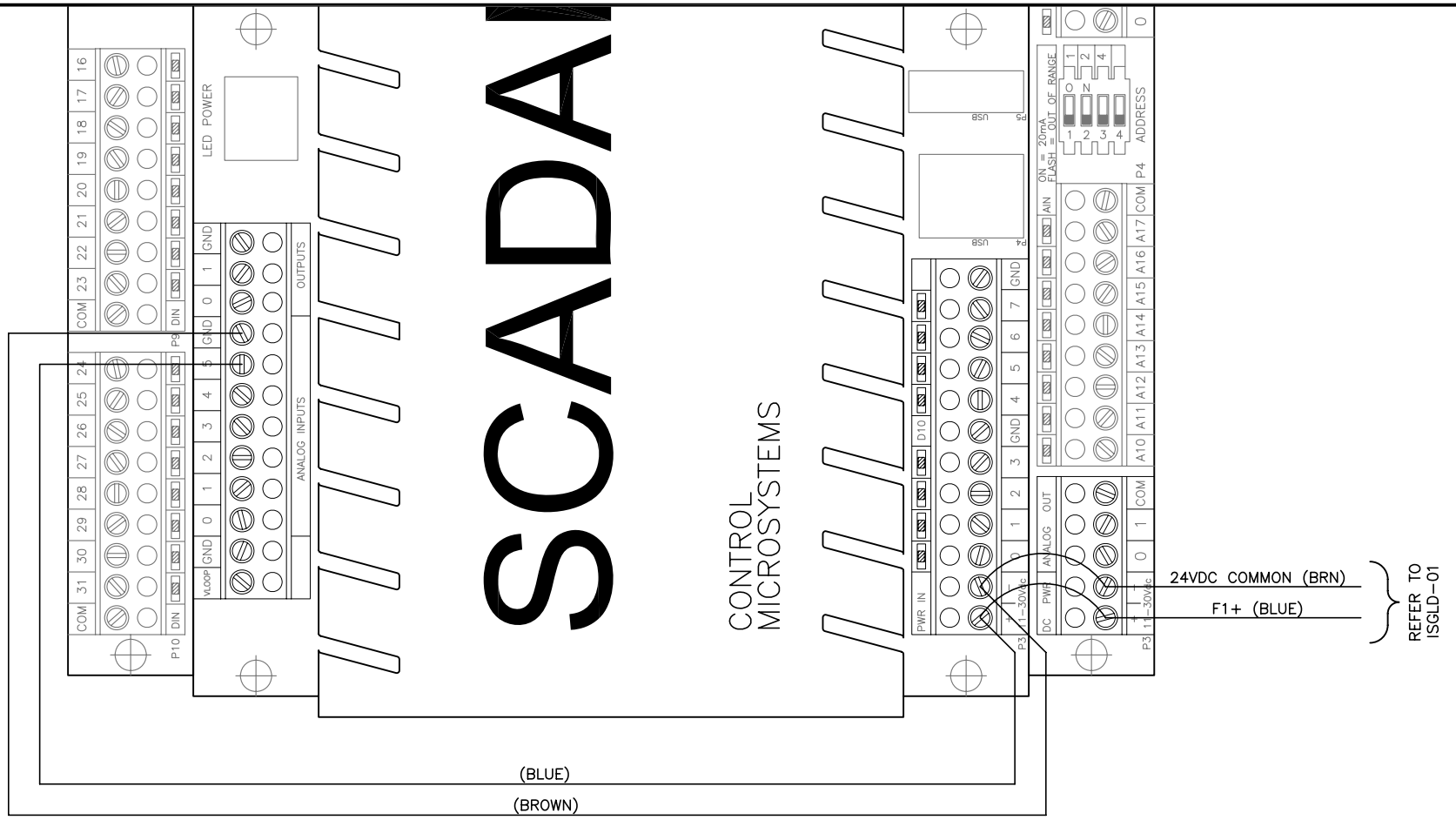
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL RTU PLC LAYOUT

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-37



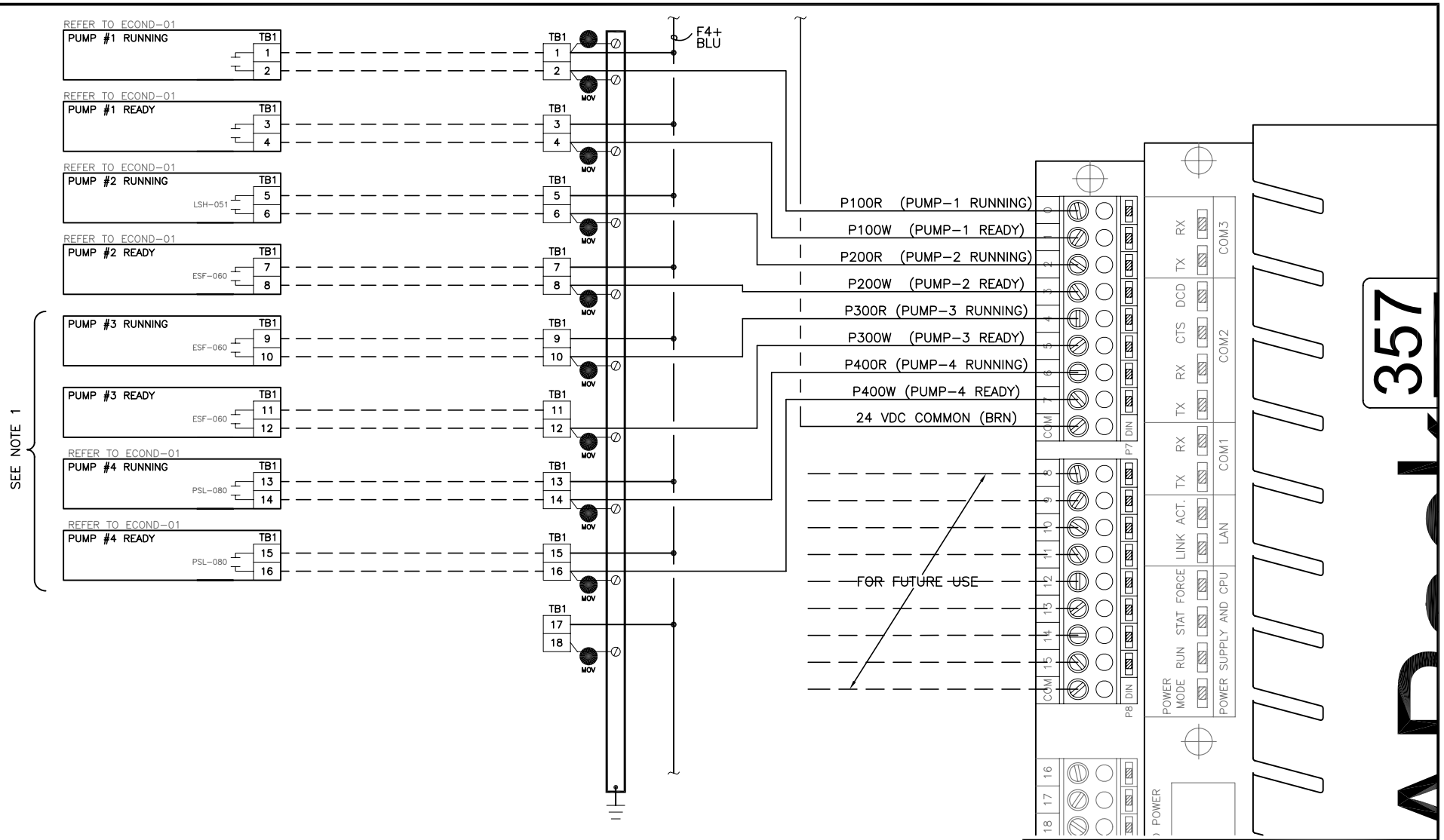
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL UPPER BOARD WIRING DIAGRAM (POWER CONNECTIONS)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-38



NOTES:

1. NUMBER OF PUMPS: AS NEEDED

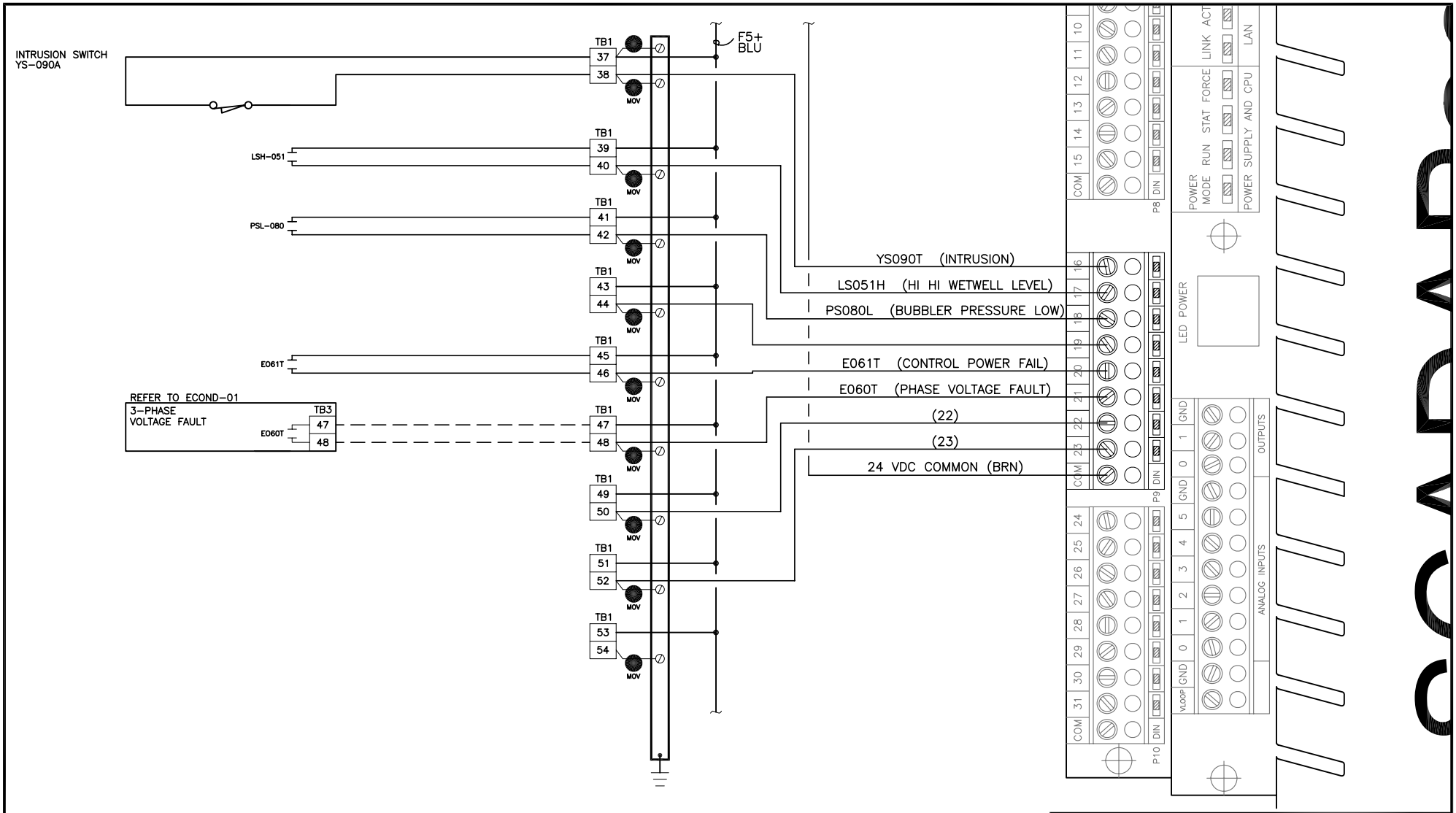
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL LOWER BOARD WIRING DIAGRAM (DI 0-7)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-39



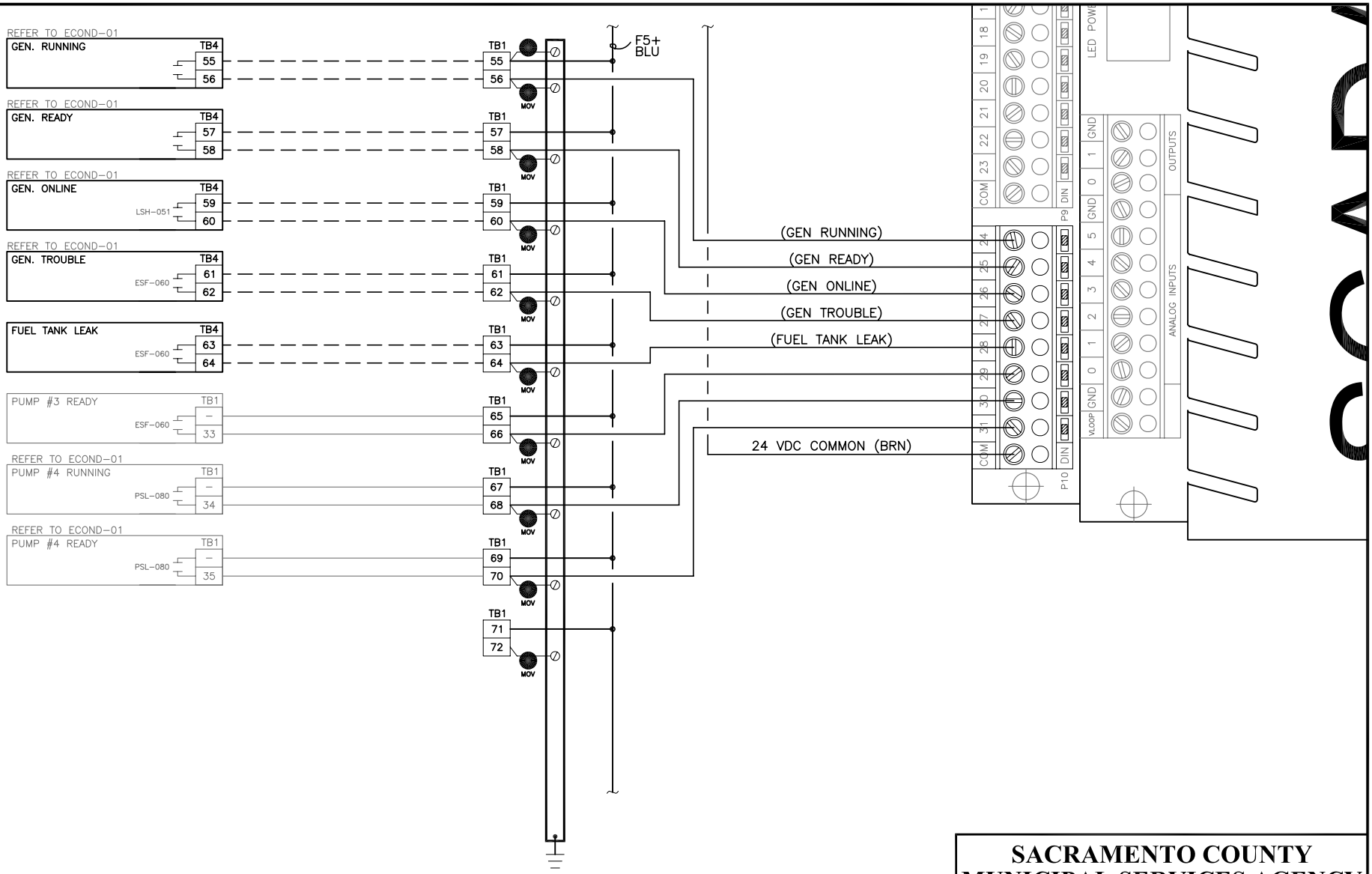
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL LOWER BOARD WIRING DIAGRAM (DI 16-23)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-40



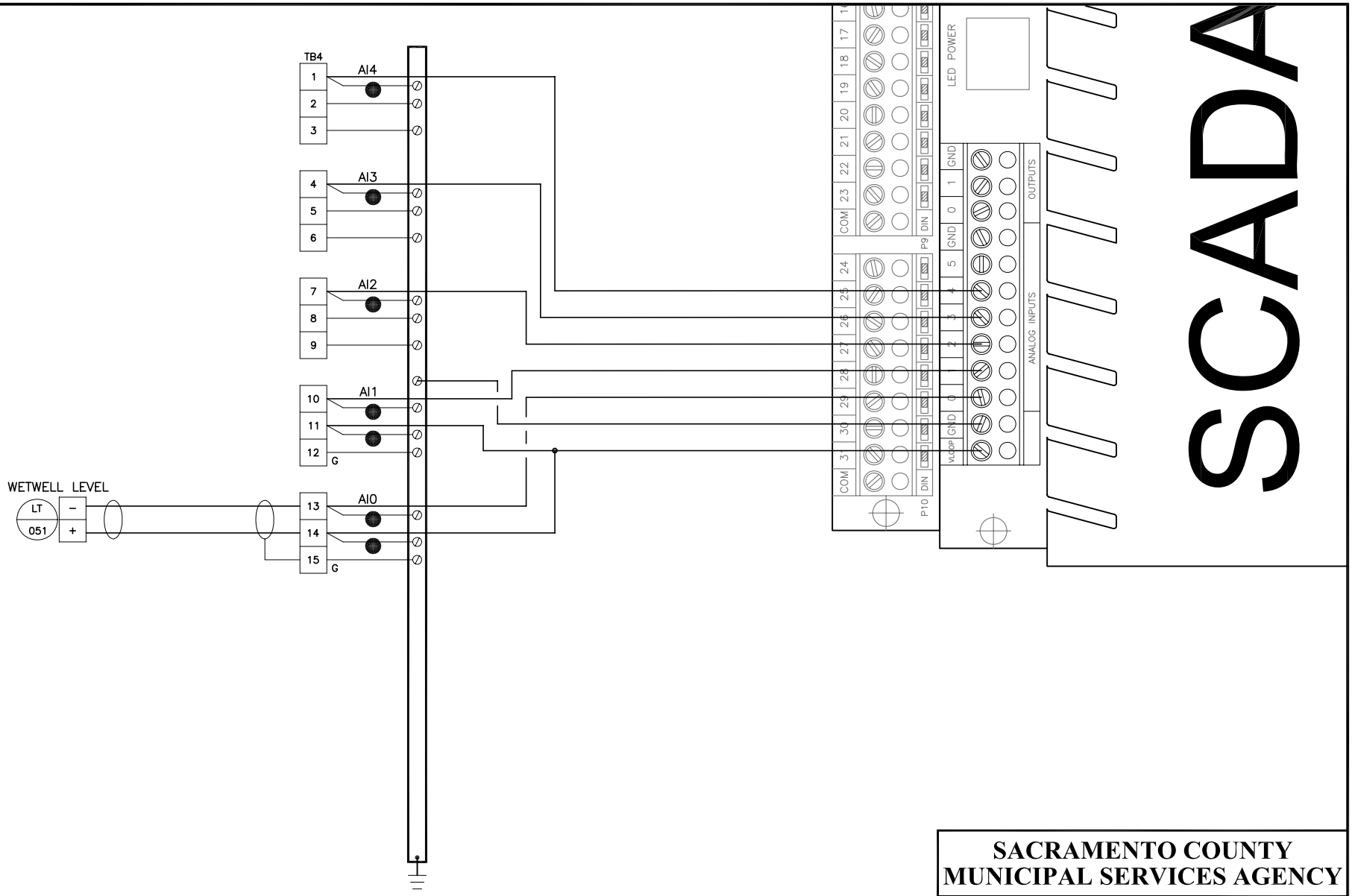
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL LOWER BOARD WIRING DIAGRAM (DI 24-36)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-41



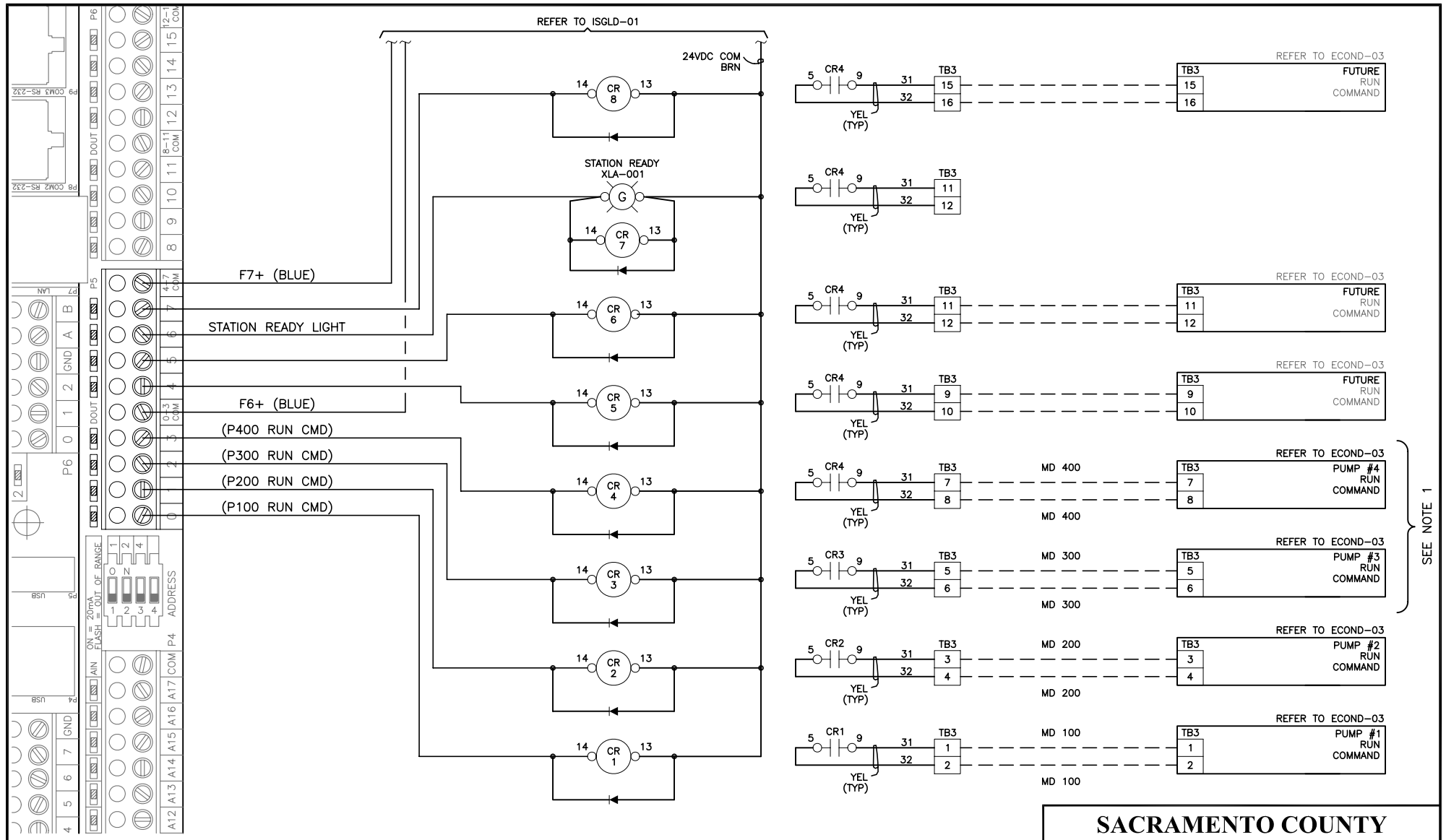
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL LOWER BOARD WIRING DIAGRAM (AI)

DRAWN BY: RAS
SCALE: NONE
DATE: 10/07

7-6I-42

Mary K Snyder
DIRECTOR



NOTES:

1. NUMBER OF PUMPS: AS NEEDED

Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL LOWER BOARD WIRING DIAGRAM (DO 0-7)

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-6I-43

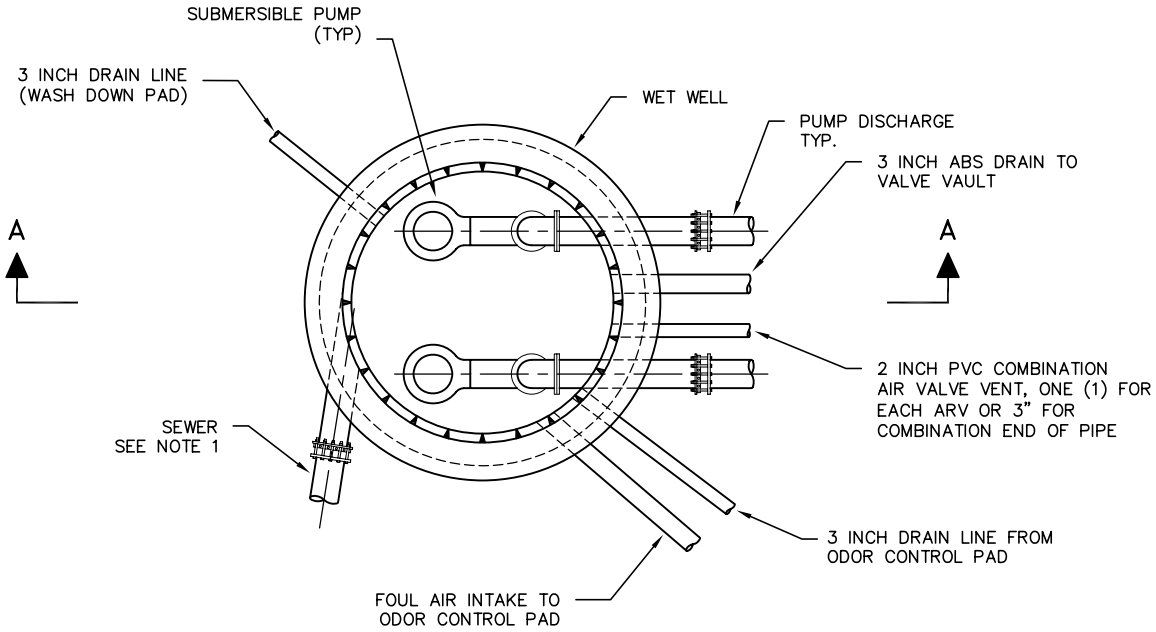
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPICAL RS 482 UPPER BOARD WIRING DIAGRAM

DRAWN BY: RAS
SCALE: NONE
DATE: 11/07

7-61-44

Mary K Snyder
DIRECTOR



℄ WET WELL

PLAN VIEW

NOTES:

1. PLACE INLET SEWER PIPE SO THAT PIPE IS TANGENTIAL TO WET WELL WALL.

Mary K Snyder

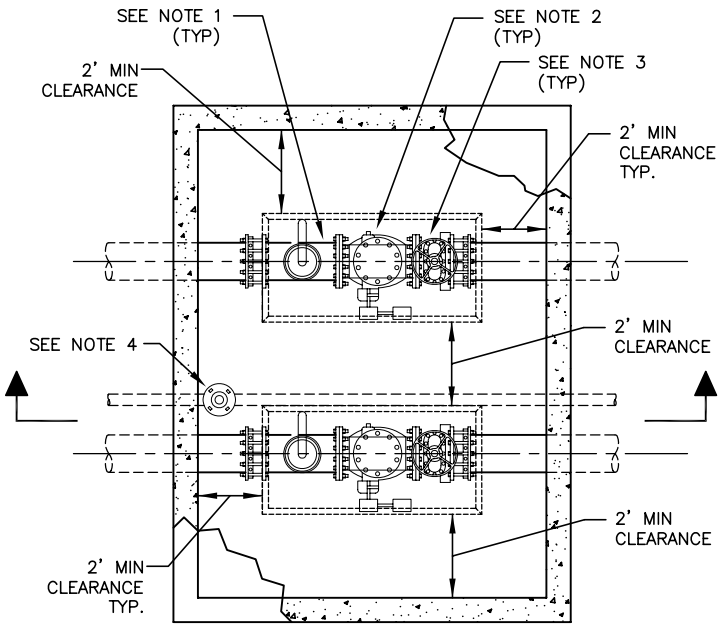
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

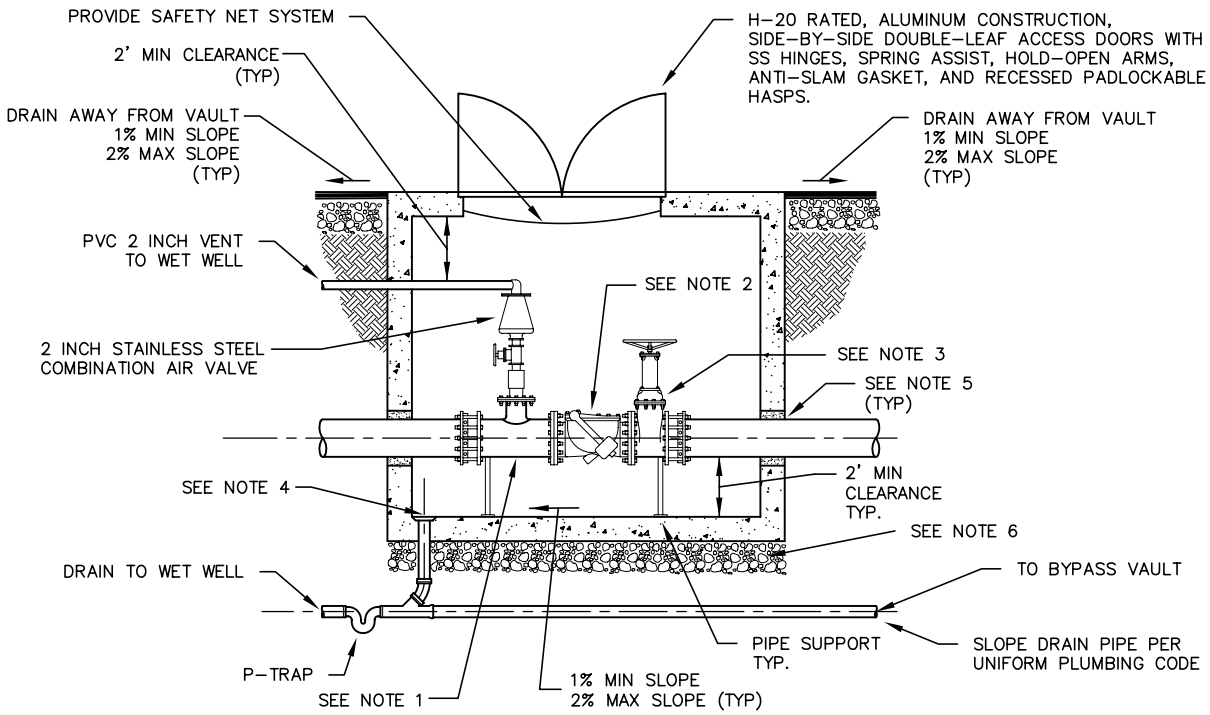
CIRCULAR
WET WELL

DRAWN BY: PL
SCALE: NONE
DATE: 08/07

7-6M-20



PLAN VIEW



SECTION

NOTES:

1. AWWA C110 REDUCING TEE, FLGxFLGxFLG
2. AWWA C508 FLGxFLG SWING CHECK VALVE WITH LEVER AND COUNTERWEIGHT
3. AWWA C500 FLGxFLG DOUBLE DISC GATE VALVE WITH NRS AND HANDWHEEL
4. 3 INCH ø ABS DRAIN, LENGTH AS REQUIRED
5. PIPE PENETRATIONS SHALL BE BORED OR BLOCKED OUT AND SEALED WITH LINK-SEAL OR APPROVED EQUAL. OPENINGS SHALL BE ADDITIONALLY REINFORCED PER STRUCTURAL DRAWINGS.
6. AB THICKNESS SHALL BE PER GEOTECHNICAL RECOMMENDATION.

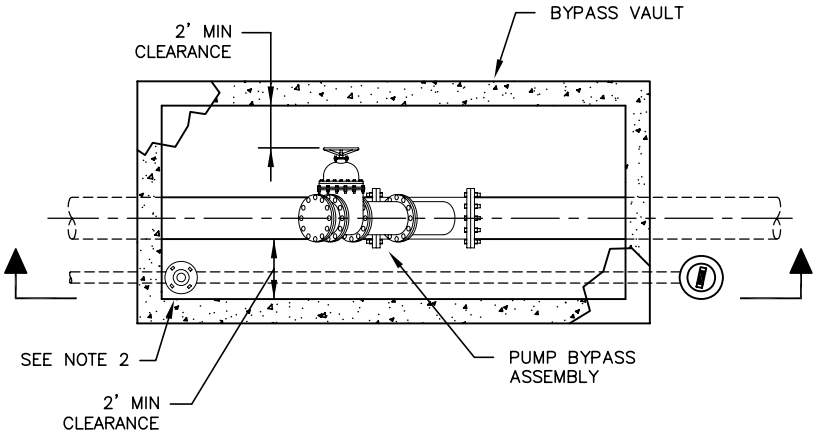
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

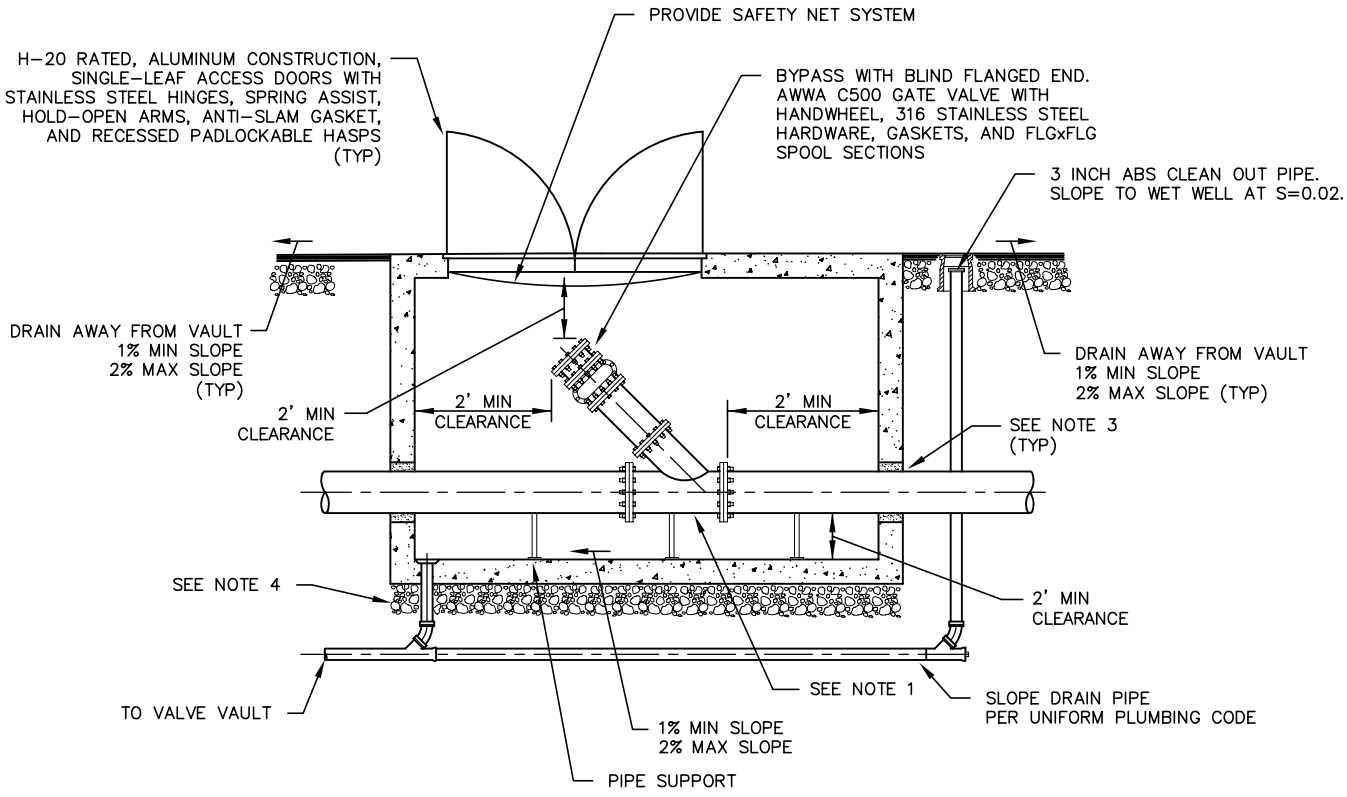
VALVE VAULT

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6M-30



PLAN VIEW



SECTION

NOTES:

1. AWWA C110 REDUCING WYE, FLGxFLGxFLG
2. 3 INCH ø ABS DRAIN, LENGTH AS REQUIRED
3. NOTED PIPE PENETRATIONS SHALL BE BORED OR BLOCKED OUT AND SEALED WITH LINK SEAL OR APPROVED EQUAL. OPENINGS SHALL BE ADDITIONALLY REINFORCED PER STRUCTURAL DRAWINGS
4. AB THICKNESS SHALL BE PER GEOTECHNICAL RECOMMENDATION.

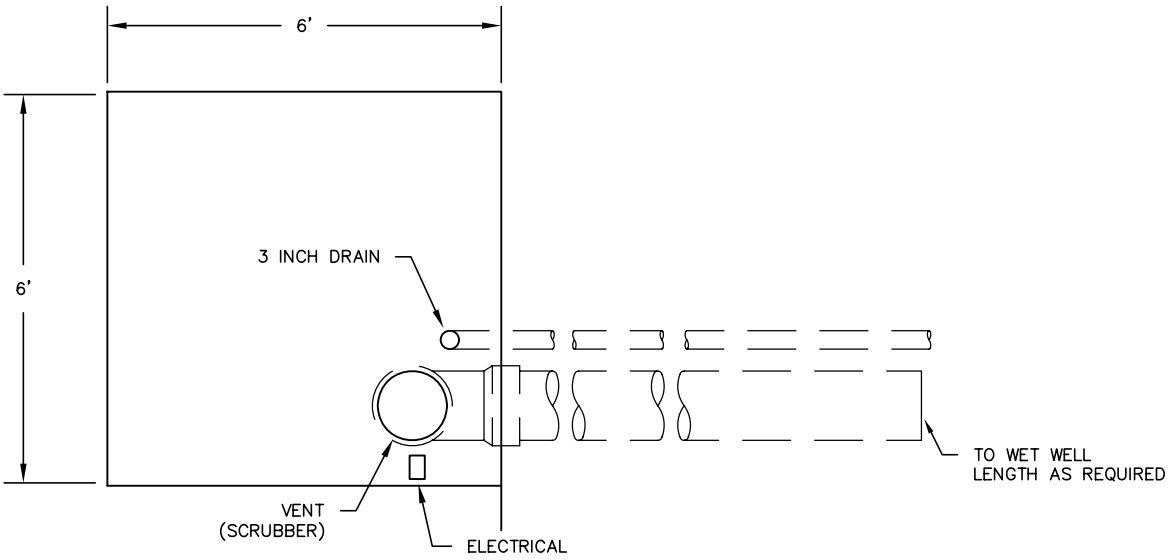
Mary K Snyder
DIRECTOR

SACRAMENTO COUNTY MUNICIPAL SERVICES AGENCY

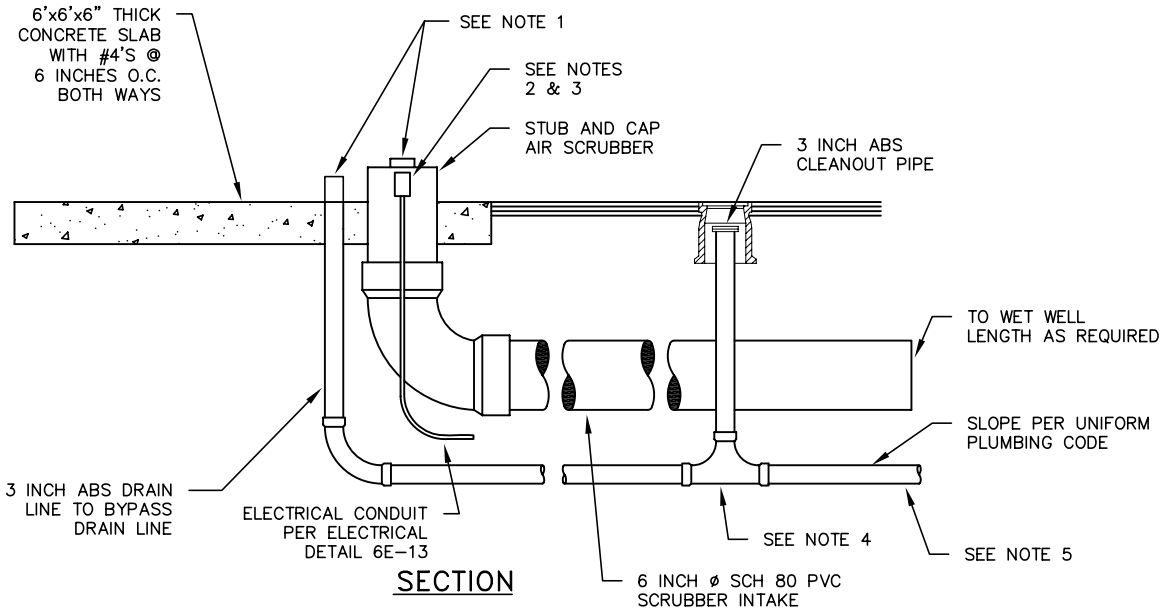
BYPASS VAULT

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

7-6M-40



PLAN VIEW



SECTION

NOTES:

1. STUB 6 INCH ABOVE FINAL GRADE.
2. STUB ELECTRICAL CONDUIT 1' ABOVE PAD.
3. PROVIDE PULL ROPE IN CONDUIT.
4. CLEANOUT TEE, TWO WAY ABS HUB.
5. CONNECT TO BYPASS DRAIN LINE.

Mary K Snyder
DIRECTOR

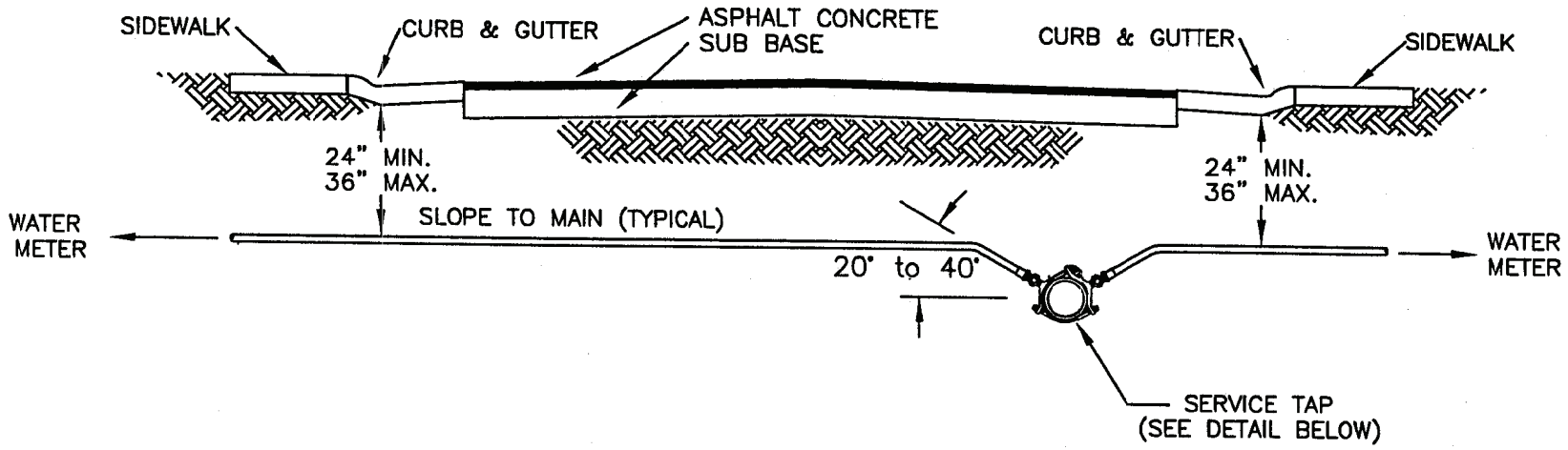
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

ODOR CONTROL PAD

DRAWN BY: PL
SCALE: NONE
DATE: 11/07

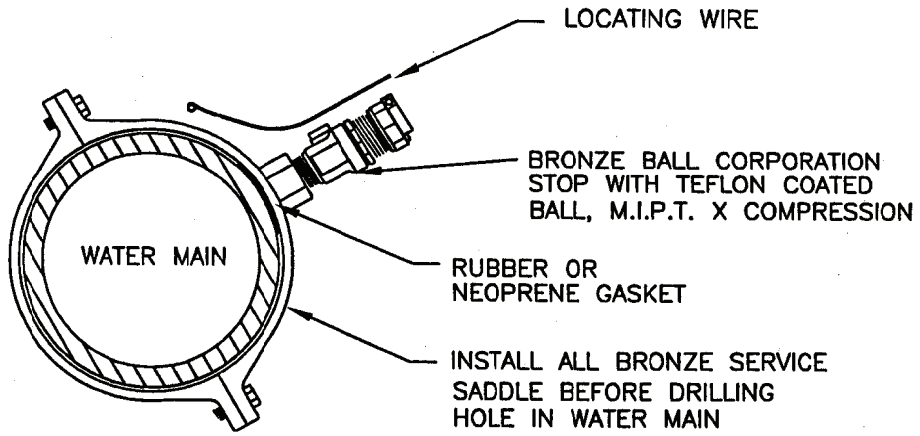
7-6M-50

DRAWING NUMBER	TITLE
8-1	1”-2” WATER SERVICE INSTALLATION (12/03)
8-2A	FIRE HYDRANT INSTALLATION WATER MAIN IN STREET (12/03)
8-2B	FIRE HYDRANT INSTALLATION WATER MAIN NOT IN ROADWAY (12/03)
8-3A	THRUST BLOCK BEARING AREA (12/03)
8-3B	PIPE RESTRAINED LENGTH (12/03)
8-4A	LOCATING WIRE FOR WATER MAINS AND SERVICES (12/03)
8-4B	LOCATING WIRE STATION (12/03)
8-5	VALVE BOX INSTALLATION AND OPERATING NUT EXTENSION (12/03)
8-6A	1” RESIDENTIAL METERED WATER SERVICE (3/05)
8-6B	1-1/2” OR 2” COMMERCIAL METERED WATER SERVICE (12/03)
8-6C	3” TO 6” WATER SERVICE & METER INSTALLATION (12/03)
8-6D	1” RESIDENTIAL WATER SERVICE POST MARKER (12/03)
8-7	FIRE PROTECTION DETAIL (12/07)
8-8A	REDUCED PRESSURE BACKFLOW PREVENTER 1” TO 2 (12/03)
8-8B	REDUCED PRESSURE BACKFLOW PREVENTER 3” AND LARGER (12/03)
8-8C	DOUBLE CHECK DETECTOR OR RP PRINCIPLE DETECTOR 6” AND LARGER (12/03)
8-9A	MAXIMUM DEFLECTION FOR DUCTILE IRON PIPE (12/03)
8-9B	MAXIMUM DEFLECTION FOR PVC PIPE (12/03)
8-10	UTILITY CROSSING (12/03)
8-11	UTILITY CROSSING UNDER EXISTING WATER MAIN (12/03)
8-12	TEMPORARY BLOW OFF ASSEMBLY (12/03)
8-13A	4” BLOW OFF ASSEMBLY AT END OF MAIN (12-03)
8-13B	4” BLOW OFF ASSEMBLY AT END OF CUL-DE-SAC (12/03)
8-13C	4” IN-LINE BLOW-OFF ASSEMBLY (12/03)
8-14A	1” COMBINATION AIR/VACUUM VALVE (12/03)
8-14B	2” COMBINATION AIR/VACUUM VALVE (12/03)
8-15	WATER MAIN CUT-IN (12/03)
8-16	RECYCLED WATER SIGN (12/03)
8-17	TRENCH DETAIL (12/03)
8-18	TRANSITION SLEEVE (12/03)
8-19	TYPICAL WELL SITE (12/03)



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

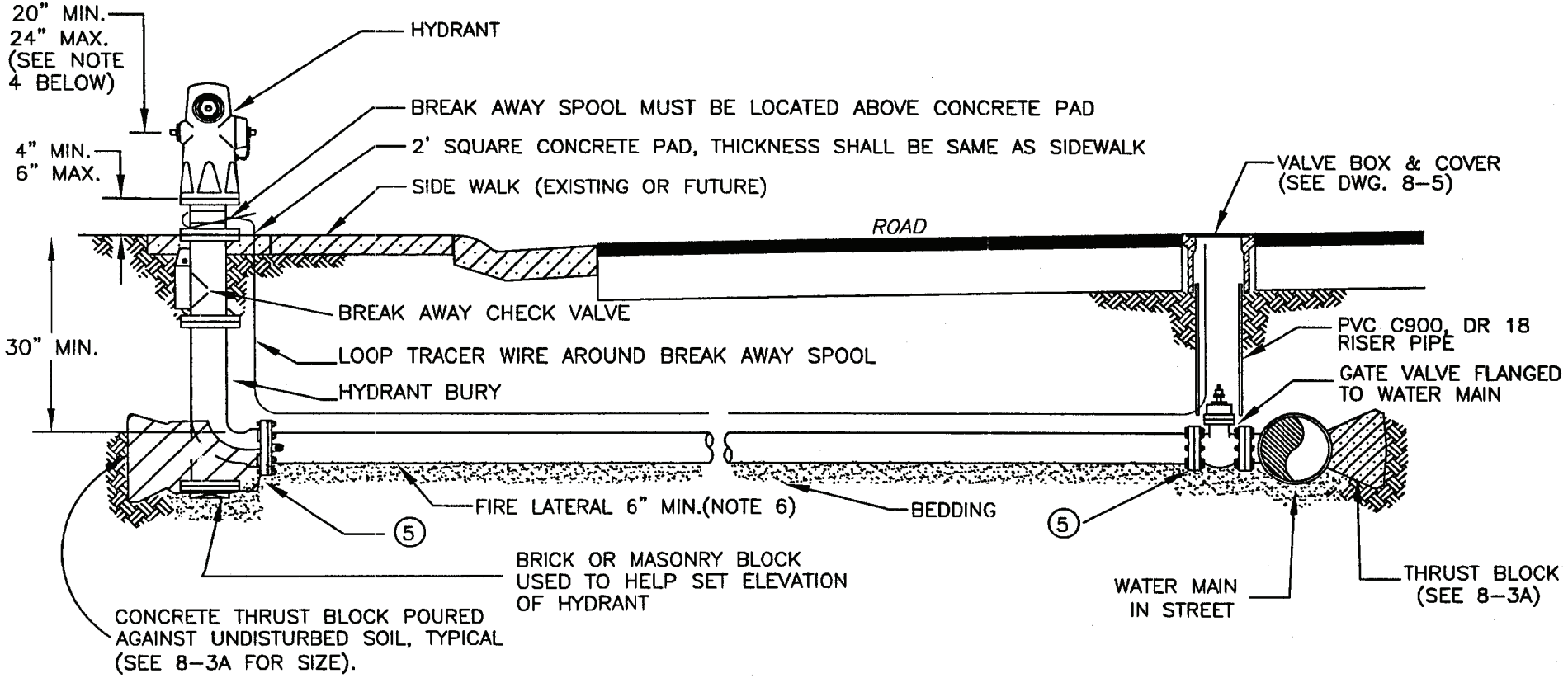
Keith DeVore

DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

1"-2" WATER SERVICE INSTALLATION

SCALE: NONE	8-1
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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

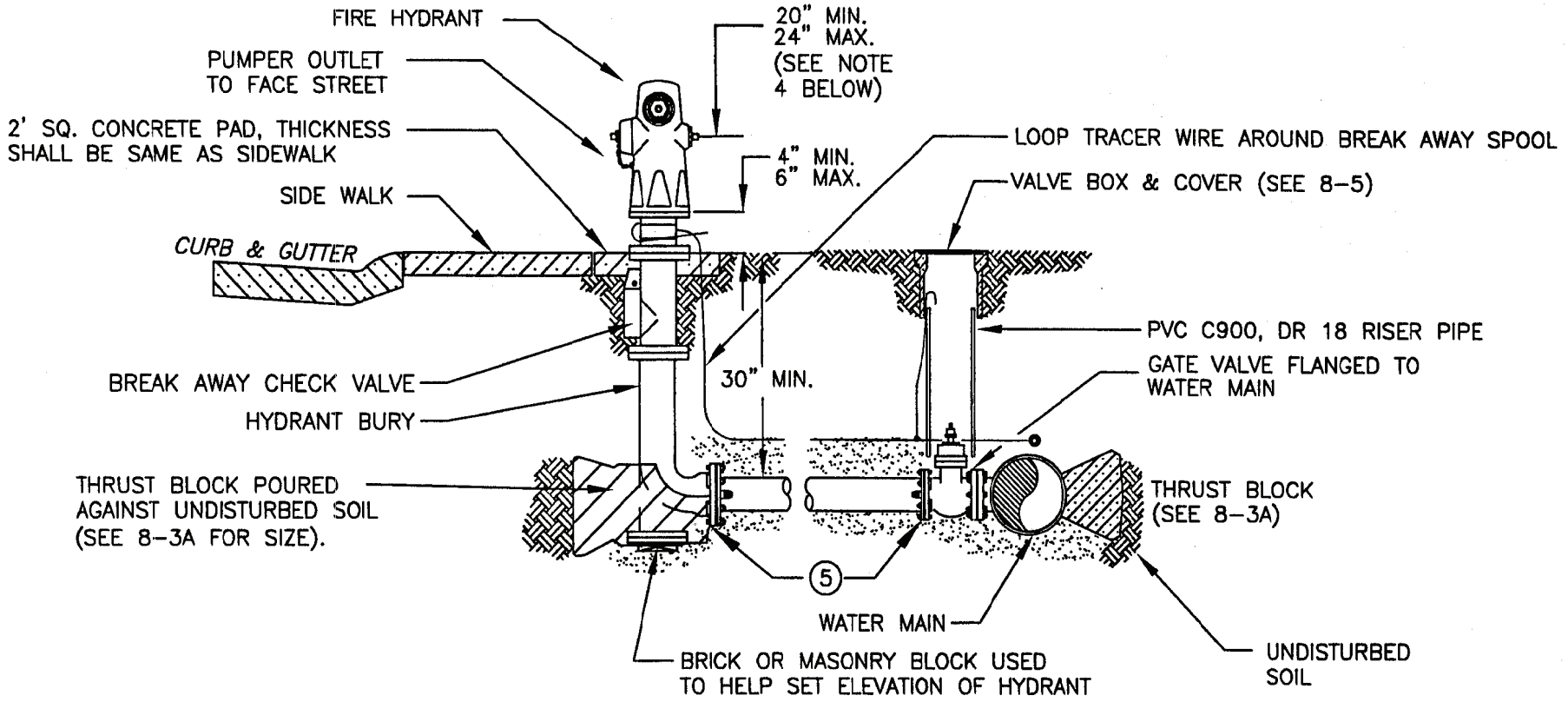
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

FIRE HYDRANT INSTALLATION

WATER MAIN IN STREET

SCALE: NONE
DATE: 12/03

8-2A



NOTES:

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DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

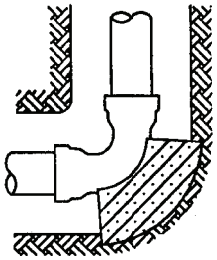
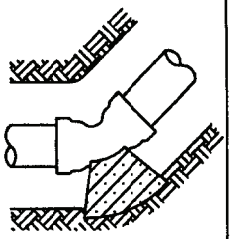
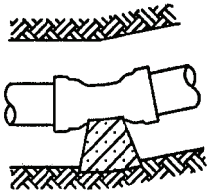
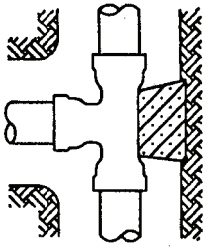
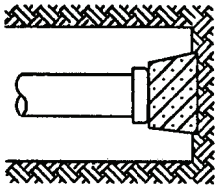
FIRE HYDRANT INSTALLATION

WATER MAIN NOT IN ROADWAY

SCALE: NONE
DATE: 12/03

8-2B

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						 SEE NOTE 5		
SIZE OF PIPE	4"	2	1	1	2	2	THRUST BLOCKS NOT ALLOWED. USE RESTRAINED JOINTS WITH RESTRAINED LENGTH PER 8-3B FOR "DEAD END".	
	6"	4	2	1	3	3		
	8"	7	4	2	5	5		
	10"	12	6	3	8	8		
	12"	16	10	5	12	12		

NOTES:

1. THRUST BLOCKS SHALL BE CONSTRUCTED OF CLASS "B" CONCRETE.
2. 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.
3. 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).
4. PIPE JOINTS SHALL BE KEPT CLEAR OF CONCRETE.
5. FOR DEAD ENDS, INSTALL 2" TEMPORARY BLOW OFF PER 8-12.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

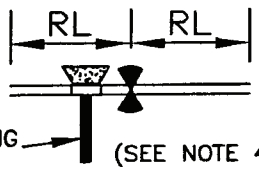
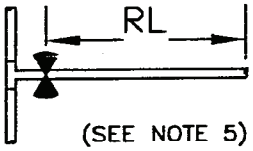
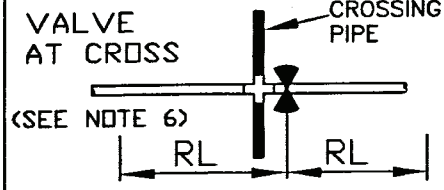
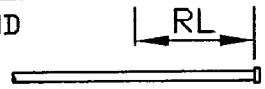
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

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 	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 		37	X	42	X	56	X	68	X	16	15	23	X	30	X	38	X
VALVE AT CROSS 	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.

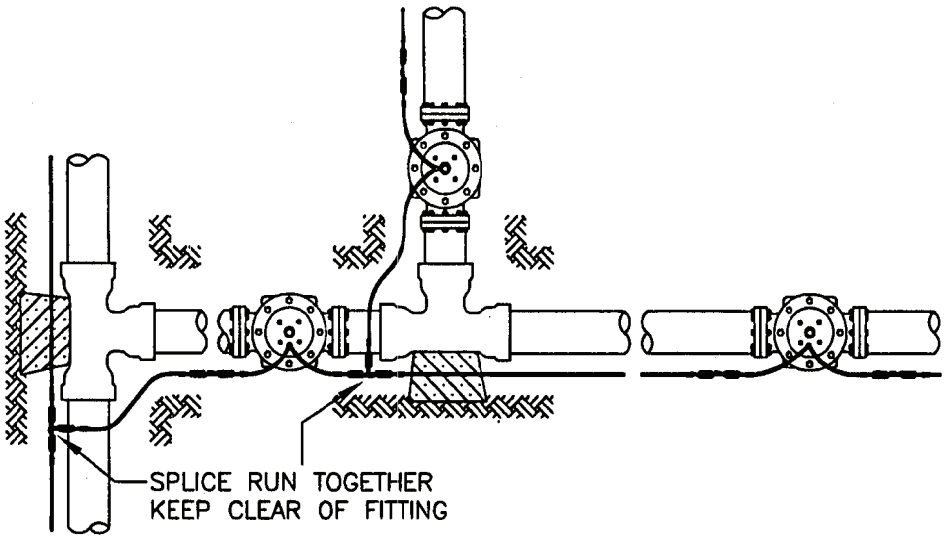
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

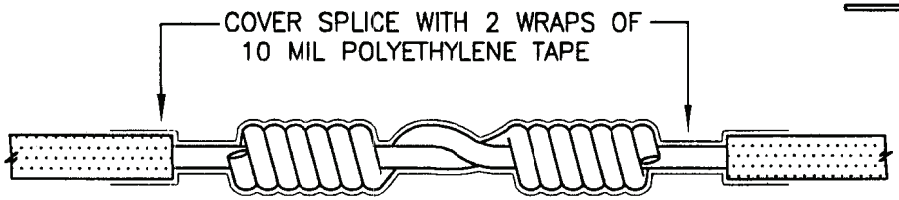
PIPE RESTRAINED LENGTH

SCALE: NONE
DATE: 12/03

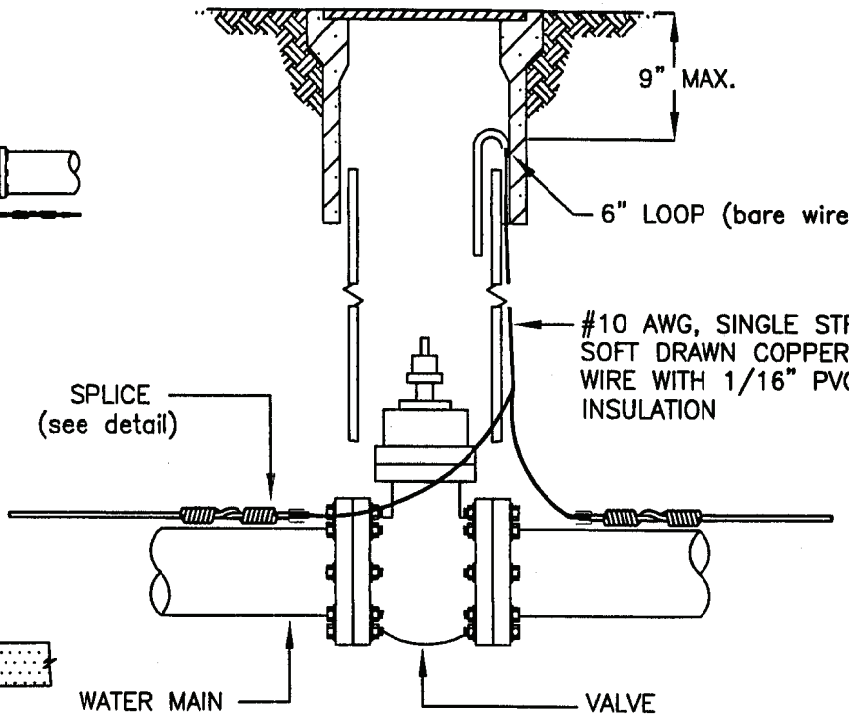
8-3B



TYPICAL LAYOUT



SPLICE 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.

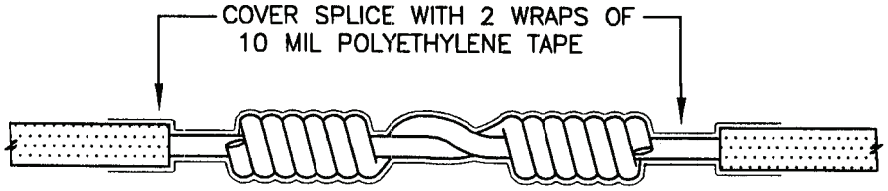
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

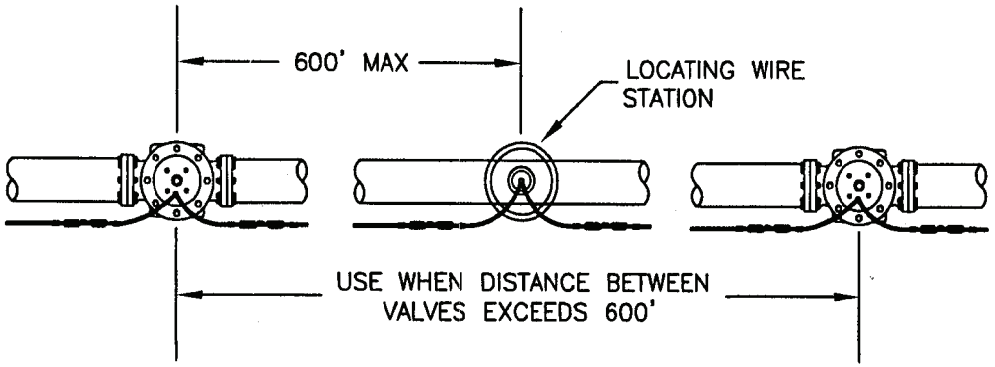
LOCATING WIRE FOR WATER MAINS AND SERVICES

SCALE: NONE
DATE: 12/03

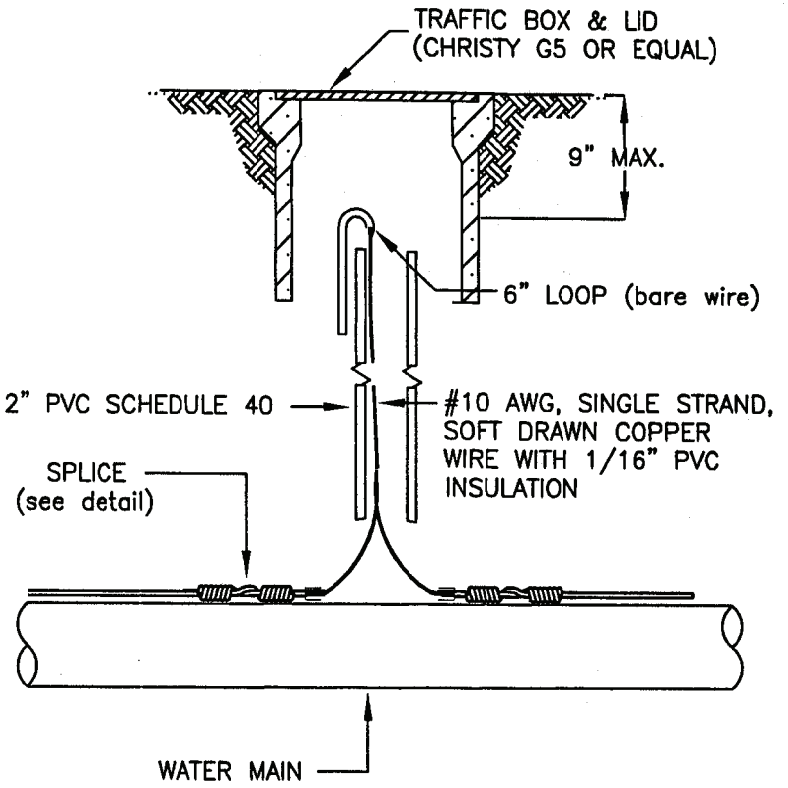
8-4A



SPLICE DETAIL



TYPICAL LAYOUT



VALVE DETAIL

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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.

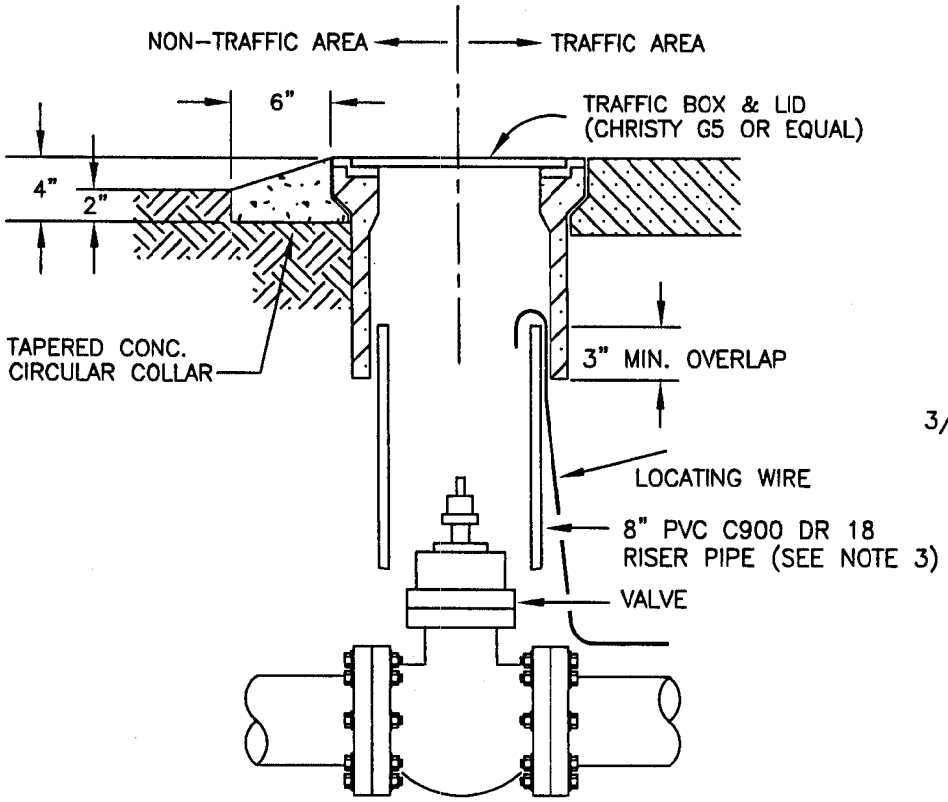
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

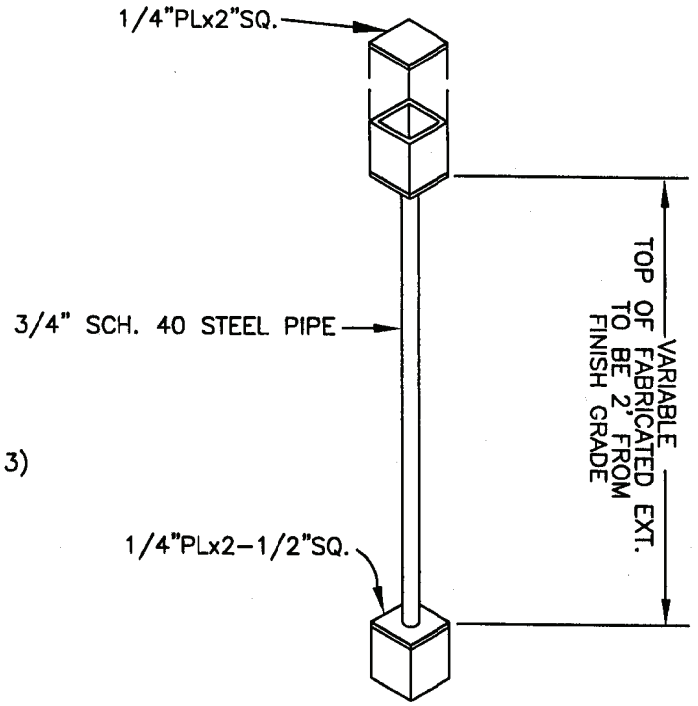
LOCATING WIRE STATION

SCALE: NONE
DATE: 12/03

8-4B



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. FOR RAW WATER ONLY: PAINT BOX INTERIOR & TOP 1 FT. OF RISER GREEN.
4. 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.

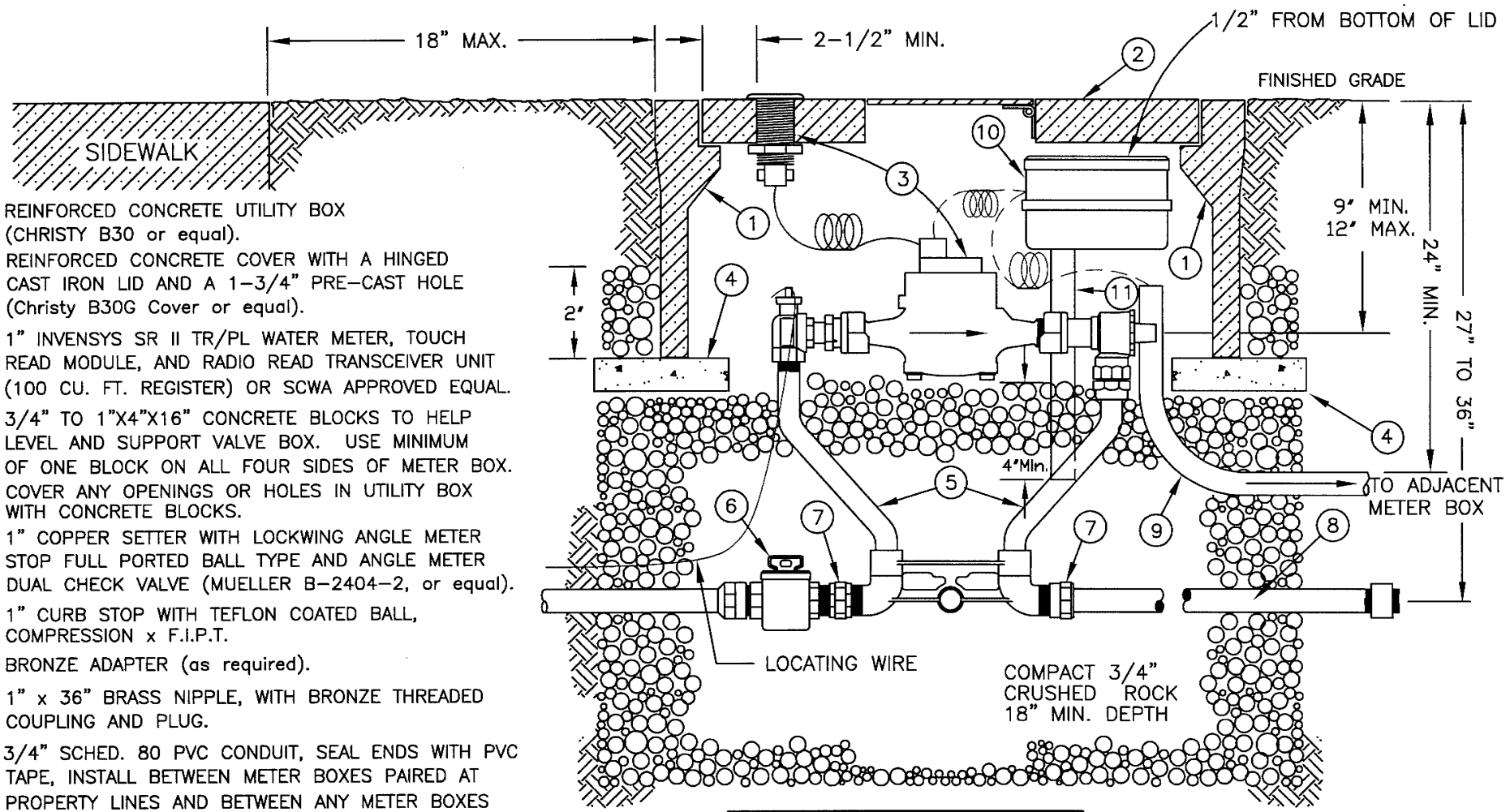
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES 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 TRANSCEIVER 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 TRANSCEIVER UNIT, INVENSYS MXU MODEL 505, TURN OVER TO SCWA FOR INSTALLATION BY SCWA. FURNISH ONE RTU PER METER.

(11) 1/2" EMT SUPPORT.

NOTE:
ALL BURIED METAL SHALL BE ENCASED WITH 8 MIL POLYETHYLENE SO THAT NO SOIL IS IN CONTACT WITH METAL.

METER BOX SHALL NOT BE LOCATED IN A DRIVEWAY UNDER ANY CIRCUMSTANCE

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

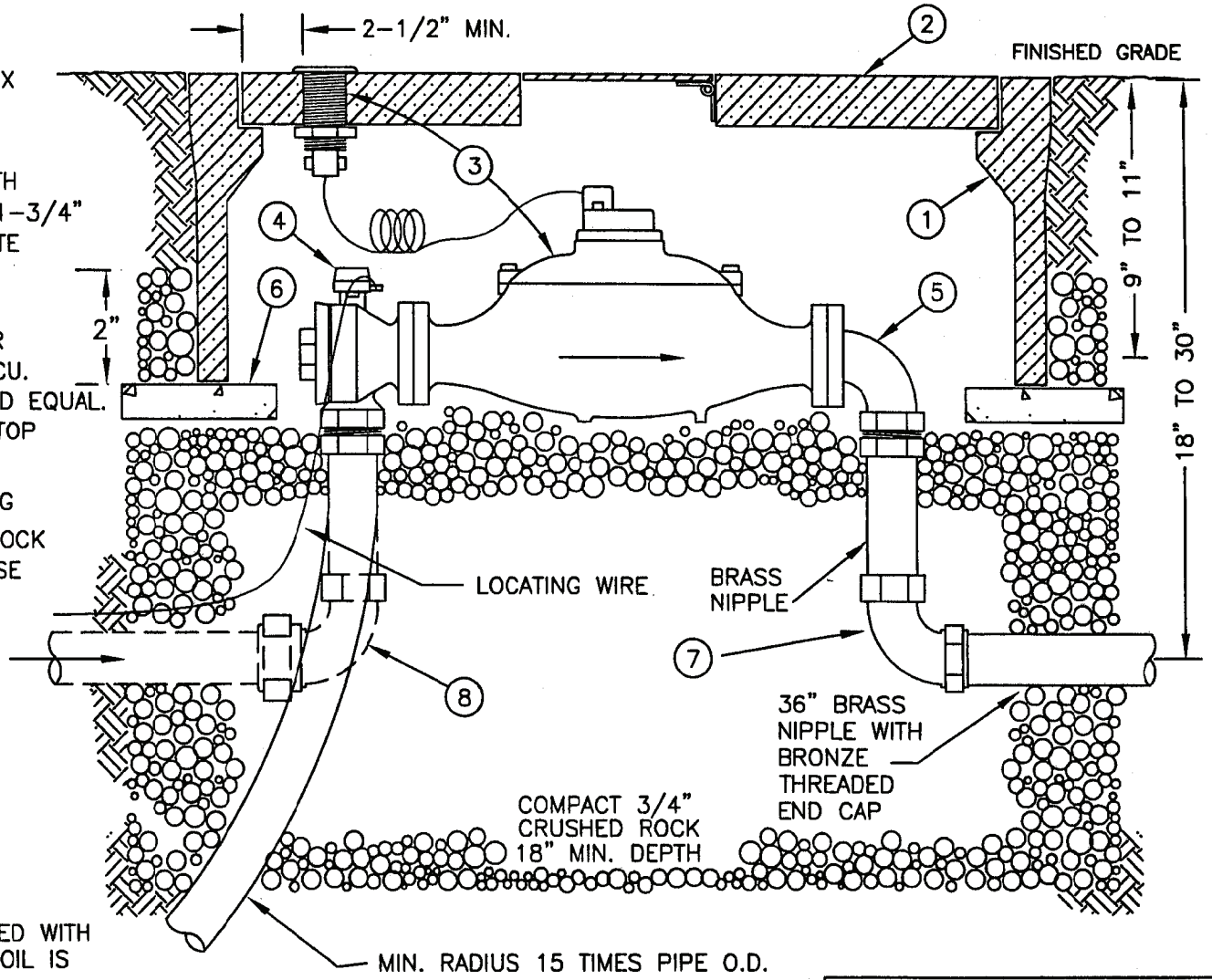
1" RESIDENTIAL METERED WATER SERVICE

SCALE: NONE
DATE: 3/05

8-6A

THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS.

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. INVENSYS SR TR/PL WATER METER AND TOUCH READ MODULE (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.



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.

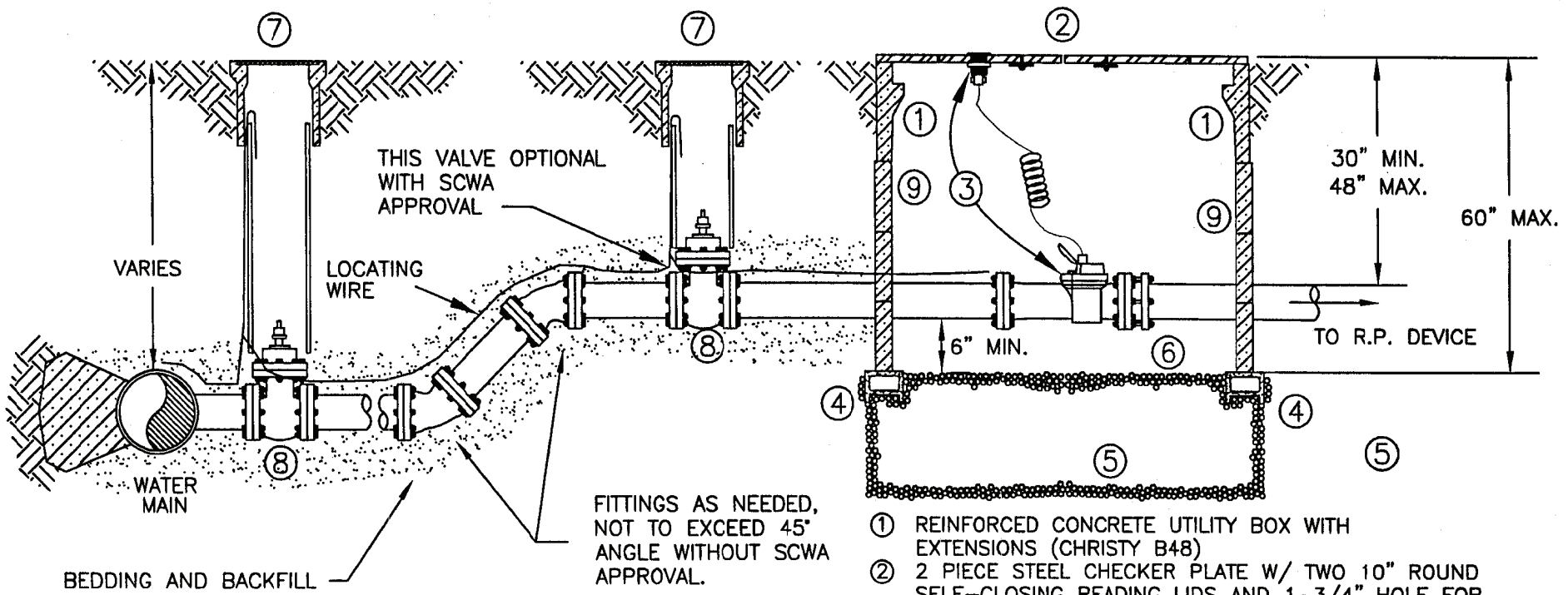
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

1-1/2" OR 2" COMMERCIAL METERED WATER SERVICE

SCALE: NONE
DATE: 12/03

8-6B



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 INVENSYS COMPOUND METER AND TOUCH READ MODULE (CUBIC FEET REGISTER), OR AS CALLED OUT ON PLANS. IF A TURBO METER IS CALLED OUT ON PLANS, TYPE SHALL BE INVENSYS DRS TR/PL.

④ CONCRETE BLOCKS SHALL BE PLACED ALONG THE ENTIRE PERIMETER TO SUPPORT BOX

⑤ 3/4" CHRUSHED 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)

NOTES:

4" TO 6" DIA. PIPE BETWEEN WATER MAIN AND METER SHALL BE DUCTILE IRON OR PVC C-900. 3" PIPE SHALL BE TYPE K COPPER OR DUCTILE IRON. JOINTS BETWEEN MAIN AND METER SHALL BE RESTRAINED.

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.

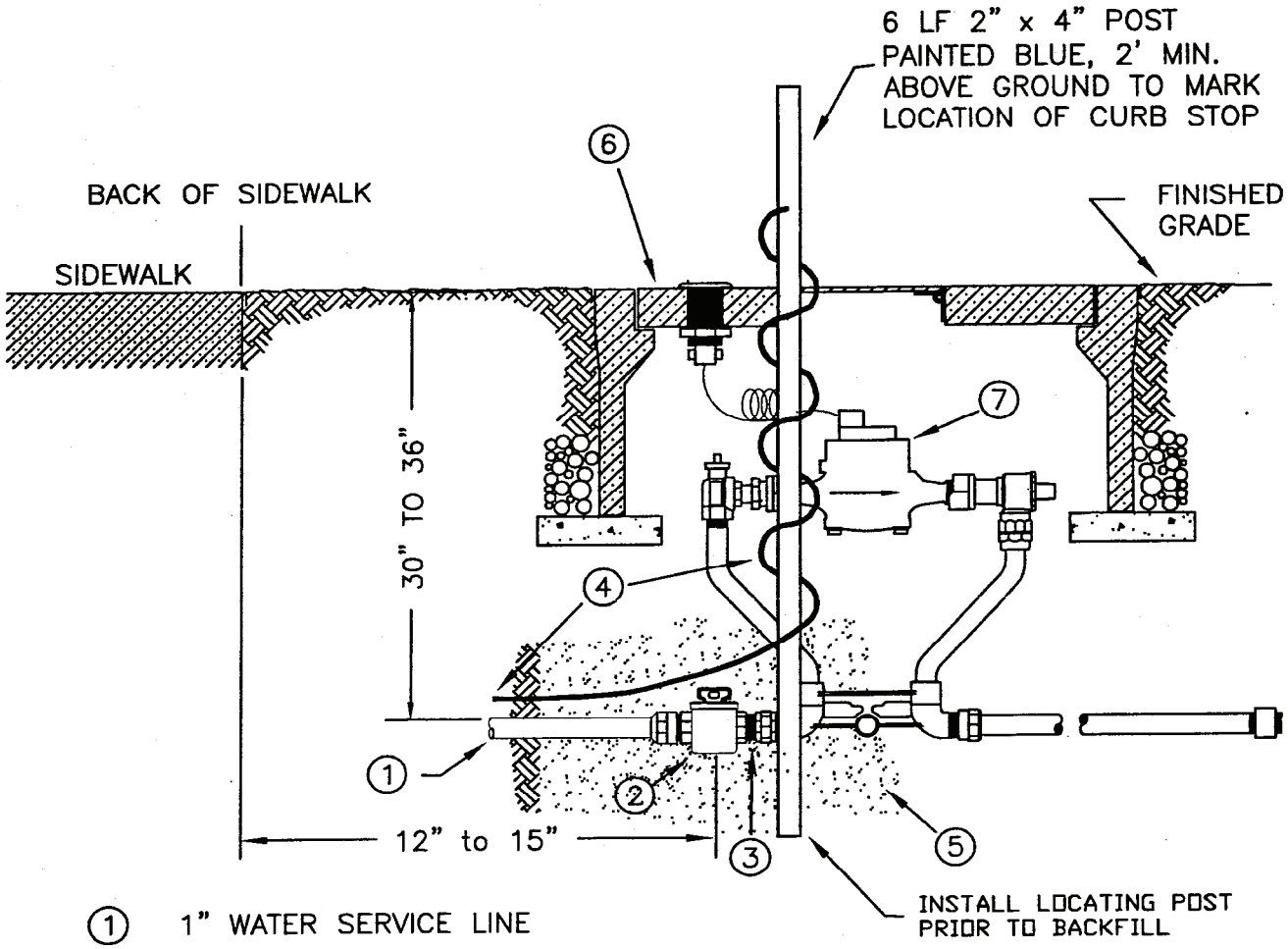
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

3" TO 6" WATER SERVICE & METER INSTALLATION

SCALE: NONE
DATE: 12/03

8-6C



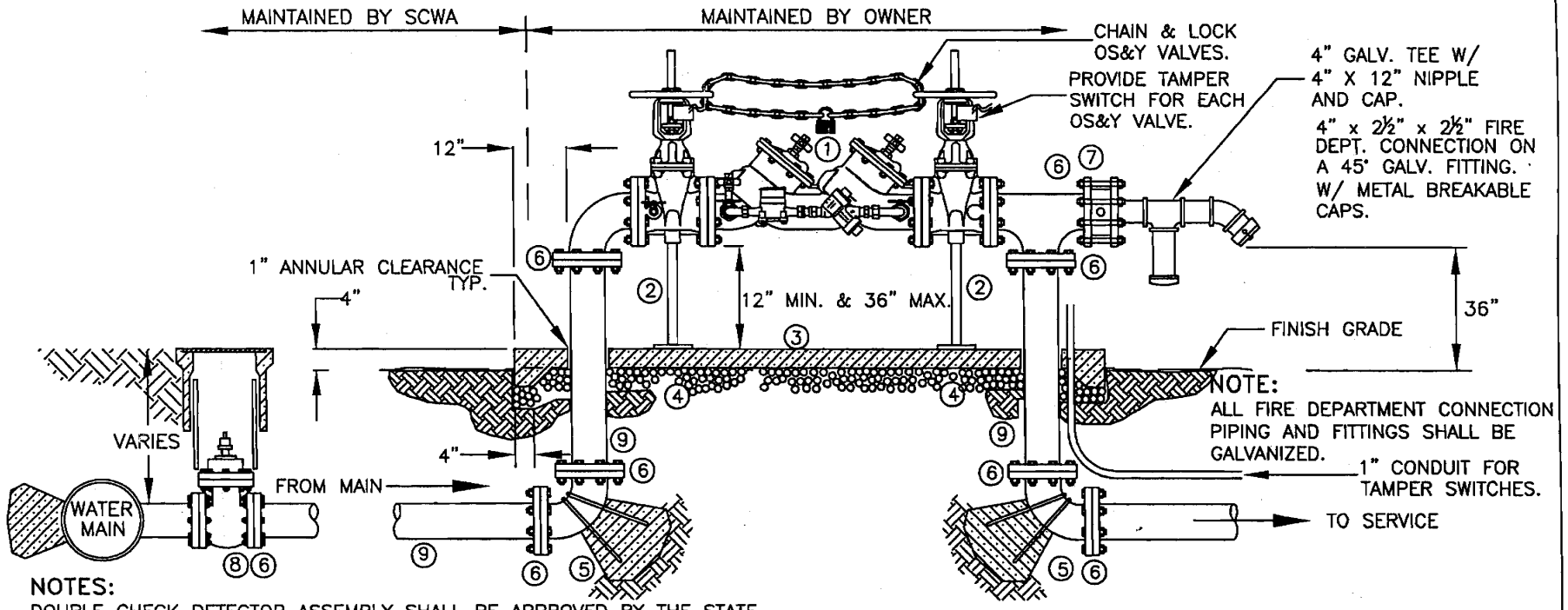
1. 1" WATER SERVICE LINE
2. 1" CURB STOP WITH TEFLON COATED BALL (COMP. BY F.I.P.T.)
3. REMOVABLE THREADED BRONZE PLUG
4. LOCATING WIRE – MIN. 3' LENGTH WRAPPED AROUND POST.
5. GRADED SAND, 12" THICK.
6. REINFORCED CONCRETE UTILITY BOX BY HOME BUILDER
7. 1" WATER METER BY HOME BUILDER

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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO MUNICIPAL SERVICES 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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

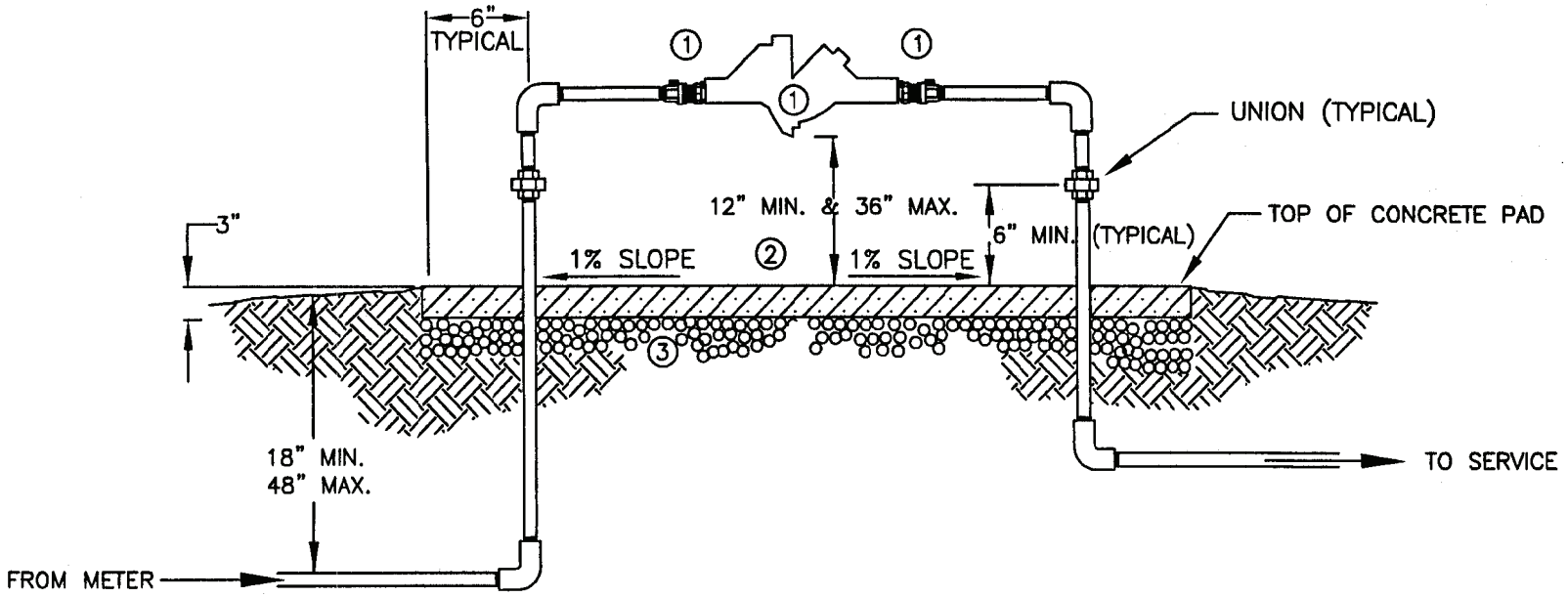
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FIRE PROTECTION DETAIL

SCALE: NONE
DATE:

8-7

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)

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-ELCTRIC 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.

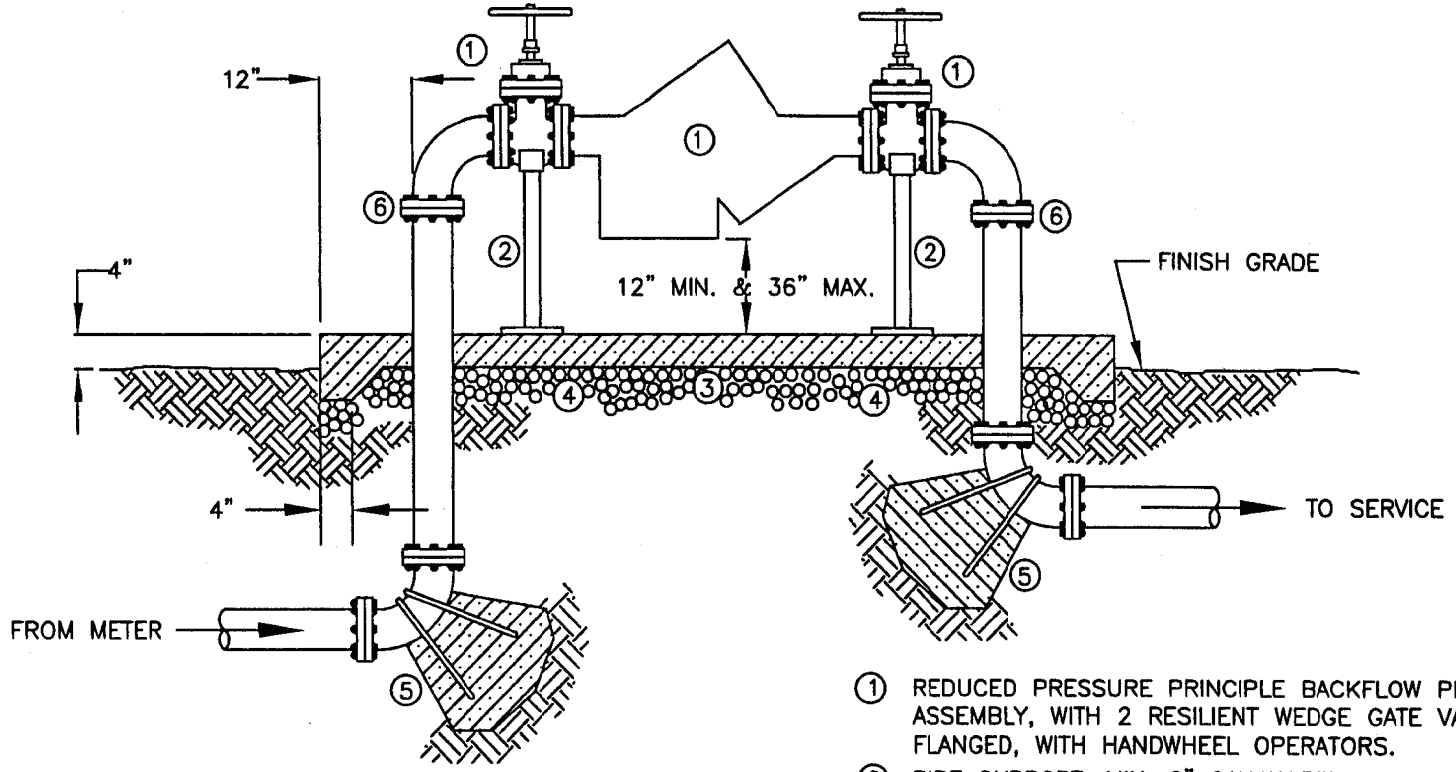
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

REDUCED PRESSURE BACKFLOW PREVENTER 1" TO 2"

SCALE: NONE
DATE: 12/03

8-8A



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.

NOTES:

REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL BE ON THE STATE OF CALIFORNIA'S DEPT. OF HEALTH SERVICES MOST RECENT LIST OF APROVED 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.

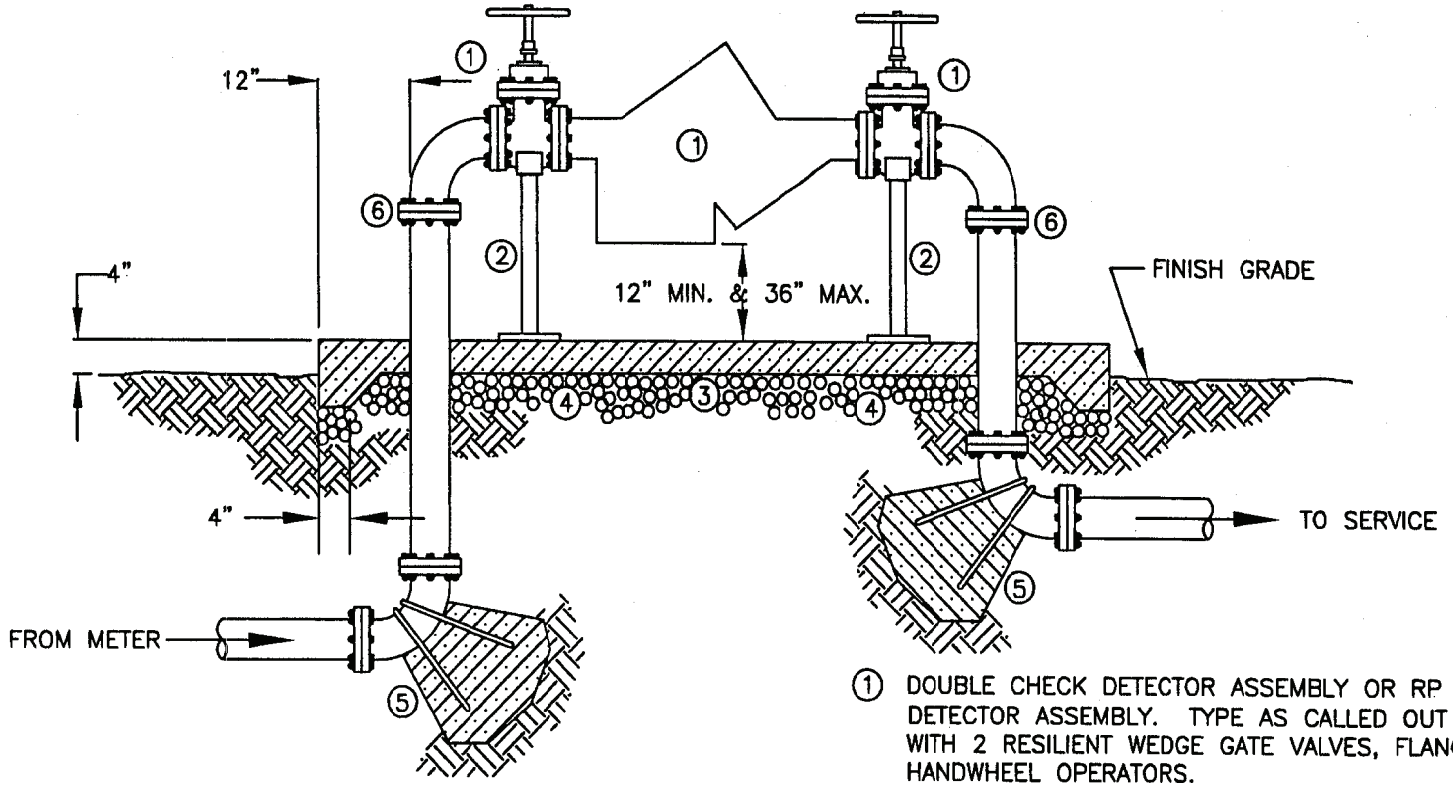
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

REDUCED PRESSURE BACKFLOW PREVENTER 3" AND LARGER

SCALE: NONE
DATE: 12/03

8-8B



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. 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.

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.

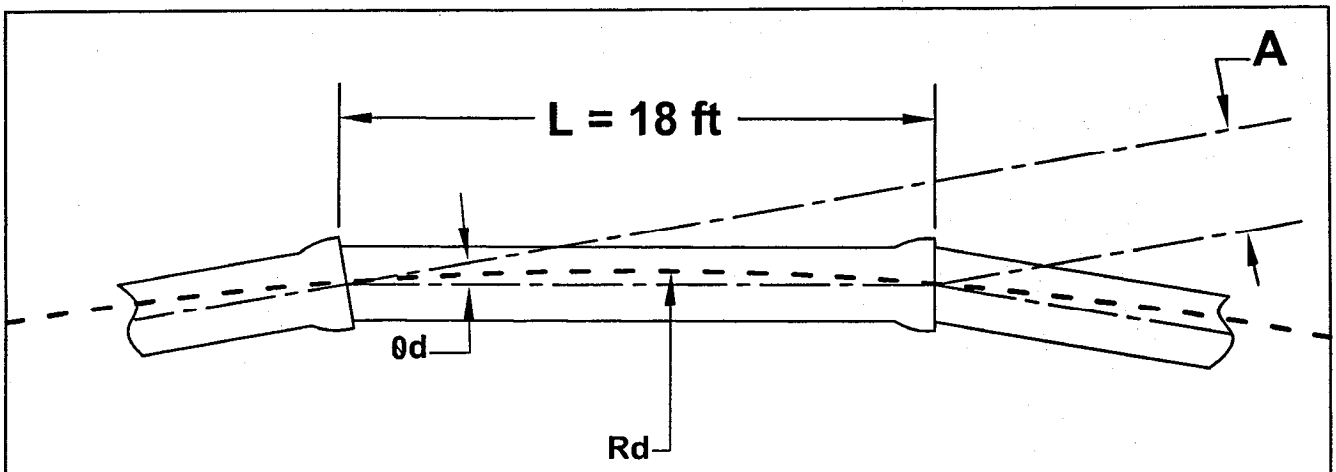
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DOUBLE CHECK DETECTOR OR RP PRINCIPLE DETECTOR 6" AND LARGER

SCALE: NONE
DATE: 12/03

8-8C



0d = Maximum joint deflection angle (degrees)

A = Offset at the end of the pipe (inches)

Rd = 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, "0d" (degrees)	Minimum Radius, "Rd" (feet)	Offset At Free End, "A" (inches)	Maximum Deflection Angle, "0d" (degrees)	Minimum Radius, "Rd" (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

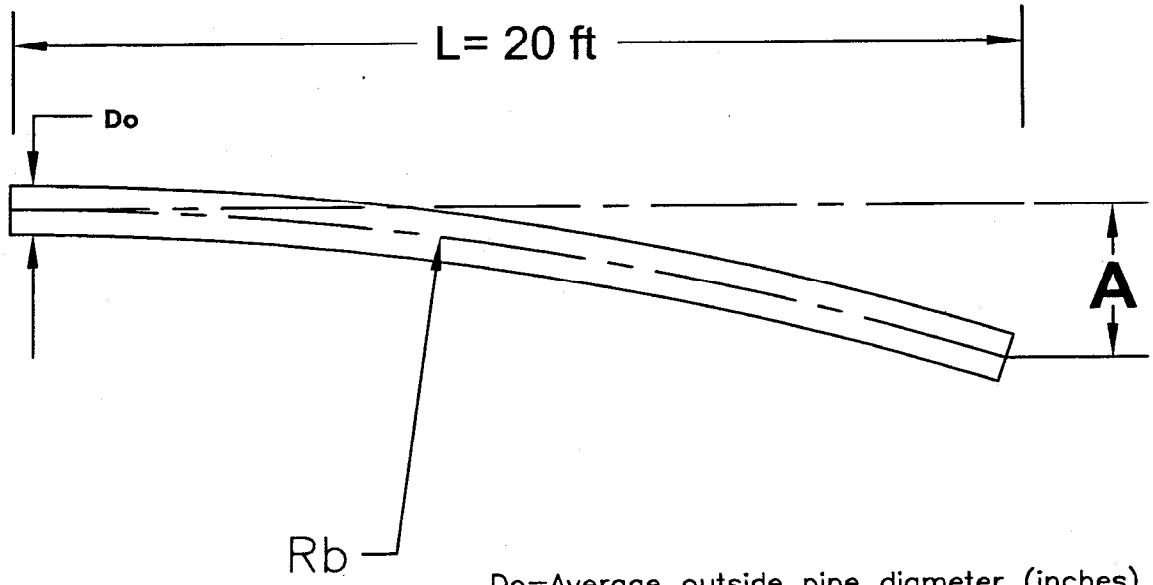
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

MAXIMUM DEFLECTION FOR DUCTILE IRON PIPE

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.

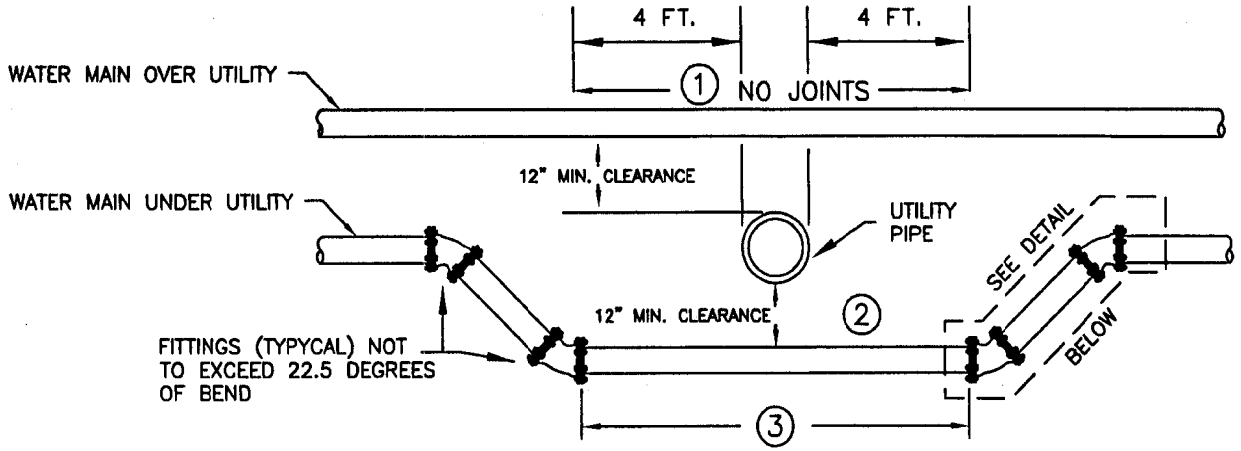
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

MAXIMUM DEFLECTION FOR PVC PIPE

SCALE: NONE
DATE: 12/03

8-9B



① IF UTILITY BEING CROSSED IS NOT A STORM DRAIN, SEWER, OR OTHER WATER LINE, THEN THE "NO JOINT" REQUIREMENT DOES NOT APPLY

② 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

③ 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.

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

A. 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.

B. IF BEND IS TO EXCEED 22.5 DEGREES, THE BEND AND THE RESTRAIN LENGTH MUST BE APPROVED BY SCWA

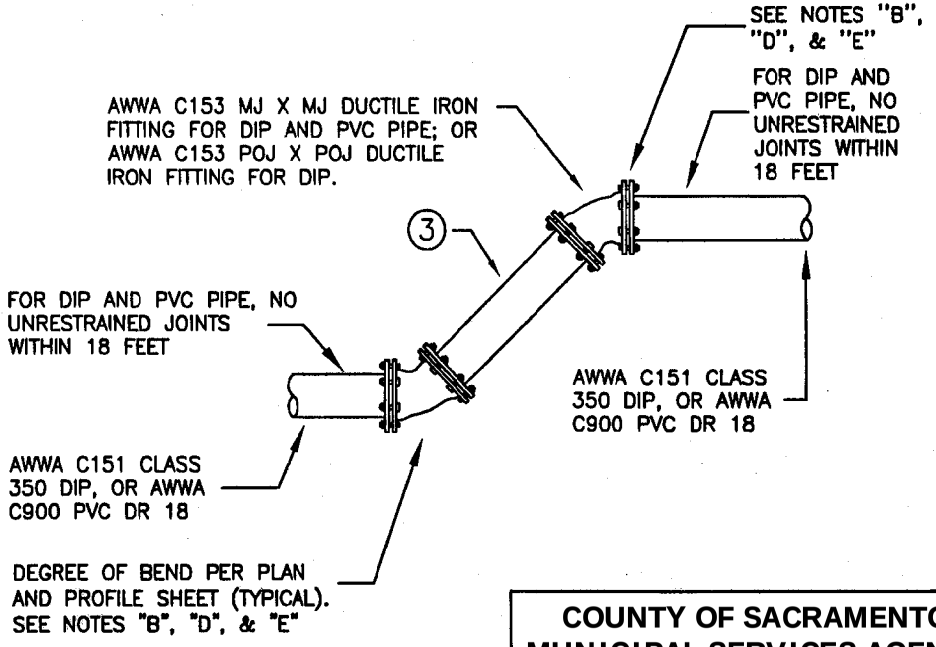
C. WRAP ALL DIP AND FITTINGS WITH 8 MIL. POLYETHYLENE ENCASEMENT IN ACCORDANCE WITH AWWA C105.

D. 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.

E. RESTRAINING DEVICE FOR PVC PIPE: USE MJ FITTINGS WITH STAR PIPE PRODUCTS ALLGRIP 3600, EBAA MEGALUG 2000PV SERIES, OR APPROVED EQUAL BY SCWA.

F. SEE PLAN & PROFILE FOR RESTRAINED LENGTH AND DEGREE OF BEND.

G. THIS DETAIL IS FOR WATER PIPES 12" IN DIAMETER & SMALLER.



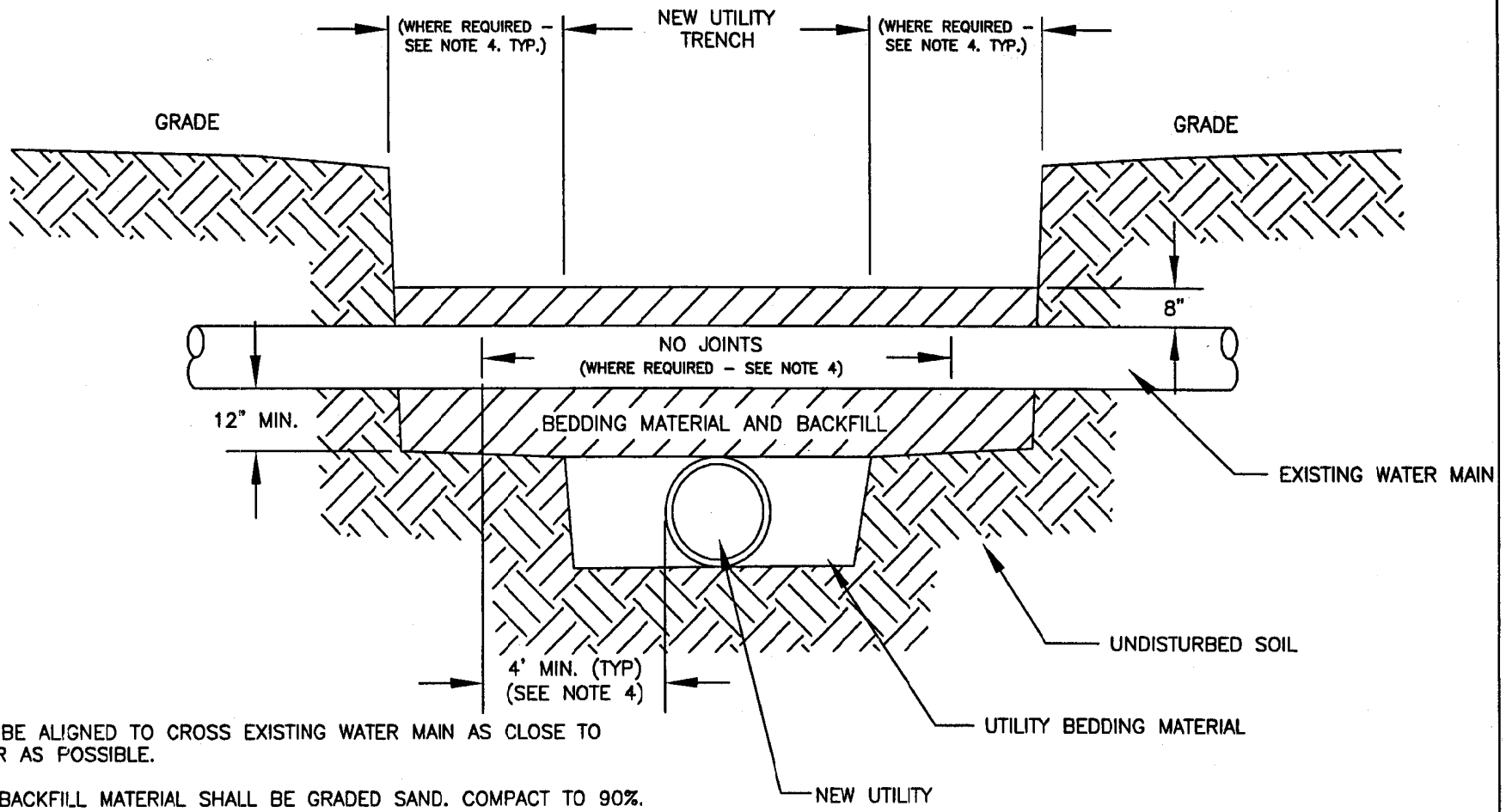
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UTILITY CROSSING

SCALE: NONE
DATE: 12/03

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.

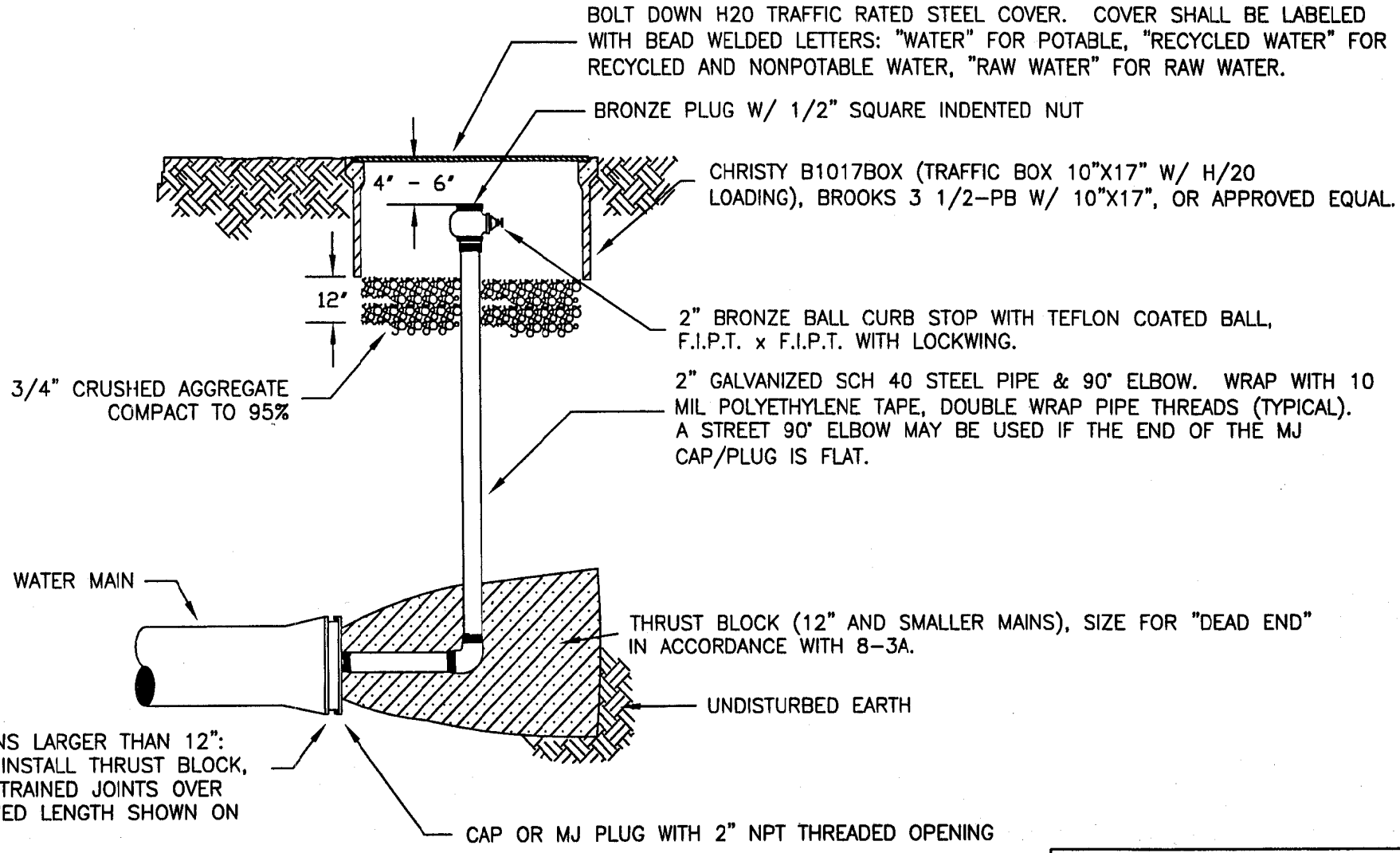
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

UTILITY CROSSING UNDER EXISTING WATER MAIN

SCALE: NONE
DATE: 12/03

8-11



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.

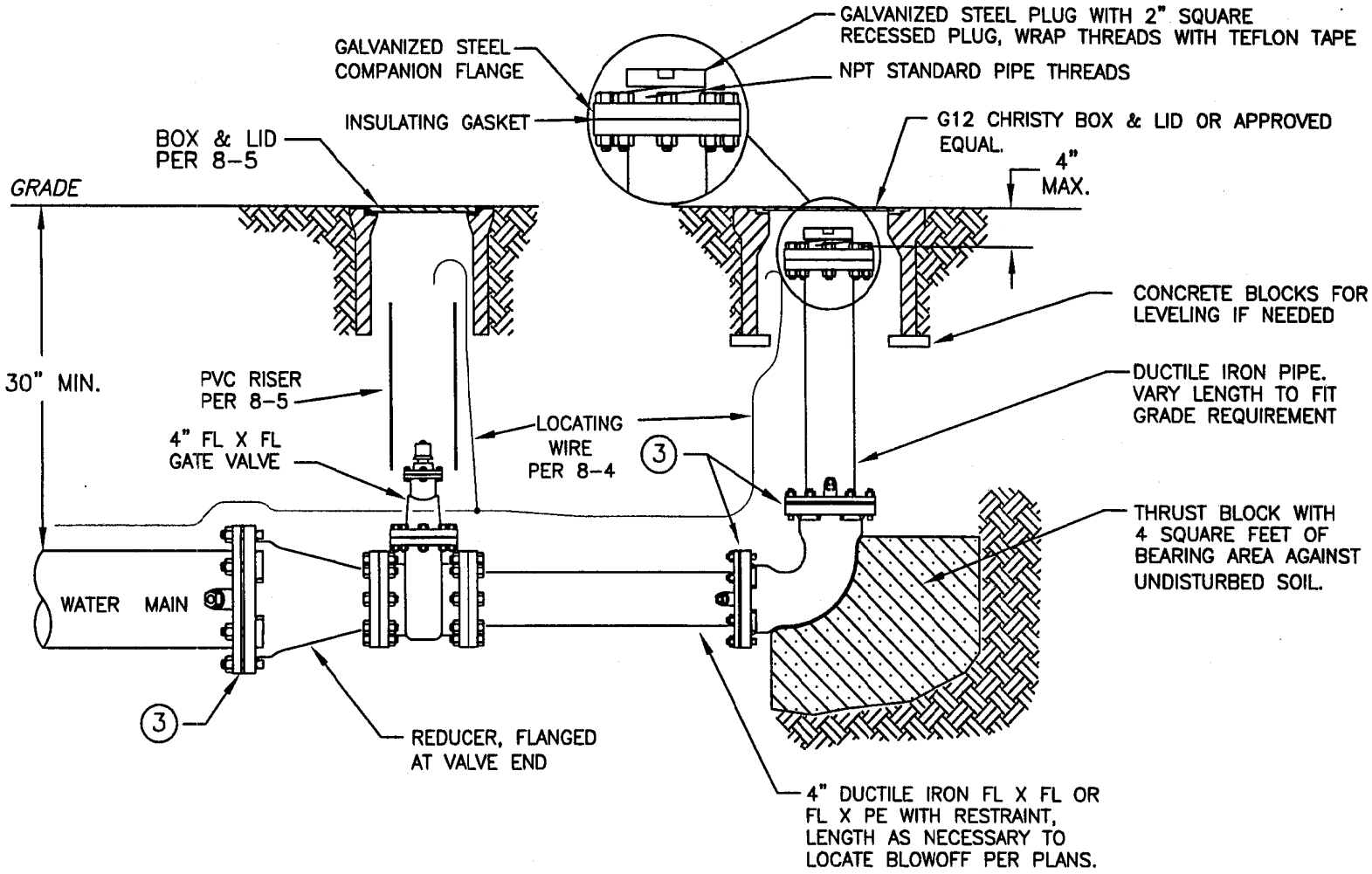
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TEMPORARY BLOW OFF ASSEMBLY

SCALE: NONE
DATE: 12/03

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.

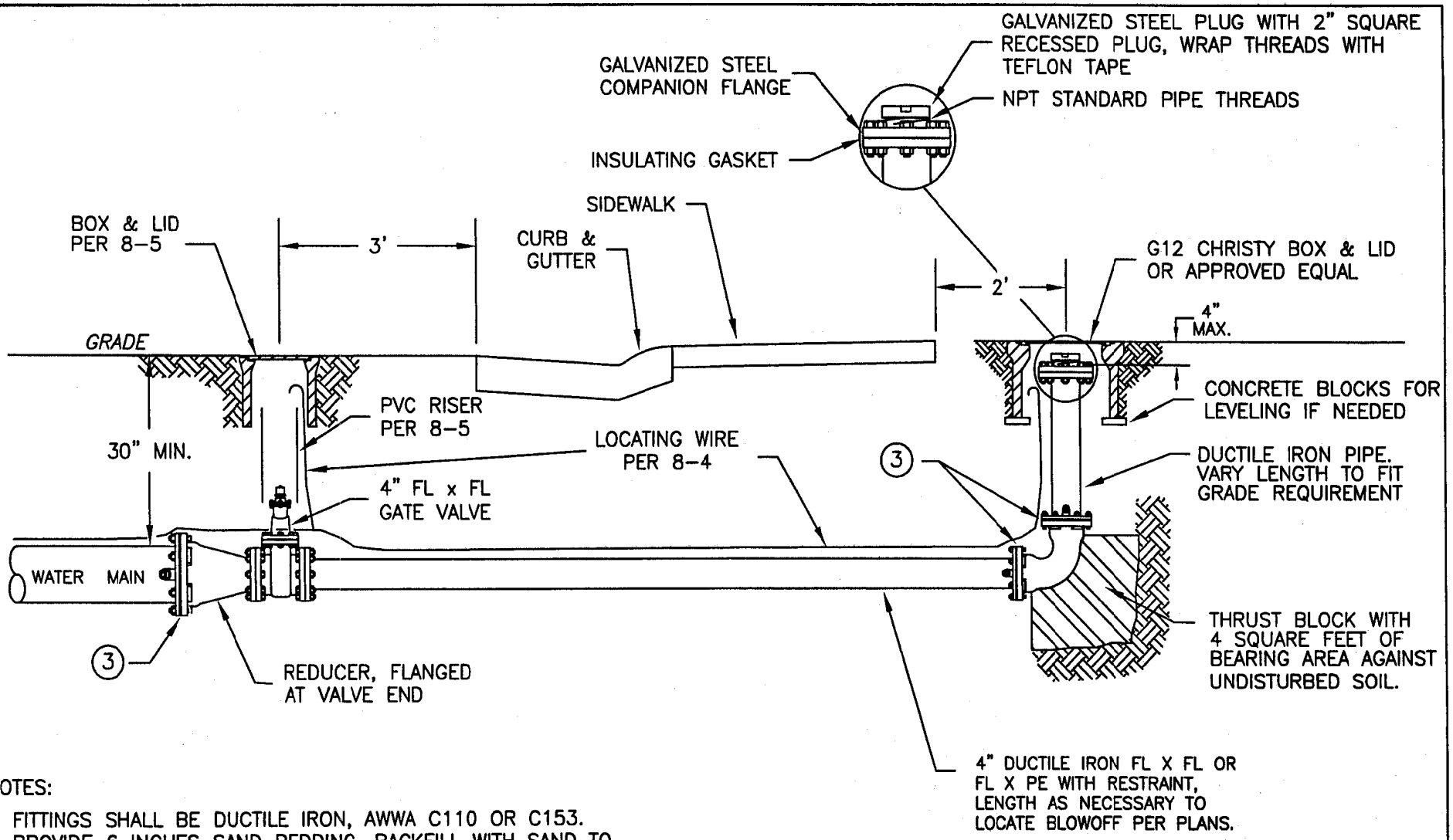
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES 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.

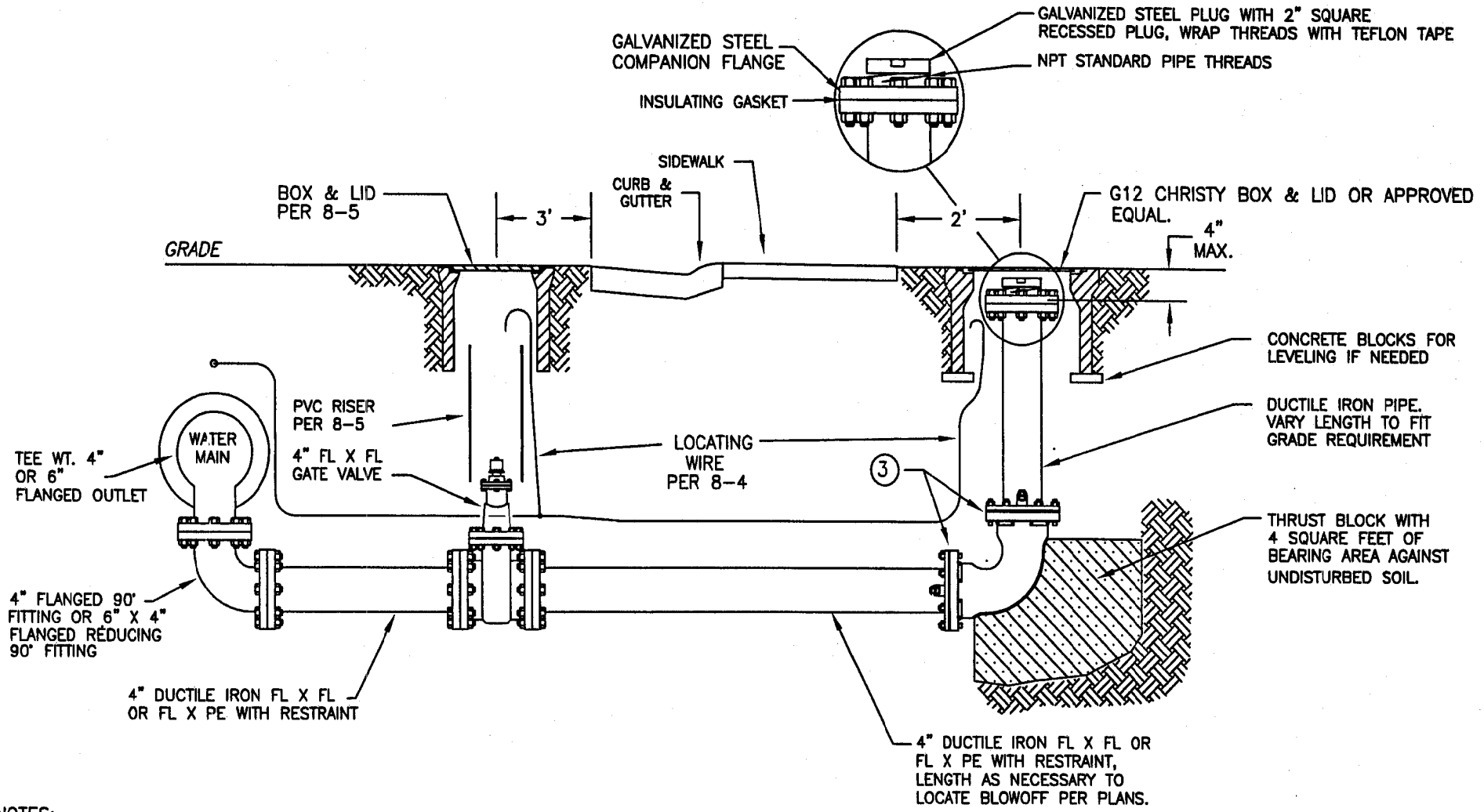
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

4" BLOW OFF ASSEMBLY AT END OF CUL-DE-SAC

SCALE: NONE
DATE: 12/03

8-13 B



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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

4" IN-LINE BLOW-OFF ASSEMBLY

SCALE: NONE
DATE: 12/03

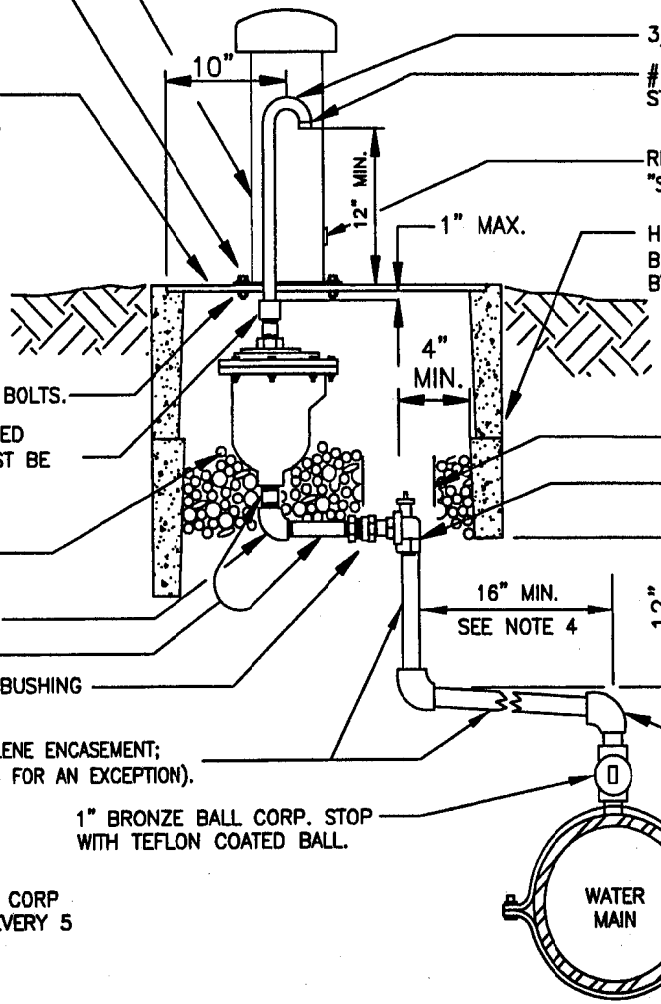
8-13C

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.

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.



3/4" SCHEDULE 40 PVC

#16 MESH BRONZE OR STAINLESS STEEL SCREEN

RIVET 1" X 4" STAINLESS STEEL NAME PLATE THAT READS "SACRAMENTO COUNTY WATER" TO TUBING.

H20 TRAFFIC RATED BOX TO ACCEPT BOLT DOWN METAL LID. BOX SHALL HAVE A 13" X 24" INSIDE DIMENSION AS MADE BY CHRISTY, BROOKS OR APPROVED EQUAL.

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

6" DIAMETER PVC SLEEVE

1" BRONZE ANGLE METER STOP BALL VALVE WITH TEFLON COATED BALL: JONES OR APPROVED EQUAL BY SCWA.

1"- 90° BRONZE FITTING (TYP)

1"- BRASS NIPPLE (TYP)

1 1/4" X 1" BRONZE THREADED BUSHING

BACKFILL W/ SAND TO 12 INCHES ABOVE PIPE AND PLACE WARNING TAPE 12 INCHES ABOVE PIPE

COPPER PIPE, TYPE K PER AWWA C800 W/ POLYETHYLENE ENCASEMENT; CONTINUOUS PIPE, NO JOINTS PERMITTED (SEE NOTE 6 FOR AN EXCEPTION).

1"- 90° COPPER FITTING (TYPICAL)

1" BRONZE BALL CORP. STOP WITH TEFLON COATED BALL.

BRONZE SERVICE SADDLE AND BOLTS, WRAP W/ 8 MIL POLYETHYLENE ENCASEMENT

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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

1" COMBINATION AIR/ VACUUM VALVE

SCALE: NONE
DATE: 12/03

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.

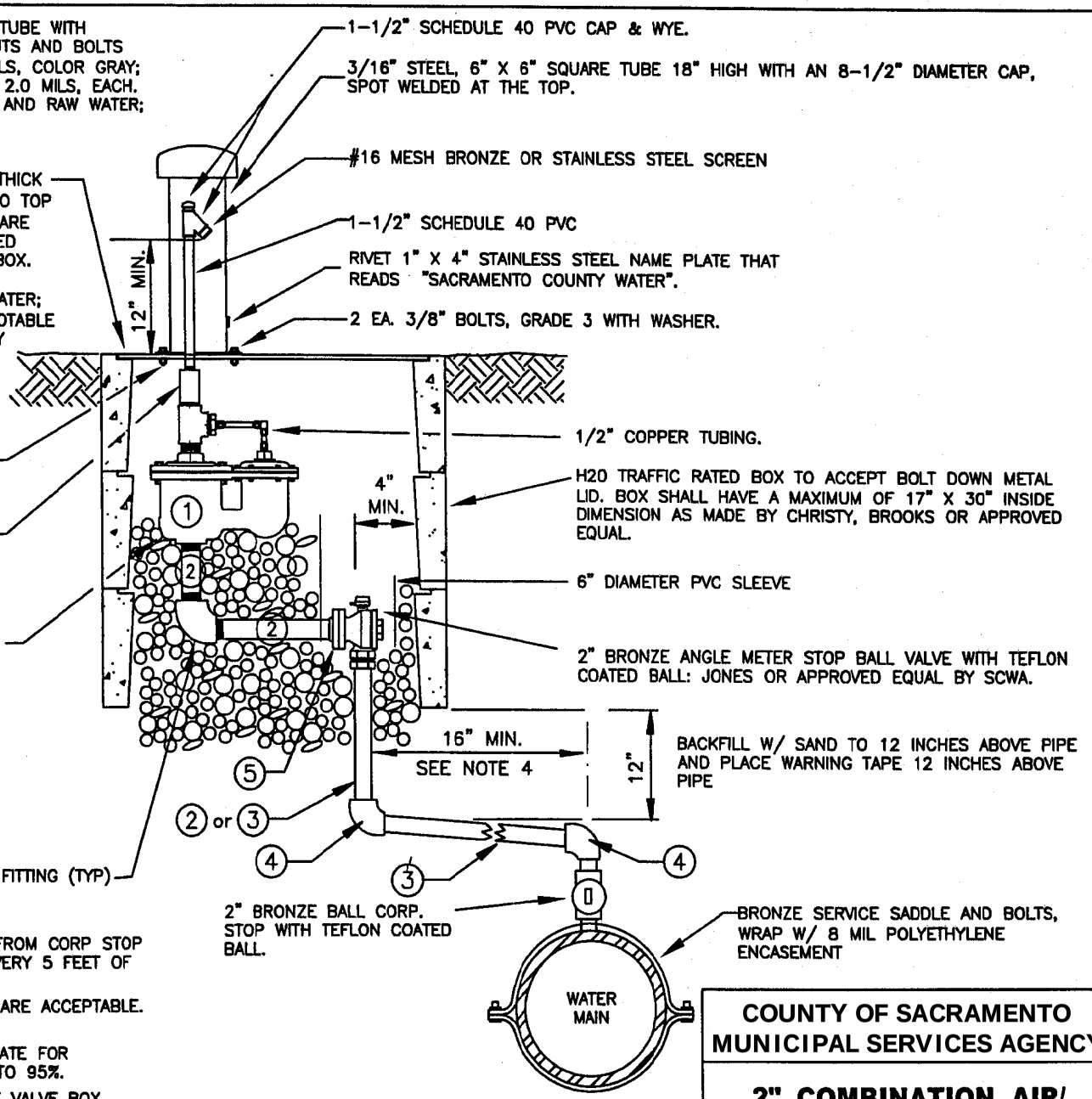
(1) 2" CRISPIN C-20 OR UL-20 COMBINATION AIR RELEASE/VACUUM VALVE OR SCWA APPROVED EQUAL

(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



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.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

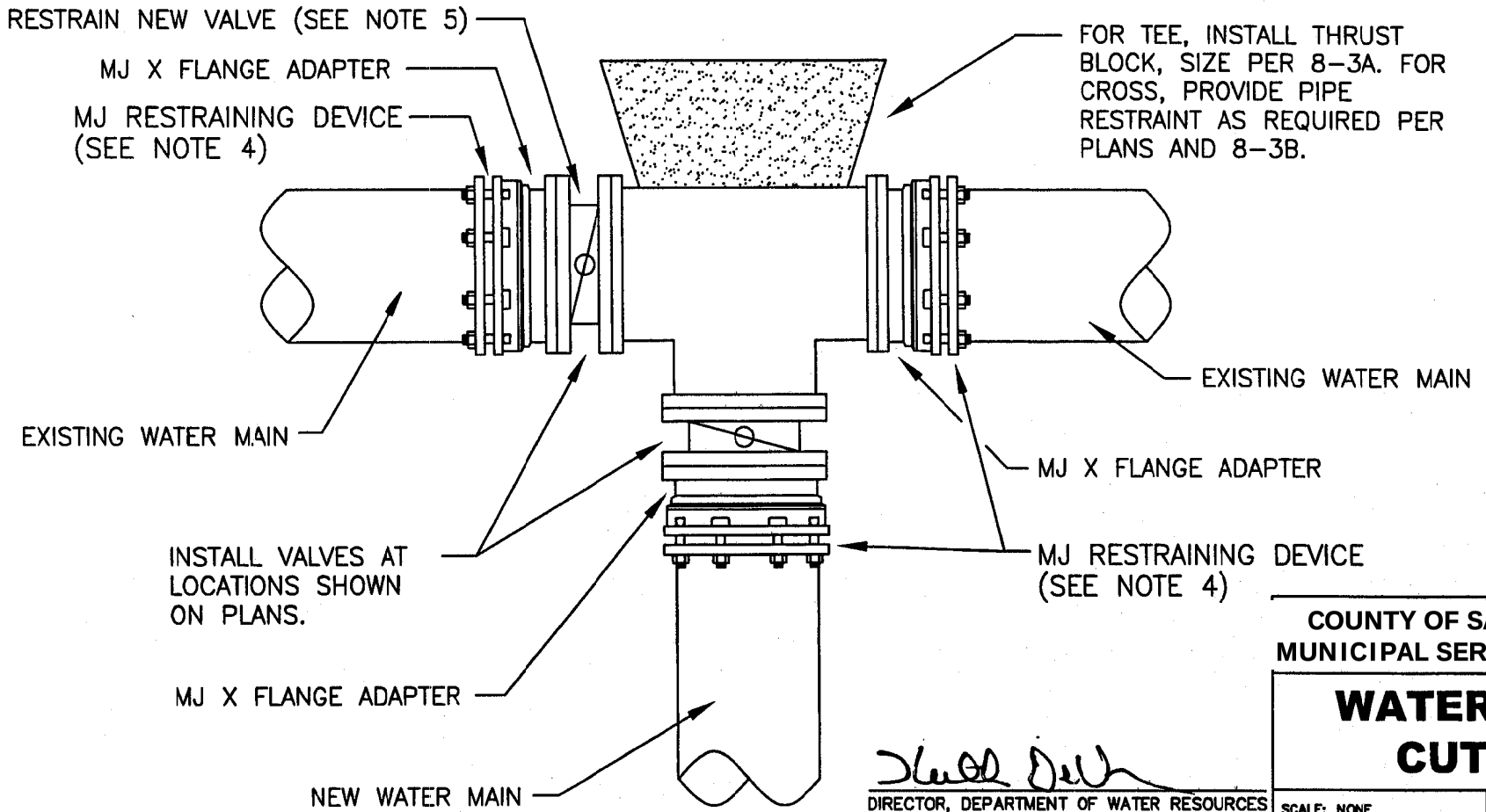
2" COMBINATION AIR/ VACUUM VALVE

SCALE: NONE
DATE: 12/03

8-14B

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.



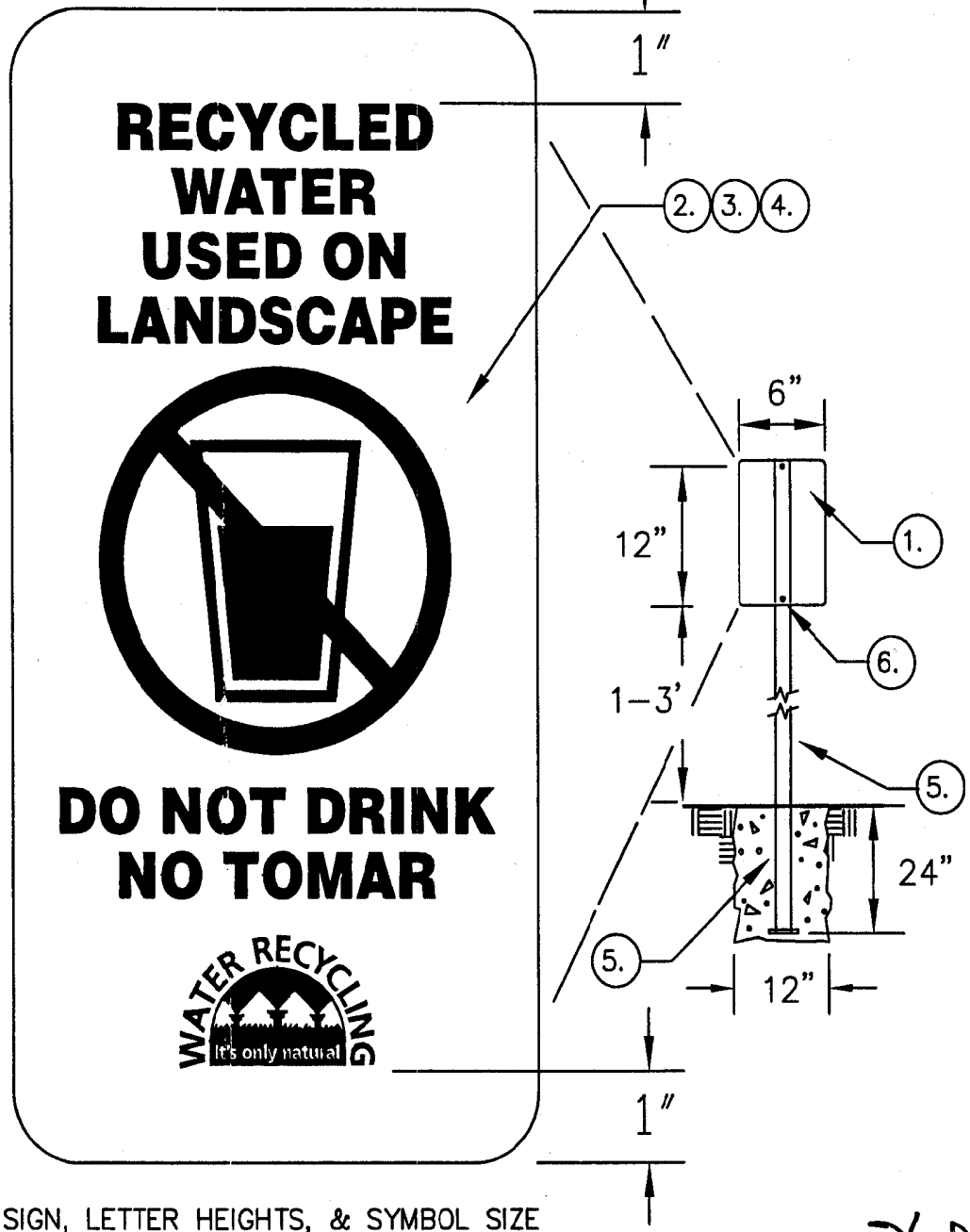
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

WATER MAIN CUT - IN

SCALE: NONE
DATE: 12/03

8-15



SIGN, LETTER HEIGHTS, & SYMBOL SIZE SHOWN ARE IN REQUIRED PROPORTIONS

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.

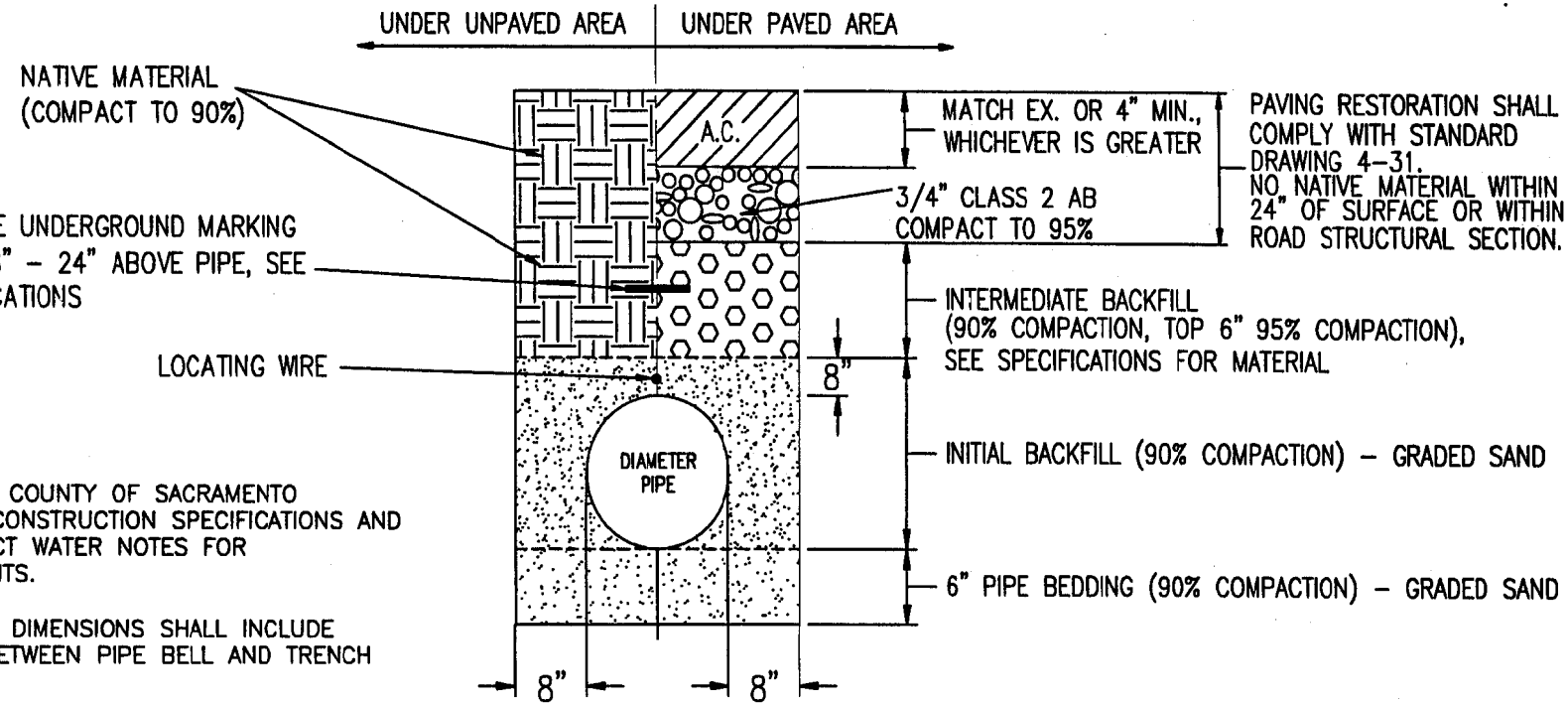
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

RECYCLED WATER SIGN

SCALE: NONE
DATE: 12/03

8-16



NOTES:

1. SEE THE COUNTY OF SACRAMENTO STANDARD CONSTRUCTION SPECIFICATIONS AND THE PROJECT WATER NOTES FOR REQUIREMENTS.

2. 6" & 8" DIMENSIONS SHALL INCLUDE DISTANCE BETWEEN PIPE BELL AND TRENCH WALL.

3. PLACE INITIAL SAND BACKFILL TO TOP OF PIPE, SPRAY WITH WATER TO COMPACT. THEN PLACE INITIAL SAND BACKFILL TO AT LEAST 8" ABOVE TOP OF PIPE, SPRAY WITH WATER TO COMPACT. AFTER SPRAYING WITH WATER, USE MECHANICAL COMPACTION METHODS IF NEEDED.

4. COORDINATE COMPACTION TESTS WITH RESIDENT ENGINEER.

5. JETTING WILL NOT BE ALLOWED FOR COMPACTION OF BACKFILL OR PIPE BEDDING MATERIAL.

6. IN UNPAVED AREAS, PIPE BEDDING MATERIAL, AND INITIAL BACKFILL MATERIALS SHALL BE COMPACTED THE SAME AS IN PAVED AREAS.

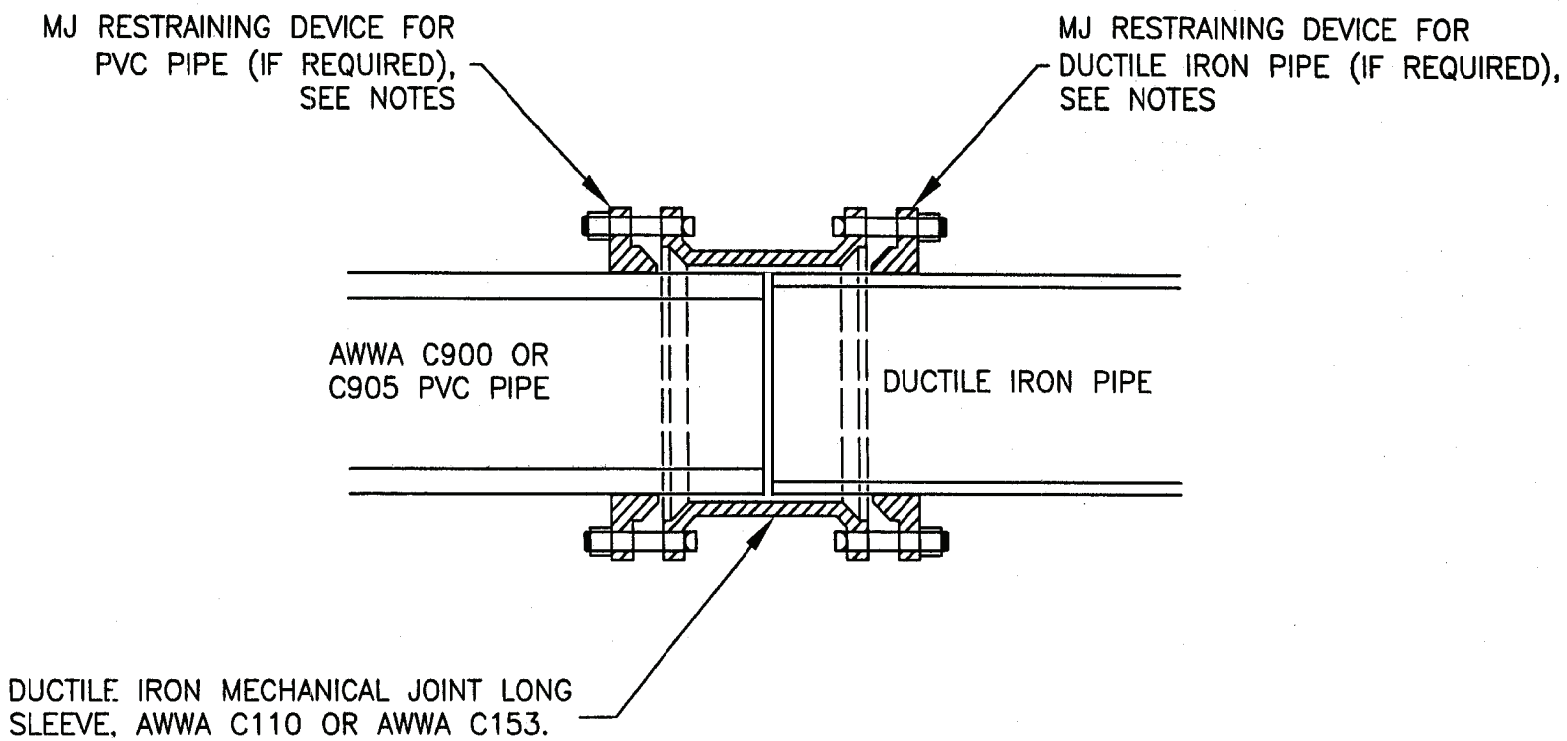
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TRENCH DETAIL

SCALE: NONE
DATE: 12/03

8-17



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.

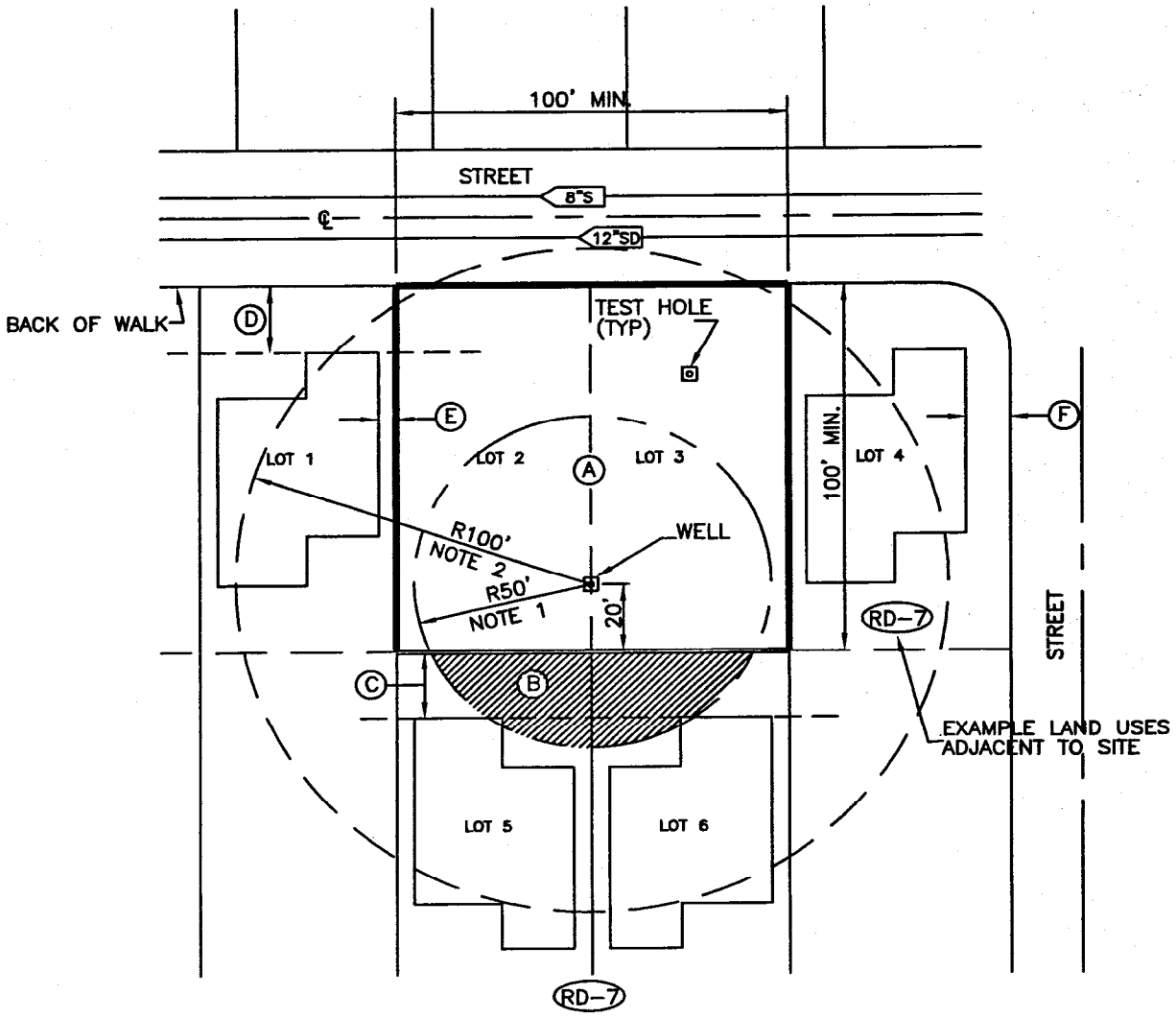
DIRECTOR, DEPARTMENT OF WATER RESOURCES

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TRANSITION SLEEVE

SCALE: NONE
DATE: 12/03

8-18



NOTES :

1. 50' RADIUS PRIMARY DRINKING WATER SOURCE PROTECTION ZONE: NO SEWER, STORMWATER, OR INDUSTRIAL LINES; NO LATERAL LINES; NO HOUSE FOUNDATIONS.
2. 100' RADIUS SECONDARY DRINKING WATER SOURCE PROTECTION ZONE: NO SEWER OR STORMWATER MAINS; NO DRAINAGE CHANNELS.
3. 200' SETBACK REQUIRED FROM FORCE MAINS (SEWER, STORMWATER, INDUSTRIAL), UNDERGROUND FUEL TANKS, SEPTIC TANKS, LEACH LINES, AND STABLES.
4. 500' SETBACK REQUIRED FROM PETROLEUM PIPELINES.
5. MINIMUM WELL LOT SIZE IS 100' X 100'. EXAMPLE RD-7 LOT SIZE TAKEN AS 55' X 100'.
6. ANY STRUCTURE(S) PROPOSED WITHIN THE SPECIAL PROVISION AREA ARE SUBJECT TO REVIEW AND APPROVAL BY SCWA FOR COMPLIANCE WITH THE DRINKING WATER SOURCE PROTECTION SETBACKS.
7. CONTACT SCWA FOR SPECIFIC INFORMATION ON A CASE-BY-CASE BASIS.

LEGEND :

- (A) WELL SITE IS TWO LOTS (TYPICAL)
- (B) SPECIAL PROVISION AREA
- (C) 20' MINIMUM SETBACK, REAR YARD.
- (D) 20' MINIMUM SETBACK, FRONT YARD.
- (E) 5' MINIMUM SETBACK, SIDE YARD.
- (F) 12.5' MINIMUM SETBACK, SIDE STREET YARD.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

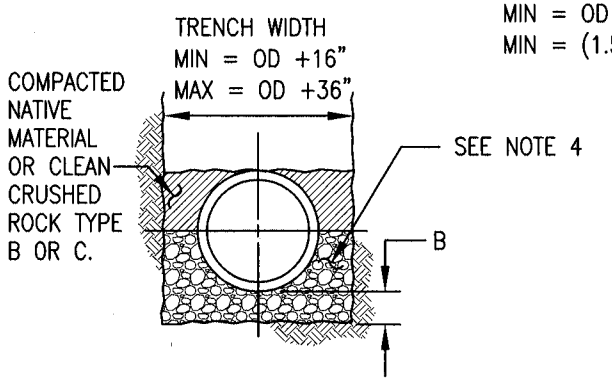
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TYPICAL WELL SITE

SCALE: NONE
DATE: 12/03

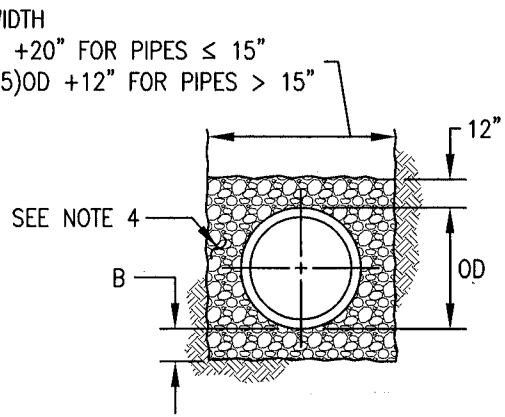
8-19

DRAWING NUMBER	TITLE
9-1	STORM DRAIN PIPE BEDDING AND INITIAL BACKFILL (4/07)
9-7A	STANDARD PRECAST CONCRETE DRAINAGE MANHOLE (6/07)
9-8A	TYPE A SADDLE MANHOLE (11/98)
9-9	GREY CAST IRON STANDARD 24” MANHOLE FRAME & COVER (8/07)
9-10	GREY CAST IRON STANDARD 36” MANHOLE FRAME & COVER (04/07)
9-11	GRATE TYPE MANHOLE COVER (08/07)
9-13B	DROP INLET TYPE B (06/07)
9-13C	DROP INLET TYPE C (09/00)
9-14	WELDED STEEL GRATE FRAME (04/07)
9-15	WELDED STEEL GRATE (04/07)
9-16	CENTER SUPPORT ASSEMBLY FOR MULTIPLE GRATES (04/07)
9-17	CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR (04/07)
9-18	DROP INLET TYPE F (08/07)
9-19	DROP INLET TYPE G (04/07)
9-21	CORRUGATED METAL PIPE DRAINAGE INLET TYPE I (11/98)
9-22	CORRUGATED PIPE FITTINGS (11/98)
9-23	PIPE CONNECTIONS (1/03)
9-24	LINED CHANNEL SECTION (7/98)
9-26G	TRASH RACK 24”-36” PIPE (1/03)
9-26H	PIPE HEADWALL, ENDWALL WINGWALL STRUCTURE (11/06)
9-27	EROSION CONTROL DITCH DISCHARGE (11/98)
9-28	BARBED WIRE AND WIRE MESH FENCES (11/98)
9-29	CHAIN LINK FENCE (12/99)
9-30	UTILITY STREAM CROSSING(11/98)
9-31	FLEXIBLE CONNECTOR PIPE TO MANHOLE (5/07)
9-32	CONSTRUCTION SITE SIGN (04/07)
9-33	UTILITY CROSSING (04/97)
9-34	CAST IRON 24” MANHOLE FRAME & COVER FOR TYPE G AND 300-1 INLET (4/07)
300-1	CURB OPENING CATCH BASIN (12/02)
301-1	CURB OPENING CATCH BASIN (12/02)
308-0	MONOLITHIC CATCH BASIN CONNECTION (3/07)
309-0	CATCH BASIN REINFORCEMENT (01/06)



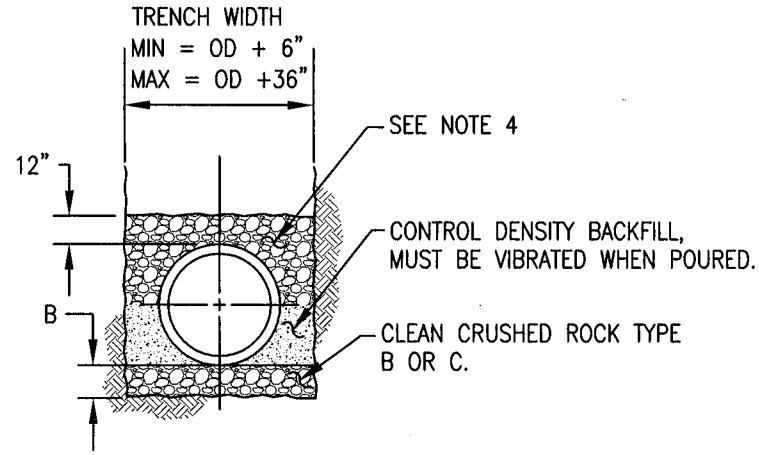
RIGID PIPE

REINFORCED CONCRETE PIPE C-76



FLEXIBLE PIPE

PVC, CORRUGATED AND RIBBED METAL

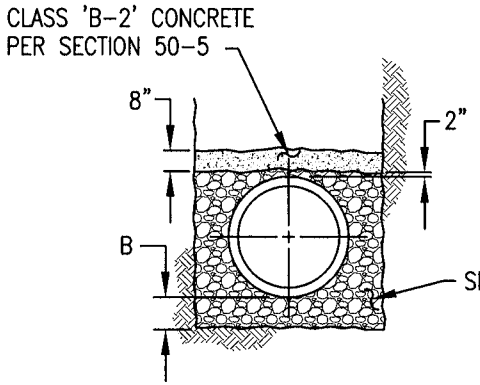


CONTROL DENSITY BACKFILL FOR FLEXIBLE PIPE

SEE NOTE 5

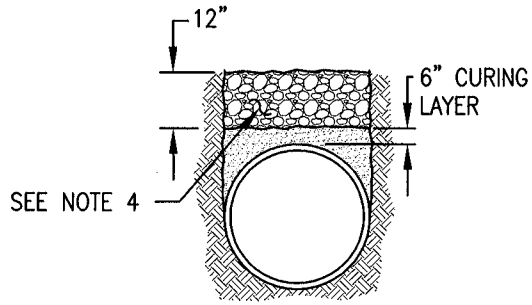
GENERAL NOTES:

1. AREA ABOVE BEDDING AND INITIAL BACKFILL PER DRAWING 4-31.
2. SEE SECTION 19 "TRENCH EXCAVATION BEDDING AND BACKFILL".
3. MINIMUM DEPTH OF BEDDING MATERIAL SHALL BE 1½" BELOW THE PIPE BELL.
4. BACKFILL WITH CLEAN CRUSHED ROCK TYPE B OR C.
5. IF MINIMUM TRENCH WIDTH CANNOT BE ACHIEVED, CONTROL DENSITY BACKFILL, PER SECTION 50-15 SHALL BE USED (UP TO SPRING LINE) IN LIEU OF CLEAN CRUSHED ROCK AT NO EXTRA COST (WITH APPROVAL OF THE DIRECTOR).
6. WILL ONLY BE ALLOWED IF THE MINIMUM COVER OVER THE PIPE BELL IS LESS THAN TABLE 38-1 AND WITH THE APPROVAL OF THE DIRECTOR.
7. B=4" FOR PIPES WITH 12"-54" ID. B=6" FOR PIPES > 54" ID.
8. THE TRENCH WIDTH ABOVE THE PIPE MAY BE INCREASED FOR CONSTRUCTION PURPOSES.



COVER LESS THAN 12"

SEE NOTE 6



CAST IN PLACE CONCRETE PIPE (CIPCP)

Kirk DeWall

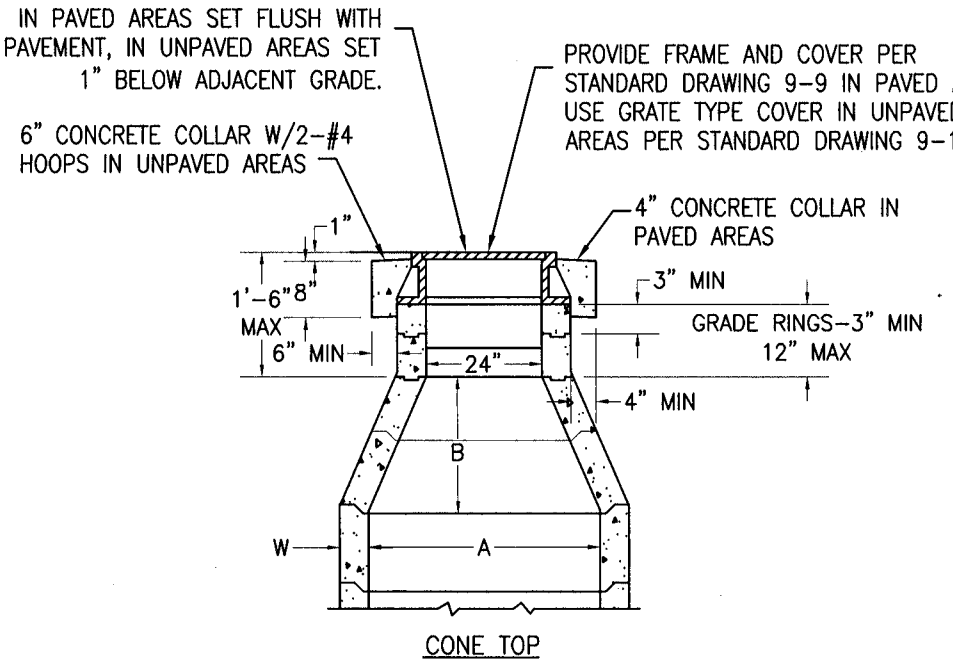
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

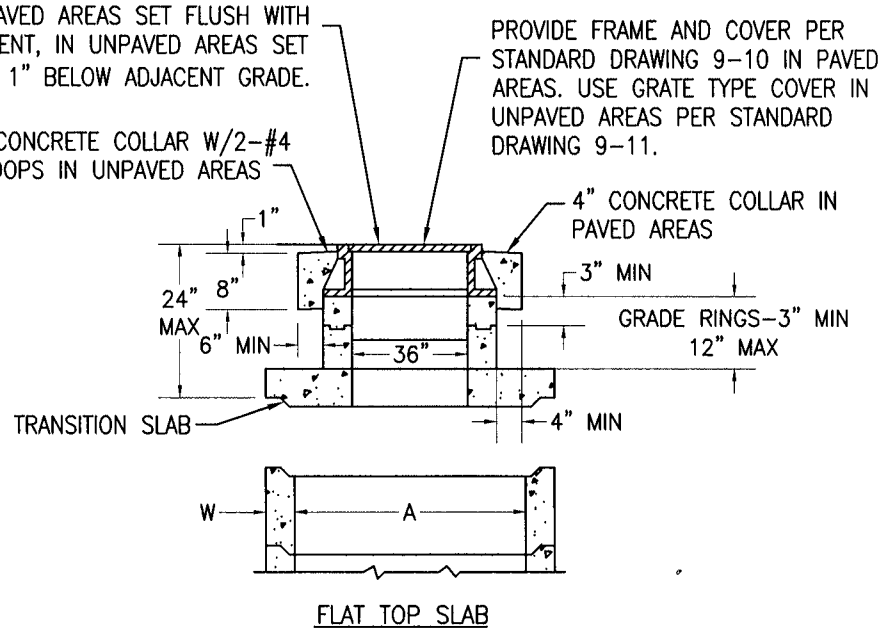
STORM DRAIN PIPE BEDDING AND INITIAL BACKFILL

DRAWN BY: STAFF
SCALE: NONE
DATE: 4/07

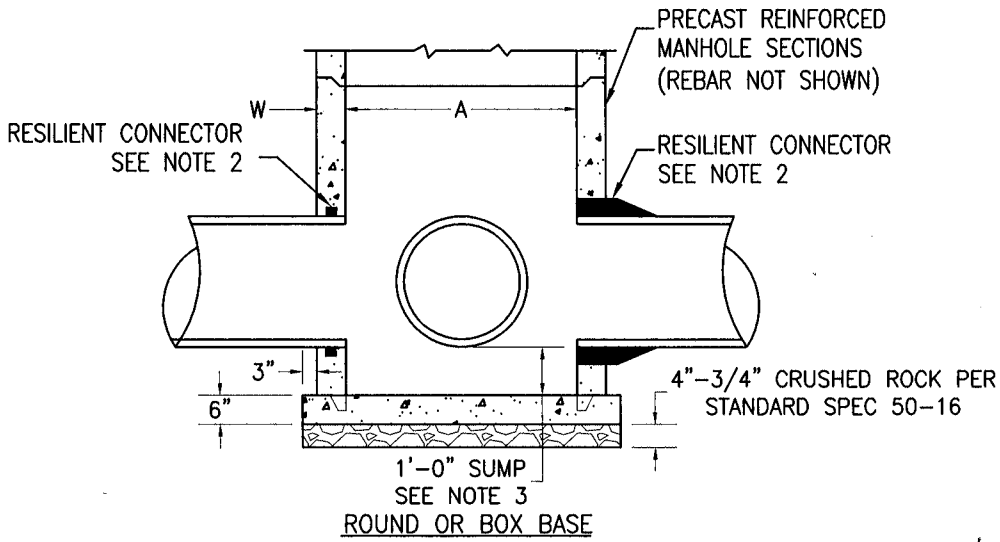
9-1



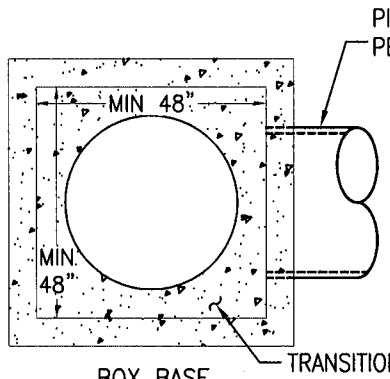
CONE TOP



FLAT TOP SLAB



ROUND OR BOX BASE



BOX BASE
(PLAN VIEW)

TABLE OF MINIMUM DIMENSIONS FOR ROUND MANHOLES

M.H.	A	B	W
48"	48"	18"	5"
60"	60"	30"	6"
72"	72"	**	7"
84"	84"	54"	8"
96"	96"	---	9"

** - TRANSITION SLAB REDUCES THE INSIDE DIAMETER FROM 72" TO 60"

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

STANDARD PRECAST CONCRETE DRAINAGE MANHOLE

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 6/07

9-7A
SHEET 1 OF 2

NOTES:

1. ALL MANHOLES SHALL MEET H-20 LOAD SPECIFICATIONS.

2. ON ALL PIPE UP TO 30" I.D. USE FLEXIBLE COMPRESSION GASKET OR BOOT CONNECTOR CONFORMING TO ASTM C-923. CONNECTION SHALL BE WATER AND SOIL TIGHT. FOR PIPES GREATER THAN 30" I.D., BASE MAY BE CAST-IN-PLACE AND A WATER STOP CONFORMING TO ASTM C-923 SHALL BE USED.

3. SUMP SHALL BE 1'-0" DEEP, MEASURED FROM INVERT OF OUTFALL PIPE. SUMP NOT REQUIRED IF OUTFALL PIPE IS 24" I.D. OR LARGER. SUMPS SHALL NOT BE ALLOWED OUT OF THE COUNTY RIGHT OF WAY.

4. RISER SECTIONS, CONES, AND ADJUSTING RINGS SHALL CONFORM TO ASTM C-478.

5. ALL JOINTS SHALL BE MADE WITH PREFORMED PLASTIC JOINT SEALING COMPOUND OR PRE-LUBRICATED GASKET. FOLLOWING INSTALLATION GROUT ALL INTERIOR AND EXTERIOR JOINTS.

6. CONCENTRIC COMPONENTS SHALL BE USED UNLESS OTHERWISE SPECIFIED ON THE PLANS.

7. PRECAST MANHOLES SHALL BE SIZED TO PROVIDE THE FOLLOWING: THE ANNULAR SPACE ON THE INSIDE OF THE MANHOLE BARREL BETWEEN CORED PIPE CONNECTION HOLES SHALL BE A MINIMUM OF 10-INCHES. IF THE CONNECTION HOLE IS CAST MONOLITHICALLY WITH THE MANHOLE BARREL THE MEASUREMENT SHALL BE TAKEN FROM THE FINISHED CONCRETE CONNECTION SURFACE.

8. SEE SECTION 39, "MANHOLES".

9. CONSTRUCT WITH FLAT SLAB-TOP WHEN HEIGHT IS TOO SHALLOW TO CONSTRUCT WITH CONES.

10. FOR THE SLAB REDUCER OF THE BOX MANHOLE (BOX TO ROUND DIAMETER), THE DIAMETER OF THE ROUND REDUCER SHALL BE A MAX OF 12" SMALLER THAN THE INSIDE BOX WIDTH.

11. FLAT SLAB TOP MANHOLES SHALL HAVE A 36" MANHOLE FRAME AND COVER PER 9-10.

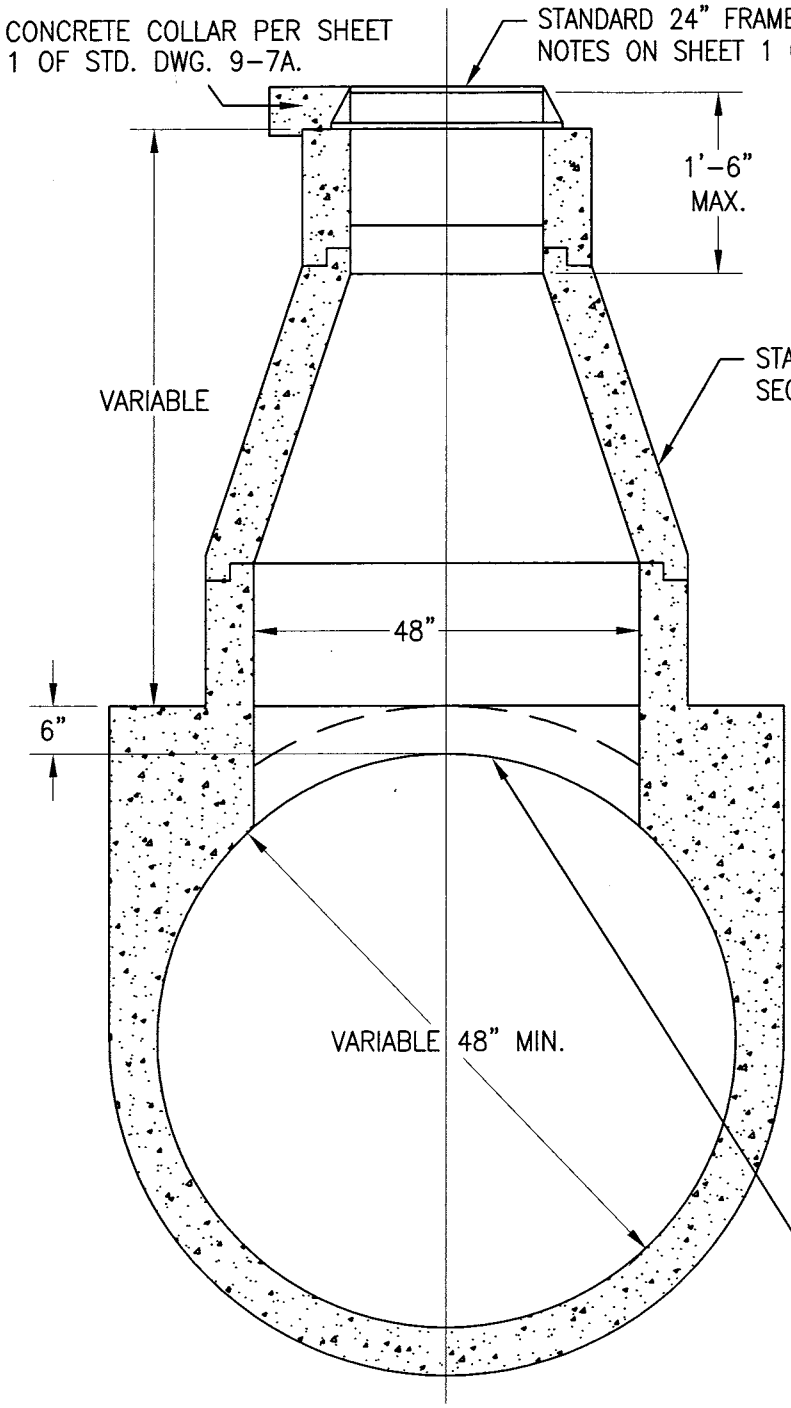
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

STANDARD PRECAST CONCRETE DRAINAGE MANHOLE

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 05/07

9-7A
SHEET 2 OF 2



TYPE A
CAST-IN-PLACE PIPE ONLY

NOTE:
REMOVE CONCRETE IN MANHOLE OPENING AND CONSTRUCT RISER BASE WHILE CONCRETE IS STILL WORKABLE.

PLACE RISER SECTION AFTER CONCRETE HAS SET.

SEE SECTION 39, "MANHOLES", AND SECTION 36, "CAST-IN-PLACE CONCRETE PIPE".

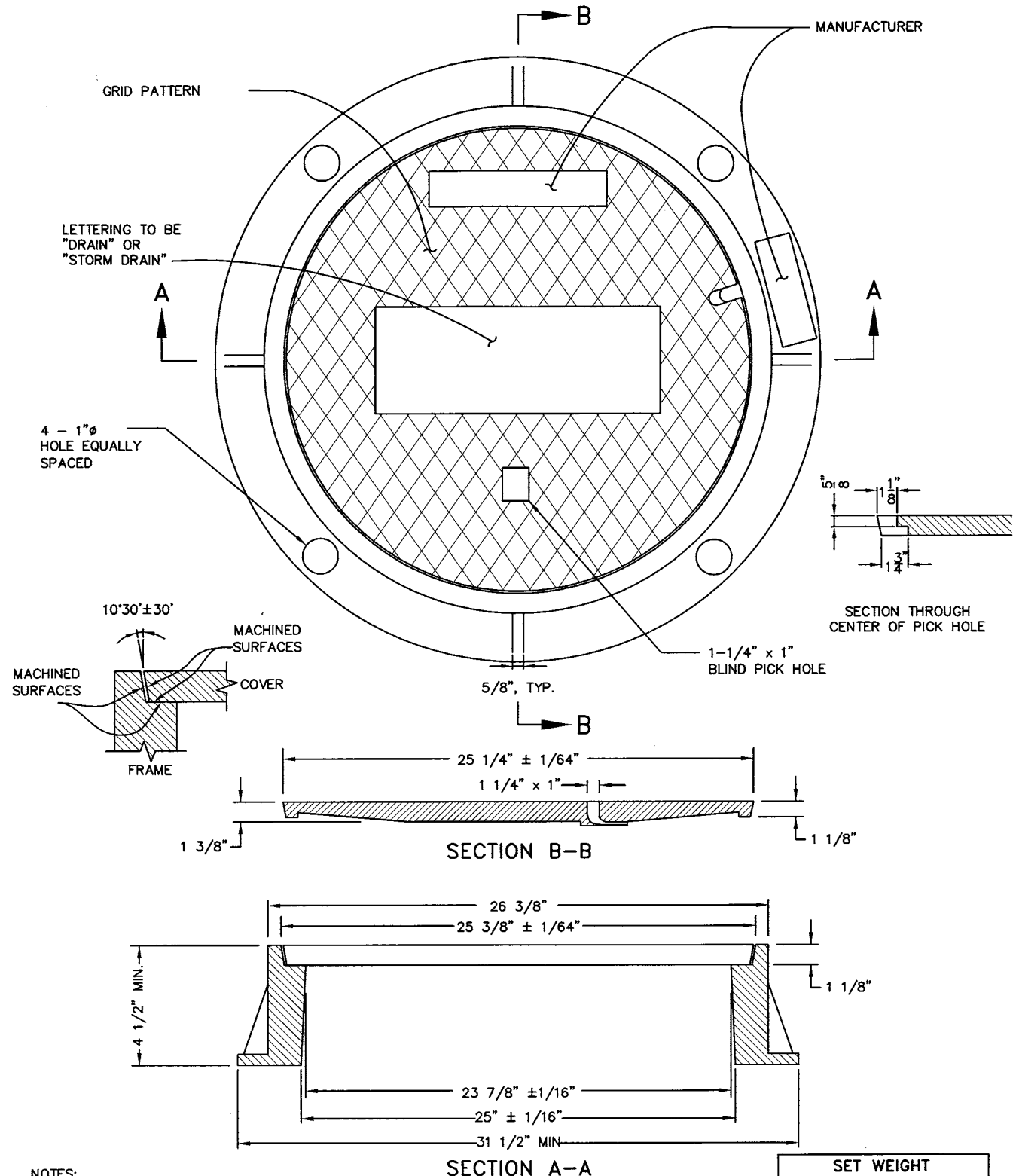
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TYPE A
SADDLE MANHOLE

DRAWN BY: M.FIELDS
SCALE: NONE
DATE: 11/98

9-8A



NOTES:

1. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
2. FRAME AND COVER TO MEET H–20 LOAD SPECIFICATIONS.
3. EXPOSED SURFACES OF THE CASTING WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
4. LOCKING COVER TYPE FRAME AND COVERS SHALL BE USED IN EASEMENT AREAS UNLESS OTHERWISE APPROVED.
5. SHALL NOT BE USED ON FLAT SLAB TOP MANHOLES.
6. MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64" TOLERANCE.

SET WEIGHT	
FRAME	140 LBS
COVER	130 LBS
TOTAL	270 LBS

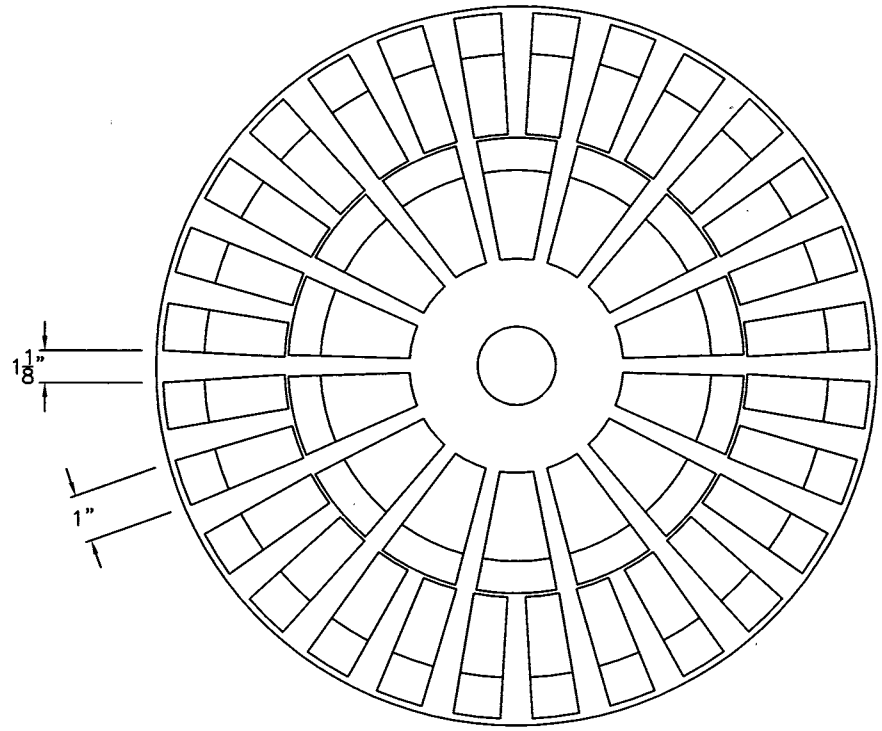
Keith DeWit
DIRECTOR, DEPARTMENT OF WATER RESOURCES

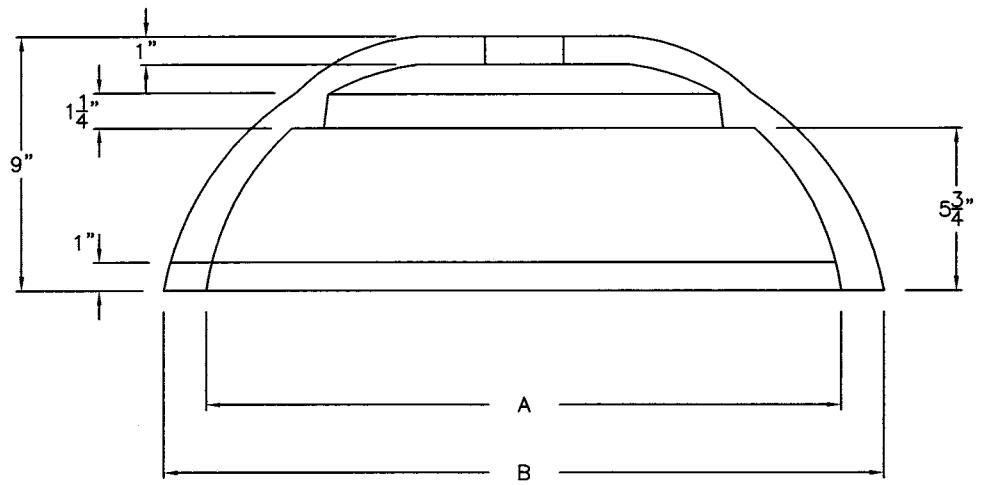
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

GREY CAST IRON STANDARD 24" MANHOLE FRAME & COVER

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 8/07

9-9
SHEET 1 OF 2





DIMINISION TABLE

LID	A	B
24"	22 5/16"	25 5/16"
36"	35 1/4"	38 1/4"

GENERAL NOTES:

1. CAST IRON TO CONFORM TO ASTM A-48, CLASS 30B.
2. NOT TO BE USED IN COUNTY RIGHT-OF-WAY.
3. EXPOSED SURFACES OF THE CASTING WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
4. LOCKING COVER TYPE FRAME AND COVERS SHALL BE REQUIRED UNLESS OTHERWISE APPROVED.

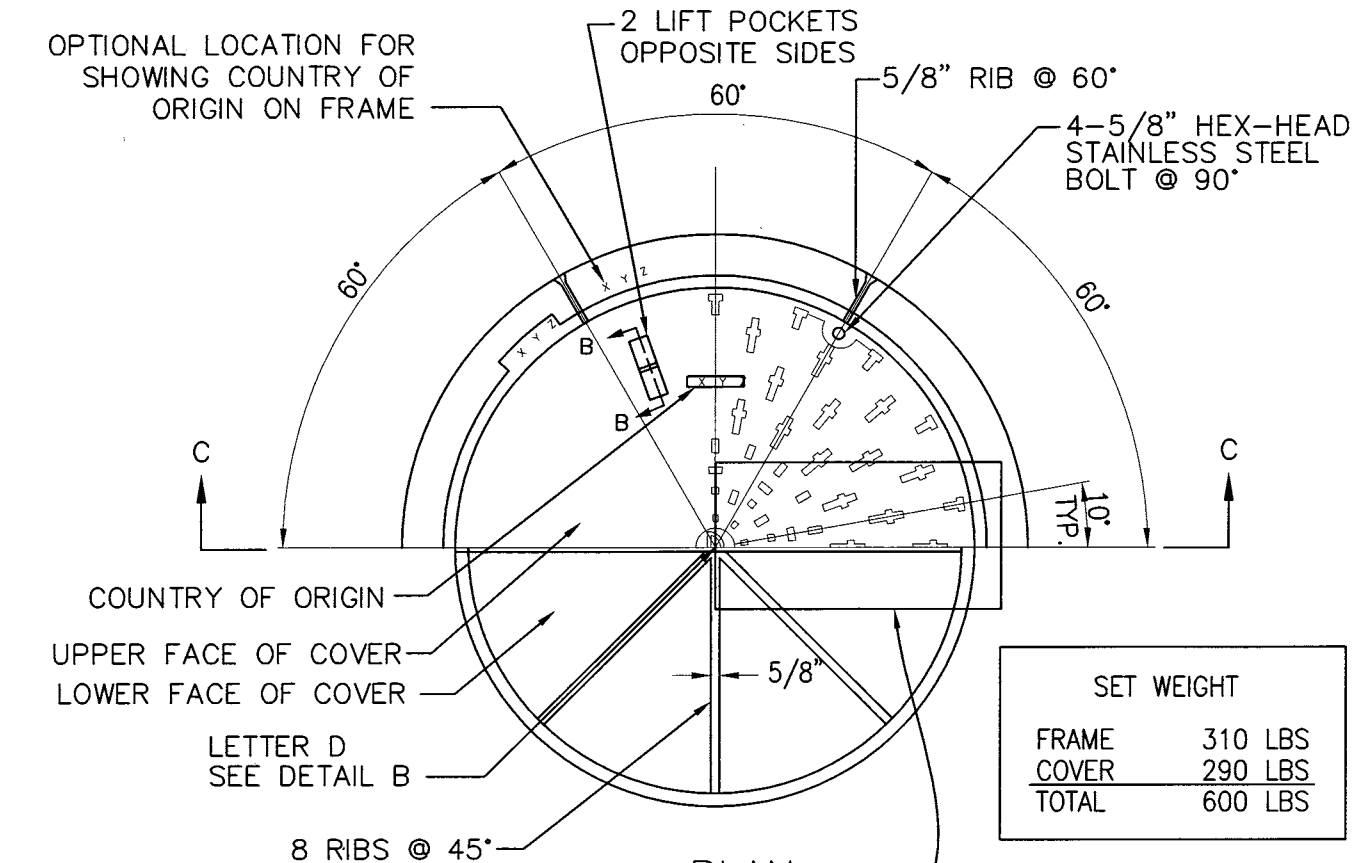
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

STANDARD 24"/36" MANHOLE COVER

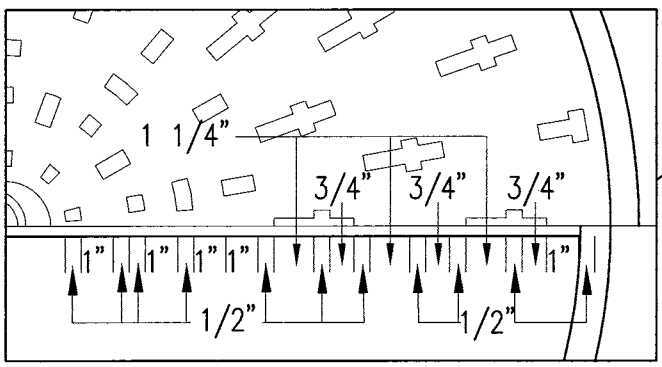
DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 04/07

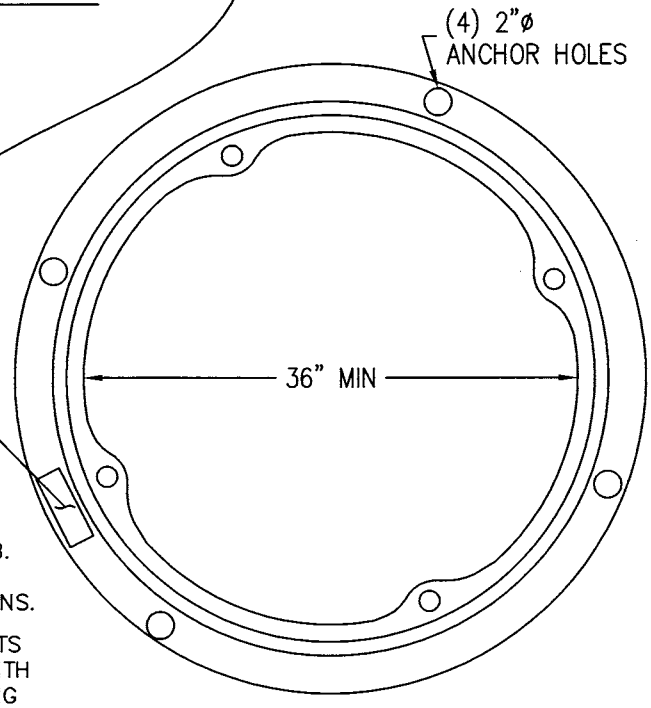
9-9
SHEET 2 OF 2



PLAN

SET WEIGHT	
FRAME	310 LBS
COVER	290 LBS
TOTAL	600 LBS





MANUFACTURER

NOTES:

1. MACHINED HORIZONTAL AND VERTICAL BEARING SURFACES NOT TO EXCEED 1/64" TOLERANCE.
2. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
3. FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS.
4. EXPOSED SURFACES OF THE CASTINGS, WITH THE PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
5. LOCKING COVER TYPE FRAME AND COVERS SHALL BE USED WHEN SPECIFIED IN CONTRACT DOCUMENTS.
6. H-20 RATED SLOTTED GRATE OR GRATE TYPE MANHOLE COVER MAY BE SUBSTITUTED FOR COVER WHEN SPECIFIED IN CONTRACT DOCUMENTS OR UPON APPROVAL OF DIRECTOR.
7. SHALL BE USED ON ALL FLAT SLAB TOP MANHOLES.

Keith DeVore

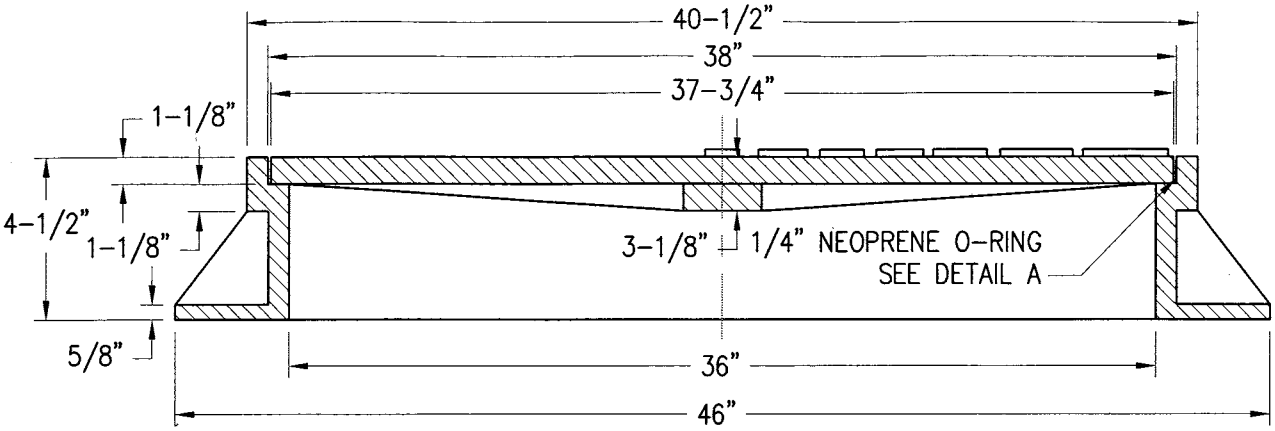
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

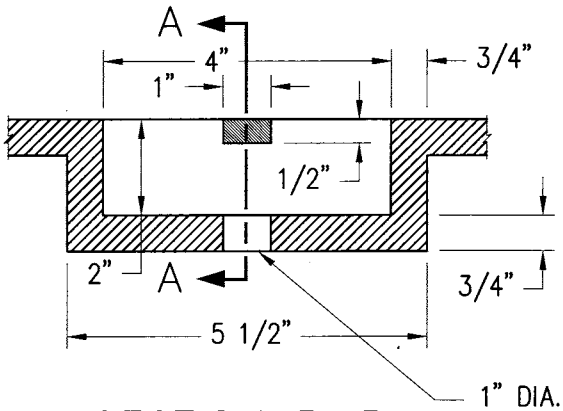
GREY CAST IRON STANDARD 36" MANHOLE FRAME & COVER

DRAWN BY: STAFF
SCALE: NONE
DATE: 04/07

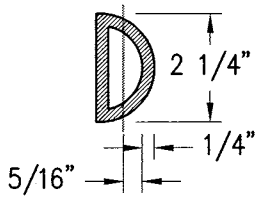
9-10
SHEET 1 OF 2



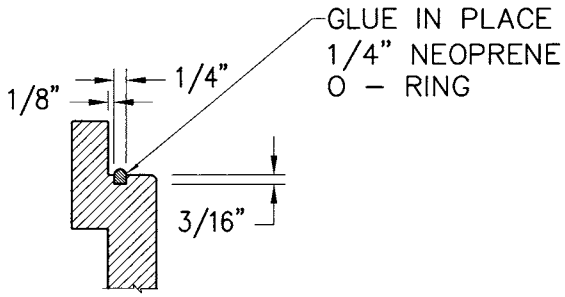
SECTION C-C



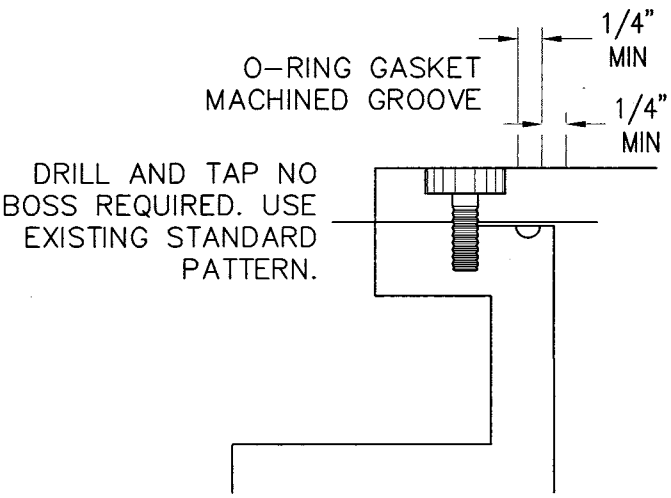
SECTION B-B
NTS.



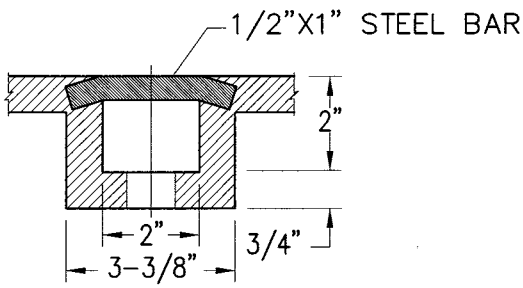
DETAIL B
NTS.



DETAIL A
NTS.



BOLT DOWN COVER DETAIL
NTS.



SECTION A-A
NTS.

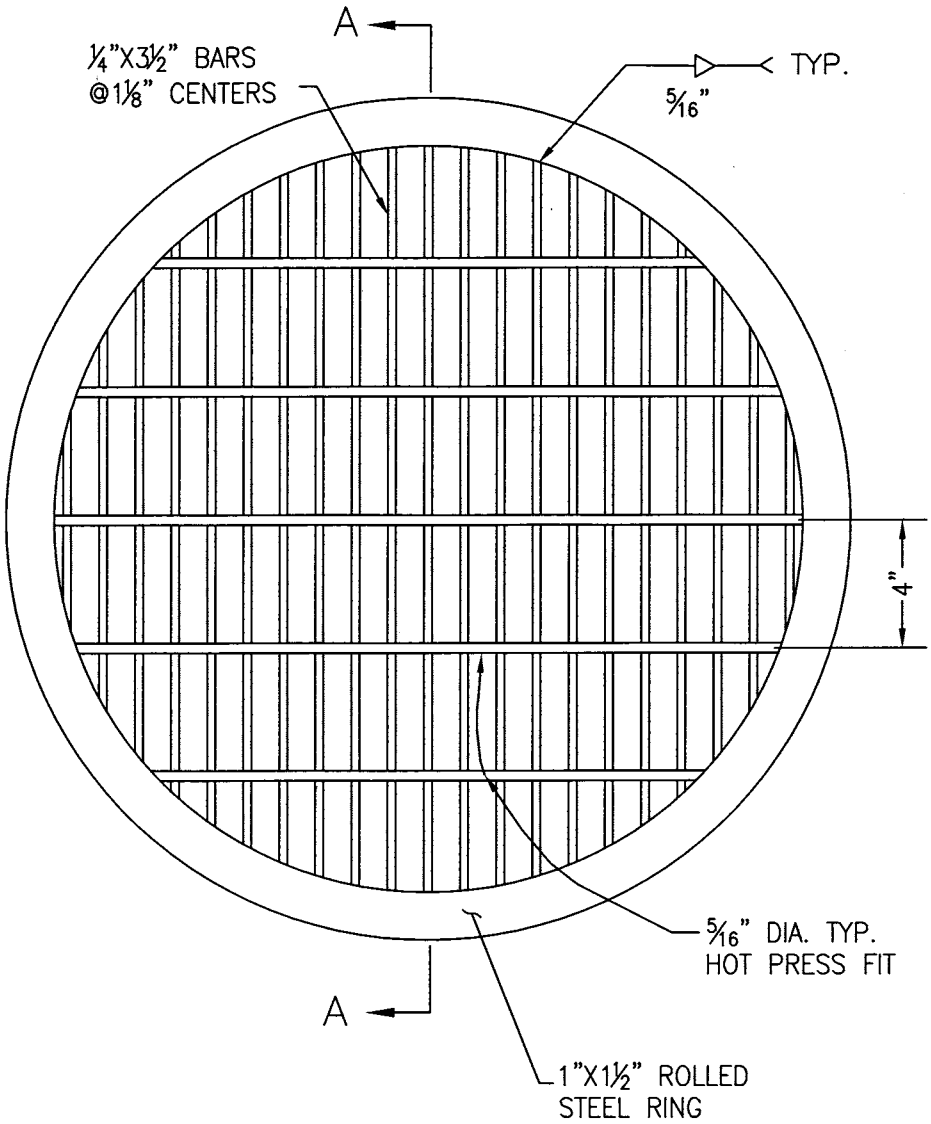
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

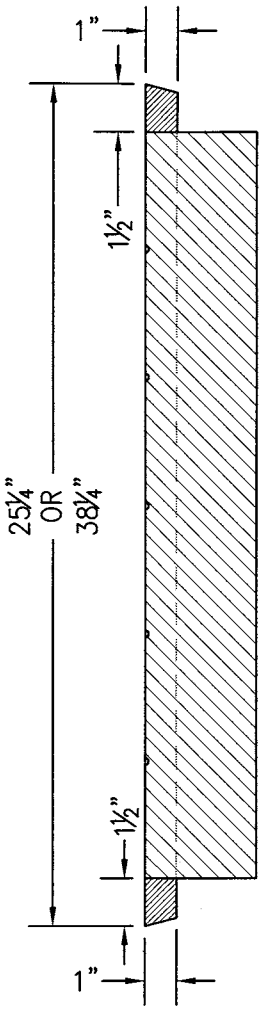
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

GREY CAST IRON STANDARD 36" MANHOLE FRAME & COVER

DRAWN BY: TRU PHAN
SCALE: NONE
DATE: 6/07

9-10
SHEET 2 OF 2





SECTION A–A

NOTES

1. MANHOLE COVER SHALL FIT FRAME SHOWN ON DRAWING 9–9 or 9–10.
2. SEATING SURFACES SHALL BE MACHINED AS SHOWN IN DETAIL ON DRAWING 9–9.
3. THIS COVER MAY BE USED ONLY WITH APPROVAL OF DIRECTOR.
4. EXPOSED SURFACES OF THE CASTINGS, WITH THE PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

Keith DeVore

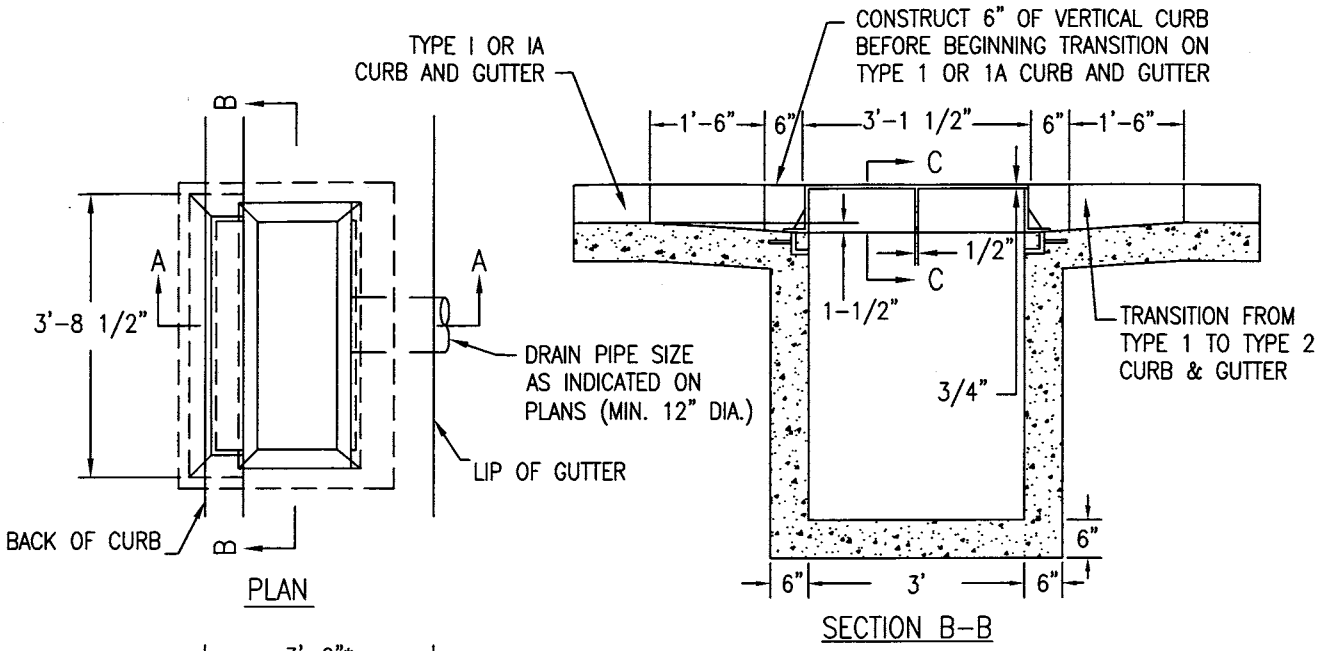
DIRECTOR, DEPARTMENT OF WATER RESOURCES

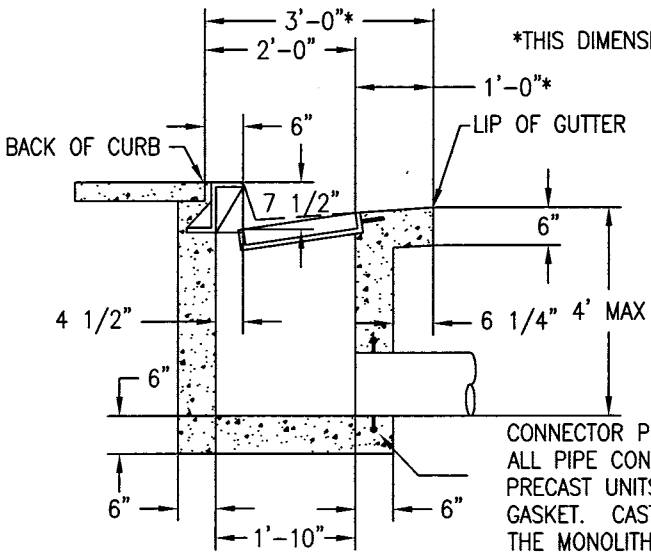
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

GRATE TYPE MANHOLE COVER

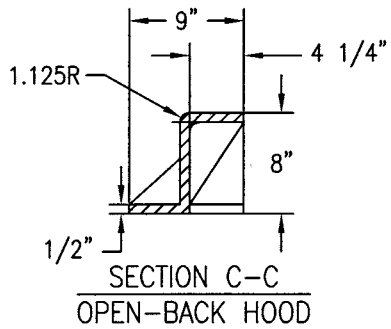
DRAWN BY: STAFF
SCALE: NONE
DATE: 08/07

9-11



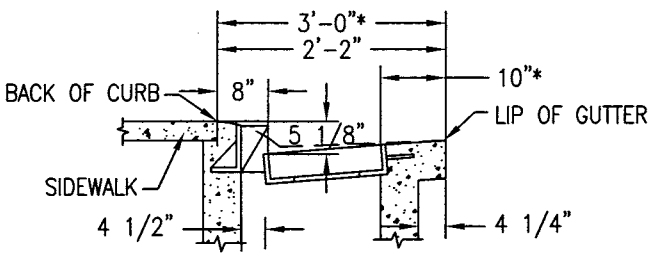


SECTION A-A
TYPE 2-VERTICAL C&G

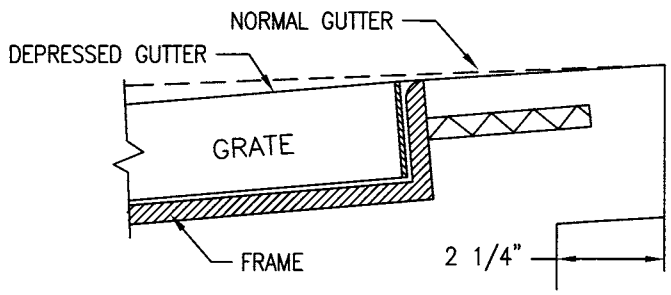


SECTION C-C
OPEN-BACK HOOD

CONNECTOR PIPE OR MONOLITHIC CATCH BASIN CONNECTION. ALL PIPE CONNECTIONS SHALL CONFORM TO ASTM C-923. PRECAST UNITS SHALL BE BOOT TYPE OR INTEGRAL COMPRESSION GASKET. CAST IN PLACE UNITS SHALL INCLUDE A WATER STOP IF THE MONOLITHIC CATCH BASIN CONNECTION IS NOT REQUIRED.



SECTION A-A
TYPE 1&1A-ROLLED C&G



GUTTER WITH
FRAME DETAIL

Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

NOTES

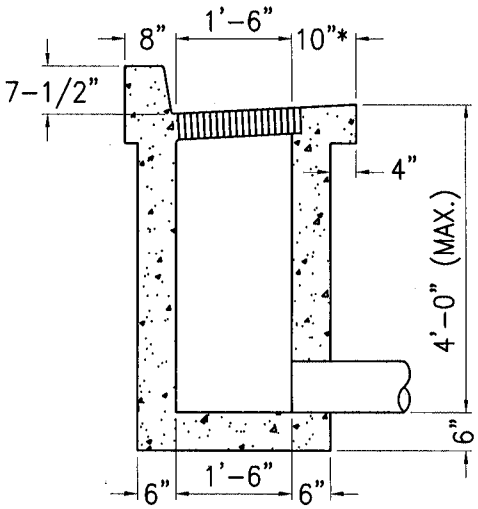
1. STANDARD DEPRESSION FOR INLET IS 1-1/2".
2. FRAME AND GRATE SHALL CONFORM TO DRAWINGS 9-14 AND 9-15.
3. OPEN-BACK HOOD SHALL BE H-20 RATED.
4. ALL EXPOSED EDGES SHALL HAVE A 1/8" R (MINIMUM).
5. AN EDGING TOOL SHALL BE USED ON ALL EDGES WHERE THE CONCRETE SIDEWALK AND CURB MEET THE TOP OF THE HOOD.
6. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
7. CAST IRON HOODS SHALL BE 3/4" THICK.

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

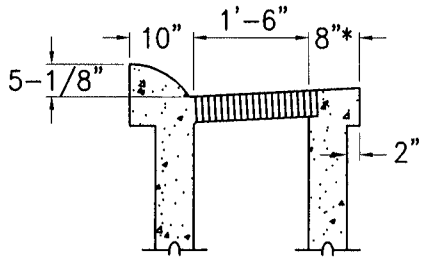
DROP INLET
TYPE B

DRAWN BY: STAFF
SCALE: NONE
DATE: 06/07

9-13B



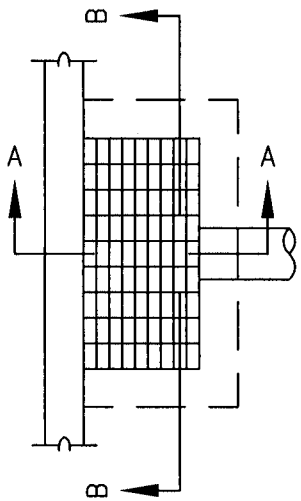
TYPE 2 CURB

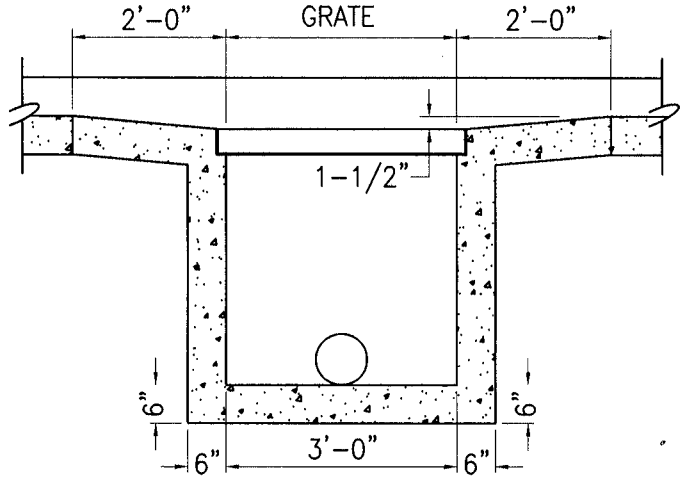


TYPE 1 OR 1A CURB

SECTION A–A

*THIS DIMENSION MAY VARY.





SECTION B–B

NOTES:

1 SEE DRAWINGS 9–14 AND 9–15 FOR FRAME AND GRATE DETAILS.

2 BOTTOM OF INLET SHALL BE PLACED PRIOR TO OR AT THE SAME TIME AS SIDE WALLS.

3 SEE NOTE 1 OF DRAWING 9–13B FOR GUTTER DEPRESSION.

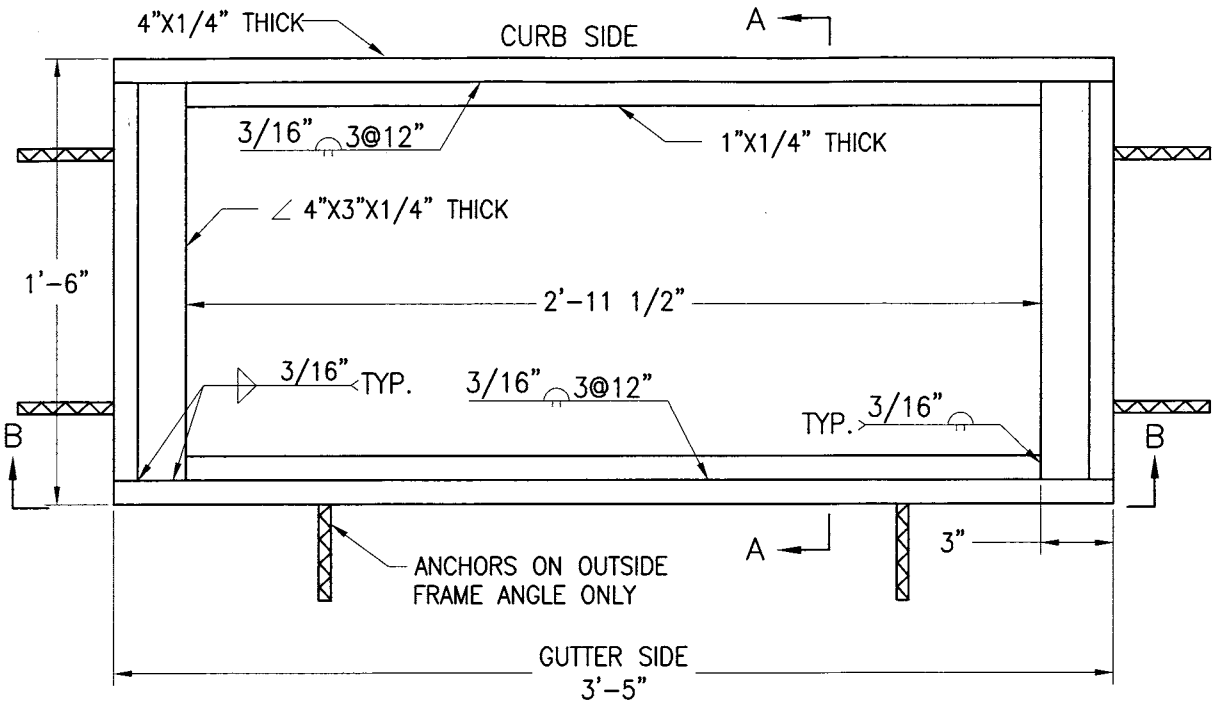
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

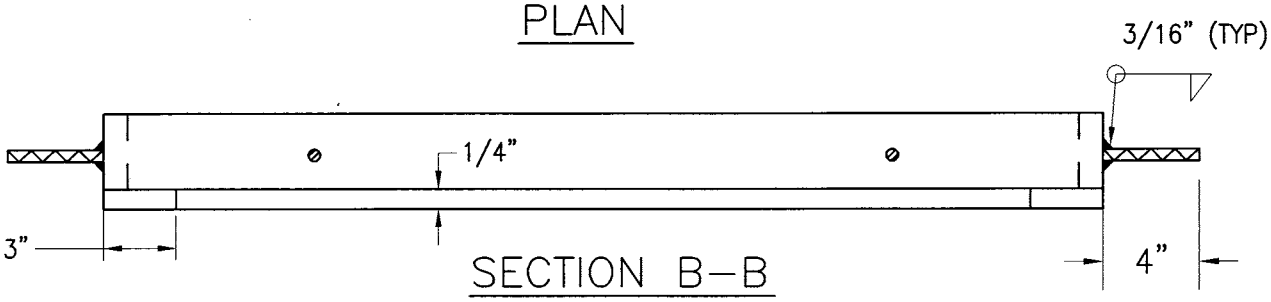
DROP INLET
TYPE C

DRAWN BY: G. OGREN
SCALE: NONE
DATE: 09/00

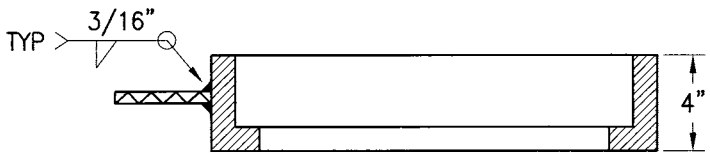
9-13C



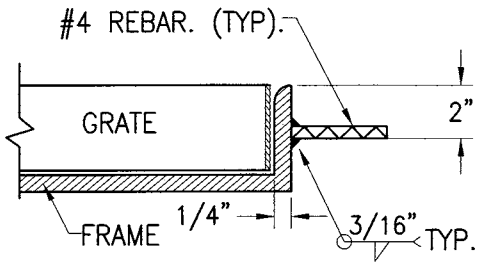
PLAN



SECTION B-B



SECTION A-A



FRAME ANCHOR DETAIL

NOTES:

1. OMIT 1/2" FRAME ANCHORS OVER CENTER SUPPORT ASSEMBLY WHEN MULTIPLE FRAMES ARE USED.
2. MATERIAL: ASTM A36 MILD STEEL.
3. SEE ARTICLE 50-34, "SEWER AND STORM DRAIN CASTINGS," OF SECTION 50.
4. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

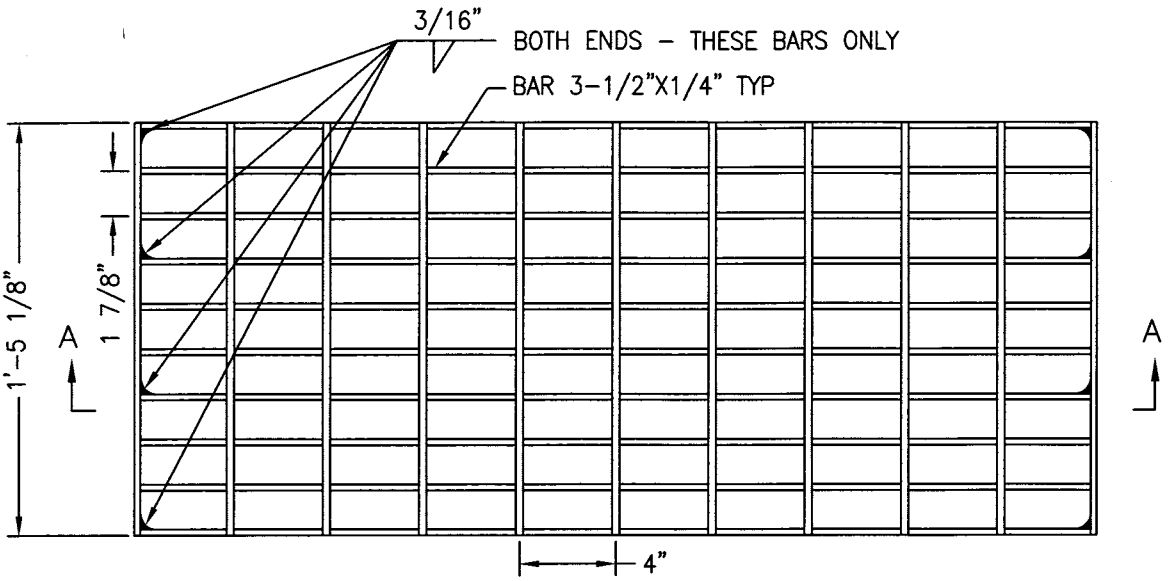
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

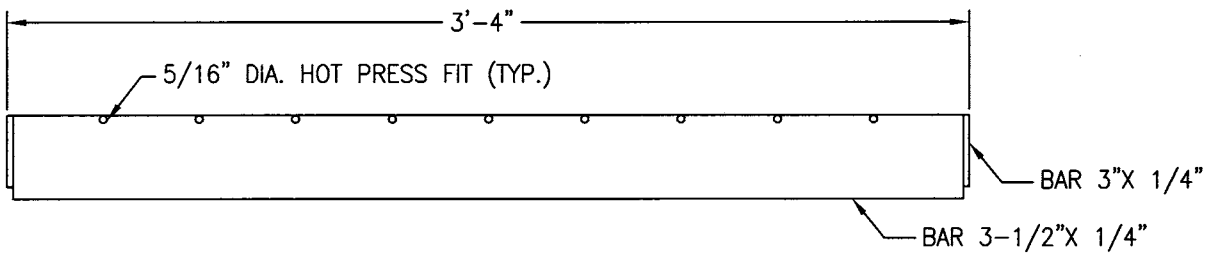
WELDED STEEL GRATE FRAME

DRAWN BY: L. PETERS
SCALE: NONE
DATE: 04/07

9-14



PLAN



SECTION A–A

NOTES:
1. DIMENSIONS TO CENTERLINE OF BARS UNLESS OTHERWISE NOTED.

2. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS, WITH THE PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

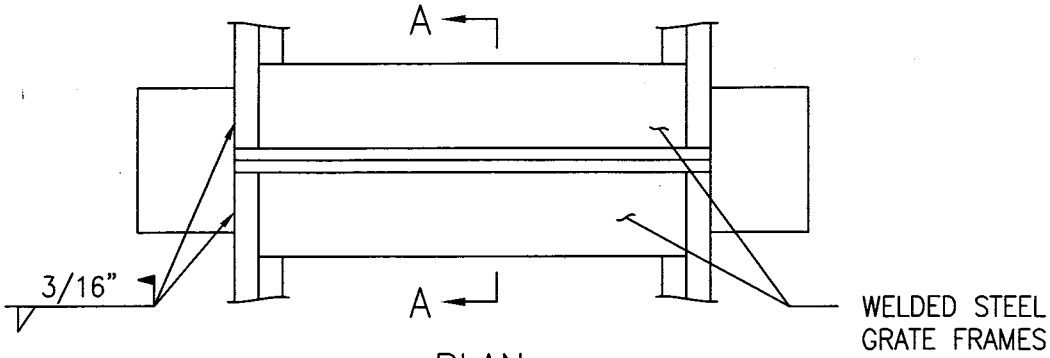
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

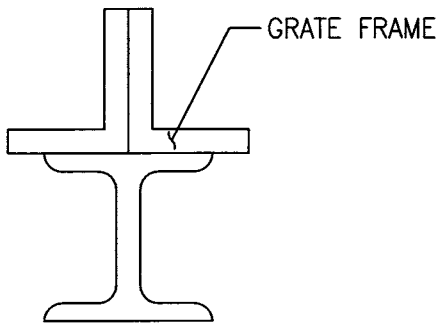
WELDED STEEL GRATE

DRAWN BY: M. FIELDS
SCALE: NONE
DATE: 04/07

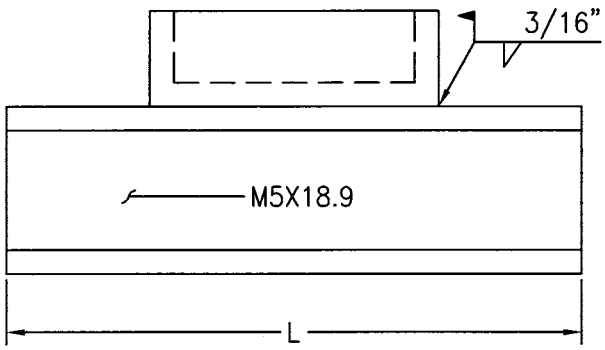
9-15



PLAN



SECTION A–A



ELEVATION

NOTES:

1. OMIT 1/2" FRAME ANCHORS OVER CENTER SUPPORT

2. L=57 INCHES FOR CURB OPENING CATCH BASIN WITH GRATING(S) AND DEBRIS SKIMMER (STANDARD PLAN 301).

3. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS, WITH PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

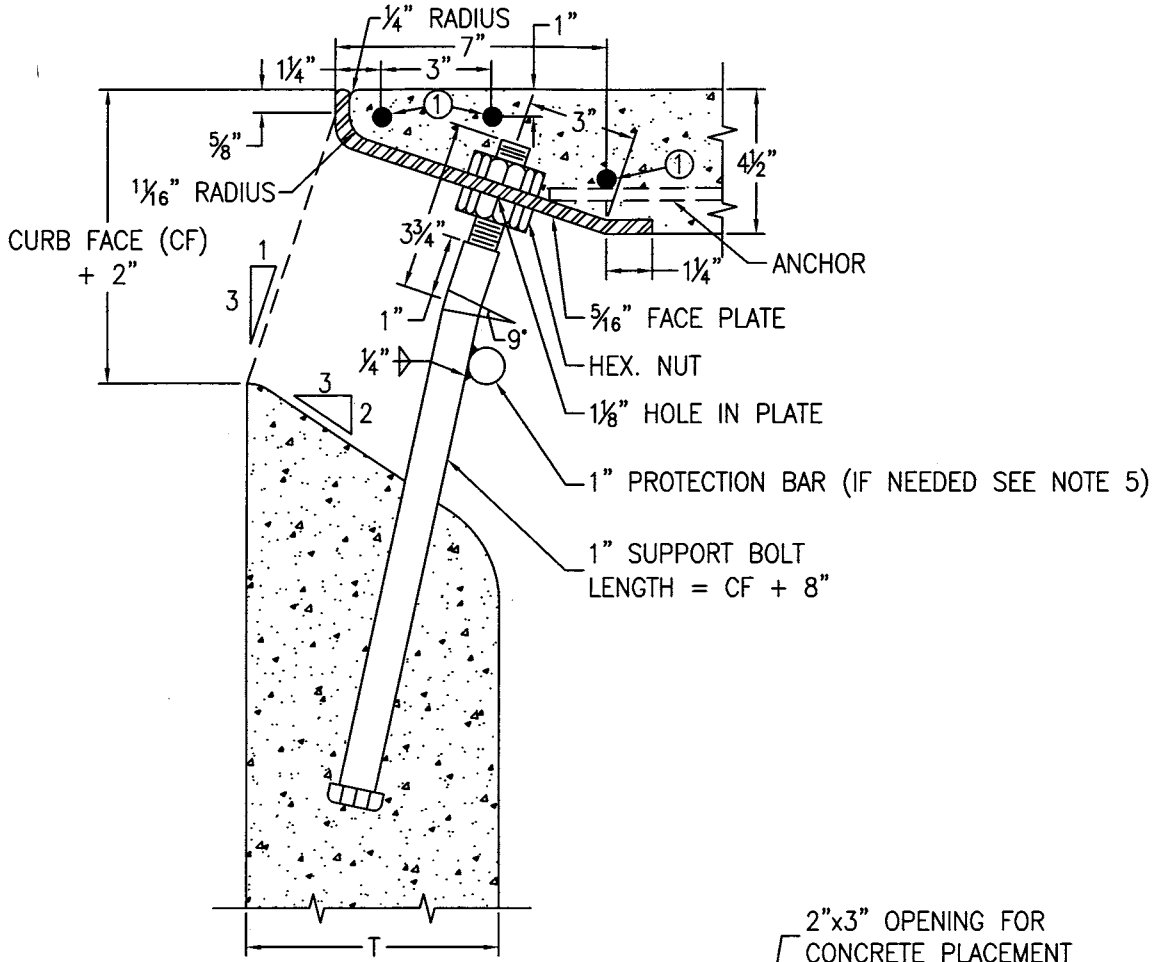
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

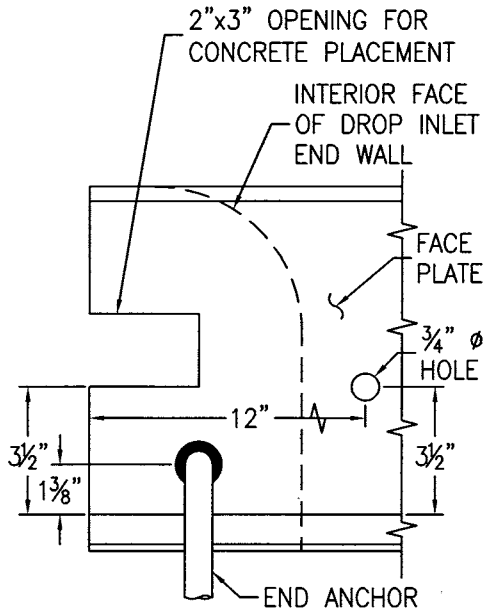
CENTER SUPPORT ASSEMBLY FOR MULTIPLE GRATES

DRAWN BY: M. FIELDS
SCALE: NONE
DATE: 04/07

9-16



① #4 BAR x W+6". IN ADDITION TO REINFORCING STEEL PER 9-19, 300-1 AND 301-1.



END DETAIL

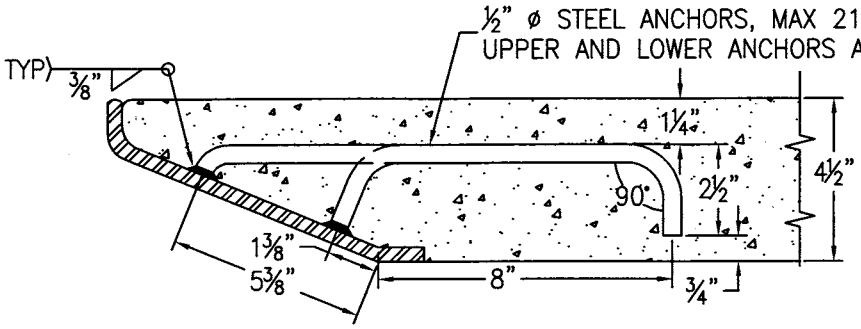
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 04/07

9-17
SHEET 1 OF 2



FACE PLATE ANCHORS

GENERAL NOTES:

1. TO BE USED ONLY IN TYPE 2 CURB AND GUTTER WITH 2" DEPRESSION. USE IN TYPE 1 CURB AND GUTTER ONLY UPON APPROVAL OF THE DIRECTOR. ALTERNATE ANGLE IRON SIZE, DEPRESSION DEPTH, AND SLAB THICKNESS MAY BE USED UPON APPROVAL OF THE DIRECTOR.
2. ALL PARTS SHALL BE STEEL, EXCEPT SET SCREWS, WHICH SHALL BE STAINLESS STEEL OR BRASS.
3. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
4. FACE PLATE LENGTHS SHALL BE CAST INTO STRUCTURE CONTINUOUS FOR THE FULL LENGTH + 12".
5. WHEN CURB INLET OPENING HEIGHT EXCEEDS: 6" INSTALL 1" ø STEEL PROTECTION BAR, 12" INSTALL 2–1" ø STEEL PROTECTION BARS (EQUALLY SPACED), 17" INSTALL 3–1" ø STEEL PROTECTION BARS (EQUALLY SPACED).
6. WHEN CURB INLET OPENING LENGTH EXCEEDS 7' INSTALL 1" ø STEEL SUPPORT BOLTS, SPACED AT NOT MORE THAN 5' O.C.
7. ALTERNATE ANGLE IRON SIZE, DEPRESSION DEPTH, AND SLAP THICKNESS MAY BE USED UPON APPROVAL OF THE DIRECTOR.
8. TOP SLAB OVER INLET SHALL BE 4½".

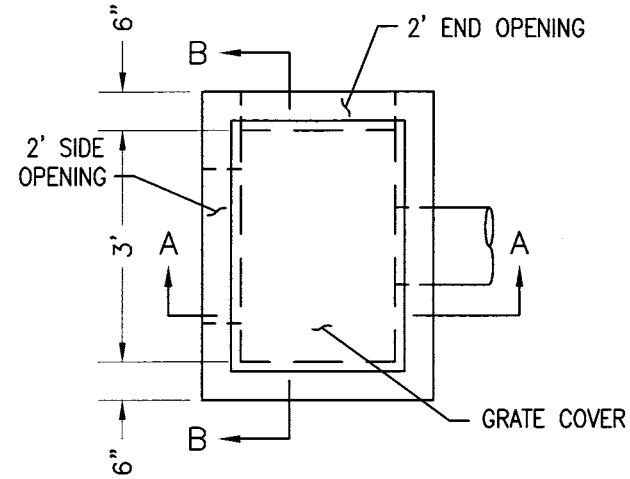
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

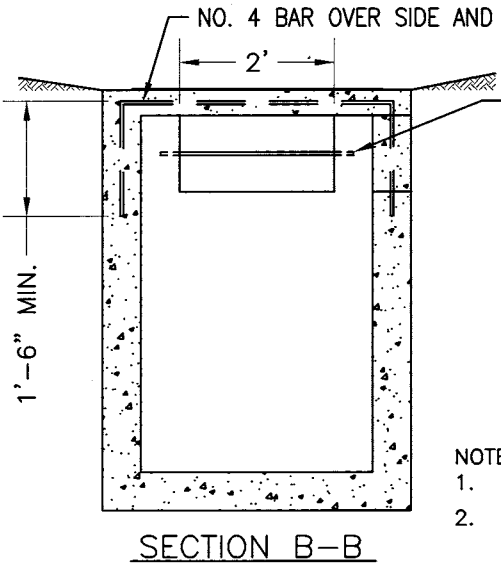
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 04/07

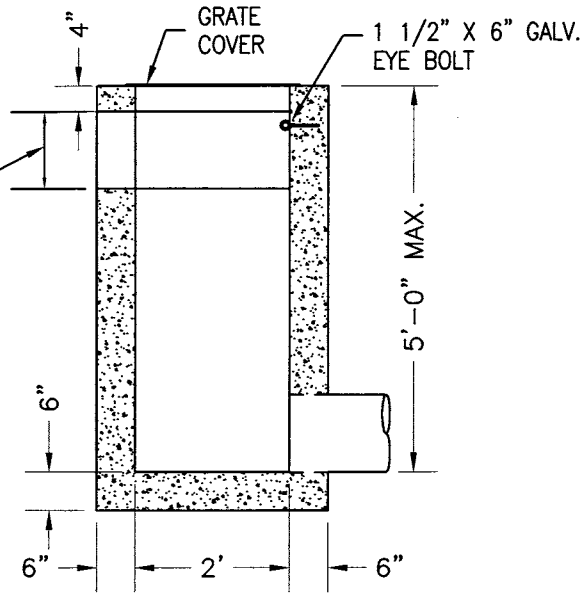
9-17
SHEET 2 OF 2





SECTION B–B

PLACE 1/2" DIA. HORIZONTAL BAR IN CENTER OF SIDE OR END OPENING GREATER THAN 6"



SECTION A–A

NOTES:

1. PROVIDE 1/4" X 18" CHAIN WELD TO COVER AND EYE BLOT.
2. PROVIDE END OR SIDE OPENINGS AS SHOWN ON PLAN OR CROSS SECTION.
3. TOP OF ALL WALLS TO BE FINISHED TO A FLAT PLANE TO PROVIDE EVEN BEARING FOR THE GRATE COVER.
4. ALL METAL SHALL BE GALVANIZED PER ASTM A123.
5. INSTALL A GREEN CARSONITE UTILITY MARKER PRODUCT NUMBER CRM306607 OR EQUIVALENT. UTILITY MARKER SHALL HAVE A 3"X12" SILVER/WHITE HIGH INTENSITY STRIP ON THE FRONT AND A 3"X3" SILVER/WHITE HIGH INTENSITY STRIP ON THE BACK. INSTALL THE UTILITY MARKER PER MANUFACTURER'S STANDARDS. THE MARKER SHALL BE INSTALLED 1' FROM THE EDGE OF PAVEMENT AT THE CENTERLINE OF THE DROP INLET.

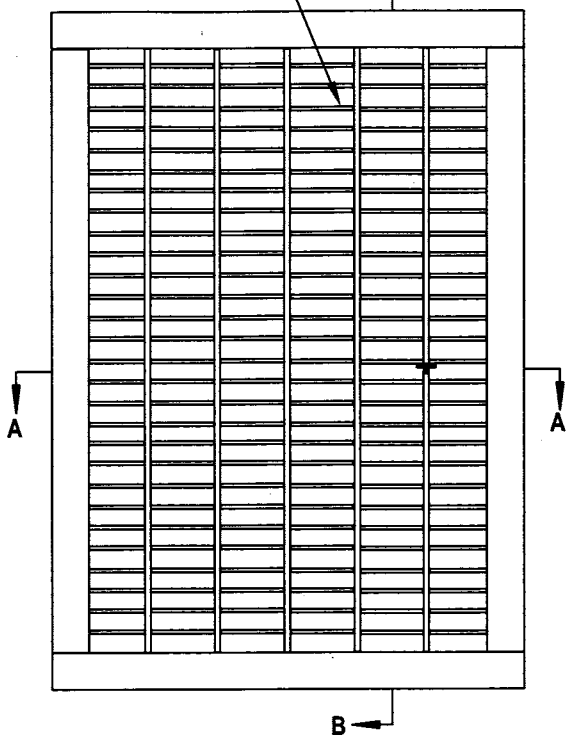
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

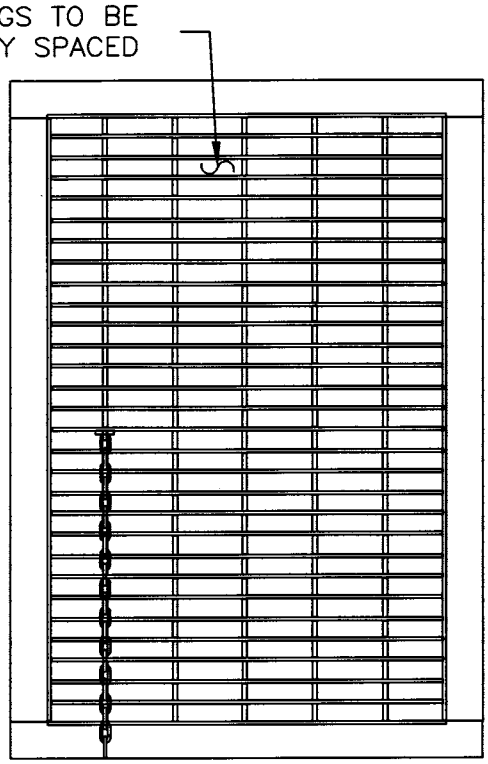
DROP INLET
TYPE F

DRAWN BY: STAFF
SCALE: NONE
DATE: 08/07

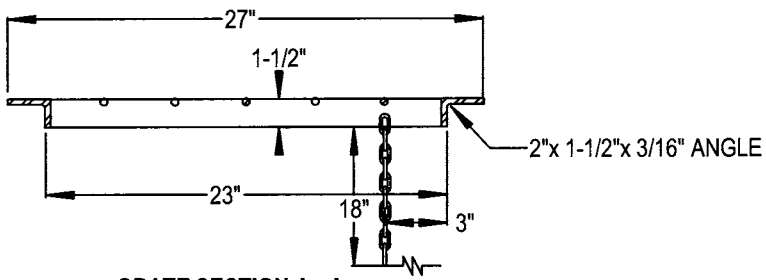
9-18
SHEET 1 OF 2



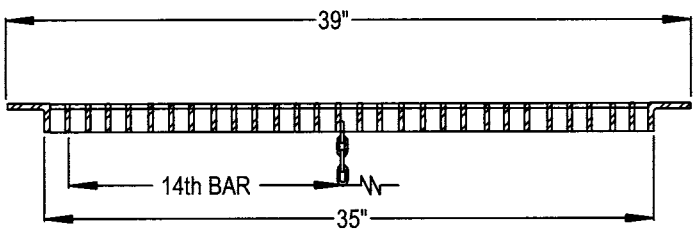
GRATE TOP VIEW



GRATE BOTTOM VIEW



GRATE SECTION A - A



GRATE SECTION B - B

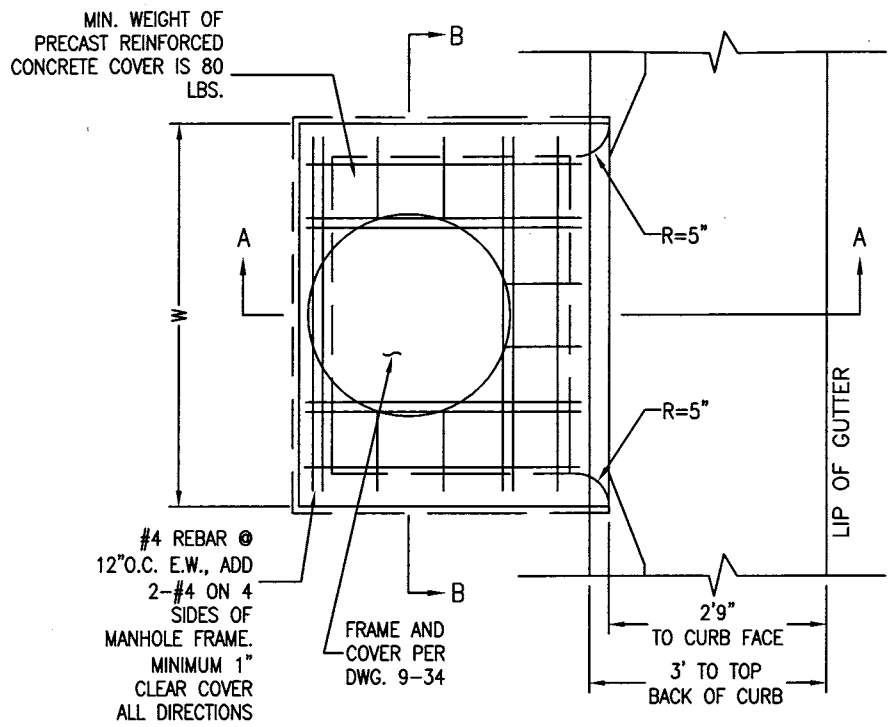
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

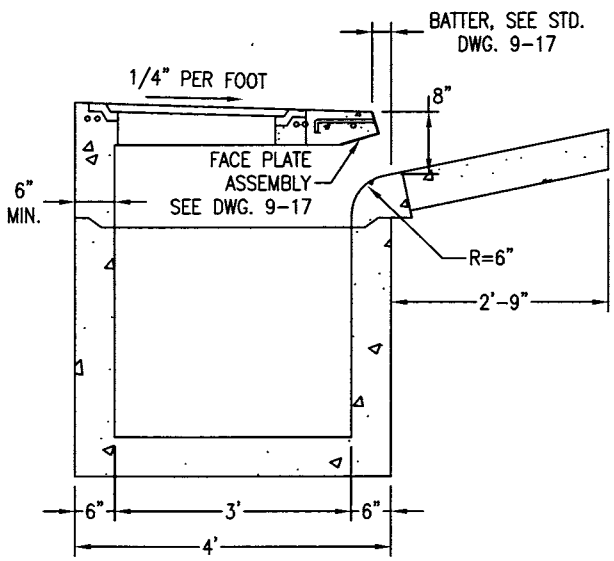
DROP INLET
TYPE F

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 04/07

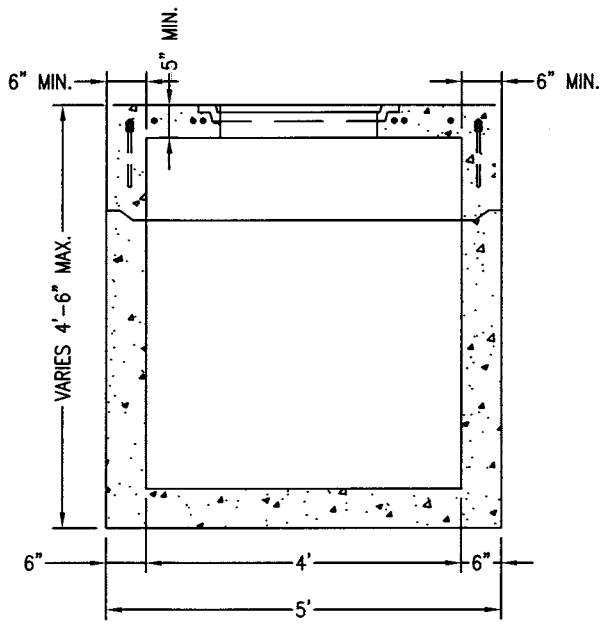
9-18
SHEET 2 OF 2



PLAN



SECTION A-A



SECTION B-B

NOTES:

1. CURB INLET ASSEMBLY MAY BE PRECAST CONCRETE, OR FORMED AND CAST-IN-PLACE P.C.C.

2. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS, WITH THE PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

3. SEE STD. DWG. 9-17 FOR FACE PLATE ASSEMBLY.

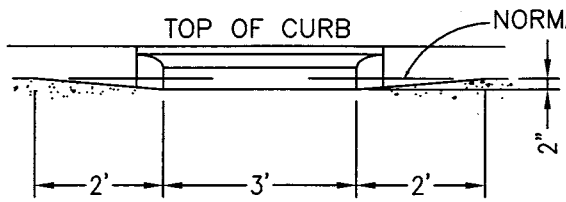
Keith Dehr
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

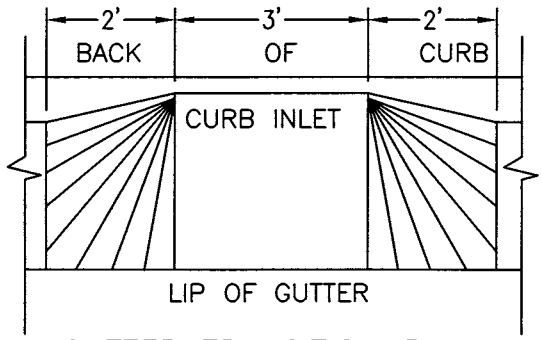
DROP INLET
TYPE G
Type 2 C & G Only

DRAWN BY: L. PETERS
SCALE: NONE
DATE: 04/07

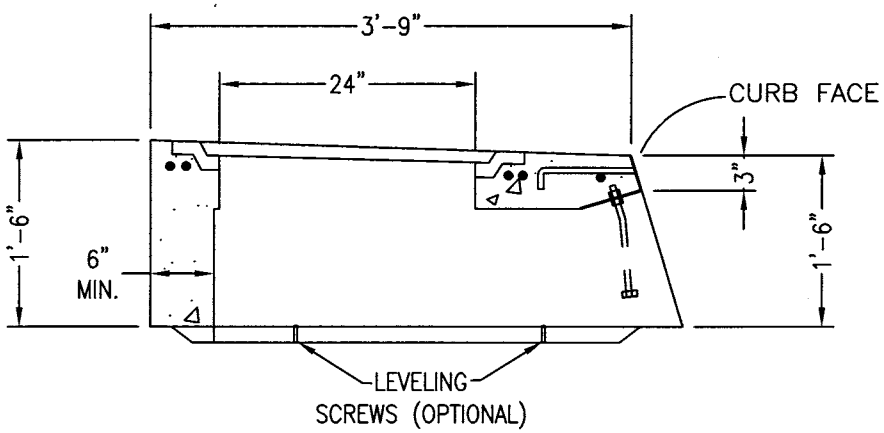
9-19
SHEET 1 OF 2



GUTTER TRANSITION ELEVATION



GUTTER TRANSITION PLAN



CURB INLET DETAIL

NOTES:
1. CURB INLET ASSEMBLY MAY BE PRECAST CONCRETE, OR FORMED AND CAST-IN-PLACE P.C.C.

2. EXPOSED SURFACES OF THE GRATES, FRAMES AND HOODS, WITH THE PARTS ASSEMBLED AND DISASSEMBLED, SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.

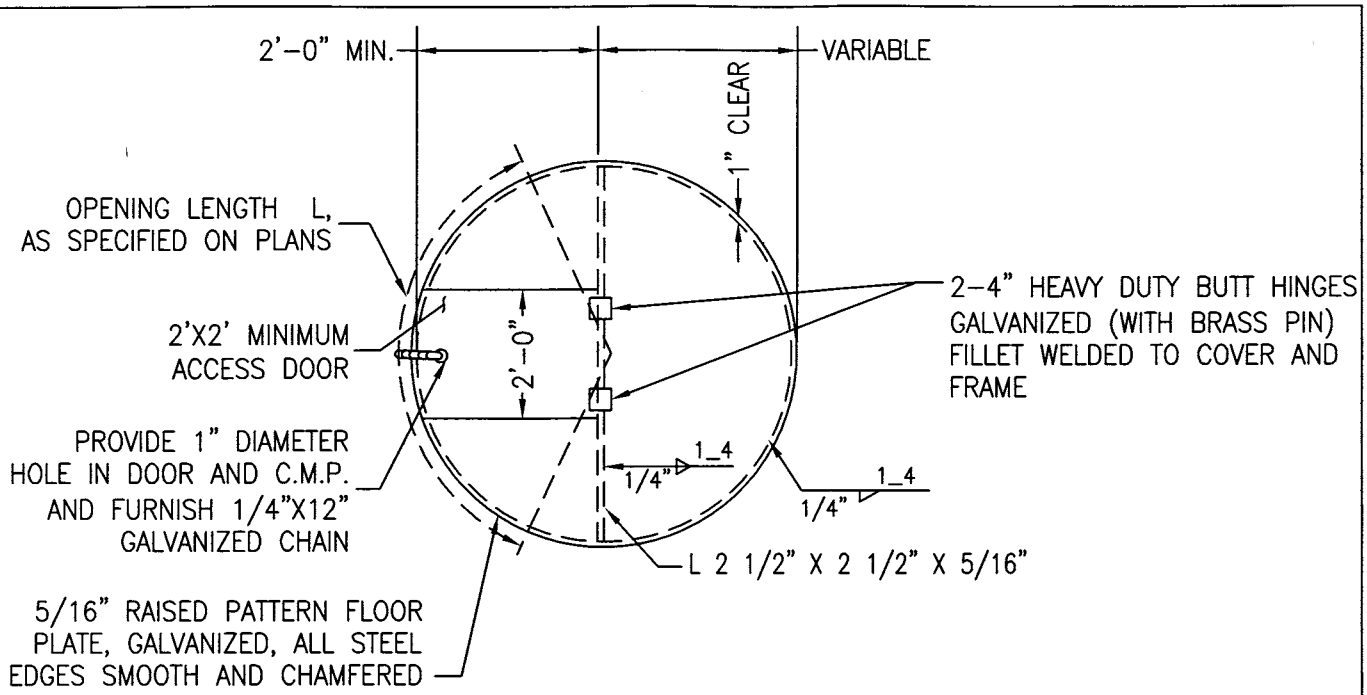
Keith Dehr
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

DROP INLET
TYPE G
Type 2 C & G Only

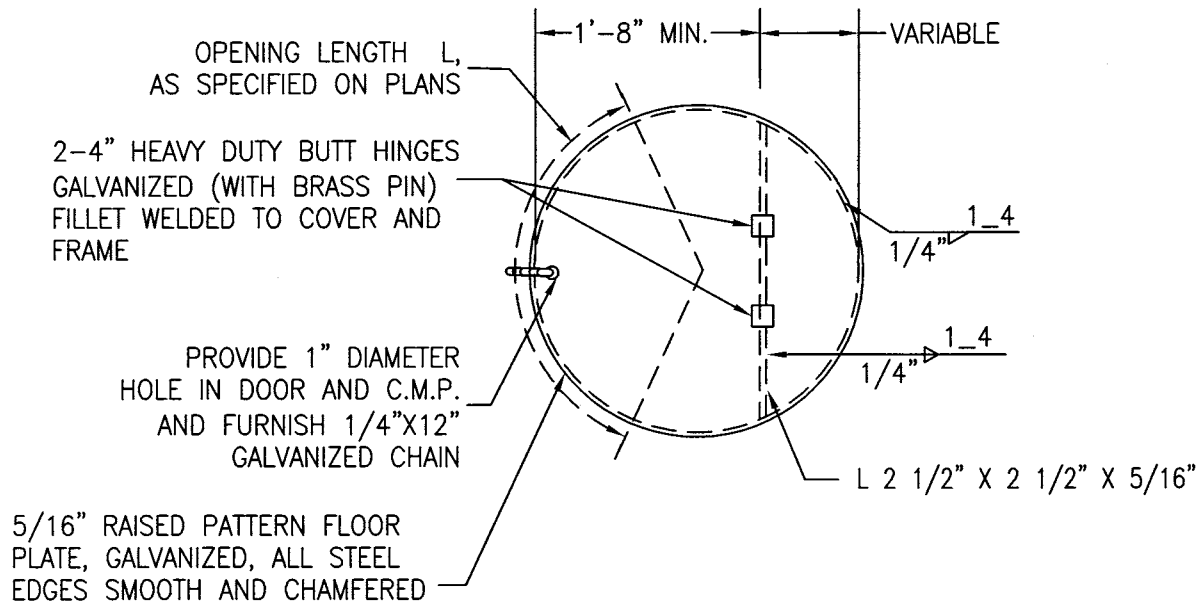
DRAWN BY: L. PETERS
SCALE: NONE
DATE: 04/07

9-19
SHEET 2 OF 2



PLAN

42" DIAMETER TO 72" DIAMETER
C.M.P. INLET



PLAN

24" DIAMETER TO 36" DIAMETER
C.M.P. INLET

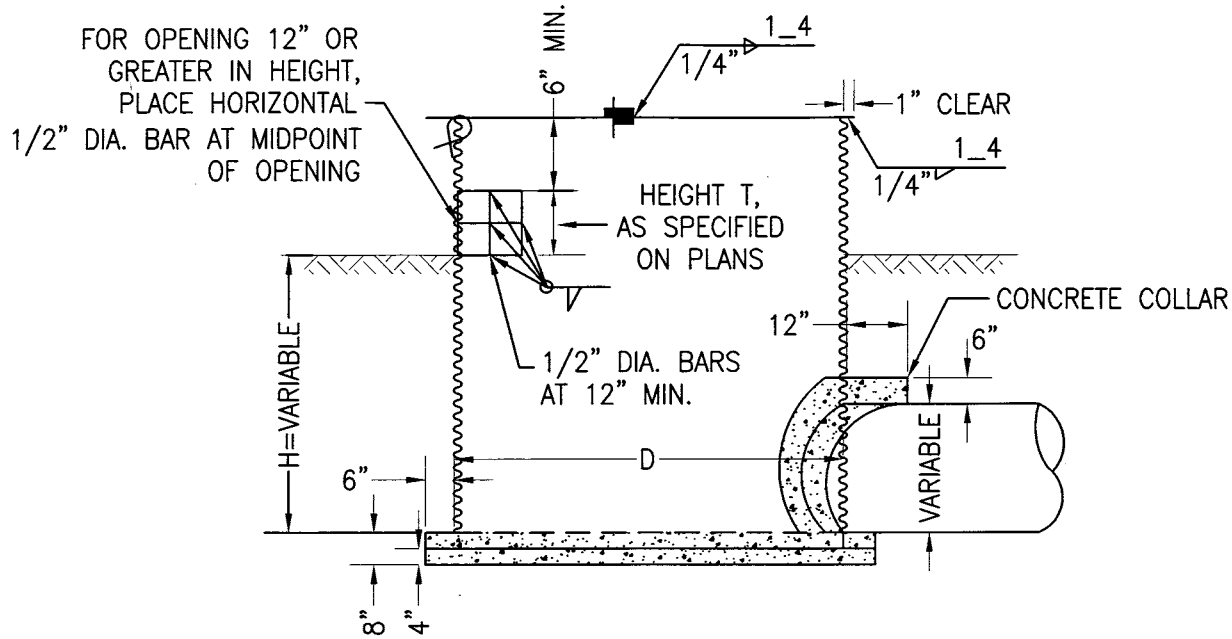
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CORRUGATED METAL PIPE
DRAINAGE INLET
TYPE I

DRAWN BY: M. FIELDS
SCALE: NONE
DATE: 11/98

9-21
SHEET 1 OF 2



SECTION
24" DIAMETER TO 36" DIAMETER C.M.P. INLET

NOTES

1. LOCATIONS, HEIGHTS, AND LENGTH OF OPENINGS SHALL BE AS SHOW ON THE PLANS.
2. AREA OF THE OPENING SHALL NOT BE LESS THAN THE AREA OF OUTFALL PIPE.
3. OUTFALL PIPE TO BE CUT FLUSH WITH INSIDE OF RISER.
4. NOT TO BE USED AS A JUNCTION STRUCTURE.
5. DIAMETER OF RISER PIPE SHALL BE AT LEAST ONE SIZE LARGER THAN OUTFALL PIPE.
6. TO BE USED ONLY WITH THE SPECIFIC APPROVAL OF THE DIRECTOR.
7. INSTALL A GREEN CARSONITE UTILITY MARKER PRODUCT NUMBER CRM306607 OR EQUIVALENT. UTILITY MARKER SHALL HAVE A 3"X12" SILVER/WHITE HIGH INTENSITY STRIP ON THE FRONT AND A 3"X3" SILVER/WHITE HIGH INTENSITY STRIP ON THE BACK. INSTALL THE UTILITY MARKER PER MANUFACTURER'S STANDARDS. THE POST SHALL BE INSTALLED 1' FROM THE EDGE OF PAVEMENT AT THE CENTERLINE OF THE DROP INLET.

RISER DIAMETER,D	H, MAX.	HEIGHT T, MAX.	GAGES (MINIMUM)
24"	4'	8"	0.079"
30"	4'	8"	0.079"
36"	5'	8"	0.109"
42"	8'	12"	0.109"
48"	8'	12"	0.109"
54"	10'	18"	0.109"
60"	10'	18"	0.109"
72"	10'	18"	0.109"

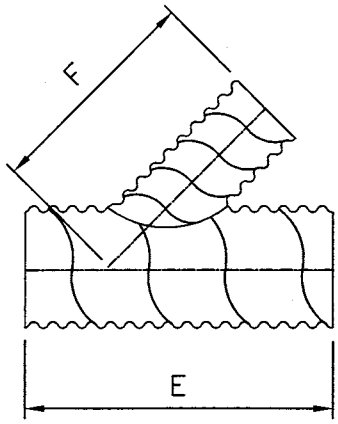
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

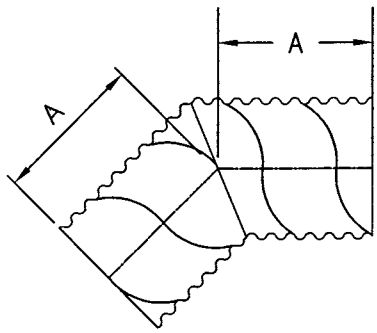
CORRUGATED METAL PIPE DRAINAGE INLET TYPE I

DRAWN BY: STAFF
SCALE: NONE
DATE: 2/07

9-21
SHEET 2 OF 2



WYE LATERAL



ELBOW
0° to 45°

FITTING SIZES

DIA (in)	A (ft)	E (ft)	F (ft)
12	1	4	2
15	1	4	4
18	1	4	4
21	2	6	4
24	2	6	4
30	2	6	4
36	2	8	6
42	2	8	6
48	2	10	8
54	3	10	8
60	3	12	10
66	3	12	10
72	3	14	10
78	3	14	10
84	3	16	12
90	3	16	12
96	3	16	12

NOTES

1. To use table, refer to diagram and select letter representing desired dimension, then enter table at correct pipe dimension and read dimension in column under appropriate letter heading.

2. Dimensions on table allow for use of standard 12 inch wide band coupler on sizes 12 inch through 54 inch and 24 inch wide band on 60 inch and larger sizes.

3. For pipe–arch fittings, choose pipe diameter equal to or greater than arch span. (Example: 35 inch x 24 inch pipe–arch; use dimensions for 36 inch pipe).

4. Structural reinforcement may be required on some larger sizes.

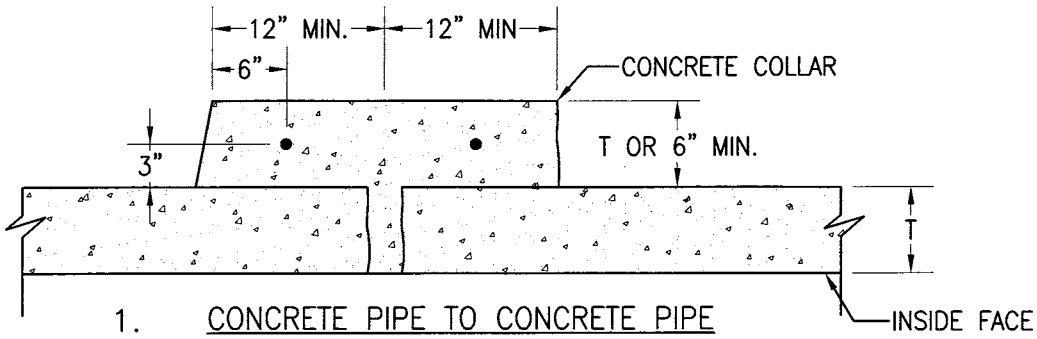
Keith Dellar
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

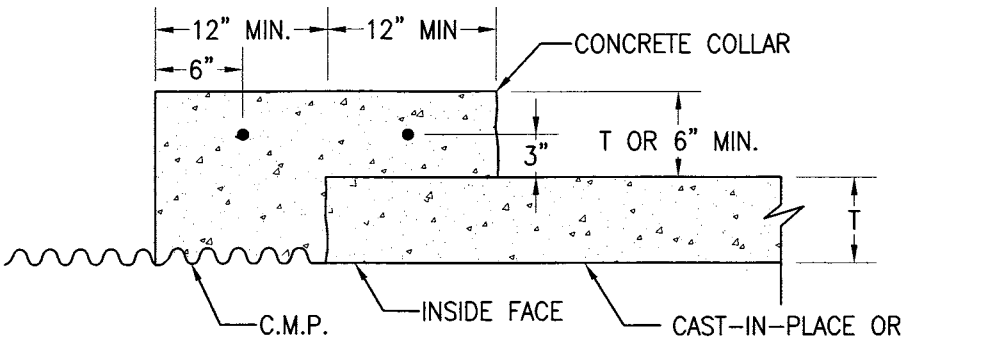
CORRUGATED PIPE FITTINGS

DRAWN BY: C. SCHUMAKER
SCALE: NONE
DATE: 11/98

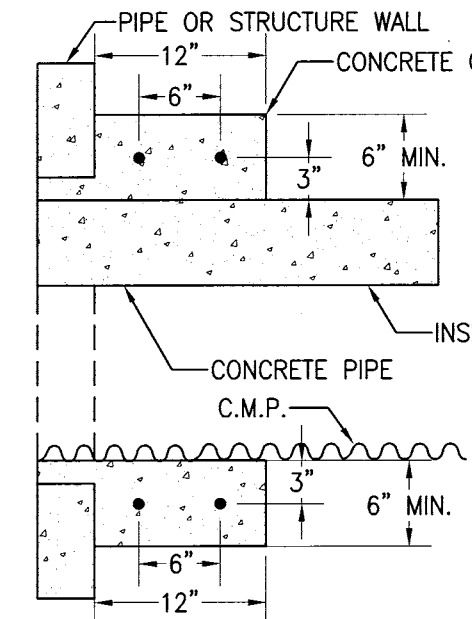
9-22



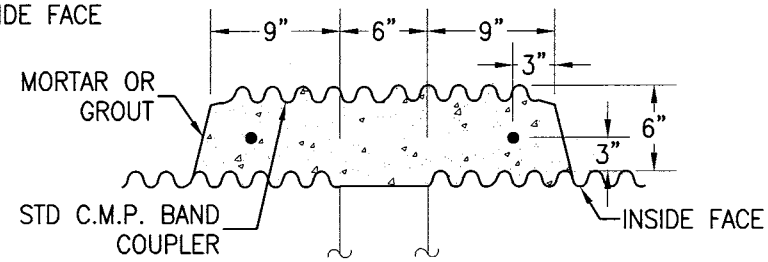
1. CONCRETE PIPE TO CONCRETE PIPE WITHOUT STANDARD JOINT



2. CAST-IN-PLACE OR PRE-CAST CONCRETE PIPE TO CSP



3. CONCRETE PIPE, C.M.P. INTO EXISTING PIPE OR STRUCTURE



4. PIPES OF DISSIMILAR METALS

NOTES:

1. TO CONNECT HDPE TYPE S OR D PIPE TO OTHER PIPES USE COLLAR SHOWN IN DETAIL 1 OR USE MANUFACTURERS STANDARD HDPE REPAIR COUPLING.
2. ALL REINFORCEMENT SHALL BE #3 REBAR.

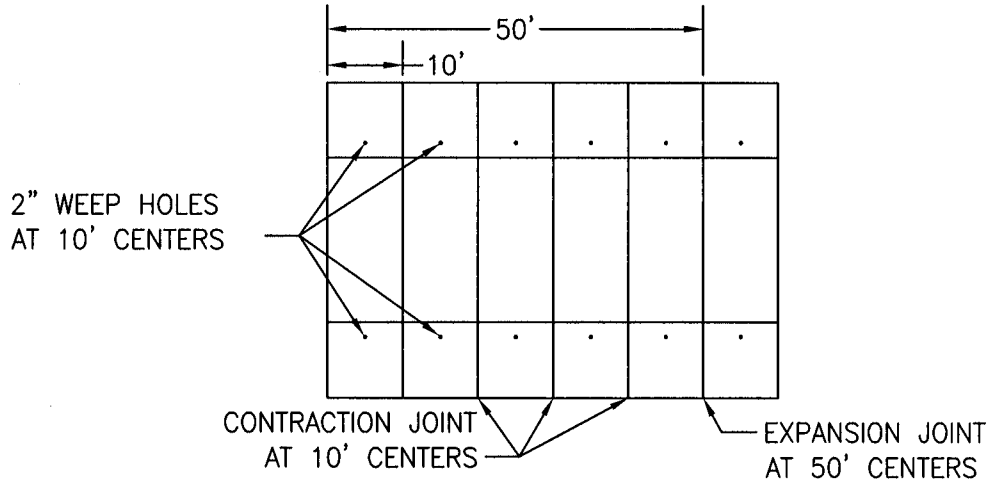
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

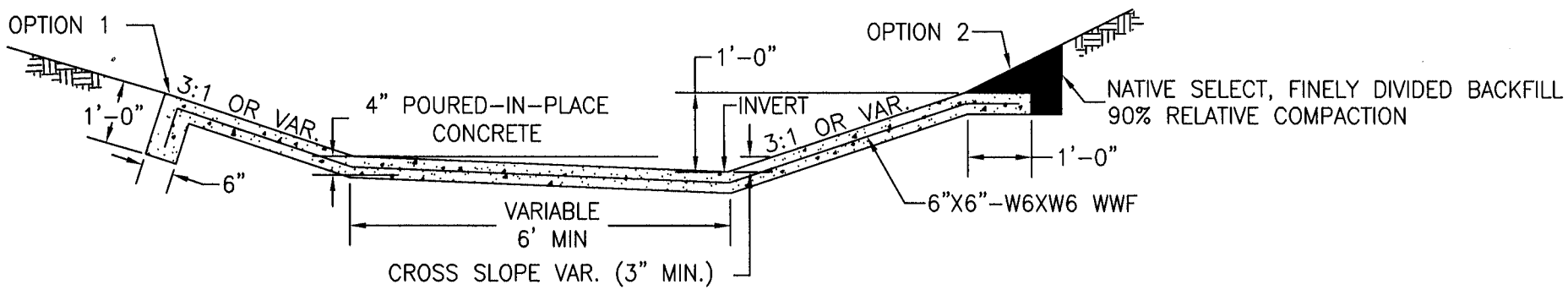
PIPE CONNECTIONS

DRAWN BY: M.FIELDS
SCALE: NONE
DATE: 1/03

9-23



PLAN VIEW



TYPICAL BOTTOM LINING

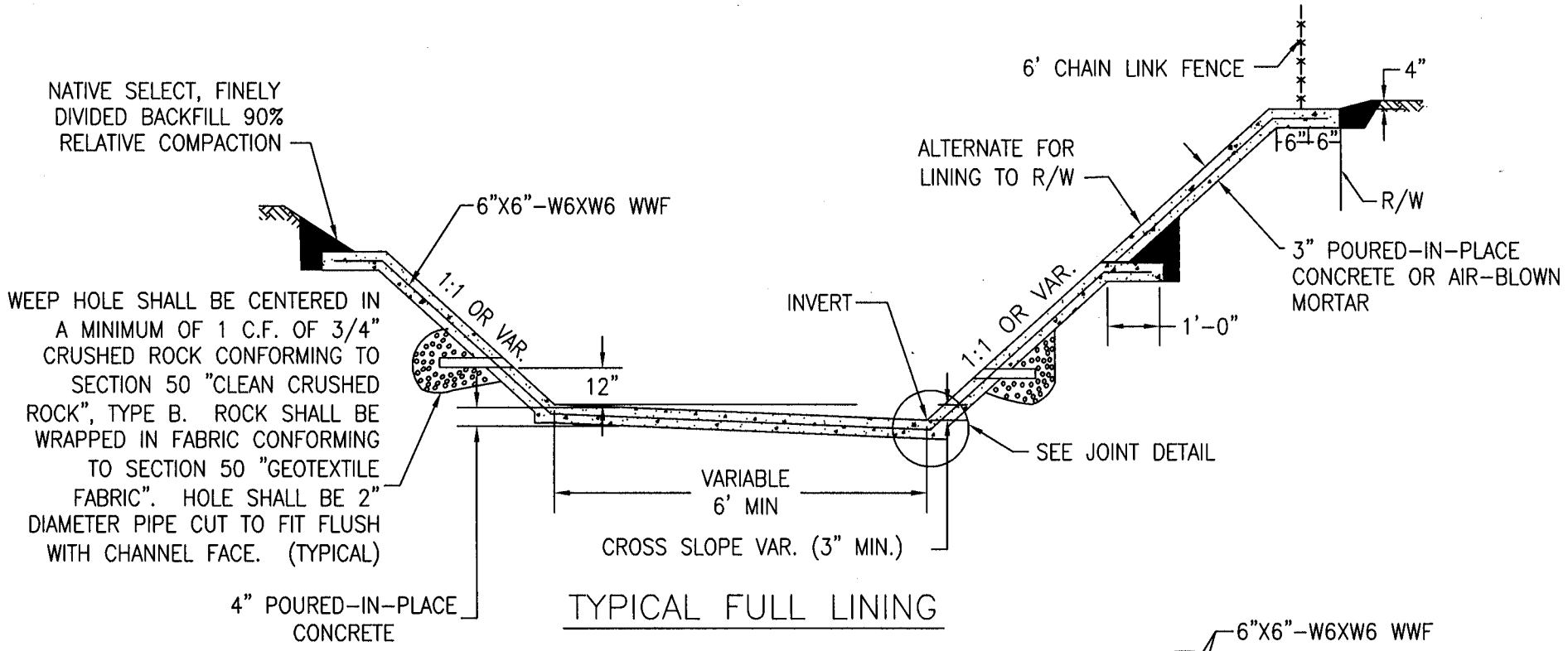
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

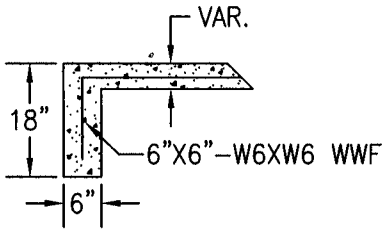
LINED CHANNEL SECTION

DRAWN BY: MYRA FIELDS
SCALE: NONE
DATE: 7/98

9-24
SHEET 1 OF 2

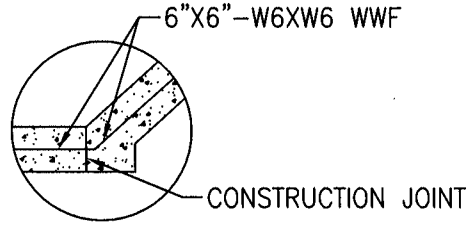


TYPICAL FULL LINING



CUTOFF WALL

TO BE PLACED ALONG ENTIRE END OF LINED SECTION AT BEGINNING AND AT END OF LINING



JOINT DETAIL

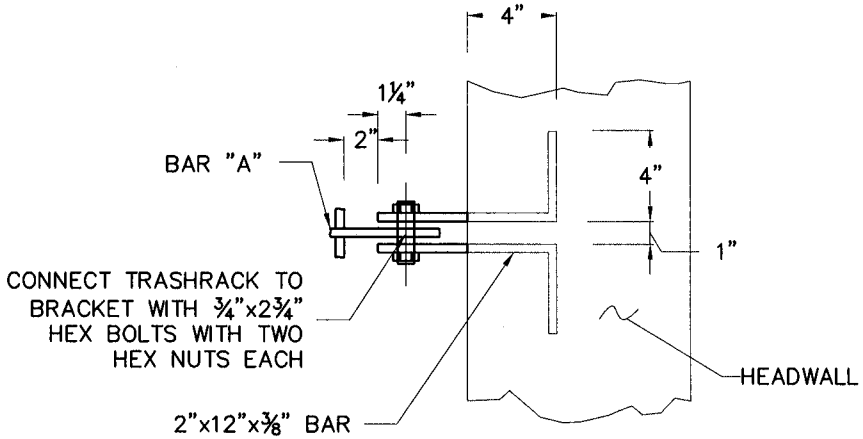
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

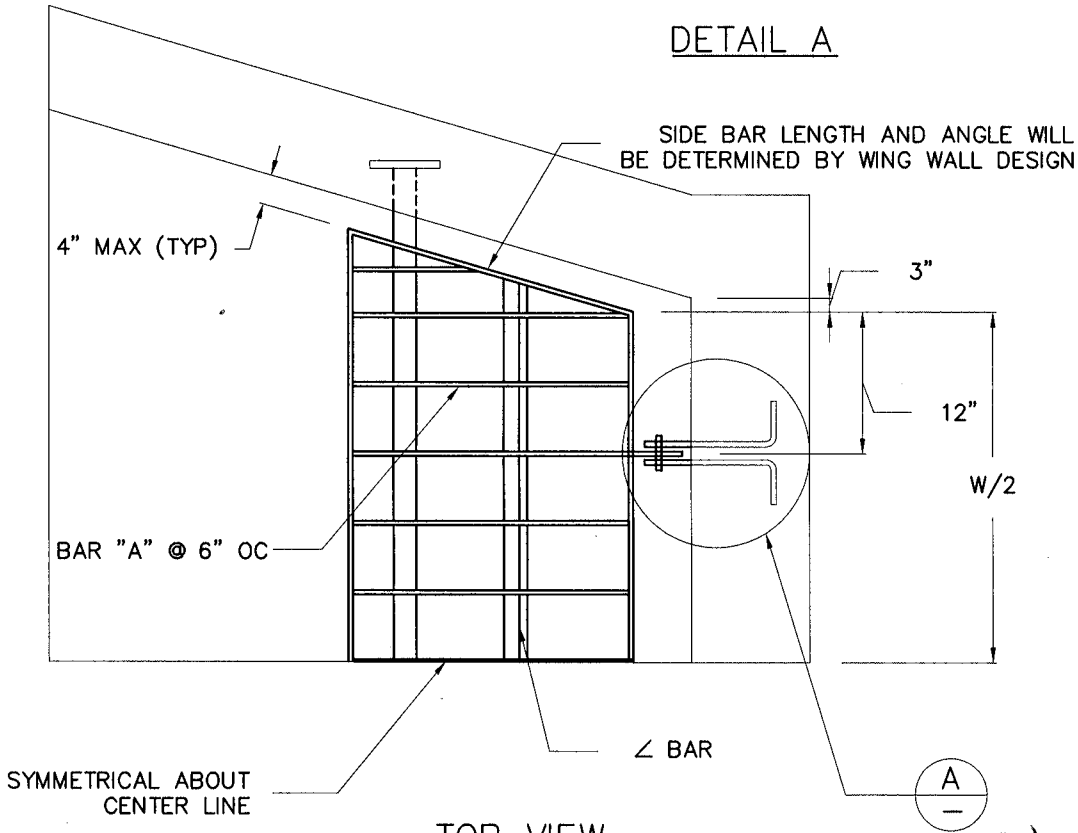
LINED CHANNEL SECTION

DRAWN BY: MYRA FIELDS
SCALE: NONE
DATE: 7/98

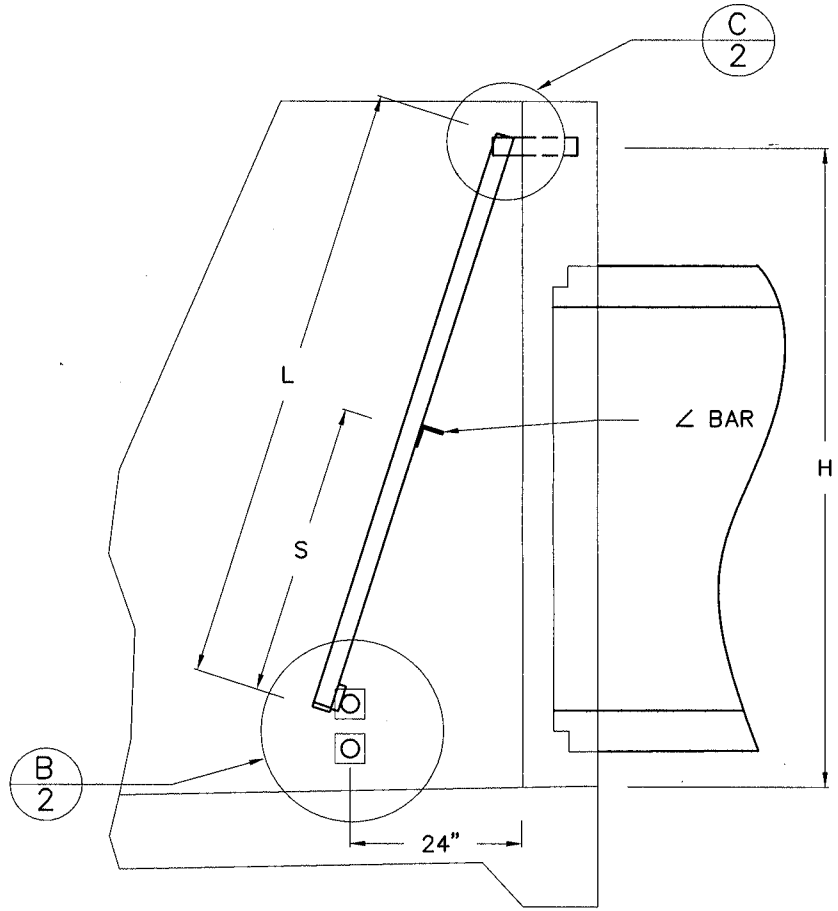
9-24
SHEET 2 OF 2



DETAIL A



TOP VIEW



SIDE VIEW

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TRASH RACK
24" - 36" PIPE

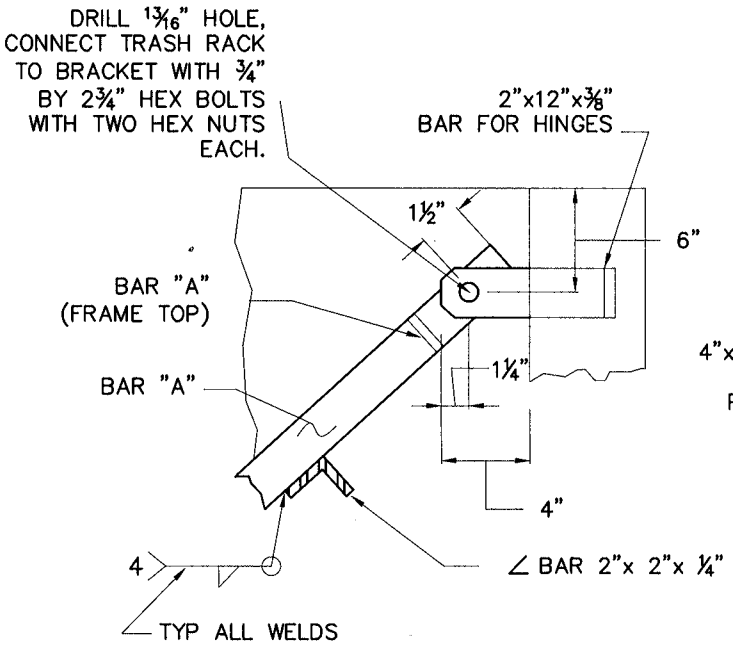
DRAWN BY: J. ESLABON
SCALE: NONE
DATE: 1/03

9-26G
SHEET 1 OF 4

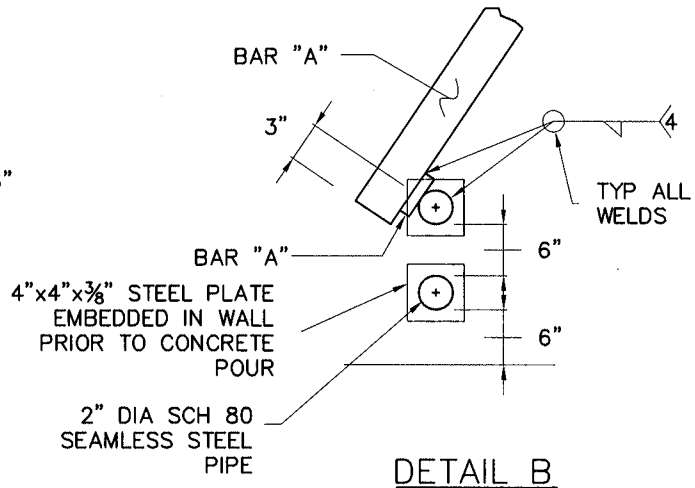
TRASH RACK DIMENSIONS

PIPE DIA (IN)	PIPE OD (IN)	QUANTITY* BAR "A"	BAR "A" SIZE (IN)	H (IN)	W (IN)	L (IN)	S (IN)
24	30	11	3/8 x 2 1/2	46	48	40	18
27	33.5	11	3/8 x 2 1/2	50	48	42	19
30	37	11	3/8 x 2 1/2	53	48	46	21
33	40.5	11	3/8 x 2 1/2	57	48	52	24
36	44	13	3/8 x 2 1/2	60	60	52	24

*** INCLUDES OUTSIDE FRAME**



DETAIL C



DETAIL B

NOTES:

1. SEE FIGURE 9-26H FOR PIPE HEADWALL DETAILS.
2. MATERIAL TO CONFORM TO ASTM DESIGNATION A-36. GALVANIZE ALL EXPOSED FERROUS PARTS AFTER FABRICATION.
3. ALL FILLET WELDS TO BE 3/16".
4. ALL STEEL SHALL CONFORM TO SECTION 75 OF THE STATE SPECIFICATIONS AND ASTM A36, A575 AND A576.

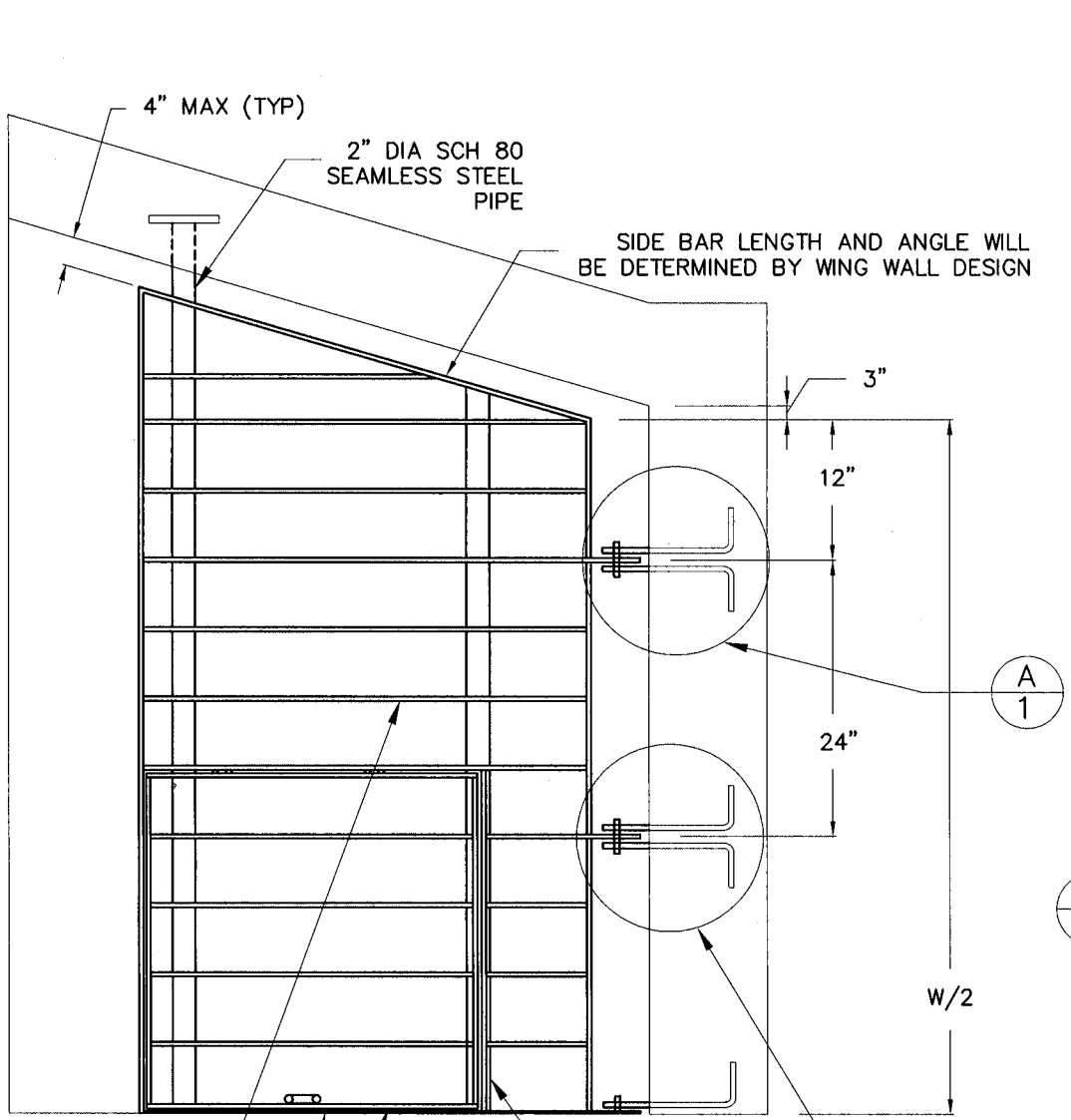
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

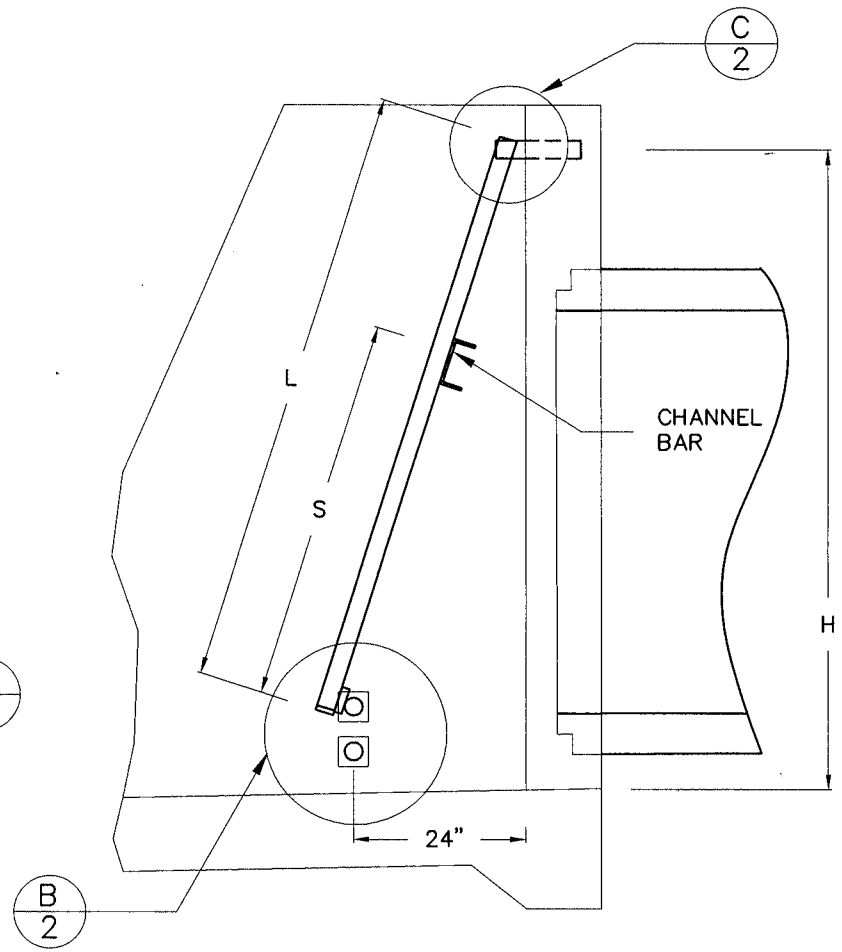
TRASH RACK
24" - 36" PIPE

DRAWN BY: J. ESLABON
SCALE: NONE
DATE: 1/03

9-26G
SHEET 2 OF 4



TOP VIEW



SIDE VIEW

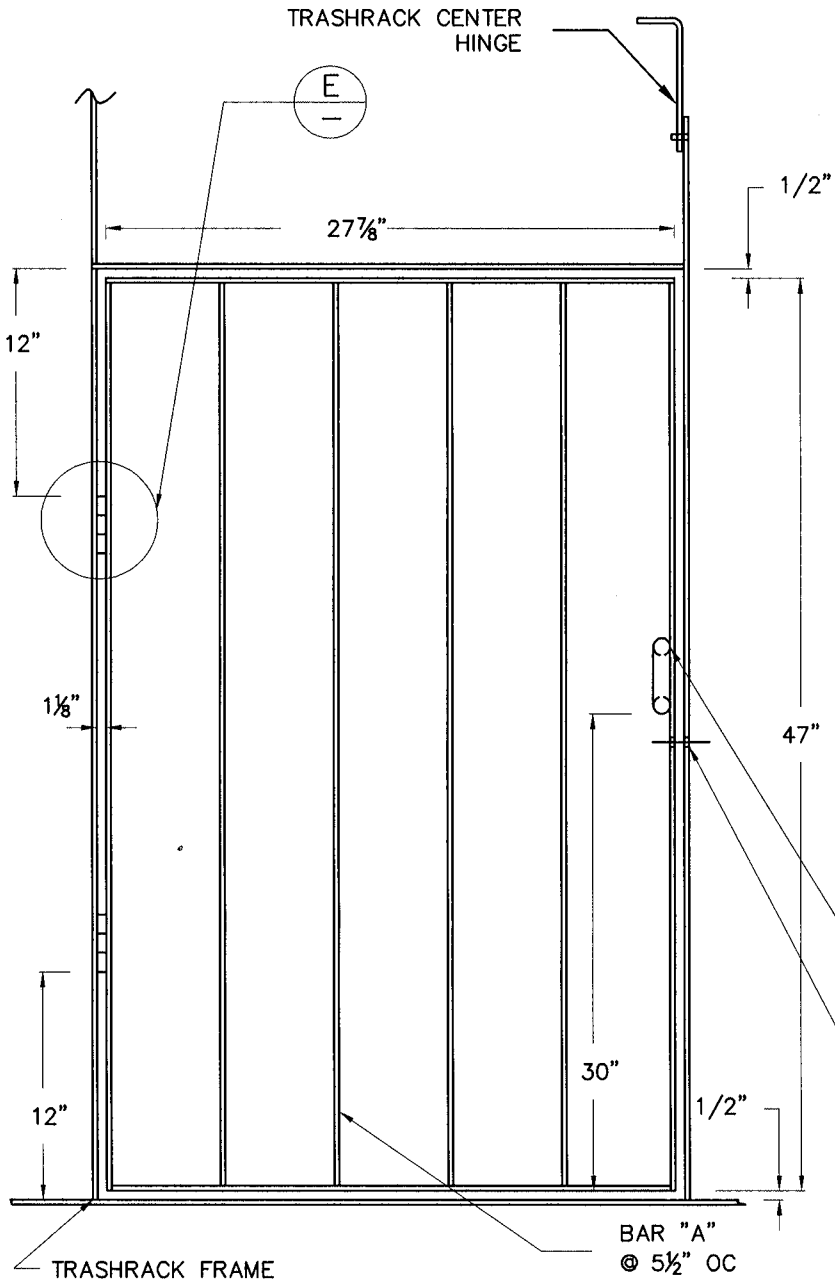
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

TRASH RACK
42" PIPE AND LARGER

DRAWN BY: J. ESLABON
SCALE: NONE
DATE: 1/03

9-26G
SHEET 3 OF 4

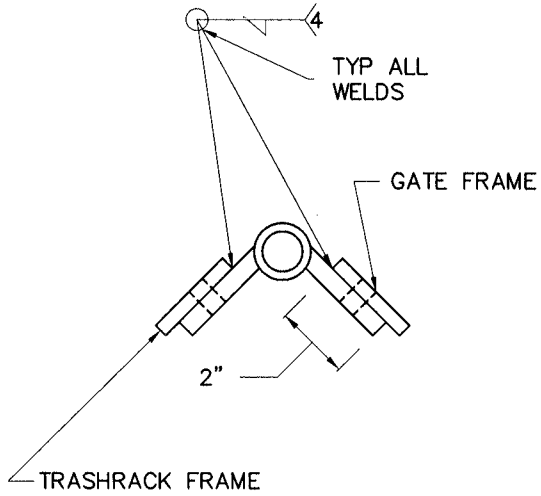


ACCESS GATE DETAIL

TRASH RACK DIMENSIONS

PIPE DIA (IN)	PIPE OD (IN)	QUANTITY* BAR "A"	BAR "A" SIZE (IN)	H (IN)	W (IN)	L (IN)	S (IN)
42	51	15	3/8x2-1/2	67	72	60	47-3/4
48	58	17	3/8x2-1/2	74	84	70	47-3/4
54	65	21	3/8x2-1/2	81	108	72	47-3/4
60	72	23	3/8x2-1/2	88	120	80	47-3/4
72	86	27	3/8x2-1/2	102	144	96	47-3/4

Includes outside frame



DETAIL E

½" ROLLED STEEL HANDLE WELDED TO GATE FRAME

DRILL ½" DIA HOLE FOR HEAVY DUTY PAD LOCK

NOTES:

1. SEE FIGURE 9-26H FOR PIPE HEADWALL DETAILS.
2. MATERIAL TO CONFORM TO ASTM DESIGNATION A-36. GALVANIZE ALL EXPOSED FERROUS PARTS AFTER FABRICATION.
3. ALL FILLET WELDS TO BE 3/16".
4. ALL STEEL SHALL CONFORM TO SECTION 75 OF THE STATE SPECIFICATIONS AND ASTM A36, A575 AND A576.
5. GATE HINGES TO BE COATED TO RESIST CORROSION.

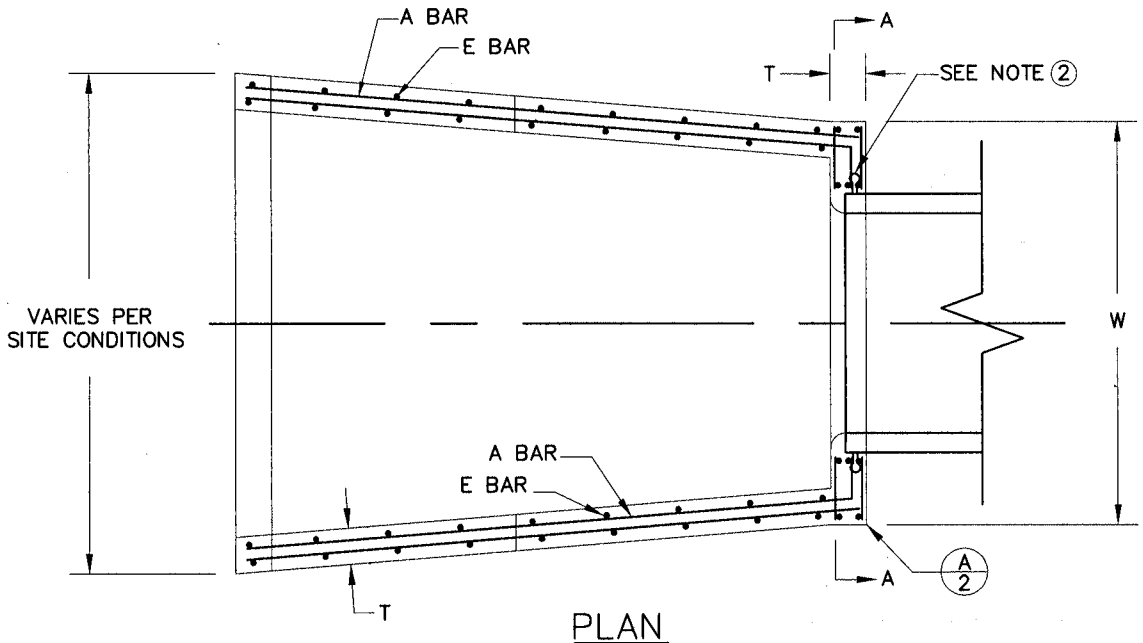
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

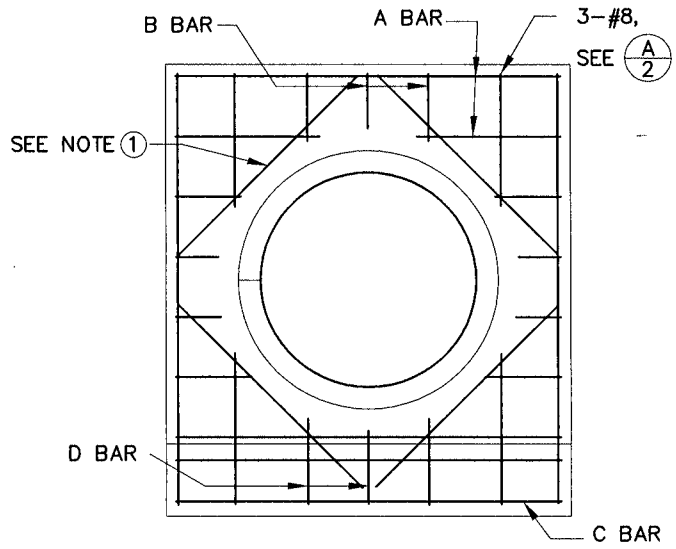
TRASH RACK
42" PIPE AND LARGER

DRAWN BY: J. ESLABON
SCALE: NONE
DATE: 1/03

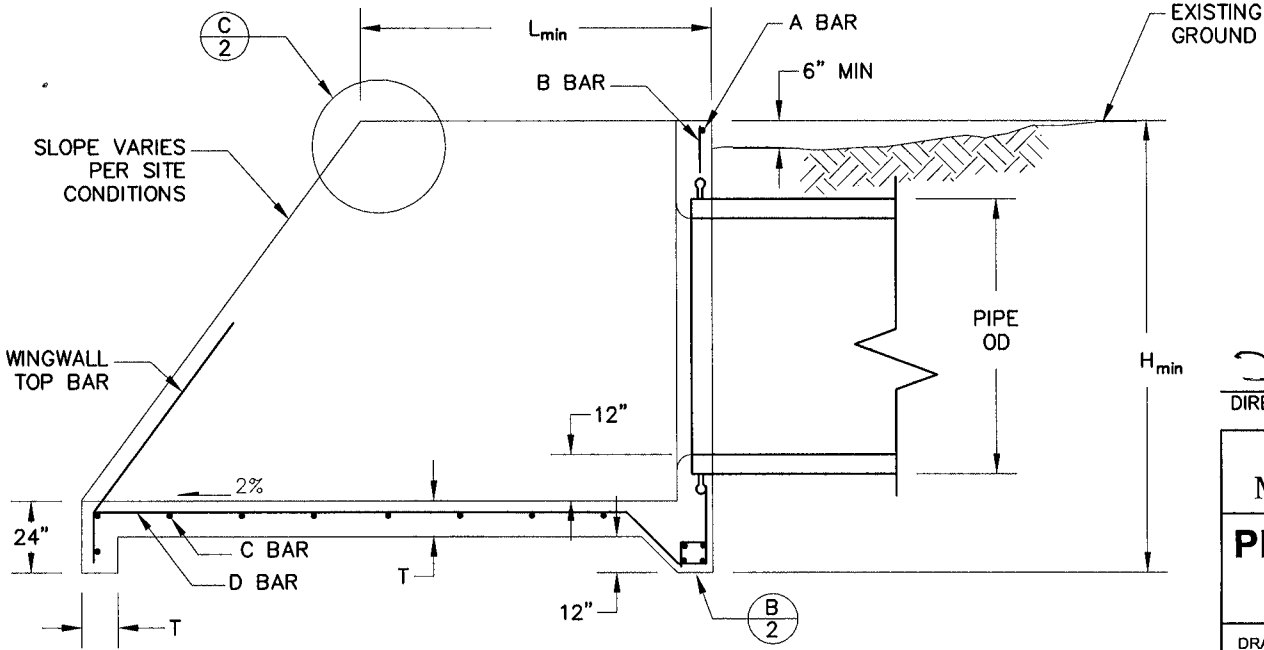
9-26G
SHEET 4 OF 4



PLAN



SECTION A–A



SIDE ELEVATION

NOTE

SEE DWG 9–26G FOR EMBEDMENT OF TRASH RACK COMPONENTS PRIOR TO POURING CONCRETE

DIRECTOR, DEPARTMENT OF WATER RESOURCES

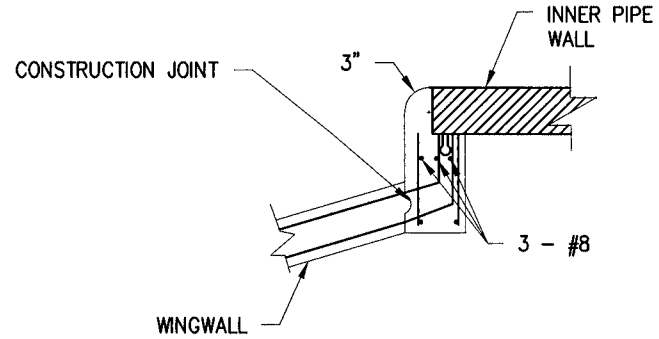
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

PIPE HEADWALL, ENDWALL WINGWALL STRUCTURE

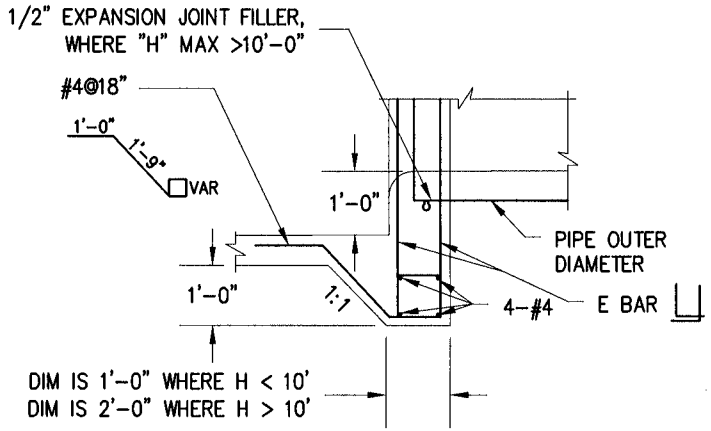
DRAWN BY: B. FORRESTER
SCALE: NONE
DATE: 11/06

9-26H

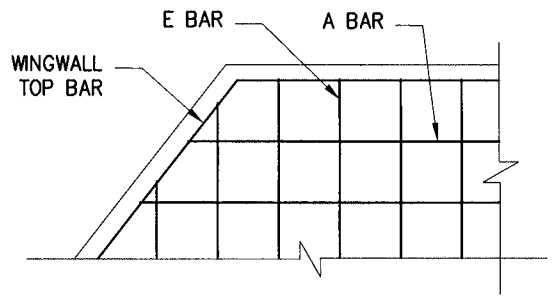
SHEET 1 OF 3



DETAIL A



DETAIL B



DETAIL C

NOTES

1. PLACE #5 REBAR ON DIAGONALS @ 4" FROM PIPE OD.
2. PIPE CONNECTIONS SHALL CONFORM TO ASTM C-923. UNITS SHALL INCLUDE A WATER STOP.
3. CHAMFER ALL EXPOSED EDGES ¾".
4. ALL STEEL MINIMUM 2" FROM CONCRETE EDGES.
5. ALL LAP SPLICES MINIMUM 12".

HEADWALL DIMENSIONS

PIPE DIA	PIPE OD	W	H_{min}	T*	L_{min}
24"	30"	4'-6"	4'-8"	8"	2'-9"
27"	33.5	4'-6"	4'-10"	8"	3'-0"
30"	37"	4'-6"	5'-3"	8"	3'-3"
33"	40.5"	4'-6"	5'-9"	8"	3'-6"
36"	44"	5'-6"	5'-9"	8"	3'-9"
42"	51"	6'-6"	6'-6"	8"	4'-3"
48"	58"	7'-6"	7'-5"	10"	5'-3"
54"	65"	9'-6"	7'-7"	10"	5'-9"
60"	72"	10'-6"	8'-3"	10"	6'-0"
72"	86"	12'-6"	9'-8"	10"	7'-3"

*T IS TO BE 10" IF A HAND RAILING IS PLACED ON THE WALL STRUCTURE.

REINFORCING STEEL DIMENSIONS AND DATA

	A BAR	B BAR	C BAR	D BAR	E BAR	WINGWALL TOP BAR
H ≤ 7'	#4@12"OC	#4@12"OC	#4@12"OC	#4@12"OC	#4@12"OC	#4
7' < H ≤ 8'	#4@12"OC EF	#4@12"OC EF	#4@12"OC EF	#4@12"OC EF	#4@12"OC EF	#4
8' < H ≤ 10'	#5@12"OC EF	#5@6"OC EF	#5@12"OC EF	#5@12"OC EF	#5@12"OC EF	#5

Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

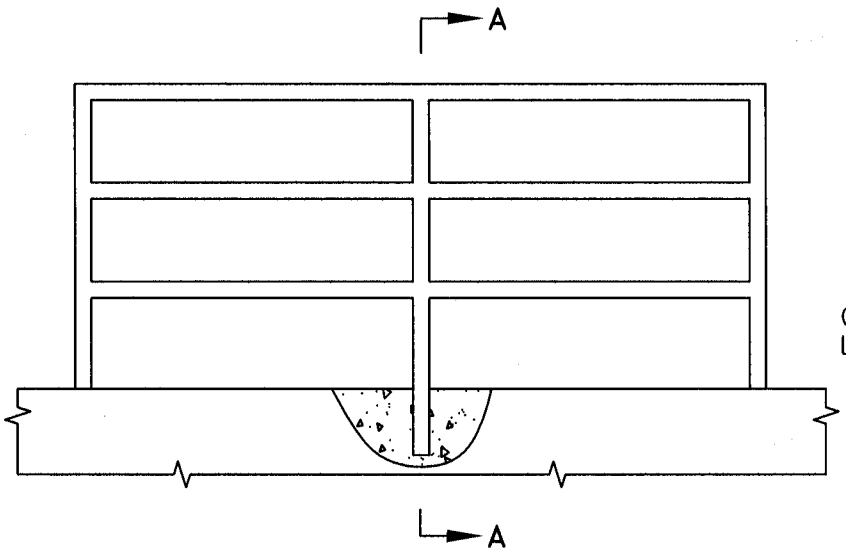
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

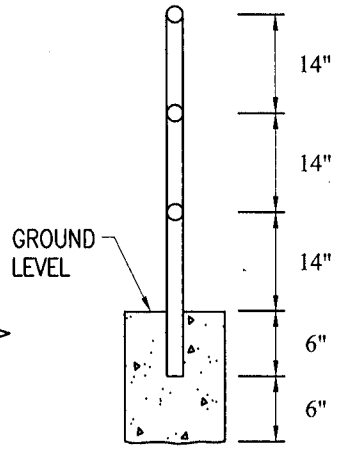
PIPE HEADWALL, ENDWALL WINGWALL STRUCTURE

DRAWN BY: STAFF
SCALE: NONE
DATE: 03/07

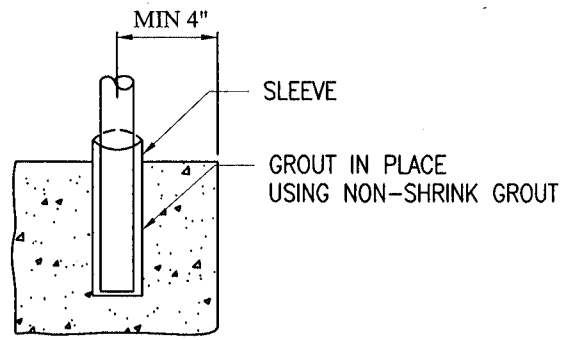
9-26H

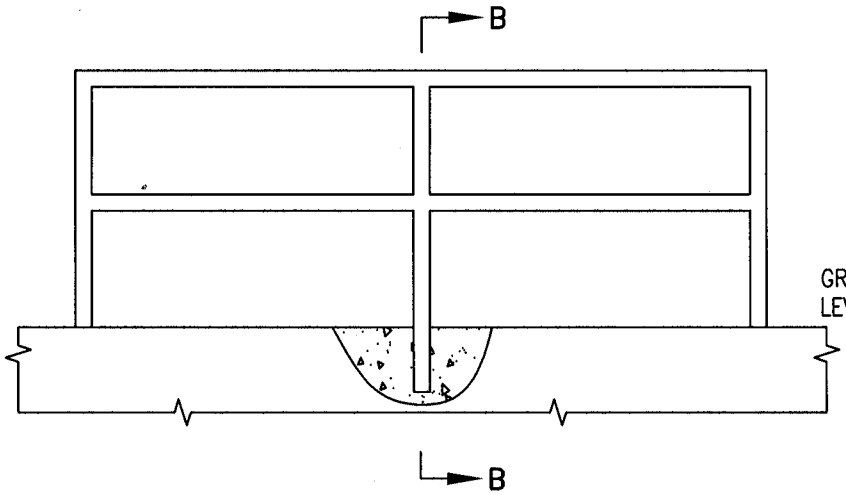
SHEET 2 OF 3

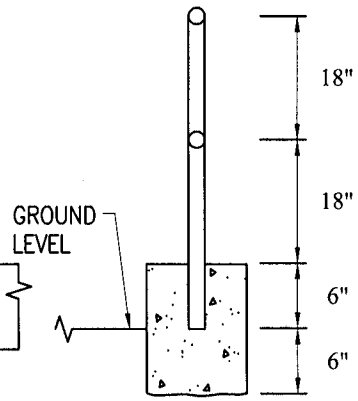




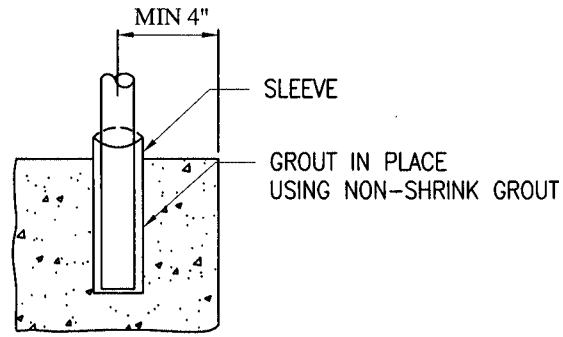
SECTION A–A







SECTION B–B



GENERAL NOTES:

1. GUARDRAIL – 1½" SEAMLESS STEEL PIPE ASTM 53 GRADE B, HOT DIP GALVANIZED. PAINT COLOR (IF NEEDED) TO BE SPECIFIED ON PLANS AT NO EXTRA COST.
2. ALL GUARDRAIL WELDS $\frac{3}{16}$" FILLET GROUND SMOOTH.
3. MAXIMUM SPACING OF POSTS SHALL BE 6'.
4. TO BE SHOWN ON IMPROVEMENT PLANS FOR PLACEMENT.

Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

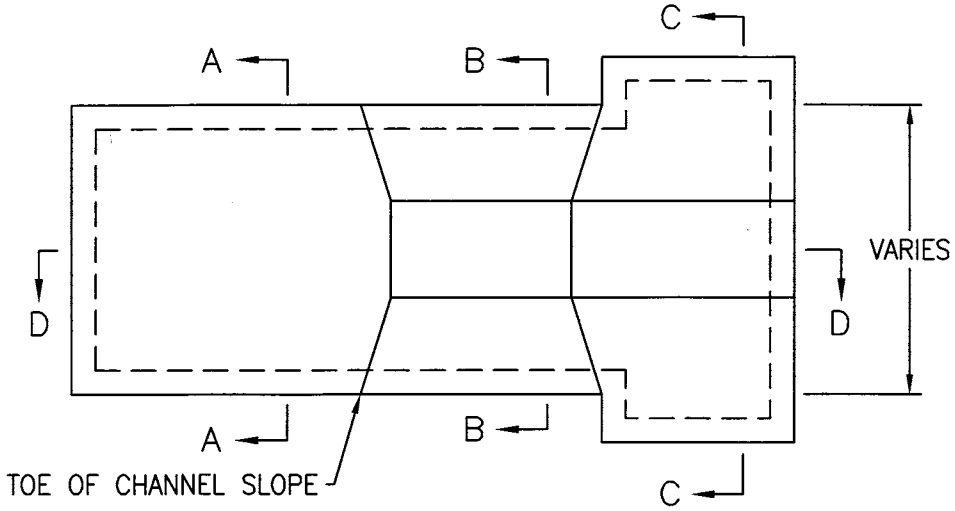
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

PIPE HEADWALL, ENDWALL WINGWALL STRUCTURE

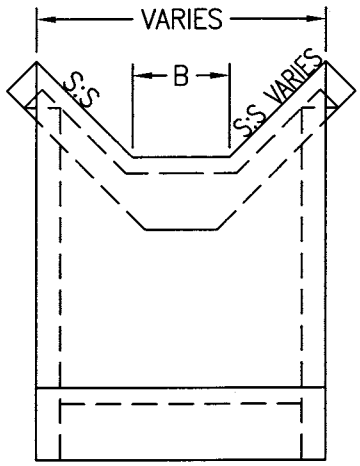
DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 04/07

9-26H

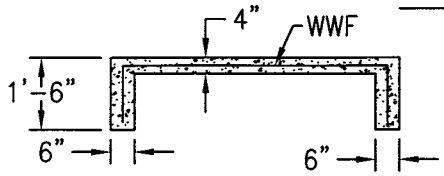
SHEET 3 OF 3



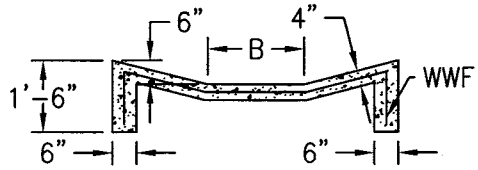
TOP VIEW



FRONT VIEW



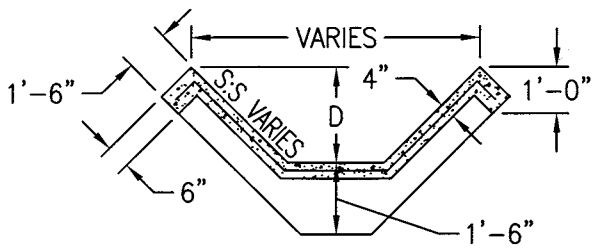
SECTION A–A



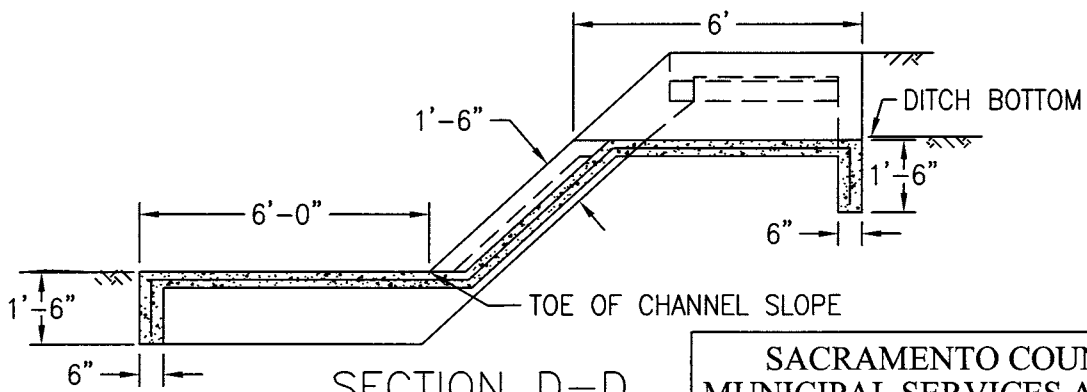
SECTION B–B

NOTES

1. USE CLASS "B" CONCRETE OR GROUTED COBBLES AS SPECIFIED.
2. 6"X6"–W6XW6 WWF THROUGHOUT CONCRETE
3. ON LINED CHANNELS APRON SHALL CONNECT TO SIDE LINING.
4. B=DITCH BOTTOM WIDTH OR AS SHOWN ON PLANS.
5. D=DITCH WATER DEPTH PLUS ONE FOOT OF FREEBOARD.



SECTION C–C



SECTION D–D

Walt DeVore

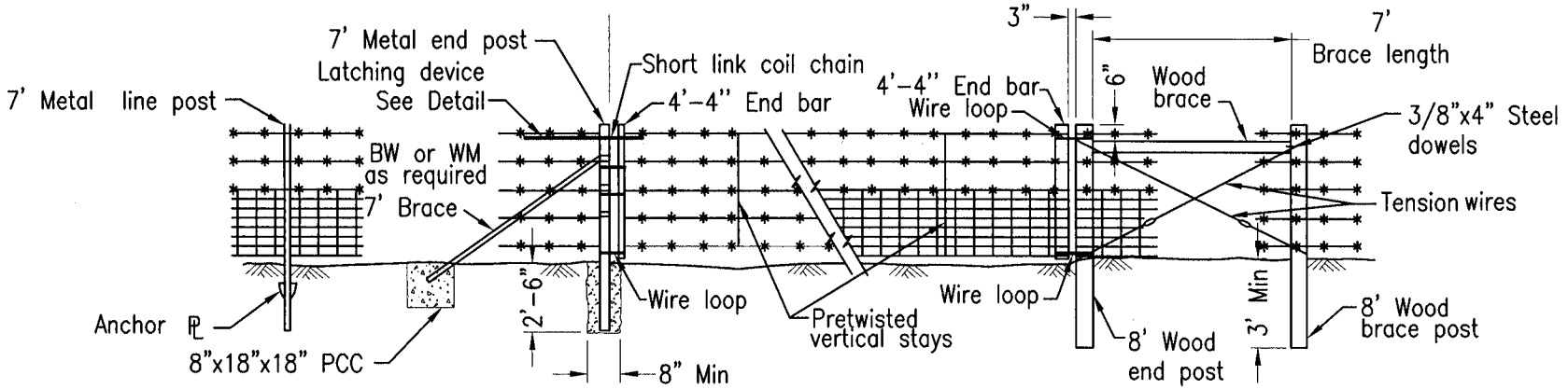
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

EROSION CONTROL DITCH DISCHARGE

DRAWN BY: M.FIELDS
SCALE: NONE
DATE: 11/98

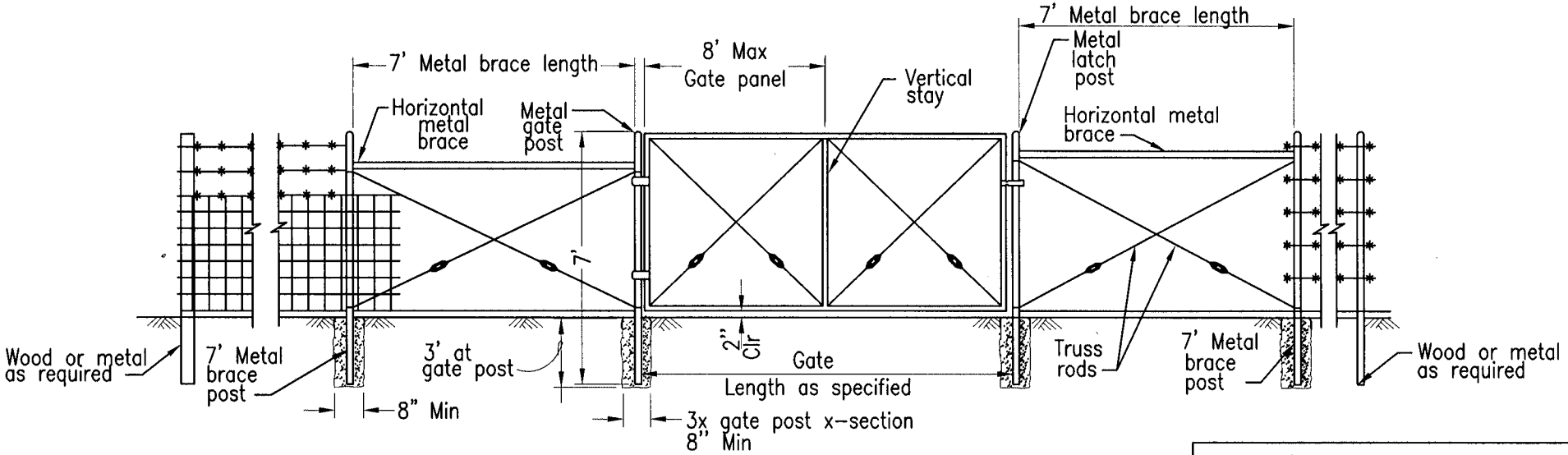
9-27



METAL POST INSTALLATION

WOOD POST INSTALLATION

GATEWAY
See Note 3



WIRE MESH GATE INSTALLATION FOR
EITHER WOOD OR METAL POST FENCES

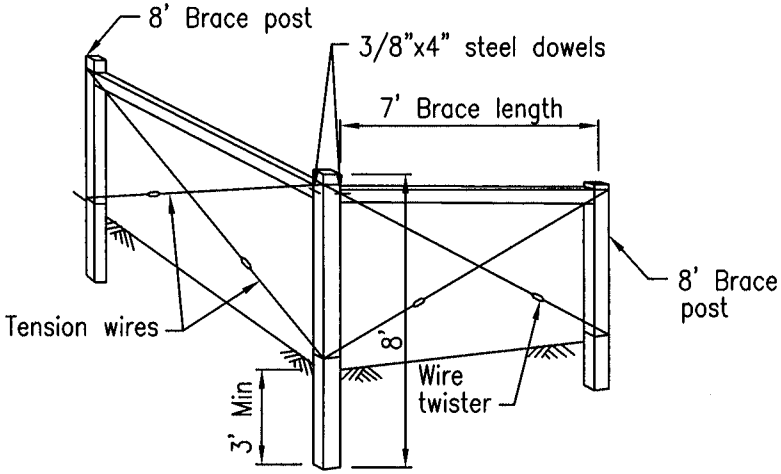
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

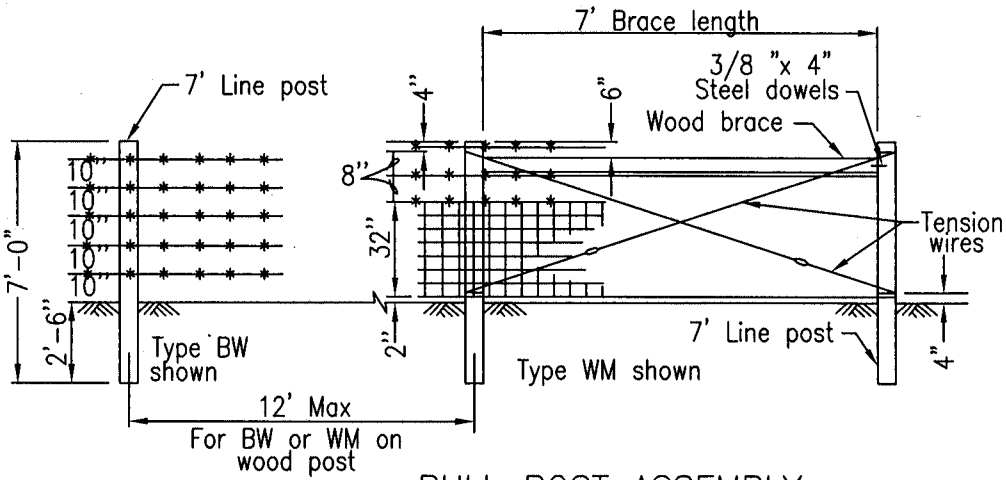
BARBED WIRE AND WIRE MESH FENCES

DRAWN BY: STAFF
SCALE: NONE
DATE: 11/98

9-28
SHEET 1 OF 3



END AND CORNER POST ASSEMBLY

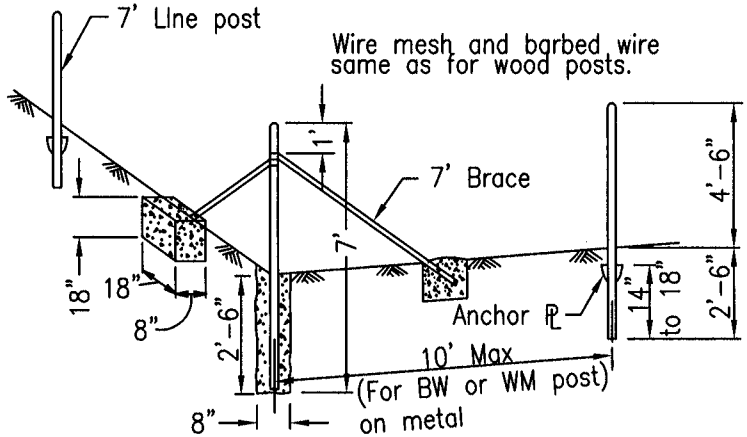


Type BW = 5 lines of barbed wire.
Type WM = Wire mesh and 3 lines of barbed wire.

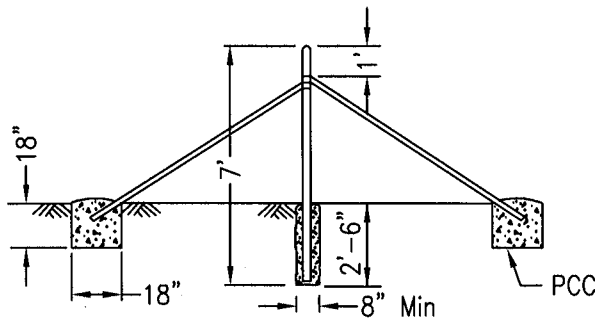
WOOD POST INSTALLATION

PULL POST ASSEMBLY

At 660' maximum intervals for WM fence.
At 1320' maximum intervals for BW fence.



END AND CORNER POST ASSEMBLY



PULL POST ASSEMBLY

At 660' maximum intervals for WM fence.
At 1320' maximum intervals for BW fence.

METAL POST INSTALLATION

DIRECTOR, DEPARTMENT OF WATER RESOURCES

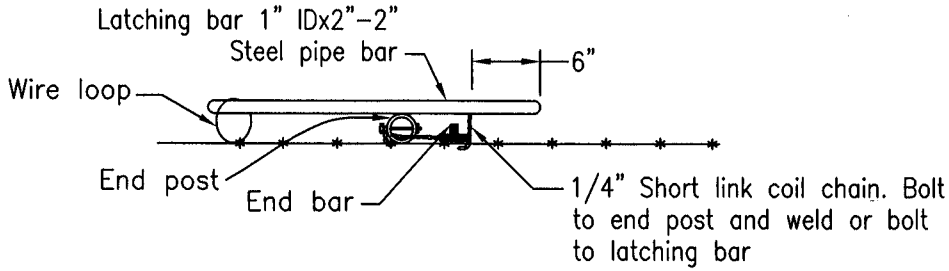
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

BARBED WIRE AND WIRE MESH FENCES

DRAWN BY: STAFF
SCALE: NONE
DATE: 11/98

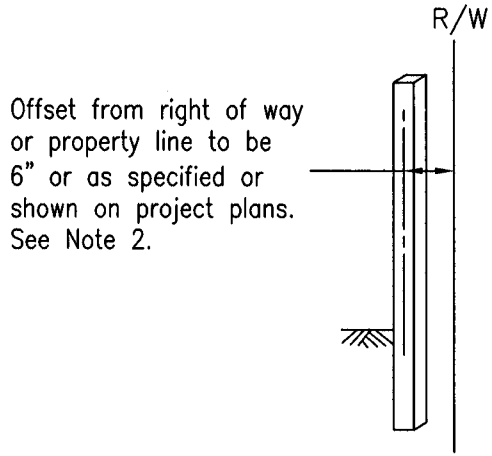
9-28
SHEET 2 OF 3

WIRE MESH GATE POST (See Note 4)		
GATE WIDTHS	NOMINAL OD	WEIGHT PER FT
Up thru 6'	2-7/8"	5.79
Over 6' thru 12'	4"	9.11
Over 12' thru 18'	5 -9/16"	14.62
Over 18' to 24' Max	6-5/8"	18.97



LATCHING DEVICE FOR GATEWAYS

See Note 1



FENCE LOCATION

NOTES

1. Metal end post and end bar shown. Use wood end post and end bar for wood post installation.

2. Offset to be 2' at monument locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 20' long.

3. Gateway to be used when specified in the special provisions.

4. Post dimensions and weights are minimums. Larger sizes may be used on approval of Engineer.

5. Line post spacing for wood post equals 12' maximum. Line post spacing for metal post equals 10' maximum.

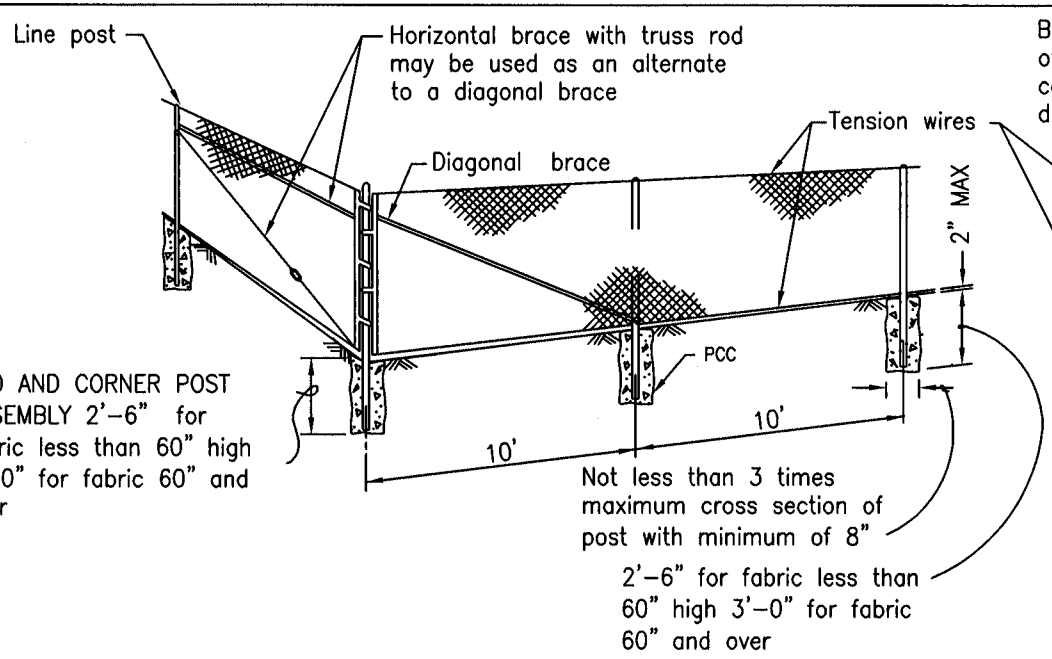
DIRECTOR, DEPARTMENT OF WATER RESOURCES

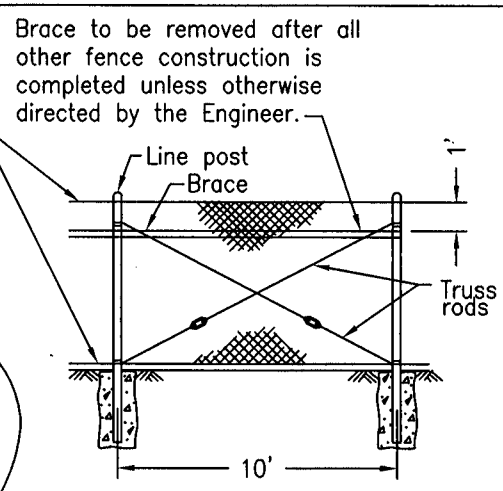
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

BARBED WIRE AND WIRE MESH FENCES

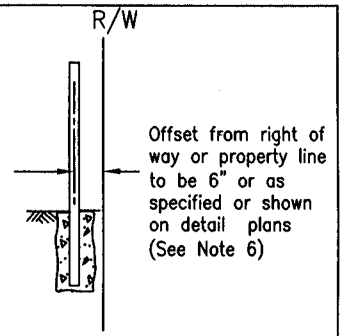
DRAWN BY: STAFF
SCALE: NONE
DATE: 4/07

9-28
SHEET 3 OF 3

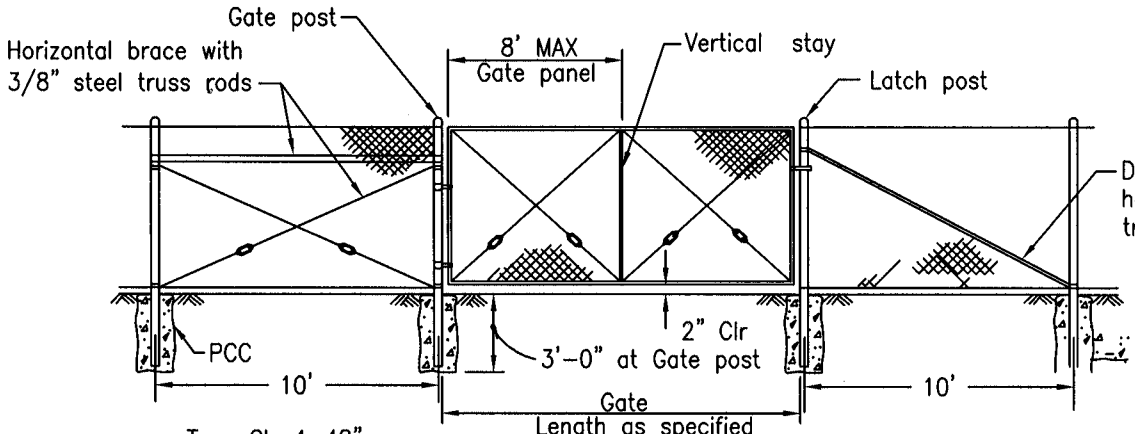




Line posts at 1000' maximum intervals braced and trussed in both directions except that this bracing and trussing may be omitted when the fabric is stretched by the equipment



FENCE LOCATION



Type CL-4=48" fabric Type CL-6=72" fabric

Notes:

1. Chain link fabric shall be zinc coated steel manufactured in compliance with ASTM Standard A 392 with a 2 inch mesh of 9 gauge wire with knuckled selvage.

2. Tension wire shall be 7 gauge.

3. Where barbed wire is specified, it shall include 3 strands of galvanized 4 point wire attached with extension arms set at 45 degrees.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CHAIN LINK FENCE

DRAWN BY: STAFF
SCALE: NONE
DATE: 12/99

9-29
SHEET 1 OF 2

TYPICAL MEMBER DIMENSIONS (See Notes)											
FENCE HEIGHT	LINE POSTS			END, LATCH & CORNER POSTS				RAILS & BRACES			
	NOMINAL ROUND O.D. (NOTES 7 & 8)	H	ROLL FORMED	NOMINAL ROUND O.D. (NOTES 7 & 8)	ROLL FORMED			NOMINAL ROUND O.D. (NOTES 7 & 8)	H	ROLL FORMED	
6' & less	2-3/8"	1-7/8"x 1-5/8"	1-7/8"x 1-5/8"	2-7/8"	3-1/2" x 3-1/2"	2" x 1-3/4"		1-5/8"	1-1/2" x 1-5/16"	1-5/8" x 1-1/4"	1-3/4" x 1-1/4"
Over 6'	2-3/8"	2-1/4" x 2"	2" x 1-3/4"	2-7/8"	3-1/2" x 3-1/2"	2-1/2" x 2-1/2"		1-5/8"	1-1/2" x 1-5/16"	1-5/8" x 1-1/4"	1-3/4" x 1-1/4"

GATE POST (NOTE 7)			
FENCE HEIGHT	GATE WIDTHS	NOMINAL O.D.	WEIGHT PER FOOT
6'-0" and Less	Up thru 6'	2-7/8"	5.79
	Over 6' thru 12'	4-1/2"	10.79
	Over 12' thru 18'	5-11/16"	14.62
	Over 18' to 24' max	6-5/8"	18.97
Over 6'-0"	Up thru 6'	3-1/2"	7.58
	Over 6' thru 12'	5-11/16"	14.62
	Over 12' thru 18'	6-5/8"	18.97
	Over 18' to 24' max	8-5/8"	28.55

Above post dimensions and masses are minimums. Larger sizes may be used on approval of the Engineer.

NOTES

1. The above table shows examples of post and brace sections which may comply with the Standard Construction Specifications.
2. Sections shown in the tables must also comply with the strength requirements and other provisions of the Standard Construction Specifications.
3. Other sections which comply with the strength requirements and other provisions of the Standard Construction Specifications may be used on approval of the Engineer.
4. Options exercised shall be uniform on any one project.
5. Dimensions shown are nominal.
6. Offset to be 2'-0" at monument locations, measured at right angles to R/W lines. Taper to achieve offset to be at least 20' long.
7. Pipe sections for posts, rails, braces, and gates shall be schedule 40 galvanized pipe manufactured in conformance with ASTM F 1083.
8. Weight per foot values for 1-5/8" O.D. pipe = 2.27 lbs/ft, 2-3/8" O.D. pipe = 3.65 lbs/ft, 2-7/8" O.D. pipe = 5.79 lbs/ft.
9. Chain link gate frames shall be a minimum of 1-7/8" pipe weighing 2.72 lbs/ft.
10. Galvanized gate holders of heavy cast construction with counterbalanced latches shall be provided for all gates. Gate holders shall be anchored with a minimum 24" length of 1-5/8" schedule 40 pipe set in 8" ø concrete base.
11. Double gate assemblies shall also be fitted with heavy duty hinges and lift bar interlocking device with drop anchor at midspan that latches to embedded pipe.

Keith DeVore

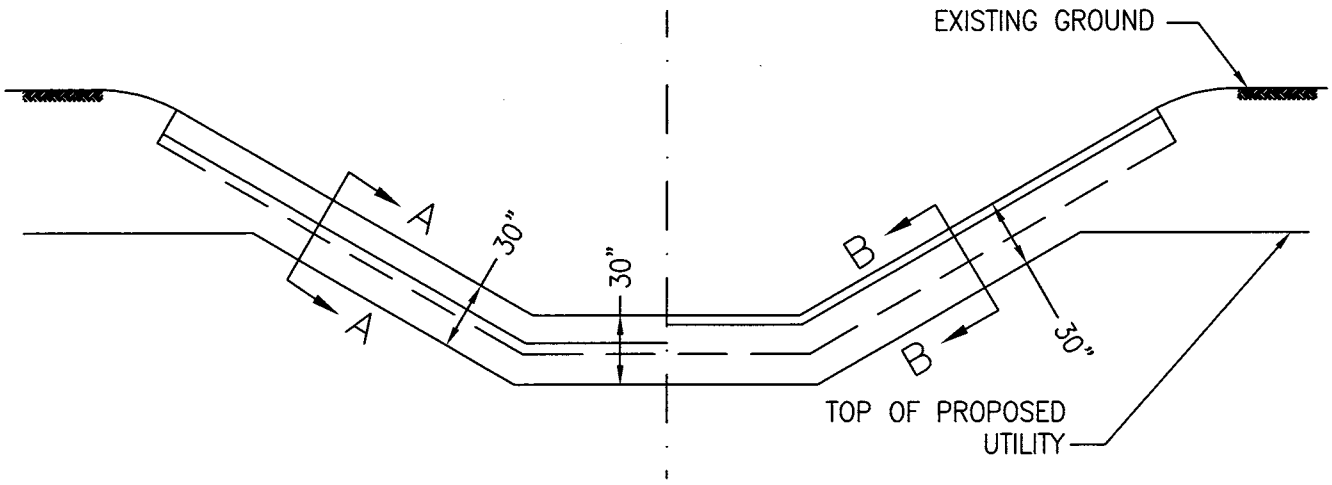
DIRECTOR, DEPARTMENT OF WATER RESOURCES

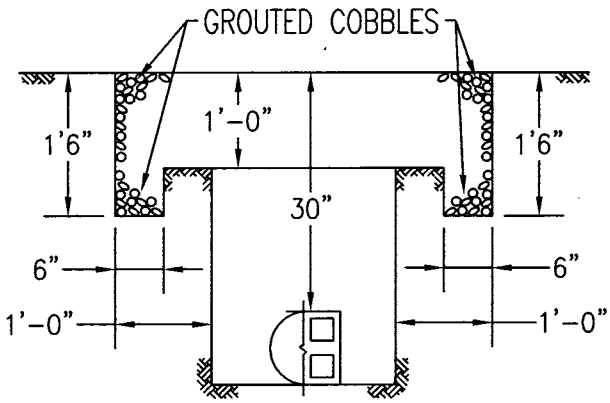
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CHAIN LINK FENCE

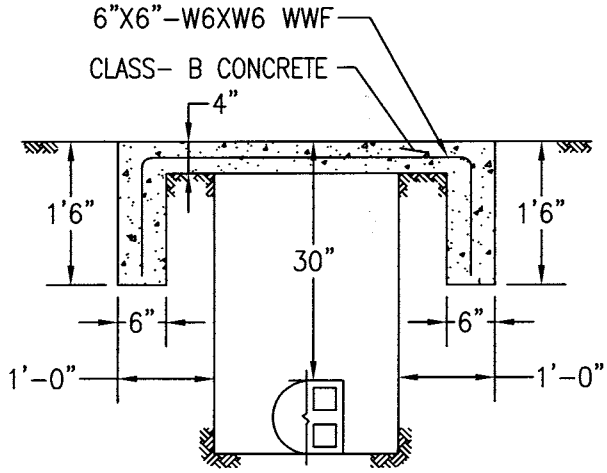
DRAWN BY: STAFF
SCALE: NONE
DATE: 4/07

9-29
SHEET 2 OF 2





SECTION A–A



SECTION B–B

NOTES

1. ALL UTILITY CROSSINGS OF EXISTING STREAMS SHALL BE AT LEAST 30" BELOW EXISTING CHANNEL SIDES AND BOTTOMS. DEEPER PLACEMENT MAY BE REQUIRED IF FUTURE CHANNEL IMPROVEMENTS ARE ANTICIPATED.

2. THE CUT SHALL BE SEALED AS SHOWN WITH GROUTED COBBLES OR CLASS B CONCRETE TO A WIDTH OF 1' ON EACH SIDE OF THE UTILITY TRENCH. ALL NATURAL STREAMS, AS SHOWN ON THE NATURAL STREAMS PLAN, SHALL UTILIZE GROUTED COBBLES.

3. CONSTRUCTION IS TO CONFORM TO SECTION 44 OF THE COUNTY CONSTRUCTION SPECIFICATIONS WITH CUT OFF WALLS CONFORMING TO STANDARD DRAWING 9–24.

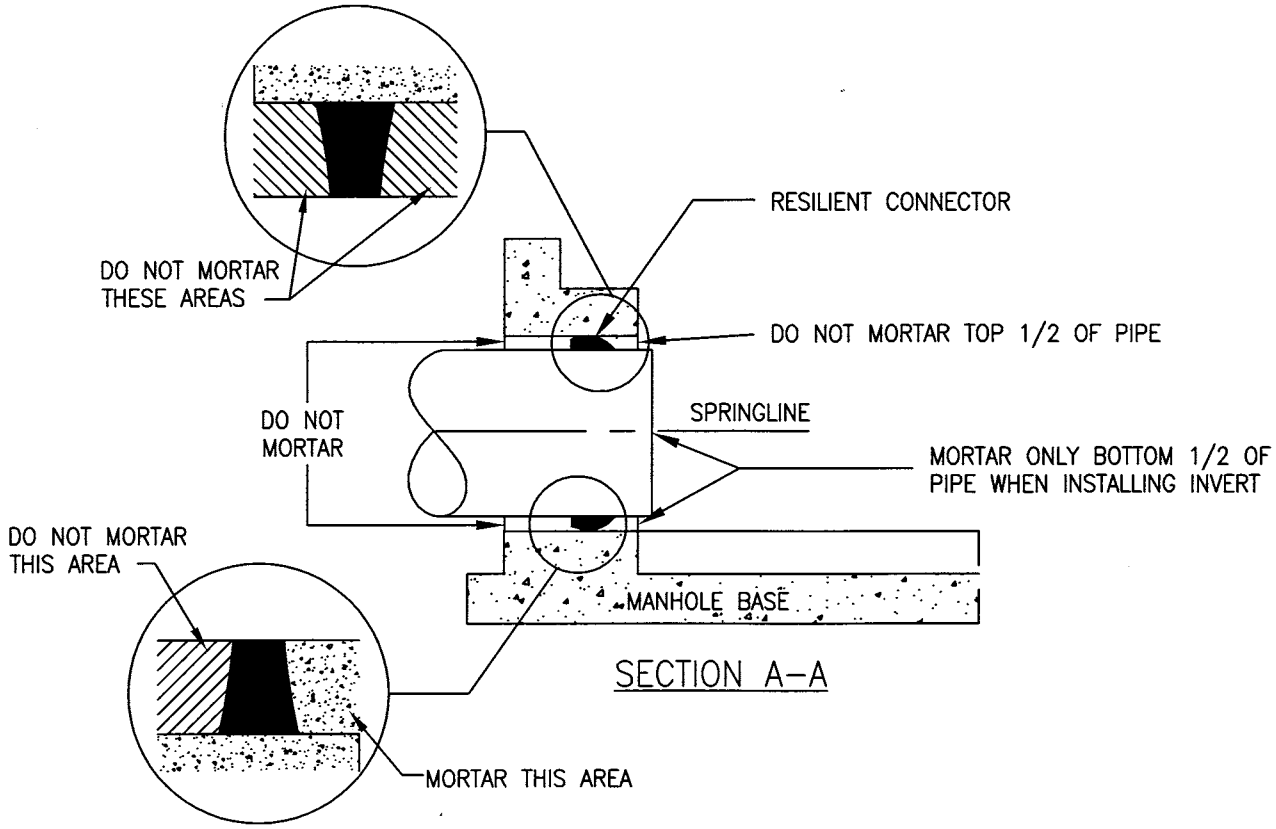
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

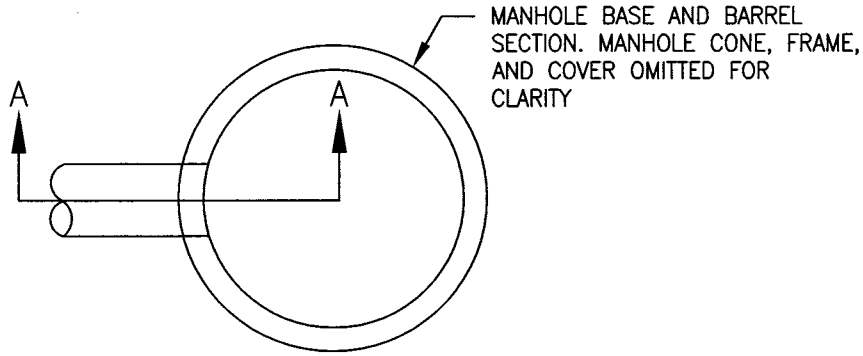
UTILITY STREAM CROSSING

DRAWN BY: M.FIELDS
SCALE: NONE
DATE: 11/98

9-30



SECTION A–A



PLAN

NOTES:

1. TO HELP CREATE A FLEXIBLE, WATERTIGHT JOINT, DO NOT PLACE MORTAR AROUND THE CONNECTOR ON THE OUTSIDE OF THE STRUCTURE OR AROUND THE TOP HALF OF THE CONNECTOR ON THE INSIDE WHEN COMPLETING THE INVERT WORK.
2. RESILIENT CONNECTORS SHALL BE A FLEXIBLE COMPRESSION GASKET OR BOOT CONNECTOR PER SECTION 39 "PRECAST CONCRETE STORM DRAIN MANHOLES" OF THE COUNTY CONSTRUCTION SPECIFICATIONS.
3. BOOT CONNECTORS SHALL NOT BE GROUTED.
4. ALL CONNECTORS SHALL MEET OR EXCEED THE REQUIREMENTS OF A.S.T.M. C–923

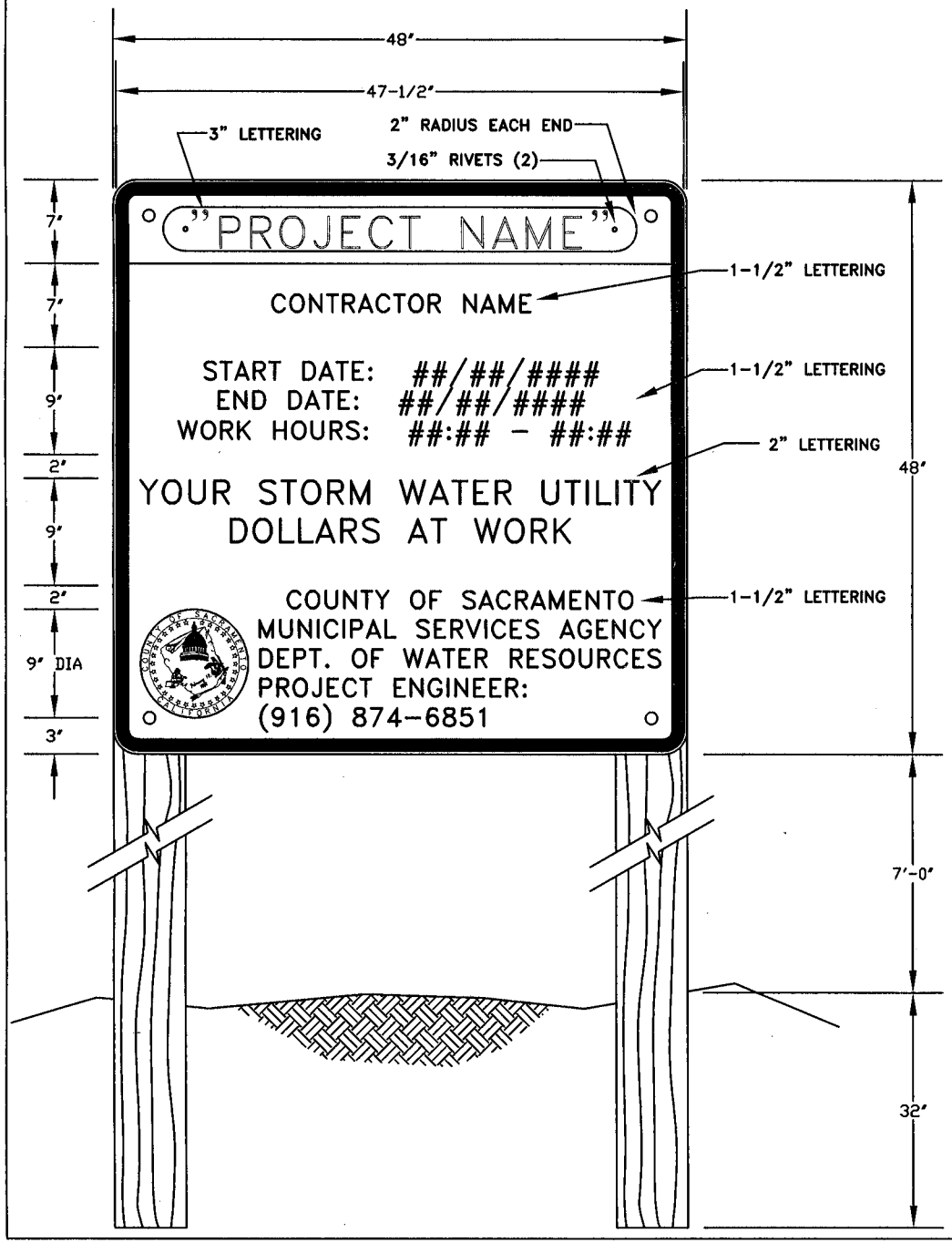
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

FLEXIBLE CONNECTOR PIPE TO MANHOLE

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 5/07

9-31



CONSTRUCTION NOTES

1. Fabricate and install in conformance with Section 12-3.06A of the State Standard Specifications.
2. Sign panel shall conform to Type IIIA minimum reflective sheeting requirements of Section 12-3.06A of the State Standard Specifications.
3. Sign panel colors shall be black letters and border on a white background. Letter height and weight as follows:

Letter Height	Line Weight
1-1/2"	5/16"
2"	1/4"
3"	3/8"

4. The County Seal emblem shall be provided by the County and installed as shown by the Contractor.
5. 4x4 Wood post shall be installed in conformance with Section 12-3.06A of the State Standard Specifications.

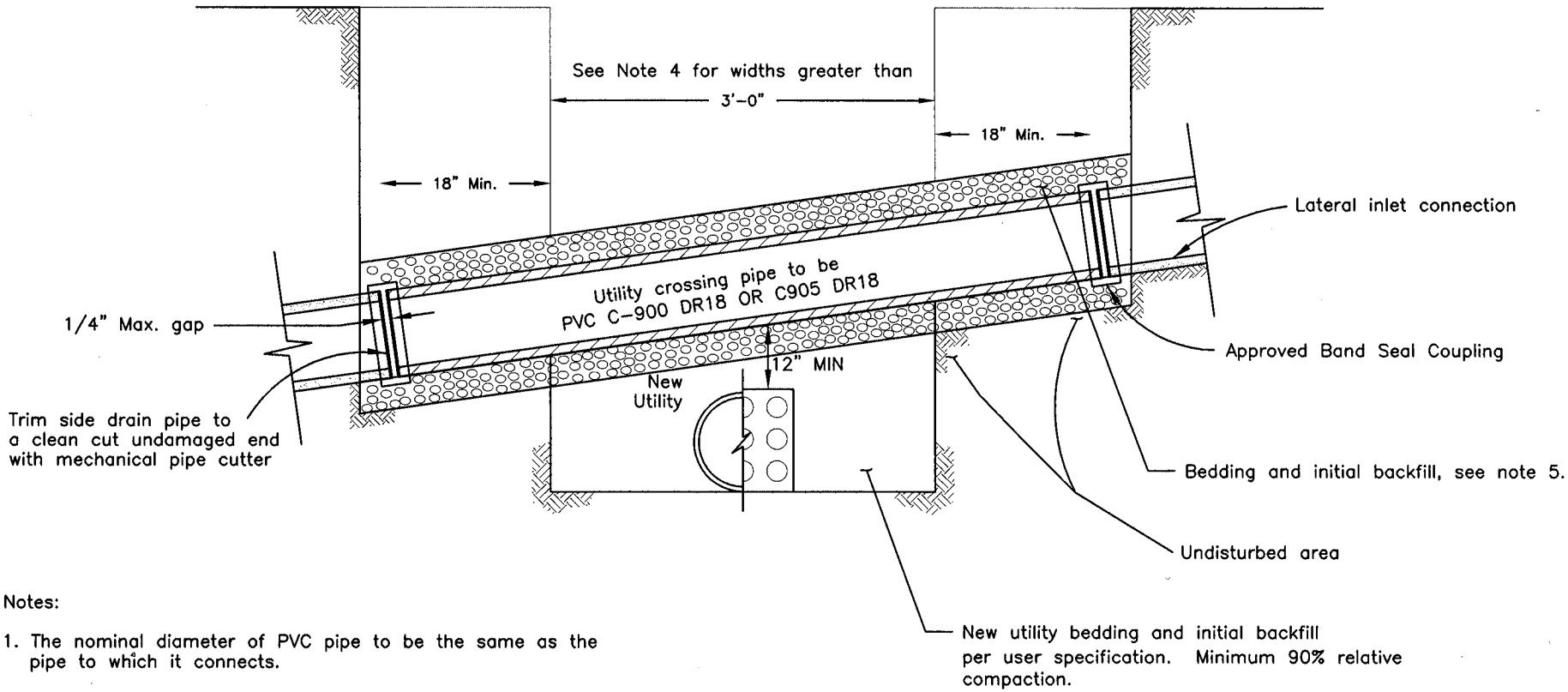
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CONSTRUCTION SITE SIGN

SCALE: NONE
DATE DRAWN: 04/07
DRAWN BY: S.R.P.

9-32



Notes:

1. The nominal diameter of PVC pipe to be the same as the pipe to which it connects.
2. Use PVC pipe when the lateral connectiion is cut or damaged.
3. Alteration of pipe grades will be permitted only after written permission has been received from the engineer.
4. Whenever the span, whether caused by trench width or crossing angle of the PVC pipe, exceeds 3'-0",. Replacement procedure and material shall be as directed by the engineer.
5. Bedding and initial backfill material shall be imported 3/4-inch crushed rock or gravel conforming to the requirements of Article 50-16, Type "B". For pipe 10" or less in diameter use 1/2-inch crushed rock or gravel conforming to Article 50-16, Type "A". Place per Standard Drawing 9-1A.
6. PVC pipe shall conform to section 50-26.04, "Polyvinyl Chloride Pipe (PVC) For Drainage", of the Standard Specifications.

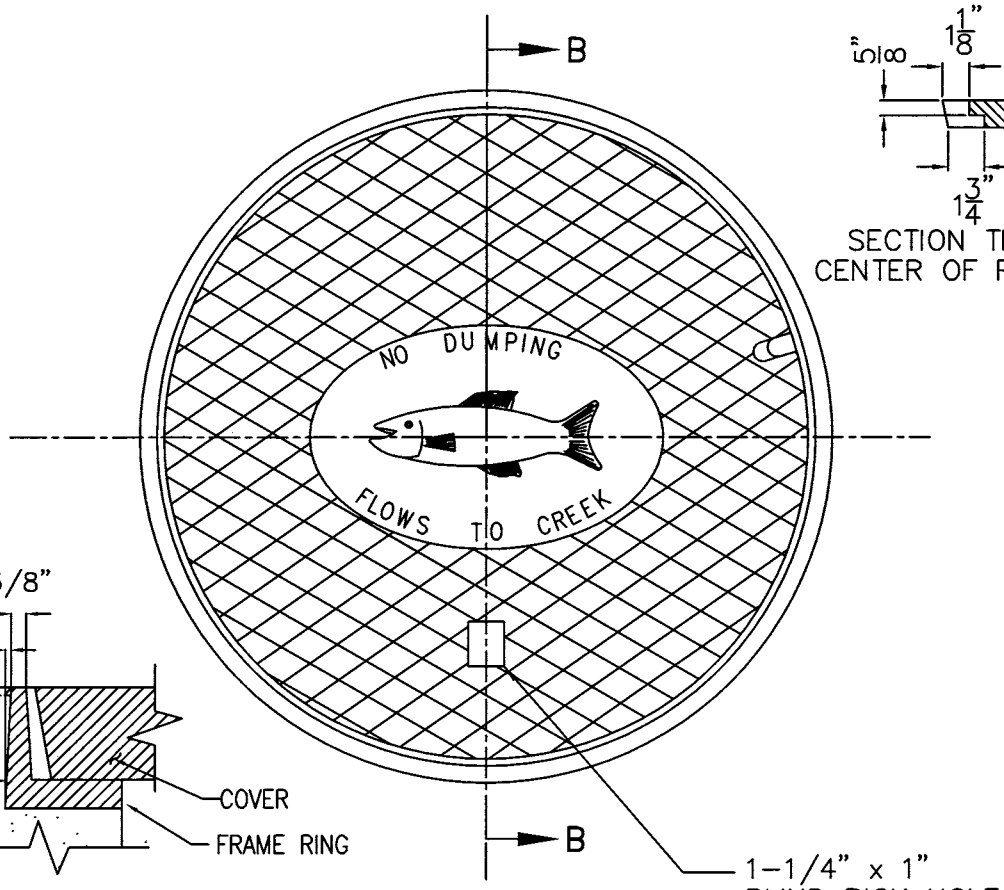
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

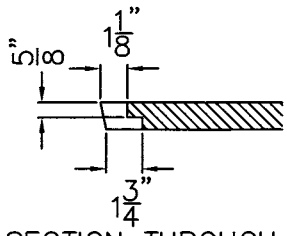
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

UTILITY CROSSING

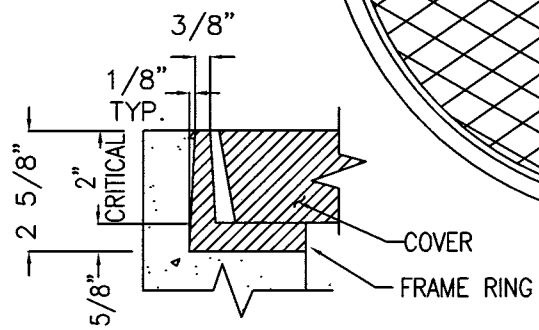
DRAWN BY: STAFF
SCALE: NONE
DATE: 4/97

9-33

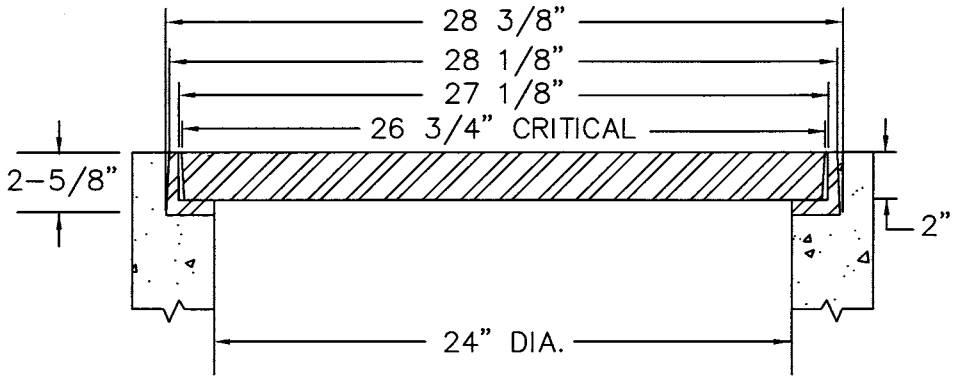


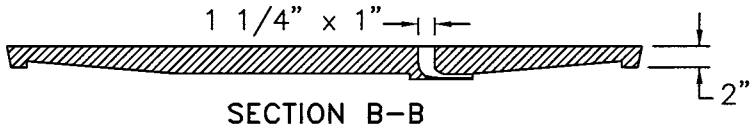


SECTION THROUGH
CENTER OF PICK HOLE



FRAME RING AND LID DETAIL





SECTION B-B

NOTES:

1. TO BE USED ONLY WITH TYPE G OR 300-1 INLET.
2. ALL CASTINGS TO CONFORM TO ASTM A48, CLASS 35B.
3. FRAME AND COVER TO MEET H-20 LOAD SPECIFICATIONS.
4. BEARING SURFACES ARE MACHINED BEVELED TO ASSURE A CLOSE, NON ROCKING SURFACE.
5. EXPOSED SURFACES OF THE CASTINGS WITH THE PARTS ASSEMBLED AND DISASSEMBLED SHALL BE PAINTED WITH COMMERCIAL QUALITY ASPHALTUM PAINT AFTER TESTING AND ASSEMBLY.
6. SEE ARTICLE 50-34, "SEWER AND STORM DRAIN CASTINGS", OF SECTION 50.

WEIGHT	
CAST IRON COVER	91 LBS.
CAST IRON FRAME RING	52 LBS.

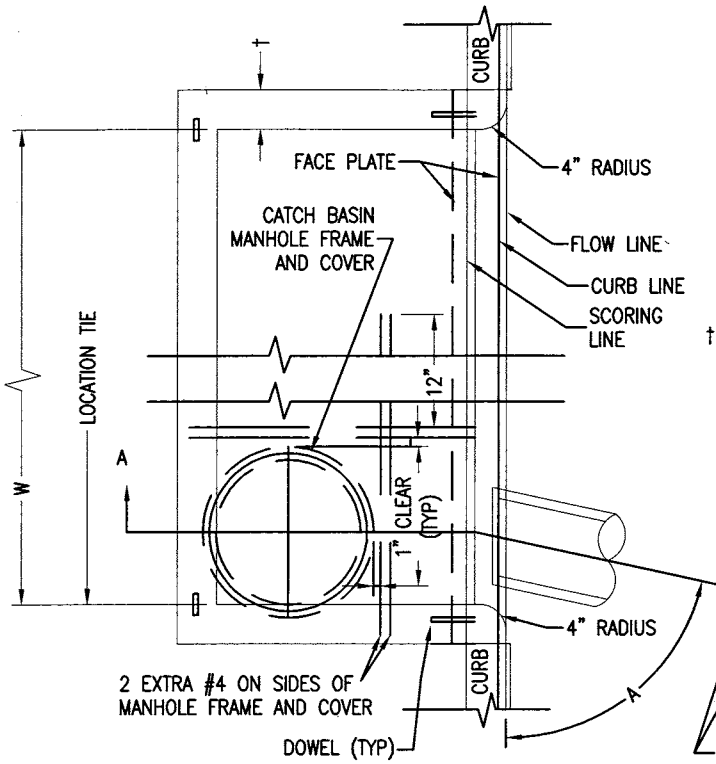
Keith DeWire
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

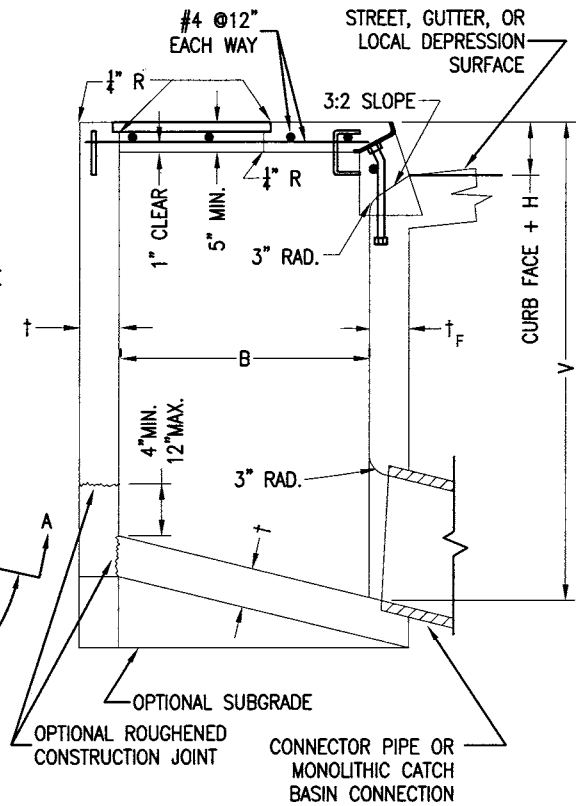
CAST IRON 24" MANHOLE FRAME & COVER FOR TYPE G AND 300-1 INLET

DRAWN BY: S. PIMENTEL
SCALE: NONE
DATE: 4/07

9-34

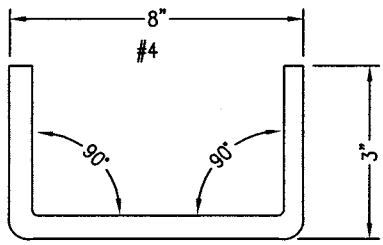


PLAN



SECTION A-A

STRUCTURAL DATA							
WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS							
MAX W	MAX V	†	$†_F$	REINFORCEMENT REQUIRED IN			
				FRONT WALL	REAR WALL	BOTTOM SLAB	END WALL
3.5'	8'	6"	6"	NO REINFORCEMENT REQUIRED			
3.5'	12'	6"	8"				
7'	6'	6"	6"				
7'	12'	8"	8"				
14'	4'	6"	6"	REINFORCEMENT REQUIRED			
14'	8'	6"	8"				
14'	12'	8"	10"				
21' AND 28'	4'	6"	6"				
	6'	6"	8"				
	8'	8"	8"				
	10'	8"	10"				
	12'	8"	10"				
FOR W > 28', V >12', OR B> 4' SEE PROJECT PLANS							



DOWEL DETAIL

Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CURB OPENING CATCH BASIN

DRAWN BY: L.PETERS
SCALE: NONE
DATE: 12/02

300-1
SHEET 1 OF 2

NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1-INCH DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.
2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH AND SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1:12 MINIMUM AND 1:3 MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8 PERCENT, IN WHICH CASE THE LONGITUDINAL SLOPE OF THE FLOOR SHALL BE THE SAME AS THE GUTTER GRADE. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
4. DIMENSIONS:
   - B = 3 FEET 2 INCHES
   - V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET. NOTED ON THE PROJECT PLANS.
   - V_u = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT AT THE UPSTREAM END OF THE BASIN, AND SHALL BE DETERMINED BY THE REQUIREMENTS OF NOTE 3, BUT SHALL NOT BE LESS THAN CURB FACE PLUS 12 INCHES.
   - V_t = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET. NOTED ON THE PROJECT PLANS.
   - H = NOTED ON THE PROJECT PLANS.
   - W = NOTED ON THE PROJECT PLANS.
   - A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.
5. PLACE CONNECTOR PIPES AS INDICATED ON THE PROJECT PLANS UNLESS OTHERWISE SPECIFIED. THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO INSURE MINIMUM 3-INCH PIPE EMBEDMENT ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3-INCH RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70 DEGREES OR GREATER THAN 110 DEGREES, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.
6. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7 FEET ON CENTER (MAXIMUM) ALONG THE BACKWALL.
7. THE FOLLOWING STANDARD PLANS ARE INCORPORATED HEREIN:
   - 308 MONOLITHIC CATCH BASIN CONNECTION
   - 309 CATCH BASIN REINFORCEMENT
   - 9-17 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
   - 9-34 CATCH BASIN MANHOLE FRAME AND COVER

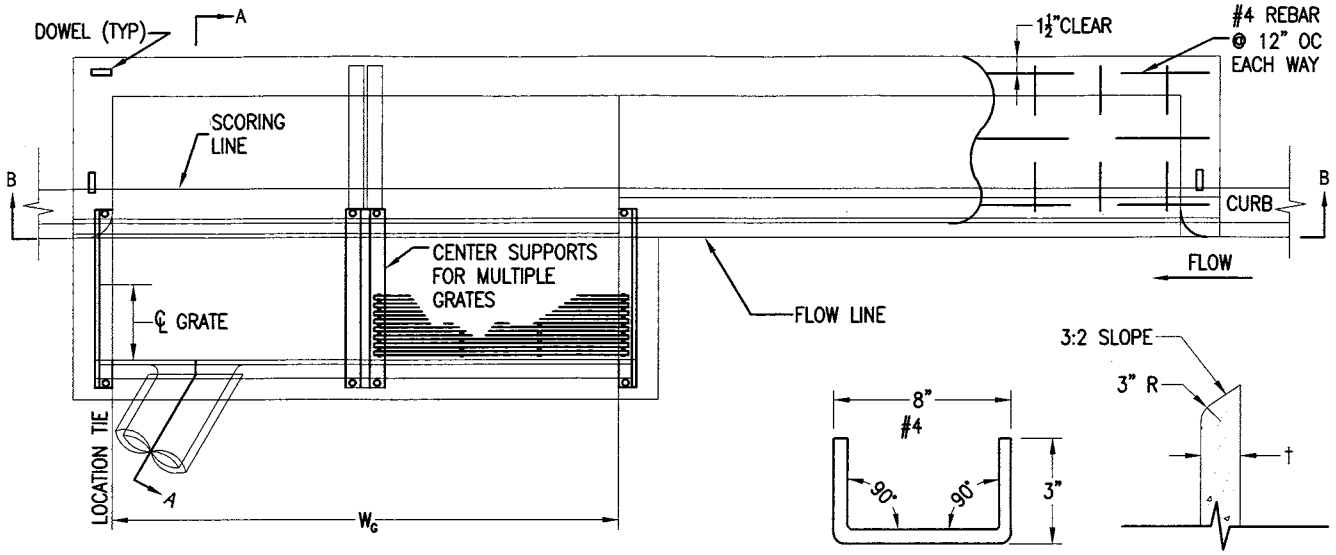
Kirk DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CURB OPENING CATCH BASIN

DRAWN BY: L.PETERS
SCALE: NONE
DATE: 01/02

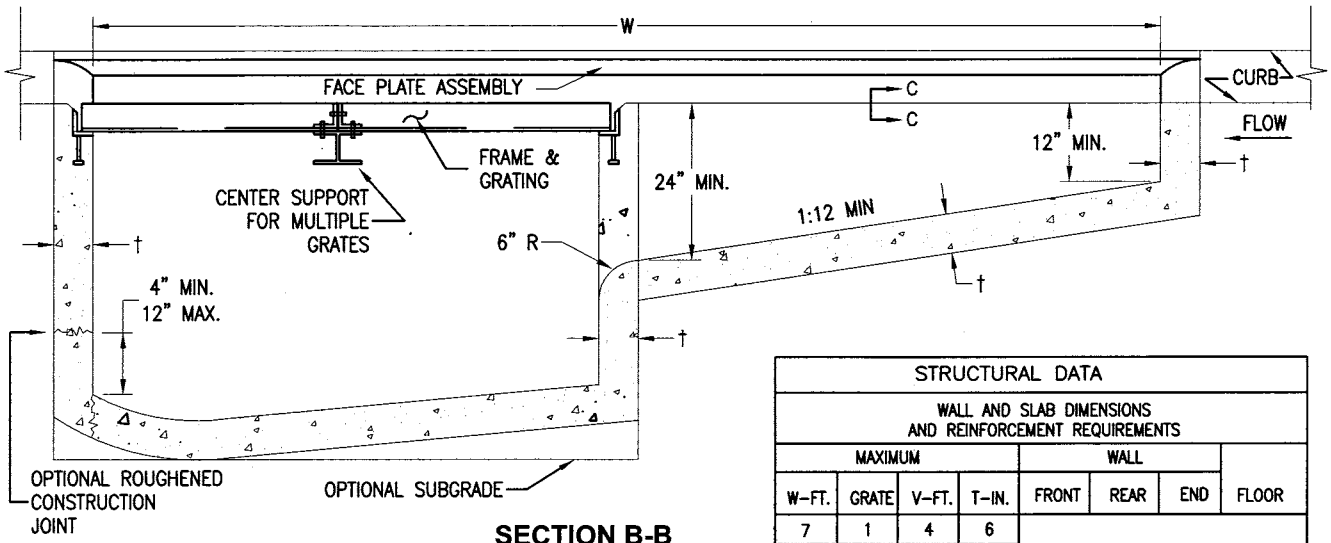
300-1
SHEET 2 OF 2



PLAN

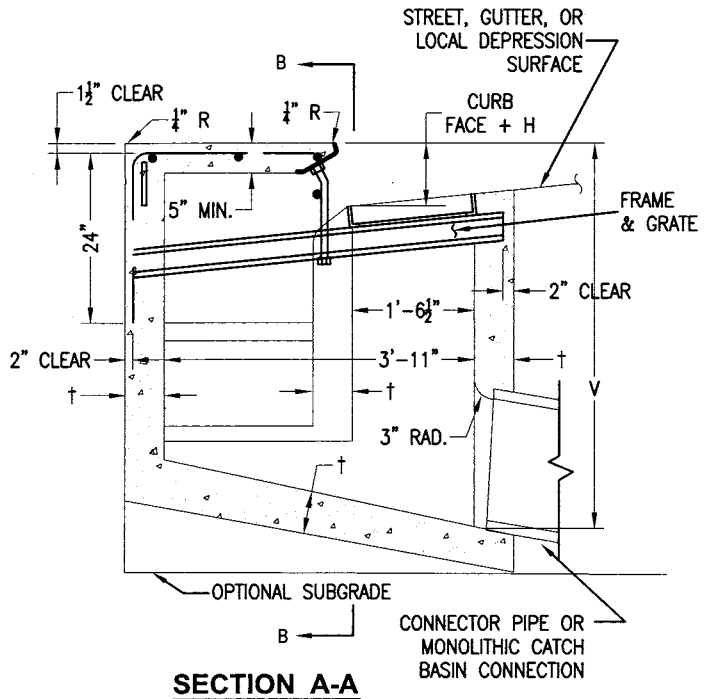
DOWEL DETAIL

SECTION C-C



SECTION B-B

STRUCTURAL DATA							
WALL AND SLAB DIMENSIONS AND REINFORCEMENT REQUIREMENTS							
MAXIMUM				WALL			
W-FT.	GRATE	V-FT.	T-IN.	FRONT	REAR	END	FLOOR
7	1	4	6	NO REINFORCEMENT REQUIRED			
7	1	8	8				
7	1	10	10				
14	3	4	6				
14	2	8	8	REINFORCEMENT REQUIRED			
14	2	10	10				
14	2	12	10				
28	6	4	6				
28	6	6	8				
28	7	4	6				
28	7	8	8				
28	7	10	10				
28	7	12	10				
FOR W > 28', V >12', OR NO. OF GRATES > 7, SEE PROJECT PLANS							



SECTION A-A

Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CURB OPENING CATCH BASIN

DRAWN BY: L.PETERS
SCALE: NONE
DATE: 12/02

301-1
SHEET 1 OF 2

NOTES:

1. WHERE THE BASIN IS TO BE CONSTRUCTED WITHIN THE LIMITS OF EXISTING OR PROPOSED SIDEWALK OR IS CONTIGUOUS TO SUCH SIDEWALK, THE TOP SLAB OF THE BASIN MAY BE POURED EITHER MONOLITHIC WITH THE SIDEWALK OR SEPARATELY, USING THE SAME CLASS OF CONCRETE AS IN THE BASIN. WHEN POURED MONOLITHICALLY, THE SIDEWALK SHALL BE PROVIDED WITH A WEAKENED PLANE OR A 1-INCH DEEP SAWCUT CONTINUOUSLY AROUND THE EXTERNAL PERIMETER OF THE CATCH BASIN WALLS, INCLUDING ACROSS THE FULL WIDTH OF THE SIDEWALK. SURFACE OF ALL EXPOSED CONCRETE SHALL CONFORM IN SLOPE, GRADE, COLOR, FINISH, AND SCORING TO EXISTING OR PROPOSED CURB AND WALK ADJACENT TO THE BASIN.
2. ALL CURVED CONCRETE SURFACES SHALL BE FORMED BY CURVED FORMS, AND SHALL NOT BE SHAPED BY PLASTERING.
3. FLOOR OF BASIN SHALL BE GIVEN A STEEL TROWEL FINISH. FLOOR OF GRATING PORTION SHALL HAVE A LONGITUDINAL AND LATERAL SLOPE OF 1:12 MINIMUM AND 1:3 MAXIMUM, EXCEPT WHERE THE GUTTER GRADE EXCEEDS 8 PERCENT, IN WHICH CASE THE LONGITUDINAL SLOPE OF THE FLOOR SHALL BE THE SAME AS THE GUTTER GRADE. SLOPE FLOOR FROM ALL DIRECTIONS TO THE OUTLET.
4. DIMENSIONS:
   V = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE CATCH BASIN AT THE OUTLET. NOTED ON THE PROJECT PLANS.
   V_t = THE DIFFERENCE IN ELEVATION BETWEEN THE TOP OF THE CURB AND THE INVERT OF THE INLET. NOTED ON THE PROJECT PLANS.
   H = NOTED ON THE PROJECT PLANS.
   W = NOTED ON THE PROJECT PLANS.
   W_G = 2 FEET 11-3/8 INCHES FOR ONE GRATING; ADD 3 FEET 5-3/8 INCHES FOR EACH ADDITIONAL GRATING. ONE GRATING IS REQUIRED UNLESS OTHERWISE SHOWN ON THE PROJECT PLANS.
   A = THE ANGLE, IN DEGREES, INTERCEPTED BY THE CENTERLINE OF THE CONNECTOR PIPE AND THE CATCH BASIN WALL TO WHICH THE CONNECTOR PIPE IS ATTACHED.
5. PLACE CONNECTOR PIPES AS INDICATED ON THE PROJECT PLANS UNLESS OTHERWISE SPECIFIED. THE CONNECTOR PIPE SHALL BE LOCATED AT THE DOWNSTREAM END OF THE BASIN. WHERE THE CONNECTOR PIPE IS SHOWN AT A CORNER, THE CENTERLINE OF THE PIPE SHALL INTERSECT THE INSIDE CORNER OF THE BASIN. THE PIPE MAY BE CUT AND TRIMMED AT A SKEW NECESSARY TO INSURE MINIMUM 3-INCH PIPE EMBEDMENT ALL AROUND, WITHIN THE CATCH BASIN WALL, AND 3-INCH RADIUS OF ROUNDING OF STRUCTURE CONCRETE, ALL AROUND, ADJACENT TO PIPE ENDS. A MONOLITHIC CATCH BASIN CONNECTION SHALL BE USED TO JOIN THE CONNECTOR PIPE TO THE CATCH BASIN WHENEVER ANGLE "A" IS LESS THAN 70 DEGREES OR GREATER THAN 110 DEGREES, OR WHENEVER THE CONNECTOR PIPE IS LOCATED IN A CORNER. THE OPTIONAL USE OF A MONOLITHIC CATCH BASIN CONNECTION IN ANY CASE IS PERMITTED. MONOLITHIC CATCH BASIN CONNECTIONS MAY BE CONSTRUCTED TO AVOID CUTTING STANDARD LENGTHS OF PIPE.
6. DOWELS ARE REQUIRED AT EACH CORNER AND AT 7 FEET ON CENTER (MAXIMUM) ALONG THE BACKWALL.
7. THE FOLLOWING STANDARD PLANS ARE INCORPORATED HEREIN:
   308 MONOLITHIC CATCH BASIN CONNECTION
   309 CATCH BASIN REINFORCEMENT
   9-14,15 FRAME AND GRATING FOR CATCH BASINS
   9-16 CENTER SUPPORT ASSEMBLY FOR MULTIPLE GRATES
   9-17 CATCH BASIN FACE PLATE ASSEMBLY AND PROTECTION BAR
8. THE GRATE SHALL BE PLACED 6" FROM THE BACK OF CURB FOR TYPE 2 CURB AND 8" FROM THE BACK OF CURB FOR TYPE 1 OR 1A CURB.

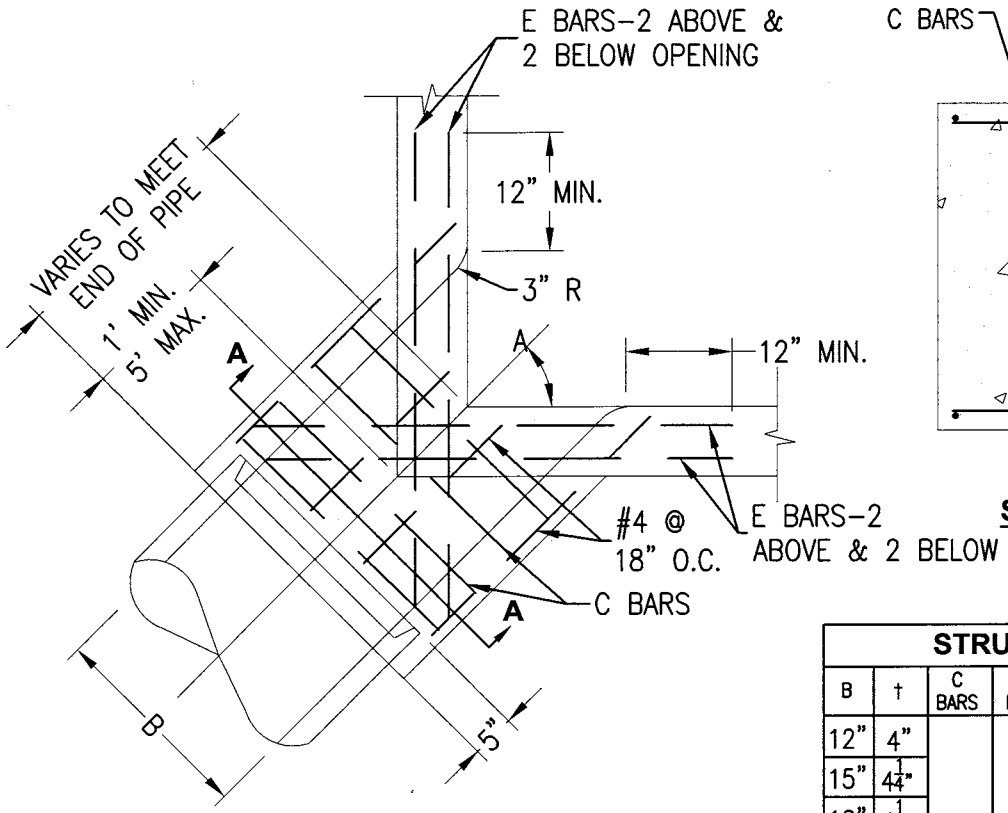
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

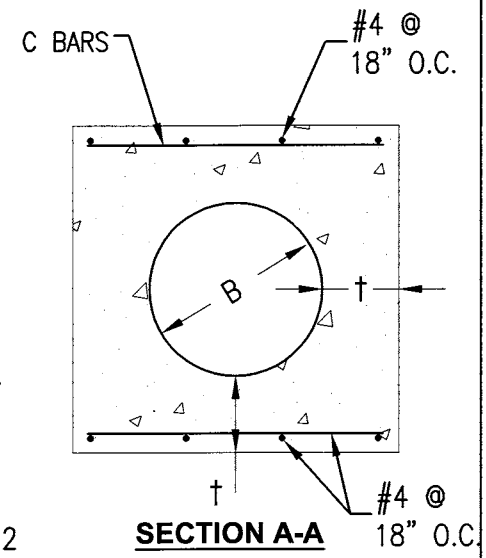
CURB OPENING CATCH BASIN WITH GRATING(S) AND DEBRIS SKIMMER

DRAWN BY: STAFF
SCALE: NONE
DATE: 08/07

301-1
SHEET 2 OF 2

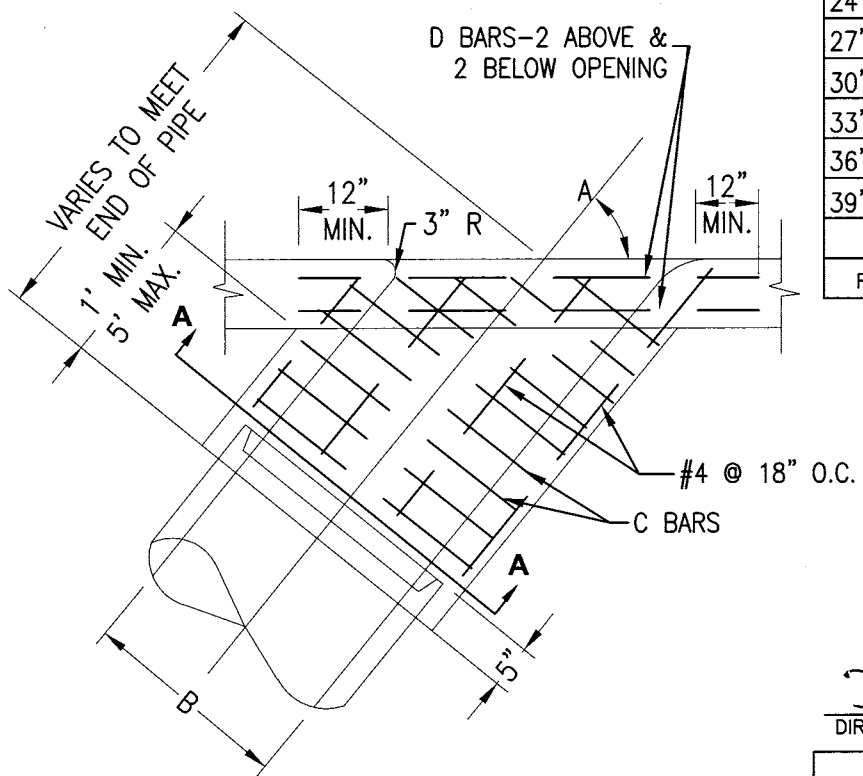


PLAN
CORNER CONNECTION



SECTION A-A

STRUCTURAL DATA							
B	†	C BARS	D&E BARS	B	†	C BARS	D&E BARS
12"	4"	#4 @ 6" O.C.	#5	42"	7 1/2"	#5 @ 6" O.C.	#6
15"	4 1/4"			45"	7 3/4"		
18"	4 1/2"			48"	8"		
21"	5"			51"	8 1/2"		
24"	5 1/4"			54"	9"		
27"	5 1/2"			57"	9 1/4"		
30"	6"			60"	9 1/2"		
33"	6 1/4"			63"	10"		
36"	6 1/2"			66"	10 1/4"		
39"	7"			69"	10 3/4"		
				72"	11"		
FOR B GREATER THAN 72" SEE PROJECT PLAN							



PLAN
SIDE CONNECTION

DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

MONOLITHIC CATCH BASIN CONNECTION

DRAWN BY: D. BOLEN
SCALE: NONE
DATE: 3/07

308-0
SHEET 1 OF 2

NOTES:

1. REINFORCING STEEL SHALL BE 1-1/2 INCHES CLEAR FROM FACE OF CONCRETE UNLESS OTHERWISE SHOWN.
2. REINFORCING STEEL FOR INSIDE FACE OF CATCH BASIN SHALL BE CUT AT CENTER OF OPENING AND BENT INTO WALLS OF MONOLITHIC CATCH BASIN CONNECTION. REINFORCING STEEL FOR OUTSIDE FACE OF CATCH BASIN SHALL BE CUT 2 INCHES CLEAR OF OPENING.
3. CONNECTION SHALL BE PLACED MONOLITHIC WITH CATCH BASIN. THE ROUNDED EDGE OF OUTLET SHALL BE CONSTRUCTED BY PLACING CONCRETE WITH THE SAME CLASS OF CONCRETE AS THE CATCH BASIN AGAINST A CURVED FORM WITH A RADIUS OF 3 INCHES.
4. CONNECTIONS SHALL BE CONSTRUCTED WHEN:
   (A) PIPES INLET OR OUTLET THROUGH CORNER OF CATCH BASIN.
   (B) ANGLE A FOR PIPES THROUGH 30 INCHES IN DIAMETER IS LESS THAN 70 DEGREES OR GREATER THAN 110 DEGREES.

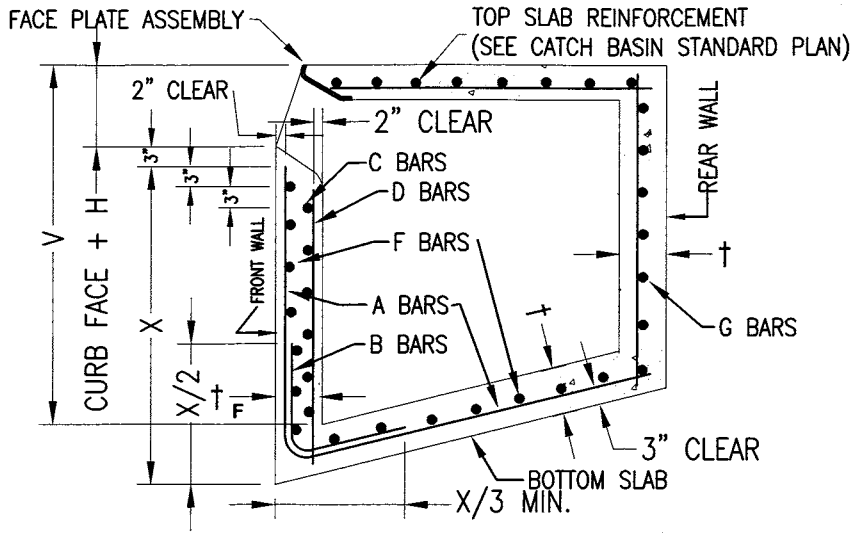
Keith DeVore
DIRECTOR, DEPARTMENT OF WATER RESOURCES

SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

MONOLITHIC CATCH BASIN CONNECTION

DRAWN BY: L.PETERS
SCALE: NONE
DATE: 01/02

308-0
SHEET 2 OF 2



TYPICAL REINFORCEMENT DETAILS

MAX. W	MAX. V	†	$†_F$	A&B BARS	C BARS	D BARS	E BARS	F BARS	G BARS
3.5'	8'	6"	–	–	–	–	–	–	–
3.5'	12'	8"	8"	–	–	–	–	–	–
7'	6'	6"	6"	–	–	–	–	–	–
7'	12'	8"	8"	–	–	–	–	–	–
14'	4'	6"	6"	–	#4@12"	#4@18"	–	–	–
14'	8'	6"	8"	–	#4@12"	#4@18"	–	–	–
14'	12'	8"	10"	–	#4@6"	#4@18"	–	–	–
28'	4'	6"	6"	#4@24"	–	–	–	#4@18"	–
28'	5'	6"	8"	#4@24"	–	–	–	#4@18"	–
28'	6'	6"	8"	#4@18"	–	–	–	#4@18"	–
28'	7'	8"	8"	#4@17"	–	–	–	#4@18"	–
28'	8'	8"	8"	#4@13"	–	–	–	#4@18"	–
28'	9'	8"	10"	#4@15"	–	–	–	#4@18"	–
28'	10'	8"	10"	#4@12"	–	–	–	#4@18"	–
28'	11'	8"	10"	#5@15"	–	–	#4@10"	#4@18"	#4@18"
28'	12'	8"	10"	#6@18"	–	–	#4@9"	#4@18"	#4@18"
FOR W>28', V>12' OR B>4' SEE PROJECT PLANS									

CURB OPENING CATCH BASIN REINFORCEMENT

NOTE: UNLESS OTHERWISE SPECIFIED REINFORCEMENT FOR CURB OPENING CATCH BASIN SHALL TERMINATE 2 INCHES FROM FACE OF CONCRETE.

DIRECTOR, DEPARTMENT OF WATER RESOURCES

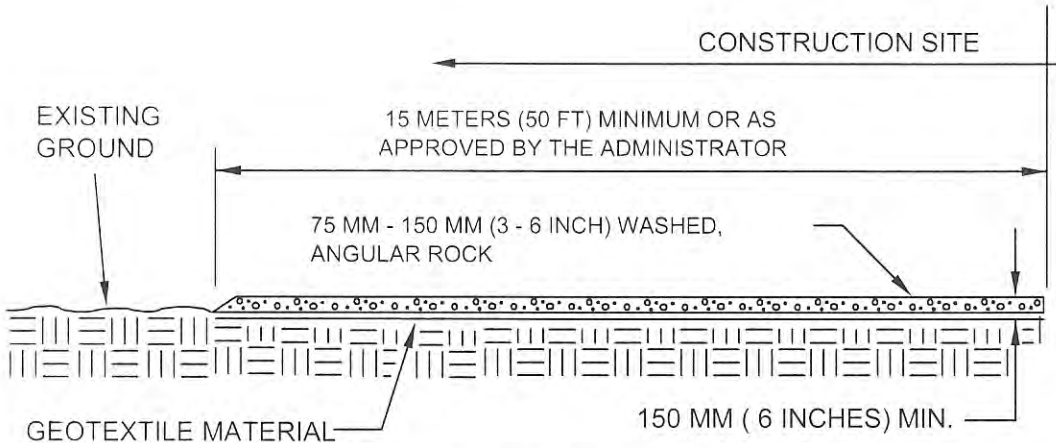
SACRAMENTO COUNTY
MUNICIPAL SERVICES AGENCY

CATCH BASIN REINFORCEMENT

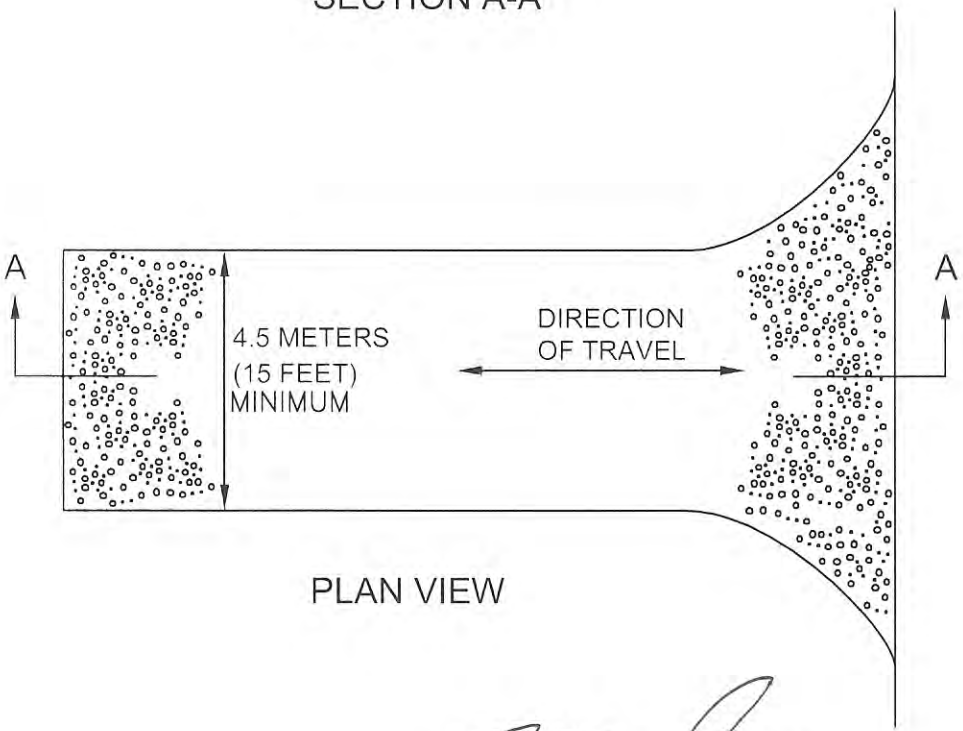
DRAWN BY: B.FORRESTER
SCALE: NONE
DATE: 01/06

309-0

DRAWING NUMBER	TITLE
11-1	STABILIZED CONSTRUCTION SITE ACCESS (09/06)
11-2	SEDIMENT TRAP VEGETATED OUTLET (09/06)
11-3	SEDIMENT TRAP STABILIZED OUTLET (09/06)
11-4	FIBER ROLLS (09/06)
11-5	SILT FENCE (09/06)
11-6	CONCRETE WASHOUT (09/06)
11-7	INLET SEDIMENT CONTROL (09/06)
11-8	STORM DRAIN INLET FILTER BAG (09/06)
11-9	EROSION CONTROL BLANKETS/MATS CHANNEL INSTALLATION (09/06)
11-10	EROSION CONTROL BLANKETS/MATS SLOPE INSTALLATION (09/06)



SECTION A-A



PLAN VIEW

NOTES

1. STABLIZED 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 RADII.
3. THE ENTRANCE SHALL BE KEPT IN GOOD CONDITION BY OCCASIONAL TOP DRESSING WITH MATERICAL 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.

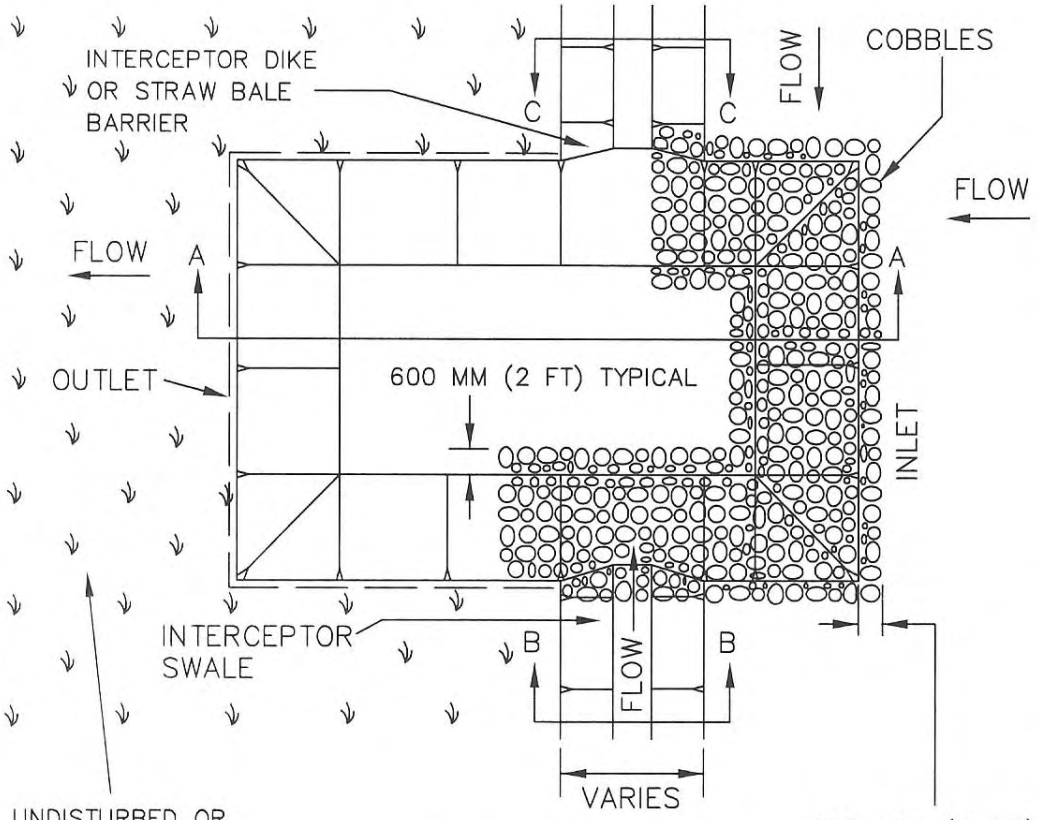
DIRECTOR, COUNTY ENGINEERING

THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS

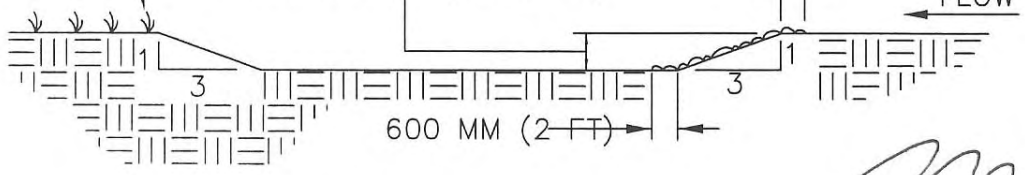
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

STABILIZED CONSTRUCTION SITE ACCESS

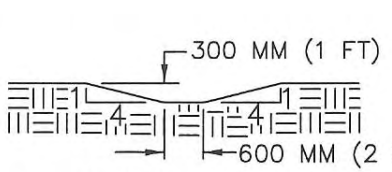
SCALE: NONE DATE DRAWN: REV SEPT 2006 DRAWN BY: SLP	11-1



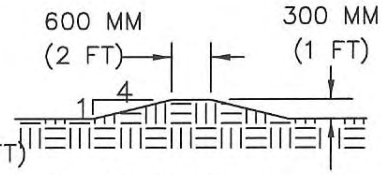
PLAN VIEW



SECTION A–A



SECTION B–B



SECTION C–C

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 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 300MM (1 FOOT) DEEP OR LESS.

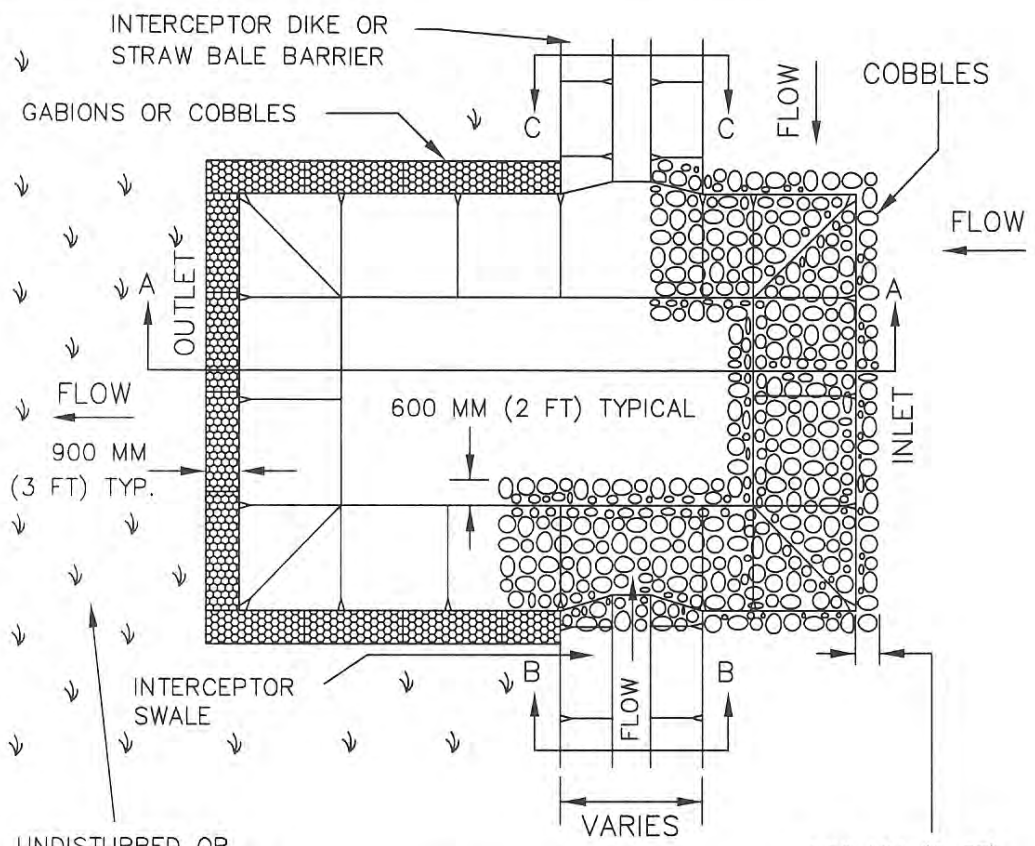
DIRECTOR, COUNTY ENGINEERING

THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS

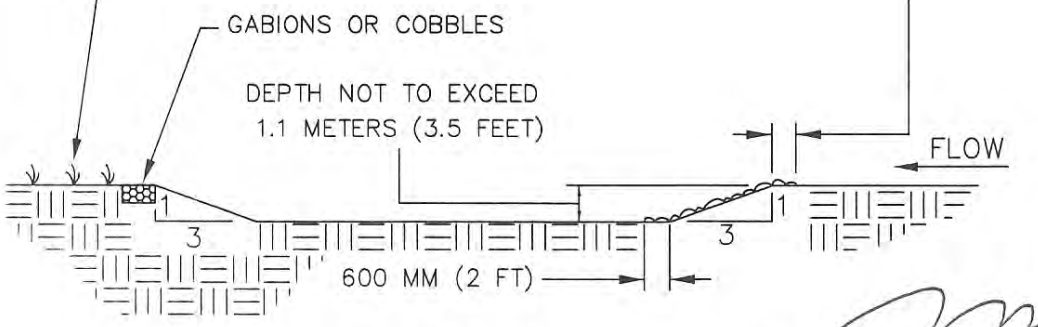
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SEDIMENT TRAP
VEGETATED OUTLET

SCALE: NONE DATE : REV. SEPT 2006 DRAWN BY: SLP	11–2



PLAN VIEW



SECTION A–A

SECTION B–B

SECTION C–C

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.

DIRECTOR, COUNTY ENGINEERING

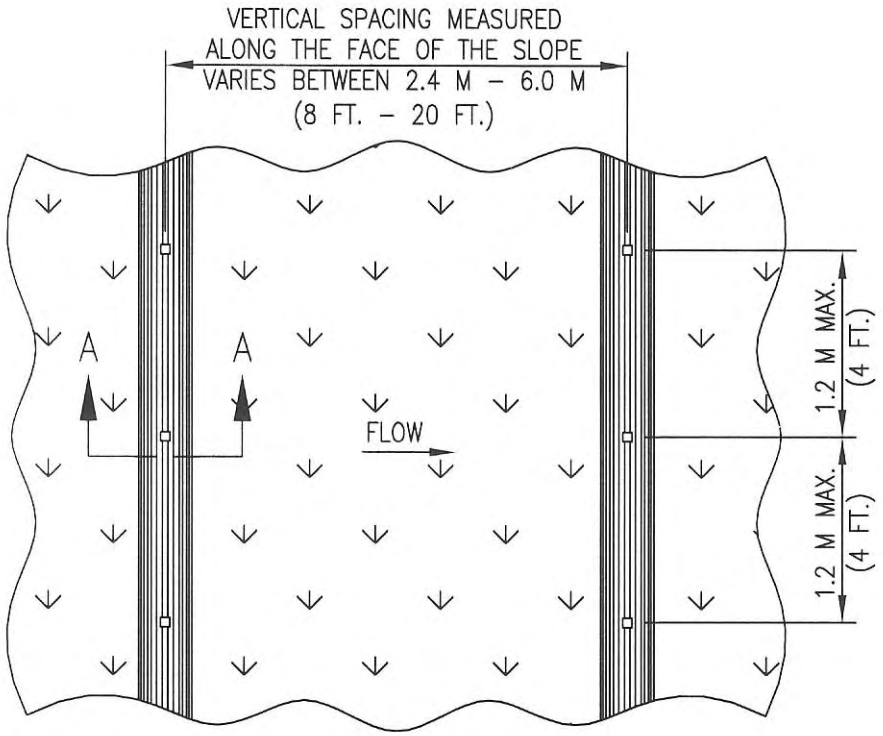
THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

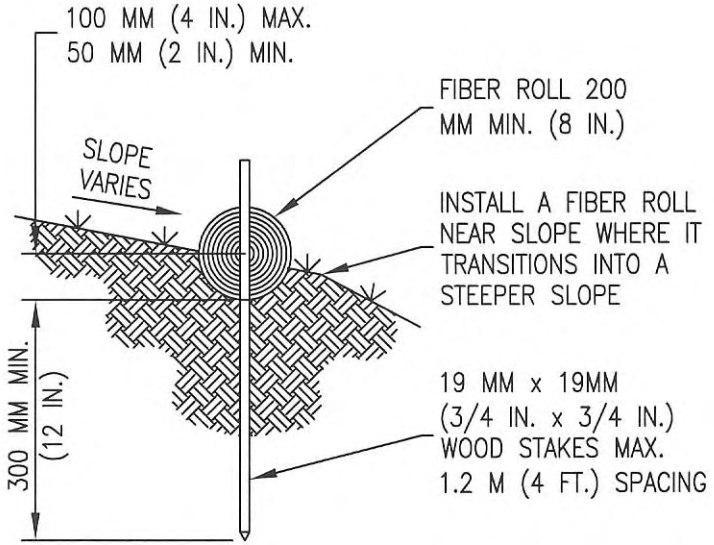
SEDIMENT TRAP STABILIZED OUTLET

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.

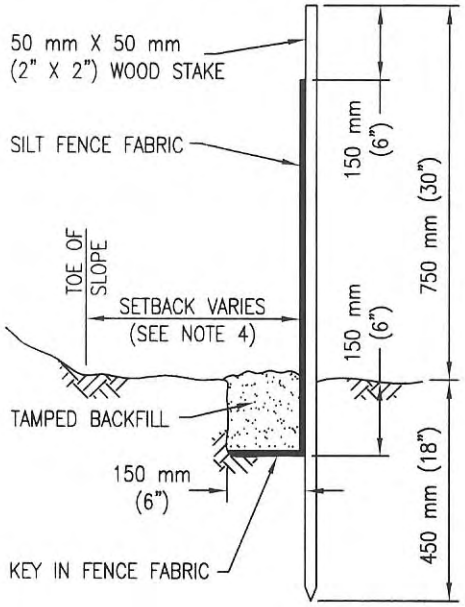
DIRECTOR, COUNTY ENGINEERING

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

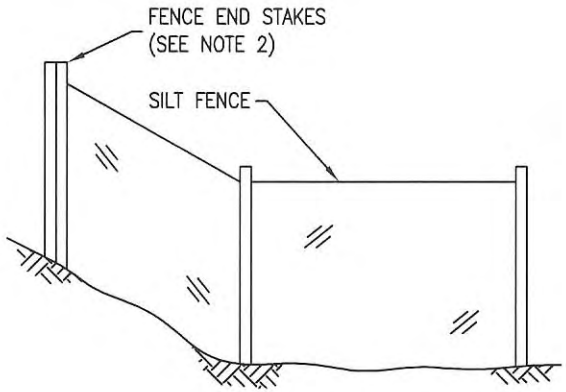
FIBER ROLLS

DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

11-4



FENCE SECTION DETAIL



FENCE END DETAIL

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.

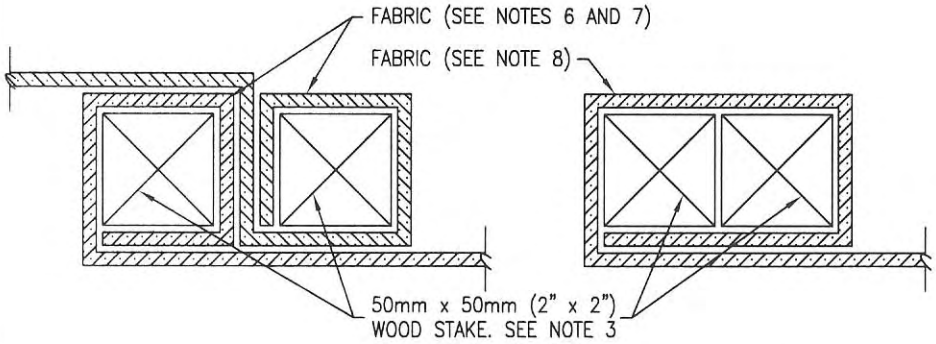
6.) OVERLAP STAKES, AND FOLD FENCE FABRIC TO AROUND EACH STAKE ONE FULL TURN.

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.

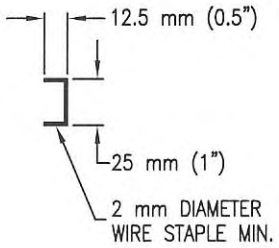
9.) MINIMUM (4) STAPLES PER STAKE.

10.) CROSS BARRIERS SHALL BE A MINIMUM OF 1/3 AND A MAXIMUM OF 1/2 THE HEIGHT OF THE LINEAR BARRIER.



JOINT DETAIL

END STAKE DETAIL



STAPLE DETAIL

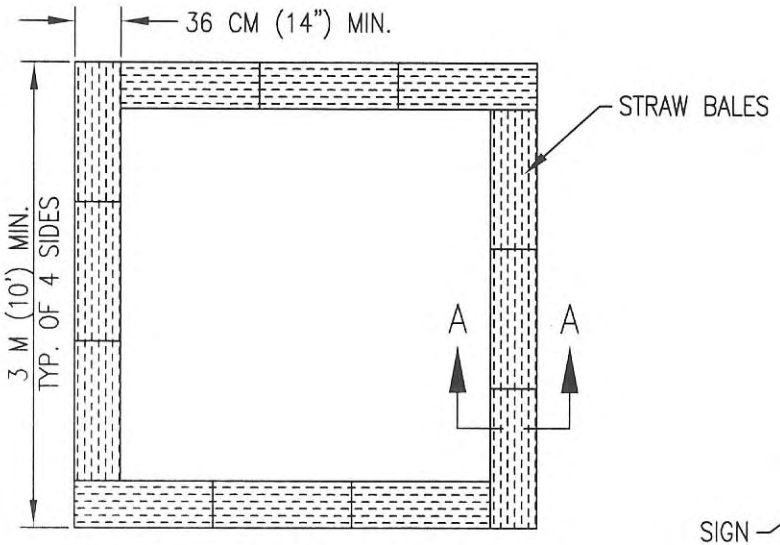
DIRECTOR, COUNTY ENGINEERING

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

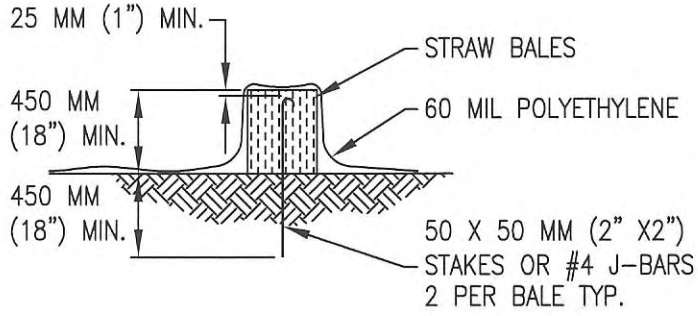
SILT FENCE

DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

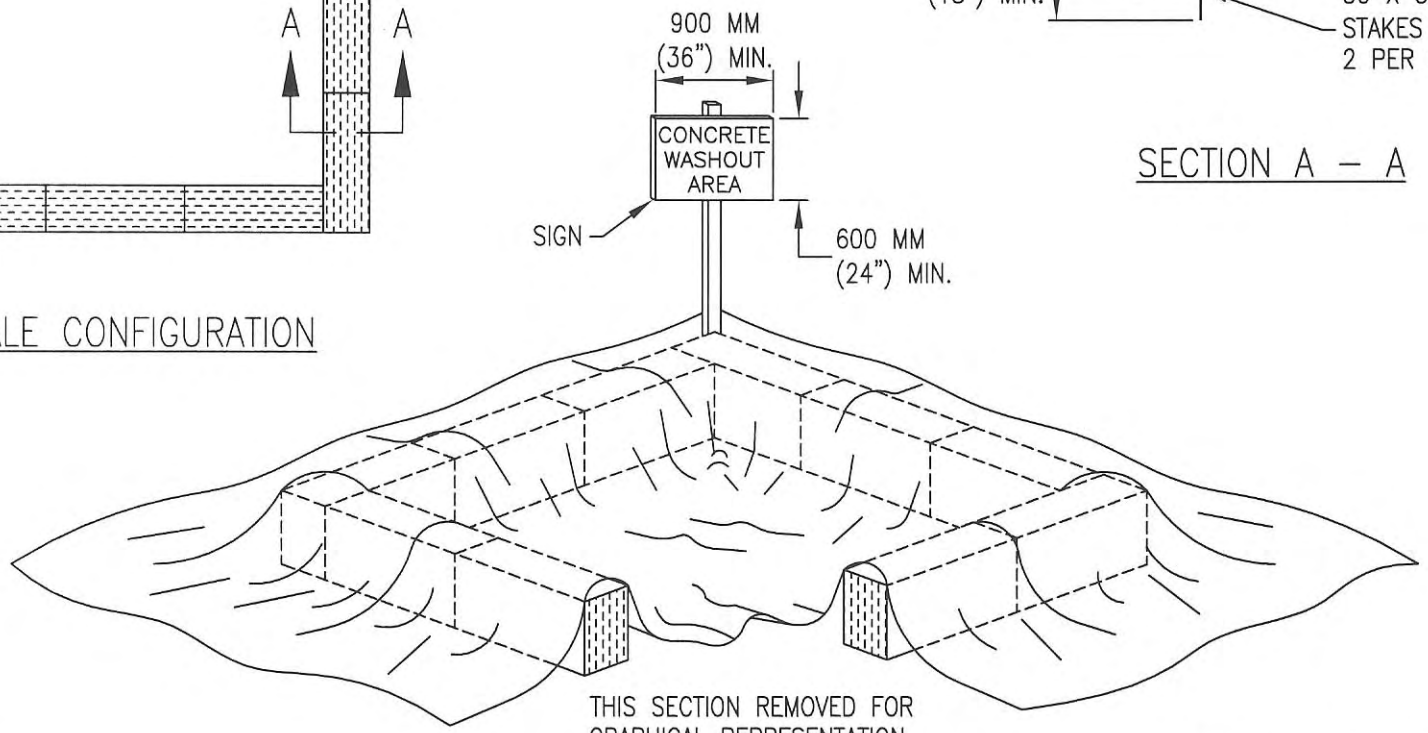
11-5



BALE CONFIGURATION



SECTION A – A



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

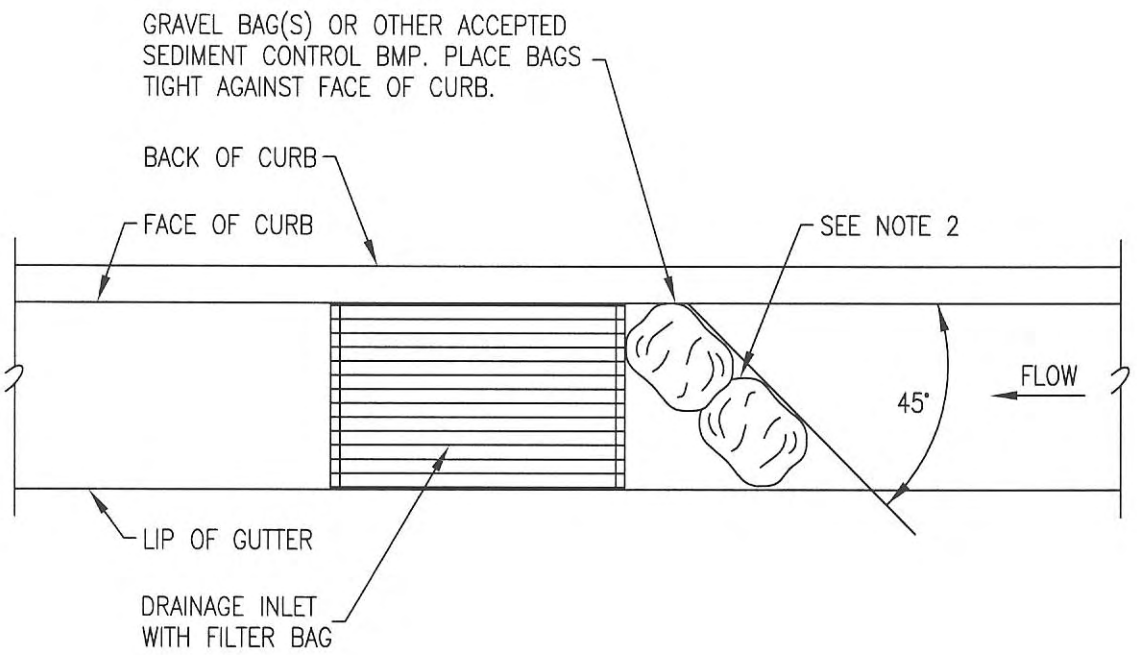
DIRECTOR, COUNTY ENGINEERING

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

PUBLIC WORKS AGENCY

CONCRETE WASHOUT

DRAWN BY: G.O. SCALE: NONE DATE: REV. SEPT 2006	11-6



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.

DIRECTOR, COUNTY ENGINEERING

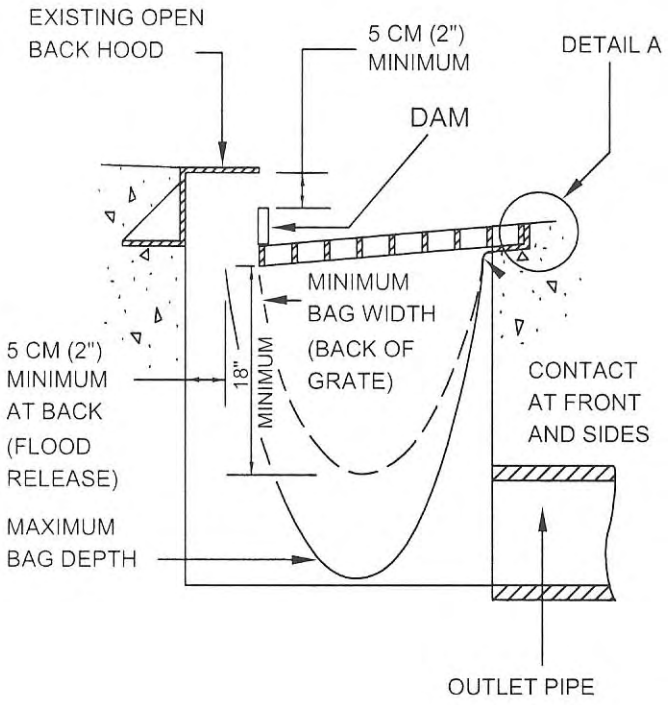
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

INLET SEDIMENT CONTROL

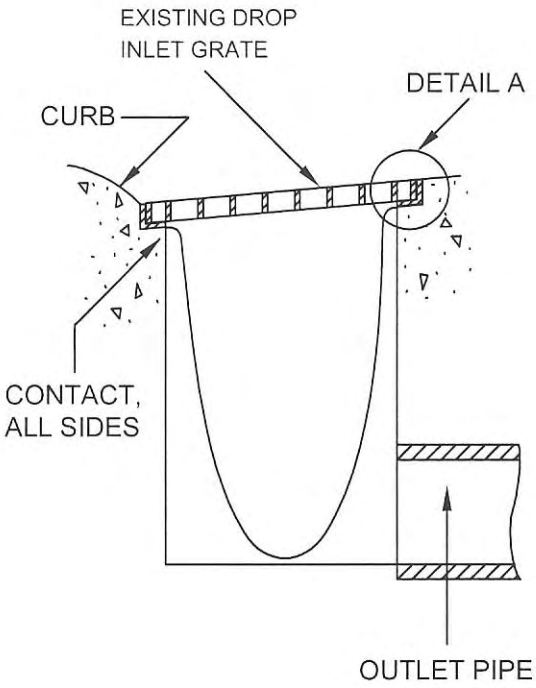
DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

11-7

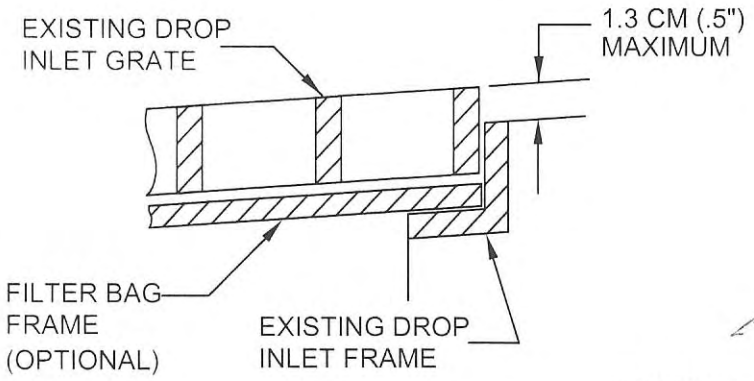
PLACEMENT AT TYPE B AND E DROP INLETS



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.

DIRECTOR, COUNTY ENGINEERING

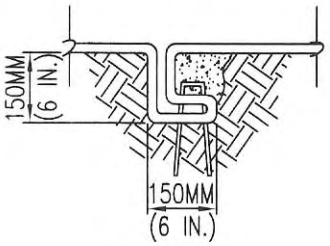
THIS DRAWING SUPERCEDES ALL PREVIOUS VERSIONS

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

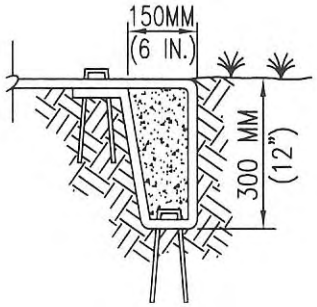
STORM DRAIN INLET FILTER BAG

SCALE: NONE
DATE DRAWN: REV. SEPT 2006
DRAWN BY: SLP

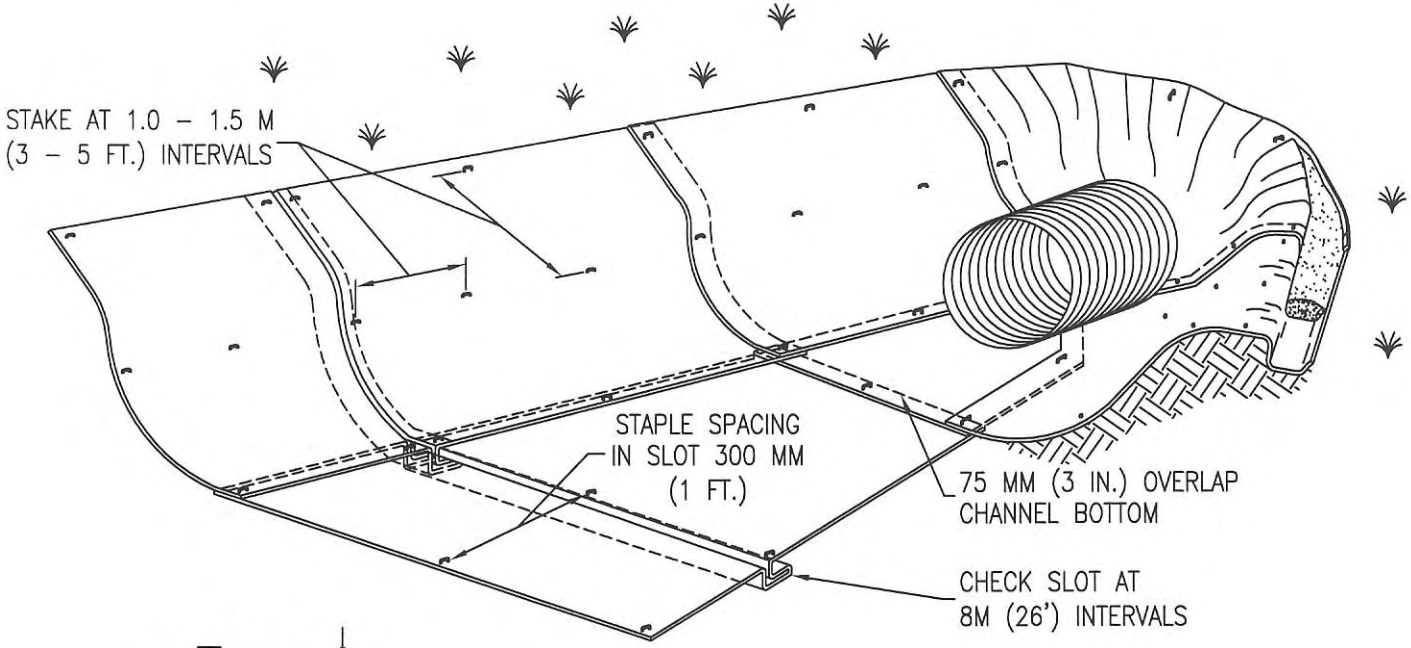
11-8



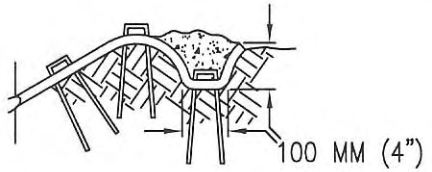
CHECK SLOT



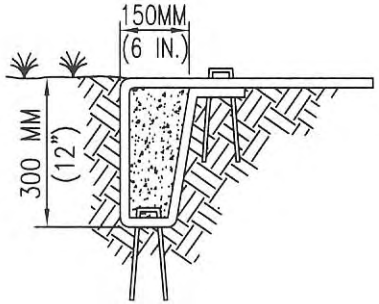
INITIAL CHANNEL
ANCHOR TRENCH



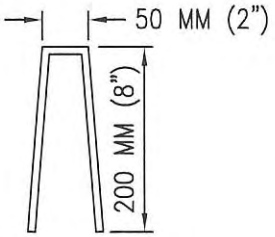
TYPICAL CHANNEL
SOIL STABILIZATION



LONGITUDAL
ANCHOR TRENCH



TERMINAL SLOPE AND
CHANNEL ANCHOR TRENCH



WIRE STAPLES

DIRECTOR, COUNTY ENGINEERING

NOTE:

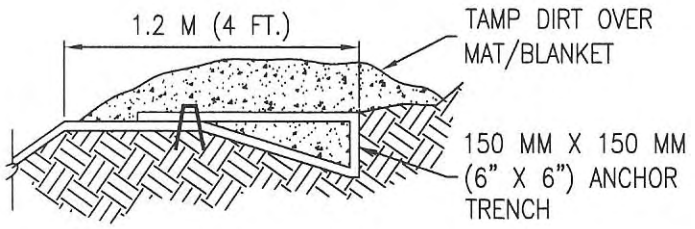
1.) CONSTRUCTION OF CHECK SLOTS, STAKING, STAPLING LAYOUT, AND MAT INSTALLATION ALL TO BE DONE PER MANUFACTURER'S SPECIFICATIONS.

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

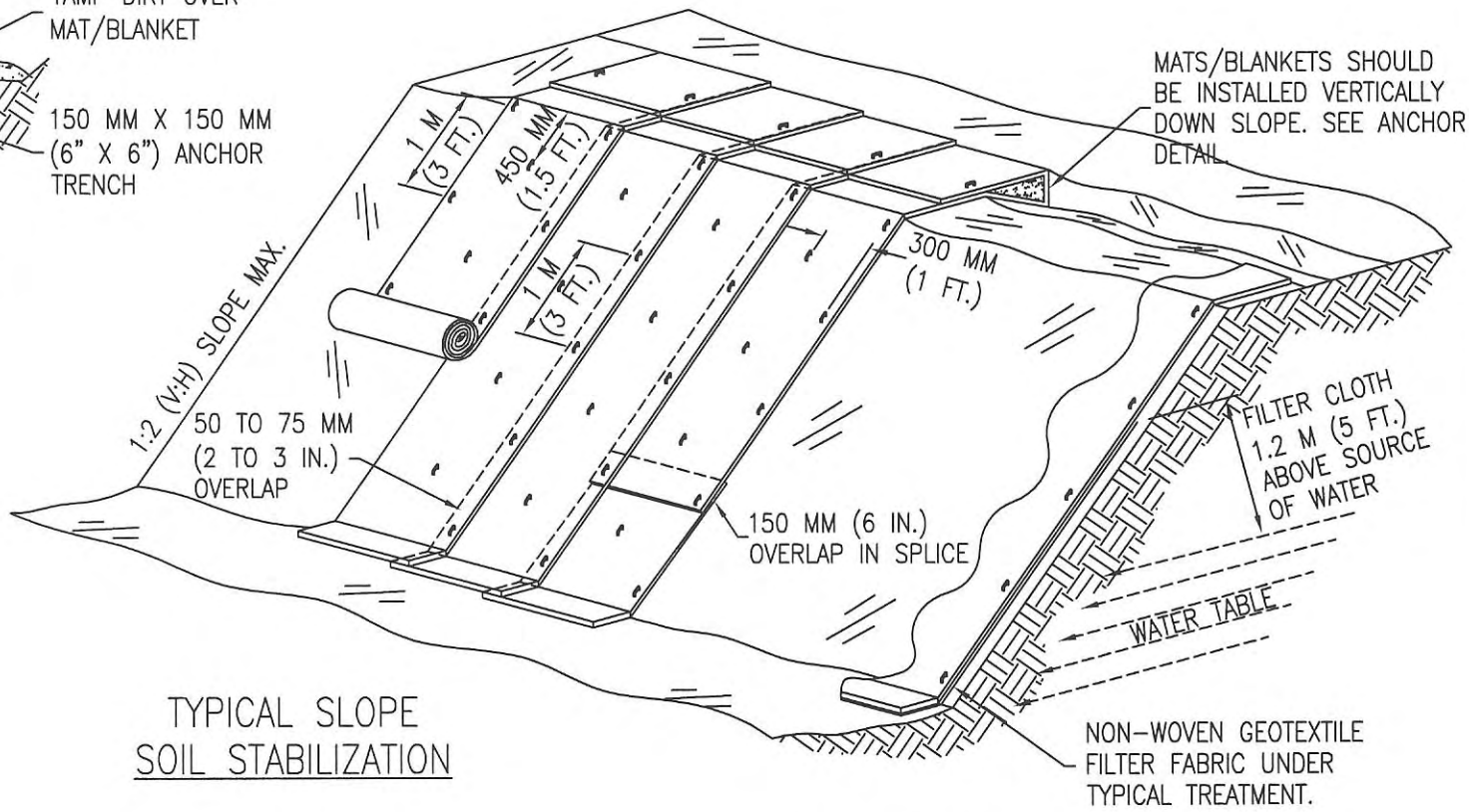
EROSION CONTROL BLANKETS / MATS CHANNEL INSTALLATION

DRAWN BY: G.O.
SCALE: NONE
DATE: REV SEPT 2006

11-9



ANCHOR DETAIL



TYPICAL SLOPE
SOIL STABILIZATION

WET SLOPE LINING

NOTES:

1.) SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2.) LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.
3.) INSTALL PER MANUFACTURER'S RECOMMENDATIONS.

DIRECTOR, COUNTY ENGINEERING

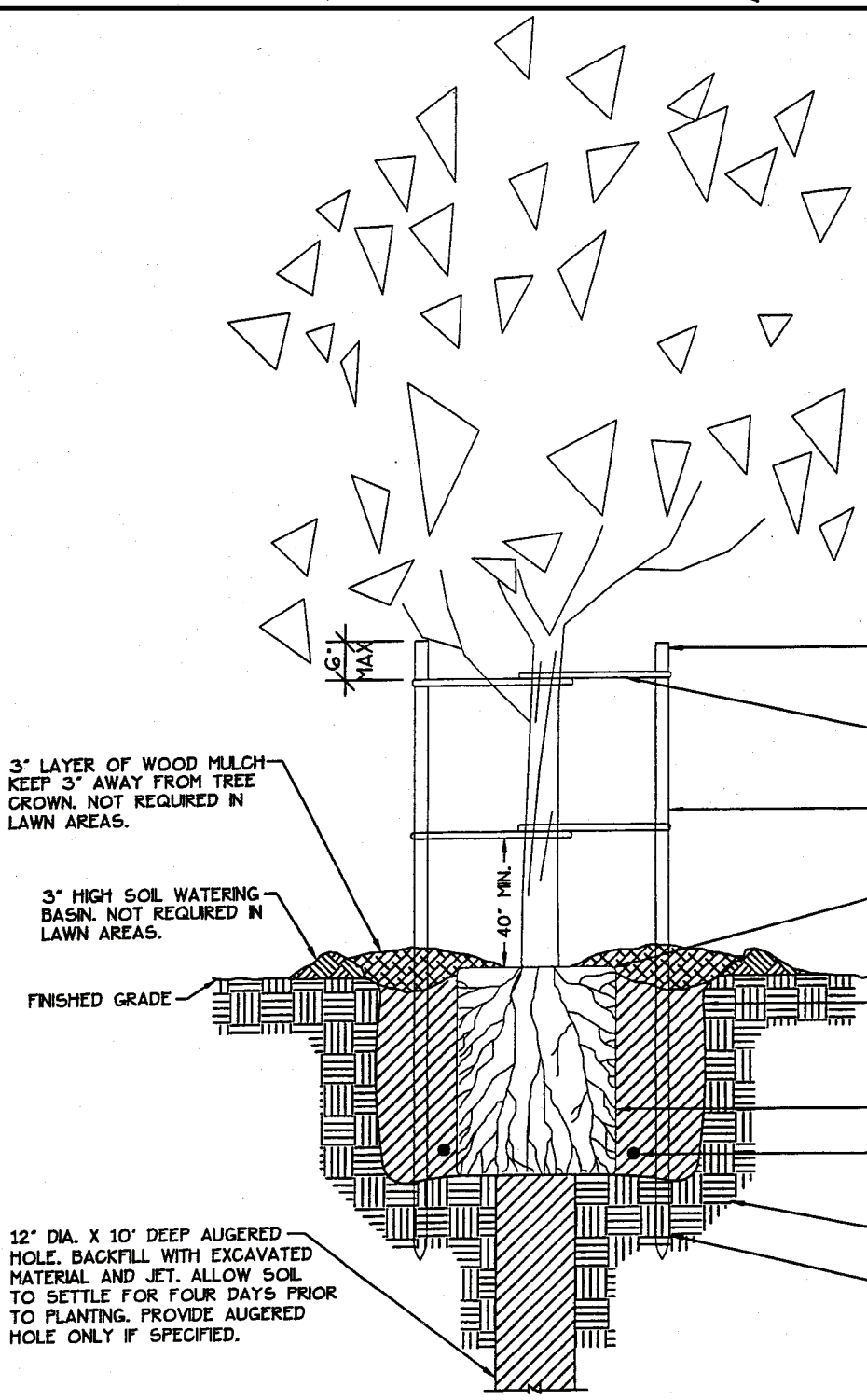
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

EROSION CONTROL BLANKETS / MATS SLOPE INSTALLATION

DRAWN BY: G.O.
SCALE: NONE
DATE: REV. SEPT 2006

11-10

DRAWING NUMBER	TITLE
L-1	TREE PLANTING (11/00)
L-2	SHRUB PLANTING (11/00)
L-3	REMOTE CONTROL VALVE (11/00)
L-4	DRIP IRRIGATION VALVE ASSEMBLY (12/07)
L-5A	GATE VALVE (12/07)
L-6	MASTER VALVE/FLOW SENSOR (BELOW GRADE) (12/07)
L-6A	1-1/2” & 2” SIZE MASTER VALVE/FLOW SENSOR (ABOVE GRADE) (12/07)
L-6B	3” SIZE AND LARGER MASTER VALVE/FLOW SENSOR (ABOVE GRADE) (12/07)
L-7	FLUSH VALVE (12/07)
L-8	AIR RELIEF VALVE (11/00)
L-9	POP-UP ROTOR SPRINKLER (11/00)
L-10	POP-UP SPRAY SPRINKLER (11/00)
L-11	BUBBLER SPRINKLER HEAD (11/00)
L-12	DRIP IRRIGATION MULTI-OUTLET EMITTER (11/00)
L-13	SUBSURFACE IN-LINE DRIP IRRIGATION LAYOUT (11/00)
L-14	SUBSURFACE IN-LINE DRIP IRRIGATION CENTER-FEED SUPPLY MANIFOLD (11/00)
L-15	SUBSURFACE IN-LINE DRIP IRRIGATION END-FEED SUPPLY MANIFOLD (11/00)
L-16	DEEP WATERING PIPE FOR TREES (11/00)
L-17	IRRIGATION CONTROLLER ENCLOSURE (11/00)
L-18	IRRIGATION SYSTEM TRENCHING (11/00)
L-19	DRINKING FOUNTAIN (11/00)
L-20	POST AND CABLE FENCING (11/00)
L-21	KNOCK-DOWN BOLLARD & STATIONARY BOLLARD (11/00)
L-22	REMOVABLE BOLLARD (11/00)
L-23	CONCRETE WALK (11/00)
L-24	CONCRETE MOWSTRIP (11/00)
L-25	BIKETRAIL PAVING SECTION (11/00)
L-26	ROADWAY MEDIAN SECTION (11/00)
L-27	REDWOOD HEADERBOARD (11/00)
L-28	DOUBLE PIPE GATE (11/00)
L-29	SINGLE PIPE GATE (11/00)



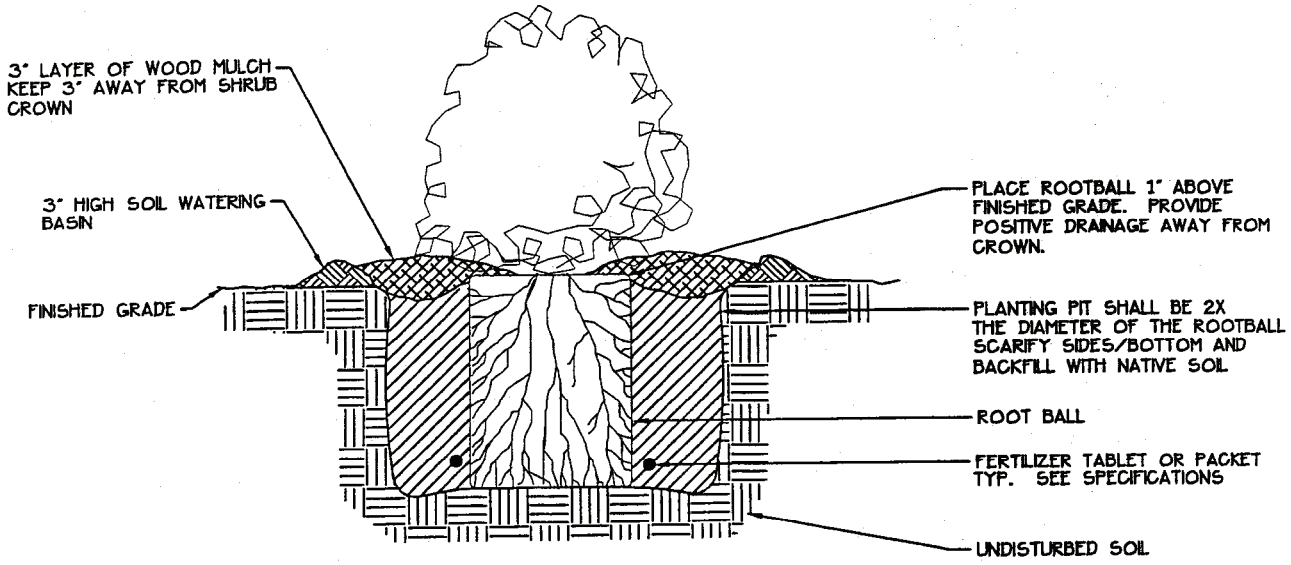
NOTE:
1. FOR 36" BOX TREES, STAKE WITH TWO 2" X 12' LONG SCHEDULE 40 GALVANIZED STEEL PIPES, PAINTED WITH TWO COATS OF DARK GREEN PAINT. TIE TREE WITH A METAL TWIST BRACE BOLTED TO THE STAKES OR OTHER APPROVED TREE TIE AS SPECIFIED.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

TREE PLANTING

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: L-1

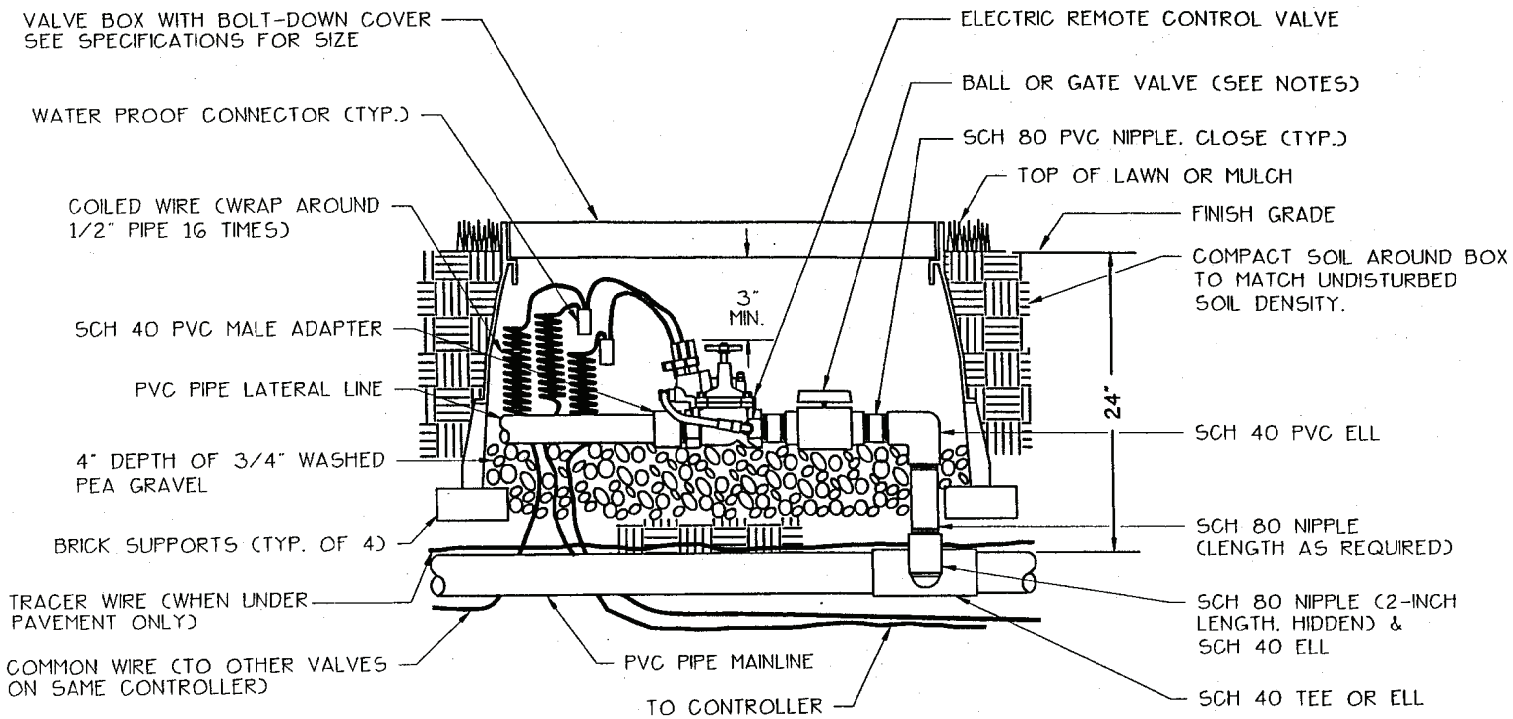


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SHRUB PLANTING

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: **L-2**



NOTES:

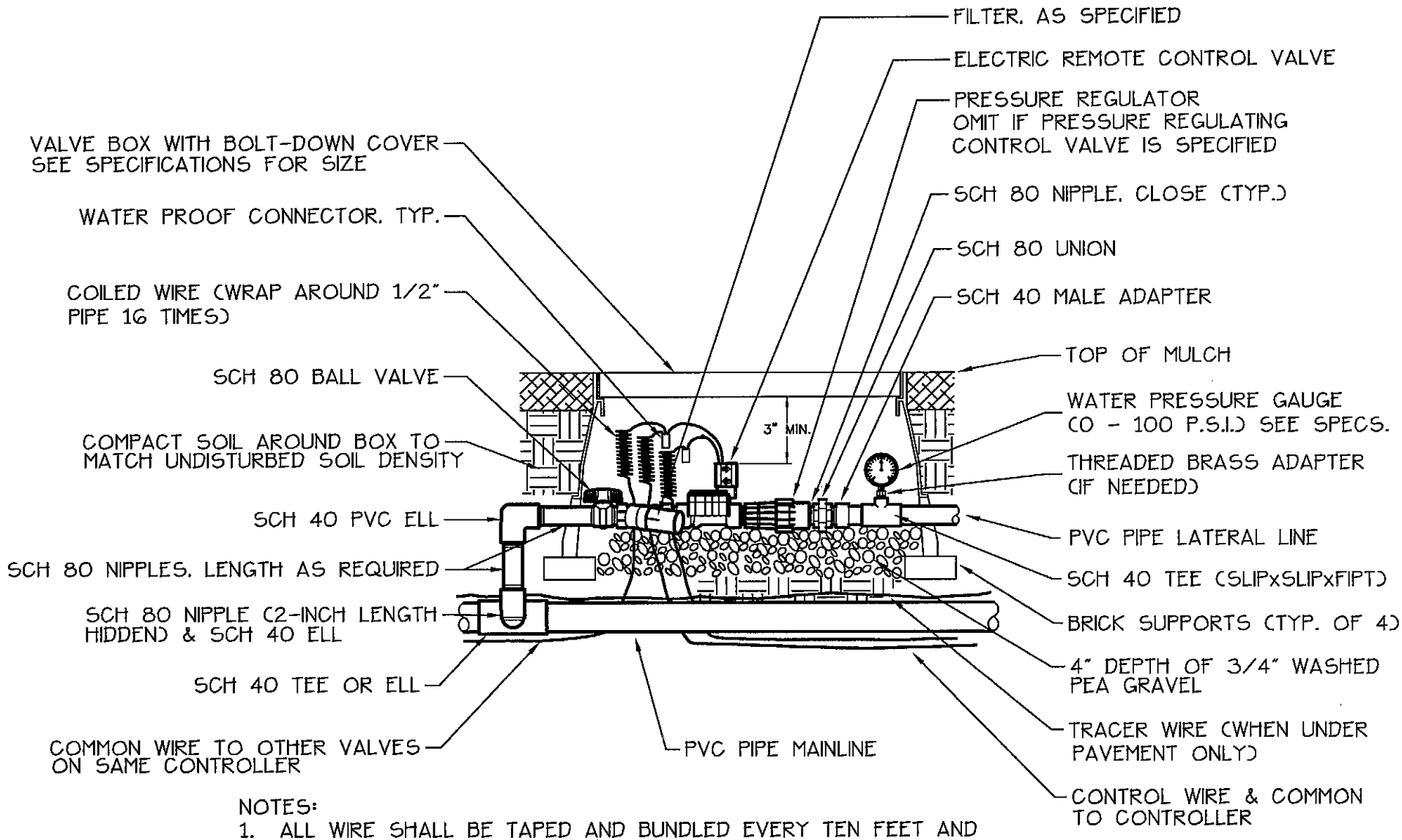
1. ALL WIRE SHALL BE TAPED AND BUNDLED EVERY TEN FEET AND SHALL BE INSTALLED AS PER LOCAL CODE.
2. SHUT-OFF VALVES 3" AND SMALLER SHALL BE SCH 80 BALL VALVES. VALVES LARGER THAN 3" SHALL BE BRASS GATE VALVES.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

REMOTE CONTROL VALVE

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: L-3



NOTES:

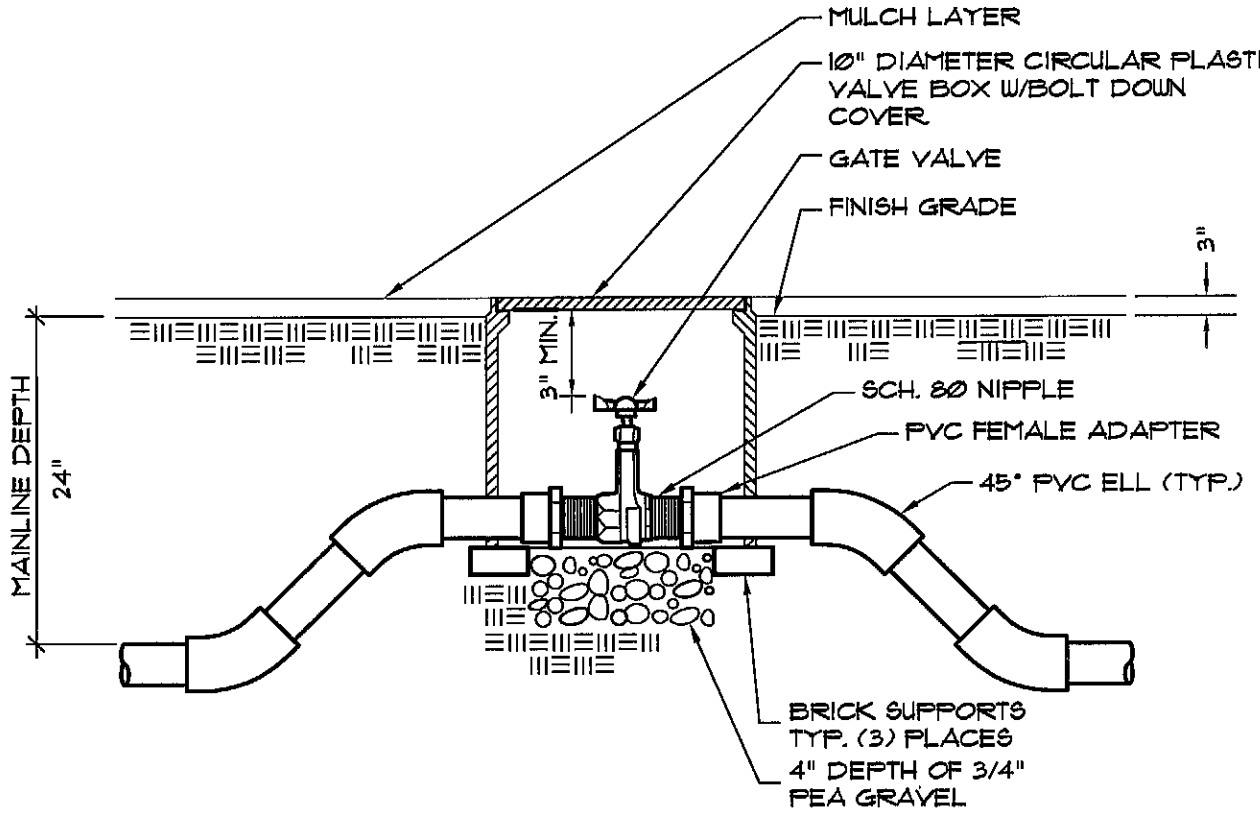
1. ALL WIRE SHALL BE TAPED AND BUNDLED EVERY TEN FEET AND SHALL BE INSTALLED AS PER LOCAL CODE.

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DRIP IRRIGATION VALVE ASSEMBLY

SCALE: NONE DATE: 12/2007	DRAWN BY: GMM/HY CHECKED BY: HY	SHEET: L-4

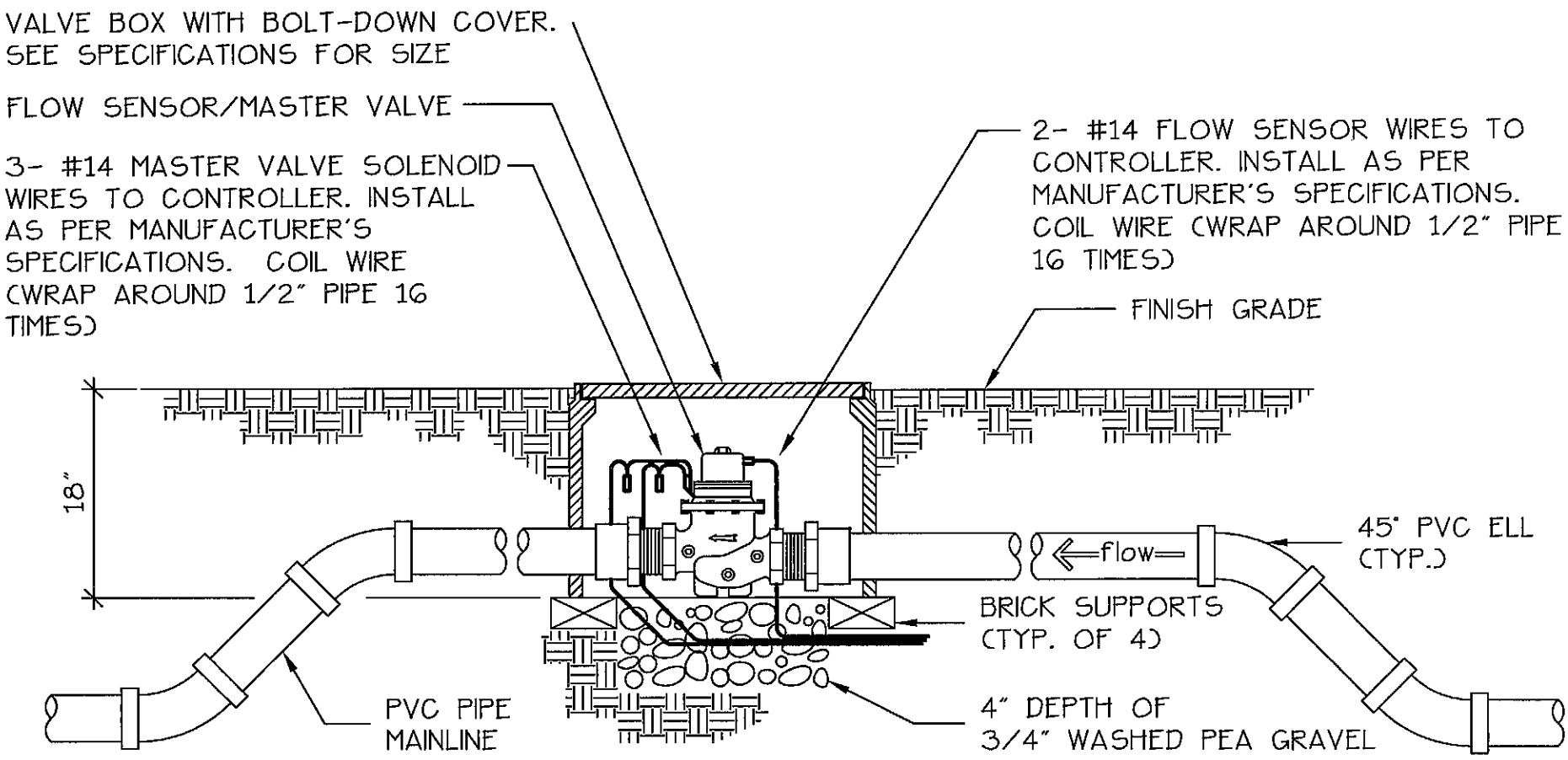


CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

GATE VALVE

SCALE: NONE	DRAWN BY: SB	SHEET:
DATE: 12/2007	CHECKED BY: HY	L-5A

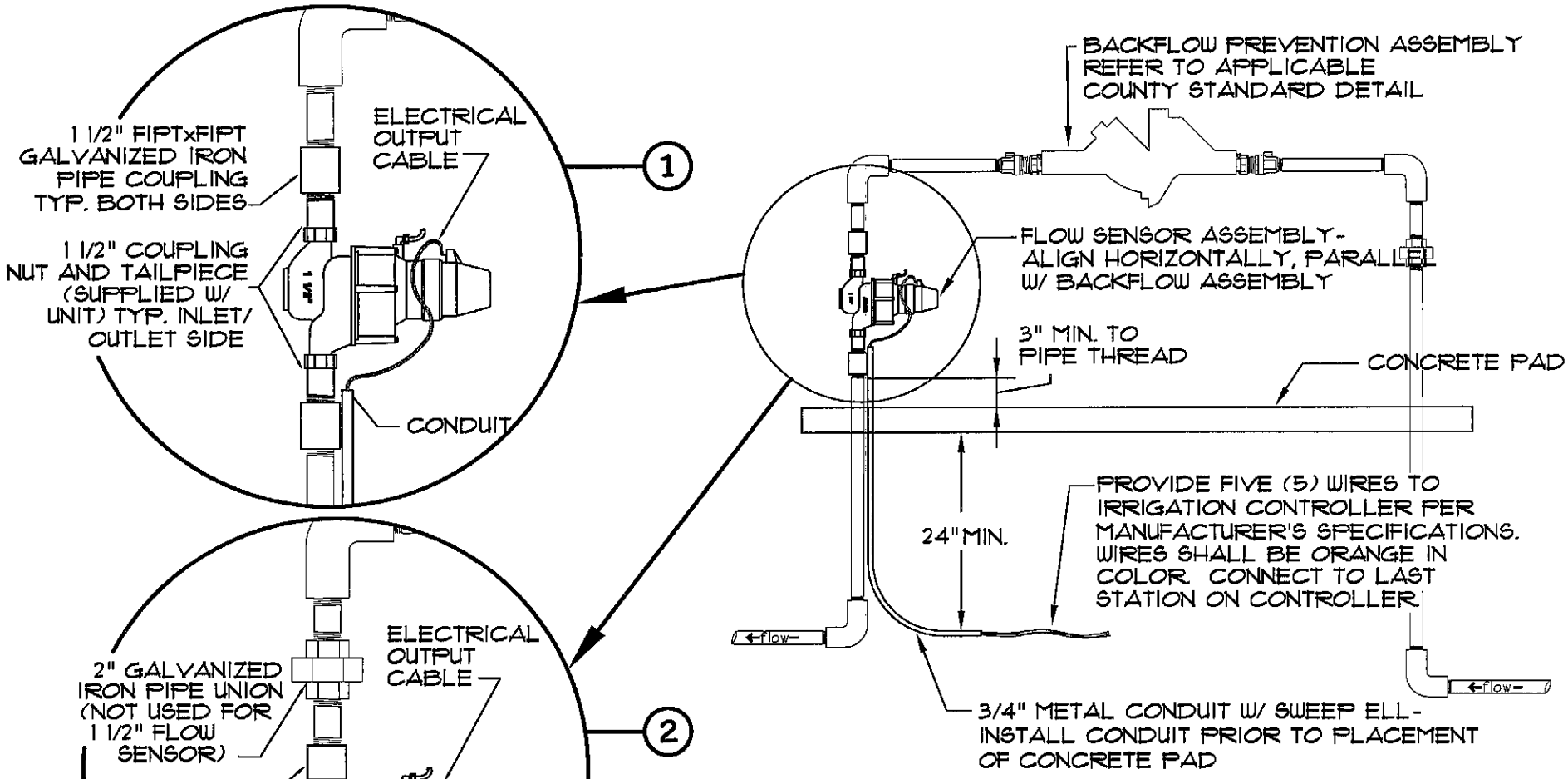


CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

MASTER VALVE/ FLOW SENSOR (BELOW GRADE)

SCALE: NONE DATE: 12/2007	DRAWN BY: GA CHECKED BY: HY	SHEET: L-6



NOTE:

① 1 1/2" FLOW SENSOR FOR FLOW RATES 6.6 - 66 GPM.

② 2" FLOW SENSOR FOR FLOW RATES 8.8 - 110 GPM.

③ COIL WIRE ADJACENT TO FLOW SENSOR (WRAP AROUND 1/2" PIPE 16 TIMES) FOR SLACK, TYP. FOR EITHER FLOW SENSOR.

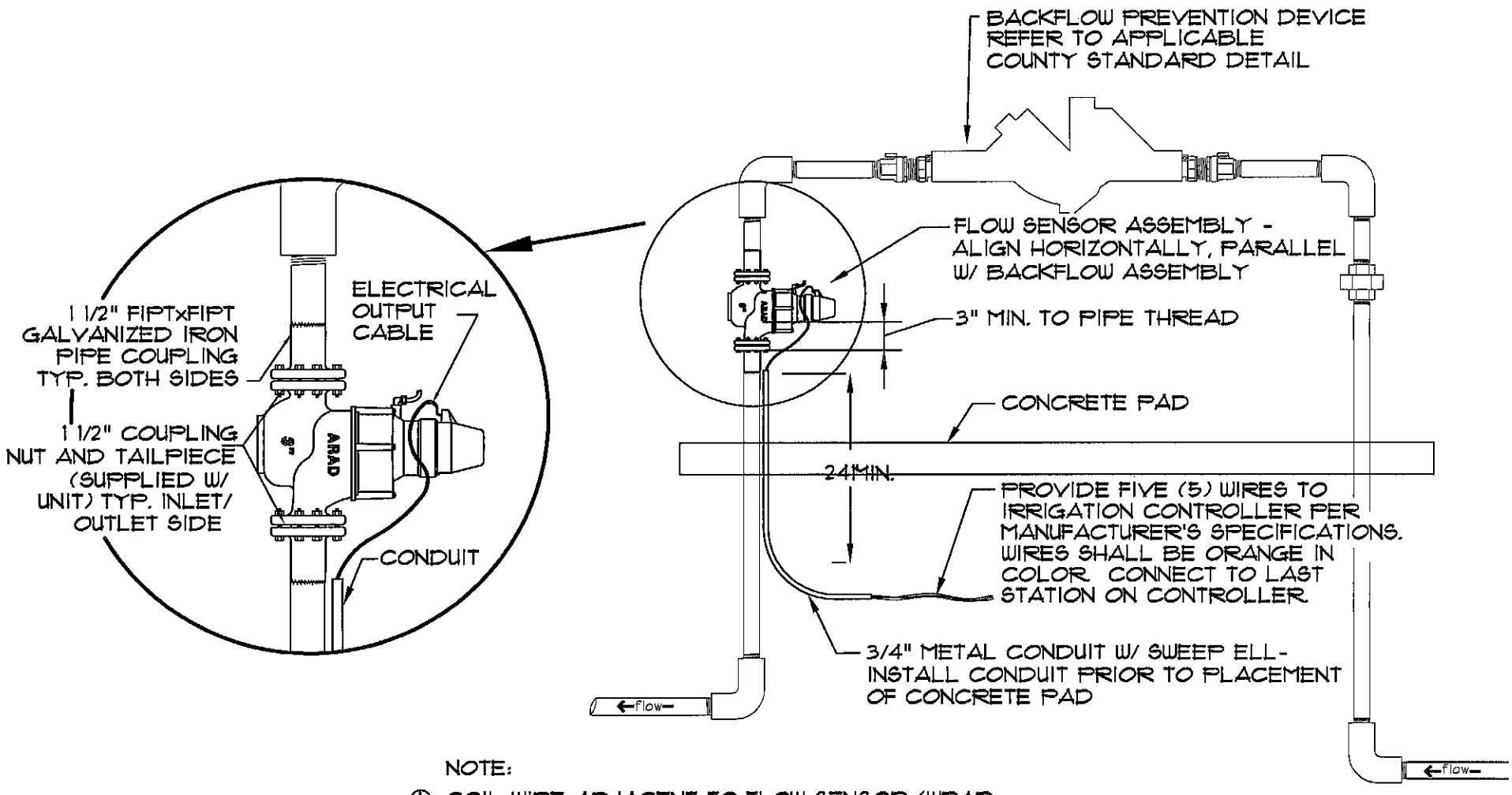
④ FLOW SENSOR SPECIFICATION IN ACCORDANCE WITH IRRIGATION PLAN

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

1-1/2" & 2" SIZE MASTER VALVE/FLOW SENSOR (ABOVE GRADE)

SCALE: NONE DATE: 12/2007	DRAWN BY: SF/HY CHECKED BY: HY	SHEET: **L-6A**



NOTE:

① COIL WIRE ADJACENT TO FLOW SENSOR (WRAP AROUND 1/2" PIPE 16 TIMES) FOR SLACK, TYP.

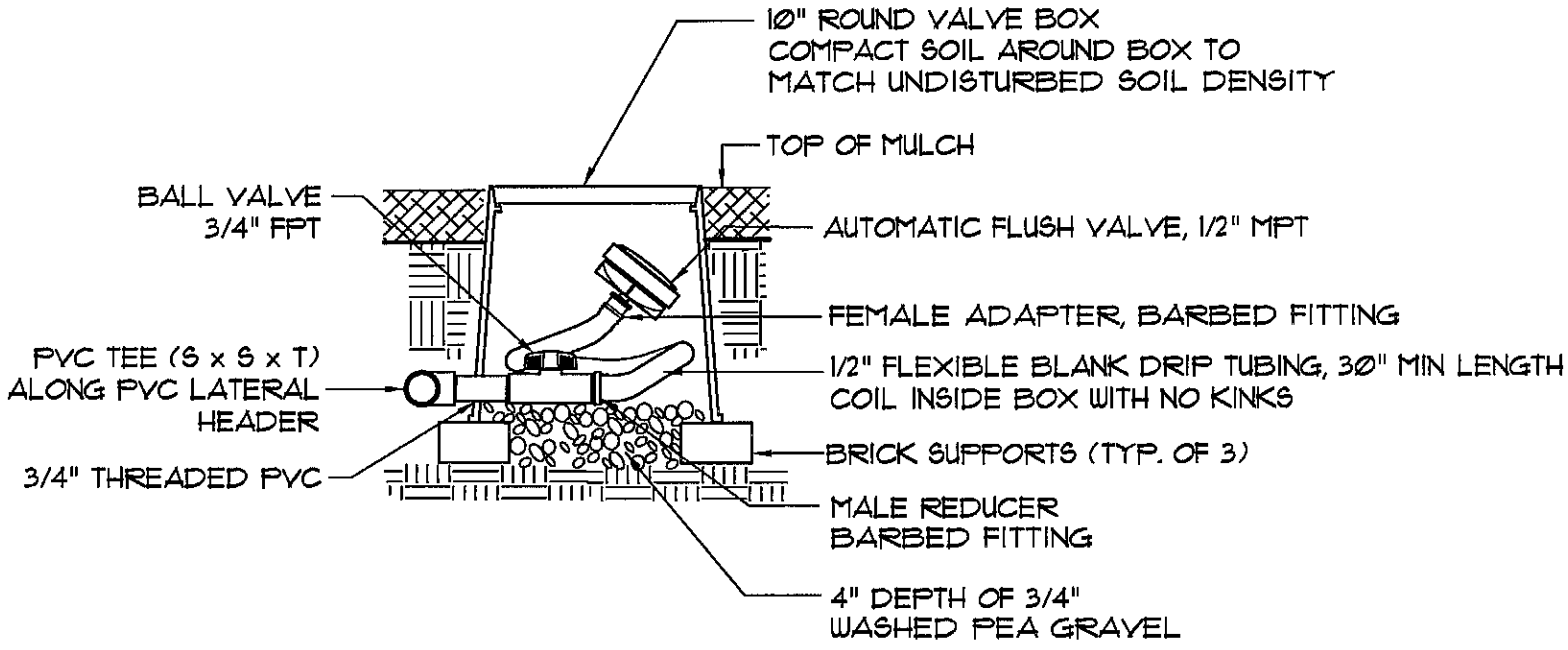
② FLOW SENSOR SPECIFICATION IN ACCORDANCE WITH IRRIGATION PLAN

CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

3" SIZE AND LARGER MASTER VALVE/FLOW SENSOR (ABOVE GRADE)

SCALE: NONE DATE: 12/2007	DRAWN BY: SF/HY CHECKED BY: HY	SHEET: **L-6B**

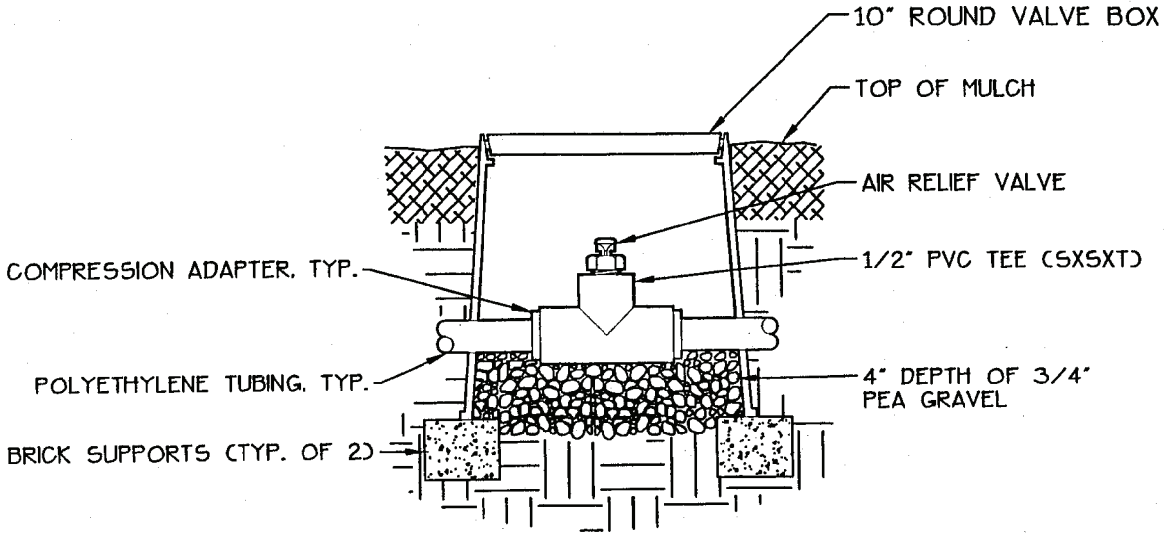


CHIEF, DEPT. OF TRANSPORTATION

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

FLUSH VALVE

SCALE: NONE	DRAWN BY: HY	SHEET:
DATE: 12/2007	CHECKED BY: HY	L-7



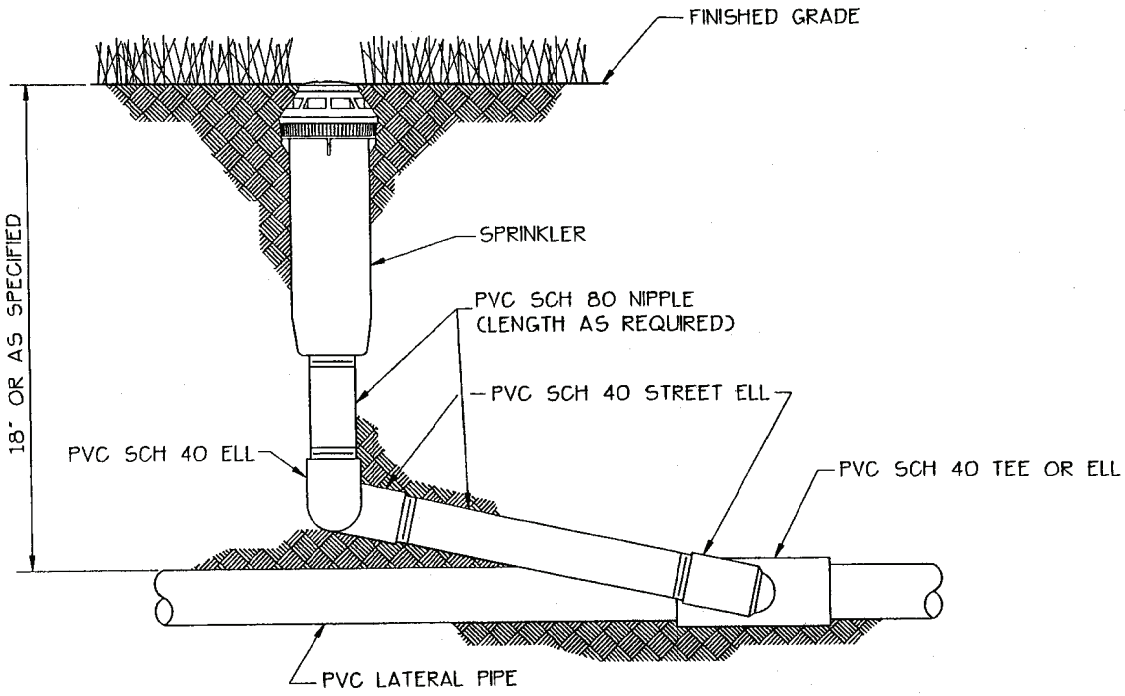
NOTE:
1. AIR RELIEF VALVE SHALL BE INSTALLED AT THE HIGHEST POINT OF THE SYSTEM, ABOVE ALL DRIPLINE LATERALS.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

AIR RELIEF VALVE

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: **L-8**



NOTES:

1. INSTALLATION OF TRIPLE SWING JOINTS SHALL BE AT AN ANGLE NO GREATER THAN 45 DEGREES TO HORIZONTAL.

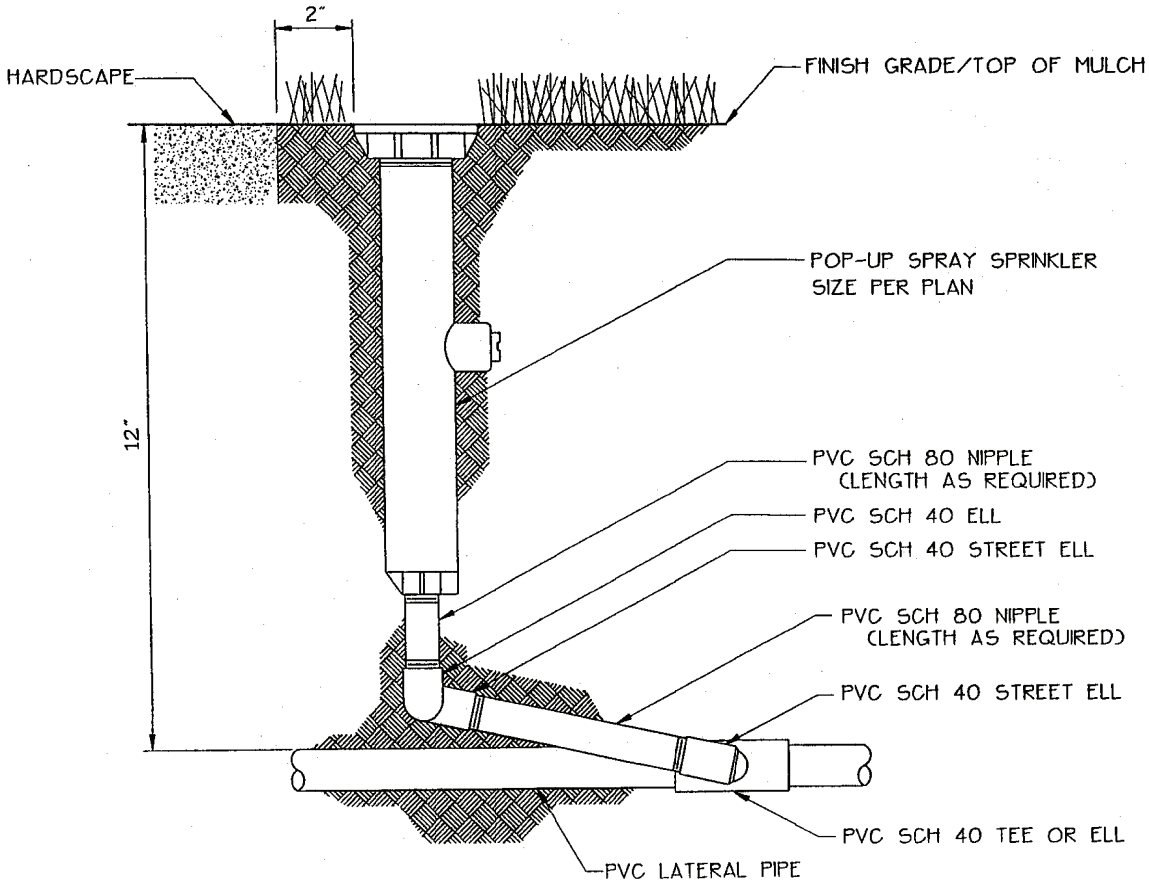
2. ALL PRE-MANUFACTURED TRIPLE SWING JOINTS SHALL BE MANUFACTURED WITH O-RINGS AND SHALL BE RATED [illegible]O PSI.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

POP-UP ROTOR SPRINKLER

SCALE: NONE	DRAWN BY: TRU P.	SHEET:
DATE: 11/2000	CHECKED BY: GMM	L-9



NOTES:

1. INSTALLATION OF TRIPLE SWING JOINTS SHALL BE AT AN ANGLE NO GREATER THAN 45 DEGREES TO HORIZONTAL.

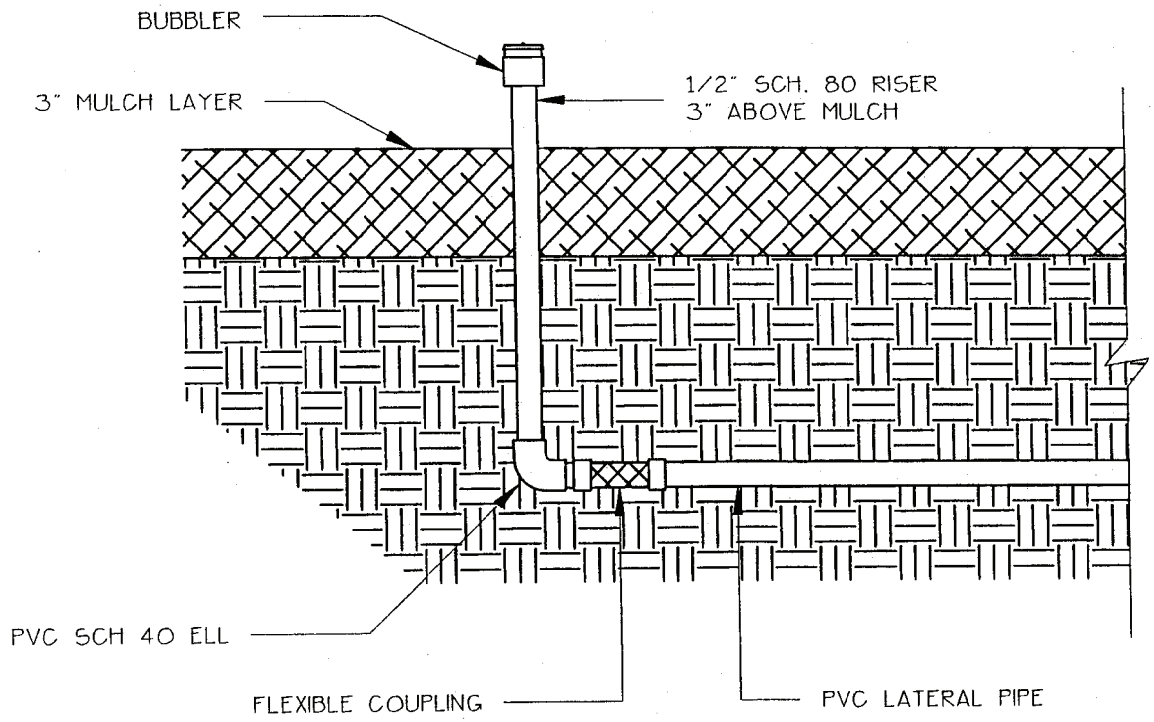
2. ALL PRE-MANUFACTURED TRIPLE SWING JOINTS SHALL BE MANUFACTURED WITH O-RINGS AND SHALL BE RATED AT 200 PSI.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

POP-UP SPRAY SPRINKLER

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: L-10

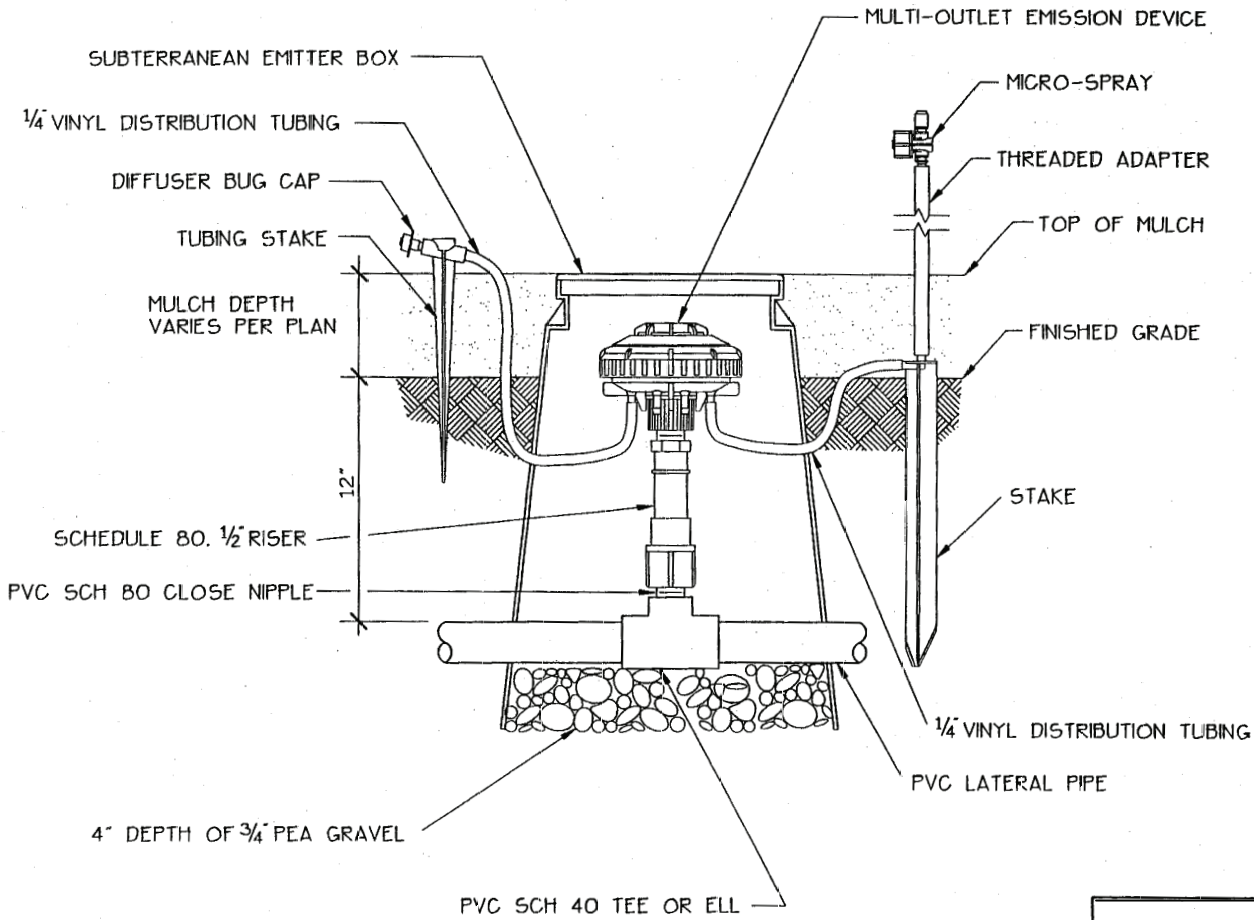


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BUBBLER SPRINKLER HEAD

SCALE: NONE DATE: 11/2000	DRAWN BY: G.A. CHECKED BY: GMM	SHEET: L-11

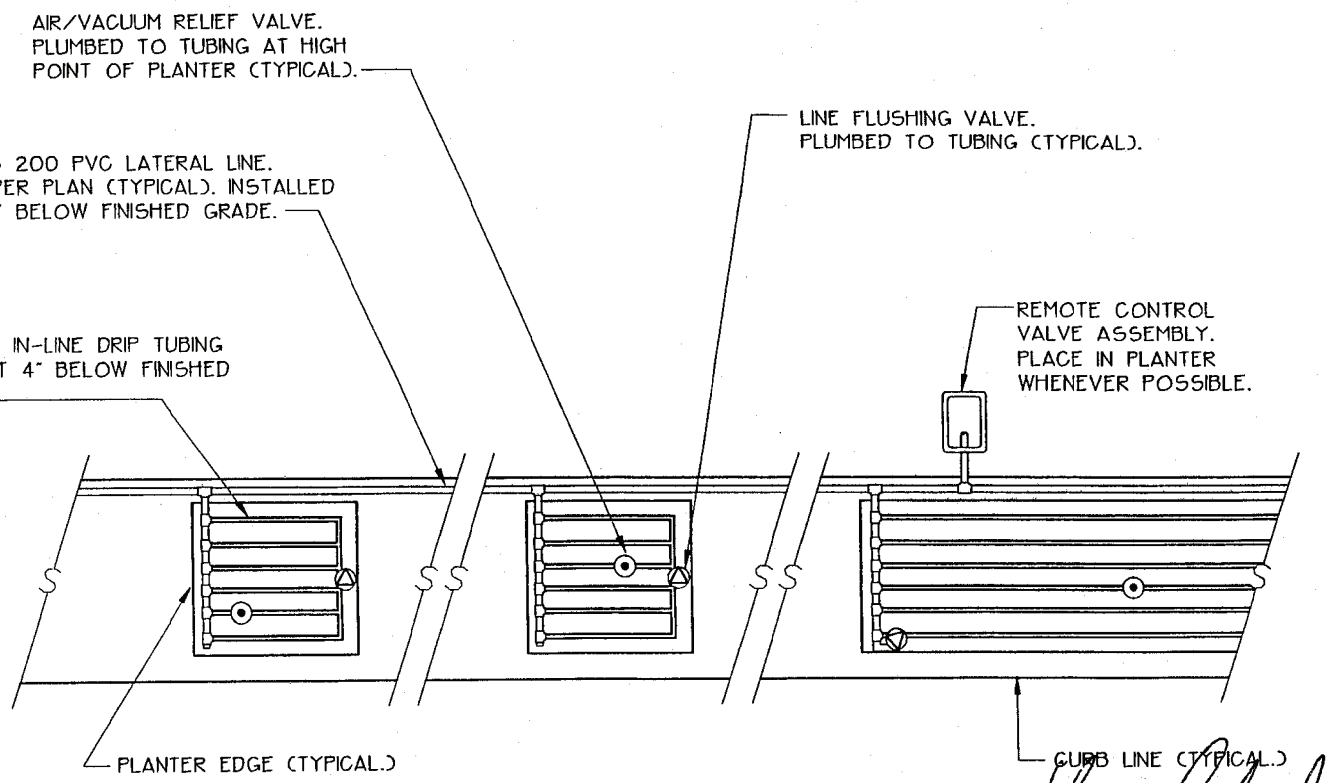


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DRIP IRRIGATION
MULTI-OUTLET EMITTER

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: **L-12**



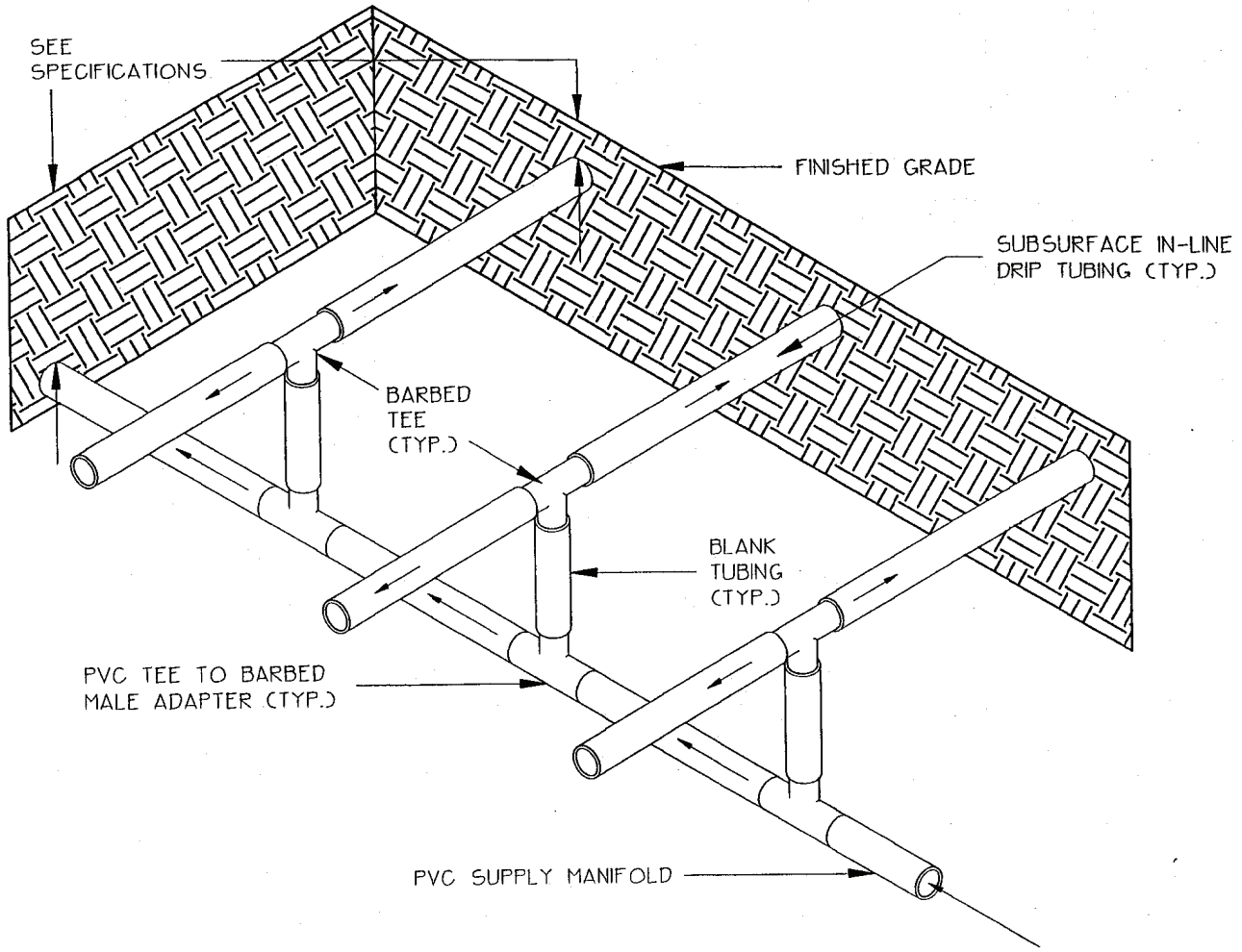
NOTE: ALL DRIP TUBING FITTINGS SHALL BE BARBED.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SUBSURFACE IN-LINE DRIP IRRIGATION LAYOUT

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: **L-13**

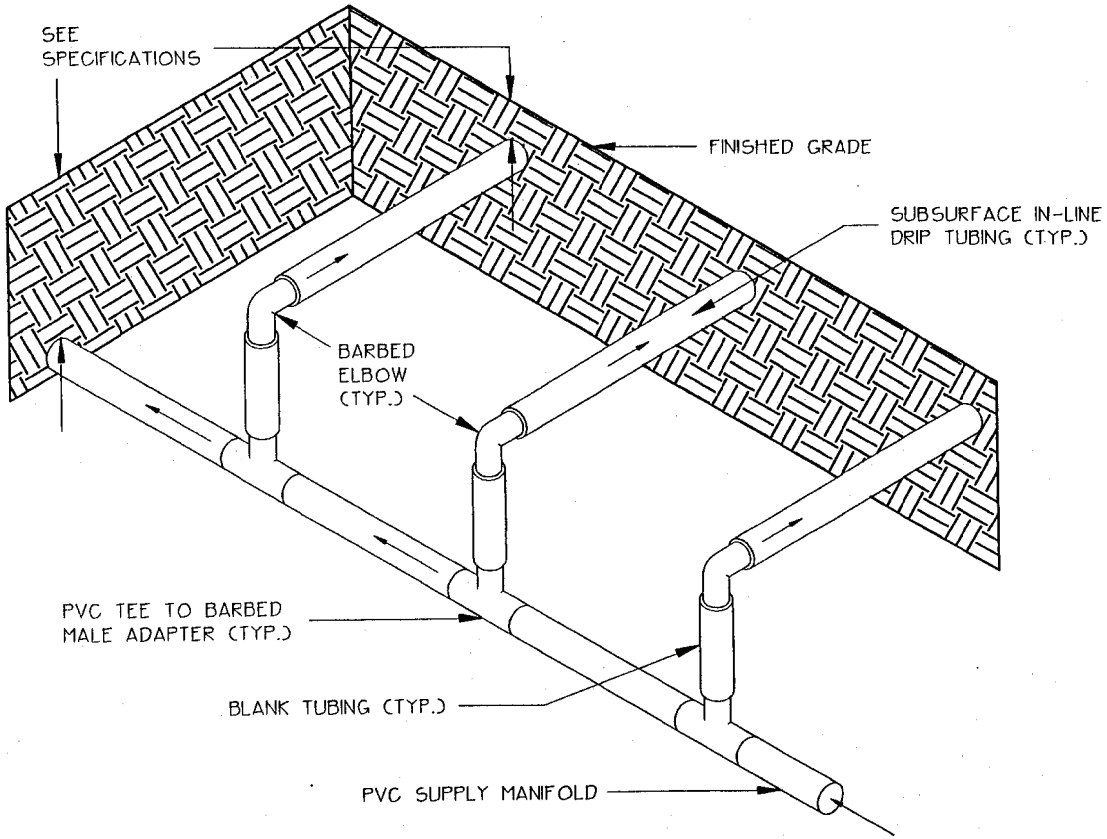


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SUBSURFACE IN-LINE DRIP IRRIGATION CENTER-FEED SUPPLY MANIFOLD

SCALE: NONE DATE: 11/2000	DRAWN BY: G.A. CHECKED BY: GMM	SHEET: L-14

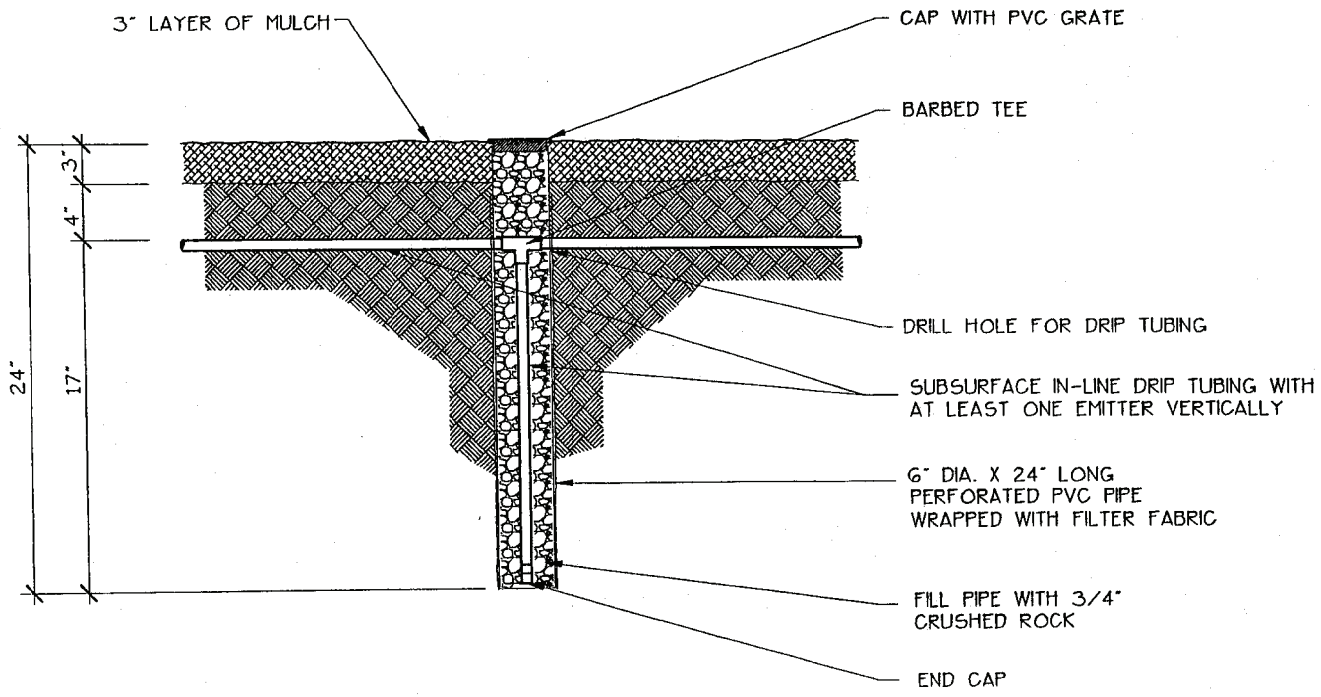


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SUBSURFACE IN-LINE DRIP IRRIGATION END-FEED SUPPLY MANIFOLD

SCALE: NONE DATE: 11/2000	DRAWN BY: GA CHECKED BY: GMM	SHEET: L-15

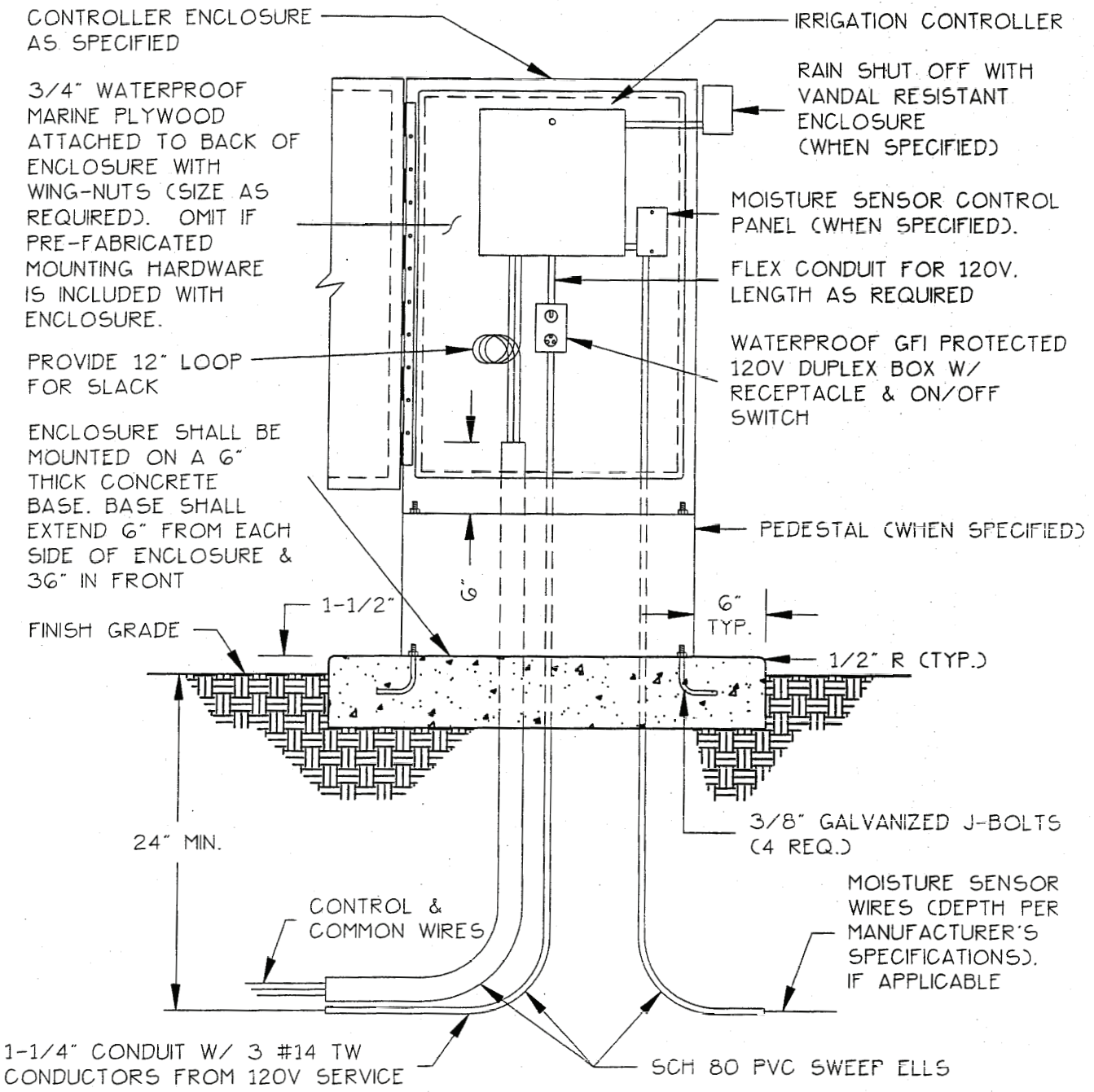


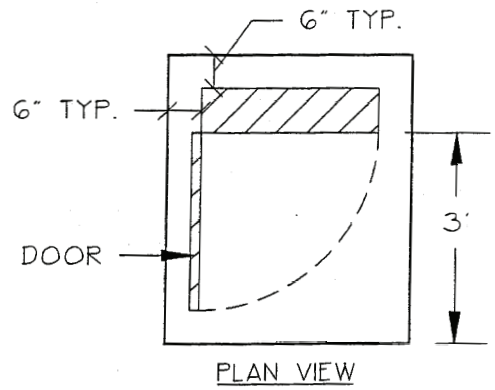
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DEEP WATERING PIPE FOR TREES

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: **L-16**





PLAN VIEW

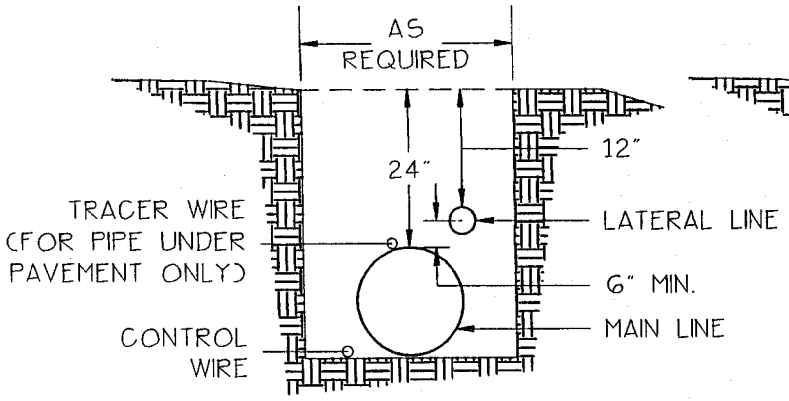
DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

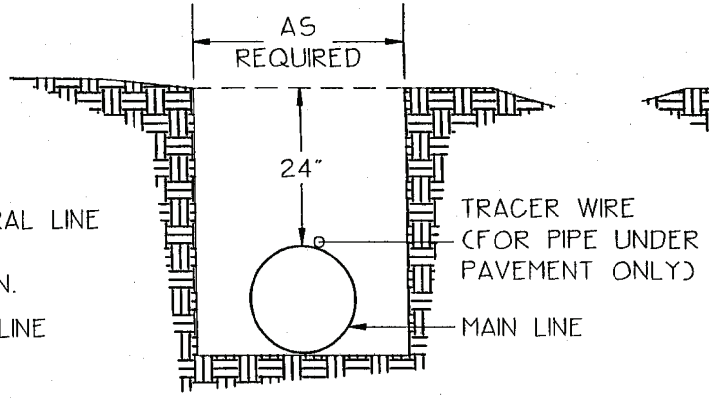
IRRIGATION CONTROLLER ENCLOSURE

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: L-17

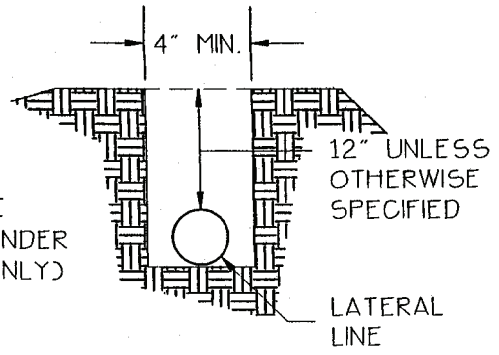
MAIN SUPPLY. LATERAL. CONTROL WIRE & TRACER WIRE

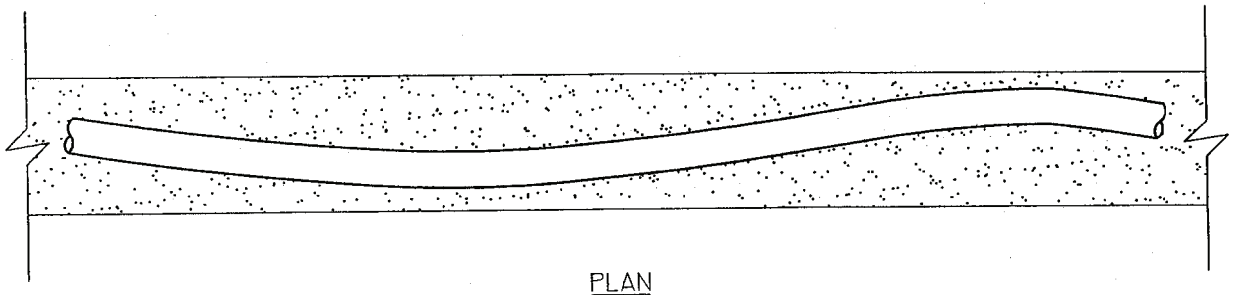


MAIN SUPPLY



PLASTIC LATERAL





PLAN

ALL PLASTIC PIPES TO BE SNAKED IN TRENCHES AS SHOWN.

NOTES:

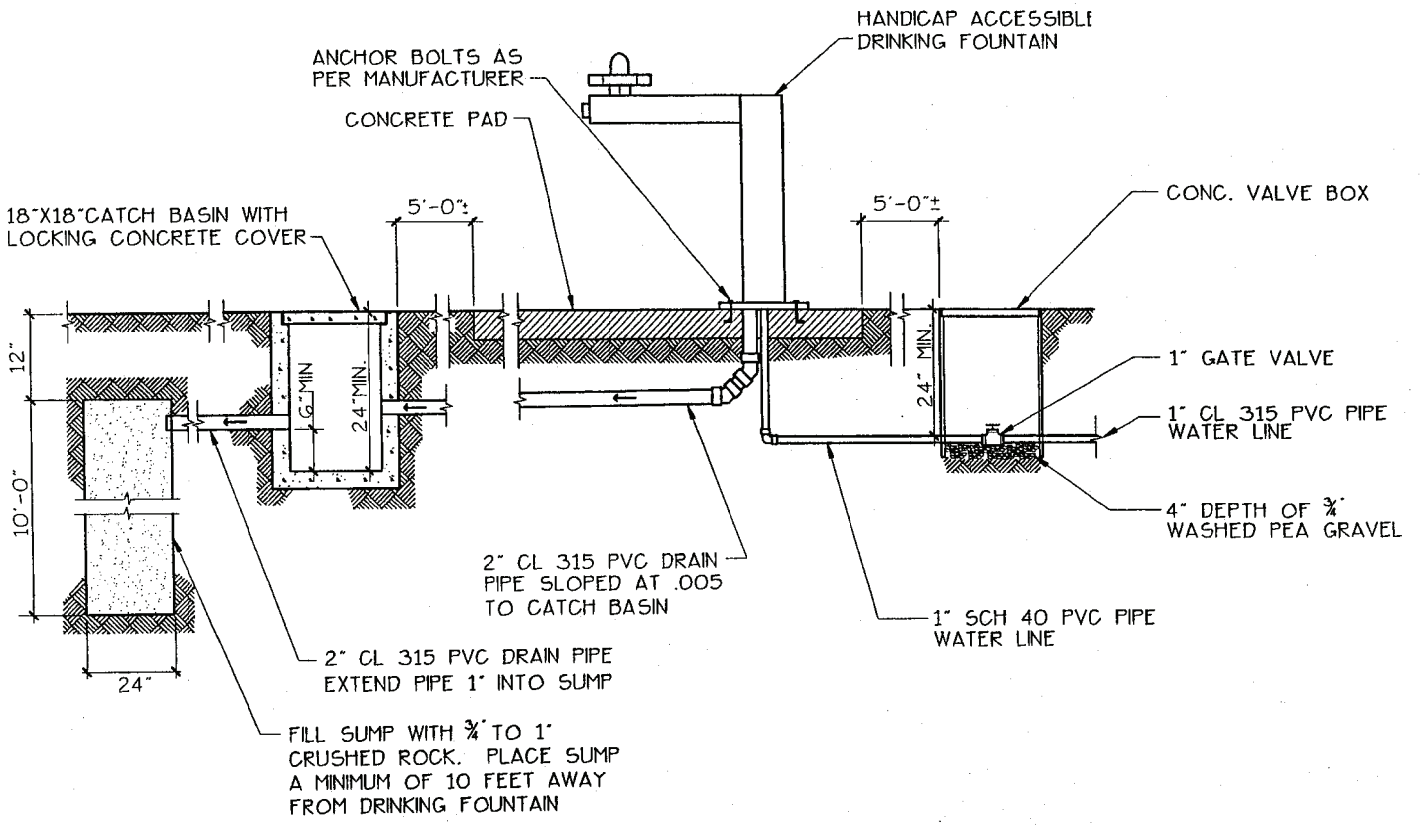
1. ALL TRENCH DEPTHS ARE MEASURED FROM WITHIN TOP OF FINISH GRADE.
2. TRACER WIRE SHALL BE REQUIRED ONLY WHEN PIPES ARE INSTALLED UNDER PAVEMENT.
3. ALL PIPE TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION SPECIFICATIONS.
4. IF SPRINKLER HEAD AND NIPPLE HEIGHT EXCEED 11". LATERAL LINE DEPTH SHALL BE 18".
5. INSTALL PIPE BEDDING UNDER PIPING. WHEN SPECIFIED
6. INSTALL SLEEVING UNDER PAVING PER PLANS.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

IRRIGATION SYSTEM TRENCHING

SCALE: NONE DATE: 11/2000	DRAWN BY: GA CHECKED BY: GMM	SHEET: **L-18**

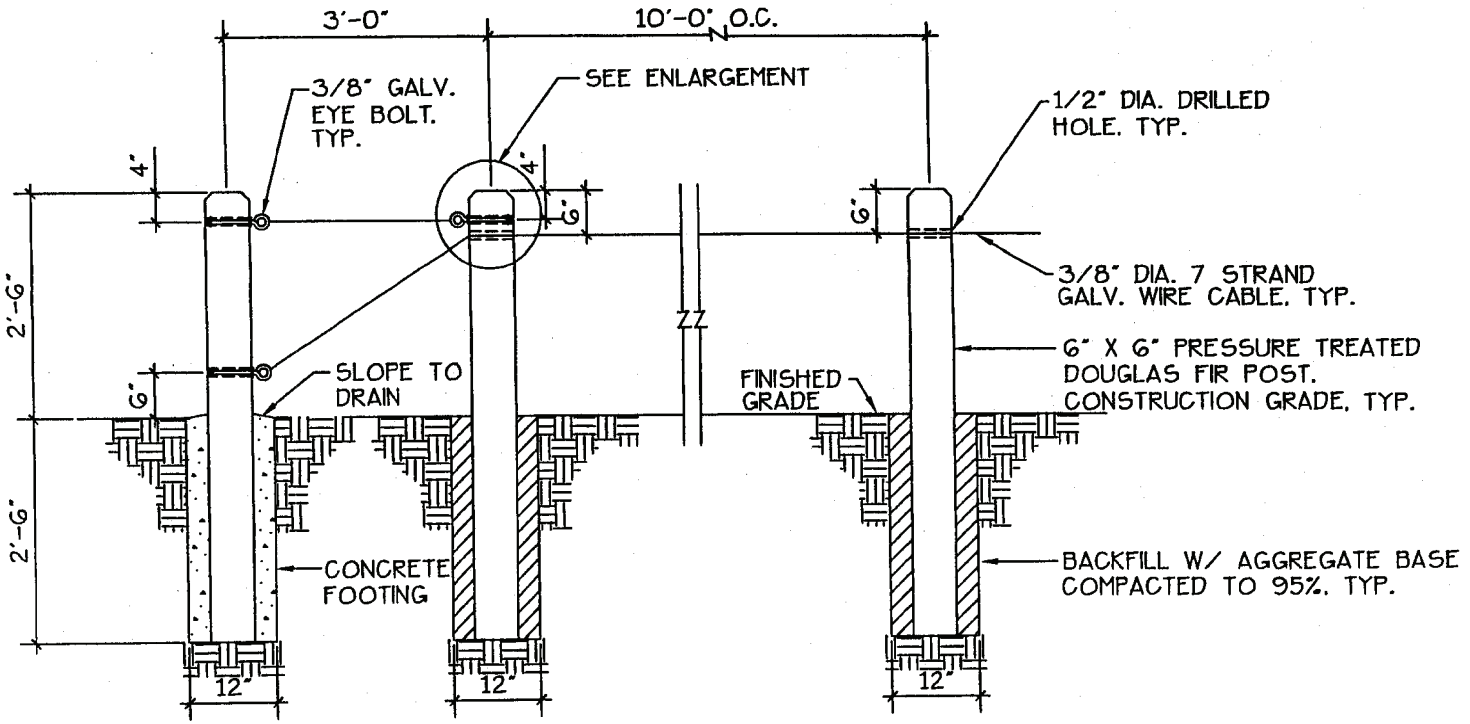


DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DRINKING FOUNTAIN

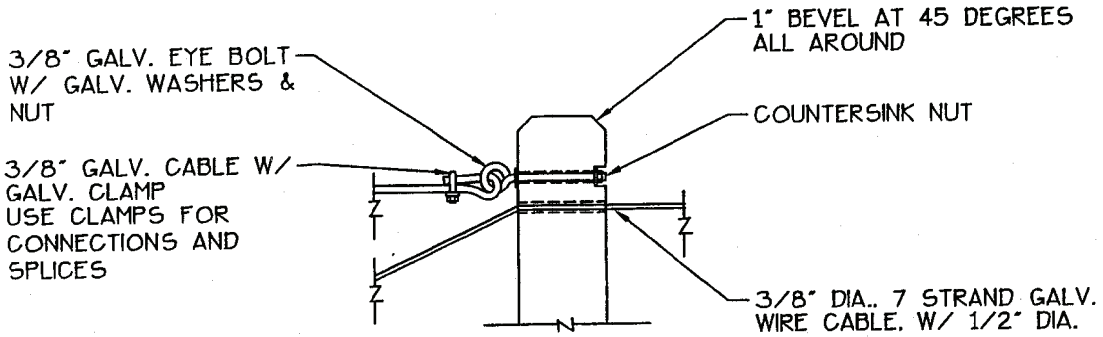
SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: **L-19**



TERMINAL POST

LINE POST

SCALE: 1/2" = 1'-0"



ENLARGEMENT

SCALE: 1" = 1'-0"

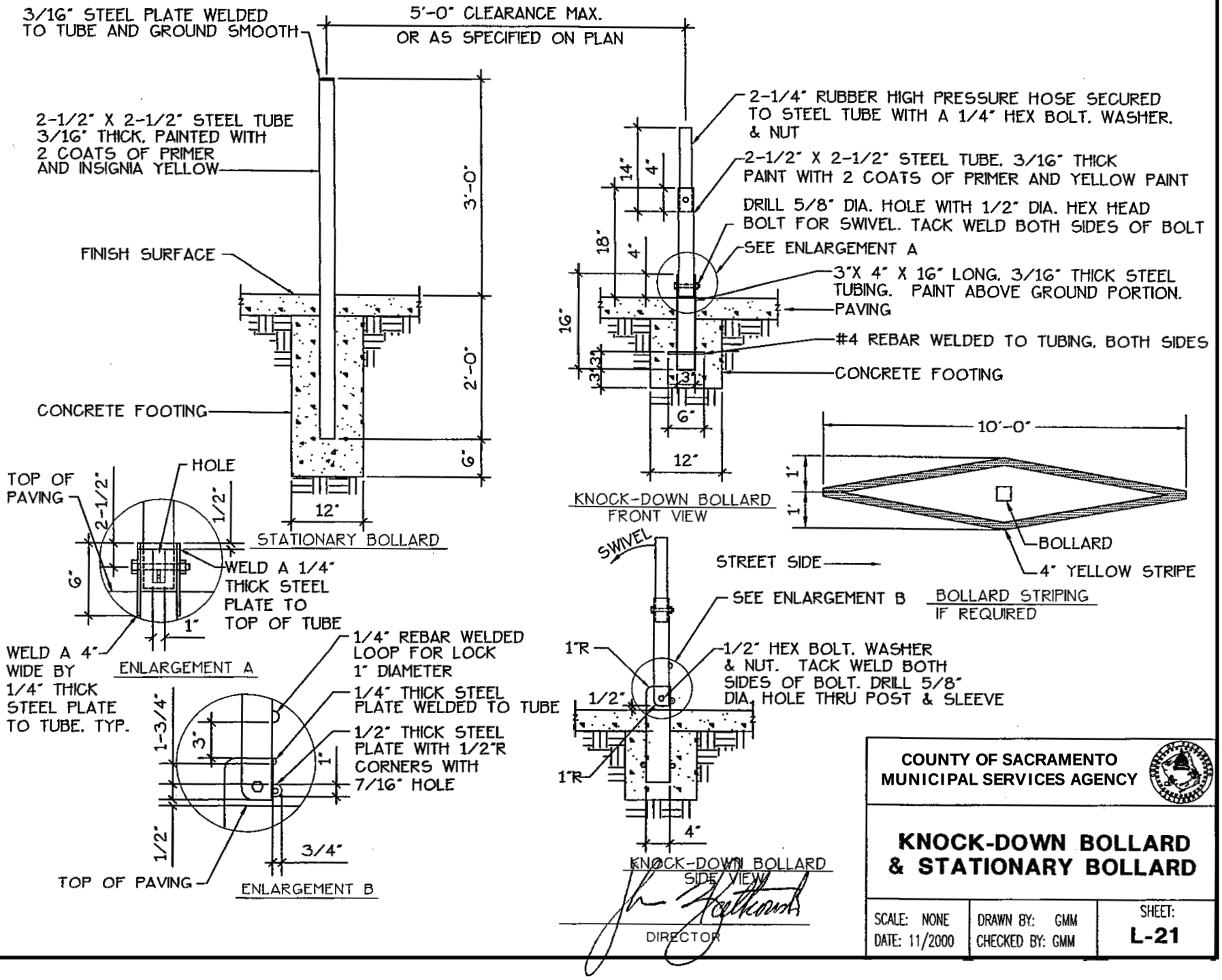
NOTE: CONCRETE FOOTINGS SHALL BE INSTALLED AT ALL TERMINAL POSTS AND AT ALL BENDS.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

POST AND CABLE FENCING

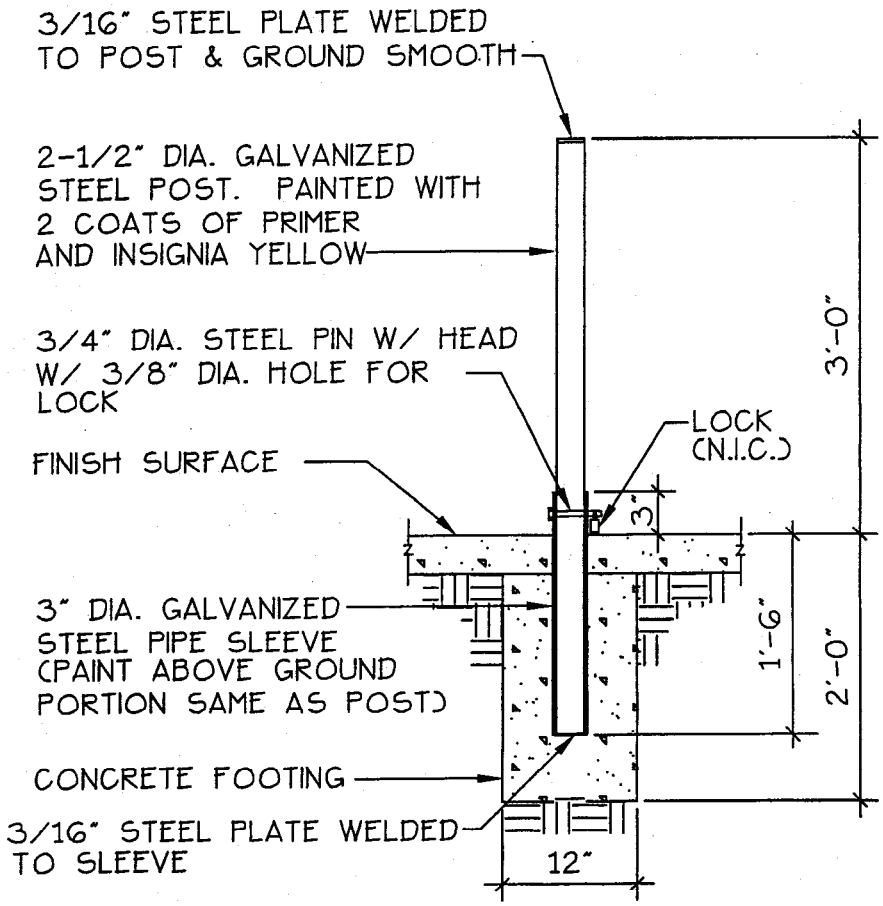
SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: **L-20**



COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

KNOCK-DOWN BOLLARD & STATIONARY BOLLARD

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: **L-21**



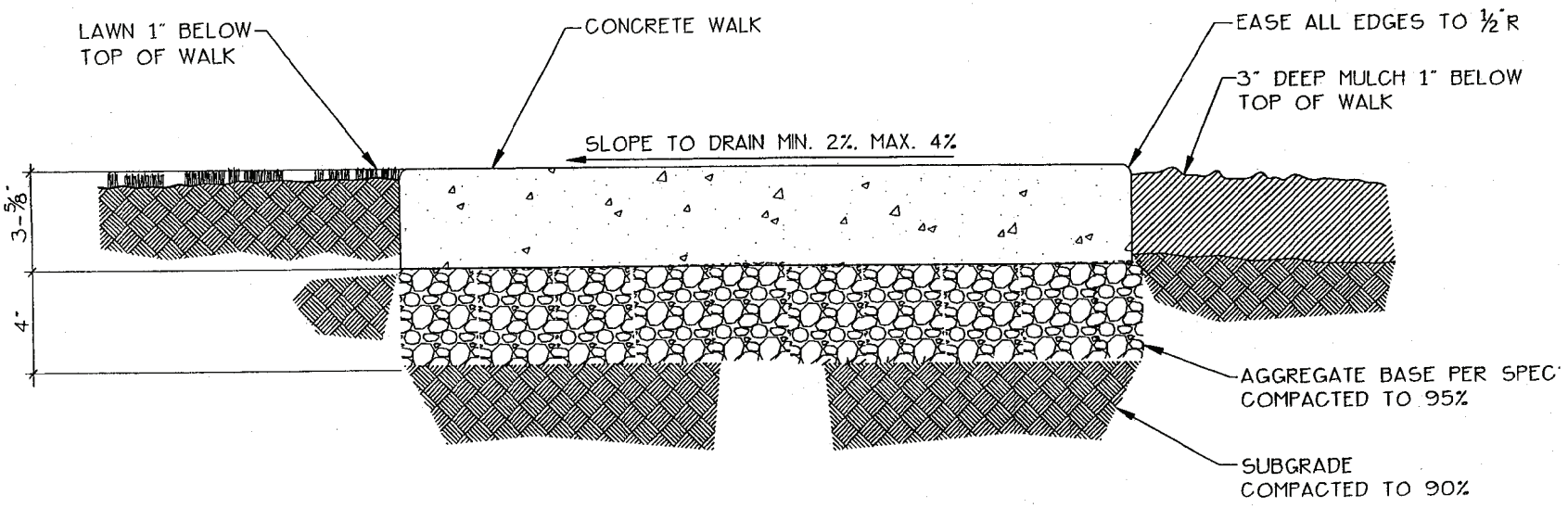
NOTE: DRILL A 13/16" DIA. HOLE THRU BOTH THE POST AND SLEEVE FOR PIN PLACEMENT.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

REMOVABLE BOLLARD

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: **L-22**



NOTES:

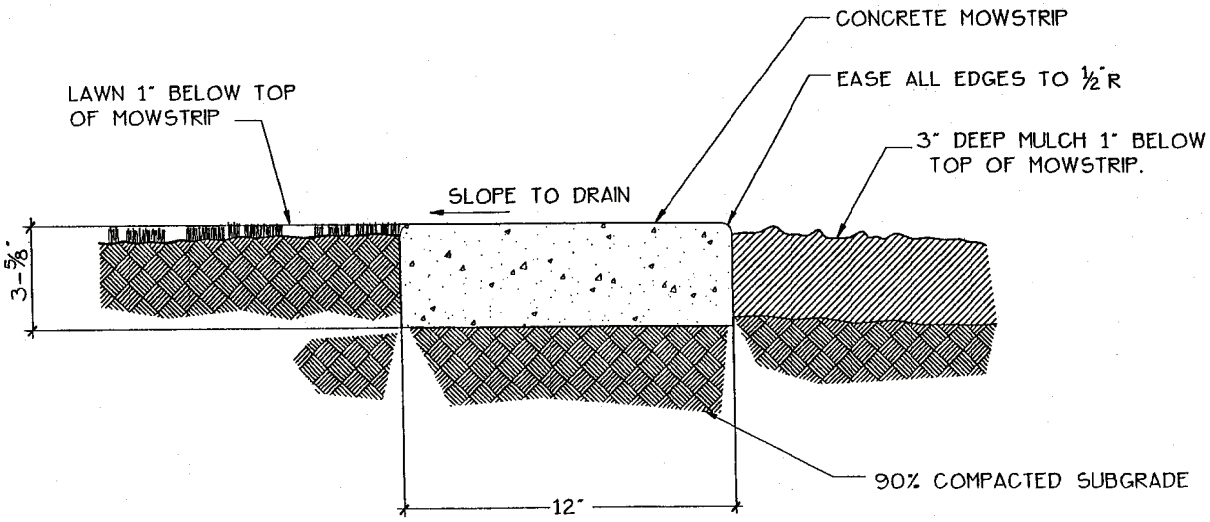
1. PROVIDE 1" DEEP SCORE JOINTS AT 10'-0" ON CENTER.
2. PROVIDE EXPANSION JOINTS AT 20'-0" INTERVALS.
3. CLASS "B" CONCRETE.
4. MEDIUM BROOM FINISH PERPENDICULAR TO WALK EDGE UNLESS OTHERWISE SPECIFIED.
5. PROVIDE FULL DEPTH FELT EXPANSION JOINTS WHEN ABUTTING WALKS, WALLS AND BUILDINGS.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

CONCRETE WALK

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: L-23



NOTES:

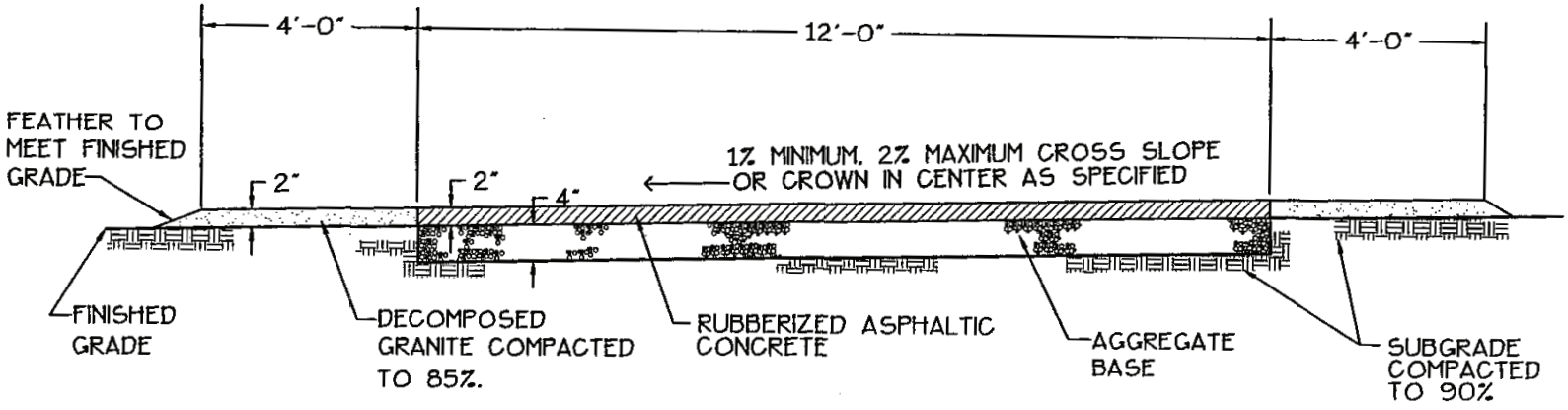
1. PROVIDE 1" DEEP SCORE JOINTS AT 10'-0" ON CENTER.
2. PROVIDE EXPANSION JOINTS AT 20'-0" INTERVALS AND AT CHANGES OF DIRECTION ALONG CURVILINEAR FORMS.
3. USE CLASS "B" CONCRETE. TYP.
4. MEDIUM BROOM FINISH UNLESS OTHERWISE SPECIFIED.
5. PROVIDE FULL DEPTH FELT EXPANSION JOINTS WHEN ABUTTING WALKS. WALLS AND BUILDINGS.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

CONCRETE MOWSTRIP

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: **L-24**



NOTES:

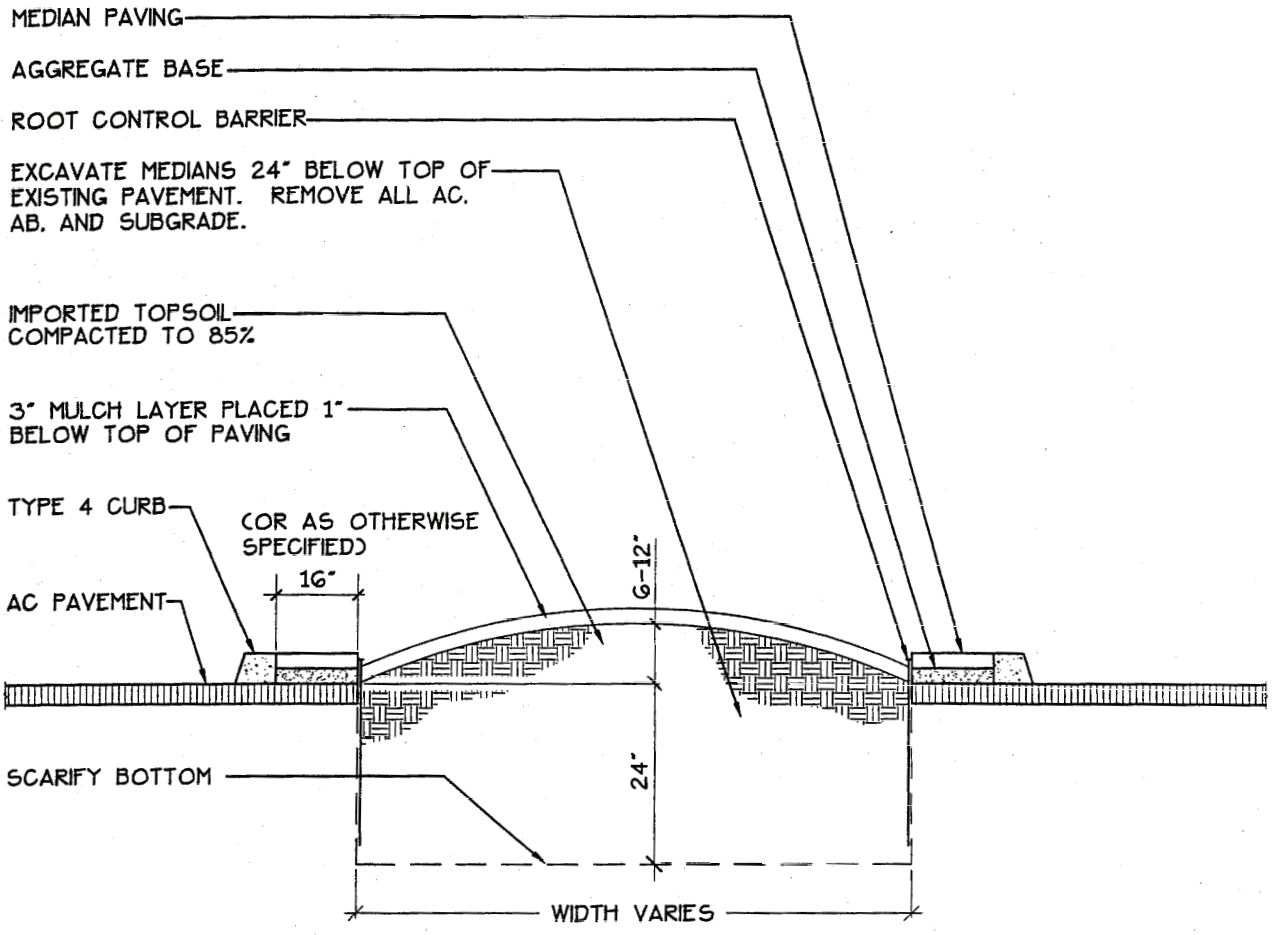
1. APPLY PRE-EMERGENT HERBICIDE UNDER DECOMPOSED GRANITE PRIOR TO INSTALLING IT.
2. APPLY PRE-EMERGENT HERBICIDE TO AGGREGATE BASE PRIOR TO PAVING ASPHALT.
3. APPLY A 4" WIDE SOLID YELLOW CENTERLINE STRIPE CONTINUOUSLY DOWN THE CENTER OF THE BIKETRAIL.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

BIKETRAIL PAVING SECTION

SCALE: NONE DATE: 11/2000	DRAWN BY: GMM CHECKED BY: GMM	SHEET: L-25



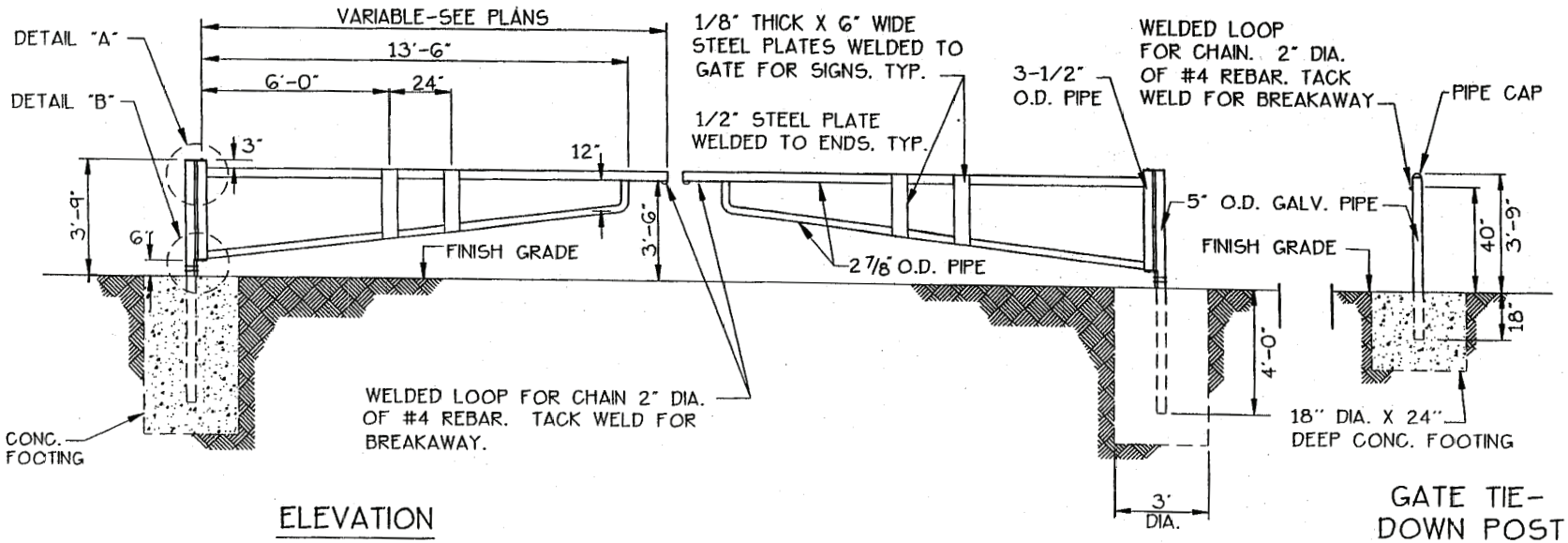
NOTE: CONTOUR OF MEDIAN WILL VARY DEPENDING UPON MEDIAN WIDTH. DO NOT EXCEED BID QUANTITY OF IMPORTED TOPSOIL TO ACHIEVE 12" HEIGHT.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

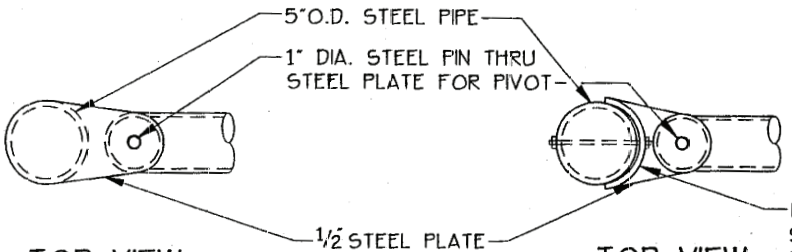
ROADWAY MEDIAN SECTION

SCALE: NONE DATE: 11/2000	DRAWN BY: SLN CHECKED BY: GMM	SHEET: **L-26**



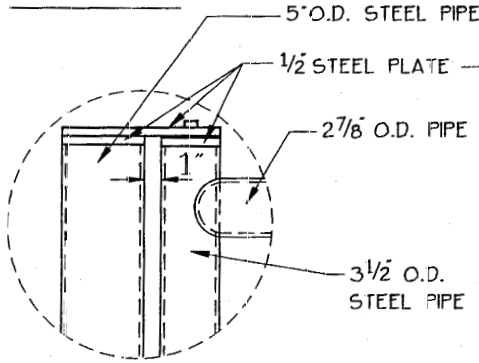
ELEVATION

GATE TIE-DOWN POST

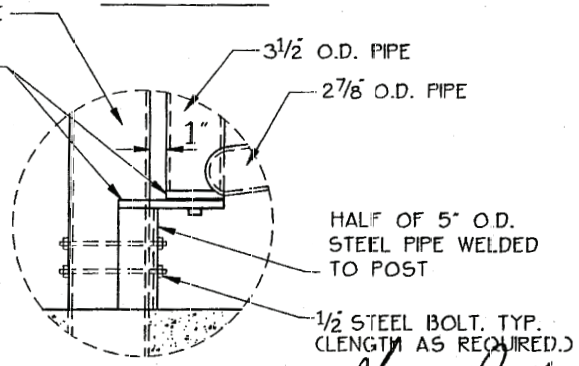


TOP VIEW

TOP VIEW



DETAIL "A"



DETAIL "B"

NOTES:

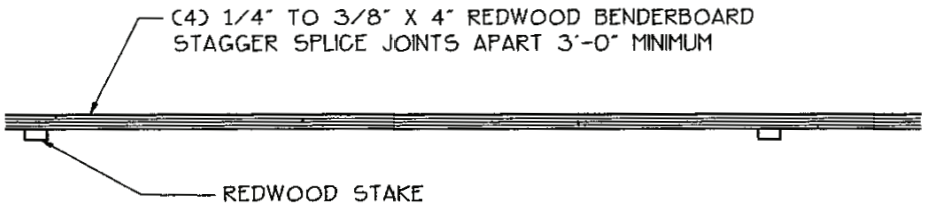
1. ALL PIPES SHALL BE BLACK STEEL PIPES. OUTSIDE DIA. (O.D.) AND WELDED.
2. ALL STEEL TO BE PAINTED WITH 2 COATS OF PRIMER AND INSIGNIA YELLOW.
3. PROVIDE 2-5" O.D. PIPE AND INSTALL WITH CONC. FOOTING (18"X24" D.) FOR TIE-DOWN WHEN GATE IS OPENED AND CLOSED.

DIRECTOR

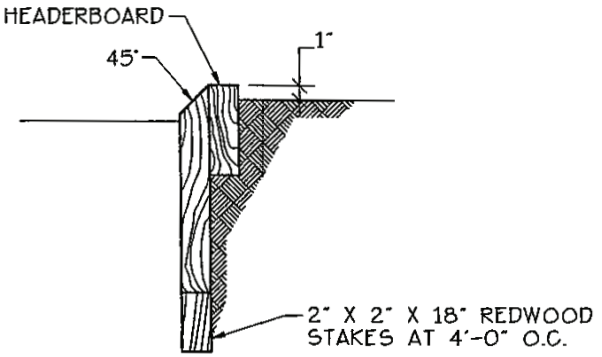
COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

DOUBLE PIPE GATE

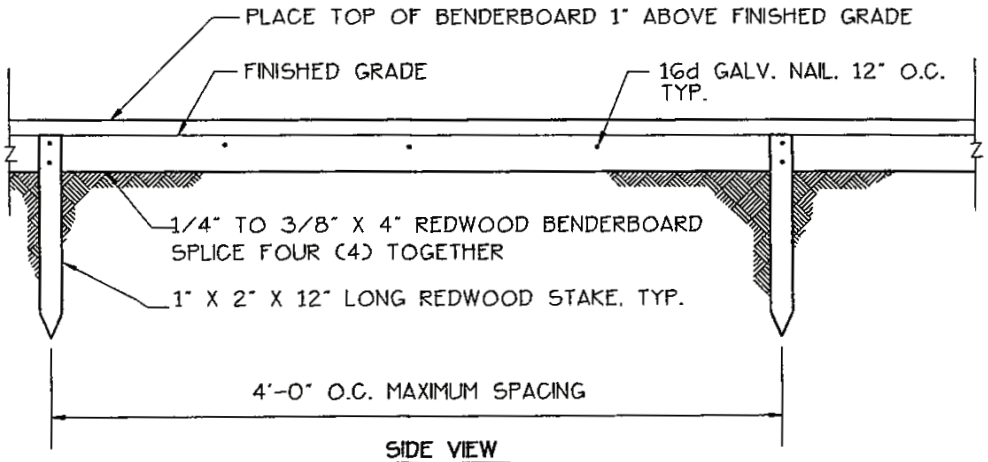
SCALE: NONE	DRAWN BY: TRU P.	SHEET:
DATE: 11/2000	CHECKED BY: MIKE M.	L-28



PLAN VIEW

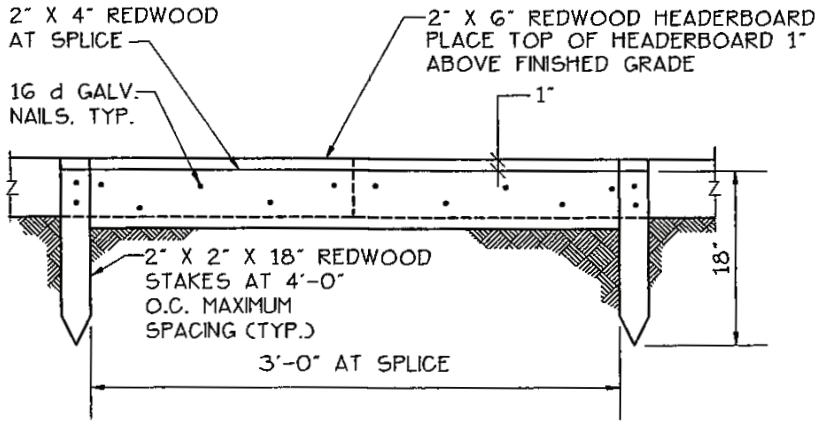


SECTION



SIDE VIEW

1/4" TO 3/8" X 4" BENDERBOARD



SPLICE DETAIL

2" X 6" HEADERBOARD

NOTES:

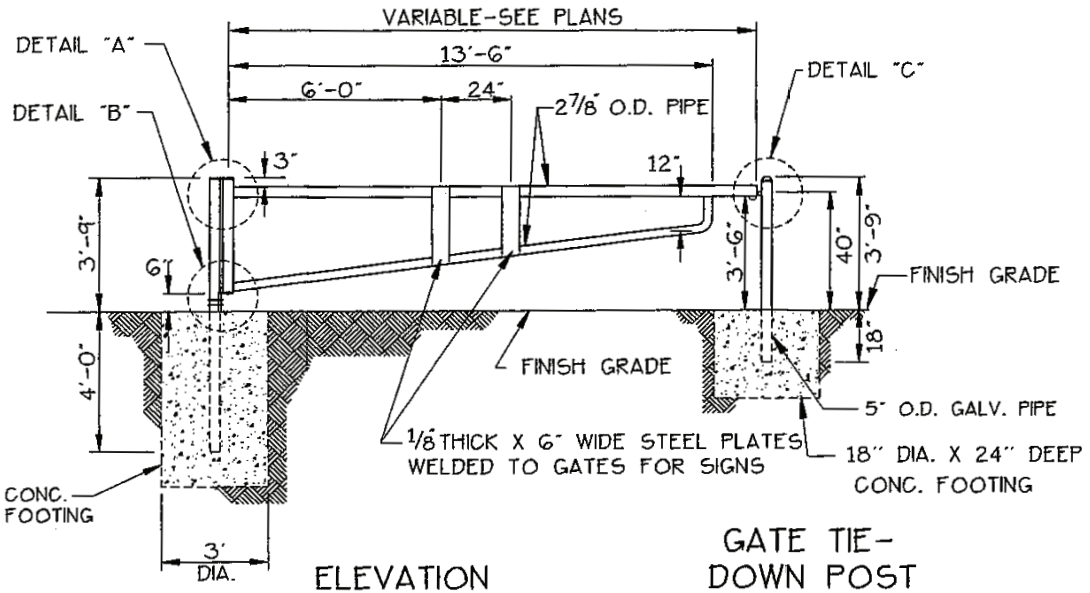
1. INSTALL ALL STAKES AND SPLICES ON PLANTING SIDE OF HEADERBOARD.
2. ALL NAILS SHALL BE GALVANIZED.
3. ALL REDWOOD SHALL BE ROUGH CONSTRUCTION COMMON GRADE IN ACCORDANCE TO CALIFORNIA REDWOOD ASSOCIATION GRADING RULES.
4. DRIVE STAKES TO RESISTANCE AND CUT TOP AT 45 DEGREE ANGLE.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

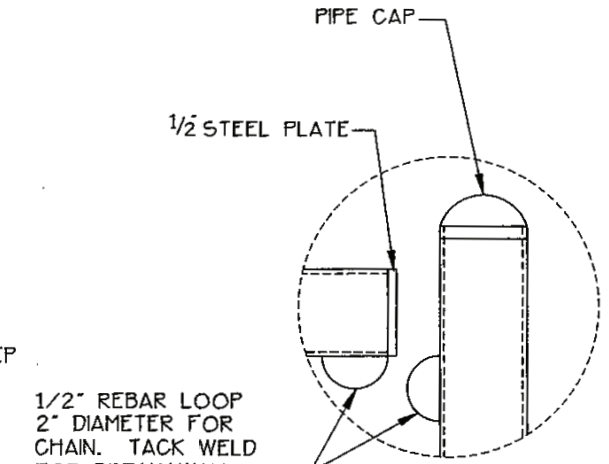
REDWOOD HEADERBOARD

SCALE: NONE DATE: 11/2000	DRAWN BY: TRU P. CHECKED BY: GMM	SHEET: L-27

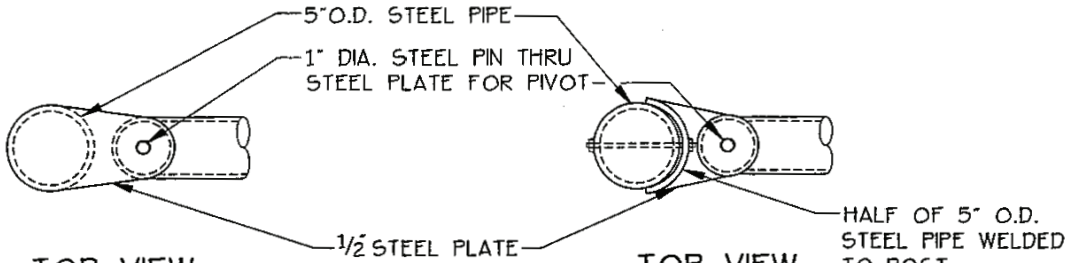


ELEVATION

GATE TIE-DOWN POST

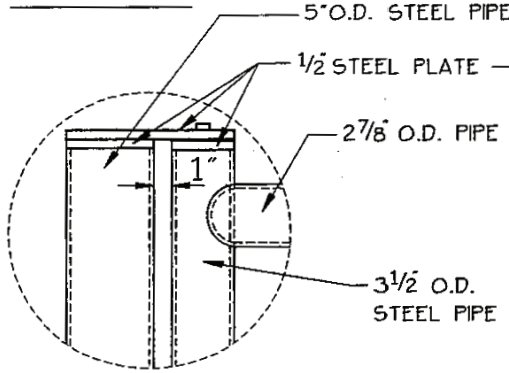


DETAIL "C"

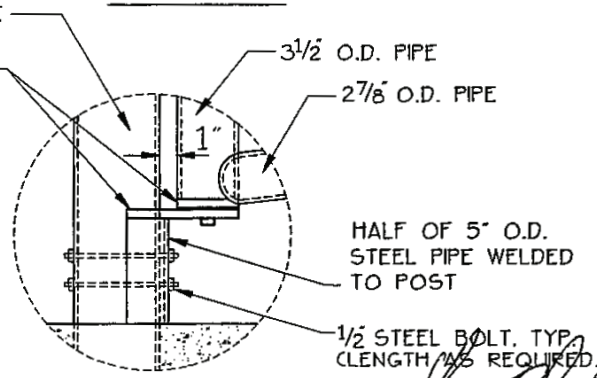


TOP VIEW

TOP VIEW



DETAIL "A"



DETAIL "B"

NOTES:

1. ALL PIPES SHALL BE BLACK STEEL PIPES. OUTSIDE DIA. (O.D.) AND WELDED.
2. ALL STEEL TO BE PAINTED WITH 2 COATS OF PRIMER AND INSIGNIA YELLOW.
3. PROVIDE 2-5" O.D. PIPE AND INSTALL WITH CONC. FOOTING (18"X24" D.) FOR TIE-DOWN WHEN GATE IS OPENED AND CLOSED.

DIRECTOR

COUNTY OF SACRAMENTO
MUNICIPAL SERVICES AGENCY

SINGLE PIPE GATE

SCALE: NONE	DRAWN BY: TRU P.	SHEET:
DATE: 11/2000	CHECKED BY: GMM	L-29