

COUNTY OF SAN JOAQUIN



Working for YOU

IMPROVEMENT STANDARDS

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TO SAN JOAQUIN
COUNTY ORDINANCE
NO. 3622**

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**CHAPTER 1
GENERAL DESIGN STANDARDS**

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CHAPTER 1 GENERAL DESIGN STANDARDS

1-1.0 PURPOSE AND DEFINITIONS

1-1.01 Purpose

The purpose of these improvement standards is to establish minimum design standards and standard plans for the construction of subdivisions, commercial and other types of development projects. This is necessary to provide for coordinated development of facilities to be used by and for the protection of the public. There is no intent to restrict a licensed Civil Engineer's prerogative to use generally accepted good engineering practices and common sense.

1-1.02 Definitions

Attention is directed to Section 1 of the State Standard Specifications and to the following additional and qualifying definitions:

Applicant: Any person, corporation, government agency, entity, or association requesting approval for design and construction of public infrastructure; often a subdivider or developer.

Board of Supervisors: Board of Supervisors of San Joaquin County, State of California.

Consulting Engineer: Any person or persons, firm, partnership or corporation legally authorized to practice Engineering in the State of California who prepares or submits improvement plans and specifications to the Department of Public Works of San Joaquin County for approval. This term is used interchangeably with Design Engineer/Civil Engineer.

Contractor: Any person or persons, firm, partnership, corporation or combination thereof who have entered into a contract with any person, corporation, company, special district, or the County of San Joaquin as party or parties of the second part, or his or their legal representatives, for the construction of any improvement or portion of any improvement within the County of San Joaquin.

County: The County of San Joaquin, a political subdivision of the State of California.

Department: San Joaquin County Department of Public Works.

Department of Public Works: The Department of Public Works of San Joaquin County.

Design Engineer/Civil Engineer: The Professional Engineer (registered by the State of California) employed by the Applicant to design, prepare plans, and conduct related engineering activities. See Consulting Engineer.

Developer/Subdivider: A person, firm, corporation, partnership, association, or agent thereof who causes land to be divided into a subdivision or causes existing property to be developed for himself or for others.

Director: The Director of Public Works of San Joaquin County acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

Engineer: Is identical to the definition of Consulting Engineer as herein defined.

Inspector: The authorized representative of the Director assigned to a job site.

Laboratory: Any testing agency or testing firm which has been approved by the Department of Public Works.

Road Commissioner: The Director of Public Works of San Joaquin County acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties delegated to them.

State: As used in the State Standard Specifications, shall mean San Joaquin County.

State Standard Specifications: Standard Specifications of the State of California, Department of Transportation, latest edition and any revisions of or additions thereto.

1-1.03 **Abbreviations**

AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Bearings Manufacturers Association
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AISC	American Institute of Steel Construction

AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWPA	American Wood Protection Association
AWWA	American Water Works Association
BOD	Biological Oxygen Demand
CA MUTCD	California Manual on Uniform Traffic Control Devices for Streets and Highways
CBC	California Building Code
CEC	California Electric Code
CSI	Construction Specifications Institute
HEC	Hydrologic Engineering Center (USACE)
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
ITE	Institute of Transportation Engineers
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Administration
RWQCB	Regional Water Quality Control Board
SWPA	Submersible Wastewater Pump Association
SWQCCP	Storm Water Quality Control Criteria Plan
UPC	Uniform Plumbing Code
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
U.S.C. & G.S.	United States Coast and Geodetic Survey
VPD	Vehicles per Day
WWPA	Western Wood Products Association

1-1.04 Publications

All publications, including but not limited to, various standards, codes, manuals, etc., referred to in these Improvement Standards shall be in accordance with the latest edition of the publication.

1-1.05 Variances

The Department of Public Works may consider deviations from these Standards. Any deviation may be approved by the Director at his sole discretion. Requests for deviations must be submitted by a Consulting Engineer in writing, together with supporting justification and technical documentation. The Design Engineer is advised to get approval from the

Director prior to proceeding with any design based on deviations from these Standards.

1-1.06 Appeal

Decisions of the Director may be appealed to the Board of Supervisors. Appeals shall be in writing and be accompanied by supporting technical data and other supporting evidence.

1-1.07 Effective Date of Standards

These Standards are effective upon adoption by Resolution of the Board of Supervisors and shall supersede all former Design Standards.

1-1.08 Revisions

These Standards may be revised, amended, or added to, and such revisions, amendments, and additions shall be binding and of full force and effect upon approval by the Director.

1-2.0 **GENERAL REQUIREMENTS**

1-2.01 Engineering and Construction Policy

- A. The engineering policy of the County requires strict compliance with the Professional Engineers Act of the California Business and Professions Code. All plans, specifications, reports, and documents required by the County shall be signed and stamped with the seal of a Registered Civil Engineer, currently licensed to practice in the State of California. This signature and seal will indicate the engineer's responsibility.
- B. All facilities covered by those standards shall be constructed by:
 - 1. Contractors holding a current valid license issued by the Contractors State License Board, Department of Professional and Vocational Standards, State of California.
 - 2. The Contractor must be licensed in one of the following classifications:
 - a) General Engineering Class A.
 - b) Specialty license covering specialty work being performed.
- C. If the Design Engineer responsible for the plans disagrees with any changes required by the Director as a result of the Department's review of

the plans, such disagreement shall be brought to the attention of the Director for resolution prior to the start of construction of the project set forth in the plans. The signature and seal of the Design Engineer on the corrected plans will signify the plans have been reviewed, approved, and authorized for construction.

1-2.02 Approved Plans

Complete plans and specifications for all proposed streets, structures, bikeways, grading, drainage facilities, sewerage, street lighting, traffic signals, traffic striping and signage, water distribution systems, industrial developments, commercial developments, and subdivisions, including any necessary dedications, easements, and rights of entry, shall be submitted to the Department of Public Works for approval. This approval must be substantiated by the signature of the Director or his authorized representatives prior to the beginning of construction of any such improvements. The Director or his representative may order any Contractor to cease work on any project if said Contractor does not have properly approved plans in his possession.

1-2.03 Reference to County Specifications and Standards

The General Notes and Special Provisions of all plans shall include the following note:

All construction and materials shall be in accordance with the latest edition of the San Joaquin County Improvement Standards

1-2.04 Work in County Rights-of-Way, Easements and Waterways

Possession of a complete set of County-approved engineered plans and an Encroachment Permit shall allow a Contractor to perform work specified on the plans in County rights-of-way, easements and waterways. The Contractor shall be bonded as required and as specified in Section 10-3001 of the Ordinance Code of San Joaquin County.

In lieu of the above required plans, minor work within County rights-of-way, easements and waterways may be performed in accordance with the following:

- A. Minor work within street rights-of-way shall be performed with an Encroachment Permit. Minor work generally consists of such items as widening or constructing sidewalks adjacent to existing roadside curb and gutter, constructing driveways, installing driveway culverts for utility related work, and work which requires cutting of the road surface as determined

by the Public Works Department.

The Encroachment Permit shall be issued in accordance with Division 3 of Title 10 of the Ordinance Code of San Joaquin County.

- B. Work within street rights-of-way and easements consisting of street light installations or street light maintenance and minor work described above may be performed with an encroachment plan. Encroachment plans shall be in accordance with all of the requirements of these standards except that paragraph 1-2.01 above, "Engineering and Construction Policy", will be waived for the preparation of the encroachment plans.
- C. Minor work within the flood plain of all rivers, sloughs, creeks, waterways, swales, and drainage easements may be performed with a San Joaquin County Flood Control District permit. Other State and Federal permits may also be required in addition to the Flood Control District permit.

Minor work generally consists of such items as connecting yard drains into existing maintenance holes, grading within the flood plain of rivers, sloughs, creeks and swales, removing trees within creeks, and other minor items of work involving waterways.

1-2.05 Improvement Plan Submittal

The initial submittal of improvement plans to the Department of Public Works shall consist of the following:

- A. Four complete sets of the following:
 - 1. Plans and specifications, prepared in accordance with these Improvement Standards and the Standard Specifications.
 - 2. Design calculations for storm sewers including watershed map and hydraulic calculations, pumping plants, structures, street lights, sanitary sewers, sewage treatment plant, and water distribution and supply system, and roadway structural sections based on "R" values and traffic indices.
 - 3. Soils Report including "R" value tests of subgrade soils and structural section design based on County approved Traffic Index.
 - 4. Where the improvement plans are for a portion of a larger development, a tentative map or study plan and facility plan for the ultimate development, showing all proposed improvements, shall be submitted along with the plans.

- B. An itemized cost estimate for all projects with an improvement cost greater than \$4,000. The estimate shall be on the Design Engineer's letterhead and be signed, dated and stamped.
- C. The plan check fee in accordance with paragraph 1-2.07 below.
- D. The name, address, e-mail address/company web page, and telephone number of the developer and Design Engineer.
- E. Utility letters in accordance with paragraph 1-2.15 below.
- F. Where existing pavement is being joined and widened, the plan submittal shall include cross sections of the existing pavement from crown line to ten (10) feet outside the right-of-way at 50' maximum intervals, and showing the proposed widening. Design elevations of proposed edge of pavement or lip of gutter and/or top of curb shall be shown along with existing elevations. The cross slope of the existing pavement to remain and proposed new pavement shall be calculated and shown for each section.

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

1-2.06 Improvement Plan Resubmittal

Plans being resubmitted shall consist of two complete sets of revised plans and any other submittal or supporting information required by the Director, plus the plan set previously marked for correction. Additional sets may be required by the Director.

1-2.07 Plan Check/Field Inspection Fee

When improvement plans are initially submitted to the Department of Public Works for checking, the total plan check fee based on the preliminary engineer's estimate for the development will be required as a deposit to initiate checking of the plans. The fee schedule shall be set forth in Section 9-240.2 of the County Development Title.

1-2.08 Plan Approval

Plans will not be considered approved nor construction authorized until the

Director has signed the original drawings. The plan approval is valid for twelve months after the date of approval. Should construction not begin within the twelve month period, the approval shall expire and the plans and engineer's estimate shall be resubmitted for review. The plan check fee for revival of plans shall be twenty-five percent (25%) of plan check fee as determined in Section 1-2.07.

1-2.09 Final Plans

The Consulting Engineer shall deliver five (5) complete sets of prints from the approved original drawings to the Director.

The original drawings shall become the property of the County and retained in the Department of Public Works after signed by the Director.

1-2.10 Plan Revisions During Construction

Should changes become necessary during construction, the Consulting Engineer shall first obtain the approval of the Director for any plan revisions. Revisions to the plans shall be made in the following manner:

1. The Consulting Engineer shall indicate the revisions on a print and submit it for review by the Director. Upon agreement of the revisions, the County will release the necessary original drawings to the Consulting Engineer for revision.
2. The original design shall not be deleted in the plans but shall be lined out.
3. In the event that eradicating the original design is necessary to maintain clarity of the plans, approval must first be obtained from the Director.
4. The changes shall be clearly shown on the plans with the changes and approval noted on the revision signature block. The Consulting Engineer and the Director shall both confirm responsibility and approval.
5. The changes shall be identified by the revision number in a triangle delineated on the plans adjacent to the change and on the revision signature block.

Minor changes which do not affect the basic design or contract may be made upon the written authorization of the Director, but said changes must be shown on "Record Drawings" before the work will be accepted as complete.

The Director may order changes in the plans in order to complete the

necessary facilities. Changes in the plans ordered by the Director shall conform to all of the above.

1-2.11 Record Drawings

The Consulting Engineer shall keep an accurate record of all approved deviations from the plans and shall provide a copy of these records to the Director upon completion of the work. These are to be utilized with the inspector's plans for preparing a complete and accurate set of "Record Drawings" for the permanent records of the County. Preparation of the "Record Drawings" is the responsibility of the Developer and his Consulting Engineer. "Record drawings" shall be submitted to the Director prior to acceptance of work as complete.

Approved deviations shall be recorded in red ink on the original approved plans, not reproducible copies. The original plans shall not be removed from the Department of Public Works for preparation of Record Drawings. A work area will be available for making additions or corrections, as will the Record Drawing stamp and pen with red ink, if required.

1-2.12 Conflicts, Errors and Omissions

Excepted from approval are any features of the plans that are contrary to, in conflict with, or do not conform to any California State Law, San Joaquin County Ordinance Code or Resolution, conditions of approval, in keeping with the standards of the profession, even though such errors, omissions or conflicts may have been overlooked in the Department of Public Works' review of the plans.

1-2.13 Change in Consulting Engineer

If the Developer elects to have a registered civil engineer or licensed land surveyor other than the design engineer who prepared the plans provide the construction staking, he shall provide the Director in writing the name of the individual or firm one week prior to the staking of the project for construction. The Developer shall then be responsible for providing all professional engineering services which may be required during construction, the preparation of revised plans for construction changes, and the preparation of "Record Drawings" upon completion of construction.

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

1-2.14 Tunnel Safety Requirements

Any boring or jacking operation of 100 foot or greater length and involving an opening greater than 30 inches in diameter is subject to the State of California Division of Industrial Safety's tunnel safety requirements. The Consulting Engineer shall submit to the Division of Industrial Safety plans and specifications applicable to the tunnel operation, with a letter requesting tunnel classification. This procedure is also recommended to avoid project delay if there is the possibility of any personnel entering the tunnel, regardless of diameter and length. The letter should identify the County Department of Public Works as the inspecting agency along with the Department's mailing address. The plans shall identify underground utilities and tanks or areas for storing fuel and toxic gases in the vicinity of the tunnel site. The request for classification should be submitted allowing ample time for the Division of Industrial Safety review in order that any special requirements can be included in the project plans and specifications. The Consulting Civil Engineer shall also attend any required pre-construction meeting.

1-2.15 Existing Utilities

All existing utilities are to be shown on the plans. In addition, the Consulting Engineer shall submit preliminary plans and final approved plans to the utility companies involved. This is necessary for the utilities to properly plan their relocation projects and needed additional facilities. Copies of the transmittal letters to the utility companies shall be provided to the Director with the first submittal for plan check. The transmittal letters shall indicate all known utility conflicts which require relocation. The conflict shall be referenced to stationing and distance from centerline. In addition, the following note shall appear on the first page of the plans: "Final Pavement work shall not occur within the road right-of-way prior to completion of utility relocation without specific approval of the Director."

1-2.16 Partial Plans

Where the improvement plans submitted cover only a portion of ultimate development, the plans shall be accompanied by the approved tentative map or a study plan if there is no approved tentative map, showing topographic features of the ultimate development at an adequate scale to clearly show the proposed improvements.

1-2.17 Other Agency Notifications

The Consulting Engineer is responsible for obtaining the approval and necessary permits of governmental or municipal agencies when their facilities or jurisdictions are involved. An approval signature block shall be on the cover sheet of the improvement plans and shall be signed by all affected

agencies prior to County approval. The plans shall clearly indicate the facilities for which the other governmental or municipal agencies are approving.

1-2.18 Inspection Requirements

- A. Any improvements for which the County will assume maintenance responsibility shall be inspected during construction by the Director. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases.
- B. The County shall be given advance notice (3 working days) of initial construction start-up and 48-hour notice of specialty inspection requirements needed during the project.
- C. Any improvements constructed without inspection as provided above or constructed contrary to the order or instructions of the Director will be deemed as not complying with Standard Specifications and will not be accepted by San Joaquin County for maintenance purposes.
- D. The Consulting Engineer shall provide the Director with a copy of all cut sheets.
- E. Within ten (10) working days after receiving the request for final inspection, the Director shall inspect the work. The Developer will be notified in writing as to any particular defects or deficiencies to be remedied. The Contractor shall proceed to correct any such defects or deficiencies at the earliest possible date. At such time as the work has been completed, a second inspection shall be made by the Director to determine if the previously mentioned defects have been repaired, altered, and completed in accordance with the plans. At such time as the County approves and accepts the work, the Developer will be notified in writing as to the date of final approval and acceptance.
- F. On assessment district projects and projects where San Joaquin County participates in the costs thereof, quantities will be measured and determined in the presence of the Director, Consulting Engineer, and Contractor, and witnessed accordingly.
- G. The County will ensure that the provisions of the approved plans and specifications are complied with, especially with regard to the quality of workmanship and materials. In the event of any discrepancy or matter of judgment, the decision of the Director will be binding on the Contractor, Design Engineer, and Developer.

- H. All work shall be performed in accordance with accepted workmanship practice, the approved plans, and these Improvement Standards. Any work not accepted by the County shall be redone until compliance is achieved. Directions given by the County relating to quality of materials and workmanship shall be complied with promptly by the Contractor.
- I. All materials used shall be subject to the inspection and approval of the Department at all times, and shall not be used before being inspected and approved by the Director. The Department has the right to require any testing deemed necessary to ensure compliance of the materials with the plans and specifications. Failure or neglect on the part of the Department to condemn or reject work or materials not in accordance with the plans and specifications shall not be construed to imply their acceptance, should their inferiority become evident up to one year after acceptance by the County. Materials rejected by the County shall be promptly removed from the job site.

1-2.19 Special Notices and Permits

- A. The Consulting Engineer shall notify the Contractor to give the following notices and have in his possession the following permits and plans:
 - 1. Contractor shall be in receipt of County approved plans prior to construction.
 - 2. Contractor shall notify all utility companies, and governmental or municipal agencies affected by the development prior to beginning of work.
 - 3. Contractor shall notify "**Underground Service Alert**" (800-227-2660 or 811) 48-hours in advance before any digging.
 - 4. Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify San Joaquin County Surveyor of any damaged or removed County, State or Federal monuments.
 - 5. Contractor shall notify Sanitation District upon application for permit and payment of required fees for sewer taps.
 - 6. The Contractor shall verify all street names with Community Development Department before ordering street signs.
 - 7. Except where specifically authorized by valid permits from Fish and Game, Corp of Engineers, RWQCB, State or local Reclamation District, and County Flood Control District, the Contractor shall conduct his

- operation entirely outside of any floodplain boundaries. Floodplain boundaries shall be clearly delineated in the field prior to construction.
8. Contractor shall conduct his operation entirely outside of any "no grading" area. These areas shall be clearly delineated in the field prior to construction.
 9. Where work is being done in an offsite easement, the Contractor shall notify the property owner 48-hours prior to commencing work.

1-2.20 Faithful Performance Security

The County may require security for performance on projects without a subdivision agreement as follows:

Faithful Performance Security: Applicants shall provide the County with an acceptable irrevocable letter of credit, or other suitable financial guarantee acceptable to the County from a financial institution authorized to do and doing business in the State of California, valid until one year after the project is accepted by the County. The security shall be in the amount of 100% of the County approved engineer's estimate.

The purpose of the Faithful Performance Security is to provide protection to the County for any expenses it may incur as a result of:

1. Failure by the Contractor to complete the installation.
2. Necessary repairs caused by poor installation techniques.
3. Necessary repairs caused by the installation of defective material.
4. Failure by the Contractor to perform in accordance with the approved plans and specifications.
5. Material liens against the County.

1-2.21 Guarantee of Workmanship, Materials and Equipment

The Applicant shall guarantee that the project installed by the Contractor (or Applicant) be free from any and all defects in materials and workmanship for a period of one year after final acceptance by the County. This guarantee shall be secured by a bond or letter of credit in an amount of at least 20 percent of Design Engineer's approved construction cost estimate, or other amount determined by the County. The County may make any necessary repairs and charge the security in the event the developer or Contractor fail to correct the defects.

Contractors performing work for the applicant shall be competent with adequate manpower and equipment to accomplish the work in accordance with the approved plans and specifications and licensed in the State of California. A representative of the Applicant and the Contractor shall be present at the job site whenever work is being conducted by subcontractors.

1-3.0 **PREPARATION OF IMPROVEMENT PLANS**

1-3.01 **General Improvement Plan Requirements**

A. Plan and Profile Sheets - All improvement plans shall be prepared on plan and profile sheets preferably 22" x 34", or 24" x 36", sheets, Plate "A" plan and profile paper, or specially prepared Consulting Engineer's sheets which have been accepted by the County.

Scales: Horizontal 1" = 20', 40', or 50'; Vertical 1" = 2', 4', or 5', but only the scale, horizontal or vertical, for which the sheet was intended shall be used.

B. Title Sheet - On all subdivision or other improvement plans, a title sheet shall be prepared showing the following:

1. The entire subdivision or parcel, project and north arrow with scale.
2. County and City limits, if applicable.
3. Street names and right-of-way widths.
4. Section lines, grant lines and corners.
5. Adjacent subdivisions, including names, lot lines and lot numbers.
6. Property lines.
7. Public easements.
8. Vicinity map.
9. Scale of drawings.
10. Index of sheets.
11. Legend of symbols.
12. Signature blocks conforming to Standard Drawing G-1 and situated at the lower right hand corner of the sheet.

13. Bench mark and temporary bench mark descriptions.
14. List of all Districts and/or agencies that supply services.
15. Planning application number if applicable.

C. Title Block - Each sheet within the set of drawings shall have an approved title block showing the sheet title, number, date, scale, and the Consulting Civil Engineer's name, signature and license number; the names of all Special Districts or agencies as applicable; the name of the subdivision or assessment district; and the bench mark description or reference to bench mark description on the title sheet. Samples may be obtained from the Department of Public Works.

The preferred location is across the lower right hand corner of the sheets.

- D. Line weights shall be selected to offer a variety of intensities with affected sewer, water, and storm drains, utilizing the boldest weight. Existing shall be dashed, proposed shall be solid. Next in importance are street property or right-of-way lines which shall be of medium weight. The lightest line weight shall be used for center lines, lot lines, curb lines, substructures, unaffected facilities, dimension lines, and call out lines. Refer to County Standard Drawing No. G-2 for specific line weights.
- E. Lettering may be vertical or slanted, with size and weight appropriate to G-2 for specific letter sizes.
- F. Drainage, Sewer, Water and Grading Plans - on all improvement drawings, the storm drainage, sanitary sewer and domestic water systems shall be shown on an overall plan layout and on the street plan and profile.

Grading and erosion and sediment control plans will be required for all subdivisions.

All plans showing the domestic water systems shall include signature blocks and be approved by the responsible water and fire districts and for encroachment approval by the Director. The signature block shall conform to County Standard Drawing No. G-1 and shall be situated near the lower right hand corner of the first sheet of the water plans.

Where wells are included as a part of the water system, the layout of the well site shall be drawn to a scale no smaller than 1 inch equals 5 feet, with the layout covering an area at least 50 feet in all directions from the well location.

G. Plan Details - the following details and supplemental information shall be shown on all plans submitted for approval:

1. Right-of-Way

Right-of-way lines, the boundaries of lots fronting on the street, drainage easements, utility easements, planting easements, section lines and corners, land grant lines and temporary construction easements, both existing and proposed, shall be shown on the plans. All right-of-way and easement lines shall be properly dimensioned.

2. Topography:

All pertinent topographic features shall be shown, such as street lines, medians, driveways (on both sides of the street when within 40 feet of a median ending), curbs, sidewalks, shoulders, location and size of storm and sanitary sewer lines, high water and frequent inundation levels, water lines, gas lines, telephone conduits, other underground utilities, existing structures, houses, streets, trees 6 inches in diameter and larger, and other foliage, traffic signals, street lights and pull boxes, underground electrical conduits, drainage ditches, utility poles, fire hydrants, retaining walls, masonry structures, and all other features of the area which may affect the design requirements for the area. When a potential utility conflict exists, elevations of the utilities shall be field verified by the Consulting Civil Engineer.

3. Contours and Elevations

Existing contours or supporting elevations shall be shown on all plans submitted for subdivision, commercial improvements, or planned unit developments.

4. Profiles:

- a. The plans shall show the existing profile of all roadway centerline, edges of pavement or top of curb, drainage ditches, storm and sanitary sewers.
- b. The plans shall show the existing ground profile for a minimum distance of 100 feet beyond temporary street endings to facilitate setting proper vertical alignment within the proposed improvement limits. The 100 foot minimum shall be increased when requested by the Director.
- c. All profiles of proposed improvements shall show the centerline

elevations at 50 foot maximum intervals and rate of grades, vertical curves and other vertical alignment data. When curb and gutters are added to existing roads, elevations shall also be shown at the edge of the outside traveled way, or if the road has a full paved section, shall also be shown two feet in from the proposed lip of gutter. Any warped surface and vertical curve shall set elevations at 25 foot intervals. All profiles shall be coordinated with County stationing if existing within 500' of the project. The Consulting Engineer shall contact the County for such stationing.

Cross sections showing existing and proposed pavement, curb and gutter, and existing ground to ten feet outside the right-of-way shall be submitted with plans for checking.

- d. Grading plans shall show final contours for commercial sites or a typical lot grading plan for residential sites.

5. Stationing and Orientation:

The stationing on plan and profile sheets shall read from left to right. Stationing shall increase from west to east or from south to north. Negative stationing shall not be used. Plans shall be so arranged that the north arrow points toward the top or right of the sheet, insofar as practical. The beginning and ending stations shall be shown for all street and utility centerline.

6. Cut and Fills:

Top of cut and toe of fill shall be shown on the plan view.

7. Bench Marks:

The bench marks and datum shall be clearly delineated on the plans both as to location, description and elevations. The datum shall be 1929 National Geodetic Vertical Datum (U.S.G.S. or U.S.C. & G.S.). Consulting Engineers shall contact the County Surveyor for location and elevation of the nearest official bench mark.

8. California Coordinate System:

The Director may require that the proposed improvements be tied into the California Coordinate System if monumented coordinate points are available within a reasonable distance (200 feet or less) of said improvement as determined by the Director.

9. Typical Sections:

A typical section for each type of facility within the improvement, setting out the structural features, shall be a part of the plans and be shown on the Title Sheet if possible. The "R" value and T.I. shall be shown with each section.

10. Cross Sections:

Cross sections shall be included in the plans, where determined necessary by the Director. When, in limited area, unusual topographic features or special conditions occur that would affect the work, individual cross sections may be shown on the pertinent plan sheet. Refer to Section 1-3.01 G4c and 1-2.05 F.

11. Special Notes:

Special notes shall be clearly indicated, and conspicuously noted on the plans that all construction work and installations shall conform to the San Joaquin County Standard specifications and that all work is subject to the approval of the Director. Notes shall contain a statement regarding obtaining Encroachment Permits from other agencies when applicable.

12. Detail Sheets:

- a. All detail drawings shall be drawn to an appropriate scale unless otherwise noted.
- b. Any detail drawings included in these design standards which are required of the project shall be referenced by the Standard Drawing Number and shall be reproduced and included in the improvement plans or special provisions. If modifications are to be made, the modification detail shall be included in the improvement plans.
- c. Any detail drawings from the State Standard Plans which may be required for the project shall be reproduced and included in the improvement plans or special provisions.

13. Sewer, water, and drainage plans shall contain the following information:

- a. In plan view show the following:
 1. Location and dimensions of dedicated streets and easements.

2. Lots to be served.
 3. All existing or proposed curbs, gutters, and pavement.
 4. The proposed alignment of the main and the location of all proposed system facilities such as valves, fire hydrants, fittings, maintenance holes, cleanouts, services, etc.
 5. All existing and proposed substructure utilities.
 6. All existing and proposed obstructions and/or appurtenances such as vaults, catch basins, traffic islands, laterals, traffic signals, signs, etc.
 7. Length, size and class of pipe between maintenance holes, tees, junctions, etc.
 8. Limits of the easement and any temporary construction easements.
- b. Profiles for all pipes, shall show the following information:
1. Flow line slope and grades (elev. @ maintenance holes, etc).
 2. Flow line and top of pipe profiles.
 3. Existing and proposed ground line.
 4. All proposed and existing utility crossings.
 5. Pipe sizes, lengths, class and type.
 6. Special bedding and backfill.
- c. Details showing all unusual proposed and existing utility crossings.
1. Show any traffic signal, sign or traffic control device as applicable.
- d. Additionally, all plans shall:
1. Show the approved permanent water source which can supply sufficient water for chlorination, flushing and hydrostatic testing.
 2. Show sufficient adjacent area to give the relation of new

facilities to existing facilities.

14. Walls

a. In plan view, show the following:

1. Location of wall in relation to right-of-way.
2. Type of wall.

1.4-0

ELECTRONIC SUBMITTALS

San Joaquin County Public Works will accept files in both CAD (Autodesk AutoCAD DWG/DXF) and GIS (ESRI shapefile or personal geodatabase) format. All file must be in the California State Plane Coordinate System, NAD83, Zone 3, United States Survey Feet (CCS83).

**CHAPTER 2
ROADWAY DESIGN STANDARDS**

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**CHAPTER 2
ROADWAY DESIGN STANDARDS**

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CHAPTER 2 ROADWAY DESIGN STANDARDS

2-1.0 **GENERAL**

2-1.01 **General Requirements**

The design and construction of public and private roadways, alleys, driveways, bike paths and all associated appurtenances such as sidewalks, curbs, gutters, street lights, barriers, signs, etc., in all unincorporated areas of San Joaquin County shall be in accordance with these minimum Design Standards.

2-1.02 **Definitions**

Unless otherwise provided in this Chapter, the following definitions shall be used in interpreting the provisions of this Chapter.

Access: The right of an owner of land to go and return from his own land to a public road.

Alley: A secondary means of access to property and is located at the rear or side of the property.

Bicycle Way: An area either within or outside the right-of-way of a dedicated street where bicycle travel is the designated use.

County Maintained Road: A road for which the County has accepted maintenance responsibilities.

Cul-de-sac Street: A road open at one end only, with special provisions for turning around, and the further extension of which is precluded by the land division design.

Easement: The right to use another's property. Easements are usually over a defined area and for a specific use such as public utilities, water drainage facilities, roads, sewers, or access.

Frontage Road or Service Road: A road immediately adjacent to freeways, expressways, or arterials. The frontage road provides access to local properties that would otherwise front on the freeways, expressways or arterials.

Median: The portion of a divided highway separating the traveled way for traffic in opposite directions. A median may be raised, landscaped or painted.

Open-Ended Cul-de-Sac: A cul-de-sac which allows emergency vehicle access and/or pedestrian and bicycle access from the bulb end.

Parkway: The area adjoining the outer edge of the roadbed, extending to the right-of-way line in which sidewalks, plantings, utilities, bank slopes and related facilities may be located.

Part-Width Road: Any street in which the improved width is less than the width necessary for a normal full-width street.

Pedestrian Way: The right-of-way designed for use by pedestrians and not intended for use by motor vehicles of any kind. A pedestrian way may be located within or outside of street right-of-way, at grade, or grade separated from vehicular traffic.

Private Rights-of-Way: May be any of the following:

- (1) any right-of-way which has been offered for dedication but which has not been accepted for maintenance by the County;
- (2) a legally established private easement for access;
- (3) a navigable waterway;
- (4) roads shown on antiquated subdivision plats that are not County maintained roads;
- (5) public roads for which there is no legally established right-of-way or easement.

Private Street/Road: A roadway within a private development, or a planned residential development whereby the street improvements remain in private ownership.

Public Road: Any road which is open for unrestricted travel by the general public. A public road may or may not be dedicated to or maintained by the County.

Restricted Access: The right of access has been dedicated to the County. A property owner no longer has a right to go to and from his property over a right-of-way line which has restricted access.

Right-of-Way: An easement for the use of roads, water and wastewater facilities, flood and drainage works, overhead and underground utilities, or any related improvements.

Road: Includes streets and highways both public and private. The terms streets, road, roadways, and highways are used interchangeably. Road includes the roadbed, all slopes, shoulders, side ditches, curb, gutters,

sidewalks, and all other related facilities within the right-of-way.

Road System: The classification of streets and highways by their diverse functions and design.

Roadbed: The portion of the road between curb-faces or between the outside line of improved shoulders.

Stub Street: A street open at one end only, with or without temporary provisions for turning around, and which is expected to be extended in the future.

Traveled-Way: The portion of the road for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

2-1.03 Other Standards

While it is not possible to set rigid design standards for every possible design situation, design of roadway improvements shall adhere to sound engineering principles and good civil engineering practice. State of California Department of Transportation references entitled Highway Design Manual, CA MUTCD and AASHTO "A policy on Geometric Design of Highways and Streets" and Americans with Disabilities Act Accessibility Guidelines (ADAAG), may be used for guidance for situations not covered by these Design Standards. In all cases, final approval of any design is left to the discretion of the Director.

2-1.04 Access Required

All parcels in a development project shall have access to a publicly maintained road either directly or by private right-of-way or easement. The use of private right-of-way or easement for access shall be approved by the Community Development Department Staff Review procedure outlined in the County Development Title.

2-2.0 ROADWAY TYPES

2.2.01 General

Roadways shall be of the approved type and width and shall be constructed as shown in the standard drawings.

2-2.02 Roadway Requirements

Road types shall be as specified in the conditions of approval for a project, the

County General Plan, or any special purpose plan for a road or area. Where no road type is specified the Director shall select the appropriate type and width of roadway to be constructed based on the planned ultimate width of right-of-way or a traffic study.

2-3.0 **TRAFFIC STUDIES**

2-3.01 Traffic Impact Studies

A. In addition to the provisions of Section 9.1150.4 of the Development Title, a written traffic impact study may be required under the following conditions:

1. Ministerial Projects. Unless waived by the Director, a written traffic impact study will be required for ministerial projects which may be expected to generate fifty or more vehicle trip ends during any hour. A written traffic impact study may also be required for projects with generation of less than 50 trip ends if justified by special circumstances as determined by the County.
2. Development Projects. A written traffic impact study shall be prepared when required as a condition of approval of a development project.
3. Supplemental Study. The Director may require a written supplemental traffic impact study if the property use is changed so that the average daily trip generation is increased by more than 15 percent over that indicated in an existing traffic impact study less than two years old.
4. Operational Analysis. An operational analysis may be required to study existing conditions for projects with generation of less than 50 trip ends if justified by special circumstances as determined by the County.

B. Responsibility

The County shall prepare or contract for the preparation of any traffic impact studies required by section 2-3.01, or the County may direct the Developer to have the study prepared. The Developer shall deposit with the County funds for all costs, as estimated by the County, prior to the County preparing or contracting for any required traffic studies.

C. Content of Traffic Impact Studies

To provide consistency and facilitate review, the following format shall be followed for organizing information gathered, traffic assumptions, analysis, findings and mitigation measures:

Introduction
Existing Circulation System
Existing Traffic Conditions
Trip Generation (per section 2.3.03)
Trip Distribution and Assignment
Project Traffic
Project plus Existing Impacts
Cumulative Traffic Conditions
Cumulative Impacts
Mitigation Measures for Project plus Existing Impacts
Mitigation Measures for Cumulative Impacts

2-3.02 Technical Memoranda

A. Traffic Technical Memorandum may be required in lieu of a Traffic Impact Study. A Traffic Technical Memorandum is only used in cases where development applications exceed the County's TIS requirement of more than 50 vehicles during any hour, but where the Director deems that the existing roadway capacity and traffic operations should not be significantly impacted as a result of the added traffic due to the proposed development.

B. Responsibility

The applicant shall prepare or contract for the preparation of any traffic technical memoranda required by section 2-3.02. The scope of the technical memorandum shall be reviewed and approved by the Public Works Department prior to commencement of any work.

C. Content of Traffic Technical Memoranda

The content and preparation of traffic technical memoranda shall be in accordance with the latest San Joaquin County Traffic Technical Memorandum Guidelines. The guidelines are available by contacting the San Joaquin County Department of Public Works Transportation Engineering Division. Trip generation shall be per the guidelines and section 2-3.03.

2-3.03 Trip Generation Rates

The latest edition of "Trip Generation" in the ITE Manual shall be used to determine traffic projections for all required studies and analyses. The daily trip generation rates and pass through/diverted link trip (PT/DL) factors to be used in preparing traffic studies are as follows:

	<u>Gross Trip rate(VPD)</u>	<u>PT/DL factor</u>	<u>Net trip rate</u>
Single Family residential(per du)	9.57	0%	9.57
Multi-family residential (per du)	6.72	0%	6.72
Office (per 1000 sf)	11.01	20%	8.81
Retail/Service (per 1000 sf)	*	70%*	*
Warehouse (per 1000 sf)	4.96	0%	4.96
Service Commercial (per 1000 sf)	*	0%*	*
Manufacturing (per 1000 sf)	3.82	0%	3.82

* Special traffic generators shall be studied on a case by case basis to determine daily trip generation rates, pass through factors, and shall be in accordance with the latest ITE manual or other available information.

2-3.04 Traffic Indexes (T.I.)

Traffic Indexes shall be determined by a traffic report based on the traffic volume, type of traffic (cars, buses, trucks), and road classification or as required by the Director. The Traffic Index is determined to the nearest 0.5. The following minimums shall apply.

<u>TYPE OF FACILITY</u>	<u>MINIMUM T.I.</u>
Cul-de-sac, Average Local and Rural Residential Rural Minor Collector	5.0
Urban or Rural Major Collector providing for traffic Movement between minor collectors and major arterials.	6.0
Commercial roads and Urban or Rural Minor Arterials.	7.0
Major Arterials and highways or arterials connecting two areas of high population density.	8.0
Major highways and thoroughfares carrying heavy truck traffic including streets in heavily industrialized areas.	9.0

2-4.0 DESIGN STANDARDS

2-4.01 Soils Report Required

All public and private roadway designs shall be based on the results of a soils investigation performed by a Registered Geotechnical Engineer, or a

Registered Civil Engineer with expertise in soils investigation. The report will address roadbed foundation conditions, grading considerations, slope stability (for slopes in excess of 2 horizontal to 1 vertical) and special conditions expected such as highly organic or soft soils or shallow bedrock which may affect design or construction. The report shall specifically determine the design resistance ("R") value of native materials at the proposed subgrade elevation to allow proper design of the roadbed structural section.

This requirement for a soils report may be waived by the Director if the project is located in an area of consistent soil characteristics, and the County has knowledge from other sources of the soil characteristics, including the "R" value.

2-4.02 Structural Section

A. Thickness

All roadway designs shall be based on the recommendations of the required soils report. The thickness of the structural section elements shall be determined from the Flexible Pavement Structural Pavement Design Guide for California Cities and Counties. A minimum asphalt concrete (A.C.) thickness of 0.17 foot shall be used on all streets except collectors, where the minimum A.C. thickness shall be 0.21 foot and arterials and expressways where the minimum A.C. thickness shall be 0.25 foot. A prime coat shall be placed when aggregate base (A.B.) is used when deep strength A.C. of 0.35 feet or less, soil sterilant is required on original ground.

2-4.03 Design Speed

A. Design of all roads shall be consistent with the design speeds expected and shall follow the recommendation of the traffic report. The following design speeds shall be the minimum used for road design.

<u>Classification</u>	<u>Minimum Design Speed</u>
Local Residential (1 Ac+)	25 mph
Local Commercial/Industrial	35 mph
Collector	45 mph
Minor Arterial	55 mph
Rural Road	55 mph
Major Arterial	55 mph
Expressway	70 mph

- B. The Director may require higher design speeds at locations where higher speeds may occur.

2-4.04 Horizontal Layout

- A. Intersection Offsets

Streets located on opposite sides of an intersecting street shall have their center lines directly opposite each other; otherwise the center lines shall be separated by a minimum 250 feet for local roads and 500 feet for rural roads, collectors, major and minor arterials and expressways, unless separated by a median.

- B. Continuation of Existing Streets

New subdivision streets which are continuations of existing streets shall be aligned so that their center lines coincide.

- C. Horizontal Curves

- 1. Minimum Curve Radii. The minimum centerline curve radii on roads, except where physical conditions make compliance impractical, shall be as follows:

	Minimum Centerline Radius (ft)
Expressways	2400
Major Arterials	1800
Minor Arterials	1200
Rural Roads and Collectors	1200
Collector Residential	600
Local Industrial/Commercial	500
Local and Rural Residential	300
Residential Cul-de-sac	150

- 2. Tangent Length Between Curves

- a. The minimum tangent length between reversing curves shall be 400 feet for expressways and minor, major and rural arterials. The minimum for all other classifications shall be as approved by the Director.
- b. Broken back curves are not allowed.
- c. The tangent section between curves shall be sufficiently long

to allow full transition from a super elevation cross section to a normal cross section and back to a super elevation cross section.

3. Compound Curves

The use of compound curves should be avoided where possible. Where special topography or other conditions exist, the use may be approved by the Director.

D. Property Line Corner Cut-off and Curb Radius

The property line corner cutoff at street intersections shall be as follows:

<u>Type of Intersection</u>	Property Line Cutoff or Radius (ft)	Curb Radius (ft)
Residential/Collector Residential	20x20	30
Commercial/Industrial	30x30	30*
Rural Road, Rural collector, Rural Residential	20x20	30 (pvmt)
Rural, Major, or Minor Arterial with Minor/Major Arterial, Expressway	75' radius	60* min.
All others	30x30	40

* May have to be increased for truck turning movements

E. Intersection Angle

Streets shall intersect at an angle as near to ninety (90) degrees as practical. The central angle on the curb return curve of adjacent corners shall be within fifteen (15) degrees of each other.

F. Cul-de-sac Streets

Cul-de-sac streets may be allowed as follows:

1. Maximum Length

Cul-de-sac streets shall have a length not exceeding one thousand

(1,000) feet and shall serve no more than twenty (20) lots. In agricultural zoning districts the maximum length shall not exceed one-half mile. In no case shall more than sixteen (16) dwelling units be served by a cul-de-sac street.

2. Turnaround

Cul-de-sac streets shall be terminated by an improved turnaround having a minimum right-of-way radius of 50 feet. Paved turnarounds shall be in accordance with the San Joaquin County Fire Road standards and these improvement standards.

3. Alternate Turnaround

Hammerheads, loops, offset bulbs and other geometric designs may only be used under special circumstances and only with the approval of the Director and shall be designed in accordance with the San Joaquin County Fire Road standards and these improvement standards.

4. Temporary Turnarounds

Temporary turnarounds shall be paved and designed in accordance with the San Joaquin County Fire Road standards and these standards.

G. Sight Distance at Intersections

Streets shall not be designed with intersections on the inside of curves, or at any location in general where sight distance will be inadequate for drivers to tell if they can safely enter the traffic flow or cross the street. Sight distances shall be as specified in the State of California, Department of Transportation Highway Design Manual (latest edition).

2-4.05 Profile Standards

A. Minimum Grades

The minimum flow line grade for gutters shall be 0.25 percent. These restrictions do not refer to centerline grades of vertical curves. Gutter elevations on vertical curves shall be adjusted to meet a 0.25 percent minimum grade. Where matching existing conditions minimum grades may be reduced only with the approval of the Director.

B. Cross Slopes

The standard cross slope shall be 2 percent. For street widening projects, the minimum cross slope shall be 1 percent, the maximum cross slope shall be 5 percent, with a 3 percent differential between the widening and existing pavement. Cross slope of a street widening project shall match the cross slope of the existing pavement within the above limits, whenever possible.

C. Vertical Curves

1. Required

Vertical curves shall be required whenever the algebraic difference of grades is 1 percent or greater for local streets and 0.5 percent or greater for collectors, arterials and expressways.

2. Minimum Length

The minimum length of vertical curves shall be determined by consideration of passing and stopping distance requirements, sight distance, drainage control and aesthetic appearance. Minimum length of vertical curves shall be as specified in the latest edition of the State of California, Department of Transportation Highway Design Manual.

D. Sight Distance

Sight distances shall be as specified in the latest edition of the State of California, Department of Transportation Highway Design Manual.

E. Intersections

When two streets intersect, the lesser classification street approach shall not have a slope over 3 percent for a minimum distance of 50 feet back from the curb line of the intersecting street. The typical crown profile of the higher classification street shall be maintained through the intersection with the lesser street meeting the crown slope at the projected edge of the outside travel lane. The crown slope may be reduced to 1.0 percent in the intersection if necessary to provide drainage.

2-4.06 Curb, Gutter and Sidewalk

A. Curb, gutter and sidewalk in residential areas shall conform to County Standard Drawing No. R-6.

- B. Curb, gutter and sidewalk in commercial or industrial areas shall conform to County Standard Drawing No. R-7.
- C. Curb, gutter and sidewalk on arterials and expressways shall conform to County Standard Drawings No. R-7 and R-8.
- D. Where sidewalks are not required, curb and gutters shall be poured monolithically with a 6-inch minimum top of curb width.
- E. Valley gutters are not allowed on any road except local residential streets, and only then with the approval of the Director. The developer shall submit evidence that the intersection cannot reasonably be drained to an underground system before cross gutters will be considered. Refer to County Standard Drawing No. R-12.
- F. Barrier curbs may be required by the Director at such locations as deemed necessary to control drainage, delineate traveled ways, provide for safe pedestrian and vehicular passage, etc. Where required, barrier curbs shall conform to Type A1-6 of the California Department of Transportation Standard Plans. Refer to County Standard Drawing No. R-8.
- G. Curb ramps shall be constructed at all curb returns in residential and commercial areas and at such other locations with sidewalks as required by the Director and conform to ADAAG. Ramps shall conform to County Standard Drawing No. R-10A and R-10B, or Caltrans Standard Drawing No. A88A.
- H. Sidewalk widths shall be measured from face of curb to back of walk. Minimum widths are shown on County Standard Drawings No. R-1, R-2, R-6, R-7, R-10A and R-10B.
- I. Sidewalk widening may be required at the discretion of the Director in areas such as school zones, local commercial areas, bus stops, rural postal drop boxes, near bicycle ways and trails, or other areas deemed appropriate. Where sidewalk widening is required, the Director shall provide width, length and transition requirements.
- J. If a sound wall is required adjacent to the right-of-way and when sidewalks are required, the sidewalk shall extend to the face of the wall.
- K. In special situations with the approval of the Director, sidewalks may be separated from the curb and gutter by a landscaping strip. The developer shall submit complete details of proposed dimensions and landscaping and method of maintenance.

2-4.07 Driveways

- A. Driveway design shall conform to County Standard Drawings Nos. R-13 through R-17 and conform to ADAAG.
- B. Maximum driveway slope within the right-of-way shall be 10 percent except in unusual terrain and specifically approved by the Director.
- C. No driveway will be allowed within 5 feet of a side property line on a commercial development. Exceptions may be approved by the Director for joint driveways or in unusual cases. Joint driveways may be required by the Director and a joint use driveway agreement will be required prior to approval of improvement plans.
- D. The minimum width for a single family residential and duplex driveway shall be 12 feet. Maximum residential and duplex driveway width shall be 25 feet. Maximum residential and duplex driveway width with vertical curb and gutter shall be 30 feet. The maximum width for a commercial driveway shall be 40 feet.
- E. A driveway transition shall be a minimum of 25 feet from the projected curb line or edge of pavement of any intersecting street and a minimum of 10 feet from the nearest curb return or edge of pavement radius in 25 mph zones. The driveway transitions shall clear all public facilities such as electroliers, traffic signal standards, utility poles, fire hydrants, etc., by a minimum of 3 feet. Any relocation of such facilities required to maintain such clearance shall be at the expense of the owner installing the driveway.
- F. A minimum of 4 feet of full height curb should be maintained between the transitions of adjoining driveways. A minimum of 2 feet of full height curb shall be maintained between property line and driveway transition.
- G. The nearest edge of driveways shall not be closer than 50 feet to the end of existing or future traffic medians. Medians shall be reconstructed and/or lengthened to conform to this section if necessary, as determined by the Director.
- H. Increased visibility requirements may be required for driveways serving a significant amount of truck traffic.
- I. Major commercial driveways which will serve significant traffic volume, as determined by the Director, shall be considered as intersecting streets and shall conform to appropriate street offset requirements.

- J. Driveways located near major arterial intersections shall be no closer than 250 feet from the existing/proposed curb return. Exceptions may be granted by the Director.
- K. Driveways and private roads accessing public streets with no curb, gutter and sidewalks shall be paved to the right-of-way with either asphalt concrete or Portland cement concrete. Driveways and private roads accessing public roads with sidewalks and/or curbs and gutters shall be paved to the right-of-way with Portland cement concrete. Driveways shall be consistent with details in County Standard Drawing No. R-17.

2-4.08 Survey Monuments

A. Required Locations

Permanent survey monuments at the following locations:

1. At the intersections of all street centerline for new and existing streets.
2. At the beginning and end of all horizontal curves.
3. At all subdivision boundary corners, lot corners and at other locations designated by the Director to allow any lot or portion of improvement to be retraced or located.
4. For street widening or partial width improvement, centerline curve monuments will not be required if improvements stop short of the street centerline. Intersection monuments are required in all cases.
5. At all section corners, quarter corners and centers of sections.

B. Type

1. Street centerline monuments shall conform to County Standard Drawing No. R-28A and R-28B.
2. Property corner and right-of-way monuments shall be a minimum of 3/4-inch I.P.S. galvanized iron pipe, capped and tagged 30 inches long for right-of-way and 24 inches long for property corners.
3. Section corner, quarter corner and centers of section monuments shall be a minimum of a 1 1/4-inch I.P.S. galvanized iron pipe 30-inches in length, capped and tagged. When monuments are in

the road pavement, they shall be placed in a survey monument frame and cover assembly per County Standard Drawing No. R-28A.

C. Map Act Compliance Required

All maps submitted for approval and recordation shall conform to applicable State laws including the Subdivision Map Act. Persons preparing maps and setting monuments shall adhere to the State of California Professional Land Surveyors Act.

D. Protection of Existing Monuments

All improvement plans shall contain a note stating that the Contractor is responsible to preserve and protect all existing survey monuments or other survey markers. Any monuments, damaged, displaced, obliterated or lost shall be re-established or replaced by a licensed land surveyor at the contractor's sole expense. A corner record must be filed in accordance with State law for any reset monuments. (California Business and Professions code §8871)

2-4.09 Signage

A. Barricades

Barricades shall be required at the end of the paved section (or traveled way for non-paved street) of all terminating streets. Barricades shall comply with County Standard Drawing No. R-25. Cul-de-sac streets shall use Type "B" barricades only where there are no curb, gutter and sidewalk. All other street terminators shall use Type "A" barricades.

B. Street Sign Locations

Street names and street name sign locations shall be shown on plans submitted for approval. Sign details shall be as shown on County Standard Drawing No. R-26. Street name signs shall be located as follows:

1. "Tee" Intersections

One street name sign shall be located on the near right-hand corner of the non-through street approach of a "Tee" intersection or at head on position of the Tee. Signs shall be visible to traffic from all sides.

2. Four-Way Intersections

A minimum of one street name sign is required at each intersection. Signs shall be visible to traffic from all sides.

3. Non-Symmetrical Intersections

For non-symmetrical intersections, or for expressways, major arterials and freeways, street sign location shall be at a location(s) visible to all traffic entering the intersection as approved by the Director.

4. Signalized Intersections

A street name sign shall be located facing each approach and hanging from the signal mast arm.

C. Traffic Signs

All signs and markings shall conform to the latest edition of the CA MUTCD and San Joaquin County Standards.

2-4.10 Striping and Marking

Design of pavement striping and marker placement shall be in accordance with Caltrans Standard Plans, subject to the approval of the Director and shall conform to the latest edition of the CA MUTCD.

2-4.11 Bridges and Overpasses

- A. All structural elements of bridges and overpasses shall be designed by a Registered Civil and/or Structural Engineer in accordance with Caltrans and AASHTO Bridge Design Standards.
- B. The design width of overpasses and bridges shall be in accordance with AASHTO Bridge Design Standards unless narrower widths are approved by the Director.
- C. Bridges over water courses shall be designed to meet the freeboard requirements in accordance with County and FEMA Standards for Flood Hazard Reduction. Detailed hydrologic and hydraulic calculations shall be submitted by a Registered Civil Engineer to document the 100-year flood water surface elevations corresponding to inwater pile bents/piers configuration and calculated potential scour depth on all inwater components.
- D. The geometric design of bridges and the approaches on either side shall

consider the potential for bridge icing during extreme weather conditions particularly in the eastern portions of the county. Curved alignments should be avoided.

- E. All bridge and overpass designs shall include a geotechnical study per Caltrans Standards.
- F. Bridge barriers shall be reinforced concrete systems that comply with Caltrans Standard Plans and Specifications, unless otherwise approved by the Director.
- G. Bridge approach guard rail systems shall comply with latest Caltrans Standard Plans and Specifications.
- H. Levee access roads (as required) shall be constructed at the terminal end of all bridge approach guard railings.
- I. Pedestrian bridge and overpass designs shall conform to California Building Code, AASHTO "Design of Pedestrian Bridges", and ADAAG. All structural components shall be constructed with non-combustible material only.
- J. Submittal documents shall include bridge plans and specifications and any conditions required by outside agencies.

2-4.12 Street Lights

A. When Required

1. Street lighting shall be required in all Urban Communities.
2. Intersection lighting shall be required in Rural Communities and antiquated subdivisions.
3. Street lights are generally not required in Agricultural Zoning Districts along rural roads except at the discretion of the Director.
4. Other locations where deemed necessary by the Director.

B. Relocation

Existing street lights which must be relocated, repositioned or reconfigured as a result of construction of new streets, widening of existing streets or construction of driveways into a development shall be

the responsibility of the developer.

C. Utility Company Authorization

In new developments, ownership of street lighting systems shall be the serving electric utility company.

Proposed street lighting systems shall be designed in compliance with the standards of the serving electric utility company.

Prior to Public Works approval of the street lighting plans, the developer shall provide a written notice from the serving electric utility company stating that fine clearances and service requirements have been checked and are adequate. The notice shall also state that, subject to service charges, the serving electric utility company will maintain the street lighting system after installation.

D. Plan Details

The plans shall show and identify all street lights to be installed, all existing lights in the immediate vicinity of the project, trees, and all applicable provisions and details specified in these standards.

On subdivision plans, the street lights shall be shown in the plan views. Subdivision street light plans shall include utility poles, public utility easements, names of adjacent subdivisions, intersecting property lines of adjacent properties, a legend conforming to County Standard Drawing Nos. G-2, G-3, G-4, and G-5; north arrow, appropriate scale, all existing street lights on both sides of any streets, and all trees within the vicinity of the proposed street lights. Photometric drawings, when required, shall show the minimum illumination on existing and proposed roads in conformance with County Standard Drawing No. R-33 and R-34.

E. Design Standards

Street lighting shall be designed in conformance with these specifications and the "American National Standard Practice for Roadway Lighting" of the American Standards Institute, except that the average and minimum illumination for the various street classifications shall be as shown on County Standard Drawing No. R-33. Data and calculations supporting the satisfaction of the above requirement shall be submitted for review, or the pre-determined design standards included herein shall apply.

An electrical plan with wiring and conduit diagrams and power source shall be submitted if required.

F. Street Light Design Details

Design details for street lights are as follows:

1. Intersections - Intersections shall have at least one street light.
2. Cul-de-Sacs - All cul-de-sacs exceeding 130 feet in length, measured from the street light location at the intersection to the right-of-way line at the end of the bulb shall have at least one street light located at the end of the bulb.
3. Pedestrian Lanes - Street lights shall be placed at both ends of pedestrian lanes.
4. Spacing - Maximum street light spacing, measured along the street centerline, shall conform to Standard Drawing No. R-34 except on 84 foot and 110 foot streets with a 1,000 foot radius horizontal curve or less, in which case the maximum spacing is 170 feet. Note that on County Standard Drawing No. R-34, light spacing for 84-foot and 110 foot street is based on a one-side arrangement. Spacing on all other streets is based on a two-side arrangement.
5. Street Light Poles - All street light poles shall be of galvanized steel, aluminum or concrete, except as provided for in Paragraph 6 below.
6. Street Lights on Existing Utility Poles - In areas with existing utility poles, the utility company shall be contacted to ascertain if the street lights can be installed on the poles. Should the utility pole option be utilized, the following shall apply:
 - a. The developer shall arrange to install utility owned and maintained street lights on existing utility poles.
 - b. Spacing of street lights shall be varied to meet locations of existing utility poles, but shall not exceed the maximum spacing specified by County Standard Drawing No. R-34. Street light mounting heights shall be as shown on Standard Drawing No. R-32. All luminaries shall have wattage relating to the street classification requirements shown on County Standard Drawing No. R-34.

7. Luminaires - The type of street light and the appropriate wattage shall be specified on the plans.
 8. Service - All street light systems shall have underground service provided.
 9. Photo Cell - A single photo cell receptacle shall be used to control light circuits for four or more lights. All other light systems shall have a photo cell in each luminaire.
- G. Master Planning - Master planning is the determination of street light locations between control points. Control points are proposed street light locations at street intersections in accordance with Section F and existing street lights. Master light plans shall result in a uniform street light system meeting minimum requirements. On 84-foot and 110-foot streets, master planning shall apply to only one side of the street. On all other streets, master planning shall apply to both sides of the street. The procedure for master planning is outlined as follows:
1. Determine the nearest intersections each way from the street light locations required. Determine the location of the street lights at the intersections in conformance with these design standards.
 2. Determine the existence of any street lights situated between the adjacent intersections above.
 3. Determine the distance between the adjacent designed intersection street lights above and/or adjacent existing street lights, whichever are nearest to the proposed street light locations.
 4. Compare the street light locations to intersecting property lines, driveways, pedestrian lanes and utility obstructions as follows:
 - a. If the location falls close to a property line and the street light locations can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.
 - b. Generally, street lights should be situated at intersecting property lines for residential lots and parcels with minimal frontage (75 feet or less).
 - c. Street light locations shall be adjusted to avoid driveways and existing utility obstructions by a minimum of five feet.

2-5.0 **TRENCH CUT POLICY**

2-5.01 **General Requirements**

- A. Resurfacing requirements specified in this policy are in addition to the trench resurfacing requirements specified by County Standard Drawing No. R-29.
- B. For the purpose of this policy, "Surfacing Age" is defined as the age of the most recently completed roadway surfacing, including construction, reconstruction, or major overlay.
- C. Where the application of seal coats is required, a Type II Slurry Seal will be used in accordance with State Standard Specifications, Section 37-2.
- D. The permittee must post a one-year maintenance bond or cash deposit, in an amount specified by the Department.
- E. All pavement markings destroyed or obliterated must be replaced in kind by the permittee. Typical pavement markings include, but are not limited to, lane lines, centerlines, stop and stop ahead legends, limit lines, raised pavement markers, and miscellaneous delineators.
- F. The permittee is responsible for Survey Monuments disturbed by trenching and is required to file a corner record and to reestablish them using a Licensed Land Surveyor after the trench restoration is completed.
- G. Functional classification maps and Public Works Project Advertising Schedules are references for this policy.
- H. To facilitate scheduling and planning, Public Works staff will make available the most current Project Advertising Schedule at the monthly Utility Coordination Meeting and make it available to the public, at the Permits Counter, in January each year.

2-5.02 **Collectors, Arterials and Expressways**

- A. Surfacing Age less than Three (3) Years: No pavement cuts. Exceptions may be approved in accordance with Section 2-5.04 EXCEPTIONS.
- B. Surfacing Age Three (3) Years and Over:
 - 1. Longitudinal Trench Cutting in Paved Shoulder

Areas:

The entire shoulder of the road is to be resurfaced. The existing surfacing adjacent to the trenched area shall be planed to accommodate the overlay in a manner that does not cause drainage concerns. The nearest pavement cut shall be a minimum of three (3) feet from the edge of pavement, or the remaining pavement shall also be removed and replaced. (See County Standard Drawing No. R-37).

2. Longitudinal Trenches within Traveled Lanes:

The entire traveled lane where the trench is located is to be resurfaced with a one (1) inch asphalt concrete overlay. The existing surfacing adjacent to the trenched area shall be planed to accommodate the overlay in a manner that does not cause drainage concerns. The overlay shall be in accordance with State Standard Specifications, Section 39. Aggregate gradation shall be consistent with the existing surfacing material. (See County Standard Drawing No. R-37).

3. Cross-Cutting:

Cross-cutting is allowed at a minimum interval of 150 feet. At each cross-cut location a minimum of ten (10) feet on each side of trench shall be planed and resurfaced with one (1) inch asphalt concrete. If cross cuts are within the 150 feet minimum interval, the entire section between the first and last cross cut shall be planed and resurfaced with one (1) inch asphalt concrete. (See County Standard Drawing No. R-36).

4. The conditions described in paragraphs 1, 2 and 3 above will not apply if resurfacing is scheduled within two years.

2-5.03 Local Roads

A. Surfacing Age Under Three (3) years: No pavement cuts allowed. Exceptions may be approved in accordance with Section 2-5.04 EXCEPTIONS.

B. Surfacing Age Three (3) to Five (5) Years:

1. Longitudinal cuts are permitted. A seal coat is required for that half of the roadway containing the trench. (See County Standard Drawing No. R-37).

2. Cross-cutting is allowed under the same conditions as Section 2-5.02(B)(3). If cross-cuts occur within the 150 feet minimum interval, resurfacing may be substituted with a slurry seal for that half of the roadway. (See County Standard Drawing No. R-36).

2-5.04 Exceptions

Excavation is prohibited in newly renovated County roadways for three (3) years after a notice of completion has been filed for a roadway improvement project, or a new roadway has been accepted. The Director of Public Works may approve exceptions that are in the best interest of the public, including but not limited to:

- A. An emergency that endangers life or property.
- B. For repair or modification to prevent interruption of essential utility service.
- C. For relocation work that is mandated by County, State or Federal law.
- D. For service for buildings where no other reasonable means of providing service exists.
- E. For potholing to verify utility depth or location.
- F. For trenchless excavations greater than three feet in depth of cover over the utility facility, and not requiring a significant surface Incision greater than industry bore pit standards.

Exceptions must be requested and submitted in writing to the Department. Payment of a nonrefundable processing fee is also required. Exceptions will be reviewed using the Departments Action Approval process, which requires the recommendation of a Deputy Director.

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STORM DRAINAGE DESIGN STANDARDS**

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CHAPTER 3 STORM DRAINAGE DESIGN STANDARDS

3-1.0 **GENERAL**

3-1.01 **General Requirements**

The design and construction of storm drainage pipes, culverts, ditches, berms, channels, detention basins, retention ponds, underground retention systems, gutters, curbs, inlets, outlets, out falls and other storm drainage appurtenances associated with new development projects in all unincorporated areas of San Joaquin County, shall be in accordance with these minimum Design Standards and shall fully consider all existing State and Federal laws and County ordinances and regulations. The San Joaquin County Storm Water Quality Control Criteria Plan (SWQCCP) provides additional requirements for National Pollutant Discharge Elimination System (NPDES) priority projects.

3-1.02 **Definitions**

Unless otherwise provided in this Chapter, the following definitions shall be used in interpreting the provisions of this Chapter.

Design Storm Runoff: The runoff produced by a theoretical design storm of a specified duration and a specified return frequency. The type of drainage facility being considered determines what return frequency storm applies, which is addressed in Section 3-2.0 of this Chapter.

Detention Basin: A drainage basin which has the capacity to temporarily store storm water runoff, and has outlet facilities capable of emptying the basin within a specified time into a terminal drain.

Hydrograph: A graphical representation of stage, flow, velocity, or other characteristics of water at a given point as a function of time.

Hydrologic Routing: The derivation of an outflow Hydrograph from a basin with a computed inflow Hydrograph, and known hydraulic properties of the outflow structure.

Retention Pond: A drainage pond with no outlet facilities for terminal drainage, that is capable of storing the required storm water runoff volume and is capable of emptying through percolation and evaporation over a specified time.

Storm Frequency: The probability of the occurrence of a hydrological event of different severity; also referred to as recurrence interval or return period.

Storm water Runoff: Water that results from precipitation which is not absorbed by the soil, evaporated into the atmosphere, or entrapped by ground surface depressions and vegetation, and which flows over the ground surface.

Terminal Waterway: A natural or man-made channel which has the capacity to contain a 50 year return frequency storm, and which by gravity carries storm water ultimately to the ocean.

Terminal Drain: A storm drainage system or portion thereof, which conveys storm runoff into a terminal waterway.

Underground Retention System: Any bored, drilled, or driven shaft, or a subsurface fluid distribution system with no outlet facilities for terminal drainage, that is capable of storing the required storm water runoff volume and is capable of emptying through percolation and evaporation over a specified time.

3-2.0 **DESIGN STORM**

3-2.01 **Storm Frequency**

The storm frequency to be used in drainage system design will be the storm frequency applicable for the design point under consideration. The following guidelines give a general rule for determining applicable design storm frequency. The actual storm frequency used will be specified at the discretion of the Director.

A. 10 Year Storm:

The drainage system for the 10 year storm is to be designed to minimize inconvenience, protect against minor damage, and reduce maintenance costs.

Improvements to be designed for the 10 year storm shall generally include local drainage facilities for office, residential, commercial, and industrial development. This will almost always include all closed conduit design and minor channel sections.

B. 50 Year and 100 Year Storm:

The drainage system for the 50 year and 100 year storms are to be designed to protect against loss of life or substantial property damage. Improvements requiring 100 year design capacity are open channels and detention basins. Minor channels and closed conduit systems shall

also meet the requirements for the 100 year storm as specified in these standards.

3-3.0 **DESIGN STORM RUNOFF**

3-3.01 Rational Formula

The Rational Formula shall be used to determine the peak flow rate for the Design Storm. This formula is:

$$Q = C I A \quad (3-1)$$

where

Q = peak rate of flow in cubic feet per second

C = coefficient of runoff having a value between 0.0 and 1.0 depending on surface characteristics.

I = the average intensity of rainfall in inches per hour for a duration equal to the critical time, usually the time of concentration.

A = the tributary area in acres corresponding to the critical time above.

The procedure for determining the values of C, A and I are given in the following sections.

A. Runoff Coefficient, C:

Table 3-1 shows the basic coefficient, C, to be used for various types of surfaces. Where a tributary area contains more than one type of surface, the value of C shall be the weighted average of the respective values shown on Table 3-2 based on percentage of each surface area to the total area.

**TABLE 3-1
BASIC RUNOFF COEFFICIENTS**

SURFACE	COEFFICIENTS
Pavement	0.95
Roofs	0.80
Compacted earth without paving or gravel	0.75
Lawns and Open Lands	0.20

**TABLE 3-2
COMPOSITE RUNOFF COEFFICIENTS AND MINIMUM INLET TIMES
FOR VARIOUS LAND USES**

LAND USE ⁽¹⁾	RUNOFF COEFFICIENT C	MINIMUM INLET TIME (Minutes)
Residential		
Rural Residential 1-5 Ac Suburban Density	0.25	30
(0.5 to 1.0 Acre Lots)	0.30	27
Low Density (Single Family)	0.35	25
Medium Density (Multi-Family)	0.50	20
High Density (Apartments)	0.65	15
Business and Commercial	0.90	10
Industrial ⁽²⁾		
Restrictive Light	0.70	13
General	0.85	10
Other ⁽²⁾		
Community Park	0.25	28
Recreation	0.30	27
Schools	0.40	24

⁽¹⁾ Refer to General Plan for description.

⁽²⁾ In lieu of using this table, composite coefficients may be determined for land uses within a development by using the basic coefficients shown in **Table 3-1**.

B. Rainfall Intensity, I:

Peak runoff for the 10 year storm must be based on the Mean Annual Precipitation map per County Standard Drawing No. D-3 and the Rainfall Intensity - Duration Curve, shown in County Standard Drawing No. D-4. Runoff for the 100 year storm may be determined by multiplying the 10 year peak rate by 1.4. Runoff for the 50 year storm may be determined by multiplying the 10 year peak rate by 1.2.

C. Tributary Area, A:

The tributary area for each point of computation shall be based on actual field reconnaissance, or use of appropriately scaled maps that certainly depict the drainage boundaries.

All of the area that will contribute runoff to the drainage system shall be considered, regardless of the limits of the particular development under consideration.

D. Critical Flow Time:

The critical flow time is that time which results in the maximum flow rate for a given point in a drainage system. Maximum flow occurs when the product of the contributing area and the rainfall intensity corresponding to the flow time is a maximum.

The time required for water to flow from the most hydraulic remote point in the watershed to the point in question is called the time of concentration. Using the intensity corresponding to this time, and the entire drainage area in the Rational Formula usually results in the maximum flow rate for the point.

The nomograph shown in County Standard Drawing No. D-5 shall be used to determine the time of concentration to the first inlet of the drainage system. If this time is less than the minimum inlet time shown in Table 3-2, the values shown in the table shall be used.

When any part of the storm waters are conveyed to the point in question by pipes or open channels, the flow time in these conveyances shall be added to the inlet time to compute the total flow time. In complex drainage situations more than one computation may be required in order to determine the combination of contributing area and flow time which results in the maximum flow rate.

E. Limitations of the Rational Method:

The Rational Method tends to become impractical in larger, more complex watershed areas. Characteristics such as varying travel times for multiple watershed branches and watershed storage are not addressed adequately by the Rational Method. Therefore, the designer is required to use a Hydrograph method for determining runoff when the drainage basin is larger than 200 acres or when a detention basin is to be designed.

3-3.02 Hydrograph Methods

Hydrograph methods of analysis are required for the larger, more complex watersheds. While the Rational Formula is appropriate for small watersheds, generally less than 200 acres, the model does not take into consideration such factors as available storage and varying times of travel. A Hydrograph method is also required for the modeling of a proposed detention basin. The following is a summary of the hydrologic models available to the design engineer and acceptable by the County for the modeling of existing and proposed watershed areas.

A. Technical Release No. 20 (TR-20):

The Soil Conservation Service (SCS) originally developed the TR-20 hydrologic model. The TR-20 computer program develops flood hydrographs and routes the flow through stream channels and reservoirs. It is capable of combining hydrographs and determining peak discharges, time of occurrence and water surface elevations. The model is based on the procedures described in the National Engineering Handbook, Section 4, Hydrology (NEH-4).

The TR-20 computer program and hydrologic model is to be based on the statistical design storm required by these standards with rainfall distribution and total precipitation as defined and recommended by the U.S. Soil Conservation Service. The model is to be based upon the Standard Methodologies set forth in the most recent version of the SCS Technical Release No. 20 and Section 4 of the National Engineering Hydrology Handbook.

B. Technical Release No. 55 (TR-55):

Technical Release No. 55 (TR-55) uses a derivation of the TR-20 Hydrograph methods to develop flood hydrographs. As a simplified version of the TR-20 model, it allows the designer to evaluate a watershed and develop comparable results without using the more complex model.

The input variables required with TR-55 include Curve Number (CN), Time of Concentration (Tc) and drainage area. The model is based on a 24-hour statistical design event. The total rainfall volume and appropriate rainfall distribution for the design storm is to be derived in accordance with the recommendations of the U.S. Soil Conservation Service. The watershed model is to be based on the most recent revision of TR-55 and its standard methodologies.

The TR-55 hydrologic model only provides runoff hydrographs and does

not include a computer program for routing hydrographs through detention basins. If the TR-55 model is used for a proposed detention basin, an additional program will be required for hydrologic routing. The Storage Indication Method or Modified Pulse Method are acceptable models for the sizing of detention basins.

C. U.S. Army Corps of Engineers Hydrologic Engineering Center Models:

The U.S. Army Corps of Engineers Hydrologic Engineering Center developed various hydrologic modeling systems capable of analyzing flood events for a wide range of conditions, from small urban watersheds to a large, multiple watershed river basins. The basic components of the models include the development of surface runoff for each watershed, channel and reservoir routing and the combining of hydrographs at confluences. The models also contain numerous program options such as dam break analysis, water surface profiling, flood damage modeling and many others, which generally pertain only to large scale capital improvements. Some projects may require analysis using one or more of USACE modeling programs.

3-3.03 Off-Site Flows

Flows entering the proposed development from outside the property are off-site flows. The off-site storm runoff must be determined and included in the drainage system design.

Available drainage reports for off-site developed areas affecting the property must be reviewed and considered in the drainage system planning and design.

Runoff entering the site from off-site areas must be computed using runoff parameters for the existing development or based on General Plan Zoning, whichever is greater.

3-3.04 Drainage Diversion

A. The diversion of natural drainage will be allowed only within the limits of the proposed improvement. All natural drainage must enter and leave the improved area at its original horizontal and vertical alignment unless an agreement, approved by the Director, has been executed with the adjoining property owners.

B. Temporary drainage diversions, such as dams and pipe plugs, shall be located and constructed in such a fashion as to permit their removal during adverse weather.

- C. Locations and removal procedures for temporary drainage installations shall be approved by the Director, and these installations shall be removed when necessary to prevent damage to adjoining property.

3-4.0 **HYDRAULIC CRITERIA**

3-4.01 **Manning Equation**

The Manning Equation shall be used to determine the capacity of open channels and enclosed gravity conduits:

$$Q = AV = \frac{1.486 R^{2/3} S^{1/2} A}{n}$$

Where Q is the flow rate in cubic feet per second;
A is the cross sectional area of the flow in square feet;
V is the flow velocity in feet per second;
R is the hydraulic radius in feet;
S is the slope in feet per foot; and
n is the Manning coefficient;

Values of the Manning coefficient for various pipes and open channels are given in **Table 3-3**.

**TABLE 3-3
MANNING COEFFICIENT**

CONDUIT MATERIAL	MANNING COEFFICIENT (n)
Closed conduits	
Cast iron pipe	0.013
Concrete pipe	0.013
Corrugated metal pipe, plain	0.024
Paved invert	0.020
Fully paved	0.015
Plastic	0.013
Vitrified clay	0.013
Open channels	
Lined channels	
Asphalt	0.015
Concrete	0.015
Rubble or riprap	0.030
Vegetal	0.040

Excavated or dredged

Earth, straight and uniform	0.030
Earth, winding, fairly uniform	0.040
Unmaintained	0.100

Natural channels (minor streams)

Fairly regular section	0.050
Irregular section with pools	0.100

Adapted from Table XIV, ASCE Manual No. 37, 1970

3-4.02 Pipe Flow Criteria

- A. Catch basin laterals shall be not less than 12 inches in diameter. All mains or trunk lines shall be not less than 18 inches in diameter.
- B. The minimum velocity in closed conduits shall be 2 feet per second (fps) when flowing eight-tenths full.
- C. The hydraulic grade line (HGL) of the design storm flow must be computed for all storm drain systems and must be shown on the design profile when it is above the top of the pipe. The HGL shall be a minimum of 1.0 feet below the elevation of the inlet grates and maintenance hole covers of all structures within the system.

3-4.03 Open Channel Flow

- A. Maximum velocities in open channels shall be as shown on Table 3-4.

TABLE 3-4

Channel Material	Max. Allowable Velocity (fps)
Fine sand	2.0
Sandy loam	2.5
Alluvial silt	3.0
Firm loam	3.5
Fine gravel	4.0
Stiff clay	4.5
Coarse gravel	5.0
Bottom paved channels	8.0
Fully lined channels	10.0

- B. Freeboard requirements shall be set by the Director or the agency governing the proposed channel facilities.

- C. Flows shall be placed in closed conduits where the flow requires a concrete pipe of 48 inches diameter or less.

3-4.04 Backwater Effects

When obstructions, transitions, junctions, constrictions, or other irregularities in an otherwise uniform channel system create backwater conditions in the system, the Consulting Engineer shall make computations to determine the effects of the backwater condition.

The Consulting Engineer shall use careful consideration in determining when losses due to channel irregularities are small enough to neglect, or when they are large enough to create considerable backwater effects.

3-4.05 Detention Basins

- A. Detention basins other than those shown on the Master Storm Drainage Map may be used for revisions to the Master Plan or for staged development only upon approval of the Director.
- B. All detention basins shall be designed for a 100 year storm frequency. The contributing watershed area shall be evaluated using standard engineering methodologies detailed in Section 3-3.02 of this Chapter. The total volume required for the basin shall be based on hydrologic routing computations by the Consulting Engineer demonstrating that the basin will operate properly.
- C. All detention basins shall have outlet facilities providing terminal drainage capable of emptying a full basin within 24 hours in urban areas and within 48 hours in rural areas.

Detention basins with gravity outlet structures will operate without any backwater effects under the design storm. A drainage pump may be designed as the basin outlet control. A backup power generator will be required to accompany any drainage pump.

- D. Detention basins shall be designed with gravity inflow and gravity out-flow whenever possible (i.e., large pipe in/smaller pipe out, or overflow in flap gated outlet). Detention systems requiring pumping facilities must meet the requirements of Section 3-5.08 of these standards and must be approved by the Director.
- E. The bottom of a detention basin shall be sloped at a minimum of 1 percent towards the outlet. Whenever possible, a low flow channel or pipe through the basin shall be incorporated into the design.

- F. The bottom of the basin shall be a minimum of 2 feet above the highest recorded ground water elevation and shall also meet all requirements of the State Water Quality Control Board. It is the responsibility of the developer's Consulting Engineer to coordinate with the State Water Quality Control Board and submit evidence of their approval to the Director.
- G. The design high water surface elevation of the basin shall be a minimum of 2 feet below all ground surface elevations upstream from the basin.
- H. The maximum side slope for publicly maintained detention basins shall be four horizontal to one vertical (4:1). Detention basins landscaped with turf that requires mowing shall have a maximum side slope of six horizontal to one vertical (6:1).
- I. Publicly maintained detention basins shall be fenced with a 6 foot high chain link fence or equal when the maximum design depth is 18 inches or more. An 18 foot double gate shall provide access within the fenced area.
- J. A minimum 10 foot wide access road to the basin or pond is required for maintenance vehicles. The access way shall be located around the basin or pond with a 15 foot minimum inside turn radius at the corners. All access ways shall be located within any required fencing.
- K. Refer to County Standard Drawing D-23 for other design requirements.
- L. Detention/Retention basins shall be privately maintained unless annexed into a County Service Area or other utility maintenance district.

3-4.06 Retention Ponds and Systems

- A. Developments will be required to provide terminal drainage where developments are within the required distance of a terminal drainage facility as specified in Chapter 9-1135 of the County Development Title.
- B. When this condition is not available, retention systems utilizing percolation as a means for emptying the retention system may be used only upon approval of the Director.
 - 1. Retention Ponds
 - a) Retention ponds which utilize percolation as a means of emptying the retention ponds shall not be permitted where the

highest recorded groundwater elevation is within 5 feet from the bottom of the retention pond.

- b) The use of dry wells for percolation may be used only upon approval of the Director.
- c) The maximum side slope for publicly maintained retention ponds shall be four horizontal to one vertical (4:1). retention ponds landscaped with turf that requires mowing shall have a maximum side slope of six horizontal to one vertical (6:1).
- d) Publicly maintained retention ponds shall be fenced with a 6 foot high chain link fence or equal when the maximum design depth is 18 inches or more. An 18 foot double gate shall provide access within the fenced area.
- e) Publicly maintained retention ponds shall be constructed per County Standard Drawing No. D-23. Deviation from this design must be approved by the Director.
- f) Design exceptions may be used only upon approval of the Director. Design shall conform to the following criteria:
 - i. Permeability and differential head available must be considered for the life of the project, not just present values.
 - ii. In-situ conditions shall be evaluated by a registered engineer. A geotechnical report with recommendations for the proposed retention pond shall be submitted for review by the County.
 - iii. The volume of retention pond storage required shall be as follows:

$$V_p = F_s C A R / 12, \text{ where}$$

- V_p is the volume of retention pond storage required.
- F_s is the factor of safety as recommended in the geotechnical report. (A factor of safety of 2.0 or higher may be used in lieu of items (f)i and (f)ii)
- C is the runoff coefficient. See Table 3-1.
- A is the contributing area in acres.
- R is the total rainfall, in inches, for the 10 year, 24 hour storm in rural areas and 10 years, 48 hour

storm in urban areas. Use the table on Standard Drawing No. D-3.

- iv. Retention ponds shall be designed to empty 100 percent of the required volume of storage V_p within 10 calendar days by percolation.
- v. Levees or berms shall not be permitted around retention ponds. The top of pond, for calculation purpose, shall be at least 1.5 feet below the lowest top of curb or street centerline in the tributary area.

2. Underground Retention Systems

- a) Underground retention systems may be used only upon approval of the Director.
- b) Underground retention systems which utilize percolation as a means of emptying the underground retention system shall not be permitted where the highest recorded groundwater elevation is within 5 feet from the bottom of the underground retention systems.
- c) Underground retention systems shall conform to the following design criteria:
 - i. Permeability and differential head available must be considered for the life of the project, not just present values.
 - ii. In-situ conditions shall be evaluated by a registered engineer. A geotechnical report with recommendations for the proposed underground retention system shall be submitted for review by the County.
 - iii. The required volume of underground retention storage system shall be:

$$V_p = F_s C A R / 12.$$

V_p is the volume of underground retention storage system.

F_s is the factor of safety as determined by a registered engineer.

C is the runoff coefficient. See Table 3-1.

A is the contributing area in acres.

- R is the total rainfall, in inches, for the 10 year, 24 hour storm in rural areas and 10 years, 48 hour storm in urban areas. Use Standard Drawing No. D-3.
- iv. Underground retention systems shall be designed to empty 100 percent of the required volume of storage V_p within 10 calendar days by percolation.
- d) The top of the underground retention system shall be at least 1.5 feet below the lowest top of curb or street centerline in the tributary area.
- e) All underground retention systems shall be designed, subject to review by the County, with pollutant filtration of storm water prior to entering into the underground percolation chamber(s) to the satisfaction of the County.
- f) Underground retention systems shall provide means of visual inspection, access and maintenance.
- g) The following statements shall appear on all plans which include the use of underground retention systems:
- i. "All underground retention systems shown on this project shall be maintained by the owners. The underground retention systems shall be modified, upgraded, or replace with similar or other appropriate devices/measures by the owners when they cease to drain the underground retention system's water within a 10 calendar day period. If pollutant filtration devices are required, regular maintenance in accordance with a required maintenance agreement will be necessary to achieve the best operation of the pollutant filtration devices."
- ii. "During site development, all underground percolation chambers shall be securely covered with filter cloth or other material as approved by the County to prevent the introduction of sediment into the settling chamber."
- h) Access to underground retention systems shall be secured with a bolted grate or solid cover to prevent unauthorized entry. A minimum of two inspection locations into each storage unit shall be provided. Forty-eight inch minimum maintenance holes shafts at each access point shall be provided. If regular

maintenance requires entering the storage unit and/or the inspection location is not secured to prevent unauthorized entry, then a fixed ladder must be installed at each inspection location.

- i) A registered engineer shall provide calculations showing that failure of the underground system will (a) not jeopardize adjacent overhead power structures or adjacent building structures and (b) not collapse soil beyond the property boundaries. In lieu of calculations, the designer may assume that the plane of failure is a 1:1 angle of repose from the outside edge of the underground structure plus 2 feet. For circular pipes, the outside edge of the structure is defined as the springline of the pipe. Structures shall be designed to resist uplift pressures. Buoyancy calculations are required to demonstrate the system meets this requirement.
- j) Underground retention systems are subject to the requirements of San Joaquin County Mosquito and Vector Control District and the California Health and Safety Code for the prevention or mosquitoes. Underground retention systems that incorporate permanent water sumps, vaults, or basins, shall be made to deny mosquito access (e.g. tight fitting covers). Any gaps or holes shall not be greater than 1/16 of an inch.
- k) Owner shall execute and record a Maintenance Agreement with the County and shall comply with Section 7 of the San Joaquin County Storm Water Quality Control Criteria Plan (SWQCCP).

3-4.07 Culvert Criteria

- A. Culverts shall be designed per the County Standard Drawing Nos. D-6 through D-11. Maximum headwater depth at inlets shall not exceed 1.5 times the pipe diameter without approval of the Director.
- B. The constants $K_e = 0.25$ and $K_o = 0.75$ shall be used for concrete pipes and box culverts. For corrugated pipes, $K_e = 0.50$ and $K_o = 1.0$ shall be used.
- C. Cross culverts, conduits and box structures shall be designed to pass the peak flow from the 10 year storm without damage to the roadway and shall be checked on the basis of the 10 year runoff plus 50 percent to determine that no serious damage will be incurred upstream as a result of the higher design storm.

- D. Cross culvert profile will be determined by an examination of the overall profile of the channel for a minimum distance of 500 feet each side of the installation.
- E. Outlet velocities of all culverts must be checked. When outlet velocity exceeds the maximum permissible channel velocity listed on Table 3-4, energy dissipaters must be provided to minimize potential erosion at the outlet.

3-4.08 Inlet Criteria

- A. Inlets shall be spaced so that the flow capacity of the inlet is not exceeded by the 10 year design storm flow rate or so that the length of gutter flow does not exceed 700 feet, whichever is less. The design flow capacity of a Type 1 Curb Inlet Catch Basin is 1.7 cfs and shall conform with the County Standard Drawing No. D-13A. The larger Type 2 Curb Inlet Catch Basin shall be used in industrial or commercial areas and shall conform with the County Standard Drawing No. D-13B. The Type 2 Curb Inlet has a design flow capacity of 2.3 cfs.
- B. Drainage in a low area (sag point) must be provided with a secondary means of outflow for flows greater than the design capacity of the drain system. This outlet must be provided as overland, street or other above ground means of carrying flow.
- C. The 18 inch storm drain inlet per County Standard Drawing No. D-14A may be used in areas outside of the pavement or in locations without curb and gutter. Capacity of this inlet is dependent on maximum allowable submergence and can be calculated using the formula $Q(\text{cfs}) = 6 (h)^{1/2}$, where h is the height of water ponding above the grate (ft).

3-4.09 Surface Flow and Allowable Inundation

- A. The depth of flow for a 100 year design storm shall not exceed 6 inches above the top of curb or where there is no curb, six inches above the edge of pavement. In all cases the depth of flow for a 100 year design storm shall be 6 inches below the lowest floor of adjacent structures.
- B. The depth flow for a 10 year design storm shall not exceed the top of curb height or where there is no curb, the edge of pavement.

3-5.0 **DRAINAGE STRUCTURES**

3-5.01 Alignment of Drainage Facilities

- A. Drainage pipelines shall be located in the street whenever possible. The location shall be in accordance with County Standard Drawings No. R-35 and D-1.
- B. Drainage pipelines shall be aligned straight between structures except where parallel to the street centerline per paragraph A above. Long radius curves are permitted for pipe 24 inches and larger. The radius of curvature must not be less than 100 feet or the manufacturers recommendation for curved alignment, whichever is greater. Curves, radii, and length of pipe joints must be shown on the improvement plans.

3-5.02 Easements

Easements for drainage facilities shall meet the requirements of the San Joaquin County development standards and the following design standards:

- A. Closed Conduit - Easements for closed conduits shall meet the following requirements:
 - 1. For pipes 24 inch in diameter and less with trench depth less than or equal to 5 feet, the minimum width of the easement shall be 15 feet with the centerline of the pipe at the quarter point of the easement; pipe may reverse sides at angle points.
 - 2. Temporary access and working easements must be obtained.
 - 3. For pipes exceeding 24 inch in diameter or trenches greater than 5 feet deep, the easement shall have additional width to provide ample working space as required by the Director.
- B. Open Channels – Easements for open channels shall have sufficient width to contain the open channel with side slopes, fencing where required, and a 15 foot service road when required by the Director. Suitable ramps must be provided for access to the bottom when bottom is used for maintenance.

3-5.03 Closed Conduit Design

- A. Closed conduits shall be either cast-in-place concrete pipe, precast reinforced concrete pipe, non-reinforced concrete pipe, corrugated steel or aluminum pipe or corrugated thermoplastic pipe (HDPE), ribbed steel or ribbed thermoplastic pipe, aluminum pipe, or corrugated, ribbed, or solid wall PVC. Alternative pipes may be used only upon approval of the Director.

- B. The specified type and class or strength of pipe or alternate pipes must be shown on the plans. Revised plans must be submitted to the County for approval if use of pipe not shown on the plans is desired.
- C. Cover requirements are shown on County Standard Drawing No. R-29. Where the minimum cover requirement cannot be provided, the conduit shall be encased in concrete slurry or provided with a concrete cover or other method of pipe protection approved by the Director. Bedding and backfill shall be in accordance with State of California Department of Transportation Standard Specifications and County Standard Drawing No. R-29.
- D. Where different size pipes meet at a junction, the pipe crown elevations shall be matched unless otherwise approved by the Director.

3-5.04 Maintenance holes and Junction Boxes

- A. Standard precast concrete or saddle type maintenance holes per County Standard Drawing Nos. S-2 and D-16 shall be used where feasible. For cases where special maintenance holes or junction boxes are necessary, the design must be detailed on the drawings and approved by the Director. In no case shall maintenance holes or junction boxes be allowed which are smaller than 24 inches inside dimensions. All maintenance holes and junction boxes other than inlets shall have standard maintenance hole covers.
- B. Maintenance holes shall be constructed at junction points, angle points greater than 15E, changes in grade and changes in pipe size. On curved pipes maintenance holes must be located at either the B.C. or E.C. of the curve.
- C. Maximum spacing of maintenance holes shall be as follows:
 - 1. For pipe sizes 24 inches or less in diameter the maximum spacing of maintenance holes shall be 500 feet.
 - 2. For pipes greater than 24 inches in diameter the maximum spacing may be up to 600 feet.
 - 3. For curved pipe with radii less than 400 feet, maximum spacing shall be 300 feet.
 - 4. For curved pipe of radii 400 feet or greater, the maximum spacing shall be 400 feet for pipe 24 inch or less in diameter and 500 feet for pipe greater than 24 inch in diameter.

D. Maintenance holes shall be sized as follows:

1. A 48 inch precast maintenance hole shall be used for pipes up to a maximum inside diameter of 33 inches. The maintenance hole shall have no more than 24 inches opening for connecting pipes at the same level in any one maintenance hole quadrant. There shall be a minimum of 5 inches at the inside face of the maintenance hole between the outside of connecting pipes.
2. A 60 inch precast maintenance hole shall be used for pipes up to a maximum inside diameter of 48 inches. The maintenance hole shall have no more than 36 inches of opening for connecting pipes at the same level in any one maintenance hole quadrant. There shall be a minimum of 6 inches at the inside face of the maintenance hole between the outside of connecting pipes.
3. A 72 inch precast maintenance hole shall be used for pipes up to a maximum inside diameter of 60 inches. The maintenance hole shall have no more than 48 inches of opening for connecting pipes at the same level in any one maintenance hole quadrant. There shall be a minimum of 6 inches at the inside face of the maintenance hole between the outside of connecting pipes.
4. A 48 inch saddle maintenance hole may be used on pipes 30 inches in diameter and over. Lateral pipes shall be no more than one half the diameter of the main line and shall enter the maintenance hole radial to the main line.

3-5.05 Inlets

- A. Drain inlets shall be constructed per County Standard Drawing Nos. D-13A through D-14A. Deviations from the standard inlets must be approved by the Director. Type 1 Curb Inlets shall be used in residential areas and Type 2 Inlets shall be used in commercial and industrial areas.
- B. A drain inlet must be placed at all gutter sag points. Inlets shall not be allowed within street crosswalks. Spacing of inlets shall meet the hydraulic criteria as set in these standards.

3-5.06 Open Channels

- A. Natural Channels

Natural or grass lined channels shall have a maximum side slope of 2:1. For locations of unstable soils the maximum side slope may be 3:1 at the discretion of the Director. The geometry of the channel shall be designed to handle the design flow.

B. Concrete Lined Channels

1. Concrete lined channels may be constructed if one or more of the following conditions are met:
 - a) the capacity of a 66 inch pipe is exceeded, or
 - b) where the cover requirements for buried pipe cannot be met, or
 - c) where the required pipe or natural channel grade cannot be maintained, or
 - d) where slope lining is required to maintain the desired channel side slope.
2. All concrete lined channels with a design water depth greater than 18" shall be enclosed by a minimum 6 foot high chain link fence and include provision for maintenance access.

C. Rock Lined Channel

Rock lined channels, including gabions, may be constructed in lieu of concrete channels, but must maintain a maximum 2:1 side slope, and must conform to Standards and Specifications of the California Department of Transportation.

D. Inlet and Outlet Structures

1. Inlets from channels to pipes shall be designed per County Standard Drawing Nos. D-18 through D-19. Trash racks may be required in high debris areas. Trash racks shall be designed per County Standard Drawing No. D-21.
2. Outlets from pipes to natural or grass lined channels shall include erosion control provisions per County Standard Drawing No. D-21.

3-5.07 Culverts

- A. The Federal Highway Administration's "Hydraulic Design of Highway Culverts" shall be used to compute the capacity of all cross culverts that are not to become a part of the closed conduit system.
- B. All head walls, wingwalls, and end walls shall be considered individually and shall be, in general, designed in accordance with the Standards and Specifications of the California Department of Transportation.

3-5.08 Pump Stations

A. General

1. The use of drainage pumps shall be avoided whenever possible, and used only with the specific approval of the Director.
2. If the use of drainage pumps is permitted, the drainage system shall be so designed as to provide for gravity outfall during the summer months and other periods of low water stages. If a low stage gravity outfall is impossible or impractical, an alternate pump of smaller capacity for low stage flow shall be provided.
3. Pumping installations shall be so designed to accommodate a design storm as specified in these standards. When a station contains gravity discharge, pumping capacity must be equal to the design inflow. When the station does not have a gravity discharge, pumping units must be designed to furnish 100 percent of the design discharge with the largest pump out of service. Any deviation from these criteria must receive the specific approval of the Director.

B. Pump Station Design

Pump stations, where allowed, shall incorporate the following features:

1. Pumps or other devices shall be duplex. Minimum desirable size is 4 inches. Maximum velocity in suction is 5 ft/sec. Centrifugal pumps shall be capable of passing 3 inch solids.
2. Pump stations with capacities over 9,000 gpm (20 cfs) shall be equipped with vertical mixed-flow pumps. Pump motors and controls shall be enclosed in a concrete block building in residential areas; otherwise pump motors may be in the open if manufactured to operate in an exposed environment. A bridge crane and adequate work access shall be provided for either open or enclosed pump stations.

3. Capacity shall be provided for the design storm with the largest pump out of service. Staged installation of pumps is allowed, providing space is provided for future installations. Where slide mount submersible pumps are used, a duplex installation of 100 percent design capacity may be used if a spare pump assembly is supplied to the County complete. Where design flows exceed 1.0 cfs, a low flow pump shall be provided in addition to the design rated pumps. The low flow pump shall operate as the lead pump.
4. Locks, keyed to the County master system, shall be provided at the access to the pump station and to the wet well.
5. A lifting loop over each pump/motor, or similar provisions for removal of pump shall be provided. Permanent hoists shall be required when removal of larger pumps is impractical.
6. Pump station and wet well shall be lighted.
7. The wet well rim and electrical panel shall be above the 200-Year Flood Elevation.
8. Pump curves, operating voltage and phasing, horsepower, etc., shall be in accordance with approved submittal per section 74 of Caltrans Standard Specifications.
9. Submersible pumps shall be capable of running in air without damage. Moisture sensing circuit breakers in terminal changer shall be incorporated into submersible pumps.
10. A NEMA weatherproof enclosure shall be provided for all outdoor controls. Electric service shall be provided by underground conduit to the utility service pedestal.
11. Controls shall be by solid state programmable controller such as Tesco Liquidtronic III Model 36-663 (or equal) with CB612 sensor (or equal) with LED digital readout with purge and clean capacities and automatic pump alternating. A standby battery and charger shall be supplied. The battery is to be able to operate the controller for 2 weeks with the external power source removed. An adjustable time delay before any restart shall be incorporated which allows delays from 1 to 10 minutes. Bubbler type controls will not be accepted. Switches for manual operation of each pump shall be included.
12. An on-site alarm with exterior lights and horn with battery backup, including power failure and high water sensors shall be provided.

13. An automatic telephone dialer and message capability for all alarms shall be installed.
14. Each pump shall have a gate valve and check valve on the discharge piping. Dual pressure mains may be required by the Director.
15. Access and work area of pump stations shall be paved with a minimum 2 inch AC over 4 inch AB.
16. 6 foot high chain link fence per Caltrans Standard A85 shall be constructed to enclose the pump station.
17. A means of dewatering force mains shall be provided.
18. The pump station shall not be in County right-of-way except with approval from the Director.
19. The interior of the structure, all machinery, piping, and exterior below grade shall be painted.
20. The County shall be provided with three complete sets of manufacturer's brochures, technical data, operation and maintenance manuals, schematics, wiring diagrams, etc., for all equipment and controls.
21. Submersible lift stations shall meet the minimum requirements of "SWPA Handbook, Submersible Sewage Pumping Systems" by Submersible Wastewater Pump Association. Pumps shall be rail mounted with auto disconnect.
22. Trash racks shall be provided upstream from the pumps. The trash racks shall be designed to be easily cleaned.
23. Emergency operation during power outages shall be provided by either a connection for a County portable generator, or a diesel powered generator onsite with automatic transfer switch as approved by the director.

C. Structural

Structures shall be reinforced concrete, fusion epoxy coated or galvanized steel. In residential areas, structures shall be below ground. Provide a hatch suitable for the removal and replacement of major equipment components. Hatches shall be spring loaded with metal provided in brass, stainless steel or aluminum materials. Where

applicable, provide equipment-lifting eyes in roof of station. All structures shall have ample working room around machinery. Minimum clearance to wall shall be 24 inch or greater as needed for adequate maintenance.

Wherever due to the size and facility requirements a pump house building is required, the building shall be masonry block. Access for equipment removal shall be provided without roof or door removal.

D. Mechanical and Piping

A reduced pressure principal backflow prevention device is required on all domestic water connections. A 1 inch metered connection is to be provided adjacent to the station with a ¾ inch hose bib on site.

E. Electrical

All electrical installations shall comply with the current County adopted California Electrical Code and NEMA. Use enclosed prefabricated electrical panels mounted above ground level outside the pump station. Provide running time meters for all motors (use reset type). Provide explosion-proof electrical appurtenances below ground or an approved type disconnect and time delay. Adequate lighting and electrical outlets shall be provided. Color code and number all wiring, switches, controls, relays, and piping. (National Standard Coding). An Electrical Permit is required from the San Joaquin County Community Development Department – Building Division. All local utility requirements shall be met by the Developer.

F. Force Main Design

Maximum velocity shall be 10 ft/sec. Minimum velocity shall be 2 ft/sec. The design shall include an outfall structure with erosion protection.

3-6.0 **DRAINAGE REPORT**

3-6.01 **Required**

A drainage report shall be required on a case by case basis as determined by the Director.

3-6.02 **Content**

Drainage reports shall contain the following:

1. General information on project, name, location, and character, and the engineer preparing the report.
2. Maps showing drainage basins relative to the project and sub-basins within the project. Each drain inlet or catch basin shall be shown with its contributing sub-basin.
3. Capacities and sizes of existing drainage systems that will be affected by the project. Calculations of design runoff before and after project development and with the entire basin developed.
4. Runoff calculations at each drain inlet or catch basin and for each pipe reach. The calculations shall include areas, runoff coefficients, time of concentration, and rainfall intensities in a table similar to County Standard Drawing No. D-2. The calculations shall also include any bypass flow from upstream inlets.
5. Hydraulic calculations for depth of flow in the gutter at each inlet or catch basin, quantity of water picked up at each basin and bypassing each basin. The hydraulic calculations shall also include the quantity of water in each pipe reach along with pipe size, length, and slope, hydraulic gradient, invert and hydraulic grade line elevations, channel dimensions, and water surface profile. This information shall be summarized in a table similar to County Standard Drawing No. D-2.
6. Detention or retention pond calculations including volumes, routing, ponding elevations, and discharge rates.
7. Pumping station calculations for sizing pumps, piping and sumps, along with a sketch of the pump station showing plan and elevations, pumps, piping, controls, and site access.

3-7.0 **DRAINAGE IMPROVEMENT PLANS**

3-7.01 **Plan and Profile Requirements**

- A. A plan and profile shall be shown for all drainage facilities which carry natural drainage that originate upstream of or within the limits of the development.
- B. The plan view shall show all pipelines, pipe sizes, flow directions, maintenance hole locations, inlets, channels, culverts, centerline stationing, and curve data on centerline, or as an offset from another construction centerline. Catch basin and connector pipe invert elevations will also be shown on the plan view.

- C. The profile shall show pipe length, slope, size and construction material used for each mainline pipe or channel sections. Maintenance hole locations, inverts and stationing shall also be shown.
- D. Channel profiles will include the channel flowline and existing ground elevation along the channel centerline. Invert elevations will be shown at the grade changes.
- E. The hydraulic grade line of the 10 year storm shall be shown on all channel profiles and the 100 year when required by the Director for major channels. In closed conduits, the hydraulic grade line shall be shown when it is above the crown of the pipe.

MAINTENANCE AGREEMENTS

The property owner of record shall be responsible for all underground retention systems regular maintenance. Accumulations of silt, trash, litter, or stagnant water which create a health or safety hazard or which endanger the design function of the facility are not permitted. Underground retention systems that cease to drain a project area as designed shall be replaced/refurbished.

An engineer shall prepare a maintenance manual for underground storage systems. The manual shall contain the name, address, and telephone number of the selected maintenance company, As-Built plans of the facilities, maintenance schedule (frequency of inspection), an inspection checklist and any other necessary inspection lists and requirements, such as manufacturer's lists and requirements. It shall also contain a blank table for documentation of necessary maintenance and upgrades recommended by the inspections. The documentation shall include inspection dates and repair dates.

Underground storage systems inspections shall be performed annually or when the system fails to operate as designed. The underground storage systems owner shall document inspection of underground storage systems utilizing an inspection checklist and shall keep these inspections on file. A new underground storage system chamber shall be installed if an inspection reveals that an underground storage system chamber is no longer effective and cannot be returned to effective use.

Underground storage system chamber maintenance shall occur when inspection shows:

- Ten percent of the underground storage system capacity is filled with sediment, for underground storage systems in paved areas. Sediment has accumulated to 3 inches or more inside the sedimentation chamber, in paved areas.
- Twenty-five percent of the underground storage systems capacity is filled with sediment for underground storage systems in landscaped areas. Sediment has accumulated to 3 inches or more inside the sedimentation chamber, in

landscaped areas.

A non-stormwater discharge has entered the sedimentation chamber. Upon change of ownership of the sedimentation chamber.

Sedimentation chamber maintenance shall include:

Removal of dirt and debris.

Replacement of filter fabrics (if any) and petrochemical absorbent material.

Cleaning of screens.

Opening of liner weep hole.

Purging of accumulated silt out of the aggregate fill by jetting, surging, or pumping.

**CHAPTER 4
WATER SYSTEM DESIGN STANDARDS**

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**CHAPTER 4
WATER SYSTEM DESIGN STANDARDS**

4-1.0 **GENERAL**

4-1.01 Authority

These standards apply to any facility or system in the County that meets any one or more of the following conditions:

- A. The system is or will be in County right-of-way.
- B. The system serves, or plans to serve, water to any land development project that is subject to approval of the County Board of Supervisors, Planning Commission, or Department of Public Works.
- C. The system provides water for fire protection in San Joaquin County.

4-1.02 Water System Expansion/Repair

Expansions or repair of an existing system shall meet the standards provided herein without reducing the supply, flow or storage presently available to the existing system, unless such reduction does not reduce the quality or quantity below the requirements for the whole system based on these standards and approval of the Director is obtained.

4-1.03 Calculations Required

Calculations shall be stamped with wet signature and submitted with the improvement plan submittal. The calculations shall show existing and projected demands, existing and projected source capacity and storage, fire flow pressure, and distribution system performance under design flow conditions.

4-1.04 Definitions

As used in these Standards, the words defined in this section shall have the meanings herein ascribed:

Distribution System: Water Mains, together with all appurtenant and service laterals, necessary valves, fire hydrants, meters, and associated material and equipment which carry potable water and distribute it to individual consumers.

Main Extension: An extension to the Distribution System that is needed to serve a new development.

Main Replacement: A replacement of an existing portion of the Distribution System.

Private Pipe Extension: An extension that provides on-site domestic service or fire protection service on the consumer's side of the Department's water meter.

Service Lateral: The pipe or tubing, fittings, valves, and appurtenances necessary to convey water from the water main to the County's meter or curb stop.

Supply System: A general term covering all facilities related to obtaining service water and delivering it for residential, commercial, industrial, agricultural, irrigation or other end use.

Tap: Physical connection to a water main which, together with appropriate metering, effects water service to individual consumers.

Transmission Line: A pipeline together with all appurtenances primarily used to transport raw or treated water between two points.

Water Purveyors: A public utility, a mutual water company, a governmental agency, or other entity, owning and operating a water system and holding a valid permit to purvey water from the State or County health department/district. Also, the owner of a planned development served by its own well and holding a valid permit.

4-2.0 **WATER SUPPLY REQUIREMENTS**

4-2.01 **Quality**

Water supplied for use in domestic water systems in San Joaquin County shall conform to the latest provisions of Sections 3, 4 and 5 of the United States Public Health Service Drinking Water Standards, the requirements of the California Health and Safety Code and the California Administrative Code, Title 22 and any other applicable laws and regulations of the State of California.

4-2.02 **Supply Source**

A. General Requirements

The following General Requirements shall apply to all development requiring facilities and services for water supply, unless otherwise specified in this Title.

1. Private Water Supply Systems: Compliance with Public Health Services. When connection to an existing public water supply system or the creation of a new system is not required by the County, water supply facilities shall comply with the requirements of the San Joaquin County Environmental Health Department.

2. Public Water Supply Systems: Approval by Agencies for Public Water Systems. For developments and subdivisions requiring a public water system, the water system shall conform to the requirements of the County Fire Warden, the San Joaquin County Environmental Health Department, the County Public Works Department, and applicable State and Federal standards.
3. Private wells are prohibited from connection to a public water system

4-2.03 Community Water System

A. General Requirements

For those projects for which a new community water system is required, or a connection to an existing community water system is required, the following shall serve as the minimum requirements when determining adequate capacity.

B. Supply

A public water system shall be designed to meet the following criteria for water supply.

1. Sufficient water shall be available from the water sources to supply adequately, dependably, and safely the total requirements of all users under maximum daily demand conditions.
2. Sufficient water shall be available from the water sources, distribution reservoirs, and distribution system to supply adequately, dependably, and safely the total requirements of all users under maximum conditions. The maximum conditions shall be defined as the higher of either maximum hourly demand or maximum day demand plus fire flow. Maximum day demand is 2.2 times average demand and maximum hourly demand is 3.8 times average demand.
3. Where the water source is provided by wells, the well system shall be capable of meeting maximum daily requirements with 20 percent of the wells unavailable. Within well systems with four or less wells, the well system shall be capable of meeting maximum daily requirements with the largest capacity well out of service. A minimum of two wells is required for any public water system.

C. Demand

Demand on a water system shall be determined based on historical usage in similar land uses as approved by the Department of Public Works. The

water system demand shall not be less than the following.

<u>Development Type</u>	<u>Average Demand</u>
Residential	450 gpd/du*
Commercial	2,000 gpad**
Industrial	1,800 gpad

* gpd/du = gallons per day per dwelling unit

** gpad = gallons per acre per day

D. Fire Flow

A public water system shall be capable of supporting fireflow requirements of the County Fire Warden, and San Joaquin County Ordinance Title 4.

Storage or adequate source capacity shall be provided to maintain this rate of flow for a period of two hours. Standby power with a minimum of two hours uninterrupted supply of fuel is required for any non-gravity storage.

E. Emergency Storage

Capacity shall be provided to protect the users from failure of the domestic water supply and to assure an adequate quantity of water for fire protection in the event of a power or source failure or major disruption of the distribution system. Emergency storage shall be determined by the following criteria:

	<u>Configuration of Water System</u>	<u>Minimum Required Storage</u>	
		<u>% of Average Daily Domestic Use</u>	<u>% of Average 2 Hour Fire Flow</u>
1.	Single power source, no standby power, and a single source of supply.	50	50
2.	Single power source, standby power, single source of supply.	25	25
3.	Double power source, single source of supply.	10	10

4. Multiple power source, 0 0
multiple source of supply.

The requirements for domestic use and fireflow shall be additive. The time for replenishment of storage shall not exceed 48 hours. Standby power must be provided with a minimum of ten hours uninterrupted supply of fuel to be eligible for credit toward minimum storage.

4-3.0 **WATER DISTRIBUTION SYSTEM DESIGN**

4-3.01 Distribution System

A. General

Distribution facilities shall be designed to provide the lowest cost over their expected life. This may not necessarily result in the lowest initial cost when long term operation and maintenance costs are considered. This policy, however, results in a water supply system that yields optimum quality at the lowest total cost to the consumer. Water mains shall be constructed of ductile iron pipe or polyvinyl chloride pipe, or meet the requirements of the water purveyor.

B. Location of Water Mains

1. General

All pipelines designed for the transmission or distribution of domestic water supply shall be located within rights-of-way dedicated for public streets or roads unless the use of an easement is specifically approved by the County.

2. Location

In all new streets, water mains shall be located on the north or west side of the street (see County Standard Drawing No. D-1). When water lines are to be constructed in existing streets, they shall be placed in the same location as new streets when practicable. However, traffic conditions, existing utilities, and other physical features shall be considered. The horizontal distance between parallel water and sanitary sewer lines shall not be less than 10 feet unless authorized by the Engineer and in accordance with Section 64630, Title 22, California Administrative Code.

3. Rights-of-way

- a) Permanent rights-of-way in a form acceptable to the County shall be provided for water mains not located in public road. The

minimum easement width shall be 10 feet and located all on one parcel. Wider easements may be required by the Director for water mains over 18 inches diameter. The pipe shall be located in the center of the right-of-way.

- b) Temporary construction easements may be required for installing mains off-site.

C. Layout and Sizing

1. General

Whenever possible, the distribution system shall be in grid form so pressures throughout the system tend to equalize under varying rates and locations of drafts.

2. Layout and Sizing of Mains

- a) System design shall be based on the Hazen-Williams formula with $C = 110$. All mains shall be sized to provide a minimum of 20 psi residual pressure at all service connections in the system under maximum hour demand or maximum day demand plus fire flow. Maximum velocities shall not exceed 10 ft/sec in design. Hydraulic analysis of any proposed distribution system shall be submitted for review to the Director upon request.
- b) The minimum size pipe shall be not less than 6 inches inside diameter. Where over 700 feet of main is installed with no looped side mains, minimum pipe size shall be 8-inch or larger.
- c) Larger size pipes shall be provided to serve multiple housing, school, commercial or industrial areas as determined by an engineering study prepared by a registered engineer. Minimum size pipes serving commercial or industrial areas shall be 10-inch inside diameter.
- d) Dual mains (one pipeline on each side of the street) may be required in streets which carry heavy concentrations of traffic, or the rights-of-way of which are 84 feet or more in width. State highways or County major arterial generally are in this category. In those streets classified for dual mains, the minimum sizes shall be 6 inches in diameter on each side in residential areas. In commercial districts, the sizes of pipe shall be not less than one 8-inch and one 6-inch.
- e) The distribution system grid shall contain at a minimum, 8-inch or larger cross-connecting mains at intervals of approximately 1,300

feet, with intermediate 6-inch lines.

- f) Dead-end mains shall be avoided if possible. If used, a dead-end main shall be provided with a fire hydrant or blow off valve. Air release valves and vacuum breakers shall be placed at high points and blow off valves at low points as required. The maximum length of a dead end line shall be 700 feet.
- g) Whenever an area outside a development can be logically served by future extension of a main or mains within the development, such mains shall extend as close as practicable to the development boundary, and be provided with a means of flushing.
- h) Whenever a water main is to cross a sewage force main, the water main shall be installed a minimum of 2 feet above the sewer line where possible and shall be of ductile iron or AWWA C-900 Class 200 PVC with no joints within 9 feet on each side of the force main. If the water main crosses a sewer line closer than 2 feet, the pipe shall be completely encased in Class 3 concrete; refer to County Standard Drawing No. W-10.
- i) All non-metallic water mains shall have a No.10 gauge solid, bare, soft drawn copper wire laid along the pipe accessible in each valve box or other access opening to the system, to facilitate locating the pipe. Wire junctions shall be field soldered.
- j) Cement coated and lined steel pipe shall not be used for mains in areas where service taps can be anticipated or where soil conditions exist that would cause corrosion. Ductile iron pipe shall not be used where soil conditions exist that would cause corrosion.
- k) Any requirement of this section that cannot be met due to terrain or other factors may be varied with the specified approval of the Director.

3. Valves

The distribution system shall be equipped with a sufficient number of valves located such that no single "shut down" will result in shutting down a transmission main; necessitate the removal from service of a length of pipe greater than 500 feet in multiple family residential, school, commercial, or industrial districts, or greater than 800 feet in other areas; and in no case shall more than two fire hydrants be removed from service. Valves shall be located such that any section of main can be shut down without going to more than three locations to close valves. Insofar as practicable, valves shall be located at street

intersections opposite the curb return. If it is necessary to locate valves between intersections, they should be installed on a property line. Valves shall be of the same size as the pipeline in which they are installed. Valves shall be resilient seat gate valves for main size 10-inch and smaller, and butterfly valves for main sizes 12-inch and larger.

4. Fire Hydrants

- a. Fire hydrants shall be placed at street intersections whenever possible, and shall be located to minimize the hazard of damage by traffic. Fire hydrants located at intersections normally will be installed at the curb return. All others should be located on a property line. They shall have maximum spacing of 500 feet measured along the street frontage in single family residential zones, and 300 feet in multi-family, commercial and industrial zones. Additional hydrants may be required on property frontage or onsite as indicated by the California Fire Code or local fire district.
- b. The minimum size main serving a fire hydrant and the pipeline, valve, and bury connecting the hydrant, shall be 6 inches in diameter. Unless prior approval is obtained from the County and the governing fire district, not more than one fire hydrant shall be placed on a 6-inch main and not more than two on an 8-inch main, unless the mains are in a looped portion of the distribution system.
- c. The type of fire hydrant installation shall be as specified by the fire district or local agency providing fire protection. Hydrants shall be wet barrel type with a minimum of one 4-1/2 inch NFPA Standard thread outlet, and two 2-1/2 inch outlets.
- d. A blue reflective marker shall be placed on the street 12 inches toward the hydrant from the center of the street.

5. Service Lines

- a. Service lines from the water main to the property line shall be installed at the time the main is constructed wherever it is known or wherever it can be reasonably assumed that a connection is or will be required.
- b. Minimum size of a service line shall be 3/4 inch inside diameter and 1-1/4 inch maximum unless specifically

approved by the Director. All service lines shall be designed to provide adequate service to the facility to be served, and shall be identified on the plans.

- c. Service lines shall be solid copper water tubing, type K, polyethylene pressure pipe or polybutylene pressure pipe, with compression type fittings.
- d. Service lines shall be equipped with angle ball curb stop or gate valve at the property line. A gate valve may be used only when the service is 2 inches in diameter or larger. Installation of a valve or meter box is required.
- e. Service lines shall not be allowed to tap into transmission lines 12 inches or larger, unless specific written approval is obtained from the County and the water purveyor.
- f. The location of water service lines shall be permanently indicated by embedding the letter "W" in the curb, directly above the line. It shall be the developer's responsibility to so mark any curb which is poured after the installation of the service lines. Where curbs do not exist and are not planned during the improvement project, a 2" x 2" x 24" construction grade redwood stake shall be driven into the ground directly above the curb stop at the property line, and shall be painted bright blue and have a "W" stamped in the top.
- g. If a lot is served by both treated and untreated water systems, the location of the service lines shall be at opposite ends of the front lot line, or as widely separated as is practical, and with the approval of the County Environmental Health Department. Backflow prevention devices are required in the treated water service line of all lots having both treated and untreated systems.
- h. Non-metallic service lines shall have No. 10 solid copper wire from the water main locating wire to the meter box. The wire shall be looped and accessible in the meter box. Refer to County Standard Drawing No. W-11.

6. Thrust Blocks

All tees, bends, plugs, fire hydrants and other sections of piping and appurtenances that might be capable of being displaced by the action of either working pressures or test pressures within the water

system shall be anchored in place by the use of thrust blocks, thrust backing or harnesses as shown on the standard drawings. The bearing pressures of thrust blocking on the supporting soil shall not exceed that allowable for the soil involved. Required thrust block bearing areas shall be in accordance with standard W-5.

7. Valve Boxes and Vaults

A valve box or vault or capped standpipe shall be provided for every valve installed below ground surface. The cover for all valve boxes and vaults shall be metallic construction capable of withstanding HS-20 traffic loading per standard W-4.

8. Bacteria Sample Stations (refer to County Standard Drawing Nos. W-7, W-8, and W-9).

Bacteria Sample Stations shall be installed in all new subdivisions having a public water system. The bacteria sample stations shall be installed on main water lines only and at locations that will be representative of the systems water quality and pressure zones. Each water system shall have a minimum of two bacteria sample stations with one additional bacteria sample station for every 100 service connections installed on the water system.

9. Blow-Off Valves (refer to County Standard Drawing No. W-4).

All blow-off valves shall have a minimum outlet size of 2 inches and shall be designed for a minimum operating pressure of 150 psi. A blow-off or fire hydrant shall be installed at the terminus of all dead-end water mains or non-circulating water mains. The blow-off shall be sized to provide a minimum of 2.0 ft/sec velocity in the attached main. Blow-offs shall be used on temporary dead ends only.

10. Air and Vacuum Release Valves (refer to County Standard Drawing No. W-13).

Air and vacuum release valves shall be installed in the water system at all points where it is indicated that air pockets may form. The design shall be such as to ensure the release of air automatically from the water main. These valves may also ensure the entrance of air into the water main when the pressure inside the line is below atmospheric pressure. All valves shall be designed for a minimum of 150 psi operating pressure. The inlet to each valve

shall be provided with a gate valve or corporation stop to provide a positive closure between the main pipeline and the air and vacuum release valve, and the air and vacuum release vent outlet shall be installed 12 inches above adjacent ground to prevent backflow.

D. Meters (refer to County Standard Drawing No. W-1).

Meters are required on all services on all public systems. Meters shall read in gallons and meet the requirements of the latest revision of AWWA Standards or the County, whichever is higher. All meters shall be installed in a meter box which reaches ground surface. Meter boxes shall be clearly marked as containing water meters and shall be capable of withstanding vehicular traffic if set near driveways, sidewalks, or other areas subject to vehicular traffic. Meters shall not be placed in driveways.

E. Pressure Regulating Stations

Pressure regulating stations shall be required within the distribution system to control pressures between different pressure zones. Whenever pressure reducing stations are installed within the system they shall:

- (1) Be located in a concrete vault.
- (2) Be installed with enough shutoff valves and bypass piping to facilitate quick removal and repair.

F. Corrosion Protection

For all steel, cast iron or ductile iron replacements/installations, the applicant shall provide the County with a soil resistivity survey of the work area conducted by a Corrosion Specialist certified by the National Association of Corrosion Engineers or a Corrosion Engineer registered by the State of California. The submitted survey shall form the basis for proposed mitigation measures to be submitted with the plans and specifications for County review.

G. Miscellaneous Fittings

1. Check Valves

All check valves shall seat readily and completely to ensure water tightness. The face of the closure element and valve seat shall be bronze, composition, or other non-corrodible material which will seat tightly under all prevailing conditions of field use. All check valves, 4-inch and larger in size, for use on distribution mains, shall be designed for a minimum of 150 psi cold water working pressure.

2. Corporation Valves, Curb Valves, and Bronze Fittings

Miscellaneous bronze fittings (i.e., elbows, insulation couplings) shall be used where appropriate throughout the system, subject to the approval of the County.

Corporation and curb valves and miscellaneous bronze fittings shall conform to these County Standards.

3. Pipe Fittings

- a. Joints: Joints and fittings shall conform to applicable AWWA specifications. Mechanical joints for straight lengths of pipe will be allowed only when specifically approved by the Engineer.
- b. Closure Fittings: Mechanical couplings shall be of a gasketed, sleeve-type, with diameter to properly fit the pipe. Tolerance on pipe and coupling, together with proper bolt and gasket arrangements, shall be sufficient to ensure permanent watertight joints under all conditions.

Where pipes of different outside diameter are connected together, or where pipe is connected to fittings of different materials, great care shall be taken to ensure that the proper ring or adapter is selected.

- c. Repair Fittings: Repair clamps, repair sleeves, joint clamps, and similar devices shall not be used to repair or join water mains. Pipe damaged during installation shall be removed and replaced.
- d. Miscellaneous Pipe Fittings: Adapters, plugs, end caps, bulkheads, slip sleeves, anchor boxes, lock-joint gaskets, yokes and rods, and other appurtenances shall be used where appropriate throughout the system, subject to the approval of the Engineer. The County does not intend to unreasonably limit the installation of any type of fittings, joint, or proprietary device; however, the installation of any such fittings, not specifically approved by these standards, is subject to the approval of the Engineer. Written request for approval of deviating items shall be made in advance through the Engineer.
- e. Tapping Sleeves: Tapping sleeves or clamps shall be used to tap existing water mains that are in service and under pressure without interrupting service. **NO TAP SHALL BE MADE ON ANY**

EXISTING WATER MAIN WITHOUT WRITTEN CONSENT OF THE ENGINEER/WATER PURVEYOR. Notification shall be made a minimum of 48 hours in advance. Care shall be exercised to select sleeves and gaskets which are properly sized to fit the type and class of pipe to be tapped. Where 4-inch or larger tapping sleeves or clamps are used, a thrust block shall be formed and poured behind the sleeve to prevent possible damage to the main from pressure shocks which develop as valves are first opened.

- f. Line Valves: Line valves shall conform to the County Specifications for gate valves or butterfly valves. Line valves shall be the same size as the main and shall open to the left (counterclockwise) with resilient seat. Line valves in ductile iron or P.V.C. pipelines shall have push-on ends. Line valves in welded steel pipelines and in ductile iron and cast iron pipelines, in connection with tapping sleeves or clamps, shall have flanged ends.

4-3.02 Backflow and Backflow Prevention Devices

- A. Backflow is the flow of water or other liquid or foreign materials into the distribution mains of the water system from another source and is strictly prohibited. Backflow shall be prevented by the installation of an appropriate, approved backflow prevention device, purchased, installed, certified and maintained by the consumer at his own expense. Recertification is required annually on all new backflow devices.
- B. Type of Protection Required
 - 1. The type of protection that shall be provided to prevent backflow into the approved water supply shall be commensurate with the degree of hazard that exists on the consumer's premises. The type of protective assembly that may be required (listed in an increasing level of protection) includes: Reduced Pressure Principle Backflow Prevention Assembly (RP), and an Air-gap separation (AG). The water user may choose a higher level of protection than required. The minimum types of backflow protection required to protect the approved water supply, at the user's water connection to premises with varying degrees of hazard are given in Table 4-1. Situations which are not covered in Table 4-1 shall be evaluated on a case by case basis and the appropriate backflow protection shall be determined by the water purveyor.

Table 4-1
REQUIRED BACKFLOW PROTECTION

Degree of Hazard	Minimum Type of Backflow Prevention
(a) Sewage and Hazardous Substances	
(1) Premises where the public water is used to supplement a reclaimed water supply. An RP may be provided in lieu of an AG if approved by the Director and Environmental Health Department.	AG
(2) Premises where there is wastewater pumping and/or treatment plants and there is no interconnection with the public water system. This does not include a single family residence that has a sewage lift pump. An RP may be provided in lieu of an AG if approved by the Director and Environmental Health Department.	AG
(3) Premises where reclaimed water is used and there is no interconnection with the potable water system. An RP may be provided in lieu of an AG if approved by the Director and Environmental Health Department.	AG

TYPE OF BACKFLOW PROTECTION REQUIRED

Degree of Hazard	Minimum Type of Backflow Prevention
(4) Premises where hazardous substances are handled in any manner in which the substances may enter a potable water system. This does not include a single family residence that has a sewage lift pump. An RP may be provided in lieu of an AG	AG

if approved by the Director and Environmental Health Department.

- (5) Premises where there are irrigation systems into which fertilizers, herbicides, or pesticides are, or can be injected. RP
- (a) Fire Protection Systems
 - (1) Premises where the fire system is directly supplied from the public water system and there is an unapproved auxiliary water supply on or to the premises (not interconnected). RP
 - (2) Premises where the fire system is supplied from the public water system and where either elevated storage tanks or private reservoirs with pumps are used. (not interconnected) RP
- (b) Dockside Watering Points and Marine Facilities
 - (1) Pier hydrants for supplying water to vessels for any purpose. RP
 - (2) Premises where there are marine facilities. RP
- 2. Two or more services supplying water from different street mains to the same building, structure, or premises through which an interstreet main flow may occur, shall have at least a standard check valve on each water service to be located adjacent to and on the property side of the respective meters. Such check valve shall not be considered adequate if backflow protection is deemed necessary to protect the water system from pollution or contamination; in such cases the installation of approved backflow assemblies at such service connections shall be required.
- 3. For residential buildings with fire sprinkler system, an RP device is not required if the system meets all of the following conditions:
 - Only one service connection to the water main for the entire parcel.

- A single water meter to measure both domestic flow and fire sprinkler demand flow.
- A fire sprinkler system that is constructed of NSF/ANSI Std. 61 approved piping materials.
- The fire sprinkler system utilizes domestic water only and does not allow any chemical additives.
- A fire sprinkler piping system that is looped within the structure and is connected to a routinely used passive purge fixture (such as a water closet).
- At a minimum, the fire sprinkler riser assembly shall equip with a check valve, a pressure gauge, a flow alarm, and a test/drain valve.

4-3.03 Storage Facilities

A. Design

All steel tanks, standpipes, reservoirs and elevated tanks for water storage shall comply with "AWWA Standards" or A.P.I. Standard 12B Bolted or Welded Equivalent and also meet all foundation and seismic requirements of the AWWA Standards.

B. Repairing and Painting

All inspection, repairing, painting and repainting of steel tanks, standpipes, reservoirs, and elevated tanks for water storage shall comply with "AWWA Standards".

4-3.04 Booster Stations

Pumping facilities may be needed to provide adequate water pressure in the Distribution System. The type, size, and location of all pumping stations within the distribution system shall be specified by the Engineer and as approved by the County. Booster pumps that may damage the distribution system are prohibited as determined by the County.

All plans and specifications submitted to the County for review and approval of pumping stations shall be signed by and prepared by, or under the direct supervision of the Design Engineer.

4-4.0 WELLS

4-4.01 Siting

Public production wells shall be sited such that drawdown from one well does not adversely affect adjacent wells, but in no case shall adjacent wells be

closer than 1,000 feet. New wells shall be located within 100 feet of a public right-of-way with adequate access from the public right-of-way as determined by the Department of Public Works.

4-4.02 Site Improvements

Each new site shall be a minimum of 60 feet by 80 feet and be situated on a separate parcel. The site shall be improved with an all-weather surface of 4 inches of aggregate base with a 12 foot paved access driveway to the public right of way and a paved turnaround on site. A well development and waste disposal plan shall be submitted for review and approval by Public Works. An onsite retention pond shall be sized for the well development volume where terminal drainage is not available to the parcel unless exempted by the Director. Each site shall be fenced with a 6 foot chain link with a 12 foot double gate at the access drive. In residential neighborhoods the fence shall include brown plastic slats.

A stationary generator with a sound attenuation enclosure or wall is required unless exempted by the Director.

**CHAPTER 5
SEWER SYSTEM DESIGN STANDARDS**

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**CHAPTER 5
SEWER SYSTEM DESIGN STANDARDS**

5-1.0 **GENERAL**

5-1.01 General Requirements

A. Scope

The design and construction of sanitary sewers, sewer pump stations, sewage treatment plants, and sewer systems, in the unincorporated area of San Joaquin County subject to control or permit requirements of the County, shall be in accordance with these minimum design standards. The work shall comply with these standards except where specific modifications have been approved by the Director of Public Works in writing.

These requirements are applicable only when sanitary sewers do not fall within the jurisdiction of other special districts or agencies. In the event that such sewers are within the jurisdiction of another agency, all sanitary sewer improvements shall be designed and constructed in accordance with the requirements of that agency.

Where a sewage agency's requirements and standards are more restrictive than this manual, that agency's requirements shall govern. However, in no case shall the design standards used be less than those enumerated herein. Whenever sewage systems are to be installed in an area which has a special purpose plan, the facilities shall be designed to conform with the various elements of that plan.

B. Plumbing Code

All work on house laterals, house sewers, building sewers, outside of public rights-of-way or sewer easements will be governed by the provisions of the Uniform Plumbing Code as amended by these standards and other applicable ordinances of the local sewage agency.

5-1.02 Enforcement

Provisions of these Design Standards shall be enforced by the Director of Public Works.

A. Deviations

Written requests for deviations from the standards contained in this manual shall be submitted to the Director of Public Works. The County staff shall make a recommendation to the Director regarding the deviation. The final decision on deviations shall be made by the Director.

B. Waiver

The requirement for review by, and approval of, the Director of Public Works for sewer plans may be waived when all of the following conditions exist:

1. The facilities are to be accepted and maintained by an established Public District or Agency.
2. The agency or district has adopted standards which, in the opinion of the Director, are equivalent to, or more restrictive than, the adopted County Standards.
3. The plans are prepared by the developer's engineer and approved by the agency's or district's engineer.
4. The agency's or district's engineer is independent of the developer and the developer's engineer and no organizational conflicts of interest exist.
5. The agency or district's engineer by certificate shall state that the plans meet or exceed the minimum County Standards.
6. The district or agency has received written approval of the Director of Public Works for waiver of the requirement of his review and approval of the plans.

5-1.03 Definitions

Wherever any of the following words, or expressions or pronouns in place of them, are used in these specifications, they shall be understood to have the meanings given as follows:

Sewage Agency: The public agency or private company who owns and operates the sewage system.

Sewage Agency's Engineer: Civil Engineer registered in California employed by the sewage agency.

ADWF: Average Dry Weather Flow.

Infiltration: The quantity of groundwater or surface water that leaks into a pipe through joints, breaks, or holes.

PWWF: Peak Wet Weather Flow = [ADWF x PF]

Sewer: Sanitary sewer main.

Service Lateral: The pipe from the sewer main to the right-of-way or easement line, which provides a point of connection for each property.

B.O.D.: Biochemical Oxygen Demand.

5-2.0 **COMMUNITY SEWAGE SYSTEM DESIGN**

5-2.01 **Sewage Quantities**

- A. The following guidelines shall be used to compute average dry weather daily sewage flow.
1. The minimum quantity of wastewater that originates from a given area or development shall be calculated from Table 5-1.
 2. Table 5-1 is based on 100 gals/day/person and 3.5 people per dwelling unit for single family, 3.0 people per dwelling unit for 2 to 4 units per parcel, and 2.5 people per dwelling unit for over 5 units per parcel and mobile homes.
 3. Developments that have a substantially different dwelling unit count per acre must calculate the contributing flow instead of using Table 5-1, based on $ADWF = \text{Dwelling units} \times 100 \text{ gals/day/person} \times \text{people per dwelling unit}$.
 4. R-M and R-MH zones require specific calculations for each development. Developments obtaining variances from zoning restrictions and regulations also require calculations for determining wastewater flows. (See 7.)
 5. Table 5-1 is based on gross acreage.
 6. The minimum average dry weather flow rate for each zoning area shall be the ADWF from Table 5-1 times the gross acreage.

7. Computed ADWF for R-M shall be the number of units per acre times 300 times the gross acreage. Computed ADWF for R-MH zone shall be the number of units per acre times 250 times the gross acreage.

$$\text{ADWF} = \text{Units/Acre} \times 300/250 \text{ gallons/day/unit} \times \text{gross acreage.}$$

B. Peaking Factor

To compute the peak flow from the average flow, the peaking factor in Standard Drawing No.S-1 shall be used. The peaking factor includes an allowance for infiltration.

**TABLE 5-1
SEWAGE QUANTITIES**

<u>ZONE</u>	<u>DESCRIPTION</u>	<u>DU/ACRE</u>	<u>AVERAGE DAILY DRY WEATHER FLOW (ADWF) gal/day/Acre</u>
AGRICULTURAL ZONES			
AL	Limited Agriculture	1 DU/Acre	*
AG	General Agriculture	1 DU/Acre	*
AU	AG -Urban Reserved	1 DU/Acre	350
RESIDENTIAL			
RR	Rural Residential	0.5 To 1 DU/Acre	350-700
R-VL	Very Low Density Res	2.5 DU/Acre	875
R-L	Low Density Res	7.3 DU/Acre	2555
R-M	Medium Density Res	13.4 DU/Acre	**
R-MH	Med High Density Res		**
R-H	High Density Res		**
COMMERCIAL			
C-O	Office Commercial		2000
C-L	Limited Commercial		2000
C-N	Neighborhood Commercial		2000
C-C	Community Commercial		2000
C-G	General Commercial		2000
C-FS	Freeway Service Commercial		2000
C-RS	Rural Service Commercial		2000
C-X	Crossroads Commercial		2000

C-R Commercial Recreation * *

INDUSTRIAL

I-W	Warehouse Industrial	1600
I-P	Industrial Park	1600
I-L	Limited Industrial	1600
I-G	General Industrial	1600
I-T	Truck Terminal	1600

SCHOOLS

Elementary	2000
Jr. High or Middle	4000
High	4500

* Assumed on septic tanks.

** Requires calculations.

5-2.02 Sewer Capacities

A. General

1. Sewers shall be designed to carry the peak flow rates (PWWF) from all areas tributary to them. Sewers shall be designed for both size and depth to accommodate developments in upstream tributary areas which would logically be served by them. The design flow rate at any point shall be the average dry weather flow of all tributary areas times the peaking factor.
2. Zoning designations shown in Table 5-1 reflect the San Joaquin County General Plan zoning designations. Changes in zoning regulations shall be taken into consideration in computing flows.
3. Sewer mains shall be designed and constructed to transmit the design flow resulting from the ultimate development of the entire tributary area even though said area may not be within the project boundaries. Consideration of the type of development anticipated or existing shall be given in arriving at the design flow but in no case shall any sewer mains be smaller than the size required by the General Plan in the areas determined by Table 5-1 with the sewer mains flowing half full. In no case shall any sewer main be less than 6" in size.

4. The maximum depth of flow at design conditions in any lateral 10-inch diameter or less shall be 0.7 diameter. Lines 12-inch diameter or larger may be designed to flow full unless direct service sewer connections are planned, in which case the 0.7 diameter maximum depth shall govern.
5. In no case shall a smaller pipe be used in any location than that upstream of said location. Sewer mains shall be designed to withstand the vertical loads which will be imposed on them.
6. In the design of a system, one of the controlling conditions shall be that the lateral system is to be at sufficient depth to provide a minimum slope for the service sewer of 1/4 inch per foot, at the same time maintaining a minimum cover of 12 inches at any buildable location within the properties to be served, and a minimum of 4 feet of cover at the right-of-way line.

B. Hydraulic Design

1. Minimum velocity for any sanitary sewer shall be 2 feet per second for pipes flowing full or half full.
2. Design velocities for sanitary sewers shall be computed using Manning's formula with a constant "n" value of 0.013 for all pipe materials.

Since sanitary sewers are to be designed with no head on the inlet, the maximum design discharge shall not exceed the flow at critical slope and velocity, due to the unstable flow conditions at critical slope and critical velocity sanitary sewers should not be designed for these conditions, but maximum design discharge shall not exceed flow under these conditions regardless of greater slope.

Maximum velocities shall not exceed 16 feet per second (fps).

NOTE: UNDER NO CONDITION SHALL A GRAVITY SEWER BE DESIGNED TO FLOW UNDER PRESSURE.

C. Minimum Size

Minimum sewer main size shall be 6 inches. Minimum service lateral size shall be 4 inches.

D. Minimum Sewer Slopes

1. Purpose

Minimum slope requirements are necessary to assure self-cleansing and self-oxidizing velocities in order to avoid significant generation of hazardous, odorous, and corrosive sulfur compounds.

2. Minimum Slopes/Capacity:

Slopes of sewers shall equal or exceed those set forth in the following table:

Pipe Size In Inches	Minimum slope ratio in feet <u>per foot</u>	Capacity at 0.7 depth <u>in MGD</u>	Capacity at full depth <u>in MGD</u>
4 (service lateral)	0.0208		
6	0.005	0.22	
8	0.0035	0.38	
10	0.0025	0.58	
12	0.002	0.85	1.0
15	0.0015	1.32	1.6
18	0.0012	1.95	2.35

3. Substandard Slopes

Slopes below the minimum slopes may be used in order to avoid pumping only upon specific approval of the Director. Such approval should be solicited well in advance of completion of design.

4. Pipe for Substandard Slopes

Pipes in substandard slope areas or for flows less than 2 feet per second and pipe in all areas downstream from substandard slope areas where the peak flow rate is four times that in the section with substandard slope shall be corrosion-resistant sewer pipe.

5-2.03 Sewer Location

A. Roads

Sewer in new roads shall be located as indicated in County Standard Drawing No. D-1. Exceptions to these location requirements may be made only on approval of the Engineer.

In existing roads, the preferred sewer locations shall be off the pavement edge no closer than 2 feet.

The entire sanitary sewer system shall be located as mentioned above and shall be designed to clear all other existing or proposed utilities by a minimum of 6 inches.

B. Water-Sewer Separation

The State Department of Health requirements for separation shall be met in locating sewers. A minimum of 10 feet horizontal separation between water and sewer line shall be maintained except in accordance with Section 64630, Title 22, California Administrative Code.

C. Easements

Location of sewer lines in easements shall be kept to a minimum. Whenever possible, sewers shall be placed in the public right of way. Where sewer lines are located within easements, the easements shall be:

1. Granted with final map, or
2. Be granted to the entity accepting and maintaining the sewers, or
3. Be dedicated to and accepted by San Joaquin County.
4. The minimum width of any easement for sanitary sewer purpose shall be 10 feet. In special cases of terrain, depth of sewer line, etc., the easement width may be wider as required by the Director.
5. All easements shall include right of ingress and egress over adjoining property for maintenance, replacement and operation. No permanent structures shall be constructed in such easements, except fences, and except utilities which are subject of any overlapping easement.

6. Where easements parallel a property line, they shall be all on one property and not split by the property line.
7. Pipelines in easements shall be located along the center of easement.

D. Future Extensions

When an area outside the proposed project can be logically served by future extension of a proposed sewer, the proposed sewer shall extend to the proposed project boundary or to the end of a paved street in a manner to facilitate the future extension.

E. Alignment

1. Sewers shall be laid on a straight alignment and grade between manholes except that curved sewers may be used subject to the following requirements.
2. Curved Sewer Requirements
 - a. All curve data shall be shown on plans.
 - b. Radius of curvature and joint deflections shall be as recommended by the pipe manufacturer and approved by the Public Works Department; however, in no case shall the radius be less than 200 feet.
 - c. All deflections shall be at the pipe joints or by specially mitered pipe sections. Actual bending of the pipe itself will not be allowed.
 - d. A maintenance hole shall be constructed at both the B.C. and E.C. of curves where the length of curve exceeds 100 feet, otherwise a maintenance hole shall be required at one end of the curve only.
 - e. Vertical curves may be used in combination with horizontal curves. Where vertical curves are used, the sewer shall be sized for the flattest slope within the curve.
 - f. Maximum combined horizontal and vertical deflection at any joint shall be as recommended by the manufacturers but in no case more than 3 degrees.

- g. The arithmetic sum of all horizontal and vertical deflection in curved sewers between adjacent maintenance holes shall not exceed 60 degrees.

5-2.04 Depth of Sewers

A. Basic Requirements

Sewers shall be installed at a depth which will provide suitable service to the properties connected and will allow subsequent installation of water lines in accordance with Section 64630, Title 22, California Administrative Code.

B. Standard Depths

Minimum cover for any sewer main shall be 4 feet within the street section, and 3 feet in sewer easements. Any deviation from this cover shall require special design and approval by the Director of Public Works.

C. Exceptions

1. Special pipe cover shall be used when total cover over public and house connection sewers is less than 4 feet, and may be required when total cover will not be placed immediately after pipe installations, or when other special conditions exist.
2. 2 to 4 feet of cover shall require the use of ductile iron pipe or other approved bedding or encasement specifically designed for the cover conditions.
3. Less than 2 feet of cover shall require concrete encasement. In no case will cover less than 1 foot be permitted.
4. All pipe lines shall be designed and constructed to a load safety factor of 1.5. The Engineer, during design, shall consider impact and dead loads imposed upon the pipe both during construction and after construction. The construction plans shall show the maximum permissible trench width at the top of the pipe which shall be predetermined by the design engineer.

5-2.05 Structures

A. Maintenance holes

1. Locations

- a. Maintenance holes shall be located at all changes in alignment or grade and at all junctions.
- b. Maintenance holes shall be located at least every 400 feet along lines smaller than 24 inches in diameter. Spacing of maintenance holes on lines 24 inches in diameter and larger will usually be at 400 feet but may be extended subject to the approval of the Director.

2. Drop maintenance holes

Drop maintenance holes shall be constructed in accordance with County Standard Drawing No. S-2 and shall be used wherever sewers enter maintenance holes at more than 24 inches above the outlet elevation of the maintenance hole. Vertical curves may be used to eliminate drop maintenance holes with approval of the Director.

3. Design

Maintenance holes shall be constructed in accordance with County Standard Drawing No. D-16. When two lines of the same size enter a maintenance hole such that the flow of one must change direction by more than 20 degrees or if flow in a single line must change direction more than that amount, the invert grade at the exit must be at least 0.10 foot below that of the entrance pipe or, as a maximum, the crown of the exiting pipe shall match the invert of the entrance pipe. If the pipes entering and exiting any maintenance hole are not of the same size, the minimum invert elevation differential shall be that which occurs when the pipes are matched crown to crown and the maximum invert elevation differential shall be based on the invert of the entering pipe matching the crown of the existing pipe. Drop connections are not governed by the above elevation requirements.

4. Protection

Where new proposed sewers are to be connected into a maintenance hole which is in active use, the designer shall call for such protection as is necessary to prevent construction debris from being washed into the active sewers. Plugged inlets or other suitable protection shall be called for in the active maintenance hole before beginning maintenance hole modifications or proposed sewer cleaning.

5. Elevations

Finished elevations of frames and covers shall be set flush with finished grades of the completed road surface or 12 inches above finished surrounding grade when more than 10 feet outside of paved roadway.

B. Cleanouts

Requirements

Dead end 6 and 8 inch sewer mains not over 200 feet in length shall terminate in standard maintenance holes or cleanouts. Dead ends over 200 feet long shall terminate in standard maintenance holes unless future extension of said dead end will include a maintenance hole within 400 feet of the upper-most maintenance hole, in which case a temporary clean out is permitted.

C. Structures and Pipes

1. Roads

All structures and pipe placed under public roads shall be of sufficient strength to support with an adequate factor of safety the backfill, road surfacing and H-20 truck loading with impact.

2. Other Pipes and Structures

Sewers under other pipes and structures shall be protected from damage and shall be constructed so as not to endanger the other pipe or structure. The concrete blanket method is not required where the distance between the outside of crossing pipes exceeds 12 inches unless required by water-sewer separation rule.

5-2.06 Service Laterals

A. Requirements

Wherever it is known or can be reasonably assumed that a building sewer connection is required, a service lateral shall be shown on the plans and installed to the property line as a part of the street sewer construction, prior to paving. Service laterals shall be installed whenever possible during construction of the sewer main using prefabricated fittings. Reference Standard Drawing No.S-7.

B. Size

Service laterals for single dwellings and small single stores or offices shall be 4 inches minimum or as required by Uniform Plumbing Code. All other service laterals shall be 6 inches or larger and at least equal to the size of the building sewer.

C. Depth

Service laterals shall be at the minimum depths herein provided and in addition such depth shall be sufficient to provide a connection to any point on the lot within the established building setback lines with a cover of one foot and a slope of not less than 0.02. Any exception to this requirement must have approval by the Director of Public Works.

D. Design

Service laterals shall be constructed in conformity with County Standard Drawing No. S-6.

E. Future Connections

Unused service connections shall be tightly sealed and staked in a manner to facilitate their future location and use.

F. Backflow Prevention

Sewers shall be designed to preclude the backflow of sewage into service laterals. If it is infeasible to install the waste receptacles in any building at least 1 foot higher than the rim elevation of the next upstream maintenance hole, or other structure providing hydraulic relief, then backflow prevention devices shall be installed in the building waste line on the property side of the service lateral cleanout.

G. Connection to Cesspools or Septic Tanks

Cesspool seepage pits shall not be connected to any public sewer. Septic tanks shall not be connected to any public sewer except where part of an approved Septic Tank Effluent Pumping (STEP) design.

H. Curb Markings

The location of all sewer service laterals shall be marked by an "S" cast into the concrete of the curb at completion of construction.

5-2.07 Force Mains and Lift Stations

A. Requirements

Where extreme hardship conditions prevail, and a substantial area cannot be serviced by gravity sewers in accordance with these standards, a sewage pumping station may be installed. No sewer design shall rely on a pumping facility without prior approval of the Director.

B. Lift Station Design

Lift stations, where allowed, shall incorporate the following features:

1. Pumps or other devices shall be duplex. Minimum desirable size is 4 inches. Maximum velocity in suction is 5 ft/sec. Pumps shall be capable of passing 3 inch solids.
2. Capacity shall be provided to handle ultimate peak flow from the tributary area with the largest pump out of service. Stage installation of pumps is allowed, however space should be provided for future installations. Where slide mount submersible pumps are used, a duplex installation of 100 percent design capacity may be used if a spare pump assembly is supplied to the County complete. Where design flows exceed 1.0 cfs, a low flow pump shall be provided in addition to the design rated pumps. The low flow pump shall operate as the lead pump.
3. Access to pump station and to wet well shall be provided with locks keyed to County Master.
4. A lifting loop over each pump/motor, or similar provisions for removal of pump shall be provided.
5. Pump station and wet well shall be lighted.
6. The wet well rim and electrical panel shall be above the 200-Year Flood Elevation.
7. Pump curves, operating voltage and phasing, horsepower, etc., shall be in accordance with approved submittal per section 74 of Caltrans Standard Specifications.
8. Submersible pumps shall be capable of running in air without damage. Moisture sensing circuit breakers in terminal changer shall be incorporated into submersible pumps.

9. Pump station controls shall be housed in a NEMA weatherproof outdoor enclosure. Electric service shall be provided by underground conduit to the utility service pedestal.
10. Controls shall be by solid state programmable controller such as Tesco Liquidtronic III Model 36-663 (or equal) with CB612 sensor (or equal) with LED digital readout with purge and clean capacities and automatic pump alternating. A standby battery and charger shall be supplied. The battery is to be able to operate the controller for two weeks with the external power source removed. An adjustable time delay before any restart shall be incorporated which allows delays from 1 to 10 minutes. Bubbler type controls will not be accepted. Switches for manually operating the pumps shall be included.
11. An on site alarm with exterior lights and horn with battery backup, including switchable power failure, and low water and high water sensors shall be provided.
12. An automatic telephone dialer and message capability for all alarms shall be installed.
13. Each sewer pump shall have a gate valve and check valve on the discharge piping. Dual pressure mains maybe required by the Director.
14. Access and work area of pump stations shall be paved with minimum 2 inches AC over 4 inches AB.
15. 6 foot high chain link fence per Caltrans Standard A85 shall be constructed to enclose the pump station.
16. A means of dewatering force mains shall be provided.
17. The lift station shall not be in County road right-of-way except with permission from the Director.
18. The interior of the structure, all machinery, piping, and exterior below grade shall be painted.
19. The County shall be provided with three complete sets of manufacturer's brochures, technical data, operation and maintenance manuals, schematics, wiring diagrams, etc., for all equipment and controls.

20. Submersible lift stations shall meet the minimum requirements of "SWPA Handbook, Submersible Sewage Pumping Systems" by Submersible Wastewater Pump Association. Pumps shall be rail mounted with auto disconnect.

C. Structural

Structures shall be reinforced concrete, fiberglass, fusion epoxy coated or galvanized steel. In residential areas, structures shall be below ground. Provide a hatch suitable for the removal and replacement of major equipment components. Hatches shall be spring loaded (Bilco type) with metal provided in brass, stainless steel or aluminum materials. Where applicable, provide equipment-lifting eyes in roof of station. All structures shall have ample working room around machinery. Minimum clearance to wall shall be 24 inches or greater as needed for adequate maintenance.

D. Mechanical and Piping

A reduced pressure principle device is required on all domestic water connections. A one inch metered connection is to be provided adjacent to the station. Provide an automatic air blower system to exchange air every 6 minutes (minimum). Provide an automatic sump pump (slope floor to sump) with check valve in discharge pipe to wet well. Provide standby pumping capacity equal to the largest single unit. Make provisions for standby emergency power connection for use during power outages. Sump pumps and air blowers shall be easily removable for maintenance.

E. Electrical

All electrical installations shall comply with the current County adopted California Electrical Code and NEMA. Use enclosed prefabricated electrical panels mounted above ground level outside the pump station. Provide running time meters for all motors (use reset type). Provide explosion-proof electrical appurtenances below ground or an approved type disconnect and time delay. Provide separate blower system within all electrical panels located below ground. Provide an approved type alternator and float switches. A manual switch adjacent to the motor which will override the control panel shall be provided. Switch shall be mounted at motor height. Adequate lighting and electrical outlets shall be provided. Outlets shall be mounted at motor height. Color code all wiring and piping. (National Standard Coding.) An Electrical Permit is required from the San Joaquin County Community Development Department – Building Division.

F. Force Main Design

Maximum velocity shall be 10 ft/sec. Minimum velocity shall be 2 ft/sec.

5-2.08 Treatment and Disposal

A. General

Treatment facilities shall include all necessary components and appurtenances as required by the County to ensure a complete, automated, operating facility which will provide for minimum maintenance and operational costs.

Storage or auxiliary pumping capacity shall be provided as required to prevent overflow during power outages, the duration of which shall be based on power company records and projections for the area in which the facilities will be constructed.

B. Regulatory Standards

Pertinent requirements of the following agency standards, including all changes thereto, shall be considered and complied with, except that in the event of conflict, the stricter design criteria shall govern.

1. Laws and standards of California Department of Public Health/State Water Resources Control Board.
2. The Porter-Cologne Water Quality Control Act and the Regional Water Quality Control Board.
3. Ordinances of the County of San Joaquin.
4. Others as appropriate.

C. Design Reports

A design for the proposed project to be constructed shall be submitted to and approved by the County. In addition to general requirements of this Standard, the following requirements apply:

1. An engineering report on the development of the site including but not limited to soils survey, geology, ground and surface water hydrology, water supply, liquid waste disposal, probable population densities, and conformance with any applicable master, regional or County plans.

2. A Master Plan relating to the disposal of wastes anticipated from the ultimate build out of the development. The plan shall conform to any applicable master, regional or County Plan for sewage disposal. Staged or phased development may be acceptable for some components of the system if such stage development can be proved financially feasible and if approved by the County.
3. The filing of a report on the proposed waste discharge in the County's name by the Developer, accompanied by the appropriate filing fee and pursuant to Section 13260 of the State Water Code (unless the waste is to be discharged into an existing community sewage system), to the Central Valley Regional Water Quality Control Board.

D. Access

All weather, paved access shall be provided to all major functional units. A minimum width of 12 feet is required. Turnaround area for the largest service vehicle shall be provided.

E. Structures

Structures shall provide protection against weather and vandalism, shall be designed to architecturally blend with the character of the Development, and shall provide maximum efficiency and minimum operational and maintenance costs to the District or County.

Laboratory storage and/or warehouse facilities may be required where the new development cannot practically utilize existing County facilities. An "in-lieu" fee may be required where it is impractical to expand existing County facilities to accommodate the new development.

F. Treatment Process

Removal requirements for treatment processes will be as required by the Waste Discharge Requirements issued by the Regional Water Quality Control Board, but in no event shall the 5 day BOD reduction be less than 85 percent using sampling procedures reflecting plant flow through time. Process design shall be based on the larger of the Design Flow Rate requirements or the average 5 day BOD requirements. Communication equipment will be required.

G. Outside Lighting

All mechanical areas shall be adequately lighted for night operation and maintenance.

H. Metering, Recording and Monitoring Equipment

1. Treatment Plants

Metering, recording, and monitoring equipment shall be provided at all treatment plants. All such equipment shall be compatible with existing County equipment.

Generally, the following equipment will be necessary:

- a) Flow meter and recorder.
- b) Recording, continuous reading chlorine analyzer to detect chlorine residual and equipped with adjustable low and high alarm contacts.
- c) Radio monitoring and alarm equipment.

2. Pumping Stations

- a) Flow meter and recorder (where required).
- b) Radio monitoring and alarm equipment.

I. Chlorination Facilities

Will consist of gas chlorinator(s) and their associated equipment. Chlorinators shall be capable of pacing sewage flows either by a flow proportional chlorinator or a series of individual chlorinators activated from the pump control panel as approved by the District. Installations shall be provided with a continuous chlorine monitor to detect chlorine residual and shall have adjustable high and low alarm contacts.

Final effluent chlorination will be required where effluent will be disposed of on lands or to water accessible to the public.

Chlorination contact facilities shall be designed to provide not less than 60 minutes contact time at peak discharge rate and shall be arranged to permit bacteriological and chemical sampling of the effluent.

Other methods of disinfection may be allowed on a case by case basis.

J. Design Flow Rate

1. Waste stabilization lagoons, aerated lagoons, and similar process with long detention times - Average Dry Weather Flows (ADWF).
2. Extended aeration plants – 50 percent of Peak Flow (PF) but not less than the Average Dry Weather Flow (ADWF).

K. Effluent Disposal

Unless a development can be connected to an existing sewage system, all effluent must be disposed of in accordance with the Discharge Requirements of the Regional Water Quality Control Board. On site disposal must be substantiated by soils, geological, hydrological, and related studies, and this resultant report submitted to the County.

Effluent must be contained within the disposal site and metering and recording devices must be installed to measure any runoff from the disposal area.

5-3.0 **ON-SITE SYSTEMS**

5-3.01 **General**

For those sites for which on-site sewer system is approved by the County, the on-site system shall meet the requirements of "Minimum Guidelines for the Control of Individual Wastewater Treatment and Disposal Systems" by CRWQCB, and "Onsite Wastewater Treatment Systems Manual" by United States Environmental Protection Agency. Percolation tests shall be conducted using Ryon's procedure. Where there is a conflict in requirements, the more stringent requirements shall apply. Cesspools and drainage wells are prohibited.

5-3.02 **Sewage Quantities**

The guidelines outlined in Section 2 and in the references cited above shall be used to compute the average daily flow.

5-4.0 **MATERIALS**

5-4.01 **Requirements**

Materials shall be chosen for their strength, durability, and ease of maintenance, with due consideration for dead and live loads, beam strength, and resistance to corrosion. Pipe joints shall be selected to provide positive

protection against entrance of roots and groundwater, and sufficient flexibility to adjust to the trench bedding. In general, the joints shall be non-rigid, and the joint sealer shall be restrained against lateral and axial movement. The installed joint shall provide positive separation between adjoining pipe sections to prevent failure of rigid materials by axial expansion during wetting.

5-4.02 Pipe Material

- A. Sewer Pipe Material Shall be: Vitrified Clay; Poly Vinyl Chloride, type PSM or PSP; Acrylonitrile-Butadiene-Styrene (ABS), solid or composite; Ductile Iron; or other material approved by the Engineer.
- B. All joints in rights of way or easements shall be bell and spigot type. Glued joints are allowed.

5-4.03 Concrete

All concrete for sewer structures and sewer pipe encasement shall be Class 3 per Section 90, latest edition, of Caltrans Standard Specifications unless otherwise shown herein or approved by the Engineer.

COUNTY OF SAN JOAQUIN



Working for YOU

**STANDARD
DRAWINGS**

NOVEMBER 2014

CHAPTER 6
STANDARD DRAWINGS
REVISED 2014

STANDARD
DRAWING NO.

TITLE

G: GENERAL

G-1	Signature Blocks
G-2	Drafting Standards
G-3	Drafting Standards
G-4	Drafting Standards
G-5	Drafting Standards

R: ROADS

R-1	Typical Urban Road Sections
R-2	Typical Urban Road Sections
R-3	Typical Rural Road Sections
R-4	Partial Width Street Section
R-5	Concrete Curb, Gutter and Sidewalk Construction Standards
R-6	Roll Curb, Gutter and Sidewalk
R-7	Vertical Curb, Gutter and Sidewalk
R-8	Vertical Curb and Vertical Curb with Apron
R-9	Curb Transition Detail
R-10A	Curb Ramps
R-10B	Curb Ramps Sections and Notes
R-10C	Curb Ramp Details
R-10D	Curb Ramp Detectable Warning Surface Detail
R-11	Expansion Joints, Weakened Plane Joints and Score Lines
R-12	Valley Gutter Detail
R-13	Type 1 Commercial Driveway
R-14	Type 2 Commercial Driveway
R-15	Typical Driveway Locations
R-16	Typical Residential Driveway at Vertical Curb and Gutter
R-17	Driveways – Type D & E for Agricultural and Rural
R-18	Structural Pavement Design Chart
R-19	Turnaround for Residential Cul-De-Sac Streets
R-20	Superelevated Knuckle
R-21	Traffic Islands
R-22	Left Turn Lane Taper Data
R-23	Bus Turnout
R-24	Curb Return
R-25	Barricades for Terminating Streets

NOTES:

1. All acronyms and abbreviations found in these County Standard Drawings comply with the California Department of Transportation Standard Plans sheets A10A and A10B.
2. All drawings are to be considered Not To Scale.

CHAPTER 6
STANDARD DRAWINGS
REVISED 2014

STANDARD
DRAWING NO.

TITLE

R: ROADS (CONT.)

R-26	Standard Street Sign Details
R-27	Traffic Signs
R-28A	Survey Monument Frame and Cover
R-28B	Survey Monument Installation Detail
R-29	Typical Trench Backfill
R-30	Adjusting Street Facilities to Grade
R-31	Road Frontage Tree Planting Guideline
R-32	Street Lighting
R-33	Street Lighting Design Criteria
R-34	Street Light Pole Spacing Guide
R-35	Understanding Utilities Locations at Existing Intersections
R-36	Trench Cutting Policy Cross Cutting of County Roadways
R-37	Trench Cutting Policy Longitudinal Cutting of County Roadways

D: STORM DRAIN

D-1	Underground Utilities Locations at New Developments
D-2	Storm Design Sheet
D-3	Mean Annual Precipitation
D-4	Intensity-Duration Curve 10-Year Rainfall
D-5	Runoff Inlet Time
D-6	Head for Standard C.M. Pipe Culverts Flowing Full
D-7	Headwater Depth for Box Culverts with Inlet Control
D-8	Head for Concrete Pipe Culverts Flowing Full
D-9	Headwater Depth for Concrete Pipe Culverts with Inlet Control
D-10	Headwater Depth for C.M. Pipe Culverts with Inlet Control
D-11	Head for Concrete Box Culverts Flowing Full
D-12	Frame & Grate Type 1 Curb Inlet Catchbasin
D-13A	Type 1 Curb Inlet Catchbasin
D-13B	Type 2 Curb Inlet Catchbasin
D-14A	18" Storm Drain Inlet Catchbasin
D-14B	18" Storm Drain Inlet Frame and Grate
D-15	Under Sidewalk Drain
D-16	Type 1 Maintenance Hole
D-17	Saddle-Type Maintenance Hole for Pipe Diameter 24" and Larger
D-18	Pipe Inlet Structure and Trash Rack 30" Diameter Pipe and Smaller
D-19	Pipe Inlet Structure 33" Diameter Pipe and Larger
D-20	Trash Rack 33" Diameter Pipe and Larger
D-21	Erosion Control Pipe Discharge
D-22	Pipe Outfall Access Control Rack
D-23	Public Storm Drain Retention/Detention Basin

CHAPTER 6
STANDARD DRAWINGS
REVISED 2014

STANDARD
DRAWING NO.

TITLE

W: WATER

W-1	Water Service Installation
W-2	Fire Hydrant Assembly
W-3	Fire Service Connection Detail
W-4	Blow-Off Layout
W-5	Valve Box Detail
W-6	Thrust Block Chart
W-7	Bacteriological Sampling Tap
W-8	Bacteriological Sampling Tap Section
W-9	Bacteriological Sampling Tap Detail
W-10	Water-Sewer-Storm Separation Standards
W-11	Locator Wire Installation
W-12	Underground Utility Locations
W-13	Air-Vacuum Release Valve

S: SEWER

S-1	Sanitary Sewer Peaking Factors
S-2	Inside Sanitary Sewer Drop Maintenance Hole
S-3	Sanitary Sewer Lamphole
S-4	Maintenance Hole Frame and Cover
S-5	Lamphole Frame and Cover
S-6	Sewer Service Lateral
S-7	Sewer Service Lateral Alternate Details
S-8	Sewer Service Lateral Repair

F: FIRE ACCESS

F-1	Turnaround for Fire Roads and Driveways over 150 feet Long
F-2	Driveway and Fire Road Zones

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

APPROVED AS "ENCROACHMENT PERMIT PLAN SET"
APPROVED FOR WORK WITHIN COUNTY RIGHT-OF-WAY ONLY

APPROVED: _____
DATE

RCE NO.: _____ EXP. DATE: _____

ENCROACHMENT PERMIT NO.: _____ DATE ISSUED: _____ BY: _____



**SIGNATURE
BLOCK**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

No.	Revision	Description	Date

Date: MAY 2019







Std. Dwg. No.

G-1

All Final Maps, Parcel Maps, or Records of Surveys, Improvement Plans or Construction Drawings submitted to the Agency for consideration shall conform to and be prepared in accordance with the following standards:

All lettering shall be a minimum of 0.10 inches high using a 0.014 inch pen. Vertical or slanted lettering may be used.

Final Maps, etc.

Subdivision Outline		0.031 inches line width
Block Outline		0.024 inches line width
Lot Lines		0.020 inches line width
Easement Lines		0.014 inches line width
Street Center Lines		0.014 inches line width
Radial Bearing Lines		0.009 inches line width

Monument Found	●
Monument Found in Cast Iron Box	⊙
Monument Set	○
Monument Set in Cast Iron Box	⊙

Letters size, style, & pen

Street Names	MAIN	0.175" solid 0.020 inch pen
Lot Numbers	44	0.175" solid 0.020 inch pen
Bearing, Distances, Curve Data, Coordinates, etc.	N45°E 50.00'	0.100" solid 0.014 inch pen
Adjacent Subdivisions and Lot Numbers	FIR TRACT	0.175" shadow 0.014 inch pen
	44	
	or	
	FIR TRACT	0.175" dotted 0.014 inch pen
	44	



DRAFTING STANDARDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Grew

No.	Revision	Description	Date

Std. Dwg. No.

G-2

Date: DEC 2014

<u>Description</u>	<u>To Be Constructed</u>	<u>Existing</u>
General		
Center Line		
Property Line		
Match Line		
Note Reference		
Revision Numer		
Streets		
Curb, Gutter and Sidewalk		
Sidewalk		
Curb Ramp		
Driveway		
Conform Pavement		
Railroad	N/A	
Barricade		
Guard Rail		
Storm Drains		
Maintenance Hole (Typ. throughout)		
Storm Drain		
Catch Basin		
Drop Inlet		



DRAFTING STANDARDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

Approved by:

Thomas M. Gill

No.	Revision	Description	Date

Std. Dwg. No.

G-3

<u>Description</u>	<u>To Be Constructed</u>	<u>Existing</u>
Sanitary Sewers		
Sanitary Sewer		
Maintenance Hole		
Sanitary Sewer Service		
Sanitary Sewer Cleanout		
Water		
Waterline		
Water Valve		
Check Valve		
Backflow Preventer		
Blow-Off Assembly		
Fire Hydrant Assembly		
Water Meter		
Miscellaneous		
Telephone		
Cable Television		
Gas Line		
Gas Valve		
Gas Meter		
Sign		
Utility Pole		
Fence		



DRAFTING STANDARDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Gull

No.	Revision	Description	Date

Std. Dwg. No.

G-4

Date: DEC 2014

<u>Description</u>	<u>To Be Constructed</u>	<u>Existing</u>
Electrical		
Electrical Conduit		
Electrical Pull Box		
Electrolier		

Signal

Combination Traffic Signal with Backplate & Luminaire		
Vehicle Signal with and without Backplate		
Combination Traffic Signal, Green Arrow, and Backplate		
Mastarm Signal with Street Name Sign		
Programmed Visibility Head With Backplate		
Pedestrian Signal Face		
Pedestrian Push Button And Associated Vehicle Phase	PPB ∅ 6	PPB ∅ 6
Inductive Detector Loop		
Traffic Signal Controller Cabinet With Door Swing As Indicated		
Type III or III M Service Cabinet with Door Swing As Indicated		

Additional symbols may be used as required to depict the work contemplated. Symbols shall conform to CSI or Industry Standards.



**DRAFTING
STANDARDS**

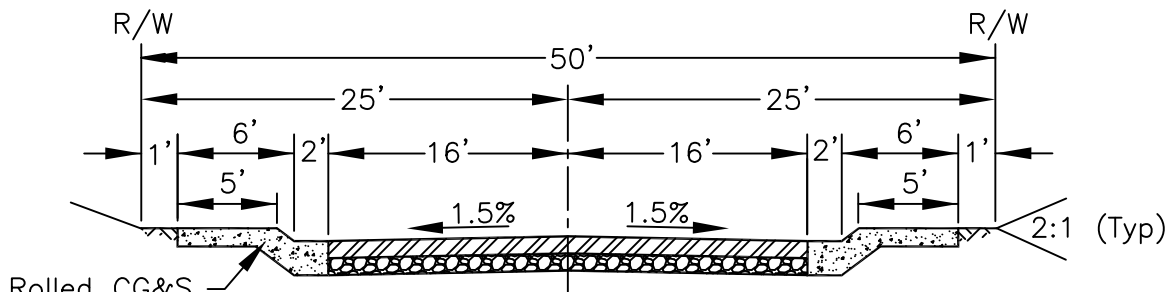
COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

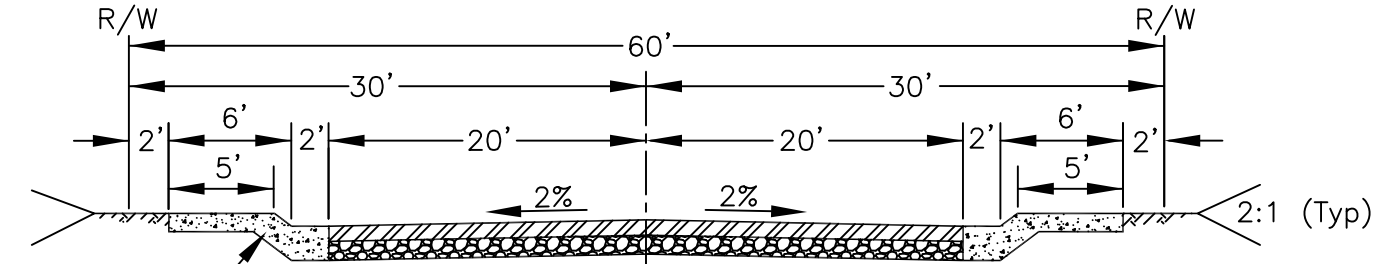
Approved by:
Thomas M. Grew

No.	Revision	Description	Date

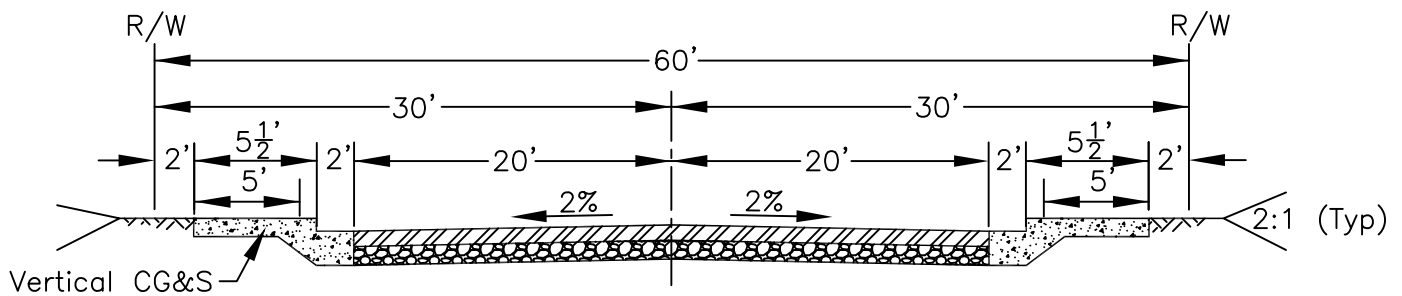
Std. Dwg. No. **G-5**



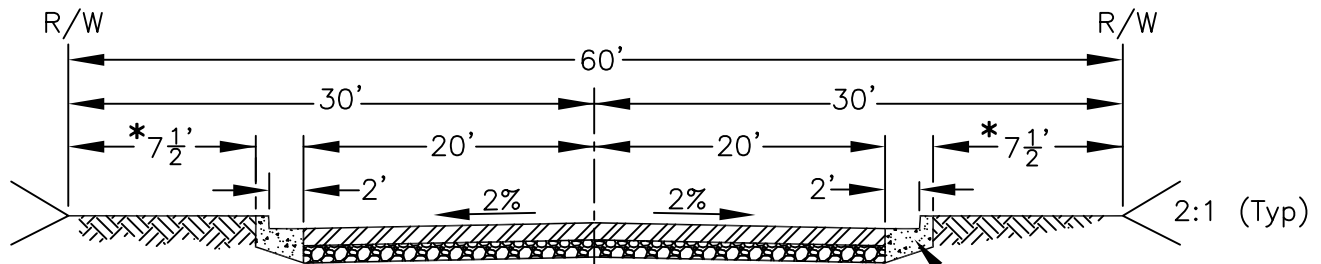
RESIDENTIAL (7)



COLLECTOR RESIDENTIAL (5)



COMMERCIAL/INDUSTRIAL (5 or 6)



LOCAL INDUSTRIAL (7)

*Sidewalks may be required.

NOTES:

1. The structural section shall be determined by the roadway design standards and County Standard Drawing No. R-18.
2. For curb, gutter and sidewalk details, refer to County Standard Drawings No. R-6 and No. R-7.

FUNCTIONAL CLASSIFICATION (FC) CONVERSION TABLE

	OLD FC CODE		NEW FC CODE
ON SYSTEM	PAI 01 PAI 11	INTERSTATE	1
	OFE 12	OTHER FREEWAYS OR EXPRESSWAYS	2
	OPA 02 OPA 14	OTHER PRINCIPAL ARTERIAL	3
	MA 06 MA 16	MINOR ARTERIAL	4
	MJC 07 COL 17	MAJOR COLLECTOR	5
	MNC 08	MINOR COLLECTOR	6
OFF SYSTEM	LOC 09 LOC 19	LOCAL	7



TYPICAL URBAN ROAD SECTIONS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

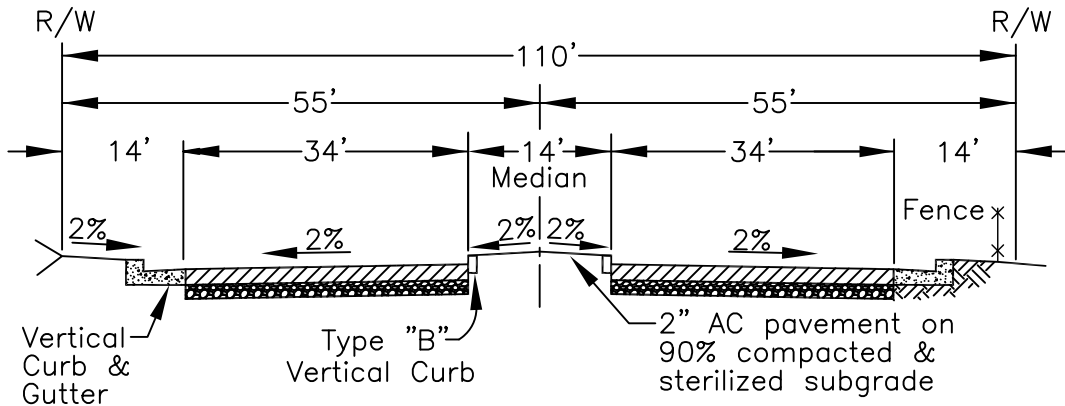
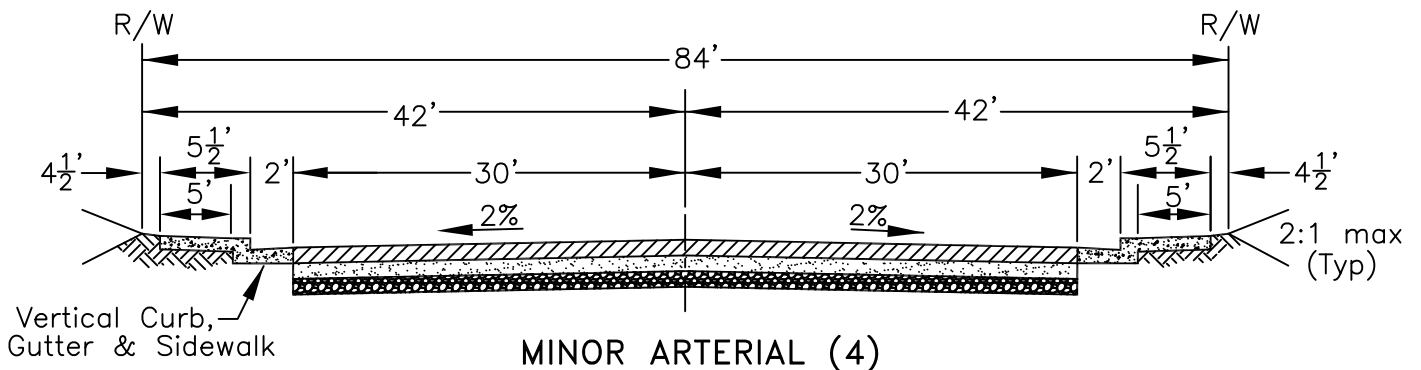
Approved by:

No.	Revision	Description	Date

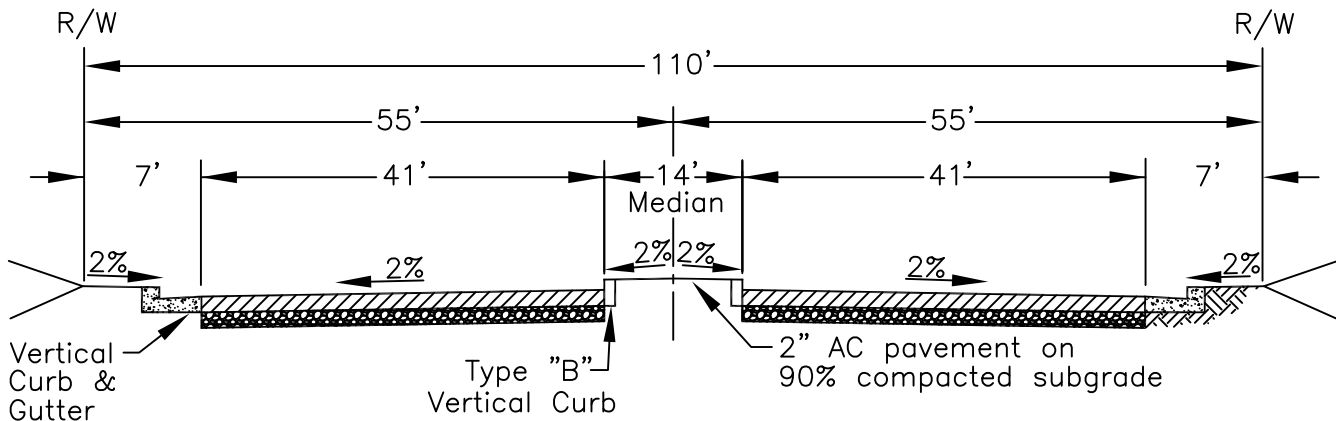
Date: MAY 2020

Std. Dwg. No.

R-1



MAJOR ARTERIAL/FOUR LANE (3)



MAJOR ARTERIAL-EXPRESSWAY/SIX LANE (3)

NOTES:

1. The structural section shall be determined by the roadway design standards and County Standard Drawing No. R-18.
2. For curb, gutter and sidewalk details, refer to County Standard Drawings No. R-6 and No. R-7.

FUNCTIONAL CLASSIFICATION (FC) CONVERSION TABLE

	OLD FC CODE		NEW FC CODE
ON SYSTEM	PAI 01 PAI 11	INTERSTATE	1
	OFE 12	OTHER FREEWAYS OR EXPRESSWAYS	2
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	MA 06 MA 16	MINOR ARTERIAL	4
	MJC 07 COL 17	MAJOR COLLECTOR	5
	MNC 08	MINOR COLLECTOR	6
OFF SYSTEM	LOC 09 LOC 19	LOCAL	7



**TYPICAL URBAN
ROAD SECTIONS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

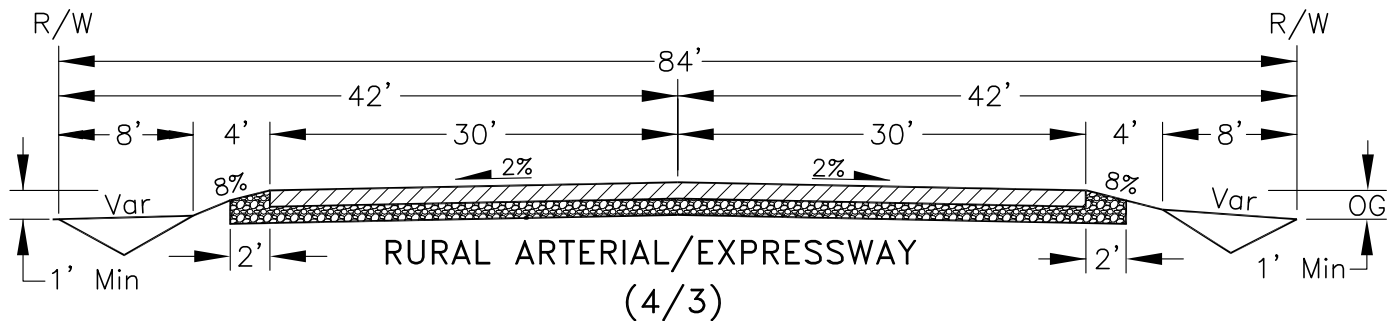
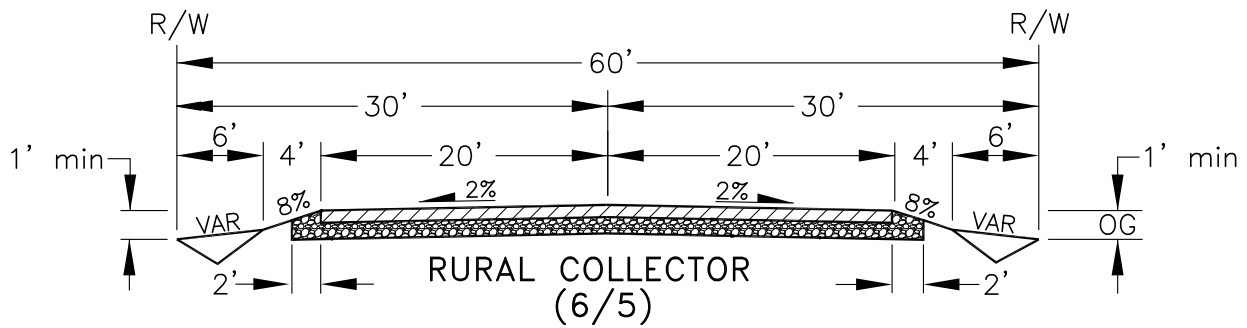
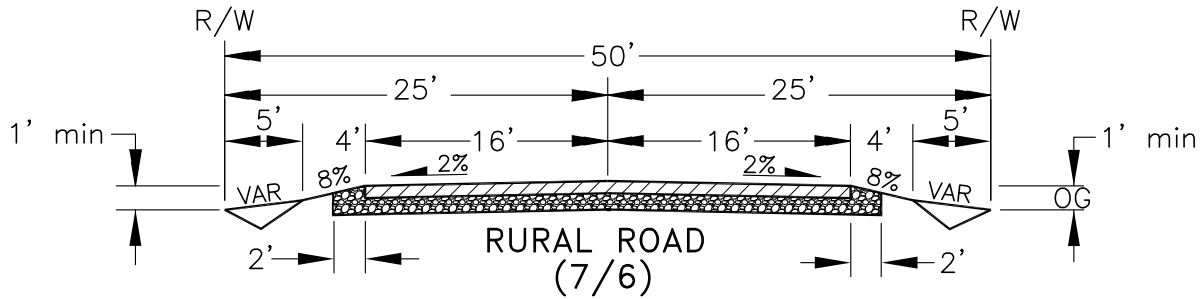
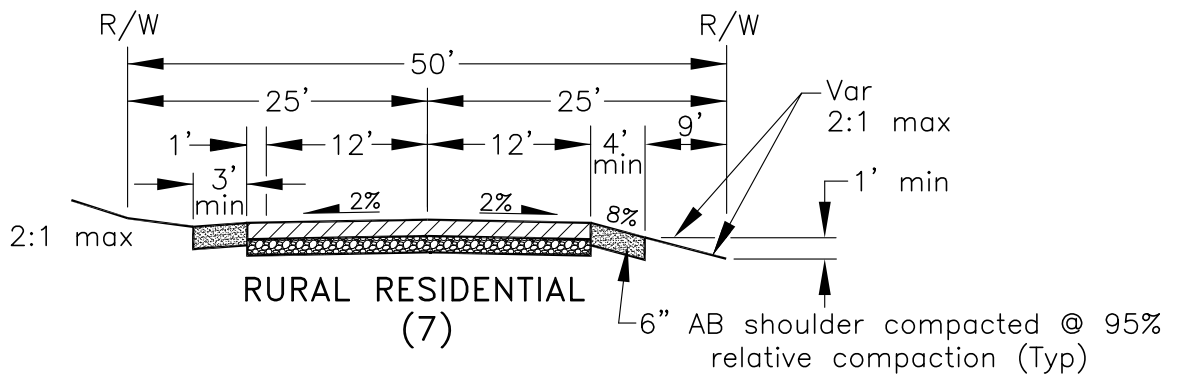
Date: MAY 2020

Approved by:

No.	Revision	Description	Date

Std. Dwg. No.

R-2



FUNCTIONAL CLASSIFICATION (FC) CONVERSION TABLE

	ON SYSTEM		NEW FC CODE
	OLD FC CODE		
ON SYSTEM	PAI 01 PAI 11	INTERSTATE	1
	OFE 12	OTHER FREEWAYS OR EXPRESSWAYS	2
	OPA 02 OPA 14	OTHER PRINCIPAL ARTERIAL	3
	MA 06 MA 16	MINOR ARTERIAL	4
	MJC 07 COL 17	MAJOR COLLECTOR	5
	MNC 08	MINOR COLLECTOR	6
OFF SYSTEM	LOC 09 LOC 19	LOCAL	7

NOTES:

- The structural section shall be determined by the roadway design standards and County Standard Drawing No. R-18.



TYPICAL RURAL ROAD SECTIONS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

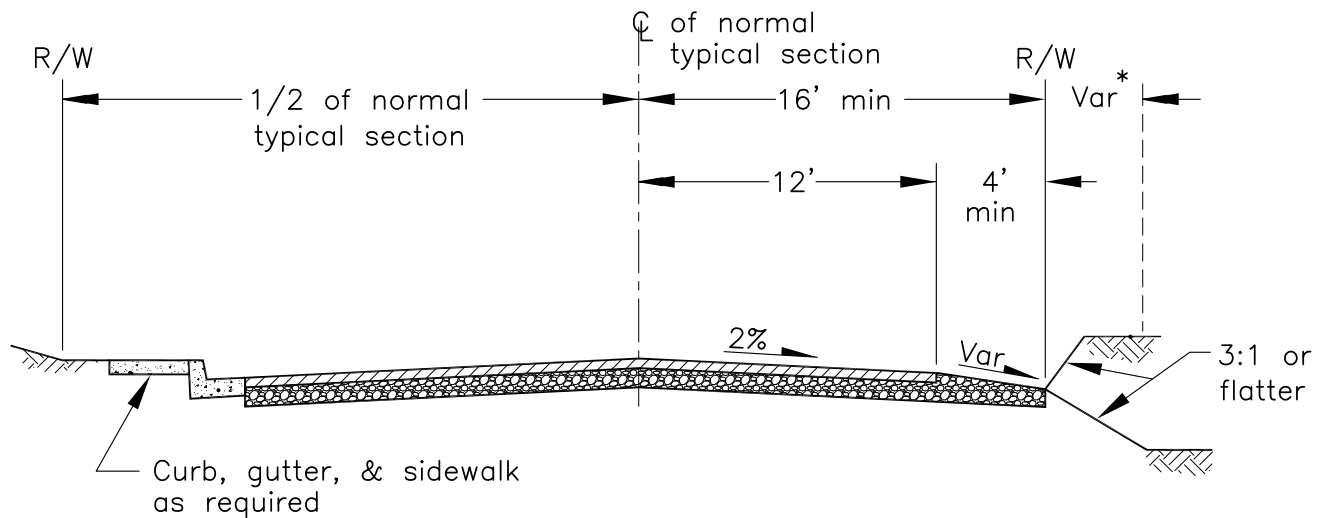
Approved by:

No.	Revision	Description	Date

Date: JUN 2016

Std. Dwg. No.

R-3



TYPICAL PARTIAL WIDTH STREET

NOTE:

Use only for new development on one side of a new roadway.

* Slope easement will be required only if side slopes exceed R/W.



PARTIAL WIDTH STREET SECTION

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

Approved by:

Thomas M. Gill

No.	Revision	Description	Date

Std. Dwg. No.

R-4

CONCRETE CURB, GUTTER AND SIDEWALK CONSTRUCTION NOTES

1. Curb, gutter and sidewalk construction shall conform to Section 73, Standard Specifications, California Department of Transportation (Caltrans), except as modified herein.
2. Reference is made to the local agencies Standard Specifications for additional requirements relating to the construction of concrete curb, gutter and sidewalk.
3. Subgrade for Curb, gutter and sidewalk and Driveways shall be compacted to a minimum relative compaction of 90% to a depth of 6". Where the subgrade "R" value is less than 30, place 4" minimum of aggregate subbase class IV under the concrete sections and compacted to a minimum of 95%.
4. All radii for rounding edges shall be 3/4" unless otherwise noted.
5. Portland cement concrete shall be Class 3, per Caltrans Section 90, Standard Specifications, California Department of Transportation (Caltrans), except as modified herein.
6. Expansion joints and weakened plane joint shall be placed as indicated elsewhere in the Construction Standards. Expansion joint spacing shall not exceed 80'.
7. Curb, gutter and sidewalk shall have a light broom finish. curb and gutter; parallel to the flow line, Sidewalks; perpendicular to the flowline.
8. Depress a 2" high letter "W" or "S", 1 1/4" deep into the top of the curb to identify service locations.
9. During construction of gutters, water shall be used to ensure proper drainage along the flowline.
10. Access curb ramps, sidewalks and improvements in the ADA path of travel shall be constructed in conformance with the Federal Americans with Disabilities Act, California Title 24, and these Standards.



CONCRETE CURB, GUTTER AND SIDEWALK CONSTRUCTION STANDARDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

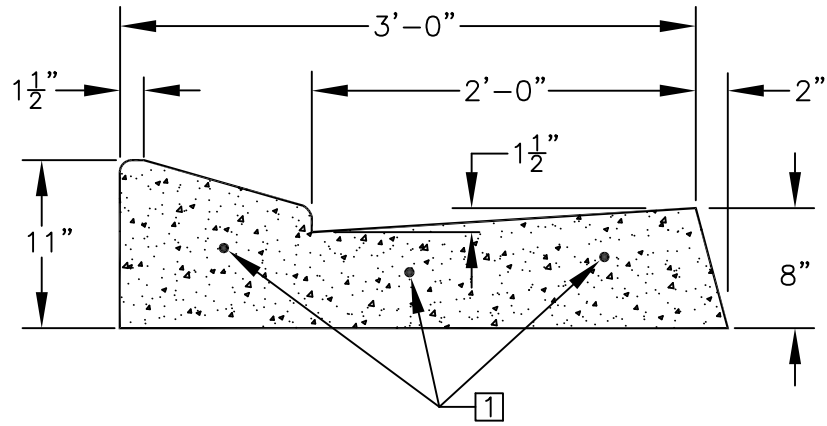
Approved by:

No.	Revision	Description	Date

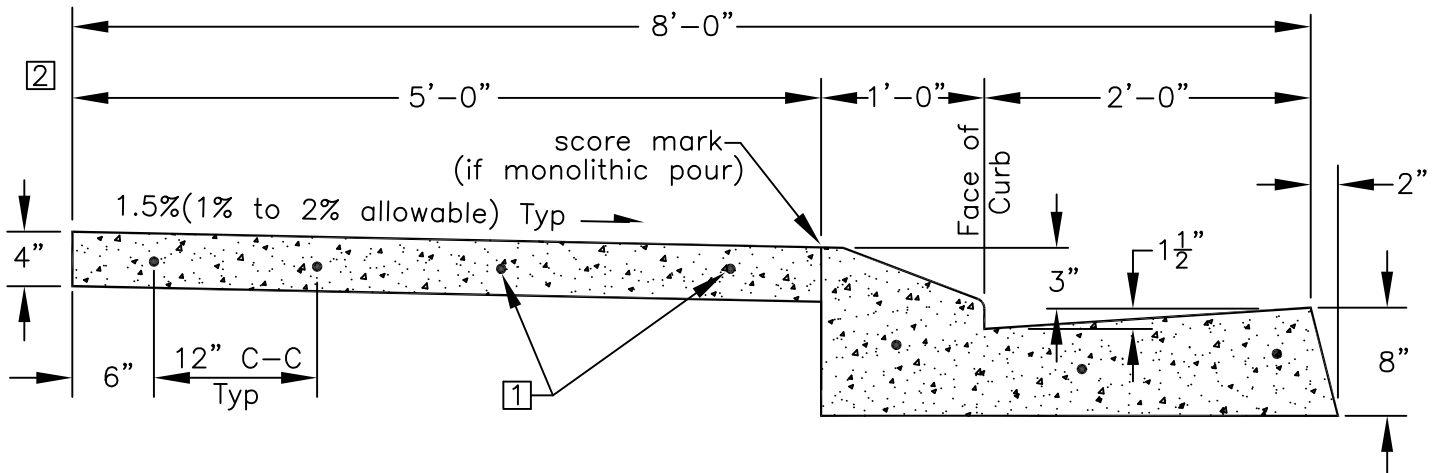
Date: DEC 2014

Std. Dwg. No.

R-5



ROLL CURB AND GUTTER



ROLL CURB, GUTTER AND SIDEWALK

NOTES:

- ① 1/2" x 24" rebar, greased and wrapped one side through all expansion and cold joints.
- ② Extend to face of wall if applicable
3. Access curb ramps, sidewalks and improvements in the ADA path of travel shall be constructed in conformance with the Federal Americans with Disabilities Act, California Title 24, and these Standards.



**ROLL CURB,
GUTTER AND SIDEWALK**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

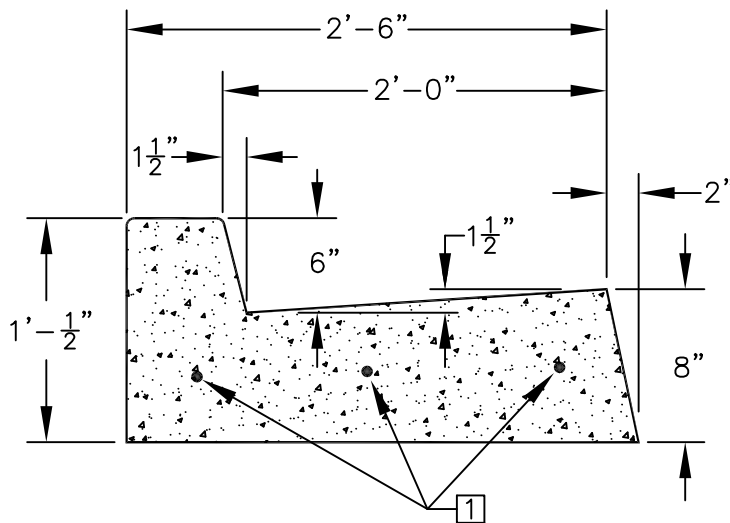
Date: MAY 2020

Approved by:

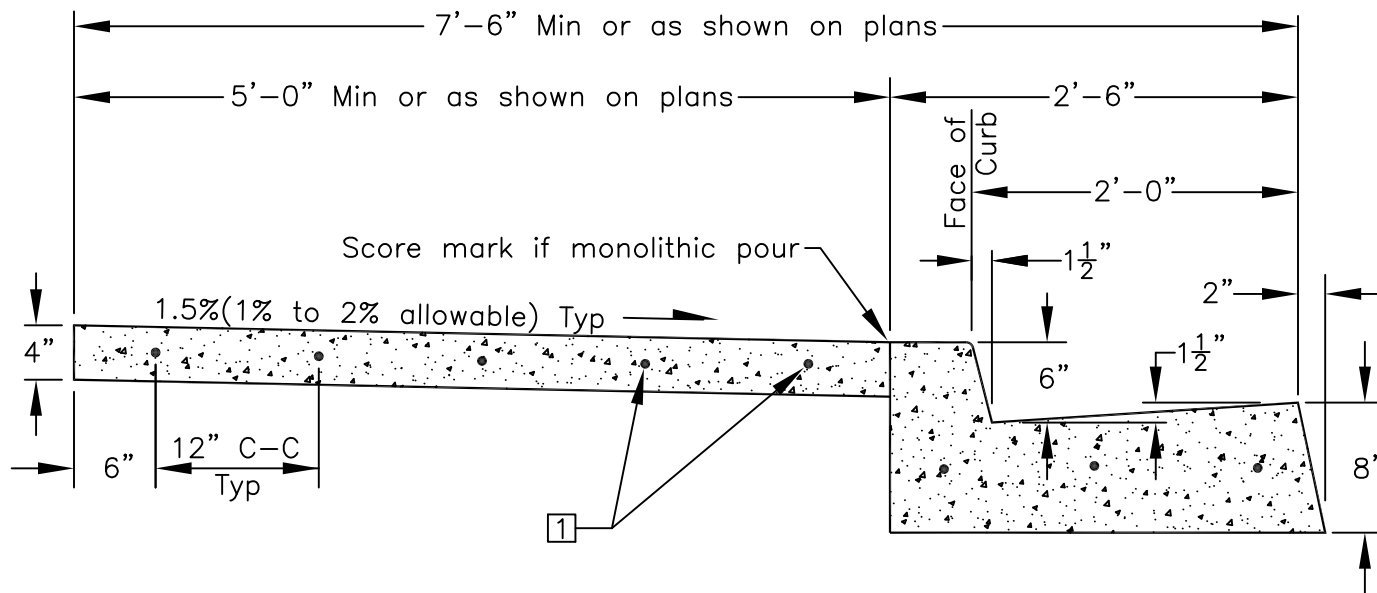
No.	Revision	Description	Date

Std. Dwg. No.

R-6



VERTICAL
CURB AND GUTTER



VERTICAL
CURB, GUTTER AND SIDEWALK

NOTES:

1 1/2" x 24" rebar, greased and wrapped one side through all expansion and cold joints.



**VERTICAL CURB,
GUTTER AND SIDEWALK**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

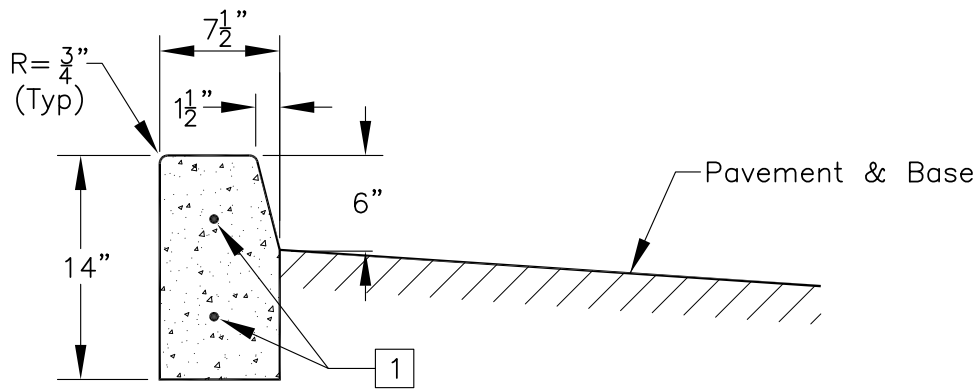
Date: MAY 2020

Approved by:

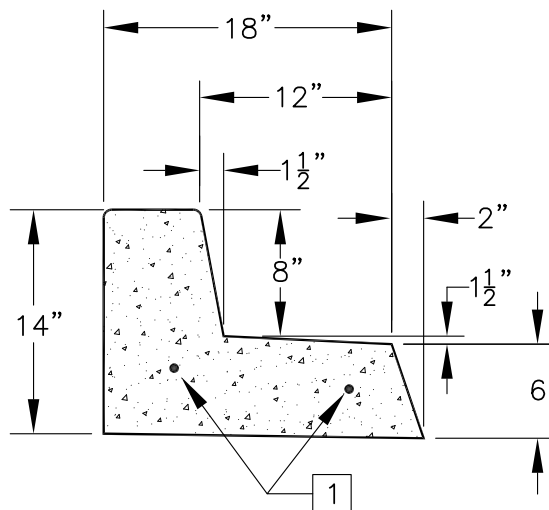
No.	Revision	Description	Date

Std. Dwg. No.

R-7



TYPE "B" VERTICAL CURB



TYPE "F" CURB & APRON

NOTES:

- 1 5/8" x 24" rebar, greased and wrapped one side through all expansion and cold joints.



**VERTICAL CURB AND
VERTICAL CURB WITH APRON**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Hill

No.	Revision	Description	Date

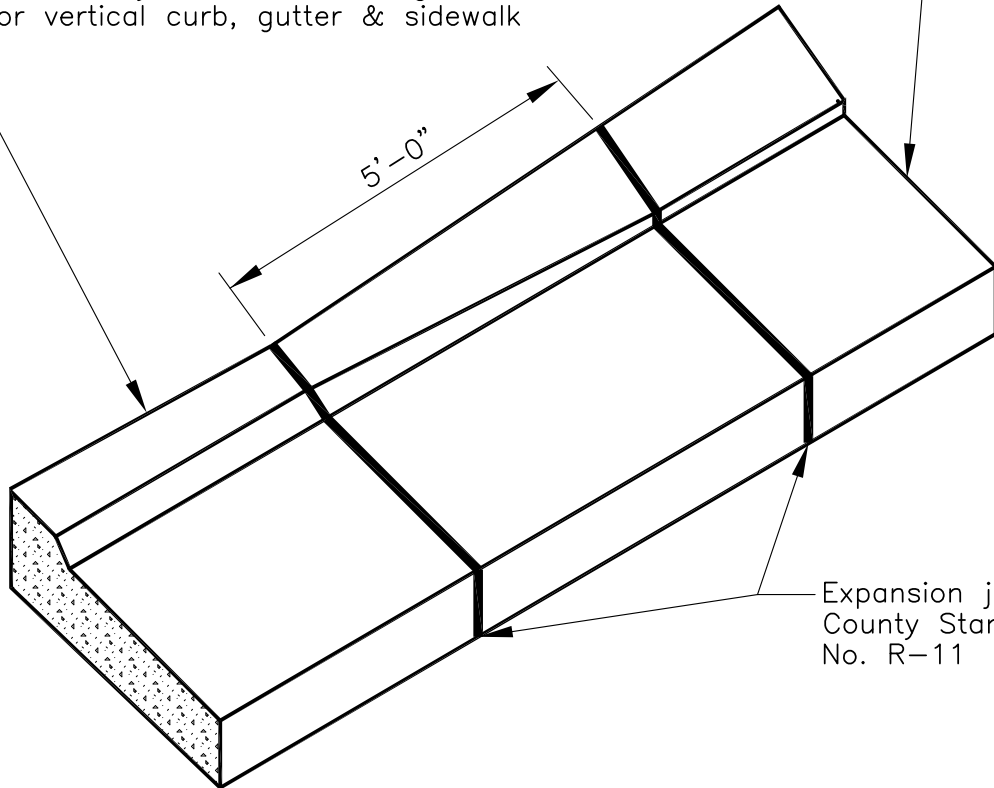
Date: DEC 2014

Std. Dwg. No.

R-8

See County Standard Drawing No. R-6
for roll curb, gutter and sidewalk

See County Standard Drawing No. R-7
for vertical curb, gutter & sidewalk



Expansion joints per
County Standard Drawing
No. R-11



CURB TRANSITION DETAIL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

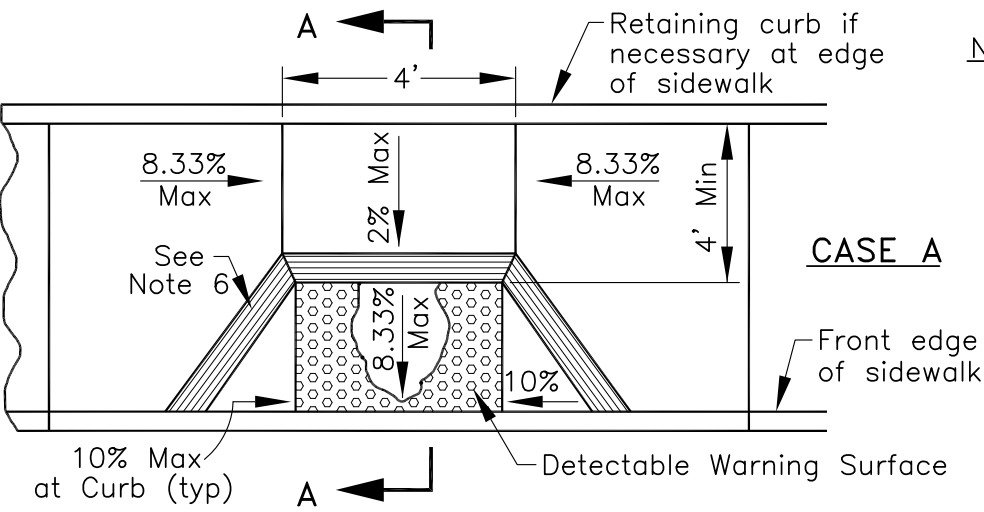
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

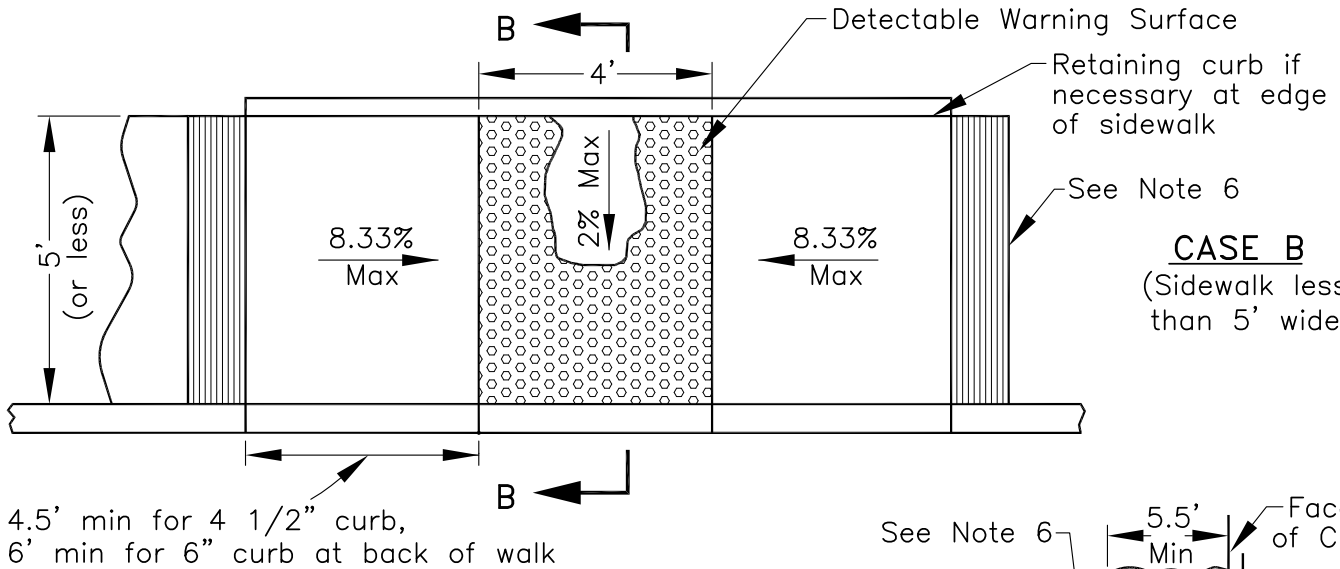
Std. Dwg. No.

R-9



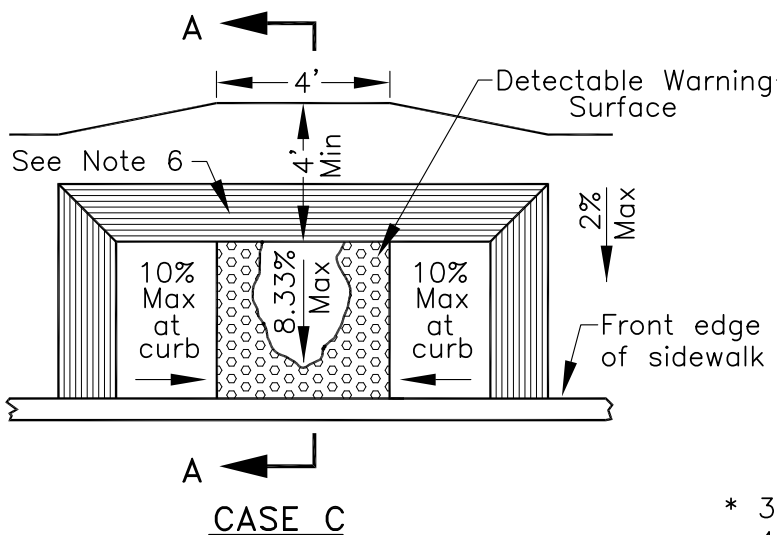
NOTE:
For Sections A-A and B-B and all related notes, refer to County Standard Drawing No. R-10B.

CASE A

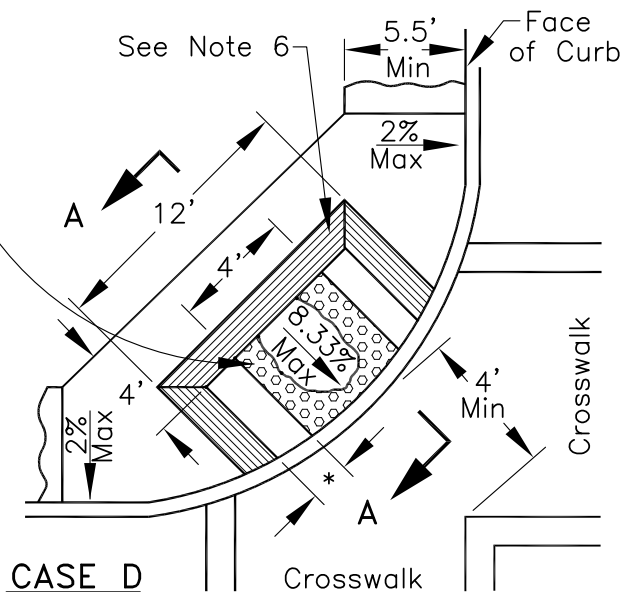


CASE B
(Sidewalk less than 5' wide)

4.5' min for 4 1/2" curb,
6' min for 6" curb at back of walk



CASE C



CASE D

* 3' min for 4 1/2" curb
4' min for 6" curb



CURB RAMPS
(Page 1 of 3)

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

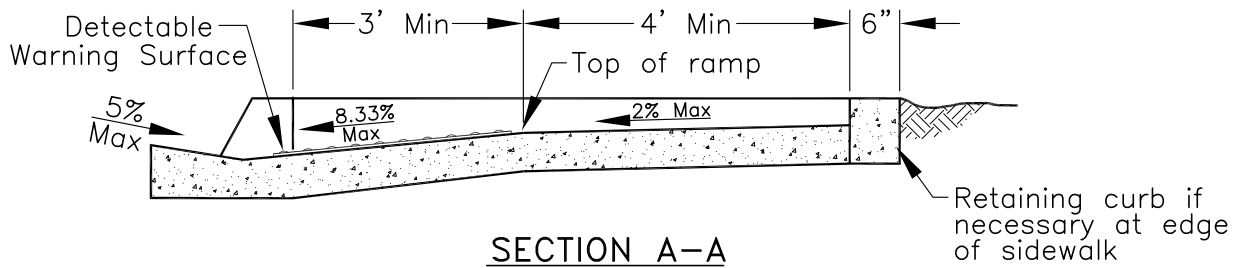
Thomas M. Gull

No.	Revision	Description	Date

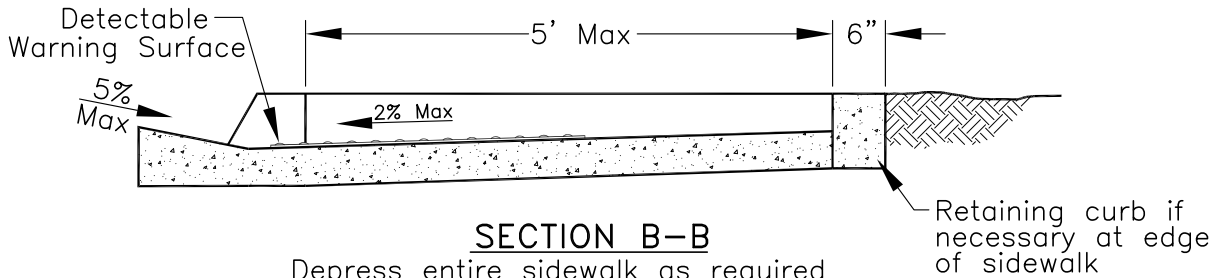
Date: DEC 2014

Std. Dwg. No.

R-10A



SECTION A-A



SECTION B-B

Depress entire sidewalk as required

For Plan Views A-A and B-B refer to County Standard Drawing No. R-10A

NOTES:

1. If distance from curb to back of sidewalk is too short to accommodate ramp and 4' platform, the sidewalk may be depressed longitudinally as in Case A or B or may be widened as in Case C.
2. If sidewalk is less than 5' wide, the full width of the sidewalk shall be depressed as shown in Case B.
3. When ramp is located in the center of the curb return, the crosswalk configuration must be similar to that shown on the plan to accommodate wheelchairs.
4. If located on a curve, the sides of the ramp don't need to be parallel, but the minimum width of the ramp shall be 4'.
5. Sidewalk and ramp thickness shall be 4" minimum.
6. The ramp shall have a 12" wide border, with 1/4" grooves approximately 3/4" center to center. See grooving detail, County Standard Drawing No. R-10C.
7. Ramp side slope varies uniformly from maximum of 10% at curb to conform with longitudinal sidewalk slope adjacent to top of the ramp, except in Case B.
8. Ramp Slopes: 1:12 max (8.33%)
9. Curb ramps shall have a detectable warning surface that extends the full width and 3'-0" depth of the ramp. Detectable Warning Surfaces shall conform to the details on this plan and the requirements in the Special Provisions and the latest Caltrans Standard Plan A88A.
10. The edge of the Detectable Warning Surface nearest the street shall be between 6" and 8" from the gutter flowline.
11. Where sidewalk ties into existing non-title 24 compliant sidewalk, 1% per foot change max.



**CURB RAMPS
SECTIONS AND NOTES**
(Page 2 of 3)

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

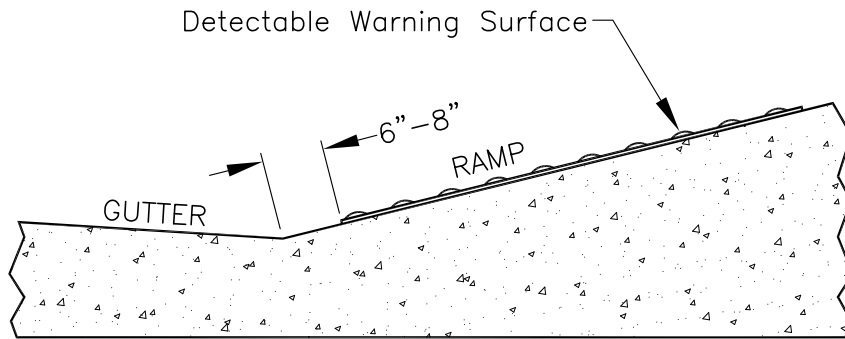
Michael Selby

No.	Revision	Description	Date

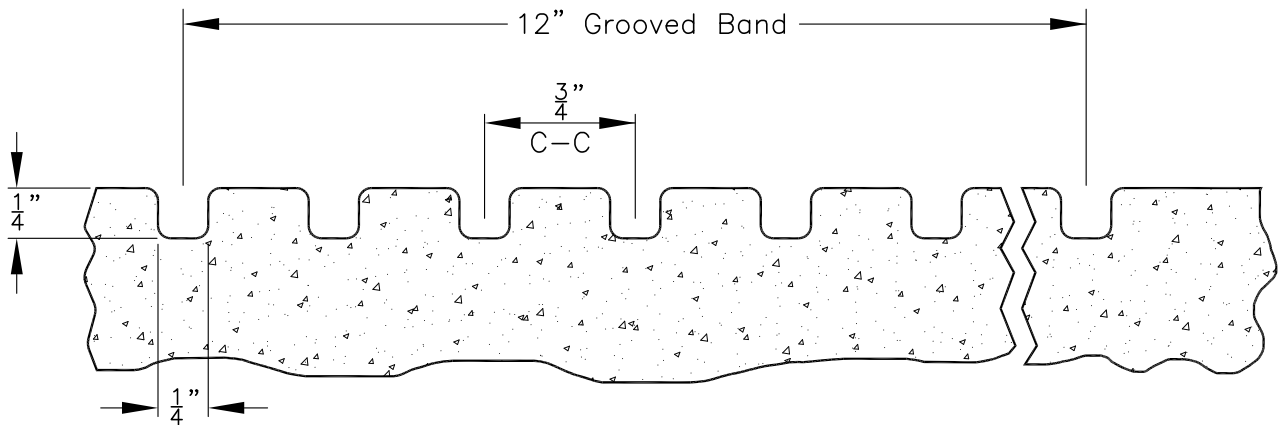
Date: MAY 2015

Std. Dwg. No.

R-10B



CURB RAMP LIP DETAIL



CURB RAMP GROOVING DETAIL



CURB RAMP DETAILS
(Page 3 of 3)

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

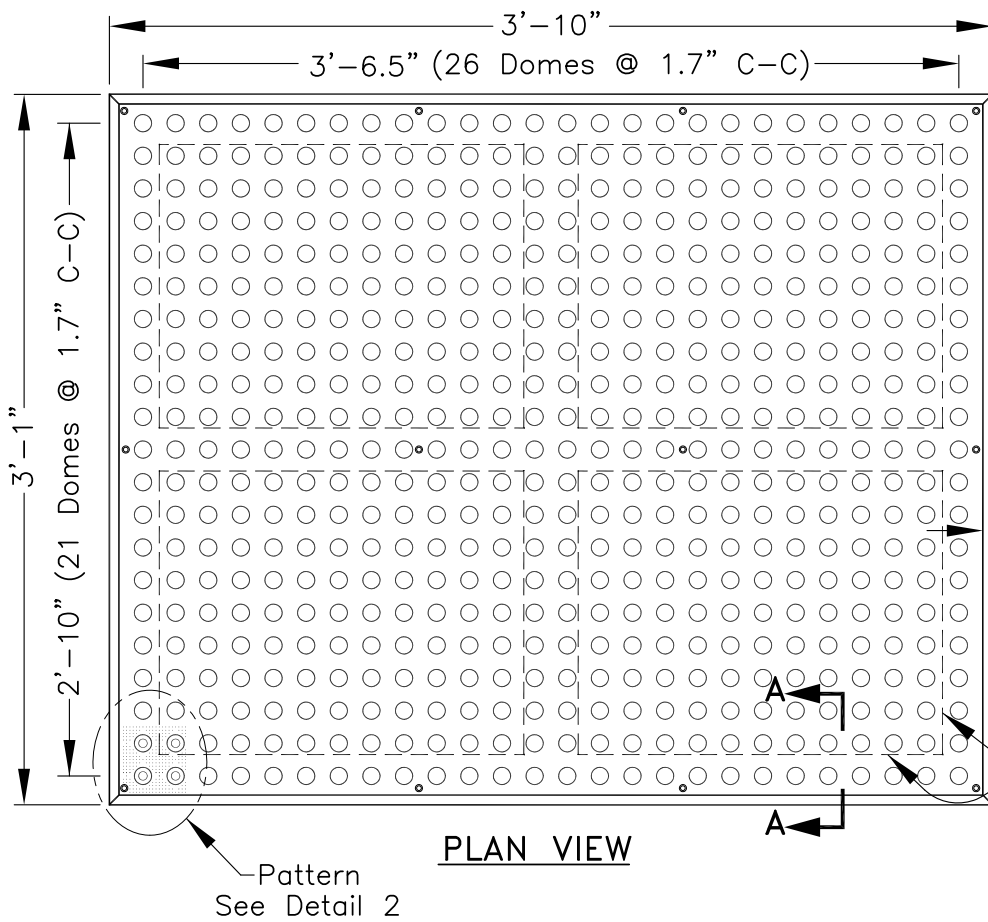
Date: MAY 2015

Approved by:

Michael Selby

No.	Revision	Description	Date

Std. Dwg. No. **R-10C**

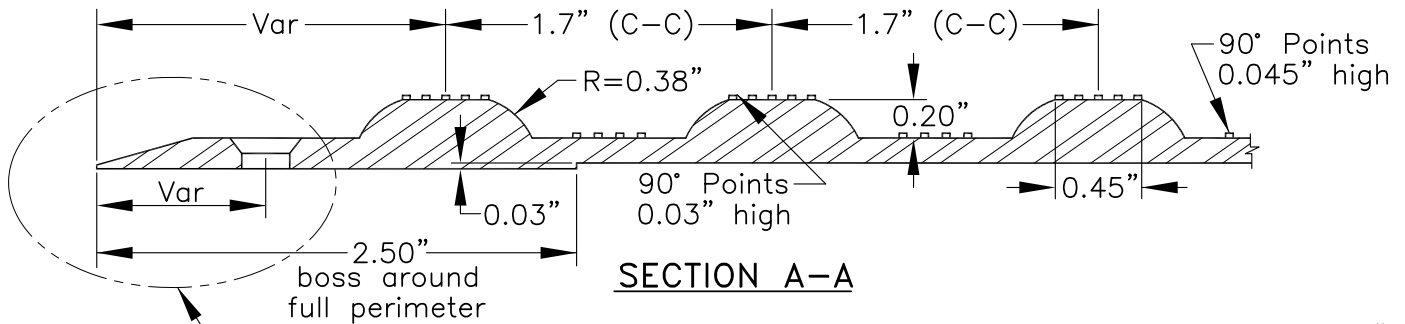


NOTE:

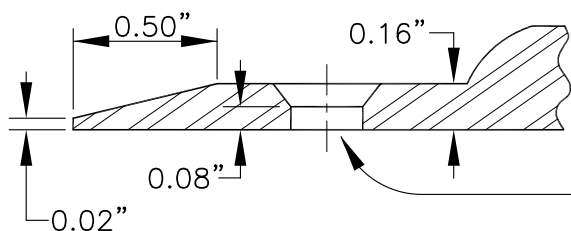
Surface mounted tile details shown. Details are applicable to tile surface sections only. Cast-in-place tile unit design and details to be approved by the engineer, tile material, fasteners, and adhesive to be approved by the engineer.

0.50"
(Typ around perimeter)

2.50" wide boss at underside of tile for structural adhesive at full perimeter and through center tile.



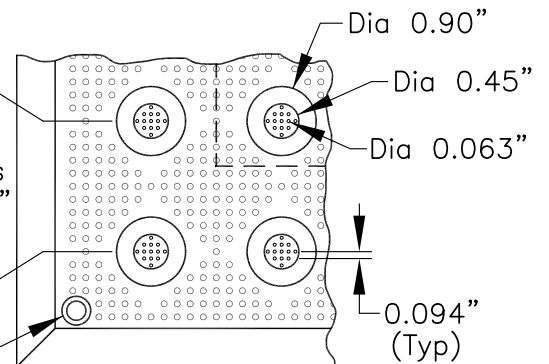
See Detail 1



DETAIL 1

10 Equal Spaces @ 0.17" = 1.70"

Dia 0.25" hole
Dia 0.375" csink
(Typ 12 Places)



DETAIL 2



**CURB RAMP
DETECTABLE WARNING
SURFACE DETAIL**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

Approved by:

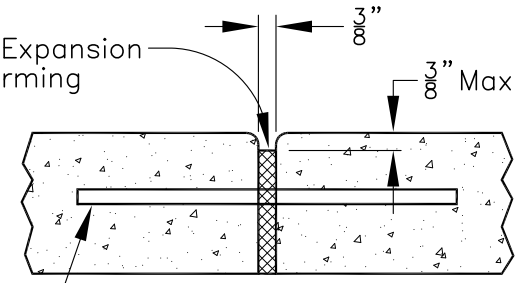
Thomas M. Hall

No.	Revision	Description	Date

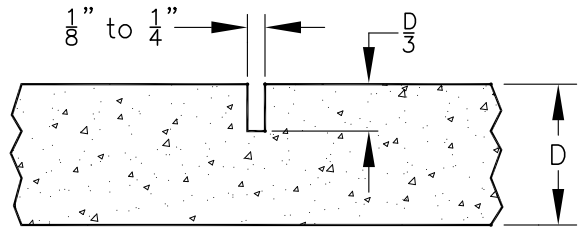
Std. Dwg. No.

R-10D

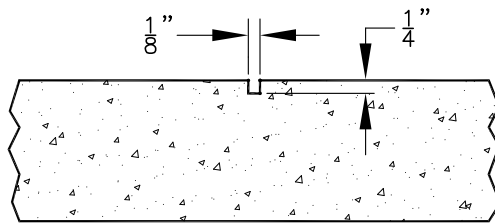
Preformed Fiber Expansion Joint Filler Conforming to ASTM D-1751



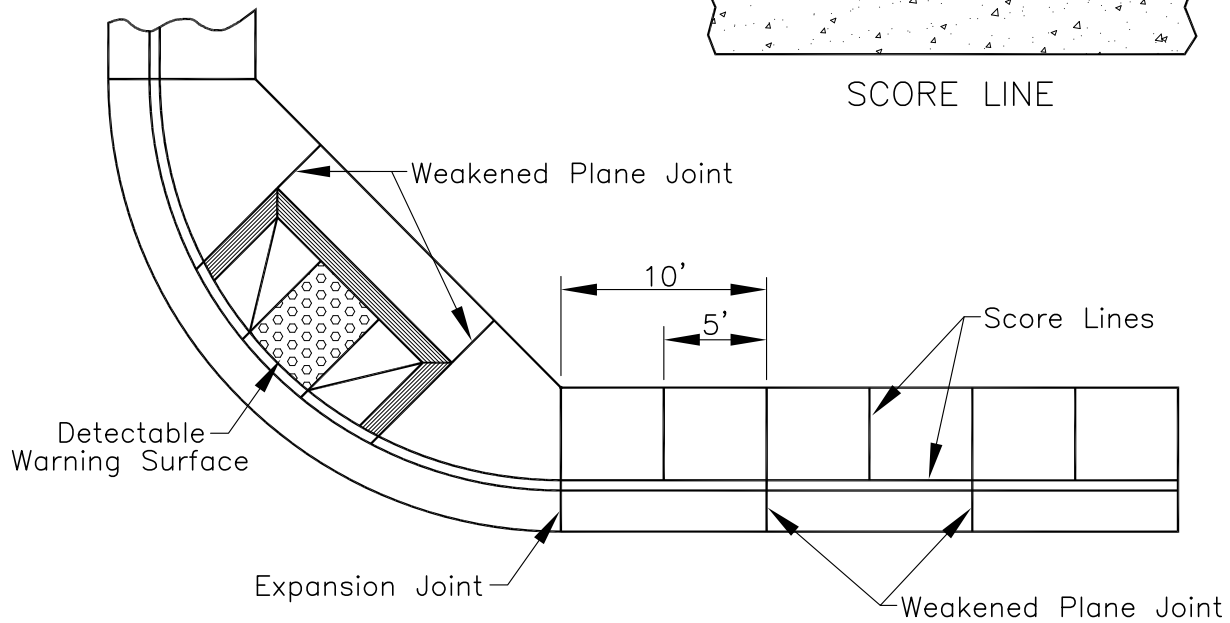
1 EXPANSION JOINT



WEAKENED PLANE JOINT



SCORE LINE



NOTES:

- 1 5/8" x 24" Long Steel Dowels, Greased and Wrapped one side through all Expansion joints.



**EXPANSION JOINTS,
WEAKENED PLANE JOINTS
AND SCORE LINES**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

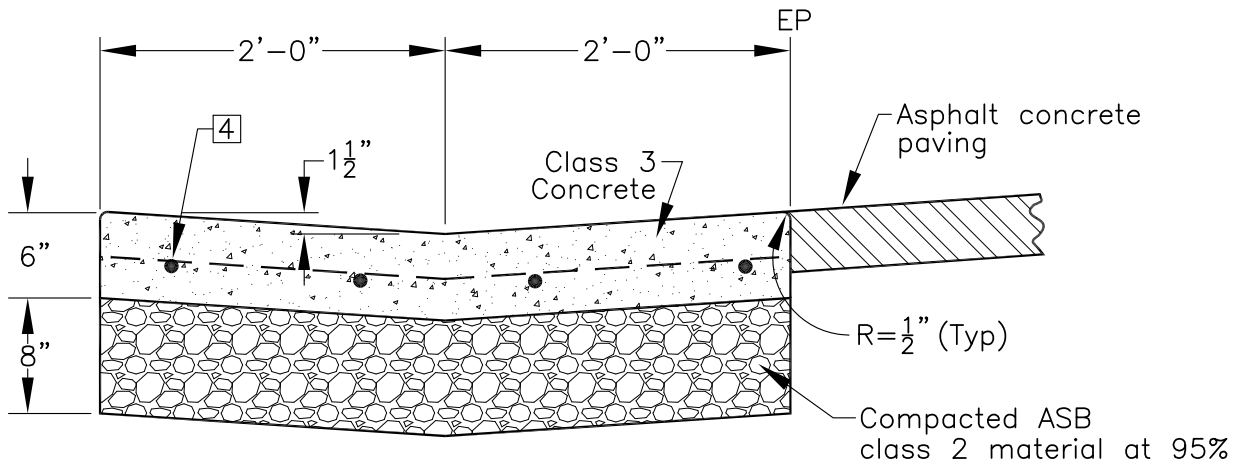
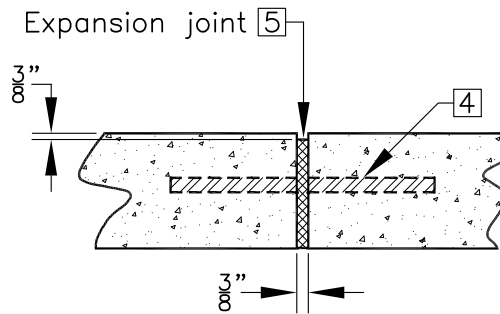
Michael Selby

No.	Revision	Description	Date

Std. Dwg. No.

R-11

Date: MAY 2015



SECTION A-A CONCRETE VALLEY GUTTER

NOTES:

1. Construct expansion joints, at 80' max intervals and at the ends of curbs, each side of catchbasins and other fixed objects.
 2. Concrete valley gutter to be used only with specific approval of the agency.
 3. Minimum slope of gutter shall be set at 0.25% unless otherwise approved by the Director of Public Works.
- [4] (4) $\frac{5}{8}$ " x 24" long steel dowels, greased & wrapped one side through all expansion joints.
- [5] Pre-formed fiber expansion joint filler conforming to ASTM D-1751.



VALLEY GUTTER DETAIL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

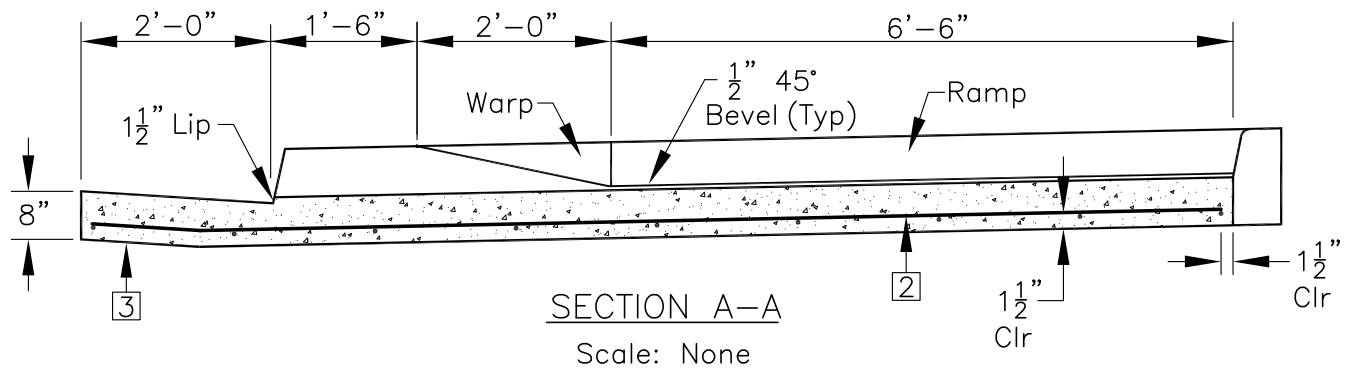
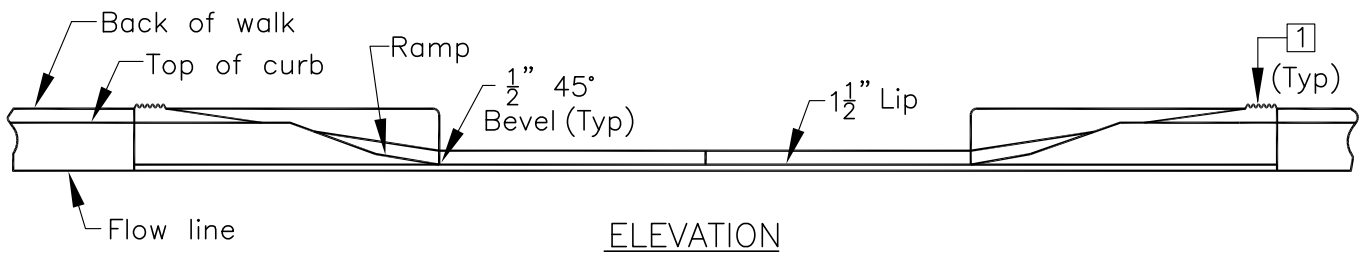
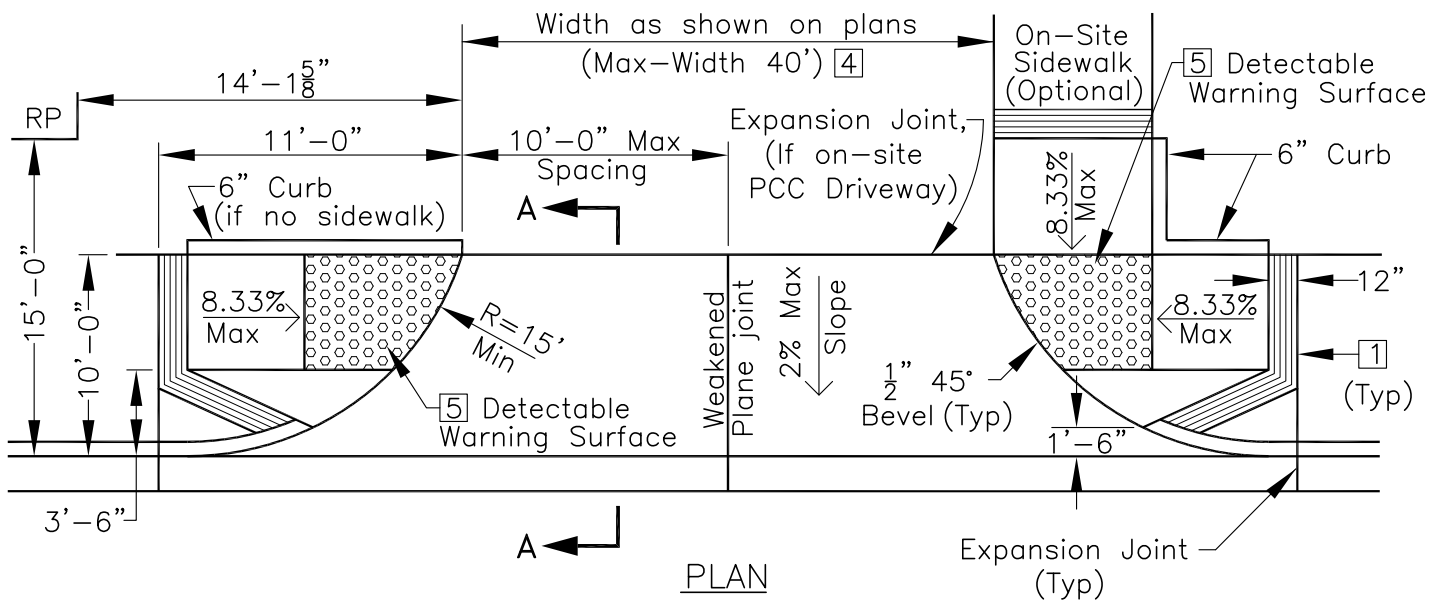
Thomas M. Hill

No.	Revision	Description	Date

Std. Dwg. No.

R-12

Date: DEC 2014



NOTES:

- [1] 12" grooved border.
- [2] #4 rebar 18" Center to Center each way. The entire width of the driveway and ramp.
- [3] Gutter pan dimensions per County Standards.
- [4] Width greater than 40 feet subject to Director's approval.
- [5] Curb ramps shall have a detectable warning surface that extends the full width and 3'-0" depth of the ramp. Detectable Warning Surfaces shall conform to the details on this plan and the requirements in the Special Provisions and the latest State Standard Plan A88A.



**TYPE 1
COMMERCIAL DRIVEWAY**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

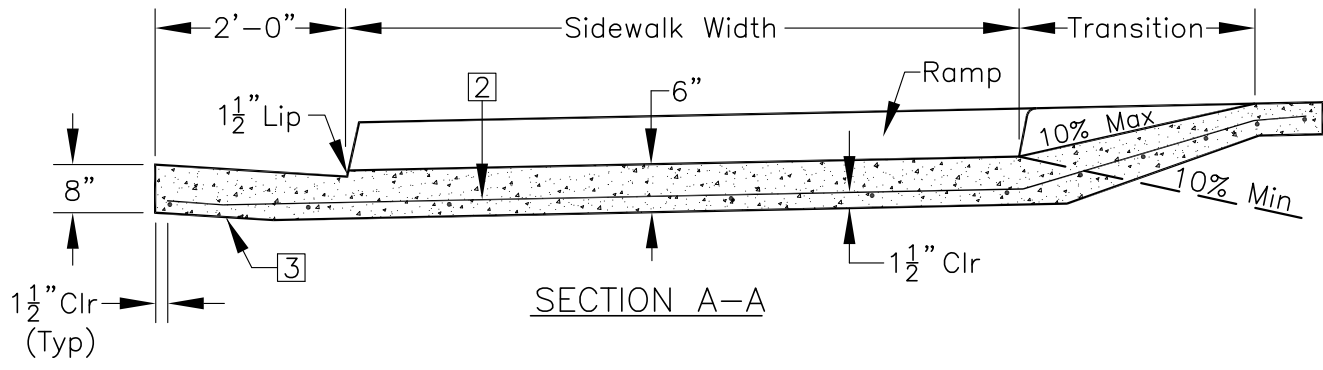
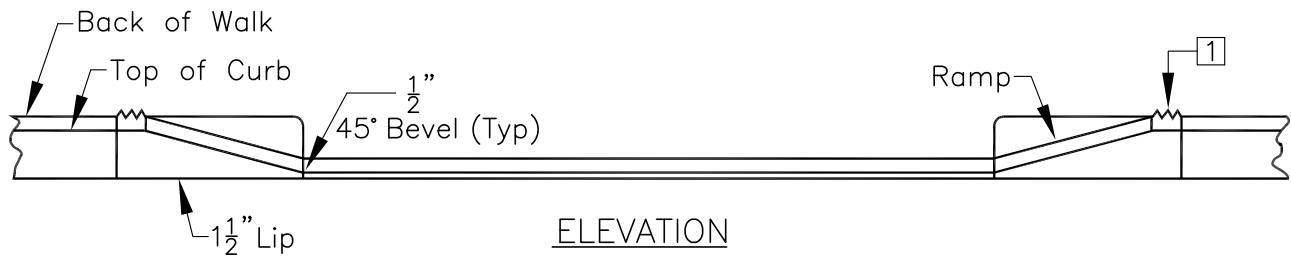
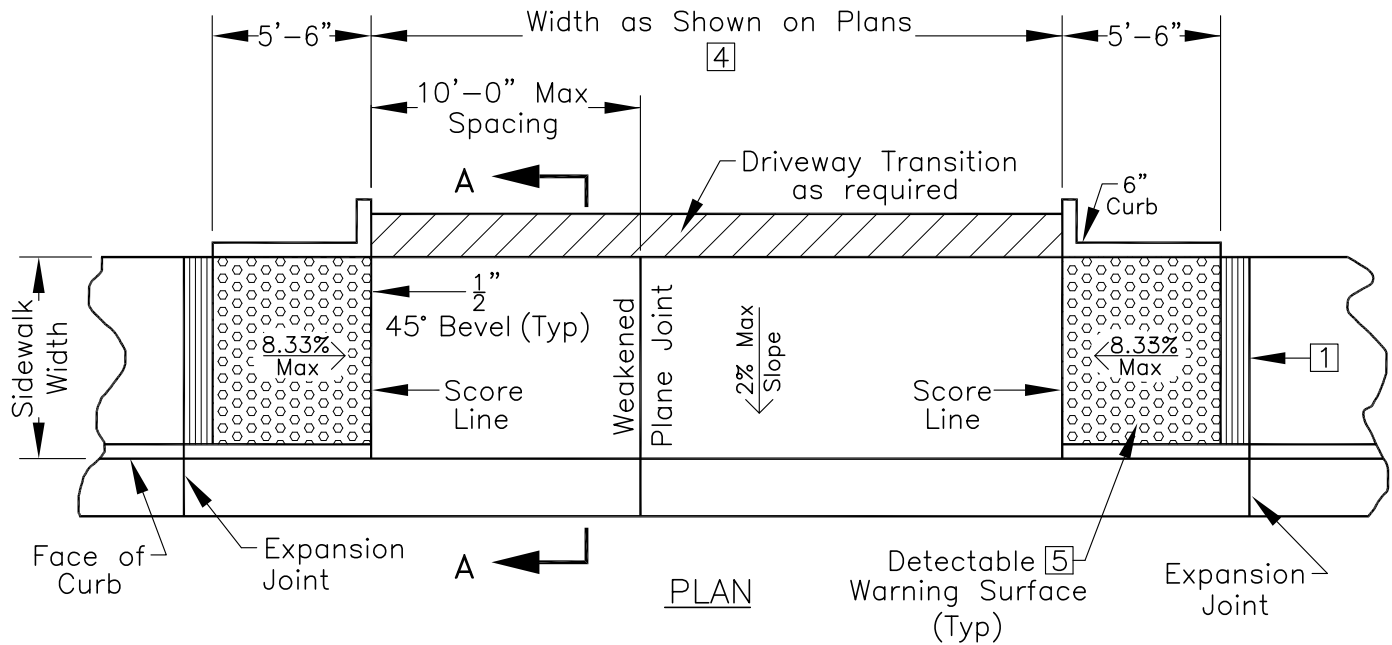
Date: MAY 2015

Approved by:

Michael Selby

No.	Revision	Description	Date

Std. Dwg. No. **R-13**



NOTES:

- ① 12" Grooved border.
- ② #4 rebar 18" Center to Center each way. The entire width of driveway and ramp.
- ③ Gutter pan dimensions per County Standards.
- ④ Width greater than 40 feet subject to Director's approval.
- ⑤ Curb ramps shall have a detectable warning surface that extends the full width and 3'-0" depth of the ramp. Detectable Warning Surfaces shall conform to the details on this plan and the requirements in the Special Provisions and the latest Caltrans Standard Plan A88A.



**TYPE 2
COMMERCIAL DRIVEWAY**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Michael Selby

No.	Revision	Description	Date

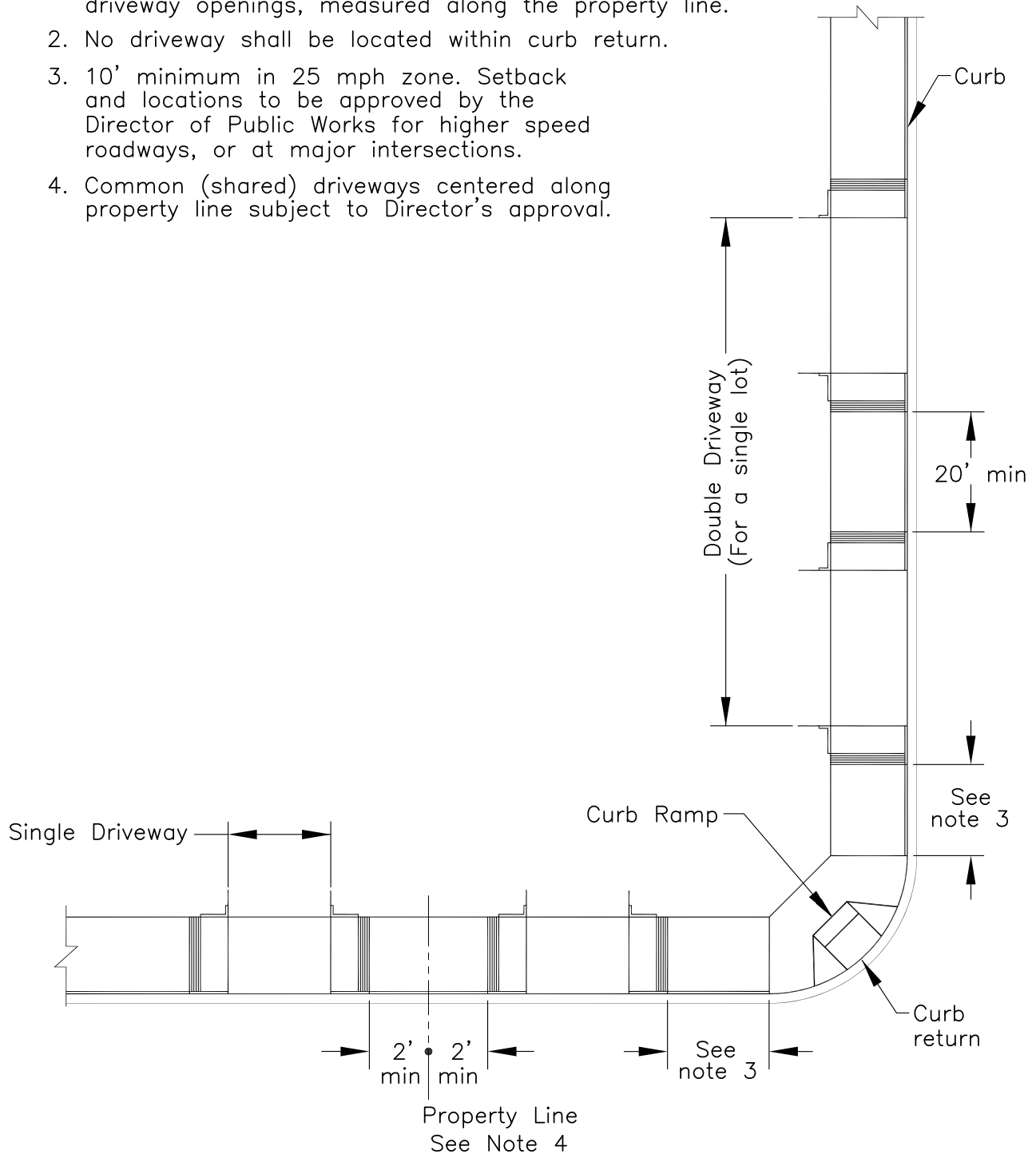
Date: MAY 2015

Std. Dwg. No.

R-14

NOTES:

1. Not more than 50% of the frontage can be in driveway openings, measured along the property line.
2. No driveway shall be located within curb return.
3. 10' minimum in 25 mph zone. Setback and locations to be approved by the Director of Public Works for higher speed roadways, or at major intersections.
4. Common (shared) driveways centered along property line subject to Director's approval.



**TYPICAL
DRIVEWAY LOCATIONS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

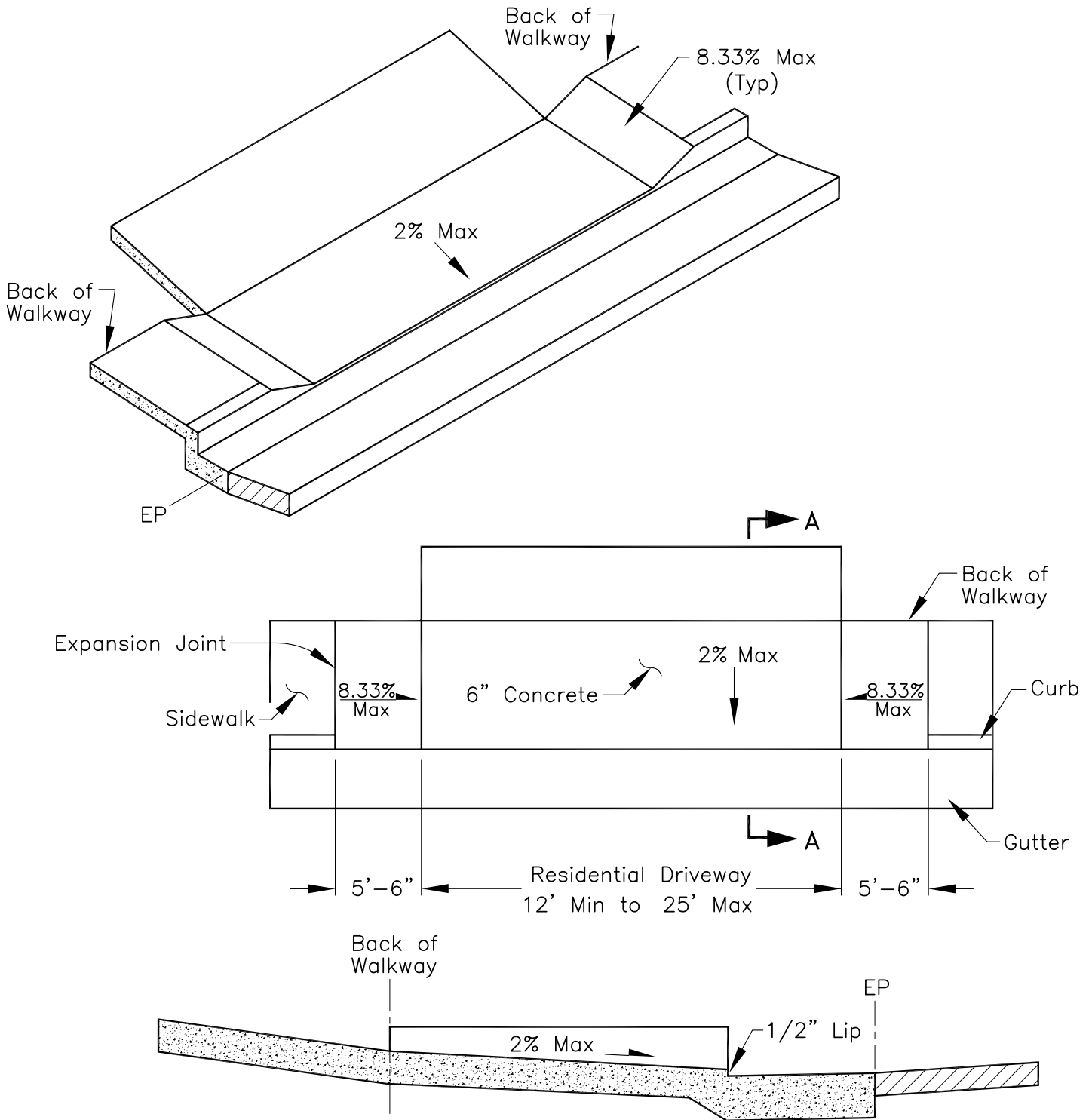
Thomas M. Hill

No.	Revision	Description	Date

Std. Dwg. No.

R-15

Date: DEC 2014



SECTION A-A

NOTES:

1. Driveway to be located entirely within the frontage of lot served.
2. Minimum 4' of vertical curb between adjacent driveways.



**TYPICAL RESIDENTIAL
DRIVEWAY AT VERTICAL
CURB AND GUTTER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

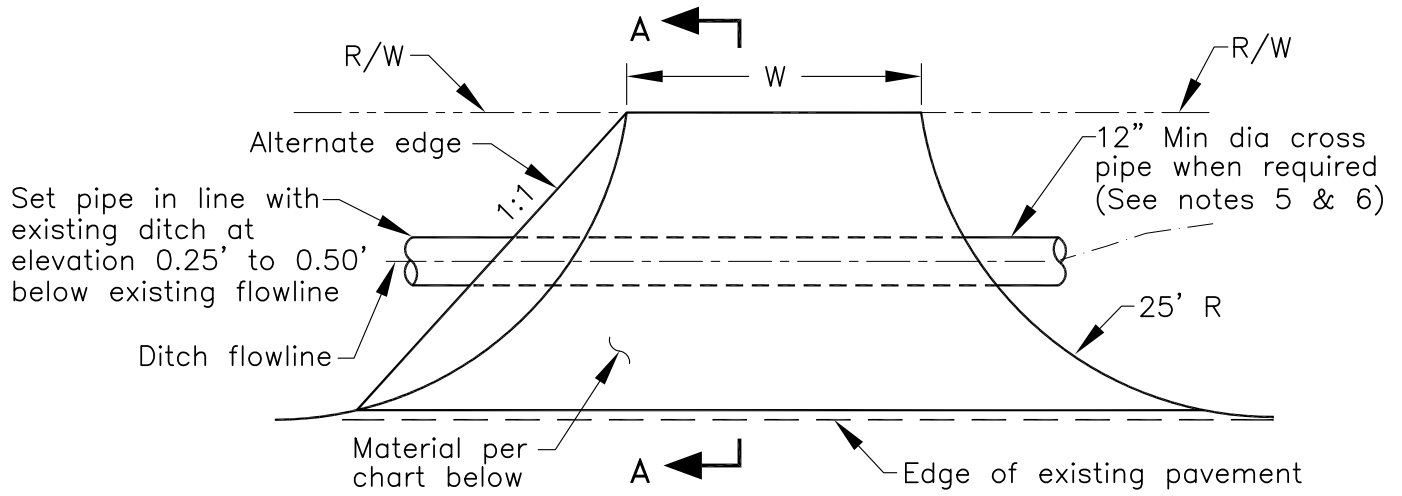
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

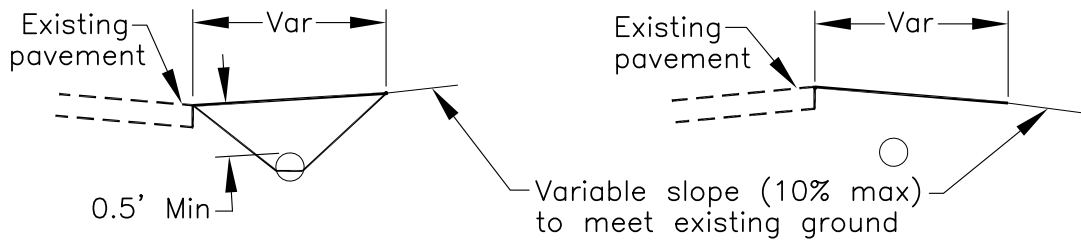
R-16

Date: DEC 2014



RURAL DRIVEWAY

TYPE	W		STRUCTURAL SECTION AC/AB(Min)	PCC (Min)
	(Min)	(Max)		
Rural Residential	12'	25'	2" AC / 4" AB	4"
Commercial, Agricultural and Industrial	15'	40'	2" AC / 6" AB	6"



SECTION A-A

NOTES:

1. Flowline of pipe shall be a min of 3" below ditch flowline and a max of 1/2 the diameter of the pipe, below ditch flowline.
2. At an intersection, no driveway shall be placed within 30' of the point of intersection of the master planned R/W lines.
3. Driveways shall be at right angles to the street.
4. Circle driveways are to be no closer than 75' between centers (residential) or 80' between centers (commercial).
5. When cross pipe is used, it shall extend a minimum of 3' past the toe of fill slopes of the driveway, all fill shall be compacted to 95% relative compaction. Maximum fill slope 2:1.
6. Pipes shall be Class 2 (min) RCP, or 0.079" Galvanized Corrugated Steel pipe, the size varies according to the hydraulic requirement.
7. Fire access roads and driveways shall comply with the San Joaquin County Fire Chiefs Association, fire access road standards.



DRIVEWAYS - TYPE D & E FOR AGRICULTURAL AND RURAL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Gull

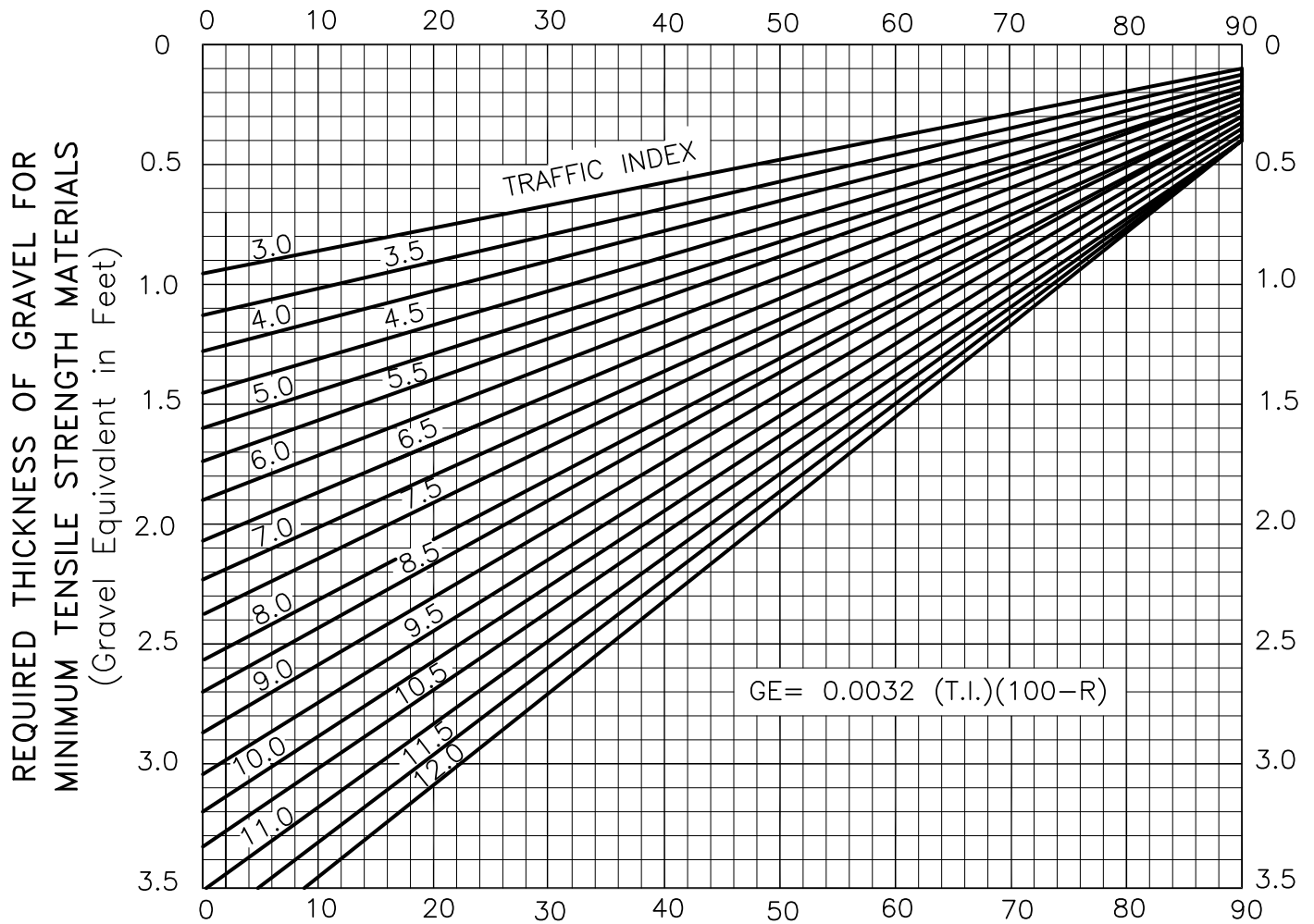
No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

R-17

RESISTANCE VALUE OF BASEMENT SOIL (R-VALUE)



Refer to Section 2.42B to determine Traffic Index (T.I.)

PROCEDURE FOR USE OF CHARTS

Find total Gravel Equivalent by intersecting Traffic Index (determined) with the existing basement soil R-Value and read thickness (in feet).

Refer to the chart at right for Gravel Equivalent Factors of surface and base materials. (Use minimum AC thickness, of 0.17', 0.21' for collectors and 0.25' for arterials and expressways).

GRAVEL EQUIVALENT FACTORS				
T.I.	AC	AB	AS	L.T.S.B.
0- 5.0	2.54	1.1	1.0	1.2
5.5- 6.0	2.32			
6.5- 7.0	2.14			
7.5- 8.0	2.01			
8.5- 9.0	1.89			
9.5-10.0	1.79			
10.5-11.0	1.71			
11.5-12.0	1.64	1.1	1.0	1.2

Lime Treated Sub Base (L.T.S.B.)



STRUCTURAL PAVEMENT DESIGN CHART

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

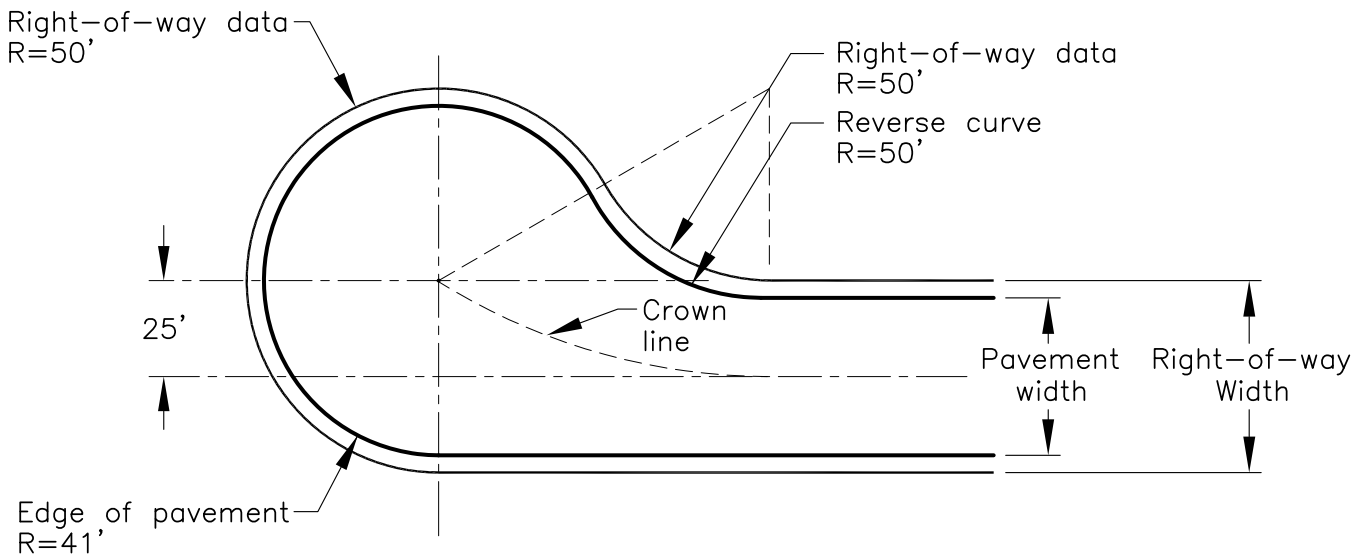
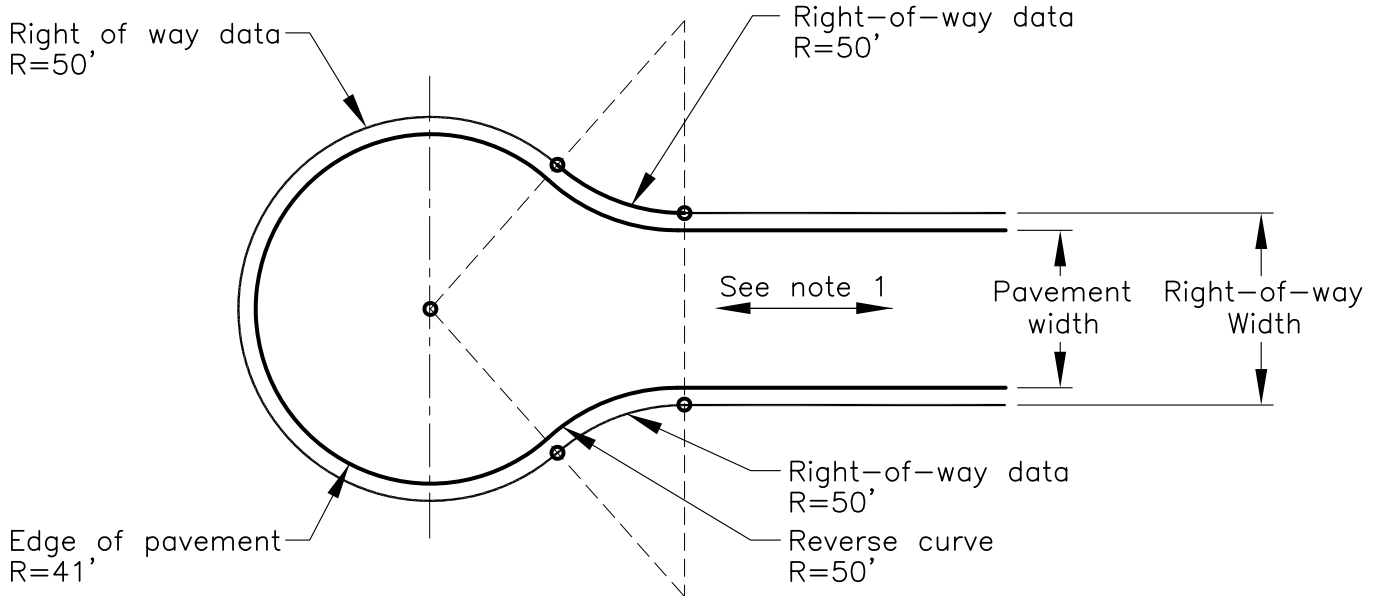
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

R-18



NOTES:

1. Cul-de-sacs: Except where special circumstances of design are apparent, cul-de-sacs shall not be more than 660' nor less than 150' in length and shall terminate with a turn-around with a paved radius of not less than forty-one feet (41').
2. Bulb may be offset to either side.
3. All facilities (curb, gutter, sidewalk and edge of pavement) shall be equidistant to the property line.
4. The structural section shall be determined by the roadway design standards and County Standard Drawing No. R-18.



**TURNAROUND FOR
RESIDENTIAL
CUL-DE-SAC STREETS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

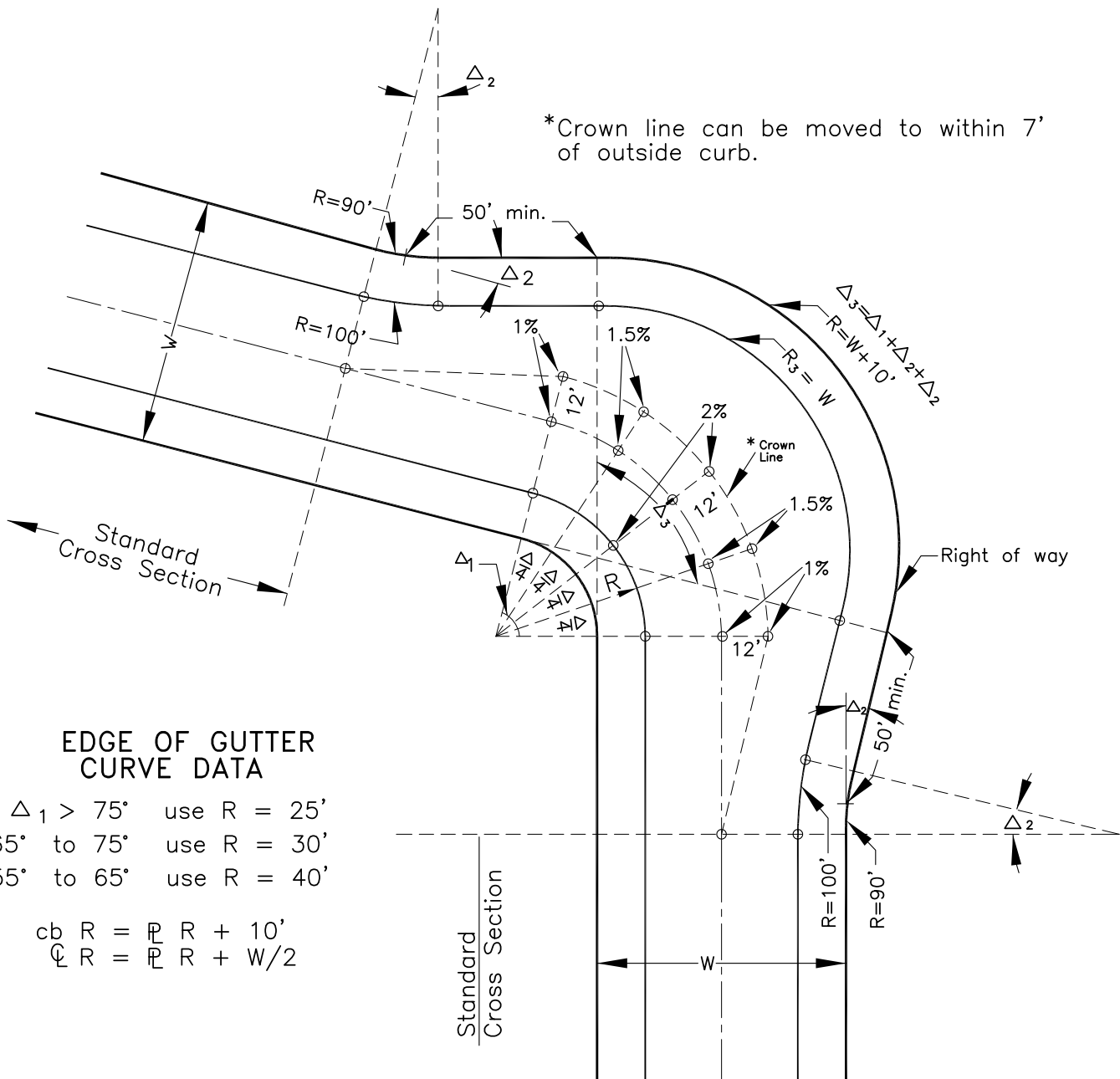
Thomas M. Grew

No.	Revision	Description	Date

Std. Dwg. No.

R-19

Date: DEC 2014



*Crown line can be moved to within 7' of outside curb.

**EDGE OF GUTTER
CURVE DATA**

- $\Delta_1 > 75^\circ$ use $R = 25'$
- 65° to 75° use $R = 30'$
- 55° to 65° use $R = 40'$

- cb $R = \frac{W}{2} R + 10'$
- $\text{CL } R = \frac{W}{2} R + W/2$

NOTES:

1. Elevations are required where circled.
2. Limits of slope, crown line to outside gutter, maximum = 4.0%; minimum = 1%.
3. All facilities (curb, gutter, sidewalk & edge of pavement) shall be equidistant to the right of way line.



**SUPERELEVATED
KNUCKLE**

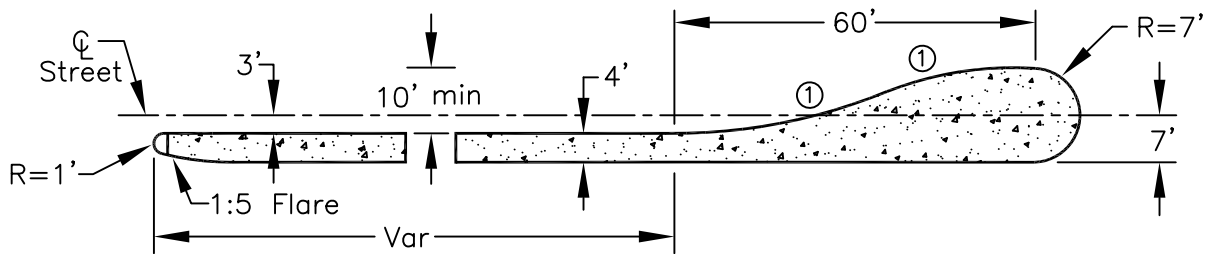
COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:
Thomas M. Hill

No.	Revision	Description	Date

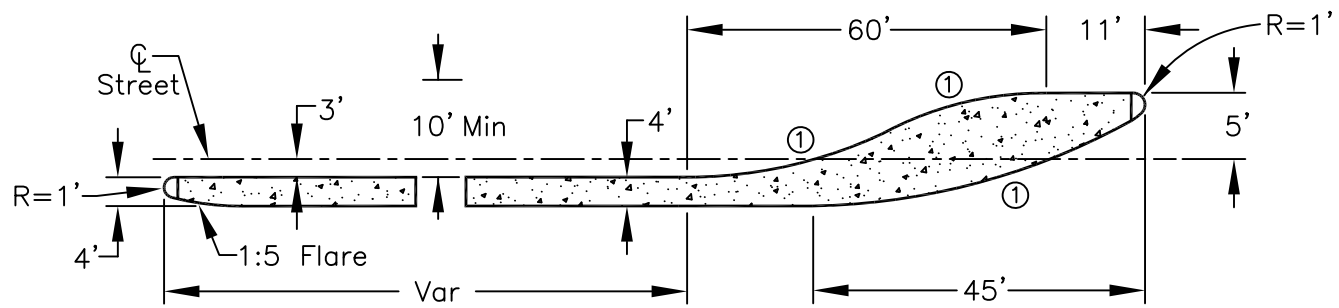
Date: DEC 2014

Std. Dwg. No. **R-20**

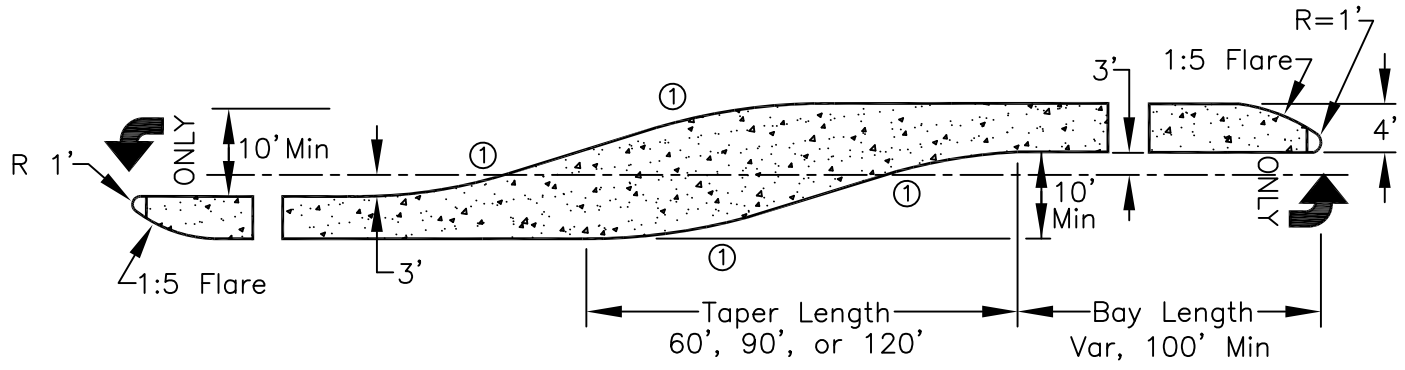


① R=100'

TYPE A



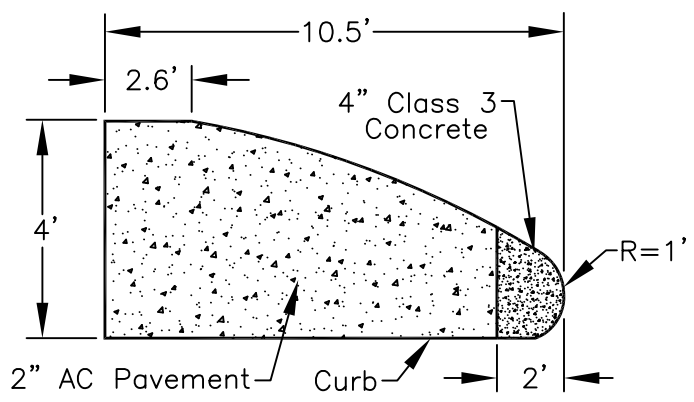
TYPE B



TYPE C

NOTES:

1. Median island shall be constructed with Caltrans Standard Type "A3" Curb.
2. Median island shall be paved with 2" AC from curb to curb, except the last 2' shall be 4" Class 3 concrete unless otherwise specified.
3. All dimensions are to flow line of curb face.
4. Bay taper to be 60'/90'/120' per Caltrans standards or as directed by Engineer.



FLARE DETAIL



TRAFFIC ISLANDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

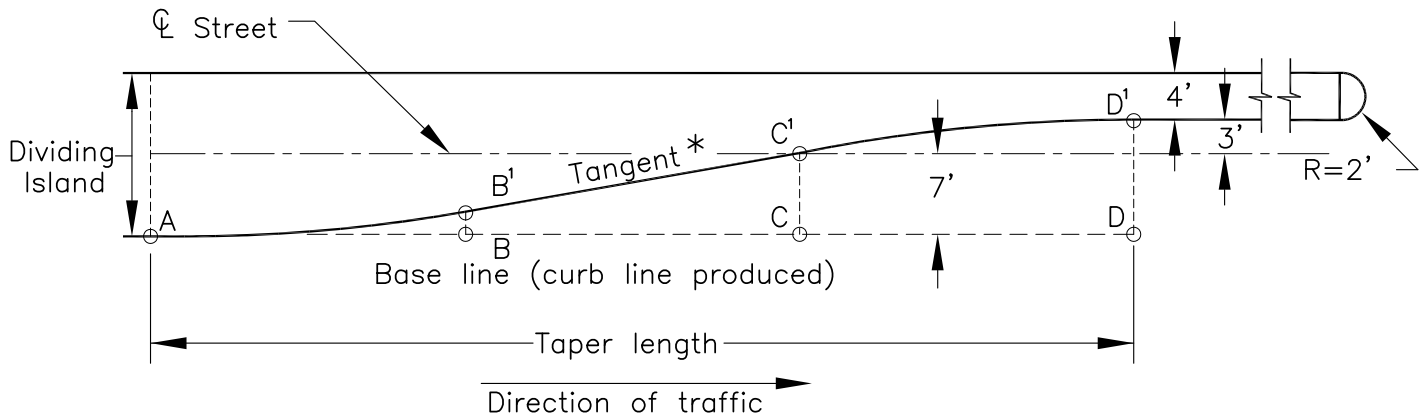
Date: DEC 2014

Approved by:

No.	Revision	Description	Date

Std. Dwg. No.

R-21



AD = Taper length
 AB = BC = CD = 1/3 AD
 AB' & C'D' are parabolic curves

* Where base line is a curve, taper between B' & C' will not be a tangent.
 Use proportional offsets from B' to C'.

The following table gives offsets from a Base line at intervals measured from point "A"

LENGTH OF TAPER - FEET			OFFSET FROM BASE LINE		
60'	90'	120'	DD'=10'	DD'=11'	DD'=12'
0	0	0	0.00'	0.00'	0.00'
5.0'	7.5'	10.0'	0.16'	0.17'	0.19'
10.0'	15.0'	20.0'	0.62'	0.69'	0.75'
15.0'	22.5'	30.0'	1.41'	1.55'	1.69'
20.0'	30.0'	40.0'	2.50'	2.75'	3.00'
30.0'	45.0'	60.0'	5.00'	5.50'	6.00'
40.0'	60.0'	80.0'	7.50'	8.25'	9.00'
45.0'	67.5'	90.0'	8.59'	9.45'	10.31'
50.0'	75.0'	100.0'	9.38'	10.31'	11.25'
55.0'	82.5'	110.0'	9.84'	10.83'	11.81'
60.0'	90.0'	120.0'	10.00'	11.00'	12.00'

NOTE:

Corresponds to major arterial per standard R-2, other designs as approved by the Director.



**LEFT TURN LANE
TAPER DATA**

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

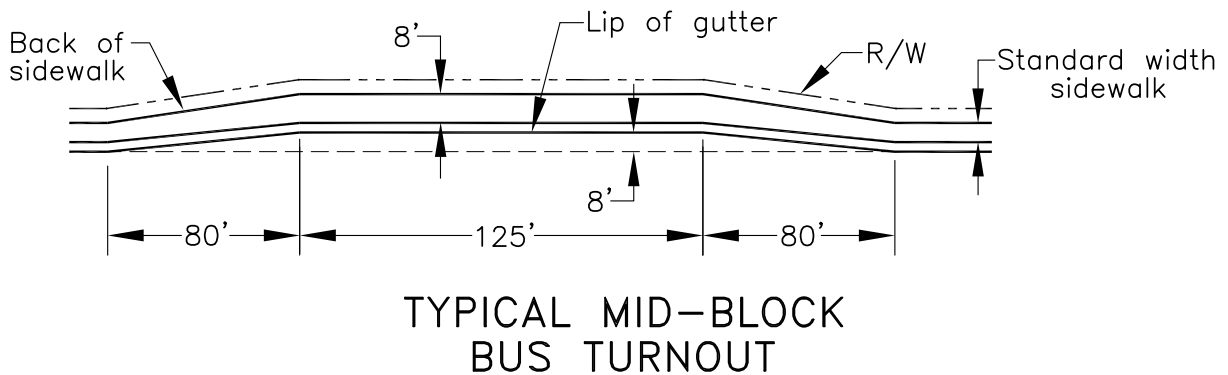
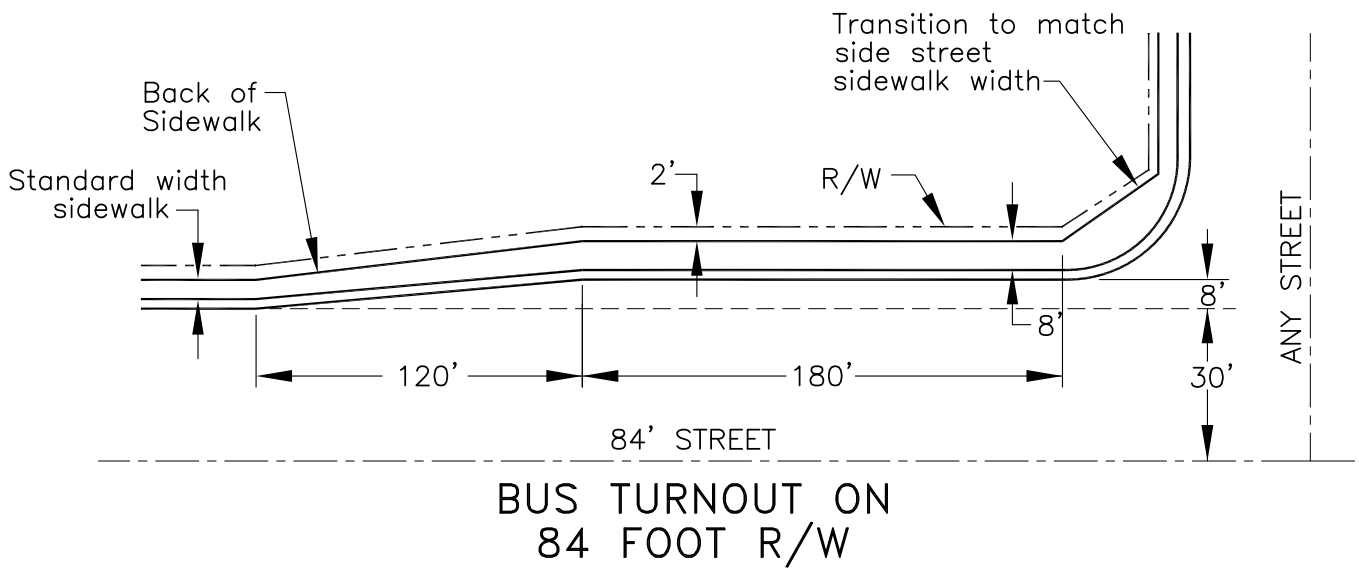
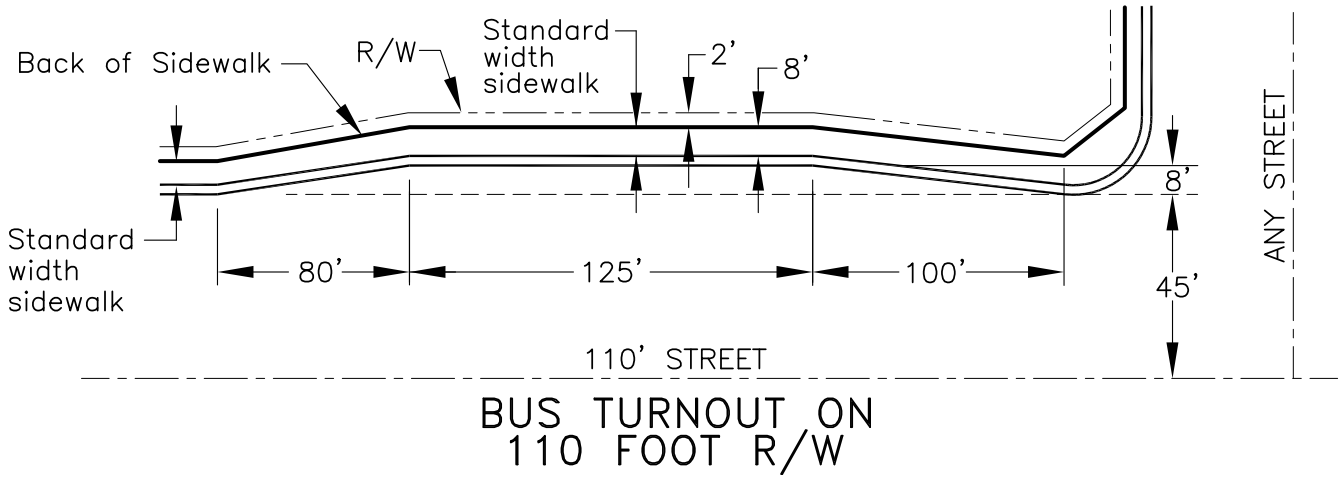
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

R-22

Date: DEC 2014



BUS TURNOUT

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

Approved by:

Thomas M. Gell

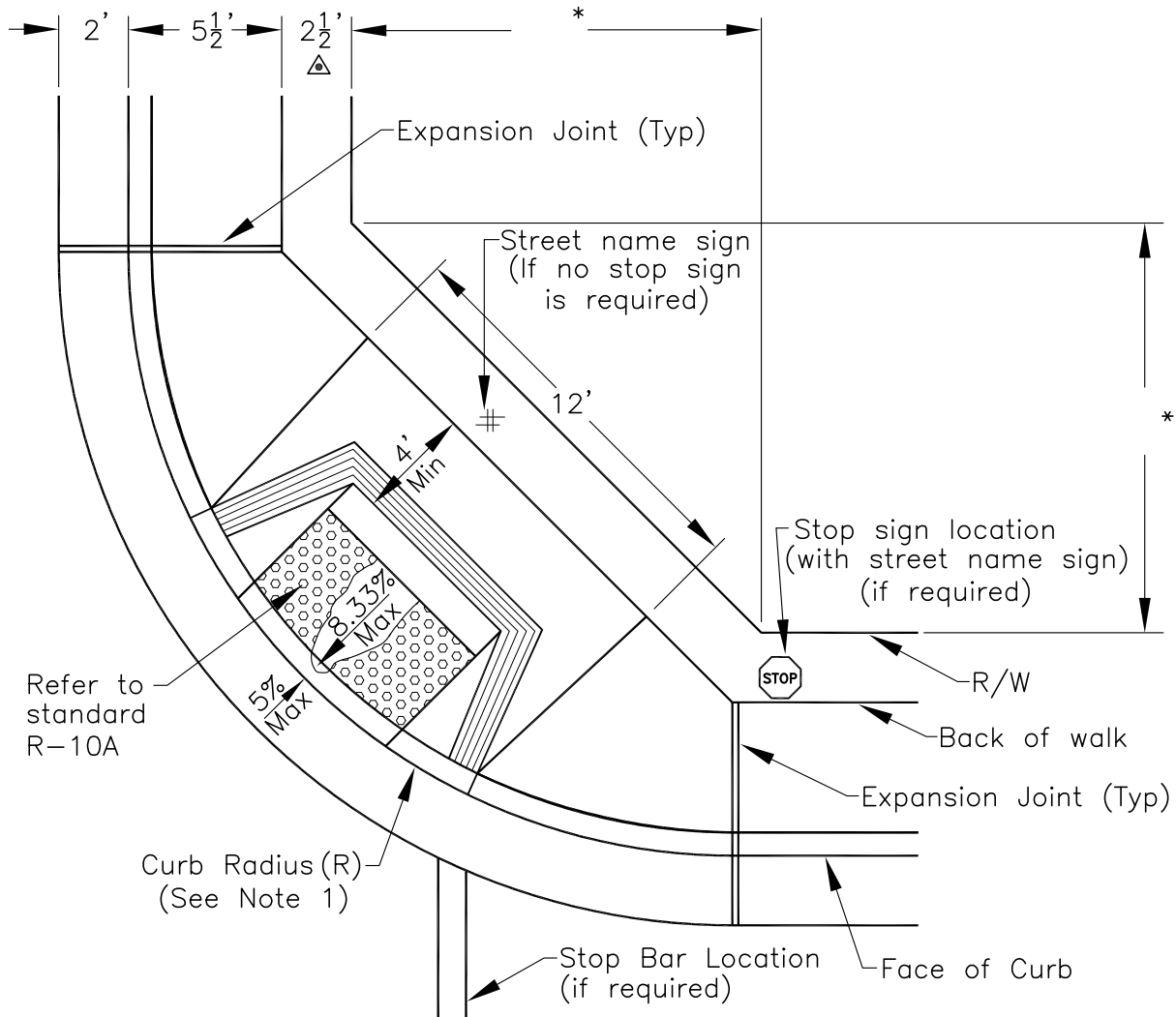
No.	Revision	Description	Date

Std. Dwg. No.

R-23

* 20' for intersection of 50' R/W and 60' R/W streets
 30' for intersection of 50' R/W or 60' R/W streets,
 with 84' R/W and 110' R/W arterials

△ 1½' (for Local Residential)



NOTES:

1. Curb radius shall be 30' for intersection of 50' R/W and 60' R/W streets and 40' for intersection of 50' R/W or 60' R/W with 84' R/W or 110' R/W arterials. (Road classifications and STAA route designations will dictate for all others.)
2. Catch basins, sign posts, utility poles or other obstructions are not to be located within the wheelchair path area.
3. See County Standard Drawing No. R-6, R-7, R-10, R-11 & R-25 for curb, gutter and sidewalk, curb ramp and sign details.
4. Access curb ramps, sidewalks and improvements in the ADA path of travel shall be constructed in conformance with the Federal Americans with Disabilities Act, California Title 24, and County Standards.



CURB RETURN

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

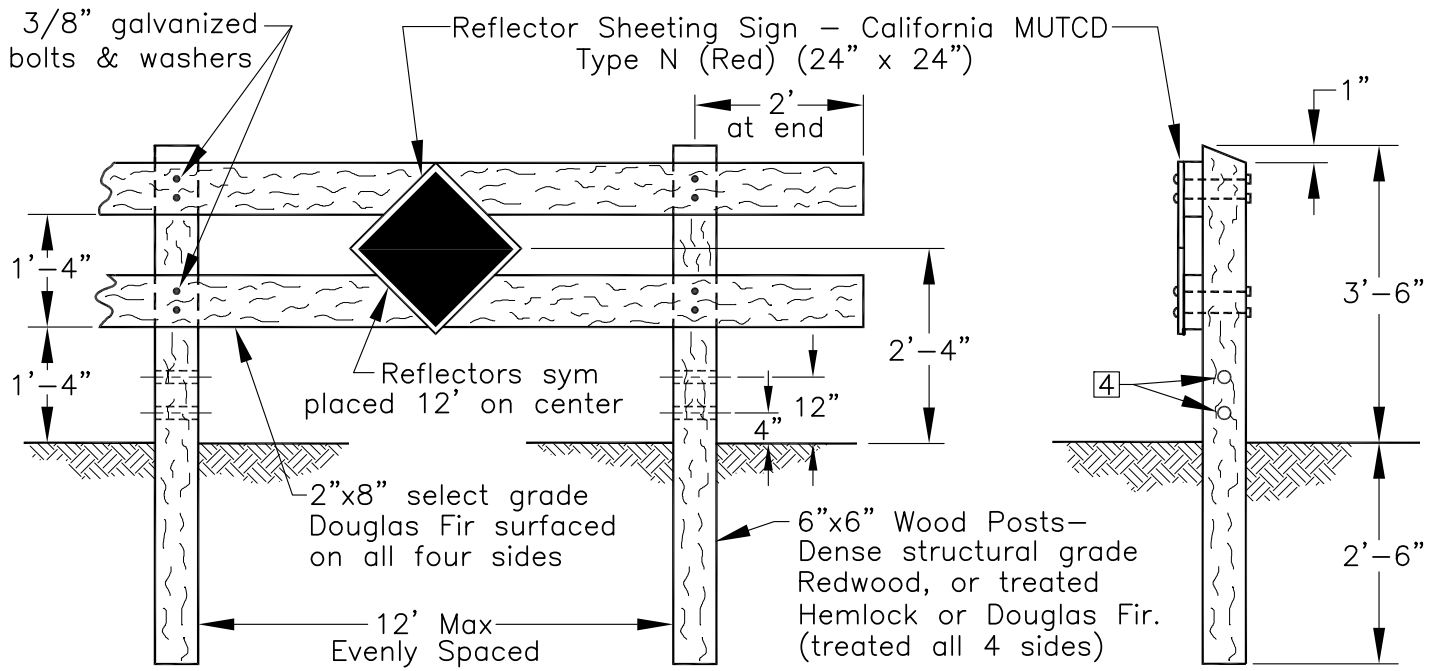
Michael Selting

No.	Revision	Description	Date

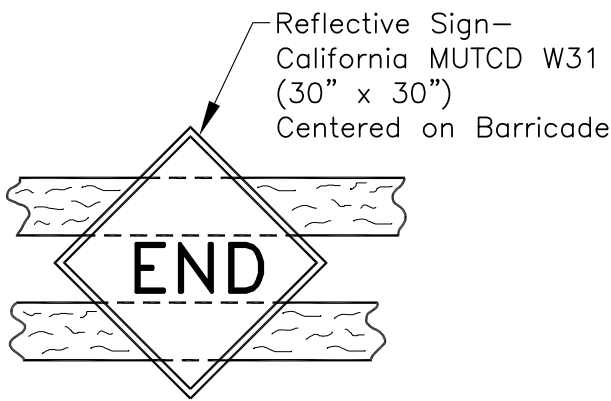
Std. Dwg. No.

R-24

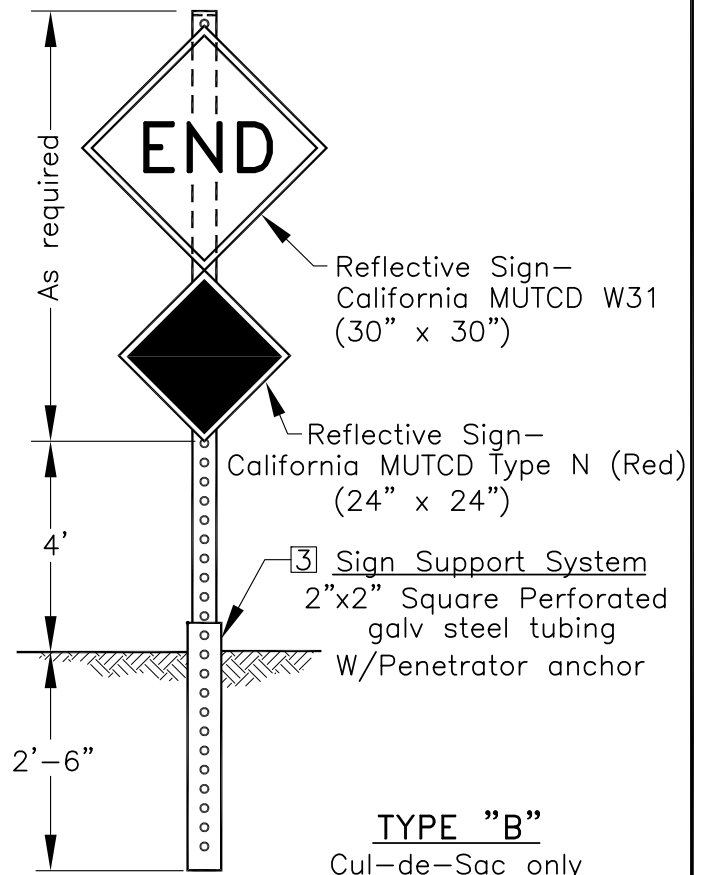
Date: MAY 2015



TYPE "A"



CENTER REFLECTOR FOR TYPE "A" BARRICADE



TYPE "B"
Cul-de-Sac only

NOTES:

1. Barricades to be as wide as street R/W
2. Barricades to be painted white using 2 coats of "Exterior Alkyd Resin Hi-Gloss Enamel" over a compatible primer.
3. Call: San Joaquin County Traffic Maintenance Division (209) 468-3088 for approved list of vendors.
4. Bore 2" diameter holes perpendicular to the roadway (2 per post).



BARRICADES FOR TERMINATING STREETS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

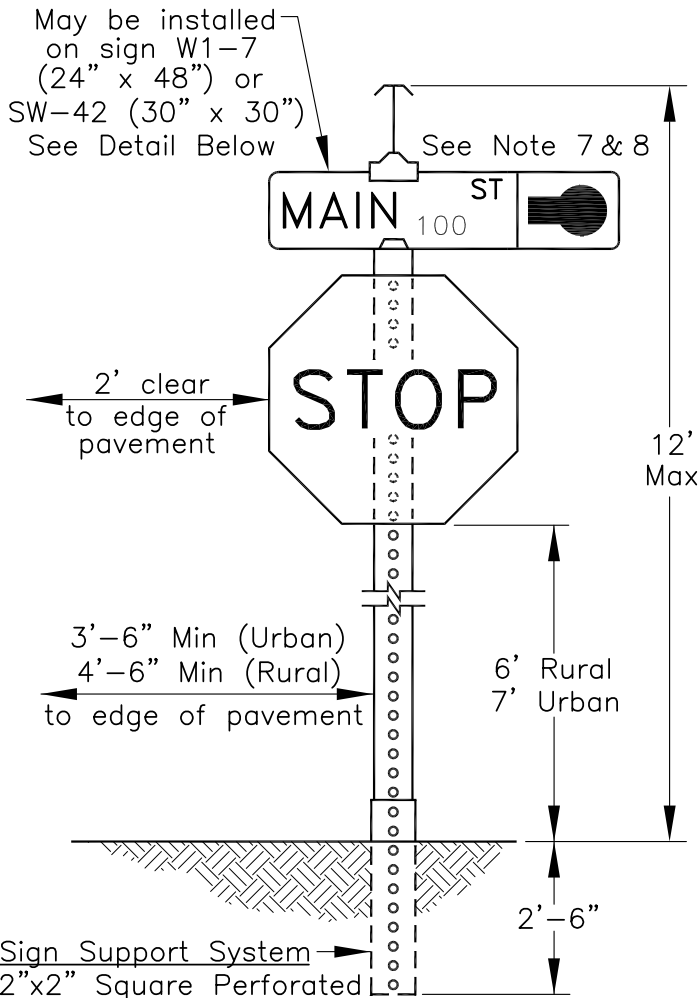
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

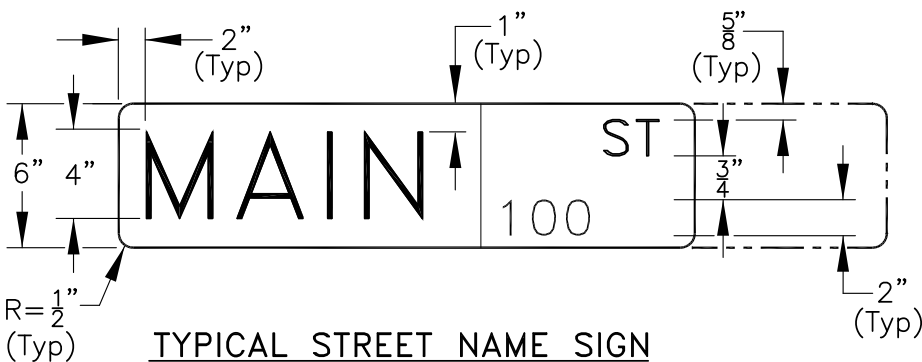
R-25

Date: DEC 2014



Sign Support System
 2"x2" Square Perforated
 Steel Tubing W/Penetrator Anchor
 Note: For a list of approved vendors, contact
 San Joaquin County Traffic Maintenance

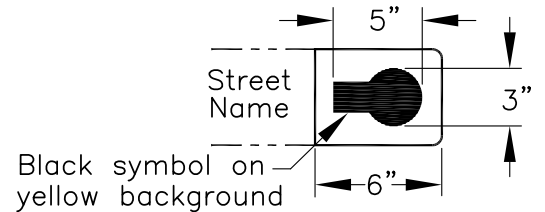
**TYPICAL STOP AND STREET
 SIGN INSTALLATION**



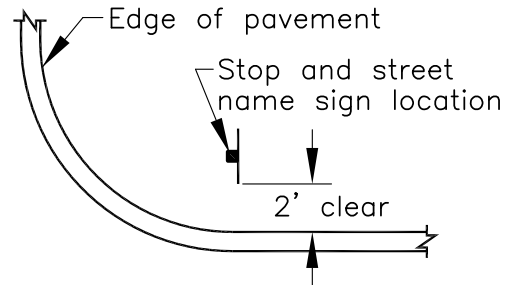
TYPICAL STREET NAME SIGN

NOTES:

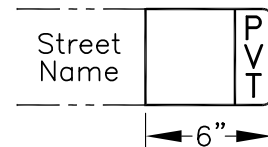
1. One street name sign is required at each intersection.
2. Block numbers are to be acquired from the San Joaquin County Community Development Department.
3. See improvement plans for location of traffic control devices.
4. The length of street name signs will vary due to the length of the street name.
5. See County Standard Drawing No. R-23 for proposed sign locations along sidewalks.
6. Stop signs shall be 30" for urban areas and for internal subdivision streets; 36" for rural areas and for streets which intersect County roadways, also to be preceded by (36" Stop Ahead sign) W3-1 with appropriate pavement markings.
7. Use the following for terminal streets less than 300' in length.
8. See below.
9. Refer to MUTCD for signalized intersections.



Black symbol on
 yellow background



**STOP & STREET NAME
 SIGN LOCATION DETAIL**



8. Use the following for
 all private roads.



**STANDARD STREET
 SIGN DETAILS**

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

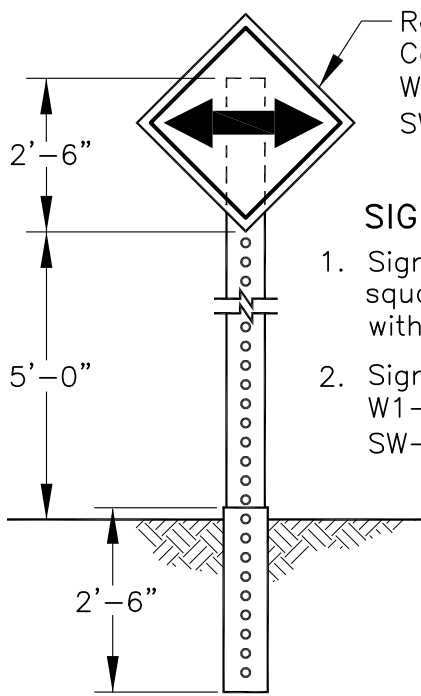
Thomas M. Gull

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

R-26



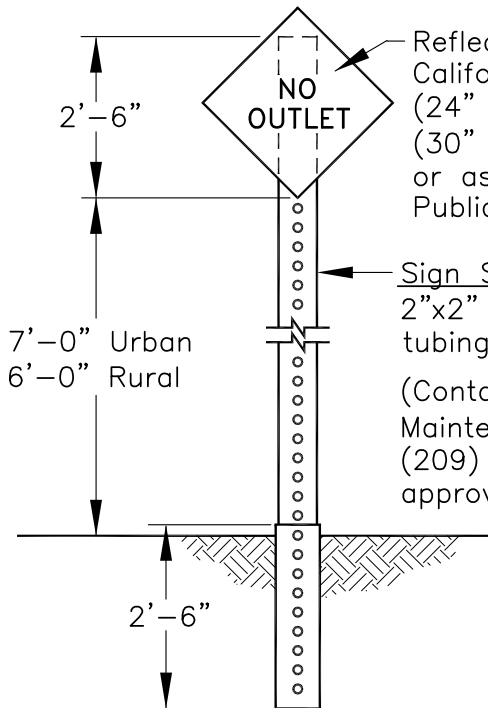
Reflective Sheeting Sign
California MUTCD
W1-7 (24" x 48") or
SW-42 (30" x 30")

SIGNS

1. Signs shall be posted on 2"x2" square perforated steel tubing with penetrator anchor.
2. Sign - California MUTCD W1-6 (24" x 48") or SW-43 (30" x 30")

Reflective Sheeting Sign
California MUTCD
Type N (Yellow)
(24" x 24")

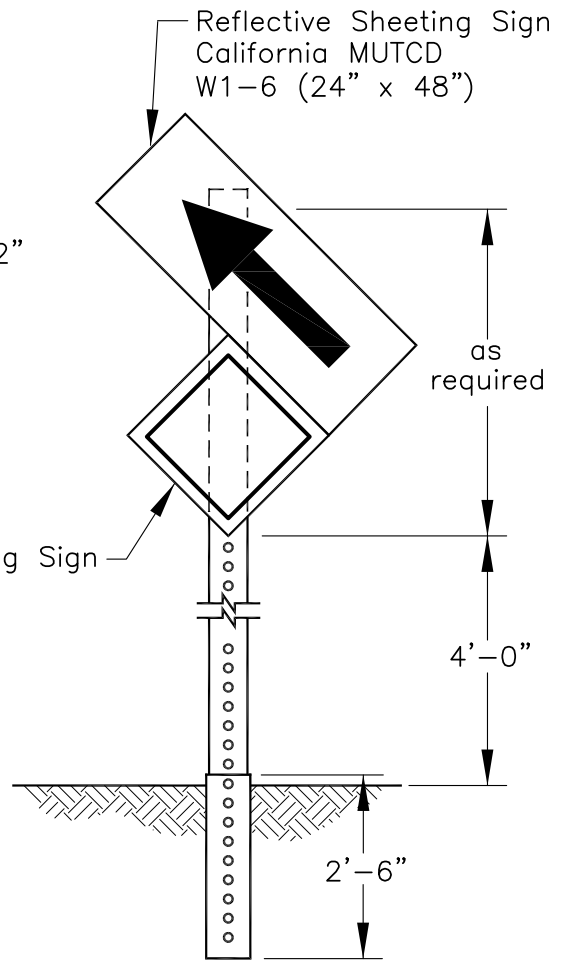
T INTERSECTION SIGN
(post across from intersection)



Reflective Sheeting Sign
California MUTCD
(24" x 24") Urban Locations
(30" x 30") Rural Locations
or as directed by S.J. Co.
Public Works Department

Sign Support System (Typ)
2"x2" square perforated steel
tubing w/penetrator anchor.
(Contact: S.J. County Traffic
Maintenance Division at:
(209) 468-3088 for an
approved list of vendors)

TYPICAL SIGN



**LANE REDUCTION
SIGNING**

1. Center the lane reduction sign behind Type A barricade (barricade to be placed on a skew with Type N (Yellow) signs attached).
2. Place Class 1 flexible post delineators (Cal Trans A73C) at a 10:1 taper preceding the Type A barricade (minimum of 5 delineators).
3. Pavement lane reduction arrows.
4. W4-2, transition sign.



TRAFFIC SIGNS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

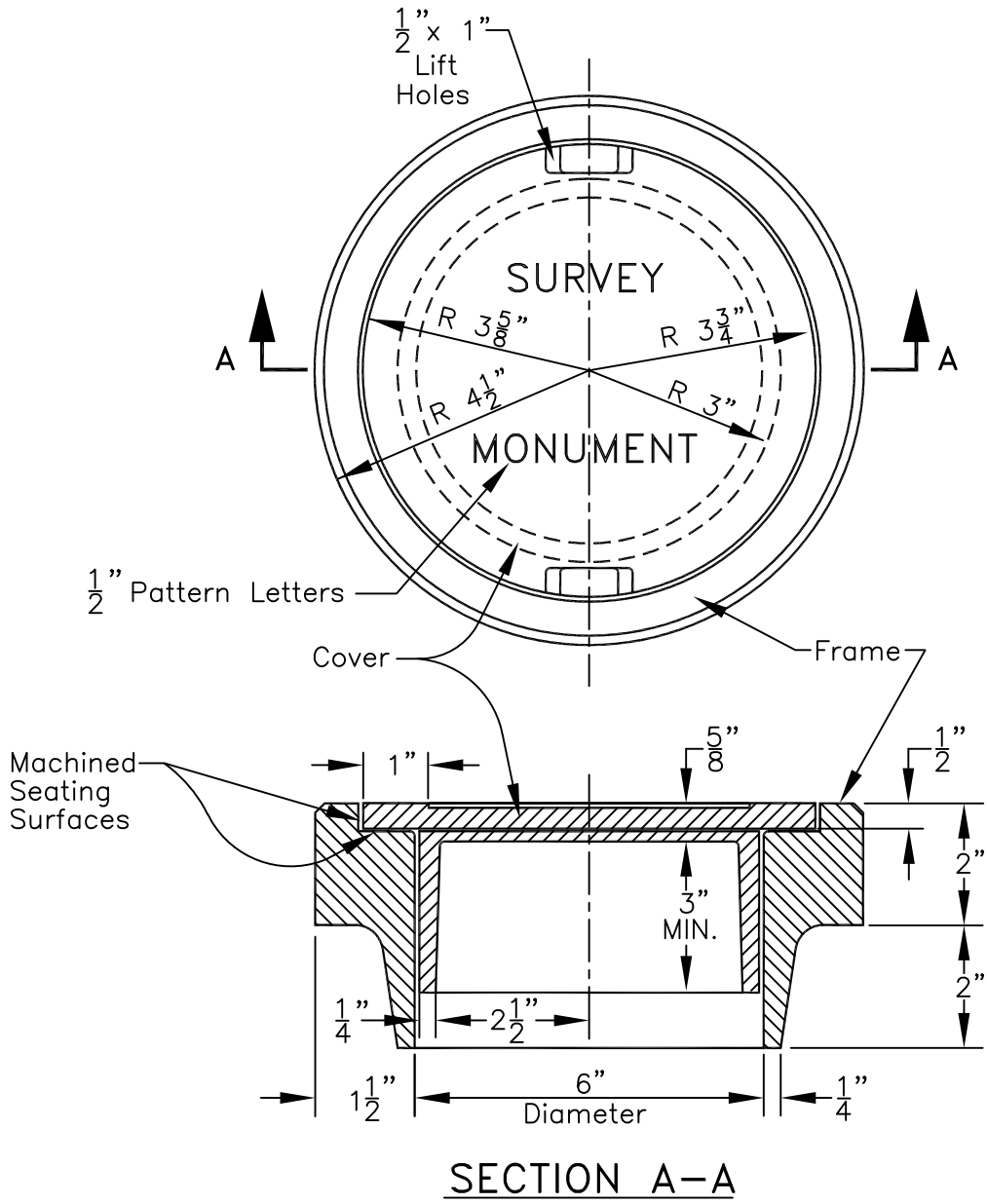
Thomas M. Goss

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

R-27



SECTION A-A

NOTES:

1. Frame and Cover shall be manufactured of cast iron conforming to ASTM A-48-Class 30.
2. Frame and Cover shall be HS20-44 Rated.
3. Frame shall weigh approx. 22 pounds. Cover shall weigh approx. 9 pounds.
4. Frame and Cover shall be coated with bituminous material conforming to A.W.W.A. C203.
5. Country of origin and manufacturer shall be cast into frame and cover.
6. For installation detail of survey monument see County Standard Drawing No. R-28B.



**SURVEY MONUMENT
FRAME AND COVER**
(Page 1 of 2)

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

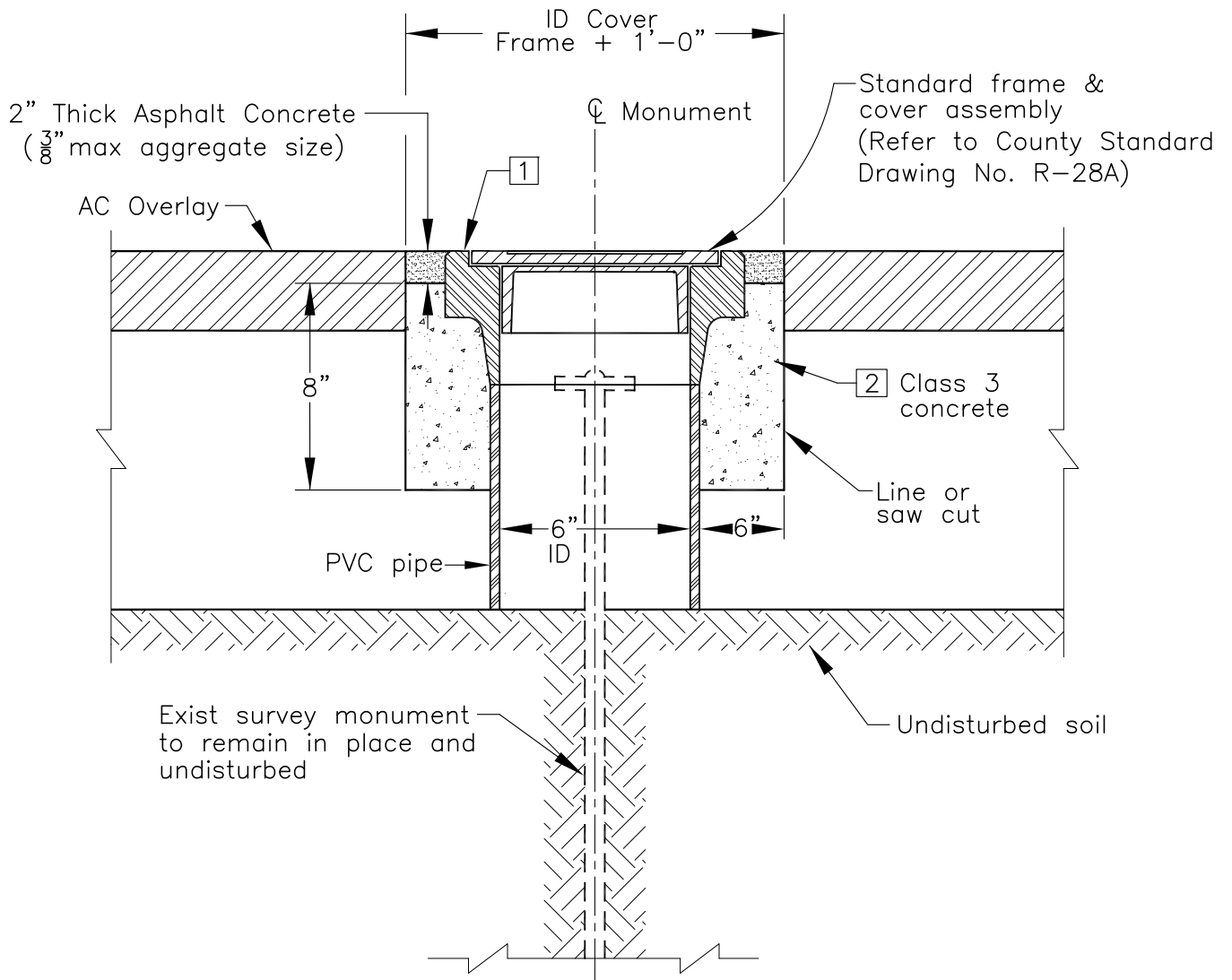
Date: AUG 2022

Approved by:

No.	Revision Description	Date
1	Revised Internal Sleeve length	8/1/22

Std. Dwg. No.

R-28A



SURVEY MONUMENT INSTALLATION DETAIL

NOTES:

- 1 Elevation of frame shall match finished grade of pavement $\pm \frac{1}{8}$ ".
- 2 Class 3 Concrete collar placed around monument frame.



SURVEY MONUMENT INSTALLATION DETAIL

(Page 2 of 2)

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

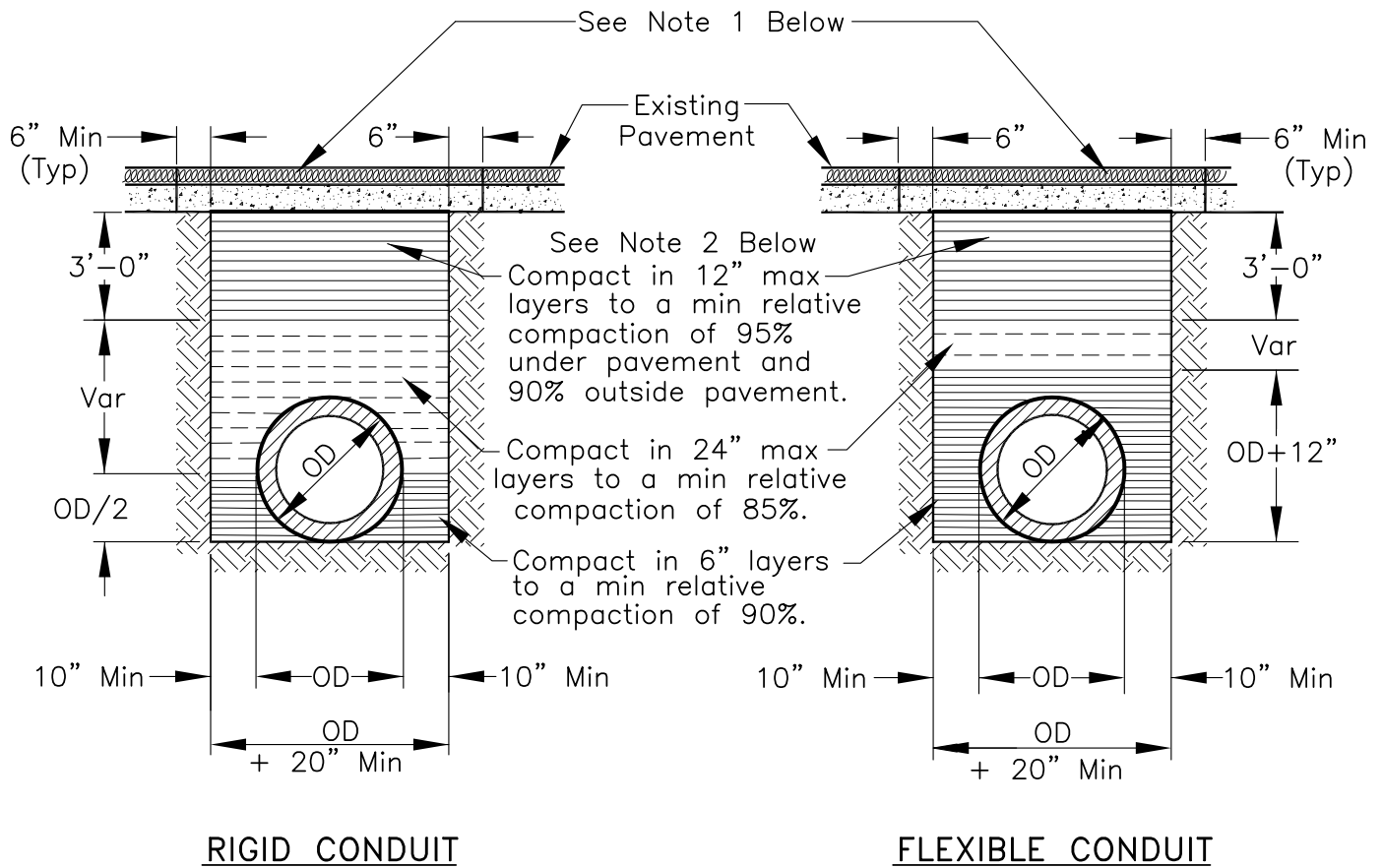
Michael Selby

No.	Revision	Description	Date

Date: MAY 2015

Std. Dwg. No.

R-28B



NOTES:

1. New pavement shall be 1" thicker than existing pavement, minimum of 0.25 Ft. New base shall be 1" thicker than existing base, min of 0.50 Ft.
2. Select native material or imported granular material as approved by the Director of Public Works. Backfill with materials equal to or better than the existing pavement and base in quality.
3. Relative compaction of materials shall be tested in accordance with the State of California, Dept. of Transportation Testing Manuals, test method No. California 216 or 231.
4. All existing pavement shall be neatly cut to line prior to trench excavation.
5. Jetting or ponding will be permitted within the street right-of-way with a 3 year bond, when approved by the Director of Public Works.
6. When shown by soil composition and compactability, ninety percent (90%) compaction may be used, when approved by the Director of Public Works.
7. Special bedding and backfill requirements may be shown on the plans or specified in the special provisions.



TYPICAL TRENCH BACKFILL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

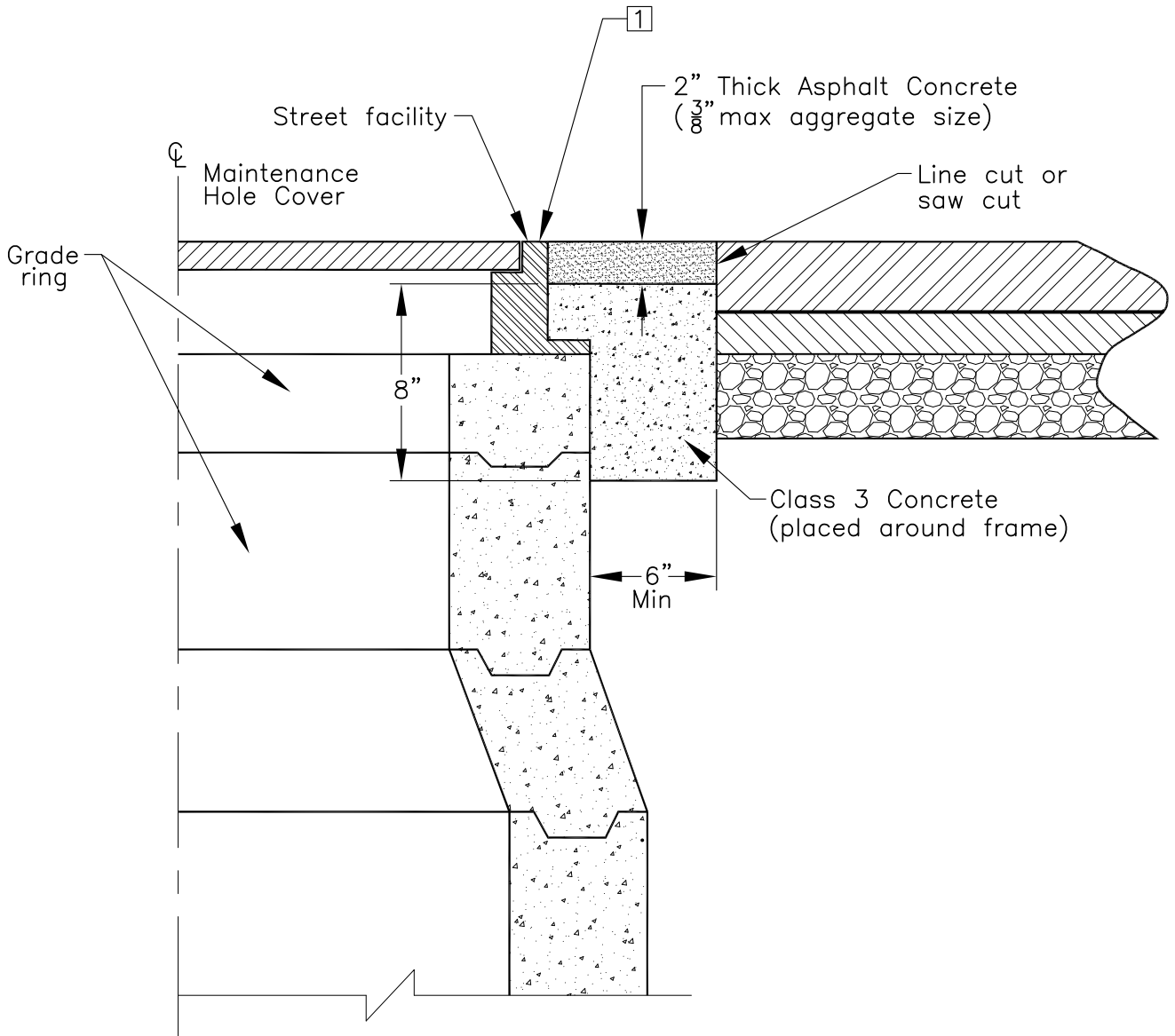
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

R-29

Date: DEC 2014



NOTES:

[1] Elevation of frame shall match finished grade of pavement $\pm 1/8$ "



ADJUSTING STREET FACILITIES TO GRADE

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

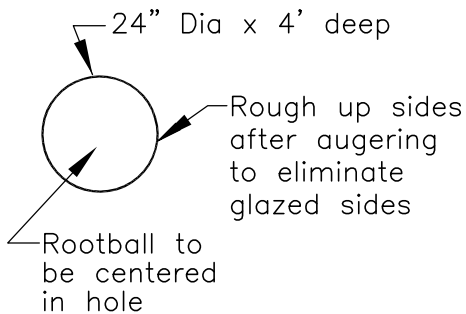
Approved by:

Thomas M. Gell

No.	Revision	Description	Date

Std. Dwg. No.

R-30



AUGER PATTERN

Install a 3" PVC perforated pipe 4' long filled with clean 3/4" gravel

Fill around rootball with a mixture of 50% soil amendment and 50% excavated soil fill to 3' deep. Add tree starter fertilizer to mixture per manufacturers recommendation for size and type of tree.

Augered soil shall be consolidated to min 80% compaction.

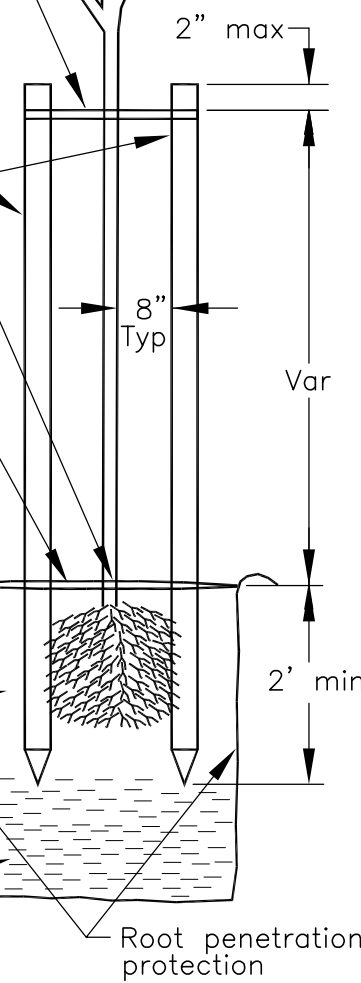
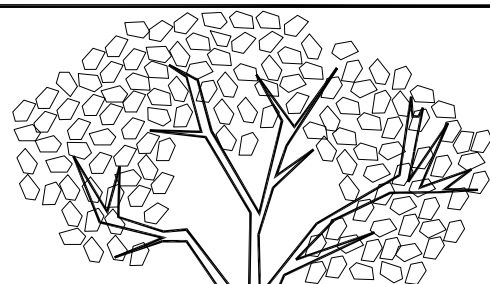
Water barrier required when adjacent to curb

Place 2 ties at lowest possible height that will still provide adequate support to the head of the tree

2" or 2" x 2" treated stakes parallel to prevailing wind

Place crown min 1" above sidewalk

Mulch top 1" with soil amendment or peat moss



NOTES:

1. Condition of tree: Shall be free of injury and disease and shall have no circular, damaged, or girdling roots.
2. Standard tree locations: In tree planting easements 30 feet from street lights and 10 feet from curb radius returns, 10 feet from sewer and water lines and driveways. Spacing to be approximately 40 feet apart, with a minimum of one tree per lot.
3. Type of tree: As specified by the San Joaquin County approved tree list. Tree shall be healthy and must meet landscape industry standards.
4. Size of tree: Shall be 5 gallon.
5. Place root barrier around rootball and perforated pipe.
6. Tree support ties shall be heavy duty .008 gauge 1" wide "Tree Tie".
7. Trees shall be planted outside of County right-of-way.



**ROAD FRONTAGE
TREE PLANTING GUIDELINE**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: JUN 2016

Approved by:

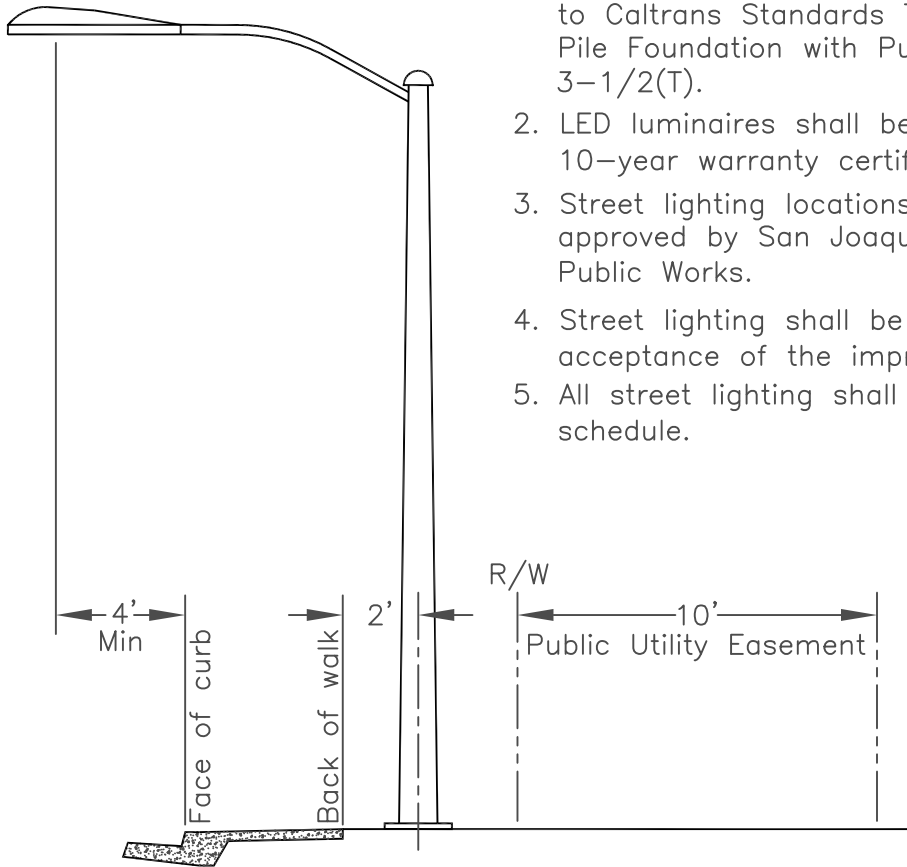
No.	Revision	Description	Date

Std. Dwg. No.

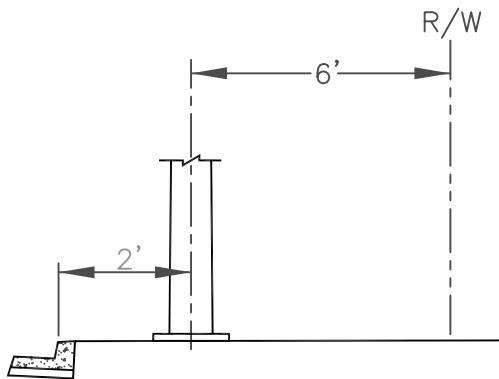
R-31

NOTES:

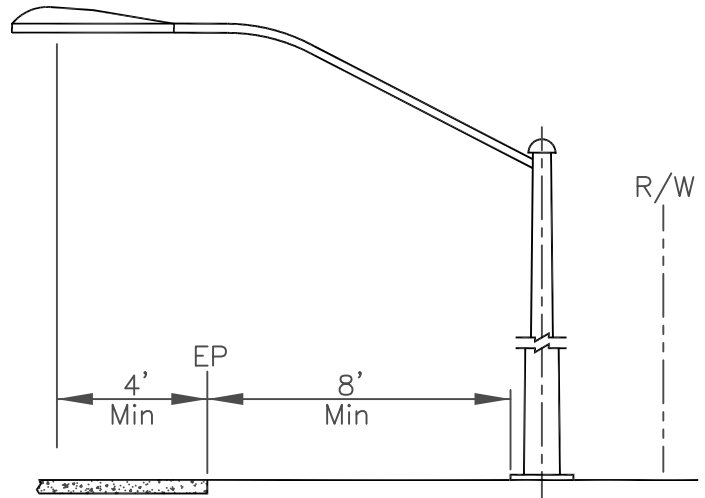
1. All street lighting and appurtenances shall conform to Caltrans Standards Type 15 on Cast-in-Hole Pile Foundation with Pull Box No. 3-1/2 or No. 3-1/2(T).
2. LED luminaires shall be CREE XSP Series with 10-year warranty certification or approved equal.
3. Street lighting locations at intersections shall be approved by San Joaquin County Department of Public Works.
4. Street lighting shall be energized prior to County acceptance of the improvements.
5. All street lighting shall be on P.G.&E. LS-2 rate schedule.



LOCAL RESIDENTIAL AND COLLECTOR RESIDENTIAL



LOCAL COMMERCIAL & INDUSTRIAL



RURAL ROADS
(OR ROADS WITHOUT SIDEWALKS)



STREET LIGHTING

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

[Signature]

No.	Revision	Description	Date

Date: JULY 2020

Std. Dwg. No.

R-32

Street Lighting designs not meeting the spacing guidelines per County Standard Drawing No. R-34, shall be designed to meet the average maintained footcandle for the appropriate street classification.

STREET CLASSIFICATION	STREET TYPE & RIGHT-OF-WAY WIDTH	AVERAGE MAINTAINED FOOTCANDLE
Expressway	110'	.57
Principal arterial	110'	.54
Minor arterial	84'	.36
Collector/ Industrial/ Commercial	60'	.26
Residential	50'	.13
Pedestrian lane	—	.17

NOTES:

1. Lumens used to calculate the Average Maintained Footcandle shall be 80% of the initial Lumen value rated by the lamp manufacturer.
2. Minimum footcandle shall be 0.10.

 <p>Public Works San Joaquin County Working for YOU</p>	<p>STREET LIGHTING DESIGN CRITERIA</p>	<p>Approved by:</p> 												
	<p><i>COUNTY OF SAN JOAQUIN</i> DEPARTMENT OF PUBLIC WORKS</p>	<table border="1"> <thead> <tr> <th>No.</th> <th>Revision</th> <th>Description</th> <th>Date</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	No.	Revision	Description	Date								
	No.	Revision	Description	Date										
<p>Date: JULY 2020</p>	<p>Std. Dwg. No. R-33</p>													

STREET CLASSIFICATION	STREET R/W WIDTH	CREE LED STREET LIGHT XSP SERIES	SPACING	
EXPRESSWAY	110'	XSPLG-D-HT-3ME-18L-40K7-UL	180'	ONE SIDE ONLY ²
PRINCIPAL ARTERIAL	110'	XSPLG-D-HT-3ME-18L-40K7-UL	220'	
MINOR ARTERIAL	84'	XSPMD-D-HT-3ME-12L-40K7-UL	220'	
COLLECTOR/ INDUSTRIAL/ COMMERCIAL	60'	XSPMD-D-HT-2ME-12L-40K7-UL	220'	BOTH SIDES
RESIDENTIAL	50'	XSPSM-D-HT-2ME-5L-40K7-UL	200'	
RURAL INTERSECTIONS	--	XSPMD-D-HT-4ME-12L-40K7-UL	ONE ONLY AT EACH INTERSECTION	

NOTES:

1. Spacing may be adjusted to allow for driveways.
2. Back-on lot spacing may be adjusted to 330 feet, if both sides of the street are lighted.
3. Back light shields shall be required for street lights in residential areas.



STREET LIGHT POLE SPACING GUIDE

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

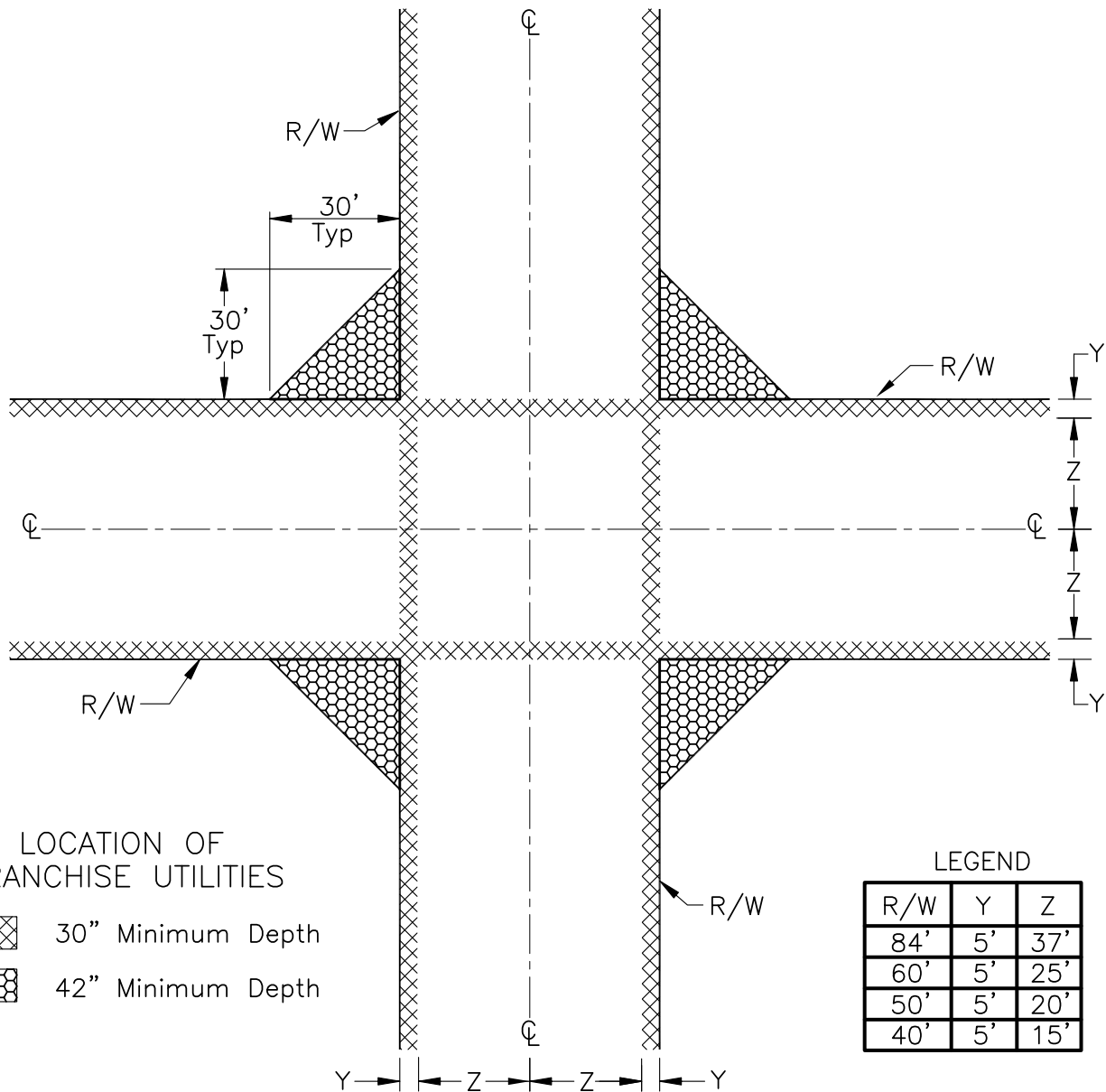
[Handwritten Signature]

No.	Revision	Description	Date

Date: JULY 2020

Std. Dwg. No.

R-34



NOTES:

1. Any deviations from the standard locations are subject to the approval of the Director of Public Works.
2. This standard shall apply to existing intersections.
3. Franchise Utilities shall include telephone, gas, electrical, telecommunications, etc.



UNDERSTANDING UTILITIES LOCATIONS AT EXISTING INTERSECTIONS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

No.	Revision	Description	Date

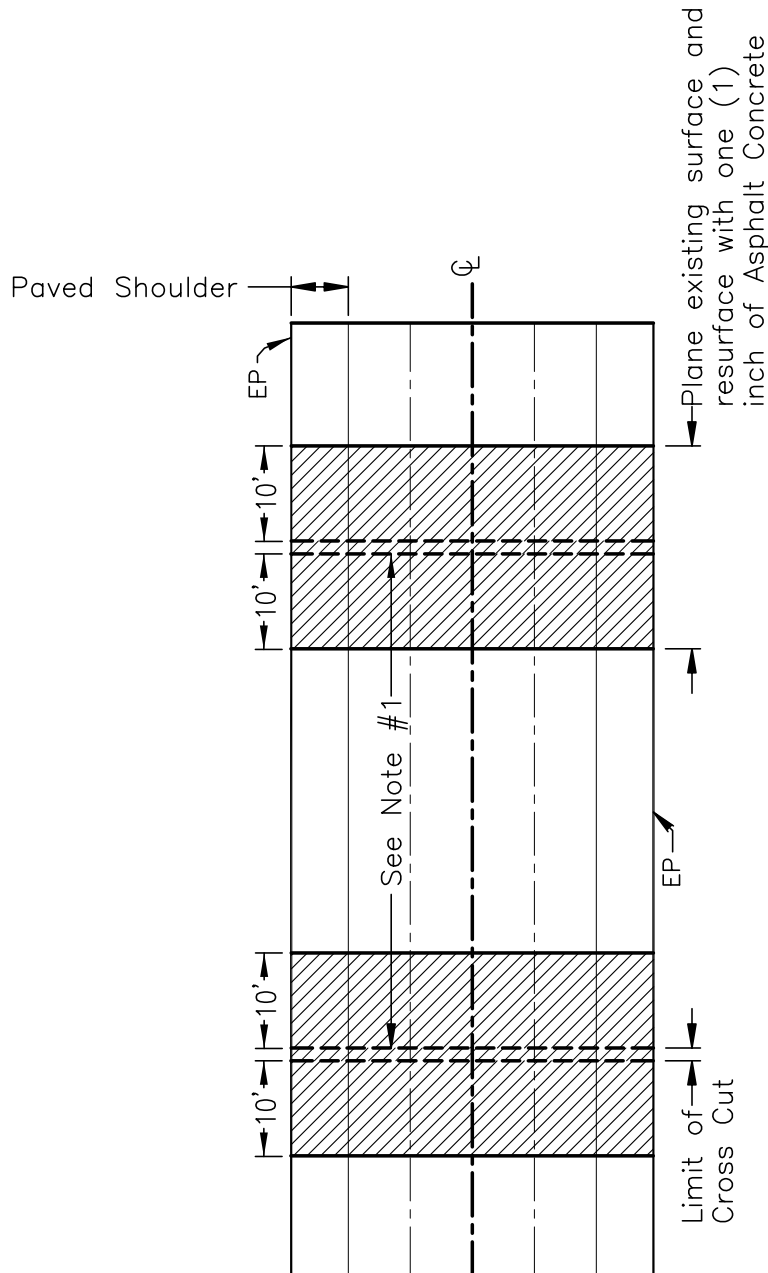
Date: DEC 2014

Std. Dwg. No.

R-35

NOTES:

1. If the distance between cross-cuts are less than 150' the entire area between cross-cuts shall be planed and resurfaced with one (1) inch of Asphalt Concrete.
2. The resurfacing requirements shall be in addition to County Standard Drawing No. R-29.
3. Resurfacing for Bell Holes shall meet these requirements. If excavation occurs within the shoulder or lane, only that area shall be resurfaced as shown.
4. If cross-cutting is performed on Local Roads at intervals less than 150' a Seal Coat for that half of the roadway containing the trench can be used in lieu of resurfacing. Section 2-5.03 (B-2).



**TRENCH CUTTING POLICY
CROSS CUTTING OF
COUNTY ROADWAYS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: MAY 2015

Approved by:

Michael Selby

No.	Revision	Description	Date

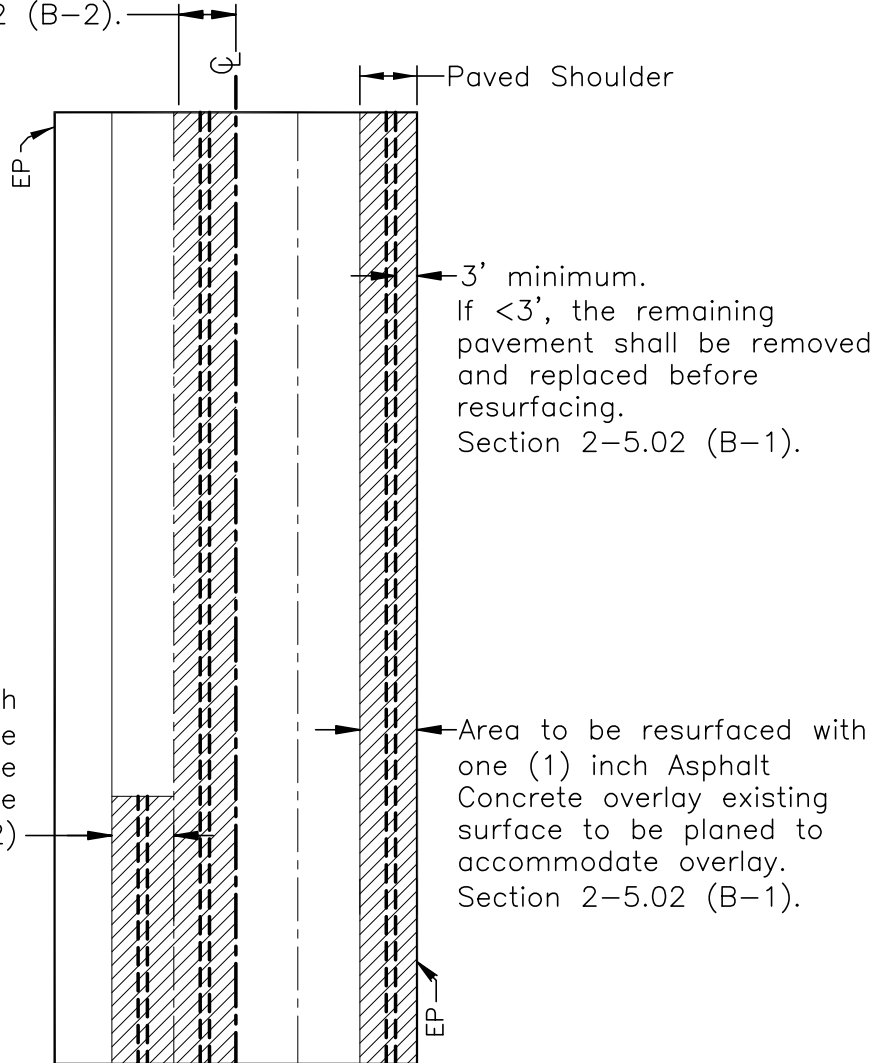
Std. Dwg. No.

R-36

NOTES:

1. The resurfacing requirements shall be in addition to County Standard Drawing No. R-29.
2. If longitudinal cuts are required on a Local Road a Seal Coat can be used for that half of the roadway containing the trench. Section 2-5.03 (B-1).

Area to be resurfaced with one (1) inch Asphalt Concrete overlay existing surface to be planed, to accommodate overlay. Section 2-5.02 (B-2).



Area to be resurfaced with one (1) inch Asphalt Concrete overlay existing surface to be planed to accommodate overlay. Section 2-5.02 (B-2)



**TRENCH CUTTING POLICY
LONGITUDINAL CUTTING
OF COUNTY ROADWAYS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

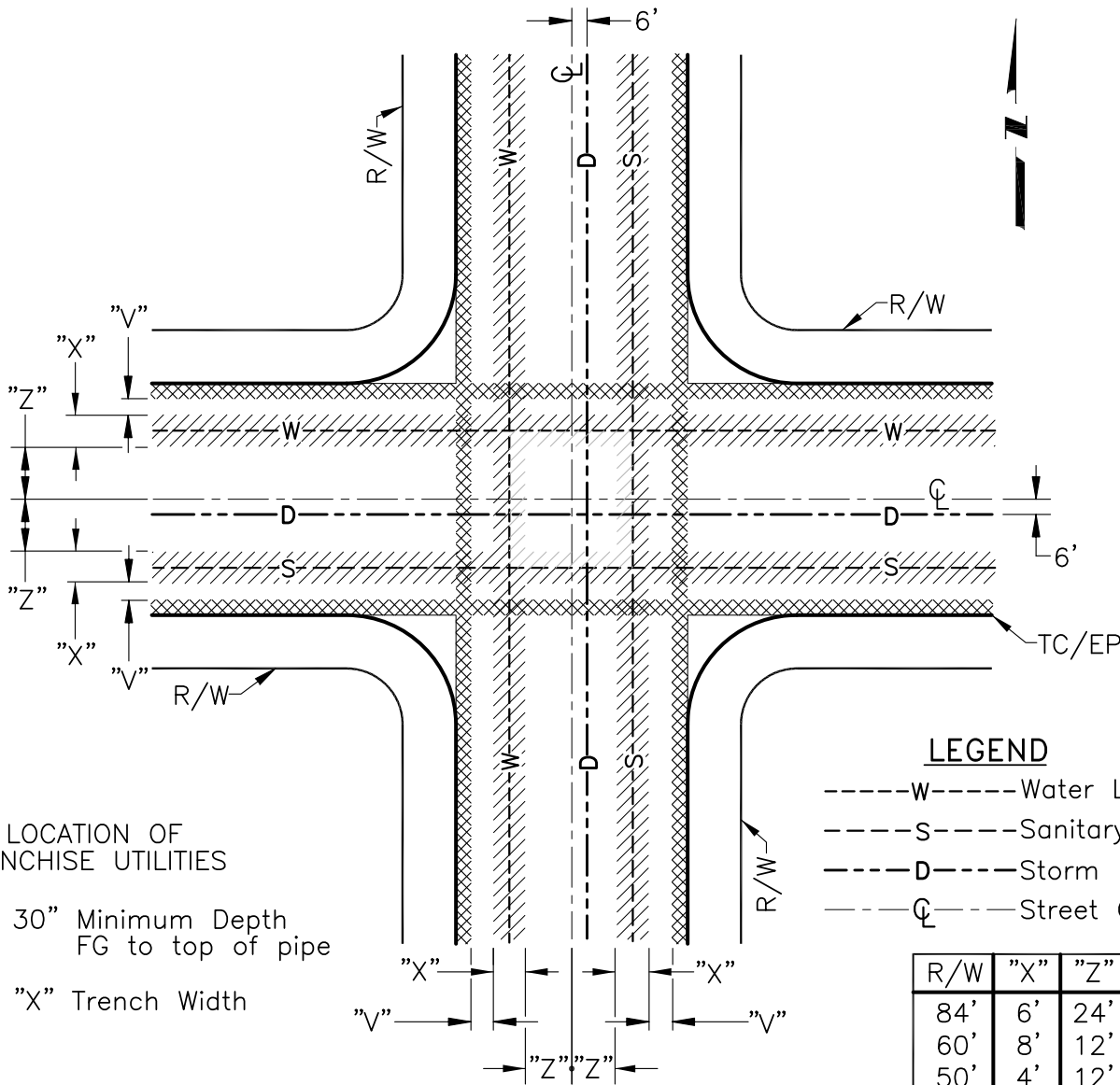
Michael Selby

No.	Revision	Description	Date

Std. Dwg. No.

R-37

Date: MAY 2015



LEGEND

- W-----Water Line
- S-----Sanitary Sewer
- D-----Storm Drain
- CL-----Street Centerline

R/W	"X"	"Z"
84'	6'	24'
60'	8'	12'
50'	4'	12'

LOCATION OF FRANCHISE UTILITIES

- 30" Minimum Depth FG to top of pipe
- "X" Trench Width

NOTES:

1. Any deviations from the standard locations shall be approved by the Director of Public Works.
2. This Standard shall apply to new developments.
3. Water Line and Sanitary Sewer shall be located within area "X" as shown.
4. Area marked "V" is variable and may be used as an alternate for Storm Sewer if approved by the Director of Public Works.



**UNDERGROUND UTILITIES
LOCATIONS
AT NEW DEVELOPMENTS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-1

STORM DESIGN SHEET

JOB NO. _____ SHEET ____ OF ____
 DESIGN BY _____ DATE ____/____/19 ____
 CHECKED BY _____ DATE ____/____/19 ____

BEGINNING DESIGN DATA: ASSUMED TIME TO INLET = _____ MINUTES
 ELEVATION HGL AT BEGINNING OF SYSTEM = _____ A HGL ELEV
 ELEVATION HGL AT END OF SYSTEM = _____ APPROX. SYSTEM LENGTH _____
 APPROX. AVERAGE SLOPE _____

SUBJECT _____

DESCRIPTION _____

POINT OF CONCENTRATION	CONTRIB. Ac (A)	RUNOFF Coef (C)	CA	INTENSITY (i)	Q cfs (≈ CAXi)	PIPE DIA.	SLOPE FT/FT	LENGTH (FT)	ΔELEV (FT)	ELEV HGL (FT)	VELOCITY (FPS)	T, MIN IN PIPE	T, MIN TOTAL



STORM DESIGN SHEET

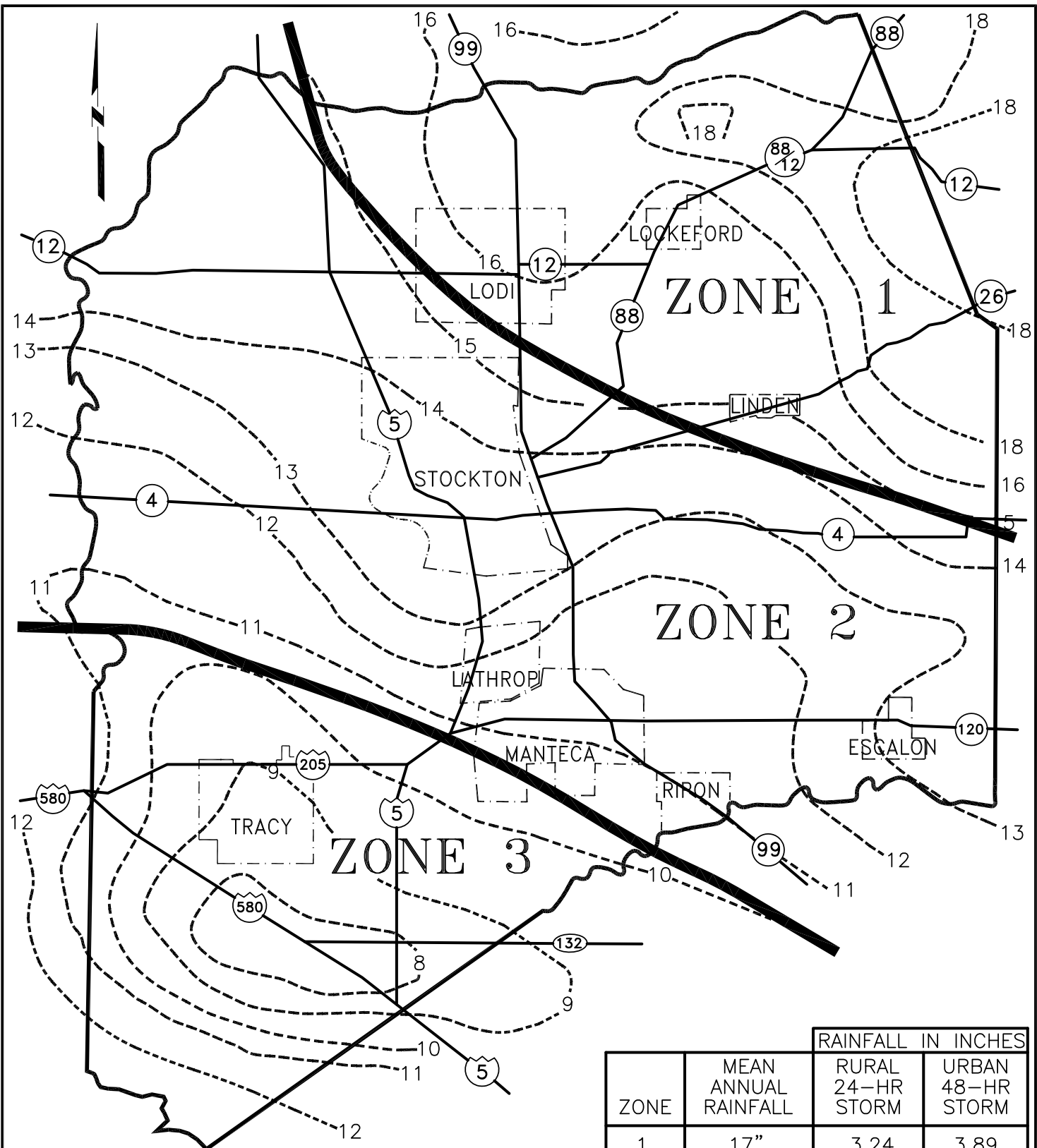
COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:
Thomas M. Stell

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.



San Joaquin County Isohyetal Map

ZONE	MEAN ANNUAL RAINFALL	RAINFALL IN INCHES	
		RURAL 24-HR STORM	URBAN 48-HR STORM
1	17"	3.24	3.89
2	13.5"	2.40	3.03
3	9"	1.39	1.87

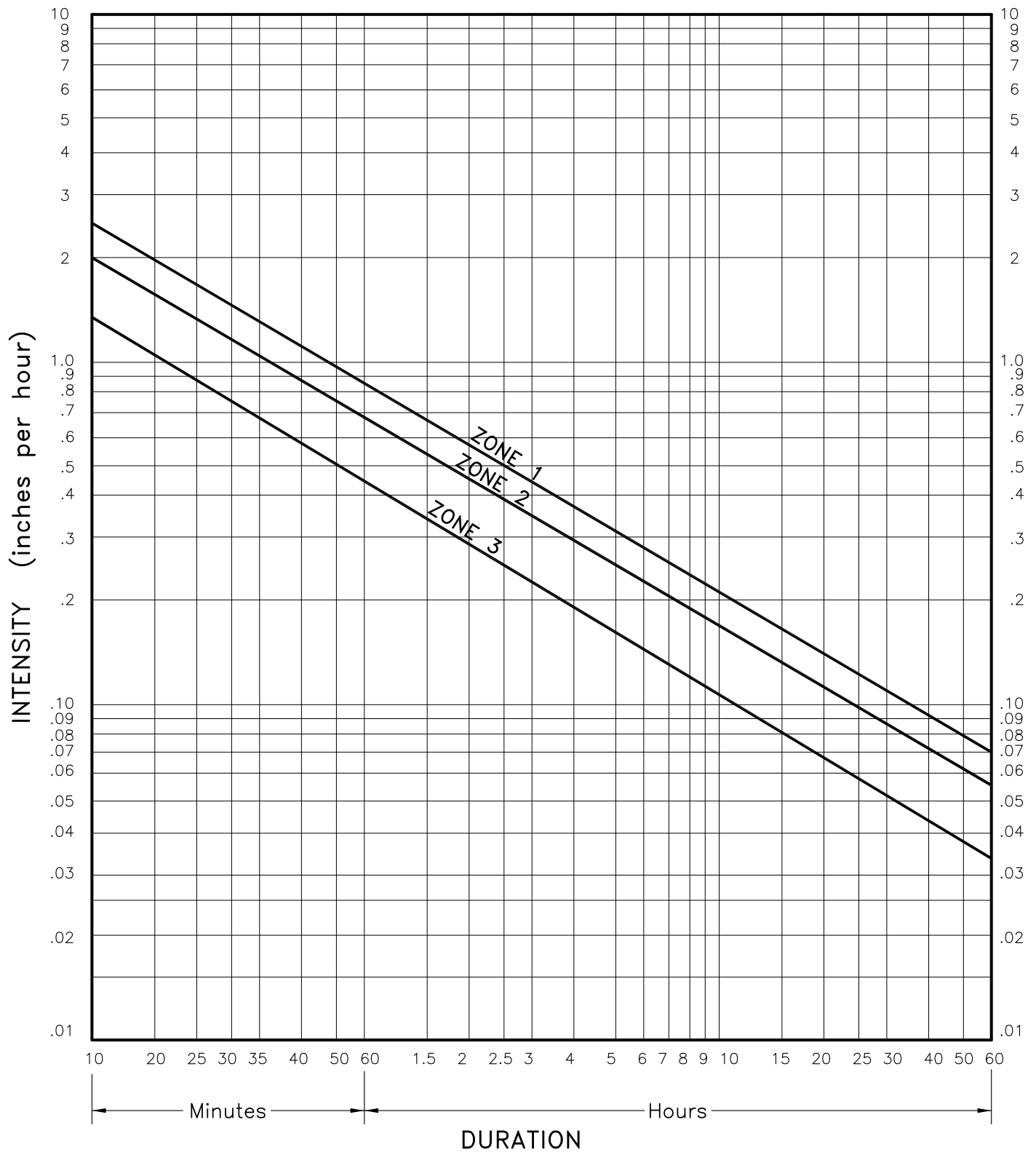


MEAN ANNUAL PRECIPITATION

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:
Thomas M. Gill

No.	Revision	Description	Date



**INTENSITY-DURATION CURVE
10-YEAR RAINFALL**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

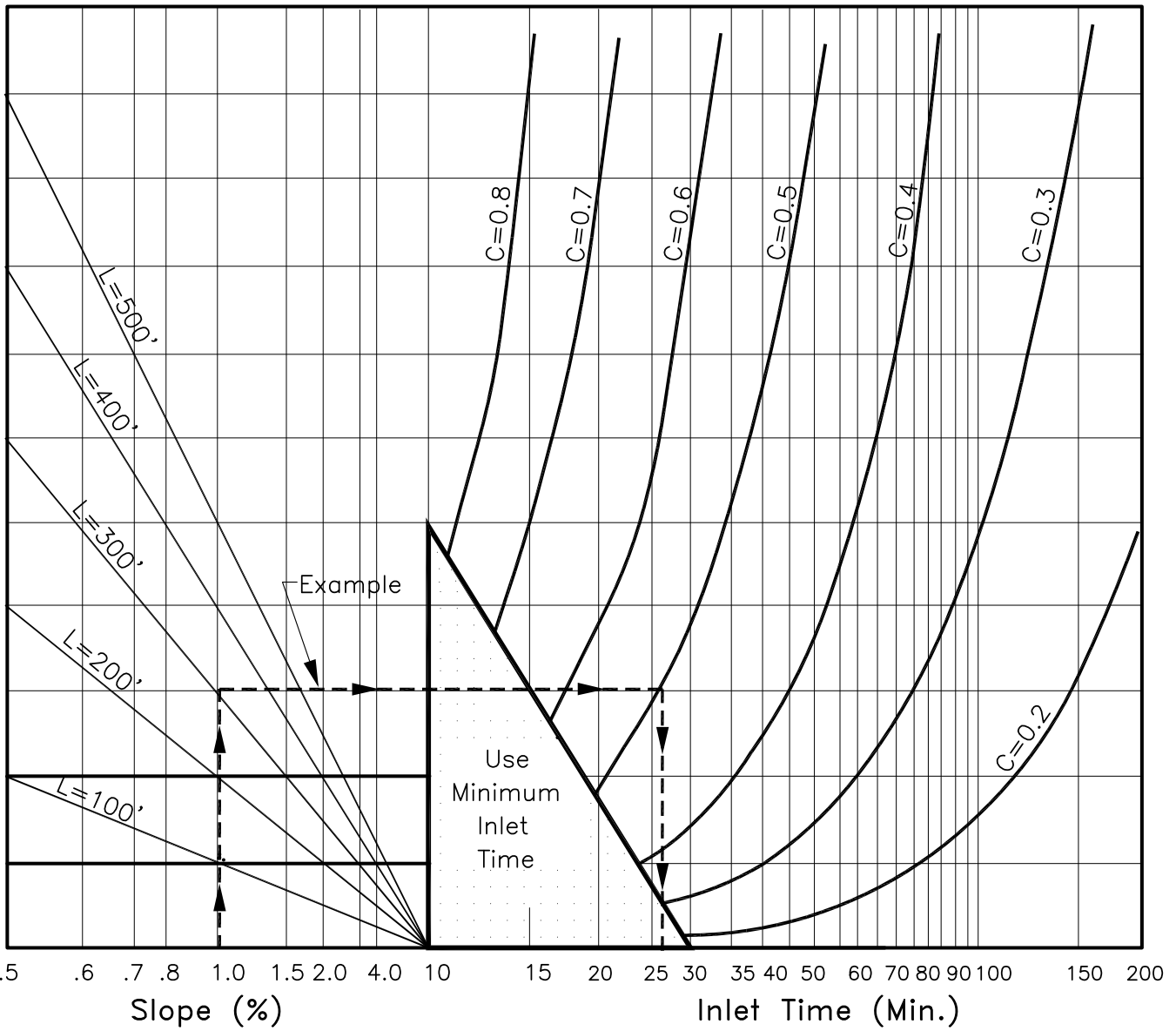
Thomas M. Gull

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-4



Example:

Given: Slope = 1%
 Length = 300'
 Coefficient of runoff = 0.5
 Read: Inlet Time = 26 min.

NOTE:

Where first inlet is in a public street, such as in single-family subdivision; use only slope and distance from back of lot to the street gutter. (Disregard street gutter flow time.)



RUNOFF INLET TIME

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

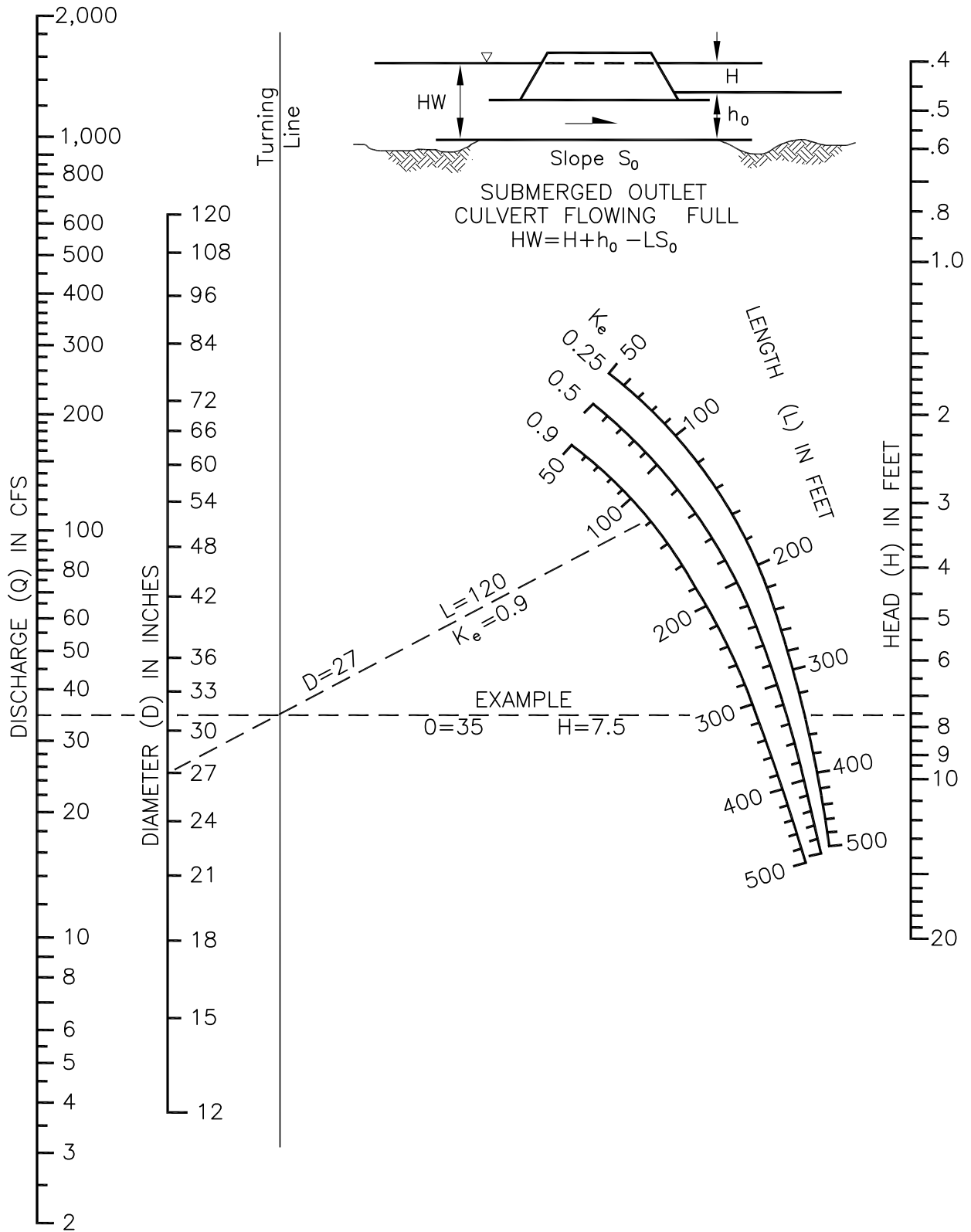
Thomas M. Hill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-5



$n=0.024$



HEAD FOR STANDARD C.M. PIPE CULVERTS FLOWING FULL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

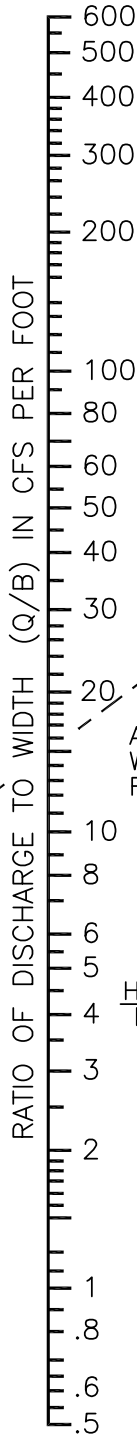
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

D-6

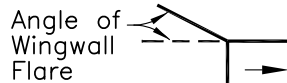
Date: DEC 2014



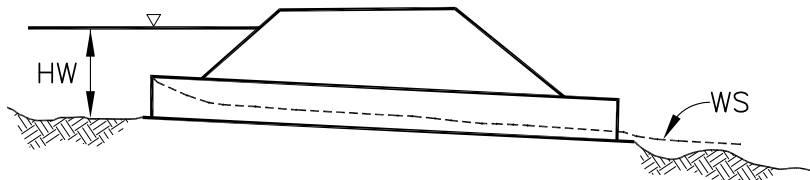
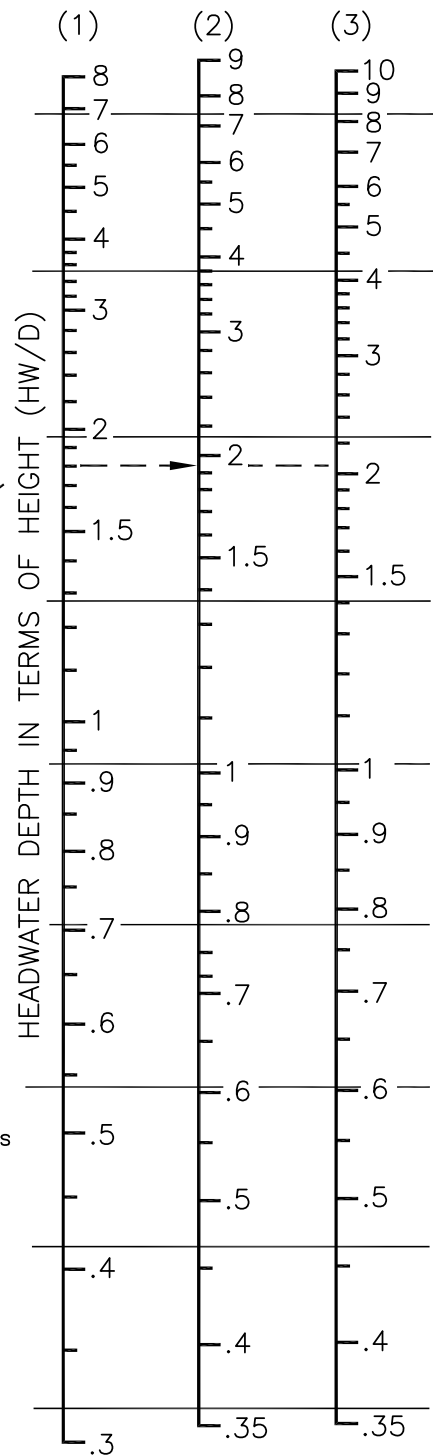
EXAMPLE
 5' = 2' box Q = 75 cfs
 Q/B = 15 cfs/ft

Inlet	HW/D	HW feet
(1)	1.75	3.5
(2)	1.90	3.8
(3)	2.05	4.1

EXAMPLE



HW/D	SCALE	WINGWALL FLARE
(1)		30° to 75°
(2)		90° and 15°
(3)		0° (extensions of sides)



TO USE SCALE (2) OR (3) PROJECT HORIZONTALLY TO SCALE (1). THEN USE STRAIGHT INCLINED LINE THROUGH D AND Q SCALES, OR REVERSE AS ILLUSTRATED.



HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

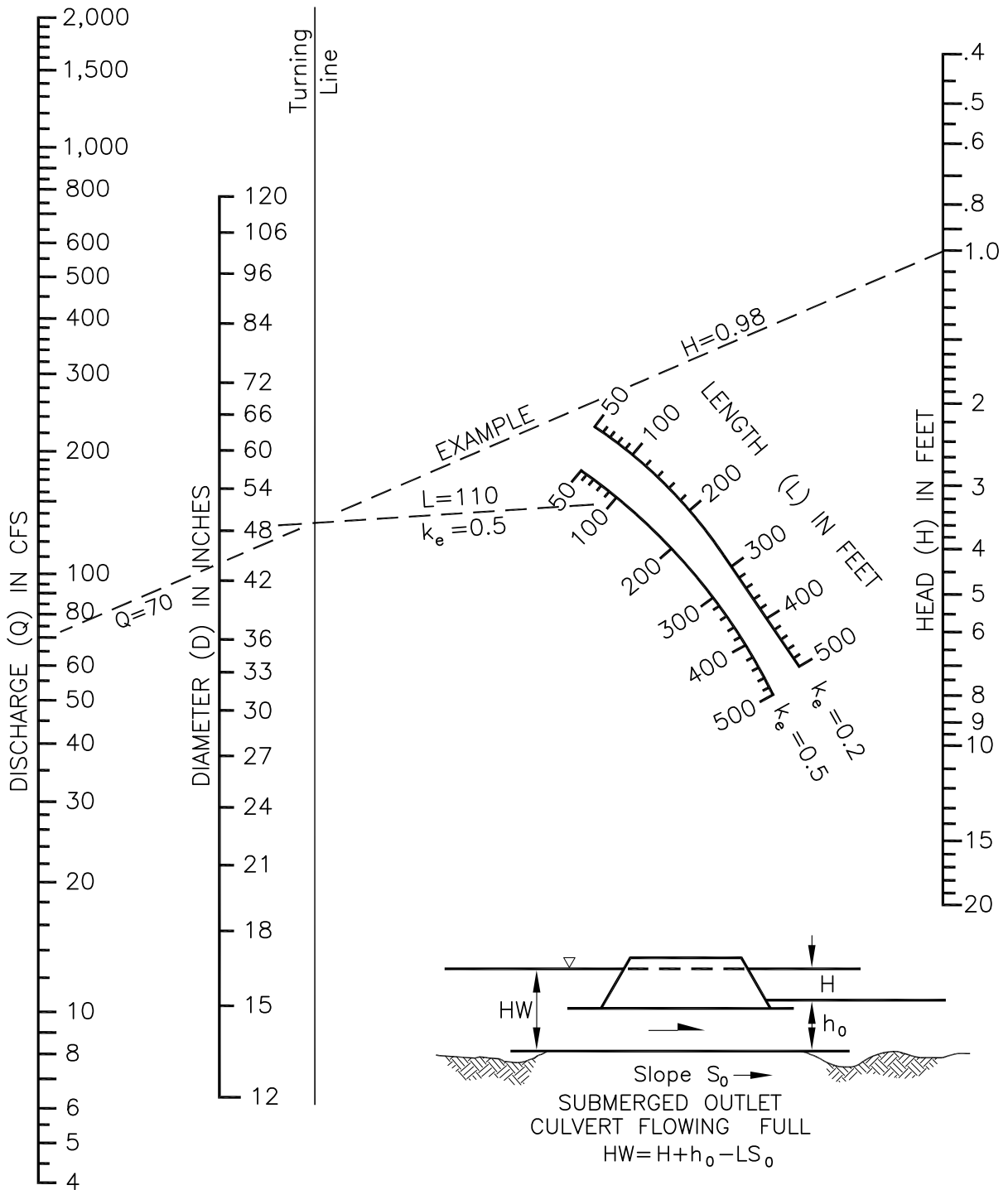
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-7



$n=0.013$



HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

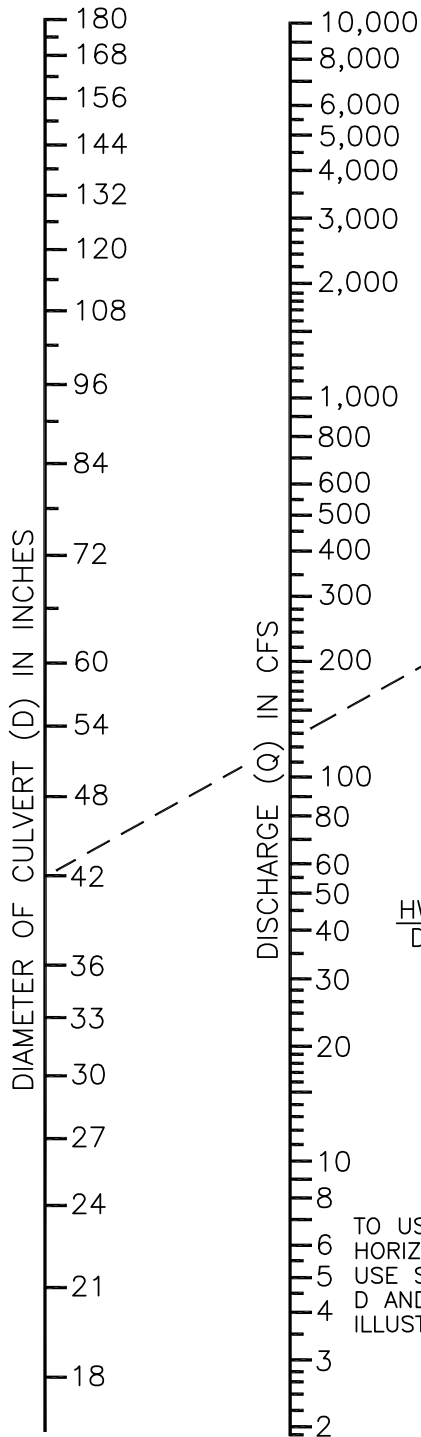
Thomas M. Gull

No.	Revision	Description	Date

Std. Dwg. No.

D-8

Date: DEC 2014



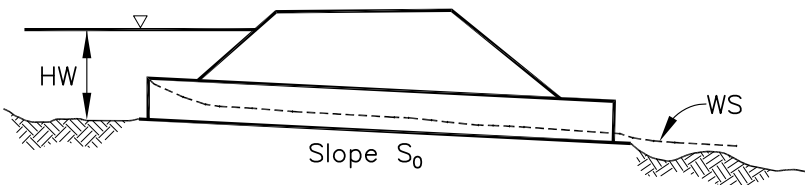
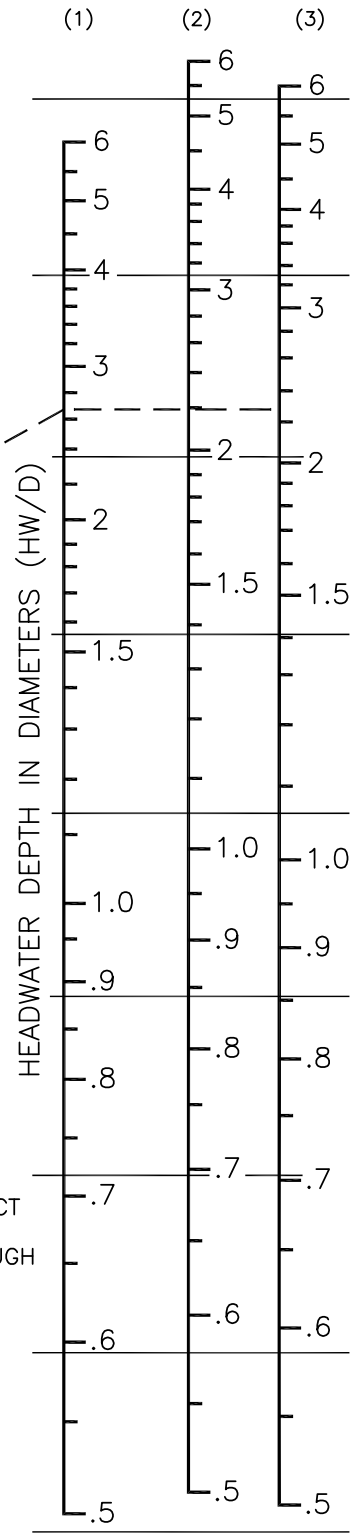
EXAMPLE
 $D=42''$ (3.5 feet)
 $Q=120$ cfs

	$\frac{HW}{D}$	HW feet
(1)	25	88
(2)	21	74
(3)	22	77

D (in feet)

$\frac{HW}{D}$ SCALE	ENTRANCE TYPE
(1)	Square edge with headwall
(2)	Groove end with headwall
(3)	Groove end projecting

TO USE SCALE (2) OR (3) PROJECT HORIZONTALLY TO SCALE (1). THEN USE STRAIGHT INCLINED LINE THROUGH D AND Q SCALES, OR REVERSE AS ILLUSTRATED.



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

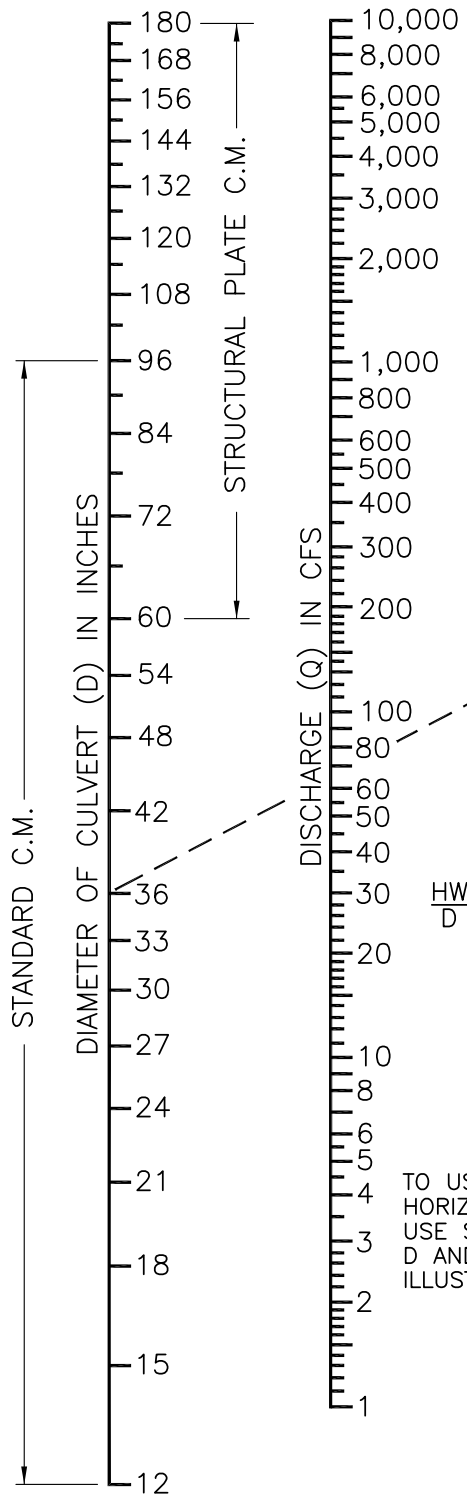
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-9



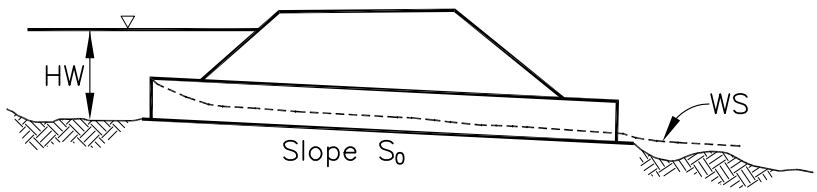
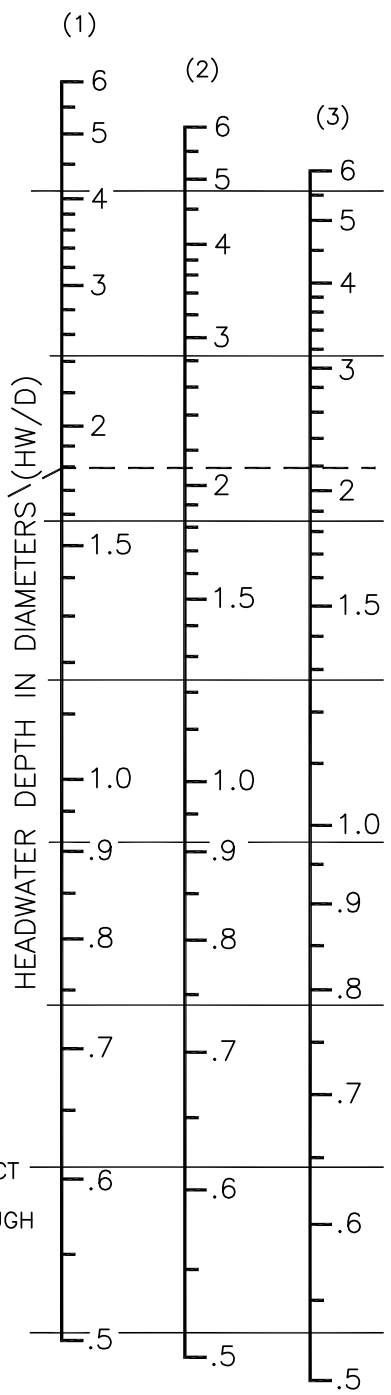
EXAMPLE
 $D=36''$ (3 feet)
 $Q=66$ cfs

Inlet	$\frac{HW}{D}$	HW feet
(1)	1.8	5.4
(2)	2.1	6.3
(3)	2.2	6.6

* D (in feet)

$\frac{HW}{D}$ SCALE	ENTRANCE TYPE
(1)	Headwall
(2)	Mitered to Conform to slope
(3)	Projecting

TO USE SCALE (2) OR (3) PROJECT HORIZONTALLY TO SCALE (1). THEN USE STRAIGHT INCLINED LINE THROUGH D AND Q SCALES, OR REVERSE AS ILLUSTRATED.



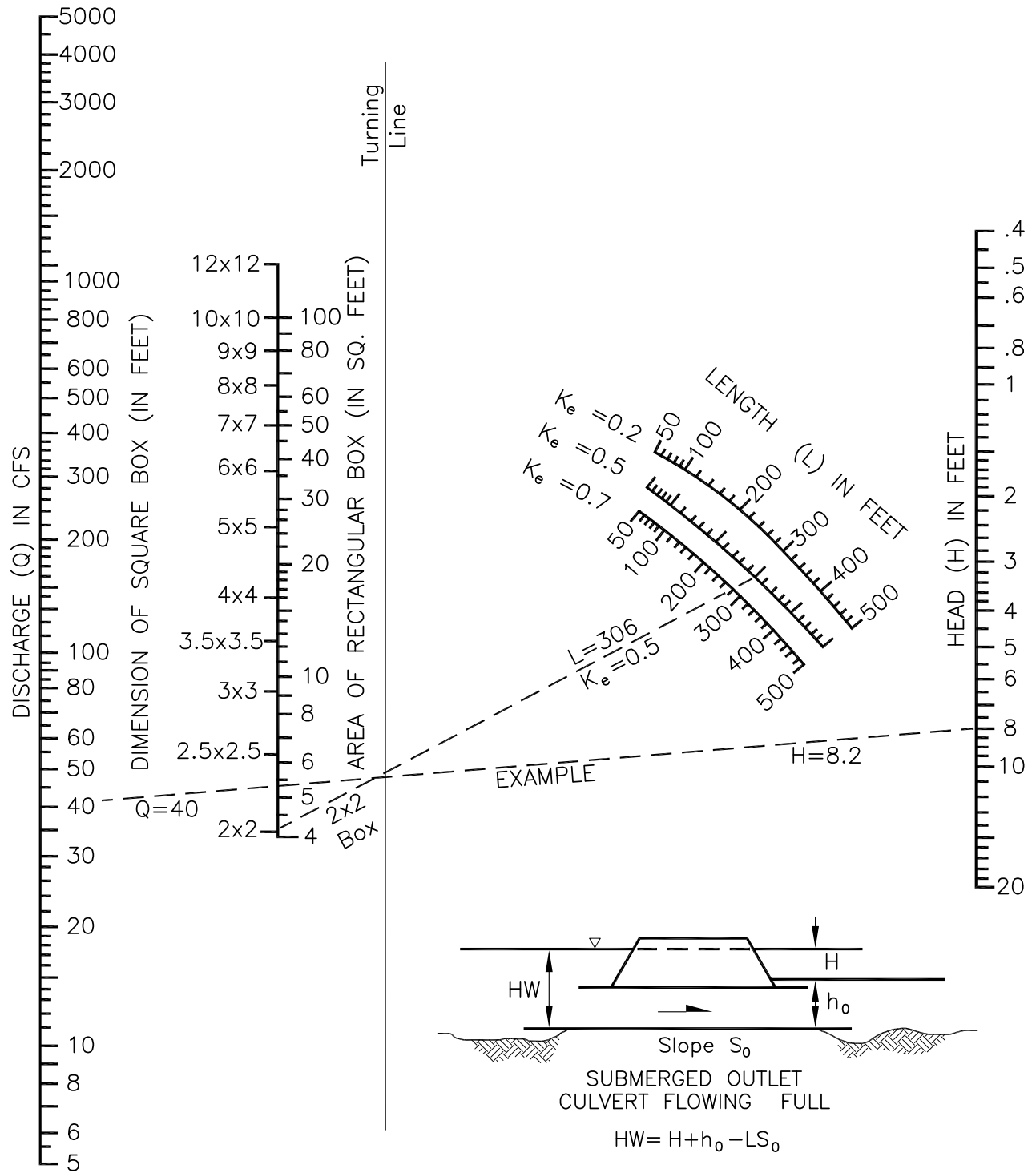
HEADWATER DEPTH FOR C.M. PIPE CULVERTS WITH INLET CONTROL

COUNTY OF SAN JOAQUIN
 DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Gull

No.	Revision	Description	Date



$n = 0.013$



HEAD FOR CONCRETE BOX CULVERTS FLOWING FULL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

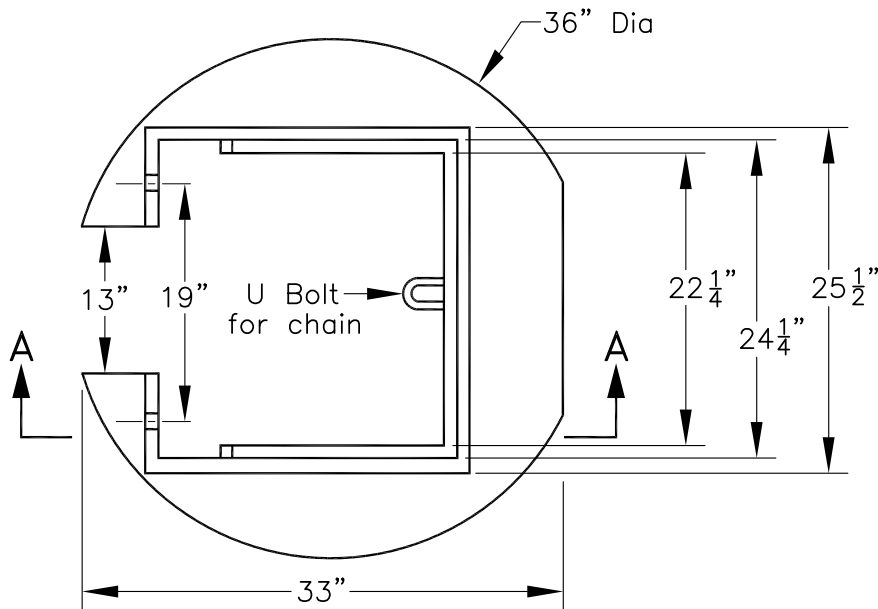
Thomas M. Hall

No.	Revision	Description	Date

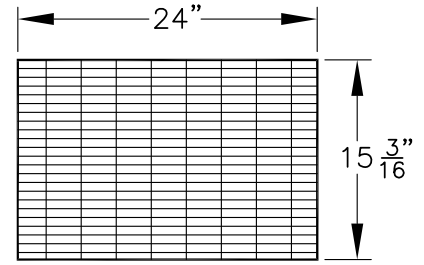
Date: DEC 2014

Std. Dwg. No.

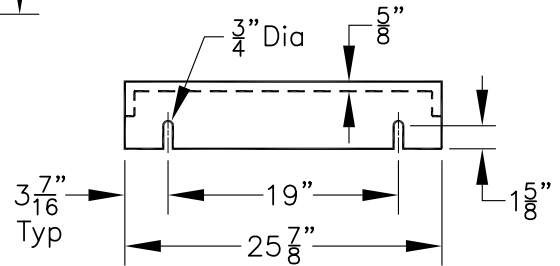
D-11



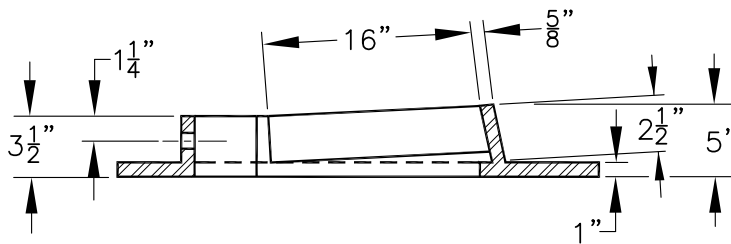
PLAN OF FRAME



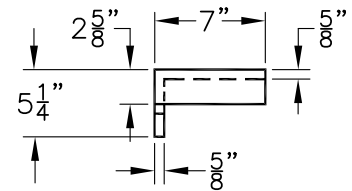
GRATE



HOOD



SECTION A-A



END VIEW OF HOOD

NOTES:

1. Frame and hood shall be manufactured of cast iron conforming to ASTM A-48-Class 30.
2. Frame, grate, and hood shall be HS20 or HL93 rated.
3. Grate shall be riveted steel, hot-dipped galvanized and chained to frame with 18" of 1/4" heat-treated chain.
4. Frame and hood shall be coated with bituminous material conforming to A.W.W.A. C203
5. Bicycle proof grates shall conform to Caltrans specifications.



**FRAME & GRATE
TYPE 1 CURB INLET
CATCHBASIN**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

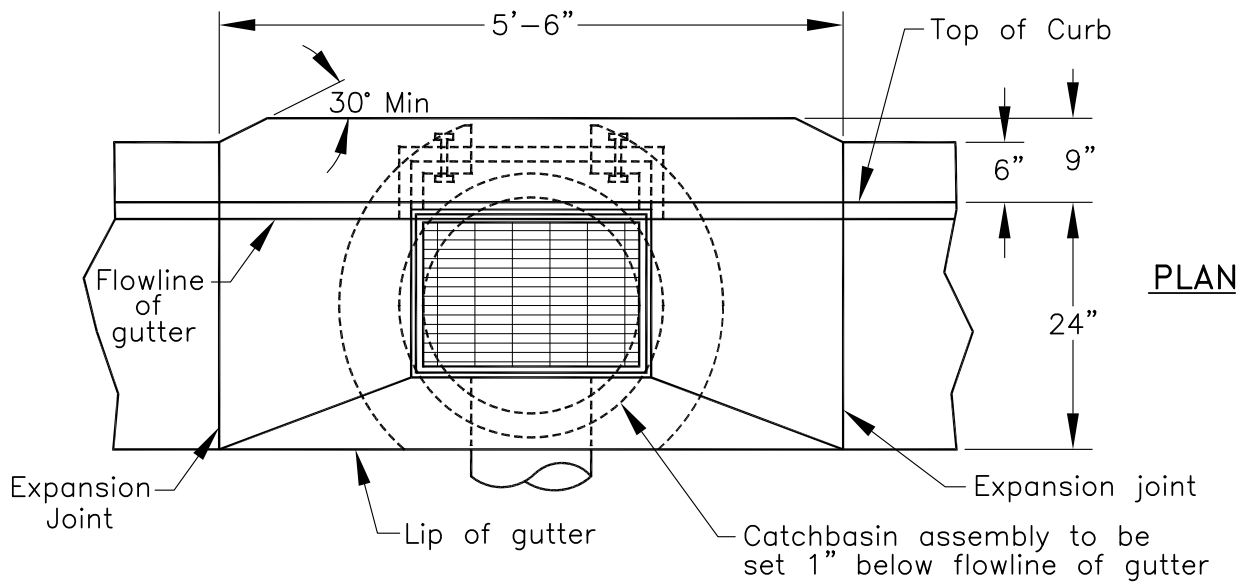
Thomas M. Hall

No.	Revision	Description	Date

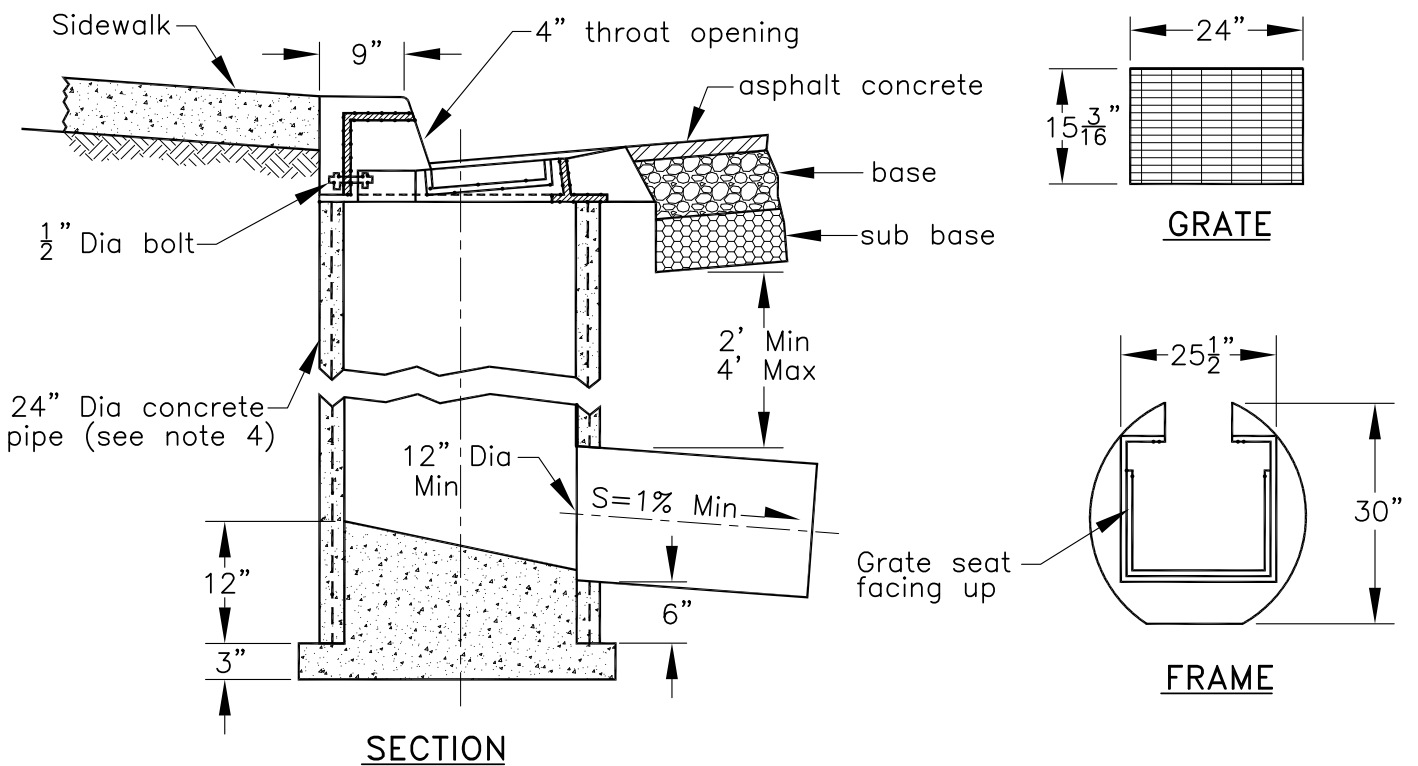
Date: DEC 2014

Std. Dwg. No.

D-12



PLAN



SECTION

GRATE

FRAME

NOTES:

1. All exposed steel shall be hot dipped galvanized.
2. Grate shall be chained to frame.
3. Grate shall be depressed 1" below gutter profile grade.
4. 24" pipe barrel shall be class II R.C.P., or class 2 or 3 non-reinforced concrete pipe.



**TYPE 1
CURB INLET CATCHBASIN**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

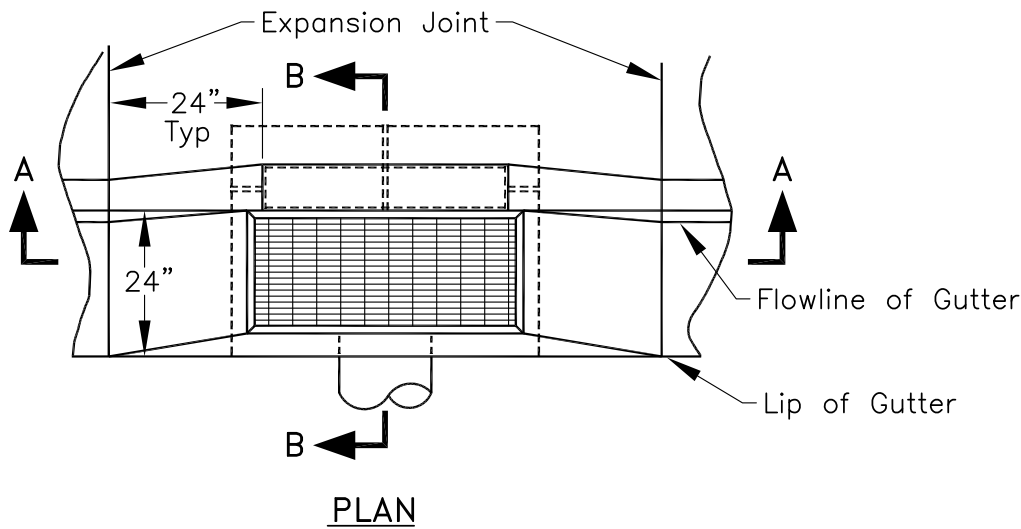
Thomas M. Hall

No.	Revision	Description	Date

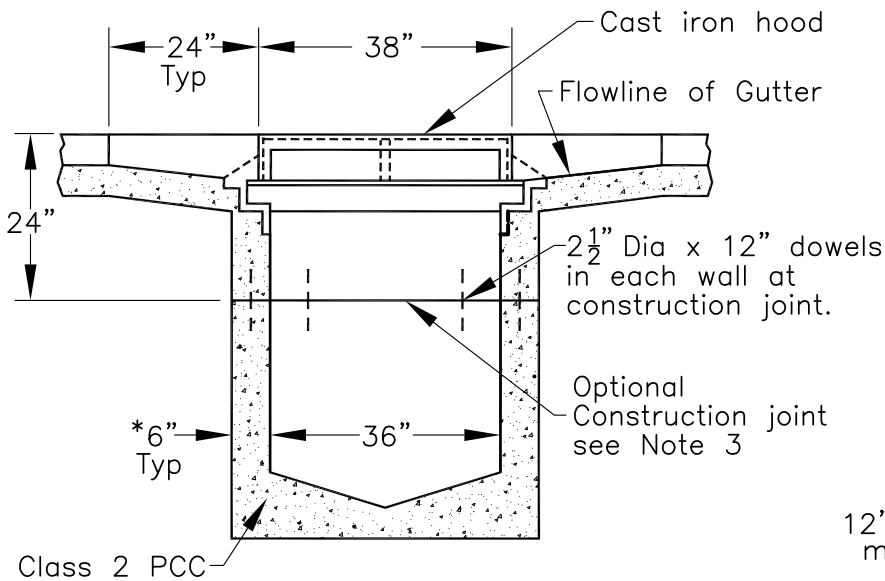
Date: DEC 2014

Std. Dwg. No.

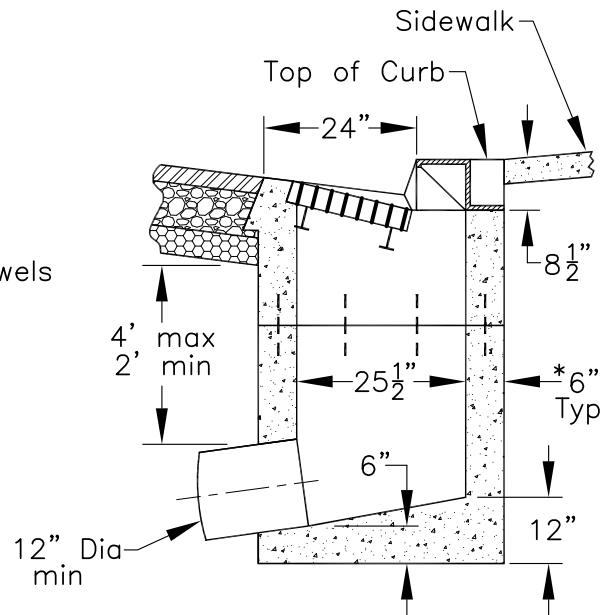
D-13A



PLAN



SECTION A-A



SECTION B-B

*8" if the top of curb to flowline of pipe exceeds 4'

NOTES:

1. Frame, Grate and Hood shall be Cast Iron and be equal to "Phoenix" P-6002. Chain grate to the frame.
2. Precast concrete catchbasin may be used with the written approval of the Director of Public Works.
3. Catchbasin Walls may be poured to an elevation not less than 2 feet below the top of Curb. It shall be the responsibility of the Contractor to frame in and pour the upper 2 feet of the catchbasin monolithically with the curb & gutter.
4. All exposed steel shall be hot dipped or galvanized.



**TYPE 2
CURB INLET CATCHBASIN**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

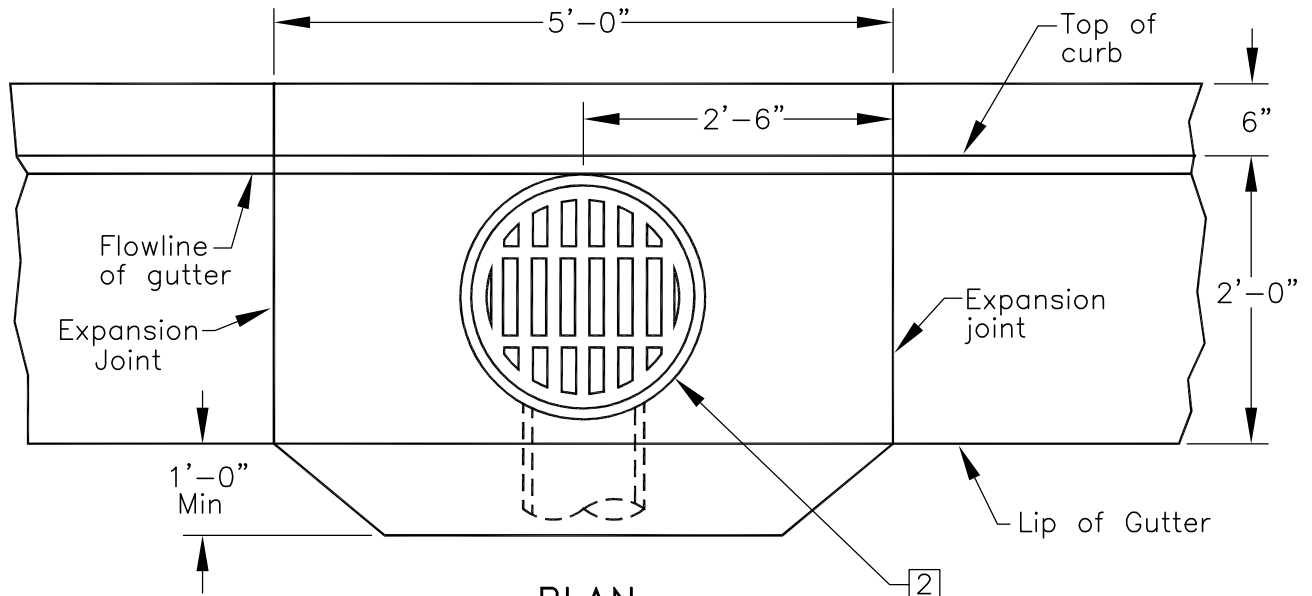
Thomas M. Hall

No.	Revision	Description	Date

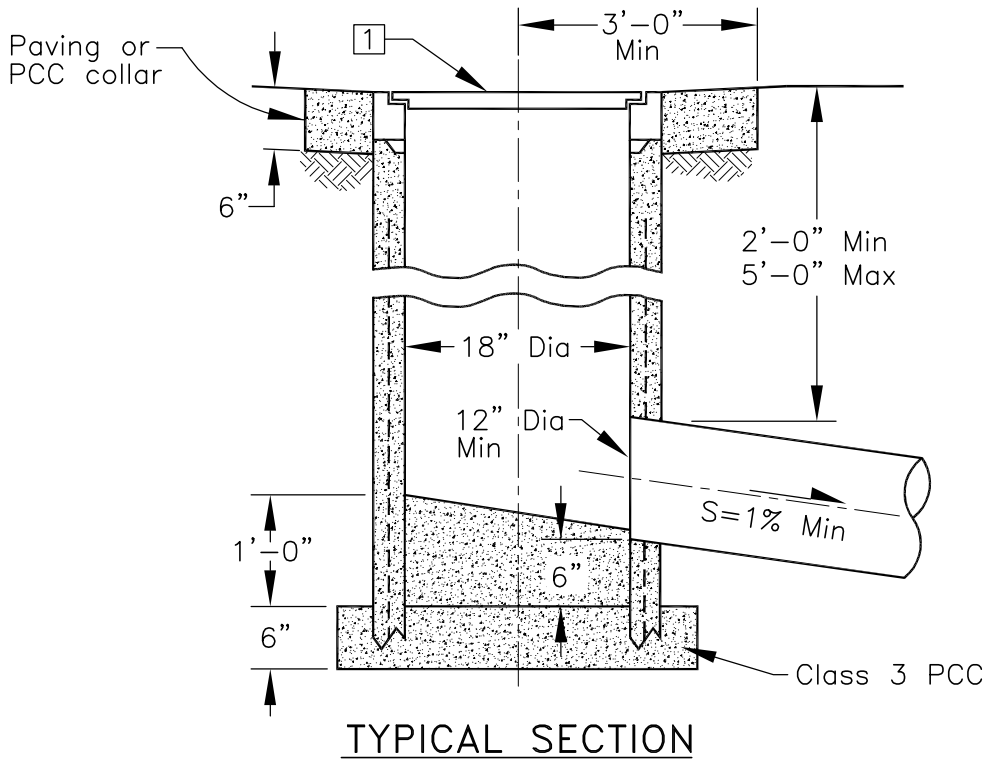
Std. Dwg. No.

D-13B

Date: DEC 2014



PLAN
Curb and Gutter Installation



TYPICAL SECTION

NOTES:

- [1] Grate and Frame shall conform to County Standard Drawing No. D-14B.
- [2] Catch Basin Assembly to be set 1.5" below flowline of gutter.



**18" STORM DRAIN INLET
CATCHBASIN**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

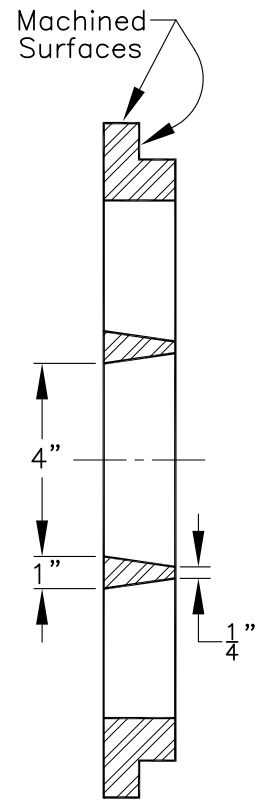
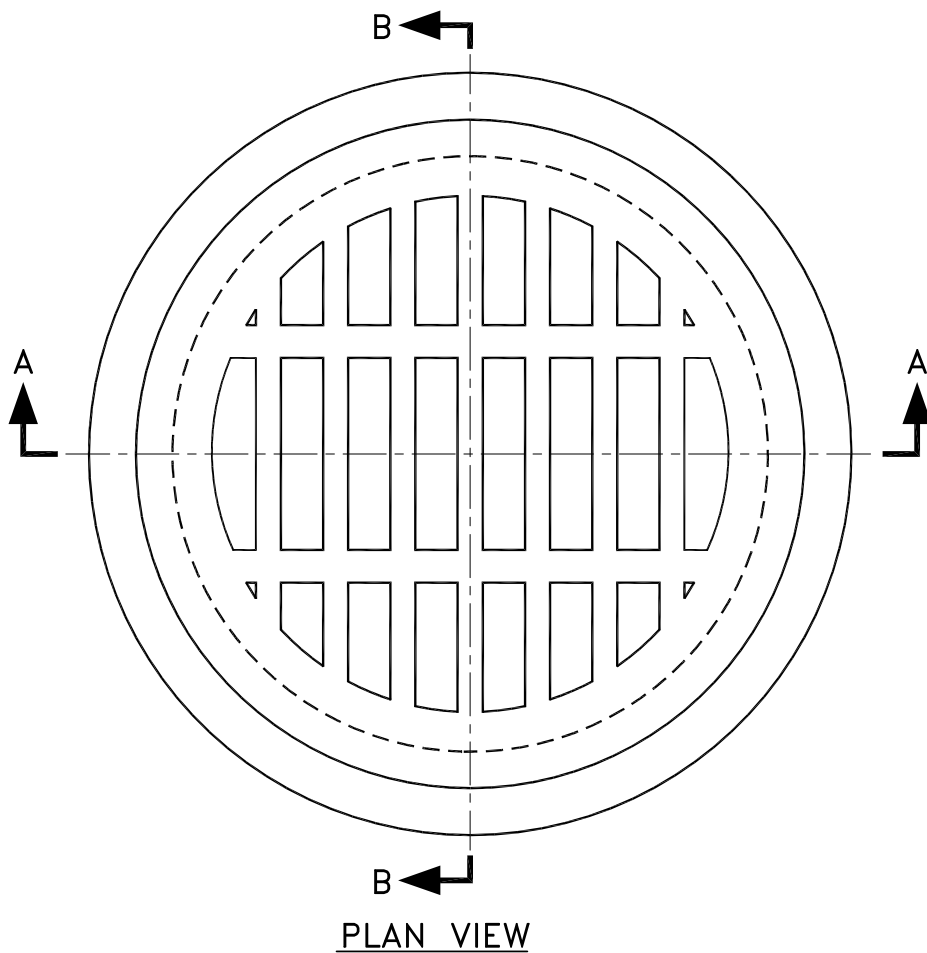
Date: JUN 2016

Approved by:

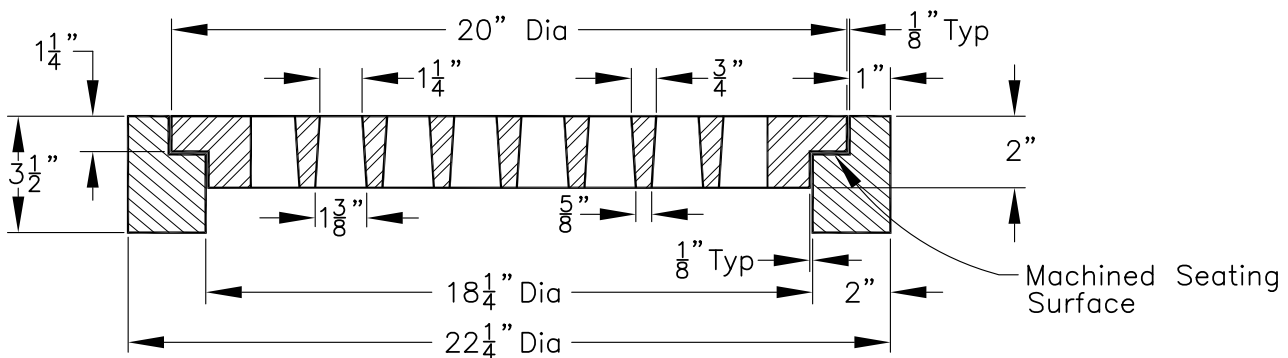
No.	Revision	Description	Date

Std. Dwg. No.

D-14A



SECTION B-B
(Grate only)



SECTION A-A

NOTES:

1. Frame and grate shall be manufactured from cast iron to ASTM A-48-30
2. Frame and grate shall be HS20 or HL93 rated.
3. Grate shall be chained to frame with 18" of 1/4" heat-treated chain.
4. May be used in right-of-way where approved by governing agency.



**18" STORM DRAIN INLET
FRAME AND GRATE**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

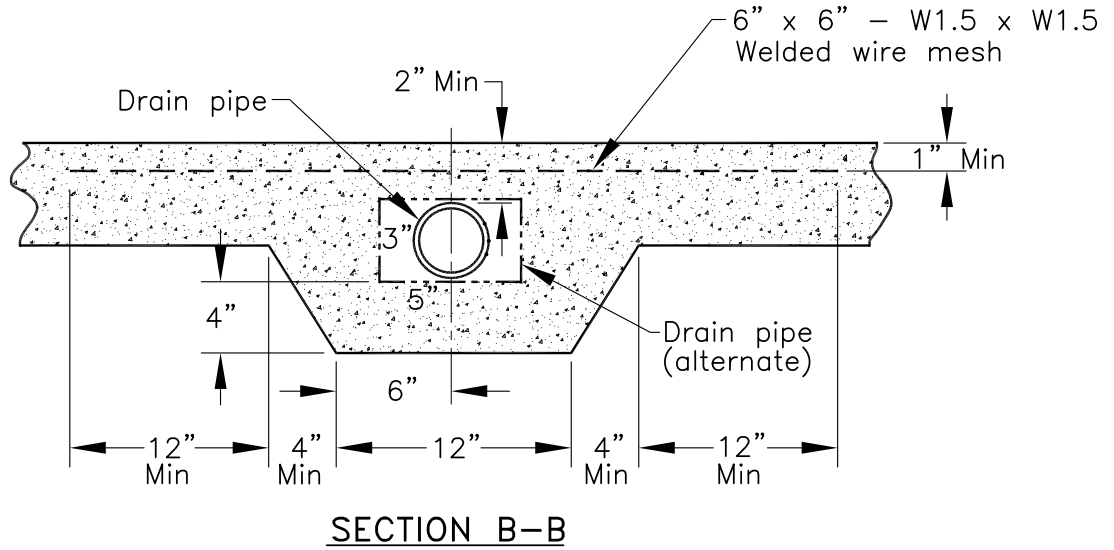
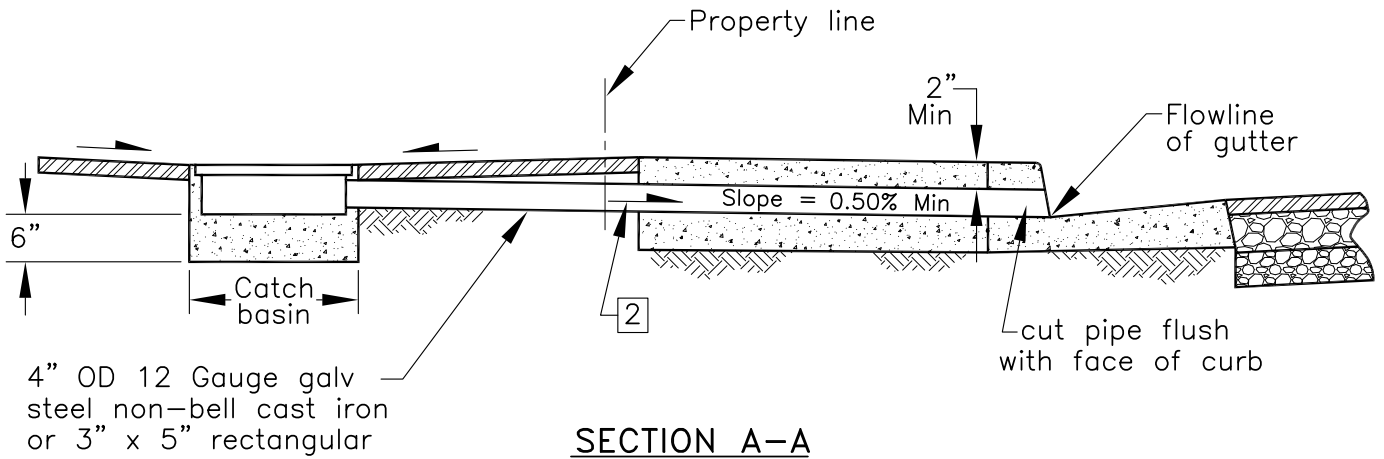
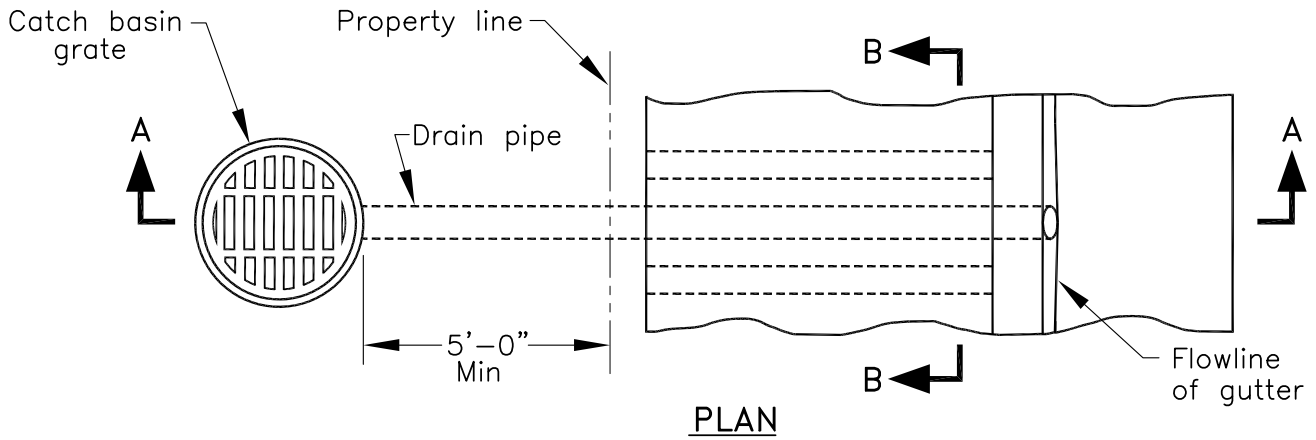
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-14B



NOTES:

1. Property owner shall be responsible for cleaning and maintaining pipe.
2. Minimum slope to be 0.5%.
3. Under sidewalk drain may only be used where approved by the agency.



UNDER SIDEWALK DRAIN

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

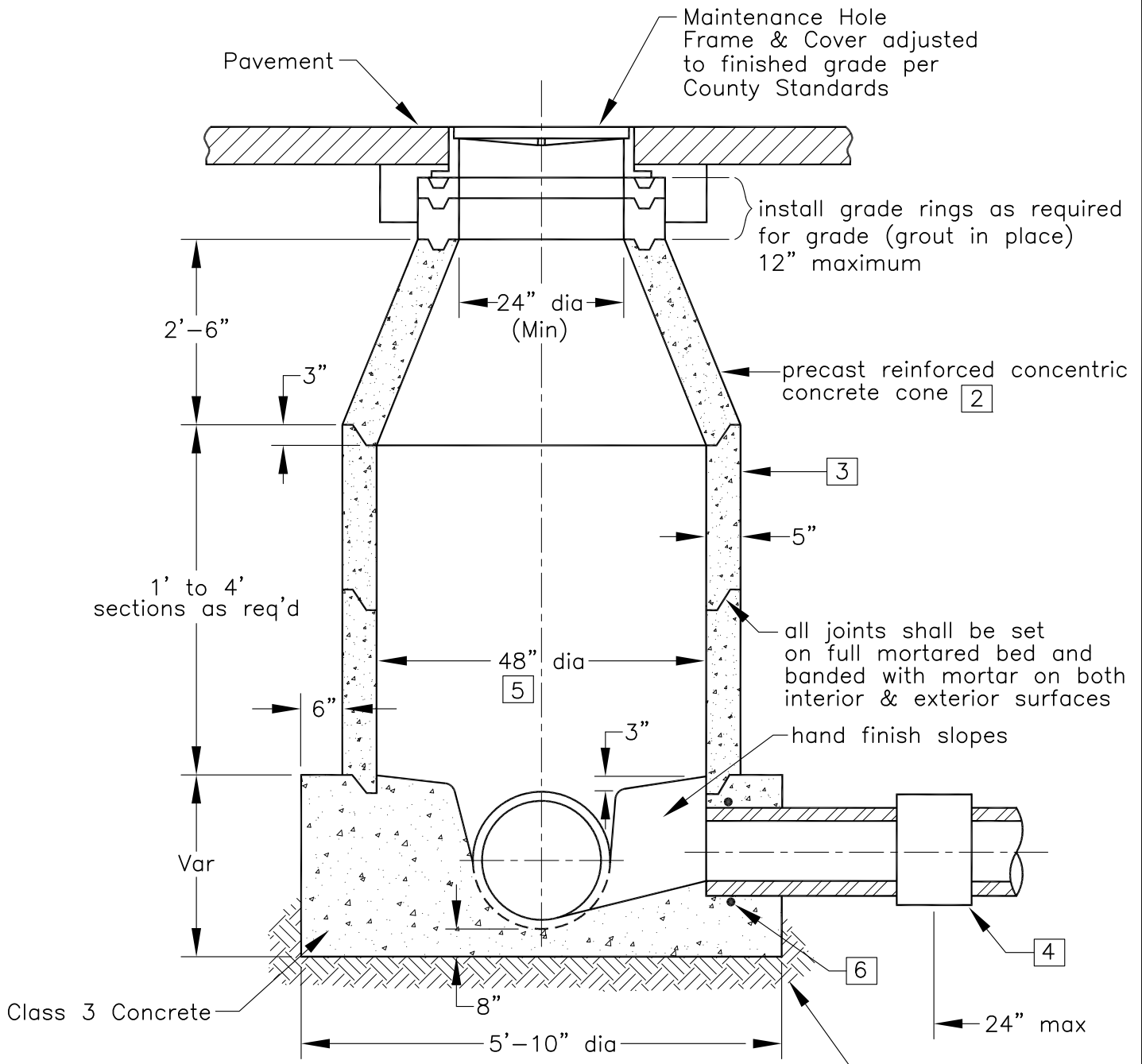
Thomas M. Hill

No.	Revision	Description	Date

Std. Dwg. No.

D-15

Date: DEC 2014



NOTES:

- 1. For pipes 33" diameter and smaller.
- 2. Eccentric reinforced concrete cone may be used with approval by agency.
- 3. Precast reinforced concrete maintenance hole unit shall conform to ASTM C-478
- 4. Construct flexible pipe joint at 2 feet maximum from base of maintenance hole for rigid pipe (except for cast-in-place).
- 5. Interior coating where required by agency.
- 6. Rubber ring waterstop or adaptor required for pvc pipe installations.
- 7. For unpaved areas, leave maintenance hole rim above ground as required by agency.



**TYPE 1
MAINTENANCE HOLE**

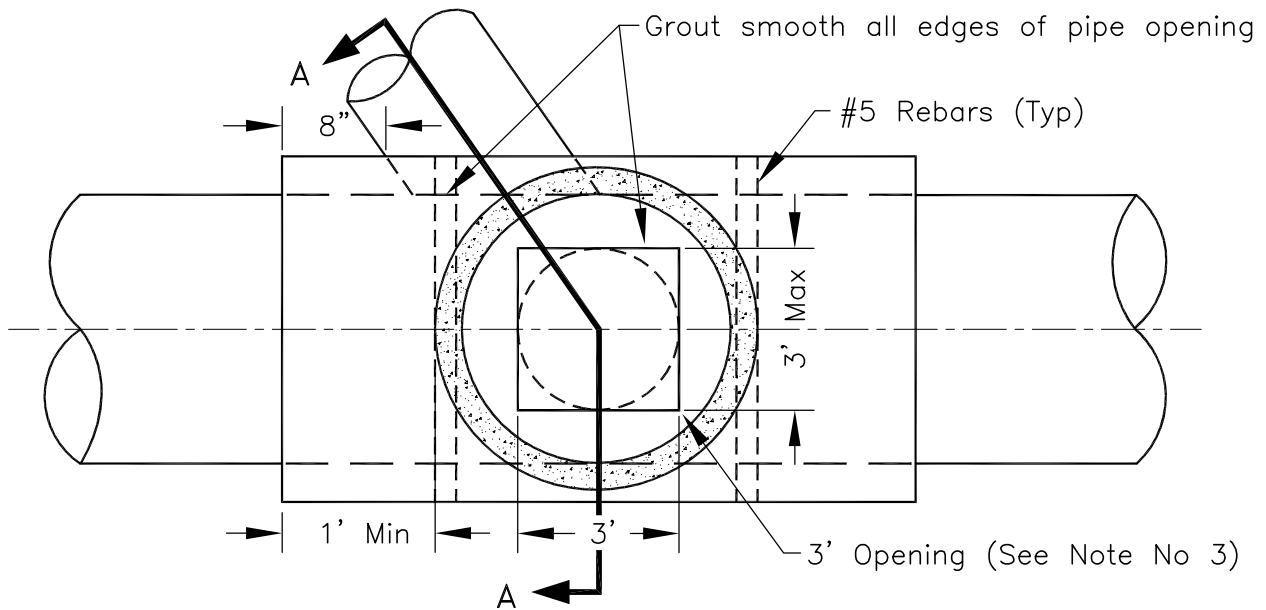
COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:
Thomas M. Hall

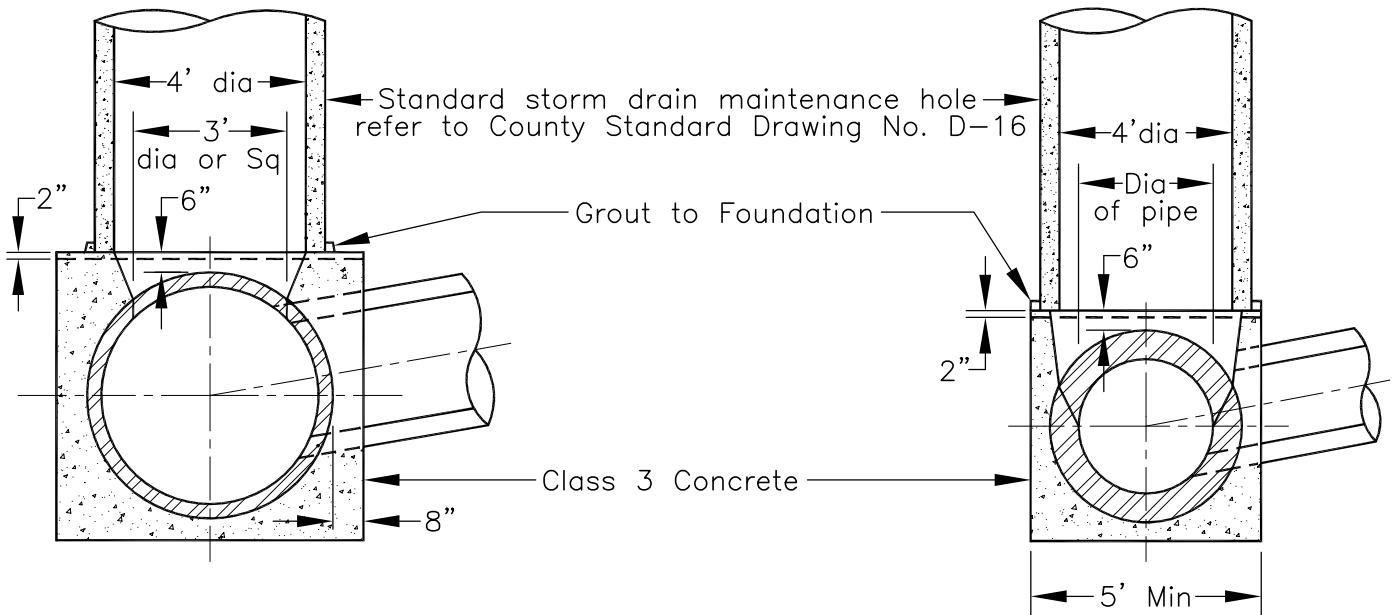
No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No. **D-16**



PLAN VIEW



SECTION A-A
PIPES LARGER THAN
44" DIA

SECTION A-A
PIPES 24" TO 44" DIA

NOTES:

1. The foundation shall be a minimum of 5' for 44" O.D. pipe and smaller.
2. For pipe larger than 44" O.D., the foundation shall extend a minimum of 8" beyond each side of the pipe.
3. Opening to be 3' long x (I.D. of pipe) wide, up to 36" I.D. pipe.
For pipes larger than 36" I.D., opening to be 36" diameter or square.



**SADDLE-TYPE MAINTENANCE
HOLE FOR PIPE DIAMETER
24" AND LARGER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

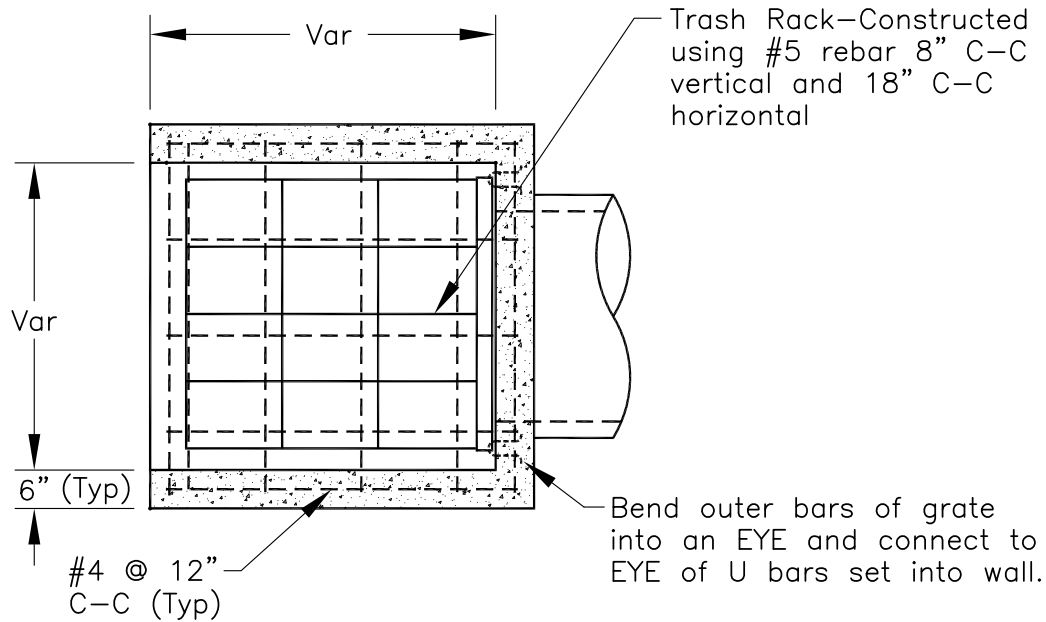
Date: JUN 2016

Approved by:

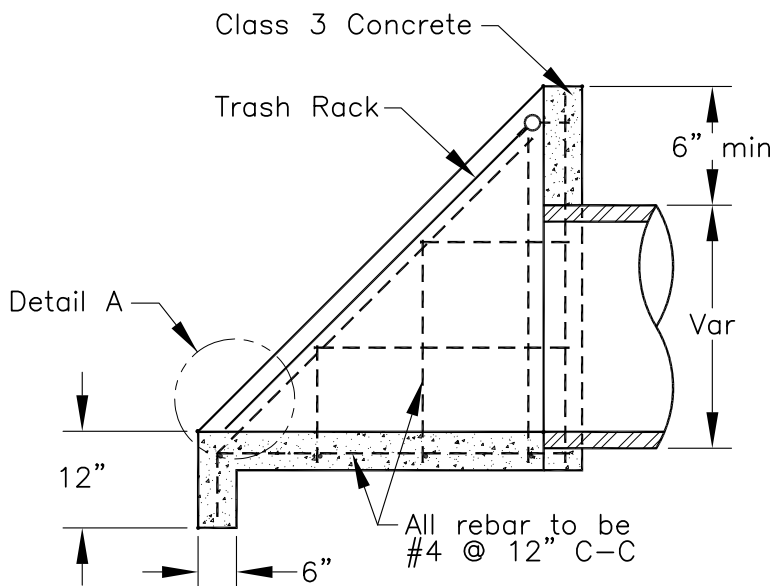
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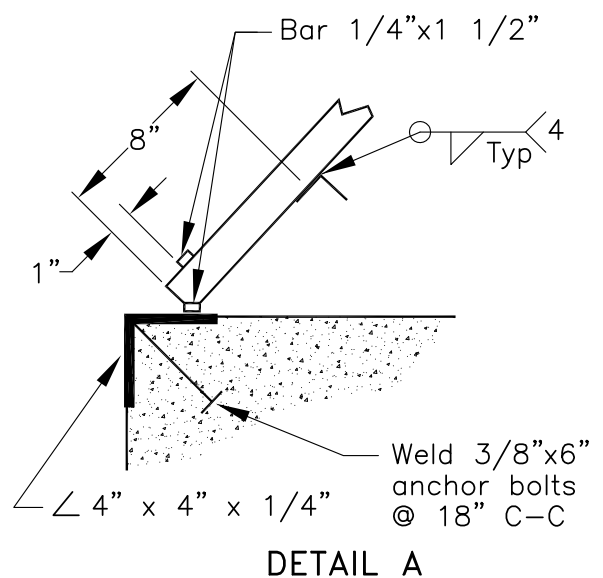
D-17



TOP VIEW



SECTION A-A



DETAIL A

NOTES:

1. Material to conform to ASTM designation A-36
2. All fillet welds to be 1/4".



**PIPE INLET STRUCTURE
AND TRACK RACK
30" DIA. PIPE AND SMALLER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

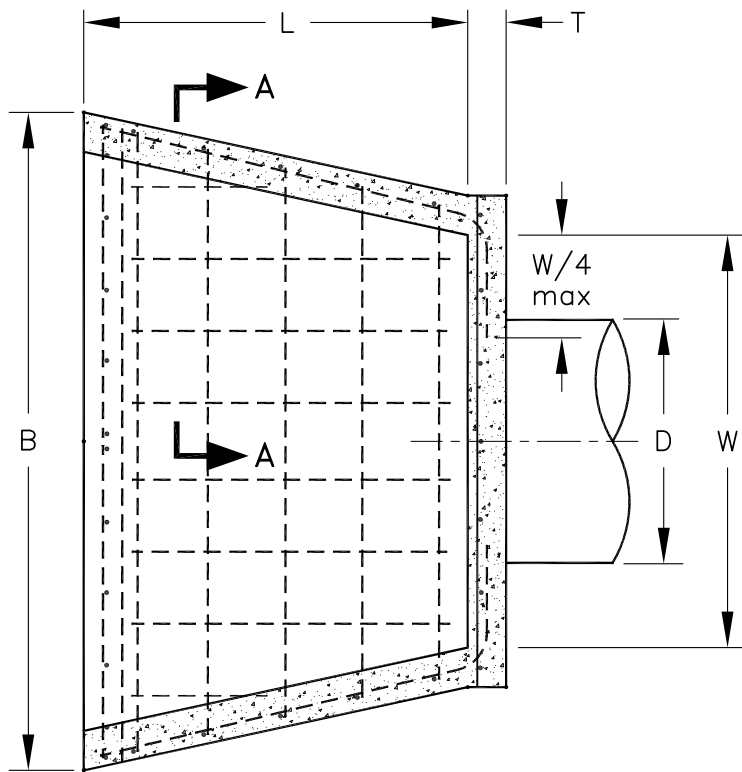
Thomas M. Grew

No.	Revision	Description	Date

Std. Dwg. No.

D-18

Date: DEC 2014



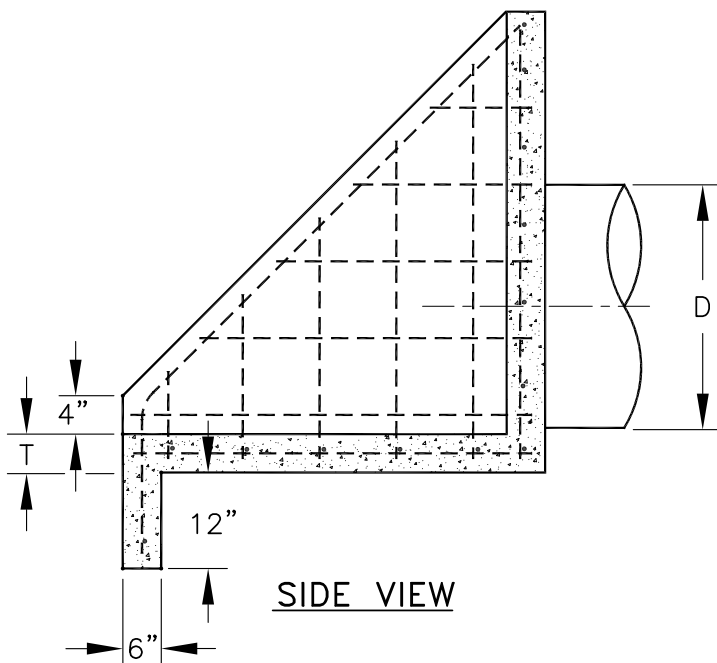
TOP VIEW

NOTES:

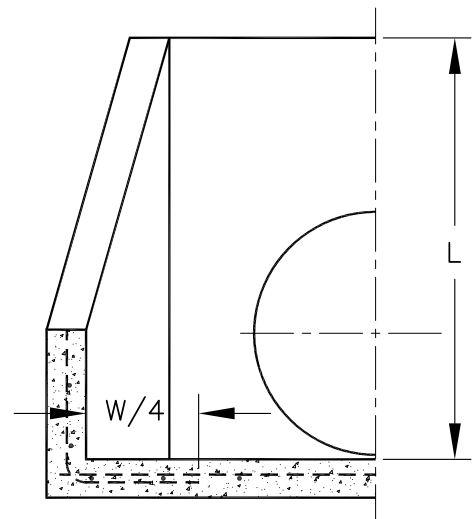
1. "B" may be reduced if required by channel dimensions.
2. Reinforcing bar spacing shown is maximum spacing.
3. Use Class 3 Concrete.
4. Refer to County Standard Drawing No. D-21 for Trash Rack detail.

DIMENSIONS & REBAR SIZING

D	W	B	L	T	REBAR (ALL)
33"	3'-5"	5'-3"	4'-0"	6"	#5 @ 12"
36"	3'-8"	5'-8"	4'-2"	6"	#5 @ 12"
42"	4'-4"	6'-4"	4'-8"	6"	#5 @ 12"
48"	4'-10"	7'-2"	5'-2"	8"	#6 @ 12"
54"	5'-4"	8'-0"	6'-0"	8"	#6 @ 12"
60"	6'-0"	8'-10"	6'-6"	8"	#6 @ 12"



SIDE VIEW



HALF SECTION A-A



**PIPE INLET STRUCTURE
33" DIAMETER PIPE & LARGER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

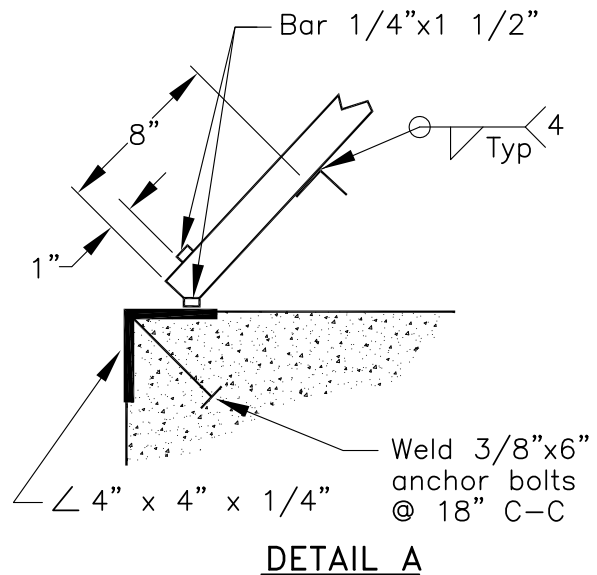
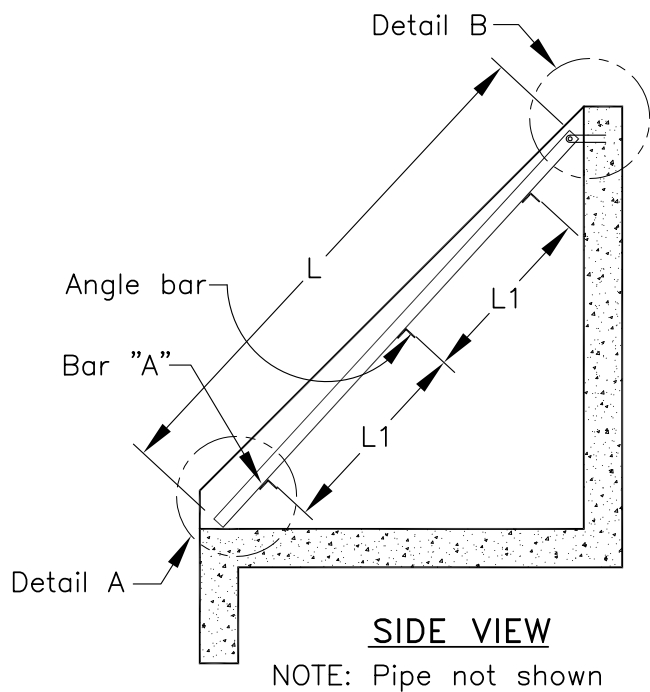
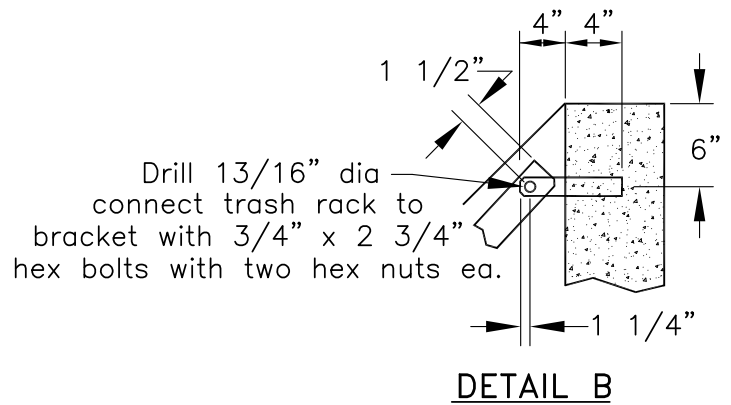
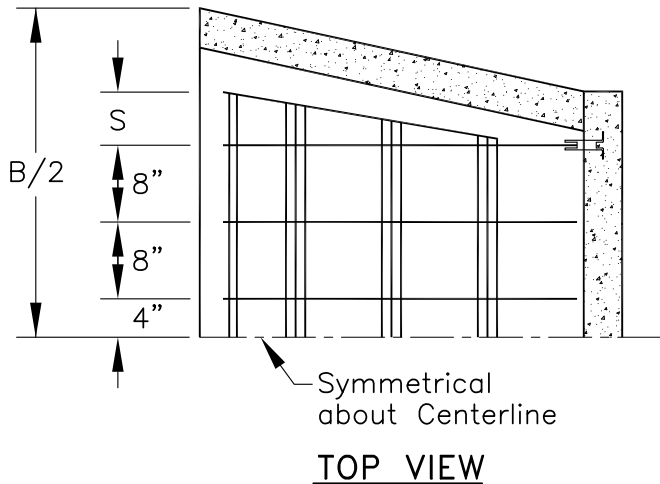
Thomas M. Gull

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-19



TRASH RACK DIMENSIONS

DIA	NUMBERS & SIZE		L	L1	S
	BAR "A"	∠ BAR			
33"	8-3/8 x 2 1/2	3-2x2x 1/4	5'-2"	1'-10"	8"
36"	8-3/8 x 2 1/2	3-2x2x 1/4	5'-5"	1'-11"	8"
42"	9-3/8 x 2 1/2	3-2x2x 1/4	6'-1"	2'-3"	9"
48"	9-3/8 x 2 1/2	4-2x2x 1/4	6'-10"	1'-9"	10"
54"	10-3/8 x 3	4-3x3x 1/4	8'-0"	2'-1 1/2"	10 1/2"
60"	11-3/8 x 3 1/2	4-3x3x 1/4	8'-9"	2'-4"	11"

NOTES:

1. This trash rack may be used with pipe inlet structures.
2. Material to conform to ASTM designation A-36.
3. "S" may vary with "B", see plate on County Standard Drawing No. D-19.
4. All fillet welds to be 1/4".
5. 2 hinges required for 33, 36 & 42 inch pipes. Three hinges required for 48, 54 & 60 inch pipes.



**TRASH RACK
33" DIAMETER PIPE & LARGER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

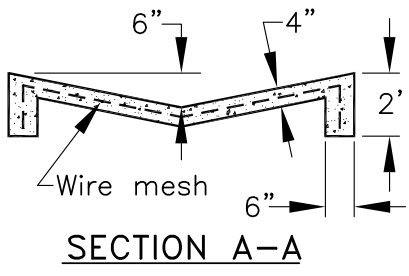
Thomas M. Hill

No.	Revision	Description	Date

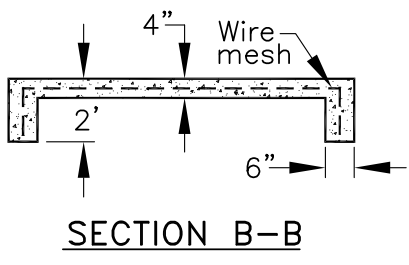
Date: DEC 2014

Std. Dwg. No.

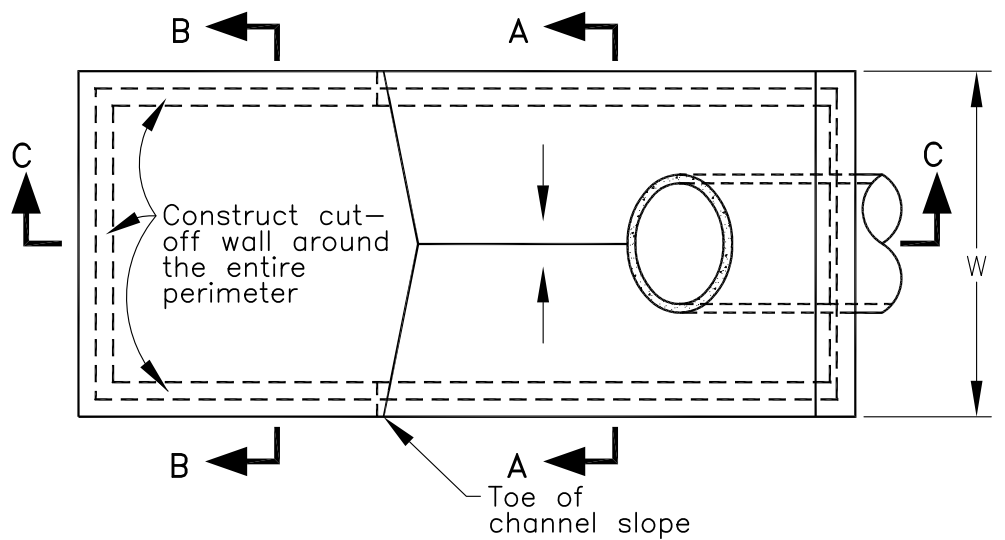
D-20



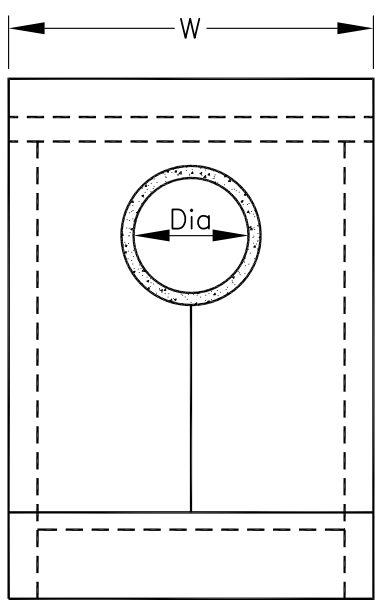
SECTION A-A



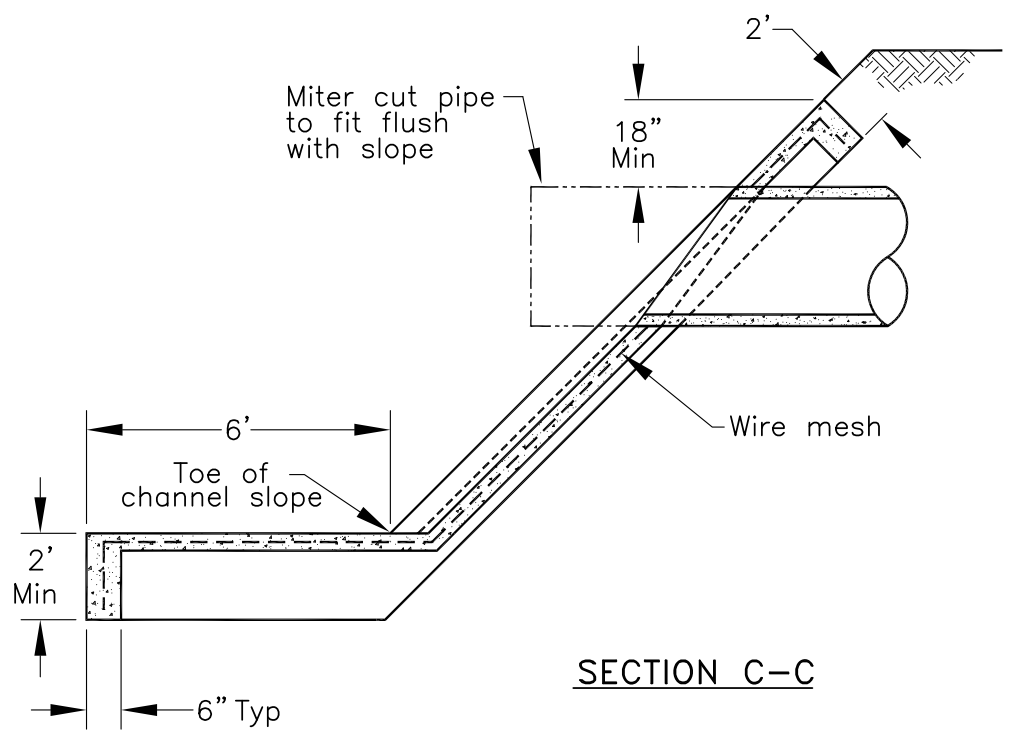
SECTION B-B



TOP VIEW



FRONT VIEW



SECTION C-C

NOTES:

1. Use Class 3 Concrete. Grout cobbles as specified.
 2. Use 6" x 6" x 10 ga. wire mesh throughout concrete.
- W = 6'-0" minimum
 W = 2' x pipe diameter (3' to 6')



**EROSION CONTROL
PIPE DISCHARGE**

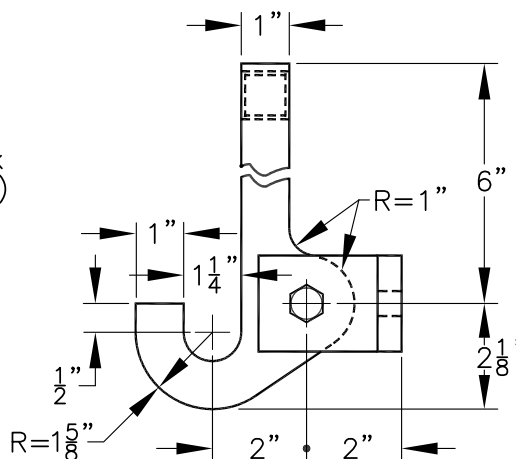
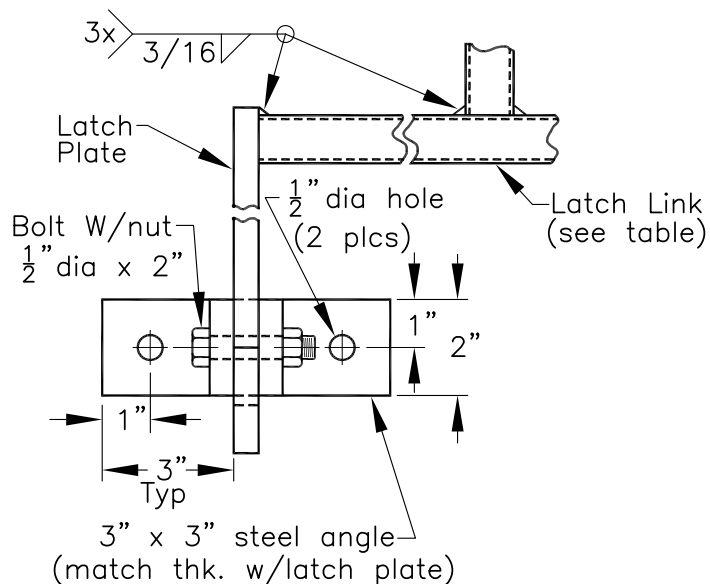
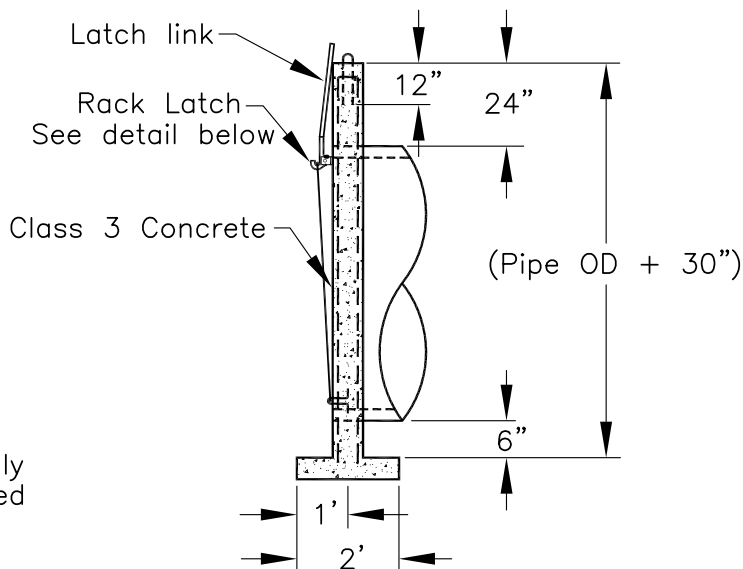
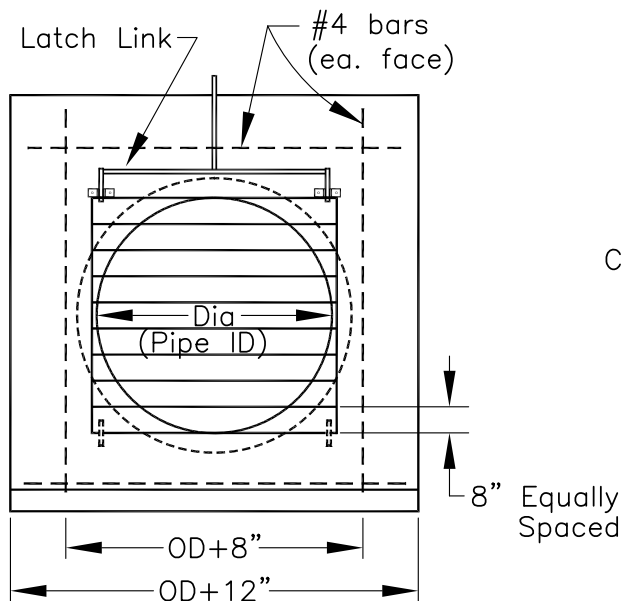
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DEPARTMENT OF PUBLIC WORKS

Approved by:
Thomas M. Grew

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No. **D-21**



RACK LATCH & LINK DETAIL

Scale: None

NOTES:

1. Fasten latch link to anchor w/chain and padlock.
2. Room shall be provided to lay rack flat.
3. Fasten latch bracket to headwall with 1/2" x 6" bolts & hex nuts, or expansion bolts.
4. When rack is in the closed position, the bottom rack bar shall be tight against the top of the hinge bracket so that the rack cannot be lifted off the latch.
5. All reinforcing steel shall have 2" embedment except as noted.

PIPE ID	REBAR	PL THK	LINKAGE SIZE
21" & 24"	#4	1/4"	1", .095" Thk.
27"	#5	1/4"	1", .095" Thk.
30"	#5	3/8"	1", .095" Thk.
33"	#6	3/8"	1", .095" Thk.
36"	#6	3/8"	1", .133" Thk.
42"	#7	3/8"	1", .133" Thk.
48" & 54"	#7	1/2"	1", .133" Thk.
60" & 84"	#8	1/2"	1", .133" Thk.



PIPE OUTFALL ACCESS CONTROL RACK

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

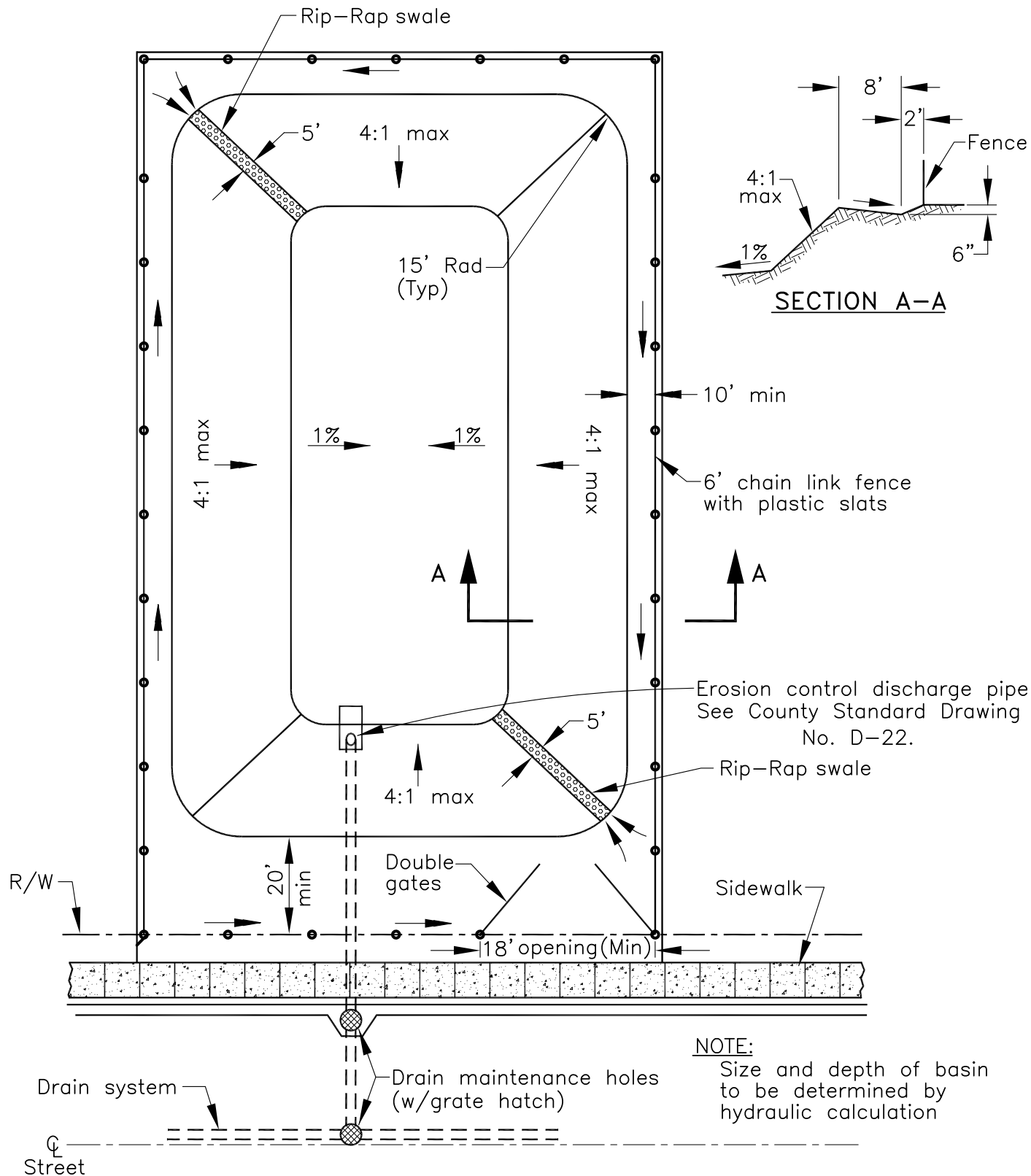
Thomas M. Gull

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

D-22



**PUBLIC STORM DRAIN
RETENTION/DETENTION BASIN**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

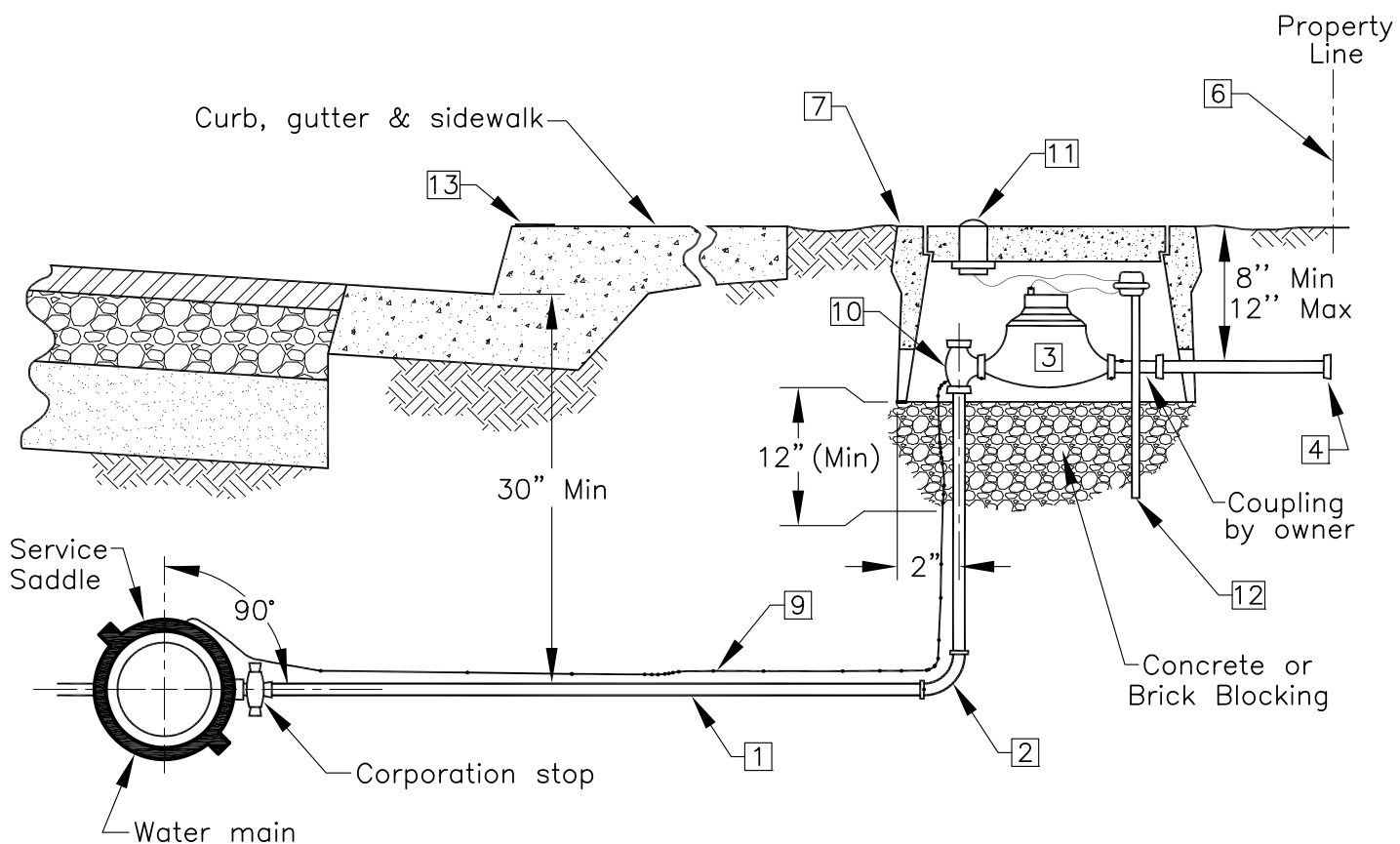
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

D-23

Date: DEC 2014



NOTES:

- 1 1" Dia min line to each lot.
- 2 Service pipe to be continuous (no joints) between main and angle meter stop. 90° Compression x Compression Elbow per AWWA standards. Inserts may be used where approved by agency.
- 3 Meters shall be specified by agency. Meters shall be furnished and installed by the Contractor. Agencies may elect to provide the meter as part of the connection fee.
- 4 Gate valve is required prior to any point of connection.
- 5. The location of the service saddle shall be a min. of 24" from another service saddle, bell, spigot, or other fitting.
- 6 Meter box may be placed adjacent to property or easement line with prior approval of agency.
- 7 Touch read meter box per agency requirements. (All boxes located in driveway areas to have traffic covers)
- 8. Appurtenances per agency requirements.
- 9 Locator wire required by agency.
- 10 Ball angle meter stop with lock lug. (After flushing service, install lock supplied by agency)
- 11 Touch read pad per agency requirements. (Provide a min of 4 feet of wire)
- 12 Remote read transceiver per agency requirements. Supported by 1/2" Schedule 80 conduit (24" min) Provide 1" clearance below the lid.
- 13 2" "W" stamped on top of curb.
- 14. Meters greater than 2" shall have an empty spool equal to the meter dimension placed in box.



WATER SERVICE INSTALLATION

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

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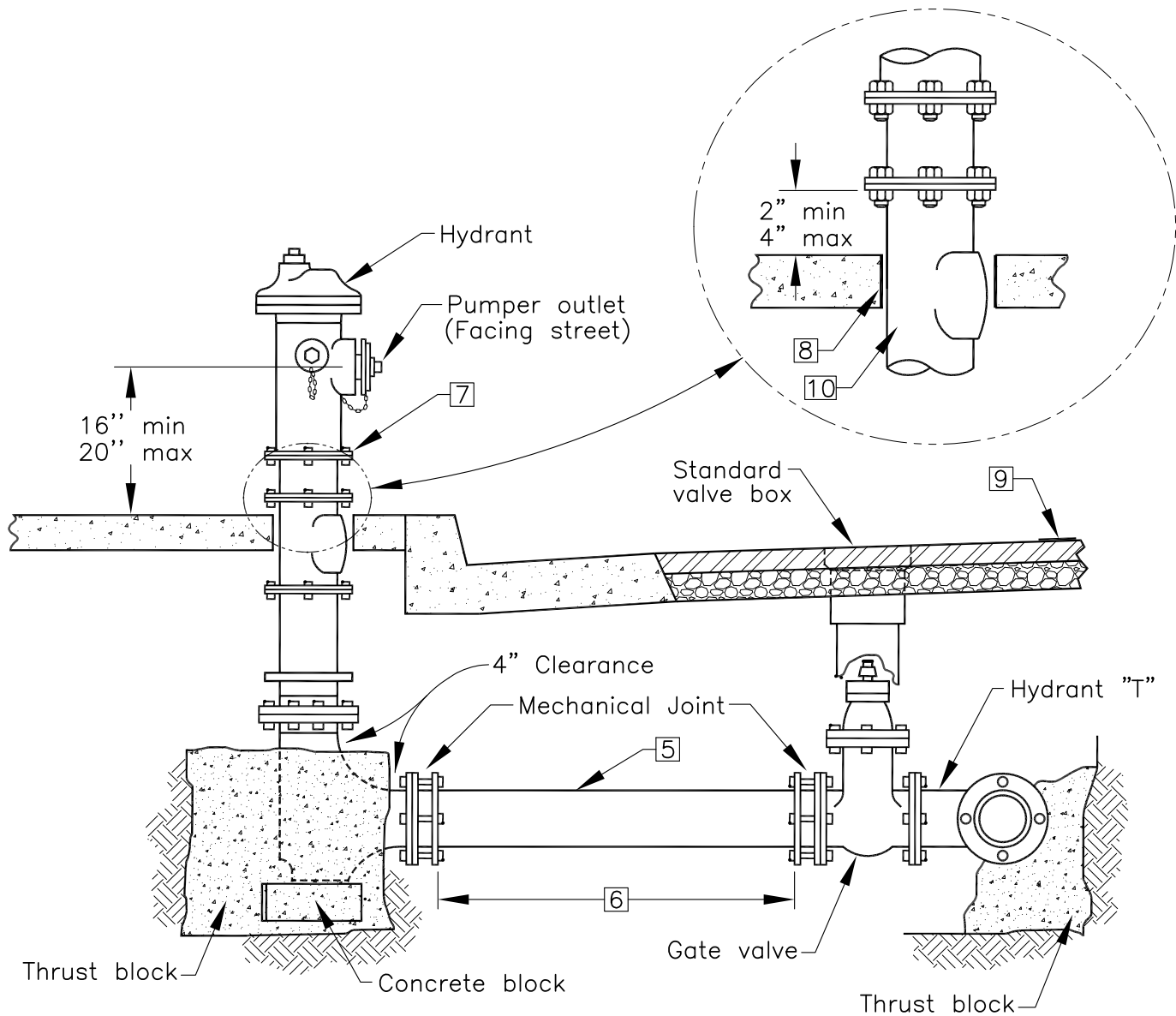
Thomas M. Grew

No.	Revision	Description	Date

Std. Dwg. No.

W-1

Date: DEC 2014



TYPICAL ASSEMBLY

NOTES:

1. Hydrant model to be approved by agency.
2. See standards for proper location of hydrant.
3. Hydrant shall be clean and free of concrete.
4. Hydrants shall be painted yellow, in accordance with agency standards.
- 5 6" dia PVC pipe (AWWA C-900 with CIP equivalent OD)
- 6 Fire hydrant laterals greater than 100 LF, shall have a gate valve installed near the fire hydrant as approved by the agency.
- 7 Break-away spool with hollow break-off bolts (nut on bottom at connection to hydrant).
- 8 Expansion joint material where hydrant is placed in concrete.
- 9 Blue reflective marker shall be placed 12" towards hydrant from center of street.
- 10 Clow Valve Company breakoff check valve Model LBI 400A or equal.



FIRE HYDRANT ASSEMBLY

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

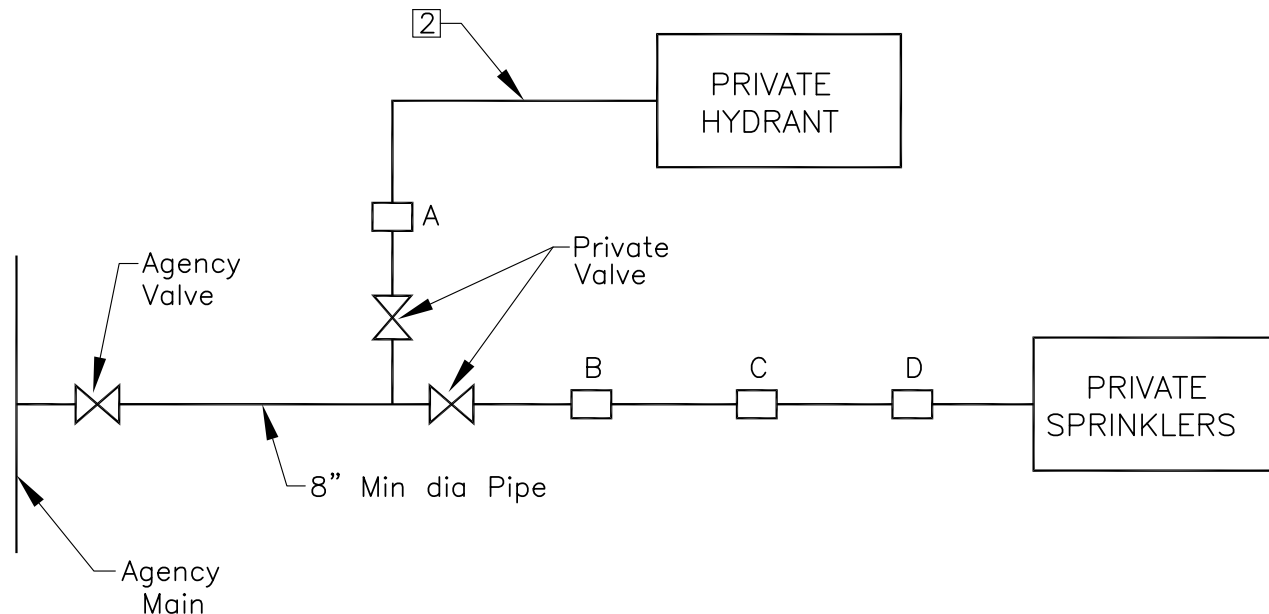
Thomas M. Hill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-2



PLAN VIEW
SINGLE CONNECTION TO MAIN

- A – Double Detector Check Valve Assembly
- B – Reduced Pressure Backflow Preventor
- C – Post Indicator Valve
- D – Fire Dept. Connection

NOTES:

- ① Fire Dept. connection with check valve per local fire Department requirements.
- ② 6" minimum pipe diameter.
- ③ 4" minimum pipe diameter.
4. All private fire systems cross-connected to unapproved water sources and connected to domestic water mains shall have backflow prevention as required by AWWA standards. Plans shall be submitted to and approved by the agency prior to construction. "As Built" drawings shall be provided prior to acceptance by the agency.
5. All fire protection systems shall be disinfected prior to connection to public water system in accordance with the agency's specifications.
6. All on-site fire hydrant systems shall have a double detector check valve installed.
- ⑦ Fire hydrant laterals greater than 100 linear feet, shall have a gate valve installed near the fire hydrant as approved by agency.
8. Locations of hydrants, Fire Department connections and detector check valves to be determined by the fire marshal.
9. For items ①, ②, ③ and ⑦ See County Standard Drawing No. W-2B.



**FIRE SERVICE
CONNECTION DETAIL**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

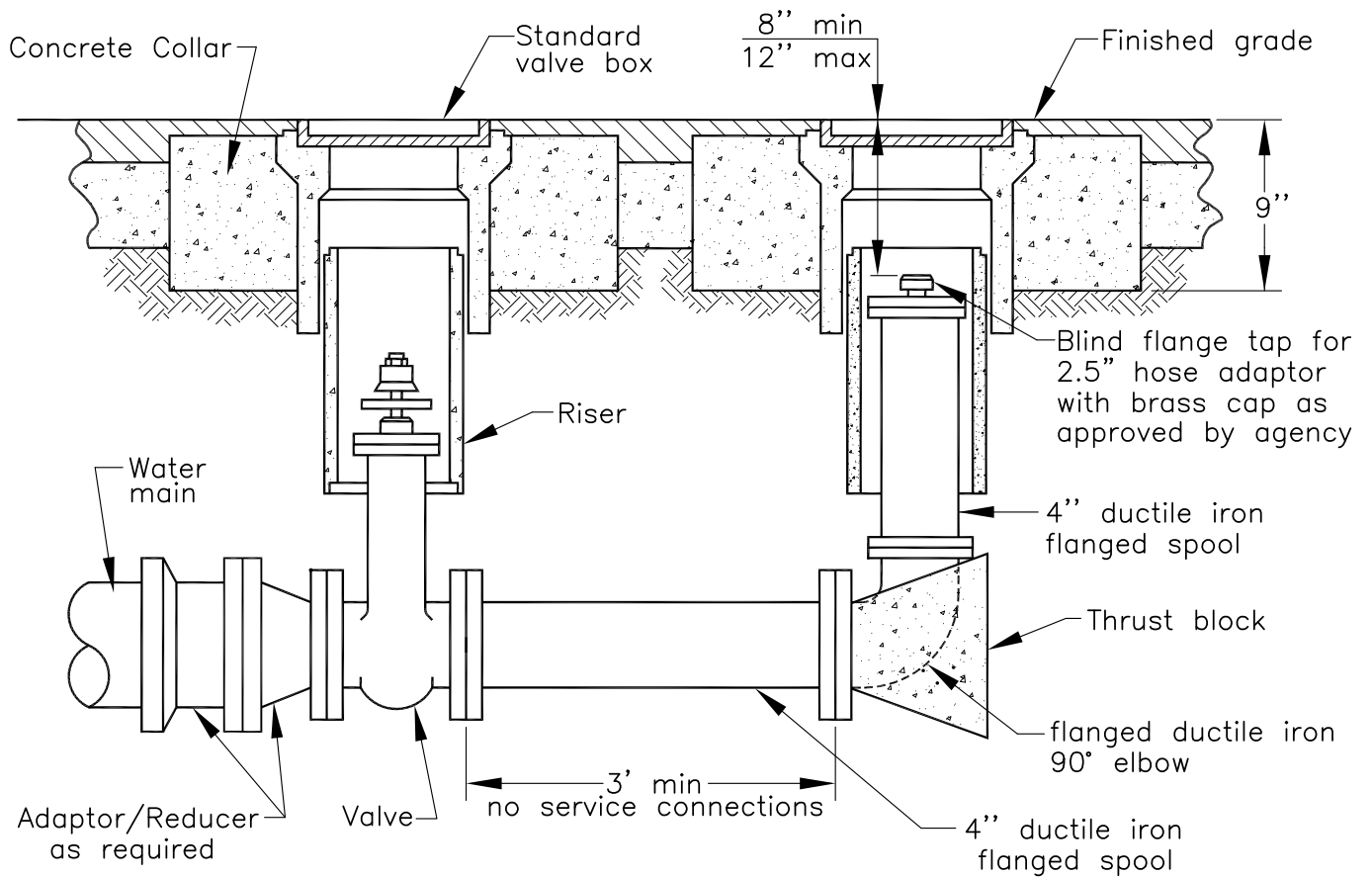
Thomas M. Hall

No.	Revision	Description	Date

Std. Dwg. No.

W-3

Date: DEC 2014



NOTE:

Blow-off may be used where approved by agency.



BLOW-OFF LAYOUT

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Hill

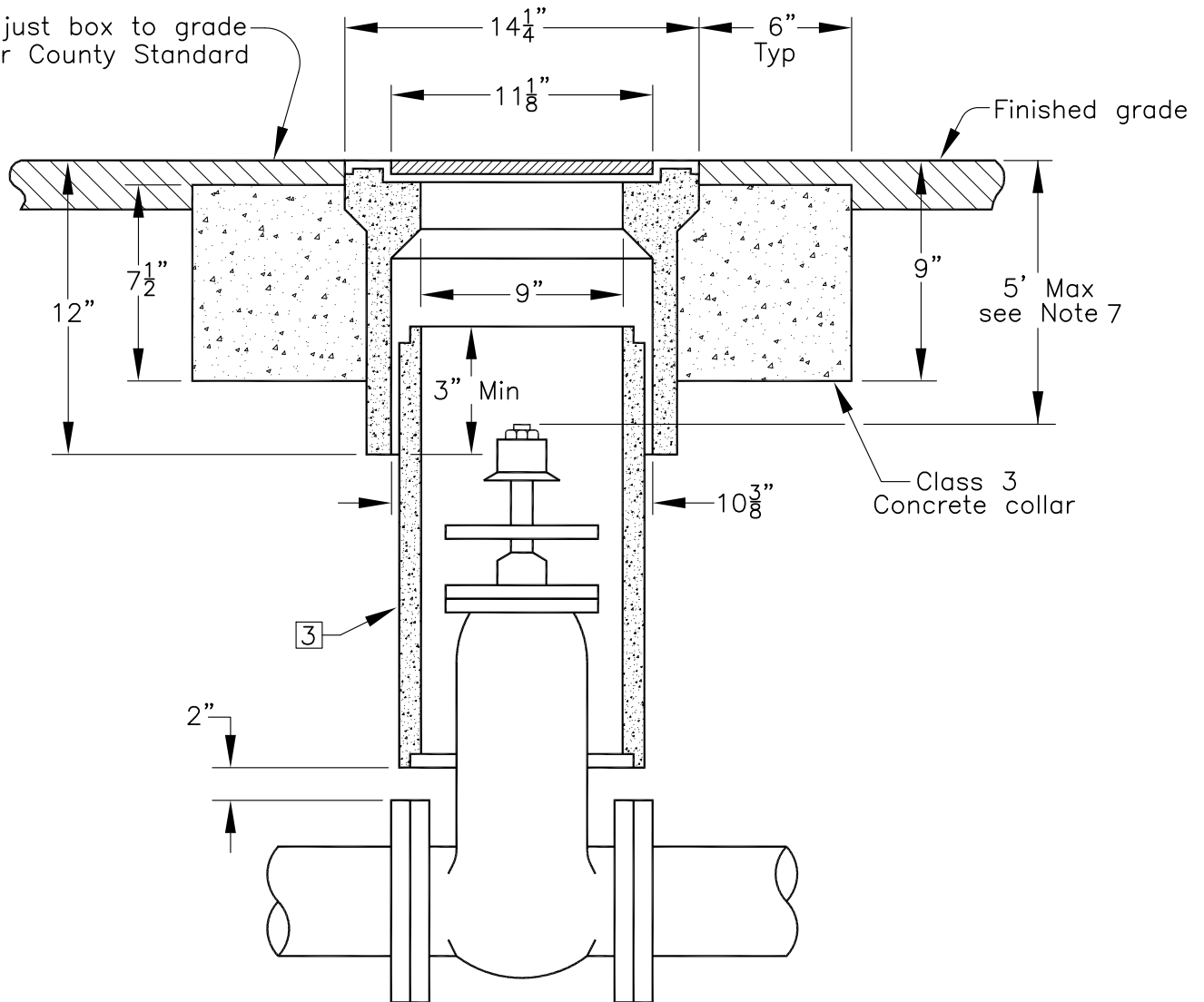
No.	Revision	Description	Date

Std. Dwg. No.

W-4

Date: DEC 2014

Adjust box to grade
per County Standard



NOTES:

1. Valve box and lid shall be Christy No. G5 or as approved by the agency.
2. All lids shall have machined seating surfaces.
3. Valve box risers shall be as manufactured for the valve box supplied.
Valve box riser to be one continuous piece and centered on valve.
Should be a riser OR 8" dia, Class 100 PVC. See Note 5.
4. For blowoff installation, refer to County Standard Drawing No. W-3.
5. Alternative valve box and risers may be used where approved by the agency.
6. Concrete collar not required when valve box is located in concrete sidewalk area.
7. Valve stem extensions may be used to comply with 5' max distance from grade to nut.
8. Trace wire required.



VALVE BOX DETAIL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

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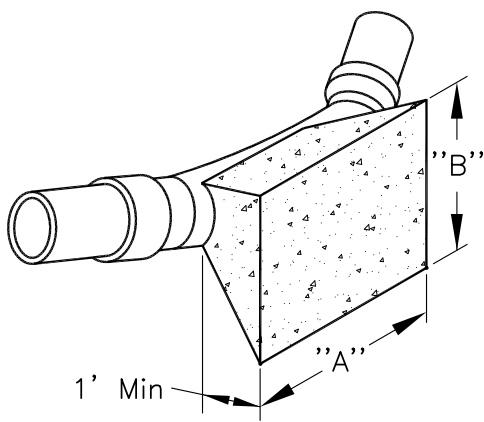
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No.	Revision	Description	Date

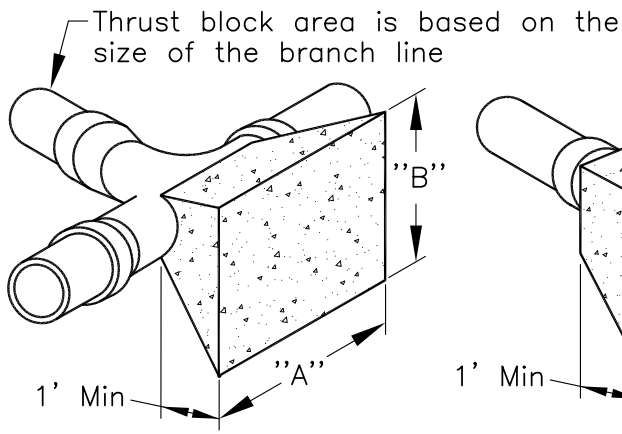
Std. Dwg. No.

W-5

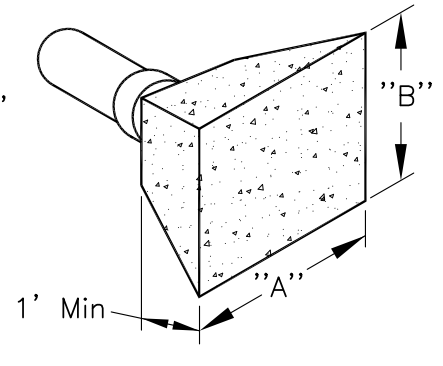
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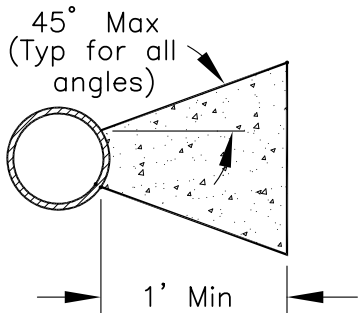
TYPICAL THRUST BLOCK
BEND



TYPICAL THRUST BLOCK
TEE OUTLET



TYPICAL THRUST BLOCK
DEAD END



TYPICAL SECTION THRU
THRUST BLOCK

NOTES:

1. All thrust blocks shall be poured against Undisturbed Soil.
2. Restraint system for vertical pipe bends shall be approved by the agency.
3. Thrust restraint systems for pipes larger than 12" shall be designed on a case by case basis and shall be approved by the agency.
4. Concrete shall be Class 3.

THRUST BLOCK AREA REQUIRED		
FITTINGS	ALLOWABLE SOIL BEARING	
	1000 LBS. PER SQ FT	
6" LINE OR SMALLER	"A"	"B"
22 1/2°	1'-6"	1'-6"
45°	2'-0"	2'-0"
90°	3'-0"	2'-6"
TEE OUTLET	2'-6"	2'-0"
DEAD END	2'-6"	2'-0"
8" LINE		
22 1/2°	2'-0"	2'-0"
45°	3'-0"	2'-6"
90°	4'-0"	3'-0"
TEE OUTLET	3'-0"	3'-0"
DEAD END	3'-0"	3'-0"
10" LINE		
22 1/2°	3'-0"	2'-0"
45°	3'-6"	3'-0"
90°	5'-0"	4'-0"
TEE OUTLET	4'-0"	3'-6"
DEAD END	4'-0"	3'-6"
12" LINE		
22 1/2°	3'-0"	3'-0"
45°	4'-0"	4'-0"
90°	7'-0"	4'-0"
TEE OUTLET	5'-0"	4'-0"
DEAD END	5'-0"	4'-0"



THRUST BLOCK CHART

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

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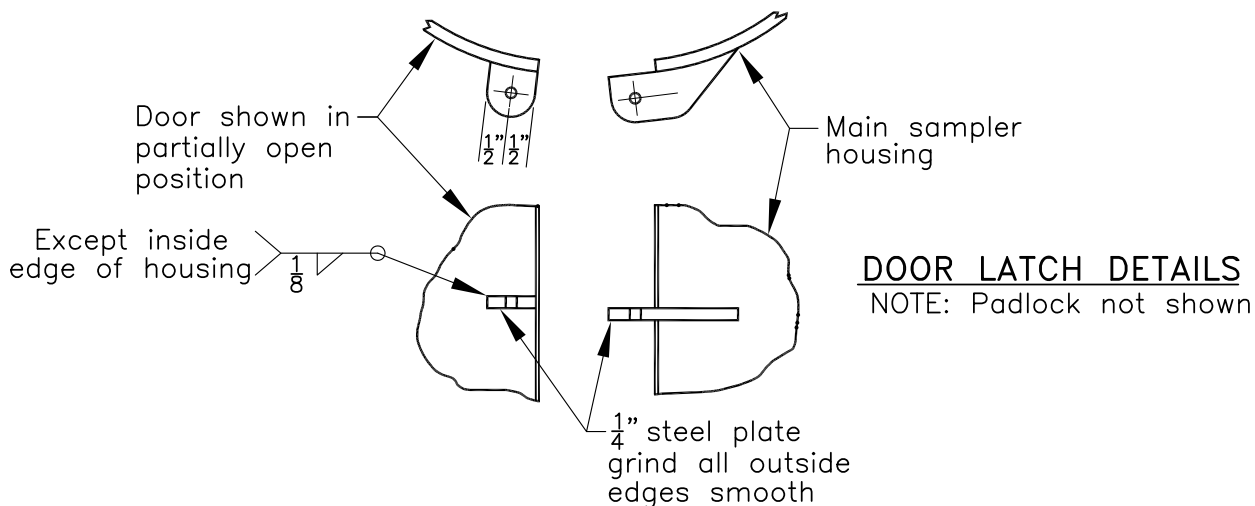
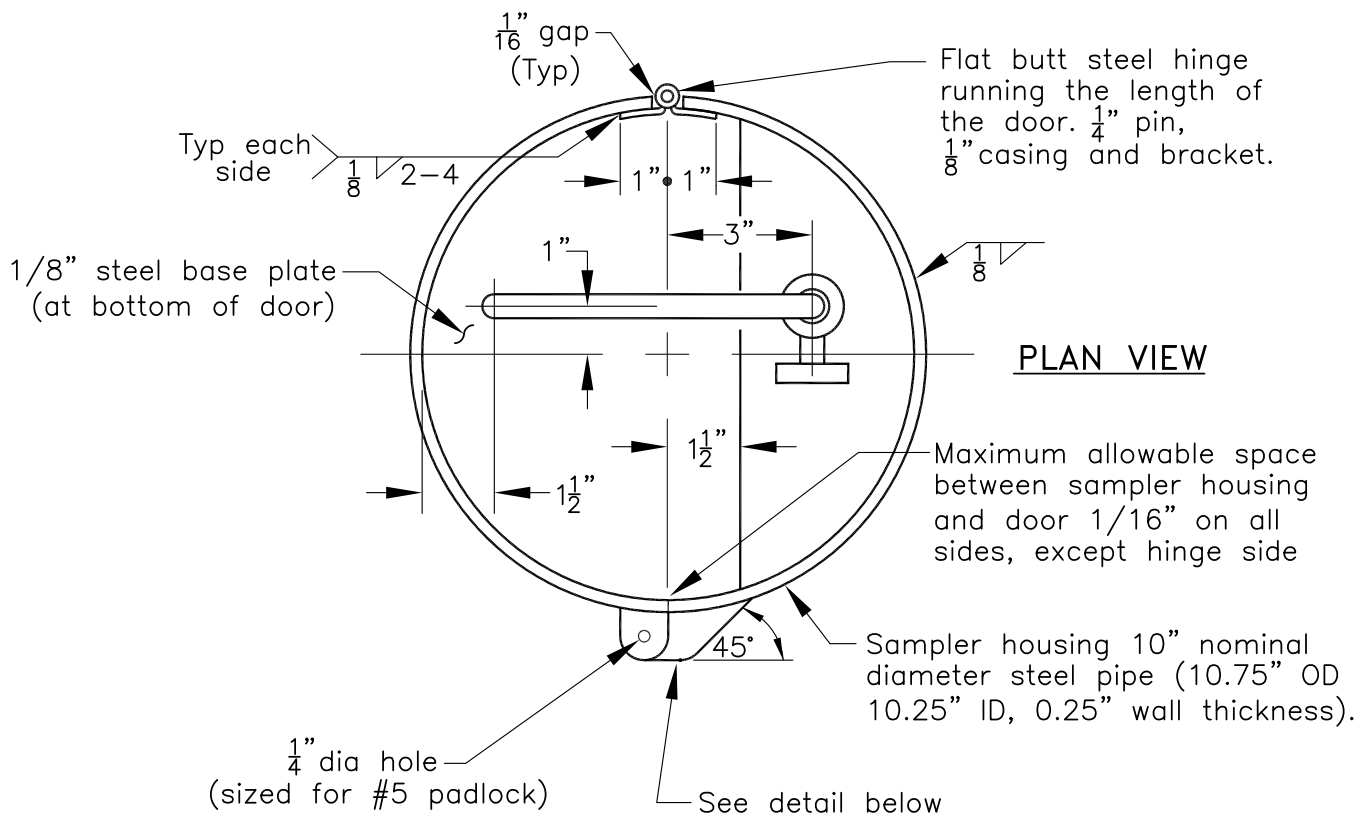
Thomas M. Hall

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-6



NOTES:

1. Interior & exterior shall be painted with CR-1 coating or approved equal, prior to installation. Color (silver) shall be approved by the Engineer. One exterior finish coat shall be applied after installation.
2. Contractor shall provide one padlock for each sampling tap as approved by the owner.
3. Housing door shall open towards street and located a min of 18" behind sidewalk or 6' behind curb/edge of pavement where no sidewalk exists.



BACTERIOLOGICAL SAMPLING TAP

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Grew

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-7

2'-6"

10" Dia

46" Dia Class 3 Concrete pad, 6" min depth, Sloped away from unit at 40:1 (on around)

18" Typ

1/2" Dia drain hole

6" Min

2'-0" Min

3/4" - 1/4" turn pvc ball valve, 150 psi rating

3/4" schedule 80 PVC pipe

1" gravel loosely packed

Double strap saddle tap for 3/4" tap Ford type FS202

3/4" corporation stop. Ford type F1002 to be compatible w/saddle tap

Bedding/backfill

Water distribution main (size & location varies)



BACTERIOLOGICAL SAMPLING TAP SECTION

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-8

Gooseneck liquid dispensing assembly, specified by agency or equivalent $\frac{3}{8}$ " PVC schedule 80 gooseneck, $\frac{3}{8}$ " - $\frac{1}{4}$ " turn Ball valve, PVC, 150 psi rating, $\frac{1}{2}$ " pipe threaded entrance end

Grind all outside edges smooth

$\frac{1}{8}$ "

$\frac{1}{4}$ " Thick steel top plate

1"

1'-6"

10" (Min)

9"

Door (open position)

Sampler housing

$\frac{3}{4}$ " schedule 80 pvc pipe

Lock nut

$\frac{1}{8}$ " thick base plate

$\frac{1}{2}$ " union

$\frac{1}{2}$ " x $\frac{3}{4}$ " reducer



BACTERIOLOGICAL SAMPLING TAP DETAIL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

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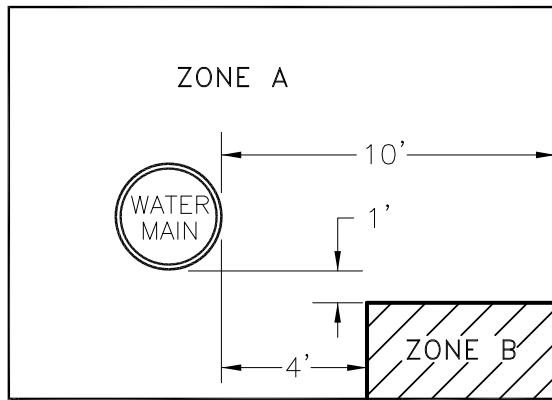
Thomas M. Grew

No.	Revision	Description	Date

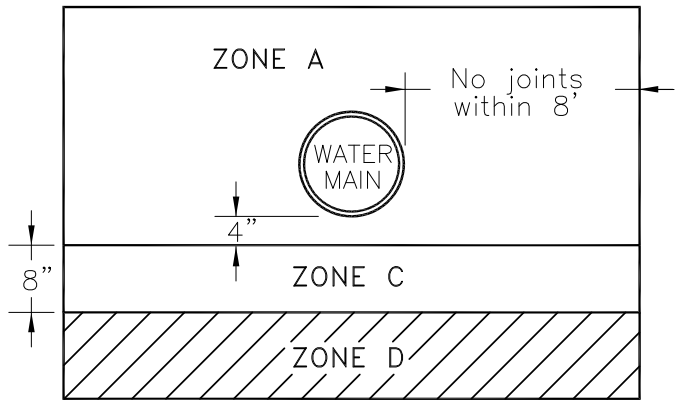
Date: DEC 2014

Std. Dwg. No.

W-9



PARALLEL CONSTRUCTION

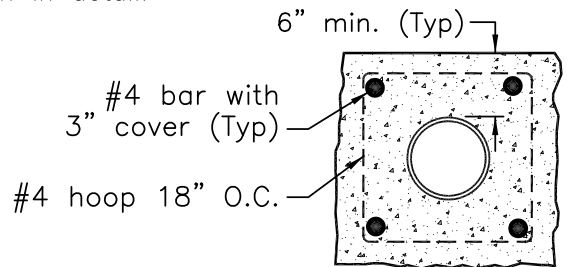


PERPENDICULAR CONSTRUCTION

- NOTES:**
1. The minimum separation distances set forth in this section shall be measured from the nearest outside edge of each pipe barrel.
 2. All crossings shall be at 90° where possible.

HAZARDOUS FLUID MAIN (INCLUDING SEWER) AND WATER MAIN:

- ZONE A:** Hazardous fluid main will not be permitted in this zone.
- ZONE B/C:** Special permission from the County Environmental Health Department is required. Permission may be granted for existing main replacement in the same location, has a diameter no greater than six inches more than the diameter of the main it is replacing and when the total parallel pipe length is less than 1320 linear feet. Main material listed below shall be used. The existing hazardous fluid main shall be encased with reinforced concrete as shown in detail.
- ZONE C/D:** No connection joints shall be made within eight horizontal feet from the main.



Reinforced Concrete Encasement Detail (Class B P.C.C.)

STORM MAIN AND WATER MAIN:

- ZONE A:** Storm main will not be permitted in this zone.
- ZONE B:** Permitted location for storm main.
- ZONE C:** Special permission from the County Environmental Health Department is required. Permission may be granted for existing main replacement in the same location and has a diameter no greater than six inches more than the diameter of the main it is replacing. Main material listed below shall be used. The existing storm main shall be encased with reinforced concrete as shown in detail.
- ZONE C/D:** No connection joints shall be made within eight horizontal feet of the main.

SPECIAL MATERIALS:

- New Water Main: Class-200 or equivalent per AWWA standards.
- New Gravity Parallel Main: Extra-strength vitrified clay pipe with compression joints; or rubber gasketed plastic pipe conforming to ASTM D3034 SDR-35 specification.
- New Industrial or Commercial Gravity Perpendicular Crossing: Class-50 or heavier ductile iron pipe with standard bituminous coating and approved mechanical joints shall be used.
- New Residential Gravity Perpendicular Crossing: Ductile iron pipe as above, Class-200 PVC (DR14 per AWWA C900) plastic pipe or rubber gasketed pipe conforming to ASTM D3034 SDR35 specification may be used.



WATER-SEWER-STORM SEPARATION STANDARDS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

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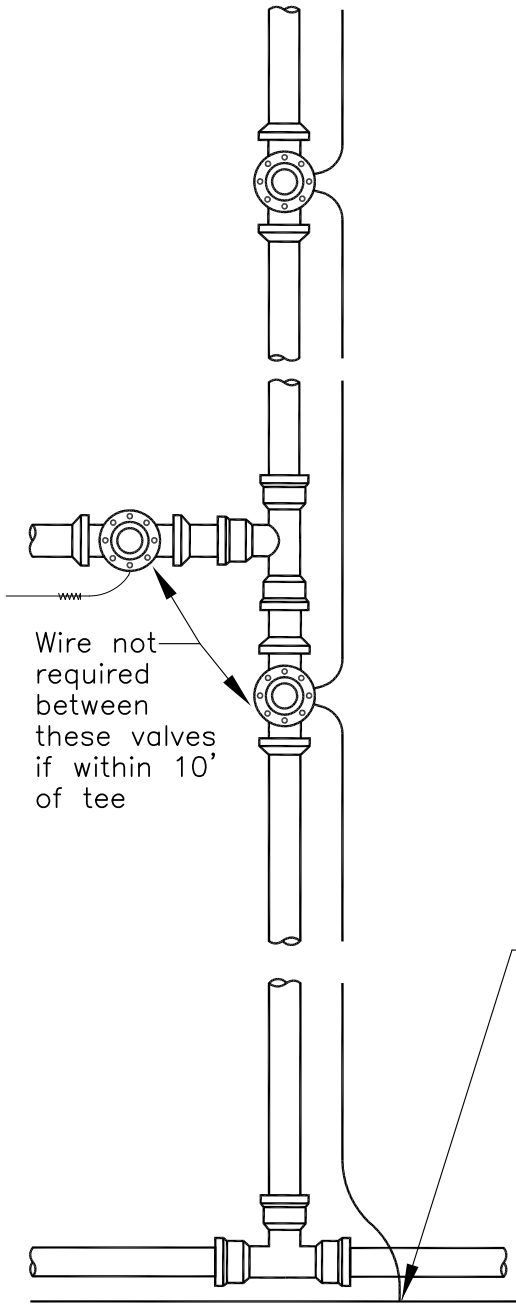
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No.	Revision	Description	Date

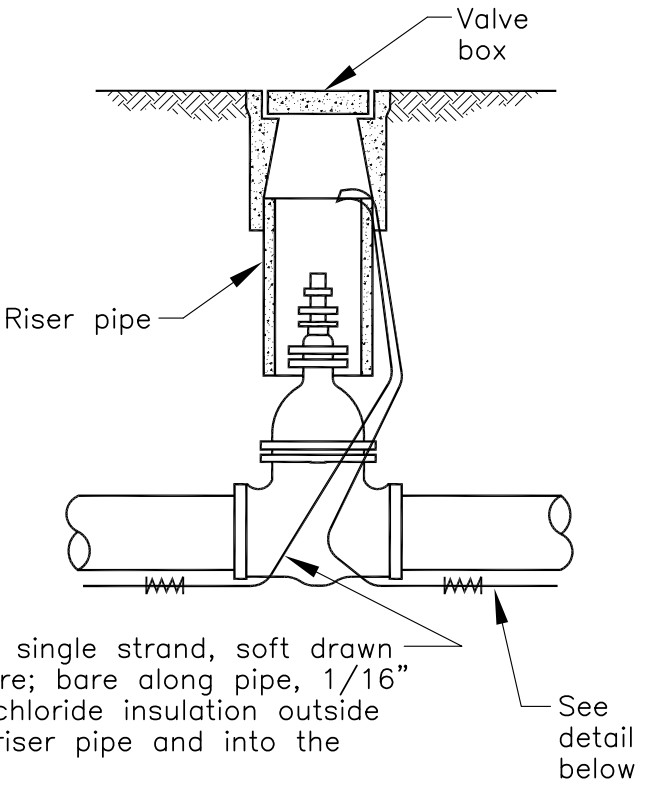
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Std. Dwg. No.

W-10

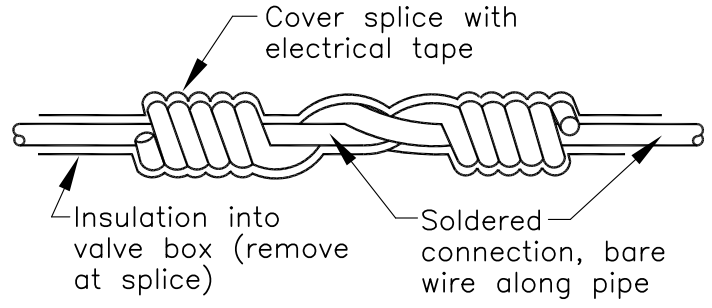


TYPICAL LAYOUT



VALVE DETAIL

Splice runs together
keep clear of fitting



SPLICE DETAIL

NOTES:

1. Wire to be continuous between valve boxes, except as noted.
2. Bare wire not to touch valves or fittings.
3. Locating wire to be laid at bottom of trench, next to pipe.



**LOCATOR WIRE
INSTALLATION**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

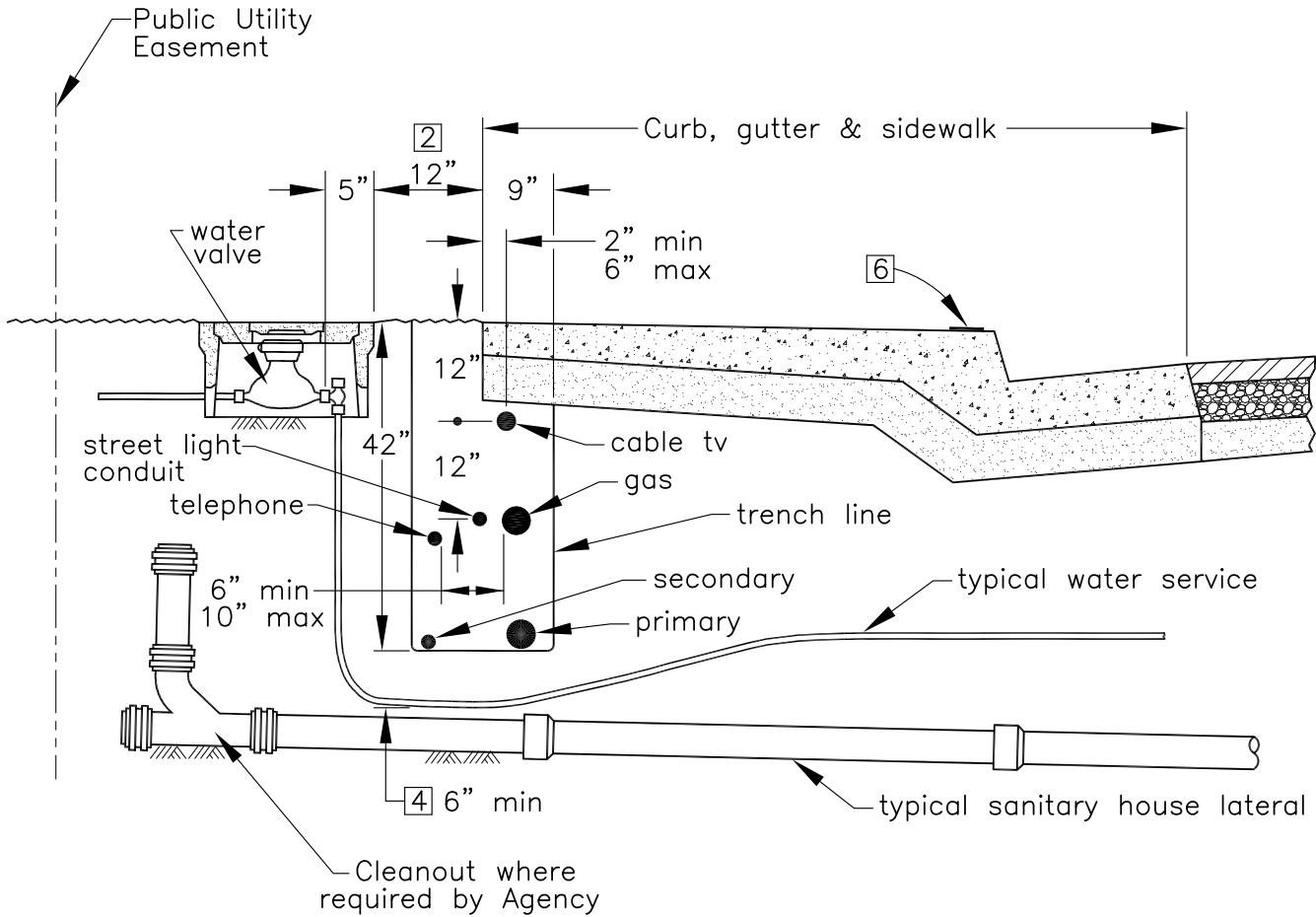
Thomas M. Bell

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-11



TYPICAL SECTION

NOTES:

1. ● Denotes cable and/or conduit.
2. Compaction of this trench shall be 85% minimum.
3. Utilities in joint trench to be placed as per public utility company/agency regulations.
4. All services crossing underneath primary and secondary electrical lines shall have a minimum clearance of 6". Electrical lines shall have a minimum clearance of 12" if placed below service laterals.
5. Water Service and Sanitary Service shall have a lateral clearance of 30" minimum.
6. 2" "S" on curb for Sanitary Sewer Service, or "W" for Water Service.



UNDERGROUND UTILITY LOCATIONS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

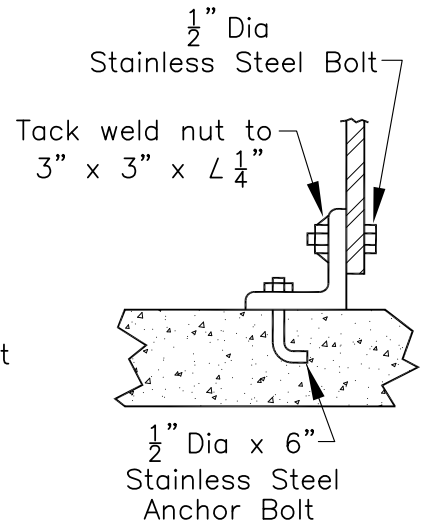
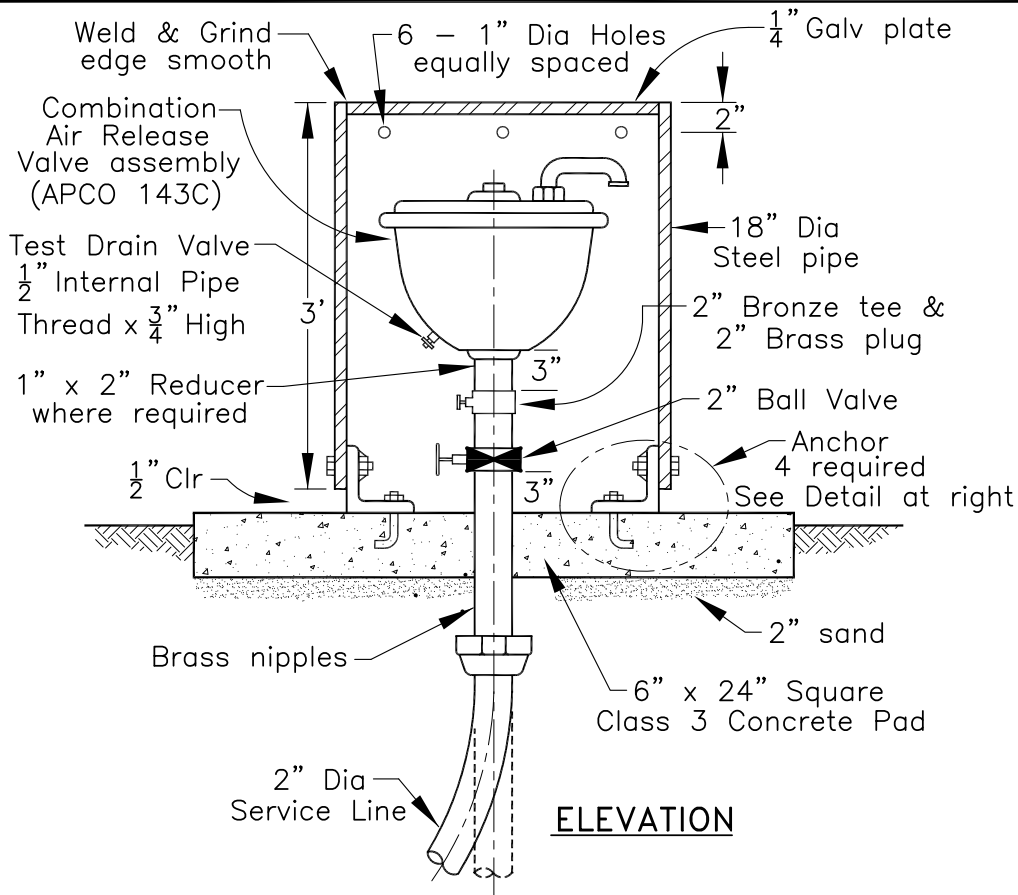
Thomas M. Gill

No.	Revision	Description	Date

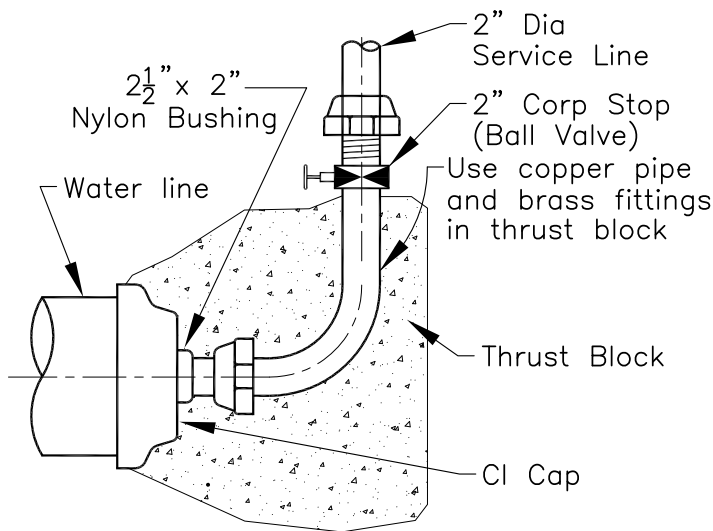
Date: DEC 2014

Std. Dwg. No.

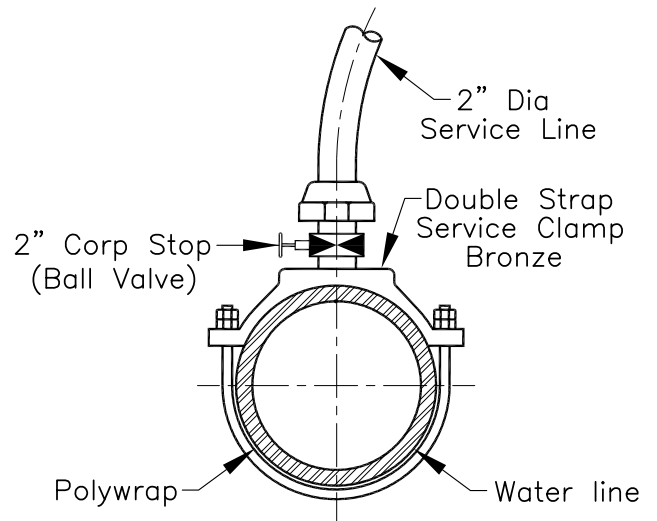
W-12



ANCHOR DETAIL



CONNECTION AT END OF MAIN LINE



CONNECTION AT HIGH POINT OF LINE

NOTES:

- Assemblies installed at easements, roads and streets without curbs shall be protected with guard post.



AIR-VACUUM RELEASE VALVE

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

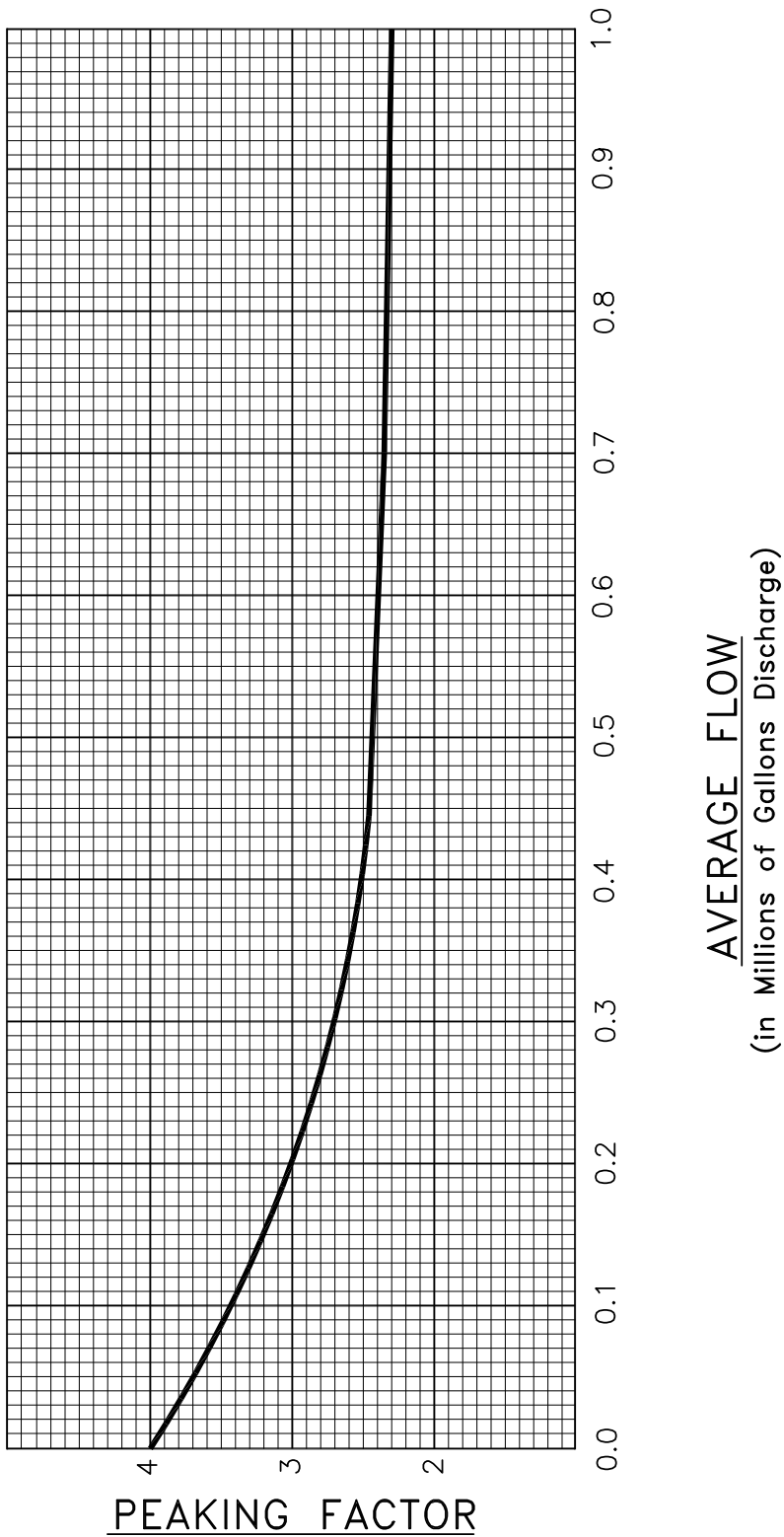
Thomas M. Gill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

W-13



Note: Peaking Factor includes an allowance for infiltration/inflow



SANITARY SEWER PEAKING FACTORS

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Gell

No.	Revision	Description	Date

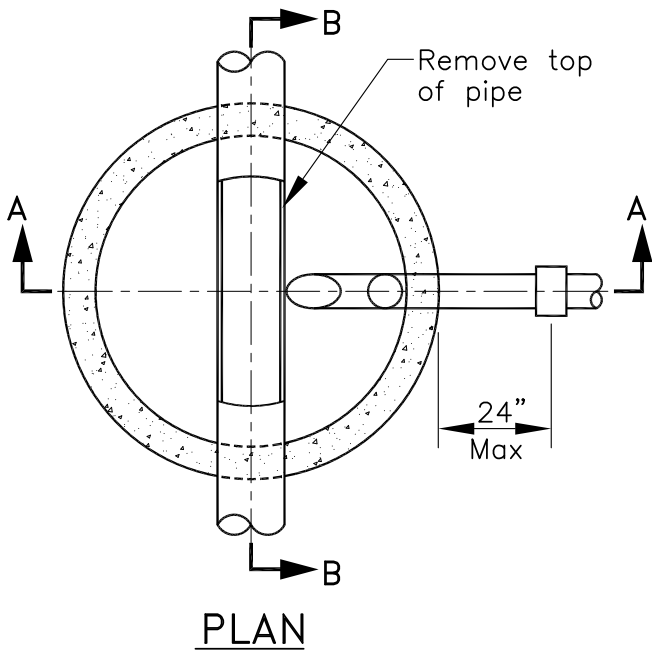
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Std. Dwg. No.

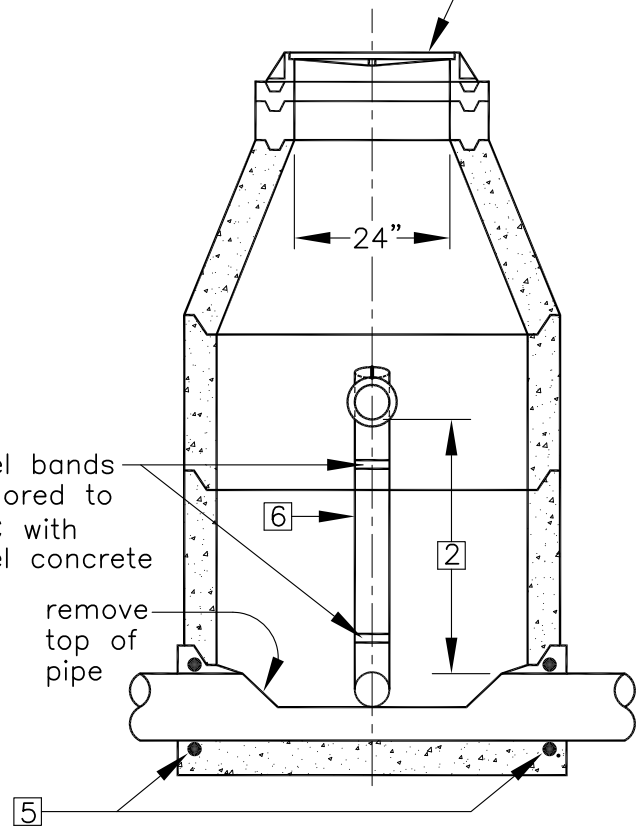
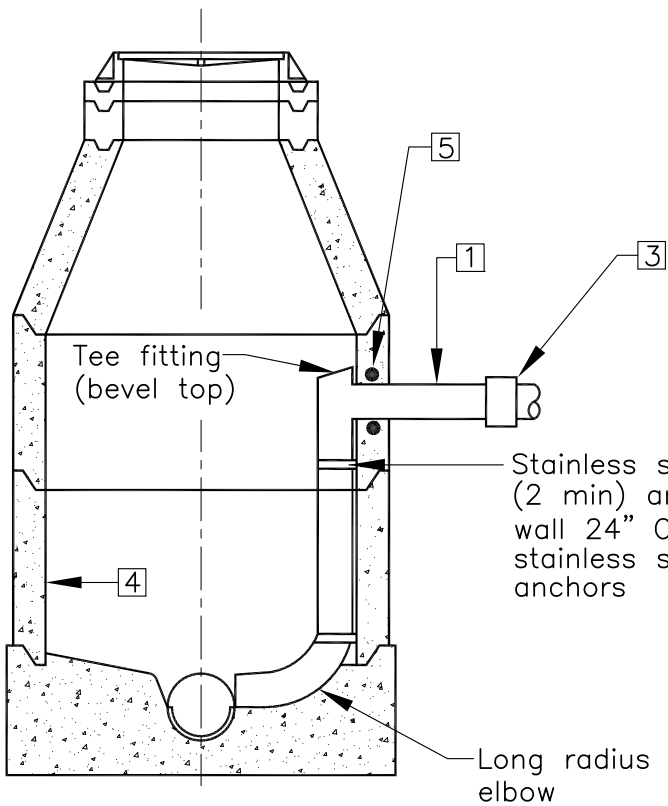
S-1

NOTES:

- 1 8" Dia max size of feeder pipe.
- 2 This type of maintenance hole shall be used where the difference in elevation between the top of outlet pipe and the invert of the feeder pipe exceeds 24".
- 3 Flexible joint—bell & spigot or caulder coupling. Solvent welded joint not permitted.
- 4 Interior coating where required by agency.
- 5 Rubber ring waterstop or maintenance hole adaptor required for pvc pipe installations.
- 6 Drop pipe to be one size larger than incoming pipe.
7. Inside drop may be used where approved by Director.



Maintenance hole frame & cover adjust to grade per county standard



**INSIDE SANITARY SEWER
DROP MAINTENANCE HOLE**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

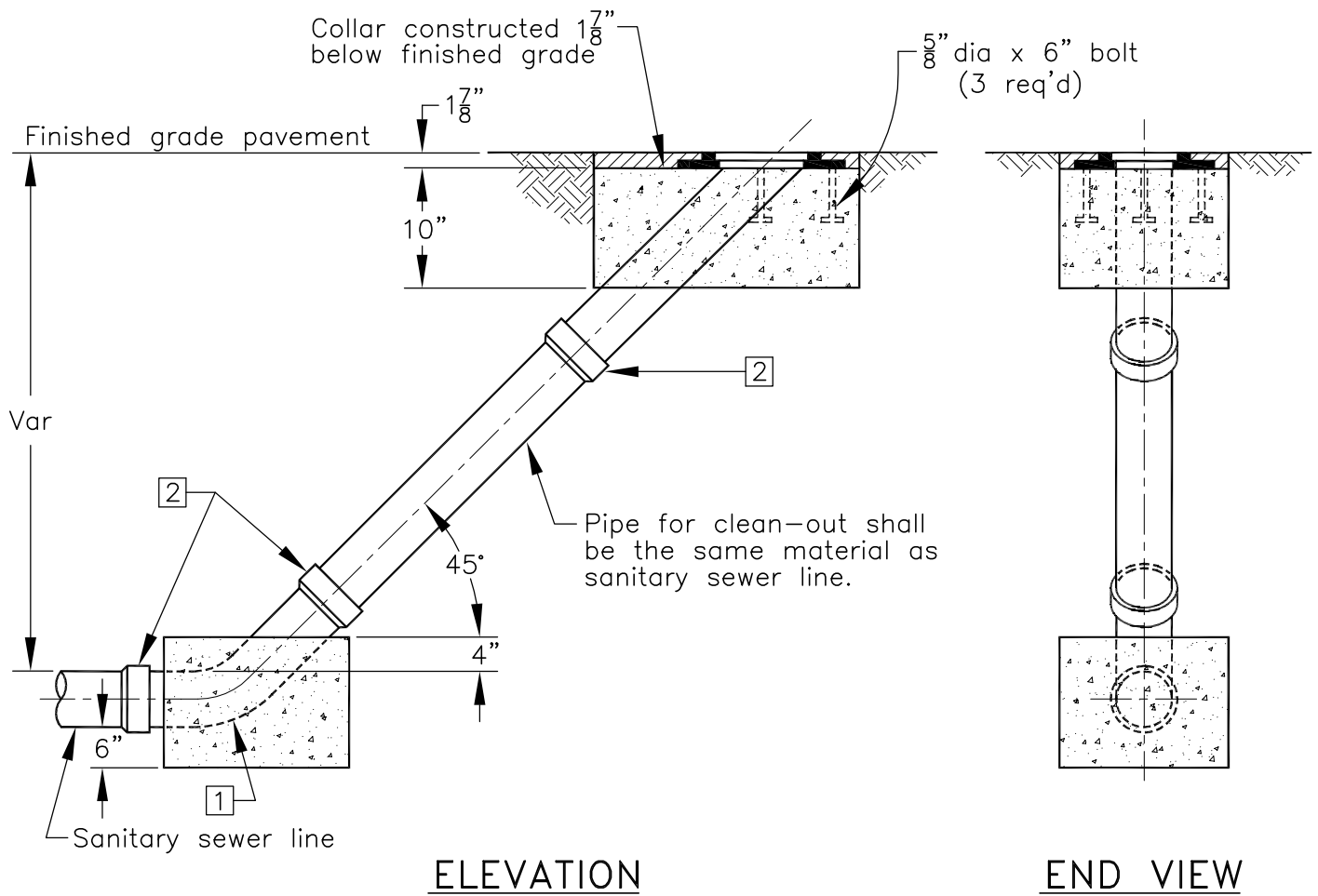
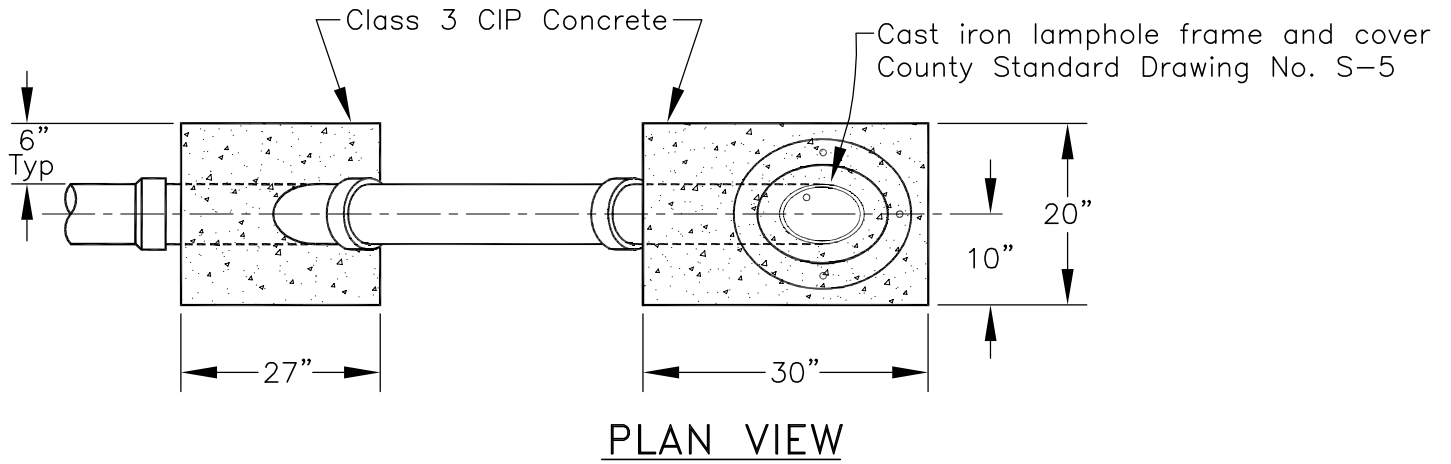
Thomas M. Hill

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

S-2



NOTES:

- 1 6" dia x 45° elbow
- 2 Joints are not to be encased in concrete.
- 3. Lamphole may be used where approved by Director.



**SANITARY SEWER
LAMPHOLE**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

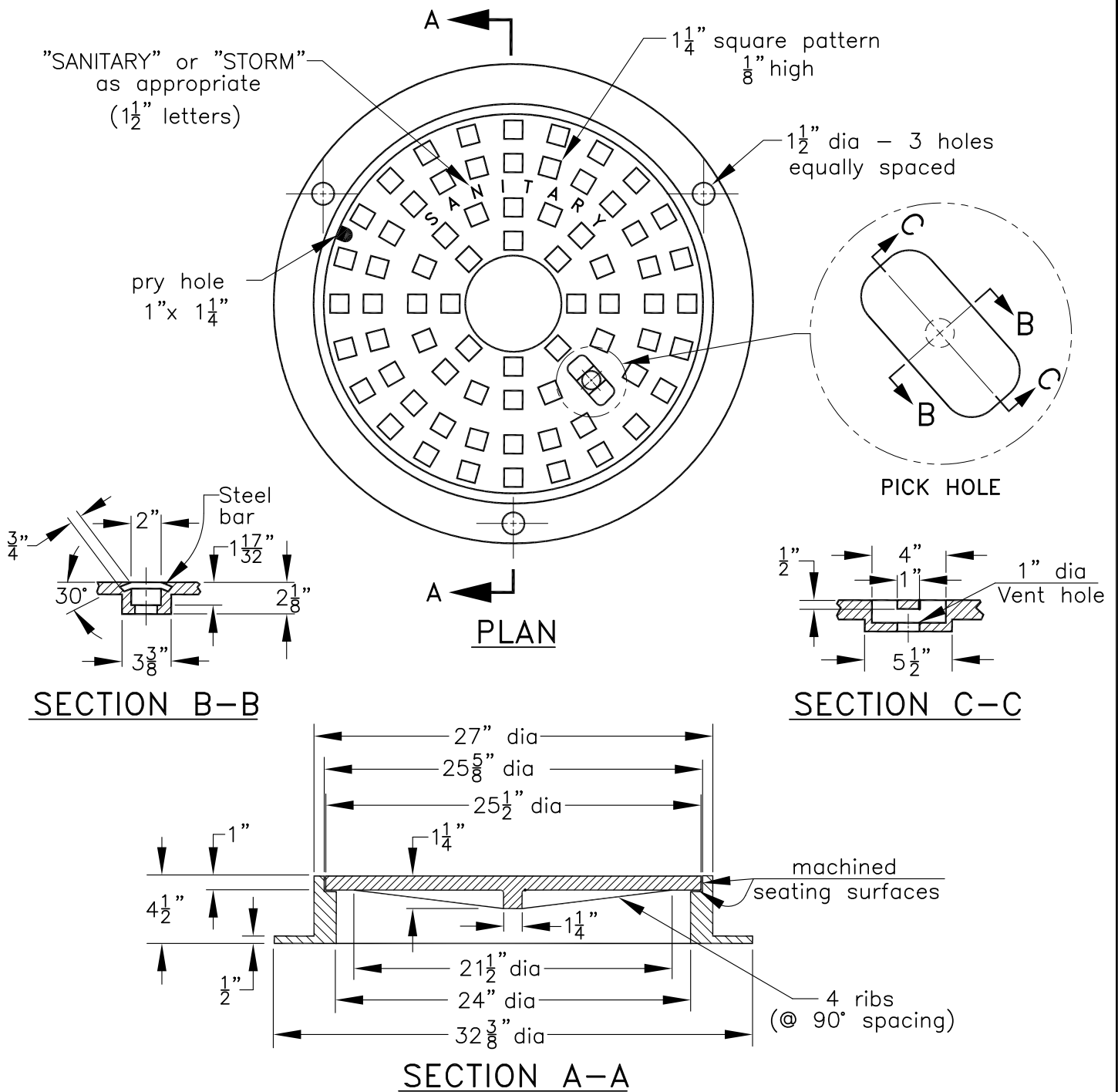
Date: JUN 2016

Approved by:

No.	Revision	Description	Date

Std. Dwg. No.

S-3



NOTES:

1. Frame and Cover shall be manufactured of cast iron, conforming to ASTM A-48-Class 30
2. Frame and Cover shall be HS20 or HL93 rated.
3. Frame shall weigh 140 pounds minimum; Cover shall weigh 130 pounds minimum.
4. Frame and Cover shall be coated with bituminous material conforming to A.W.W.A. standards.



**MAINTENANCE HOLE
FRAME AND COVER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

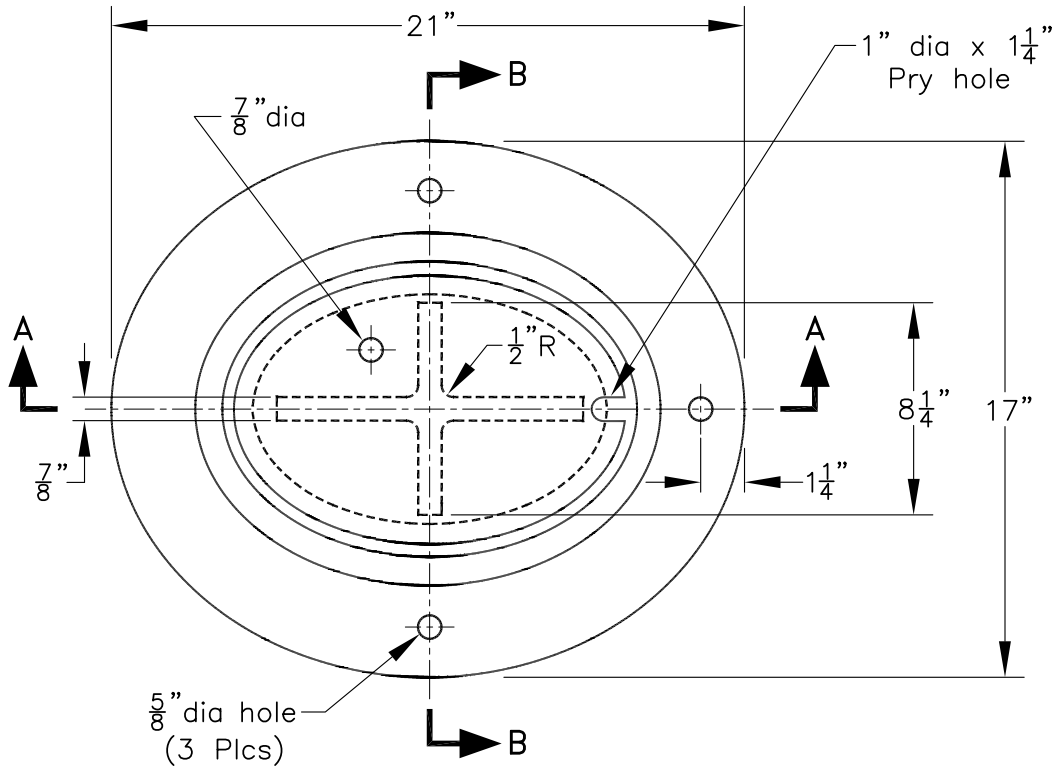
Thomas M. Grew

No.	Revision	Description	Date

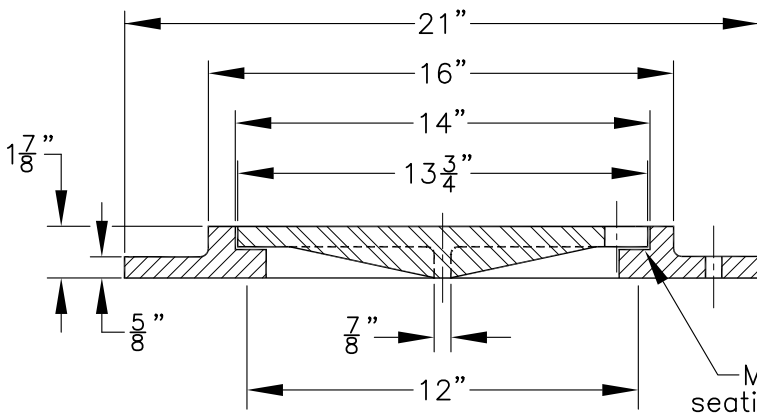
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Std. Dwg. No.

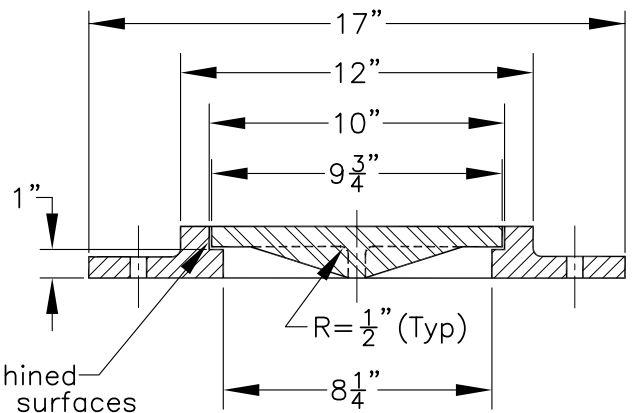
S-4



PLAN



SECTION A-A



SECTION B-B

NOTES:

1. Frame and cover shall be manufactured from cast iron conforming to ASTM A-48-Class 30.
2. Frame and cover shall be HS20 or HL93 rated.
3. Frame shall weigh approx 45 pounds.
4. Cover shall weigh approx 25 pounds.
5. Frame and cover shall be coated with bituminous material conforming to A.W.W.A. standards.



**LAMP HOLE
FRAME AND COVER**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

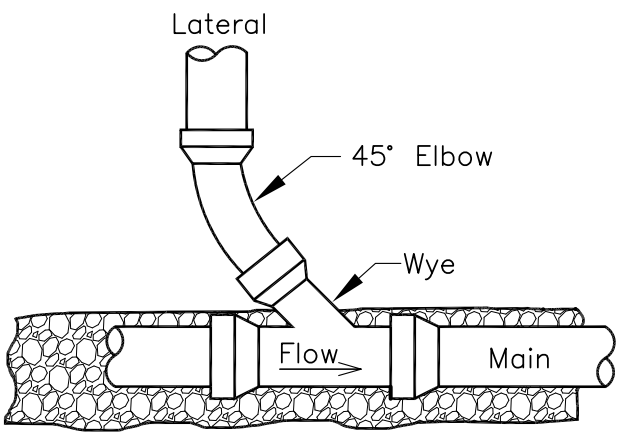
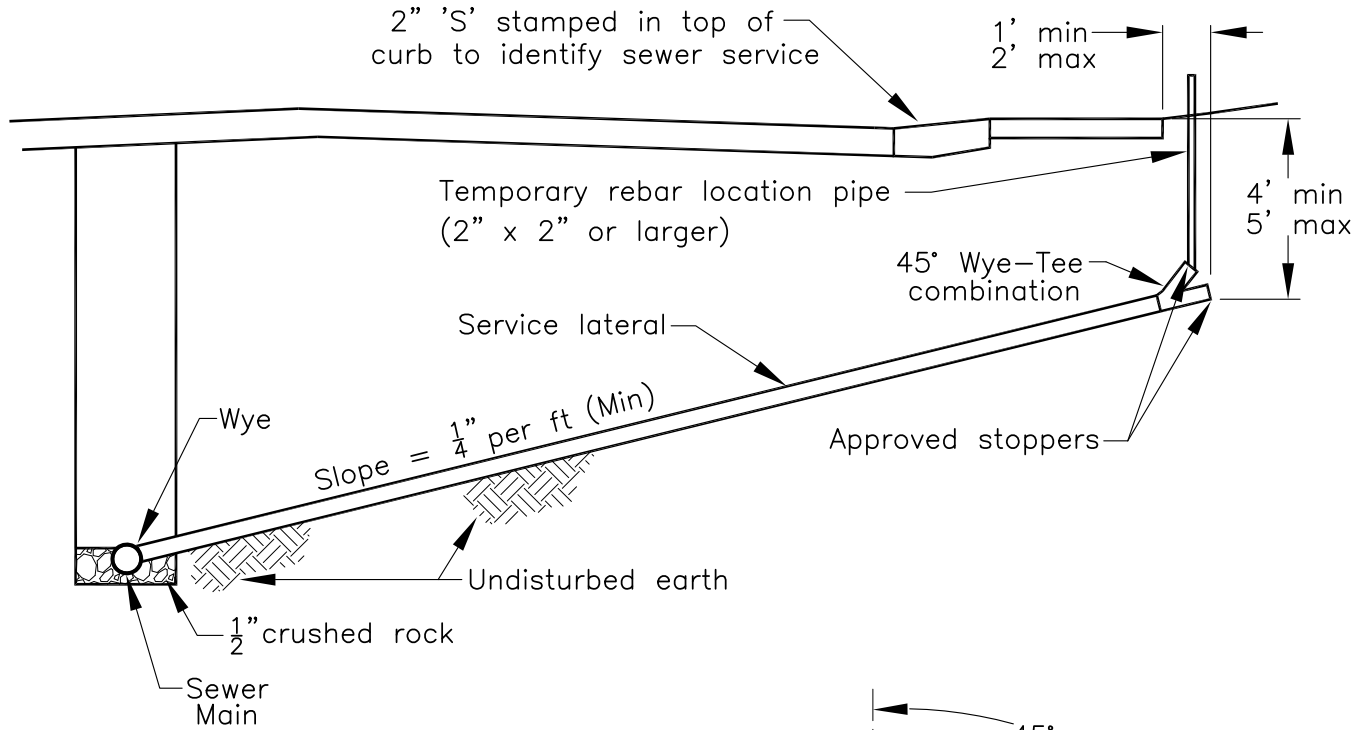
Thomas M. Gill

No.	Revision	Description	Date

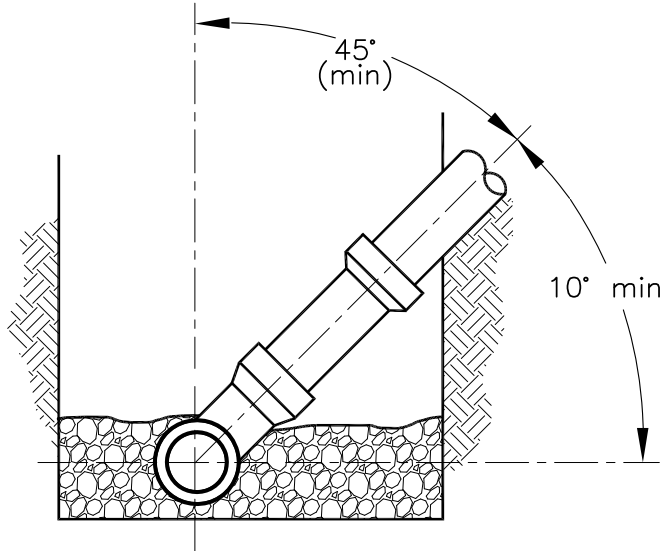
Std. Dwg. No.

S-5

Date: DEC 2014



WYE DETAIL
(PLAN VIEW)



CROSS SECTION DETAIL

NOTES:

1. All services shall be 4" inside diameter or as shown on plan.
2. Contractor shall use the most appropriate type of connection. With approved alternates on County Standard Drawing No. S-7B for the particular situation.
3. See standard plan for required cleanouts & boxes.



SEWER SERVICE LATERAL

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

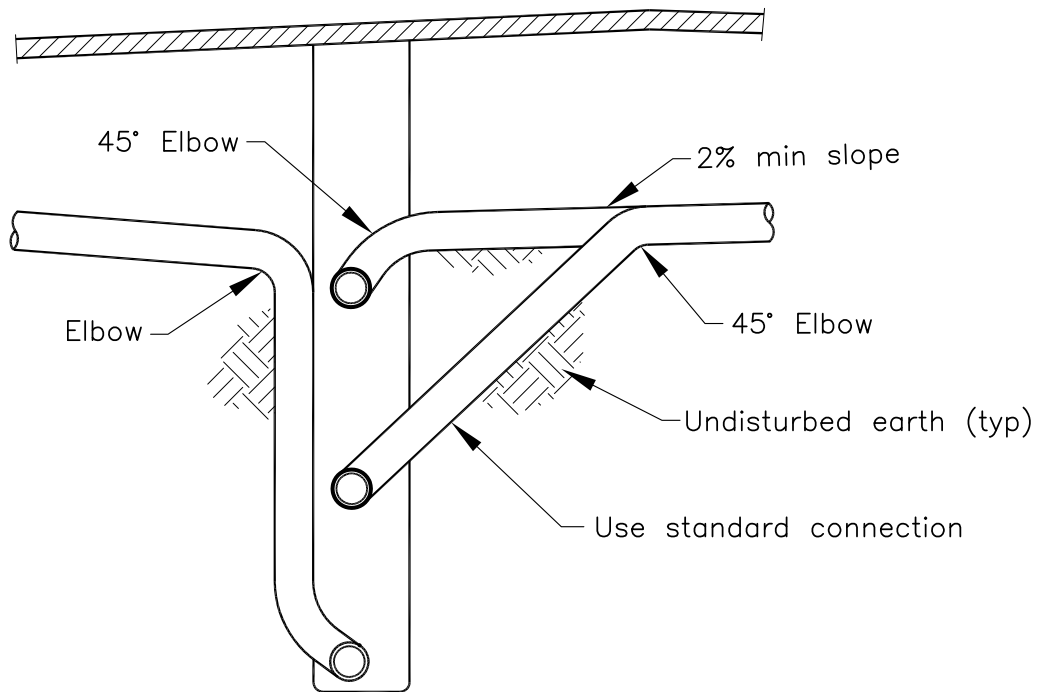
Date: DEC 2014

Approved by:

Thomas M. Hill

No.	Revision	Description	Date

Std. Dwg. No. **S-6**



NOTE:

Alternate connections shall be used only with Director approval.



**SEWER SERVICE LATERAL
ALTERNATE DETAILS**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

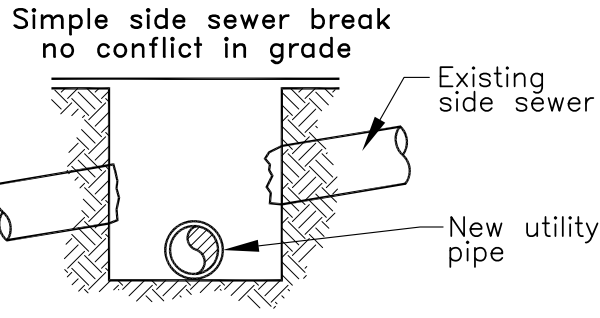
Thomas M. Gill

No.	Revision	Description	Date

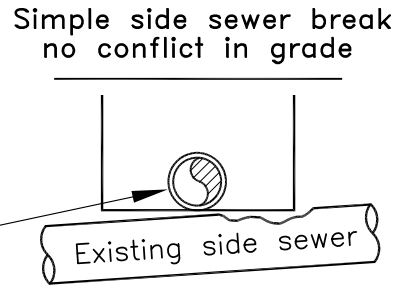
Std. Dwg. No.

S-7

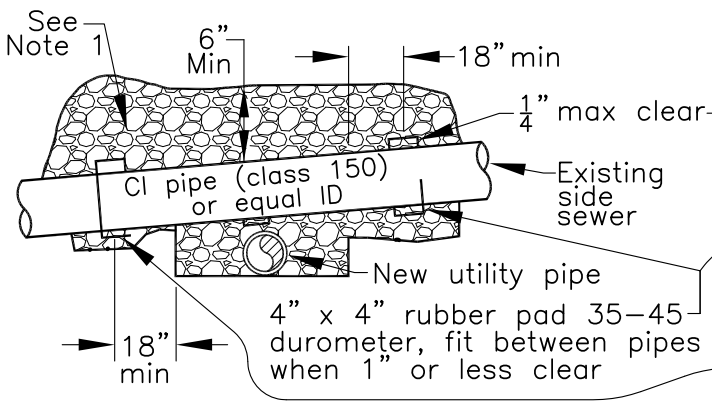
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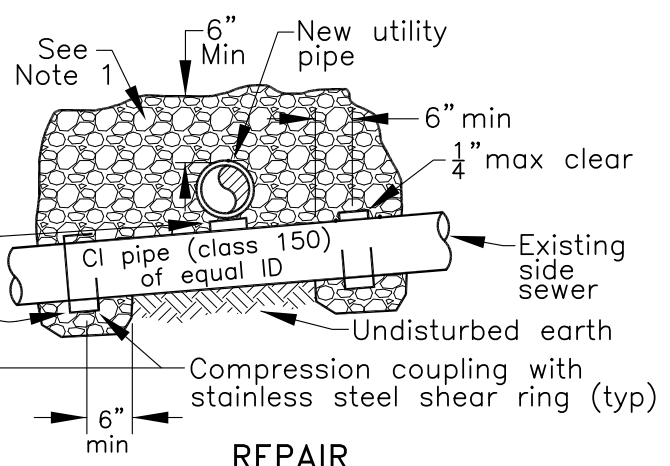
BREAK



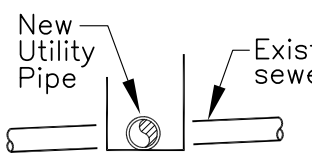
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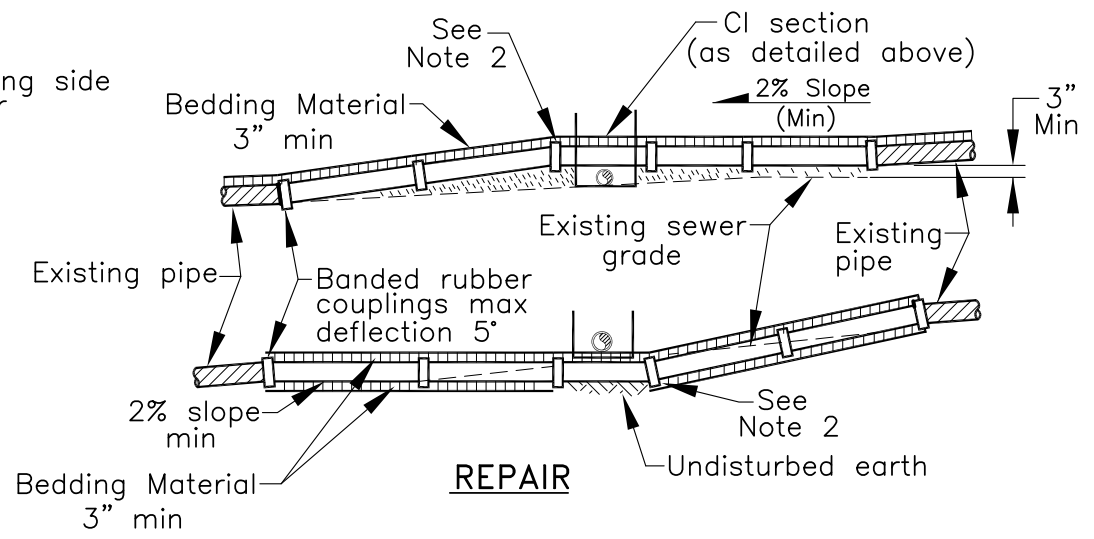
REPAIR
SIMPLE SIDE SEWER BREAK
WITH CONFLICT IN GRADE



REPAIR
SIMPLE SIDE SEWER BREAK
WITH CONFLICT IN GRADE



BREAK OR CONFLICT



NOTES:

1. 1/2" Crushed rock fill entire excavation outside trench area min 18" each side of sewer line.
2. Bevel pipes, banded rubber coupling, max deflection 10°



**SEWER SERVICE
LATERAL REPAIR**

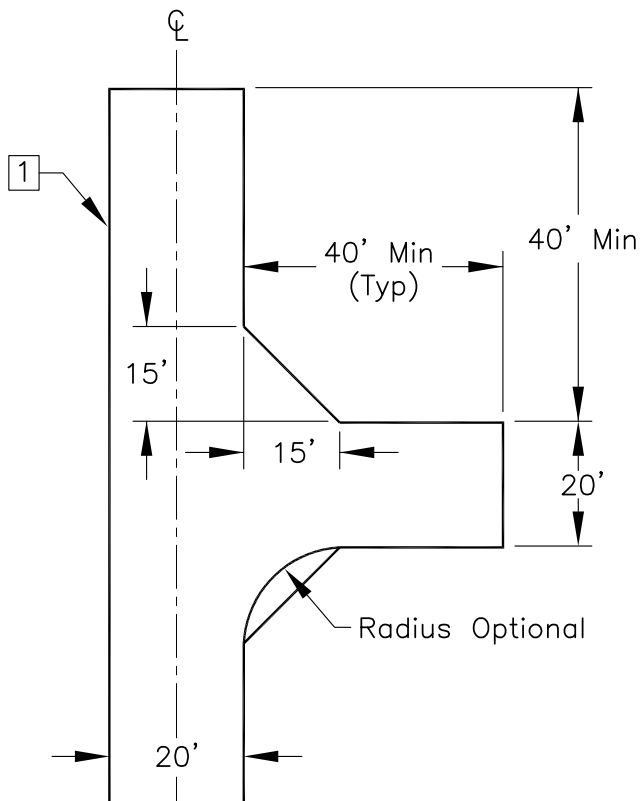
COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

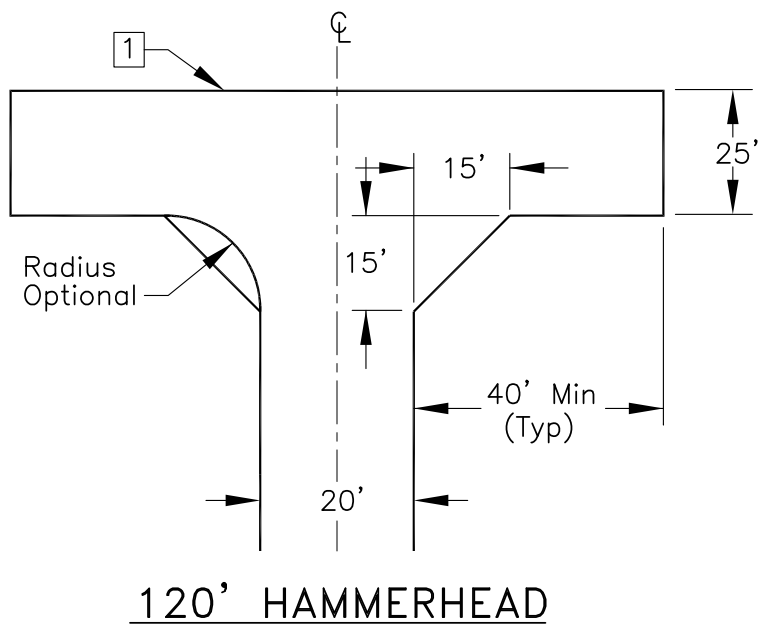
Approved by:
Thomas M. Grew

No.	Revision	Description	Date

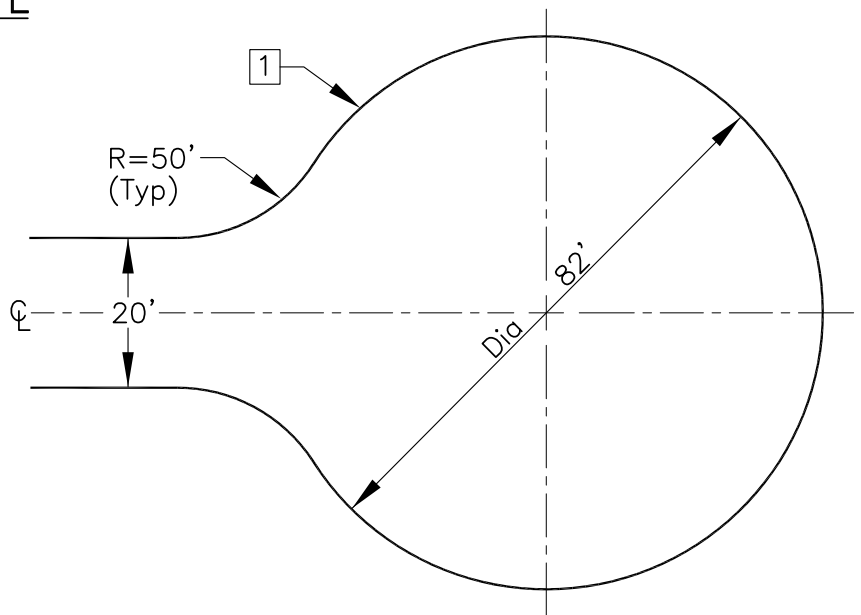
Std. Dwg. No. **S-8**



ACCEPTABLE ALTERNATIVE
TO 120' HAMMERHEAD



120' HAMMERHEAD



82' DIAMETER CUL-DE-SAC

NOTES:

1 Edge of pavement



**TURNAROUND FOR
FIRE ROADS AND DRIVEWAYS
OVER 150 FEET LONG**

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Date: DEC 2014

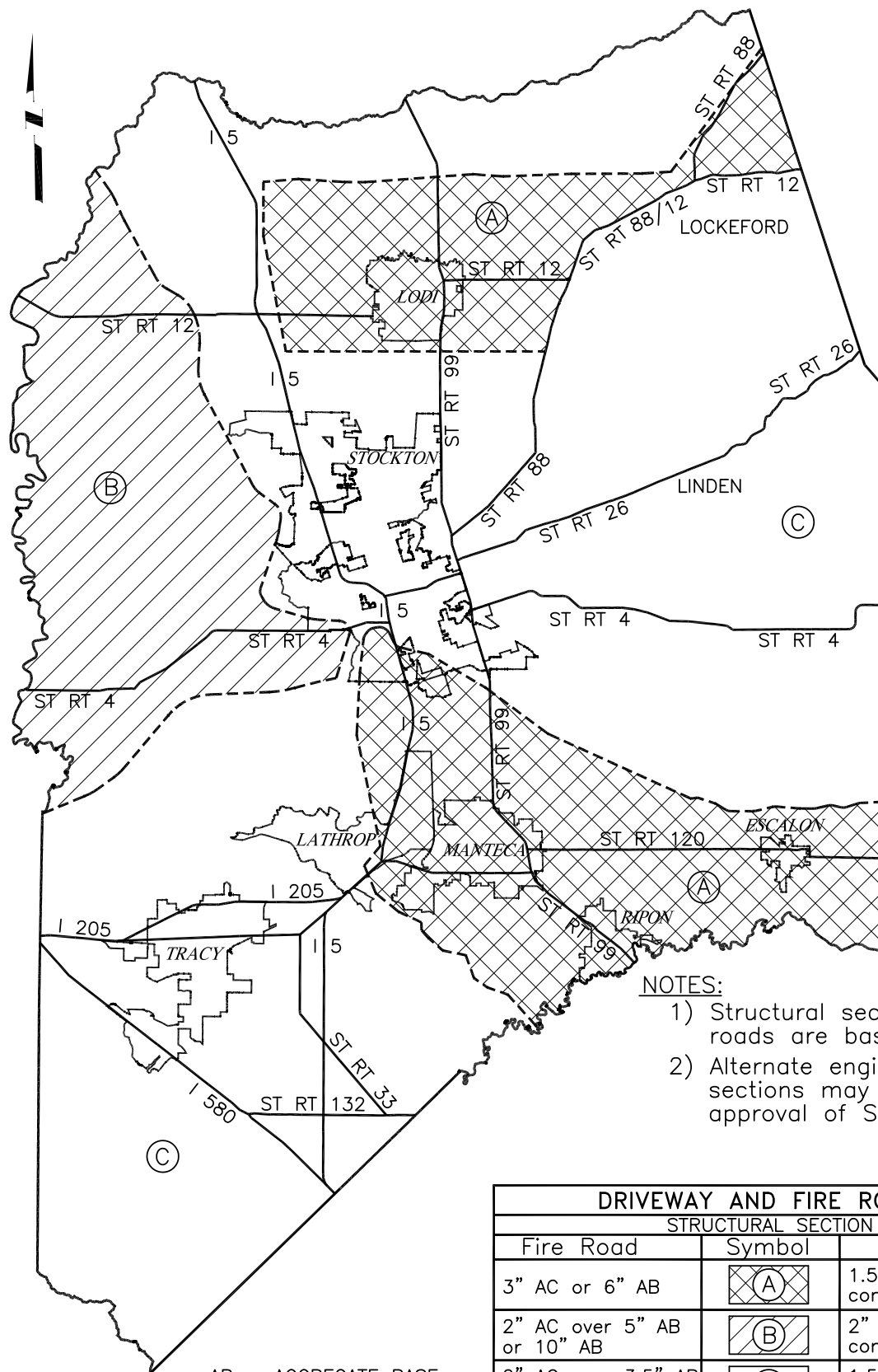
Approved by:

Thomas M. Gill

No.	Revision	Description	Date

Std. Dwg. No.

F-1



NOTES:

- 1) Structural sections for the fire roads are based on a TI = 3.0
- 2) Alternate engineered structural sections may be used with the approval of San Joaquin County.

AB = AGGREGATE BASE
AC = ASPHALT CONCRETE

DRIVEWAY AND FIRE ROAD ZONES		
STRUCTURAL SECTION		
Fire Road	Symbol	Driveway
3" AC or 6" AB	(A)	1.5" AC or 4" AB over compacted native material
2" AC over 5" AB or 10" AB	(B)	2" AC or 6" AB over compacted native material
2" AC over 3.5" AB or 8" AB	(C)	1.5" AC or 4" AB over compacted native material



DRIVEWAY AND FIRE ROAD ZONES

COUNTY OF SAN JOAQUIN
DEPARTMENT OF PUBLIC WORKS

Approved by:

Thomas M. Grew

No.	Revision	Description	Date

Date: DEC 2014

Std. Dwg. No.

F-2