

TABLE OF CONTENTS

STANDARDS AND SPECIFICATIONS FOR THE ACCEPTANCE OF PUBLIC IMPROVEMENTS FOR THE CITY OF SOUTH PADRE ISLAND, TEXAS

Article 1 - General Provisions (Administrative Clauses)	Page No.
1.01 Short Title	03
1.02 Purpose	03
1.03 Administration	03
1.04 Engineering Plan Required	03
1.05 Performance Guarantees	05
1.06 Improvement Installation	07
1.07 Improvement Dedication	08
1.08 Maintenance Responsibility	09
1.09 Use of Professional Consultants	09
1.10 Status of Private Improvements	09
 Article 2 - Minimum Standards for Street Design and Construction	
2.01 Minimum Right-of-Way Widths	09
2.02 Minimum Street Pavement Widths	10
2.03 General Street Design Standards.....	10
2.04 Clearing, Grubbing, Excavation, and Embankment.....	12
2.05 Subgrade.....	14
2.06 Base Course	15
2.07 Bituminous Pavement (Hot Asphalt Concrete).....	16
2.08 Hydraulic Cement Concrete.....	18
2.09 Pavement Markings, Street Signs, and Traffic Control Devices.....	23
2.10 Finishing Shoulders, Ditches, and Slopes	24
2.11 Street Lights	25
2.12 Curbs and Gutters	26
2.13 Sidewalks	27
2.14 Driveways, Alleys, Entrances, and Approaches	29
2.15 Bridges	31
2.16 Backfill and Compaction	31
2.17 Pavement Restoration	31
2.18 Parking Lots	31
2.19 Valley Gutters	33
2.20 Traffic Impact Report	33
2.21 Access for Fire Vehicles and Apparatus	36
2.22 Clear View of Intersecting Streets	37
2.23 Locations and Depths of Utilities within Public Right-of-Way.....	37
 Article 3 - Water Distribution System	
3.01 Mandatory Connection.....	38
3.02 Private Water Sources.....	38
3.03 Application Required.....	38
3.04 Specifications and Design Approval by other Agencies.....	39
3.05 Fire Protection Lines and Hydrants	39
3.06 Pipe Materials and Testing	40
3.07 Valves and Fire Hydrants.....	41
3.08 Handling and Laying of Pipe.....	43
3.09 Valves, Valve Boxes, Fittings, and Blow-Offs.....	46
3.10 Setting Fire Hydrants	46

3.11 Anchorage of Bends, Tees and Plugs	47
3.12 Backfilling, Clean-Up, and Restoration	47
3.13 Service Connections	50

Article 4 - Sanitary Sewer Collection System

4.01 Use of Sewer required	50
4.02 Specifications and Design, Approval by Other Agencies	51
4.03 Building Connections	51
4.04 Excavation, Backfill and Restoration	52
4.05 Location of Sanitary Sewer Facilities	52
4.06 Safety	52

Article 5 - Storm Water Drainage Design and Construction

5.01 Grading and Drainage Plan	52
5.02 Stormwater Retention and Detention.....	53
5.03 Stormwater Sewer System Specifications	53

Article 6 - Barricades and Channelizing Devices

6.01 Functions.....	66
6.02 Safety Plan Required	66
6.03 Barricade Design and Usage	66

Article 7 - Erosion and Sediment Control

7.01 Purpose.....	66
7.02 Scope of Authority.....	66
7.03 Applicability	66
7.04 Erosion and Sediment Control Plan.....	67
7.05 Erosion and Sediment Control Requirements	67
7.06 Review of the Erosion and Sediment Control Plan.....	69
7.07 Permits	70
7.08 Inspection.....	70
7.09 Enforcement.....	70
7.10 Project Termination	71

**Article 8
Standard Plans**

Drainage Design Standards

Design - Use TxDOT Hydraulics Design Manual found at:

<http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm>

Culverts, Pipes, Wingwalls and Other Structures – Use TxDOT Standards found at:

<http://www.dot.state.tx.us/insdot/orgchart/cmd/cserve/standard/bridge-e.htm>

ARTICLE 1

GENERAL PROVISIONS

1.01 Short Title: These regulations shall be known as and may be cited as the Standards and Specifications for the Acceptance of Public Improvements for the City of South Padre Island, Texas, and may be referred to hereinafter as "these standards and specifications," or "these standards."

1.02 Purpose: The purpose of this document is to develop a uniform standard for the construction of improvements within the City of South Padre Island, Texas, and all other areas under its jurisdiction. With such a standard, improvements consistent in nature and requiring a minimum of maintenance will be constructed throughout the City.

1.03 Administration: These standards shall be administered and enforced by the Public Works Director / City Engineer, who shall be appointed by the City Manager, and who shall have the following duties with respect to these Standards:

- A. May designate one or more City employees or other members of the City government, who have particular skills or competence, to act as his authorized representative.
- B. May adopt such administrative policies as he deems necessary for the carrying out of his responsibilities.
- C. Shall review and process requests for engineering plan approval.
- D. Shall provide for the proper inspection of the installation and/or construction of improvements.
- E. Shall serve in a technical and advisory role to the City Council on the area of public improvements.
- F. May cause the cessation of any installation, construction, re-construction, alteration, or conversion of any project in violation of the requirements of these standards.
- G. Shall provide recommendations to the City Manager concerning the acceptance of public improvements after commencement of inspections and/or warranty period.
- H. May refer any violation to the City Attorney for prosecution or may take such other appropriate action, such as the issuance of stop-work orders, the revocation of permits, or the withholding of permits.
- I. Shall serve as the City Engineer for projects developed solely by City staff. Shall have the Authority to approve improvements which, in his/her professional judgment, meet or exceed the intent of these standards and specifications.

1.04 Engineering Plans Required: It shall be unlawful to commence or to proceed with the installation, construction, re-construction, alteration, or conversion of any improvement governed by these standards, or portion thereof, without first submitting detailed engineering plans of the proposed project to the Public Works Director for review and approval.

- A. Preparation: The submitted engineering plans shall be prepared by a professional engineer, registered / licensed in the State of Texas, whose name, seal, and registration number shall appear upon each drawing and set of specifications submitted for review and approval.
- B. Content: The submitted plans shall be prepared at a scale that is legible and acceptable to the Public Works Director, and shall conform to the requirements of these standards.
- C. Approval Procedure: The engineering plan approval process shall include the following steps:

(1) Advisory Consultation: In order to conserve time, effort, and expense, the applicant shall consult with the Public Works Director prior to the preparation of the engineering plans in order to become familiar with the requirements of these standards and specifications as well as any historical or physical factors that may impact the specific project.

(2) Engineering Plan Preparation: Following the advisory consultation, the applicant shall prepare the engineering plans for the proposed project. It is strongly recommended that the applicant maintain constant communication with the Public Works Director during this phase to provide for the early identification of any problems that may develop prior to official submission as well as to assist in maintaining the continuity of the approval process.

(3) Preliminary Submission: Once the engineering plans have been completed, the applicant shall submit a minimum of three (3) complete sets of the engineering plans, specification documents, calculations, and all other required information to the Public Works Director for review.

(4) Preliminary Approval: The Public Works Director will review the submitted plans and documentation for compliance with the requirements of these standards and specifications. The Public Works Director will then: approve, approve with stated conditions, or deny approval of the submitted plans. The Public Works Director shall communicate the action in writing to the applicant specifically listing any conditions attached to the preliminary approval, or in the case of denial, the reasons for denial. In addition, the applicant shall also receive a "red-lined" copy of the submitted plans and documents for reference purposes.

(5) Approval by Other Agencies: Following the preliminary approval of the plans, but prior to the final approval, in those instances where the proposed improvements will be transferred to another agency (such as the Laguna Madre Water District), or would require the approval of another agency (such as the State Department of Transportation, the General Land Office, or the United States Army Corps of Engineers), the applicant will submit copies of the proposed engineering plans to those agencies for their review and approval. The Public Works Director shall not grant final approval to any submitted engineering plan until each reviewing agency has completed its review of the plan and has submitted a letter certifying same to the Public Works Director.

(6) Final Submission: Once the plan has been revised in accordance with the requirements of the preliminary approval, as well as the requirements of any other approving agencies involved, the applicant shall submit three (3) copies of the revised plans and all associated documentation, to the Public Works Director for a final review. The applicant shall also submit one (1) copy of an estimate of cost for the complete installation of all of the improvements contemplated in the submitted engineering plans. Where the estimate of cost is based upon an engineer's estimate, the submitted document shall include an itemized list of the tasks involved, total lineal feet or other unit of measure for each task, the unit price used, and the total cost of each task. Where the estimate of cost is based upon actual bids, copies of the bid forms utilized shall be submitted.

(7) Final Review Phase: The Public Works Director will review the submitted final engineering plans for conformance with the requirements of the preliminary approval, as well as the requirements of any other approving agency. If the Public Works Director finds that any previously identified items have not been addressed, or that some additional items are at variance with the approved preliminary plans and do not conform to the City's required standards and specifications, he shall notify the applicant in writing. The Public Works Director shall not grant final approval to any submitted engineering plan until all items at variance with the City's required standards and specifications have been revised to comply.

(8) Performance Guarantee: The Public Works Director will also review the submitted cost estimate and establish the amount of the performance guarantee securing installation of the improvements contemplated in the proposed engineering plans. The Public Works Director shall notify the applicant in writing of the amount established.

(9) Final Approval: Once the final engineering plans have been revised to conform to the requirements of all City Standards and Specifications, and all required documentation has been submitted and approved, the Public Works Director shall transmit the final approval to the applicant in writing along with one (1) set of the final engineering plans stamped "Approved." The stamped set of plans shall be maintained by the applicant upon the site of the proposed construction for reference purposes by the City Inspectors.

(10) Period of Validity: The final approval of the engineering plans by the Public Works Director shall lapse one (1) year from the date of such approval; provided, however, that if this time period should lapse prior to the installation of the proposed improvements, such approved plans will be subject to revision to conform with any amendments to the City's Standards and Specifications that may be adopted between such time and the date at which the final approval of the engineering plans either lapse or are implemented.

(11) Pre-Construction Conference and Commencement of Construction: No clearing of vegetation, excavation, filling of land, or installation of improvements covered by the submitted engineering plans shall be performed until those plans have been reviewed and granted final approval by the Public Works Director, and a pre-construction conference between the contractor and the Public Works Director has been held in which the phasing of the construction is discussed, and the required inspection schedule is determined. Phasing should identify the sequence of construction activities, including the expected date on which each stage of construction will begin, the estimated duration of time of each stage of construction, and the anticipated date on which all construction activities will be concluded.

(12) Change Orders: If, in the course of construction, the applicant desires to modify the size, type, quality, quantity, and or location of any or all of the improvements required or regulated by these standards, the applicant shall submit a written change request to the Public Works Director for review and written approval prior to proceeding with the installation or modification of the improvements involved. Based upon the nature of the proposed change, the Public Works Director may require the submission of revised engineering plans.

1.05 Performance Guarantees: After the engineering plans have been submitted, but before the record plat for the proposed subdivision has been approved, the applicant shall either complete the improvements in accordance with the approved engineering plans under the observation and inspection of the appropriate agency, or post a performance guarantee in accordance with the provisions hereafter set forth.

A. Generally: The performance guarantee shall:

(1) Be prepared on forms approved by the City Attorney and submitted in completed form for approval by the City Council.

(2) Insure or guarantee the construction and completion of the improvements, as set forth in the final engineering plans over a period not to exceed one (1) year.

(3) Be in an amount equivalent to one hundred and ten (110) percent of the estimated cost of completion of all the proposed improvements included in the submitted engineering plans. Such estimate shall be prepared by the applicant and reviewed and approved by the Public Works Director, who shall recommend the amount of the guarantee to the City Council.

(4) Provide for the release of all of the monies so obligated upon demand by the City Council in accordance with the requirements of this Article.

B. Performance Guarantees, Type: Performance guarantees securing the proposed improvements shall be secured to the City by one of the following methods, or combination thereof:

(1) Cash, deposited with the City Secretary, or deposited in a local bank in an account assigned to the City.

(2) A surety bond, issued on a corporate surety licensed and authorized to do business in the State of Texas as a surety.

(3) Certificates of deposit assigned to the City.

(4) An escrow account, such funds to be held in a special account by the escrow holder, distributed only with the approval of the City, and subject to audit by the City.

(5) An irrevocable letter of credit from a local bank and assigned to the City.

(6) Other financial guarantee, which the City Council deems adequate to secure the proposed improvements. Any alternative performance guarantees submitted shall not include either "signature" or "property" bonds.

The City Council expressly reserves the right to reject any guarantee it considers to be inadequately secured at its own discretion.

C. Bonds, Escrow Agreements, Irrevocable Letters of Credit, Issued by Whom:

(1) A performance guarantee issued by a surety company, title insurance company, escrow agent, or bank shall insure or guarantee, to the extent specified by the Public Works Director in his estimate of cost thereof, the construction and completion of all of the improvements proposed by the final engineering plans.

(2) In no event shall the surety company, title insurance company, escrow agent, or bank, have any material or other property interest in the proposed subdivision to which the performance guarantee relates, nor have any other business relationship with the subdivider in any other subdivision, development, or project that would, from the standpoint of the City, be considered a conflict of interest. The surety company, title insurance company, escrow agent, or bank shall attach to the performance guarantee a notarized disclosure statement fully disclosing all current and impending business relationships with the subdivider.

(3) To be eligible, all surety companies, title insurance companies, escrow agents, and banks shall be approved by the City Attorney. If the surety company, title insurance company, escrow agent, or bank fails to comply with any of the provisions of the performance guarantee, or fails to release the obligated monies to the City upon demand, they shall not be allowed to act in that capacity for any project within the jurisdiction of the City for a period of five (5) years, and shall be subject to the penalties herein established. In addition, the City Attorney shall take such other actions in law or in equity as may be required to secure all obligated funds.

D. Release of Guarantee:

(1) Term: The term of the performance guarantee shall not exceed one (1) year.

(2) Inspection: Before the developer's obligation to the City of South Padre Island is terminated, all required improvements shall be constructed under the observation and inspection of the inspecting agency, and shall either be accepted for maintenance by the City Council (or respective agency) in the instance of public improvements, or given final approval by the City Council on recommendation by the Public Works Director in the instance of private improvements.

(3) Release of Performance Guarantee, Procedure:

(a) The subdivider may, from time to time, request partial release of the obligated sum contained in the performance guarantee as work progresses. Such a request shall be in writing, addressed to the Public Works Director, and shall specify the work that has been completed as well as the

work remaining to be completed. The amount requested for release shall be determined by using current market values for materials and labor, and shall not exceed the ratio of work completed to the entire improvements secured.

(b) Upon receipt of such request, the Public Works Director (or his appointed designee) shall verify the actual level of completion and shall prepare a recommendation on the requested release for presentation to the City Council. In preparing the recommendation, the Public Works Director may: recommend release of the amount requested; or, recommend the release of some other amount which, based upon the investigation, more accurately reflects the actual level of completion in relation to the entire amount of improvements secured.

(c) Following receipt of the Public Works Director's recommendation on the requested release, the City Council may approve the amount recommended by the Public Works Director; or, approve the release of an amount less than the amount recommended by the Public Works Director; or, deny the request.

(d) Following action by the City Council on the requested release, the City Secretary shall notify in writing the surety holding the performance guarantee authorizing the specific release. Until such time as the City Council shall, by such written authorization addressed to the surety, release the specified amount, the surety shall continue to hold the obligated sum as established in the agreement.

(e) In no case shall the City Council release more than ninety (90) percent of the total performance guarantee over the term of the guarantee. The final ten (10) percent of the performance guarantee shall only be authorized for release by the City Council in its entirety after the Public Works Director certifies that all improvements have been completed in their entirety, constructed in accordance with the approved engineering plans, and meet all of the City's required standards and specifications.

(4) If, at the end of the one (1) year period, all of the improvements reflected by the final engineering plans have not been completed, the City Council may:

(a) Require the surety to perform on the guarantee and pay to the City such amount as shall be equal to the lesser of the amount required to complete the improvements, or the amount of the guarantee not heretofore released; or,

(b) Require the subdivider to submit a new performance guarantee which has been recalculated in order to allow for inflation a period not to exceed an additional one (1) year.

1.06 Improvement Installation:

- A. Commencement: No clearing of vegetation, excavation, grading, filling of land, or installation of improvements shall be performed within the area encompassed by the required engineering plan, until that plan is approved by Public Works Director, and a pre-construction conference between the contractor and the Public Works Director has been held in accordance with Section 1.04(C)(11).
- B. Inspection: The construction of all improvements shall be inspected for conformance with the approved engineering plans by the Public Works Director or his designee, as well as any other approving agency as the development may impact their jurisdiction.

(1) Inspection Fee: The contractor shall pay to the City an inspection fee, as may be established by the Public Works Director. The inspection fee shall be paid upon approval of the final engineering plans. No work shall be permitted to take place unless and until all required fees have been paid.

(2) Notice: The contractor shall notify the Public Works Director concerning the need for an inspection no later than twenty-four (24) hours prior to the anticipated inspection.

(3) General Inspection: The Public Works Director, or his designee, is hereby authorized to inspect, or cause to be inspected, any construction on which work is in progress. The Public Works Director, or his designee, is hereby empowered to enter upon any land for the purpose of making inspections, examinations, and surveys, or to place and maintain there, monuments, markers, notices, signs, or placards in order to effect the provisions of these standards.

(4) Required Inspections: Although the Public Works Director, or his designee, may generally inspect the construction of improvements at any time, certain inspections at specific points in the construction process are required. The nature and number of these required inspections vary by the type of improvements to be constructed, and shall be identified by the Public Works Director as part of the approval of the final engineering plans.

(5) Stop Work Orders: If, at any time, the Public Works Director, or his designee, determines that the construction of improvements on the subject site is at variance with the approved engineering plans, or these standards and specifications, he/she may order the cessation of such construction, reconstruction, alteration, or conversion by the posting of a "stop work" order on the premises, or by notice in writing to the contractor, his agents, or to the person doing the work, stating the nature of the violation.

(6) Acceptance of Work: Neither the City, nor any affected agency, shall be obligated to accept any work which is not in accordance with the approved engineering plans and these current edition of Standards and Specifications. If the Public Works Director, or his designee, finds, upon inspection, that any of the improvements have not been constructed in accordance with the approved engineering plans or the City's specifications, the contractor shall be required to take such steps as mandated by the Public Works Director to replace, repair, or otherwise complete the improvements in question.

C. Maintenance of Construction Sites: The contractor shall maintain the construction site in such a manner that junk, trash, and litter shall not accumulate thereon, nor be carried by the elements to adjoining properties. All junk, trash, and litter from construction or related activities shall be picked up at the end of each workday and placed in containers for regular removal.

1.07 Improvement Dedication:

A. Requirements: The City Council will not accept dedication of the improvements, nor release any performance guarantee until the following steps have occurred:

(1) The improvement(s) has been completely constructed.

(2) As-Built Plans of the constructed improvement(s) have been submitted to the Public Works Director in the number of copies established by administrative procedure.

(3) The Public Works Director certifies that all external inspecting agencies have accepted those improvements, which fall under their respective jurisdictions.

(4) The Project Engineer, a Registered Professional Engineer in the State of Texas, certifies he/she has inspected the improvements, which fall under the City's jurisdiction, and the improvements have been constructed in conformance with the approved engineering plans and these standards and specifications.

(5) The Public Works Director certifies that those improvements, which fall under the City's jurisdiction, have been constructed in conformance with the approved engineering plans and these Standards and Specifications.

(6) A maintenance bond has been filed in the amount equivalent to ten (10) percent of the cost of all improvements constructed. The maintenance bond shall be for a minimum period of two (2) years and shall assure the satisfactory condition of the improvements for that duration. The maintenance bond shall be established in the same fashion as performance guarantees. The commencement of the maintenance

period shall begin from the date of acceptance of the improvements by the City Council.

(7) A title insurance policy has been furnished to, and approved by, the City Attorney, establishing that the improvements have been completed, are ready for dedication to the City, and are free and clear of all liens and encumbrances.

- B. Procedure: Once the requirements of Section 1.07(A) have been met, the City Manager or his Designee may accept dedication of the improvements that would fall under the City's jurisdiction. Acceptance of the dedication of the subject improvements would occur by written notice of acceptance to the developer. This notice may also incorporate release of the performance guarantee securing the construction of the improvements.

1.08 Maintenance Responsibility: For the duration of the two (2) year maintenance bond period, the contractor shall be responsible for the maintenance and repair of any damage done to, or failure of, the subject improvements. Failure to maintain the improvements in a manner acceptable to the Public Works Director may result in the withholding of building or occupancy permits, the billing of the contractor for maintenance services performed by the City, and ultimately a demand by the City on the maintenance bond.

1.09 Use of Professional Consultants: At any point during the process, from the initial advisory consultations on the proposed engineering plans through the final release of the maintenance bond, the Public Works Director may elect, at his/her discretion, to utilize qualified technical personnel or professional consultants. The cost of such professional assistance shall be borne by the contractor.

1.10 Status of Private Improvements: For any project, subdivision, or other development, the use of private improvements may be used. That is, improvements intended to be maintained by the property-owner or a maintenance association, rather than dedicated to the public for maintenance purposes. Such private improvements must conform to the same standards and specifications of construction as public improvements. In addition, engineering plans for such private improvements must be submitted to the Public Works Director for review and approval, a suitable performance guarantee submitted, and the construction of the private improvements inspected in the same fashion as the public improvements required by these standards

ARTICLE 2

MINIMUM STANDARDS AND SPECIFICATIONS FOR STREET DESIGN AND CONSTRUCTION

2.01 Minimum Right-of-Way Widths: The minimum widths of street right-of-ways, from lot line to lot line, shall not be less than the following:

<u>Street Type</u>	<u>Right-of-Way (in feet)</u>	
	<u>Curb & Gutter</u>	<u>Rural</u>
Access Drive	20'	20'
Local Street	50'	50'
Low Volume Street	50'	50'
Collector Street	80'	90'
Arterial Street	100'	110'
Diameter of Cul-De-Sacs Including Side Ditches	100'	100'
	110'	110'

- A. In cases of deep cuts where the top of the ditch bank slope falls beyond the minimum right-of-way line, or where topographic or other engineering considerations warrant additional right-of-way, such additional right-of-way may be required by the Public Works Director.

2.02 Minimum Street Pavement Widths: The minimum width of the street pavement shall be as follows:

A. Minimum pavement widths for standard cross-section streets (designed with curb and gutter):

	<u>Street Type</u>	<u>Pavement Width</u>	<u>Notes</u>
	Access Drive	24'	No curb/gutter required
provisions	Local Street	28'	Includes street parking
provisions	Collector Street	52'	Includes street parking
provisions	Arterial Street	64'	Includes street parking
	Diameter of Cul-De-Sacs	64'	Local Street Only
	Hammerhead Turnarounds	20'	See Detail

Note: For curb and gutter streets, pavement width measurements are from back of the curb to the back of the corresponding curb.

B. Minimum pavement widths for rural cross-section streets (designed without Curb & Gutter and with side ditches):

	<u>Street Type</u>	<u>Pavement Width</u>	<u>Notes</u>
	Access Drive	20'	No side ditches required
	Local Street	22'	No parking on street
provisions	Collector Street	48'	Includes street parking
	Arterial Street	N/A	Curb & Gutter only
	Diameter of Cul-De-Sacs	48'	
	Hammerhead Turnarounds	20'	See Detail

2.03 General Street Design Standards:

- A. All intersecting streets shall be located directly opposite another existing or proposed street, or shall be a minimum of two hundred (200) feet distant, as measured between the ends of the nearest turning radii, at the curb. In those instances where local or collector streets intersect with arterial, their alignment shall be continuous.
- B. Multiple intersections involving the junction of more than two streets shall not be permitted. Streets shall intersect at right angles and shall continue at ninety (90) degrees for fifty (50) feet away from intersection.
- C. The dedication of new half streets along tract boundaries generally shall not be permitted. Exceptions can be made, however for divided boulevards, in instances where developers are working to comply with a thoroughfare plan.
- D. Where a street does not extend beyond the boundary of a development, and its continuation is not required for access to adjoining property, a cul-de-sac turnaround shall be provided at the end of such permanent dead-end streets in accordance with these standards and specifications. Such cul-de-sac streets shall not exceed five hundred (500) feet in length. Hammerhead turnarounds may be allowed for newly platted dead end streets that do not exceed 300 feet in length.
- E. If the property adjacent to the proposed subdivision is undeveloped, and the street must be a dead-end street temporarily, additional right-of-way shall be provided for a temporary turnaround for all such temporary dead-end streets, with a notation on the subdivision plat that such additional

right-of-way outside of the normal street right-of-way width shall revert to abutters whenever the street is continued. Such temporary dead-end streets shall not exceed five hundred (500) feet in length, and the temporary turnaround shall be constructed in accordance with these standards and specifications. No building permits shall be issued for any lots abutting a temporary turnaround as shown on any recorded subdivision plat unless and until the temporary turnaround is actually constructed, and has been approved by the Public Works Director. A Type III Barricade, a Type 4 Marker, or approval equal shall be constructed at all Dead-ends and shall comply with the Texas Manual on Uniform Traffic Control Devices (current edition).

- F. Curves in Streets: A tangent of at least one hundred (100) feet long shall be introduced between reverse curves on all streets. Where there is a deflection angle of more than ten (10) degrees in the alignment of a street, a curve with a radius adequate to insure safe sight distances shall be made. The minimum radii of curves shall be:

<u>Street Type</u>	<u>Minimum Radii</u>
Access Drive	150'
Local Street	300'
Collector Street	300'
Arterial Street	1000'

All changes in grade for streets shall be connected by a vertical curve of a minimum length necessary to provide adequate sight distance and other safety factors. To calculate the minimum length for the curve connecting changes in grade multiply by the appropriate value:

Crest Curve	Collector Streets - 50' Local streets - 28'
Sag Curve	Collector Streets - 50' Local Streets - 35'

- G. Street Grade and Elevations: All streets shall be designed so as to provide for the discharge of surface water from the pavement and right-of-way by grading and drainage. For adequate drainage, the minimum street grade shall not be less than two tenths (0.2) of one percent along the curb and gutter or not less than one tenth (0.1) of one percent along the roadside swale. Maximum street grades shall be as follows:

<u>Street Type</u>	<u>Maximum Grade</u>
Access Drive	15%
Local Street	12%
Collector Street	8%
Arterial Street	6%
Cul-De-Sac	12%

The Public Works Director shall not approve any street, which will be subject to inundation or flooding. All streets must be designed at an elevation, which will make them flood-free in order that portions of any development will not be isolated by floods. (See Article 5 - Stormwater Drainage.)

- H. Cross-Slopes: The cross-slopes on all streets, including intersections shall be a minimum of two (2) percent and a maximum of four (4) percent. Street cross-slopes in cross walk areas must comply with maximum cross slopes for sidewalks.
- I. Reserve Strips: Reserved strips of land which control or limit access along or at the terminus of public streets are prohibited.
- J. Intersection Radii: A minimum corner clip of twenty (20) feet at the street right-of-way intersection,

and a minimum radius of twenty-five (25) feet at the back of the curb or edge of the pavement shall be required. Intersections with arterial and collector streets shall require intersection geometrics as directed by the Public Works Director.

- K. Normal Crown: The pavement crown for all streets shall be computed at a minimum rate of one-quarter (1/4) inch per foot, except where otherwise noted on the approved engineering plans.
- L. Shoulders: The minimum width of shoulders behind the curb and gutter or abutting the rural cross-section pavement edge, where required, shall be as follows:

<u>Street Type</u>	<u>Minimum Shoulder Width</u>	
	Curb & Gutter	Rural Section
Local Street	2'	4'
Collector Street	2'	6'
Arterial Street	2'	10'

NOTE: Shoulders shall be constructed by specifications listed under Section 2.06 - Base Course

- M. Minimum Stopping Sight Distance: The stopping sight distance for streets shall be as follows:

<u>Street Type</u>	<u>Minimum Stopping Distance</u>
Access Drive	200'
Local Street	200'
Collector Street	200' (30 mph)
Collector Street	305' (40 mph)
Arterial Street	495' or as determined by Public Works Director

- N. Valley Gutters: See Article 5 - Stormwater Drainage.
- O. Alternate Construction Materials: This specification covers the use of Bituminous Pavement (Hot Asphalt Concrete) and Hydraulic Cement Concrete Pavement. If a developer wishes to utilize a construction material not covered by these specifications, they must first obtain approval of the Public Works Director.

When requesting approval for an alternate material, engineering test data, adequate to allow a complete evaluation of the proposed material, must be provided. Comparisons on the cost of maintenance, durability, and design life may also be required before approval is given.

2.04 Clearing, Grubbing, Excavation, and Embankment:

- A. Description: This section shall regulate the clearing, grubbing, removing, and disposing of all vegetation and debris within the construction limits of the project, except such objects as are designated to remain or are to be removed in accordance with other articles of these standards and specifications. This section shall also regulate the excavation, hauling, disposal, stripping and stockpiling of top soil, compaction of material, and all other earthwork for the construction of the roadway, side ditches, and swales, in accordance with the approved engineering plans. Additional specifications as required under a Beach and Dune Construction Permit shall also apply in the event such permit is required and issued.
- B. General: All areas, as shown on the plans, shall be cleared of all structures and obstructions. Those trees and shrubs and other landscape features specifically designated by the Public Works Director for preservation shall be carefully marked and protected from abuse, marring, or damage during construction operations. Continual parking and/or servicing of equipment under the

branches of trees marked for preservation will not be permitted. Any damage to natural terrain or to vegetation or objects designated to remain shall be repaired, replaced, or otherwise compensated for as determined by the Public Works Director. The excavation and embankments for the roadway, and all other earthwork shall be finished to reasonably smooth and uniform surfaces. Erosion during and after construction shall be controlled by methods established under Article 7 - Erosion and Sediment Control.

C. Drainage Structures: Culverts, storm sewers, manholes, and inlets shall be removed in proper sequence for maintenance of traffic and drainage. All structures shall be replaced by methods established under Article 5 - Stormwater Drainage.

D. Underground Obstructions: Underground obstructions, except those items designated for preservation, shall be removed to the following depths:

(1) In areas to receive embankments: Two (2) feet below natural ground, except when permitted by the plans, trees and stumps may be cut off as close to natural ground as practicable on areas which are to be covered by at least three (3) feet of embankment.

(2) In areas to be excavated: Two (2) feet below the lower elevation of the excavation.

(3) All other areas: One (1) foot below natural ground.

E. Disposal of Material: Unless otherwise shown herein, all materials and debris removed shall become the property of the contractor, including all merchantable timber, and shall be removed from the site and disposed of by a permitted solid waste hauler or state certified hauler or in a manner satisfactory to the Public Works Director. NOTE - No on-site burning will be allowed.

F. Top Soil: The contractor shall remove and stockpile all top soil within the limits of the roadway and earthwork construction areas. The top soil shall be stockpiled on the site and re-distributed over those areas that will be seeded and/or sodded at the completion of the earthwork

G. Backfill: Holes remaining after removal of all obstructions, objectionable material, trees, stumps, and so forth, shall be backfilled with approved material, compacted, and restored to its original contours by blading, bulldozing, or by other methods, as approved by the Public Works Director. Before backfilling, the remaining ends of all abandoned storm sewers, conduits, culverts, sanitary sewers, and water or gas pipes shall be plugged in a manner approved by the appropriate utility agency or the Public Works Director.

H. Sand: All sand material removed from existing dunes located within the City limits shall remain within the City limits and in areas approved by the Public Works Director.

I. Specification: Except as they may be superseded by these standards and specifications, the specifications for clearing, grubbing, excavation, and embankment shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division I, Earth Work and Landscape

Item 100	Preparing Right-of-Way
Item 103	Disposal of Wells
Item 104	Removing Concrete
Item 105	Removing Stabilized Base and/or Asphaltic Pavement
Item 106	Obliterating Abandoned Road
Item 110	Excavation
Item 112	Subgrade Widening

Item 132	Embankment
Item 134	Backfilling Pavement Edges
Item 150	Blading
Item 152	Road Grader Work
Item 154	Scraper Work
Item 156	Bulldozer Work
Item 158	Specialized Excavation Work
Item 160	Top Soil
Item 162	Sodding for Erosion Control
Item 164	Seeding for Erosion Control
Item 166	Fertilizer
Item 168	Vegetative Watering
Item 169	Soil Retention Blanket
Item 170	Irrigation System
Item 180	Wildflower Seeding
Item 192	Landscape Planting
Item 193	Landscape Establishment

2.05 Subgrade:

A. Description: This section regulates the preparation and construction of that part of the road bed below the proposed road materials. Subgrade construction shall be in close conformance to the lines, grades, and cross-sections shown on the approved engineering plans, or as may subsequently be established by the Public Works Director.

B. Construction Requirements:

(1) The subgrade material shall be brought to a firm and unyielding condition with a uniform density. All soft and yielding material that will not compact readily when rolled or tamped shall be removed and replaced with suitable material. Paving material shall not be placed on soft, spongy, or otherwise unsuitable subgrade. In areas having poor soil conditions, subgrade stabilization shall be required to meet the needs of this section.

(2) Unless otherwise provided, the roadbed below the subgrade shall be so constructed that it will have, as nearly as possible, a uniform density throughout. In both cuts and fills, it shall be rolled with a 3-wheel roller weighing no less than ten (10) tons, or with other approved compacting equipment capable of providing a smooth, even subgrade surface. In areas not accessible to the roller or other equipment, the required compaction shall be obtained with mechanical tamps or vibrators.

(3) Unless otherwise provided, the first six (6) inches below the subgrade shall be compacted to at least the ninety-five (95) percent of the maximum density as determined by the Modified Proctor Test.

(4) During subgrade preparation, and after its completion, adequate drainage shall be provided at all times to prevent water from standing on the subgrade. In no case shall paving material be placed upon the subgrade when the subgrade is muddy or unstable. No hauling shall be done nor equipment moved over the subgrade when its condition is such that undue distortion results, unless the subgrade is protected with adequate plank runways, mats, or other satisfactory means approved by the Public Works Director.

(5) A leveling course is not required as long as the finished subgrade conforms to the lines, grades, and cross-sections of the approved engineering plans, and is firm and unyielding with a uniform density. However, if a leveling course becomes necessary, it shall be of suitable compacted material.

(6) Prior to the placement of paving materials, proof rolling of the subgrade shall be required as evidence that the subgrade is in a firm and unyielding condition, and constructed with a uniform density.

In the event that the subgrade, including any portion of the construction of an embankment or any cut required to meet the proposed subgrade, does not meet with the above described compaction requirement to the satisfaction of the Public Works Director, it shall be the responsibility of the contractor to prove that the ninety-five (95) percent compaction has been achieved.

- C. Specification: Except as they may be superseded by these standards and specifications, the specifications for subgrade preparation and construction shall conform to the requirements of the following sub-sections of the current Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division II, Subgrade Treatments and Base

Item 204	Sprinkling
Item 210	Rolling
Item 216	Rolling (Proof)
Item 260	Lime Treatment (Road Mixed)
Item 263	Lime Treatment (Plant Mixed)
Item 265	Fly Ash or Lime – Fly Ash Treatment (Road Mixed)
Item 275	Cement Treatment (Road Mixed)

2.06 Base Course:

- A. Description: This section regulates construction of the foundation course of selected material placed and compacted as a base upon the prepared subgrade. Base course construction shall be in close conformance to the lines, grades, and cross-sections shown on the approved engineering plans, or as may subsequently be established by the Public Works Director.

B. Construction Requirements:

(1) Subgrade Preparation: Subgrade upon which the base course is to be placed shall be prepared as set out in Section 2.05.

(2) Spreading: If the required thickness of the base course exceeds seven (7) inches, the material shall be placed in two or more layers as directed. Traffic of any kind will not be permitted on the base course if it causes displacement of the material or mixing with the subgrade.

(3) Compacting: Stone or gravel base material for each lift, after spread and shaped, shall be compacted to a minimum one hundred (100) percent of the maximum dry density as determined in accordance with AASHTO T 99. An approved vibrating device shall be used. It may be supplemented by a 10-ton, 3-wheel tandem, or pneumatic tire roller. The contractor shall use such construction procedures, including sufficient wetting and number of passes with the vibrator to insure that the above density is attained. In the event subsequent courses are flexible, the base course shall be proof rolled prior to the placing of the next course. Any roller marks, irregularities, or failures shall be corrected as directed.

(4) Surface Requirements: At the time paving materials are to be placed on the base, the base shall meet the required density as set out herein, and also the surface tolerance for subgrade as required by these standards and specifications for the kind of pavement to be placed thereon.

- C. Specification: Except where they may be otherwise superseded by these standards and specifications, the specifications for base course preparation and construction shall conform to the requirements of the following sub-sections of the current Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division II, Subgrade Treatments and Base

Item 204	Sprinkling
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Item 210	Rolling
Item 216	Rolling (Proof)
Item 247	Flexible Base
Item 251	Reworking Base Courses
Item 260	Lime Treatment (Road Mixed)
Item 263	Lime Treatment (Plant Mixed)
Item 265	Fly Ash or Lime – Fly Ash Treatment (Road Mixed)
Item 275	Cement Treatment (Road Mixed)
Item 276	Cement Treatment (Plant Mixed)
Item 292	Asphalt Treatment (Plant Mixed)

2.07 Bituminous Pavement (Hot Asphalt Concrete):

- A. Description: This section regulates the construction of one or more courses of hot asphalt concrete pavement as either a base, binder, wedge, leveling, or surface course on a prepared base in accordance with these standards and specifications, and in close conformance with the lines, grades, thickness, and typical cross-sections reflected on the approved engineering plans, or as may subsequently be established by the Public Works Director.
- B. Job Mix Formula: A job mix formula for the various bituminous mixtures for the project shall be furnished by the contractor. No mixture will be accepted until the job mix formula has been approved and signed by the Public Works Director. The job mix formula will specify:
- (1) The type of bituminous mixture.
 - (2) The type and size of the aggregates (smooth, round river wash aggregates are not allowed).
 - (3) The percent of manufactured fine aggregate, when required.
 - (4) The type and grade of bitumen.
 - (5) The percentage of bitumen (based on total weight of the mixture exclusive of water or solvents).
 - (6) The percentage of aggregate passing the No. 4 sieve (based on the total weight of the aggregate).
 - (7) The mix temperature of the plant, both minimum and maximum.

The following provisions shall prevail in the administration of the job mix formula:

Variations from the job mix formula will be permitted as noted. The total percent passing the No. 4 sieve may vary ± 3.0 percentage points. The bitumen may vary ± 0.3 percentage points. Variations beyond these limits will be investigated and the contractor required to correct the conditions causing them.

If analysis shows a variation of ± 5.0 percentage points in the total passing the No. 4 sieve, ± 0.5 percentage points in the bitumen, or a gradation not in accordance with the specified mix composition, it will be cause for discontinuance of the work until the nonconformance has been corrected. One or any combination of such variations may be cause for ordering removal of the material and replacement with acceptable material at the expense of the contractor.

Sampling and testing of the final mixture shall be at least once during each day of placing bituminous mixtures, or at the request of the Public Works Director. Certified results of each day's testing shall be made available to the Public Works Director within twenty-four (24) hours.

- C. Conditioning of Existing Surfaces: When the surface of the existing pavement or old base is irregular, it shall be brought to uniform grade and cross-section as directed by the Public Works Director. When shown on plans, or directed by the Public Works Director, all longitudinal and transverse joints and all cracks shall be sealed by the application of an approved joint sealing compound before spreading the mixture upon a Hydraulic Cement concrete surface. Contact surface or curbing, gutters, manholes, and other structures shall be painted with a thin, uniform coating of bituminous material prior to the bituminous mixture being placed against them.

- D. Preparation of Subgrade or Base: Mixtures for base may be placed upon an earth subgrade or and existing pavement surface to be used as a base, or on a prepared base or subgrade as specified in the approved engineering plans. Preparation of the subgrade or base shall closely conform to the lines, grades, and cross-sections reflected on the approved engineering plans, or as subsequently identified by the Public Works Director. Just prior to placing the initial hot asphalt base course, the area upon which it is to be placed shall be proof-rolled with a pneumatic tire roller. Proof-rolling will not be required on resurfacing or widening and other areas inaccessible to the roller. Any roller marks, irregularities or failures shall be corrected as directed by the Public Works Director.

- E. Prime Coat: Priming shall conform to the applicable provisions of the Texas Department of Transportation's Standard Specifications for construction of Highways, Streets, and Bridges (current edition).

- F. Tack Coat: The tack coat on base or binder shall conform to the applicable provisions of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition).

- G. Spreading Mixtures: Any surface on which a mixture is spread shall be free from objectionable or foreign material at the time of spreading. Base, binder, wedge, and leveling courses shall be allowed to cure before being subjected to traffic or before a subsequent course is placed thereon. If the required depth of any course is to exceed three (3) times the top size of the aggregate used as shown by actual screen analysis, the course shall be constructed in two or more lifts. At locations where it is impractical to use conventional mechanical methods, other acceptable mechanical methods or acceptable hand methods may be used for placing and spreading upon approval by the Public Works Director.

- H. Compacting: There shall be operated with each spreader at least two rollers. The initial compaction shall be performed with a 10-ton, 3-wheel roller, subsequent compaction and finish rolling shall be performed with an approved tandem roller. No mixture shall be dispatched from the plant so late in the day that it cannot be spread and compacted in daylight of the same day. A sufficient number of rollers shall be used to permit compaction to be completed within thirty (30) minutes of the time the bituminous mixture has been spread. However, in any case, compaction shall be completed before the temperature of the mixture drops below one hundred and eighty (180) degrees Fahrenheit. When rolling adjacent lanes, the roller shall compress the joint by starting partially in the cold lane and lapping from six (6) to ten (10) inches over the hot material.

- I. Specification: Except as they may be otherwise superseded by these standards and specifications, the specifications for the preparation and construction of bituminous pavement shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division III, Surface Courses and Pavement

- Item 300 Asphalts, Oils, and Emulsions
- Item 301 Asphalt Antistripping Agents

Item 302	Aggregates for Surface Treatments
Item 303	Aggregates for Surface Treatments (Lightweight)
Item 305	Salvaging, Hauling, and Stockpiling Reclaimable Asphaltic Pavement
Item 310	Prime Coat
Item 314	Emulsified Asphalt Treatment
Item 315	Fog Seal
Item 316	Surface Treatments
Item 318	Hot Asphalt-Rubber Surface Treatments
Item 330	Limestone Rock Asphalt Pavement
Item 334	Hot Mix-Cold Laid Asphaltic Concrete Pavement
Item 340	Dense-Graded Hot-Mix Asphalt (Method)
Item 341	Dense-Graded Hot-Mix Asphalt (QC/QA)
Item 342	Permeable Friction Course (PFC)
Item 351	Flexible Pavement Structure Repair
Item 354	Planing and Texturing Pavement
Item 356	Fabric Underseal
Item 358	Asphaltic Concrete Surface Rehabilitation

2.08 Hydraulic Cement Concrete Pavement:

A. Description: This section regulates pavements composed of Hydraulic Cement concrete, constructed on a prepared subgrade in conformance with these standards and specifications, and in close conformance with the lines, grades, thickness, and typical cross-sections shown on the approved engineering plans, or as subsequently approved by the Public Works Director.

B. Materials:

(1) Concrete: In general, ready-mixed concrete meeting the requirements of ASTM Specification C94, "Specifications for ready-mixed concrete" shall have the following:

Cement	520 pound (5½ bag) minimum
Water/Cement Ratio	5.5 gallons per 94 lb. sack of cement
Air Content	6.5 % (±1.5 %) by volume

Fine Aggregate No less than 35% nor more than 45% of the total weight of the aggregate in each cubic yard.

Coarse Aggregate ¾ inch, 1 inch, or 1½ inch maximum, but not greater than 1/4 the depth of the slab.

Slump No less than 1¼ inches nor more than 3 inches for machine placed concrete. No less than 2 inches nor more than 4 inches for hand placed concrete.

Compressive Strength	7 day -- 3,000 psi minimum
	28 day -- 4,000 psi minimum

An admixture to produce the required rate of hardening at various temperatures may be required by the Public Works Director under the following circumstances:

Over 80 degrees F	Type D water-reducing admixture
Between 40 and 80 degrees F	Type A water-reducing admixture

Under 40 degrees F Additional cement and/or calcium chloride. Calcium Chloride, if used, shall not exceed one (1) percent by weight of the cement and shall meet the requirements of ASTM Specification D98.

(2) Steel: Tiebars, where used, shall be deformed and shall meet the requirements of ASTM Specifications A15 (billet steel) or A16 (rail steel), except that rail steel shall not be used for tiebars that are to be bent and re-straightened during construction.

(3) Joint Material: In general, preformed fillers or inserts shall meet the requirements of ASTM Specifications D1751 or D1752. Preformed fillers or inserts shall be of rectangular X-section and non-corrodible and shall be furnished in a single piece for the full length of each joint, unless otherwise approved by the Public Works Director.

(4) Curing Material: Material for curing concrete shall meet the requirements of the following specifications:

Liquid Membrane-Forming Compound	ASTM C309
Waterproof Paper	ASTM C171
Polyethylene Sheeting	ASTM C171
Burlap Cloth	AASHO M182
Cotton Mats	AASHO M73

C. Mixing and Hauling: Ready-mixed concrete shall meet the requirements of ASTM Specification C94, "Specifications for Ready-Mixed Concrete." The concrete plant shall have a current "Certificate of Conformance for Concrete Production Facilities," issued by the National Ready-Mixed Concrete Association.

D. Forming:

(1) Setting Forms: The subgrade or base under the forms shall be compacted and cut to grade so that the forms, when set, will be at the required elevation. Forms shall be of such cross-section and strength, and so secured, as to resist the pressure of the concrete when placed, and the impact and vibration of any equipment which they support, without springing or settlement. The method of connection between the sections shall be such that the joints shall not move in any direction. The maximum deviation of the top surface shall not exceed 1/8 inch in ten (10) feet, or the inside face not more than 1/4 inch in ten (10) feet from a straight line. The contractor shall check and correct alignment and grade elevations of the forms immediately before placing the concrete. When any form has been disturbed or any grade has become unstable, the form shall be re-set and re-checked. Forms shall be capable of being removed without excessive damage to the concrete pavement.

(2) Slipform Paving: As an alternative to using fixed forms, a slipform paver may be used, providing the surface of the pavement does not exceed the required tolerance. If any traffic is allowed to use the prepared subgrade or base, the subgrade or base shall be checked and corrected immediately ahead of placing the concrete.

E. Placing, Finishing, and Texturing:

(1) Placing: The concrete shall be deposited on the subgrade or base so as to require as little rehandling as possible. Necessary hand spreading shall be done with shovels, not rakes. Workmen shall not be allowed to walk in the plastic concrete with boots or shoes coated with earth or foreign substances. Placing shall be continuous between transverse joints without the use of intermediate bulkheads.

(2) Strike-Off, Consolidation, Finishing, and Texturing: The sequence of operations shall be the strike-off and consolidation, joint forming and floating, straight edging, and texturing.

(a) The pavement shall be struck off and consolidated with a mechanical finishing

machine, vibrating screed, or hand finishing methods when approved by the Public Works Director. A slipform paver may also be used.

(b) The concrete shall be adequately consolidated; however, vibrators shall not be operated longer than ten (10) seconds in any one location.

(c) After the pavement has been struck off and consolidated, and joints formed, it shall be scraped with a ten (10) foot long straight-edge having a handle to permit operation from the edge of the pavement. Any excess water and laitance shall be removed from the surface of the pavement. The straight-edge shall be operated at ninety (90) degrees to the transverse joints and shall be moved forward one-half of its length after each pass. Irregularities shall be corrected by adding or removing concrete. All disturbed places shall again be straight-edged. The use of wood floats shall be kept to a minimum; they may only be used in areas not accessible to finishing equipment and for compacting concrete in the vicinity of formed joints.

(d) In general, adding water to the surface of the concrete to assist in finishing operations shall not be permitted. If the Public Works Director should permit it, it shall be applied as a fog spray with approved spray equipment.

(e) A burlap bag or broom shall be used for texturing. If a burlap drag is used, it shall be at least three (3) feet wide, and long enough to cover the entire pavement width. It shall be kept clean and saturated while in use. It shall be laid on the pavement surface and dragged in the direction in which the pavement is being placed. If a broom is used, brooming shall generally be parallel to transverse joints if these are formed, and at ninety (90) degrees to the direction of paving if transverse joints are sawed.

(f) Before texturing is completed, and before the concrete has taken its initial set, the slab, curb, and formed joints shall be finished with an edger, as reflected on the approved engineering plans.

F. Curing: Concrete shall be cured by protecting it against loss of moisture, rapid temperature change, and mechanical injury for at least three (3) days after placement. White liquid membrane-forming compound, waterproof paper, white polyethylene sheeting, moist curing, or a combination of these, as reflected on the approved engineering plans, may be used.

(1) Generally, white liquid membrane-forming compound shall be used, and it shall be applied to the pavement surface immediately after the completion of the texturing operation. The compound shall also be applied to the pavement edges immediately after the forms have been removed. An application rate of one (1) gallon per two hundred (200) square feet shall be used.

(2) The compound shall be kept agitated to prevent the pigment from settling.

(3) The contractor shall have the equipment needed for adequate curing available before commencing concrete placement.

G. Pavement Protection: The contractor shall be responsible for concrete placed during rain or low temperatures. Any concrete damaged by rain or low temperatures shall be removed and replaced at the contractor's expense.

H. Joints: Contraction joints, expansion joints, and longitudinal joints shall be placed as indicated on the approved engineering plans. Transverse construction joints shall be used as required. Transverse joints shall extend continuously through the pavement and curb. Longitudinal joints are those joints parallel to the construction lane.

(1) Transverse Contraction Joints: Transverse contraction joints shall consist of weakened planes made by forming or sawing grooves in the surface of the pavement. They shall be equal to at least one fourth the depth of the slab.

(a) Formed transverse contraction joints shall be made by:

(i) Installing an approved insert in the plastic concrete. The insert shall be installed at ninety (90) degrees to, and within 1/8 inch of the pavement surface, or

(ii) Depressing an approved tool or device into the plastic concrete. The tool or device shall remain in place until the concrete has attained its initial set, and then shall be removed without disturbing the adjacent concrete.

(b) Sawed transverse contraction joints shall be made by sawing grooves having a 1/4 inch maximum width in the surface of the pavement. After each joint is sawed, the adjacent concrete surface shall be cleaned. Sawing of the joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling.

(c) All joints shall be sawed before uncontrolled shrinkage cracking occurs. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions. A standby saw shall be available in the event of a breakdown. The sawing of any joint shall be omitted if a crack occurs at or near the joint location before the time of sawing. In general, all joints shall be sawed in sequence. All contraction joints in lanes adjacent to previously constructed lanes shall be sawed before uncontrolled cracking occurs. If extreme conditions make it impractical to prevent erratic cracking by timely sawing, contraction joints shall be formed before initial set of the concrete as provided above.

(d) The length between transverse contraction joints shall not exceed fifteen (15) feet, and in no case shall be less than ten (10) feet. Transverse contraction joints shall be placed at every catch basin, inlet, or manhole in the line of pavement.

(2) Transverse Construction Joints: Transverse construction joints shall be used only when approved by the Public Works Director whenever the placing of concrete is suspended and initial set may occur.

(3) Expansion Joints: The preformed joint filler shall be held in a vertical position. An approved installing bar or other device shall be used to ensure proper grade and alignment during placing and finishing of the concrete. Finished joints shall not deviate in horizontal alignment more than one-quarter (1/4) inch from a straight line. If preformed joint fillers are assembled in sections, there shall be no off-sets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

(4) Longitudinal Hinge Joints: Longitudinal hinge joints shall consist of weakened planes made by forming or sawing grooves in the surface of pavement, equal to at least one-third of the depth of the slab.

(a) Formed longitudinal hinge joints shall be made in the same manner as formed transverse contraction joints (see Section 2.08(H)(1) above).

(b) Sawed longitudinal hinge joints having a 1/4 inch maximum width shall be made by sawing grooves after the concrete has hardened. In general, the joint shall be sawed before use by any construction traffic or before opening, if construction traffic does not use the pavement.

(c) Whenever the width between forms of pavement under construction is greater than thirteen and one-half (13.5) feet, longitudinal joints shall be constructed so as to divide the pavement into strips.

I. Testing:

(1) Air Testing: The air content shall be measured by the pressure method or by the volumetric method. One air content determination shall be made for each one hundred (100) cubic yards of concrete placed, or upon the direction of the Public Works Director, to ensure the required air content is obtained; however, in no case shall less than two (2) checks be made daily.

(2) Test Specimens: The contractor shall furnish the concrete necessary for casting test cylinders. An independent testing laboratory designated by the contractor and approved by the Public Works Director shall fabricate and test specimens. The results shall be reported to the Public Works Director.

(3) Pavement Thickness: Before final acceptance of the pavement, its thickness shall be determined by coring at intervals not less than one hundred (100) lineal feet in each pavement lane. The length of a core shall be determined to the nearest 0.1 inch in accordance with ASTM Specification C174.

(a) When the measurement of the core is deficient in thickness by more than 0.25 inch, but not more than 1.0 inch from the required thickness, two (2) additional cores will be taken from the area represented. The additional cores will be taken at a distance of twenty-five (25) feet from the original core to determine the affected area.

(b) If the measurement of any core is less than the specified thickness by more than 1.0 inch, the actual thickness of the pavement in this area will be determined by taking exploratory cores at ten (10) foot intervals parallel to the centerline in each direction from the affected location until a core is found which is not deficient by more than 1.0 inch. In determining the area deficient in thickness more than 1.0 inch, each exploratory core shall represent an area having a length of ten (10) feet and a width equal to the lane or average placement width.

(c) Pavement deficient in thickness more than 1.0 inch from the specified thickness shall be removed and replaced at the contractor's expense. Areas found to be deficient by more than 0.25 inch, but less than 1.0 inch shall be evaluated by the Public Works Director. If, in his judgment, the deficient areas warrant removal, they shall be removed and replaced with concrete of the thickness shown on the approved engineering plans at the contractor's expense.

(d) The cost of the coring will be borne by the contractor.

J. Surface Tolerance: The finished surface of the pavement shall be tested for smoothness by use of a ten (10) foot long straight-edge placed parallel to the centerline of the pavement in each wheel lane. Ordinates measured from the face of the straight-edge to the surface of the pavement shall at no place exceed 1/4 inch. Areas that do not meet the required surface accuracy shall be clearly marked out, and the contractor shall:

(1) Grind down any areas higher than 1/4 inch but not higher than 1/2 inch above the correct surface.

(2) Correct any areas lower than 1/4 inch, but not lower than 1/2 inch below the correct surface by grinding down the adjacent high areas.

(3) When the deviation exceeds 1/2 inch from the correct surface, the pavement slab shall be broken out and replaced for a length, width, and depth which will allow the formation of a new slab of the required quality in no way inferior to the adjacent undisturbed pavement.

K. Opening to Traffic: The Public Works Director shall decide when the pavement is to be opened to traffic. In general, the pavement shall not be opened to traffic, including construction traffic, but with the exception of sawing equipment, until seven (7) days after the placing of the concrete, or until the compressive strength of job-site cured six (6) inch by twelve (12) inch cylinders (ASTM Specification C31) averages three thousand (3,000) psi, whichever is longer.

L. Specification: Except as they may be otherwise superseded by these standards and specifications, the specifications for the preparation and construction of Hydraulic Cement concrete pavement shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and

Bridges (current edition):

Division III, Surface Courses and Pavement

Item	360	Concrete Pavement
Item	361	Full-Depth Repair of Concrete Pavement
Item	368	Concrete Pavement Terminals

Division IV, Structures

Item	420	Concrete Structures
Item	421	Hydraulic Cement Concrete
Item	440	Reinforcing Steel
Item	458	Waterproofing, Membranes for Structures

2.09 Pavement Markings, Street Signs, and Traffic Control Devices:

A. Description: This section regulates the application of pavement markings and the installation of street signs and traffic control devices as reflected on the approved engineering plans, or as subsequently identified by the Public Works Director.

B. Pavement Markings:

(1) Pavement markings shall be applied to the new road surface as shown on the approved engineering plans.

(2) The type, color, and location of pavement markings shall be in conformance with the Texas Manual on Uniform Traffic Control Devices (current edition).

(3) Pavement markings shall be applied in conformance with Division VI, "Lighting and Signage", Item 666, "Reflectorized Pavement Markings," of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition).

(4) Paints shall comply with the requirements for Type II Marking Materials as defined in Item 666, and shall include reflectorized glass traffic beads.

C. Street Signs:

(1) Reflectorized street signs bearing the name of the street and utilizing the existing City of South Padre Island street sign design, or as subsequently identified by the Public Works Director, shall be placed at all street intersections.

(2) The Public Works Director shall approve the location and inspect the installation of all street name signs in all subdivisions.

(3) The size, height, and type of sign shall conform to the City design and to TMUTCD Standards and approved by the Public Works Director.

(4) The City shall not issue any certificates of occupancy for any building on any street until the street name sign has been installed and approved.

(5) Street Names:

(a) A street which is, or is planned as, an extension of an existing street shall bear the same name.

(b) The name of a proposed street that is not in alignment with an existing street shall not duplicate the name of an existing or platted street. Names shall be sufficiently different in sound and in spelling from other existing street names so as to avoid confusion.

(c) All the names of proposed streets shall be submitted to the United States Postal Service for comment, and approved by the Public Works Director.

D. Traffic Control Devices:

(1) The contractor shall bear all expense for the purchase and installation of all traffic regulatory signs and signals required to be placed as required on the approved engineering plans, or as subsequently identified by the Public Works Director.

(2) The location and type of traffic regulatory signs and/or signals required shall be determined by the Public Works Director as part of the engineering plan approval.

(3) The specifications for traffic regulatory signs and signals shall be in accordance with the current edition of the Texas Manual on Uniform Traffic Control Devices (current edition), and the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division VI, Lighting and Signing

Item 636	Aluminum Signs
Item 643	Sign Identification Decals
Item 644	Small Roadside Sign Supports and Assemblies
Item 647	Large Roadside Sign Supports and Assemblies
Item 650	Overhead Sign Supports
Item 652	Highway Sign Lighting Fixtures
Item 654	Sign Walkways
Item 656	Foundations for Traffic Control Devices
Item 658	Delineator and Object Marker Assemblies
Item 680	Installation of Highway Traffic Signals
Item 681	Temporary Traffic Signals
Item 682	Vehicle and Pedestrian Signal Heads
Item 684	Traffic Signal Cables
Item 686	Traffic Signal Pole Assemblies (Steel)
Item 688	Pedestrian Detectors and Vehicle Loop Detectors

2.10 Finishing Shoulders, Ditches and Slopes:

A. Description: This section shall regulate the final shaping and dressing of shoulders, ditches, swales, and slopes by hand or machine methods, or both, to the required smoothness and in close conformance to the lines, grades, elevations, and cross-sections shown on the approved engineering plans, or as designated by the Public Works Director.

B. Construction Requirements:

(1) The minimum width of shoulders shall be in conformance with the requirements of Section 2.03(L) of these standards and specifications. The shoulder width shall be measured from the edge of the pavement to the point of intersection between the shoulder slope and the side slope.

(2) Unless otherwise provided, shoulders shall be constructed of earth or other approved material which contains no sod, weeds, sticks, roots, or other perishable matter.

(3) The inside edges shall be built up slightly above the finished surface of the adjoining pavement

or stone shoulder and compacted thoroughly with a roller weighing no less than five (5) tons and with the roller wheels slightly overlapping the stone shoulder. Rolling shall continue until there is no break between the pavement and shoulders, and until the required cross-section is obtained.

(4) In those areas where rolling is not practical, compaction shall be obtained with mechanical tamps, vibrators, or other means as may be approved by the Public Works Director.

(5) Ditches, swales, and other earthen drainage ways shall be finished to the lines and grades shown on the approved engineering plans, or as otherwise designated by the Public Works Director.

(6) All cut and fill slopes shall be constructed to the cross-sections shown on the approved engineering plans. Cut and fill slopes shall be finished to the degree ordinarily obtained by a blade grader, scraper, or hand shovel.

(7) Specification: Except as they may be otherwise superseded by these standards and specifications, the specifications for the final shaping and dressing of shoulders, ditches, swales, and slopes shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division I, Earth Work and Landscape

Item 110	Excavation
Item 112	Subgrade Widening
Item 132	Embankment
Item 134	Backfilling Pavement Edges
Item 150	Blading
Item 152	Road Grader Work
Item 154	Scraper Work
Item 156	Bulldozer Work
Item 158	Specialized Excavation Work
Item 160	Top Soil

2.11 Street Lights:

A. Description: This section shall regulate the provision of street lights, in all new or expanded developments. It shall be the responsibility of the contractor to install all street lighting required by the development as required by the approved engineering plans, or as subsequently required by the Public Works Director.

B. Street Lighting Plan Required: The contractor shall submit a street lighting plan to the Public Works Director for review and approval as an element of the overall engineering plan approval.

C. Street Lighting Plan Requirements:

(1) A street light shall be placed at every street intersection.

(2) A street light shall be placed at the apex of every curve in the street.

(3) A street light shall be placed every two hundred and fifty (250) lineal feet along the street.

(4) Wiring for the street lighting system shall be placed underground.

(5) The lighting from any luminaire shall be so shaded, shielded, or directed to prevent direct light from being cast upon any adjacent residential property, and to prevent glare or other objectionable problems to surrounding areas.

(6) The system shall not consist of individual street lights, but shall be composed of a reasonable number of complete circuits. Each circuit in the street lighting system will be equipped with a circuit breaker and a disconnect switch.

(7) The Public Works Director may vary these requirements as the demands of specific situations may dictate.

D. Specifications: Street lighting shall conform to the following standards and specifications:

(1) The "American National Standard Practice For Roadway Lighting" shall govern illumination standards.

(2) All electrical work shall conform to the "National Electrical Code."

(3) Except as they may be otherwise superseded by these standards and specifications, the installation of street lighting systems shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for construction of Highways, Streets, and Bridges (current edition):

Division IV, Structures

Item 416	Drilled Shaft Foundations
Item 421	Hydraulic Cement Concrete
Item 432	Riprap
Item 440	Reinforcing Steel
Item 441	Steel Structures
Item 442	Metal for Structures
Item 445	Galvanizing
Item 449	Anchor Bolts

Division VI, Lighting, Signing, Markings, and Signals

Item 610	Roadway Illumination Assemblies
Item 613	High Mast Illumination Poles
Item 614	High Mast Illumination Assemblies
Item 616	Performance Testing of Lighting Systems
Item 618	Conduit
Item 620	Electrical Conductors
Item 622	Duct Cable
Item 624	Ground Boxes
Item 625	Zinc-Coated Steel Wire Strand
Item 628	Electrical Services
Item 656	Foundations for Traffic Control Devices

2.12 Curbs and Gutters:

A. Description: This section shall regulate the installation of Hydraulic Cement concrete curbs and gutters as required by the approved engineering plans, or as subsequently required by the Public Works Director.

B. Location: Hydraulic Cement concrete curbs and gutter shall be provided along both sides of all streets.

C. Dimensions: Curbs shall be five and three-fourths (5 3/4) inch, Ty II Curb (monolithic), Ty II curb or Ty II Curb and Gutter as shown on the plans. Curbs and gutters shall conform to the typical

cross-sections as shown on TxDOT Standard CCCG-12 in Article 8, "Standard Plans."

- D. Materials: The quality of the material in the design of the concrete mixture for curbs and gutters shall conform to that of rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."
- E. Joints: Joint construction shall be in accordance with Section 2.08, "Hydraulic Cement Concrete Pavement." Joints not covered by these standards and specifications shall be constructed as directed by the Public Works Director. Joints in curbs and gutters shall be sealed for the full width of the section.
- F. Curing: The curing for concrete curb and gutter sections shall conform to that of a rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."
- G. Weather Limitations: The weather limitations effecting concrete curb and gutter sections shall be the same as that of a rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."
- H. Subgrade: The preparation of the subgrade for concrete curb and gutter sections shall conform to that of a rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."
- I. Other Specifications: Except as they may be otherwise superseded by these standards and specifications, the installation of concrete curbs and gutters shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division III, Surface Courses and Pavement

Item 360 Concrete Pavement

Division IV, Structures

Item 420 Concrete Structures

Item 421 Hydraulic Cement Concrete

Item 427 Surface Finishes for Concrete

Item 438 Cleaning and/or Sealing Joints and Cracks (Rigid Pavement and Bridge Decks)

Item 440 Reinforcing Steel

Item 458 Waterproofing, Membranes for Structures

Division V, Miscellaneous Construction

Item 529 Concrete Curb, Gutter, and Combined Curb and Gutter

2.13 Sidewalks:

- A. Description: This section shall regulate the installation of Hydraulic Cement concrete sidewalks, as required by the approved engineering plans or as subsequently required by the Public Works Director.
- B. Preliminary Considerations: In grading the entire right-of-way, provisions shall be made for the location of sidewalks on each side of the street, one (1) foot from the front lot line. A proper grade shall be provided by the contractor according to the standards and cross-sections reflected on the approved engineering plans.
- C. Sidewalk Specifications:

(1) Sidewalks shall be a minimum of five (5) feet wide in residential areas and eight (8) feet wide in business areas or areas with heavy pedestrian traffic as determined by the Public Works Director, and shall be constructed of Hydraulic Cement concrete conforming to the same specification as rigid pavement as required by Section 2.08, "Hydraulic Cement Concrete Pavement."

(2) Sidewalks shall be constructed in one course, four (4) inches thick. The grade of the new sidewalk shall be in conformity with the grade established in the approved engineering plans, and shall have a slope two (2) percent toward the center of the street. Sidewalks shall have a longitudinal slope no greater than one (1) inch per foot.

(3) The subgrade of sidewalks shall be constructed to the required depth below the finished surface in accordance with the approved engineering plans, and shall be compacted to a smooth, firm surface. All soft and spongy places not affording a suitable subgrade shall be removed and replaced with granular backfill and compacted.

(4) The forms for sidewalks shall be of metal or wood, straight and free of warp, and of sufficient strength to resist springing during the process of depositing concrete against them. The forms shall be the full depth of the sidewalk and shall be securely staked, braced, and held firmly at the required line and grade. All forms shall be thoroughly cleaned and oiled before concrete is placed against them. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

(5) Transverse joints shall be made at an interval of five (5) feet and only with a proper joint cutting tool or metal division plates. Expansion joints shall be placed at intervals not to exceed twenty-five feet. Expansion and isolation joints filler (asphalt impregnated type) shall be preformed, resilient, non-extruding, asphalt impregnated cane fiber joint filler conforming to ASTM C175-73. Joint sealer shall be either a hot-poured or cold applied type rubber joint sealer. A polyethylene tape bond breaker shall be used with all cold-applied sealers.

(6) Where driveways cross the sidewalk, they shall be constructed of concrete, six (6) inches thick, of the same finish and material as specified for the sidewalk, and at the same grade approved for the sidewalk. They must be designed either concave or flat, as approved by the Public Works Director.

(7) Sidewalks which abut streets shall be ramped with a nonslip surface so that street and sidewalk intersections merge to a common elevation enabling persons in wheelchairs to travel freely. Pedestrian ramps shall conform to TxDOT standard PED-12A as shown in Article 8, "Standard Plans".

(8) Finishing: The surface of the sidewalk shall be finished with a wooden float. No plastering of the surface shall be permitted. All outside edges of the sidewalk and all joints shall be edged with a one-quarter inch radius edging tool.

(9) Curing: The curing for concrete sidewalks shall conform to that of a rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."

(10) Testing and Surface Tolerance: The testing and surface tolerance for concrete sidewalks shall conform to that of a rigid pavement as specified in Section 2.08, "Hydraulic Cement Concrete Pavement."

(11) All sidewalks must comply with the Texas Accessibility Standards (TAS) regulations pertaining to sidewalks.

D. Conformance with Existing Sidewalks: In the continuation of an already constructed sidewalk, if the existing sidewalk is larger than five (5) feet wide, the new sidewalk shall conform to the existing sidewalk's width. If the existing sidewalk is less than five (5) feet wide, the new sidewalk shall be no smaller than five (5) feet wide. If the sidewalk under construction is in a gap between

two already constructed sidewalks in the same block, the new sidewalk shall be constructed according to the width of the wider of the two existing sidewalks.

- E. Clearing of Sand, Debris and Weeds Required: The occupant of occupied premises or the owner of unoccupied premises situated within the City is required to keep the sidewalks in front of or adjacent to such premises free from sand, debris and weeds. In case any sand, debris and/or weeds accumulates on any sidewalk and has not been removed by the occupant or owner within ten days (10) days from the time the material accumulates, then in either such case, the occupant or owner shall be deemed to be in violation of the provisions of this section.
- F. Other Specifications: Except as they may be otherwise superseded by these standards and specifications, the installation of concrete sidewalks and curb and gutter shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division III, Surface Courses and Pavement

Item 360 Concrete Pavement

Division IV, Structures

Item 420 Concrete Structures
Item 421 Hydraulic Cement Concrete
Item 427 Surface Finishes for Concrete
Item 438 Cleaning and/or Sealing Joints and Cracks (Rigid Pavement and Bridge Decks)
Item 440 Reinforcing Steel
Item 458 Waterproofing, Membranes for Structures

Division V, Miscellaneous Construction

Item 531 Sidewalks

- G. Alternate Construction Materials: This specification covers the use of Hydraulic Cement Concrete Sidewalks. If a developer wishes to utilize a construction material not covered by these specifications, they must first obtain approval of the Public Works Director.

When requesting approval for an alternate material, engineering test data, adequate to allow a complete evaluation of the proposed material, must be provided. Comparisons on the cost of maintenance, durability, and design life may also be required before approval is given.

2.14 Driveways, Alleys, Entrances and Approaches:

- A. Description: This section shall regulate the installation of driveways, alleys, entrances, and approaches, as reflected on the approved engineering plans, building permit applications, or as directed by the Public Works Director.
- B. Residential Driveway Dimensions:

(1) Depths: Residential driveways shall be constructed as shown to meet or exceed the following depths:

- (a) Five (5) inches of reinforced Hydraulic concrete cement.
Minimum strength - 3000 psi
#3 reinforcing steel – 18" c-c
Four (4) inches of sand cushion

Director. (b) Or other hard surface construction (i.e. brick pavers) as approved by the Public Works

(c) City Right-of-Way Permit required before construction of each driveway.

(2) Widths:

(a) One and Two Family Residential:

Minimum - Ten (10) feet

Maximum - Thirty (30) feet.

(b) Three Family Residential and Above:

Minimum – Twenty-four (24) feet

Maximum - Twenty-four (24) feet.

(3) The dimensions and geometrics of that portion of a driveway within the street right-of-way shall conform to the standard shown in Article 8, "Standard Plans."

C. Alleys and Nonresidential Driveway Dimensions:

(1) Depths: Cross-section depths of alleys and / or nonresidential driveways and widening lanes are dependent upon the existing road cross-section, the speed limit, and the nature of the land use served by the entrance. The limits of these depths are as follows:

(a) Six (6) inches of reinforced hydraulic cement concrete. Minimum Strength - 3000 psi,
No. 3 reinforcing steel – 12" c-c or as approved by the Public Works Director,

Six (6) inches of sand cushion or
Compacted and Stable Subgrade

Director. (b) Or other hard surface construction (i.e. brick pavers) as approved by the Public Works

(2) Width: Alleys and / or nonresidential driveways shall be constructed to no more than a thirty-six (36) foot width unless otherwise approved by the Public Works Director.

(3) The dimensions and geometrics of that portion of a driveway within the street right-of-way shall conform to the standard shown in Article 8, "Standard Plans."

D. Relationship to Sidewalks: Where driveways cross the sidewalk, they shall be constructed of concrete, six (6) inches thick, of the same finish and material as specified for the sidewalk, and at the same two (2) percent grade approved for the sidewalk. All sidewalks within driveways must comply with the Texas Accessibility Standards (TAS) regulations pertaining to sidewalks and pedestrian walkways.

E. General Requirements: For residential and nonresidential driveways, the subgrade, materials, design requirements and other requirements shall conform to the requirements for the applicable rigid pavement of these standards and specifications.

F. Culverts: Culverts under all driveway entrances and/or approaches shall be constructed and installed whenever necessary to provide adequate drainage in accordance with the approved engineering plans, building permit, or as directed by the Public Works Director. The minimum size culvert shall be a reinforced Hydraulic Cement concrete pipe (RCP), twelve (12) inches in diameter, and.

G. Drainage: Driveways and Entrance approaches shall not be constructed in a manner which will

negatively impact lateral drainage or drainage structures.

- H. Other Specifications: Except as they may be otherwise superseded by these standards and specifications, the installation of driveways, entrances, and approaches shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division V, Miscellaneous Construction

Item 530 Intersections, Driveways, and Turnouts

2.15 Bridges:

- A. Description: This section shall regulate the construction of bridges or other structures having a clear span of twenty (20) feet or greater, as reflected upon the approved engineering plans.
- B. Plans Reviewed Separately: Plans for bridges and other structures having a clear span of twenty (20) feet or more shall be reviewed separately from the street plans. Construction may be separate or combined with the adjacent street at the discretion of the contractor.
- C. Design Criteria: The plans shall be designed to meet the criteria set forth in the AASHTO "Standard Specifications for Highway Bridges" in effect at the time of the design, and shall be designed for HS-20 loading.
- D. Approval by Other Agencies: Prior to review of the plans by the Public Works Director, copies of the acceptance of the waterway opening by the various other governmental agencies having jurisdiction over stream crossings at the time of the design shall be submitted along with the plans.
- E. Delay in Construction: In the event that construction of the bridge is not initiated within one (1) year after approval of the final engineering plans, such plans shall be re-submitted to the Public Works Director for re-review, and certain design features may be required to be changed due to changes in design criteria.
- F. Other Specifications: Except as they may be otherwise superseded by these standards and specifications, the construction of bridges and other structures shall conform to the requirements of the following sub-sections of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition):

Division IV, Structures

All Items

2.16 Backfill and Compaction:

- A. All Backfill and Compaction shall comply with appropriate Sections/Divisions of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets and Bridges (current edition).

2.17 Pavement Restoration:

- A. Pavement restoration shall be designed by a Licensed Engineer in the State of Texas and as approved by the Public Works Director. All work shall be performed within the accordance of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets and Bridges (current edition).

2.18 Parking Lots:

A. Description: This section shall regulate the construction of parking areas, as reflected upon the approved engineering plans. The following are recommended minimum standards for parking lots.

B. Classification System:

(1) Drives and Service Areas: These areas are the drives through the parking lot. The service areas are the delivery or loading dock for receiving merchandise and any travel service utilized by the solid waste collection equipment.

(2) Parking Only: These areas are self-explanatory and are to be striped.

C. Specifications:

(1) Pavement Depth:

(a) Rigid-Type Pavement (Hydraulic Cement Concrete)

	<u>Drives & Service Areas</u>	<u>Parking Only</u>
Uniform Design Thickness	6"	5"

(b) Flexible-Type Pavement

	<u>Drives & Service Areas</u>	<u>Parking Only</u>
Asphaltic Surface Course	3"	2"
Aggregate Base	10"	8"

(c) Or other hard surface construction (i.e. brick pavers) as approved by the Public Works Director.

(2) Striping: Open parking areas shall be delineated by pavement striping and must meet the requirements listed below:

(a) Dimensions: All head-in parking spaces must provide a non-restricted area with the minimum dimensions of Nine (9) feet by Eighteen (18) feet or parallel parking spaces of Nine (9) feet by Twenty (20) feet. No tandem parking shall be allowed except as allowed under the City of South Padre Island Zoning Regulations. Parking space and travelway dimensions shall follow dimensions listed under Article 8, Standard Plans.

(b) Handicapped Parking: All parking areas shall comply with the Texas Accessibility Standards (TAS).

(3) Access Near Street Corners: All driveways located on corner lots shall be placed adjacent to the interior, or side, property line, the furthest distance attainable from the street corner.

(4) Exterior Lighting: The following standards are required of all exterior lighting:

(a) Lighting fixtures, whether mounted upon a building or independently upon a pole, light standard, or other structure, shall not exceed twenty-four (24) feet in height.

(b) All luminaires (the complete lighting unit, consisting of the lighting source and all necessary mechanical, electrical, and decorative parts) shall be a "cut-off type" luminaire (a luminaire with elements such as shields, reflectors, or refractor panels which direct and cut-off the emitted light at a specific cut-off angle). All luminaries shall have a cut-off angle of ninety (90) degrees or less.

(c) The lighting from any luminaire shall be so shaded, shielded, or directed to prevent

direct light from being cast upon any adjacent residential property, and to prevent glare or other objectionable problems to surrounding areas.

(d) Neither the direct nor reflected light from any luminaire shall fall upon any adjacent public street.

(e) No exterior light shall have any blinking, flashing, or fluttering light or other illuminating device which has a changing light intensity or brightness of color. Lighting that reduces in intensity for long periods during off peak hours will be allowed.

(f) Prior to any exterior lighting being installed or substantially modified, an exterior lighting plan shall be submitted to the Public Works Director to determine if the requirements of this Section have been met.

(5) Drainage: All off-street parking areas shall be drained so as to prevent drainage to abutting properties. The manner of site drainage proposed shall conform to the requirements of Article 5, "Storm Water Drainage," and shall be submitted to the Public Works Director for review and approval.

2.19 Valley Gutters:

A. Description: This section shall regulate the installation and use of valley gutters, as reflected upon the approved engineering plans, or subsequently approved by the Public Works Director.

B. Dimensions and Grades: Valley gutters shall generally follow the pattern indicated by the typical details shown in Article 8, "Standard Plans," with actual plans, dimensions, and grades for specific crossings being shown on the submitted engineering plans.

C. Materials and Design: Valley gutters shall be constructed of:

(1) Hydraulic Cement concrete (rigid pavement as per Section 2.08 of these specifications) when the adjacent regular street sections are of similar paving material.

(2) Hydraulic Cement concrete (rigid pavement as per Section 2.08 of these specifications) when the adjacent regular street sections are of hot asphaltic concrete.

(3) Full depth hot asphaltic concrete (as per Section 2.07 of these specifications) for a width not less than four (4) feet each side of the gutter thread line when the adjacent regular street sections are paved of hot asphaltic concrete.

D. Joints: No joint parallel to the thread line of a valley gutter shall be less than four (4) feet from said thread line. The joints lateral to valley gutter sections should be of an approved type which, based upon the Public Works Director approval, have the least potential for allowing surface run-off to infiltrate along the joint into the pavement or subgrade.

E. Subgrade: Subgrade shall conform generally to the provisions of Section 2.05 of these specifications excepting, however, the subgrade under a valley gutter must be "hand-shaped" in order to control a full and uniform paving thickness in relation to that of the adjacent regular street sections.

2.20 Traffic Impact Report:

A. Description: This section regulates the preparation of traffic impact reports where required by the Public Works Director in the case of development anticipated to have a significant impact on transportation. The Transportation Impact Report (TIR) is designed to identify the transportation (traffic) impacts and problems which are likely to be generated by a proposed use and/or

development, to identify all improvements required to insure safe ingress to and egress from a proposed use and/or development, to promote the maintenance of adequate street capacity, and the elimination of hazardous conditions.

B. Applicability: A TIR may be required in the following cases:

(1) Any development which proposes to take direct access to any collector or arterial road.

(2) Any residential development that proposes to have more than twenty (20) dwelling units.

(3) Any use which, according to the Table of Average Trip Generation Rate by Land Use Category, or according to any qualified traffic engineer, will generate in excess of either two hundred and fifty (250) trips per acre per day, or one hundred (100) trips per day.

C. Contents of the TIR

(1) General Site Description: A detailed description of the roadway network within one (1) mile of the site, a description of the proposed land use(s), the anticipated stages of construction, and the anticipated completion date of the proposed land development shall be provided. This description, which may be in the form of a map, shall also include the following items:

(a) All intersections.

(b) All proposed and existing ingress and egress locations.

(c) All existing roadway widths and right-of-ways.

(d) All existing traffic signals and traffic control devices.

(e) All existing and proposed public transportation services and facilities within a one (1) mile radius of the site.

(2) Description of Existing Traffic Conditions: A twenty-four (24) hour traffic count shall be conducted for a period of seven (7) days (Monday-Sunday) on all roadways which have direct access to the proposed development site for developments on roadways classified as arterials or collectors. The existing average daily traffic volume and the highest peak hour volume for any hour between 3:00 p.m. and 6:00 p.m. shall be recorded. These traffic volumes shall be averaged to determine the average hourly peak traffic volumes for the seven (7) day period. For streets classified as primarily residential, traffic conditions will be monitored on seven consecutive average traffic days. For purposes of data collection, these include Tuesday, Wednesday and Thursday excluding all days in March, Independence Day, New Year's Eve, New Year's Day, and Thanksgiving Day for residential streets only.

(3) Transportation Impact of the Development: The average daily trip generation rates (trip ends) and the highest average hourly trip generation rate between 3:00 p.m. and 6:00 p.m., for the proposed use shall be determined from the Table of Average Trip Generation Rate by Land Use Category, or from figures provided by a qualified traffic engineer. A report shall be made detailing the nature and extent of the trip generation expected to result from the proposed land use and/or development.

(4) Determination of Roadway Service Level:

(a) Calculate Service Volumes: Roadway service volumes shall be calculated at Level of Service "C" for roads identified as arterials and at Level of Service "D" for roads identified as collectors. Critical elements to be considered in this calculation are: lane width, number of lanes, restricted lateral clearance, and the service/volume capacity ratio, percentage of site passing distance greater than one thousand five hundred (1,500) feet, percentage of trucks, grade, and operating and average roadway speeds. Data and procedures contained in the Highway Capacity Manual, Special Report 87, published

by the Highway Research Board, shall be utilized in deriving data required by the TIR. Service volume for the given level of service will be computed directly from capacity under ideal conditions using the adjustment factors for level of service and the critical elements listed above. The specific tables to be used vary, depending upon whether the roadway being analyzed is a multi-lane or a two-lane roadway.

(b) Calculate Whether the Roadway is Currently Operating at the Required Level of Service: The roadway is considered to be operating at or above level of service "C" if the service volume computed in subsection (a) is greater than the hourly peak volume for the period between 3:00 p.m., and 6:00 p.m. All arterial roadways operating below level of service "C" shall be identified as congested locations.

(5) Determination of Intersection Service Level:

(a) Calculation of the Intersection Capacity Levels of Service "C:" A load factor analysis is an indicator of the level of service at which an intersection is functioning. The calculation required by this section will identify intersections that are presently operating above capacity for levels of service "C" and "D." A load factor analysis shall be conducted for a period of seven (7) continuous days on all intersections within one-half (0.5) miles of the proposed site. The highest average hourly load factor between 3:00 p.m., and 6:00 p.m., shall also be recorded. A maximum load factor of three-tenths (0.3) will be allowed for intersections involving two (2) arterials or and arterial and one (1) collector roadway. All such intersections with a load factor greater than three-tenths (0.3) are operating below level of service "C" and shall be identified as congested locations. A maximum load factor of seven-tenths (0.7) will be allowed for intersections involving two (2) collector roads. All such intersections with a load factor greater than seven-tenths (0.7) are operating below level of service "D" and shall be identified as congested locations. This load factor will represent the highest average for the seven (7) day period.

(b) Determine the Capacity of Intersections Within One-Half Mile of the Proposed Site at Levels of Service "C" and "D:" For intersections which currently are operating with a load factor below three-tenths (0.3) during the peak afternoon period, the intersection capacity for level of service "C" shall be determined. For intersections currently operating with a load factor below seven-tenths (0.7) during the peak afternoon period, the intersection capacity for level of service "D" shall be determined. This calculation will require that a traffic count be conducted for a seven (7) day period at all affected intersections. Peak volume between 3:00 p.m., and 6:00 p.m., shall also be recorded. The traffic count shall determine (1) the percentage of right-hand turns, (2) the percentage of left-hand turns, (3) the percentage of trucks, and (4) the peak hour factor. In addition to the traffic survey, an analysis of the intersection shall be undertaken. This analysis will determine the current width of the intersection and the "green time" to cycle time ratio (G/C ratio). The calculation for determining the capacity at level of service "C" and "D" will involve the following assumptions: (1) load factor = 0.3 (for level of service "C") or 0.9 (for level of service "D"), (2) metropolitan area over one million (1,000,000) population, (3) outlying business and residential area, (4) no parking, and (5) no bus stops.

(6) Analysis of Transportation Impact: The projected total future peak hour traffic demand shall be calculated for all roads fronting on the proposed site and all intersections within one-half (0.5) mile of the site. This demand shall consist of an assumed normal increase in traffic volume of one (1) percent per year (unless traffic engineering studies indicate a different rate of increase) and the anticipated traffic that will be generated by the proposed development. An analysis shall be undertaken to determine if roadways and intersections will operate at the appropriate level of service following completion of the development given the future peak hour traffic that will be generated by the proposed development. This analysis shall consist of the comparison of the total peak hour intersection and roadway traffic demand with the service volumes for levels "C" and "D" computed in subsection (3) above. All roadways and intersections that would operate below the required level of service following completion of the development shall be considered deficient.

(7) Maintenance of Levels of Service "C" and "D:" Whenever the level of service is determined to be below level "C" in the case of arterials, or below Level "D" in the case of collectors, development shall not be permitted unless the developer makes the roadway or other improvements necessary to maintain a

level of service "C" or "D," respectively.

(8) Traffic Control Devices: Whenever, as a result of the additional traffic generated, it is determined that a traffic signal or regulatory signage is needed, the developer shall be responsible for installing all such devices and signs.

(9) Large Developments (over 250 vehicle trips generated per one hour period):

(a) The impact report for developments which will generate between 250 and 1,000 trips per peak hour shall involve an analysis of all arterial and collector roadways and all intersections within one (1) mile of the site.

(b) The impact report for developments which will generate over 1,000 trips during the peak hour shall involve analysis of all arterial and collector roadways and all intersections within three (3) miles of the proposed site.

2.21 Access for Fire Vehicles and Apparatus:

A. Description: The purpose of this section is to facilitate rapid and effective extinguishment of fires by ensuring that all premises that a fire department may be called upon to protect in case of fire shall be readily accessible for effective fire department operations.

B. Access Provided: Every non-residential use permitted by the Zoning Ordinance shall provide for fire vehicles and emergency apparatus from a public street as follows:

(1) A dead-end access exceeding three hundred (300) feet in length shall be provided with a turnaround of sixty (60) feet in diameter at the closed end.

(2) Except as provided by this section, a fire lane shall be provided to permit access to any portion of any structure which is more than:

(a) One hundred fifty (150) feet from the nearest street right-of-way, when the structure is thirty (30) feet in height or less.

(b) Fifty (50) feet from the nearest street right-of-way when the structure exceeds thirty (30) feet in height.

(3) When fire vehicles and apparatus are provided access to any portion of a structure more than the distances from a street right-of-way specified in Subsection (2) above, by the means of a buffer yard or adjoining property, the requirements of Subsection (2) shall not apply.

(4) In addition to the situations above which require a fire lane, a fire lane to provide access to any portion of the building may also be required if the Fire Chief determines that the distance of a structure from the nearest hydrant, the configuration of the structures on a site, or other special characteristics of the site otherwise inhibit rapid, effective fire extinguishment.

(5) The Fire Chief may determine that public health and safety require fire lanes, in addition to private fire protection facilities required by the City Building Code, for any structure classified by the Building Code as a high hazard use; any structure to be occupied by uses which involve extreme risks of fire, smoke, explosion, or toxic gas; or, structures to be used as places of assembly for large congregations of people susceptible to panic.

C. Fire Lane Standards: Fire lanes shall comply with the following standards:

(1) The fire lane shall provide clear, unobstructed access for vehicles and apparatus at all times.

(2) Signs prohibiting parking or standing of motor vehicles shall be required.

(3) Fire lanes shall be eighteen (18) feet in width.

(4) The fire lane shall be an all-weather roadway of asphaltic cement or Hydraulic cement concrete surface.

(5) An alley may contribute all or part of a required fire lane if it meets all other requirements of this section.

2.22 Clear View of Intersecting Streets:

- A. Sight Triangle Required: In order to provide a clear view of intersecting streets to motorists, there shall be a triangular area of clear vision formed by the two intersecting streets. The size of the triangular area is a function of traffic volume and speed.
- B. Sight Triangle to Remain Clear: On any portion of a lot that lies within the triangular area described and illustrated below, nothing shall be erected, placed, planted, or allowed to grow in such a manner as to materially impede vision between a height of thirty (30) inches above walk grade to a height of six (6) feet above walk grade.
- C. Specification: The triangular area shall be formed by a point on each street right-of-way line located twenty-five (25), fifty (50), or one hundred (100) feet from the intersection of the street right-of-way lines, as indicated below, and a third line connecting the two points.

<u>Road Classification</u>	<u>Sight Distance from Intersection of Street Right-of-Way Lines</u>
Access Drive	50
Cul-de-Sacs	50
Local Streets	50
Arterial and Collector Streets	100

2.23 Locations and Depths for Utilities within the Limits of the Public Right-of-Way.

The following are suggested locations for underground utilities. Final locations must be approved by the Public Works Director. No utilities are to be placed under the Roadway.

Utilities not listed below shall be placed as approved by the Public Works Director.

The developer has the option of providing utility easements outside of the minimum Right of Way requirements for the placement of utilities.

A. Water or Telephone Utilities:

(1) Water utility will be constructed on the south or west side of the right-of-way, twenty one (21) feet from the road centerline.

(a) Ten (10) inch and smaller water mains will have a minimum cover of Two (2) feet.

(b) Twelve (12) inch and larger water mains will have a minimum cover of Three (3) feet.

(c) House or building water service lines will have a minimum cover of Two (2) feet.

(2) Telephone and signal utilities will be constructed on the south or west side of the right-of-way, seventeen (17) feet from the road centerline.

(a) The duct line or cable will have a minimum cover of twenty-four (24) inches, and depths of a conduit ranging from four (4) to seven (7) feet.

(b) Direct buried distribution cables will have a maximum cover of thirty (30) inches.

(c) House or building service drops will have a minimum cover of twenty-four (24) inches.

B. Electric Utilities or utility pole:

Electric Utilities will be constructed on the south or west right-of-way, one (1) foot off the property line, towards the centerline of the road.

(1) The duct line or cable will have a minimum cover of thirty (30) inches, and depths of a conduit ranging from five and one-half (5.5) to seven (7) feet.

(2) Direct buried primary cables will have a minimum cover of thirty-six (36) inches, and secondary cables with a minimum cover of thirty (30) inches.

(3) House or building service drops shall have a minimum cover of twenty-four (24) inches.

C. Storm Water Drainage Facilities: Storm sewer installations will be constructed on the north or east side of the right-of-way, from the road centerline.

D. Sanitary Sewer Facilities:

Sanitary sewer facilities will be constructed on the north or east side, twenty three (23) feet from road centerline.

(1) If installed in an alley or easement, the centerline of the trench shall be the centerline of the alley or easement.

(2) House or building sewer taps will have a minimum cover of four (4) feet at the property line.

E. Utility Agency Approval:

(1) All plans and specifications pertaining to the construction of any utility infrastructure must have written approval and authorization for construction from the appropriate utility agency and by the Public Works Director prior to construction.

ARTICLE 3

THE WATER DISTRIBUTION SYSTEM

3.01 Mandatory Connection: A direct connection shall be made to the public water system not later than sixty (60) days after a public water line shall be considered available to the property. A public water line shall be considered available to the property if it is located within one hundred and fifty (150) feet of the property line of the property to be connected to the waterline.

3.02 Private Water Sources: The construction and maintenance of any private water supply within the jurisdiction of the City is hereby prohibited.

3.03 Application Required:

A. No pipe or water main of any kind shall be installed within any right-of-way or easement of the City, or connected with the water system without the prior approval of the Public Works Director. All such work shall have the written permission of the Public Works Director before being installed

and put into use.

- B. Applications for new or extended water mains shall be made in writing to the Public Works Director and shall be accompanied by the required number of copies of the proposed engineering plans.
- C. All applications for new or extended water mains shall be in writing and shall be accompanied by a drawing showing the water main or extension, and the location of the proposed work.

3.04 Specifications and Design, Approval by Other Agencies:

- A. Except as they may be otherwise superseded by these standards and specifications, the design and specifications for size, slope, alignment, materials of construction, and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling of the trench for water mains, lines, connections, and other installations shall conform to the requirements of the Laguna Madre Water District.
- B. Copies of the proposed engineering plans shall be submitted to the Laguna Madre Water District for their review and approval. Submission of these plans may occur prior to, or concurrently with, submission of the plans to the Public Works Director.
- C. The Public Works Director shall not grant final approval to any submitted engineering plans until each reviewing agency has completed its review and approval of the plans, and notated such in writing.

3.05 Fire Protection Lines and Hydrants:

- A. Detector Check Valve: All water mains laid on private property for the sole purpose of providing fire protection through fire hydrants or sprinkler systems, shall be provided with a detector check valve with a bypass compound meter, sized as approved by the Public Works Director. The detector check valve and meter shall be housed in an underground vault, with the size and design approved by the Public Works Director. All costs for furnishing and installing the detector check valve and bypass meter, complete with approved vault shall be borne by the developer and/or contractor. The detector check valve will be checked periodically by the City and the meter will be read at the same time other meters are read.
- B. Usage Reports: The property owner shall promptly report to the City any fires that occur requiring water usage through the fire protection line, and the City will reset the detector valve. In the event that routine checks of the detector valve show that the valve is open, and no fire has been reported, the property-owner shall be subject to the penalties contained in Chapter 21 of the City's Code of Ordinances.
- C. Fire Hydrants: Fire hydrants shall be operated by authorized fire protection personnel. Operation of City fire hydrant by an unauthorized person shall be subject to the penalties contained in Chapter 21 of the City's Code of Ordinances. Water may be obtained from the City hydrants upon written permission from the Public Works Director, subject to the following conditions:

(1) Written requests for usage shall be filed with the Public Works Director at least twenty-four (24) hours in advance of the proposed usage. The request shall state the time usage is to begin and end, the location of the fire hydrant to be used, and the intended purpose of the water to be supplied. The Public Works Director may deny the request for any reason he believes necessary to protect the interest of the City.

(2) Fire hydrant operation shall be done only by authorized City personnel.

(3) A water meter sized for attachment to the fire hydrant shall be secured from Laguna Madre Water District. The applicant shall be solely responsible for any deposits required by the Water District, as well as any subsequent payments required by the Water District for the water used.

(4) The applicant shall provide suitable hoses as required to avoid any possible damage to the public or private property. The applicant shall be responsible for any damages done to public or private property and to the fire hydrant.

(5) Use of water from fire hydrants shall be limited to the hours of 8:30 a.m., to 4:30 p.m., Monday through Friday, excluding legal City holidays, unless otherwise specifically approved by the Public Works Director.

D. Requirements for Backflow Preventer: Any water user who uses, or proposes to use, any chemical or other foreign additive to his water supply shall, at his own expense, install a backflow preventer on the City, or "supply" side of the location where the chemical, or other additive, is included in the water supply. The backflow preventer shall operate on the reduced pressure principle and operate completely automatically. The backflow preventer location and installation shall be approved by the Public Works Director.

E. Maintenance: Any break in a service lateral located on privately owned property shall be promptly repaired at the expense of the property-owner(s).

3.06 Pipe Material and Testing:

A. Description: This section regulates the materials specifications and testing for water mains as shown on the approved engineering plans, or as subsequently approved by the Public Works Director.

B. Poly-Vinyl Chloride (PVC) Pipe: Poly-vinyl Chloride pipe shall conform to the requirements of ASTM D2241. The material used to produce the pipe shall conform to ASTM D1784, Type 1, Grade 1, two thousand (2,000) pounds per square inch design stress. The standard dimensional ratio shall be SDR 21, and the pipe shall be rated for 200 pounds per square inch working pressure.

C. Pipe Joints: All PVC joints shall be of the slip joint type, in accordance with AWWA C111, standard for rubber gaskets.

D. Testing and Disinfection:

(1) Generally: Before water mains shall be accepted and put into service, they shall be properly pressure tested, sterilized, and flushed in accordance with the requirements of this Article, and to the satisfaction of the Public Works Director. Bacteriological tests shall be made by the contractor and must meet State of Texas Standards as evidenced by test results furnished to the City. All hydrostatic testing and disinfection shall be performed by the contractor under the observation of the Public Works Director, or his designee.

(2) Hydrostatic Tests:

(a) Time for Making Test of Jointed Pipe: Jointed pipe may be subjected to hydrostatic pressure, inspected, and tested for leakage following completion of backfill and after adequate curing time has been allowed, if reaction blocking is used. The specific time for conducting the test shall be arranged with the Public Works Director.

(b) Pressure During Test: After the pipe has been laid and backfilled as specified, all newly laid pipe, or any valved section of it, shall, unless otherwise specified, be subjected to hydrostatic

pressure of one hundred twenty-five (125) pounds per square inch.

(c) Duration of the Pressure Test: The duration of each pressure test shall be at least two (2) hours in length. If the pressure is released at any time short of the two (2) hour time period, the Public Works Director may require a complete re-testing.

(d) Procedure: Each valved section of the pipe shall be slowly filled with water, and the specified test pressure measured at the lowest elevation. Pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, and all necessary apparatus shall be furnished by the contractor. The contractor shall furnish all gauges and measuring devices for the test and will make all taps into the pipe.

(e) Expelling Air Before the Test: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary at points of highest elevation, and afterwards tightly plugged.

(f) Correction Due to Failure of Test: Leaking slip joints shall be equipped with bell joint clamps to stop the leakage. Any cracked or defective pipes, fittings, valves, or hydrants discovered as a result of the pressure test shall be removed and replaced by the contractor with sound material and then the test shall be repeated until satisfactory results are attained.

(g) Permissible Leakage: Suitable means shall be provided by the contractor for determining the quantity of water lost by leakage under static pressure test. No slip joint pipe installation will be accepted until, or unless, this leakage is less than the limits set out below for the corresponding pipe diameter.

Allowable Leakage per 1,000 Feet of Pipeline at 125 PSI

<u>Pipe Size</u>	<u>Leakage (Gallons per Hour)</u>
4"	0.34
6"	0.50
8"	0.67
10"	0.84
12"	1.01

The above table is based on slip joint with eighteen (18) foot nominal lengths. For pipe with twenty (20) foot nominal lengths, multiply the above leakage by 0.9.

(h) Variation From Permissible Leakage: Should any tests of combined sections of pipe laid disclose leakage per mile of pipe greater than that specified in subsection (g) above, or if individual sections show leakage greater than twenty-five (25) percent above the specified limit, the contractor shall, at his own expense, locate and repair and/or replace the defective joints until the leakage is within the specified allowance.

(i) Leakage Defined: Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

(3) Disinfection of the Mains: Disinfection of the mains shall be performed by the contractor. Assistance may be provided by the City or the Water District at their discretion. This work is to begin after the main, or section thereof, has been filled with water for testing as specified. Disinfection shall be in accordance with the latest edition of AWWA C601, "Standard for Disinfecting Water Mains." The contractor shall furnish the chlorine, all necessary equipment for its application, the water, and make all bacteriological analyses.

3.07 Valves and Fire Hydrants:

A. Valves:

(1) Description: This section regulates the materials specifications for valves and fire hydrants as shown on the approved engineering plans, or as subsequently approved by the Public Works Director.

(2) Generally: Those valves twelve (12) inches and smaller in size shall be vertical gate valves and each equipped with a standard valve box.

(3) Gate Valves: Gate valves shall be cast iron body AWWA Standard left-hand thread, 200-pound working pressure, bronze-mounted, double disc, parallel type, "O" ring stem seals, iron rising stem, with two (2) inch square nut; complete with mechanical joints and accessories; coated inside and outside with standard bitumastic coating for water mains. The stems, stem nuts, seat rings, gate rings, wedges, and hooks shall be made of bronze. Approved manufacturers of valves are: Mueller (A-2380-21) or approved equal.

(4) Valve Boxes: Valve boxes shall be cast iron adjustable screw type, five and one-half (5.5) inch shaft with base, water cover, and skirt.

B. Fire Hydrants:

(1) Specifications: Fire hydrants shall be AWWA Standard Compression Drytop, two (2) piece standpipe, four (4) inch valve opening, six (6) inch inlet connection, two to two and one-half (2 to 2.5) inch hose nozzles, one (1) four and one-half (4.5) inch steamer nozzle, six (6) inch mechanical bell joint inlet with cast iron retainer glands with set screws. Center flange of all fire hydrants shall be three (3) inches above the finished ground line. Cast iron fittings shall be cement mortar and lined with a bituminous seal coat inside and out. Hydrants shall be equipped a six (6) inch branch valve and box between it and the main to which it is connected. Valves shall open to the left. Hose threads shall conform to existing hydrants. Fittings twelve (12) inches and smaller shall have a pressure rating of two hundred and fifty (250) pounds per square inch.

(2) Approved Manufacturers: Approved manufacturers of fire hydrants are Mueller and American Darling, or approved equal.

3.08 Handling and Laying of Pipe:

A. Description: This section regulates the handling, excavation, and installation for water mains, lines, connections, and other installations, as shown on the approved engineering plans, or as subsequently approved by the Public Works Director.

B. Care:

(1) Care of Pipe, Fittings, and Accessories: All materials furnished by the contractor, including pipe, fittings, valves, hydrants, and other accessories shall, unless otherwise directed by the Public Works Director, be unloaded at the point of delivery and hauled to and distributed at the site of the project by the contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists, or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways shall not be allowed to roll against pipe already on the ground.

(2) Handling of Pipe: Pipe shall be handled so as to avoid damage to its coating, lining, and structural integrity. If any part of the coating or lining is damaged, the decision whether to replace or simply repair the effected pipe shall be that of the Public Works Director, or his designee. If the Public Works Director elects to permit repair of the pipe, the repairs shall be made by the contractor, at his own

expense, and in a manner acceptable to the Public Works Director, prior to installation. Any pipes or fittings with cracks, fractures, chipped ends, or other visible defects shall be removed from the site.

(3) Distribution and Orientation: Pipe shall be distributed on the site of the work parallel with and opposite or near the place it is to be laid in the trench. The bell ends of the pipe shall face the direction in which the work will proceed, unless otherwise directed by the Public Works Director.

C. Pipe Installation:

(1) Notice: No construction on any project shall be commenced unless twenty-four (24) hours' notice has been given by the contractor to the Public Works Director to arrange for the assignment of an inspector. This requirement shall also apply to re-starting of construction after stoppage for any reason.

(2) Alignment and Grade: All pipe shall be laid and maintained to the required lines and grades, with fittings, valves, and hydrants at the required locations; with joints centered and spigoted home; and with all valve and hydrant stems plumb. All pipes shall be laid to the depth shown on the approved engineering plans, measured from the established street grade or the surface of the permanent improvement to the top of the barrel of the pipe. In the absence of definite measurements, the depth of cover shall be four (4) feet for pipe lines twelve (12) inches in diameter or larger, or five (5) feet for pipe lines ten (10) inches in diameter or smaller.

D. Protection of Facilities:

(1) Underground and Surface Structures: Temporary support, adequate protection, maintenance and/or replacement of all underground and surface utility structures, drains, sewers, field tiles, and other obstructions encountered in the course of the work shall be furnished by the contractor at his own expense, and as directed by the Public Works Director.

(2) Trenching Around City-Owned Trees: Trenching must not be closer than having the inside wall of the trench four (4) feet from the trunk of trees fifteen (15) inches in diameter or larger. On trees smaller than fifteen (15) inches in diameter, the inside wall of the trench must be no closer than three (3) feet. When trenching is to be done closer than the above minimums, it shall be done only with the written permission of the Public Works Director. In such instances where permission is secured, the trees and stumps should be removed and relocated by a competent tree specialist.

(3) Deviations Caused by Other Utility Structures: Whenever existing utility structures or branch connections leading to main sewers, main drains, or other conduits, pipes, ducts, or other structures present obstructions to the grade and/or alignment of the pipe, they shall be permanently supported, removed, relocated, or reconstructed by the contractor. In those instances where their relocation or reconstruction is impractical, a deviation from the line and/or grade may be permitted by the Public Works Director in the manner directed by him.

(4) Location and Damage to Underground Facilities: The locations of existing underground facilities shown on the approved engineering plans should be based upon the most accurate information available. Nevertheless, the contractor shall use due caution to avoid damage thereto and shall be responsible for verifying their location and any damage to such underground facilities.

(5) Subsurface Exploration: Whenever necessary to determine the location of existing pipes, valve, or other underground structures, the contractor shall make all explorations and excavations for such purposes as may be necessary, or as may be subsequently directed by the Public Works Director.

E. Excavation and Preparation of the Trench:

(1) Description: The trench shall be dug to the alignment and depth required, but only so far in advance of the pipe-laying as the Public Works Director, or his designee, shall permit. The trench shall be so braced and drained such that workmen may perform their duties therein safely and efficiently. It is

essential that the discharge from pumps be led to natural drainage channels, to drains, or to storm sewers, in accordance with the approved erosion and sediment control plan.

(2) Width: The trench width may vary with, and depend upon, the depth of the trench and the nature of the excavated material encountered; but, in any case, shall be of ample width to permit the pipe to be laid and jointed properly and the backfill to be placed and compacted properly. The minimum width of an unsheeted trench shall be one (1) foot greater than the nominal diameter. The maximum clear width of the trench shall not be more than three (3) feet greater than the external diameter of the pipe.

(3) Pipe Foundation in Good Soil: The trench, unless otherwise specified by the Public Works Director, shall have a flat bottom conforming to the grade to which the pipe is to be laid. The pipe shall be laid upon sound soil cut true and even, so that the barrel of the pipe will have equal bearing for its entire length. For PVC pipe, the pipe foundation shall be free of any stones one-half (0.5) inch in diameter or larger.

(4) Correcting Faulty Grade: Any part of the trench excavated below grade shall be corrected with approved material, fully compacted.

(5) Pipe Foundation in Poor Soil: When the bottom of the trench, uncovered at subgrade, is soft and cannot, in the opinion of the Public Works Director, support the pipe, further depth and/or width may be excavated, as directed by the Public Works Director, and refilled with compacted granular backfill to the pipe foundation grade, as required.

(6) Bell Holes Required: Bell holes of ample dimensions shall be dug in the trench at each joint to permit the jointing to be made properly.

(7) Braced and Sheeted Trenches: Whenever necessary to prevent caving, excavations in sand, gravel, sandy soil, or other unstable material shall be adequately sheeted and braced. Where sheeting and bracing are used, the trench width shall be increased accordingly. Trench sheeting shall remain in place until the pipe has been laid, tested for defects, repaired is necessary, and the earth around it compacted to a depth of two (2) feet over the top of the pipe.

(8) Removal of Excavated Material on an Improved Street or Dedicated Right-of-Way: All material removed from the trench on an improved street shall be hauled away from the site of work or excavation and shall be deposited at a dump provided by the contractor. The backfill material shall be as specified elsewhere in these standards and specifications.

(9) Excavation for Trench in Unimproved Areas: Material excavated from a trench in an unimproved area may be reused, if in the opinion of the Public Works Director, it is suitable.

(10) Manner of Piling Excavated Material: All excavated material shall be piled in a manner that will not endanger the work and will not obstruct adjacent streets, sidewalks, or driveways. Gutters shall be kept clear, or other satisfactory provisions made for street drainage.

(11) Flow of Sewers and Drains Maintained: Adequate protection shall be made for the flow of sewers, drains, and water courses encountered during construction, and structures which may have been disturbed shall be satisfactorily restored upon completion.

(12) Property Protection: Trees, fences, poles, and all other property shall be protected, unless their removal is authorized. Any property destroyed or damaged shall be satisfactorily restored by the contractor.

(13) Interruption of Water Service: No valve or other control on the existing system shall be operated for any purpose by the contractor without the approval of the Water District. All consumers affected by such operation shall be notified by the contractor at least twenty-four (24) hours before the operation, and be advised of the estimated time when service will be restored.

F. Pipe Laying:

(1) Materials Inspection: Before lowering any materials into the trench for assembly, the pipe, fitting, valve, or fire hydrant shall be thoroughly inspected by the Public Works Director, or his designee, so as to identify any defects, damage, or unsoundness of the material. Any defective, damaged, or unsound pipe, fitting, valve, or fire hydrant shall be rejected.

(2) Pipe to be Clean: When the pipe is laid, it shall be free of all foreign matter. Pipe twenty (20) inches and under in diameter may be cleaned by flushing in place, under the supervision of the Public Works Director, or his designee, if in his opinion, the pipe contains dirt that can be so removed. If not, then the pipe shall be cleaned by swabbing and then flushing before it is placed in the trench. All pipes larger than twenty (20) inches in diameter shall be swabbed out and thoroughly cleaned by flushing before placing in the trench.

(3) Manner of Handling Pipe and Accessories into the Trench: Proper implements, tools, and facilities satisfactory to the Public Works Director shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, fittings, valves, and fire hydrants shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to the pipe or pipe coating and/or lining. Under no circumstances shall pipe and accessories be dropped or dumped into the trench.

(4) Laying the Pipe: Unless otherwise specified by the Public Works Director, after placing a length of pipe in the trench, the gasket material for the joint shall be properly positioned. The spigot end shall then be centered in the bell, the pipe forced "home," and brought to true alignment. It shall then be secured with earth carefully tamped under and on each side, except at the bell holes. Care should be taken to prevent dirt from entering the joint space.

(5) Preventing Trench Water from Entering the Pipe: At all times when pipe laying is not in progress, the open ends of pipe shall be closed by approved means, and at no time shall trench water be permitted to enter the pipe.

(6) Cutting Pipe: Cutting of pipe for the insertion of valves, fittings, or closure pieces shall be done in a neat and workman-like manner without damage to the pipe. Wherever it is necessary to cut cast, ductile iron, or PVC pipe, and where the pipe is equipped with a slip joint type bell end, the cut end of the pipe shall be adequately beveled so as to prevent the edge of the cut pipe from cutting or tearing the gasket as the spigot end is inserted into the bell of the adjoining pipe or fitting.

(7) Bell Ends to Face Direction of Laying: Unless otherwise directed by the Public Works Director, the pipe shall be laid with the bell ends facing in the direction of the laying.

(8) Permissible Deflection of Joints: Whenever necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, to avoid obstructions, plumb stems, or for other reasons, the degree of deflection shall be approved by the Public Works Director.

(9) Unsuitable Conditions for Laying Pipe: No pipe should be laid in water, or when the trench conditions or the weather are unsuitable for such work, except as may be authorized by the Public Works Director.

(10) Immovable Structures: Concrete walls, footings, piers, abutments, or other immovable structures shall not be poured directly around the pipe; instead sleeves or special wall castings shall be used.

G. Jointing Pipe:

(1) Preparation of Pipe Ends: Before laying the pipes, all lumps, blisters, and excess coal-tar

coating shall be removed from the bell and spigot ends of each pipe. The pipe ends shall then be wire-brushed and wiped until clean and dry. Where mechanical or slip joints are specified, oil and grease shall also be removed. Pipe ends shall be kept clean until the joints are made. The spigot end for mechanical joints shall be lubricated with a soapy solution before installing the gaskets.

(2) Making Up Slip Joints: After preparation of the pipe ends for a slip joint, the gasket shall be inserted in the bell, or on the spigot, as appropriate. Both the bell and the spigot ends of the pipe, including the gasket, shall be lubricated with the proper joint lubricant; and the spigot shall be centered and either pushed or jacked "home." In the case of pre-stressed concrete pipe, the gasket shall be checked to insure its proper seating, and joint shall be mortared, both inside and outside as recommended by the supplier or required by the Public Works Director.

(3) Making Up Mechanical Joints: After the preparation of the pipe ends for a mechanical joint, the gasket shall be inserted in the bell by drawing the gland toward the bell. The bolts shall be drawn up uniformly on opposite sides of the pipe with a ten (10) inch torque wrench.

(4) Lubrication: The form of lubrication used on pipe fittings and joints shall be water soluble, non-toxic, non-objectionable in taste and/or odor imparted to the water, non-supporting of bacterial growth, and have no deteriorating effect on rubber gaskets.

3.09 Valves, Valve Boxes, Fittings, and Blow-Offs:

- A. Valves and Blow-Offs: Gate Valves, butter-fly valves, blow-offs, and pipe fittings shall be set and jointed to new pipe in the same manner heretofore specified for the cleaning, laying, and jointing of pipe.
- B. Valve Boxes: Cast iron valve boxes shall be firmly supported and maintained, centered, and plumb over the operating nut of the valve, with box cover flush with the surface of the finished pavement or grade, where applicable, or at such other level as may be directed by the Public Works Director.
- C. Back Siphonage to be Prevented: Drainage branches or blow-offs shall not be connected to any sewer or submerged in any stream or be installed in any manner that will permit back-siphonage of contaminated water into the water distribution system.

3.10 Setting Fire Hydrants:

- A. General Location: Hydrants shall be located in a manner to provide complete accessibility, and in such a location that the possibility of damage from vehicles or injury to pedestrians will be minimized. Unless otherwise directed by the Public Works Director, the setting of a hydrant shall conform to the following requirements:

(1) Location in Relation to Curb or Pavement Lines: When placed behind curb or pavement, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle caps will be less than twenty-four (24) inches or more than forty-two (42) inches from the gutter face of the curb or edge of pavement. If set between streets, the hydrant shall be placed in a manner designated by the Public Works Director and the Fire Chief. If any unusual conditions prevail, alternative locations will be subject to the approval of the Public Works Director and the Fire Chief. The contractor shall verify the hydrant locations with the Public Works Director and the Fire Chief before setting any hydrants.

(2) Location in Relation to Sidewalk: When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the hydrant, or nozzle caps, shall be within six (6) inches of the sidewalk.

- B. Position of Nozzles: All hydrants shall stand plumb and shall have their pumper nozzle pointing perpendicular to the curb or street. They shall conform to the established grade with nozzles at

least eighteen (18) inches above the ground.

- C. Connection to the Main: Each hydrant shall be connected to the main water line with a six (6) inch branch controlled by an independent six (6) inch gate valve, except as may be otherwise directed by the Public Works Director.
- D. Drainage at Hydrants: Wherever hydrants are set in impervious soil, a drainage pit two (2) feet in diameter and two (2) feet deep shall be excavated below each hydrant and filled completely with coarse gravel or broken stone mixed with coarse sand, under and around the bowl of the hydrant and to a level six (6) inches above the waste opening. No hydrant drainage pit shall be connected to a sanitary sewer line.
- E. Anchorage for Hydrants: All fire hydrants shall be shackled to the branch or auxiliary valve and the valve shackled to the tee in a manner approved by the Public Works Director.
- F. Cleaning: Hydrants shall be thoroughly cleaned of dirt or foreign matter before setting.

3.11 Anchorage of Bends, Tees, and Plugs:

- A. General Requirements: Adequate precautions shall be taken to prevent the separation of joints at tees, elbows, and plugged ends. This shall be done by the use of restrained joints, as shown on the approved engineering plans, or as required by the Public Works Director. In the absence of specific details, on all pipe lines eight (8) inches in diameter or larger, all tees, plugs, caps, and bends in excess of twenty-two and one-half (22.5) degrees shall be securely anchored to prevent the joints from parting and leaking. Reaction blocking or metal harnessing may be used only as approved by the Public Works Director.

(1) Restrained Joints: Restrained joints, details of design, construction, application, installation and number of joints necessary for the restraint of a given thrust shall meet these construction standards. The design shall also include the strengthening of the pipe walls such that they will also withstand the added longitudinal tensile loading as necessary. These details shall be approved by the Public Works Director prior to installation.

(2) Material for Reaction Blocking: Where reaction or thrust blocking is permitted, it shall be of concrete or a mix not leaner than one (1) cement to two and one-half (2.5) sand, and five (5) stone, having a compressive strength not less than two thousand (2,000) pounds per square inch after twenty-eight (28) days. Blocking shall be placed between solid undisturbed ground and the fitting to be anchored. The area of bearing on the pipe and on the ground shall be approved by the Public Works Director. The blocking shall be so placed that the pipe, fittings, joints, and fasteners will be accessible for repair, unless otherwise directed by the Public Works Director.

(3) Metal Harness: A metal harness of tie rods and pipe clamps of adequate strength to prevent movement, or other suitable means may be used if approved by the Public Works Director. Steel rods, clamps, and washers shall be cadmium plated or otherwise rust-proof treated, or shall be coated and painted as directed by the Public Works Director.

3.12 Backfilling, Clean-Up, and Restoration:

- A. Generally:

(1) Backfill Material: The backfill material shall comply with the requirements of Item 400, – Excavation and Backfill For Structures,” of the Texas Department of Transportation’s Standards and Specifications For Construction of Highway’s, Streets, and Bridges (current edition). At the contractor’s request, the excavated material may be used for backfilling the trench, provided it meets the Texas Department of Transportation requirements, and is approved by the Public Works Director as being suitable material.

(2) Selection of Backfill Material: Backfill for pipelines shall be compacted earth or granular backfill, and shall be in conformance with the requirements of these standards. The materials selected and the compaction methods utilized shall be subject to the approval of the Public Works Director.

(3) Compaction Tests: Where compaction tests are required, they shall be conducted by outside, independent testing laboratories at the contractor's expense. The test results will be submitted directly from the testing laboratory to the City.

B. Backfill Procedure on Improved Streets or Dedicated Right-of-Ways: The backfill procedure on improved streets or within dedicated right-of-ways shall conform to the following method:

(1) Trench Cut: If the trench is to be cut in the existing pavement, the opening shall be no larger than necessary to place the pipe. The opening shall be made by sawing with a concrete saw. The saw cut shall be cut back of the area which might slough off due to the vibration of undisturbed earth.

(2) Backfill: If the trench crosses the existing pavement, it shall be backfilled with Type -D" sand backfill to a point twelve (12) inches from the top of the pavement. The top twelve (12) inches of the travel portion shall then be restored according to the existing surface in accordance with Article 8, "Standard Plans."

(3) Compaction: All backfill within the right-of-way shall be compacted to a ninety-five (95) percent maximum dry density test.

C. Backfill Procedure in Unimproved Areas:

(1) Backfill at the Pipe Zone: For any trench outside of the existing pavement or dedicated right-of-way, the trench must be backfilled with sand or pea-gravel free from debris, rocks or boulders. The backfill shall be deposited in the trench simultaneously on both sides of the pipe for the full width of the trench and to an elevation of at least six (6) inches above the top of the barrel of pipes ten (10) inches in diameter or less, and not less than six (6) inches above the horizontal centerline of pipes twelve (12) inches in diameter or larger. The backfill material shall be moistened, tamped in six (6) inch layers, and thoroughly compacted under and on each side of the pipe to provide solid backing against the external surface of the pipe.

(2) Backfill Above the Pipe Zone: Succeeding layers of backfill may contain coarser material as approved by the Public Works Director. Excavated material may be utilized for backfill if approved by the Public Works Director. The backfill shall be compacted by puddling with hose and long pipe nozzle, or by flooding the trench. Mechanical tamping may be permitted by the Public Works Director where the backfill material does not puddle readily. The contractor shall take proper precautions to prevent the floating of the pipe when flooding the trench. The contractor shall be wholly responsible for neglect of those precautions. Excess material shall be spread uniformly of the trench backfill.

(3) Compaction: All backfill materials shall be compacted to a ninety-five (95) percent wet density test.

D. Backfill, Miscellaneous Requirements:

(1) Exclusion of Debris, Rock and Boulders: No debris, rock or stone exceeding the standards established by these standards and specifications for backfill in the pipe zone area shall be used for at least one (1) foot above the top of the pipe. No rock or stone larger than six (6) inches in its greatest dimensions shall be used at any stage of the backfilling.

(2) Deficiency of Backfill: Any deficiency identified in the quality of the material provided for backfilling shall be replaced at the expense of the contractor. Any deficiency identified in the quantity of the material provided for the backfilling of trenches or filling depressions caused by settlement, shall be

supplied at the expense of the contractor.

E. Site Restoration:

(1) Generally: The contractor shall be responsible for the restoration of pavement, curbs, gutters, sidewalks, shrubbery, trees, fences, grass and sod, driveways, or any other disturbances that may have been caused during the course of installation of the water line. The level of restoration shall be to a condition better or equal to the condition that existed prior to the disturbance. The approach to restoration, and its completion, shall be reviewed and approved by the Public Works Director. The contractor shall make a diligent effort to protect property adjacent to the zone of operations.

(2) Replacement of Drainage and Sewer Lines and Structures: The contractor shall replace all drainage and sewer line and structures removed or damaged in the course of constructing the water main in accordance with the approved engineering plans for the project, and to the satisfaction of the Public Works Director.

(a) Replacement of Drainage or Sewer Pipe: All drainage or sewer tile or pipe damaged shall be replaced with the same diameter, extra strength "O" -ring type joint, or approved equal, pipe conforming to the specifications for pipe outlined in Section 3.06, "Pipe Materials and Testing." The pipe shall be laid on thoroughly compacted bedding conforming to the requirements of Section 3.08, "Handling and Laying of Pipe." If the effected pipe is perpendicular to the water main trench, the pipe shall be supported by a native lumber plank of at least two (2) inches in thickness. The plank shall be at least one-half (0.5) as wide as the nominal diameter of the pipe, or a minimum of seven (7) inches in width, whichever is greater. The pipe shall extend at least twelve (12) inches beyond each trench wall. Replacement of sewer pipe shall be at least to the first existing joint on each side of the water main trench. Existing, disturbed surface drainage ditches, swales, etc., shall be re-cut and graded as directed by the Public Works Director.

(b) Structure Replacement: All drainage or sewer structures damaged or removed shall be replaced in accordance with details shown on the approved engineering plans, or as directed by the Public Works Director.

(3) Seeding and Sodding: Grassed areas which have been damaged in the construction of water mains shall be restored by seeding or sodding, as directed by the Public Works Director, and in the following manner:

(a) Mulched Seeding:

(i) The area to be seeded shall be smooth and uniform and shall conform to the finished grade as shown on the approved engineering plans, or as may be otherwise designated by the Public Works Director.

(ii) The seed bed shall be loosened to a depth of one (1) to two (2) inches before fertilizer or seed is applied.

(iii) Fertilizer and seed may be drilled in, but shall not be covered more than one-half (0.5) inch deep.

(iv) If hydraulic methods are used, the fertilizer and seed may be mixed with water and the mixture sprayed over the area to be seeded. All leguminous seeds shall be inoculated.

(v) The seeded area shall then be covered by a continuous blanket of mulch material approximately two (2) inches in depth. Mulch material shall consist of an approved straw, free from noxious weeds.

(vi) The mulch shall be held in place by a bituminous material (RC-70 or AE90T)

applied as a film. Sufficient amount shall be used to hold the mulch material in place.

(b) Seed and Fertilizer Mixtures: The fertilizer mixture shall be of a 10-20-10 analysis and shall be applied at a rate of five (5) pounds per one thousand (1,000) square feet. The seeding mixture shall be applied at a rate of six (6) pounds per one thousand (1,000) square feet. The seeding mixture shall be divided per the Texas Department of Transportation's Standards and Specifications for Construction of Highways, Streets, and Bridges (current edition). Where seeding is to be done in a heavily shaded area, the seeding mixture shall be altered to a 4-1-1 mixture.

(c) Broadcast Seeding: When seeding in open areas for erosion protection, or as required on the approved engineering plans, "broadcast seeding" shall be applied at the rate of one hundred (100) pounds per acre, with no fertilizers required.

(d) Sodding: When sodding is required by the Public Works Director, it shall conform to the Texas Department of Transportation specifications.

(4) Final Clean-Up: Surplus pipe material shall be returned to the contractor's yard. Tools and temporary structures shall be removed by the contractor, and all dirt, rubbish, and excess earth from excavations shall be hauled to a dump provided by the contractor. The construction site shall be left clean. Completion of the clean-up shall be to the satisfaction of the Public Works Director.

(5) Maintenance of Surface: The contractor shall maintain the surface of unpaved trenches, shrubbery, fences, sod and other surfaces disturbed by the project. Such items will be considered subject to the maintenance bond required in Article 1, Section 1.07, and shall be maintained for the same period as re-paved areas, curbs, gutters, and sidewalks.

3.13 Service Connections:

A. Generally:

(1) No water service pipe or water main of any kind shall be installed or connected with the public water system without the prior approval of the Water District.

(2) All such work shall have the prior written permission of, and be approved by the Water District before being installed and put into use.

(3) All applications for water taps to water mains or extensions shall be in writing and shall be accompanied by a drawing showing the water main, or extension, and the location of the proposed connection.

B. Connections: The City shall require users of the public water system to install a separate connection with the public water main, and a separate water meter for each building which is served by the water system.

ARTICLE 4

SANITARY SEWER COLLECTION SYSTEM

4.01 Use of Sewers Required:

A. It shall be unlawful for any person to place, deposit, or permit to be deposited in any unsanitary manner on public or private property within the City of South Padre Island, or in any area under the jurisdiction of said City, or into any sewer which connects to the storm water drainage system of the City, any human or animal excrement, garbage, or objectionable waste.

B. It shall be unlawful to discharge to any natural outlet within the City of South Padre Island, or in

any area under its jurisdiction, any wastewater or other polluted waters, except where suitable treatment has been provided in accordance with applicable State and Federal regulations governing such discharges.

- C. It shall be unlawful to construct or maintain any privy, privy vault, septic tank, mound system, cesspool, or other facility intended or used for the disposal of wastewater where public sanitary service is available.
- D. The owner of any house, building, or property used for human occupancy, employment, recreation, or other purposes, situated within the City, or in any area under its jurisdiction, and abutting upon any street, alley, easement, or right-of-way in which there is now located, or may be in the future, a public sanitary sewer, is hereby required at the owner(s) expense to install suitable toilet facilities therein, and to connect such facilities directly with the proper public sewer in accordance with the provisions of this Article, within ninety (90) days after the date of official notice to do so.

4.02 Specifications and Design, Approval by Other Agencies:

- A. Except as they may be otherwise superseded by these standards and specifications, the design and specifications for size, slope, alignment, materials of construction, and the methods to be used in excavating, placing of the pipe, jointing, testing, and backfilling of the trench for a sanitary sewer system shall conform to the requirements of the Texas Commission on Environmental Quality and the Laguna Madre Water District.
- B. Copies of the proposed engineering plans shall be submitted to the Laguna Madre Water District for their review and approval. Submission of these plans may occur prior to, or concurrently with, submission of the plans to the Public Works Director.
- C. The Texas Commission on Environmental Quality will be included as a reviewing agency when the tract to be developed is located within the operating limits of a private sewer company other than the Laguna Madre Water District, or if the tract to be developed requires a sanitary sewer treatment facility.
- D. The Public Works Director shall not grant final approval to any submitted engineering plans until each reviewing agency has completed its review and approval of the plans, and notated such in writing.

4.03 Building Connections:

- A. A separate and independent building sewer shall be provided for every building lot. At such time as a public sanitary sewer becomes available to a property served by a private wastewater disposal system, a direct connection shall be made to the public sanitary sewer system, and any septic tanks, cesspools, and similar private wastewater disposal facilities shall be cleaned of sludge and removed or filled with suitable material, as approved by the Public Works Director.
- B. The submitted engineering plans shall identify the location of laterals for all building sewers. Where sanitary sewers are being installed as part of the required improvements of a subdivision, in those instances where the laterals for building connections must cross proposed street right-of-ways, the laterals will be installed to the opposite right-of-way line, capped, and backfilled prior to the construction of the street.
- C. All costs and expenses incidental to the installation and connection of the building sewer shall be borne by the developer and/or contractor.

- D. No person shall make connection of roof down spouts, exterior foundation drains, or other sources of surface runoff or groundwater to a building sewer or building drain which is connected either directly or indirectly to a public sanitary sewer. Any such connections which currently exist on the effective date of these standards and specifications shall be completely and permanently disconnected within sixty (60) days of the effective date of these standards and specifications.
- E. Any break in a service lateral located on privately owned property shall be promptly repaired at the expense of the property-owner(s).
- F. It shall be the property-owner's responsibility to keep the service lateral clean from stoppage from his point of connection to the sanitary sewer main.

4.04 Excavation, Backfill, and Restoration:

Excavation and backfill for the installation of sanitary sewer pipelines, as well as the eventual surface restoration from such excavation, shall be governed by Section 5.03(F), of these standards and specifications, "Excavation and Backfill for Underground Conduits."

4.05 Location of Sanitary Sewer Facilities:

- A. All sanitary sewer facilities shall be located within easements dedicated to the public for such use, or public street right-of-way.
- B. In those instances where sanitary sewer facilities are located within a public street right-of-way, their location shall be governed by Section 2.23 of these standards and specifications, "Locations and Depths for Utilities within the Limits of the Public Right-of-Way."

4.06 Safety: All excavations for sanitary sewer or building sewer installations shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property disturbed in course of the work shall be restored in a manner acceptable to the Public Works Director.

ARTICLE 5

MINIMUM STANDARDS FOR STORM WATER DRAINAGE DESIGN AND CONSTRUCTION DETAILS

5.01 Grading and Drainage Plan: As an element of the engineering plans submitted to the Public Works Director for review and approval, the contractor shall submit a grading and drainage plan for the entire site affected by the proposed development. The grading and drainage plan shall include as a minimum:

- A. The total size of the watershed, both graphically and numerically.
- B. Contours of the subject site, on a one-half (1/2) foot intervals, reflecting both the elevations of the pre-development site, and the proposed finished grades.
- C. Calculation of pre-development and post-development storm water run-off, and the retention/detention needs based upon the Rational Method.
- D. Proposals for the management and retention/detention of storm water drainage.
- E. Location of, and accessibility to, existing public storm sewers.
- F. Provisions for the accommodation of upstream drainage areas.

- G. Location, size/capacity, specification, and direction of flow of all proposed subsurface storm water drainage pipes, inlets, manholes, above ground storm water drainage swales and gutters, retention/detention areas, and any other proposed drainage structures.
- H. It is strictly prohibited to temporarily or permanently direct, divert or increase any amount of storm water runoff to the Gulf of Mexico waters or any portion or portions of Public Beach.
- I. Drainage design standards and criteria utilized in the design of Storm Water facilities shall comply with the TxDOT Hydraulic Design Manual (current edition).
- J. Consideration shall be given to the effects of positive overflow along roadside ditches and away from low adjacent properties.

5.02 Storm Water Retention/Detention: The Public Works Director shall determine the effect of each proposed development on existing drainage facilities outside of the area of the development. Where it is anticipated that the additional run-off incident to the development will overload an existing downstream drainage facility, provision shall be made for the retention/detention of storm water run-off to such an extent necessary to alleviate the condition.

- A. Excess Storm Water Run-Off, Defined: For the purposes of this section, "excess storm water run-off" shall include all increases in storm water resulting from: an increase in the amount of impervious surface of the site, including all additions of buildings, roads, and parking lots; changes in soil absorption caused by compaction during development; modifications in contours, including the filling or draining of small depressed areas, alterations of drainage ways, or regrading of slopes; destruction of substantially vegetated areas; alterations of drainage ways or the installation of collection systems to intercept street flows or to replace swales or other drainage ways; or the alteration of subsurface flows, including any underground dewatering or diversion practices such as curtain drains, compared with the site in its natural state.
- B. Limitation on Storm Water Run-Off: No development shall cause downstream property-owners, water courses, channels, or conduits to receive storm water run-off from proposed developments at a higher peak flow rate than would have resulted from the same storm event occurring over the site of the proposed development in its natural, undeveloped state. For the purposes of this section, "undeveloped state" shall mean that all the natural retention areas and drainage ways, plus existing drain tiles and highway drainage structures shall be included in the flow calculations.
- C. Storage Capacity: All storm water storage facilities shall be designed with sufficient capacity to accommodate all run-off caused by the development in excess of the run-off which would have resulted from the site if left in its natural, undeveloped state. The storage capacity of all storage facilities shall meet criteria described in Figure 7 of this Article.
- D. Design Specifications: All developer plans for required retention/detention facilities and improvements shall be submitted to the Public Works Director for approval prior to any earth work or construction on the proposed development.

5.03 Storm Water Sewer System Specifications:

- A. Description: This section regulates construction, installation, and materials specifications for storm water sewer improvements as shown on the approved engineering plans, or as subsequently approved by the Public Works Director.
- B. Pipe Materials: The type and class of pipe to be used shall be as described herein and shown as such on the submitted engineering plans. The contractor shall provide the Public Works Director with a pipe certification for each job.

(1) Reinforced Concrete Pipe (RCP)(Standard):

(a) Specification: Precast reinforced concrete pipe shall conform to the design shown on the plans and to ASTM C76 or C655 for circular pipe; ASTM C506 for arch pipe; or ASTM C507 for horizontal elliptical pipe.

(b) Joints: Reinforced concrete pipe may be jointed using mortar, cold-applied plastic asphalt sewer joint compound, rubber gaskets, or cold-applied preformed plastic gaskets. For all jointing materials except mortar, the contractor shall furnish the Public Works Director with the Manufacturer's Certificate of Compliance.

(2) Corrugated Polyethylene Pipe (CPP)(Special Use): Specification: High density Corrugated Polyethylene Pipe shall conform to the design shown on plans and to the following:

AASHTO M252: Specification for Corrugated Polyethylene Drainage Tubing, 3- to 10- Inch Diameter

AASHTO M294: Specification for Corrugated Polyethylene Pipe, 12- to 48- Inch Diameter

ASTM D1056: Specification for Flexible Cellular Materials - Sponge or Expanded Rubber

ASTM D1248: Specification for Polyethylene Plastics Molding and Extrusion Materials

ASTM D3350: Specification for Polyethylene Plastics Pipe and Fittings Materials

ASTM D2321: Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe

The product supplied under this specification shall be high density polyethylene corrugated exterior/smooth interior pipe. Four- through 10-inch diameters shall meet all the requirements of AASHTO M252 with the addition that the pipe have a smooth interior liner. Twelve- to 36-inch diameters shall conform to AASHTO M294 Type S. Forty-two and 48-inch diameters shall have minimum pipe stiffness of 20 and 17 psi, respectively, at 5% deflection; and shall meet all other requirements of AASHTO M294.

Material shall meet ASTM D 1248 Type III, Category 4, grade P33, Class C; or ASTM D3350 Cell Classification 324420C.

Minimum conveyance factors shall be based on a Manning –n” value of 0.010 and shall be as shown:

Conveyance Factors			
Nominal Diameter (in.)	Conveyance Factor	Nominal Diameter (in.)	Conveyance Factor
12	46.3	30	532.9
15	83.9	36	866.6
18	136.4	42	1307.2
24	293.9	48	1866.4

Couplings and fittings:

Coupling bands shall cover at least one full corrugation on each section of pipe. When gasketed coupling bands are required, the gasket shall be made of closed-cell synthetic expanded rubber meeting the requirements of ASTM D 1056, Type 2. Gaskets shall be installed on the coupling band by the pipe manufacturer. All coupling bands shall meet or exceed the soil tightness requirement of the AASHTO Standard Specification for Highway Bridges, section 23, paragraph 23.3.1.5.4.(e).

Pipe fittings shall conform to AASHTO M252 or AASHTO M294. Fittings approved by the Public Works Director are also acceptable.

C. Pipe Installation:

(1) Survey Lines and Grades: The setting of survey lines and grades, in conformance with the approved engineering plans, shall be the responsibility of the contractor.

(2) Clearing and Excavating: Except as otherwise specified herein, clearing and excavating shall be conducted in the manner prescribed in subsection (F) of this Article, "Excavation and Backfill for Underground Conduits."

(3) Handling: Pipe materials and fittings shall be handles in a manner to insure installation in a sound and undamaged condition. Pipe materials and fittings should not be dropped or dumped. Slings, lifting bags, hooks, and other devices should be used to protect the pipe, joint elements, and coatings. All pipe materials and fittings should be shipped and stored with provisions to prevent shock contact with adjacent units.

(4) Pipe Laying:

(a) All work shall be in accordance with the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets and Bridges (current edition).

(b) Equipment, methods, and materials shall be utilized insuring installation to the lines and grades reflected upon the approved engineering plans.

(c) Maintain the following tolerances from true alignment and grade:

Alignment	two (2) inches
Grade	± one-half (1/2) inch

Joint deflection shall not exceed the maximum allowable deflection per pipe joint according to ASTM C425, ASTM C594, and AWWA C600. Only one correction for alignment and/or grade shall be made between adjacent manholes.

(d) Except where pipe sections are being encased in concrete, no pipe is to be supported by blocks.

(e) Accomplish curve alignments with bends, bevels, and upper joints. Joint deflection shall not exceed the maximum allowable deflection per joint according to ASTM C425, ASTM C594, and AWWA C600.

(f) All pipe shall be inspected for soundness and damage due to handling before being lowered into the trench. Any pipe found to be damaged will be removed immediately from the site of the work.

(g) The interior of all pipes, pipe fittings, and joints shall be cleaned prior to installation.

(h) All pipe shall be laid accurately to the required line and grade, and in such a manner as to form a close concentric joint with the adjoining pipe, and to bring the invert of each section to the required grade. Bell holes shall be dug in advance of the pipe being laid.

(i) Pipe laying shall proceed upgrade, beginning at the lower end of the sewer, unless otherwise approved by the Public Works Director. The spigot or tongue end of each pipe shall be installed downstream.

(j) All open ends of pipes and branches shall be sealed with plugs or bulkheads firmly held in place in a manner acceptable to the Public Works Director. At the end of each day's work, the open ends of all pipes shall be satisfactorily protected against entrance of animals, earth, or other materials.

(k) Each length of section shall be properly pulled or shoved "home" with a winch or "come-a-long," against the section previously laid, to make a proper joint. The pipe shall then be securely held in position during the backfill operations. Joints shall not be pulled or cramped more than the design of the joint will permit and so as not to injure the conduit.

(l) Pipe shall only be installed when weather and trench conditions are suitable. The pipe shall be anchored or braced as required to prevent displacement after establishing the final position.

(5) Jointing:

(a) General Requirements:

(i) Joints shall be located to provide for differential movement and changes in the type of pipe embedment, concrete collars, and structures. The pipe shall be supported from the wall of the manhole to the first joint in a normal sewer trench with a concrete cradle structurally continuous with the base slab or footing.

(ii) All joint and gasket surfaces shall be cleaned and lubricated with a lubricant recommended by the pipe manufacturer.

(iii) Methods and equipment shall be utilized capable of fully honing or making up the joints without damage.

(iv) The joint opening and deflection shall be checked for specification limits.

(v) Each piece of pipe shall be examined prior to installation for soundness and compliance with specifications.

(b) Provisions for Jointing Reinforced Concrete Pipe:

(i) Reinforced concrete pipe may be jointed using cold-applied plastic asphalt sewer joint compound, rubber gaskets, or cold-applied preformed plastic gaskets. For all jointing materials, the contractor shall furnish the Public Works Director with the Manufacturer's Certificate of Compliance.

(ii) Construction methods for preparation and sealing of the joints for reinforced concrete pipe shall be in conformance with Item 464, "Reinforced Concrete Pipe," of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition).

(c) Rubber Gasket Joints: Check gasket position and condition after assembly with a feeler gauge prior to installation of the next section.

(d) Vertical Pipe Deflections: Vertical pipe deflections after installation shall not exceed five (5) percent of the pipe diameter.

(e) Temporary Plugs:

(i) Plugs: Plugs shall be provided and installed as manufactured by the pipe manufacturer. Plugs fabricated by the contractor may only be used with the approval of the Public Works Director. Plugs shall be water-tight against heads up to 20 feet of water. The plugs shall be placed in such a manner as to facilitate their removal when required to connect pipe.

(ii) Location: Plugs shall be installed as specified by the Public Works Director, or as reflected upon the approved engineering plans. Also, the open end of the sewer shall be plugged at

the end of the work day to prevent the entry of footage material until work is resumed.

(f) Connection to Existing Pipelines and Structures:

(i) The pipe shall be connected to existing structures and pipelines where indicated on the approved engineering plans, or as designated by the Public Works Director. Pertinent sections of these specifications pertaining to joint locations shall be observed.

(ii) The structure will be prepared by making an opening with at least two (2) inches of clearance around the fitting to be inverted. The concrete structure shall be initially cut with a concrete saw. The opening between the pipe and the manhole wall shall be filled with an expansion grout in such a manner that a water-tight condition will result.

(iii) Manholes to be built on an existing sewer line shall be constructed in such a manner as will not disrupt service of the existing sewer. The manhole base, walls, and invert shall be completed before the top half of the sewer pipe is cut or broken away. Rough edges of the pipes thus exposed shall be covered with expansive grout, in such a manner as to produce a smooth acceptable finish. Any portion of the existing sewer damaged by the contractor shall be repaired or replaced as directed by the Public Works Director, at the contractor's expense.

(iv) Connections between different pipe materials shall be made using a proprietary transition coupling, unless otherwise specified on the approved engineering plans.

(6) Dewatering: Dewatering sufficient to maintain the water level below the surface of the trench bottom shall be accomplished prior to pipe laying or jointing, if not done prior to excavation and placement of the bedding as called for. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or along the side of the trench. Provisions shall be included to prevent floatation of the pipe should the water control measures prove inadequate. When the dewatering operation is ended, the trench shall be replaced in such a manner so as to not disturb the pipe and its foundation.

(7) Bedding Materials: Each pipe shall be laid in the bedding specified upon the approved plans. Unless otherwise specified by the Public Works Director, the contractor shall use Class "B" bedding as reflected in these standards and specifications.

(a) Definition of Terms for Bedding Explanations:

- Bc = Outside Diameter of the Pipe, in inches.
- H = Backfill Cover Above Top of Pipe, in inches.
- D = Inside Diameter of the Pipe, in inches.
- d = Depth of Bedding Material Below the Pipe, in inches.

The value of "d," depth of bedding material below the bell of the pipe shall be as follows:

<u>"D" inside diameter of pipe</u>	<u>"d" depth of bedding material</u>
27 inches and smaller	3 inches
30 to 60 inches	4 inches
Larger than 60 inches	6 inches

(b) Class "A" Bedding (Concrete Cradle):

(i) Class "A" bedding is that method of bedding in which the conduit is set on "d" inches of concrete in an earth foundation and encased in concrete up to 1/4" of "Bc" to fit the lower part of the conduit's exterior breadth. The remainder of the conduit is to be surrounded to a height of at least twelve (12) inches above its top by densely compacted granular fill material carefully placed by hand to

completely fill all spaces under and adjacent to the conduit, unless otherwise specified by the Public Works Director.

(ii) The fill shall be tamped thoroughly on each side and under the conduit, as far as practicable, in layers not to exceed six (6) inches in thickness.

(iii) The concrete used for Class "A" bedding shall be plain concrete with a 28-day compressive strength of 3,000 psi, unless otherwise specified by the Public Works Director.

(c) Class "B" Bedding: Class "B" bedding is that method of bedding in which the conduit is set on "d" inches of sand cushion in an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least sixty (60) percent of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve (12) inches above its top by densely compacted granular backfill material carefully placed by hand to completely fill all spaces under and adjacent to the conduit. The fill to be tamped thoroughly on each side and under the conduit, as far as is practicable, in layers not to exceed six (6) inches in thickness. Bell excavation shall also be provided.

(d) Class "C" Bedding: Class "C" bedding is that method of bedding in which the conduit is set on an earth foundation, carefully shaped to fit the lower part of the conduit exterior for a width of at least fifty (50) percent of the conduit's breadth. The remainder of the conduit is to be surrounded to a height of at least twelve (12) inches above its top by lightly compacted granular backfill material carefully placed around the exterior of the conduit. Bell excavation shall also be provided.

(e) Unstable Subgrade Conditions: If unstable subgrade conditions are encountered on the site, and it is determined by the Public Works Director that the bedding specified upon the approved engineering plans will not provide suitable support for the pipe, additional excavation to the limits determined by the Public Works Director will be required. This additional excavation will be backfilled with crushed stone material, approved by the Public Works Director, to provide the necessary support.

(f) Sewer Line Connections: Connections to trunks, mains, and side sewers shall be left uncovered until after an acceptance inspection has been made by the Public Works Director. After approval of the connection, the bare pipe shall be covered with compacted granular backfill material to a minimum depth of twelve (12) inches above the crown of the pipe. The trench shall then be fully backfilled as required.

(8) Cross-Connections Prohibited: No storm water drain, roof drain, or drain tile shall be connected into a sanitary sewer line.

D. Manholes:

(1) Generally: Manholes shall be installed where shown on the approved engineering plans, or where subsequently designated by the Public Works Director. They must be constructed according to these standards and specifications. The tops of all manhole castings shall be placed flush with the proposed elevation reflected upon the approved engineering plans, unless otherwise directed by the Public Works Director.

(2) Materials Specification:

(a) Pre-cast or Cast-in-Place Reinforced Concrete Manholes: all pre-cast or cast-in-place concrete manholes shall be constructed in conformance with ASTM C478. Steps shall be cast-in-place in accordance with the requirements of these standards and specifications. All concrete, reinforcing, and wall thickness shall be in accordance with ASTM C478. All manhole joints shall be watertight and constructed in accordance with ASTM C443. The bottom of the structures shall be of either pre-cast, poured-in-place, or monolithic bottom stack, with 3,000 psi, concrete to conform to the approved engineering plans, and shall be at least eight (8) inches thick and reinforced as required by these standards and specifications.

(b) Polyethylene Manholes: The use of polyethylene manholes, conforming to ASTM D1248, and comparable to those distributed by Advanced Drainage Systems, Inc., may be substituted under special conditions with the approval of the Public Works Director.

(c) Manhole Steps: Manhole steps, when required, shall be furnished and installed as per these standards. The steps shall be located as follows:

(i) The first step shall be positioned no greater than thirty-six (36) inches below the finished surface grade.

(ii) The last step shall be so situated that it is no greater than twenty-four (24) inches above the spring line or invert or the outfall pipe, whichever is less.

(iii) The maximum acceptable interval between steps shall be sixteen (16) inches.

(iv) All steps shall be of either cast iron or approved non-corrosive fiberglass materials. Cast iron steps shall be tumbled or sandblasted and all burrs and sharp edges removed. All materials used in the manufacture of steps shall conform to the latest edition of ASTM specifications.

(d) Material for Jointing Manholes: Material for jointing manholes shall be one (1) part Hydraulic Cement to not less than one (1) part nor more than two (2) parts Mason's sand mixed with the least amount of clean water necessary to provide a workable mixture.

(e) Pre-Cast Manhole Components: Pre-cast manholes shall conform to ASTM C478, latest edition. Cones and sections shall be substantially free from fractures, large or deep cracks, and surface roughness. Slabs shall be sound and free from gravel pockets, all pre-cast manhole components shall be manufactured by an experienced and reputable manufacturer whose pre-cast manhole components have been used commercially for at least three (3) years.

(f) Monolithic Concrete Manholes: Monolithic concrete manholes shall conform to the approved engineering plans unless otherwise specified by the Public Works Director. Walls and dimensions shall be of approved thickness and the maximum step spacing shall be sixteen (16) inches.

(g) Cast Iron Frames, Covers, and Steps: Gray cast iron frames, covers, and steps shall conform to the requirements of ASTM A48 for Gray Cast Iron, latest edition. The dimensions, weights, and finish preparation shall conform to the appropriate construction standards, unless otherwise designated by the Public Works Director.

(h) Ductile Cast Iron Frames, Covers, and Grates: Ductile cast iron frames, covers, and grates shall conform to the requirements of ASTM A536. Dimensions, weights, and finish preparations shall conform to the appropriate construction standards, unless otherwise designated by the Public Works Director.

(3) Construction Details:

(a) Dewatering: Dewatering of the site shall conform to the same requirements for sewer trench dewatering. Subgrade preparation is an adequate foundation for all manhole structures and shall be obtained by removal and replacement of all unsuitable material with six (6) inch minimum crushed stone, or such other means as designated by the Public Works Director.

(b) Bedding: Pre-cast base sections shall be placed on a well-graded granular bedding course conforming to the requirements for sewer bedding, but not less than four (4) inches in thickness and extending to the limits of the excavation. The bedding course shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast element.

(c) Cast-in-Place Bases: Unless otherwise specified, the cast-in-place bases shall be at least eight (8) inches in thickness and shall extend at least six (6) inches radially outside of the outside dimensions of the manhole section. The cast-in-place base shall be made of 3,000 psi concrete, 28-day compression test, and shall be reinforced as shown on the approved engineering plans or as otherwise specified by the Public Works Director.

(d) Lift Holes and Joints: All lift holes and joints between pre-cast elements in manholes shall be thoroughly wetted and then be completely filled with non-shrinking concrete grout, smoothed and painted both inside and out, to insure water tightness. All joints between pre-cast elements in manholes shall be made with an approved bitumastic material or an approved rubber gasket in accordance with ASTM C443, latest edition. Pre-cast sections shall be placed and aligned to provide vertical sides and vertical alignment of the ladder rungs. The completed manhole shall be rigid, true to dimensions, and be watertight.

(e) Placing of Castings:

(i) Castings Placed on Concrete Surfaces: Castings placed on concrete surfaces shall be set in full grout beds. The grout shall be mixed in a proportion of one (1) part Hydraulic Cement to three (3) parts Mason's sand, by volume, based upon dry materials. Castings shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary or unless otherwise specified by the Public Works Director.

(ii) Streets at Grade: Where work is in paved streets or areas which have been brought to grade, not more than fifteen (15) inches shall be provided between the top of the cone or slab and the underside of the manhole casting for adjustment of the casting to street grade.

(iii) Unpaved Streets or Alleys: Where work is in an unimproved street or alley, not less than twelve (12) inches of adjusting rings shall be provided between the top of the cone or slab and the underside of the manhole casting for adjustment of the casting to finished grade. The top of the manhole casting shall be flush with the finished grade unless otherwise specified by the Public Works Director.

(iv) Manholes Within Vegetated Areas: Where work is in vegetated areas, the top of the manhole casting shall be flush with the finished grade unless otherwise specified by the Public Works Director.

(v) Reducing Cone: Where the last manhole section is a reducing cone and is set to final grade as required by the Public Works Director; then if as part of the continuous work, it becomes necessary to lower this casting, and it entails going below the cone, compensation to the contractor may be allowed for said adjustment and changing of the manhole stacks.

(vi) Adjusting Rings: When adjusting rings are used to set the castings to grade, they shall be pointed up and made watertight.

(f) Channels and Inverts: Channels and inverts shall be made to conform accurately to the sewer characteristics and grades, and shall be brought together smoothly with well-rounded junctions, satisfactory to the Public Works Director, and in accordance with the approved engineering plans.

(g) Pipe Connections: Special care shall be taken to see that the openings through which pipes enter the structure have all pipe ends sawed and smoothed completely. Pipes are to be firmly full of jointing material to ensure watertightness. The pipes shall not protrude further than three (3) inches into the inside face of the manhole, measured along the horizontal center of the pipe. Where polyethylene manholes are used, pipe connections shall be in accordance with the manufacturers specifications, or as specified by the Public Works Director. In the case of a smooth sidewall pipe, rubber water stops, "O" ring gaskets, or poured-in-place pipe sleeves shall be used for watertightness between the pipe and manhole,

they shall be core drilled or star drilled in a circle of required diameter then knocked out. In no instance shall new holes be sledge-hammered out.

E. Catch Basins, Inlets, and Special Structures:

(1) Generally: This work shall consist of catch basins, inlets and special structures, together with necessary frames, grates, or lids all constructed in conformance with the approved engineering plans or as directed by the Public Works Director.

(2) Materials: All materials shall conform to the materials requirements for manholes in these specifications.

(3) Construction Methods:

(a) Concrete: Poured or pre-cast concrete structures shall be constructed in conformance with the applicable provisions of the section on manholes.

(b) Pre-cast Reinforced Concrete Sections: Pre-cast reinforced concrete sections shall be laid in grout composed of one (1) part Hydraulic Cement to three (3) parts Mason's sand, by volume, based on dry materials, or an approved bitumastic material.

(c) Placing of Castings: Castings placed on concrete or pre-cast concrete surfaces shall be set in full grout beds. The mortar shall be mixed in proportions of one (1) part Hydraulic Cement to three (3) parts Mason's sand, based on dry materials. Castings shall conform to construction standards and shall be set accurately to the finished elevation so that no subsequent adjustment will be necessary.

(d) Cleaning: All newly constructed catch basins, inlets, and special structures shall be cleaned of an accumulation of silt, debris, or foreign matter of any kind, and shall be free from such accumulations at the time of final inspection.

F. Excavation and Backfill for Underground Conduits:

(1) Generally: For the purpose of this section, underground conduits shall be considered sewer pipe, or any other pipe conduit indicated on the plans. Wherever the term "pipe" or "pipe line" is used, it shall mean underground conduit. Excavation and backfill shall include all excavation, backfilling, surface removal, disposal of surplus material, regrading of all disturbed surfaces, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes, catch basins, inlets or other structures forming a part of the pipe line.

(2) Construction Details:

(a) Surface Removal: Along the proposed pipe line, as indicated on the approved engineering plans, the contractor shall remove the surface materials only to such widths as will permit a trench to be excavated and which will afford sufficient room for proper efficiency and proper construction. Where sidewalks, driveways, pavements, and curb and gutter are encountered, care shall be taken to protect such against fracture or disturbance beyond reasonable working limits. All pavements shall be cut with an abrasive saw; and concrete streets, driveways, walks, alleys, etc., cut to the nearest joint, or as required by the Public Works Director.

(b) Width of Excavation: The width of trenches in earth for pipe sewers, basin connections, house connections, and other structures shall be such as to provide a clearance of not less than six (6) inches or more than fifteen (15) inches on each side of the structure. Sidewalls of pipe trenches shall be vertical from the bottom of the trench to a point not less than twelve (12) inches above the top of the pipe. Above that point, sidewalls may be battered to safe slopes. Trench bracing shall be employed, if necessary, to maintain these maximum widths of trench. The bottom of the trench shall conform to the details shown on the approved engineering plans.

(c) Length of Excavation or Working Zone: In general, the contractor shall confine his raw excavation and working zone to a two (2) block area, but in no case farther than can be backfilled in the same day. Areas that have been excavated and pipes placed which are back from this raw excavation or working zone shall undergo temporary and/or permanent restoration, as spelled out in these standards and specifications.

(d) Excavation Below Grade: In cases where the excavation is carried beyond or below the lines and grades reflected on the approved engineering plans, the contractor shall, at his own expense, refill any such excavated space with suitable granular base material, as required by the Public Works Director.

(e) Subsurface Exploration: All available information and/or written reports on subsurface exploration in the vicinity of the proposed pipe line construction will be made available by the City for examination by the contractor upon request. However, it is expressly understood and agreed that the City shall in no way be held responsible for the interpretation of this information, its accuracy, or its thoroughness. The contractor may make such subsurface explorations as they believe necessary to verify and supplement the information received from the City.

(f) Short Tunnels or Jacking: In some instances, trees, fire hydrants, sidewalks, and other obstructions may be encountered, the proximity of which may be a hindrance to open cut excavation. In such case, as designated by the Public Works Director, the contractor shall excavate by means of short tunnels or jacking of pipe in order to protect such obstructions against damage.

(g) Piling Excavated Material: All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural watercourses shall not be obstructed for a period not to exceed the normal working day.

(h) Trenches to be Dry: All water shall be removed from the trench to a depth below the outside of the pipe bell prior to the laying of the pipe, or to a depth to prevent rolling of the base material, whichever is greater.

(i) Base Stabilization: After the trench is excavated to grade, the Public Works Director, or his designee, shall examine the base and determine whether or not it is satisfactory for pipe laying. If the base is not satisfactory, it shall be removed and replaced with crushed stone as ordered by the Public Works Director. The crushed stone shall have a minimum size of one (1) inch and a maximum size of two and one-half (2.5) inches, and extend a minimum depth of six (6) inches below the barrel of the pipe. Should the base still not be suitable for adequate support of the pipe (e.g., a boiling or quicksand situation, muck, etc.), the contractor shall bring alternate methods of suitable construction techniques to the Public Works Director for approval.

(3) Safety:

(a) Barricades, Guards, and Safety Provisions: The contractor shall, before closing roads or pedestrian accessways, furnish and erect standard barricades and signs to protect the public. These barricades and signs shall be placed and adequately maintained in accordance with the Texas Manual on Uniform Traffic Control Devices (current edition), or the appropriate governing agency's requirements.

(b) Existing Underground Structures: Existing storm sewers, sanitary sewers, water mains, electric conduits, telephone conduits, cable television conduits, and other underground structures shall be reflected on the submitted engineering plans according to the best available information. The exact location and protection of these facilities and structures, their support and maintenance in operation during construction, is the express responsibility of the contractor (in cooperation with the proper

authorities of the respective utility involved).

(c) Structure Protection: Temporary support and adequate protection and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the contractor at his expense, and under the direction of the Public Works Director. The structures, which may have been disturbed, shall be restored by the contractor upon the completion of the work, or as required by the Public Works Director.

(d) Protection of Property and Surface Structures: Trees, shrubbery, fences, poles, and all other property and surface structures shall be protected during construction operations, unless their removal for purposes of construction is authorized by the Public Works Director. Any fences, poles, or other man-made surface improvements which are moved or disturbed by the contractor, and are outside of the construction right-of-way or permanent easement, shall be restored to their original condition at the contractor's expense. Any trees, shrubbery, or other vegetation which are approved for removal by the Public Works Director in order to facilitate construction operations, shall be removed completely, including stumps and roots, by the contractor. Responsibility for any damages or claims for damage caused by the construction operations to trees, shrubbery, or other landscape improvements which were not authorized for removal, shall be assumed by the contractor. Settlement of any damage claims for such damage shall be made by the contractor as soon as possible and in a manner satisfactory to the damaged party and/or the Public Works Director.

(e) Caution in Excavation: The contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined. The contractor shall be held responsible for the repair of such structures when broken or otherwise damaged by the construction operations.

(4) Deviations Occasioned by Other Structures or Utilities: Whenever obstructions are encountered during the progress of the work and interfere to such an extent that an alteration in the plan is required, the Public Works Director shall have the authority to change the plans and order a deviation from the line and grade, or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions. Where gas, water, telephone, electrical, cable television, or other existing utility is an impediment to the vertical or horizontal alignment of the proposed pipe line, the Public Works Director shall have the authority to order a change in grade or alignment, or shall direct the contractor to arrange with the respective utility for their removal.

(5) Interruption to Utilities: The contractor shall take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing utility line, the contractor shall immediately notify the responsible official from the organization operating the utility interrupted. The contractor shall lend all possible assistance in restoring service, and shall assume all costs, charges, or claims connected with the interruption and repair of such service.

(6) Interference With and Protection of Streets: The contractor shall not close or obstruct any portion of a street without first notifying, in writing, the Public Works Director. The contractor shall give the Public Works Director a minimum of five (5) working days' notice in advance of starting any work on or affecting a road, property, or facilities. Streets, roads, private ways, and sidewalks shall be maintained passable by the contractor, at his expense, and the contractor shall assume full responsibility for the adequacy and safety of the provisions made therefore.

(7) Construction in Easements (Permanent and Temporary): In easements across private property, the contractor shall confine all operations within the easement area and shall be responsible and liable for all damage outside the easement area. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or subsidence beyond the easement limits, damage to improvements, or to provide reasonable access and working area for efficient operation by the contractor.

(8) Backfill:

(a) Backfill Material: The backfill material shall comply with the requirements of Item 400, "Excavation and Backfill for Structures," of the Texas Department of Transportation's Standards and Specifications For Construction of Highway's, Streets, and Bridges (current edition). At the contractor's request, the excavated material may be used for backfilling the trench, provided it meets the Texas Department of Transportation requirements, and is approved by the Public Works Director as being suitable material.

(b) Compacting Backfill:

(i) Approved Methods of Compaction: All backfill material shall be compacted to the density specified in the Texas Department of Transportation's Standards and Specifications For Construction of Highway's, Streets, and Bridges (current edition), which shall be obtained by either water jetting or mechanical tamping the backfill material in six (6) inch lifts. The contractor shall show proof of obtaining the required compaction prior to the placement of any permanent surfacing.

(ii) Right-of-Way Backfill: All backfill material within the right-of-way of all streets shall be compacted in one of the following manners: The backfill material shall be deposited in six (6) inch layers and shall be thoroughly tamped or compressed, either by an approved air tamp, vibrator, or in a large excavated area, by a ten (10) ton roller. The backfill material, if suitable, shall be deposited in the trench and compacted by jetting with water. The contractor shall provide and install weep holes in all structures, as required by the Public Works Director.

(iii) Jet Holes: The holes through which water is injected into the backfill shall be centered over the trench backfill and at longitudinal intervals of not more than six (6) feet. Additional holes shall be provided if deemed necessary by the Public Works Director to secure adequate settlement. All holes shall be jetted and shall be carried to a point one (1) foot above the top of the pipe. Drilling the holes by means of augers or other mechanical means will not be permitted. Care shall be taken in jetting so to prevent direct contact with, or disturbance of, the pipe.

(iv) Water Jetting: The water shall be injected at a pressure and a rate just sufficient to sink holes at a moderate rate. After a hole has been jetted to the required depth, the water shall continue to be injected until it begins to overflow the surface. The contractor shall bore test holes at such locations as the Public Works Director may designate in order to determine the effectiveness of the water jetting. An approved solid auger shall be used for boring test holes. As soon as the jetting has been completed, all holes shall be filled with soil and compacted. Surface depressions resulting from backfill subsidence caused by the jetting shall be filled and recompacted by tamping or rolling to the satisfaction of the Public Works Director.

(v) Dust Control: The contractor shall maintain filled surfaces which are subject to vehicular traffic in a continual dust-free condition by the use of approved temporary treatments until final paving or other final treatment of the surface is accomplished.

(vi) Removal of Topsoil: The contractor shall remove all topsoil prior to the excavation for piping. The topsoil shall be removed to a depth of twelve (12) inches below grade. The topsoil shall be stored on the project site for use in final grading and restoration.

(vii) Rip Rap: The contractor shall furnish and place revetment riprap in the areas reflected on the approved engineering plans, and in accordance with the specifications outlined below:

Material: The material shall be of broken rock or rock excavation of a gradation such that: No individual piece weighs more than one hundred twenty (120) pounds. Ninety (90) to one hundred (100) percent of the material passes a 12-inch sieve. Twenty (20) to sixty (60) percent of the material passes a 6-inch sieve. Not more than ten (10) percent of the material passes a 1-inch sieve. Reasonable care shall be taken in loading to obtain a similar gradation for consecutive loads.

Placing Riprap: The revetment riprap may be placed by dumping and

shall be graded or placed to the required thickness at the locations shown on the plans. The thickness of the riprap shall be as measured perpendicular to the slope. The slope or area where the riprap is to be placed shall be cut back to the required depth of the riprap so that the final cross-section is smooth and in alignment with the adjacent earthen slopes.

(9) Restoration:

(a) Generally: The restoration of surfaces shall include the construction of repaired surfaces as indicated on the approved engineering plans. The type of surface restoration required shall be shown on the submitted engineering plans or described in the project specifications.

(b) Construction Details:

(i) Temporary Surface Over Trench: Whenever conduits are constructed under traveled roadways, driveways, sidewalks, or otherwise improved surfaces, a temporary surfacing shall be placed over the top of the trench during seasonal periods when final surface materials may not be available. The type of temporary surface shall be approved by the Public Works Director. The temporary surface shall be maintained at the contractor's expense until final restoration of the improved surface is completed as specified.

(ii) Removal of Pavement, Sidewalk, Driveway and Curb: Whenever the pipe is located along or across an improved surface, the width of the trench shall be held as nearly as possible to the excavation zone (O.D. pipe + 30 inches). Where brick or concrete pavement, sidewalk, driveway, or curbing is cut, the width of the cut shall be to the nearest joint. Exposed surfaces of Hydraulic Cement or asphalt over Hydraulic Cement shall be cut with a pavement saw before breaking.

(iii) Replacement of Permanent Type Pavement, Sidewalks, Driveways, Curbs, Gutters, and Structures: The contractor shall restore (unless as otherwise specified by the Public Works Director) all permanent type pavements, sidewalks, driveways, curbs, gutters, fences, poles, and other property and surface structures removed or disturbed during, or as a result of, construction operations to a condition which is equal or better in appearance and quality to the condition that existed before the work began. The surface of all improvements shall be constructed of the same material, unless otherwise specified by the Public Works Director, and match in appearance the surface of the improvements which were removed. Repairs and improvements shall be performed in accordance with Article 2 of these specifications and as noted in Article 8 - Standard Plans.

(iv) Seeding and Sodding: At locations indicated on the approved engineering plans, or where designated by the Public Works Director, the contractor shall prepare seed beds, furnish and spread fertilizers, and furnish and plant the seed as specified herein on the disturbed areas.

(v) Disposal of Surplus Excavated Material: Surplus excavated material not needed for backfill shall be promptly removed from the site by the contractor. Unless otherwise specified by the Public Works Director, all materials and debris removed shall become the property of the contractor.

(vi) Clean-Up: All surplus materials, all tools, and all temporary structures shall be removed from the site by the contractor. All dirt, trees, scrub brush, rubbish, etc., shall be hauled from the project site and suitably disposed of. The construction site should be left clean and acceptable to the Public Works Director at the earliest possible date. Before acceptance of the underground conduit construction, all pipes, manholes, catch basins, inlets, and other appurtenances shall be cleaned of all debris and foreign material. After all backfill has been completed, the ground surface shall be shaped to conform to the contour of adjacent surfaces, unless otherwise specified by the Public Works Director. General clean-up of the entire construction area shall otherwise conform to the applicable requirements specified.

G. Other Specifications: Except as they may be otherwise superseded by these standards and

specifications, the construction, installation, and materials specifications for storm water sewer improvements shall conform to the requirements of the Texas Department of Transportation's Standard Specifications for Construction of Highways, Streets, and Bridges (current edition).

ARTICLE 6

BARRICADES AND CHANNELIZING DEVICES

6.01 Functions: The functions of barricades and channelizing devices are to warn and alert drivers of hazards created by construction or maintenance activities in or near the traveled way and to guide and direct drivers and/or pedestrians safely past the hazards. In fulfilling these two functions, barricades and channelizing devices are often required to satisfy two opposing requirements. For example, a channelization installation should be constructed to provide protection for men working in the roadway. At the same time, the channelization devices should provide a smooth and gradual transition which reduces the width of the traveled way. In this case, the channelization devices should not inflict any severe damage to a vehicle that inadvertently strikes them, but in doing so runs counter to the goal of providing protection for men working in the roadway. The overall objective should be the development of a traffic plan which uses a variety of traffic control measures in whatever combination necessary to assure smooth, safe vehicular and/or pedestrian movement past the work area, while at the same time, providing maximum safety for the workmen and equipment on the job.

6.02 Safety Plan Required: Barricades and channelizing devices are elements in a total system of traffic control devices for use in right-of-way construction and maintenance operations. To this end, a safety plan shall be included as an element of the engineering plans submitted for the review and approval of the Public Works Director. The safety plan will designate the various locations where the need for barricades and channelizing devices are anticipated, the type and combination of traffic control devices proposed for use, and the sub-system of warning devices that will precede the traffic control devices, including size, number, and placement. The safety plan will be modified as needed to accommodate safe passage of traffic.

6.03 Barricade Design and Usage: Provide traffic control devices that conform to details shown on the plans, the Texas Manual on Uniform Traffic Control Devices (current edition), the Compliant Work Zone Traffic Control Device List as maintained by the Traffic Operations Division of TxDOT, and TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (current edition):

Division V

Item 502 Barricades, Signs, and Traffic Handling

ARTICLE 7

EROSION AND SEDIMENTATION CONTROL

7.01 Purpose: The purpose of this Article is to control soil and sand erosion on land that is undergoing development and to preserve the natural terrain, dune systems and waterways of the land within the City of South Padre Island. The provisions of this Article are intended to provide a natural community environment and to prevent soil and sand erosion which makes necessary costly repairs to roadside ditches, gullies, washed out fills, roads and embankments. The resulting sediment of soil erosion clogs storm sewers and roadside ditches, creates silt problems in the Bay and covers pavements, all of which pose a threat to public health and safety. Interpretation and application of the provisions of this Article shall be pursuant to these purposes.

7.02 Scope of Authority: Any person, firm, corporation, or business proposing to develop land, perform earthwork or construct within the City of South Padre Island shall apply to the Public Works Director for approval of an Erosion and Sedimentation Control Plan, and issuance of a Grading Permit, as specified in

this Article. No land shall be graded except upon issuance of such a permit.

7.03 Applicability: Submission of an Erosion and Sedimentation Control Plan, in conjunction with an application for a Grading Permit shall be required in the following instances:

- A. Those projects requiring submission and approval of engineering plans by the Public Works Director, as required by these standards and specifications.
- B. Those requiring issuance of a Building Permit for commercial, residential, or institutional buildings in which there is substantial land disturbance as decided by the Public Works Director or his designee.
- C. Those involving the grading, removal of protective ground cover or vegetation, land filling, or other land disturbing activity affecting a surface area of 5,000 square feet or more.
- D. Those involving the excavation, filling, or combination of excavation and filling affecting four hundred (400) cubic yards or more of soil, sand, gravel, stone, or other material.
- E. Those involving street, highway, road, or bridge construction, enlargement, relocation, or reconstruction.
- F. Those involving the laying, repairing, replacing, or enlarging of an underground pipe or utility for a distance of one hundred and fifty (150) feet or more.

7.04 Erosion and Sediment Control Plan: No person shall begin a land disturbing activity subject to the requirements of this Article without first receiving approval of an Erosion and Sediment Control Plan (that complies with the Texas Commission on Environmental Quality's Stormwater General Permit Conditions), and issuance of a Grading Permit. The Erosion and Sediment Control Plan shall include the following:

- A. The site boundaries and adjacent lands which accurately identify the site location.
- B. Bay or Gulf waters, ponds, wetlands, channels, ditches, and other bodies of water and water courses on and adjacent to the site.
- C. Location and dimensions of storm water drainage systems and natural drainage patterns on and immediately adjacent to the site.
- D. Locations and dimensions of utilities, structures, roads, highways, and paving surfaces. Location of dunes, dune vegetation and other trees and vegetation.
- E. Contours of the subject site, on a one-half (1/2) foot interval, reflecting both the elevations of the pre-development site, and the proposed finished grades.
- F. Site Construction Plan:
 - (1) Locations and dimensions of all proposed land disturbing activities.
 - (2) Location and dimensions of all temporary soil stockpiles.
 - (3) Location and dimensions of all erosion control measures necessary to meet the requirements of this Article, throughout all phases of construction and permanently after completion of the development of the site.
 - (4) Schedule of the anticipated starting and completion dates for each land disturbing activity, including the installation of erosion control measures needed to meet the requirements of this Article.
 - (5) Provisions for the maintenance of the erosion control measures during construction.

(6) List of potential pollutants

- G. Identification of the persons or entity which will have the legal responsibility for maintenance of the erosion control structures and measures after the development is completed.
- H. The proposed phasing of the development of the site, including clearing, rough grading and construction, final grading and landscaping. Phasing should identify the expected date on which the clearing will begin, the estimated duration of exposure of cleared areas; and the sequence of clearing, installation of temporary sediment control measures, installation of storm drainage facilities, paving of streets and parking areas, and the establishment of temporary and permanent vegetative cover.
- I. The location of any utility easements that is located within ten (10) feet of the property.

7.05 Erosion and Sediment Control Requirements: The following requirements shall be met on all sites:

- A. Finished Grade: All excavations, grading, or filling shall have a finished grade not to exceed a 3:1 slope. All areas within City Right-of-Way shall not exceed a 12:1 slope.
- B. Site Dewatering: Sediment-laden water flowing from the site shall be detained by temporary sediment basins. Also, water shall not be discharged in a manner that causes erosion in the receiving channel or onto or along roadways, curb and gutter or roadside swale.
- C. Waste and Material Disposal: Wastes or unused building materials, including but not limited to garbage, debris, cleaning wastes, wastewater, toxic materials, and hazardous substances shall not be carried by runoff from a site. Proper disposal of all wastes and unused building materials, in line with the nature of the waste or material by the City approved solid waste hauler is required.
- D. Tracking: Sediment being tracked from a site onto public or private roadways shall be minimized. This can be accomplished initially by a well-planned layout of roads, access drives, and parking areas of sufficient width and length. However, protective covering may also be necessary.
- E. Sediment Removal: Public or private roadways shall be kept clear of accumulated sediment. If appreciable sedimentation occurs after a storm event, the sediment shall be deposited on the parcels of land from where it likely originated.
- F. Drain Inlet Protection: All storm drain inlets shall be protected against sedimentation with straw bales, filter fabric, or equivalent barriers meeting accepted design criteria, standards, and specifications.
- G. Design Standards: TxDOT Standards EC (1)-09 and EC (2)-93 thru EC (8)-93 as shown in Article 8, "Standard Plans" may be used to identify appropriate installations for erosion control best management practices.
- H. Site Erosion Control: The following items apply only to the time period when land disturbing activities are taking place.

(1) Runoff passing through a site from adjacent areas shall be controlled by diverting it around disturbed areas. Surface water concentrations in excess of four (4) cubic feet per second shall be intercepted and directed to a stable outlet. Alternatively, the existing channel may be improved to prevent erosion or sedimentation from occurring.

(2) Runoff from a disturbed area shall be controlled by one or more of the following measures:

(a) Barring unforeseeable weather conditions, all disturbed ground left inactive for seven (7) or more days, shall be stabilized by seeding, sodding, mulching, or covering, or by other equivalent erosion control measures.

(b) With disturbed areas within a site of five (5) acres or more, where drainage is in the same direction or where runoff will result in loss of soil, an abatement program or recovery program is required. Where feasible, one or more sediment basins shall be constructed. Each sediment basin shall have a depth of at least three (3) feet, and have sufficient surface area to trap the sediment. The size of the sedimentation basin should be at least one (1) percent of its drainage area. Sediment shall be removed from time to time to maintain a minimum three (3) foot depth. When the disturbed area is stabilized, the sediment basin(s) can be removed. However, if erosion is likely to continue, the sediment basin shall be maintained by the existing or subsequent property-owners. The discharge rate from a sediment basin shall not cause a scouring in the receiving channel.

(c) With disturbed areas within a site of less than five (5) acres, filter fences, straw bales, or equivalent erosion control measures placed along all side slope and downslope areas of the site, shall be required. Also, if concentrated runoff passes through a site, filter fences shall be placed along the edges of the concentrated flow area to reduce the amount of sediment removed from the site. However, if these measures are not sufficient to control off-site sedimentation, a sediment basin may still be required by the Public Works Director.

(3) Open Channels: Provisions shall be made to accommodate the increased runoff caused by changed soil and surface conditions during and after grading. Open channels designed so that their final gradient shall result in velocities of five (5) feet per second or less shall be established to permanent vegetation. Open channels with velocities in excess of five (5) feet per second shall be established to permanent vegetation by use of commercial erosion control blankets, lined with rock riprap, or other suitable material as approved by the Director of Public Works.

(4) Erosion from all soil storage piles shall be controlled by placing straw bales, filter fence, or other appropriate barriers around the piles. Adjacent storm drain inlets shall be protected using similar filter barriers. Moreover, any soil storage pile containing more than ten (10) cubic yards of material shall be located at least twenty-five (25) feet up slope from a roadway or a drainage channel. Furthermore, if remaining in existence for more than seven (7) days, the storage piles shall be stabilized by mulching, vegetative cover, tarps, or other means. Storage piles containing less than ten (10) cubic yards of material may be located closer than twenty-five (25) feet to a roadway or drainage channel, but shall be covered with tarps or a suitable alternative if in existence for less than seven (7) days. However, if a pile is in existence for more than seven (7) days, barriers shall also be placed around the pile.

(5) Re-establishment of Vegetation: Where natural vegetation is removed during the grading, vegetation shall be re-established as soon as possible or during the next preferred seeding period after grading has been completed. Finished grades, not to be disturbed by future improvements, shall be mulched when seeded.

I. Maintenance of Erosion Control Measures: During the period of land disturbance at a site, all sediment basins and other erosion control measures necessary to meet the requirements of this Article shall be applied by the contractor or subsequent property-owner. If sedimentation is likely to be a problem after land disturbing activities have ceased, some or all of the sediment basins and other erosion control measures shall be maintained by the contractor or subsequent property-owner for as long as the problem exists.

J. Finished Lots:

(1) In subdivision where earth movement is necessary and the material is suitable for use as topsoil, the contractor shall stockpile the top six (6) inches of earth to be removed. When the rough grade is completed, the topsoil shall be redistributed across the proposed lots, making it easier to re-establish lawns and landscaping features. Top soils shall not be:

(a) Used for subsurface filling.

(b) Removed from the subject property and sold, or otherwise transferred for use off-site.

(c) Removed from the subject property and sold, or otherwise transferred for monetary gain or other advantage, back to the subsequent owners of the lots developed upon the subject property.

(2) All lots shall be seeded and mulched or sodded before an occupancy permit shall be issued, except that a temporary occupancy permit may be granted in cases of undue hardship due to unfavorable ground or weather conditions.

7.06 Review of the Erosion and Sediment Control Plan: The Public Works Director shall promptly review the erosion and sediment control plan in conjunction with the submitted engineering plans, or building permit application, to determine if the requirements of this Article have been met. If the requirements are met, the Public Works Director shall approve the plan, inform the applicant, and issue the permit. If the requirements are not met, the Public Works Director shall inform the applicant in writing and either may require additional information, or disapprove the plan. If additional information is requested, and subsequently submitted, The Public Works Director shall again determine whether the plan meets the requirements of this Article. If the plan is then disapproved, the Public Works Director shall inform the applicant in writing giving the reasons for the disapproval.

7.07 Permits:

A. Performance Guarantee: As a condition of approval and issuance of the permit, the Public Works Director may require the applicant to provide a performance guarantee to insure a good faith execution of the erosion and sediment control plan and any permit requirements.

B. Permit Conditions: All permits shall require the applicant to:

(1) Notify the Public Works Director at least twenty-four (24) hours before commencing any land disturbing activity.

(2) Notify the Public Works Director of the completion of erosion control measures within seven (7) days after their installation.

(3) Obtain permission from the Public Works Director prior to modifying the erosion and sediment control plan.

(4) Install all erosion control measures as identified in the approved erosion and sediment control plan.

(5) Maintain all road drainage systems, storm water drainage systems, erosion control measures, and other facilities identified in the erosion and sediment control plan until the project has been terminated (See Section 7.10).

(6) Remove sediment resulting from land disturbing activities from adjacent surfaces and drainage ways, and/or repair erosion damage to adjacent surface and drainage ways.

(7) Allow the Public Works Director, or his designees, to enter the site for verifying compliance with the requirements of the erosion and sediment control plan, or for inspecting the performance of any work necessary to bring the site into compliance with the erosion and sediment control plan.

7.08 Inspection: To insure compliance with the erosion and sediment control plan, the Public Works Director, or his designees, shall inspect sites having ongoing land disturbing activities. By applying for a grading permit, the applicant consents to the City inspecting the proposed development site and all work in

progress. If land disturbing activities are being carried out without a permit, the Public Works Director, or his designees, shall issue a stop-work order pursuant to the provisions of Section 7.09.

7.09 Enforcement:

- A. The Public Works Director, or his designees, shall post a stop-work order if:
 - (1) Any land disturbing activity regulated under this Article is being undertaken without a permit.
 - (2) The erosion and sediment control plan is not being implemented in good faith.
 - (3) The conditions of the permit are not being met.
- B. Ten (10) days after posting a stop-work order, the Public Works Director may issue a "notice of intent" to the violator stating that fourteen (14) days after issuing the "notice of intent" the Public Works Director will use the performance guarantee to perform the work necessary to provide compliance with the requirements of this Article.
- C. If, within five (5) days after notification, a permit holder does not comply with the erosion and sediment control plan or permit conditions, the Public Works Director shall revoke the permit.
- D. Any person found in violation of any of the provisions of this Article shall be subject to the penalties contained in Chapter 21 of the City's Code of Ordinances.
- E. Compliance with the provisions of this Article may also be enforced by injunction.

7.10 Project Termination: An orderly and timely completion of a project with land disturbing activities should be planned between all persons involved with a site.

- A. Nearing the end of a project, but prior to final grading, seeding, and mulching, the person holding the permit shall petition in writing for the Public Works Director to authorize the installation of utility lines on the site. Those persons involved in the installation of utility lines shall perform their work promptly to minimize the time period during which some of the land may be left in a relatively unprotected state. After the utility lines have been installed, the person holding the permit shall promptly complete all erosion and sediment control measures.
- B. When a project has been completed, the person holding the permit shall petition, in writing, the Public Works Director for approval of the erosion and sediment control measures which are to remain on the site. The Public Works Director shall subsequently inspect the site to evaluate the adequacy of these control measures.
 - (1) If the erosion control measures are approved, any performance guarantees shall be released. However, maintenance responsibilities shall remain with the person owning the land.
 - (2) If the erosion control measures are not approved because they are not in line with the erosion and sediment control plan, the Public Works Director shall notify, in writing, the person holding the permit of the unacceptable features, and establishing a fourteen (14) day period within which corrective measures must be taken.
 - (a) After the conclusion of the fourteen (14) day period, if corrective measures have been taken, the person holding the permit may petition, in writing, for the Public Works Director to again evaluate the adequacy of the erosion control measures.
 - (b) If the Public Works Director again determines that the erosion control measures are inadequate, the Director may delay the release of any performance guarantee for a period of up to two (2) months.

(c) If the two (2) month period elapses without the necessary corrective measures having been taken, the Public Works Director may use the performance guarantee to finance such changes or additions to the erosion control measures as may be needed to complete the project.

ARTICLE 8
STANDARD PLANS

When Using TxDOT Statewide Standard Files:

TxDOT divisions maintain statewide electronic master files. The responsible division is identified in the plan title block, and good quality printed versions of the file may be used statewide in plan sets without being signed and sealed by a licensed engineer. All title block information, TxDOT logos and information must remain. Consultants are not permitted to remove or reuse TxDOT statewide standard files without permission.

Modified Standard Files

A modified standard file is specific to a particular job. Any modifications to a statewide or district standard file, however minor, must be documented briefly and dated in the revision block of the sheet, and the designation "(MOD)" must be appended to the standard plan name inside the title block. Each modified standard file must be signed and sealed by a licensed engineer.

By using these files you accept the TxDOT terms and conditions as specified at the following location:

<http://www.txdot.gov/inside-txdot/division/design/cad-disclaimer.html>

DRAINAGE DESIGN STANDARDS

Figure 1 – Runoff Computation Form for Storm Drains

Figure 2 – Hydraulic Design Form for Storm Drains

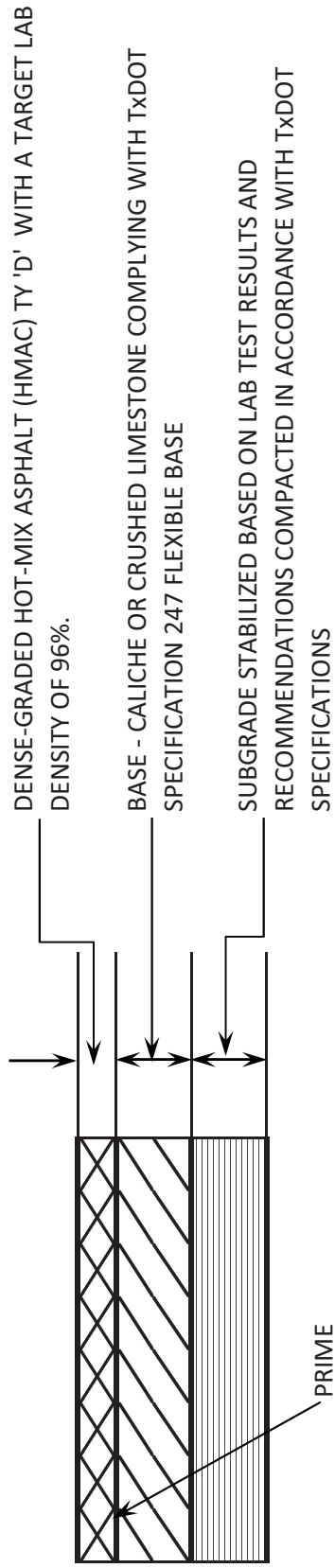
Figure 3 – Design Computation Form for Culverts

Design Criteria - Use TxDOT Hydraulics Design Manual found at:

<http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm>

Standards for Culverts, Pipes, Wingwalls and Other Drainage Structures – Use TxDOT Standards found at:

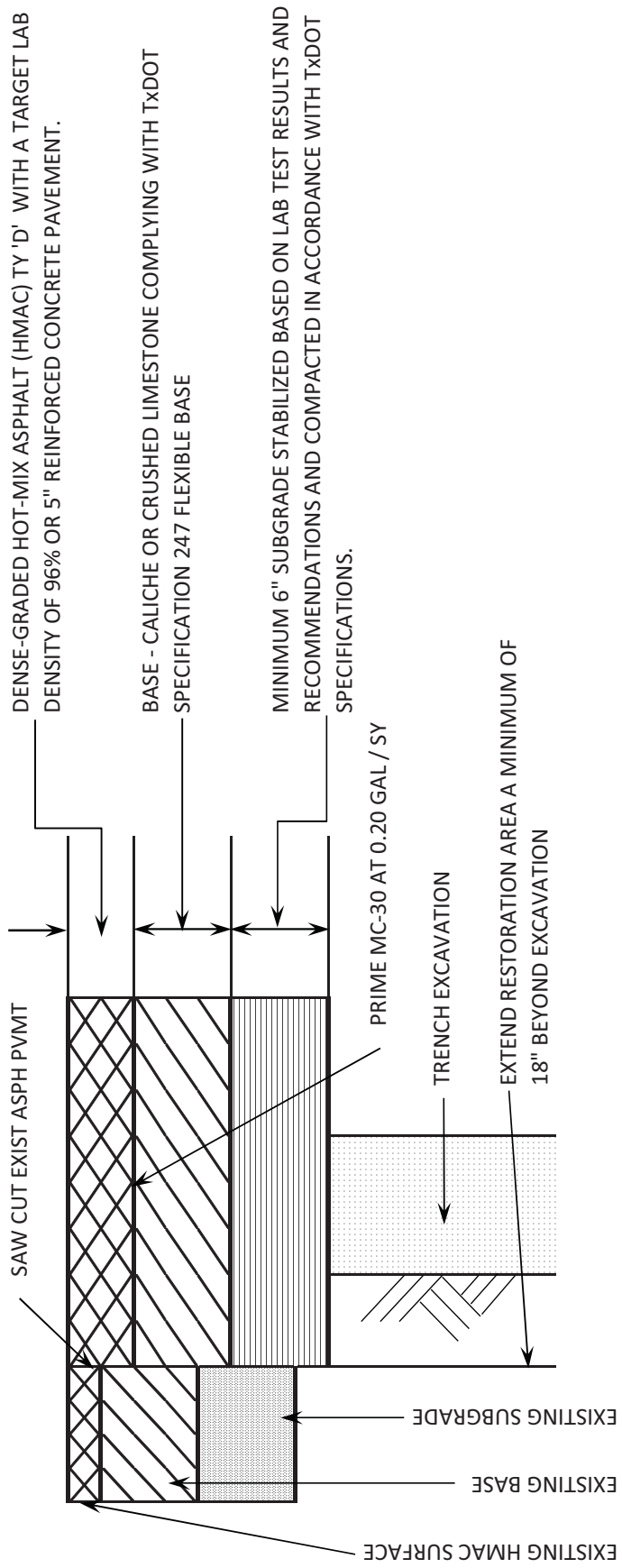
<http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/bridge-e.htm>



SECTION	STREET CLASSIFICATION & SECTION THICKNESS	
	MINOR STREETS	COLLECTOR / ARTERIAL STREETS
HMAC	2"	2"
CALICHE	7"	8"
CRUSHED LIMESTONE	5"	6"
BASE		
STABILIZED SUBGRADE	6"	8"

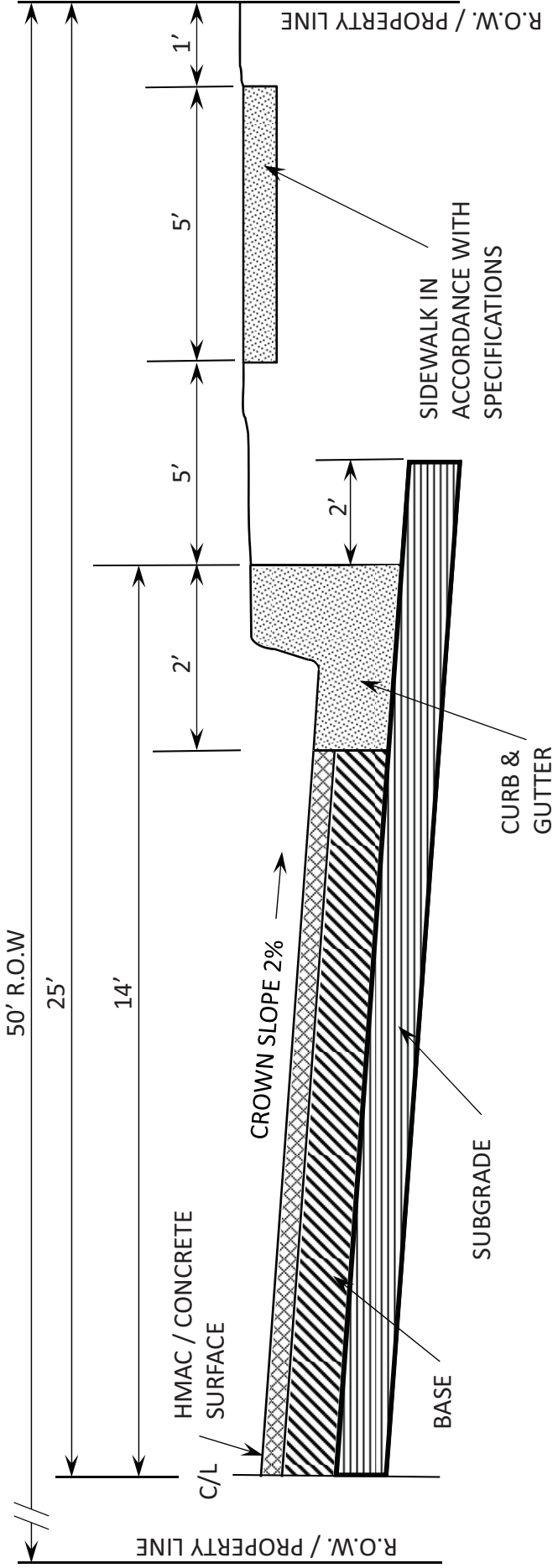
ASPHALT PAVEMENT SECTION

(NOT TO SCALE)



PAVEMENT RESTORATION SECTION

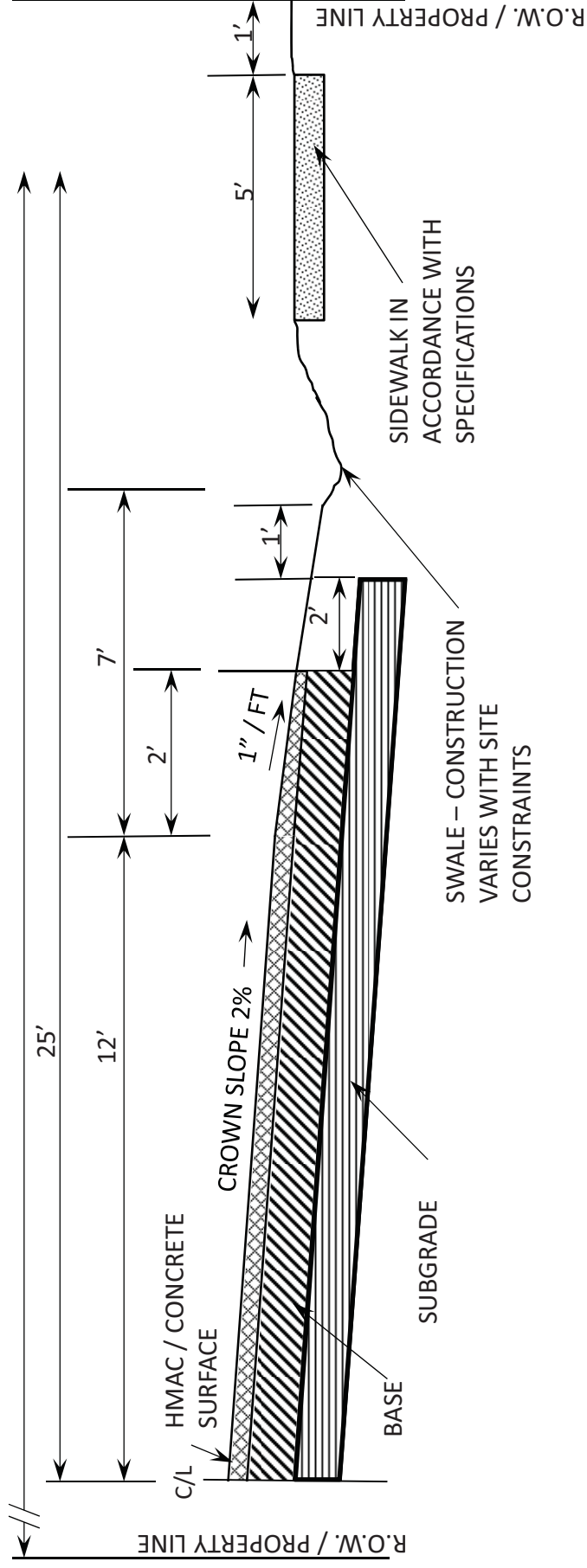
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MINOR STREET CROSS SECTION WITH CURB & GUTTER

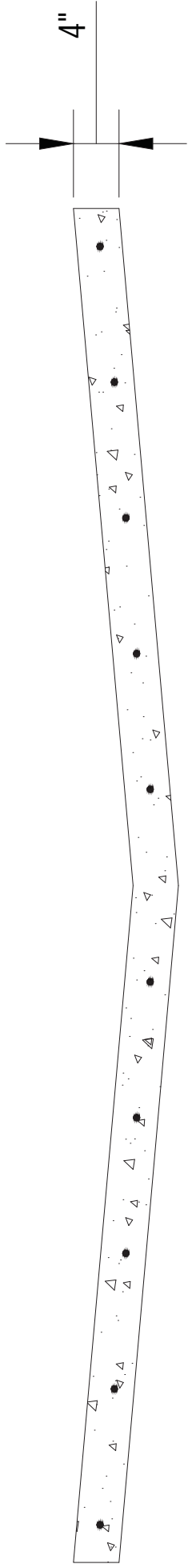
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50' R.O.W

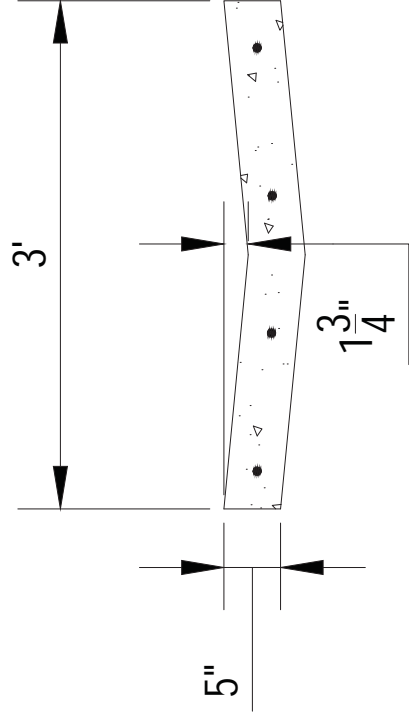


MINOR STREET CROSS SECTION WITHOUT CURB & GUTTER

(NOT TO SCALE)



DRIVEWAY CROSS SECTION

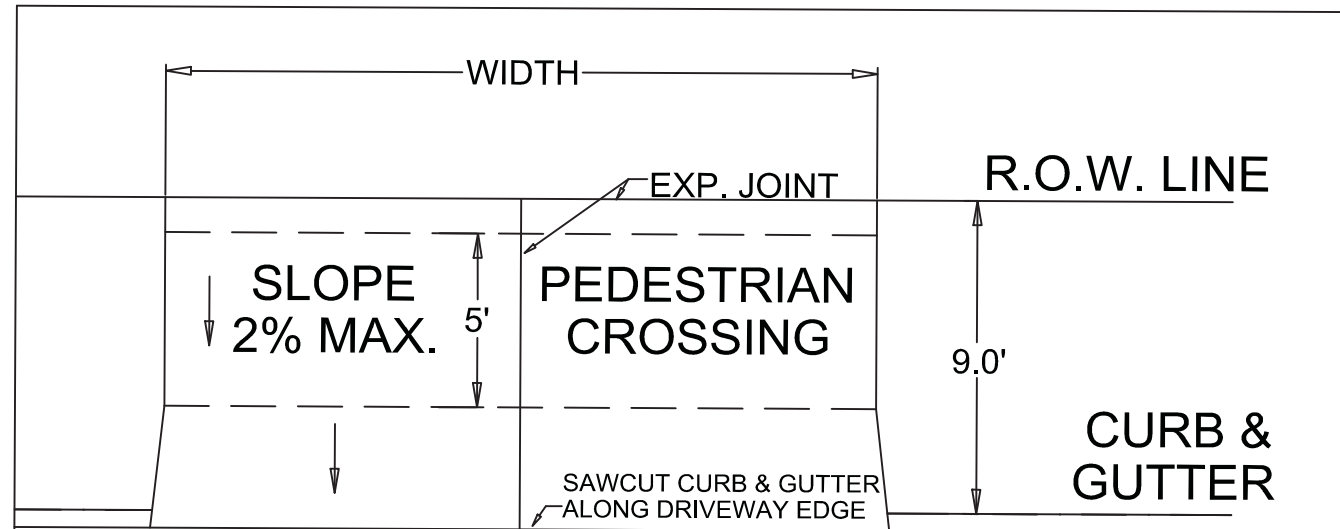


EXPANSION JOINTS @ 20'

STEEL #3 @ 12" E.W.

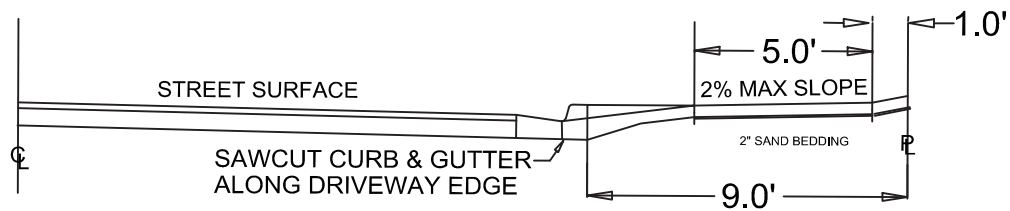
3000 PSI CONCRETE

VALLEY GUTTER



DRIVEWAYS SHALL CONSIST OF 5" THICK, 3000 PSI CONCRETE WITH #3 BARS AT 18" O.C.E.W. ON SAND BEDDING OVER COMPACTED SUBGRADE.

PLAN VIEW

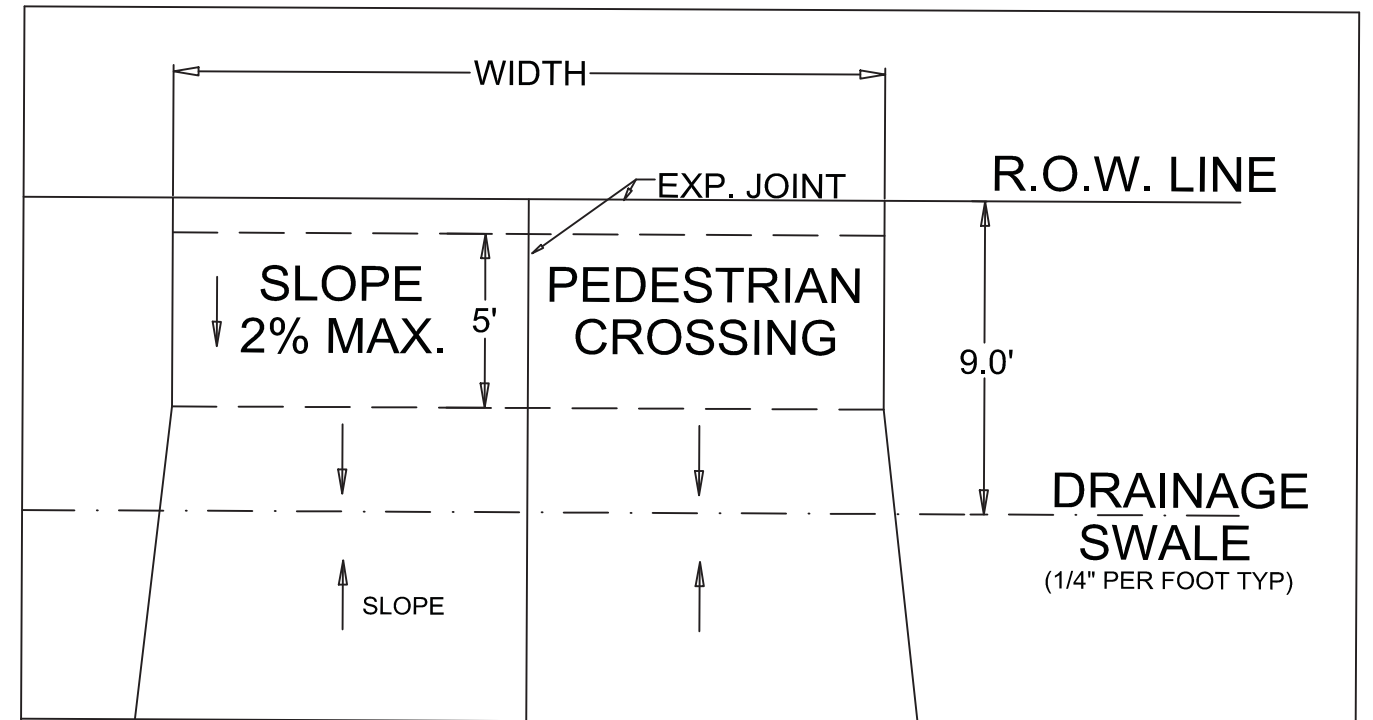


CROSS SECTION

NOTES:

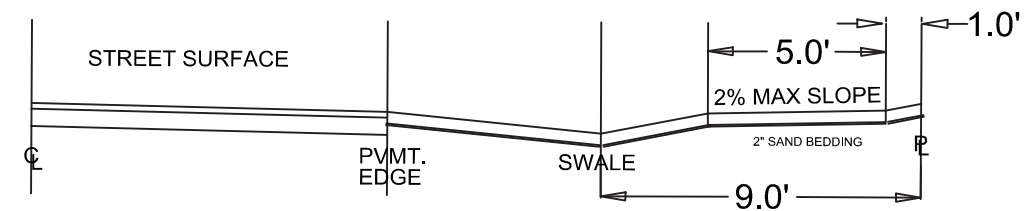
1. PLACE A 1/2" ASPHALT BOARD EXPANSION JOINT ALONG THE R.O.W. LINE AND DOWN THE CENTER OF THE DRIVEWAY IF NECESSARY.
2. DRIVEWAYS SHALL NOT BE PLACED WITHIN 30 FEET OF INTERSECTING STREET EDGES, OR STOP SIGNS.
3. DRIVEWAYS SHALL NOT BE CONSTRUCTED WITHIN THE CURB RETURN OF A STREET.
4. DRIVEWAYS MUST CONFORM TO TEXAS ACCESSIBILITY STANDARDS AND CITY STANDARDS.

City of South Padre Island DEPARTMENT OF PUBLIC WORKS	RESIDENTIAL DRIVEWAY ON SIDE STREET WITH CURB AND GUTTER	
RECORD COPY SIGNED BY Marceline J. Newman, P.E.	11/20/13 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.
		STANDARD NO.



DRIVEWAYS SHALL CONSIST OF 5" THICK, 3000 PSI CONCRETE WITH #3 BARS AT 18" O.C.E.W. ON SAND BEDDING OVER COMPACTED SUBGRADE.

PLAN VIEW

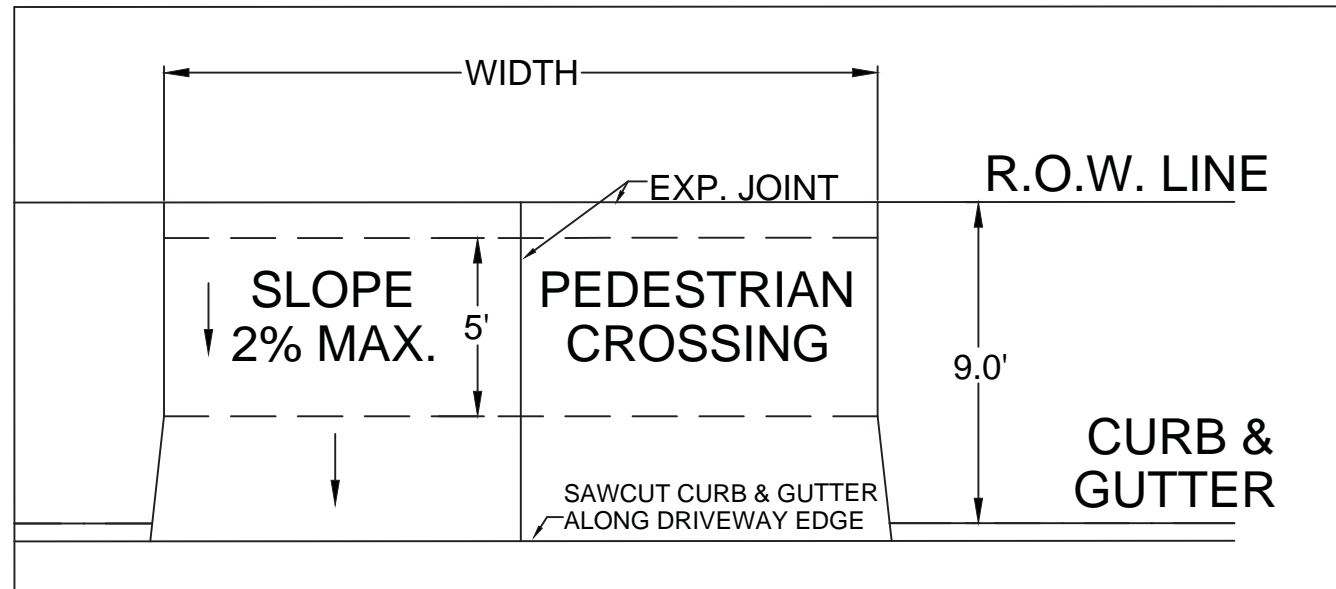


CROSS SECTION

NOTES:

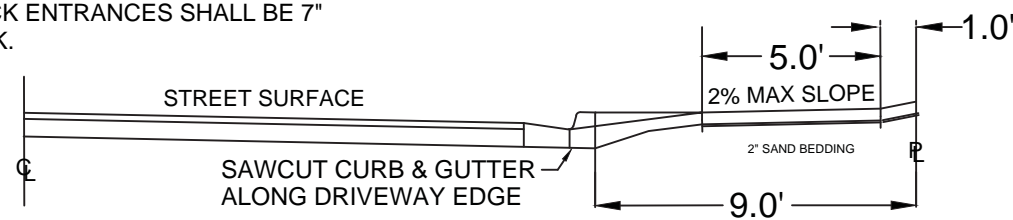
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2. DRIVEWAYS SHALL NOT BE PLACED WITHIN 30 FEET OF INTERSECTING STREET EDGES, OR STOP SIGNS.
3. DRIVEWAYS SHALL NOT BE CONSTRUCTED WITHIN THE CURB RETURN OF A STREET.
4. DRIVEWAYS MUST CONFORM TO TEXAS ACCESSIBILITY STANDARDS AND CITY STANDARDS.

City of South Padre Island DEPARTMENT OF PUBLIC WORKS	RESIDENTIAL DRIVEWAY ON SIDE STREET WITHOUT CURB AND GUTTER	
RECORD COPY SIGNED BY Marceline J. Newman, P.E.	11/20/13 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.
		STANDARD NO.



STANDARD VEHICULAR DRIVEWAYS SHALL CONSIST OF 6" THICK, 3000 PSI CONCRETE WITH #3 BARS AT 12" O.C.E.W. ON SAND BEDDING OVER COMPACTED SUBGRADE. TRUCK ENTRANCES SHALL BE 7" THICK.

PLAN VIEW

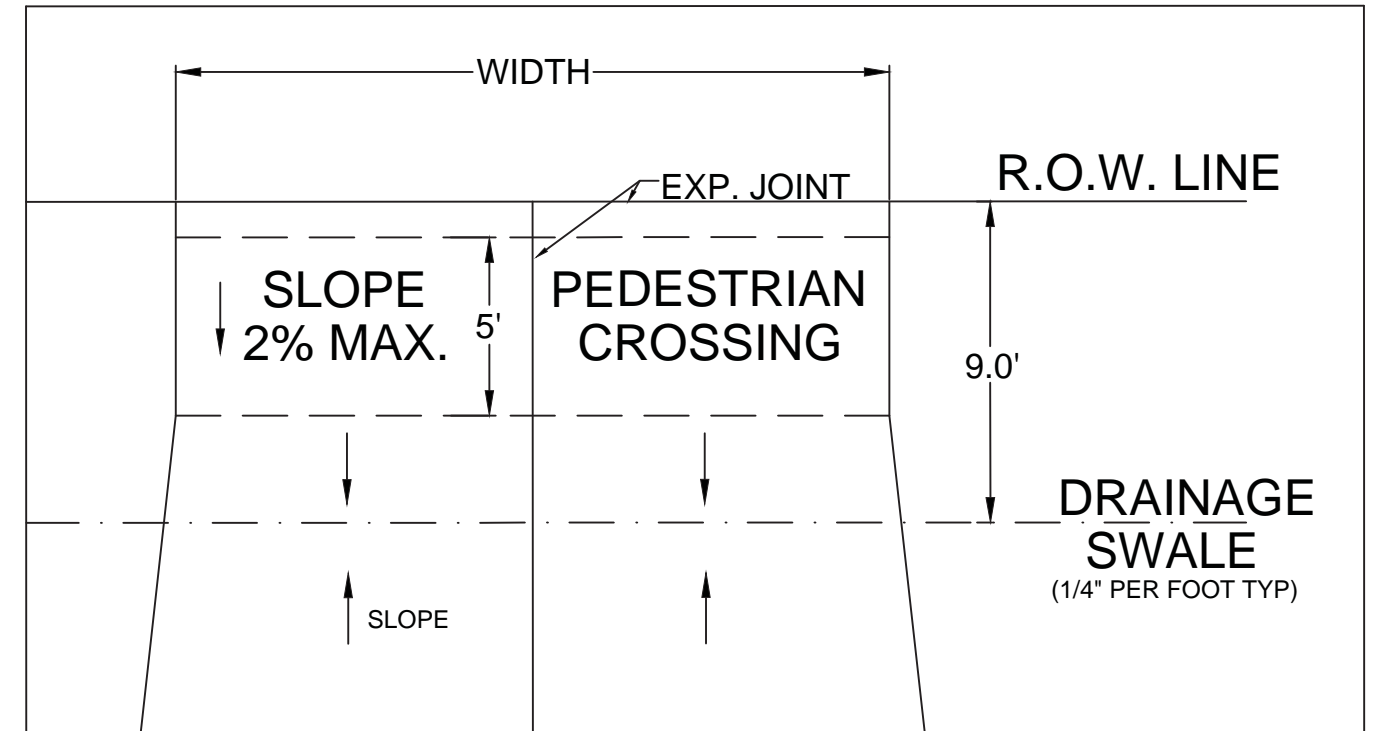


CROSS SECTION

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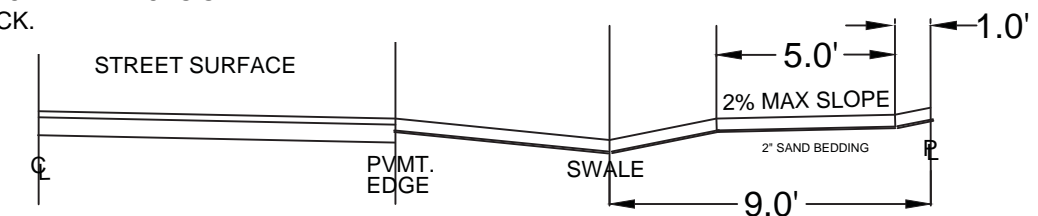
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2. DRIVEWAYS SHALL NOT BE PLACED WITHIN 30 FEET OF INTERSECTING STREET EDGES, OR STOP SIGNS.
3. DRIVEWAYS SHALL NOT BE CONSTRUCTED WITHIN THE CURB RETURN OF A STREET.
4. DRIVEWAYS MUST CONFORM TO TEXAS ACCESSIBILITY STANDARDS AND CITY STANDARDS.

City of South Padre Island DEPARTMENT OF PUBLIC WORKS	COMMERCIAL DRIVEWAY ON SIDE STREET WITH CURB AND GUTTER	
RECORD COPY SIGNED BY <i>Marceline J. Newman, P.E.</i>	11/20/13 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.
		STANDARD NO.



STANDARD VEHICULAR DRIVEWAYS SHALL CONSIST OF 6" THICK, 3000 PSI CONCRETE WITH #3 BARS AT 12" O.C.E.W. ON SAND BEDDING OVER COMPACTED SUBGRADE. TRUCK ENTRANCES SHALL BE 7" THICK.

PLAN VIEW



CROSS SECTION

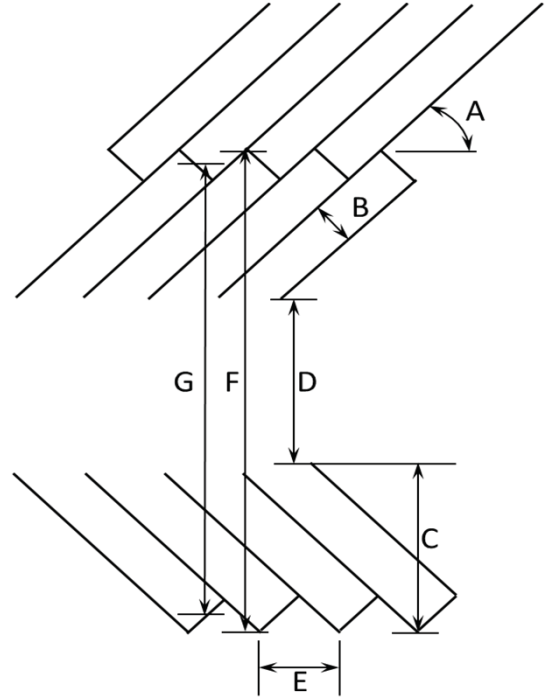
NOTES:

1. PLACE A 1/2" ASPHALT BOARD EXPANSION JOINT ALONG THE R.O.W. LINE AND DOWN THE CENTER OF THE DRIVEWAY IF NECESSARY.
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City of South Padre Island DEPARTMENT OF PUBLIC WORKS	COMMERCIAL DRIVEWAY ON SIDE STREET WITHOUT CURB AND GUTTER	
RECORD COPY SIGNED BY <i>Marceline J. Newman, P.E.</i>	11/20/13 ADOPTED	THE ARCHITECT/ENGINEER ASSUMES RESPONSIBILITY FOR APPROPRIATE USE OF THIS STANDARD.
		STANDARD NO.

PARKING DIMENSIONS

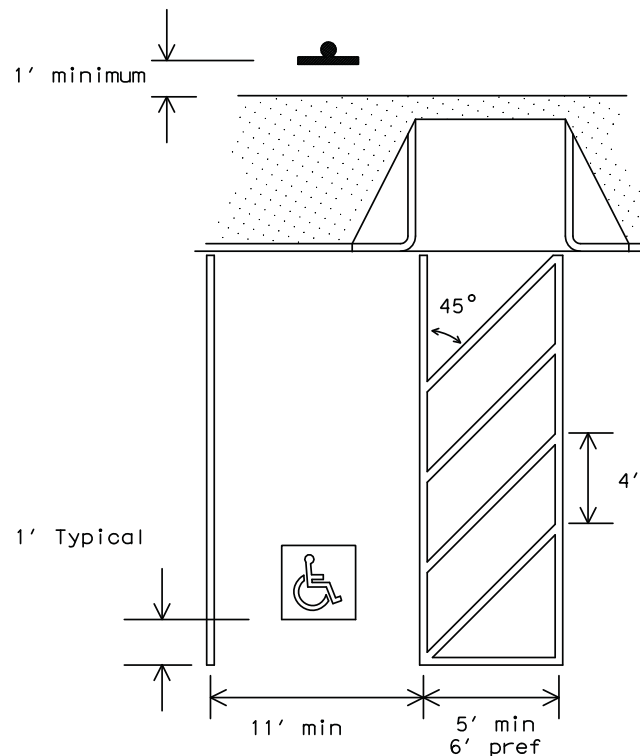
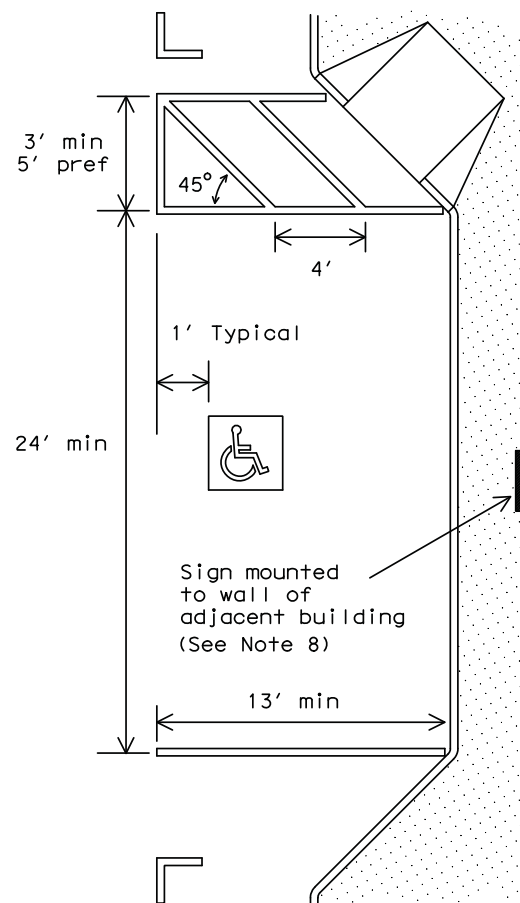
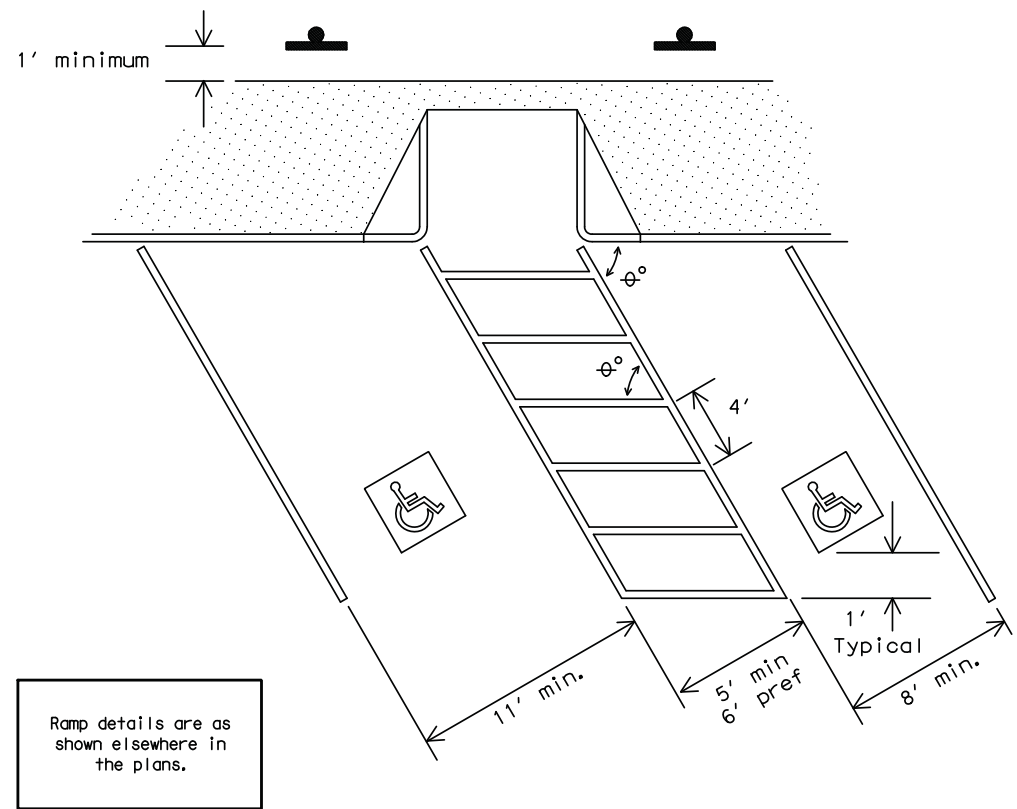
A	B	C	D	E	F	G
0°	8' 0"	8.0	12.0	23.0	28.0	-
	8' 6"	8.5	12.0	23.0	29.0	-
	9' 0"	9.0	12.0	23.0	30.0	-
	9' 6"	9.5	12.0	23.0	32.0	-
	10' 0"	10.0	12.0	23.0	32.0	-
20°	8' 0"	14.0	11.0	23.4	39.0	31.5
	8' 6"	14.5	11.0	24.9	40.0	32.0
	9' 0"	15.0	11.0	26.3	41.0	32.5
	9' 6"	15.5	11.0	27.8	42.0	33.1
	10' 0"	15.9	11.0	29.2	42.8	33.4
30°	8' 0"	16.5	11.0	16.0	44.0	37.1
	8' 6"	16.9	11.0	17.0	44.8	37.4
	9' 0"	17.3	11.0	18.0	45.6	37.8
	9' 6"	17.8	11.0	19.0	46.6	38.4
	10' 0"	18.2	11.0	20.0	47.4	38.7
45°	8' 0"	19.1	14.0	11.3	52.2	46.5
	8' 6"	19.4	13.5	12.0	52.3	46.5
	9' 0"	19.8	13.0	12.7	52.5	46.5
	9' 6"	20.1	13.0	13.4	53.3	46.5
	10' 0"	20.5	13.0	14.1	54.0	46.9
60°	8' 0"	20.4	19.0	9.2	59.8	55.8
	8' 6"	20.7	18.5	9.8	59.9	55.6
	9' 0"	21.0	18.0	10.4	60.0	55.5
	9' 6"	21.2	18.0	11.0	60.4	55.6
	10' 0"	21.5	18.0	11.5	61.0	56.0
70°	8' 0"	20.6	20.8	8.5	61.2	58.5
	8' 6"	20.8	19.5	9.0	61.1	58.2
	9' 0"	21.0	19.0	9.6	61.0	57.9
	9' 6"	21.2	18.5	10.1	60.9	57.7
	10' 0"	21.2	18.0	10.6	60.4	57.0
80°	8' 0"	20.1	25.0	8.1	65.2	63.8
	8' 6"	20.2	24.0	8.6	64.4	62.9
	9' 0"	20.3	24.0	9.1	64.3	62.7
	9' 6"	20.4	24.0	9.6	64.4	62.7
	10' 0"	20.5	24.0	10.2	65.0	63.3
90°	8' 0"	19.0	26.0	8.0	64.0	-
	8' 6"	19.0	25.0	8.5	63.0	-
	9' 0"	19.0	24.0	9.0	62.0	-
	9' 6"	19.0	24.0	9.5	62.0	-
	10' 0"	19.0	24.0	10.0	62.0	-



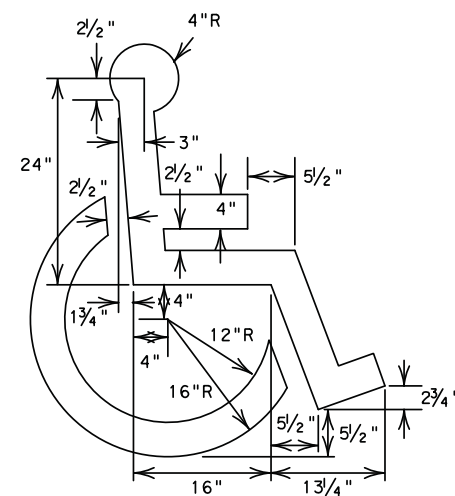
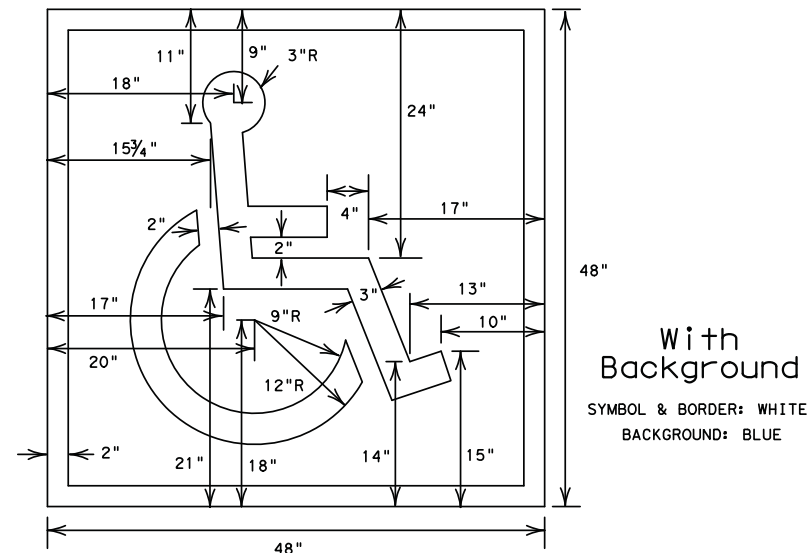
A	Stall Angle
B	Stall Width
C	Vehicle Projection for 19' Stall Length
D	Aisle Width
E	Curb Length Per Car
F	Wall to Wall Width for Double Aisle
G	Overlap Center to Overlap Center Width for Double Aisle

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TYPICAL ACCESSIBLE PARKING SPACE DIMENSIONS

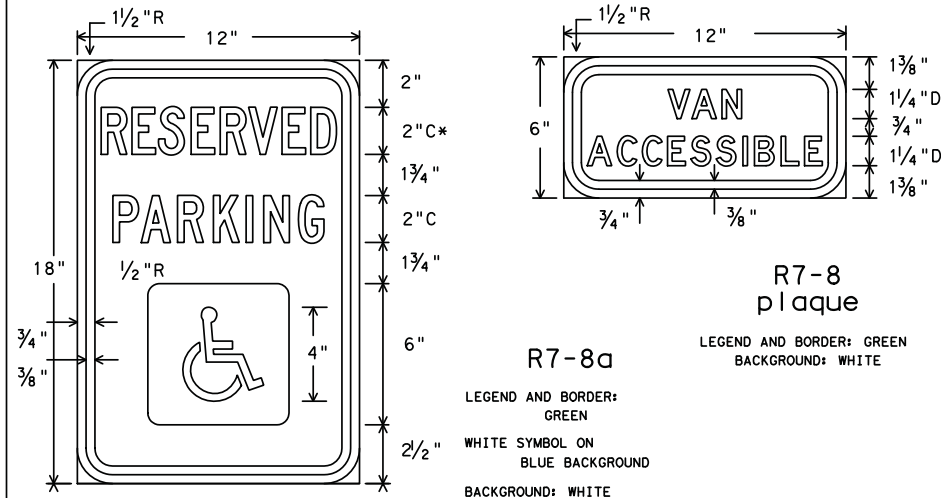


PAVEMENT MARKINGS



Symbol Only SYMBOL: BLUE OR WHITE

HANDICAPPED PARKING SIGN



SPECIFICATION REFERENCE TABLE	
MATERIALS AND TESTS DIVISION SPECIFICATIONS	
ALUMINUM SIGN BLANKS	D-9-7110
REFLECTIVE SHEETING, TYPE C (HIGH SPECIFIC INTENSITY)	D-9-8300

GENERAL SIGN NOTES:

The Alphabets and lateral spacing between letters and numerals shall conform with the Texas "Manual on Uniform Traffic Control Devices for Streets and Highways", latest edition, and any approved changes thereto. Lateral spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.

Legend shall be applied by screening process of black and/or transparent colored ink, cut-out black vinyl non-reflective decal sheeting and/or reflective sheeting or combination thereof. Background shall be white reflective sheeting (Type C).

Sign blanks shall be one piece 0.08 inch thick sheet aluminum alloy (Type A), unless otherwise noted elsewhere in the plans.

GENERAL NOTES:

- All parking space limit lines shall be 4" solid white lines.
- Aisle markings shown are examples only. Other methods to indicate a NO PARKING area are acceptable. Aisle markings shall be white.
- Dimensions of limit lines, aisle markings, and symbol (with or without background) may vary + 10%.
- Pavement marking symbols (with background):
 - are REQUIRED unless stated elsewhere in the plans,
 - should be placed toward the far end of the parking spaces so as to be visible to motorists in the travel lane,
 - may be painted or prefabricated material, and
 - shall be 30" x 30" minimum.
- With approval of the Engineer, prefabricated pavement marking symbols with background of other dimensions exceeding the 30" x 30" minimum may be used. Alternative designs shall include a proportion sized symbol of accessibility, and shall conform to the illustrated colors for background, symbol and border.
- An R7-8 sign:
 - shall be REQUIRED for each accessible parking space,
 - shall NOT be placed between two accessible parking spaces,
 - shall NOT be placed in a location that restricts movement of wheelchairs within the adjacent sidewalk, and
 - shall have a minimum mounting height of 7 feet. If mounted to wall or located so as not to be near pedestrian traffic minimum mounting height may be 7 feet.
- Post mounted signs should be placed approximately 1 foot (or greater) behind the curb to prevent damage from vehicle overhang.
- Signs may be mounted directly to an adjacent wall of a building when post mounting is impractical.



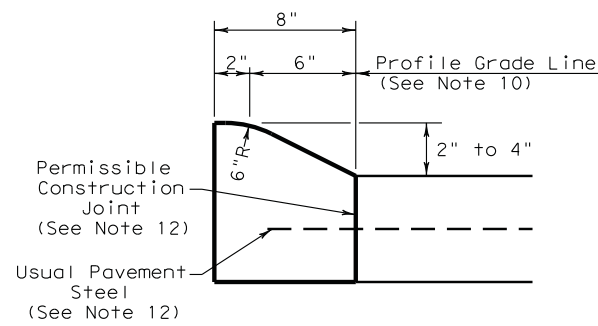
PAVEMENT MARKINGS AND SIGNING FOR ACCESSIBLE PARKING

PM(AP) - 98

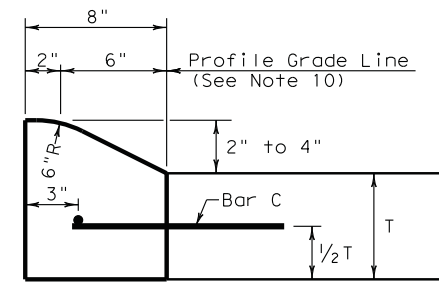
© TxDOT August 1995		DATE	BY	CHKD	APP'D	CHKD
REVISIONS		DATE	BY	CHKD	APP'D	CHKD
4-98						

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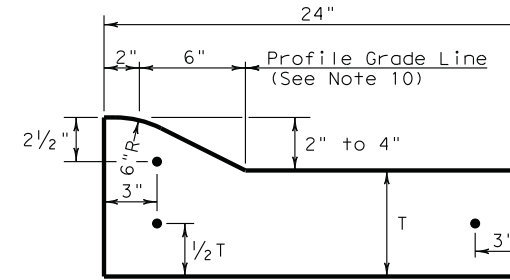
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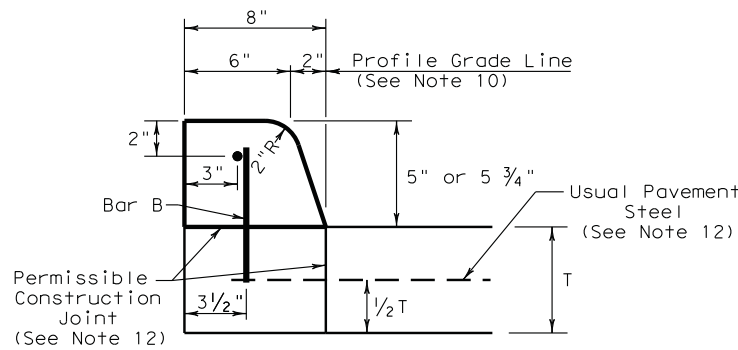
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



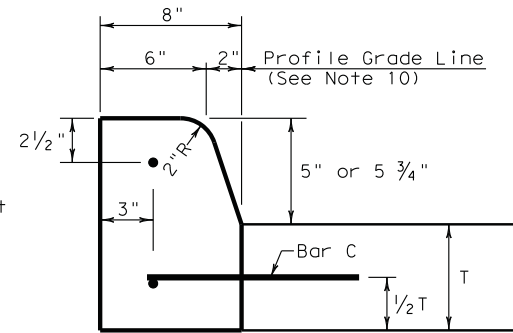
TYPE I CURB
2" - 4" HEIGHT



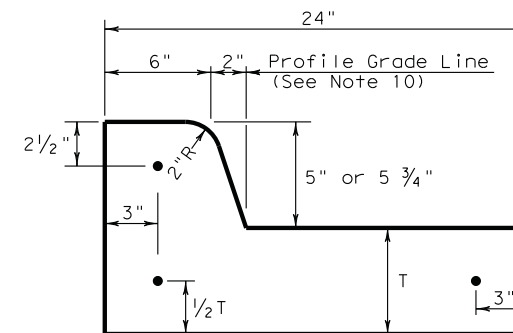
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



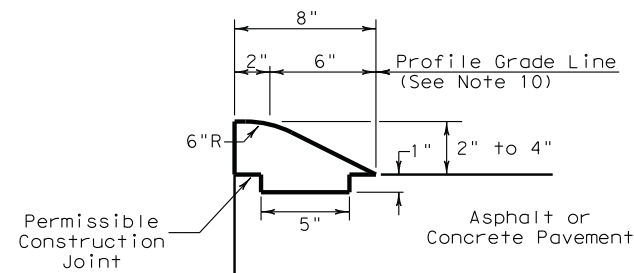
TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT



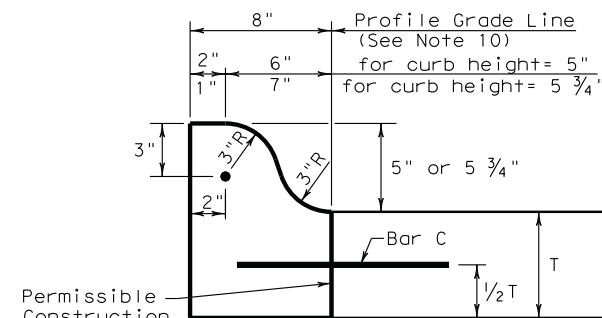
TYPE II CURB
5" - 5 3/4" HEIGHT



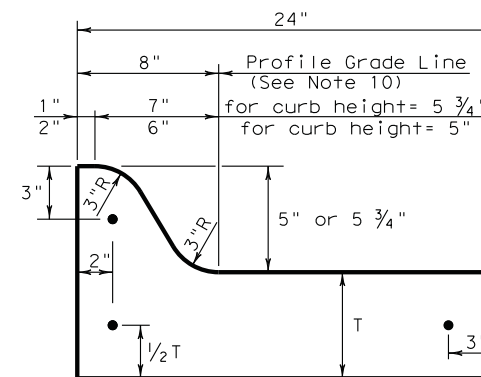
TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT



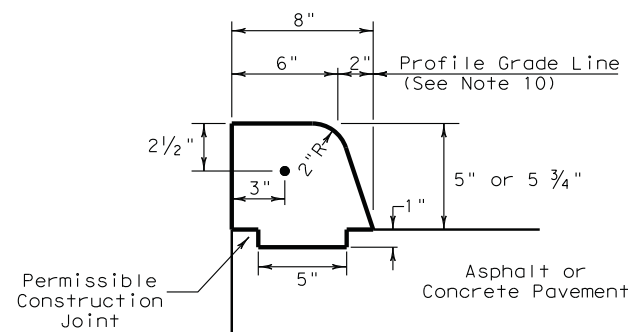
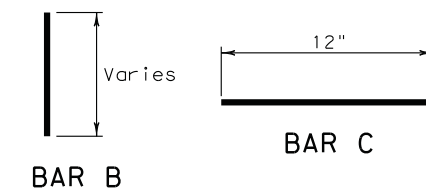
TYPE III CURB (KEYED)
2" - 4" HEIGHT



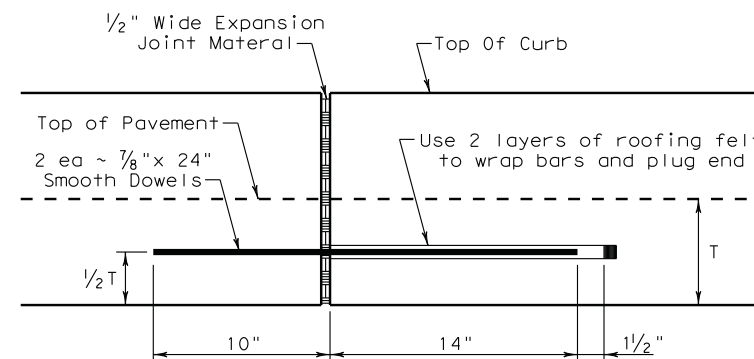
TYPE IIa CURB
5" - 5 3/4" HEIGHT



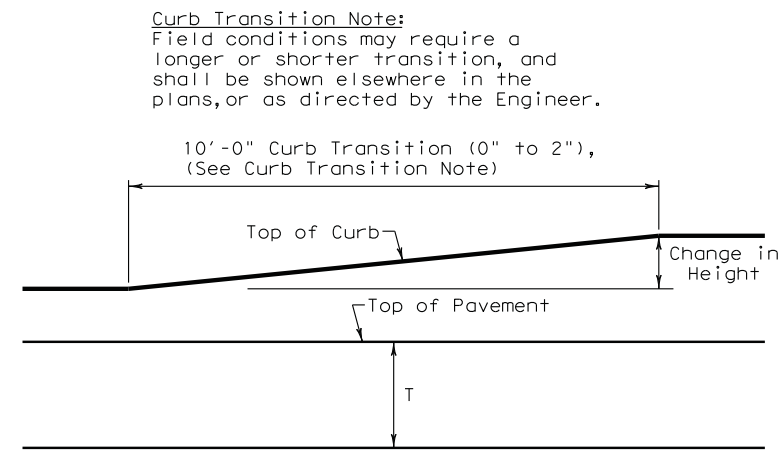
TYPE IIa CURB AND GUTTER
5" - 5 3/4" HEIGHT



TYPE IV CURB (KEYED)
5" - 5 3/4" HEIGHT



EXPANSION JOINT DETAIL



CURB TRANSITION

Note: To be paid for as Highest Curb

General Notes

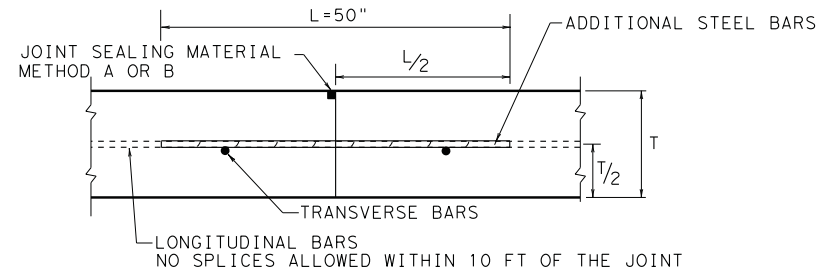
- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

		Design Division Standard	
<h2>CONCRETE CURB AND GUTTER</h2> <h3>CCCG-12</h3>			
FILE: cccg12	DN: TxDOT	CK: AM	DW: VP
© TxDOT 1995	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST		COUNTY	SHEET NO.

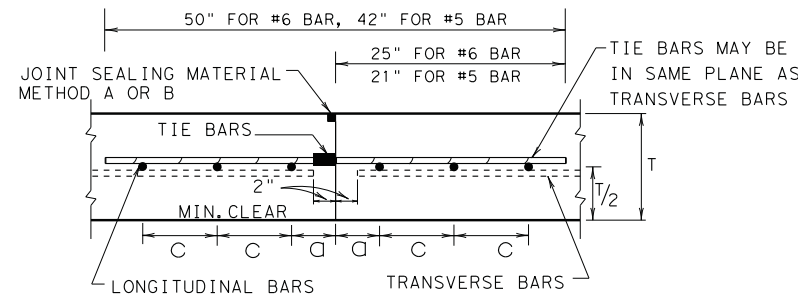
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GENERAL NOTES

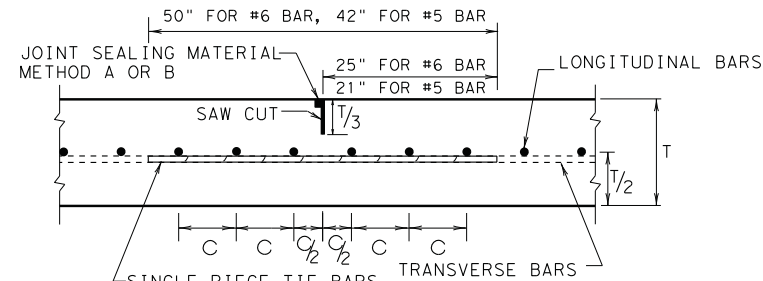
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT, ARE NOT COVERED BY THIS STANDARD.
2. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60). STEEL BAR SIZES SHALL CONFORM TO TABLE NO. 1 & 2.
4. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO.1 AND AS SPECIFIED.
5. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
6. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT SHALL BE ONE THIRD OF THE SLAB THICKNESS.
7. WHEN APPROVED BY THE ENGINEER, SINGLE PIECE TIE BARS MAY BE USED BY INSERTING INTO PLASTIC CONCRETE AT LONGITUDINAL CONTRACTION JOINTS.
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. MISSING OR DAMAGED TIE BARS SHALL BE REPLACED BY DRILLING AND EPOXY GROUTING AT THE CONTRACTOR'S EXPENSE.
10. OMIT TIE BARS LOCATED WITHIN 18 IN. OF THE TRANSVERSE CONSTRUCTION JOINTS. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
11. OBTAIN THE ENGINEER'S WRITTEN APPROVAL, IF THE CONCRETE MIX DESIGN USES MORE THAN 5.5 SACKS/CY.
12. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN.



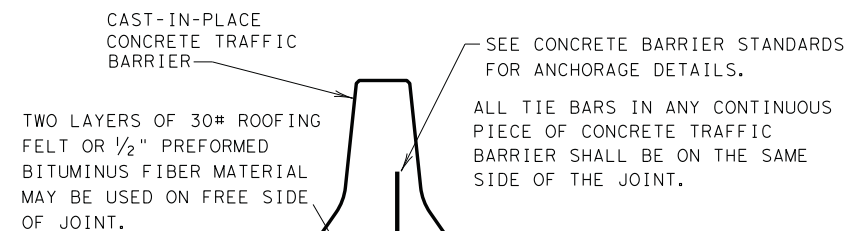
TRANSVERSE CONSTRUCTION JOINT SECTION X - X



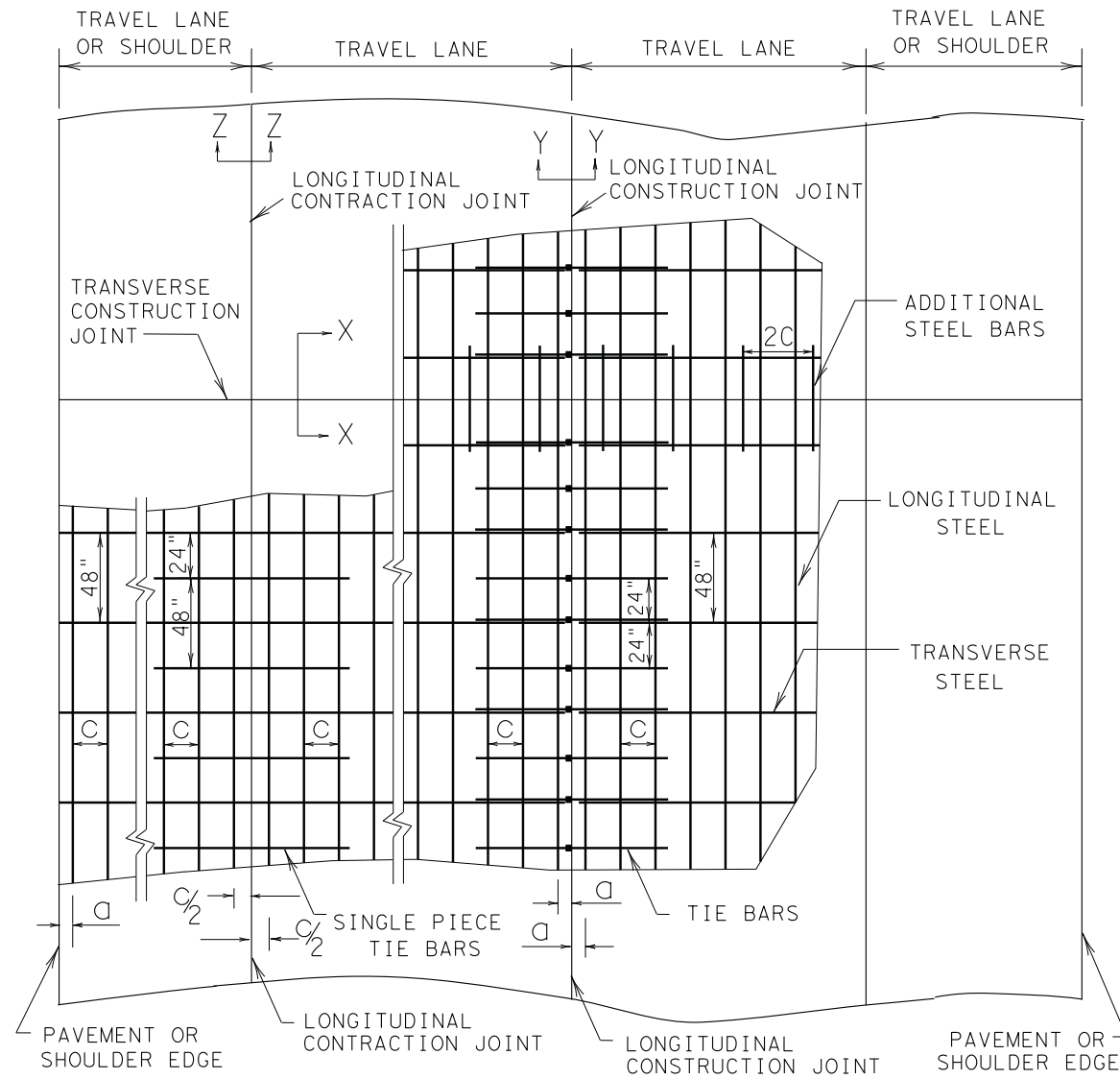
LONGITUDINAL CONSTRUCTION JOINT SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT SECTION Z - Z



FREE LONGITUDINAL JOINT DETAIL



TYPICAL PAVEMENT LAYOUT

PLAN VIEW (NOT TO SCALE)

SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
6.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24

SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
6.0	#5	7.5	3 TO 4	15	50
6.5	#5	7.0	3 TO 4	14	50
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50

SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

Texas Department of Transportation Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

ONE LAYER STEEL BAR PLACEMENT

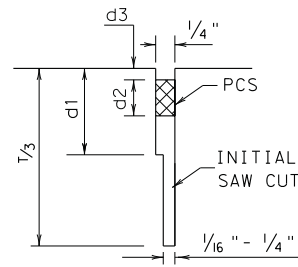
T - 6 to 13 INCHES

CRCP (1) - 11

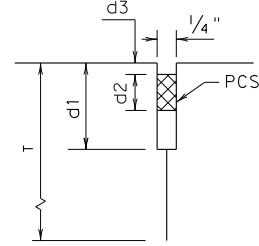
FILE: crcp111.dgn DN: TxDOT CK: LL DW: HC CK: © TxDOT November 2009 CONT SECT JOB HIGHWAY REVISIONS 10/10/2011 ADD GN #12 DIST COUNTY SHEET NO.

DATE: FILE:

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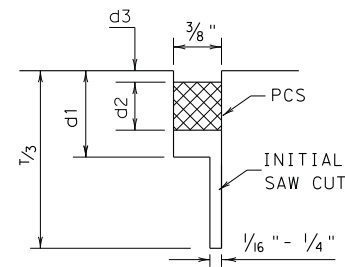


SAWED
LONGITUDINAL JOINT

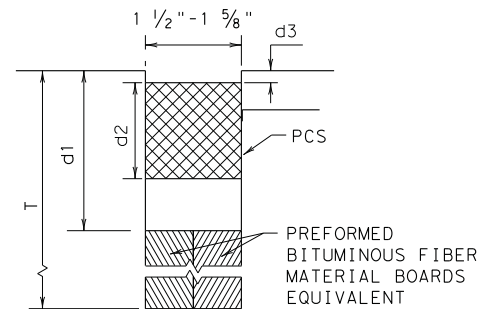


LONGITUDINAL
CONSTRUCTION JOINT

LONGITUDINAL JOINT SEALS



SAWED
CONTRACTION JOINT



FORMED
FORMED EXPANSION JOINT

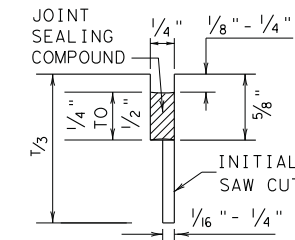
TRANSVERSE JOINT SEALS

METHOD A: PREFORMED COMPRESSION SEALS (PCS)
(CLASS 6 PREFORMED JOINT SEALANT)

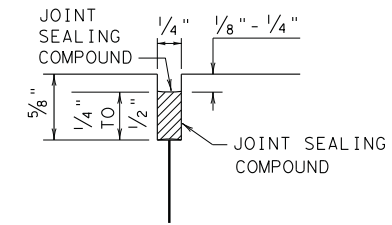
GENERAL NOTES FOR METHOD "A"

- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- DIMENSIONS d1, d2, AND d3 SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
- THE JOINT RESERVOIR FOR SEALANT SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION AND THE TWO SAWED JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 AND PRIOR TO BEGINNING OPERATIONS, THE CONTRACTOR SHALL SUBMIT A STATEMENT FROM THE SEALANT MANUFACTURER SHOWING THE RECOMMENDED EQUIPMENT AND INSTALLATION PROCEDURES TO BE USED.
- THE SAW CUT FOR THE LONGITUDINAL JOINT SHALL BE ONE FOURTH THE SLAB THICKNESS WHEN CRUSHED LIMESTONE IS USED AS THE COARSE AGGREGATE.

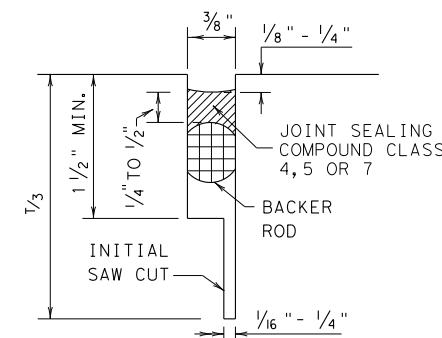
DATE:
FILE:



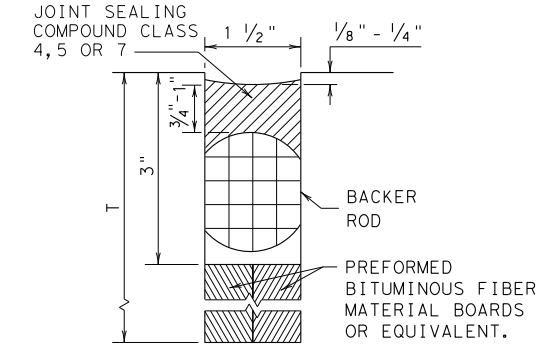
SAWED
LONGITUDINAL JOINT



LONGITUDINAL OR TRANSVERSE
CONSTRUCTION JOINT



TRANSVERSE SAWED
CONTRACTION JOINT



TRANSVERSE FORMED
EXPANSION JOINT

METHOD B: JOINT SEALING COMPOUND

GENERAL NOTES FOR METHOD "B"

- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- THE ENGINEER SHALL SELECT A TARGET PLACEMENT THICKNESS FOR THE SEALANT DETAILS WHICH SHOW RANGES IN THICKNESS. THE TARGET THICKNESS WILL NORMALLY BE THE MIDPOINT OF THE RANGE.
- THE JOINT RESERVOIR FOR SEALANT SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION AND THE TWO SAWED JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 AND PRIOR TO BEGINNING OPERATIONS, THE CONTRACTOR SHALL SUBMIT A STATEMENT FROM THE SEALANT MANUFACTURER SHOWING THE RECOMMENDED EQUIPMENT AND INSTALLATION PROCEDURES TO BE USED.
- THE SAW CUT FOR THE LONGITUDINAL JOINT SHALL BE ONE FOURTH THE SLAB THICKNESS WHEN CRUSHED LIMESTONE IS USED AS THE COARSE AGGREGATE.

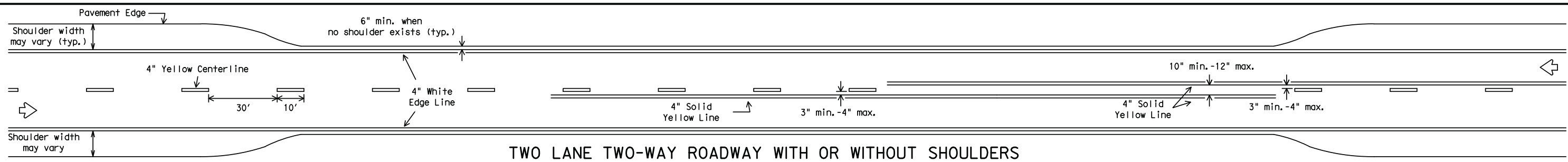


CONCRETE PAVING DETAILS
JOINT SEALS

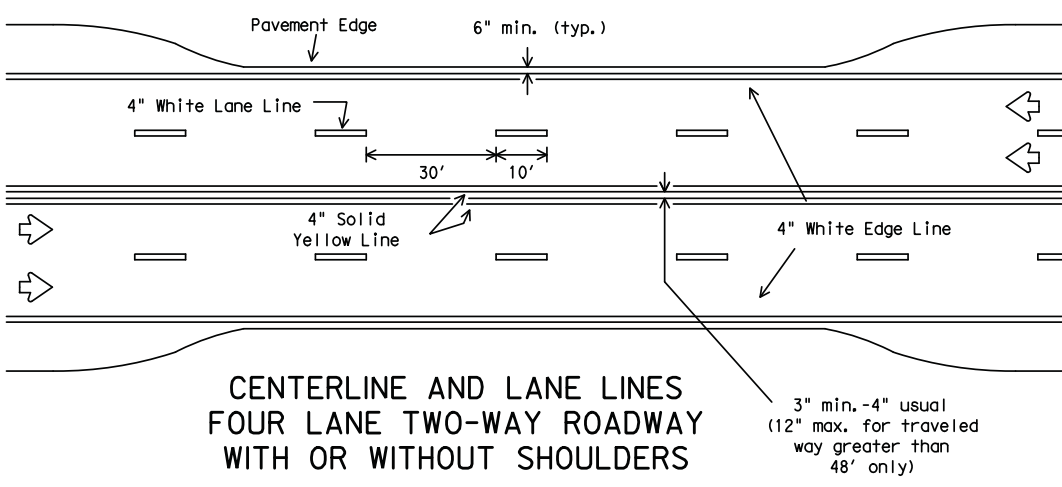
JS-94

FILE: js94.dgn	DN: TxDOT	CK: LJB	DW: BD	CK: GLG
© TxDOT September 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY		SHEET NO.

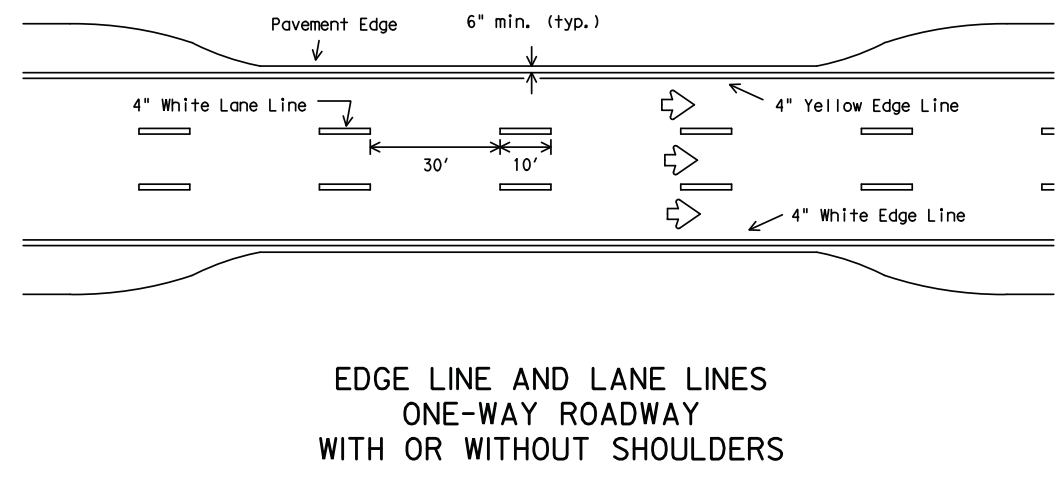
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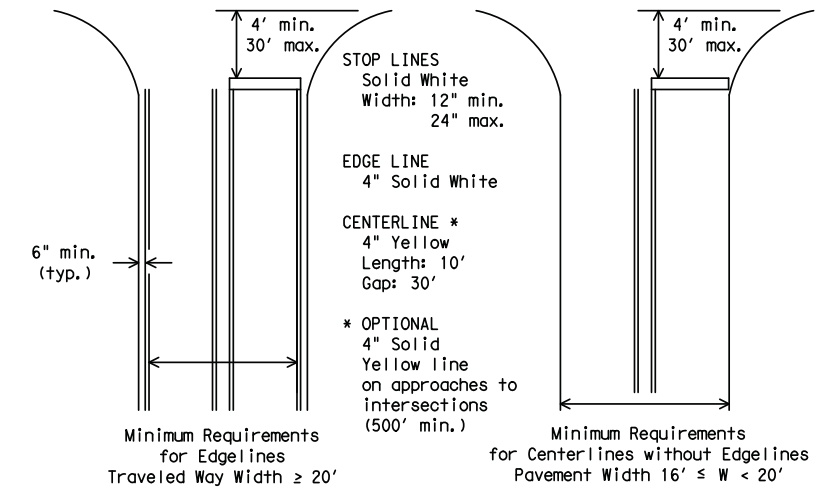
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



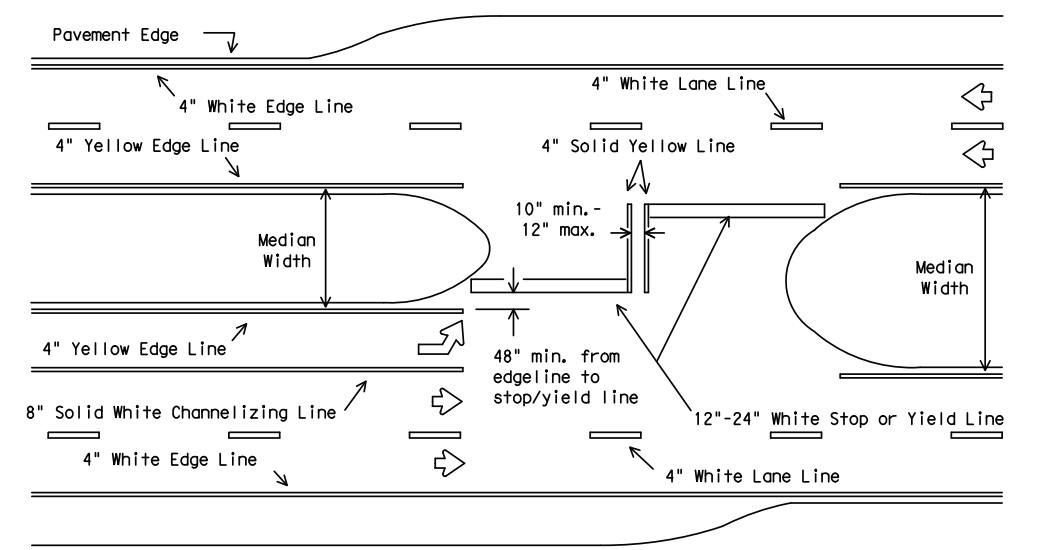
CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

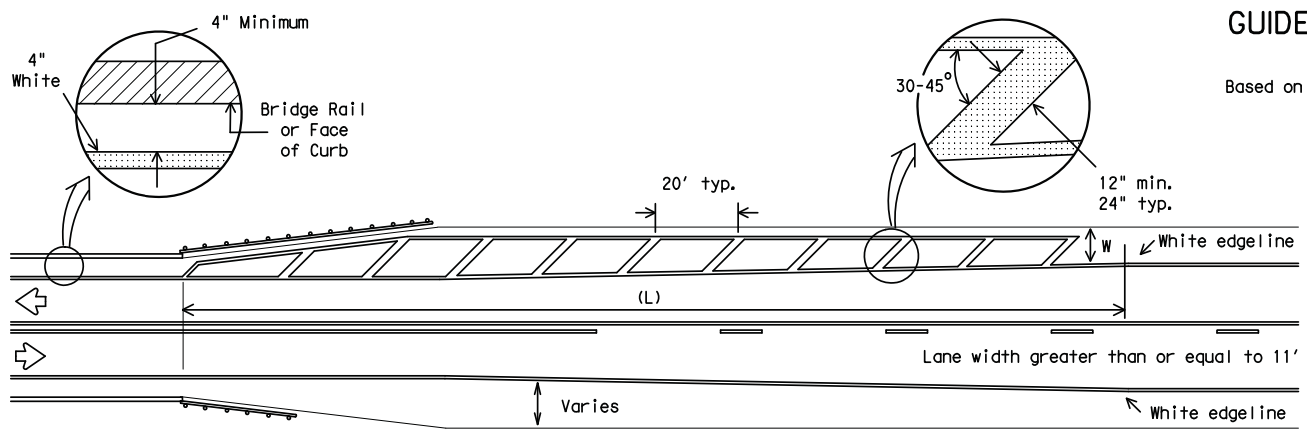


GUIDE FOR PLACEMENT OF STOP LINES,
EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths for Undivided Highways



All medians shall be field measured to determine the location of necessary striping. Stop/Yield bars and centerlines shall be placed when the median width is greater than 30 ft. The median width is defined as the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges and of opposite approaches of the same intersection. The narrow median width will be the controlling width to determine if markings are required.

FOUR LANE DIVIDED ROADWAY INTERSECTIONS



NOTES:

1. No-passing zone on bridge approach is optional but if used, it shall be a minimum 500 feet long.
2. For crosshatching length (L) see Table 1.
3. The width of the offset (W) and the required crosshatching width is the full shoulder width in advance of the bridge.
4. The crosshatching is not required if delineators or barrier reflectors are used along the structure.
5. For guard fence details, refer elsewhere in the plans.

ROADWAYS WITH REDUCED SHOULDER
WIDTHS ACROSS BRIDGE OR CULVERT

TABLE 1 - TYPICAL LENGTH (L)

Posted Speed *	Formula
≤ 40	$L = \frac{WS^2}{60}$
≥ 45	$L = WS$

* 85th Percentile Speed may be used on roads where traffic speeds normally exceed the posted speed limit. Crosshatching length should be rounded up to nearest 5 foot increment.
L=Length of Crosshatching (FT.) W=Width of Offset (FT.) S=Posted Speed (MPH)

EXAMPLES:

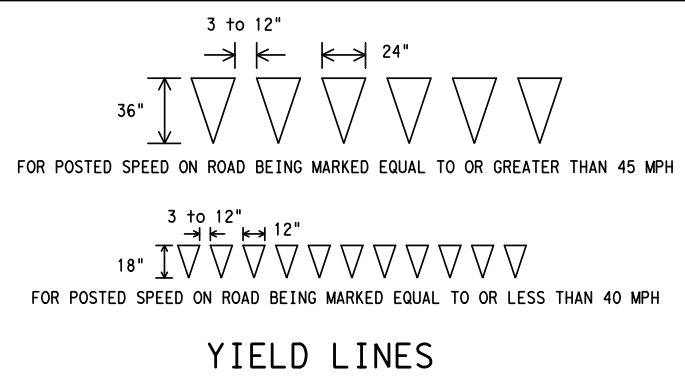
An 8 foot shoulder in advance of a bridge reduces to 4 feet on a 70 MPH roadway. The length of the crosshatching should be:
 $L = 8 \times 70 = 560$ ft.
A 4 foot shoulder in advance of a bridge reduces to 2 feet on a 40 MPH roadway. The length of the crosshatching should be:
 $L = 4(40)^2 / 60 = 106.67$ ft. rounded to 110 ft.

GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should typically be placed a minimum of 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel and not the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



YIELD LINES

Texas Department of Transportation
Traffic Operations Division

TYPICAL STANDARD
PAVEMENT MARKINGS

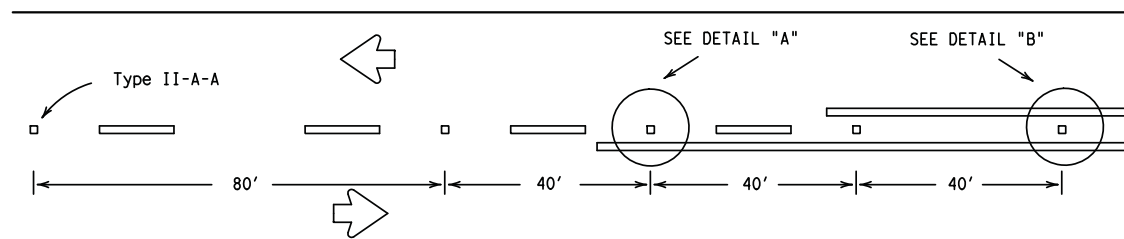
PM(1)-12

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REVISIONS	CONT	SECT	JOB	HIGHWAY
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5-00				
8-00				
3-03	DIST	COUNTY		SHEET NO.
22A				

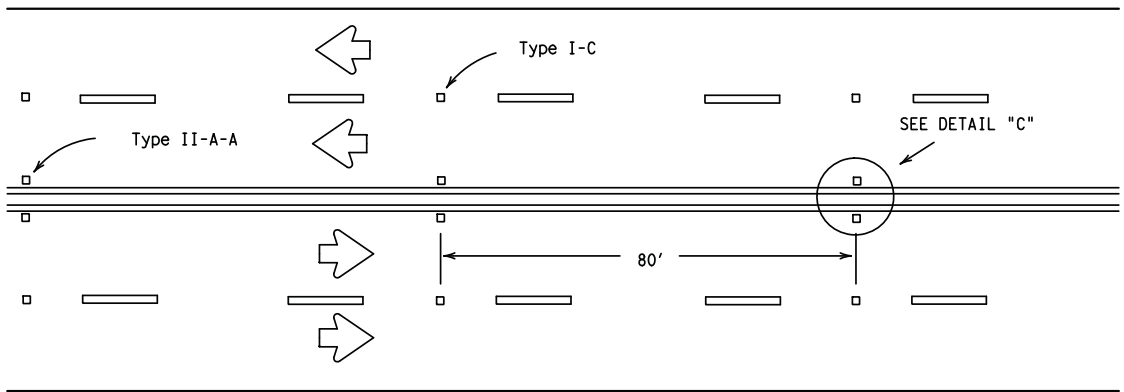
DATE:
FILE:

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REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

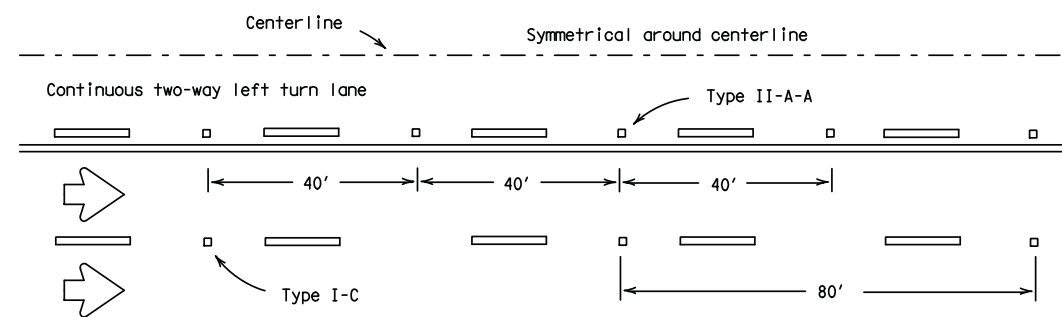


CENTERLINE FOR ALL TWO LANE ROADWAYS

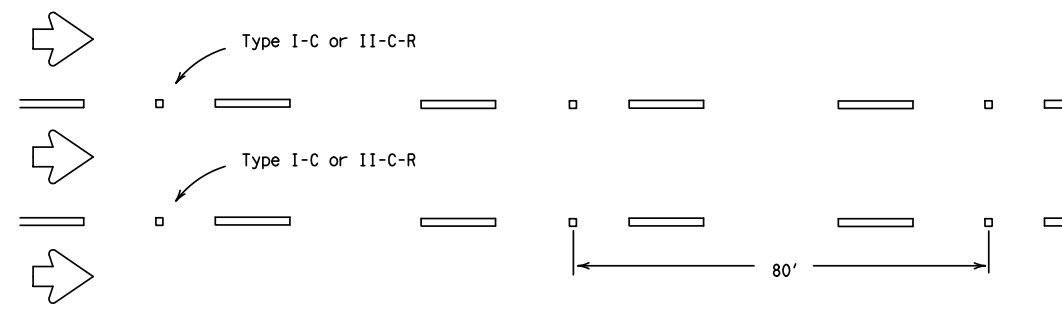


CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY HIGHWAYS

Raised pavement marker Type I-C, clear face toward normal traffic, shall be placed on 80-foot centers.

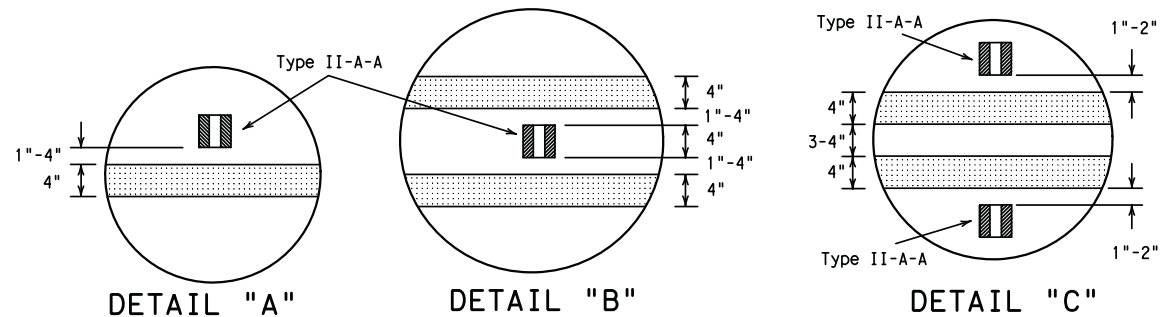


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

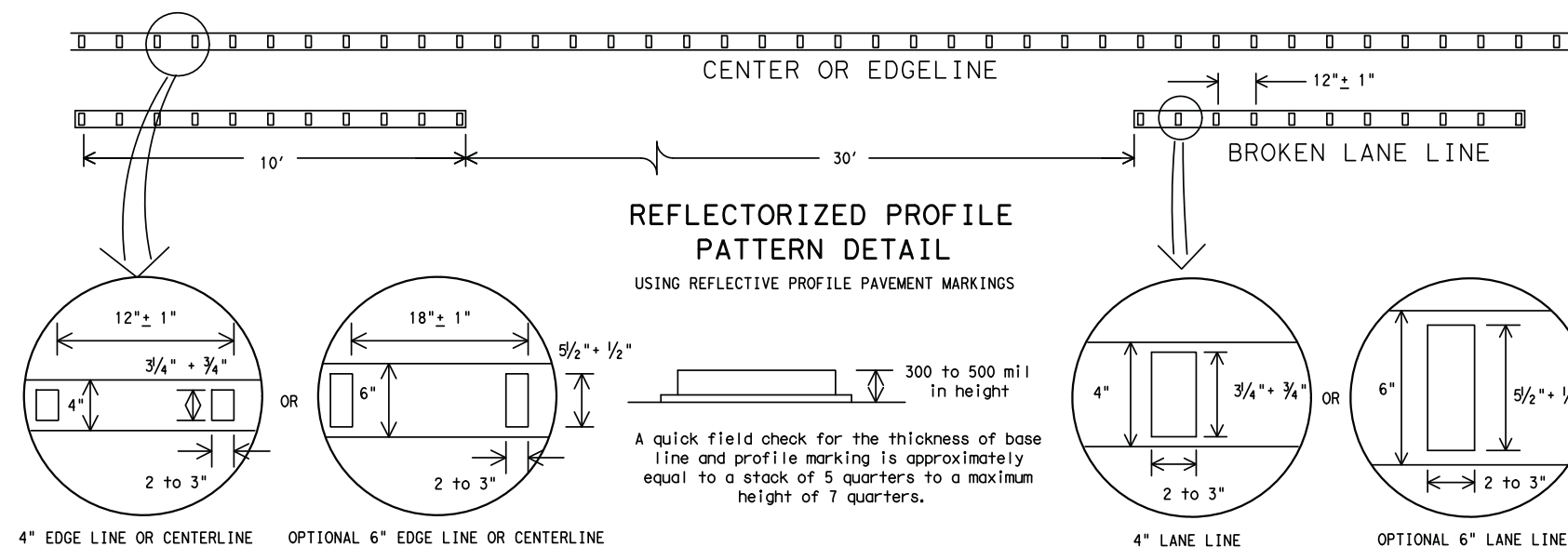
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.



DETAIL "A"

DETAIL "B"

DETAIL "C"



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTE:

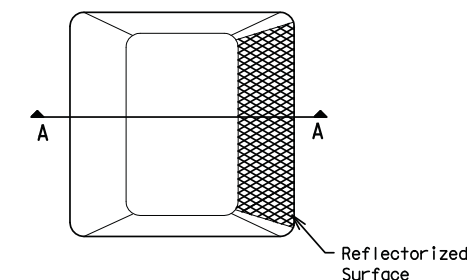
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

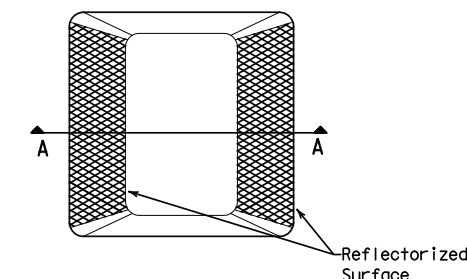
- All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
- On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

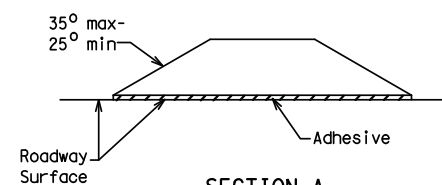
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation
Traffic Operations Division

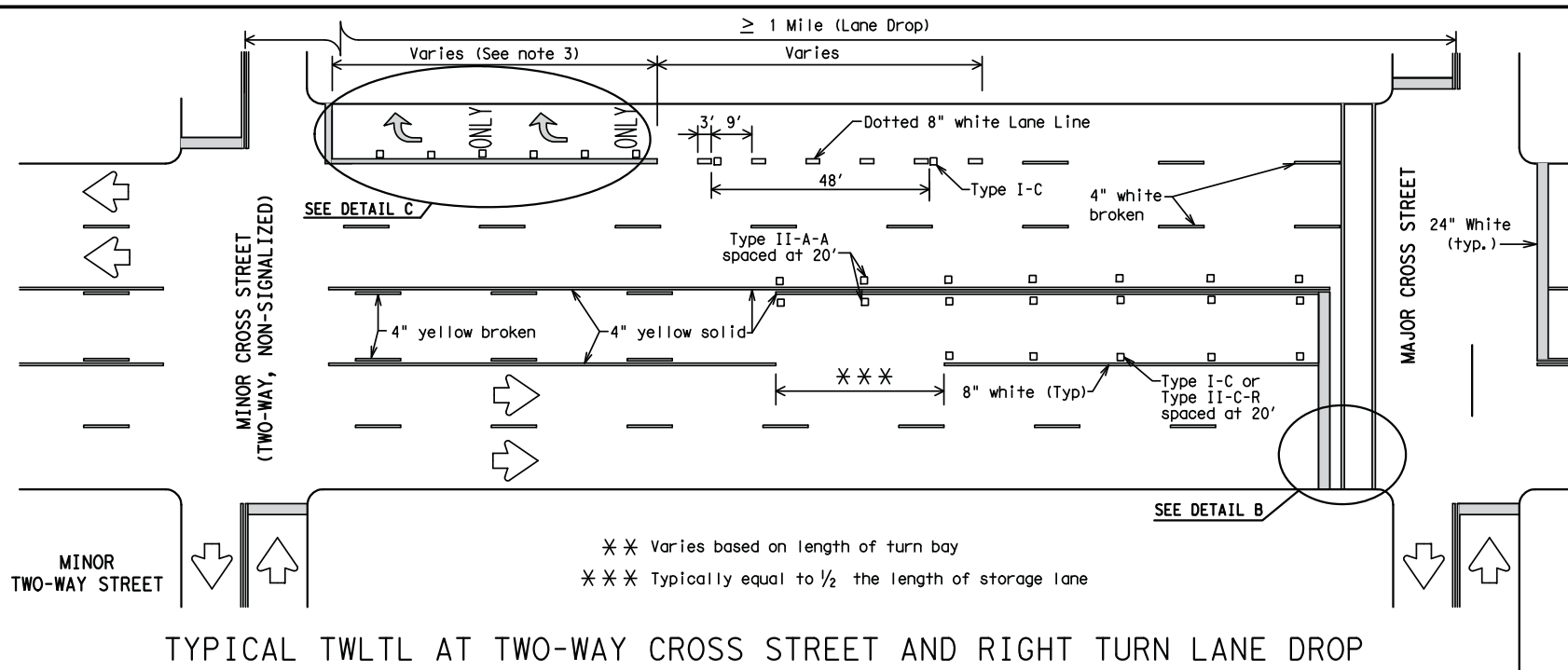
POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS

PM(2)-12

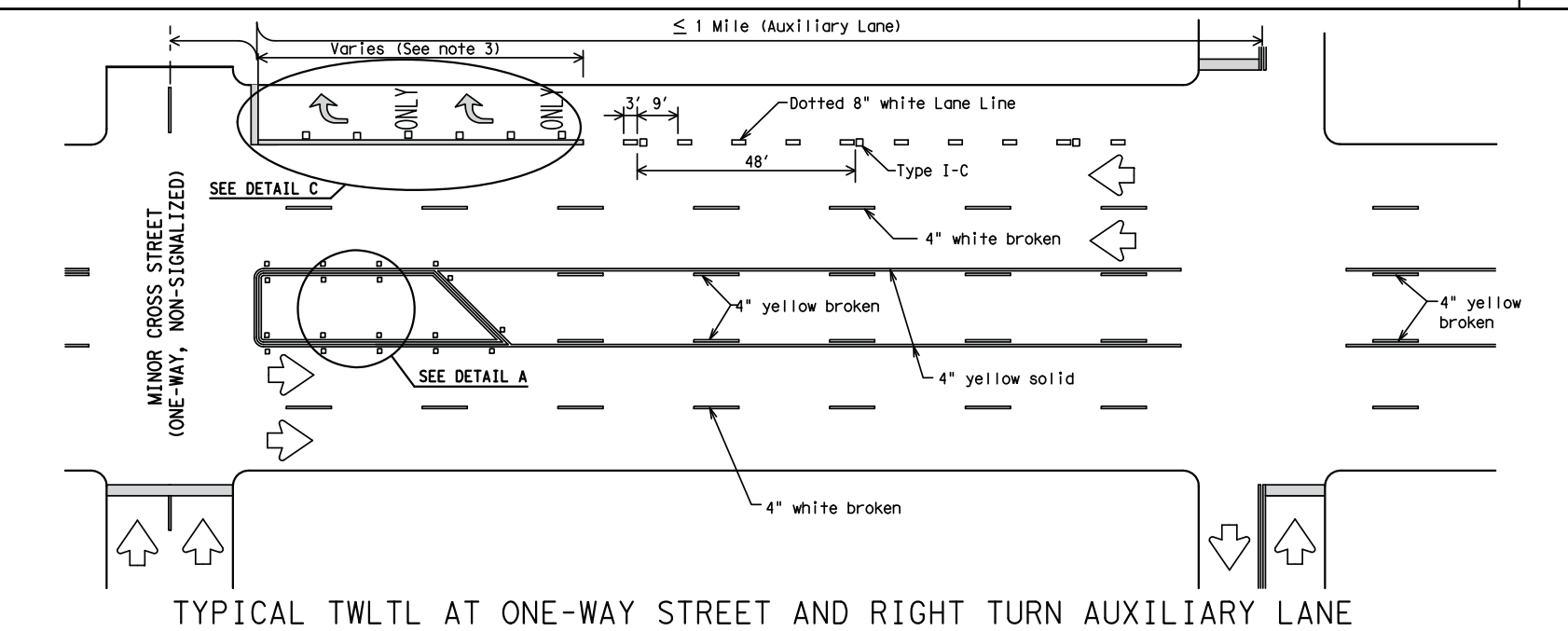
© TxDOT April 1977		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS		CONT	SECT	JOB	HIGHWAY
4-92	2-10				
5-00	2-12				
8-00					
2-08					
		DIST	COUNTY		SHEET NO.

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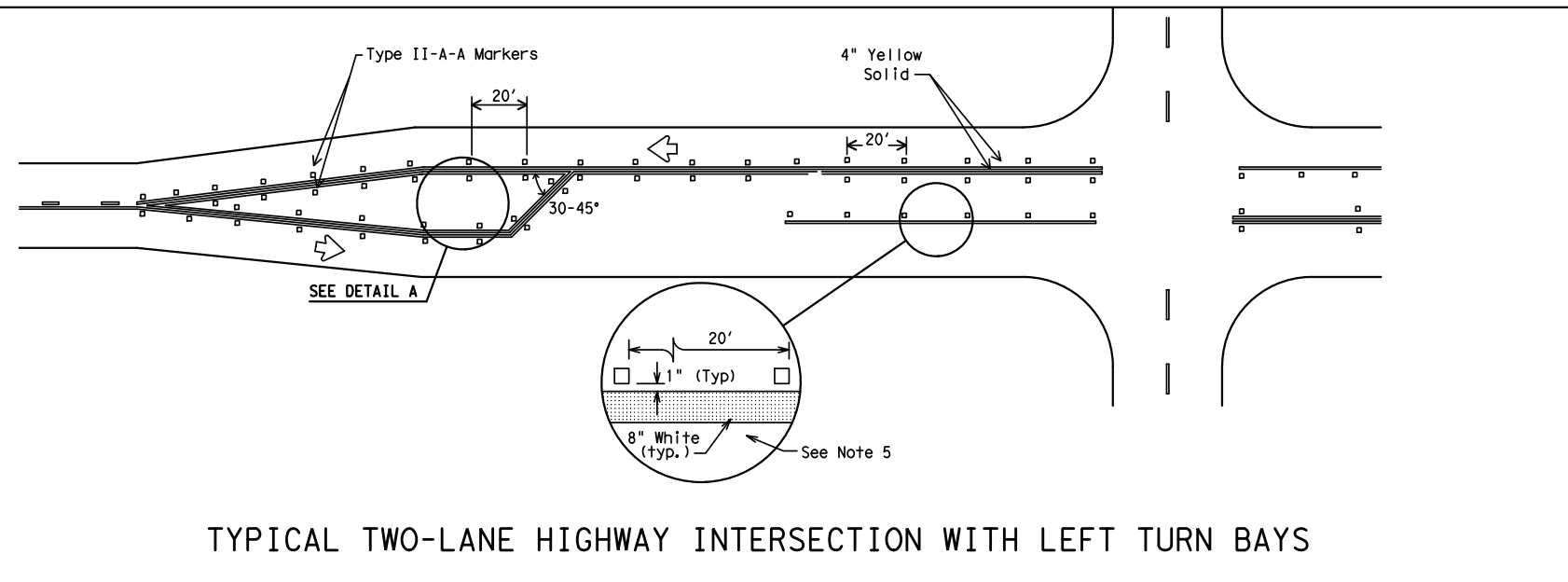
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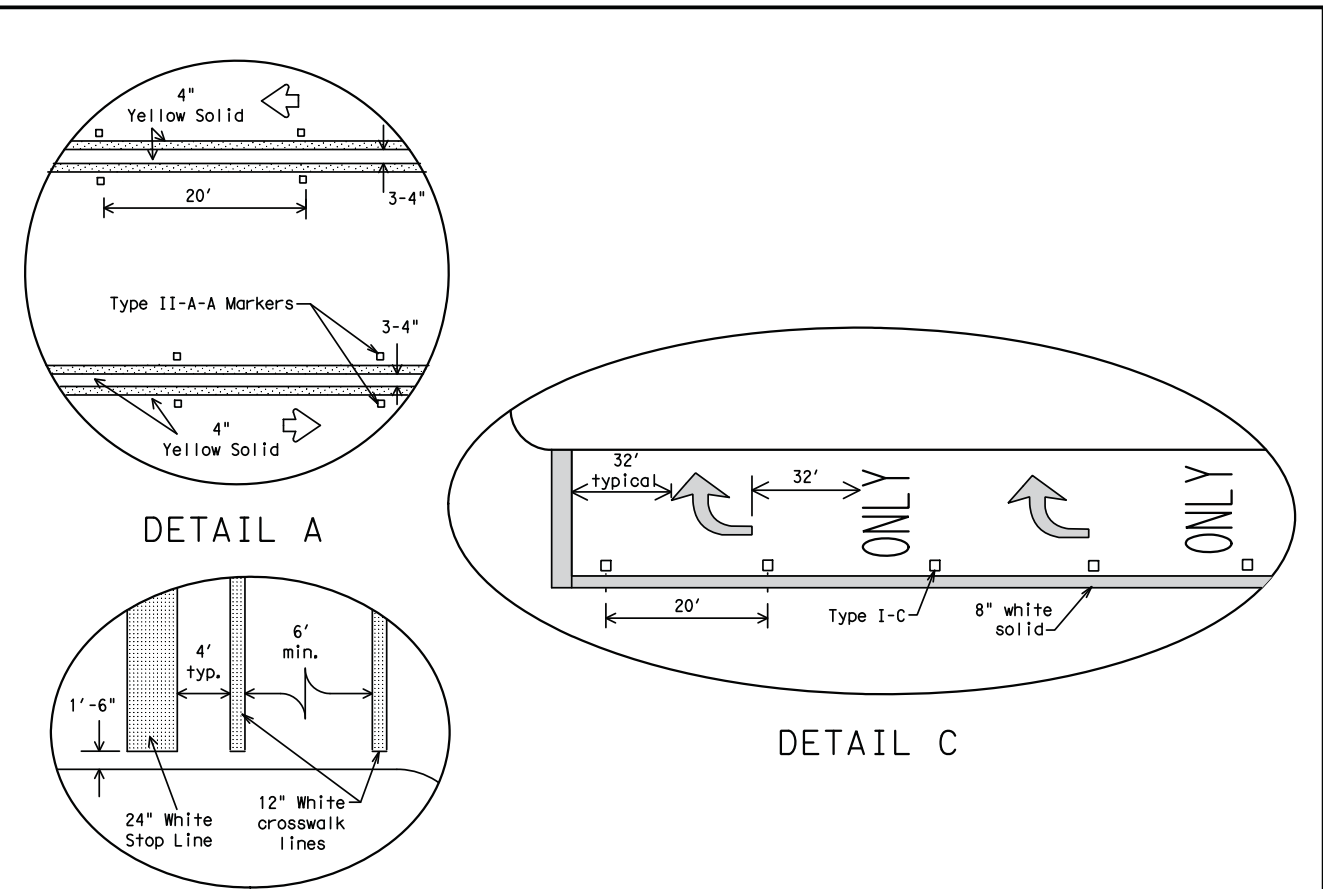
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS

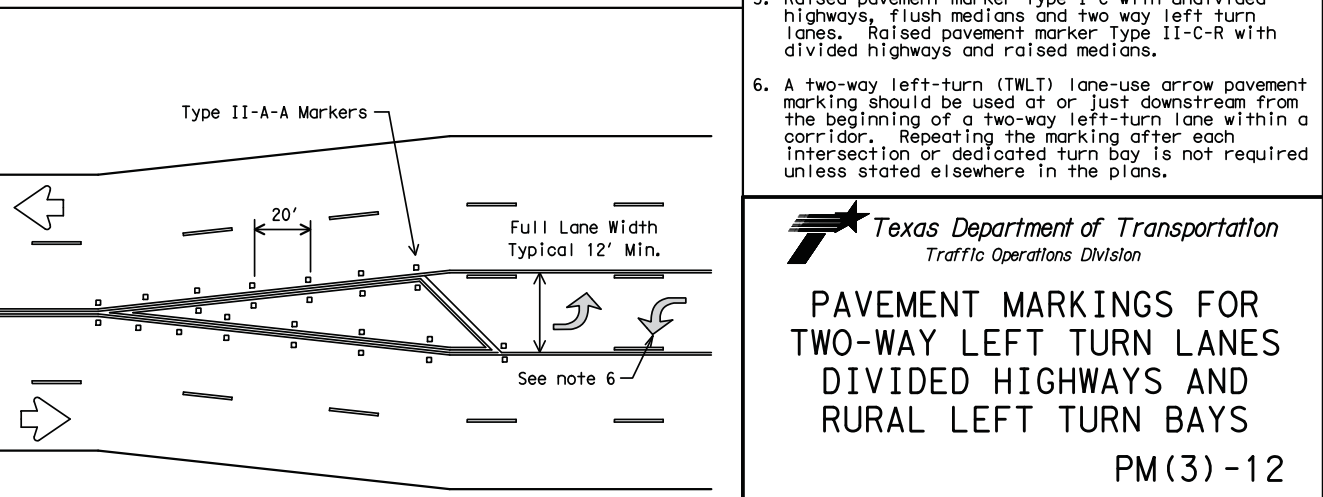


MATERIAL SPECIFICATIONS

PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

- GENERAL NOTES**
- Refer elsewhere in plans for additional RPM placement and details.
 - Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows as shown in the Standard Highway Sign Designs for Texas.
 - When lane used word and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
 - Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used.
 - Raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Raised pavement marker Type II-C-R with divided highways and raised medians.
 - A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.



TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

Texas Department of Transportation
Traffic Operations Division

PAVEMENT MARKINGS FOR TWO-WAY LEFT TURN LANES DIVIDED HIGHWAYS AND RURAL LEFT TURN BAYS
PM(3)-12

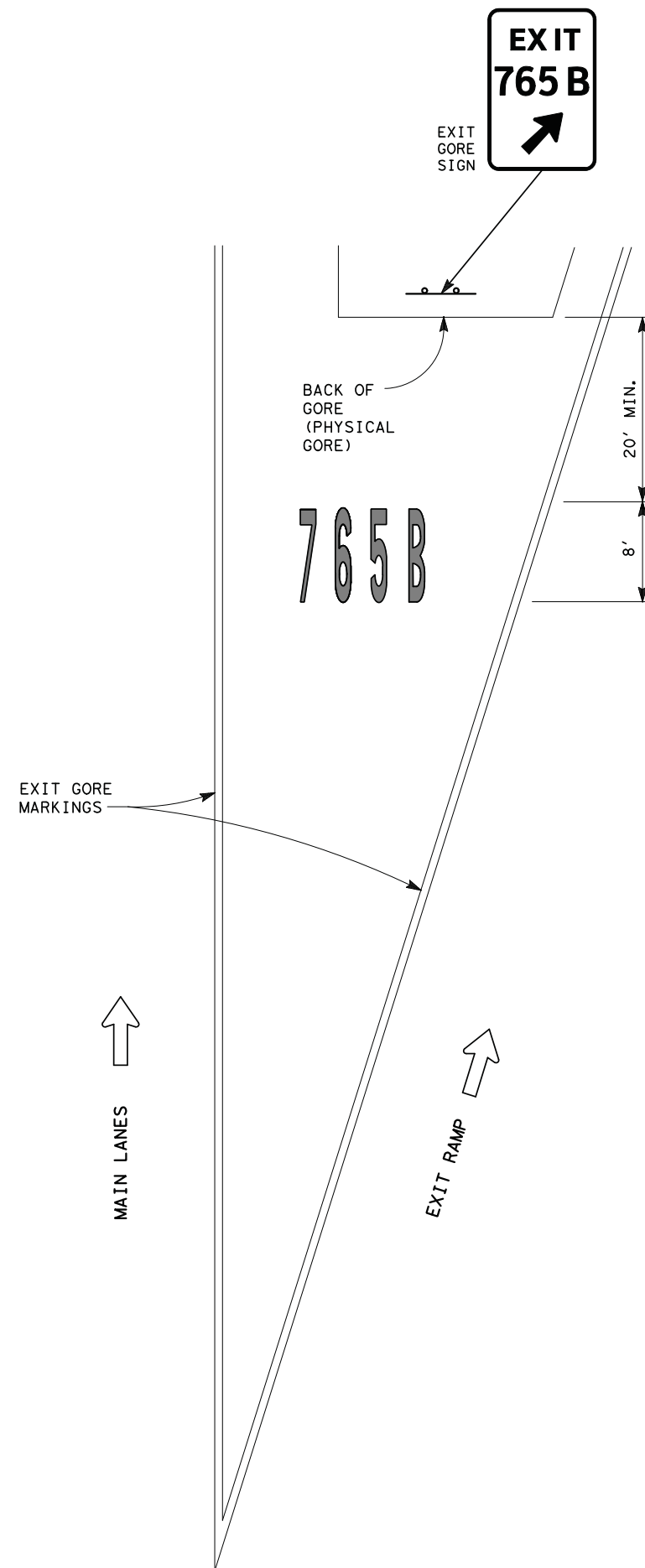
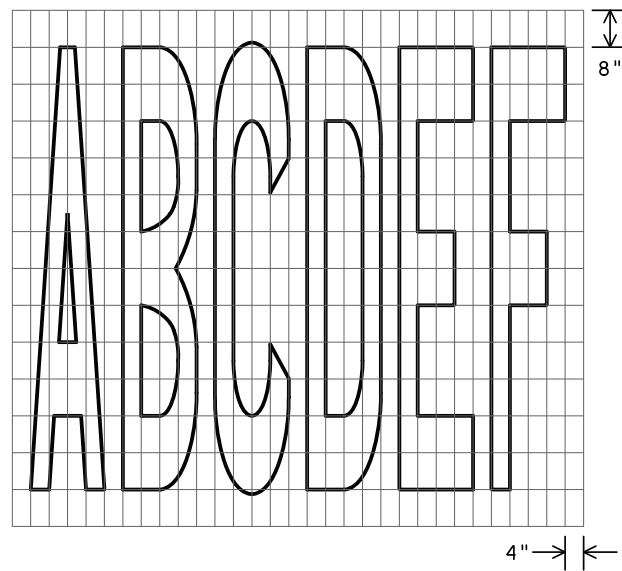
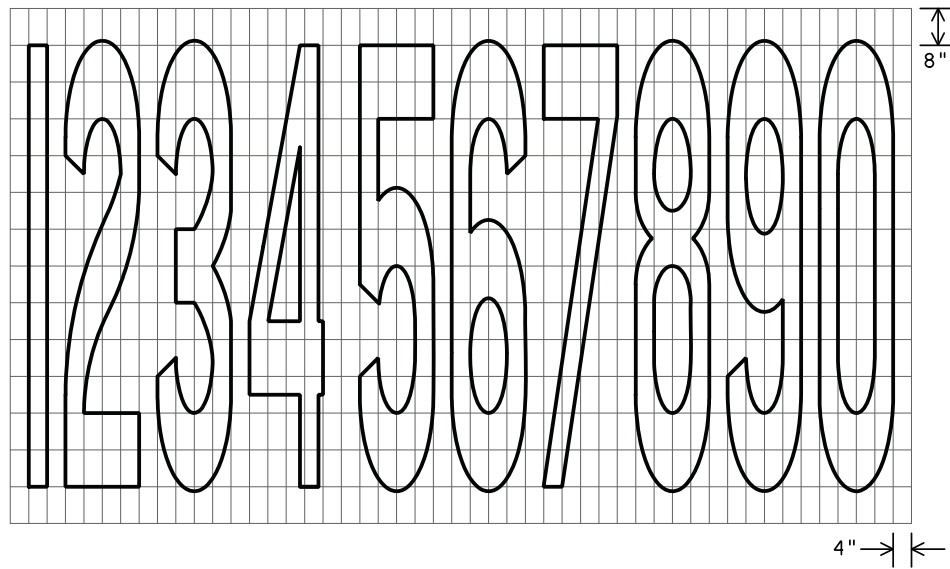
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REVISIONS			
5-00	2-12	CONT	SECT
8-00			JOB
3-03			HIGHWAY
2-10		DIST	COUNTY
			SHEET NO.

22C

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FILE:



GENERAL NOTES

1. Minimum 8 foot white markings should be used, unless otherwise noted.
2. Spacing between letters and numbers should be approximately 4 inches.
3. Pavement markings are to be located as specified elsewhere in the plans.
4. All pavement marking materials shall meet the required Departmental Material Specifications or as specified in these plans.



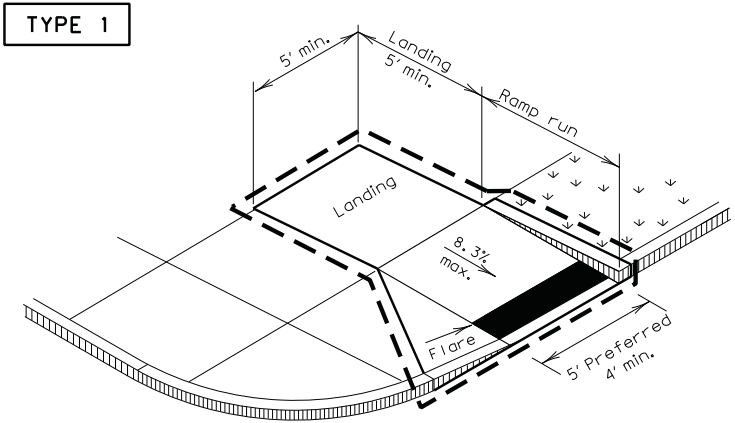
**EXIT NUMBER
GORE MARKINGS FOR
AERIAL VIEW DETAIL**

PM(4)-12

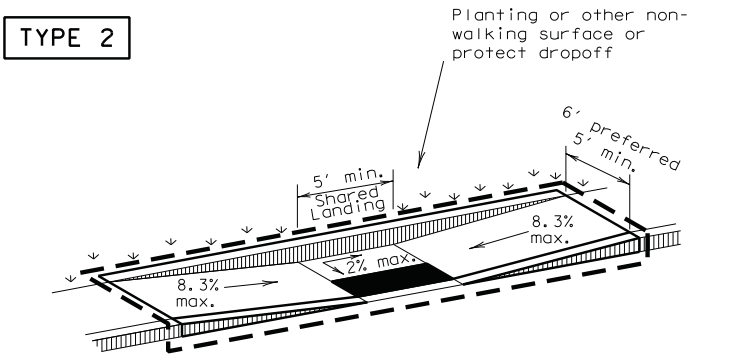
© TxDOT April 2006		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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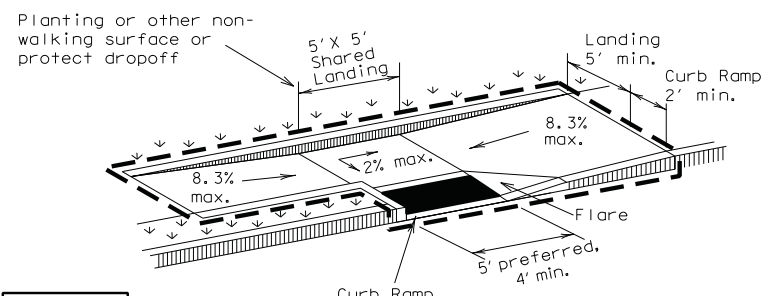


PERPENDICULAR CURB RAMP

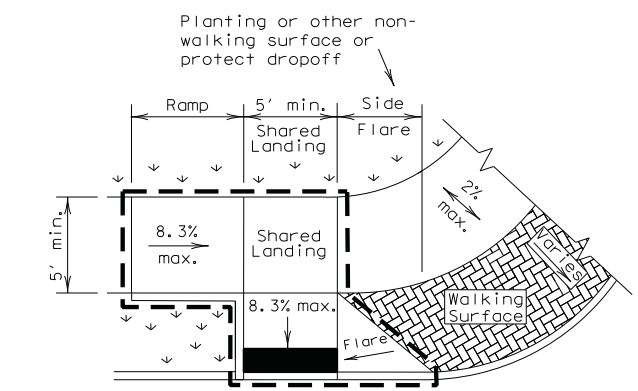


PARALLEL CURB RAMP

(Use only where water will not pond in the landing.)

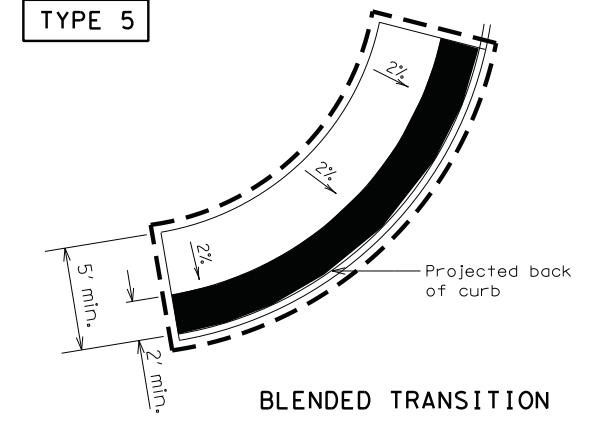


TYPE 3

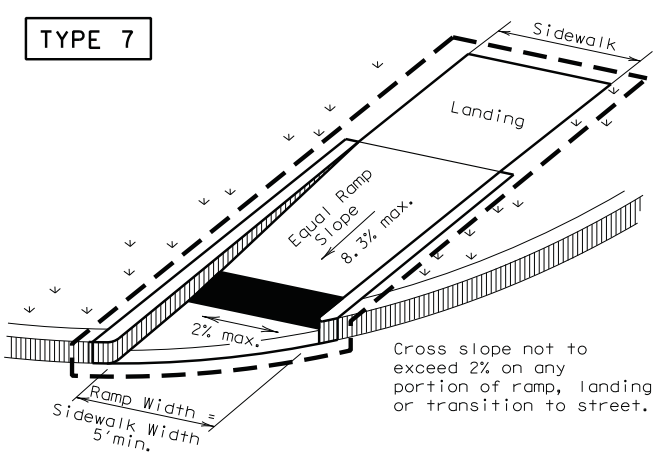


TYPE 6

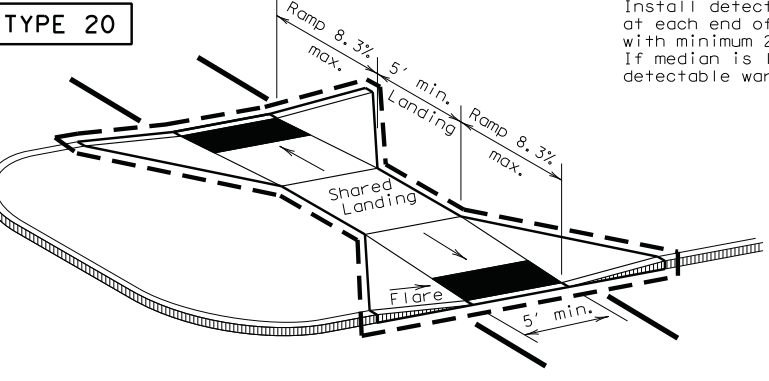
COMBINATION CURB RAMPS



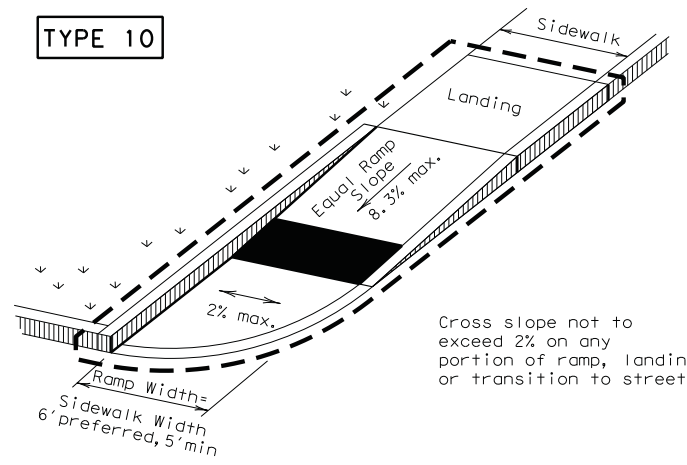
BLENDED TRANSITION



(Sidewalk set back from curb)

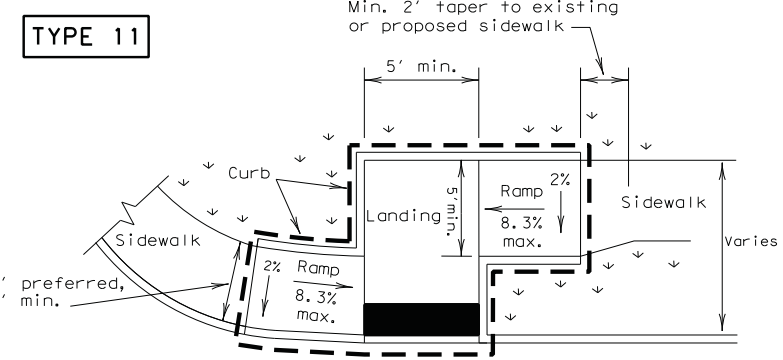


CURB RAMPS AT MEDIAN ISLANDS

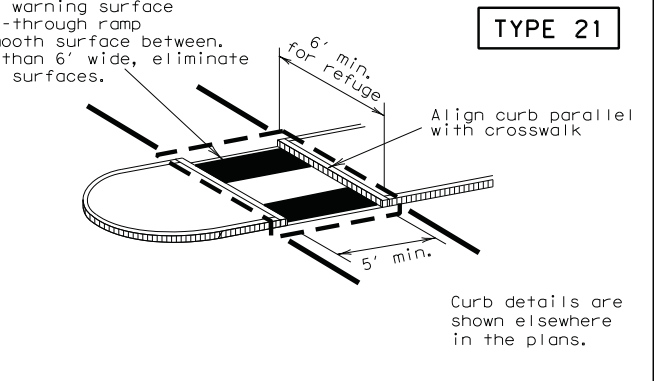


(Sidewalk adjacent to curb)

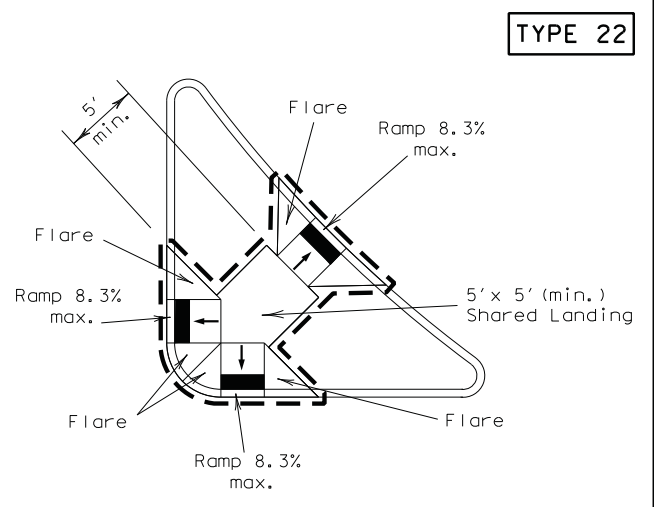
DIRECTIONAL RAMPS WITHIN RADIUS



OFFSET PARALLEL CURB RAMP



Curb details are shown elsewhere in the plans.



COMBINATION ISLAND RAMPS

NOTES / LEGEND:

See General Notes on sheet 2 of 4 for more information.

- ∇ ∇ ∇ ∇ ∇ Denotes planting or non-walking surface not part of pedestrian circulation path.
- Ramp Limits of Payment
- Detectable Warning Surface

PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: PK	DW: TxDOT	CK: HD
© TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
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VP June 13, 2012	DIST	COUNTY	SHEET NO.	

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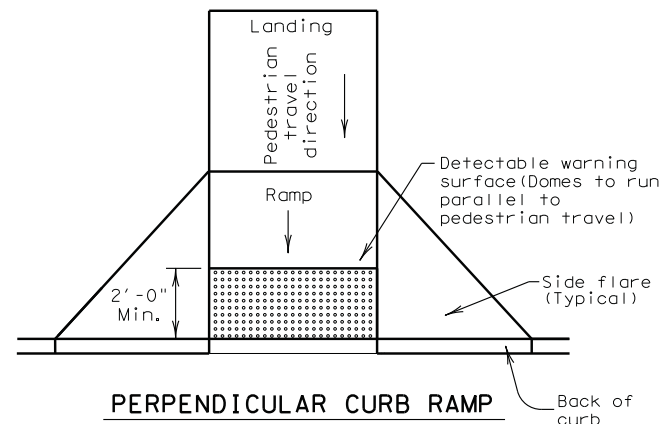
General Notes

Curb Ramps

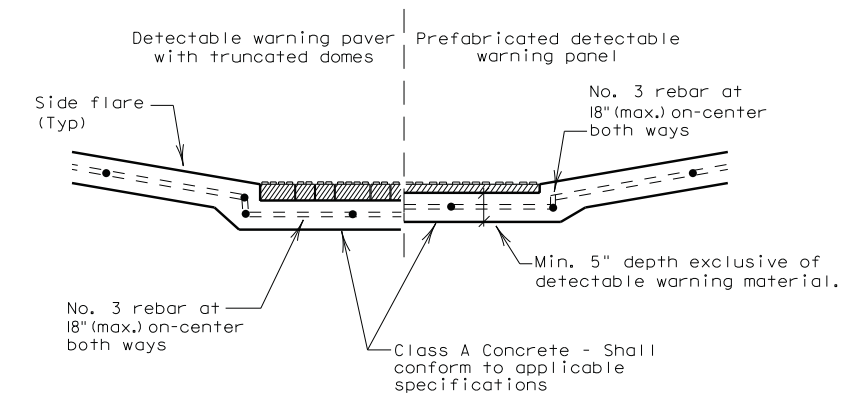
1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Lesser slopes that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5' x 5' passing areas at intervals not to exceed 200' are required.
4. Landings shall be 5' x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5' x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever on accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

Detectable Warning Material

18. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 705 of the TAS. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
19. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
20. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
21. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
22. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb. Align the rows of domes to be perpendicular to the grade break between the ramp run and the street. Detectable warning surfaces may be curved along the corner radius.
23. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.



Typical placement of detectable warning surface on sloping ramp run.



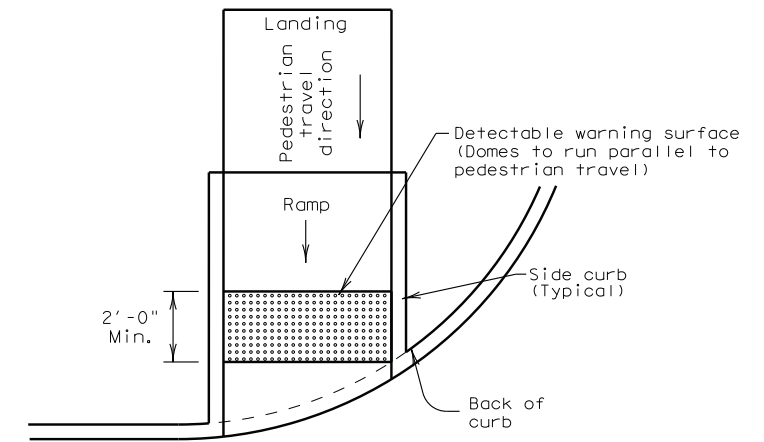
DETECTABLE WARNINGS

Detectable Warning Pavers

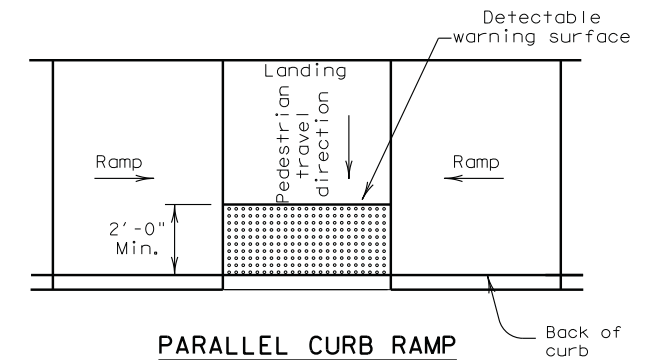
24. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
25. Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.

Sidewalks

26. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within one or more reach ranges specified in TAS 308.
27. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
28. Street grades and cross slopes shall be as shown elsewhere in the plans.
29. Changes in level greater than 1/4 inch are not permitted.
30. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than 5% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 505.
31. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
32. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
33. Sidewalk details are shown elsewhere in the plans.



Typical placement of detectable warning surface on sloping ramp run.



Typical placement of detectable warning surface on landing at street edge.

SHEET 2 OF 4



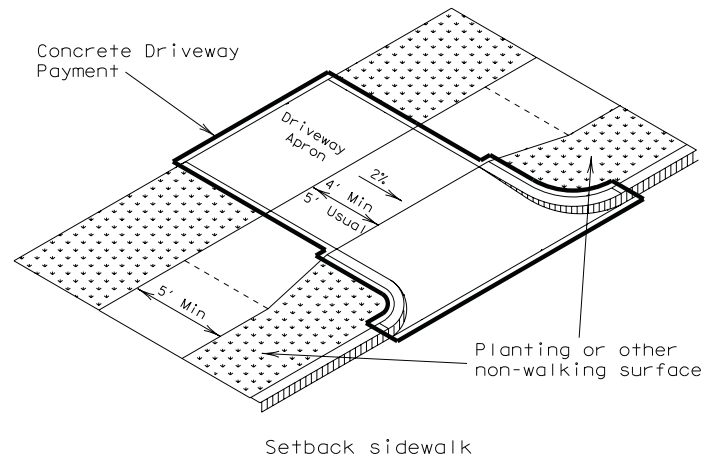
PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

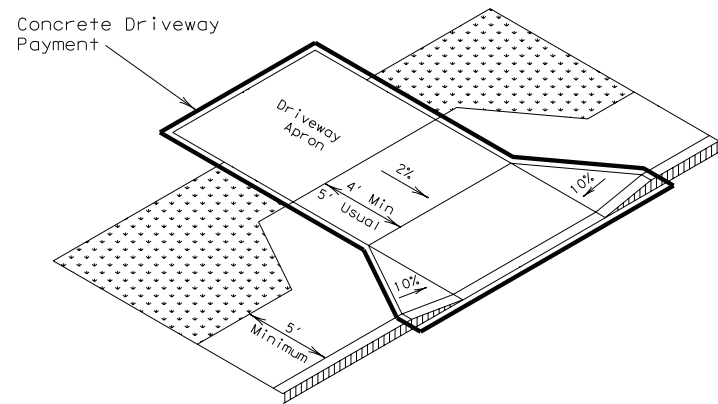
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© TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
VP June 13, 2012	DIST	COUNTY	SHEET NO.	

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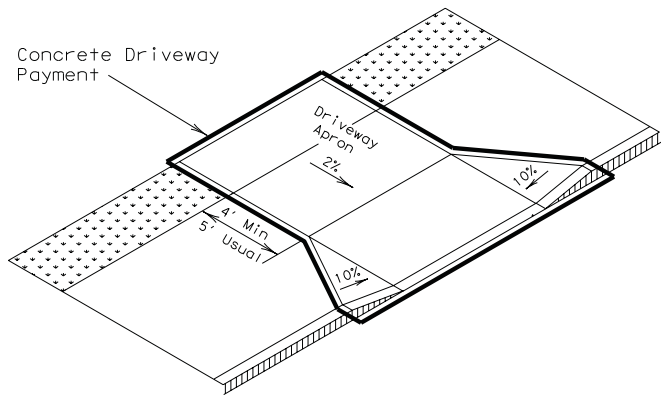
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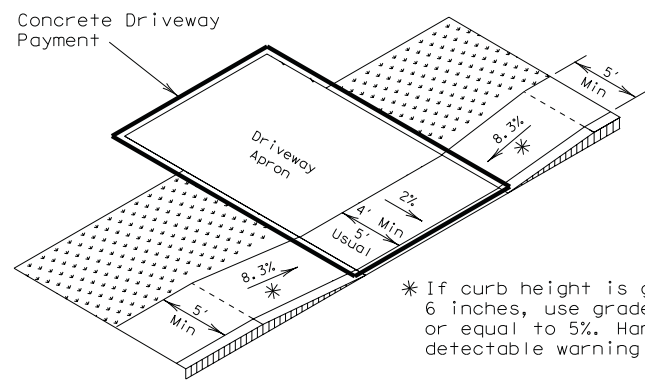
Setback sidewalk



Apron offset sidewalk



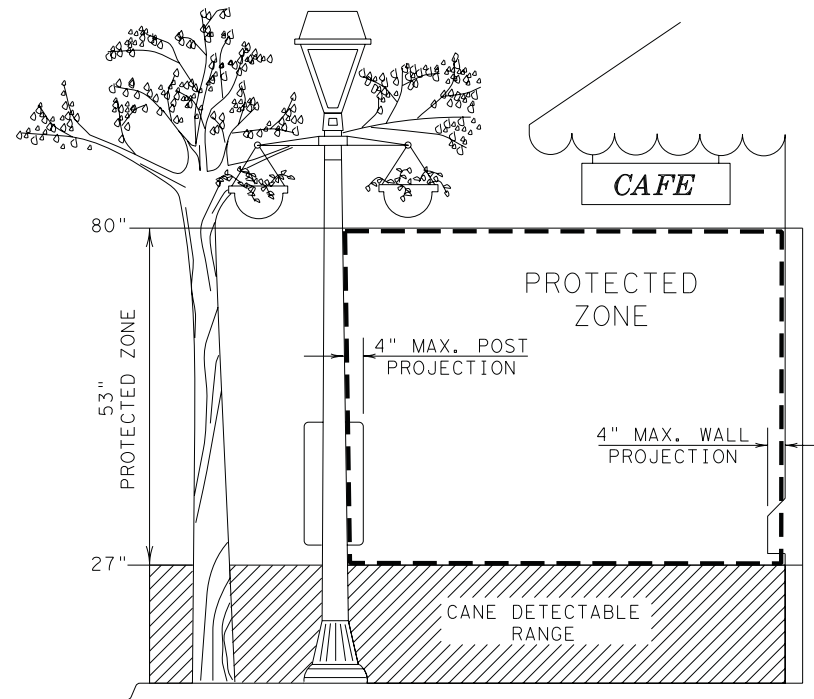
Wide sidewalk



Ramp sidewalk

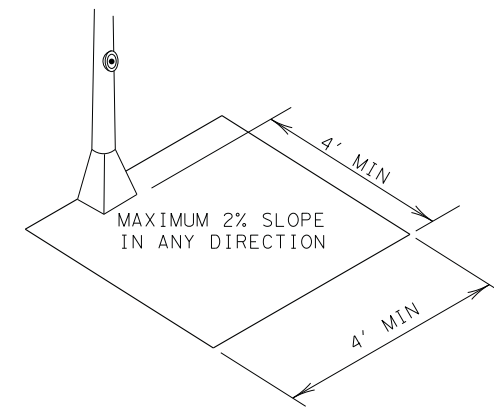
SIDEWALK TREATMENT AT DRIVEWAYS

* If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

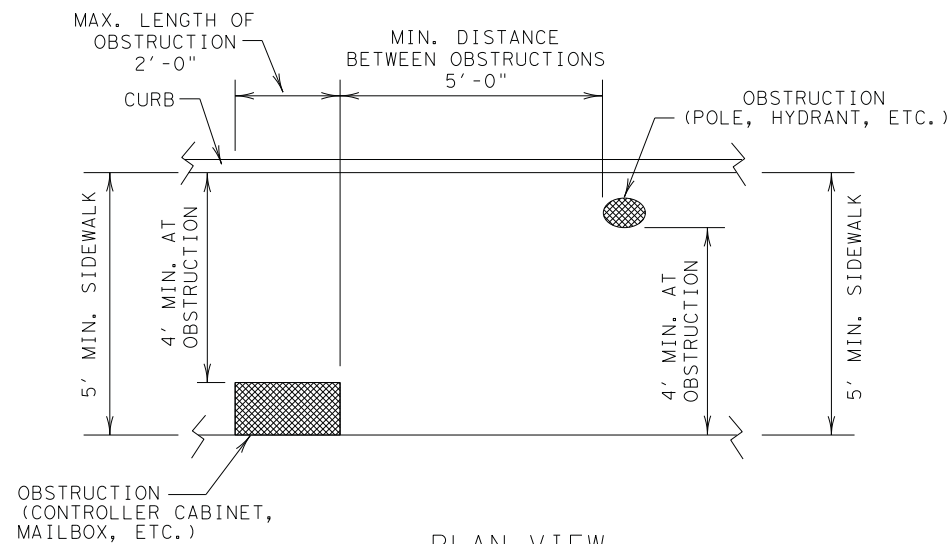


PROTECTED ZONE

In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27" and 80" above the surface.

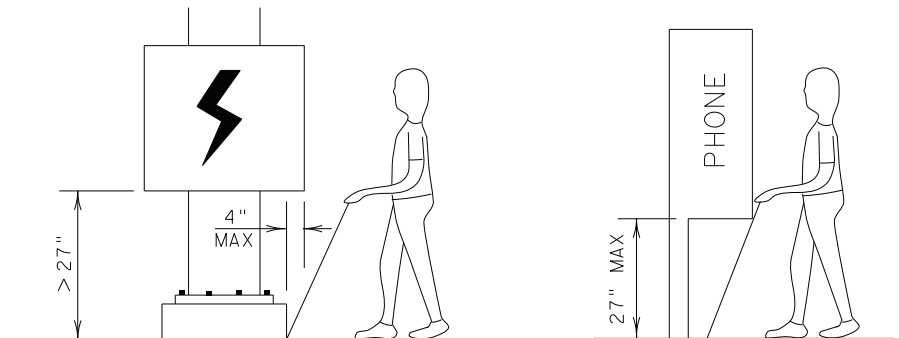


CLEAR GROUND SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON

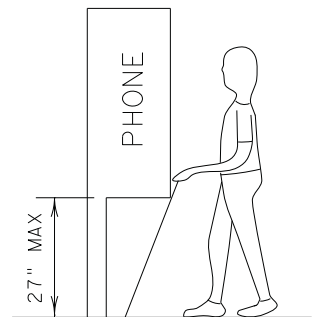


**PLAN VIEW
PLACEMENT OF STREET FIXTURES**

(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.



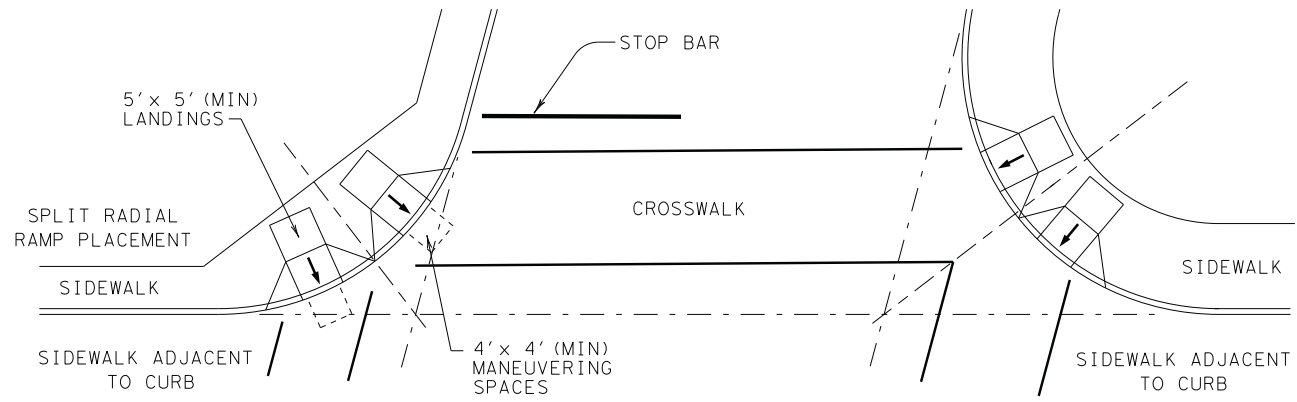
Protruding objects of a height $\leq 27"$ are not detectable by cane and do not require additional treatment.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

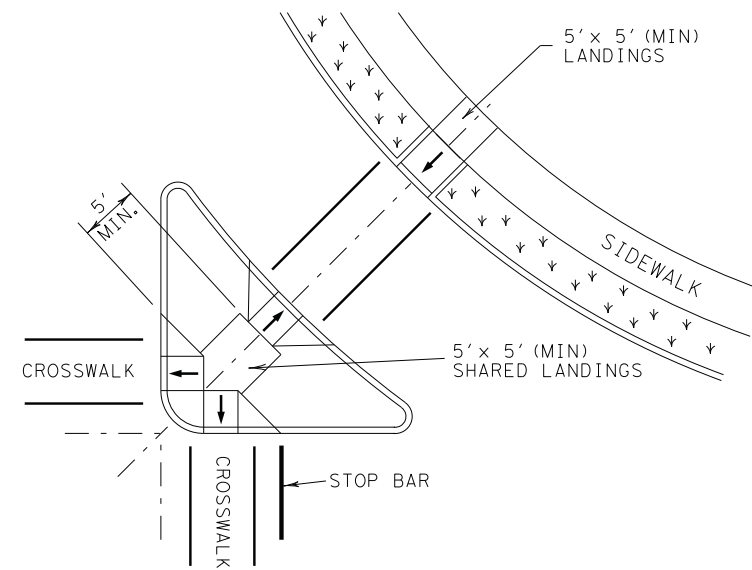
SHEET 3 OF 4

		Design Division Standard	
PEDESTRIAN FACILITIES CURB RAMPS			
PED-12A			
FILE: ped12a.dgn	DN: TxDOT	CK: PK	DW: TxDOT
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REVISIONS	DIST		COUNTY
VP June 13, 2012	SHEET NO.		

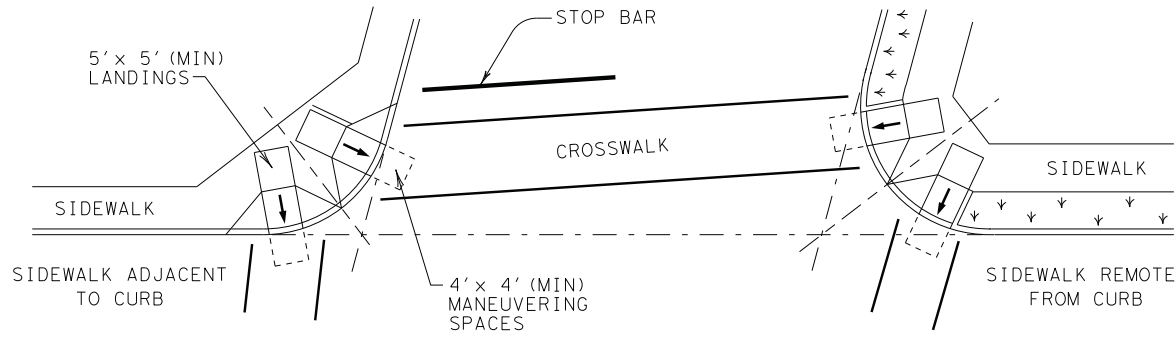
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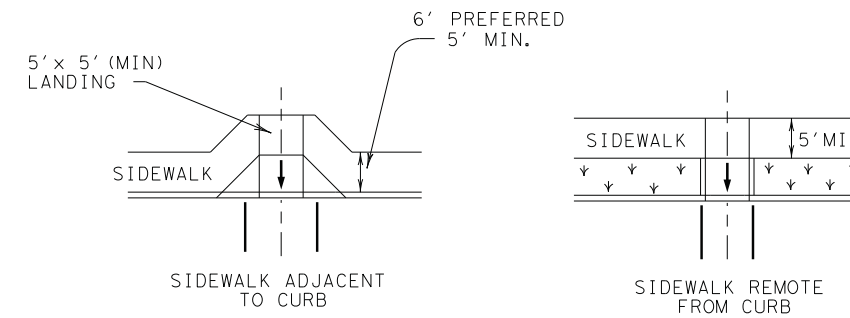
SKewed INTERSECTION WITH "LARGE" RADIUS



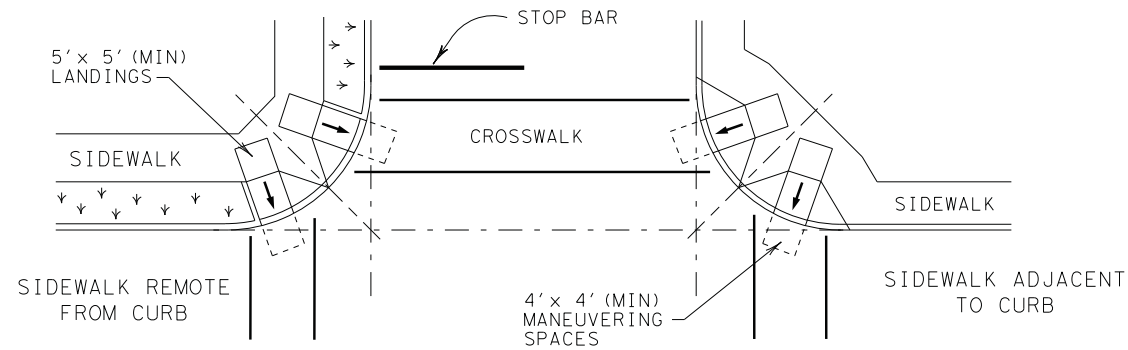
AT INTERSECTION W/FREE RIGHT TURN & ISLAND



SKewed INTERSECTION WITH "SMALL" RADIUS



MID-BLOCK PLACEMENT PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

TYPICAL CROSSING LAYOUTS



PEDESTRIAN FACILITIES
CURB RAMPS

PED-12A

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Barricade and Construction (BC) Standard Sheets General Notes:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
2. The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets", the TxDOT "Roadway Design Manual" or engineering judgment.
6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
12. The Engineer has the final decision on the location of all traffic control devices.
13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

Worker Safety Apparel Notes:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel" labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes prequalified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
 Traffic Operations Division - TE
 Phone (512) 416-3134

WEB ADDRESSES FOR REFERENCED DOCUMENTS

Compliant Work Zone Traffic Control Devices List (CWZTCD)
<http://www.txdot.gov/publications/traffic.htm>

Texas Manual on Uniform Traffic Control Devices (TMUTCD)
<http://www.txdot.gov/publications/traffic.htm>

Standard Highway Sign Designs for Texas (SHSD)
<http://www.txdot.gov/publications/traffic.htm>

Traffic Engineering Standard Sheets
<http://www.txdot.gov/business/disclaim.htm>

Material Producer List
http://www.txdot.gov/business/producer*list.htm

Departmental Material Specifications (DMS)
http://www.txdot.gov/services/construction/material*specifications/

Roadway Design Manual
http://www.txdot.gov/services/general*services/manuals.htm



**BARRICADE AND CONSTRUCTION
 GENERAL NOTES
 AND REQUIREMENTS**

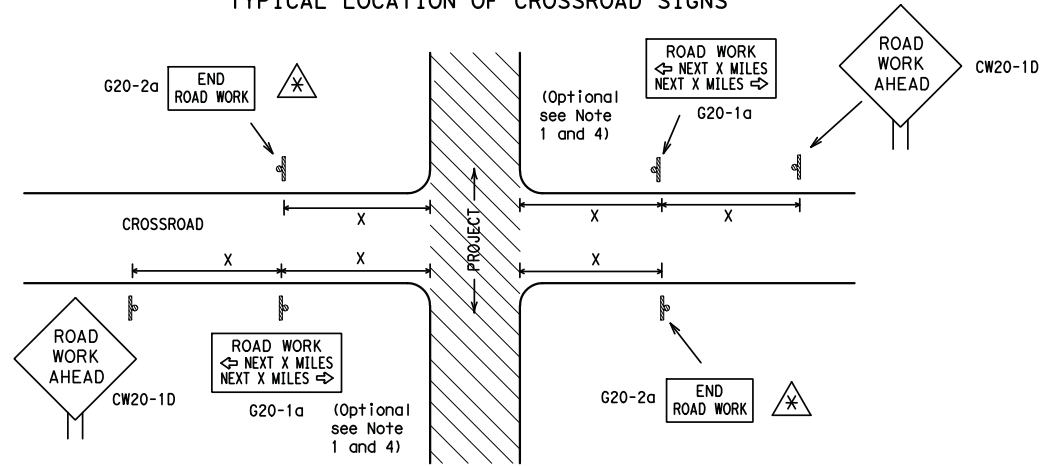
1 of 12 BC(1)-07

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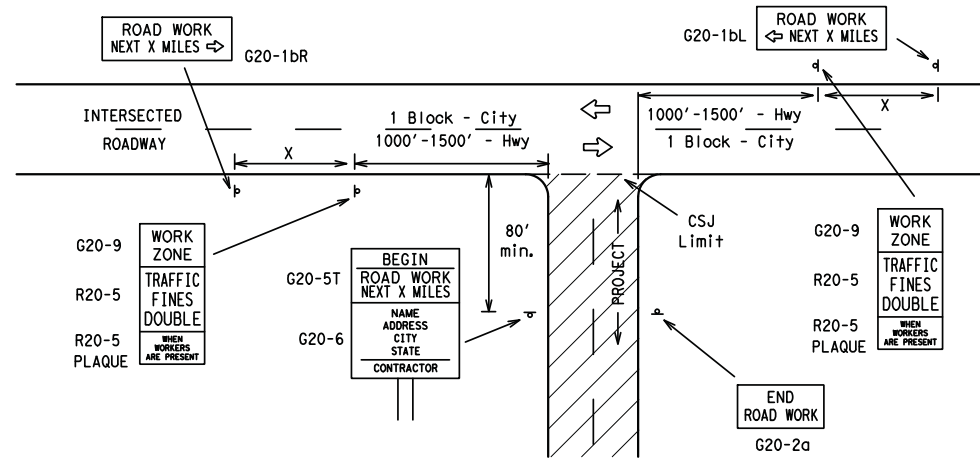
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TYPICAL LOCATION OF CROSSROAD SIGNS



- △ May be mounted on back of CW20-1D sign with approval of engineer. (See note 2 below)
- The typical minimum signing on a crossroad approach should be a CW20-1D ROAD WORK AHEAD sign and a G20-2a END ROAD WORK sign, unless noted otherwise in plans.
 - The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" END ROAD WORK (G20-2a) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
 - Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
 - The G20-1a sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection the Contractor shall place the G20-6 "Contractor Name" sign behind the Type III Barricades for the road closure (see BC(10) also). The G20-1bL and G20-1bR signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

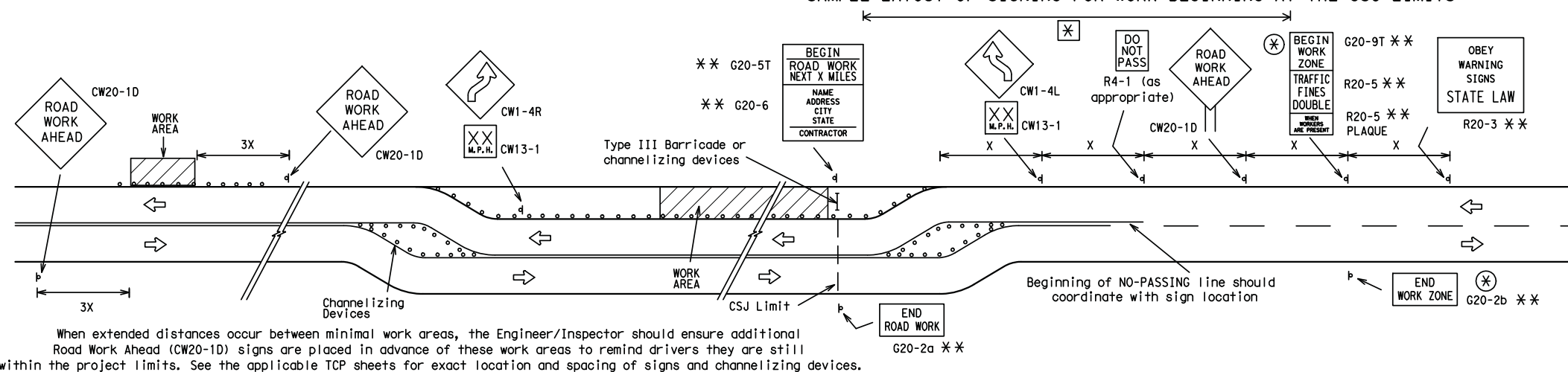
Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "X" (Feet (Apprx.))
CW20 CW21 CW22 CW23 CW25	48" x 48"	48" x 48"	30	120
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	35	160
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	40	240
			45	320
			50	400
			55	500 ²
			60	600 ²
			65	700 ²
			70	800 ²
			75	900 ²
			80	1000 ²
			*	*

* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.
 △ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

General Notes:

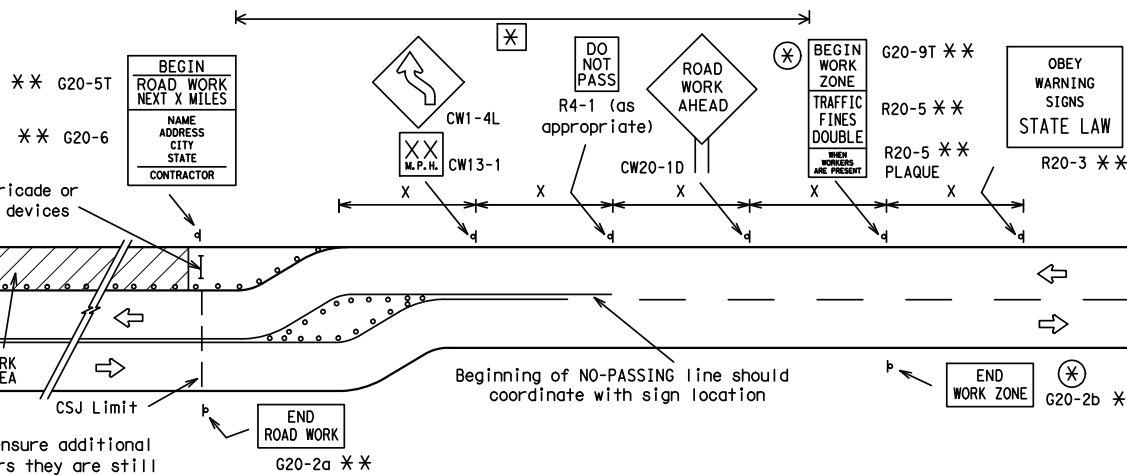
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" ROAD WORK AHEAD (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

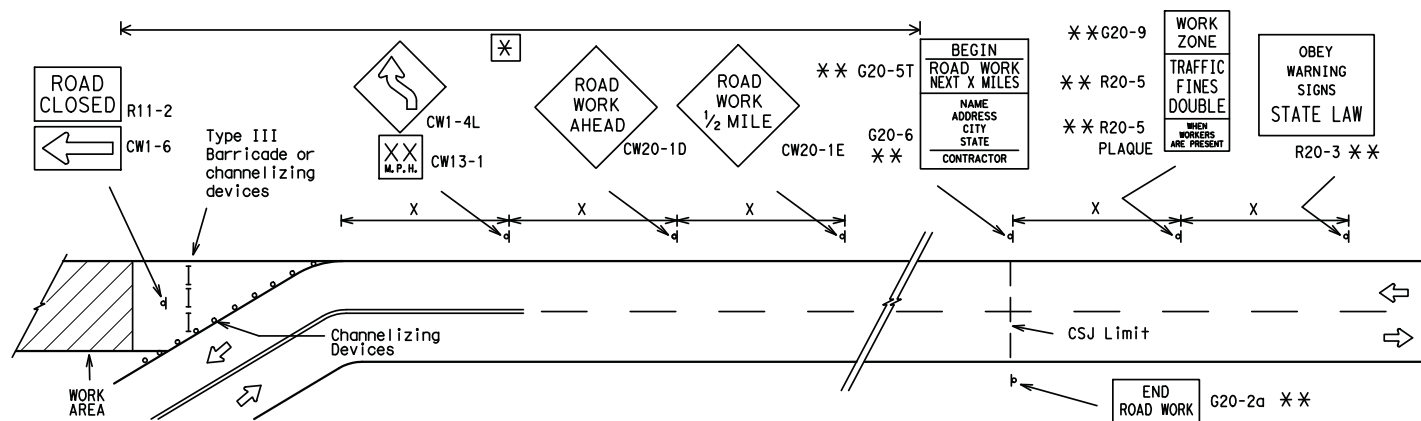


When extended distances occur between minimal work areas, the Engineer/Inspector should ensure additional Road Work Ahead (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS

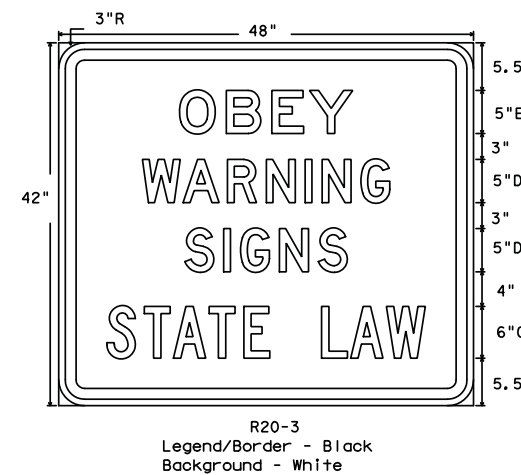


NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and G20-5T sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The G20-9T and G20-2b shall be used when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a work zone where traffic fines may double if workers are present.
- ** Required CSJ Limit signing. See Note 10 on BC(1).
- △ Area for placement of "ROAD WORK AHEAD" sign and other signs or devices as called for on the Traffic Control Plan.

LEGEND

- △ sign
- Channelizing Devices
- I Type III Barricade
- X See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.



R20-3
Legend/Border - Black
Background - White

Texas Department of Transportation
Traffic Operations Division

BARRICADE AND CONSTRUCTION PROJECT LIMIT STANDARD

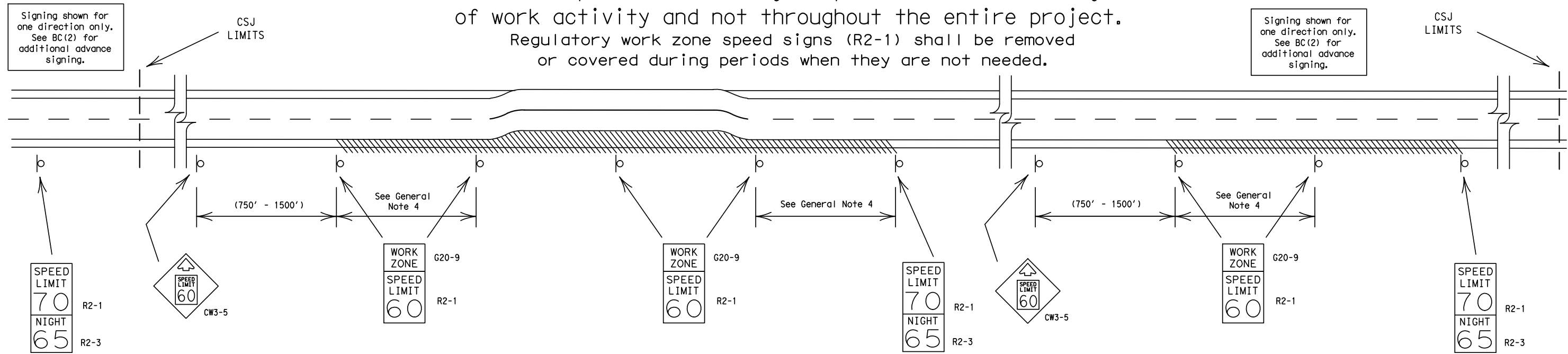
2 of 12 BC(2)-07

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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 15 feet of pavement edge or actually on the pavement.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

GENERAL NOTES:

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:
 - 40 mph and greater 0.2 to 2 miles
 - 35 mph and less 0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the CW3-5 sign, G20-9 plaque and the R2-1 and R2-3 signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless otherwise noted.
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.

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BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT STANDARD

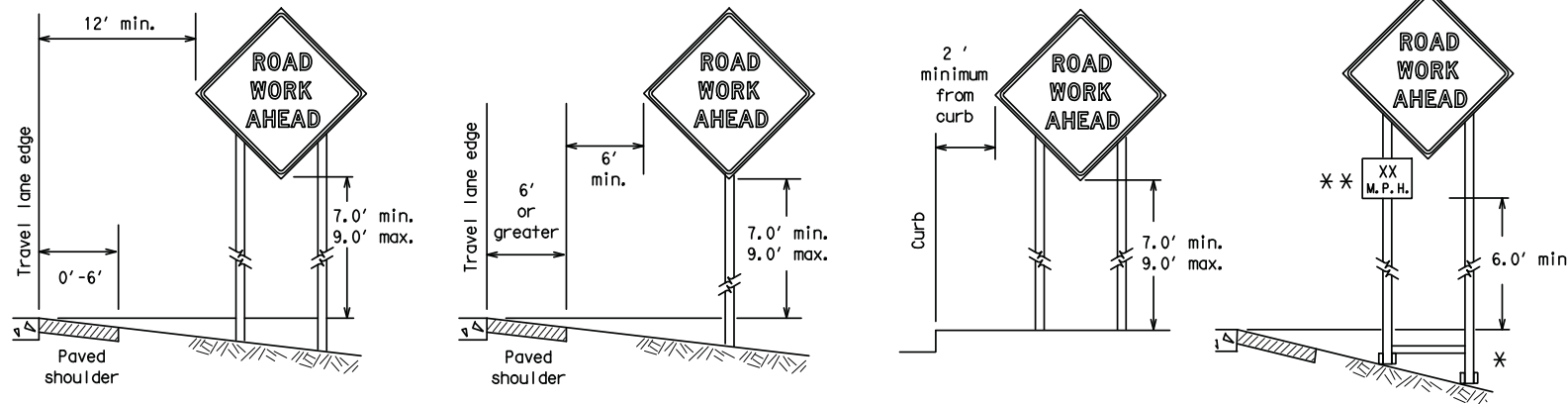
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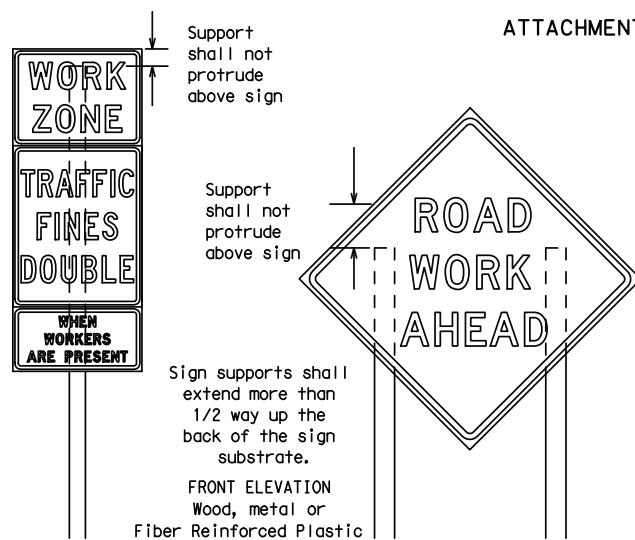
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



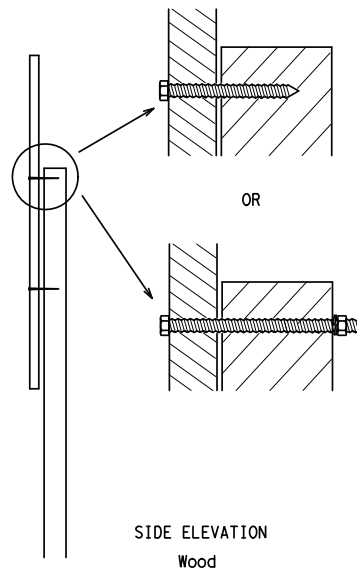
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

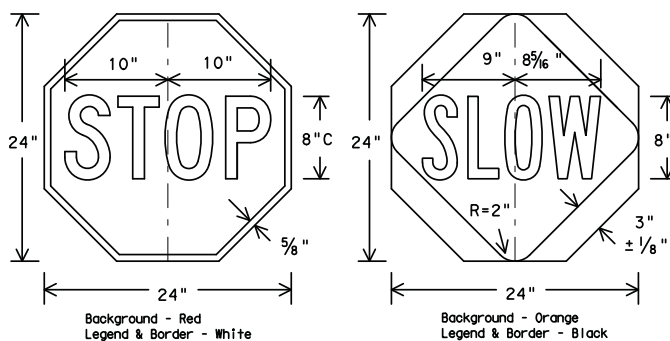


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails will NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
- When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
 - Wooden sign posts shall be painted white.
 - Barricades shall NOT be used as sign supports.
 - Nails shall NOT be used to attach signs to any support.
 - All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
 - The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
 - The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
 - The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
 - Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 - The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the Texas Manual on Uniform Traffic Control Devices) Part 6)**
- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - Long-term stationary - work that occupies a location more than 3 days.
 - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
- The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday, or raised to appropriate Long-term/Intermediate sign height.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

- The Engineer may allow the use of smaller size construction warning signs on secondary roads or city streets where speeds are low if the sign size is listed as an option on the "Typical Construction Warning Sign Size and Spacing" chart shown on BC(2).
- The Contractor shall furnish the sign sizes shown in plans, the BC Sheets, the TCP sheets or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

- All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type C (High Specific Intensity), shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type E (Fluorescent Prismatic), shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This type of sign support meets the crashworthiness standards regardless of the direction of impact. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face. These materials can damage the retroreflectivity of sheeting.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbags shall be made of a durable material that tears upon vehicular impact.
- Rubber (such as tire inner tubes) shall NOT be used for sandbags.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.



BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES STANDARD

4 of 12

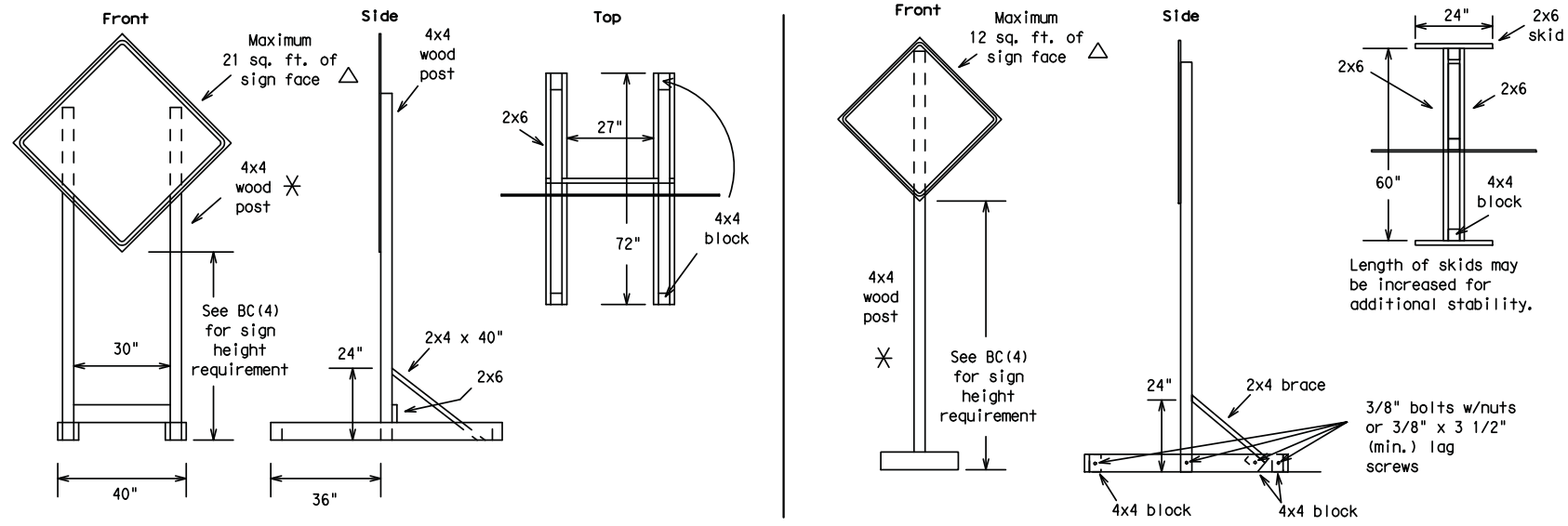
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	DIST	COUNTY		SHEET NO.

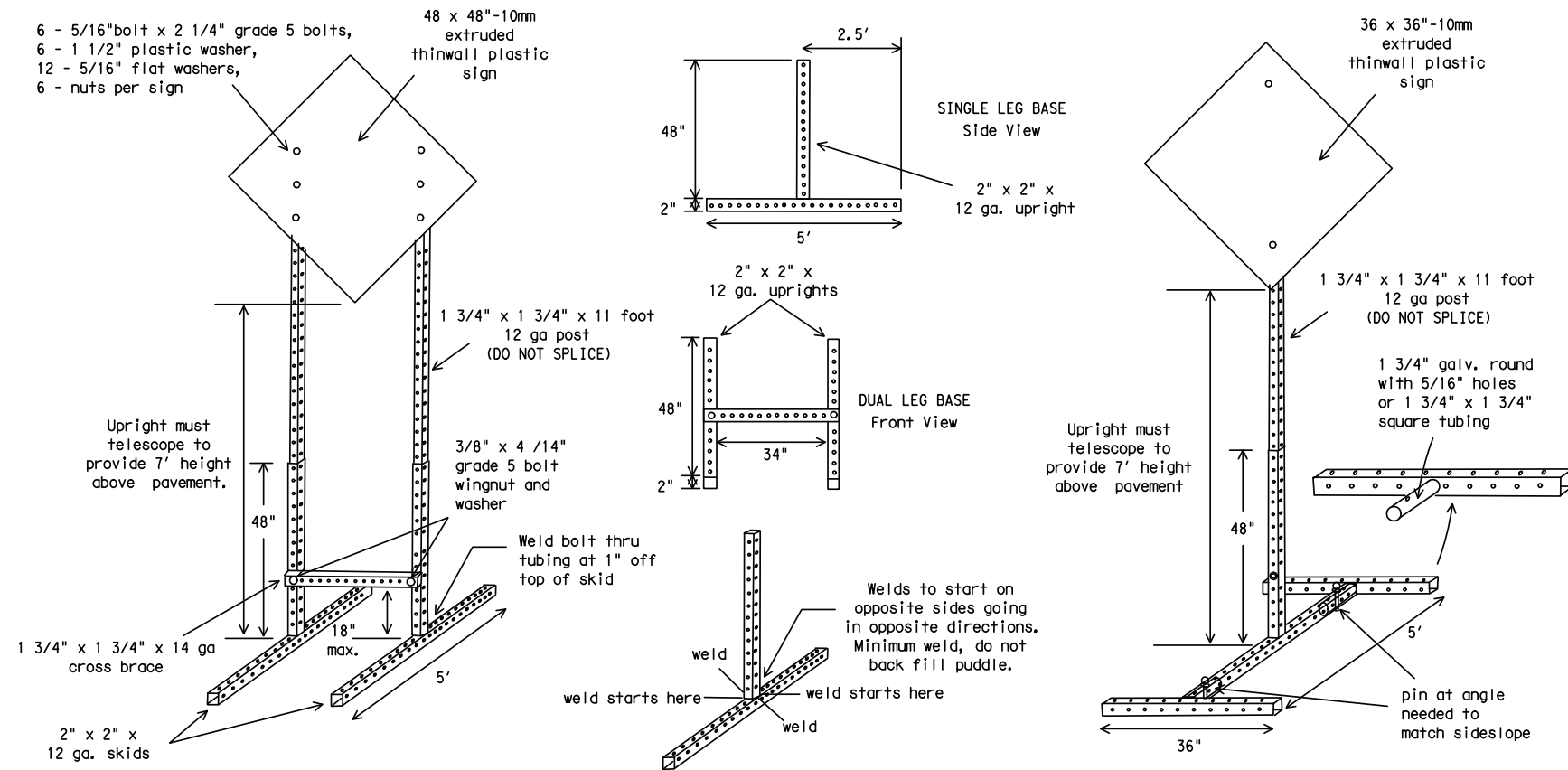
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SKID MOUNTED WOOD SIGN SUPPORTS

LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

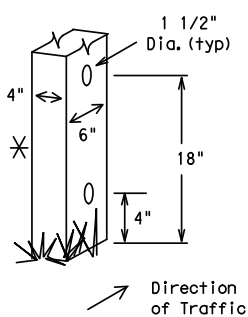


SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).



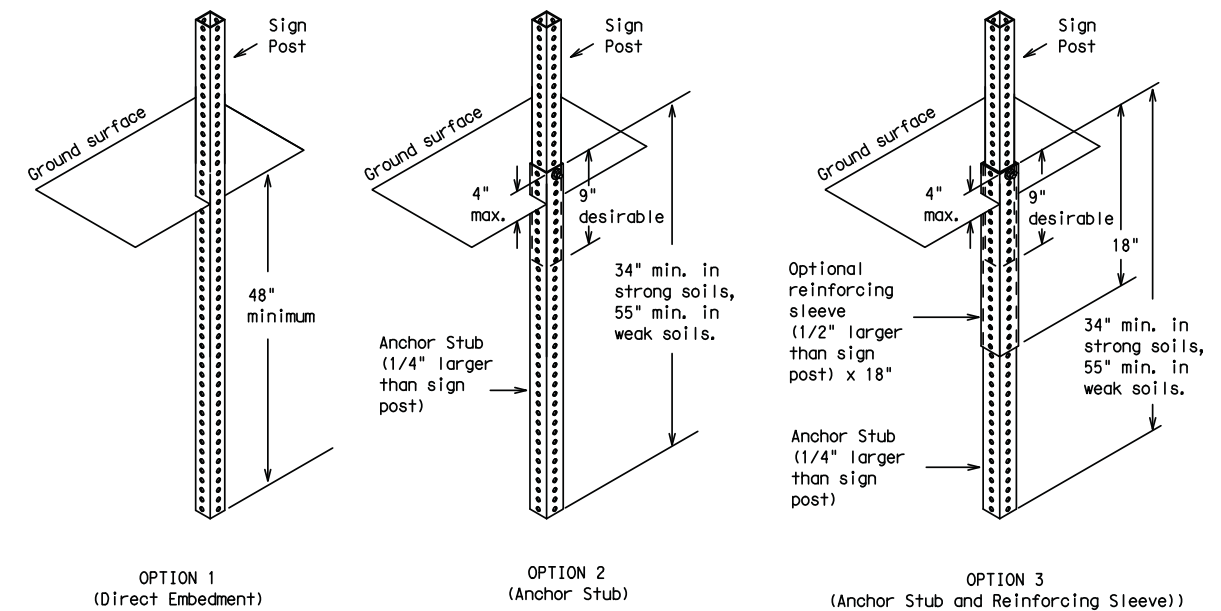
WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

Nominal Post Size	No. of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

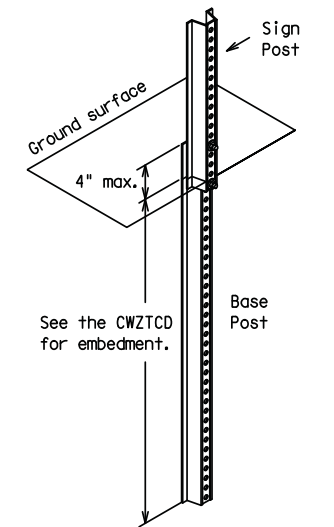
GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installations can be used for larger signs.

PERFORATED SQUARE METAL TUBING



WING CHANNEL



GENERAL NOTES

- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
- More details of approved Long/Intermediate and Short Term supports can be found on the CWZTCD list. See BC(1) for website location.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

□ See BC(4) for definition of "Work Duration."

✱ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

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 Traffic Operations Division

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT STANDARD

5 of 12

BC(5)-07

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PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 720 feet. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

Word or Phrase	Abb.	Word or Phrase	Abb.
Access Road	ACCS RD	Major	MAJ
Air Quality	AIR QLT	Miles	MI
Alternate	ALT	Miles Per Hour	MPH
Avenue	AVE	Minor	MNR
Best Route	BEST RTE	Monday	MON
Boulevard	BLVD	Normal	NORM
Bridge	BRDG	North	N
Cannot	CANT	Northbound	(route) N
Center	CNTR	Parking	PKING
Construction Ahead	CONST AHEAD	Parking Lot	PRK LOT
Detour Route	DETOUR RTE	Road	RD
Do Not	DONT	Right Lane	RGT LN
East	E	Saturday	SAT
Eastbound	(route) E	Service Road	SERV RD
Emergency	EMER	Shoulder	SHLDR
Emergency Vehicle	EMER VEH	Slippery	SLIP
Entrance, Enter	ENT	South	S
Express Lanes	EXP LANE	Southbound	(route) S
Expressway	EXPWY	Speed	SPD
XXXX Feet	XXXX FT	Street	ST
Fog Ahead	FOG AHD	Sunday	SUN
Freeway	FRWY, FWY	Telephone	PHONE
Freeway Blocked	FWY BLKD	Temporary	TEMP
Friday	FRI	Thursday	THURS
Hazardous Driving	HAZ DRIVING	To Downtown	TO DWN TN
Hazardous Material	HAZMAT	Traffic	TRAF
High-Occupancy Vehicle	HOV	Travelers	TRV LRS
Highway	HWY	Tuesday	TUES
Hours	HR	Time Minutes	TIME MIN
Information	INFO	Upper Level	UPPR LVL
It Is	ITS	Vehicle	VEH
Junction	JCT	Warning	WARN
Left	LFT	Wednesday	WED
Left Lane	LFT LN	Weight Limit	WT LIMIT
Lane Closed	LN CLSD	West	W
Lower Level	LOWR LVL	Westbound	(route) W
Maintenance	MAINT	Wet Pavement	WET PVMT
		Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXXX BLVD CLOSED

Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI
ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT
ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Application Guidelines

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *
FORM X LINES RIGHT
USE XXXXX RD EXIT
USE EXIT I-XX NORTH
USE I-XX E TO I-XX N
WATCH FOR TRUCKS
EXPECT DELAYS
END SHOULDER USE
WATCH FOR WORKERS

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXXX TO XXXXXXXX
US XXX TO FM XXXX

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM-X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

** See Application Guidelines Note 6.

Wording Alternatives

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS.

FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the CW20-7a Flagger Symbol, are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow panel provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS) STANDARD

6 of 12 BC (6) - 07

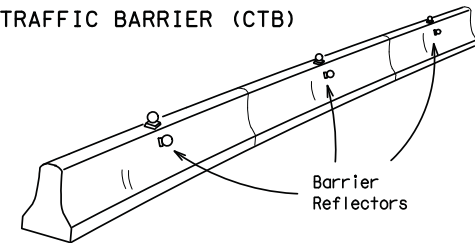
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	DIST	COUNTY	SHEET NO.	

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BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

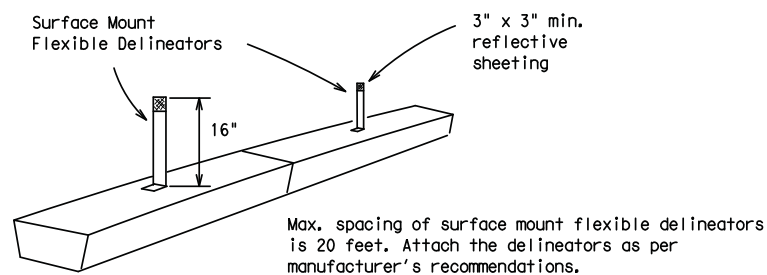
- Barrier Reflectors shall be prequalified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors (Type C Delineators) can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 502.

CONCRETE TRAFFIC BARRIER (CTB)

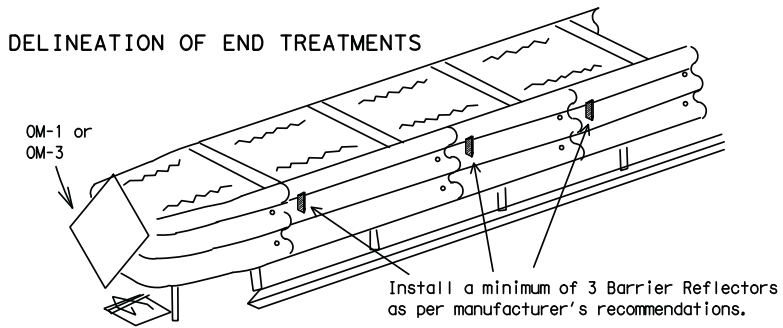


- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented. Yellow Barrier Reflectors shall be made with Type E Fluorescent Prismatic Yellow Retroreflective Sheeting. White reflectors shall be made with Type D White Prismatic sheeting.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS



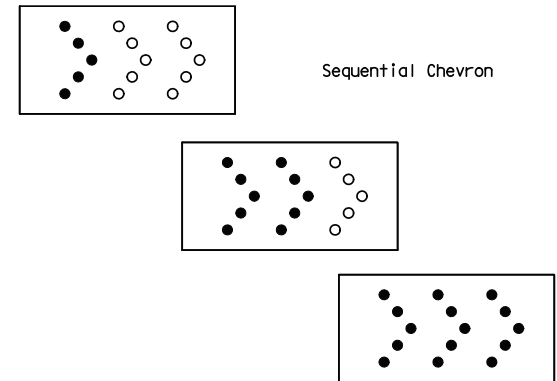
	APPROACHING TRAFFIC	
	BOTH SIDES	ONE SIDE
DELINEATION	OM-1	OM-3 or Vertical Panel

END TREATMENTS FOR CTB'S USED IN WORK ZONES

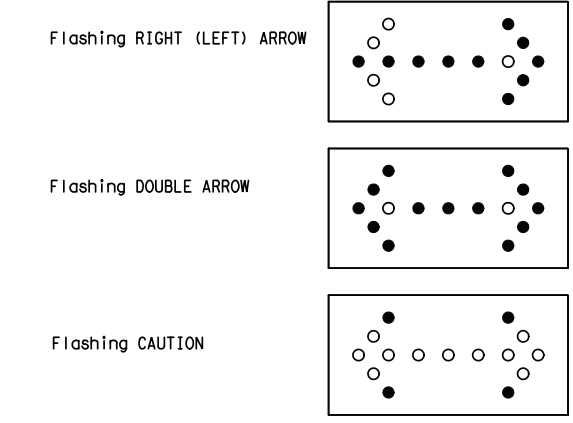
End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

TYPICAL FLASHING ARROW PANEL

Arrow Panels may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.



- The Flashing Arrow Panel should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Panels should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Panel.
- The Flashing Arrow Panel should be able to display the following symbols:



TYPE	REQUIREMENTS		MINIMUM VISIBILITY DISTANCE
	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

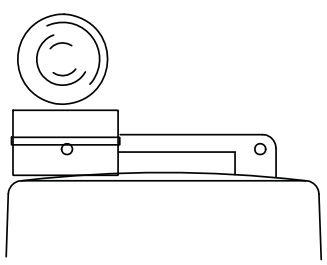
ATTENTION: Flashing Arrow Panels shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW PANEL FROM THE RIGHT-OF-WAY OR PLACE THE ARROW PANEL BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

- The "CAUTION" display consists of four corner lamps flashing simultaneously.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Panel shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.

- The Flashing Arrow Panel shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Panel SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Panel provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted arrow panels should be 7 feet from roadway to bottom of panel.

WARNING LIGHTS



Type C Warning Light or approved substitute mounted adjacent to the travel way.

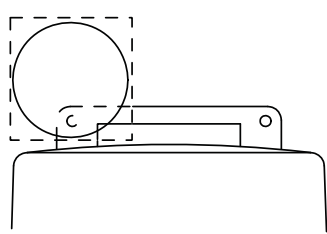
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type E Sheeting (Fluorescent Prismatic) meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type D (Non-fluorescent Prismatic).
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



Warning reflector may be round or square. Must have a reflective surface area of at least 30 square inches

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the dates shown in the CWZTCD to ensure that the TMA meets the age requirements and the crashworthiness criteria established by the Federal Highway Administration (FHWA) for TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned approximately 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR STANDARD

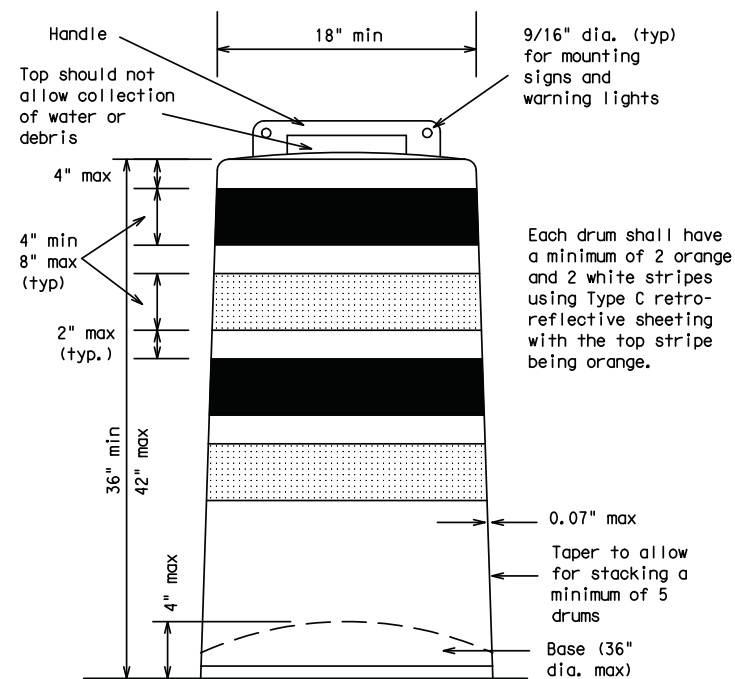
7 of 12 BC(7)-07

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Prequalified plastic drums shall meet the following requirements:

- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectORIZED space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.

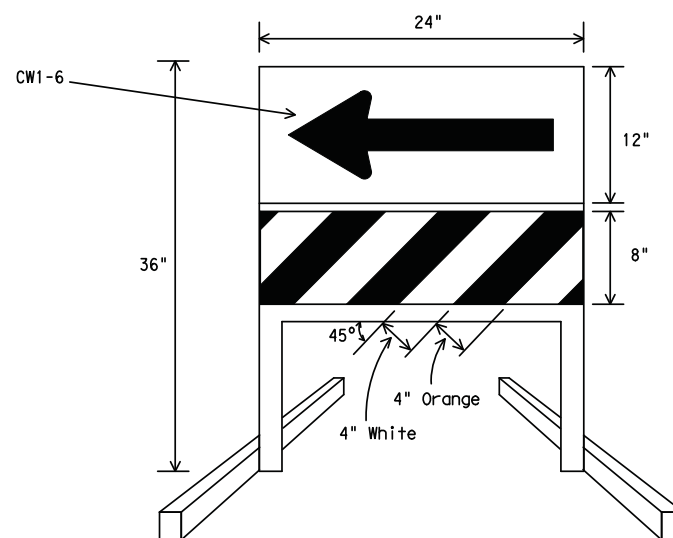
- Drum body shall have a minimum unballasted weight of 7.7 lbs. and maximum unballasted weight of 11 lbs. The wall of the drum body shall be a minimum of 0.07 inch in thickness. Weight of any drum supplied shall not vary more than 0.5 lb. from that of the prequalified sample.
- Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Flat Surface Reflective Sheeting." High Specific Intensity (Type C) retroreflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

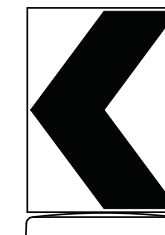
BALLAST

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



DIRECTION INDICATOR BARRICADE

- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type E Fluorescent Prismatic Orange above a rail with Type C High Specific Intensity retroreflective sheeting in alternation 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane
Divider, Driveway sign D70a, Keep Right
R4 series or other signs as approved
by Engineer



12" x 24"
Vertical Panel
mount with diagonals
sloping down towards
travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type E (Fluorescent Prismatic) sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type C (High Specific Intensity). Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES STANDARD

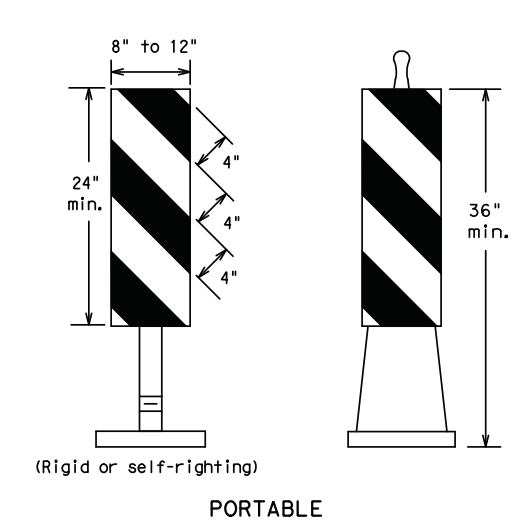
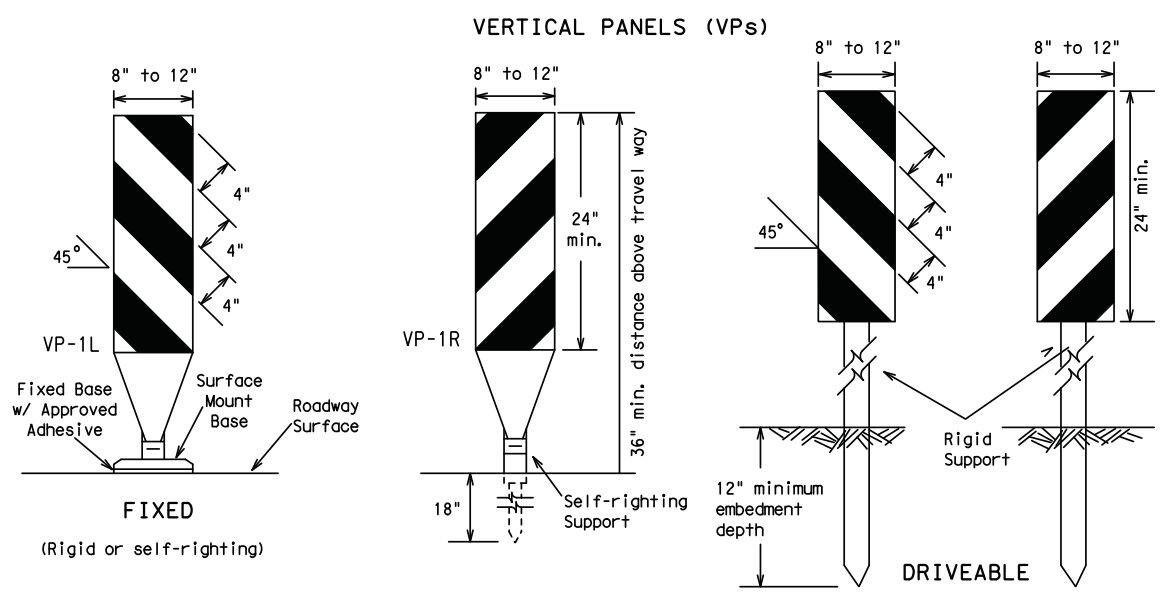
8 of 12

BC(8)-07

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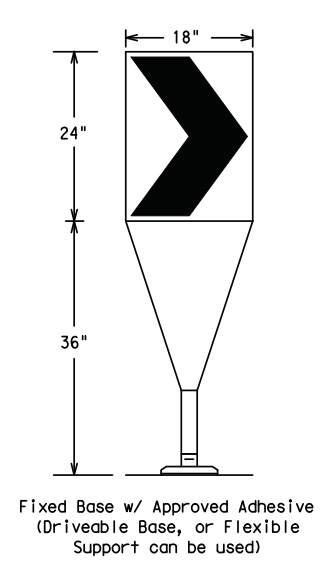
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CHANNELIZING DEVICES



- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
- VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
- VP's used on expressways and freeways or other high speed roadways, shall have a minimum of 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is greater than 36 inches, a panel stripe of 6 inches shall be used.

CHEVRONS

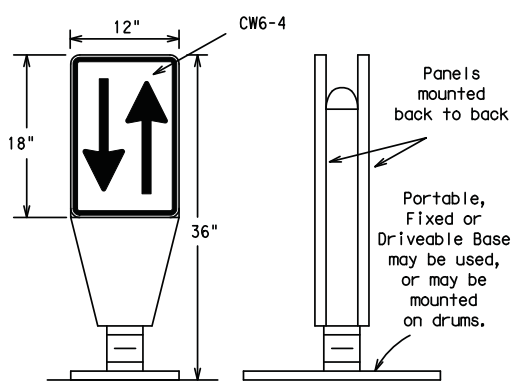


- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type E (Fluorescent Prismatic) conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall be black vinyl non-reflective decal sheeting meeting the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

GENERAL NOTES:

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh approximately 35 lbs.
- Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.
- Examples on this sheet are commonly used channelizing devices in work zones. For other devices, refer to the CWZTCD.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

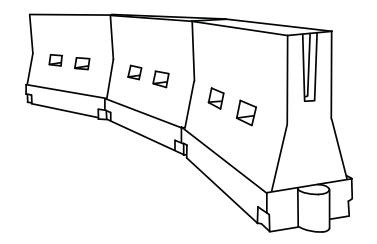


- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with simple tubular markers or VPs.
- Spacing between the OTLD shall not exceed 500 feet. Tubular markers or VPs placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type E (Fluorescent Prismatic) conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall be black vinyl non-reflective decal sheeting meeting the requirements of DMS-8300.

Posted Speed	Formula	Minimum Desirable Taper Lengths *X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60' - 75'
35		205'	225'	245'	40'	70' - 90'
40		265'	295'	320'	40'	80' - 100'
45	L=WS	450'	495'	540'	45'	90' - 110'
50		500'	550'	600'	50'	100' - 125'
55		550'	605'	660'	55'	110' - 140'
60		600'	660'	720'	60'	120' - 150'
65		650'	715'	780'	65'	130' - 165'
70	700'	770'	840'	70'	140' - 175'	
75	750'	825'	900'	75'	150' - 185'	
80	800'	880'	960'	80'	160' - 195'	

*X Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS



LONGITUDINAL CHANNELIZING DEVICES

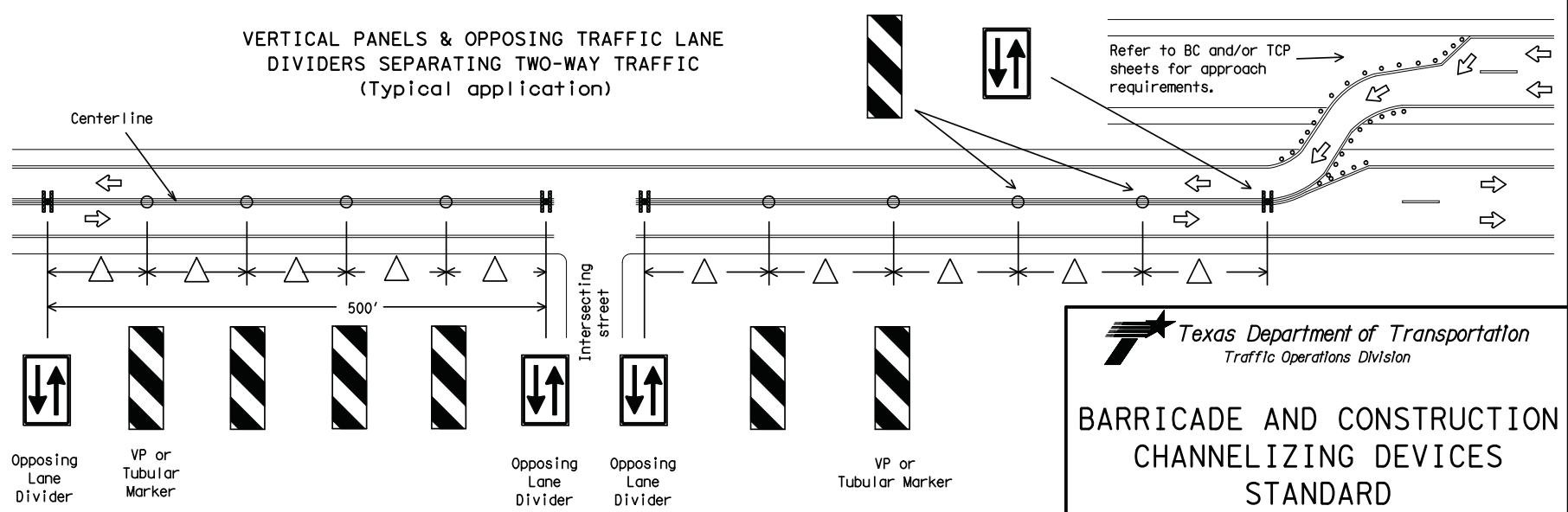
- Longitudinal channelizing devices are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. **They are not designed to contain or redirect a vehicle on impact.**
- Longitudinal channelizing devices may be used instead of a line of cones or drums.
- Longitudinal channelizing devices shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Longitudinal channelizing devices should not be used to provide positive protection for obstacles, pedestrians or workers.
- Longitudinal channelizing devices shall be retroreflective, or supplemented with retroreflective delineation as required for temporary barriers on BC(7)-07.

WATER BALLASTED SYSTEMS USED AS BARRIERS

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall be not less than 32 inches in height.

VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS SEPARATING TWO-WAY TRAFFIC (Typical application)



△ Spacing between the VP's or tubular markers shall not exceed 100 feet. On roadways with speeds less than 45 MPH, spacing between the tubular markers or VP's shall be as shown on the channelizing spacing table shown on this page. If the table shows spacing greater than 100 feet based on the roadway speed, then use a maximum of 100 feet spacing between the tubular markers or VP's. Every fifth channelizing device shall be an OTLD, except when the OTLD must be spaced closer to accommodate an intersection. Spacing between the OTLD shall not exceed 500 feet.

Texas Department of Transportation
Traffic Operations Division

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES STANDARD

9 of 12 BC(9)-07

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TYPE III BARRICADES

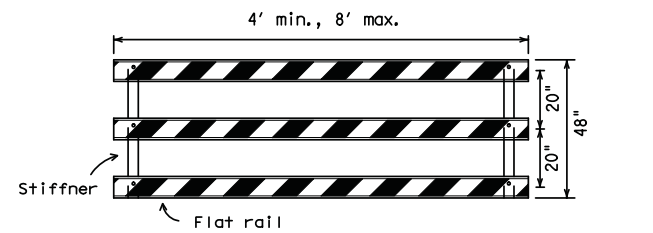
1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type III Barricades and a list of all materials used in the construction of Type III Barricades.
2. Type III Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.

TYPICAL STRIPING DETAIL FOR BARRICADE RAIL

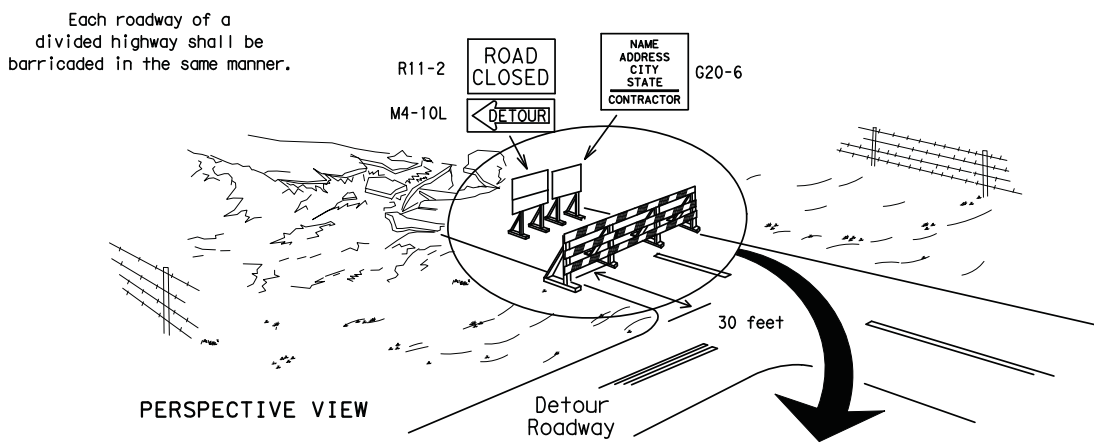


TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



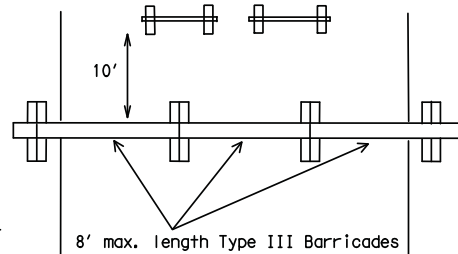
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPE III BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

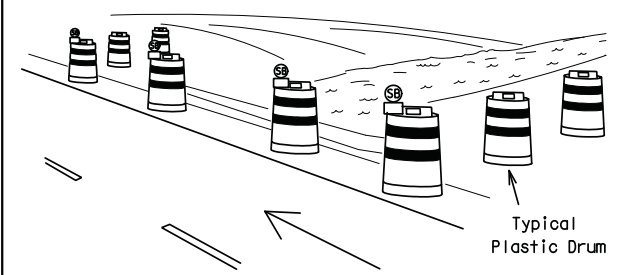
The three rails on Type III barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



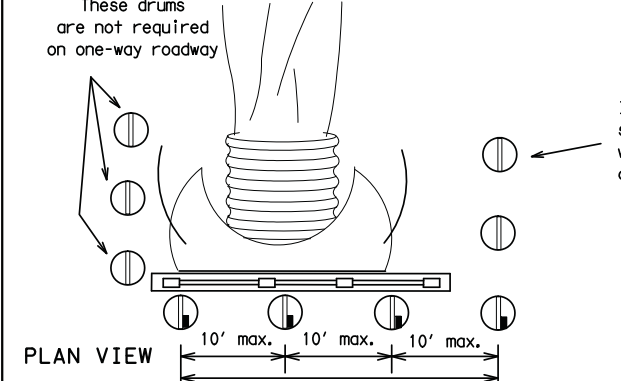
PLAN VIEW

1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type III Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



PERSPECTIVE VIEW



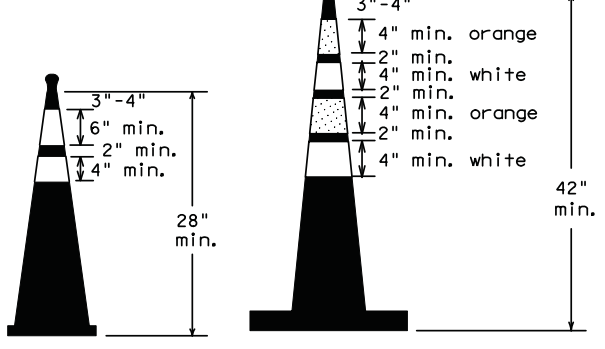
PLAN VIEW

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

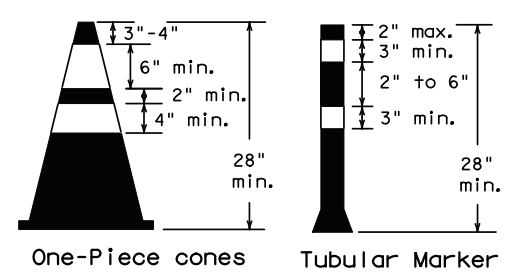
Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

- Legend
- Plastic drum
 - Plastic drum with steady burn light or yellow warning reflector
 - SB Steady burn warning light or yellow warning reflector

CONES

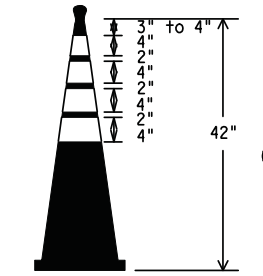


Two-Piece cones



Tubular Marker

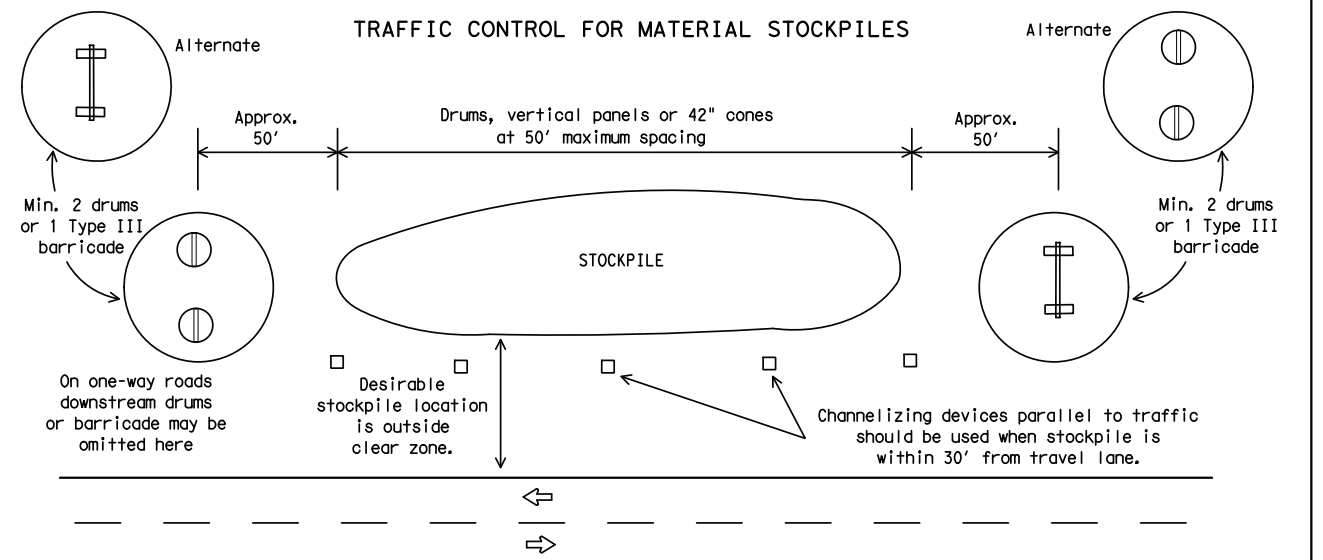
28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type C encapsulated bead (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

TRAFFIC CONTROL FOR MATERIAL STOCKPILES



1. Traffic cones and tubular markers shall be a minimum of 28 inches in height when used either on freeways or at nighttime.
2. Cones or tubular markers shall be predominantly orange, fluorescent red-orange, or fluorescent yellow-orange. They should be kept clean and bright for maximum visibility.
3. Cones used only for daytime operations do not require the reflectorized bands.
4. Cones and tubular markers used for nighttime operations shall be reflectorized. Reflectorized material shall have a smooth, sealed outer surface that displays the same approximate color during the day and night. The reflectorized bands shall be retroreflective Type C (High Specific Intensity) conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
5. When used at night, appropriate personnel shall ensure that cones and tubular markers remain in their proper location and in an upright position.
6. Reflectorization of 28" cones shall consist of a minimum 6 inch band placed at least 3 inches but not more than 4 inches from the top, supplemented by a minimum 4 inch band spaced a minimum of 2 inches below the 6 inch band.
7. Reflectorization of 42" cones shall be provided by alternating 4 to 6" orange and white stripes with orange on top.
8. Reflectorization of tubular markers shall be a minimum of two 3 inch bands placed a maximum of 2 inches from the top with a maximum of 6 inches between bands.
9. One-piece cones or tubular markers are generally suitable for temporary usage (up to 8 hours) with other channelization devices such as vertical panels, drums or two-piece cones for long term usage. Care should be taken to ensure they remain in their proper location and in an upright position.
10. Cones or tubular markers used on each project shall be of the same size and shape.
11. The handle may be designed as a hook or other shape, fabricated from non-rigid materials similar to the cone material, and may extend up to a maximum of 8 inches above the top of cone. Length of the handle shall not be considered with regard to the overall height of the cone.

Texas Department of Transportation
Traffic Operations Division

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES STANDARD

10 of 12 BC(10)-07

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

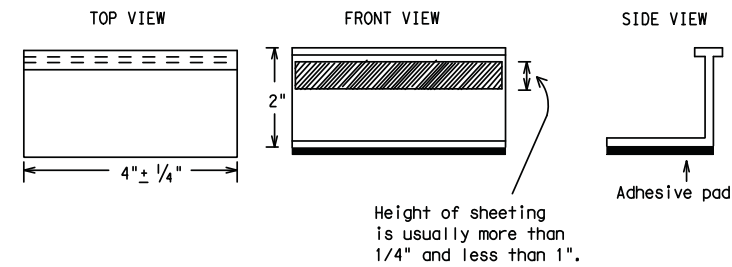
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway, shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than two weeks, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
 - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
 - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

Raised Pavement Markers used as Guidemarks

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
 YELLOW - (two amber reflective surfaces with yellow body).
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS

PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PREFABRICATED PAVEMENT MARKINGS-PERMANENT	DMS-8240
PREFABRICATED PAVEMENT MARKINGS-REMOVABLE	DMS-8241
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS STANDARD

11 of 12

BC(11)-07

© TxDOT February 1998		Rev: TxDOT	CK: TxDOT	Rev: TxDOT	CK: TxDOT
2-98	REVISIONS	CUAT	SECT	JUB	HIGHWAY
1-02					
11-02		DIST		COUNTY	SHEET NO.
9-07					

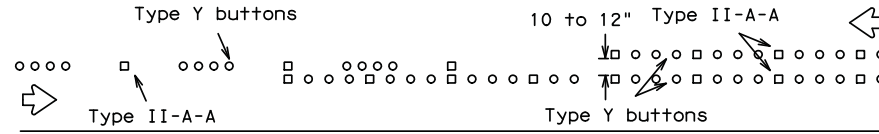
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TXDOT for any purpose whatsoever. TXDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

PAVEMENT MARKING PATTERNS

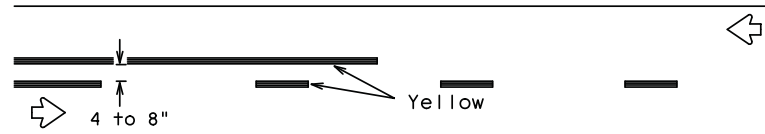
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



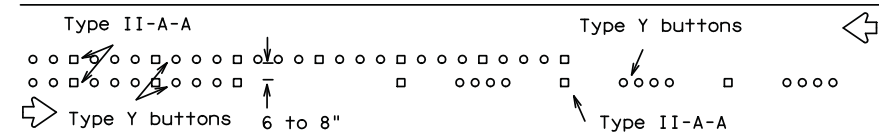
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



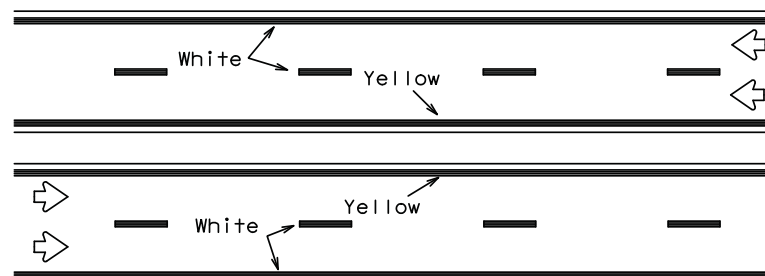
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



RAISED PAVEMENT MARKERS - PATTERN B

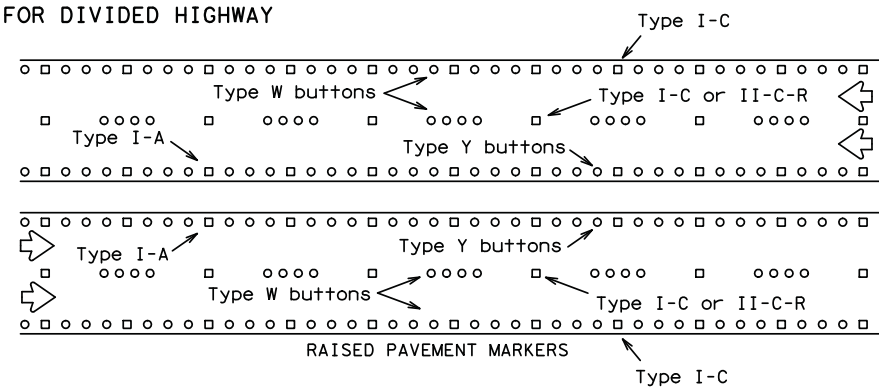
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



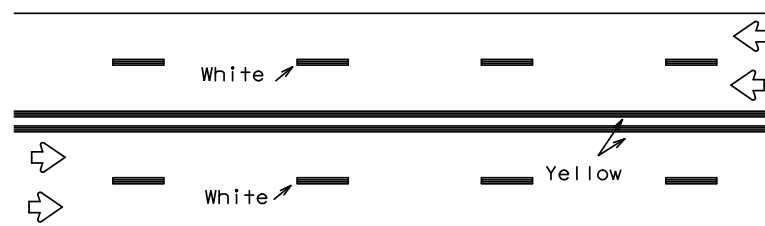
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



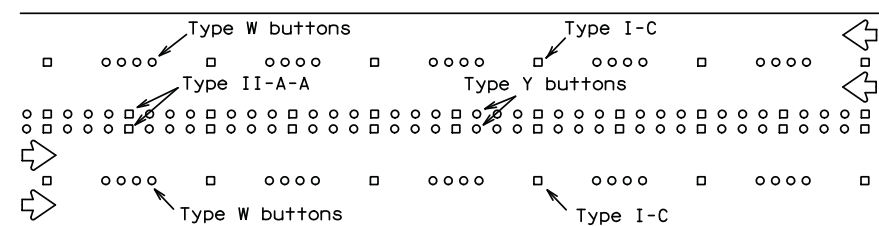
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



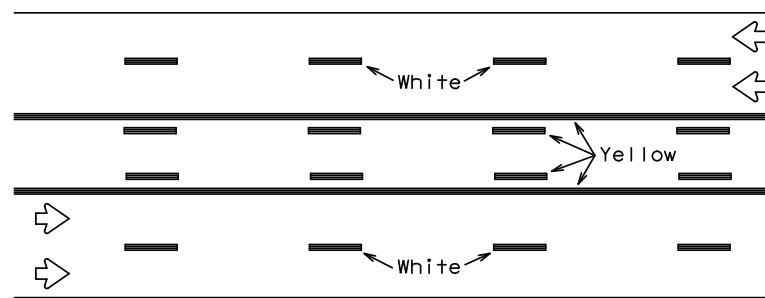
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



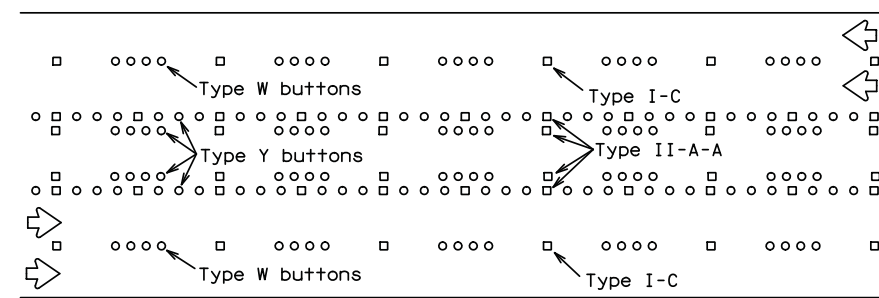
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE



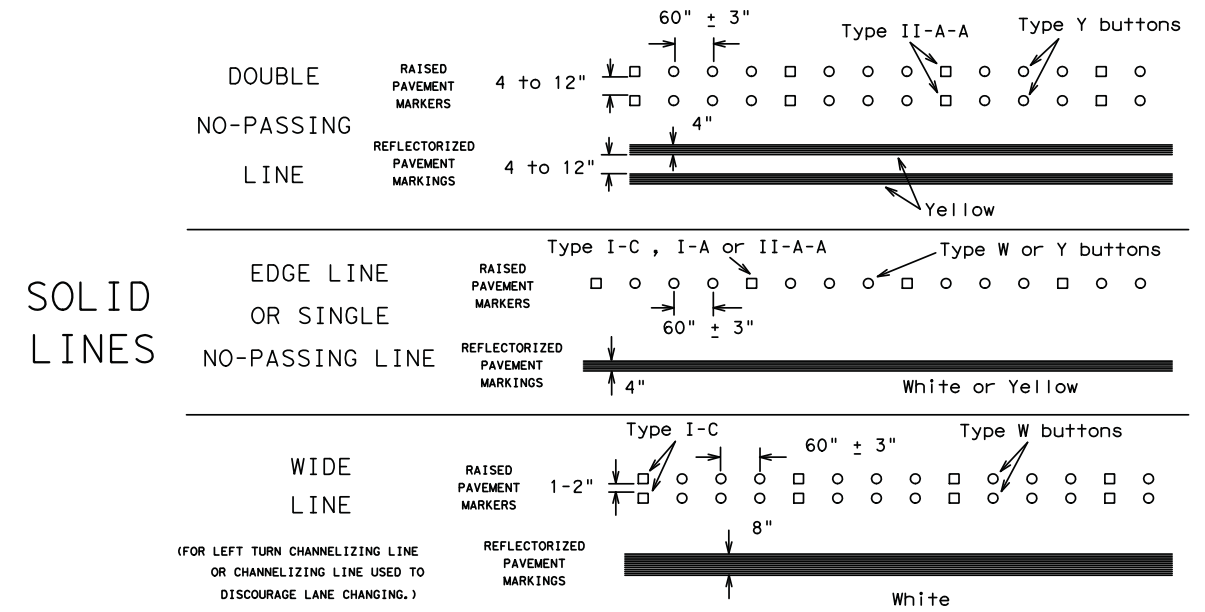
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



RAISED PAVEMENT MARKERS

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

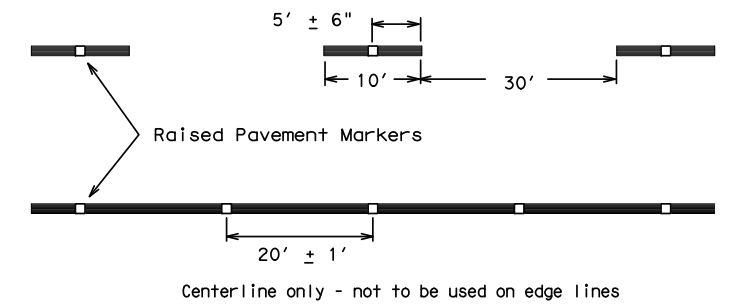


SOLID LINES

BROKEN LINE
(FOR CENTER LINE OR LANE LINE.)

REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS STANDARD

12 of 12 BC(12)-07

© TXDOT February 1998		REV: TXDOT	CK: TXDOT	DN: TXDOT	CK: TXDOT
1-97	REVISIONS	CUNY	SECT	JUB	HIGHWAY
2-98					
11-02					
9-07					
		DIST		COUNTY	SHEET NO.

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DATE: _____
 FILE: _____

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 1122.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

- 1.
 - 2.
- No Action Required Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
 Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
 Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
 Individual 404 Permit Required
 Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1.
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.


VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

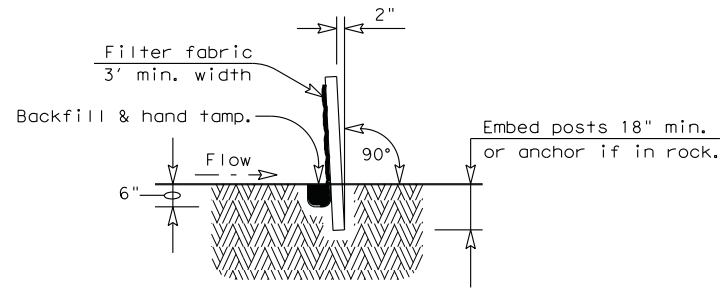
- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.

 Texas Department of Transportation		Design Division Standard		
<h2 style="margin: 0;">ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</h2> <h1 style="margin: 0;">EPIC</h1>				
FILE: epic.dgn	DN: TxDOT	CK: AM	DW: VP	CK: AR
© TxDOT January 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS				
12-12-2011 (DS)	DIST	COUNTY	SHEET NO.	

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SECTION A-A

GENERAL NOTES

1. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

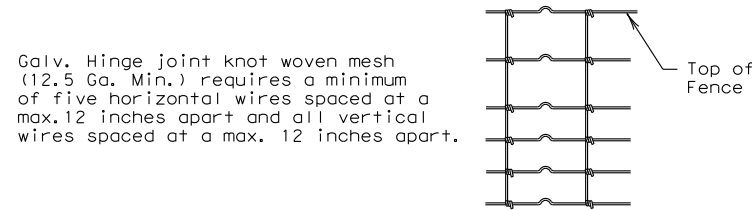
PLAN SHEET LEGEND

Sediment Control Fence — SCF

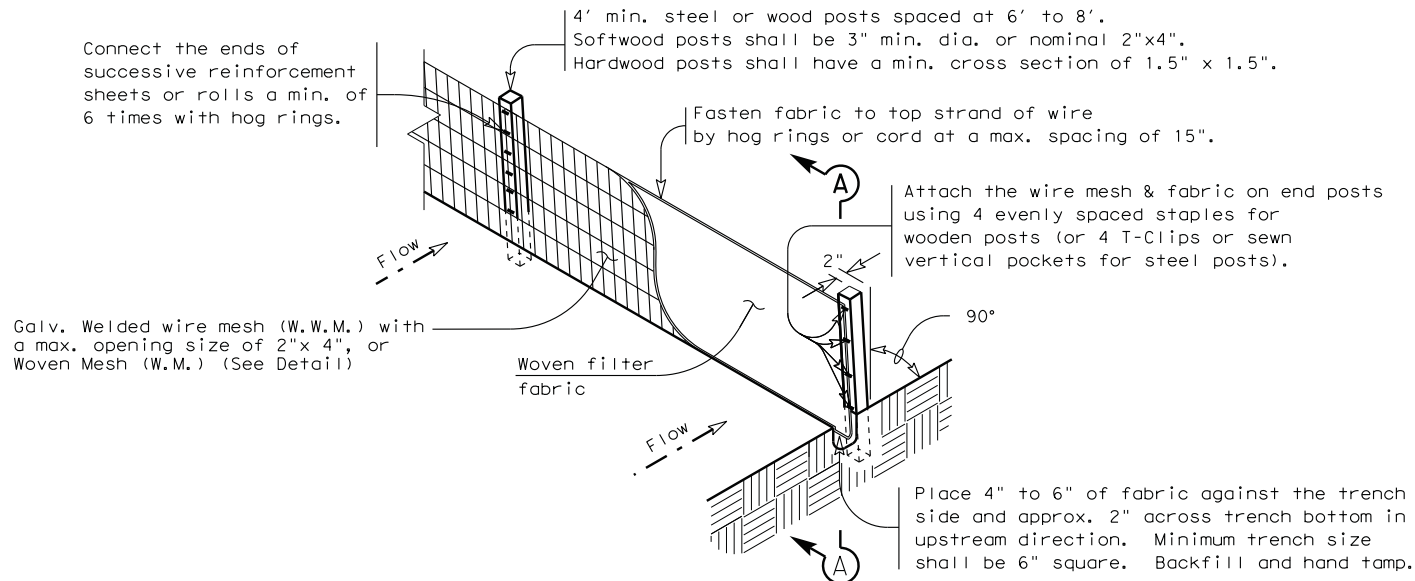
SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a max. flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

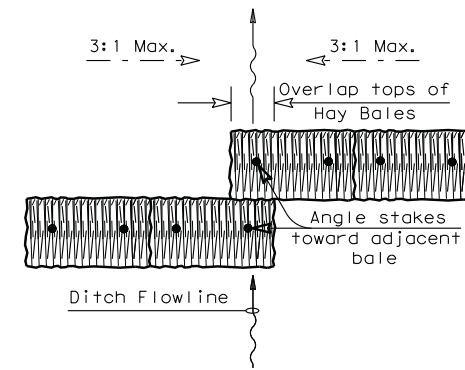


Hinge Joint Knot Woven Mesh (Option)

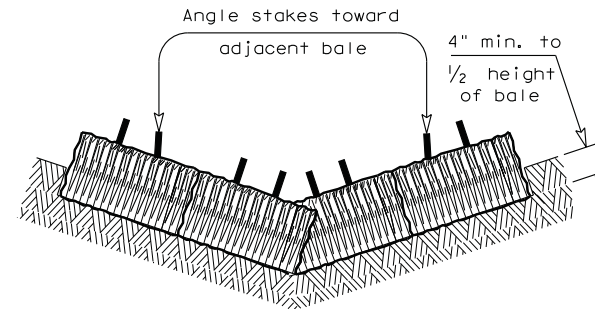


TEMPORARY SEDIMENT CONTROL FENCE

SCF



PLAN VIEW



PROFILE VIEW

PLANS SHEET LEGEND

Baled Hay — BH

BALED HAY USAGE GUIDELINES

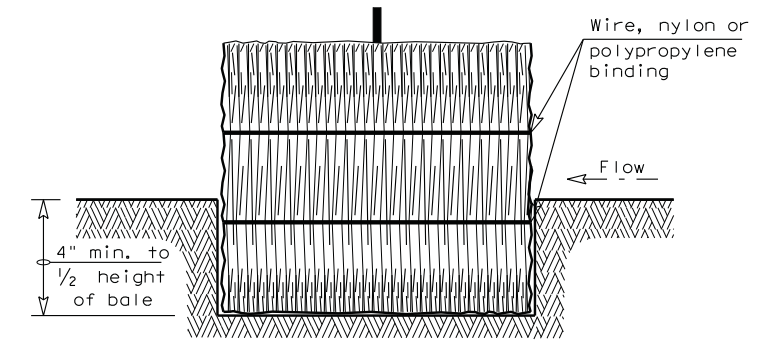
A Baled Hay installation may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A two year storm frequency may be used to calculate the flow rate to be filtered. The installation should be sized to filter a maximum flow thru rate of 5 GPM/FT² of cross sectional area. Baled hay may be used at the following locations:

1. Where the runoff approaching the baled hay flows over disturbed soil for less than 100'. If the slope of the disturbed soil exceeds 10%, the length of slope upstream the baled hay should be less than 50'.
2. Where the installation will be required for less than 3 months.
3. Where the contributing drainage area is less than 1/2 acre.

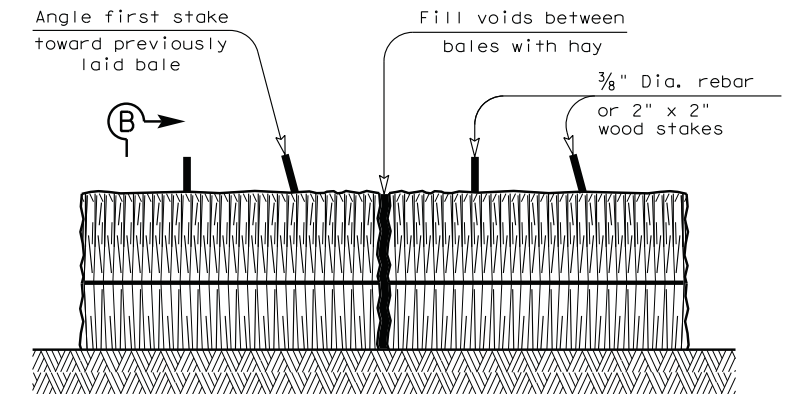
For Baled Hay installations in small ditches, the additional following considerations apply:

1. The ditch sideslopes should be graded as flat as possible to maximize the drainage flowrate thru the hay.
2. The ditch should be graded large enough to contain the overtopping drainage when sediment has filled to the top of the baled hay.

Bales should be replaced usually every 2 months or more often during wet weather when loss of structural integrity is accelerated.



SECTION B-B



BALED HAY FOR EROSION CONTROL

BH

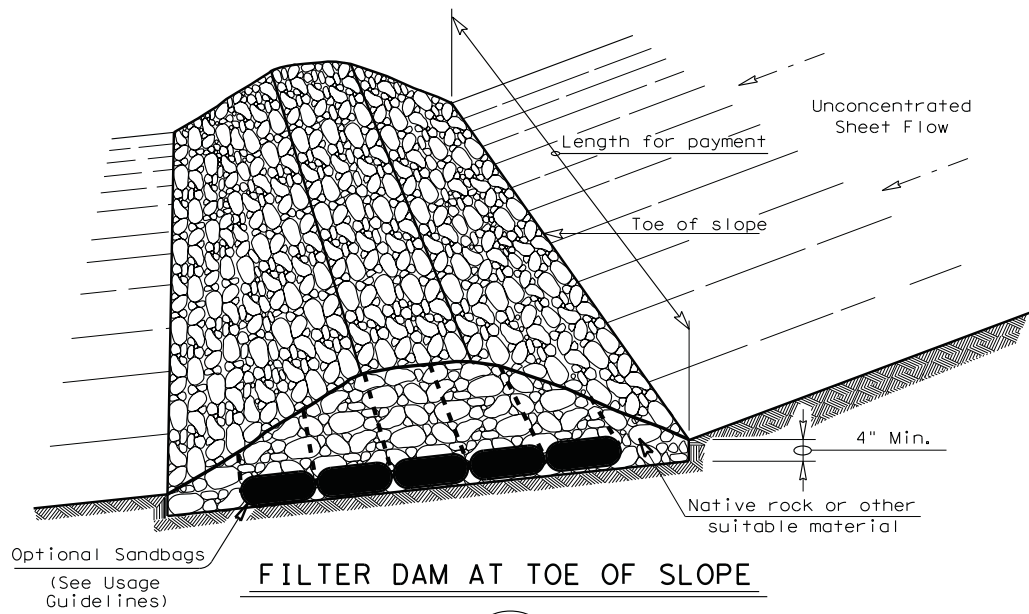
GENERAL NOTES

1. Hay bales shall be a minimum of 30" in length and weigh a minimum of 50 Lbs.
2. Hay bales shall be bound by either wire or nylon or polypropylene string. The bales shall be composed entirely of vegetative matter.
3. Hay bales shall be embedded in the soil a minimum of 4" and where possible 1/2 the height of the bale.
4. Hay bales shall be placed in a row with ends tightly abutting the adjacent bales. The bales shall be placed with bindings parallel to the ground.
5. Hay bales shall be securely anchored in place with 3/8" Dia. rebar or 2" x 2" wood stakes, driven through the bales. The first stake shall be angled towards the previously laid bale to force the bales together.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & BALED HAY			
EC(1)-09			
FILE: ec109.dgn	DN: TxDOT	CK: AM	DW: TV
© TxDOT June 1993	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST		COUNTY	
		SHEET NO.	

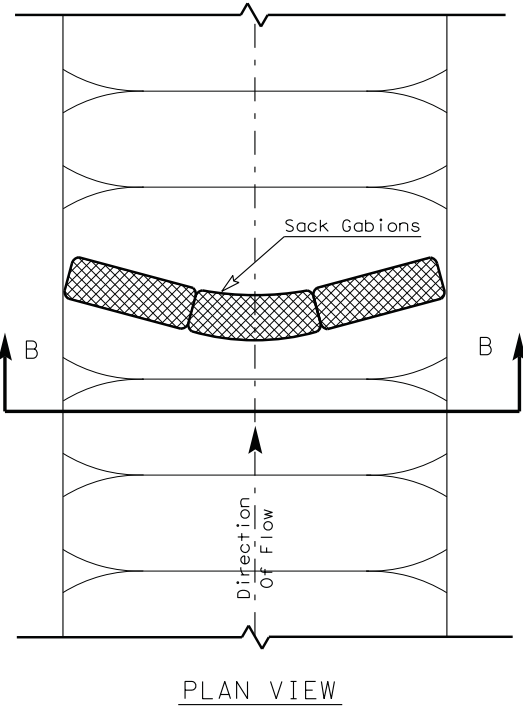
DATE:
FILE:

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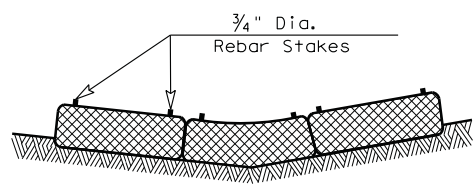


FILTER DAM AT TOE OF SLOPE

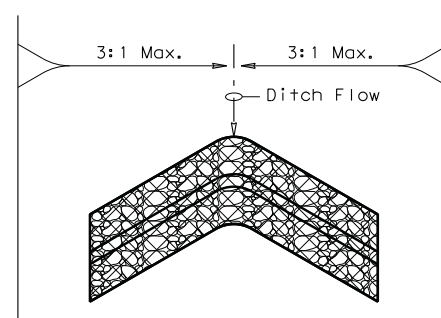
(RFD1)
TYPE 1



PLAN VIEW



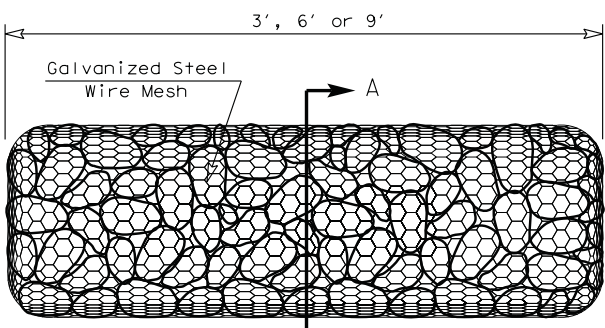
SECTION B-B



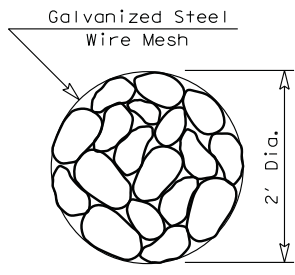
"V" SHAPE
(Plan View)

PLANS SHEET LEGEND

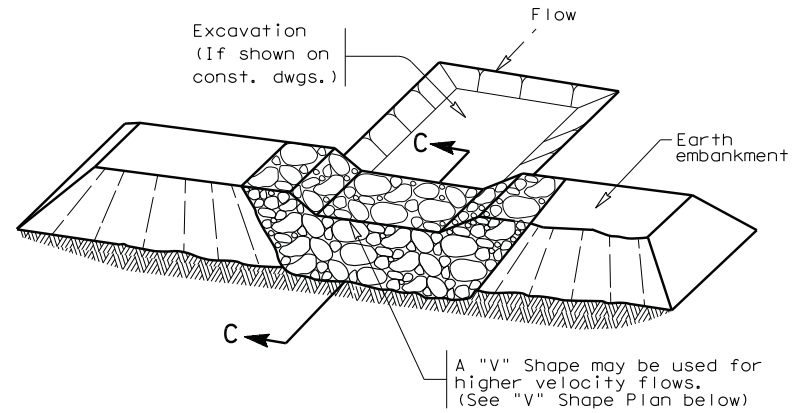
- Type 1 Rock Filter Dam (RFD1)
- Type 2 Rock Filter Dam (RFD2)
- Type 3 Rock Filter Dam (RFD3)



TYPE 4 (SACK GABIONS)

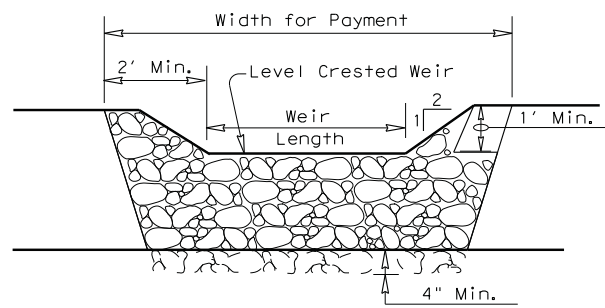


SECTION A-A

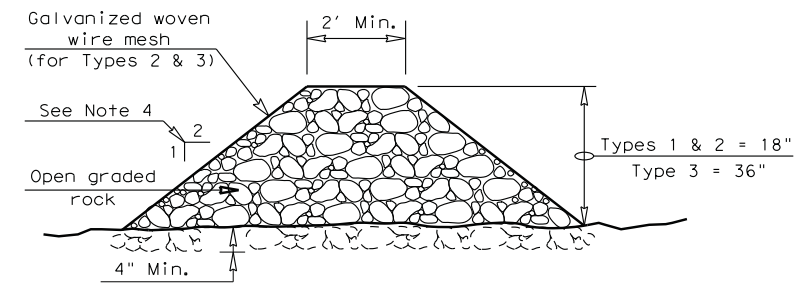


FILTER DAM AT SEDIMENT TRAP

(RFD1) OR (RFD2)
TYPE 1 OR TYPE 2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

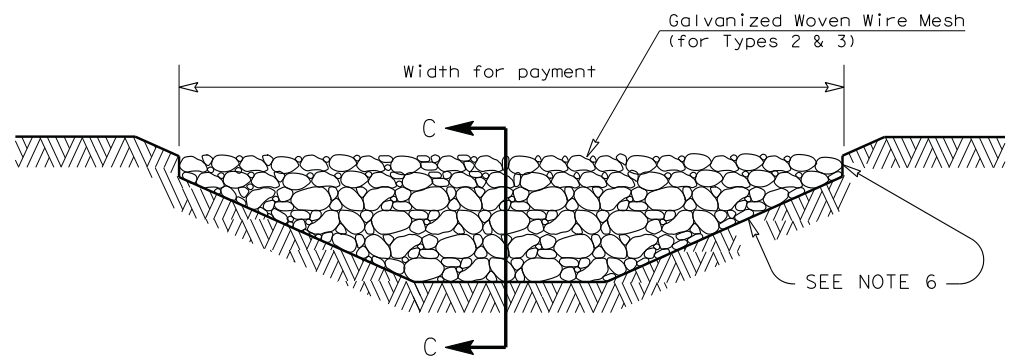
Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approx. 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions): Type 4 May be used in ditches and smaller channels to form an erosion control dam.



FILTER DAM AT CHANNEL SECTIONS

(RFD1) OR (RFD2) OR (RFD3)
TYPE 1 OR TYPE 2

GENERAL NOTES

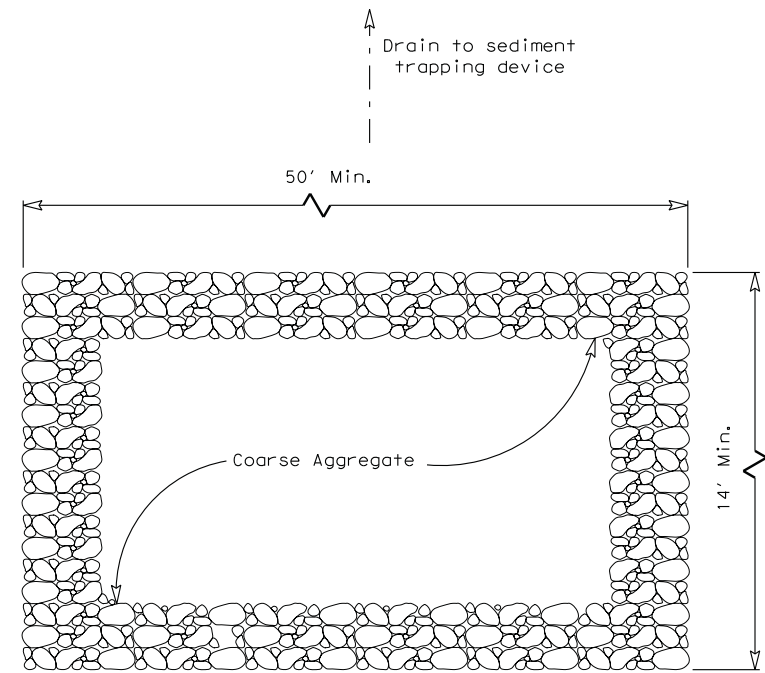
1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. In stream use the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes.
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC (2) -93			
FILE: ec293.dgn	DN: TxDOT	CK: HEJ	DW: BD
© TxDOT June 1993	CONT	SECT	JOB
REVISIONS	DIST		COUNTY
			SHEET NO.

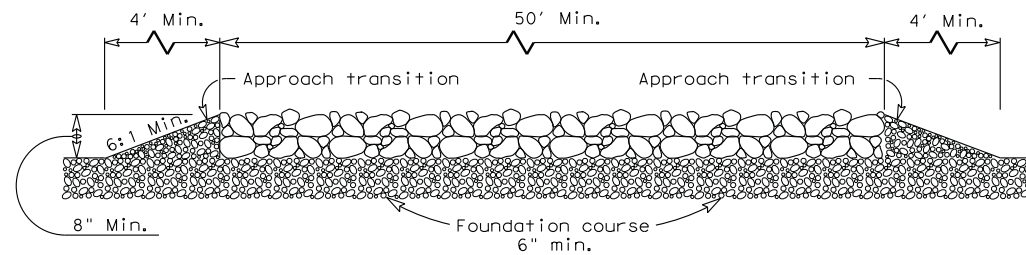
DATE: FILE:

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PLAN

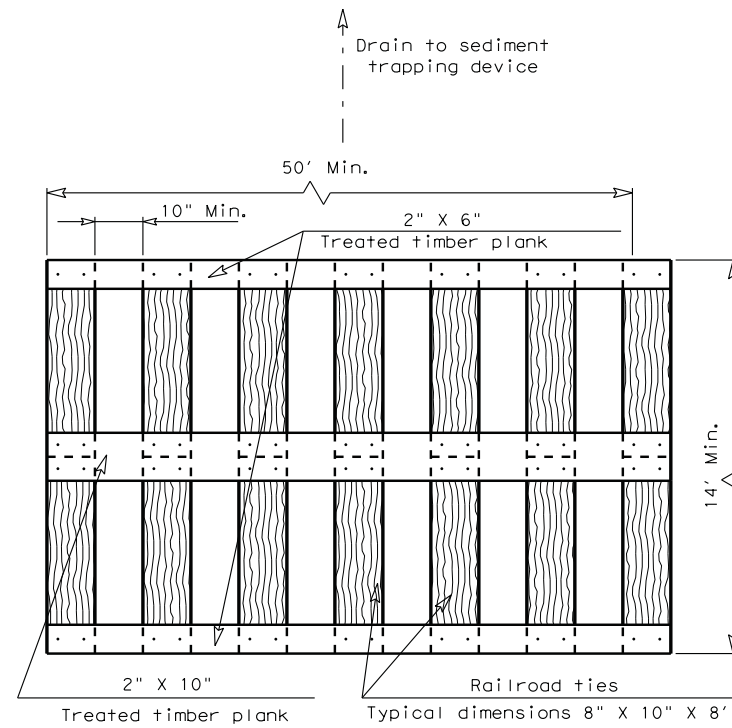


PROFILE

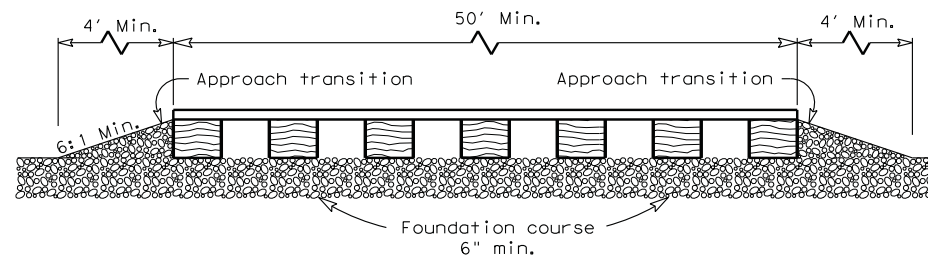
CONSTRUCTION EXIT (TYPE 1)

GENERAL NOTES

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN

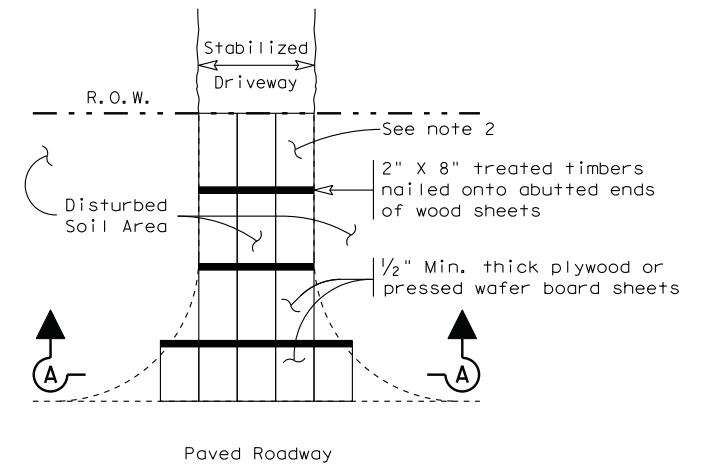


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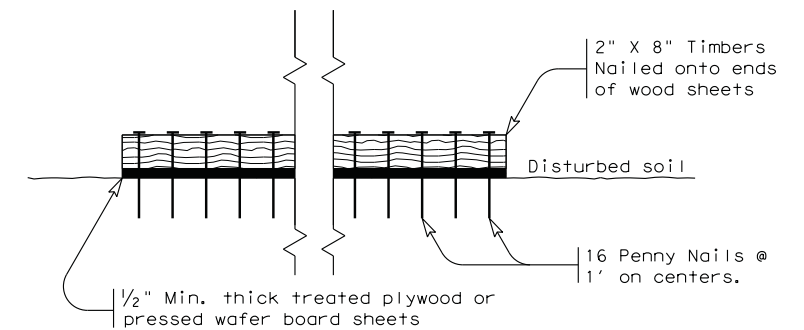
CONSTRUCTION EXIT (TYPE 2)

GENERAL NOTES

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PLAN



SECTION A-A

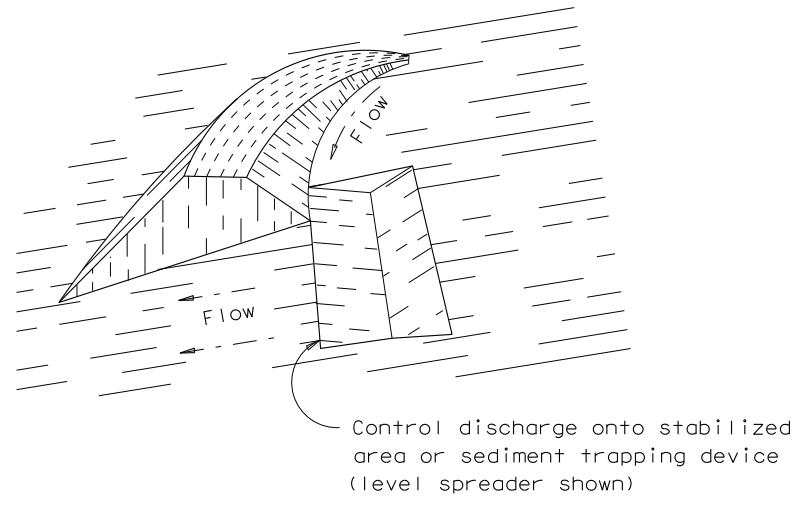
CONSTRUCTION EXIT (TYPE 3)

GENERAL NOTES

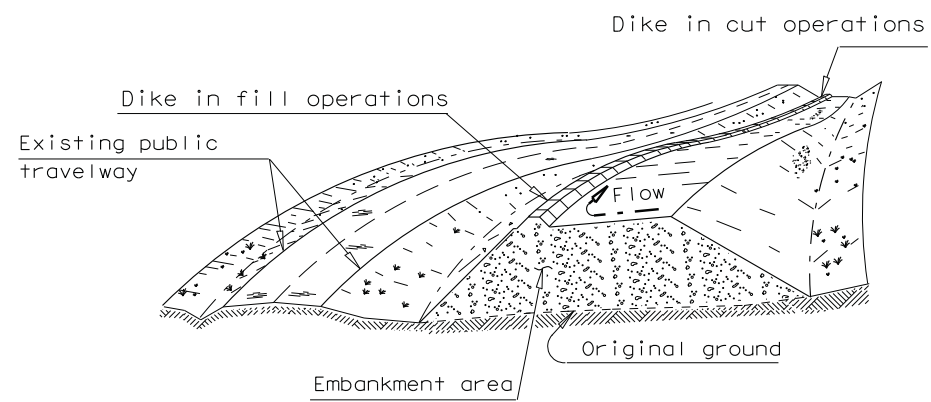
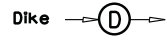
1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC (3) - 93			
FILE: ec393.dgn	DN: TxDOT	CK: HEJ	DW: BD
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REVISIONS	COUNTY		SHEET NO.

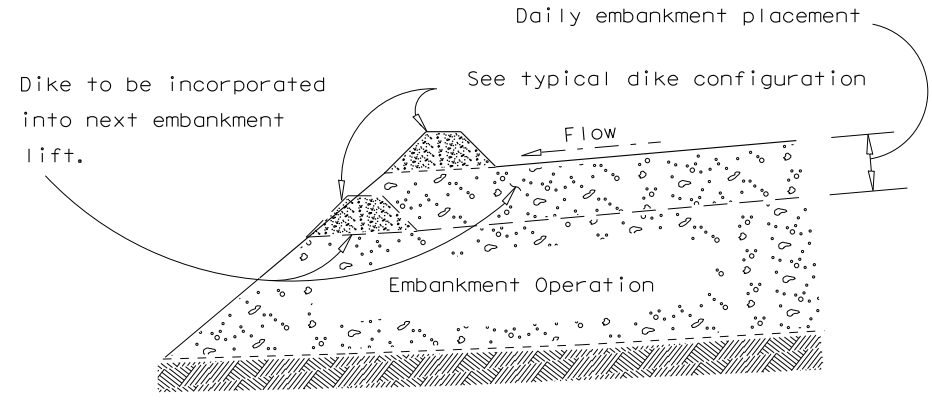
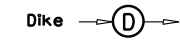
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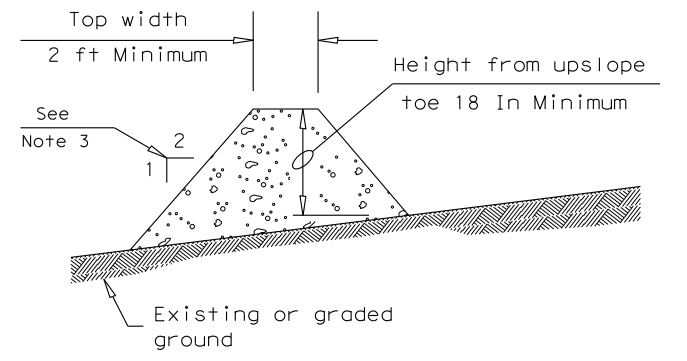
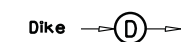
PERIMETER DIKE



DIVERSION DIKE



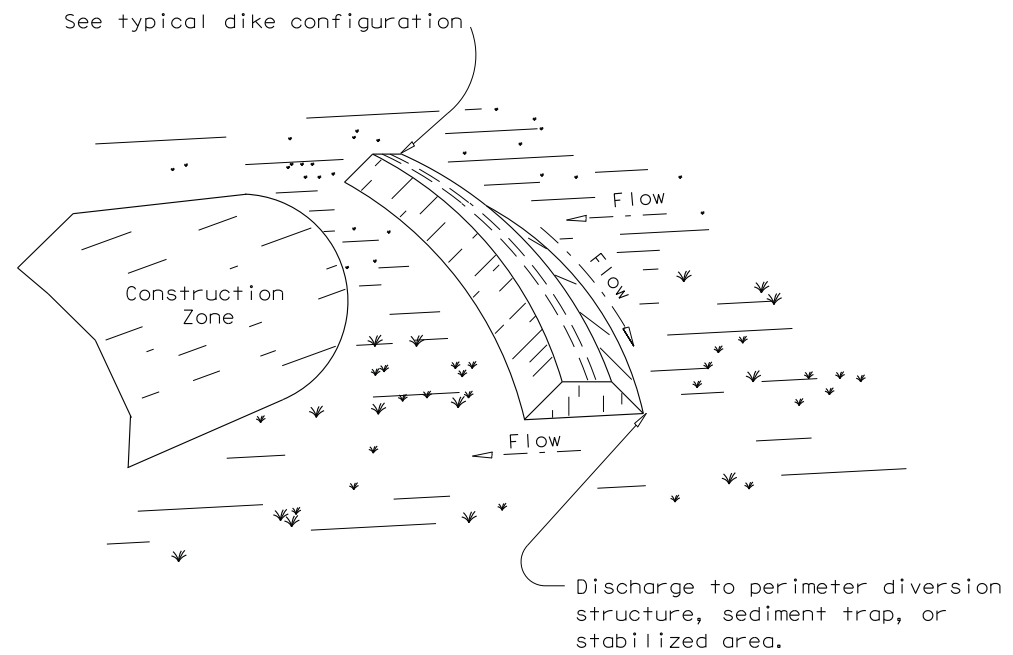
EMBANKMENT SECTION - DIVERSION DIKE



TYPICAL DIKE CONFIGURATION

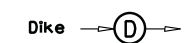
GENERAL NOTES:

1. Soil used in dike construction shall be machine compacted.
2. Top width and height of dike may be modified with prior approval of the Engineer.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
4. Grading shall be shown elsewhere in the plans or as directed by the Engineer.
5. The Engineer reserves the right to modify the dimensions shown for the dike dependent on runoff volume characteristics.
6. Dikes that are in place for more than 14 calendar days should be stabilized to prevent sediment runoff.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



INTERCEPTOR DIKE

PLANS SHEET LEGEND



DIKE USAGE GUIDELINES

A dike may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a dike should not exceed 5 acres. The spacing of dikes should be as follows:

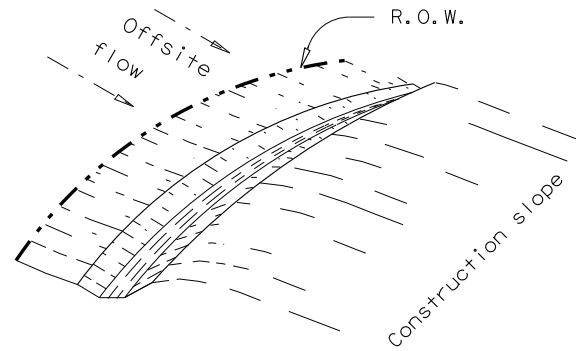
Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100'	200'	300'

Intercepted runoff flowing along a dike should outlet to a stabilized area (vegetation, rock, etc.).

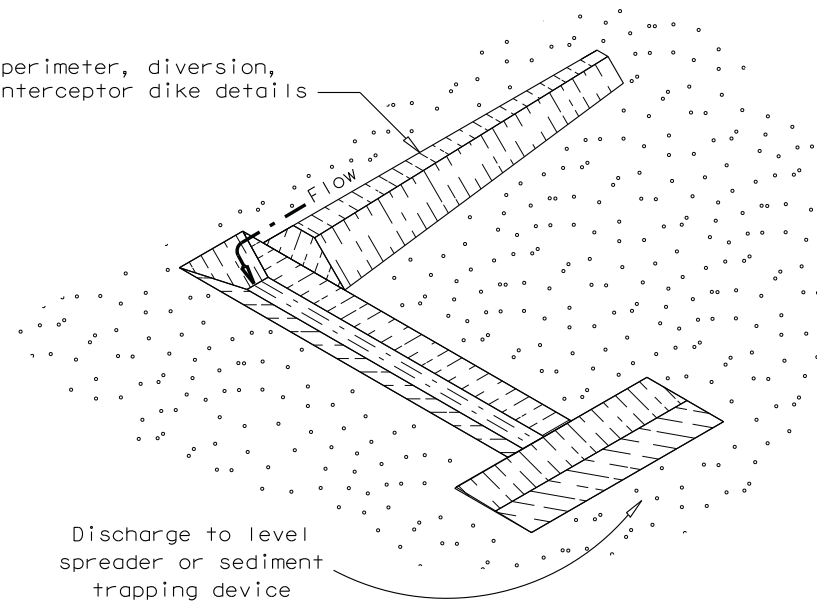
		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES DIKES (EARTHWORK FOR EROSION CONTROL)			
EC (4) - 93			
FILE: ec493.dgn	DN: TxDOT	CK: HEJ	DW: BD
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REVISIONS		HIGHWAY	
DIST		COUNTY	SHEET NO.

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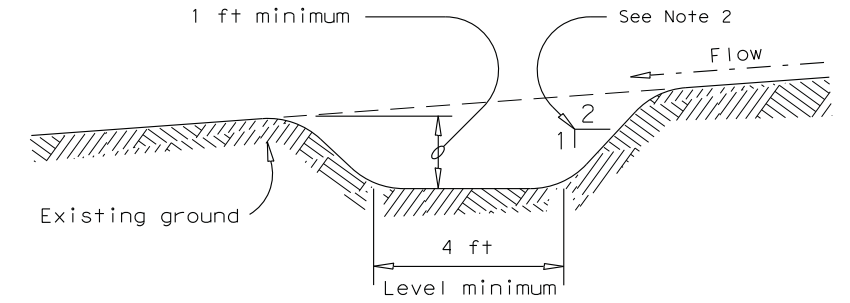
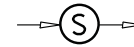
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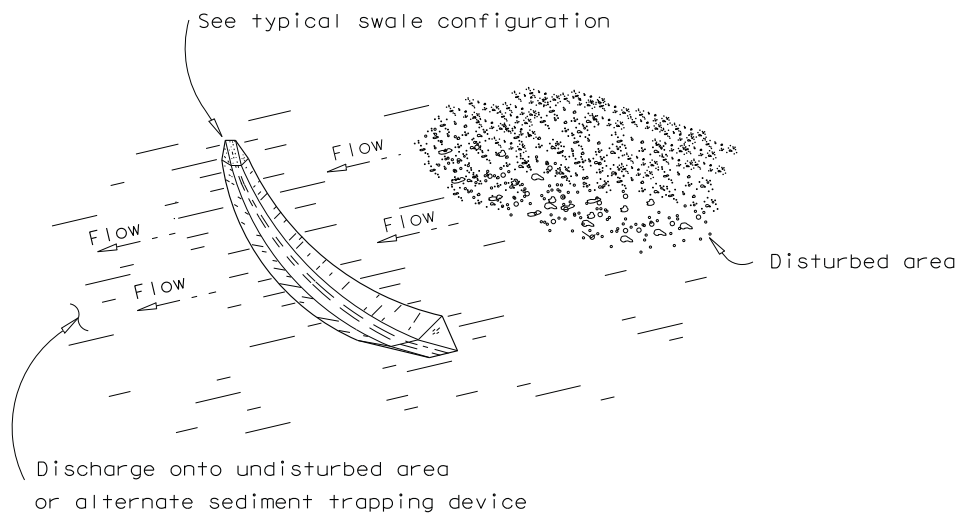
PERIMETER SWALE



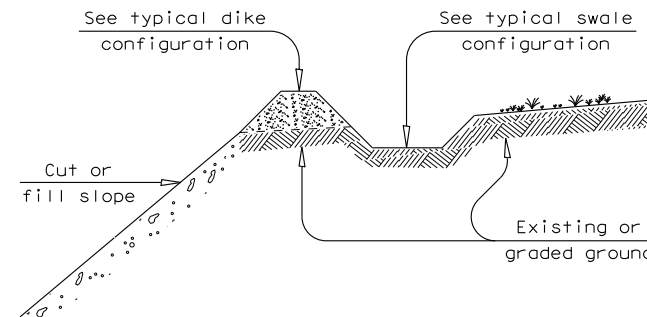
DIVERSION SWALE



TYPICAL SWALE CONFIGURATION



INTERCEPTOR SWALE



DIVERSION DIKE WITH SWALE

GENERAL NOTES:

1. Dimensions of swale may be modified with prior approval of the Engineer.
2. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter.
3. Grading shall be shown elsewhere on the plans or as directed by the Engineer.
4. The Engineer reserves the right to modify the dimensions shown for the swale dependent on runoff volume characteristics.
5. Swales that are in place for more than 14 calendar days should be stabilized through seeding or other measures to control sediment runoff.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

SWALE AND DIKE/SWALE USAGE GUIDELINES

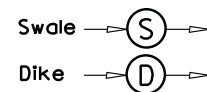
A swale or dike/swale may be used to intercept runoff and divert it around unstabilized areas or to divert sediment laden runoff to an erosion control device (sediment basin or trap, rock filter dam, etc.).

The drainage area contributing runoff to a swale or dike/swale should not exceed 5 acres. The spacing of swales and dike/swales should be as follows:

Slope of disturbed areas above dike	greater than 10%	5 - 10%	less than 5%
Maximum distance between dikes	100'	200'	300'

Intercepted runoff flowing in a swale or dike/swale should outlet to a stabilized area (vegetation, rock, etc.).

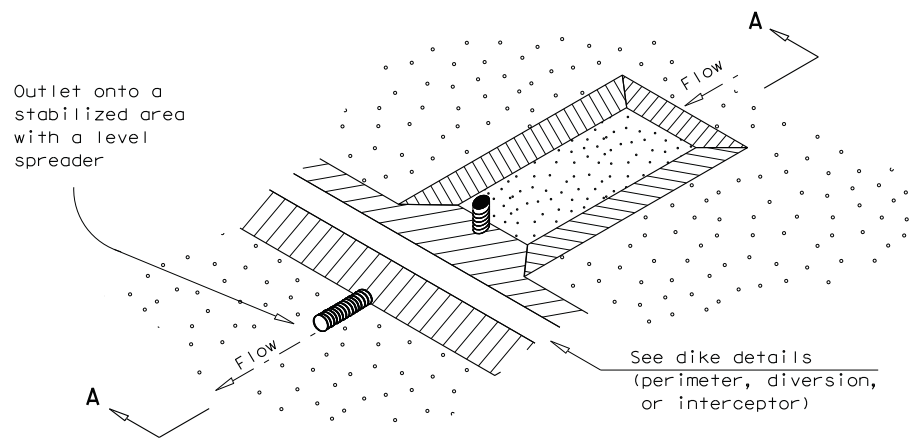
PLANS SHEET LEGEND



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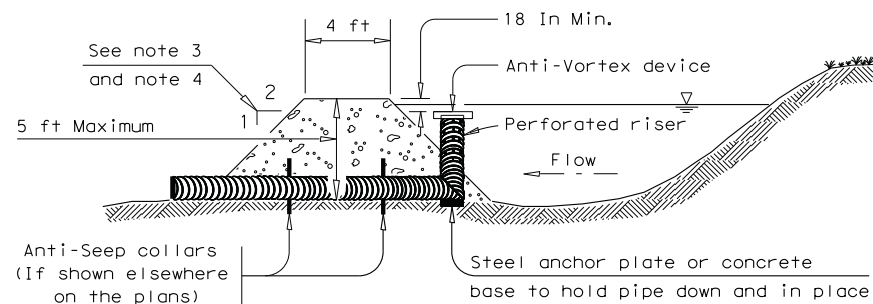
				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES SWALES (EARTHWORK FOR EROSION CONTROL) EC (5) - 93					
FILE: ec593.dgn	DN: TxDOT	CK: HEJ	DW: BD	CK:	
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REVISIONS					
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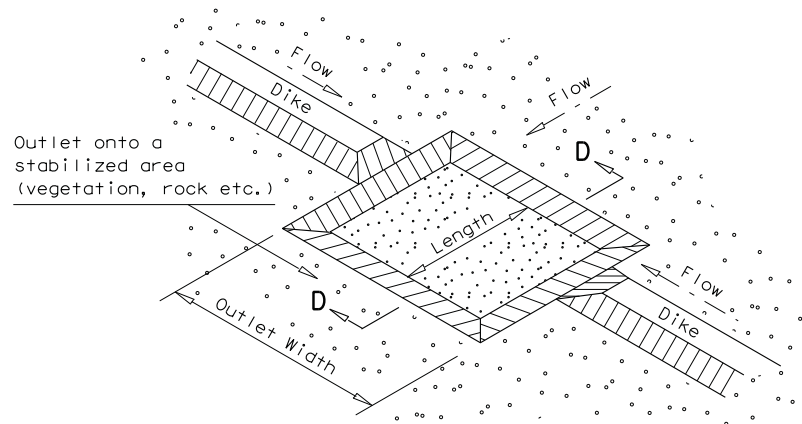


SEDIMENT BASIN AND/OR TRAP WITH PIPE OUTLET

ST/PO

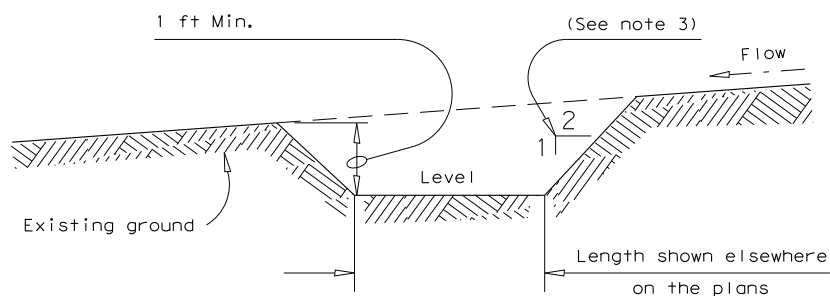


SECTION A-A

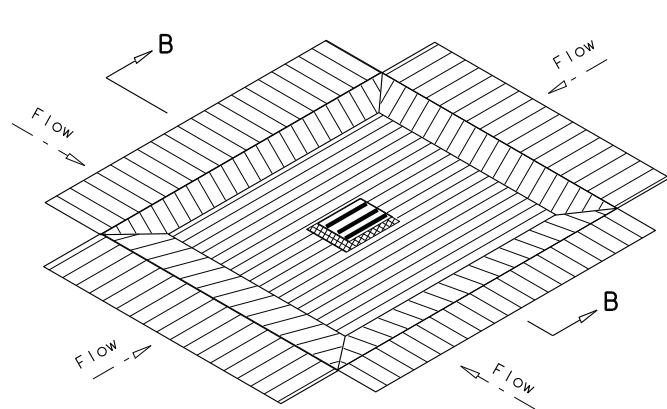


SEDIMENT TRAP WITH LEVEL STABILIZED OUTLET

ST

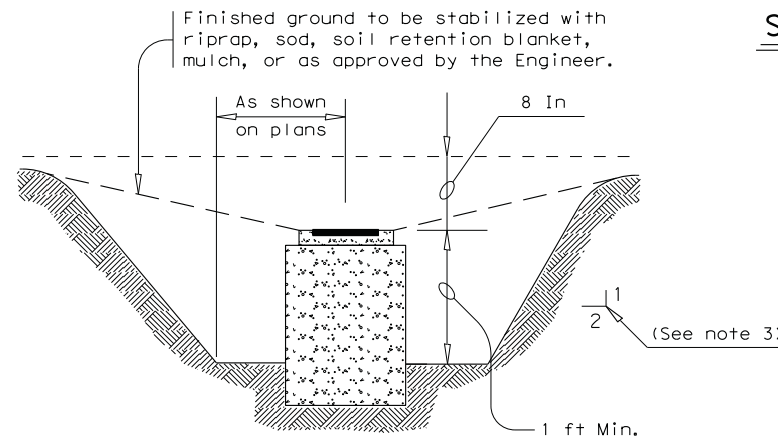


SECTION D-D

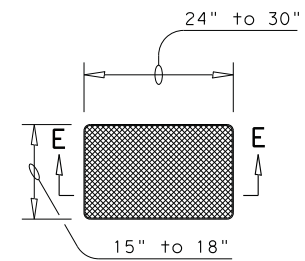


DROP INLET SEDIMENT TRAP

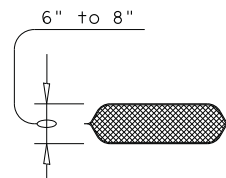
ST-DI



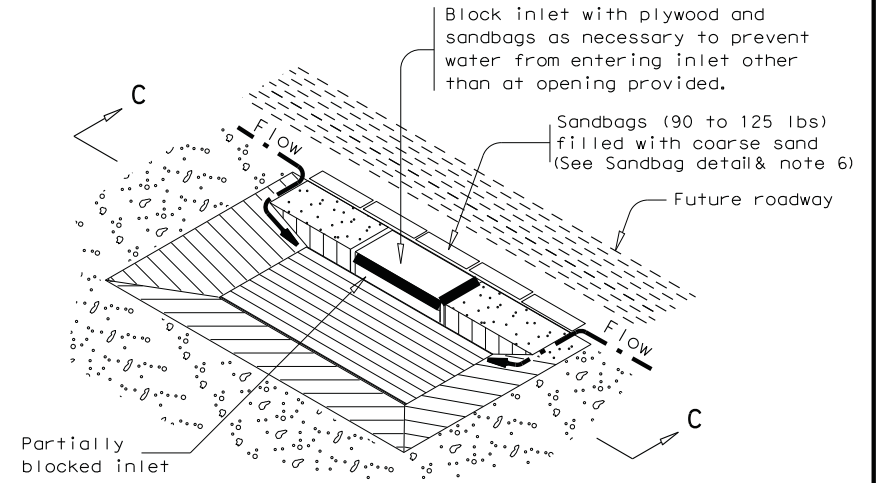
SECTION B-B



SANDBAG DETAIL

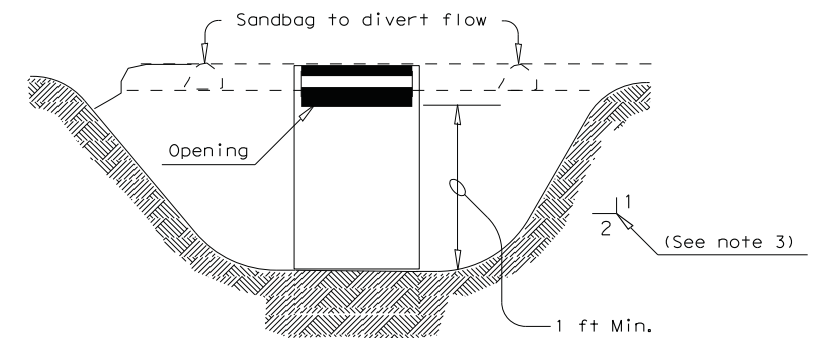


SECTION E-E



CURB INLET SEDIMENT TRAP

ST-CI



SECTION C-C

GENERAL NOTES

1. Pipe outlet material shall conform to the Item "Pipe Underdrains" or as accepted by the Engineer.
2. All pipe connections shall be watertight.
3. Side slopes within the safety clear zone of a roadway shall be 6:1 or flatter. Protect the traveling public from inlet stacks within the clear zone.
4. Sediment basins shall have side slopes of 3:1 or flatter.
5. The dimensions and limits of excavation for sediment basins and traps will be as shown elsewhere on the plans.
6. The sandbag material shall be made of polypropylene, polyethylene or polyamide woven fabric, min. unit weight 4 ounces/SY, Mullen burst strength exceeding 300 psi and ultraviolet stability exceeding 70%.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment basin and/or trap may be used to precipitate sediment out of runoff draining from an unstabilized area.

Basins: The drainage area for a sediment basin should not exceed 100 acres. The basin capacity shall be at least 1800 CF/Acre of drainage area (0.5" over the drainage area). If the disturbed area draining to the basin is larger than 10 acres, the basin capacity should be 3600 CF/Acre (1.0" over the drainage area).

The basin should have a 40 hour draw-down time with an emergency spillway. The spillway may be designed to pass the peak rate of runoff from a 25 year frequency storm. The 100 year storm should be investigated to consider possible flooding impacts.

The entrance into the basin should be protected from erosion. The basin should be cleaned when the capacity has been reduced by 1/3.

Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced @ 500'± on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

The trap outlet may either be through a perforated riser and pipe assembly designed to achieve a 40 hour draw-down time or over a level stabilized area (vegetation, rock, etc.).

The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

PLANS SHEET LEGEND

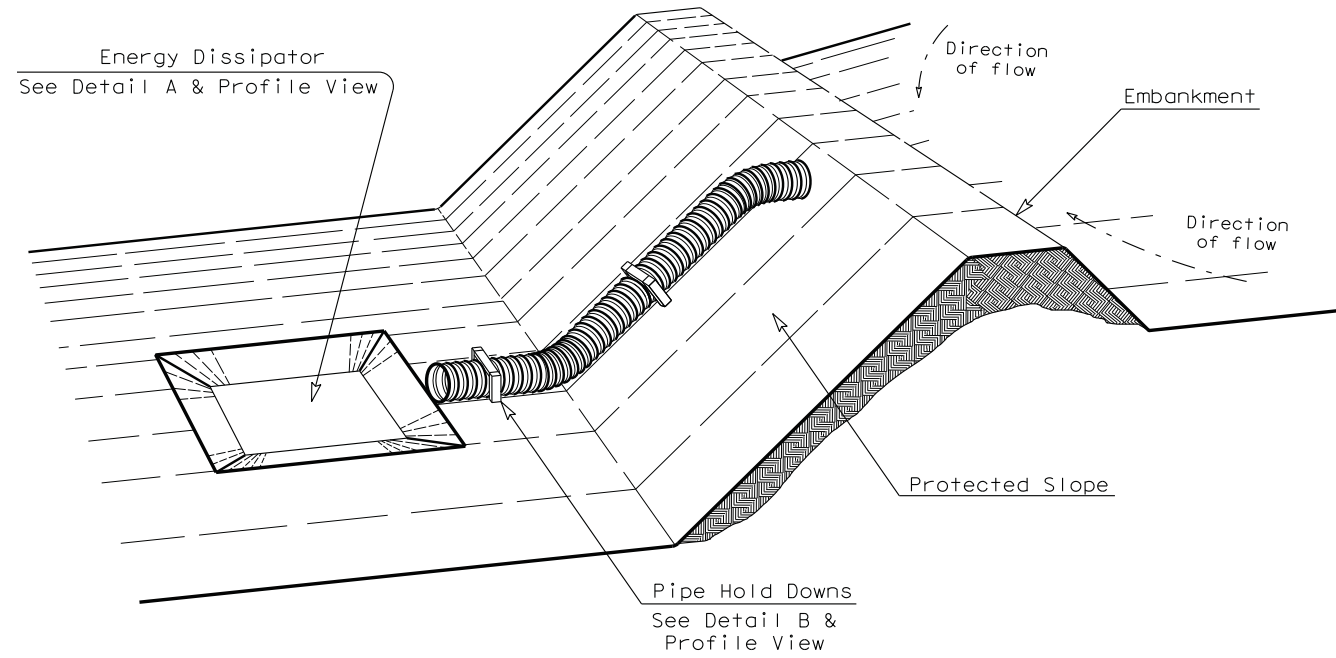
- (ST/PO) —
Sediment Basin and/or Trap with Pipe Outlet
- (ST-DI) —
Drop Inlet Sediment Trap
- (ST-CI) —
Curb Inlet Sediment Trap
- (ST) —
Sediment Trap with Level Stabilized Outlet

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES SEDIMENT BASINS AND TRAPS (EARTHWORK FOR EROSION CONTROL) EC (6) - 93			
FILE: ec693.dgn	DN: TxDOT	CK: HEJ	DW: BD
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		DIST	COUNTY
		SHEET NO.	

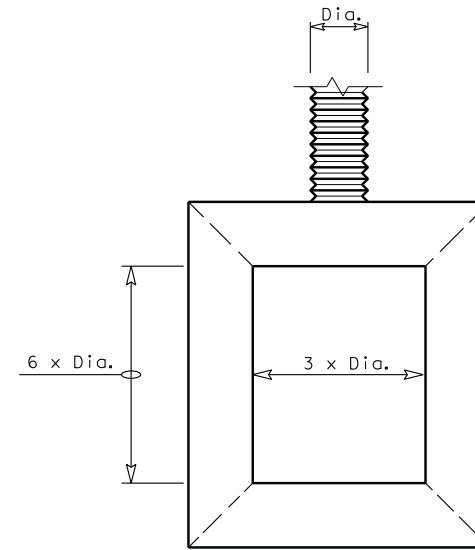
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PERSPECTIVE VIEW

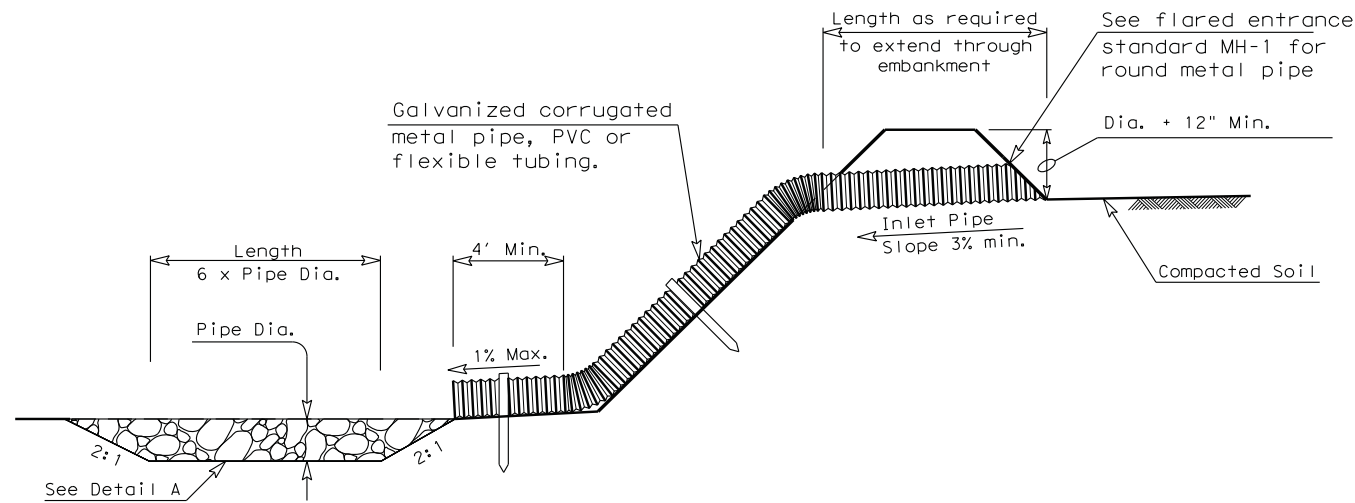


DETAIL A
(Plan View)

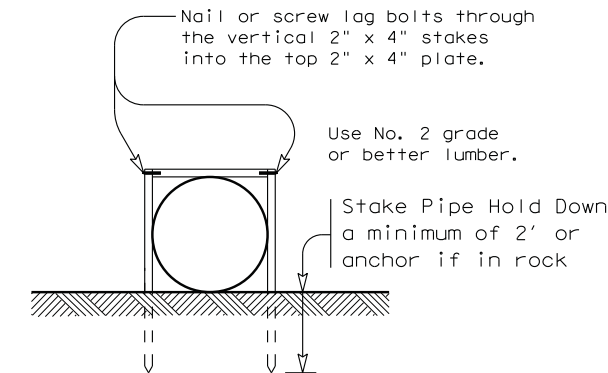
PIPE SLOPE DRAIN DESIGN CRITERIA		
PIPE/TUBING SIZE	DIAMETER	MAXIMUM DRAINAGE AREA
PSD 12	12"	0.5 Acre
PSD 18	18"	1.5 Acres
PSD 21	21"	2.5 Acres
PSD 24	24"	3.5 Acres
PSD 30	30"	5.0 Acres

GENERAL NOTES

1. The inlet pipe shall have a slope of 3 percent or greater. Pipe diameter shall be as indicated on the construction drawings.
2. The top of embankment shall be at least 12" higher than the top of the inlet pipe at all points.
3. The pipe shall be galvanized corrugated metal pipe, PVC, or flexible tubing with watertight connection bands.
4. Pipe shall be secured with hold-down grommets spaced a maximum of 10' on centers or with pipe hold downs as shown in Detail B.
5. The sediment trap shall be constructed to the dimensions as shown and in accordance with Special Specification, "Earthwork for Erosion Control". As otherwise detailed on the plans, the sediment trap may be stabilized using concrete or rubble riprap as per Item, "Riprap".
6. A standard flared entrance section shall be used with the pipe slope drain. See TxDOT standard MH-1 for details.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.



PROFILE VIEW



DETAIL B
(Elevation View)

PIPE SLOPE DRAIN WITH ENERGY DISSIPATOR

PSD

PIPE SLOPE DRAIN USAGE GUIDELINES

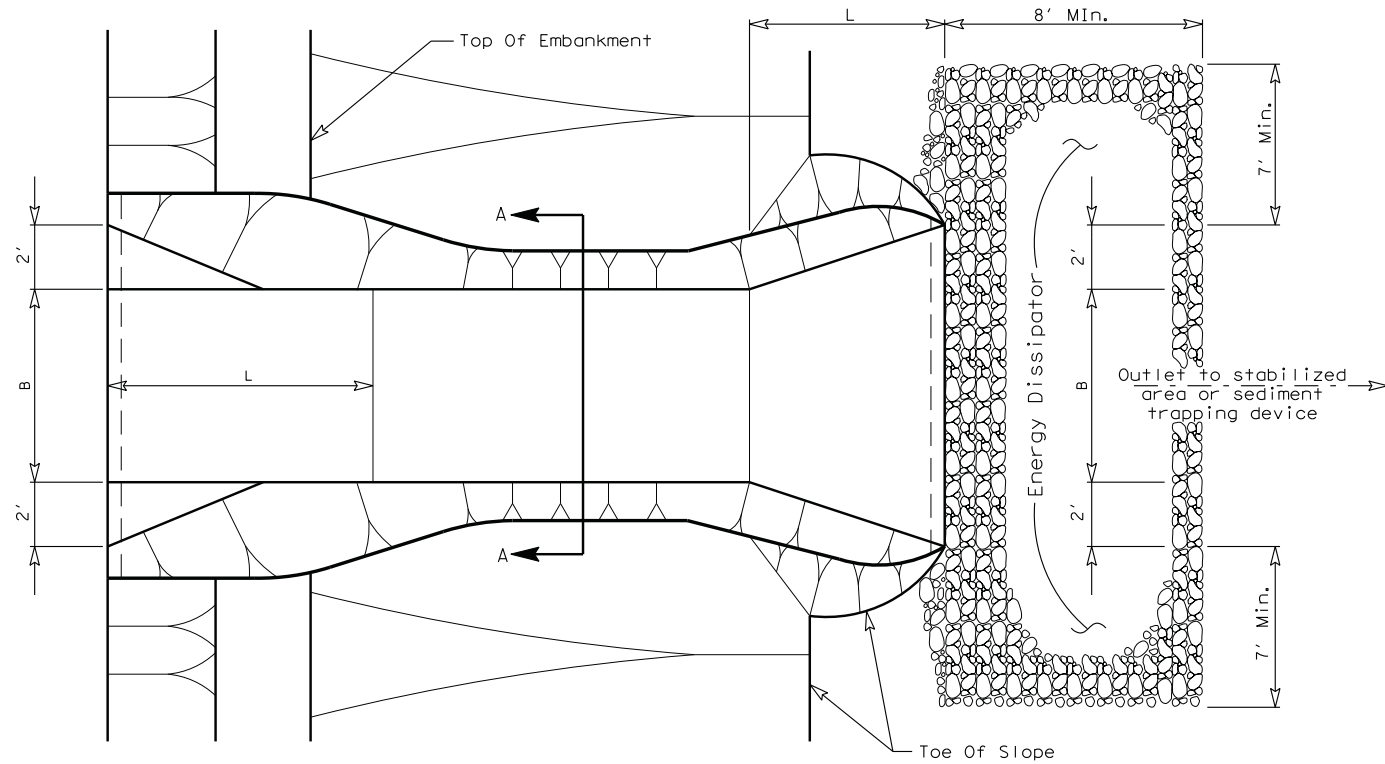
A Pipe Slope Drain (PSD) should be constructed to drain concentrated surface runoff safely down slopes without causing erosion. The drainage area contributing runoff to a PSD should not exceed 5 acres. The PSD should be sized to drain the peak rate of runoff without overtopping at the earth dike entrance. A 25 year storm frequency may be used to calculate the flow rate.

PLAN SHEET LEGEND

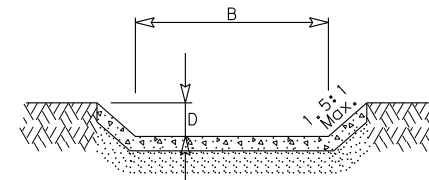
Pipe Slope Drain — PSD —

		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES TEMPORARY PIPE SLOPE DRAINS EC (7) - 93			
FILE: ec793.dgn	DN: TxDOT	CK: HEJ	DW: BD
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REVISIONS		HIGHWAY	
DIST		COUNTY	
		SHEET NO.	

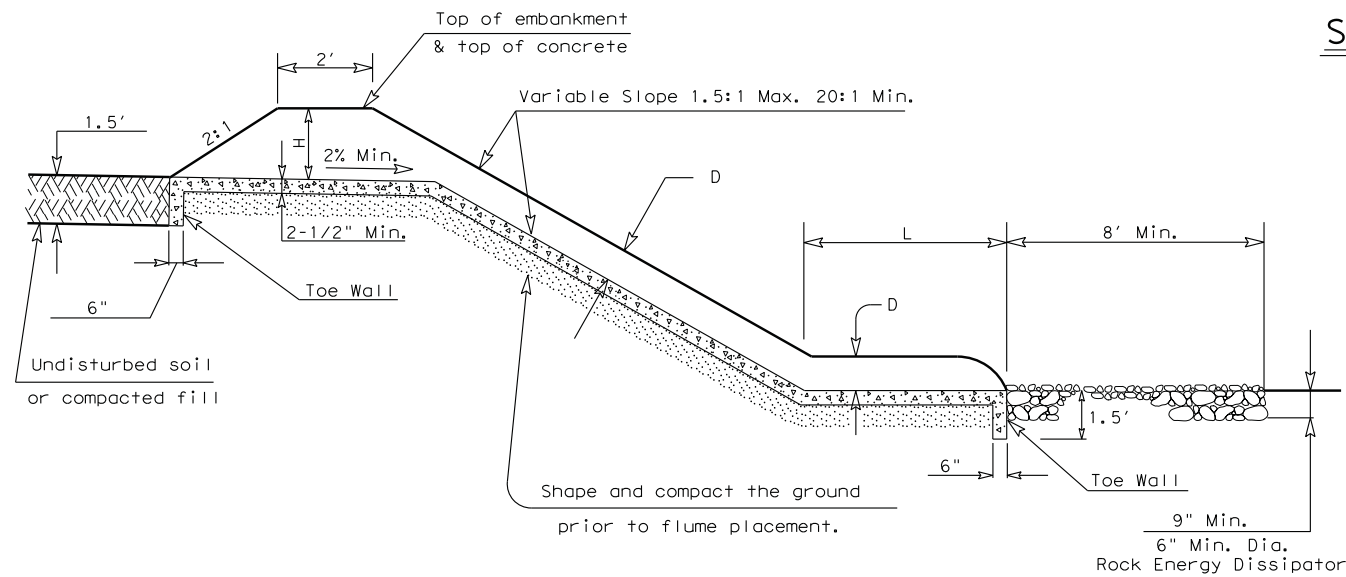
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PLAN VIEW

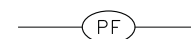


SECTION A-A



PROFILE VIEW

PAVED FLUME



PLANS SHEET LEGEND

Paved Flume — (PF) —

DESIGN CRITERIA					
Group/Size	B Bottom Width	H Min.	D Min.	L Min.	Maximum Drainage Area
A-2	2'	1.5'	8"	5'	5 Acres
A-4	4'	1.5'	8"	5'	8 Acres
A-6	6'	1.5'	8"	5'	11 Acres
A-8	8'	1.5'	8"	5'	14 Acres
A-10	10'	1.5'	8"	5'	18 Acres
B-4	4'	2'	10"	6'	14 Acres
B-6	6'	2'	10"	6'	20 Acres
B-8	8'	2'	10"	6'	25 Acres
B-10	10'	2'	10"	6'	31 Acres
B-12	12'	2'	10"	6'	36 Acres

PAVED FLUME USAGE GUIDELINES

A Paved Flume should be constructed to drain concentrated surface runoff safely down slopes without causing erosion. The drainage area contributing runoff to a paved flume should not exceed that given in the Design Criteria above. The paved flume should be sized to drain the peak rate of runoff without overtopping the embankment at the earth dike entrance. A 25 year storm frequency may be used to calculate the flow rate.

GENERAL NOTES

1. The group/size is a designator for the dimensions of the paved flume. The group/size is designated by a letter (A or B) and the bottom (B) dimension. The appropriate size shall be indicated on the construction plans.
2. For high velocity flows, the aggregate of the energy dissipator should be secured with 20-gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate should be placed on the mesh to the dimensions specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings.
3. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

				Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES TEMPORARY PAVED FLUMES EC (8) - 93					
FILE:	ec893.dgn	DN:	TxDOT	CK:	HEJ
© TxDOT	May 1993	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS		DIST:	COUNTY:		SHEET NO.:

DATE:
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DRAINAGE DESIGN STANDARDS

Figure 1 – Runoff Computation Form for Storm Drains

Figure 2 – Hydraulic Design Form for Storm Drains

Figure 3 – Design Computation Form for Culverts

Design Criteria - Use TxDOT Hydraulics Design Manual found at:

<http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm>

Standards for Culverts, Pipes, Wingwalls and Other Drainage Structures – Use TxDOT Standards found at:

<http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/bridge-e.htm>

