

DIVISION TWOSTANDARDS FOR DRAINAGE
CHAPTER 2.1 GENERAL

Sec. 2.1.1

It is the general purpose of these standards that waters generated by storms, springs, or other sources be carried through a system of waterways and conduits and disposed of in such a manner that adjacent improvements, existing or projected, will be free from flood hazard from a 10, 25 or a 100-year storm, whichever is indicated by these standards. Flood hazard is defined as potential damage by water having sufficient depth or velocity to damage improvements or to deposit or scour soil other than within channels.

Sec. 2.1.2

Each improvement shall be designed so as to not increase the flow of water onto adjacent properties except as otherwise provided in this section. Increased flow is permissible in downstream channels provided that the developer shall furnish downstream facilities adequate to handle the total flow without adverse affect on other properties and/or shall obtain downstream easements all to the satisfaction of the City Engineer.

Sec. 2.1.3

Unless diversion of water is required to conform to a comprehensive drainage plan, water shall be received and discharged at the locations which existed prior to development and as nearly as possible in the manner which existed prior to development. Should diversion be required, sufficient work shall be done upstream and/or downstream to provide all affected properties at least the same level of flood protection as existed prior to the diversion.

Sec. 2.1.4

Construction of an improved waterway by reaches will be allowed where determined feasible by the City Engineer. Interim construction of the improved reach upstream and downstream may be required by the City Engineer to the extent he may deem necessary to assure functioning of the improved reach and to be compatible with the full improvement which may ultimately be required in the area. Construction of waterways by separate reaches is further discussed in Chapters 2.5 and 2.6.

Sec. 2.1.5

The design standards in this Division are to be deemed to be minimal, and alternates are permissible which are determined by the City Engineer to be of equal or higher quality. The City Engineer may allow such exceptions as he may find to be reasonably required by the circumstances of the case, to be in the public interest and in conformity with the general objectives of these standards.

Sec. 2.1.6

All drainage facilities other than those accepted for maintenance by the City shall be maintained by an entity with taxing powers. Such entity shall be established prior to recordation of the final map, at the expense of the subdivider.

Sec. 2.1.7

Certain Design Aids are attached to these Standards and shall be used where expressly so required and otherwise may be used in designing drainage facilities. Other design aids referred to shall be used where required. Additional aids may be used, upon approval, from sources listed in the references or from other generally accepted references.

CHAPTER 2.2 CLASSIFICATION OF WATERWAYS

Sec. 2.2.1 General

- 2.2.1.1 A waterway is defined as any natural channel, artificial channel, or closed conduit which provides a course for drainage water to flow.
- 2.2.1.2 Waterways subject to these design standards shall be classified as defined below. A waterway may be subdivided into reaches, each of which may be of a different classification; however, each reach of a waterway so subdivided shall be of a length which is reasonable to adequately analyze the storm drain facilities.
- 2.2.1.3 Bridges and culverts are not considered as channel reaches. Hydraulic design of such structures is discussed in the appropriate chapter of these standards.
- 2.2.1.4 Waterways are also designated as being major, secondary, or minor based on the tributary watershed area as discussed in Chapter 2.3 of these standards.

Sec. 2.2.2 Natural Waterways

- 2.2.2.1 Natural waterways shall not be used for design discharges in excess of those which occur in the undeveloped state, unless approved by the City Engineer. Approval must be requested in writing and must be accompanied by Engineering calculations satisfactorily demonstrating conformance to the requirements in Section 2.2.2.2

2.2.2.2 Natural waterways which have sufficient waterway area to contain the design discharge and which have proven themselves reasonably stable, may be left natural and shall be classed as natural waterways. Natural waterways which are slightly inadequate and unstable at infrequent locations may also be classed as natural waterways, provided minor channel improvement are made which render the waterway adequate and stable. Such minor channel improvements shall be of such character as to substantially preserve the natural features of the waterway.

2.2.2.3 For fencing requirements see Article 2.7

Sec. 2.2.3 Closed Conduits

2.2.3.1 Closed conduits are the preferred method of storm water conveyance and shall be required for all waterways unless alternate methods are expressly approved or required by the City Engineer. Requests for approval shall be made in writing.

2.2.3.2 Any system of underground drainage facilities, other than culverts, shall be classified as a closed conduit.

2.2.3.3 The City Engineer is empowered to require closed conduits and shall approve the design thereof.

Sec. 2.2.4 Constructed Channels

2.2.4.1 All waterways which cannot be classified under Section 2.2.2 or 2.2.3 are classed as constructed channels.

2.2.4.2 Constructed channels shall be protected as shown on sheets D-3 and D-4. Any other landscaping shall be designed for minimum maintenance and risk to the general public. Plant materials and arrangements thereof shall be subject to the approval of the City Engineer and the Planning Department.

2.2.4.3 For fencing requirements see Article 2.7.

CHAPTER 2.3 HYDROLOGIC DESIGN

Sec. 2.3.1 General

- 2.3.1.1 Hydrologic design shall be predicated upon full urban development of the tributary watershed except where development cannot occur, such as in very rough or steep terrain. Lands which are undeveloped at the time of design shall be assumed to be fully developed as residential unless a publicly proposed development, proposed zone change, the General Plan, or applicable specific plan indicates a more intense land use.
- 2.3.1.2 Cemeteries, publicly owned parks, publicly owned golf courses, and similar publicly owned areas may be considered as pervious areas to the extent that they are actually pervious, except as publicly proposed plans show that the body having jurisdiction intends to alter the existing use of the area so as to make the surface less pervious.
- 2.3.1.3 When a comprehensive drainage plan, as provided for in Section 66483 et seq. of the Subdivision Map Act, has been prepared for a drainage area, the developer shall conform to the plan unless specific alterations are approved by the agency which has jurisdiction.
- 2.3.1.4 Average recurrence interval is defined as the average number of years, over a long period of time, between actual occurrences of a hydrological event of a given or greater magnitude. Flood flows to be used for the design of waterways, channels and closed conduits shall have minimum average recurrence intervals as follows:
- a. Major Waterways have drainage areas of over four square miles and shall be designed for an average recurrence interval of 100 years.
 - b. Secondary Waterways have drainage areas between one and four square miles and shall be designed for an average recurrence interval of 25 years.
 - c. Local Waterways have drainage areas of less than one square mile and shall be designed for an average recurrence interval of 10 years.

2.3.1.5 A given waterway, therefore, will be classed as local in its upper reaches, then change to the secondary classification at a point where the drainage area exceeds one square mile and then change again to the major classification at a point where the drainage area exceeds four square miles.

2.3.1.6 Those waterways set forth in a comprehensive drainage plan of the City shall be designed and constructed to carry the discharge of water indicated in such a plan. For all other watersheds, design discharge shall be determined by use of the following methods or by other methods approved by the City Engineer.

Sec. 2.3.2 Method of Computation of Discharge for Drainage Areas

2.3.2.1 For Local and Secondary Waterways

- a. Determine drainage area in acres and determine slope(s) from divide point to point of concentration.
- b. Determine the initial time of concentration for an initial area of reasonable size by using roof to gutter time and the average velocity through the initial area. Where the size of the watershed is larger than the initial area it shall be subdivided into reaches of reasonable length and the average velocity of flow in each reach used to determine the time through each reach. The sum of the initial time plus the time through each reach will equal the time of concentration for the point of concentration.

Roof to Gutter Times

<u>Time</u>	<u>Land User</u>
10 minutes	R-3, Commercial, Industrial
15 minutes	R-1, R-2

- c. Where reaches from two or more watersheds meet, the longest time of concentration shall govern.
- d. Determine the intensity from the Intensity-Duration curves in Sheet D-1.

e. Determine the runoff coefficient (C) from Sheet D-2 for the type of development. For development types not included, composites shall be derived by using the applicable values from Sheet D-2.

f. Compute $Q = CiA$

Where: C is the runoff coefficient
i is the intensity in inches per hour
A is the drainage area in acres
Q is the design runoff in cubic feet per second.

g. Repeat above steps as necessary for each reach of the watershed.

2.3.2.3 For Major Waterways

For all watersheds of four square miles the runoff shall be determined using Soil Conservation Methods as detailed in Technical Release No. 55 "Urban Hydrology for Small Watersheds".

CHAPTER 2.4 HYDRAULIC DESIGN

Sec. 2.4.1 General

2.4.1.1 For the solution of hydraulic design problems commonly encountered, reference may be made to those sources shown in the references at the end of this division or other generally accepted reference. For uncommon design problems not susceptible to solution by the above-mentioned references, the design engineer shall provide such reference, treatise, model study report, or prototype test as is necessary to confirm his hydraulic design.

2.4.1.2 Local waterways outletting into major or secondary waterways shall be designed to operate against a 10-year flow in the major or secondary waterway, provided the ground elevation along the local system is above the 100-year water surface elevation in the major waterway or the 25 year water surface elevation in the secondary waterway.

D5:2.4.1.2

- 2.4.1.3 Major waterways shall be designed for an average recurrence interval of 100 years with free board.
- 2.4.1.4 Secondary waterways shall be designed for an average recurrence interval of 25 years with freeboard.
- 2.4.1.5 Local waterways shall be designed for an average recurrence interval of 10-years with freeboard.
- 2.4.1.6 Design depth of flow in gutters shall not exceed the top of a 6-inch curb for the 5-year flow. Where the discharge exceeds gutter capacity, a storm drain or other facilities including inlets, shall be provided to convey the entire 10-year flows.
- 2.4.1.7 Freeboard requirements are specified in Sections 2.4.3 & 2.4.4

Sec. 2.4.2 Manning's "n" Values

Manning's "n" values for design shall be as follows:

- | | |
|---|---------|
| 1. Plastic pipe | n= .011 |
| 2. Concrete, steel troweled or smooth-form finish, concrete pipe, vitrified clay pipe | n= .013 |
| 3. Concrete, wood float or broomed finish; including pneumatically applied mortar | n= .015 |
| 4. Asphaltic concrete | n= .016 |
| 5. Road Mix pavement | n= .018 |
| 6. Corrugated metal pipe | n= .024 |
| 7. Sack concrete riprap | n= .030 |
| 8. Grouted rock riprap | n= .030 |
| 9. Loose rock riprap | n= .035 |
| 10. Grassed channels | n= .035 |

For natural channels, landscaped channels or materials not covered above, "n" values shall be determined from Reference No. 3 or 4.

Sec. 2.4.3 Open Channels

- 2.4.3.1 Constructed channels and waterways shall be designed to carry the quantity of flow determined as set forth in Chapter 2.3 with the minimum free board between the design water surface and the top of bank of 0.5 feet or 0.2 of the specific energy, whichever is greater. (See paragraph 2.4.3.4 for superelevation). When the minimum freeboard does not provide the necessary differential head to allow adequate gravity drainage for projected development of the tributary areas, the design water surface shall be lowered sufficiently to allow such areas to drain to the channel by gravity, except where levees are permitted.

- 2.4.3.2 Levees are generally undesirable; however, an exception to allow levees may be granted by the City Engineer in situations of extreme difficulty if he determines that the proposed levee is the only feasible method of providing adequate flood protection.
- 2.4.3.3 For natural waterways, the design flow may be allowed in the natural overflow area if the drainage easement is provided, which will include the overflow area, and freeboard as specified in Section 2.4.3.1 between the water surface and adjacent ground.
- 2.4.3.4 Prior to computing the required freeboard, super elevation of the water surface on curves shall be determined by use of formulas contained in Reference No. 1 or 2 or the formulas listed in Sec. 2.10 and the design water surface adjusted accordingly. Constructed channels shall not be designed with a slope in the range of $\pm 20\%$ of critical slope unless added freeboard for instability waves is provided, as determined from the formula listed in Section 2.10
- 2.4.3.5 Channels designed for super-critical flow shall have their sequent depth below the top of bank.
- 2.4.3.6 Channels shall be designed taking into account the energy losses due to existing and projected road crossings or other obstructions to be placed within the channels. Energy losses for bridge piers, interior walls in multiple box culverts, or other obstruction within the channel shall be predicated upon the obstruction width plus 2-feet of debris allowance for each obstruction. For bridge piers or multiple box culverts, in lieu of the 2-feet of debris allowance on the full height of the pier or interior walls, such piers or walls may be extended upstream on a 2 to 1 downward slope to the channel invert, and debris considered as obstructing only the upper $\frac{1}{4}$ of the design depth of flow at the pier or wall.
- 2.4.3.7 Bridges, culverts, and utility crossings which span major and secondary open channels and which are existing, planned or projected at the time of channel design shall have a minimum clearance from soffit to design water surface of 1.0-foot (3.0 feet at Kern River Crossings) and shall cause no encroachment on the specified minimum freeboard in the upstream channel or waterway. channels shall be designed with proper allowances for hydraulic losses for all such planned or projected future crossings to maintain clearance and freeboard as specified above.

- 2.4.3.8 In the case where a crossing is proposed over an existing channel where the hydraulic effect of the crossing was not considered in design of the channel, minor encroachment on freeboard may be permitted provided it can be shown that such encroachment would not adversely affect gravity drainage of adjacent tributary areas. Modification of the existing channel and special attention to the design of piers or other obstructions placed in the channel may be required to keep an encroachment on freeboard at an acceptable magnitude.
- 2.4.3.9 The water surface profile shall be computed and plotted for all constructed channels and at critical locations on natural channels.
- 2.4.3.10 Culverts of all types are to be designed in accordance with the criteria contained in the standards for streets.

Sec. 2.4.4 Closed Conduit Systems

- 2.4.4.1 Major and secondary waterways placed within a closed conduit system shall have a minimum of 1-foot clearance between the design water surface and the soffit of the conduit. The design depth on circular conduits shall not exceed 0.80 of the diameter of the conduit for major and secondary waterways.
- 2.4.4.2 Local waterways placed in closed conduit system may be designed for full conduit capacity and pressure flow. The hydraulic entrance condition at a closed conduit local waterway shall be such that the 10 year discharge will have the specified freeboard in the upstream channel or waterway. The entrance to the closed conduit local waterway may be submerged provided that the above criteria are satisfied.
- 2.4.4.3 At inlets and non-pressure type manholes within a closed conduit system the hydraulic grade line shall be not less than 0.5-foot below the gutter or inlet surface elevation.
- 2.4.4.4 For conduits designed for super-critical flow, the energy grade line shall not be above ground level at inlets or non-pressure type manholes.
- 2.4.4.5 In addition to normal friction losses, energy losses due to entrance and exit conditions, bends and transitions shall be computed and considered.

- 2.4.4.6 At locations where conduits are stubbed out for future extension, the design hydraulic grade line shall be low enough to allow proper drainage of the tributary area, with a minimum of 1.5-feet below general existing ground level.
- 2.4.4.7 Energy losses due to debris load caused by splitting flow at entrance to or within a closed conduit system shall be computed in the same manner as obstruction losses in open channels.
- 2.4.4.8 Hydraulic grade line for conduits draining into retention or detention basins shall be designed to the half design depth elevation of the basin or the outlet pipe soffit elevation, whichever is greater.
- 2.4.4.9 Minimum slopes for closed conduit shall conform to the provisions in article 1.2.1.3 of this manual to provide for self cleaning.

CHAPTER 2.5 ALIGNMENT, SLOPE PROTECTION, AND STRUCTURAL DESIGN

Sec. 2.5.1 General

- 2.5.1.1 Structural design of drainage facilities placed within road, highway or street rights of way shall be subject to the approval of the agency having jurisdiction over said road, highway or street. Structural design of all other drainage facilities shall conform to accepted engineering practices and to the criteria set forth below.
- 2.5.1.2 At the upstream end of channels, waterways, and closed conduits, construction shall be done so as to conform the new work to the existing waterway. This construction shall be such that hydraulic conditions in the upstream waterway will not be altered in a way which would cause degradation, erosion or other undesirable effects.
- 2.5.1.3 At the downstream end of a reach of constructed channel, waterway or closed conduit, interim works shall be constructed as necessary to insure proper operation of the project works. Excavation shall be performed in the downstream reach as necessary to insure complete gravity drainage of the project reach without ponding of water during the interim period until the downstream reach is constructed to an ultimate design.
- 2.5.1.4 Insofar as is practicable, catch basins, manholes, inlet structures, etc., shall conform to City Standards.
- 2.5.1.5 All work shall be done in accordance with the California Department of Transportation Standard Specifications, current edition.

SEC. 2.5.2 Constructed Channels and Landscape Constructed Waterways

- 2.5.2.1 Generally speaking, constructed channels and waterways are prohibited unless expressly allowed by the City engineer. In the event approval is obtained the channel or waterway shall conform to the provisions in the following sections and restrictions placed at time of approval.
- 2.5.2.2 Minimum centerline radii for curves in constructed channels and waterways shall be three times the top width of the design water surface. Minimum inside radii for maintenance roads shall be 40 feet.
- 2.5.2.3 Minimum bottom width of constructed channels shall be 8 feet for lined channels without maintenance road and 10 feet for rock slope protected channels or grassed channels. For constructed waterways having side slopes 4 to 1 or flatter, a triangular channel may be permitted.
- 2.5.2.4 Grassed channels or rock slope protected channels shall have side slopes 2 to 1 or flatter. Concrete lined channels shall have side slopes 1.5 to 1 or flatter unless designed structurally to resist all lateral loads applied to the bank lining. Channels shall have flatter side slopes if soil instability appears probable from field investigation. Design of slopes in unstable soils shall be predicated upon results of an investigation by a registered professional engineer qualified in soils engineering.
- 2.5.2.5 Bank protection shall be provided in constructed channels in accordance with the criteria shown on the drawings of typical section on Plates D-3 and D-4. Velocities referred to on the typical sections are in each case the mean velocity of a 10-year storm flow in the cross section. The term "stress areas" as used in these standards shall refer to those locations where the erosion potential is greater than a straight, uniform channel reach, and includes junctions, transitions, and curves whose centerline radii are less than six times the width of the design water surface unless the engineer can show that the erosion potential is not excessive. Stress area protection shall extend downstream from the end of the stress area a distance equal to 10 times the design water depth.
- 2.5.2.6 At drop structures or in other locations where a hydraulic jump may occur, bank protection shall be provided downstream from the jump for a minimum distance of 6 times the sequent depth. This protection shall cover the channel invert and extend to the height of the sequent depth and may be either concrete, concreted-rock slope protection, sacked concrete slope protection or air-blown mortar. A minimum distance of 10-feet shall be provided with rock slope protection immediately downstream from the lined reach covering the same cross section as required for the lining.

- 2.5.2.7 Any of the channel lining materials specified below may be used for bank protection.
- a. Low-growing grass, which will form a thick, dense sod. The proposed grass mixture is to be submitted to and approved by the City Engineer.
 - b. Rock slope protection facing class, Method B Placement.
 - c. Concreted-rock slope protection, facing class, Method B Placement.
 - d. Sacked concrete slope protection.
 - e. Concrete slope paving.
 - f. Air-blown mortar with welded wire mesh reinforcing.
- 2.5.2.8. Lower limiting velocities may be required for the design of channels constructed in certain soils, where the circumstances require.
- 2.5.2.9 For any velocity and hydraulic stress combination, the materials shown for a condition of higher velocity and stress may be used in lieu of those on the typical sections.
- 2.5.2.10 Bottom stabilization or protection may also be required where velocities are sufficient to cause invert erosion. Earth channels, in those areas not otherwise protected will generally be required to be seeded with low-growing grass to establish a vegetative cover to the top of channel banks.
- 2.5.2.11 Drainage facilities shall be so constructed and areas adjacent to channels so graded that side drainage will enter in a manner which will prevent erosion, substantiated by the Geotechnical Engineer, within the rights-of-way. This will often require constructed side inlets and collector ditches to carry side flow to inlets.
- 2.5.2.12 Side inlets shall convey the flow under maintenance roads in culverts to the main channel invert, except that this requirement may be waived for waterways which have side slopes 4 to 1 or flatter. Metal conduits may be used for this purpose. Where closed conduits are not required for side drainage in waterways, other facilities such as lined valley gutters shall be provided to prevent erosion within the waterway.

- 2.5.2.13 Tributary waterways shall be conveyed under maintenance roads in closed conduit where such flows can be conveyed in 48-inch diameter or smaller galvanized metal conduit. Larger tributary waterways may be placed in closed conduit for maintenance road crossings, or they may enter the main channel in properly designed open-channel junction structures.
- 2.5.2.14 Major and secondary tributary waterways generally shall enter the main channel at an angle not exceeding 25 degrees from being parallel to flow in the main channel, and such junctions shall be designed in accordance with a momentum analysis of the flows.
- 2.5.2.15 Where open channel tributaries cross maintenance roads, a convenient turn-around area shall be provided for maintenance vehicles. Minimum diameter of a turn-around shall be 40-feet.

Sec. 2.5.3 Closed Conduits

- 2.5.3.1 The minimum inside dimension for a closed conduit shall be 18 inches and the closed conduit shall be placed within the traveled way whenever possible.
- 2.5.3.2 The alignment of closed conduits shall be as nearly straight as practicable. Manholes shall be provided at all junctions, at intervals not to exceed 600 feet along the conduit, and at all bends sharper than 15 degrees. Bends of 15 degrees or less may be constructed with pre-formed angled sections or by placing conduit along a curve using standard beveled pipe.
- 2.5.3.3 Closed conduits, including non-reinforced and cast-in-place concrete pipe, shall be structurally designed to withstand earth and surcharge loads normally anticipated. The clearance between top of pipe and ground shall be sufficient to prevent displacement of, or damage to, the conduit by all loading and land uses. A minimum of 2 feet of cover will be required in all cases. The cover required within road rights of way shall be to the satisfaction of the agency having jurisdiction of the road. A minimum of Class III reinforced concrete pipe or equivalent non-reinforced pipe shall be used in all traveled ways. Rubber gasketed pipe, capable of sustaining 10 feet of head above gutter flowline, shall be installed at all siphon locations, under sidewalks and for all joints where pipe flowline is below hydraulic grade elevation at the outlet.
- 2.5.3.4 Conduits shall be designed to have a minimum useful life of 50 years. Cast-in-place concrete pipe, Asbestos Cement Pipe, non-reinforced concrete pipe and Reinforced Concrete Pipe conforming to the California Department of Transportation Standard Specifications, current edition, will be acceptable in closed conduit systems.

Polyethylene (PE) large diameter profile wall pipe conforming to ASTM F894 on Polyvinylchloride (PVC) large diameter profile wall pipe conforming to ASTM F794 will be acceptable in closed conduit systems. Installation of PE and PVC pipe shall be in accordance with ASTM D2321. Only Class I, II and III embedment materials will be considered suitable.

2.5.3.5 Metal conduit will not be acceptable in closed conduit systems. Outlets into the Kern River shall be furnished with flap gates or acceptable substitute to prevent backflow.

Sec. 2.5.4 Cross Gutters

2.5.4.1 Street cross gutters may be used only at entrances to cul-de-sacs and other short streets provided the tributary area is no more than 7 acres of residential (R-1) development or equivalent. Equivalent non R-1 acreage shall be that acreage which produces the same area of landscape irrigation runoff as 7 acres of R-1. For estimation purposes R-1 will produce 5 lots each at 25' x 60' landscape runoff per acre (7,500 S.F. per acre).

Cross gutters will not be permitted across major arterials, major collectors, local collectors or streets with anticipated traffic volumes greater than 200 vehicles per day. Mid-block cross gutters will not be permitted. Siphons will be accepted and shall be designed to pass the required design flow in the gutter.

CHAPTER 2.6 RIGHT-OF-WAY REQUIREMENTS

Sec. 2.6.1 General

Land rights shall be conveyed to the City in one of the following forms, whichever is appropriate:

- (1) Separate parcel easement dedicated on a subdivision map
- (2) Easement dedicated on a subdivision map as part of adjacent lots
- (3) Fee simple or easement offered or granted by separate documents.

Sec. 2.6.2 Rights-of-Way for Natural Waterways

For natural waterways a drainage easement or right-of-way when required shall be provided which includes the entire waterway area plus freeboard. Prior to final approval, the easement is to be staked by the subdivider's engineer and reviewed by the Department of Public Works. In the case of a natural waterway

having banks with side slopes steeper than two horizontal to one vertical, the right-of-way may be required to be increased to provide width for not less than 2 to 1 slopes from the existing toe of bank, plus a 10 foot wide buffer strip. Additional rights-of-way will also be required where unstable ground conditions exist. (See Plate D-5)

2.6.2.2 For fencing requirements see Chapter 2.7

Sec. 2.6.3 RIGHTS-OF-WAY FOR CONSTRUCTED CHANNELS AND LANDSCAPED
CONSTRUCTED WATERWAYS AND APPURTENANCES

2.6.3.1 Right-of-way for constructed channels with side slopes steeper than four horizontal to one vertical shall be provided as follows:

- a. For channels with top width greater than fifty feet, top width of channel plus twenty feet on each side for continuous maintenance roads and interceptor ditches. If interceptor ditches are not needed, fifteen feet of right-of-way on each side in addition to the top width of the channel will be considered adequate.
- b. For channels with top width fifty feet or less, one side of the channel need only be provided right-of-way for an interceptor ditch, nine feet, or if an interceptor ditch is not needed, five feet. The other side of the channel will meet the requirements of (a) above for right-of-way.
- c. The right-of-way provided shall also include any cut slopes which may be required to allow for difference in elevation between the maintenance road and natural ground, except that if the adjacent natural ground is graded down to the maintenance way on a slope of 4 to 1 or flatter the slopes need not be included within the right-of-way.

- 2.6.3.2 Right-of-way for constructed channels with side slopes 4 to 1 or flatter shall be sufficient to contain the top width of the channel plus a minimum of five feet on each side.
- 2.6.3.3 Where open-channel tributaries are permitted to cross the maintenance road, as described in Chapter 2.5, additional right-of-way shall be provided to accommodate a minimum 40-foot diameter turn-around.
- 2.6.3.4 At intersections of the channel with public roads, sufficient right-of-way shall be provided to permit access from the public road to the maintenance road. In the event that the right-of-way does not intersect a public road or projected public road, a turn-around or a 15-foot wide access right-of-way shall be provided from a public road to the channel right-of-way at intervals not to exceed one channel mile.
- 2.6.3.5 Right-of-way for concrete lined channels not having maintenance roads shall extend to 0.5-foot outside the top of bank, with a 15-foot wide access right-of-way provided to the channel from a public road at intervals along the channel, generally not more than 2,000 feet apart. Such access shall extend to channel invert by means of concrete access ramps having a maximum slope of 15 percent.
- 2.6.3.6 The right-of-way for landscaped constructed waterways may be the same as that designated for unlined constructed channels or, at the option of the constructing individual or agency, right-of-way for such waterways may be increased as desired to provide additional area for planting or other landscaping. For such waterways whose side slopes are 4 to 1 or flatter, the right-of-way shall equal or exceed that shown on Sheet D-4.
- 2.6.3.7 Where interim construction, upstream or downstream of a project reach, is required, in accordance with the provisions of chapters 2.1 and 2.5, all easements or rights-of-way, temporary or permanent, necessary to accomplish such work shall be acquired by the subdivider.

- 2.6.3.8 For Fencing Requirements see Chapter 2.7
- Sec. 2.6.4 Rights-of Way for Closed Conduits and Appurtenances
- 2.6.4.1 A right-of-way sufficient to contain the closed conduit and appurtenances plus a minimum of five feet on each side, measured from the edge of the conduit or drainage structure, shall be provided but in no case shall the right-of-way be less than 15-feet in width. Whenever possible, rights-of-way for conduits shall be adjacent to property lines and outside of areas where structures are planned. Under no circumstances shall closed conduits and appurtenances be constructed less than 10-feet from any planned or existing structure.
- 2.6.4.2 Rights-of-way for interim work shall be provided as described in Section 2.6.3 above.

CHAPTER 2.7 FENCING REQUIREMENTS FOR CHANNELS

- Sec. 2.7.1 Fencing requirements for constructed channels shall conform to Sec. 15.48.020 of the Municipal Code (MC).
- Sec. 2.7.2 Natural channels need not be fenced, except where special hazards exist or where required in MC 15.48.020
- Sec. 2.7.3 For constructed channels, six feet high chain link fabric with tension wire shall be installed on each side of the right-of-way. At all road intersections fencing shall prevent public access to channels or culverts, and 14-foot wide chain link drive gates shall be provided at all points of access to maintenance ways, or to channels not requiring maintenance ways.
- Sec. 2.7.4 For minor channels with depths less than 1.5 feet, the City Engineer may waive the fence requirement.
- Sec. 2.7.5 Fences located adjacent to streets at or near intersections shall conform to Article 17.08.175 "Clear Sight View" of the Municipal Code.

CHAPTER 2.8 DRAINAGE BASINS

Sec. 2.8.1 Definitions

- 2.8.1.1 Retention Basin- Any drainage facility which is used as a terminal facility for the storage of runoff shall be classified as a retention basin.
- 2.8.1.2 Detention Basin - A holding basin designed for the temporary storage of runoff from a high intensity storm. The basin automatically drains when the storm subsides and the downstream facilities can accommodate the flow from the basin.
- 2.8.1.3 Retardation Basin - Synonomous with Detention Basin.

Sec. 2.8.2 Capacity Requirements

2.8.2.1 Retention Basins

- a. The retention basin capacity shall be based upon the following formula:

$$V = 0.15 \times \Sigma(CxA) \quad (24\text{-hr, } 100\text{-yr storm})$$

V is the design volume in acre-feet

C is the runoff coefficient

A is the drainage area

Σ denotes the summation of all C x A for areas draining into the basin.

- b. The retention basin shall be designed such that the design water surface is one-foot below the lowest gutter inlet elevation.

2.8.2.2 Detention Basins

Detention basins require special design consideration. The engineer shall have the design method approved by the Department of Public Works prior to designing the facility.

Sec. 2.8.3 Fencing Requirements

Fencing shall conform to City Standard Drawing S-9, S-10 and S-11. Fence at or near intersections shall also conform to Article 17.08.175, "Clear Sight View", of the Municipal Code.

Sec. 2.8.4 Right-of-Way

The right-of-way required for the retention or detention basin shall be deeded in fee to the City. Beneficiaries or trustees under Deeds of Trust shall sign the deed. Reversionary clauses will not be permitted.

Sec. 2.8.5 Design

Design shall conform to City Standard Drawing S-9.

2.8.5.1 No basin will be permitted unless it shall be shown to the satisfaction of the City Engineer by approved tests and analysis of soil borings, by a registered Civil Engineer that the design volume of the basin will completely drain within seven days. Percolation tests for this requirement shall be approved by the Public Works Department. The method would be generally as follows:

- 1) The infiltration rate shall be determined using a Flooding type Infiltrometer. (Bibliography Ref. 12, P. 12-7)
- 2) Divide depth of basin by infiltration rate to determine percolation time.

2.8.5.2 Slope stability analysis by a registered professional engineer qualified in soils engineering will be required for all sumps with side slope greater than 2 horizontal to 1 vertical, with water depths exceeding 8 feet, or depths exceeding ten (10) feet measured from top of slope to bottom of sump.

CHAPTER 2.9 STORM DRAIN CONSTRUCTION PLANS

Storm Drain construction plans shall contain all notes, details and specifications necessary to complete the proposed work. Said information shall include, but not be limited to the following checklist:

- 2.9.1 Project Title
- 2.9.2 Vicinity Map
- 2.9.3 Key Map drawn to a scale of 1" = 200'
- 2.9.4 Engineer's signature with seal and license expiration date
- 2.9.5 Number of sheets
- 2.9.6 Pipe specifications of all pipe which may be utilized
- 2.9.7 Notes peculiar to this project
- 2.9.8 Standard drawings sheet or reference to applicable standards
- 2.9.9 Bench Mark - USGS datum - not verified by the City - equations won't be acceptable
- 2.9.10 Maximum sheet size = 24" x 36"
- 2.9.11 Legend
- 2.9.12 Plan & profile
- 2.9.13 Horizontal & vertical scales on each sheet (1" = 50' and 1" = 10' maximums)
- 2.9.14 North arrow
- 2.9.15 Storm drain line location relative to centerline or property line

- 2.9.16 Pipe size and slope - ensure 2' minimum cover
- 2.9.17 Relation to existing pipes, utilities, etc. - show by cross sections with verified depths
- 2.9.18 Required utility separations
- 2.9.19 Lateral size to catch basins
- 2.9.20 Stationing - from south to north and west to east (coincident with street stationing)
- 2.9.21 Manhole locations - not to exceed maximum distance between
- 2.9.22 Conforms to master plan
- 2.9.23 Connection to existing lines or structures
- 2.9.24 Construction phasing limits shown
- 2.9.25 24 hour inspection notice - Prior to the start of any phase of construction, the City Construction Inspection Section shall be given at least 24 hours notice. The Section may be notified at (805) 326-3049.
- 2.9.26 Compaction test note - Compaction tests shall be the responsibility of the developer/subdivider/contractor. The number and location of required tests shall be determined by the City Engineer.
- 2.9.27 Materials list
- 2.9.28 Engineer's estimate, based on unit prices as approved by the City Engineer, for plan check and inspection fee determination
- 2.9.29 Submit plan check and inspection fees
- 2.9.30 Engineer's Certificate;
I hereby certify that these plans and specifications comply with City of Bakersfield ordinances, standards, and design criteria, and that they include all improvement requirements of the Advisory Agency or other review board.
I am responsible for all calculations and drawings on these plans and any errors, omissions, or violations of those ordinances, standards, and design criteria shall be corrected during construction.

Chapter 2.10 FORMULAS

SUPERELEVATION:

1. Rectangular channels

a. Subcritical Flow $S = \frac{3V^2b}{4gR}$

b. Supercritical Flow $S = 1.2 \frac{V^2b}{gR}$

2. Trapezoidal channels

a. Subcritical flow $S = \frac{V^2(b+2Zd)}{2(gR-2ZV^2)}$

b. Supercritical flow See Reference No. 5 & 8

INSTABILITY WAVES:

$$H_w = 0.25 d_c (1 - 11.1 (S_o - 1)^2) \text{ for } S_c \leq S \leq 1.3 S_c$$

DEFINITIONS:

s = Superelevation above normal water surface (feet)

V = Average velocity (fps)

b = Channel bottom width (feet)

R = Centerline Radius (feet)

g = Acceleration due to gravity (fps²)

Z = Co-tangent of bank slope

d = Normal depth (feet)

d_c = Critical depth (feet)

S_c = Critical slope

S_o = Channel bottom slope

H_w = height of wave above normal depth (feet)

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Berkley, California
May 1967

Definition and Scope:

Hydrologic soil groups are used for estimating the runoff potential of soils on watersheds. Four groups are used on soil properties that influence runoff.

Assumptions:

Classification is at the end of long-duration storms occurring after prior wetting and opportunity for swelling, and without the protective effect of vegetation.

Criteria:

- Group A- Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and would result in a low runoff potential.
- Group B- Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately coarse textures. These soils have a moderate rate of water transmission.
- Group C- Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a very slow rate of water transmission.
- Group D- Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with a high swelling potential, (2) soils with a high permanent water table, (3) soils with claypan or clay layer at or near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

References:

- (1) United State Department of Agriculture. National Engineering Handbook, "Hydrology," Section 4. Soil Cons. Ser.
- (2) General Soil Map, Kern County 7-E-18286-O-C Soil Conservation Service.

CRITERIA FOR SEWER DESIGN		
ITEM NO.	ITEM	BASIS OF DESIGN
1	Minimum size of street sewer	8 inches diameter, 6 inches in Cul De Sac where no possibility of extension of line
2	Location	Sewers shall be located in streets or alleys. Location in easement subject to approval by the City Engineer
3	Minimum design slope	Slope to be such that velocity of flow = 2 F.P.S. when pipe is full or half full. In special cases, and with previous approval of the City Engineer, an absolute minimum velocity of 1.6 F.P.S. when pipe is full or half full may be approved
4	Maximum slope	Velocity not to exceed 10 F.P.S. without approved erosion protection
5	Manholes	At sewer junctions, changes in alignment, grade and size. Not more than 350 feet for sewer under 15" diameter, Not more than 600 feet for sewers between 15" and 30". At junction of sewers with a difference in invert elevations three feet (3') a drop connection will be required. J of sewers of different diameters shall be so design 28' depths of both sewers will be at a c
6	Inverted Syphons	Plan and p Engineer for approval
7	Depth	Depth o provide a minimum of of cover. Where circumstances require two and one half (2½) feet, accordance with the requirements
8	House Connections	shall be run to property lines and num grade of ¼" per foot. Depth of ty line shall be a minimum of two and ½) feet.
9	Design Formula	formula, use n = 0.013

DELETED

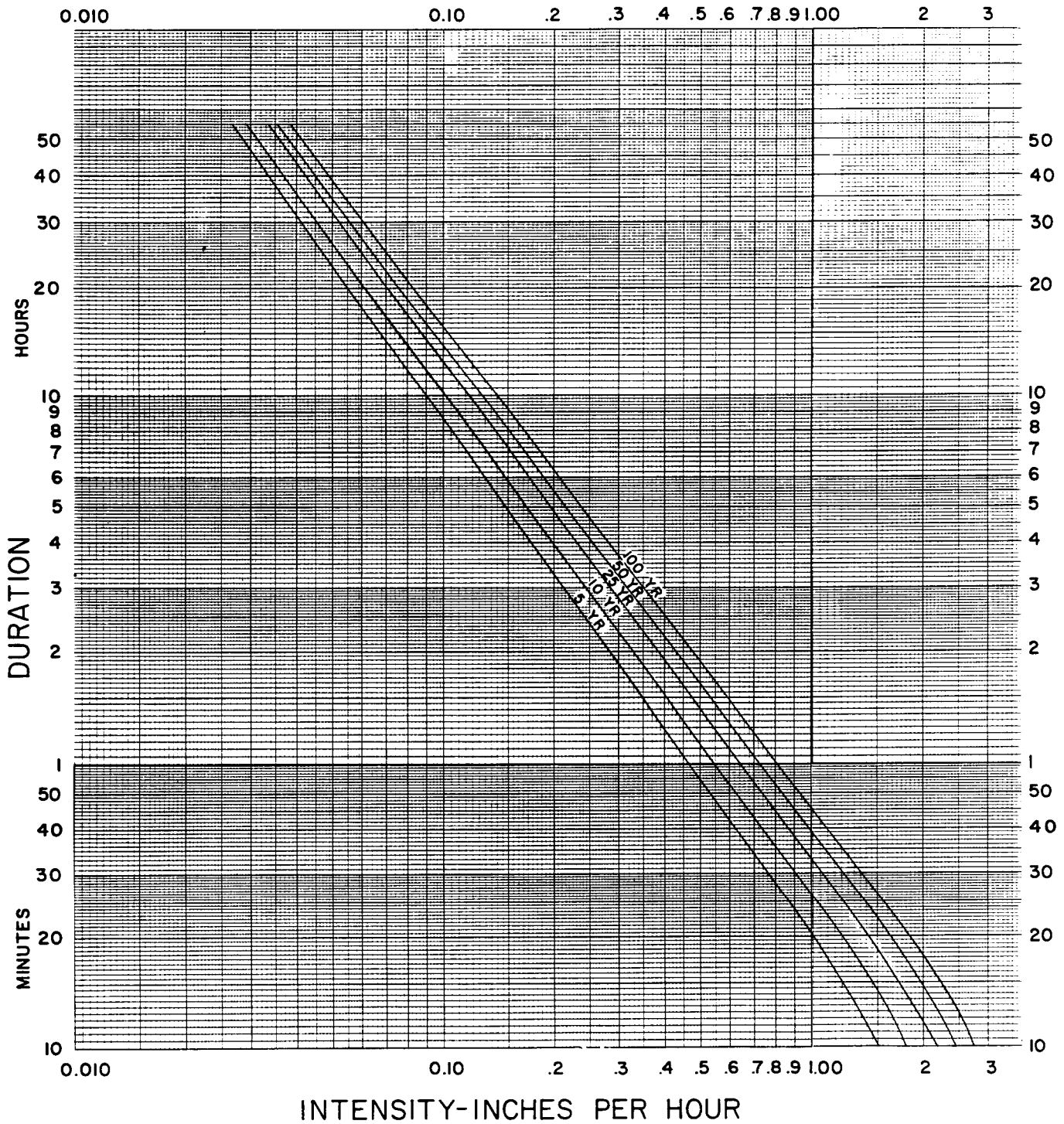
PUMPING STATION shall be a package pumping station shall consist of (2) non-clog pumps, each to handle the maximum flow. Capacity shall not exceed 10 minute of average flow. Operation shall be automatic. Packaged pumping station shall be manufactured by a firm having a minimum of five (5) years experience in the building of packaged units. Pneumatic ejector lift stations may be installed subject to the approval of the City Engineer. Single well lift stations with submerged pumps are not approved.

SEWER PIPE SIZE	DESIGN GRADES	STANDARD DESIGN MINIMUM GRADES
6"	.0050	
8"	.0035	
10"	.0025	
12"	.0020	
15"	.0015	

NUMBER OF RESIDENCES	G. P. M. CAPACITY RESIDENCE
30 — 200	1.0
250 — 400	0.9
450 — 600	0.8

ZONE	DESIGN FLOW C. F. S. / ACRE
Residential, single family	.008
Residential, unlimited	.012
Commercial	.015
Light Industrial	.020

APPROVED BY THE CITY COUNCIL <i>[Signature]</i> 62	<h2>SEWER DESIGN STANDARDS</h2>	DATE Nov 28, 1960
CITY CLERK <i>[Signature]</i>		DISTRICT Hillis
APPROVED <i>[Signature]</i>	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	SCALE None
		S-23



APPROVED BY THE CITY COUNCIL

_____ 19__

CITY CLERK

APPROVAL RECOMMENDED

[Signature]

ASSISTANT PUBLIC WORKS DIRECTOR

APPROVED

[Signature]

PUBLIC WORKS DIRECTOR

INTENSITY VS DURATION CURVES

CITY OF BAKERSFIELD CALIFORNIA
ENGINEERING DEPARTMENT

DATE MAY 6, 1983

DRAWN G.E.G.

PROJECT ENGINEER B.J.D.

DESIGN ENGINEER A.L. MOORE

No. OF SHEETS

CITY OF BAKERSFIELD

RATIONAL METHOD

URBAN RUNOFF COEFFICIENTS (C)

TYPE OF DEVELOPMENT (Includes Street Area)	(c)	
	<u>Sandy Soil</u>	<u>Heavy Soil</u>
R-1, 6,000 S.F.	0.42	0.44
R-1, 7,500 S.F.	0.38	0.39
R-1, 10,000 S.F.	0.34	0.34
R-1 15,000 S.F.	0.27	0.27
R-2	0.55	0.58
R-3; R-4; M-H	0.80	0.80
Commercial	0.90	0.90
Industrial	0.80	0.80
Parks Undeveloped	0.15	0.22
Grasslands, Type A Soil	0.15	
Grasslands, Type B Soil	0.25	
Grasslands, Type C Soil	0.35	
Grasslands, Type D Soil	0.45	

SURFACE TYPE (For Composites)

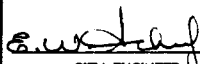
Pavement, drives and roofs	0.95
Backyards	0.05

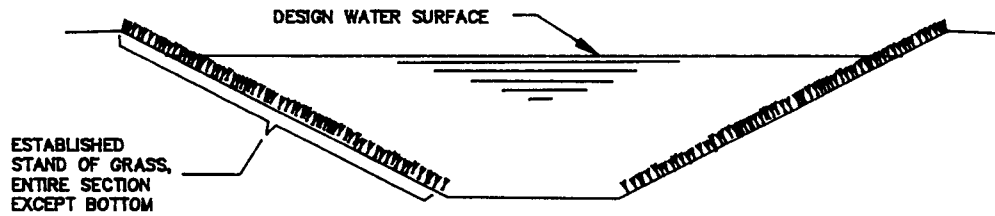
<u>Lawns & Landscaped Areas</u>	<u>Sandy Soil</u>	<u>Heavy Soil</u>
Flat Slope, 2%	0.10	0.17
Average Slope, 2% to 7%	0.15	0.22
Steep Slope, 7%	0.20	0.35

Sandy Soils - SCS Group A & B Soils
 Heavy Soils - SCS Group C & D Soils

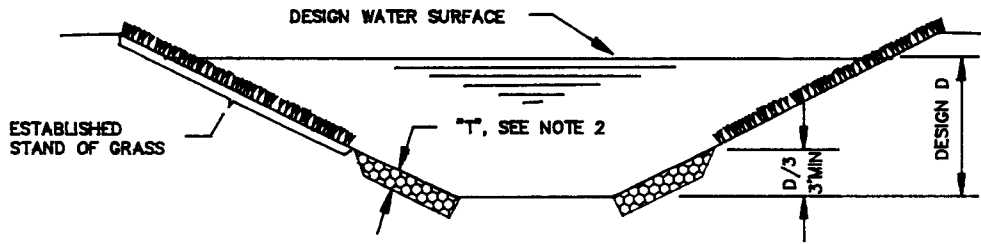
Soil groups for area in question can be determined by using Section 2.11 or by referring to the General Soil Map on file with the County of Kern.

DL:RAT.MET

	RATIONAL METHOD URBAN RUNOFF COEFFICIENTS	DATE
		DRAWN
		CHECKED
		SCALE
APPROVED	CITY OF BAKERSFIELD CALIFORNIA	SHEET NO.
 CITY ENGINEER		D-2
	ENGINEERING	DEPARTMENT



VELOCITY LESS THAN 5 FT/SEC
NON-STRESS AREAS

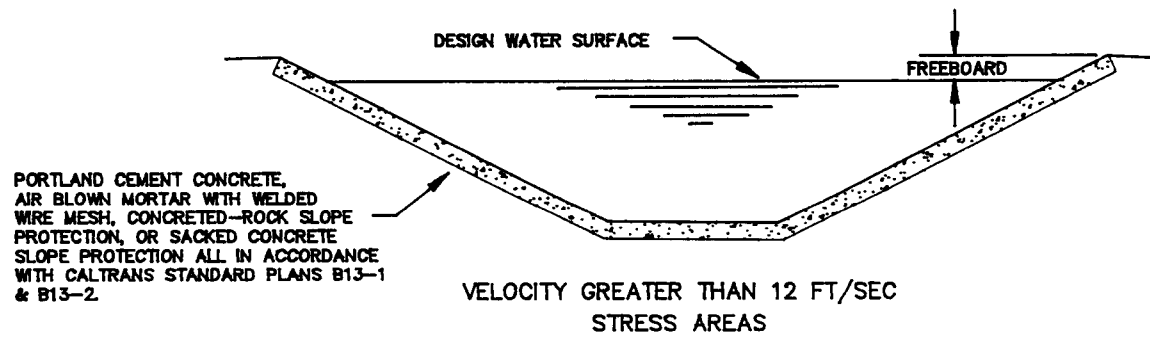
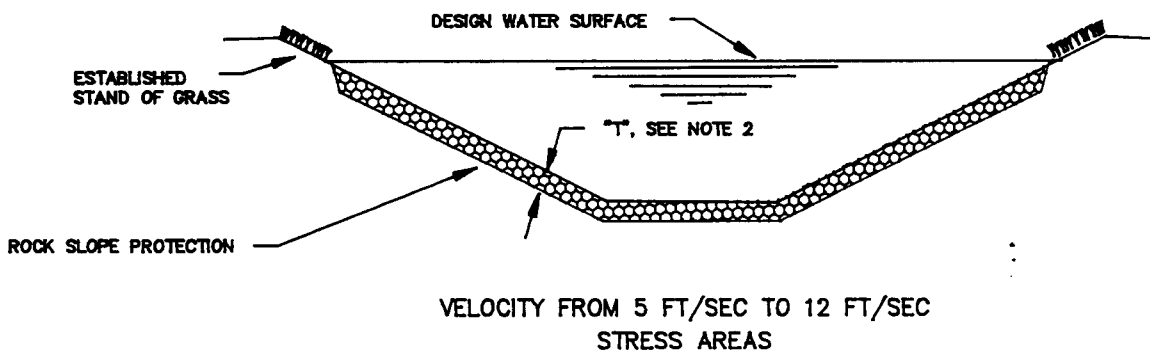
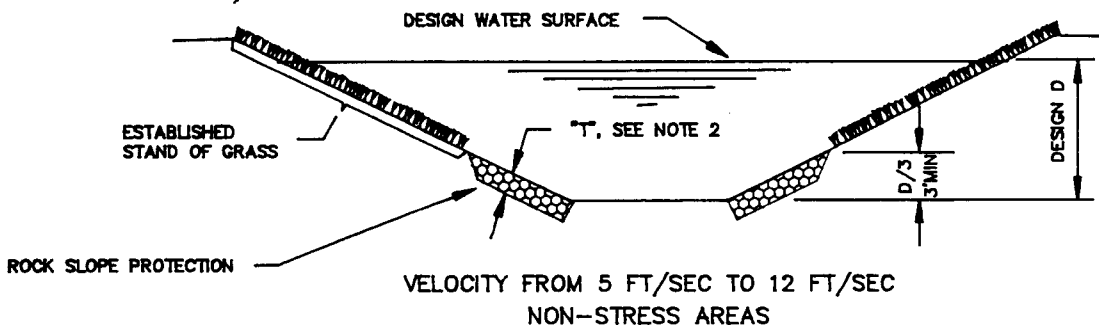


VELOCITY FROM 3 FT/SEC TO 5 FT/SEC
STRESS AREAS

NOTES

1. VELOCITY BASED ON Q-10. DESIGN WATER SURFACE BASED ON DESIGN Q PER CHAPTER 2.3 HYDROLOGIC DESIGN.
2. THICKNESS "T" PER CALTRANS STANDARD PLAN B13-2.

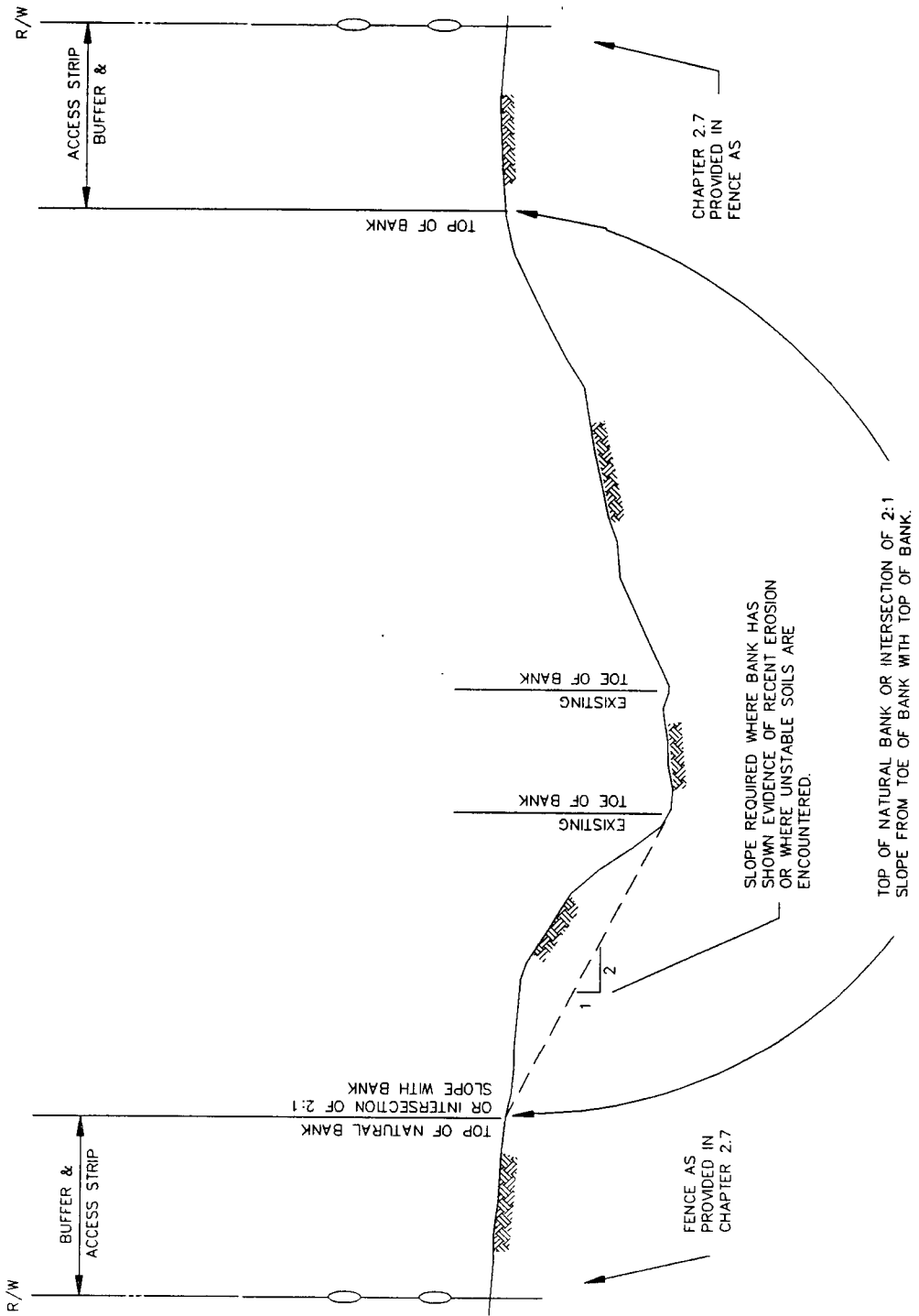
	SUBDIVISION DESIGN MANUAL		DATE 9/15/88
			DRAWN BJD
		CHANNEL PROTECTION	CHECKED
			SCALE NTS
APPROVED	CITY OF BAKERSFIELD CALIFORNIA		SHEET NO.
<i>B. W. [Signature]</i>	ENGINEERING	DEPARTMENT	D-3
CITY ENGINEER			



NOTES

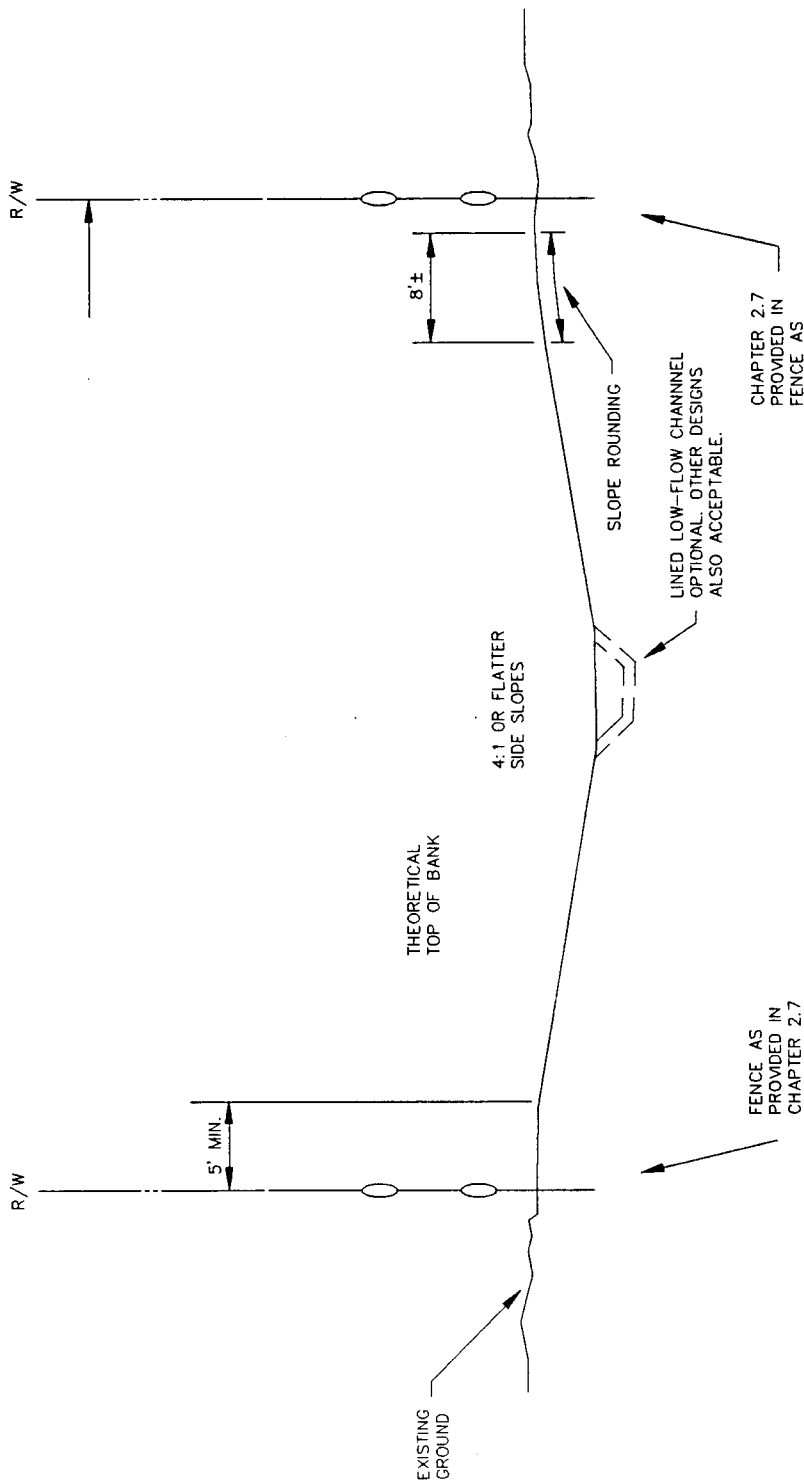
1. VELOCITY BASED ON Q-10. DESIGN WATER SURFACE BASED ON DESIGN Q PER CHAPTER 2.3 HYDROLOGIC DESIGN.
2. THICKNESS "T" PER CALTRANS STANDARD PLAN B13-2.

	SUBDIVISION DESIGN MANUAL	DATE 9/15/88
	CHANNEL PROTECTION	DRAWN BJD
APPROVED <i>[Signature]</i> CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA	CHECKED
	ENGINEERING	SCALE NTS
	DEPARTMENT	SHEET NO. D-4



USE OF OPEN CHANNELS FOR STORM WATER CONVEYANCE IS RESTRICTED IN ACCORDANCE WITH SECTION 2.2.3. CLOSED CONDUITS ARE THE PREFERRED METHOD OF CONVEYANCE AND SHALL BE REQUIRED FOR ALL WATERWAYS UNLESS OTHER ALTERNATE METHODS ARE APPROVED BY THE CITY ENGINEER.

APPROVED <i>[Signature]</i> CITY ENGINEER	SUBDIVISION DESIGN MANUAL		DATE 12/11/89
	RIGHT OF WAY FOR NATURAL CHANNELS		DRAWN BJD
CITY OF BAKERSFIELD CALIFORNIA		ENGINEERING	CHECKED
DEPARTMENT			SCALE NTS
			SHEET NO. D-5

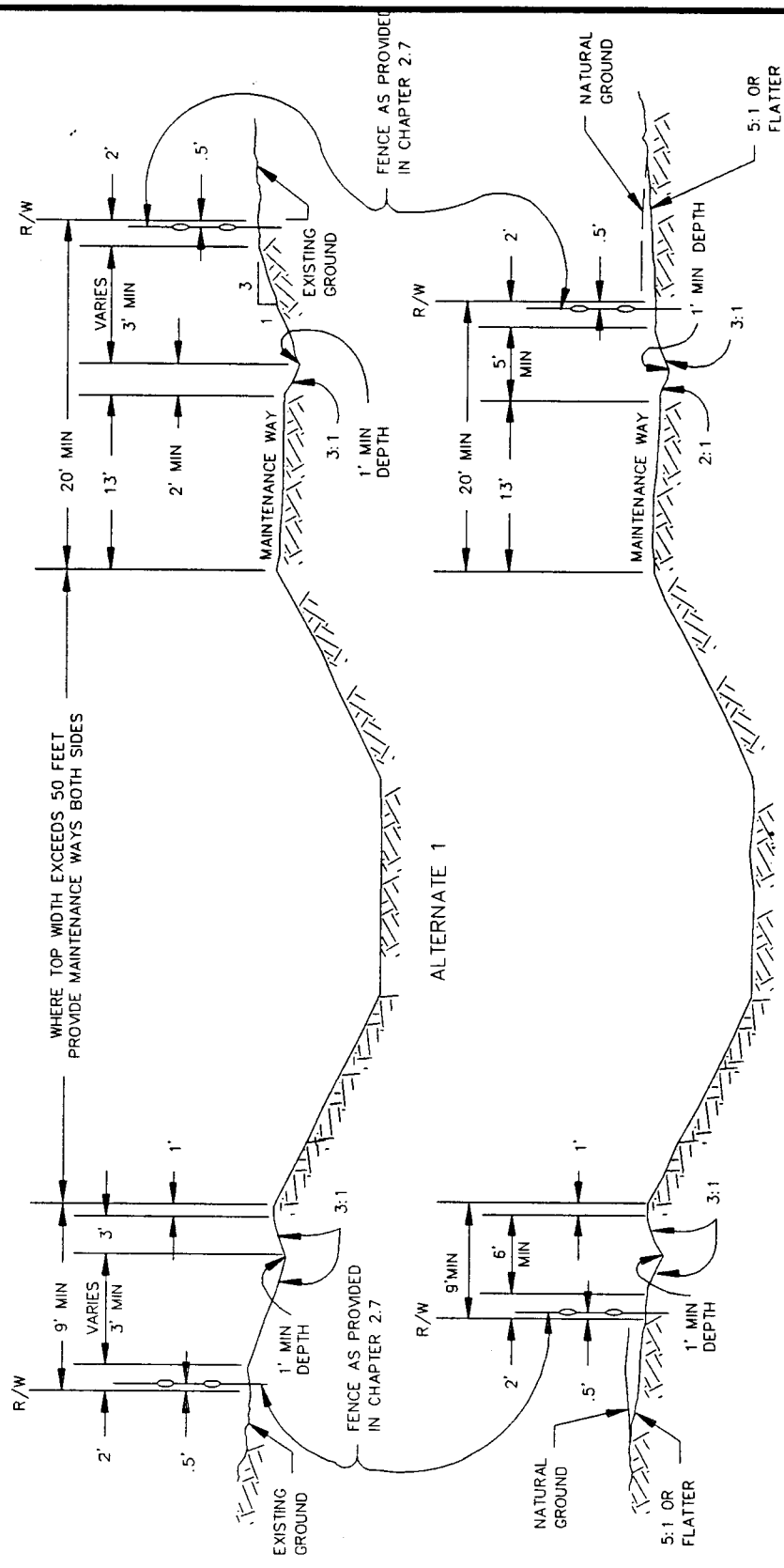


PLANTING: PLANT MATERIALS AND ARRANGEMENTS SHALL GENERALLY FOLLOW THE GUIDELINES CONTAINED IN DIVISION 5 OF THIS MANUAL AND AS A MINIMUM SHALL COVER THE AREA FROM THE DESIGN WATER SURFACE TO THE RIGHT OF WAY (R/W) LINES. EXCEPT FOR THE REQUIRED MAINTENANCE WAY, EARTH PORTIONS NOT CONTAINING TREES OR SHRUBS SHALL HAVE AN ESTABLISHED STAND OF GRASS.

FOR MAINTENANCE WAY, PROVIDE A 10' WIDE STRIP FREE OF TREES AND SHRUBS ON A 5:1 OR FLATTER SLOPE. THE MAINTENANCE WAY MAY BE LOCATED ANYWHERE WITHIN THE R/W ON 5:1 OR FLATTER SLOPE.

USE OF OPEN CHANNELS FOR STORM WATER CONVEYANCE IS RESTRICTED IN ACCORDANCE WITH SECTION 2.2.3. CLOSED CONDUITS ARE THE PREFERRED METHOD OF CONVEYANCE AND SHALL BE REQUIRED FOR ALL WATERWAYS UNLESS OTHER ALTERNATE METHODS ARE APPROVED BY THE CITY ENGINEER.

APPROVED <i>E. W. [Signature]</i> CITY ENGINEER	SUBDIVISION DESIGN MANUAL		DATE 12/11/89
	LANDSCAPED		DRAWN BJD
ENGINEERING DEPARTMENT	CONSTRUCTED CHANNELS		CHECKED
	CITY OF BAKERSFIELD CALIFORNIA		SCALE NTS
			SHEET NO. D-6



ALTERNATE 1

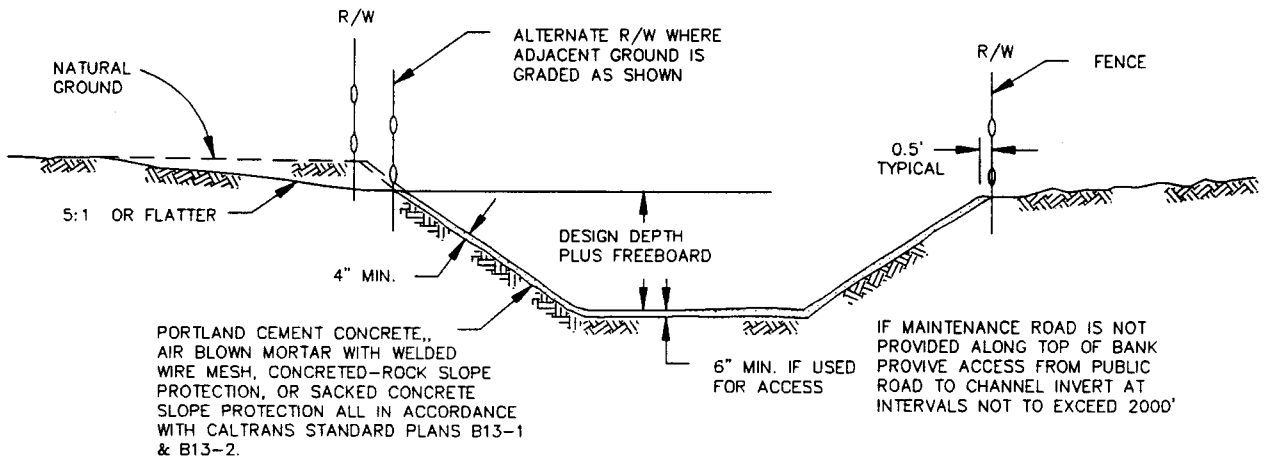
ALTERNATE 2

RIGHT OF WAY FOR NON-LINED CONSTRUCTED CHANNELS WITH SIDE SLOPES STEEPER THAN 5:1
 MINIMUM RIGHT OF WAY FOR LANDSCAPED CONSTRUCTED WATERWAYS

SEE PLATE D6 FOR ADDITIONAL ALTERNATE
 FOR LANDSCAPED CONSTRUCTED WATERWAYS

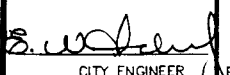
USE OF OPEN CHANNELS FOR STORM WATER CONVEYANCE IS RESTRICTED IN ACCORDANCE WITH SECTION 2.2.3. CLOSED CONDUITS ARE THE PREFERRED METHOD OF CONVEYANCE AND SHALL BE REQUIRED FOR ALL WATERWAYS UNLESS OTHER ALTERNATE METHODS ARE APPROVED BY THE CITY ENGINEER.

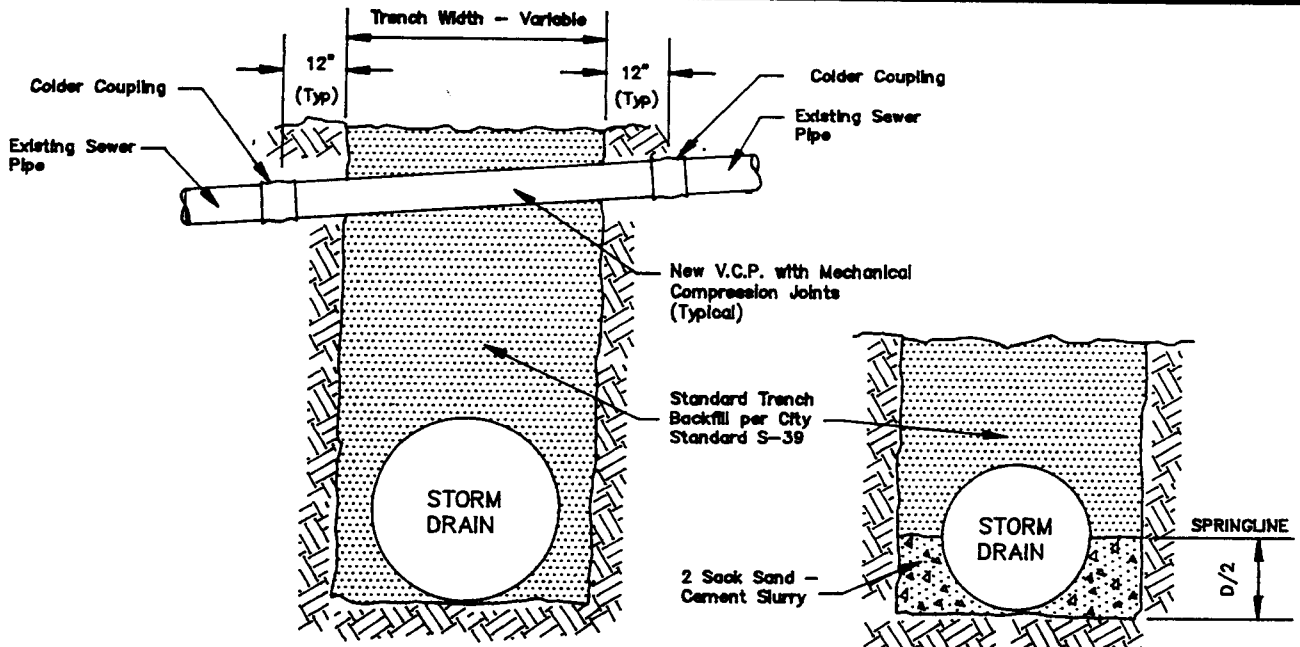
APPROVED <i>[Signature]</i> CITY ENGINEER	SUBDIVISION DESIGN MANUAL		DATE 12/11/89
	RIGHT OF WAY		DRAWN LDT/BJD
ENGINEERING	CONSTRUCTED CHANNELS		CHECKED
	CITY OF BAKERSFIELD CALIFORNIA		SCALE NTS
	DEPARTMENT		SHEET NO. D-7



RIGHT OF WAY FOR LINED CONSTRUCTED CHANNELS

USE OF OPEN CHANNELS FOR STORM WATER CONVEYANCE IS RESTRICTED IN ACCORDANCE WITH SECTION 2.2.3. CLOSED CONDUITS ARE THE PREFERRED METHOD OF CONVEYANCE AND SHALL BE REQUIRED FOR ALL WATERWAYS UNLESS OTHER ALTERNATE METHODS ARE APPROVED BY THE CITY ENGINEER.

APPROVED	SUBDIVISION DESIGN MANUAL RIGHT OF WAY FOR LINED CONSTRUCTED CHANNELS	DATE	12/11/89
		DRAWN	LDT/BJD
 CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA	CHECKED	
		SCALE	NTS
		SHEET NO.	D-8
	ENGINEERING	DEPARTMENT	

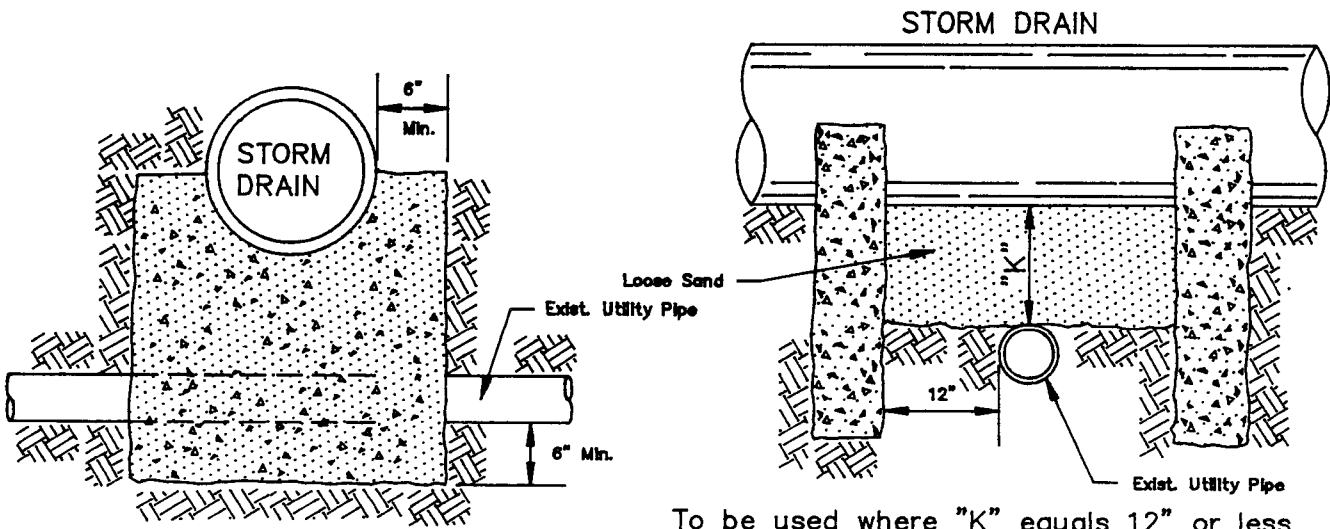


May be used in place of Compacting Soil to Springline. Slurry shall be vibrated.

Alternate Concrete Cradle Detail

For replacing sewer - when broken

No Scale

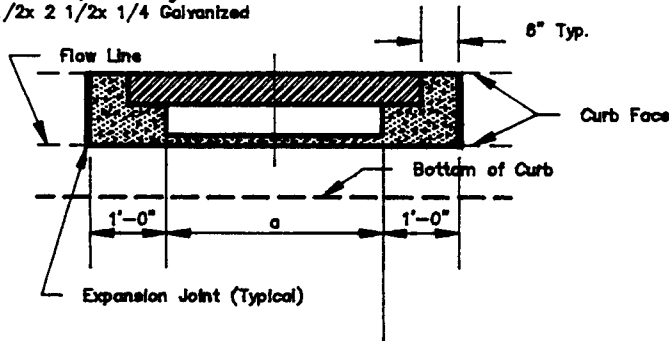


Pipe Saddle Detail

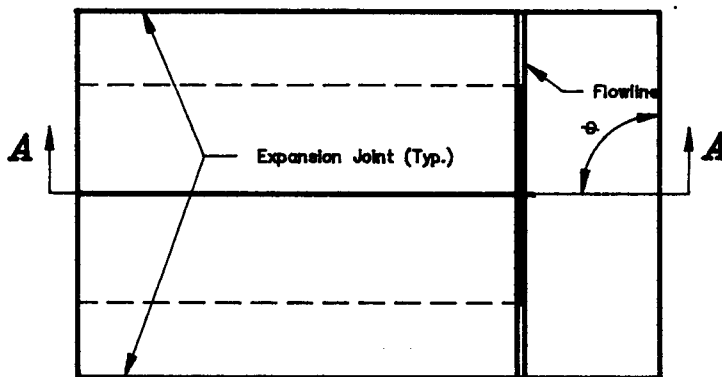
No Scale

APPROVED <i>[Signature]</i> CITY ENGINEER	SUBDIVISION DESIGN MANUAL PIPE SADDLE DETAIL	DATE 7/24/89
		DRAWN LDT
CITY OF BAKERSFIELD CALIFORNIA	CHECKED	SCALE NTS
	SHEET NO.	D-9
	ENGINEERING	DEPARTMENT

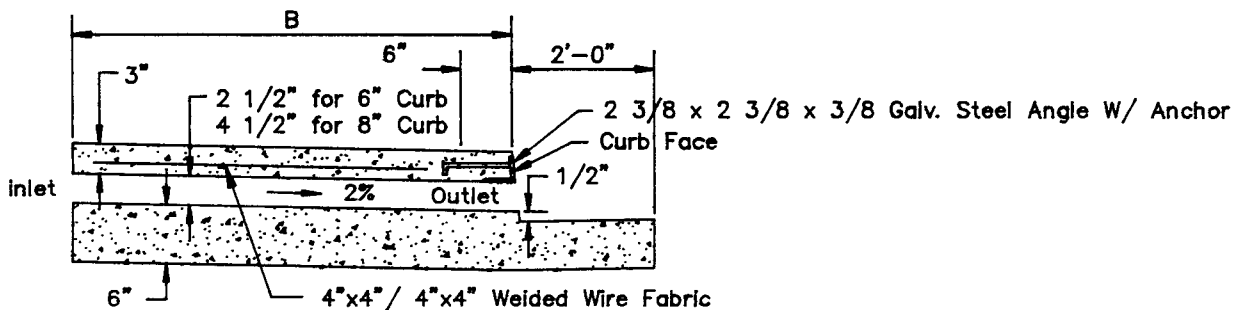
Alhambra Foundry Company
 No. A-3901, Face Angle
 2 1/2x 2 1/2x 1/4 Galvanized



ELEVATION



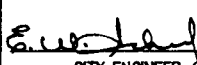
PLAN



SECTION A-A

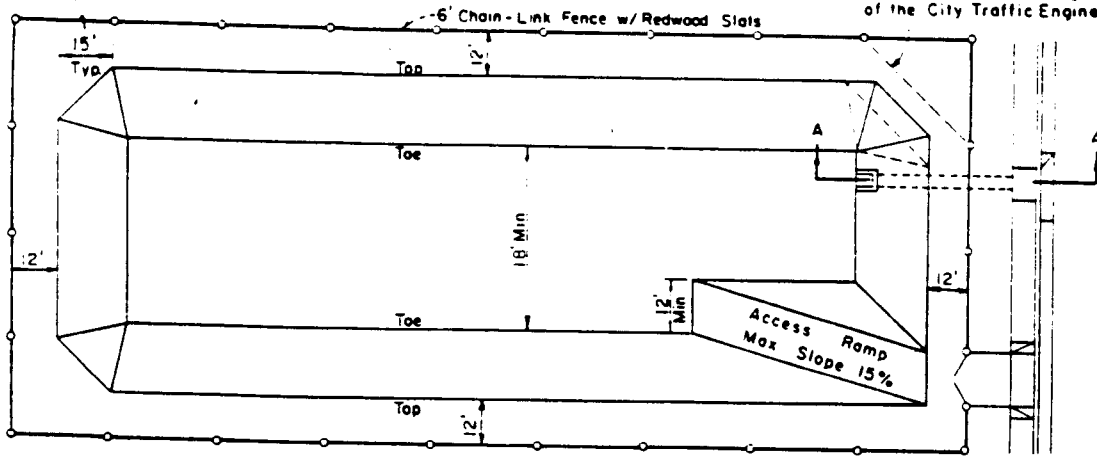
GENERAL NOTES:

1. All work shown shall conform to the applicable sections of the specifications entitled, "Standard Specifications, State of California, Department of Transportation, current edition.
2. All concrete shall be Class "A" and shall be within 2-1/2" to 5-1/2" slump.
3. Subgrade preparation shall be constructed true to grade and cross section, with compaction of 90% to a depth of 0.50 feet.
4. Existing sidewalk shall be sawcut and removed at the first scoring line at or beyond the planned joint. All exposed surfaces of the sidewalk underdrain shall match the existing curb, gutter, and sidewalk surfaces.
5. Expansion joint filler material shall consist of preformed of a durable, resilient compound.
6. Dimensions:
 $1" \leq a \leq 3"$
 $b = \text{variable}$
 $\theta = 90^\circ$
 All dimensions to be approved by the engineer.
7. All inlet modifications shall be subject to the approval of the City Engineer.

STANDARD SIDEWALK UNDERDRAIN		DATE 7/24/89
		DRAWN LDT
APPROVED  CITY ENGINEER		CHECKED
		SCALE NTS
CITY OF BAKERSFIELD CALIFORNIA		SHEET NO. S-15
ENGINEERING	DEPARTMENT	

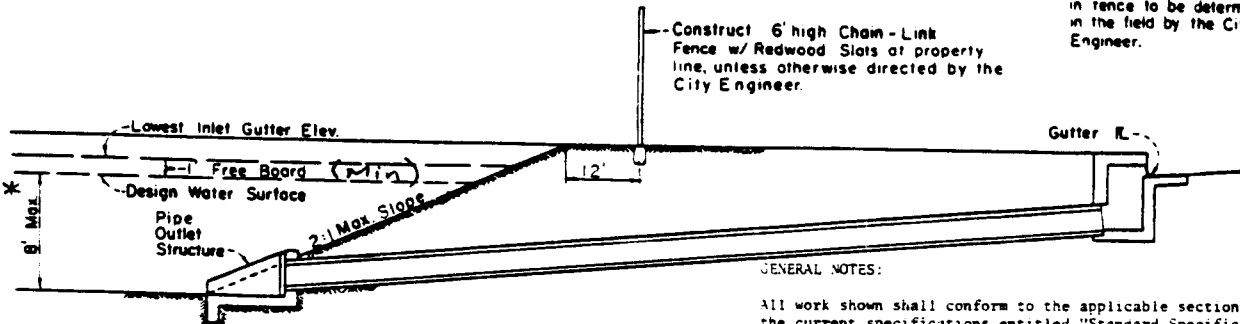
Corner Cutoff

Fence cutoff at street corners shall conform to the requirements of the City Traffic Engineer.



PLAN

NOTE: Location and number of drive and walk gates in fence to be determined in the field by the City Engineer.



SECTION A - A

GENERAL NOTES:

All work shown shall conform to the applicable sections of the current specifications entitled "Standard Specification, State of California, Business and Transportation Agency, Department of Transportation", and the following special provisions.

Drainage basin shall be a minimum of one buildable lot, fronting on a street, and having a shape and location acceptable to the City Engineer.

Landscaped park drainage basins shall not be governed by this standard.

Basin site shall be deeded in fee to the City of Bakersfield.

Side slopes shall not exceed 2:1

All exposed metal in the outlet structure shall be hot dipped galvanized after fabrication.

Outlet structure shall be constructed with Class "A" (6 sack) concrete within 2 1/2" to 5 1/2" slump.

Concrete shall contain no additives unless prior written approval is obtained from the City Engineer.

Concrete shall be cured with a white pigmented curing compound complying to Section 90-7.01B of the Standard Specifications.

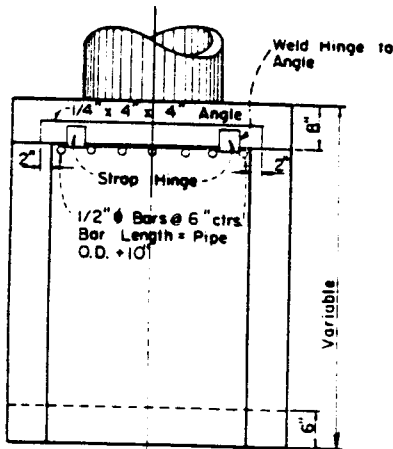
No pipe bells shall be placed in structure.

Chain link fence and gates shall conform to the specifications shown on City of Bakersfield Standard Drawings S-10 and S-11.

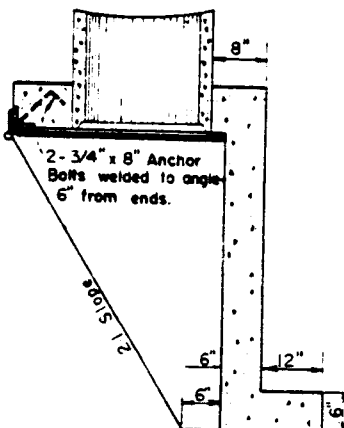
All new drainage basins including area between fence & sidewalk shall be sterilized with a permanent sterilant such as Hyvar A. Additional treatment to the area between fence and sidewalk shall be as directed by the Engineer. Application rate is twenty-five (25) pounds per acre. A representative of the Parks Division shall be on site at time of sterilization.

Basin capacity shall conform to City of Bakersfield Public Works Department Design Policy for Drainage.

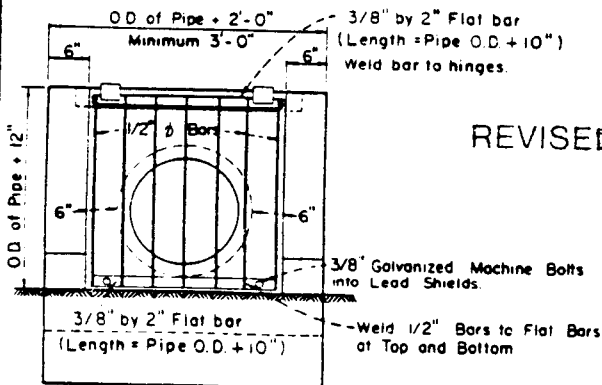
* UNLESS OTHERWISE ALLOWED



PLAN



SECTION

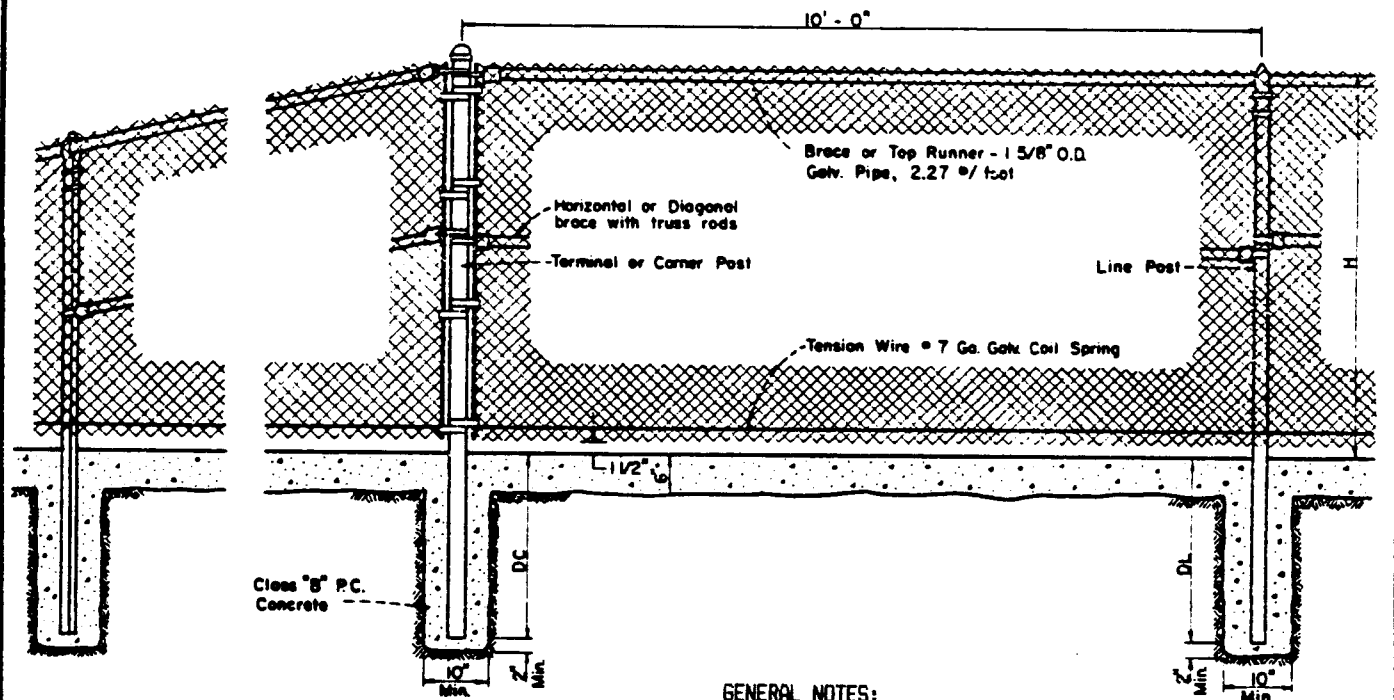


ELEVATION
OUTLET STRUCTURE

REVISED JUL '89

APPROVED BY THE CITY COUNCIL
JUNE 6, 1983
[Signature]
CITY CLERK
APPROVED
[Signature]
CITY ENGINEER

STANDARD DRAINAGE BASIN	DATE Nov 10, 1982
	DRAWN GLR, GEG.
CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	CHECKED <i>[Signature]</i>
	SCALES NONE
S-9	



GENERAL NOTES:

Installation of fencing and gates shall be in accordance with the requirements of Section 80-4 of the specifications entitled "Standard Specifications, State of California, Department of Transportation", current edition.

A 6" x 6" concrete curb shall be constructed under all fence. Within City parks, a 6" thick x 9" wide curb shall be used. In either case a 1 1/2" clearance between the curbing and the fabric shall be used.

Concrete shall be Class "B" (5 sack) and shall be within 2 1/2" to 5 1/2" slump. Surface of concrete shall be troweled smooth, and brush finished. Concrete shall contain no additives unless prior written approval is obtained from the City Engineer. Concrete shall be cured with a white pigmented curing compound complying to Section 90-7.01B of the Standard Specifications.

Corner post shall be installed at all angles in fence line in excess of 10 degrees.

End, Corner and Gate Posts shall be braced to the nearest line post with galvanized diagonal or horizontal braces used as compression members and galvanized 3/8" steel truss rods with turnbuckles or truss tighteners used as tension members.

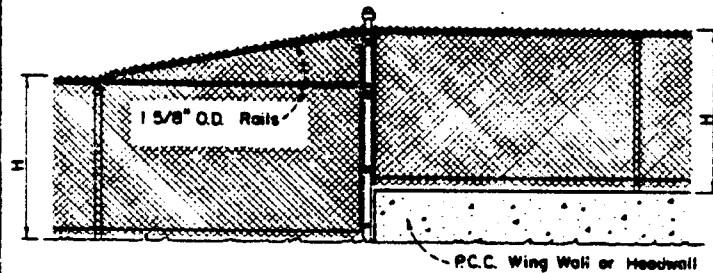
Fabric shall be fastened to Gate Post, Terminal Post or Corner Post with 1/4" x 3/4" stretcher bar bonds at 8" on center.

Fabric shall be fastened to line post with fabric bonds spaced approximately 14" apart, and to last runner and bottom tension wires with fabric bonds spaced approximately 24" apart.

Chain link fence fabric shall conform to the specification of ASTM designation: A 392, Class 1.

Subgrade preparation shall be constructed true to grade and cross section with compaction of 85% to a depth of 0.50 ft.

REVISED 10/4/83



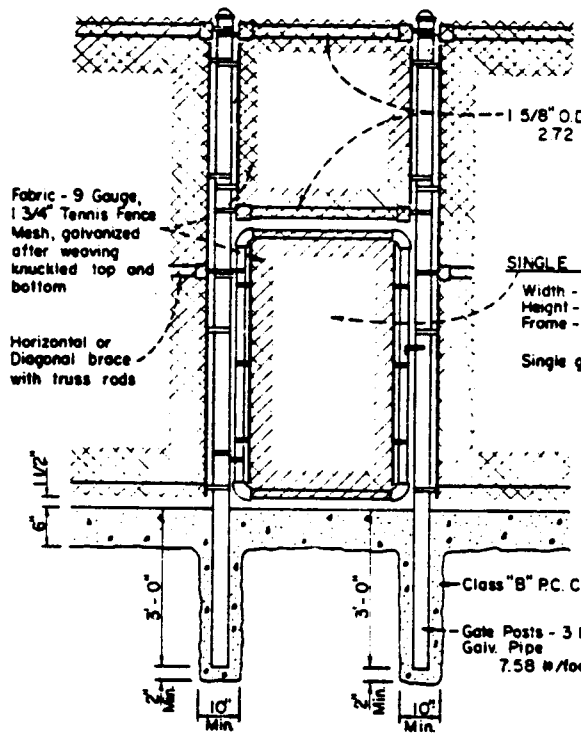
TYPICAL DETAIL AT CULVERT ENDWALLS

FENCING TABLE			
	HEIGHT 1	HEIGHT 2	HEIGHT 3
H	5'	6'	10'
DC	2'-6"	3'-0"	3'-0"
DL	2'-0"	2'-6"	3'-0"
Terminal Post or Corner Post	2 7/8" O.D. Galv. Pipe 5.79 #/ Ft.	2 7/8" O.D. Galv. Pipe 5.79 #/ Ft.	3 1/2" O.D. Galv. Pipe 7.58 #/ Ft.
Line Post	H Column 1 7/8" x 1 5/8" 2.70 #/ Ft. 1 7/8" O.D. Galv. Pipe 2.72 #/ Ft.	H Column 2 1/4" x 1 7/8" 4.10 #/ Ft. 2 3/8" O.D. Galv. Pipe 3.65 #/ Ft.	2 7/8" O.D. Galv. Pipe 5.79 #/ Ft.
Fence Fabric	9 Gauge, 2 inch Mesh, Galv. After Weaving, Knuckled Top And Bottom		9 Gauge, 1 3/4 inch Tennis Fence Mesh, Galv. After Weaving, Knuckled Top And Bottom
Redwood Slat	2 3/8" x 1/4"		

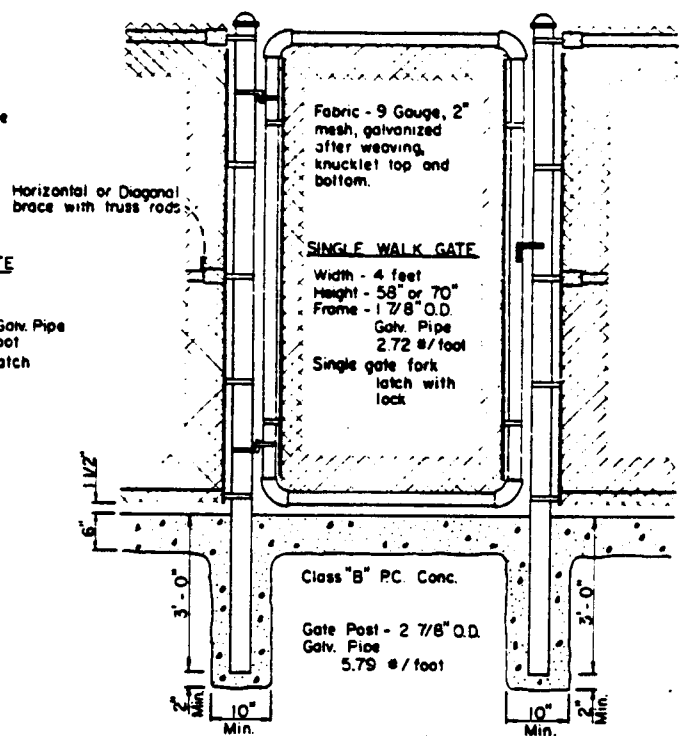
NOTE:

When redwood suburban screen is required, it shall be used with 3 x 5 9 gauge fabric so constructed that the slats are locked into position and can only be removed with use of tools.

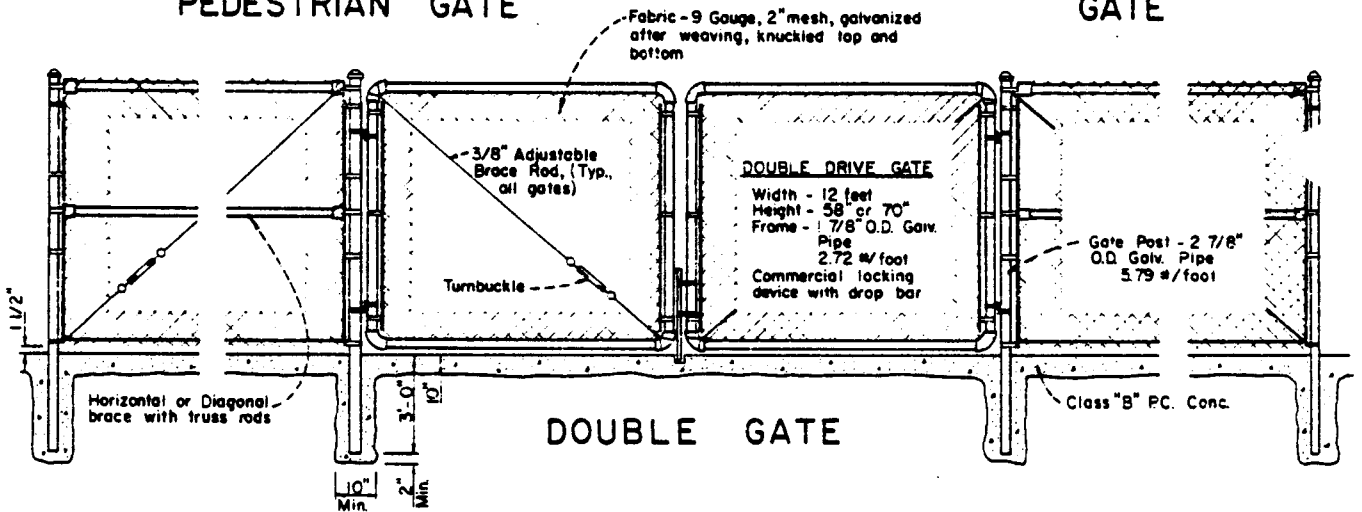
APPROVED BY THE CITY ENGINEER NOV 7 1979 <i>H. E. Boyer</i> CITY ENGINEER	REVISED JUL 89 STANDARD CHAIN LINK FENCE	DATE NOV 7 1979 DRAWN G. L. R. CHECKED <i>G. A. Thomas</i> NONE
APPROVED <i>J. Dale Hawley</i> CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	S-10



**10 FOOT FENCE
PEDESTRIAN GATE**



**PEDESTRIAN
GATE**



DOUBLE GATE

GENERAL NOTES:

Subgrade preparation shall be constructed true to grade and cross section with compaction of 85% to a depth of 0.50 feet.

Concrete shall be Class "B" (5 sack) and shall be within 2 1/2" to 5 1/2" Slump.

Surface of concrete shall be troweled smooth, and brush finished.

Concrete shall contain no additives unless prior written approval is obtained from the City Engineer.

Concrete shall be cured with a white pigmented curing compound complying to Section 90-701B of the Standard Specifications.

End, Corner and Gate Posts shall be braced to the nearest line post with galvanized diagonal or horizontal braces used as compression members and galvanized 3/8" steel truss rods with turnbuckles or truss lighteners used as tension member.

When redwood suburban screen is required it shall be used with 3x5-9 gauge fabric so constructed that the slats are locked into position and can only be removed with use of tools.

Frames shall be made with fittings or welded, with welds ground smooth, and regalvanized.

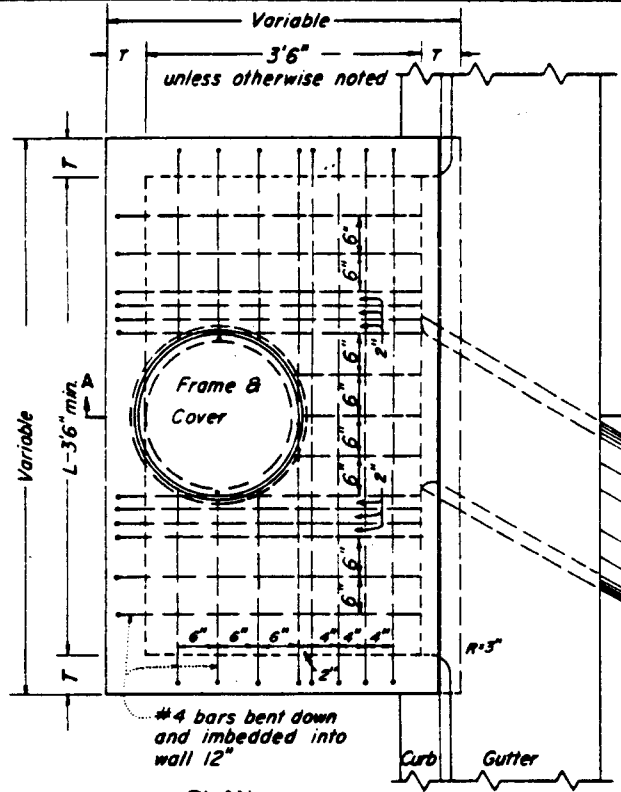
Chain-Link fence fabric shall conform to the specifications of ASTM Designation: A 392, Class I.

Installation of fencing and gates shall be in accordance with the requirements of Section 80-4 of the Standard Specifications, State of California, Business and Transportation Agency, Department of Transportation, current edition, and these General Notes:

Curbing as specified by C.O.B. Standard Drawing S-10 shall be continued under gates.

REVISED JUL '89

APPROVED BY THE CITY ENGINEER Nov. 7, 1979 <i>J. E. Brown</i> CITY ENGINEER	STANDARD CHAIN LINK GATES	DATE Nov. 7, 1979 DRAWN G.L.R. CHECKED SCALE None
APPROVED <i>J. Dale Hawley</i> CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	S-11

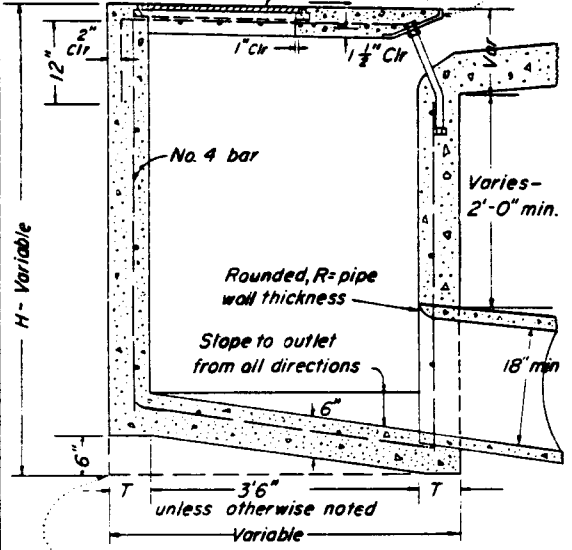


PLAN

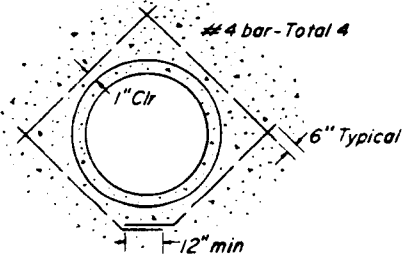
Alhambra Foundry galvanized frame & cover # A1530 with 2- $\frac{3}{4}$ " stainless steel socket head set screws (set opposite and finished flush) or equal.

Sidewalk Slope $\frac{1}{4}$ in/ft

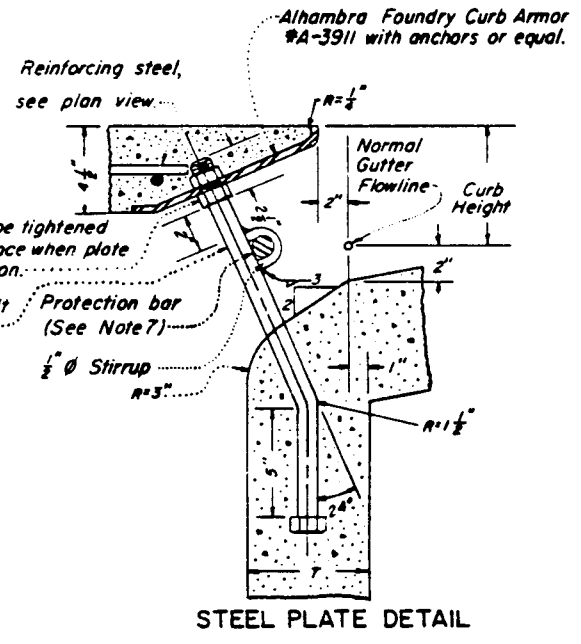
See Steel Plate Detail



SECTION A-A



REINFORCING AROUND PIPE



STEEL PLATE DETAIL

GENERAL NOTES:

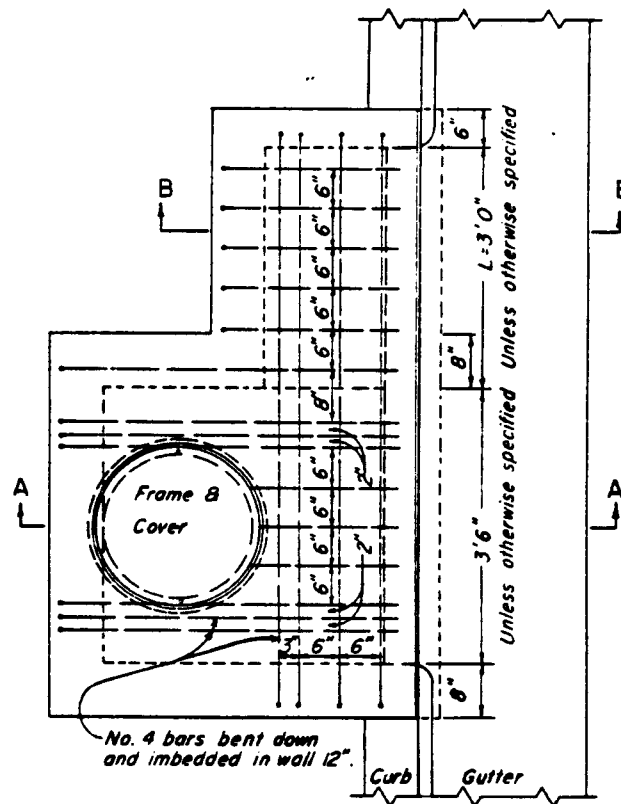
1. All concrete shall be Class "A" and shall be within 2 $\frac{1}{2}$ " to 5 $\frac{1}{2}$ " slump.
2. Slab to be poured monolithic with sidewalk where sidewalk is constructed or replaced. Surfaces of all exposed concrete shall match slope, finish, color and scoring of adjacent concrete.
3. WALL THICKNESS: T=6" except when:
 H > 8 feet T=8"
 L > 8 feet T=8"
 Catch basin walls shall be increased by 2" minimum in thickness if poured against earth in lieu of outside face forms.
4. Wall reinforcing not required when H=8' or less and L=7' or less. Walls exceeding these limits shall be reinforced with No. 4 bars at 18" O.C., both ways. All reinforcing shall be No. 4 bars 1 $\frac{1}{2}$ " clear of inside face unless otherwise shown.
5. All exposed metal parts shall be galvanized after fabrication.
6. Support bolts shall be installed when length of opening exceeds 5'0" and shall be spaced at not more than 5'0" O.C. and not less than 3'0" O.C.
- * 7. When curb opening exceeds 5 $\frac{1}{2}$ ", a plain round steel protection bar 1" in diameter shall be installed. Bar shall be imbedded 5" at each end.
8. Pipe shall be as specified or as directed by the Engineer. The angular cut on the pipe shall be made as directed by the Engineer.
9. All work shall conform to the applicable sections of the specifications entitled "Standard Specifications, State of California, Department of Transportation", current edition.

JUL '89

* Revised 9/22/82

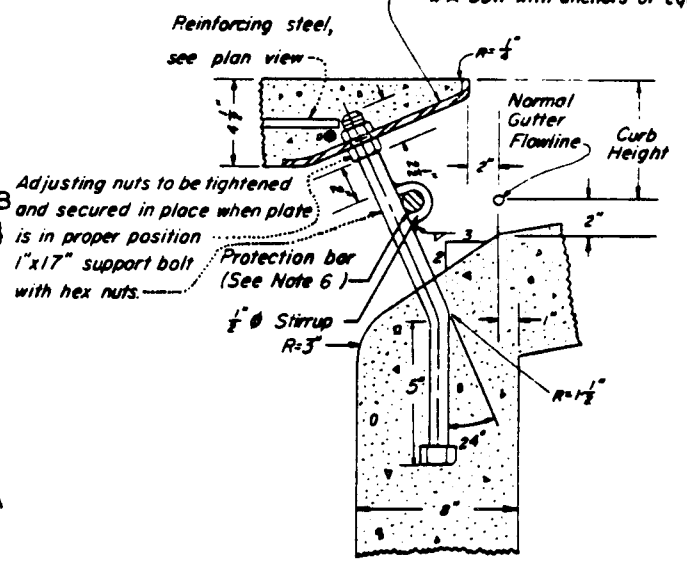
APPROVED BY THE CITY COUNCIL Feb 17, 1982 <i>Philip Kelman</i> CITY CLERK	STANDARD CATCH BASIN TYPE "A"	DATE JUN 26, 1982
APPROVED <i>J. Dale Hawley</i> CITY ENGINEER		DRAWN G.E.G. CHECKED B.J.D. SCALE None
CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT		S-12

Alhambra Foundry Curb Armor #A-3911 with anchors or equal.



PLAN

No. 4 bars bent down and imbedded in wall 12"



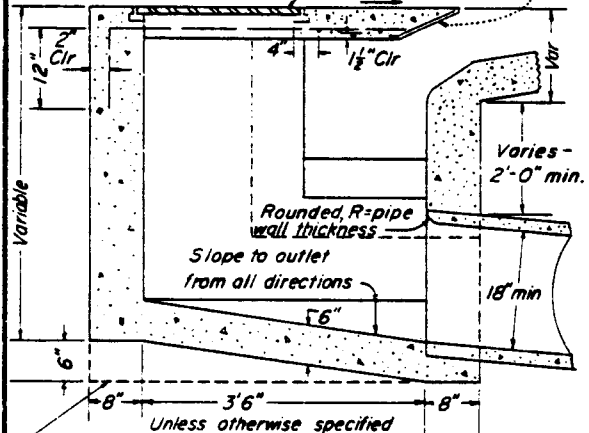
STEEL PLATE DETAIL

GENERAL NOTES:

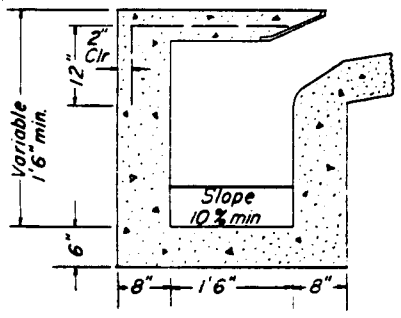
1. All concrete shall be Class "A" and shall be within 2 1/2" to 5 1/2" slump.
2. Slab to be poured monolithic with sidewalk where sidewalk is constructed or replaced. Surfaces of all exposed concrete shall match finish, slope, color and scoring of adjacent concrete.
3. Catch basin walls shall be increased by 2" minimum in thickness if poured against earth in lieu of outside face forms.
4. All reinforcing shall be No. 4 bars unless otherwise shown. All exposed metal parts shall be galvanized after fabrication.
5. Support bolts shall be spaced at not more than 5'-0" O.C. and not less than 3'-0" O.C.
- * 6. When curb opening exceeds 5 1/2", a plain round steel protection bar 1" in diameter shall be installed. Bar shall be imbedded 5" at each end.
7. Pipe shall be as specified or as directed by the Engineer. The angular cut on the pipe shall be made as directed by the Engineer.
8. All work shall conform to the applicable sections of the specifications entitled, "Standard Specifications, State of California, Department of Transportation", current edition.

Alhambra Foundry galvanized frame & cover No. A1530 with 2- 3/4" stainless steel socket head set screws (set opposite and finished flush) or equal.

Sidewalk Slope 1/4" in/ft. See Steel Plate Detail



SECTION A-A

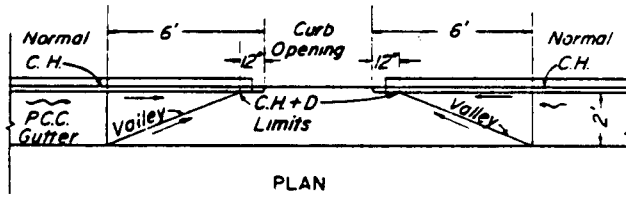


SECTION B-B

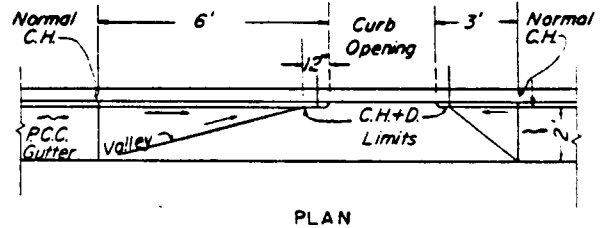
REVISED JUL '89

* Revised 9/22/82

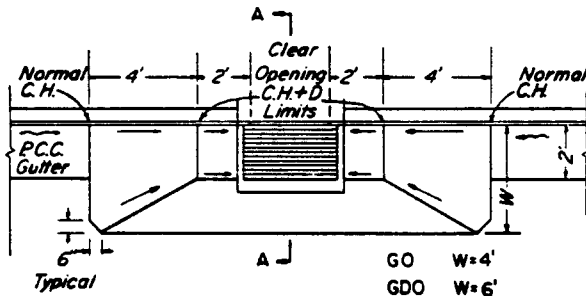
APPROVED BY THE CITY COUNCIL FEB 17 1982 <i>Philip Kelman</i> CITY CLERK	STANDARD CATCH BASIN TYPE "A-1"	DATE Feb. 5, 1982
APPROVED <i>J. Dale Hawley</i> CITY ENGINEER		DRAWN G.E.G.
CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT		CHECKED B.J.D.
		SCALE None
		S-13



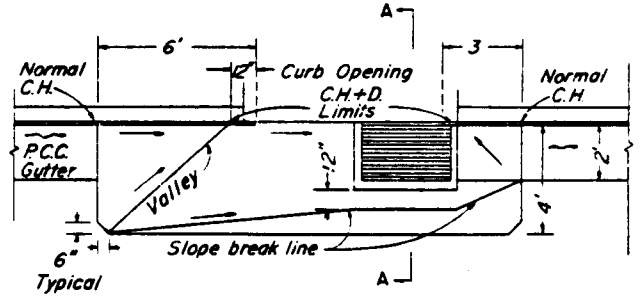
TYPE A CATCH BASIN IN GRADE SAG



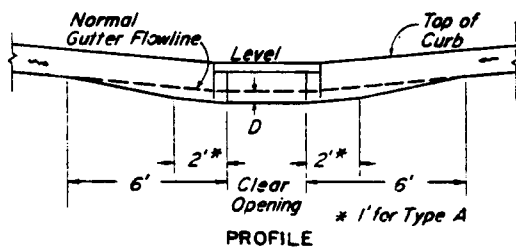
TYPE A & A-1 CATCH BASIN ON GRADE



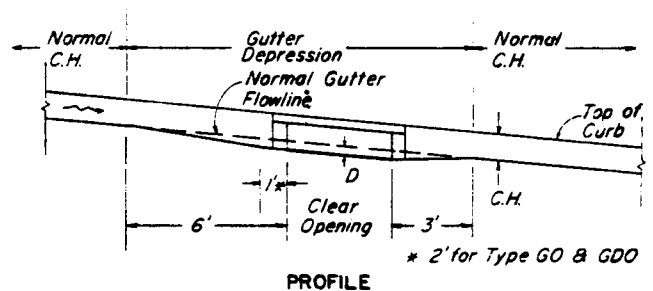
TYPE GO & GDO INLET IN GRADE SAG
(GO SHOWN)



TYPE GOL INLET ON GRADE



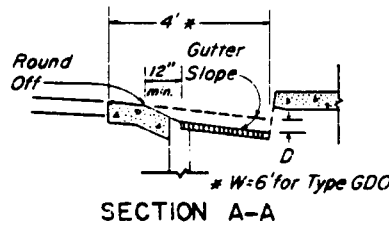
TYPE GO & GDO INLET, TYPE A CATCH BASIN
IN GRADE SAG



GRATE INLET AND CATCH BASIN ON GRADE

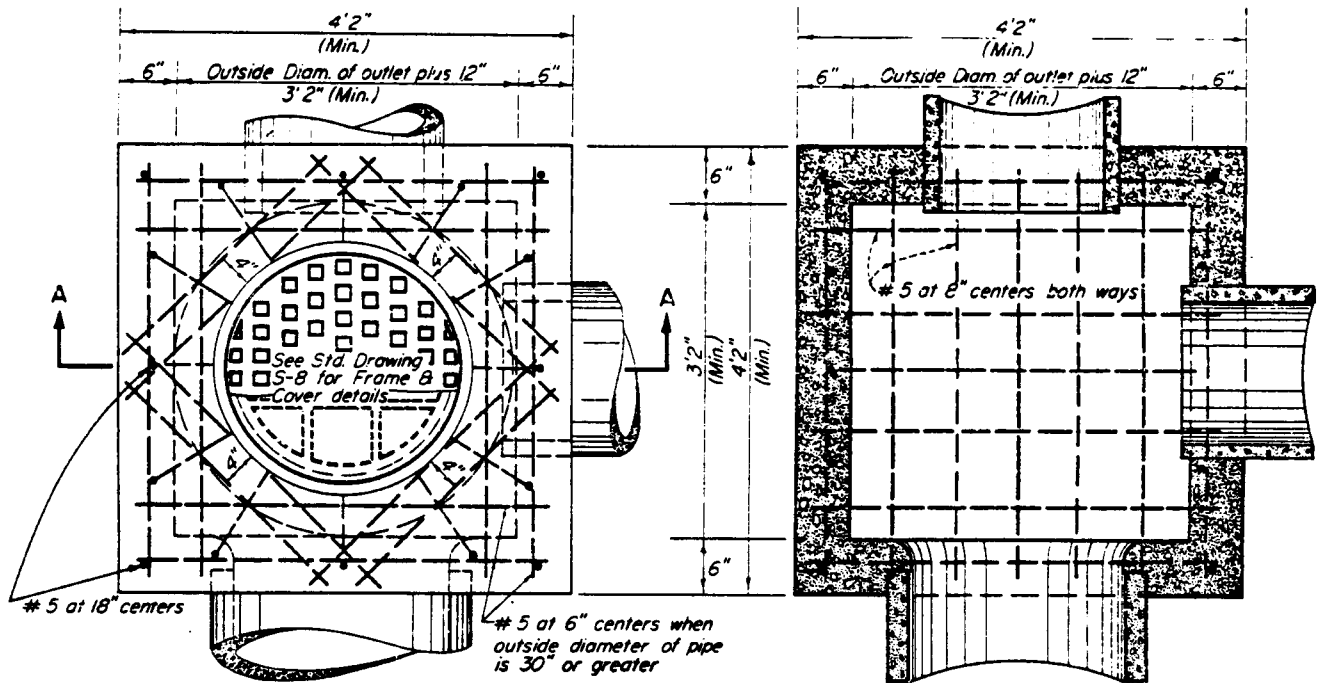
GENERAL NOTES

1. D = Gutter Depression. It shall be 2" for Type A and A-1 catch basins and 3" for other inlet types unless otherwise shown.
C.H. = Curb Height.
C.H.+D Limits = Limits of total depression in gutter.
— = Straight Grade, Downward Slope.
~ = Gutter direction of flow.
2. Gutter depressions shall be Class "B" P.C.C. 6" thick.
3. GDO, GO and GOL inlets may be used with approval of the City Engineer. GDO, GO and GOL inlets shall be constructed, without steps, in conformance to State of California, Department of Transportation Standard Plans D72 & D74 and Grates shall be Type 24 in conformance to Standard Plan D77-B.
4. Details for A.C. pavement. When P.C.C. pavement is used, corners shall be squared off.



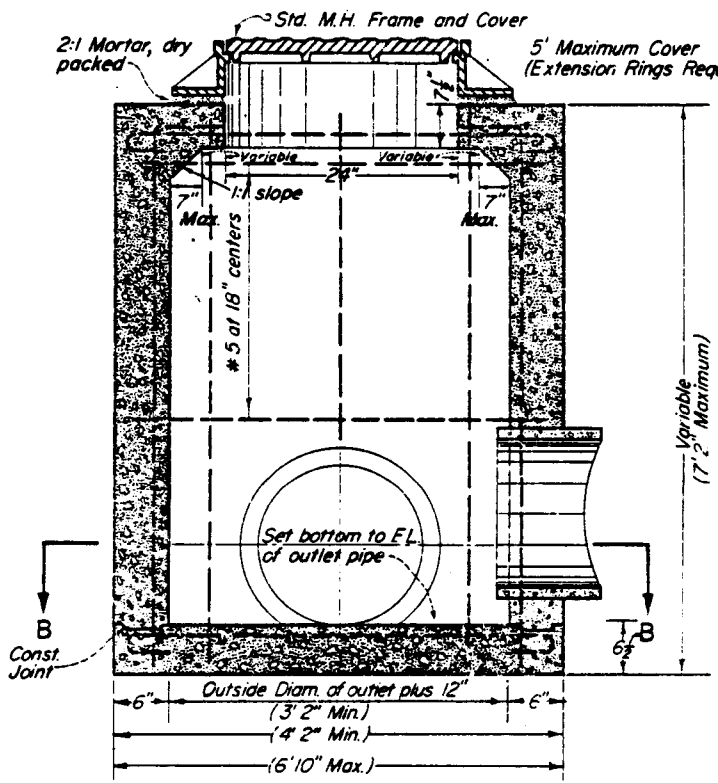
SECTION A-A

APPROVED BY THE CITY COUNCIL Feb 17, 82 <i>Philip Selman</i> CITY CLERK	STANDARD GUTTER DEPRESSIONS	DATE Feb. 8, 1982
APPROVED <i>J. Dale Hawley</i> CITY ENGINEER		DRAWN G.E.G.
	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	CHECKED B.J.D.
		SCALED NONE
		S-14



PLAN

SECTION B-B



SECTION A-A

GENERAL NOTES:

All concrete to be of Class "A" unless otherwise specified.

All reinforcing steel shall be of # 5 round bars and bent as shown.

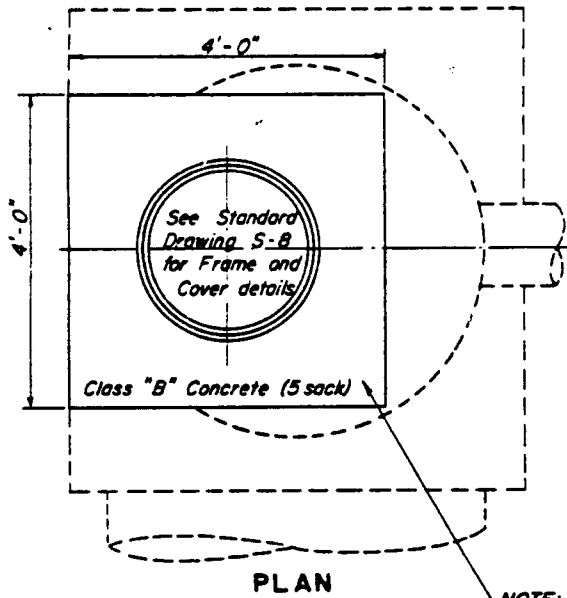
Pipe shall be as specified or as directed by the Engineer.

Manhole casting shall be to specifications for "Standard Manhole Frame and Cover" - Manhole cover shall have cast thereon in raised letters "DRAIN", lettering to be 3" in height and raised $\frac{5}{8}$ ".

All work shall conform to the applicable sections of the specifications entitled "Standard Specifications, State of California, Department of Transportation", current edition.

REVISED JUL '89

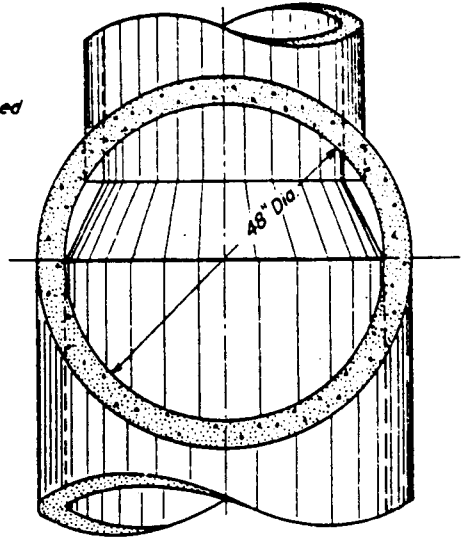
APPROVED BY THE CITY COUNCIL <i>Feb 3 1965</i>	<p style="text-align: center;">STANDARD DRAINAGE STRUCTURES</p> <p style="text-align: center;">JUNCTION BOX</p>	DATE Jan. 12, 1963
CITY CLERK <i>[Signature]</i>		DRAWN Hillis
APPROVED <i>H.E. Bergon</i> CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	CHECKED J.D.H.
		SCALES None
		S-19



PLAN

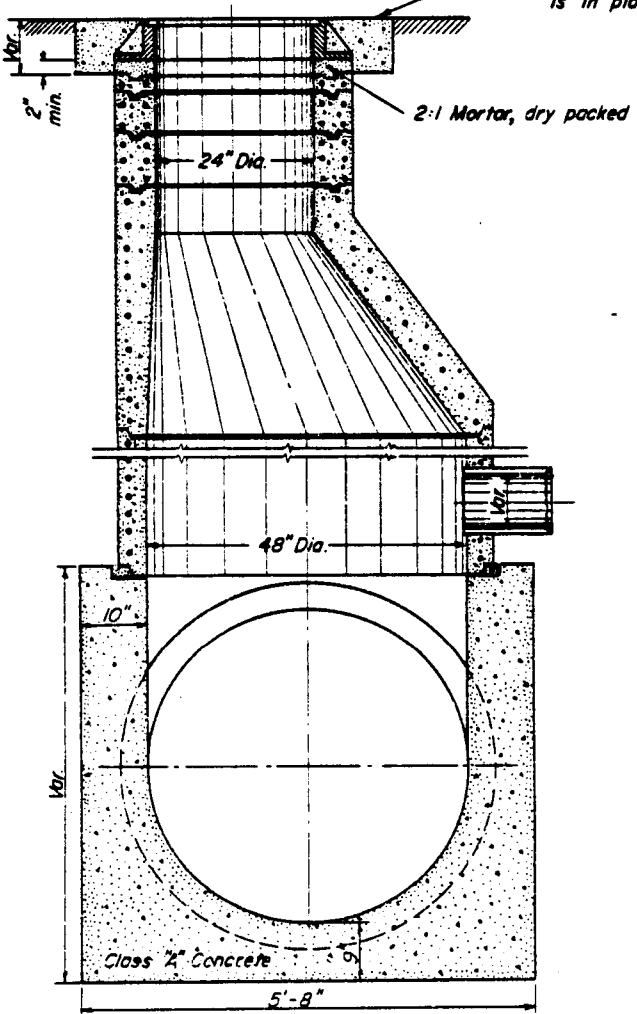
The upper portions of incoming and outgoing sewers shall be removed and the broken edges shall be plastered smooth with cement mortar.

Transition between inverts shall be a smooth warped surface.



SECTION

NOTE: P.C.C. slab not to be poured until paving is in place.



SECTION

GENERAL NOTES:
All work shall conform to the applicable sections of the specifications entitled "Standard Specifications, State of California, Department of Transportation", current edition.

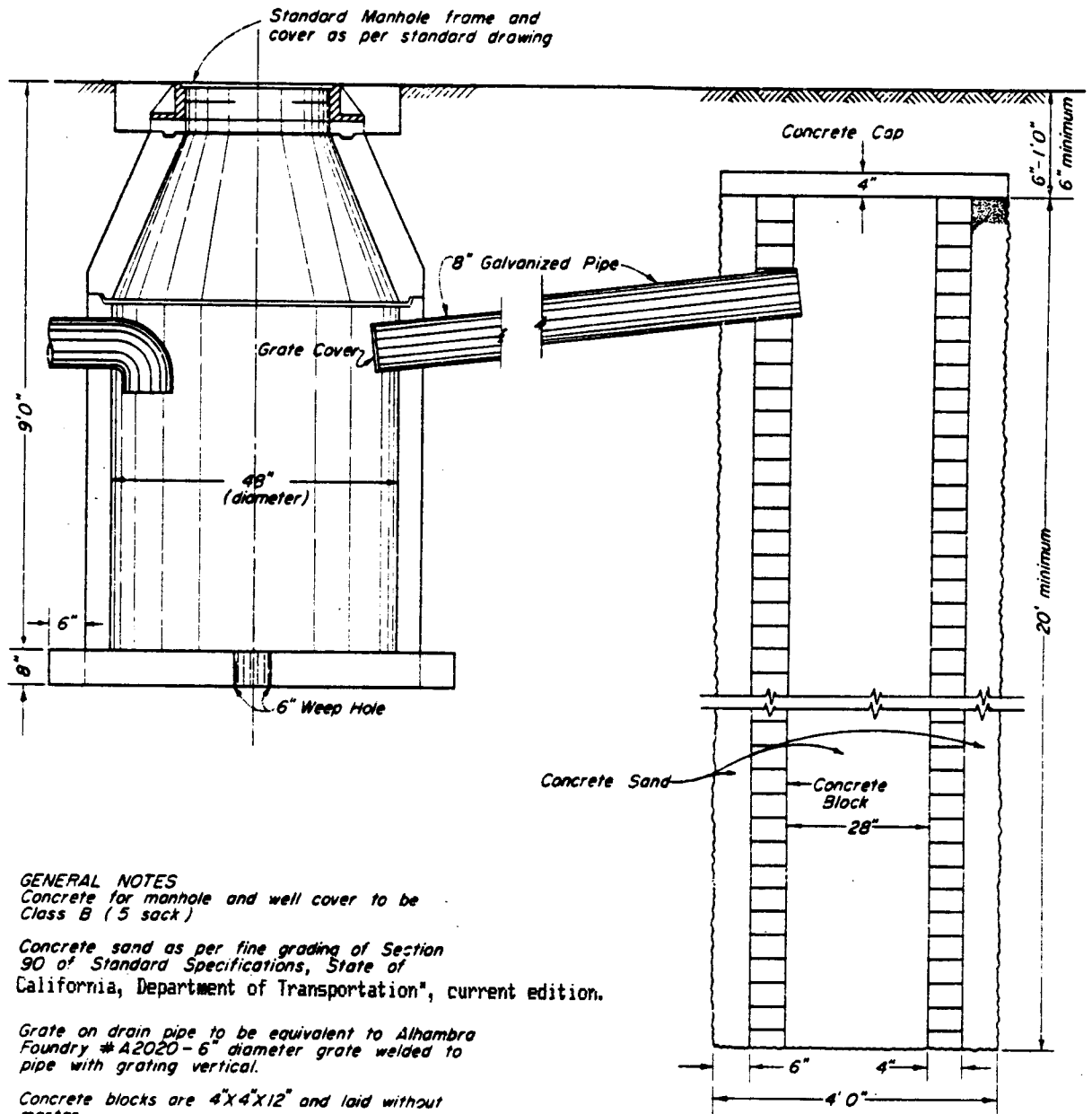
Mortar shall consist of one part portland cement to two parts pf clean, well graded sand.

Joints shall be filled with mortar and neatly raked or wiped on inside of pipe.

Precast reinforced manhole sections shall be constructed in accordance with the provisions of ASTM C-478, current edition.

REVISED JUL '89

APPROVED BY THE CITY COUNCIL <i>[Signature]</i> 10-65	STANDARD MANHOLE TYPE "B"	DATE 11-12-64
CITY CLEAR		DRAWN T.J.M.
APPROVED <i>H.E. Bergan</i> CITY ENGINEER	CITY OF BAKERSFIELD CALIFORNIA ENGINEERING DEPARTMENT	CHECKED J.D.H.
		SCALES None
		S-21



GENERAL NOTES
 Concrete for manhole and well cover to be Class B (5 sack)

Concrete sand as per fine grading of Section 90 of Standard Specifications, State of California, Department of Transportation, current edition.

Grate on drain pipe to be equivalent to Alhambra Foundry #A2020-6" diameter grate welded to pipe with grating vertical.

Concrete blocks are 4"x4"x12" and laid without mortar.

REVISED JUL 1963

APPROVED BY THE CITY ENGINEER <i>Feb 8 65</i>	STANDARD DRAINAGE WELL TYPE "B"	DATE June 30, 1963
CITY CLERK <i>J. D. H.</i>		DRAWN Hills
APPROVED <i>H. E. Berger</i>	CITY OF BAKERSFIELD CALIFORNIA	CHECKED J. D. H.
CITY ENGINEER	ENGINEERING DEPARTMENT	SCALES None
		S-24