

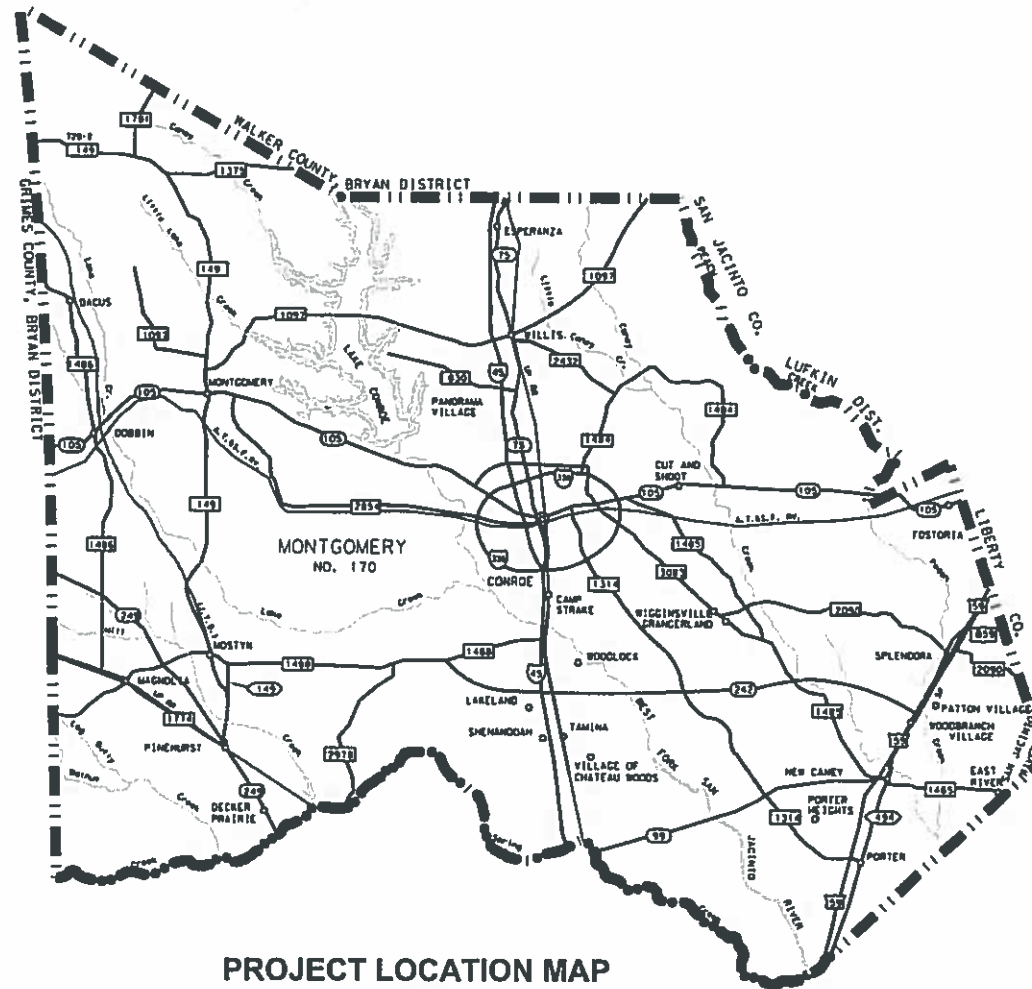
SEE SHEET 2 FOR INDEX OF SHEETS

# STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER	
6	RMC 6376-71-001	IH 45, ETC.	
STATE	DISTRICT	COUNTY	
TEXAS	HOU	MONTGOMERY	
CONTRACT	SECTION	JOB	SHEET NO.
6376	71	001	1

## PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

**MONTGOMERY COUNTY**  
**RMC 6376-71-001**  
**LIMITS: VARIOUS HIGHWAYS IN MONTGOMERY COUNTY**  
**TYPE OF WORK: CONCRETE STRUCTURE REPAIR**



**PROJECT LOCATION MAP  
(NTS)**

**NO EXCEPTIONS  
NO EQUATIONS  
NO RAILROADS**



Texas Department of Transportation®

COUNTY MONTGOMERY PROJ. NO. \_\_\_\_\_  
 HWY. NO. \_\_\_\_\_ LETTING DATE \_\_\_\_\_  
 CONTRACTOR NAME \_\_\_\_\_  
 CONTRACT BEGIN DATE \_\_\_\_\_  
 WORK COMPLETED DATE \_\_\_\_\_  
 DATE OF ACCEPTANCE \_\_\_\_\_

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT.

SUBMITTED FOR LETTING: 3/5/21

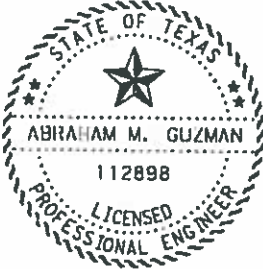
*Abraham M. Dungan, PE*  
AREA ENGINEER

APPROVED FOR LETTING: 4-22-21

*Michael J. W. [Signature]*  
DIRECTOR OF MAINTENANCE

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# THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

PE  
 ABRAHAM M. GUZMAN, P.E.      4/19/21  
 DATE

	<small>PRINT DATE</small>	<small>REVISION DATE</small>	
© 2021			
<b>Texas Department of Transportation</b> <small>Houston District - Montgomery Area Office</small>			
<b>INDEX OF SHEETS</b>			
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<small>REV. NO.</small>	6		IH 45, ETC.
<small>STATE</small>	<small>DISTRICT</small>	<small>COUNTY</small>	
TEXAS	HOU	MONTGOMERY	
<small>CSU</small>			<small>SHEET NO.</small>
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REVISIONS

Project Number: RMC 6376-71-001

County: Montgomery County

Highway: IH 45, etc.

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Control: 637671001

**GENERAL NOTES:**

Supervision:

Plans are required. Refer questions to:

Texas Department of Transportation  
Adam C. Galland, P.E., Area Engineer  
901 N. FM 3083 E.  
Conroe, Texas 77303  
(936) 538-3300

This project will be managed by and request for payment addressed to:

Texas Department of Transportation  
David Jeffreys, Maintenance Supervisor  
901 N. FM 3083 E.  
Conroe, Texas 77303  
(936) 538-3350

**General:**

This is a Routine Maintenance, Non Site Specific Call Out Contract.

Contractor questions on this project are to be addressed to the following individual(s):

Adam Galland, P.E., [Adam.Galland@txdot.gov](mailto:Adam.Galland@txdot.gov)  
Abraham Guzman, P.E., [Abe.Guzman@txdot.gov](mailto:Abe.Guzman@txdot.gov)

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following address:

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/>

Questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, and CCSJ/Project Name.

The Engineer will determine the locations of the day's work. Work to be performed on an as needed basis where directed.

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This contract is a 2-year contract and will be for 730 calendar days. During the Preconstruction Meeting a begin work date will be determined. Any changes to the begin date will be at the discretion and approval of the Area Engineer. Failure to begin work or failure to complete work on time or within the specified time on the work order will result in Liquidated Damages.

Work request shall be on a call out or emergency call out basis and work order(s) will accompany the call out. Commence work upon issuance of a work order. Call out work orders, only, will be issued for no less than \$1,000.00 per work order. Emergency work orders may consist of only one or multiple items.

The Contractor will begin call out work within the required time for each work order. Work orders are expected to be completed per the contract plans within the number of days allowed for each work order. All call out work orders will have a begin date and number of working days. The Contractor will begin work within 48 hours of notification for routine call outs, unless otherwise approved by the Engineer. Work will be completed within the required number of working days. The Contractor will begin work within 4 hours of notification for emergency call outs and complete within 48 hours, unless otherwise approved by the Engineer. Failure to begin work within the required time and proceed to completion within the required time will result in the assessment of liquidated damages.

An email address shall be provided to receive and respond to all Mobilization Letters.

It is the Contractor's Responsibility to ensure familiarity with the existing site conditions and all aspects of the contract prior to bidding

Provide hard hats, safety vests, rubber boots, gloves, and all other safety materials or devices to complete the work in a safe manner.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

Work will not be permitted when impending bad or inclement weather may impair the quality of the work being performed. The inspector shall have the discretion to make decisions regarding whether work shall be performed or cancelled.

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

Superelevate the curves to match the existing surface.

Grade street intersections and median openings for surface drainage.

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If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

Tolls incurred by the contractor are incidental to the various bid items.

Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

The Area Engineer must approve all repair materials before work is performed. All concrete placed for repairs must be rapid or ultra-rapid setting concrete. The area to be repaired, including rebar, must be cleaned and free from debris before placing concrete repairs materials. All work and materials must conform to Departmental Materials Specifications.

Testing materials and equipment shall be provided by the contractor. Please communicate with the Area Office on testing requirements and procedures. It will be at the discretion of the Area Engineer as to who will be responsible for the testing and providing results. Please note that it may be Area Engineer's preference to have the contractor test and provide the results to the Area Office.

**General: Site Management**

Existing pavement markings removed or damaged by more than 20 ft. will be replaced with temporary striping. Temporary striping shall be paint based unless otherwise directed by the Engineer. This work will be considered incidental to the item of work.

Record the beginning and ending stations of any no passing zones in the field before beginning the overlay. Restripe the no passing zones immediately after the overlay in the same locations, unless otherwise shown in the plans, or otherwise directed.

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

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Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

**Tricycle Type**

Wayne Series 900  
Elgin White Wing  
Elgin Pelican

**Truck Type - 4 Wheel**

M-B Cruiser II  
Wayne Model 945  
Mobile TE-3  
Mobile TE-4  
Murphy 4042

Locate equipment or materials, temporarily stored on State right of way during non-working hours at least 30 feet from the edge of the pavement.

Maintain continuous access to public and private drives and side roads.

**General: Traffic Control and Construction**

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Existing pavement markings removed or damaged by more than 20 ft. will be replaced with temporary striping. Temporary striping shall be paint based unless otherwise directed by the engineer. This work will be considered incidental to the item of work.

**General: Utilities**

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662 to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities.

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If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and Federal Regulations relating to the type of work involved.

**Item 7: Legal Relations and Responsibilities**

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

Maintain the roadway slope stability. Maintaining slope stability is subsidiary to the various bid items.

If the work is on or in the vicinity of an at-grade railroad crossing, involves incidental work on railroad right of way, or involves construction of a railroad grade separation structure, notify the railroad company's Division Engineer and the Department's Project Engineer at least 30 days before performing any work on the railroad right of way and make arrangements for railroad flaggers unless otherwise shown in the contract. Obtain the required Railroad Right of Entry Permit from the railroad company. Payment of applicable permit fees is the responsibility of the Contractor. Acquiring the Railroad Right of Entry Permit is a lengthy process, allow sufficient time for this.

No significant traffic generator events identified.

**Item 8: Prosecution and Progress**

Working days will be computed and charged based on a *calendar day* workweek in accordance with Section 8.3.1.5.

The Lane Closure Assessment Fee is shown in the following table. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling."

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**Lane Closure Assessment Fee**

ROADWAY	LANE CLOSURE ASSESSMENT FEE
SH 105	\$ 500.00
FM 1097 W: FM 149 to IH 45	\$ 400.00
FM 1097 E: IH 45 to Walker C/L	\$ 200.00
FM 1097 (Ext.): FM 149 to Bethel Rd.	\$ 50.00
FM 1484	\$ 200.00
FM 3083	\$ 400.00
FM 1314	\$ 500.00
FM 1375	\$ 0.00
LP 336	\$ 500.00
FM 1488	\$ 500.00
FM 2978	\$ 400.00
FM 1774	\$ 400.00
FM 830	\$ 200.00
FM 149	\$ 200.00
FM 2090	\$ 200.00
FM 2432	\$ 300.00
SH 75	\$ 300.00
FM 1791	\$ 50.00
FM 1485	\$ 500.00
FM 2854	\$ 200.00
FM 1486	\$ 100.00
SH 242	\$ 1,000.00
SH 249	\$ 500.00
LP 494	\$ 300.00
IH 69	\$ 2,000.00
IH 69 FRTG	\$ 500.00
IH 69L	\$ 300.00
IH 45	\$7,000.000
IH 45 FRTG	\$1,000.000

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**Item 104: Removing Concrete**

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

**Item 361: Repair of Concrete Pavement**

Please see the current planned locations for full depth repair. Note: All below areas for repair are approximate in measurement.

SH 105 W at RR Bridge in Dobbin – 7' X 4', 21' X 6', 12' X 6'

SH 105 at Lake Creek Bridge in Dobbin – 6' X 4'

SH 105 SB just before FM 2854 – 12' X 6'

SH 105 at Stewart Rd. – 12' X 6'

SH 105 SB at FM 2854 – (2) 6' X 6', 6' X 14', 12' X 6'

SH 105 NB just before Tejas Blvd. – 6' X 12'

LP 336 at Bridge just after Silverstone – 6' X 2', 6' X 12'

LP 336 at Second Bridge after Silverstone – 6' X 6', 6' X 10'

LP 336 at Third Bridge after Silverstone – (2) 6' X 3'

LP 336 at Old Parking Ride before FM 2854 – 6' X 12'

The above locations are subject to change, based on severity. There will be other full depth repairs not listed above. The contractor should be familiar with the roadways throughout Montgomery County and bid appropriately for call out and emergency work.

For full depth repair, remove only the quantity of pavement replaceable during the daily allowable work schedule. Full depth repairs will be directed by the Area Engineer.

Remove loose sub-base material and replace it with concrete. Use a bondbreaker, such as a polyethylene sheet, at the interface between the replaced sub-base material and the new concrete pavement.

Supply polyethylene fabric on the job site sufficient to cover the area of repair.

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Do not place concrete placement if impending weather may result in rainfall or low temperatures that may impair the quality of the finished work.

Repair portions of the concrete pavement surfaces that are damaged while in a plastic state before those areas receive permanent pavement markings and open to traffic. Perform repairs that are structurally equivalent to and cosmetically uniform with adjacent undamaged areas. Do not repair by grouting onto the surface.

Ready mix concrete will be permitted if the equipment and construction methods can produce the desired results. Hand finishing will be permitted.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

**Item 429: Concrete Structure Repair**

Work to be performed on an as needed basis, directed by the Area Engineer

**Item 438: Cleaning and Sealing Joints**

Work to be performed on an as needed basis, directed by the Area Engineer. Class 7 material shall be used for work performed under this item unless otherwise directed by the Area Engineer.

**Item 454: Bridge Expansion Joints**

Work to be performed on an as needed basis, directed by the Area Engineer.

**Item 500: Mobilization**

This contract consists of Call Out Mobilization for routine work and Emergency Mobilization for any emergency or unexpected work.

**Item 502: Barricades, Signs, and Traffic Handling**

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct

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these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

Erect temporary signs when exit ramps are closed or moved to new locations during construction.

If a section is not complete before the end of the workday, pull back the base material to the existing pavement edge on a 6H: 1V slope. Edge drop-offs during the hours of darkness are not permitted.

Before detouring traffic onto the mainlane shoulders, remove dirt, debris, vegetation, and other deleterious material from the surface of the shoulders. Appropriately sign the detour in an approved manner. This work is subsidiary to the various bid items.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Use shadow vehicles with Truck Mounted Attenuators (TMA) for lane and shoulder closures.

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

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**One Lane Closure**

**FM 1097 W, FM 1097 E, FM 1097 (ext), FM 1375, FM 1484, FM 1486, FM 3083, FM 1314, FM 1488, FM 1791, FM 2978, FM 1774, FM 830, FM 149, FM 2090, FM 2432, SH 75, FM 1485, FM 2854, LP 494, IH 45 FRTG., IH 69 FRTG. & IH 69L**

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Friday	9:00 AM – 3:00 PM	7:00 PM – 5:00 AM	5:00 AM – 9:00 AM 3:00 PM – 7:00PM

**One Lane Closure**

**SH 105, LP 336, SH 242, SH 249**

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Friday	9:00 AM – 3:00 PM	7:00 PM – 5:00 AM	5:00 AM – 9:00 AM 3:00 PM – 7:00PM

**One Lane Closure**

**IH 45 & IH 69**

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Friday	None	7:00 PM – 5:00 AM	5:00 AM – 9:00 AM 3:00 PM – 7:00PM

**Two Lane Closure**

**LP 336, SH 105, SH 249 & IH 45, IH 45 FRTG., IH 69, IH 69 FRTG.**

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Friday	None	Emergency only and with Engineer Approval	5:00 AM – 9:00 PM

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**Weekend One or Two Lane Closure**

SH 105, FM 1097, FM 1484, FM 3083, FM 1314, FM 1375, LP 336, FM 1488, FM 2978, FM 1774, FM 830, FM 149, FM 2090, FM 2432, SH 75, FM 1791, FM 1485, FM 2854, FM 1486, SH 242, FM 1097 (ext), SH 249, LP 494, IH 45, IH 45 FRTG., IH 69, IH 69 FRTG. & IH 69L

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Saturday through Sunday	None	Emergency only and with Engineer Approval	11:00 AM – 8:00 PM

**Full Closure of Highway Facility**

SH 105, FM 1097, FM 1484, FM 3083, FM 1314, FM 1375, LP 336, FM 1488, FM 2978, FM 1774, FM 830, FM 149, FM 2090, FM 2432, SH 75, FM 1791, FM 1485, FM 2854, FM 1486, SH 242, FM 1097 (ext), SH 249, LP 494, IH 69, IH 69 FRTG. & IH 69L

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Sunday	None	Emergency only and with Engineer Approval	5:00 AM – 10:00 PM

**Full Closure**

**IH 45 (Roadway / Ramps / Direct Connector)**

Day	Daytime Work Hours	Nighttime Work Hours	Restricted Hours Subject to Lane Assessment
Monday through Sunday	None	Emergency only and with Engineer Approval	5:00 AM – 10:00 PM

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events.

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer.

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Before payment will be made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for nay day during the month in which approved services were provided.

Coordinate and correspond with the Department through the Area Engineer or representative.

Provide full-time, off-duty uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas Commission on Law Enforcement Officers Standards. The cost of the officers Is paid for on a force account basis.

A minimum of 7 days in advance of any total closure, notify the Houston District Public Information Office of which roadways, ramps, intersections, or lanes will be closed, the dates they will remain closed, and when they will be opened again to traffic.

A minimum of 7 days in advance of any total closure, place a portable changeable message (PCM) sign at the location of each total closure which informs the traveling public of the details of the closure. Alternately, if the Traffic Control Plan provides a positive barrier at the locations, a non-trailer mounted static message board sign behind the positive barrier may be used in place of a PCM.

Use Uneven Lane Signs (CW 8-11) during resurfacing operations for elevation differences between adjacent lanes of greater than 1 in.

The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

All lane closures, except for emergency lane closures, are considered subsidiary to the various bid items.



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All work and materials furnished with this item are subsidiary to the pertinent bid items except:

- Emergency lane closures not associated with other contract work items and performed as directed, payable under force account Safety Contingency and Erosion Control Maintenance.
- Truck mounted attenuators payable under Item 6185 6002 and Item 6185 6005.
- Law enforcement personnel payable under force account.

**Item 506: Temporary Erosion, Sedimentation and Environmental Controls**

The use of hay bales is not permitted as Storm Water Pollution Prevention Plan (SWP3) measures.

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated.

If physical conditions encountered at the job site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7. Since the disturbed area is less than 5 acres, a "Notice of Intent" (NOI) is not required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal Laws.

Implement temporary and permanent erosion control measures to comply with the National Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

**Item 512: Portable Traffic Barrier**

Transport Low Profile Concrete Barriers (LPCB) used for traffic handling from the Department's stockpile located on the north side of IH 610 at Long Drive.

Where required by the Engineer, provide anchor pins for Type 2 Low Profile Concrete Barriers as shown on the current LPCB standard. Anchor pins are subsidiary to the Low Profile Concrete Barrier.

Transport Standard Height Concrete Traffic Barriers (including JJ Hook and Safety Shape) used for traffic handling from the Department stockpile located at 901 N. FM 3083 East in Conroe, Texas.

Use only the J-J Hook type connection between barriers.

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After completing the project, return Low Profile Concrete Traffic Barriers (CTB) used for traffic handling, to the Department stockpile located at 901 N. FM 3083 East in Conroe, Texas.

After completing the project, return Standard Height Concrete Traffic Barriers (including J-J Hook and Safety Shape) used for traffic handling, to the Department stockpile located at 901 N. FM 3083 East in Conroe, Texas.

After completing the project, return the associated CTB connecting hardware to the area office or as directed.

If placing the concrete traffic barrier on pre-stressed concrete box beams with exposed reinforcing steel, protect the reinforcing steel by supporting the concrete traffic barrier on 4 in. by 4 in. timbers. Place the timbers transversely and space them on 4 ft. centers. The cost of the labor and materials to perform this work are subsidiary to the Item, "Portable Concrete Traffic Barrier."

Work to be performed on an as needed basis, directed by the Area Engineer.

**Item 514: Permanent Concrete Traffic Barrier**

Add a 3/4-in. longitudinal chamfer to the Single Slope Concrete Barrier (SSCB) railing. Provide a continuous chamfer typically located 6 in. above the final grade. The cost of this is subsidiary to the Item, "Permanent Concrete Traffic Barrier."

Work to be performed on an as needed basis, directed by the Area Engineer.

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

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

For driveways and turnouts, coarse aggregate Grade No. 3 through No. 8 conforming to the gradation requirements specified in the Item, "Hydraulic Cement Concrete" will be permitted.

For reinforcing steel in sidewalks and pedestrian ramps, use No. 4 bars at a maximum 18 in. spacing center-to-center in both directions.

Work to be performed on an as needed basis, directed by the Area Engineer.

**Project Number:** RMC 6376-71-001

**County:** Montgomery County

**Sheet 3 G**

**Highway:** IH 45, etc.

**Control:** 637671001

**Item 721: Fiber Reinforced Polymer Patching Material**

Work to be performed on an as needed basis, directed by the Area Engineer. This item will be used in the repair of spalled areas, potholes, and joints on concrete and asphalt pavements.

**Item 3025: Raising and Undersealing Concrete Slab**

Work to be performed on an as needed basis, directed by the Area Engineer.

**Item 4003: Type CAC Concrete**

Work to be performed on an as needed basis, directed by the Area Engineer.

**Item 6185: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)**

A shadow vehicle with Truck Mounted Attenuators (TMAs) or Trailer Attenuators (TAs) is required as shown on the appropriate Traffic Control Plan (TCP) sheets. TMAs/TAs must meet the requirements of the Compliant Work Zone Traffic Control Device List.

Level 3 Compliant TMAs are required for this project.

Do not use trailer mounted attenuators for this project.

A total of three (3) shadow vehicles with a TMA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed on the project.

In addition to the shadow vehicles with TMAs that are specified as being required on the TCP layout sheets for this project, provide additional shadow vehicles with TMAs as shown on the TCP Standard sheets. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed on the project.

This item will be paid for by the day. The contractor is responsible to furnish, operate, maintain and remove upon completion of work.



CONTROLLING PROJECT ID 6376-71-001

DISTRICT Houston  
HIGHWAY IH0045

COUNTY Montgomery

# QUANTITY SHEET

CONTROL SECTION JOB				6376-71-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00139792			
COUNTY				Montgomery			
HIGHWAY				IH0045			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	104-6029	REMOVING CONC (CURB OR CURB & GUTTER)	LF	200.000		200.000	
	361-6009	FULL - DEPTH REPAIR CRCP (15")	SY	300.000		300.000	
	361-6052	FULL - DEPTH REPAIR CRCP (8"-14")	SY	600.000		600.000	
	420-6009	CL A CONC (COLLAR)	EA	2.000		2.000	
	429-6003	CONC STR REPAIR(DECK REP(PART DEPTH))	SF	50.000		50.000	
	429-6008	CONC STR REPR(RAPID VERT AND OVERHEAD)	SF	500.000		500.000	
	429-6009	CONC STR REPAIR (STANDARD)	SF	50.000		50.000	
	429-6011	CONC STR REPR(REMOV AND REPL WINGWALL)	CY	5.000		5.000	
	438-6008	CLEANING AND SEALING JOINTS (CL 7)	LF	2,000.000		2,000.000	
	454-6001	SEALED EXPANSION JOINT (4 IN) (SEJ - A)	LF	100.000		100.000	
	465-6166	INLET (COMPL)(TY AAD)	EA	2.000		2.000	
	471-6003	GRATE & FRAME	EA	1.000		1.000	
	471-6004	FRAME & COVER	EA	1.000		1.000	
	471-6005	RING & COVER	EA	1.000		1.000	
	479-6001	ADJUSTING MANHOLES	EA	1.000		1.000	
	500-6033	MOBILIZATION (CALLOUT)	EA	12.000		12.000	
	500-6034	MOBILIZATION (EMERGENCY)	EA	4.000		4.000	
	512-6005	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)	LF	120.000		120.000	
	512-6017	PORT CTB (DES SOURCE)(F-SHAPE)(TY 1)	LF	30.000		30.000	
	512-6029	PORT CTB (MOVE)(F-SHAPE)(TY 1)	LF	120.000		120.000	
	514-6013	PERM CTB (F-SHAPE) (TY 1)	LF	30.000		30.000	
	529-6008	CONC CURB & GUTTER (TY II)	LF	200.000		200.000	
	529-6010	CONC CURB (U-TURN)	LF	200.000		200.000	
	721-6002	FIBER REINFORCED POLYMER PATCHING MATLS	LB	50.000		50.000	
	3025-6001	RAISING AND UNDERSEALING CONCRETE SLAB	LB	8,000.000		8,000.000	
	4003-6001	TYPE CAC CONCRETE	CY	10.000		10.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	10.000		10.000	
	6185-6002	TMA (STATIONARY)	DAY	150.000		150.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	25.000		25.000	

# SUMMARY OF ROADWAY QUANTITIES

RMC 6376-71-001	104 6029	361 6009	361 6052	420 6009	429 6003	429 6008	429 6009	429 6011	438 6008	454 6001
	REMOVING CONC (CURB OR CURB & GUTTER)	FULL-DEPTH REPAIR CRCP (15")	FULL-DEPTH REPAIR CRCP (8"-14")	CL A CONC (COLLAR)	CONC STR REPAIR (DECK REP (PART DEPTH))	CONC STR REPR (RAPID VERT AND OVERHEAD)	CONC STR REPAIR (STANDARD)	CONC STR REPR (REMOV AND REPL WINGWALL)	CLEANING AND SEALING JOINTS (CL 7)	SEALED EXPANSION JOINT (4 IN) (SEJ-A)
	LF	SY	SY	EA	SF	SF	SF	CY	LF	LF
	200	300	600	2	50	500	50	5	2000	100
<b>TOTAL</b>	200	300	600	2	50	500	50	5	2000	100

RMC 6376-71-001	465 6166	471 6003	471 6004	471 6005	479 6001	500 6033	500 6034	512 6005	512 6017	512 6029
	INLET (COMPL) (TY AAD)	GRATE & FRAME	FRAME & COVER	RING & COVER	ADJUSTING MANHOLES	MOBILIZATION (CALLOUT)	MOBILIZATION (EMERGENCY)	PORT CTB (FURN & INST) (F-SHAPE)(TY1)	PORT CTB (DES SOURCE) (F-SHAPE)(TY 1)	PORT CTB (MOVE) (F-SHAPE)(TY 1)
	EA	EA	EA	EA	EA	EA	EA	LF	LF	LF
	2	1	1	1	1	12	4	120	30	120
<b>TOTAL</b>	2	1	1	1	1	12	4	120	30	120

RMC 6376-71-001	514 6013	529 6008	529 6010	721 6002	3025 6001	4003 6001	6001 6001	6185 6002	6185 6005
	PERM CTB (F-SHAPE)(TY 1)	CONC CURB & GUTTER (TY II)	CONC CURB (U-TURN)	FIBER REINFORCED POLYMER PATCHING MATLS	RAISING AND UNDERSEALING CONCRETE SLAB	TYPE CAC CONCRETE	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	LF	LF	LB	LB	CY	DAY	DAY	DAY
	30	200	200	50	8000	10	10	150	25
<b>TOTAL</b>	30	200	200	50	8000	10	10	150	25

PRINT DATE	REVISION DATE
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## SUMMARY OF ROADWAY QUANTITIES

FED. RD. DIV. NO.	HIGHWAY NUMBER	
6	IH 45, ETC.	
STATE	DISTRICT	COUNTY
TEXAS	HOU	MONTGOMERY
CSJ		SHEET NO.
6376-71-001		5

FILENAME:

CSJ:

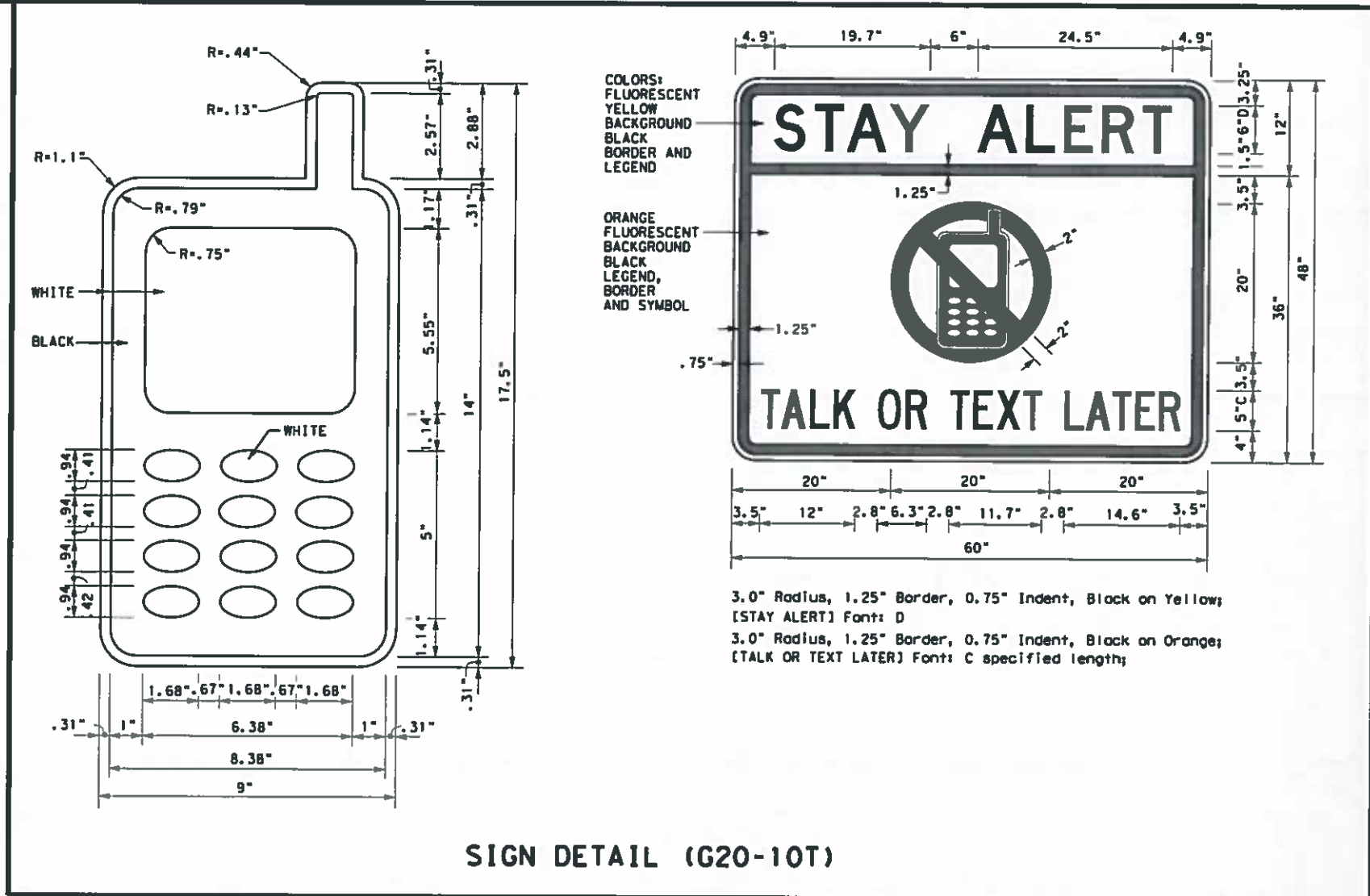
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**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

- 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).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- 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.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- 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.
- The Engineer has the final decision on the location of all traffic control devices.
- 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:**

- 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," or equivalent revisions, and 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.



**SIGN DETAIL (G20-10T)**

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified 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) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT <a href="http://www.txdot.gov">http://www.txdot.gov</a>	
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)	
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)	
MATERIAL PRODUCER LIST (MPL)	
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"	
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)	
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)	
TRAFFIC ENGINEERING STANDARD SHEETS	

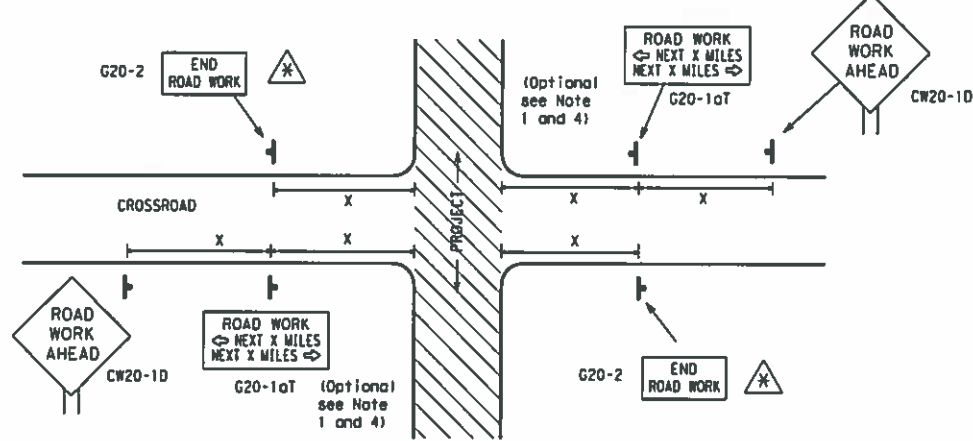
SHEET 1 OF 12

		Traffic Operations Division Standard
<b>BARRICADE AND CONSTRUCTION          GENERAL NOTES          AND REQUIREMENTS</b>		
<b>BC(1)-14</b>		
FILE: bc-14.dgn © TxDOT November 2002	DWG: TxDOT CONT: 6378 SECT: 71 REV: 5-10, 8-14, 9-07, 7-13	JOB: 001 HIGHWAY: IH 45, ETC. COUNTY: MONTGOMERY SHEET NO.: 6

DATE: FILE:

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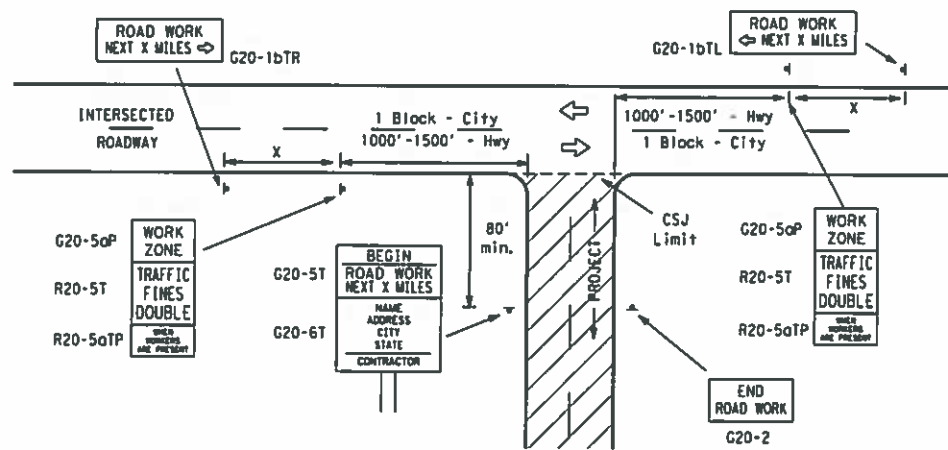
**TYPICAL LOCATION OF CROSSROAD SIGNS**



\* May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)

- The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "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" (G20-2) 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 "ROAD WORK NEXT X MILES" (G20-1aT) 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 "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "X" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25	36" x 36"	48" x 48"	50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14			55	500 <sup>2</sup>
			60	600 <sup>2</sup>
			65	700 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	70	800 <sup>2</sup>
			75	900 <sup>2</sup>
			80	1000 <sup>2</sup>
			*	* <sup>3</sup>

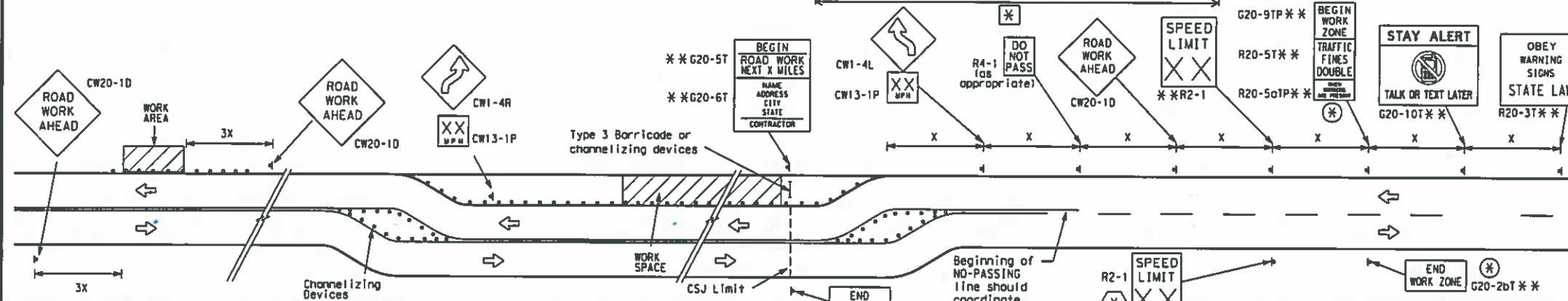
<sup>4</sup> For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

<sup>5</sup> Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

**GENERAL NOTES**

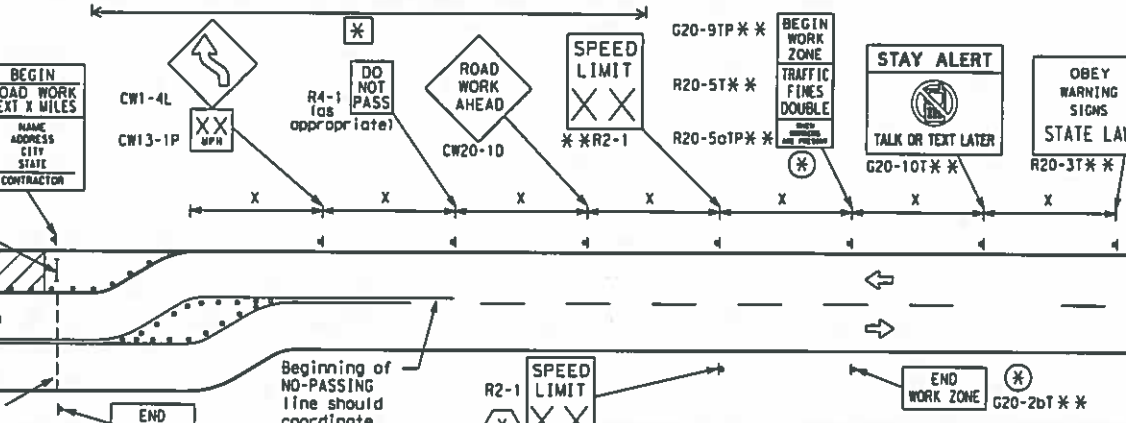
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be 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**

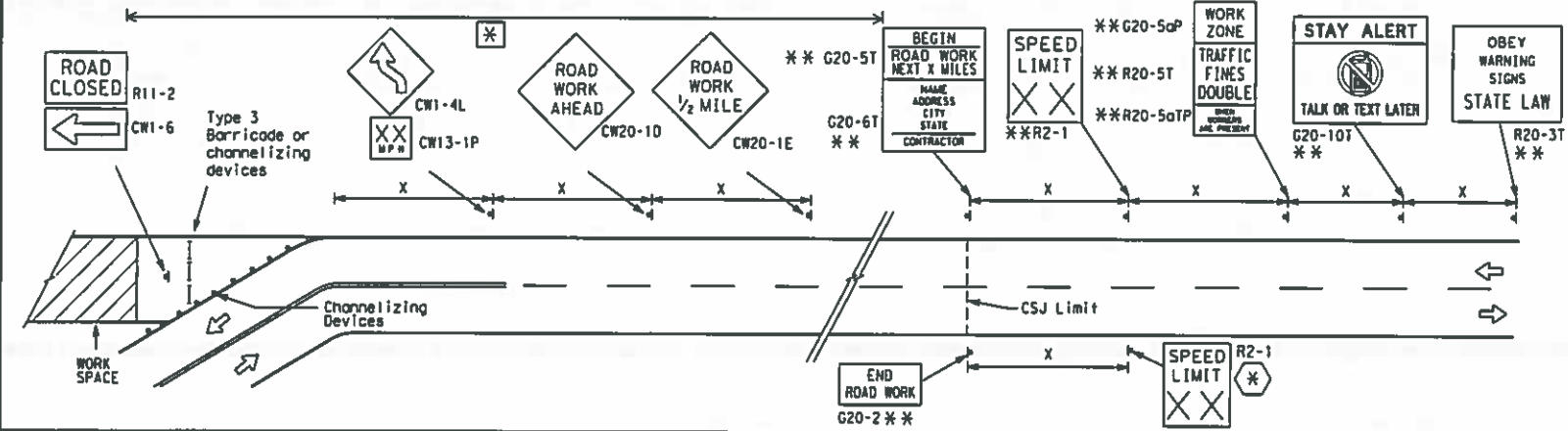


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing 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 "BEGIN ROAD WORK NEXT X MILES" (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 "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
  - \*\* Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
  - \* Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
  - \* Contractor will install a regulatory speed limit sign at the end of the work zone.

**LEGEND**

—	Type 3 Barricade
○ ○ ○	Channelizing Devices
—	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12

Texas Department of Transportation Traffic Operations Division Standard

**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

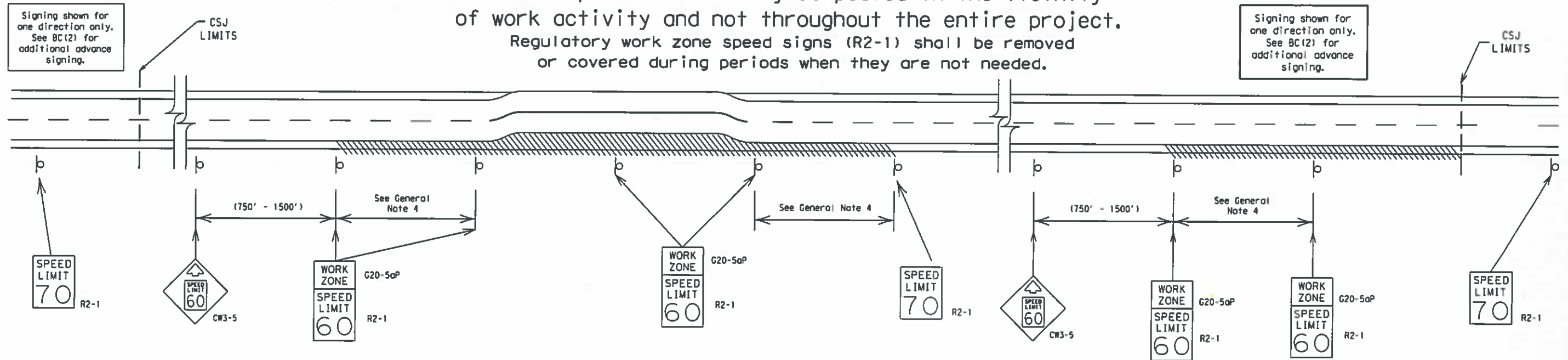
BC(2)-14

FILE# bc-14.dgn	DW TxDOT	CA TxDOT	DW TxDOT	CK TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	6378	71	001	IH 45, ETC.
9-07	8-14	DIST	COUNTY	SHEET NO.
7-13		HOU	MONTGOMERY	7

# 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 may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

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 "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) 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 as otherwise noted under "REMOVING OR COVERING" on BC(4).
- 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.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



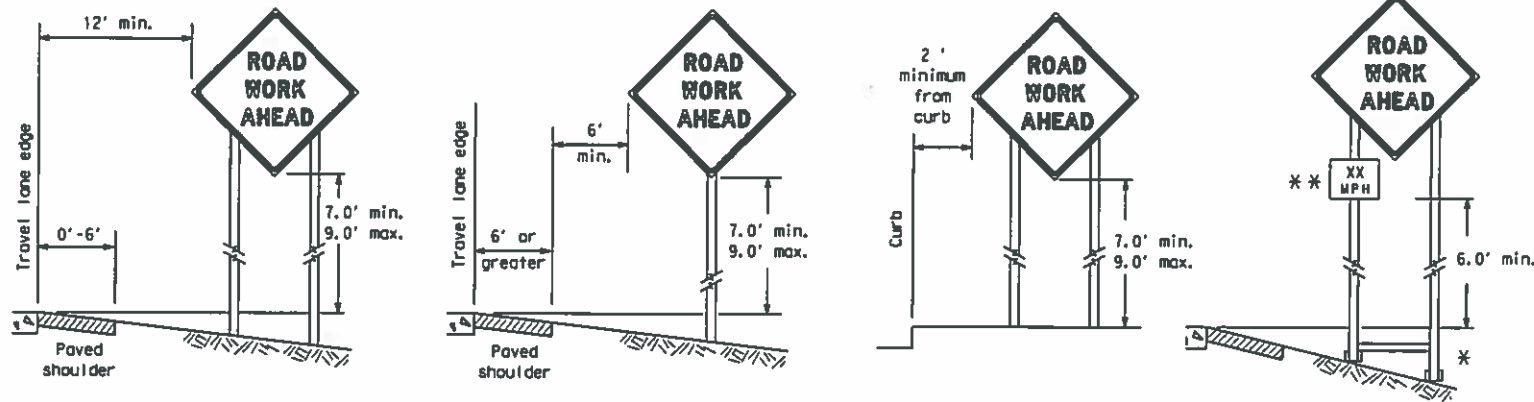
## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 14

FILE#	bc-14.dgn	DN# TxDOT	CR# TxDOT	DR# TxDOT	CC# TxDOT
© TxDOT	November 2002	COM#	SECT#	JOB#	HIGHWAY#
REVISIONS		6376	71	001	IH 45, ETC.
9-07	B-14	DIST	COUNTY	SHEET NO.	
7-13		HOU	MONTGOMERY	8	

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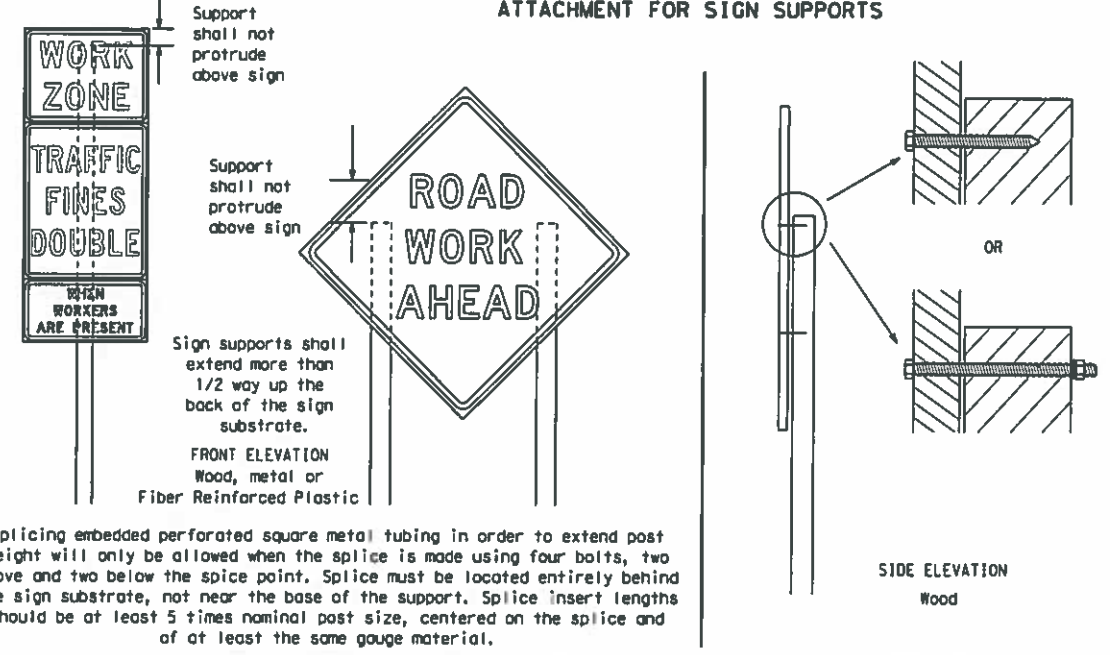
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



\* 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**

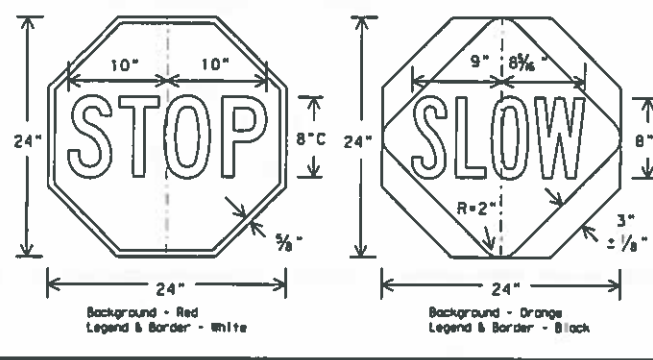


**Nails shall NOT be allowed.**  
Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

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.

**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.
  - 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 Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans 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 A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, 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 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.
- 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 should be used.
- 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.
- 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.

**FLAGS ON SIGNS**

- Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

Texas Department of Transportation  
Traffic Operations Division Standard

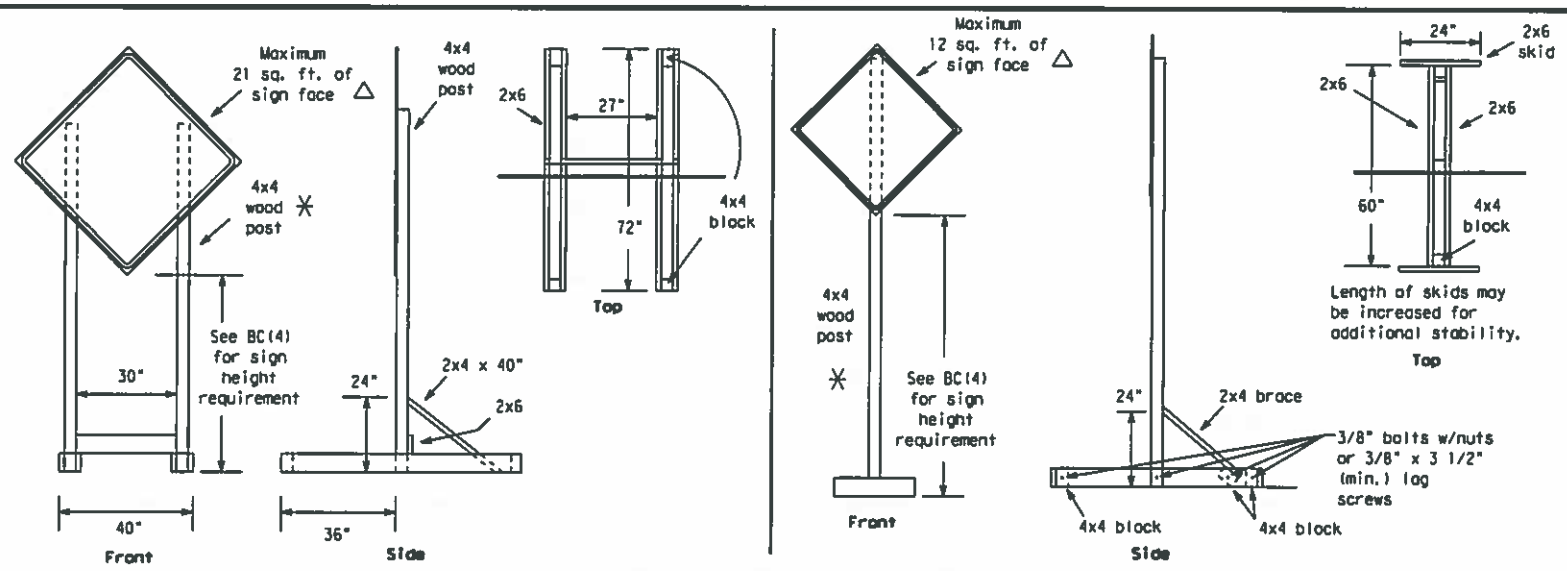
**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC (4) - 14**

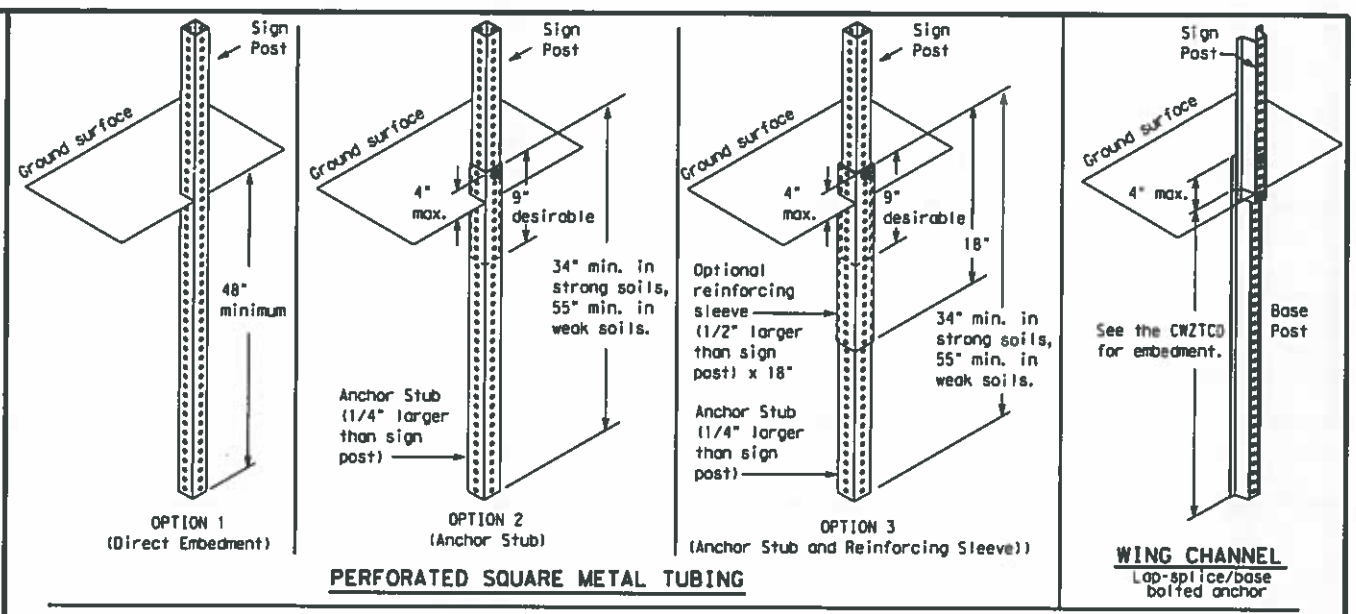
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© TxDOT	November 2002	COM#	SECT#	JOB#	HIGHWAY				
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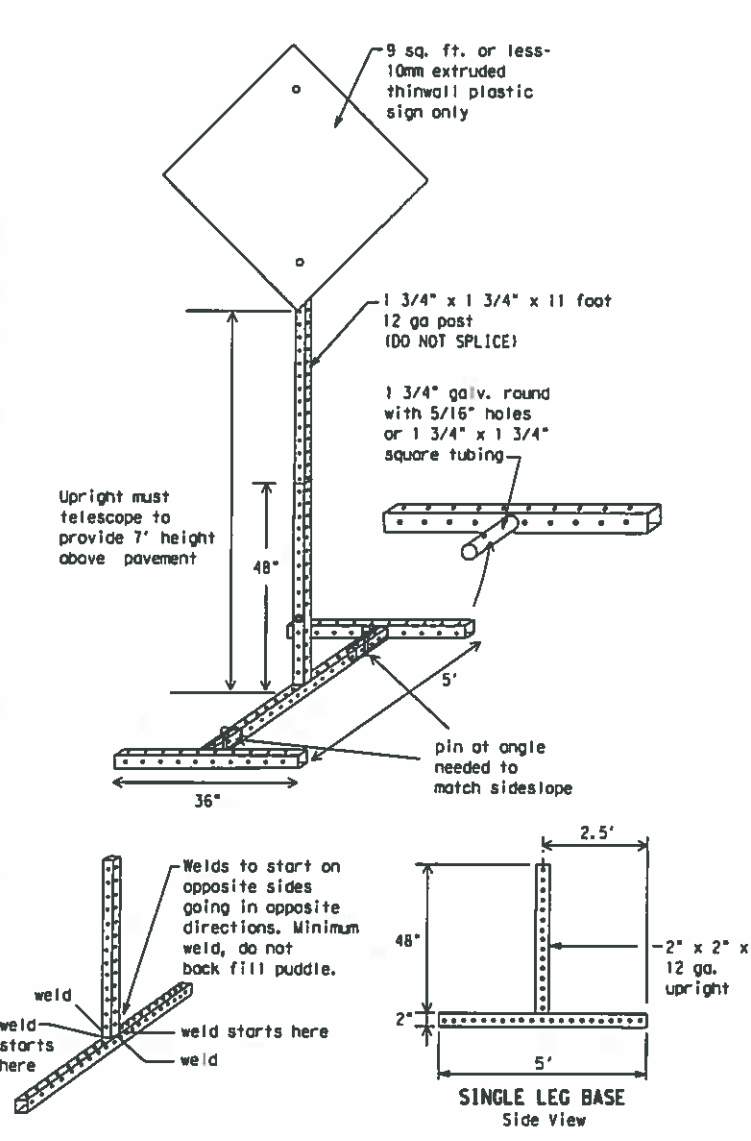
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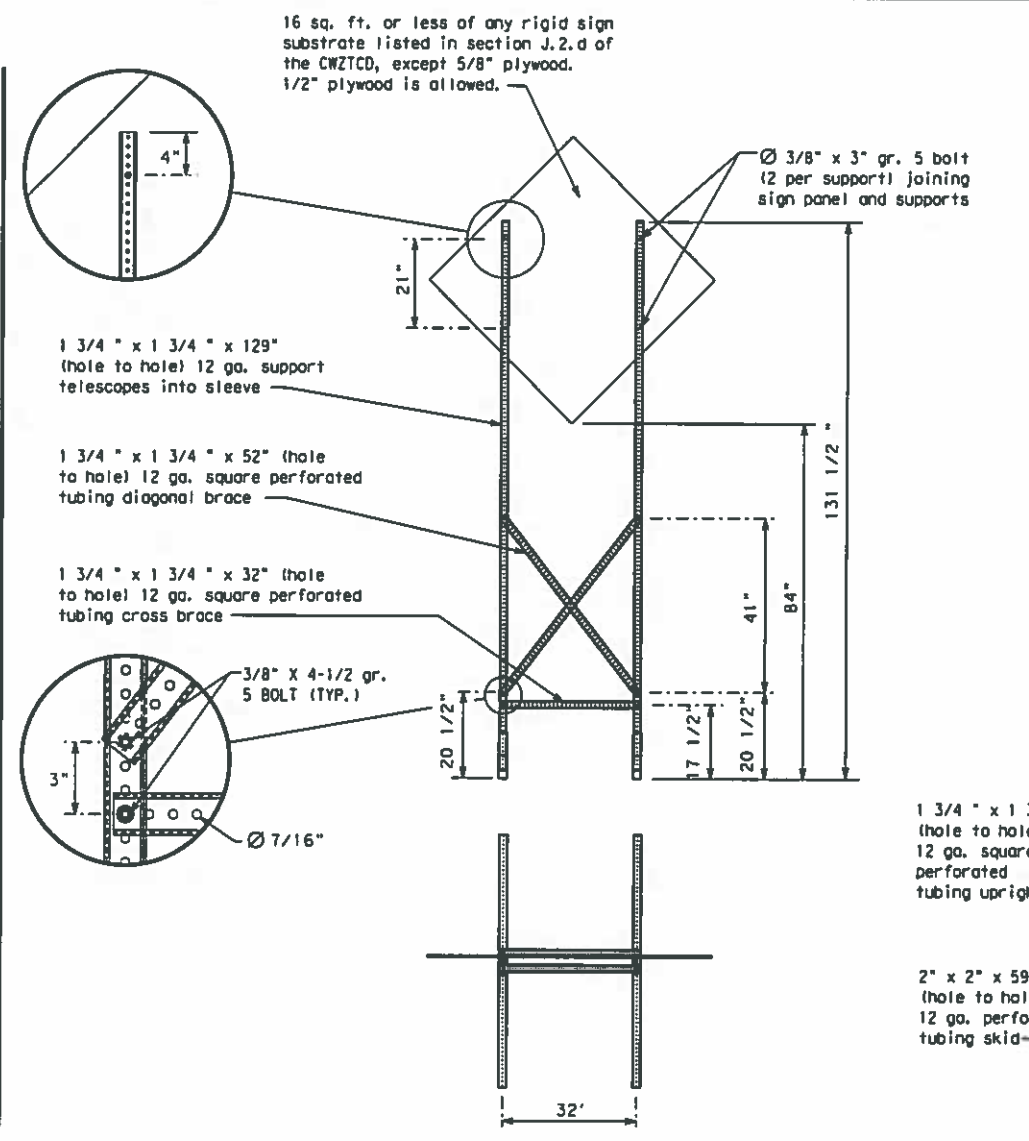
**SKID MOUNTED WOOD SIGN SUPPORTS**  
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □



**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.



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**



**WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS**

Nominal Post Size	Number 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

**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)).

**OTHER DESIGNS**  
MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

- 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.
  - 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.

SHEET 5 OF 12



**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

BC (5) - 14

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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.)

## 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, unless shown in the T MUTCD.
- 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 600 feet at night and 800 feet in daylight. 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.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canal	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWN TN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLRS
High Occupancy	HOV	Tuesday	TUES
Vehicle Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PYMT
Maintenance	MAINT	Will Not	WONT

Roadway designation = IH-number, US-number, SH-number, FM-number

## 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.

## 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 *

### 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.

## 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.

## 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, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

## 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 "Flogger Symbol" (CW20-7) 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 board provided it meets the visibility, flash rate and dimming requirements on BC(17), for the same size arrow.

SHEET 6 OF 12



## BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

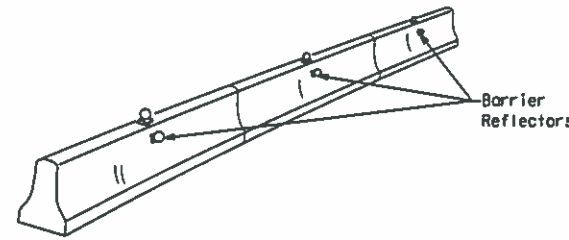
BC (6) - 14

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© TxDOT November 2002	CONT: 71	SECT: 001	JOB: JH 45, ETC.	HIGHWAY
REVISIONS	DIST: HOU	COUNTY: MONTGOMERY	SHEET NO. 11	
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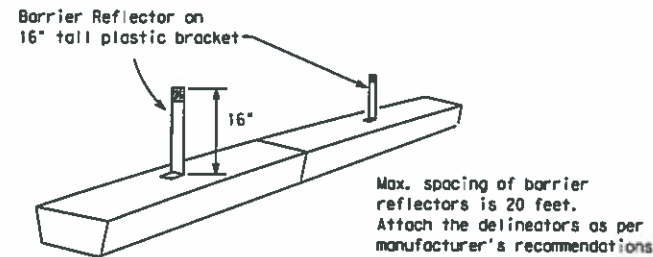
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



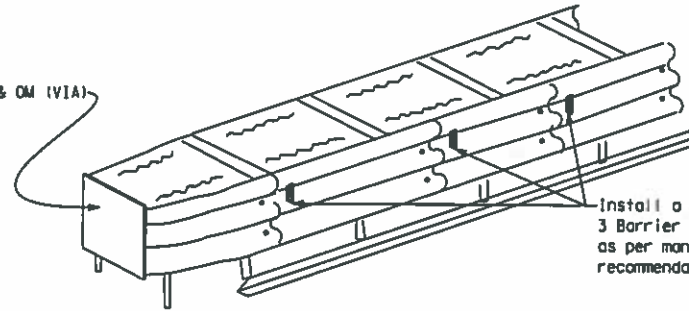
**CONCRETE TRAFFIC BARRIER (CTB)**

- 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.
- 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)**

See D & OM (VIA)



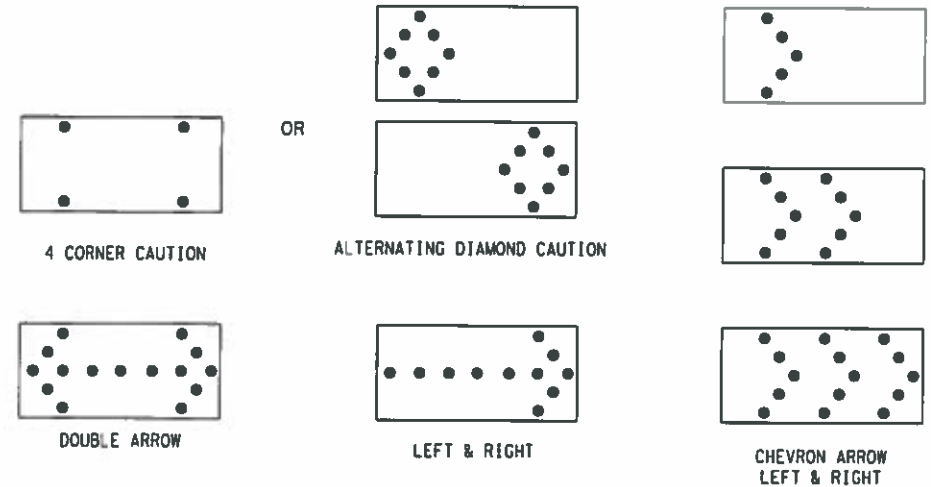
**DELINEATION OF END TREATMENTS**

**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.

Arrow Boards 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 Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards 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 Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board 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 Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

**ATTENTION**  
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

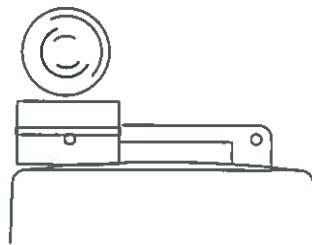
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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 B<sub>FL</sub> or C<sub>FL</sub> Sheeting 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

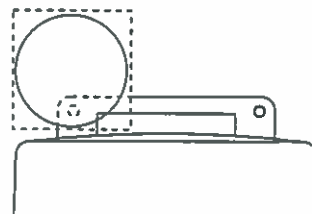
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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 B or Type C.
- 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.



Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow 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) or the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 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 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**

**BC (7) - 14**

FILE#	bc_14.dgn	DR#	TxDOT	CR#	TxDOT	DR#	TxDOT	CR#	TxDOT
©TxDOT	November 2002	CDMT	SECT	JOB	HIGHWAY				
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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**

Pre-qualified plastic drums shall meet the following requirements:

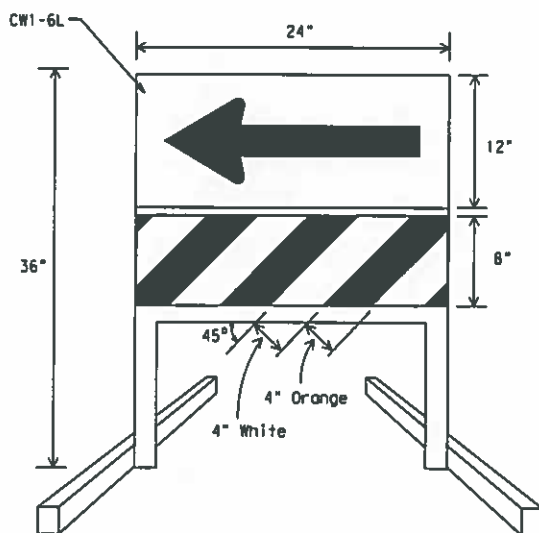
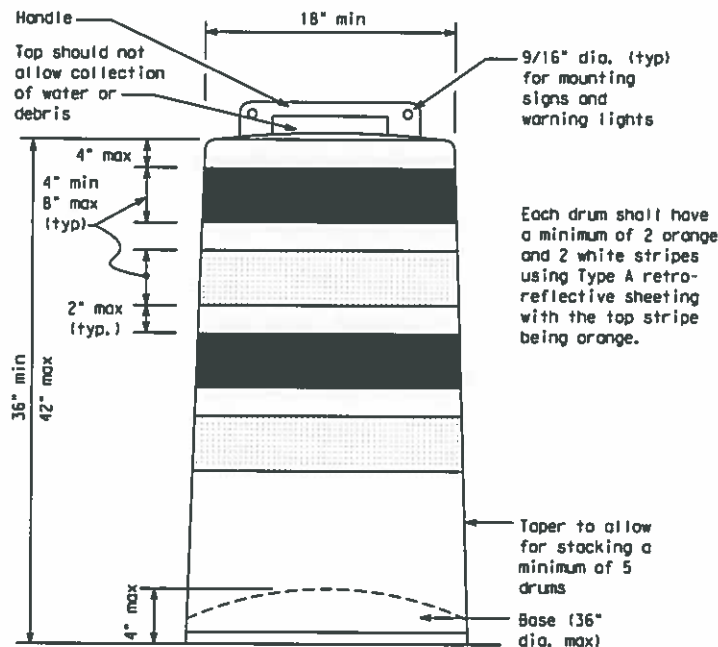
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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 maximum unballasted weight of 11 lbs.
- 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, "Sign Face Materials." Type A reflective 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.

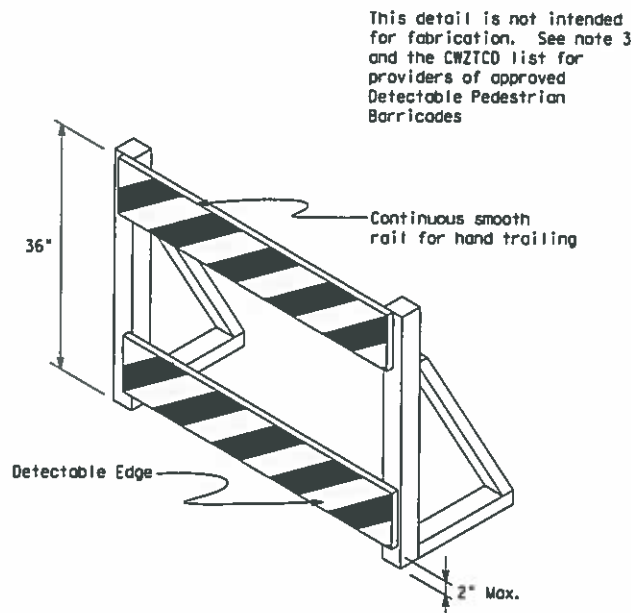
**BALLAST**

- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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 (CWI-6) sign in the size shown with a black arrow on a background of Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
- 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.

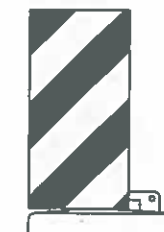


**DETECTABLE PEDESTRIAN BARRICADES**

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



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 B<sub>FL</sub> or Type C<sub>FL</sub> Orange 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 A 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, except for the R9 series signs discussed in note 8 below.
- 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.

SHEET 8 OF 12

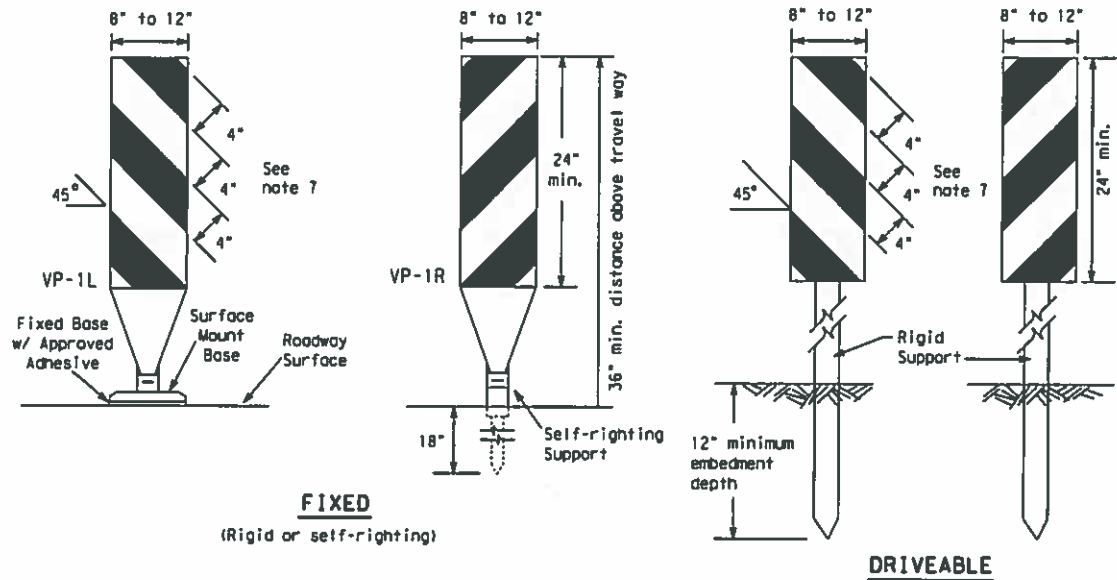


**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

BC (8) - 14

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9-07 8-14						

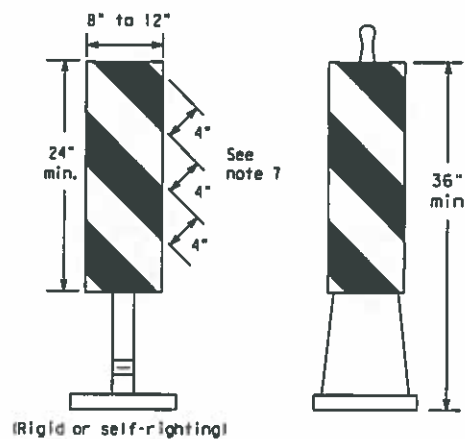
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**FIXED**  
(Rigid or self-righting)

**DRIVEABLE**

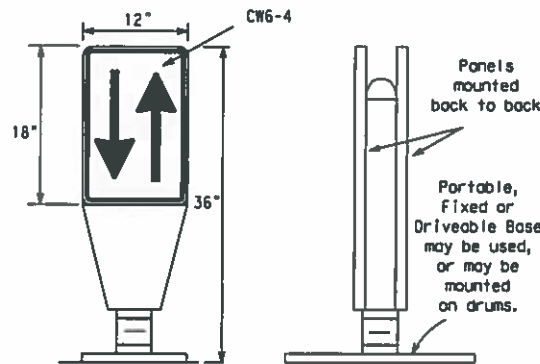
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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.
3. 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.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



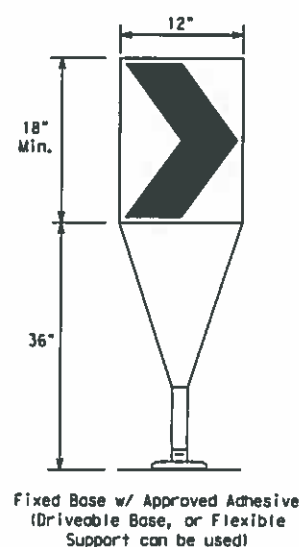
**PORTABLE**

**VERTICAL PANELS (VPs)**

1. 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.
2. The OTLD may be used in combination with 42" cones or VPs.
3. Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
4. The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



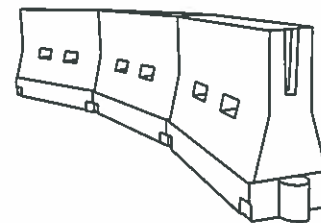
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

1. The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
2. 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.
3. 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.
4. To be effective, the chevron should be visible for at least 500 feet.
5. Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
6. 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.

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

1. LCDs 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.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rolls as shown on BC(10) placed near the top of the LCD along the full length of the device.

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

1. 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.
2. 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.
3. 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.
4. 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.
5. When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a 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 cones and the top of the unit shall not be less than 32 inches in height.

**HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS**

**GENERAL NOTES**

1. 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).
2. 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.
3. 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).
4. 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.
5. Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
6. 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.
7. 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.

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75	750'	825'	900'	75'	150'	
80	800'	880'	960'	80'	160'	

\*\*Taper lengths have been rounded off.  
L=Length of Taper (FT.) W=Width of Offset (FT.)  
S=Posted Speed (MPH)

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 14**

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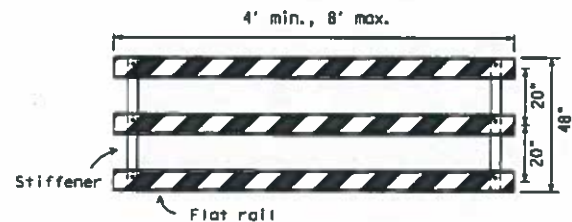
**TYPE 3 BARRICADES**

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 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 A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



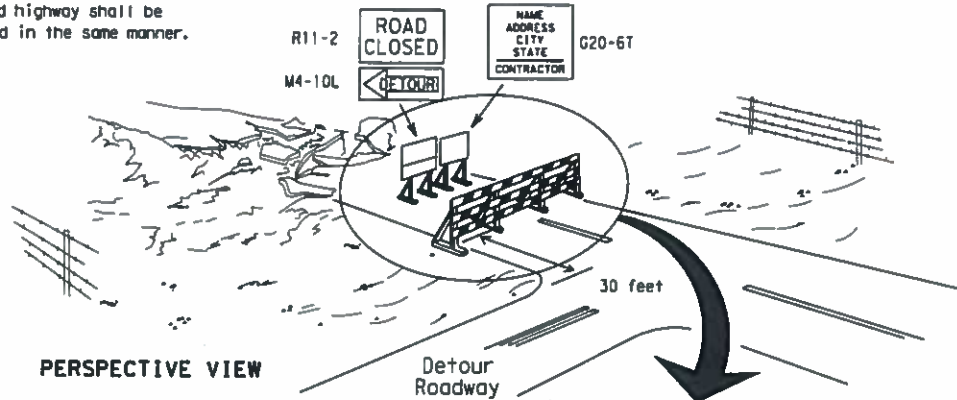
**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

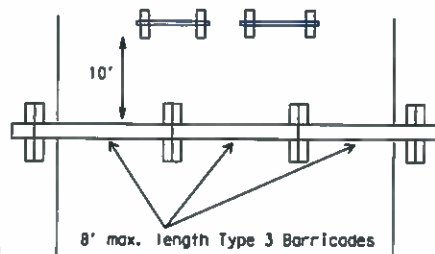
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

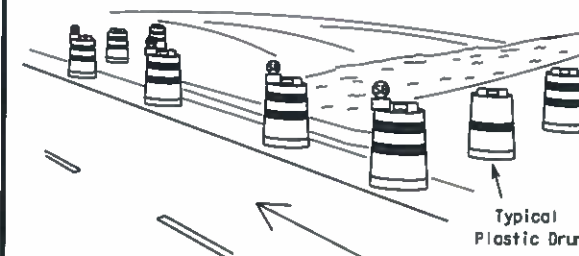
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



PLAN VIEW

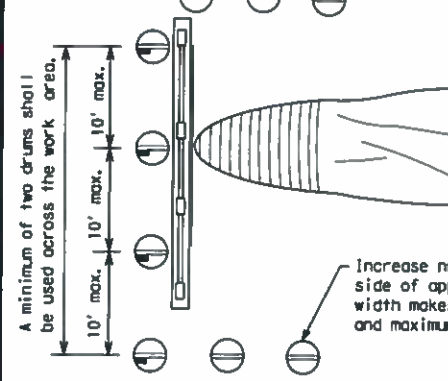
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

These drums are not required on one-way roadway



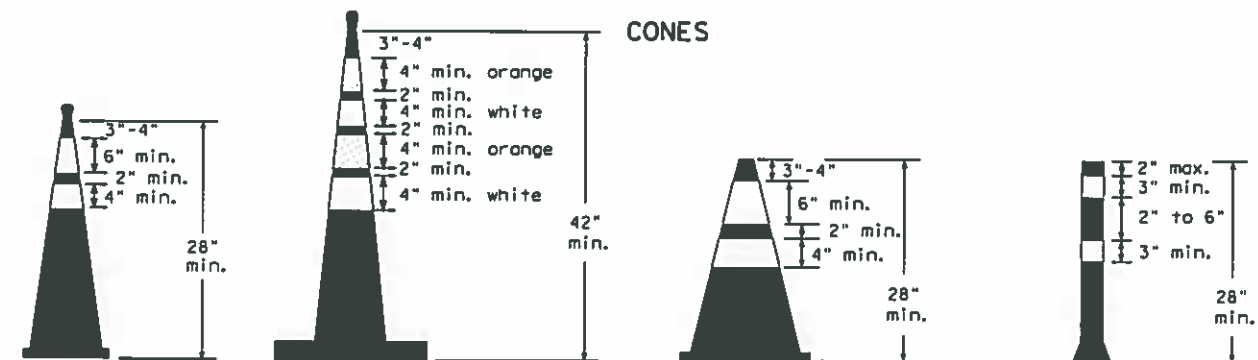
PLAN VIEW

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

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.

**LEGEND**

	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector



**CONES**

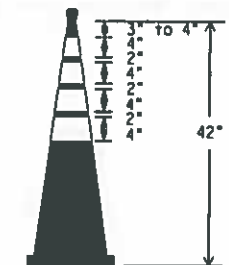
Two-Piece cones

One-Piece cones

Tubular Marker

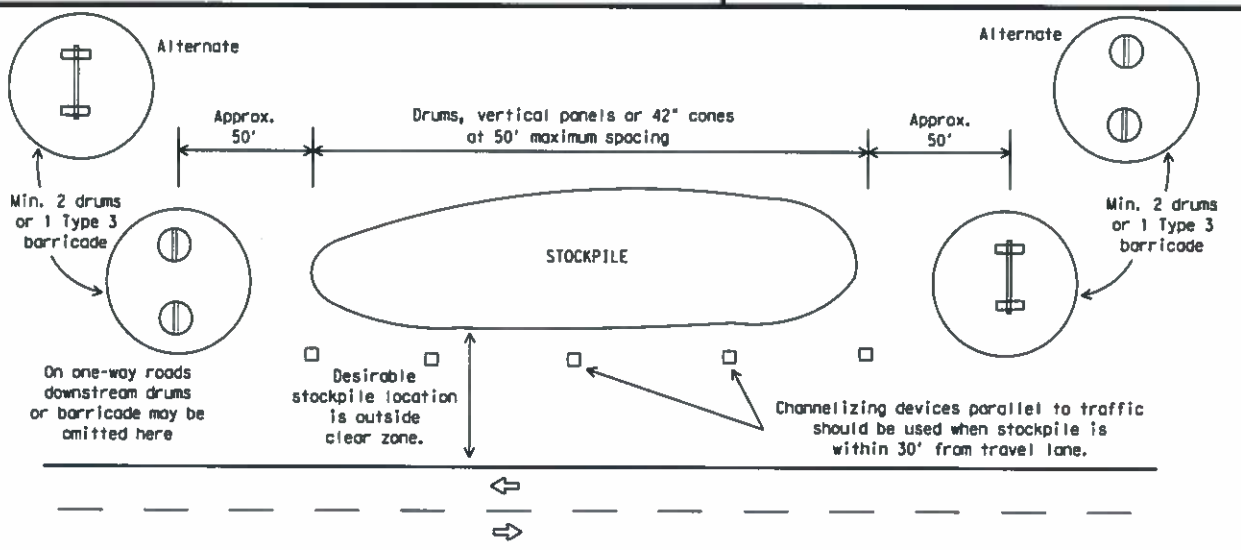
28" Cones shall have a minimum weight of 9 1/2 lbs.  
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGELINE 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 (topposing 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 A 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 predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(14). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.

SHEET 10 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC(10) - 14**

FILE# bc-14.dgn	DATE TxDOT	CHK TxDOT	DATE TxDOT	CHK TxDOT
©TxDOT November 2002	COM#	SECT	JOB	HIGHWAY
REVISIONS	8376	71	001	IH 45, ETC.
9-07	DIST	COUNTY	SHEET NO.	
7-13	HOU	MONTGOMERY	15	

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DATE: FILE:

## 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 (fall back) shall meet the requirements of DMS-8240.

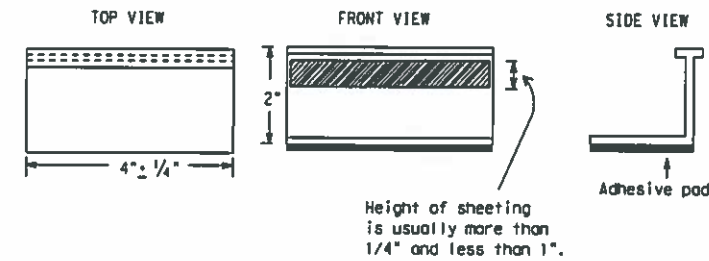
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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 three days, 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 as described in Item 677.
- 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
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	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).

SHEET 11 OF 12



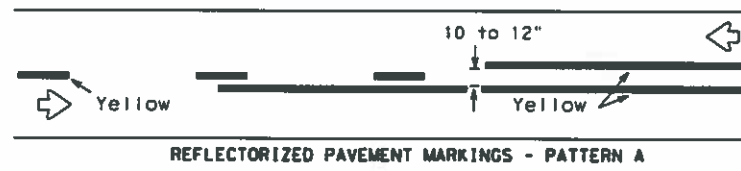
## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

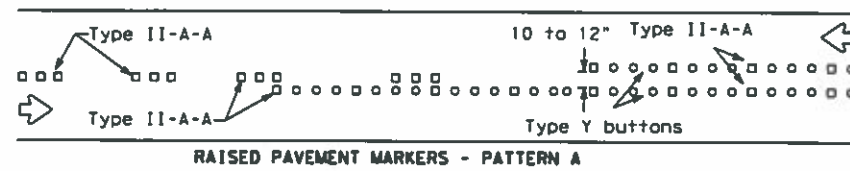
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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS				
2-98 9-07	8378	71	001	IH 45, ETC.
1-02 7-13	DIST	COUNTY	SHEET NO.	
11-02 8-14	HOU	MONTGOMERY	16	

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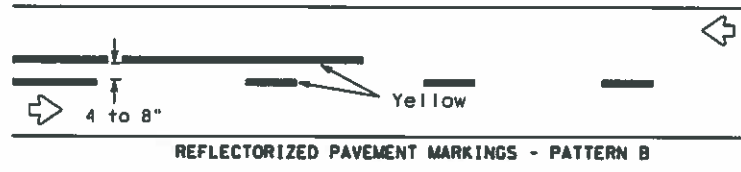
### PAVEMENT MARKING PATTERNS



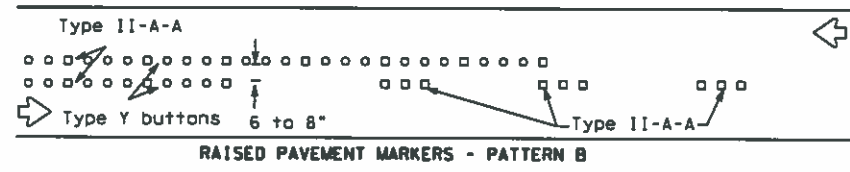
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



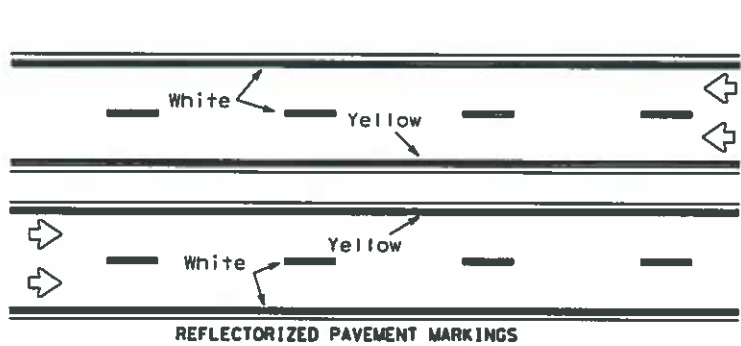
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



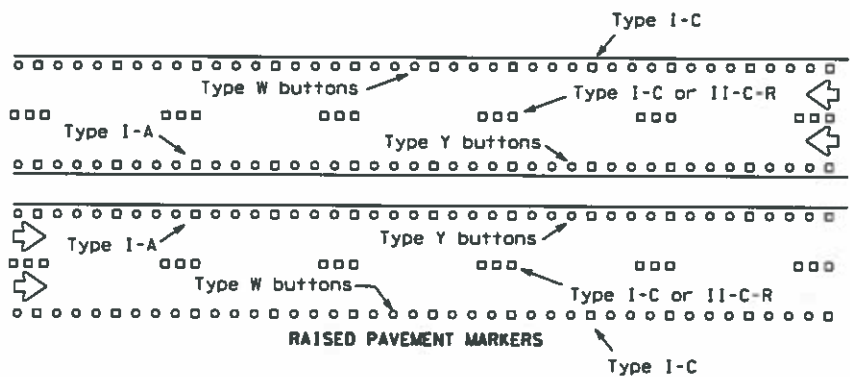
RAISED PAVEMENT MARKERS - PATTERN B

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.

### CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



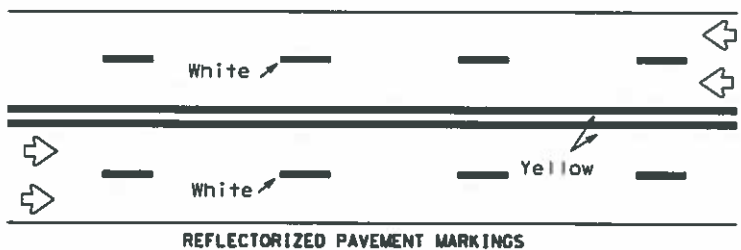
REFLECTORIZED PAVEMENT MARKINGS



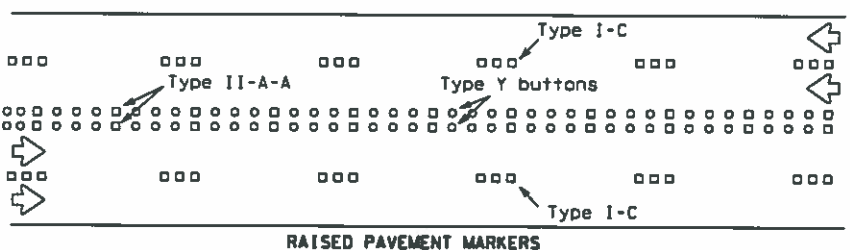
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

### EDGE & LANE LINES FOR DIVIDED HIGHWAY



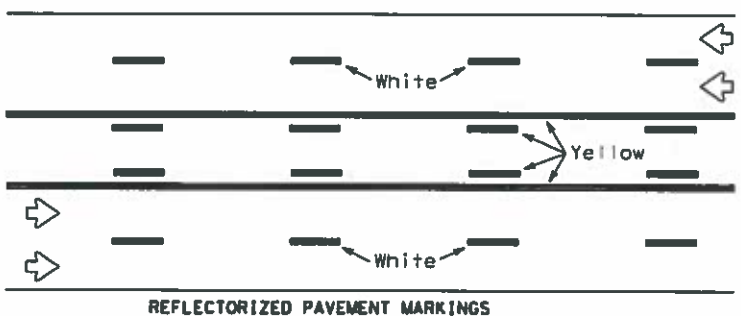
REFLECTORIZED PAVEMENT MARKINGS



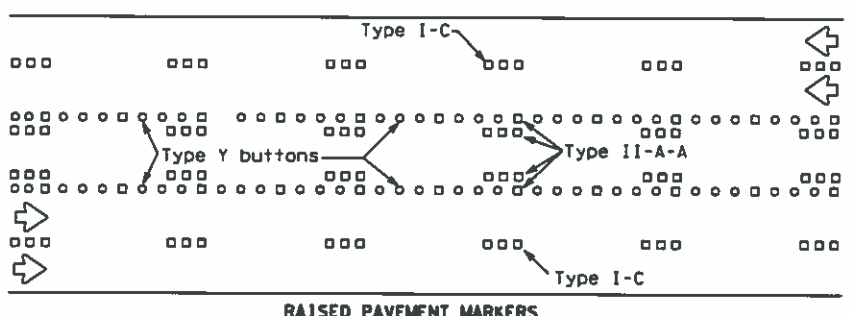
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

### LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

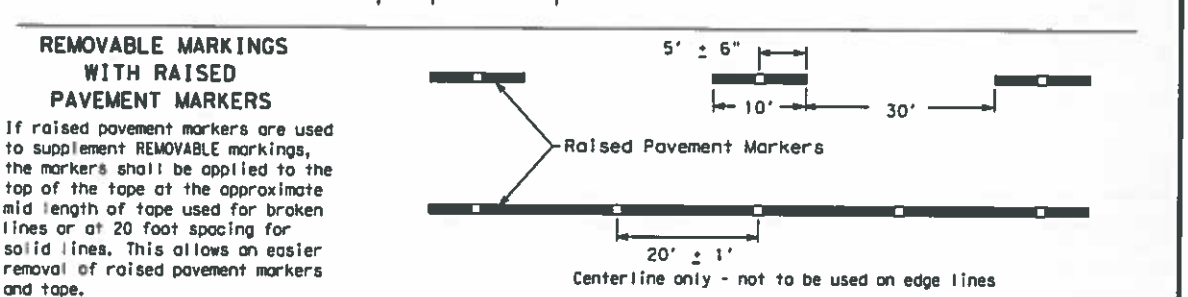
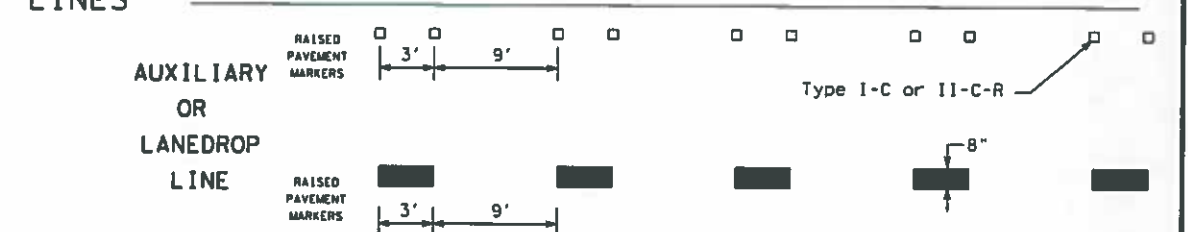
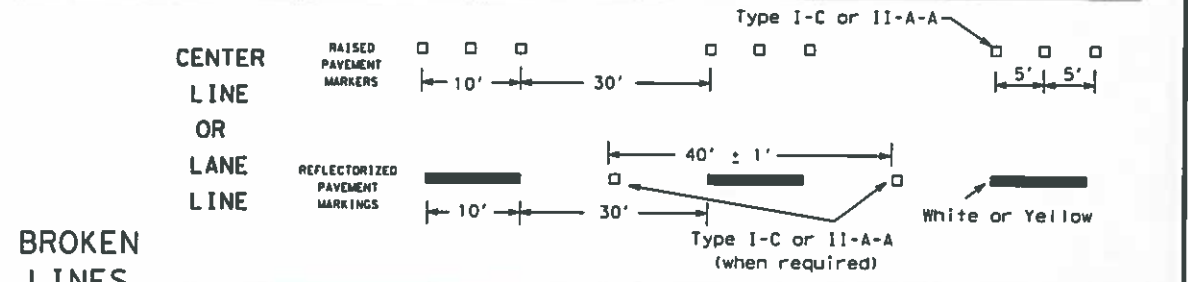
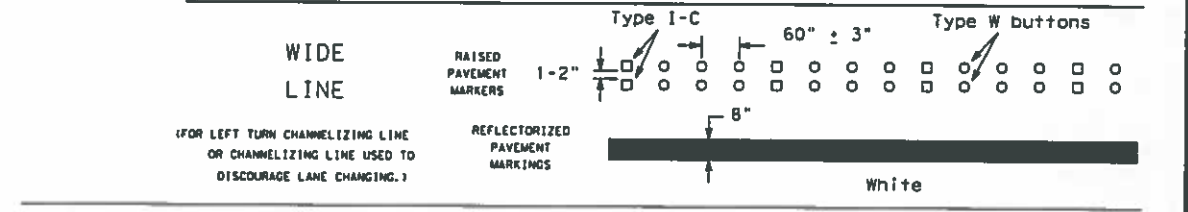
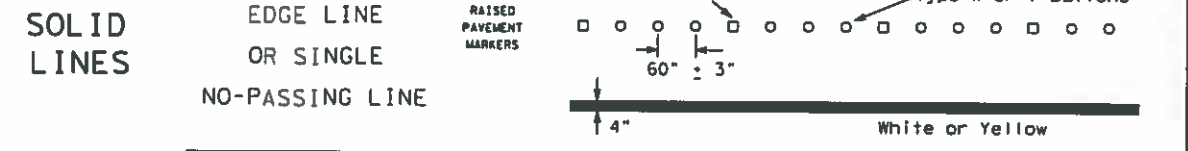
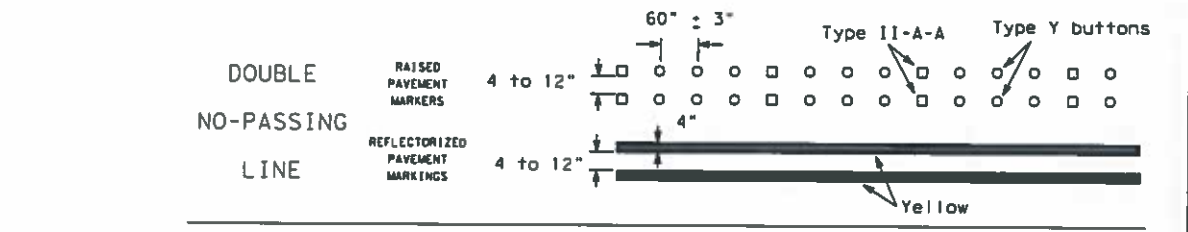


RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

### TWO-WAY LEFT TURN LANE

### STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SHEET 12 OF 12



### BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

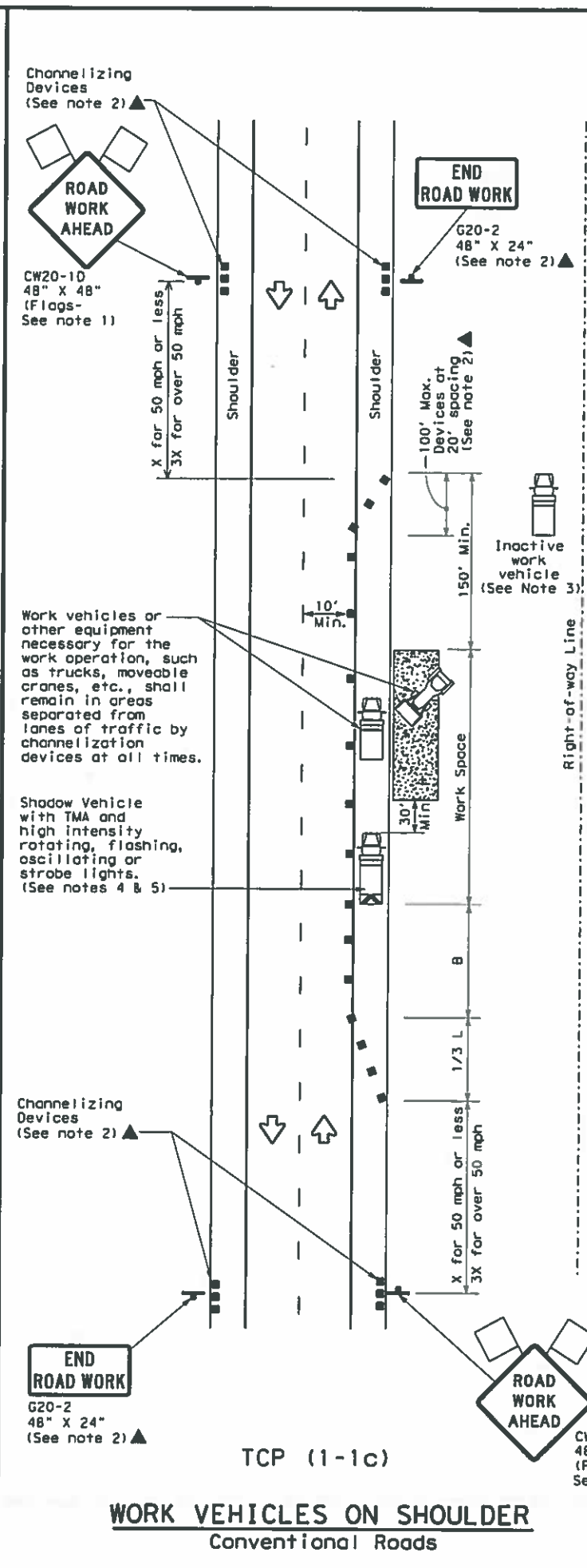
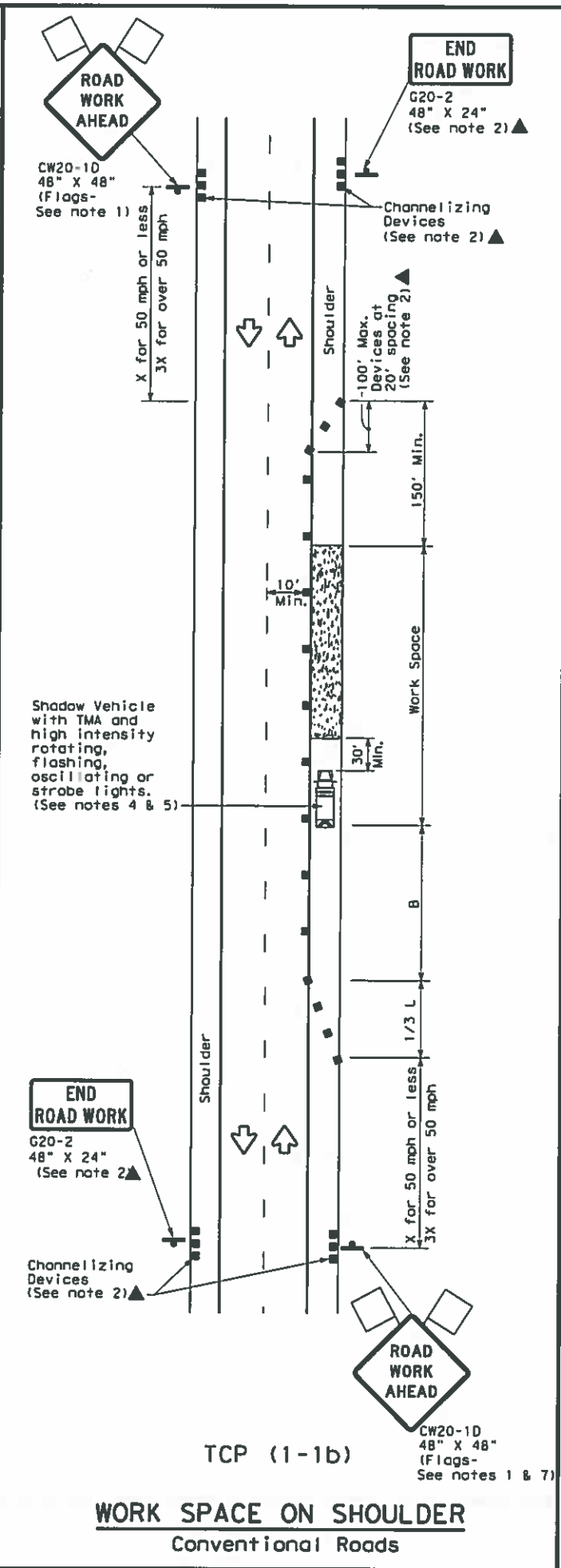
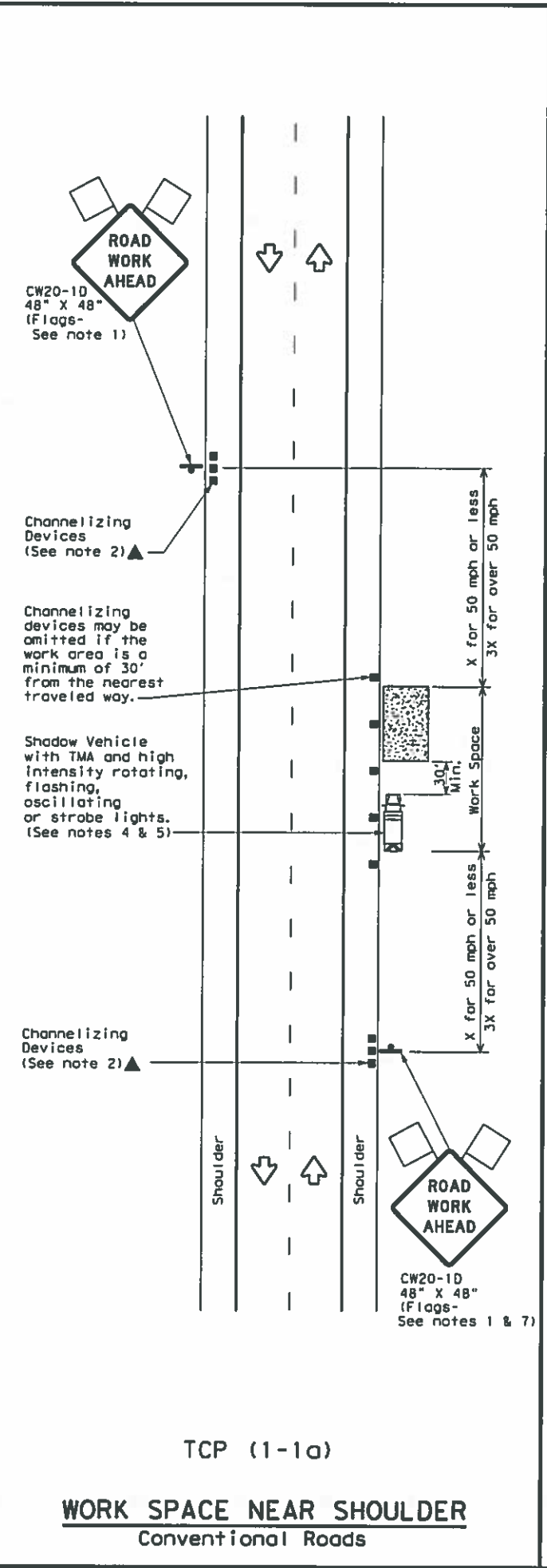
Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

FILE: bc-14.dgn	DR: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	700'	770'	840'	70'	140'	800'	475'	
75	750'	825'	900'	75'	150'	900'	540'	

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
  - See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
  - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-10 "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation  
 Traffic Operations Division Standard

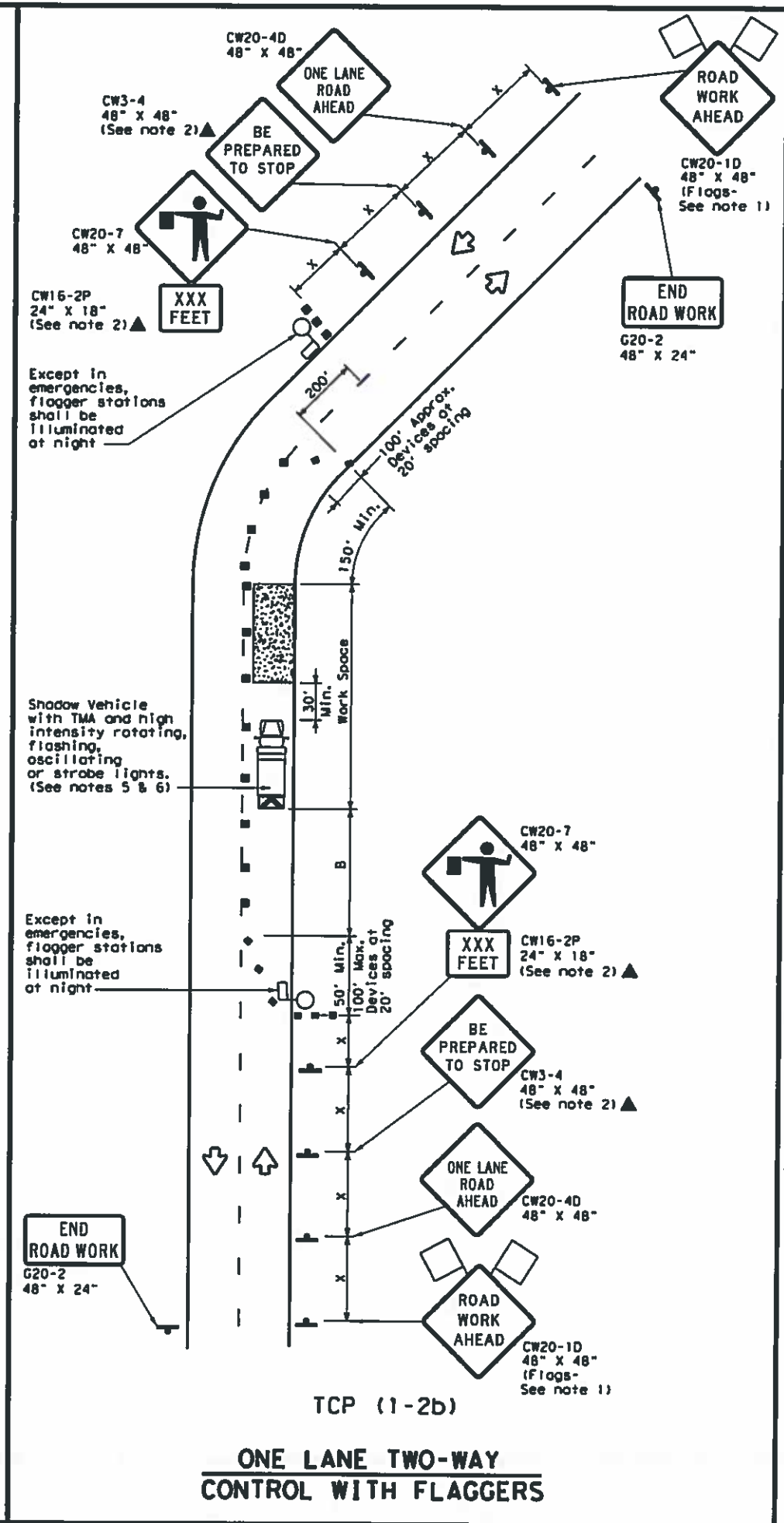
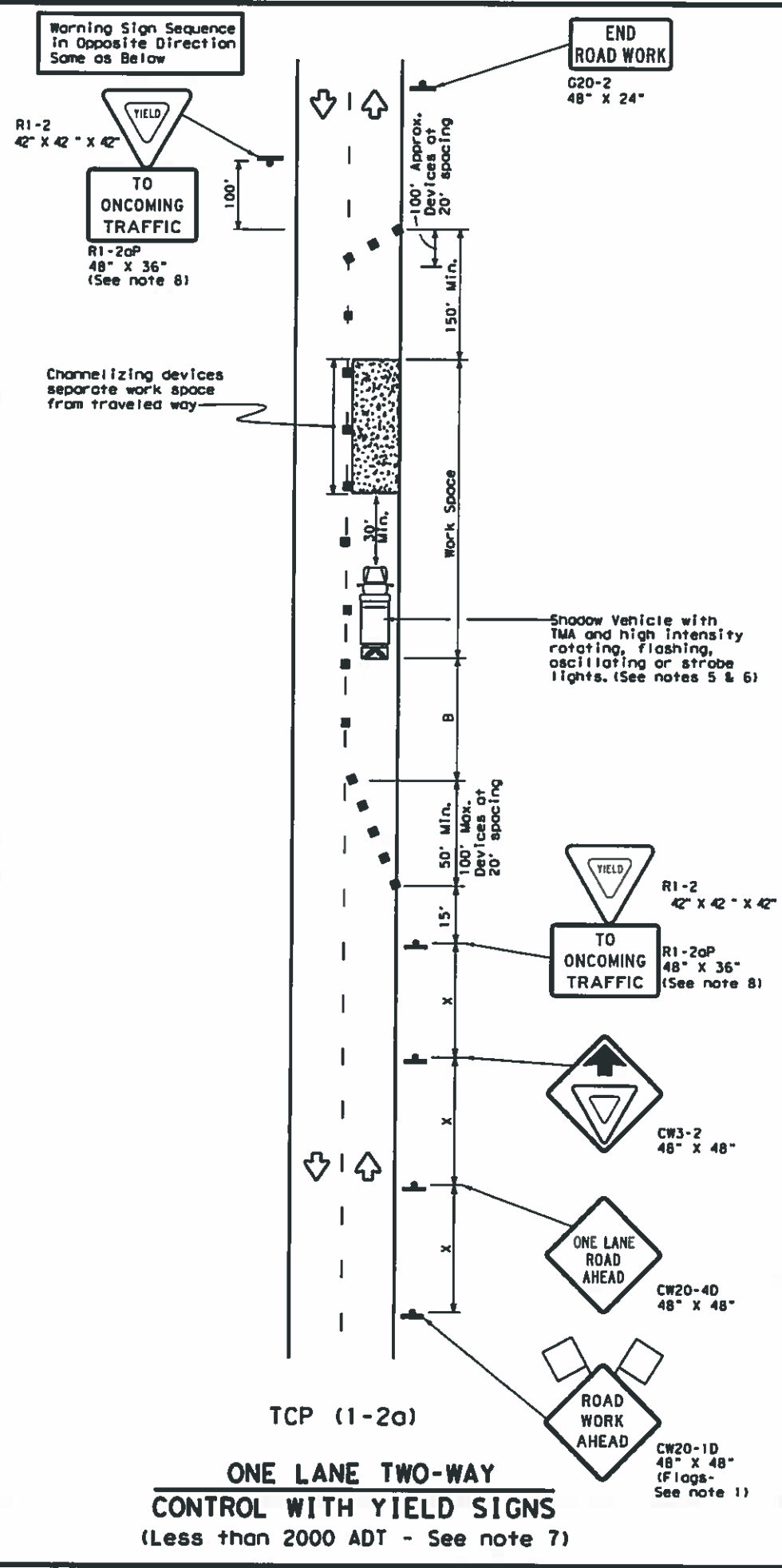
**TRAFFIC CONTROL PLAN**  
**CONVENTIONAL ROAD**  
**SHOULDER WORK**

**TCP (1-1) - 18**

FILE: tcp1-18.dgn	DW:	CR:	DR:	ER:
© 1-001 December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	6378	71	001	IH 45, ETC.
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	HOU	MONTGOMERY	18	
1-97 2-18				

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**LEGEND**

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flogger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing * Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70	700'	770'	840'	70'	140'	800'	475'	730'	
75	750'	825'	900'	75'	150'	900'	540'	820'	

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

**TYPICAL USAGE**

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

**GENERAL NOTES**

- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
  - Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flogger or R1-2 "YIELD" sign is less than 1500 feet.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- TCP (1-2a)**
- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
  - R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.
- TCP (1-2b)**
- Flaggers should use two-way radios or other methods of communication to control traffic.
  - Length of work space should be based on the ability of flaggers to communicate.
  - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flogger and a queue of stopped vehicles (see table above).
  - Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
  - Flaggers should use 24" STOP/SLOW paddies to control traffic. Flags should be limited to emergency situations.



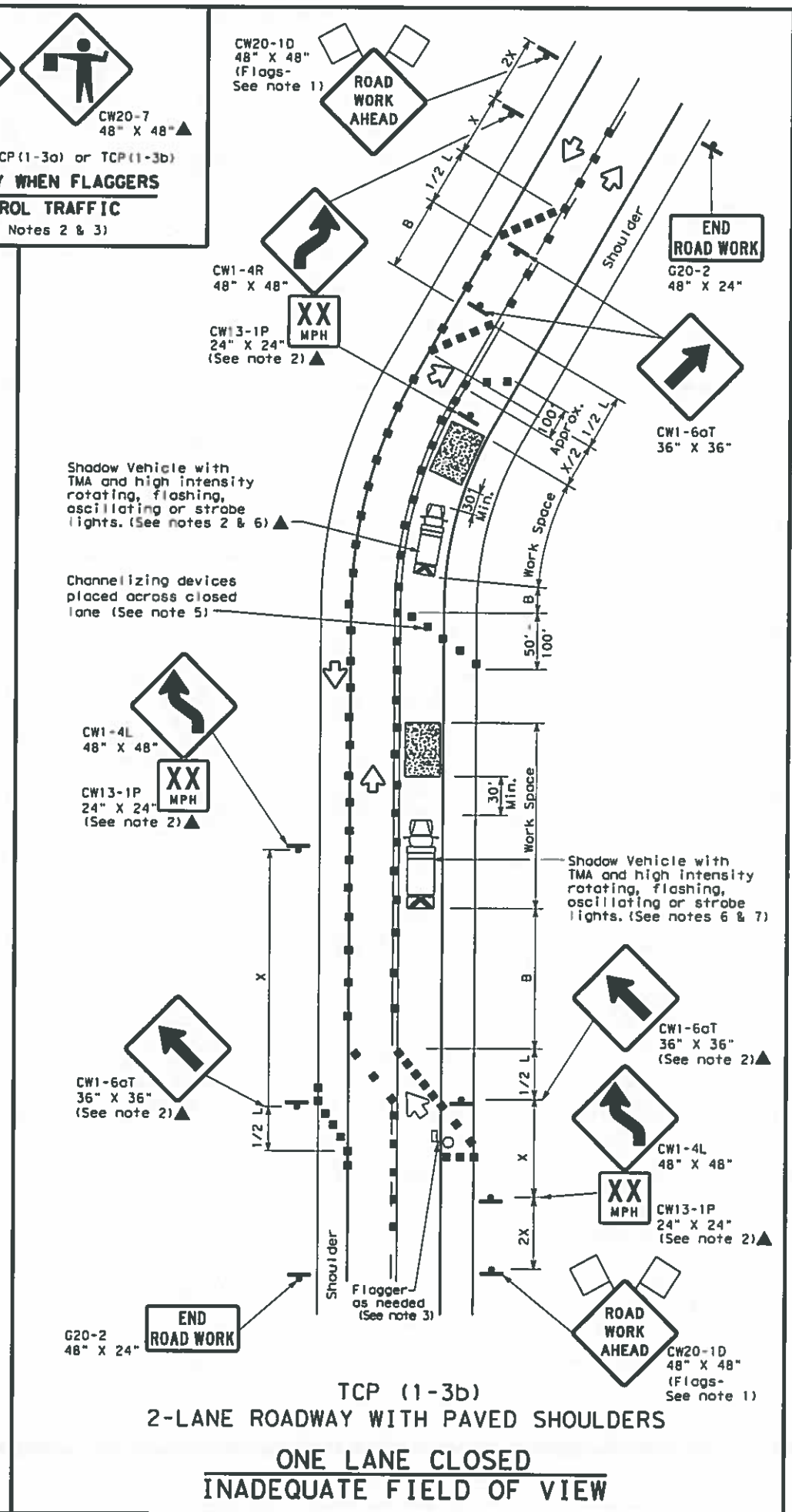
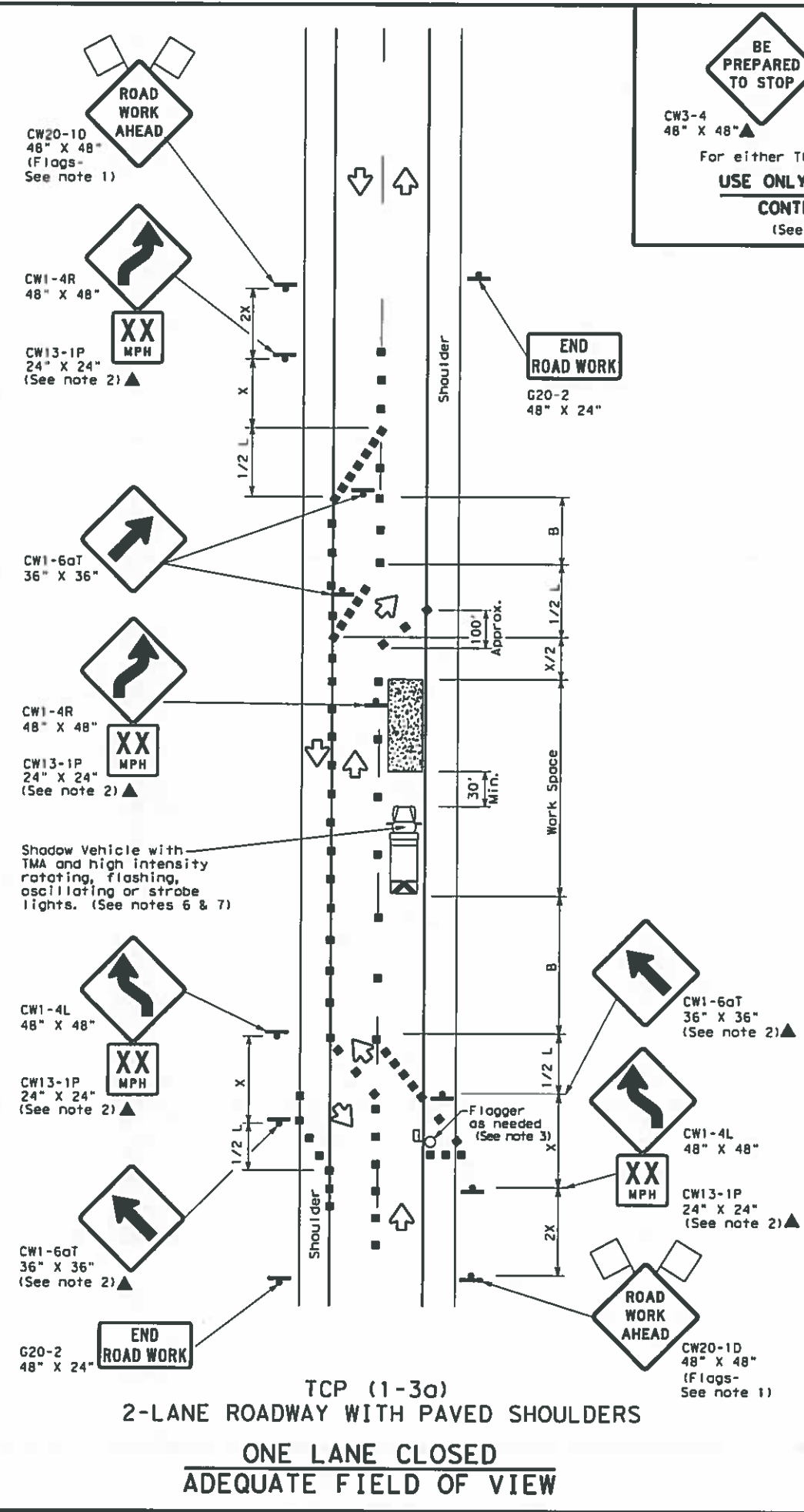
**TRAFFIC CONTROL PLAN**  
**ONE-LANE TWO-WAY**  
**TRAFFIC CONTROL**

**TCP (1-2) - 18**

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4-90 4-98	6378	71	001	IH 45, ETC.
2-94 2-12	DIST	COUNTY	SHEET NO.	
1-97 2-18	HOU	MONTGOMERY	19	

DATES: FILES:

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LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed * X	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40	L = WS	265'	295'	320'	40'	80'	240'	155'
45		450'	495'	540'	45'	90'	320'	195'
50	L = WS	500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60	L = WS	600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	L = WS	700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
  - DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
  - When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
  - Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the area of conflicting markings not the entire work zone.

**Texas Department of Transportation**  
Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN**  
**TRAFFIC SHIFTS ON**  
**TWO LANE ROADS**  
**TCP (1-3) - 18**

FILE: tcpl-3-18.dgn	DR: [ ]	CK: [ ]	DR: [ ]	CK: [ ]
© TxDOT December 1985	COM: [ ]	SECT: [ ]	JOB: [ ]	HIGHWAY: [ ]
REVISIONS		6378	71	001
2-94 4-98	8-95 2-12	DIST: [ ]	COUNTY: [ ]	SHEET NO. [ ]
1-97 2-18		HOU	MONTGOMERY	20

DATE: FILE:

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CW20-1D  
48" X 48"  
(Flags-  
See note 1)

x for 50 mph or less  
3x for over 50 mph

Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. (See notes 4 & 5)

END ROAD WORK  
G20-2  
48" X 24"

END ROAD WORK  
G20-2  
48" X 24"

RIGHT LANE CLOSED  
CW20-5TR  
48" X 48"

ROAD WORK AHEAD  
CW20-1D  
48" X 48"  
(Flags-  
See note 1)

TCP (1-4a)

ONE LANE CLOSED

CW20-1D  
48" X 48"  
(Flags-  
See note 1)

CW20-5TL  
48" X 48"

CW1-6aT  
36" X 36"

(See note 7)

Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. (See notes 4 & 5)

END ROAD WORK  
G20-2  
48" X 24"

END ROAD WORK  
G20-2  
48" X 24"

CW1-4R  
48" X 48"  
XX MPH

CW1-6aT  
36" X 36"  
(See note 2)

CW1-4L  
48" X 48"  
XX MPH  
CW13-1P  
24" X 24"  
(See note 2)

RIGHT LANE CLOSED  
CW20-5TR  
48" X 48"

ROAD WORK AHEAD  
CW20-1D  
48" X 48"  
(Flags-  
See note 1)

TCP (1-4b)

TWO LANES CLOSED

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths X'			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L=WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
\* Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

- Flags attached to signs where shown are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
- The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
- A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

- Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation  
Traffic Operations Division Standard

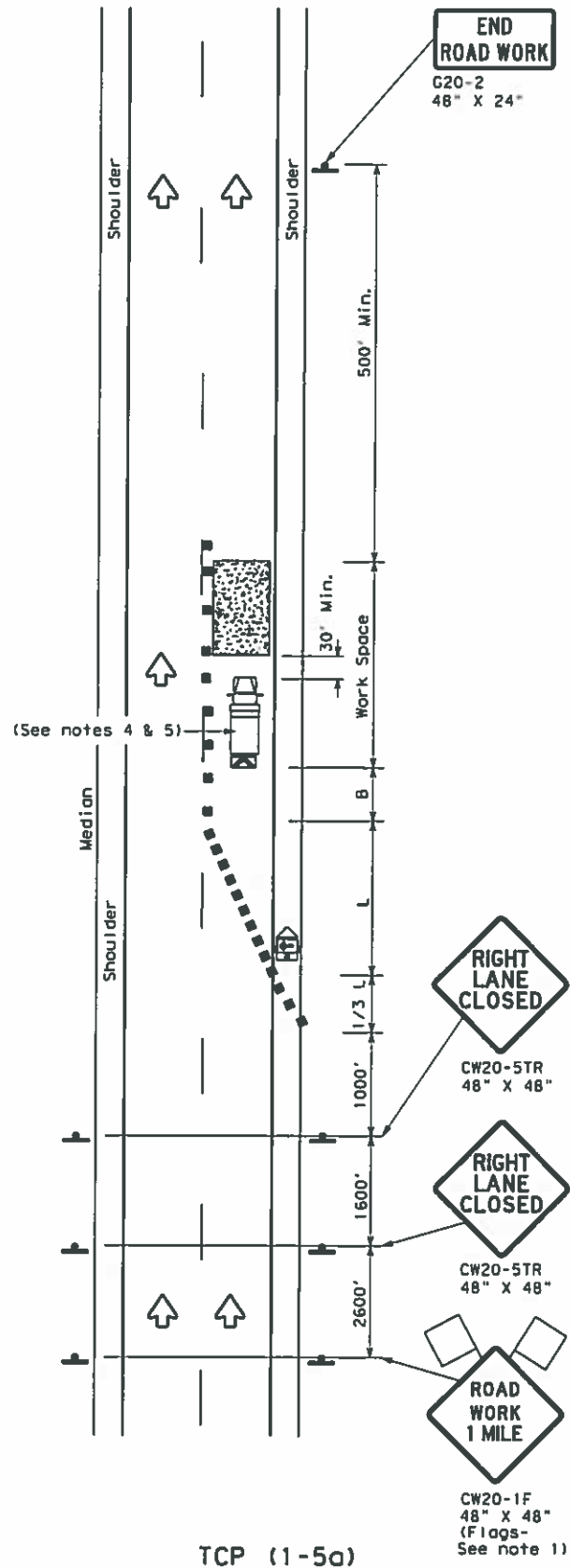
TRAFFIC CONTROL PLAN  
LANE CLOSURES ON MULTILANE  
CONVENTIONAL ROADS

TCP (1-4) - 18

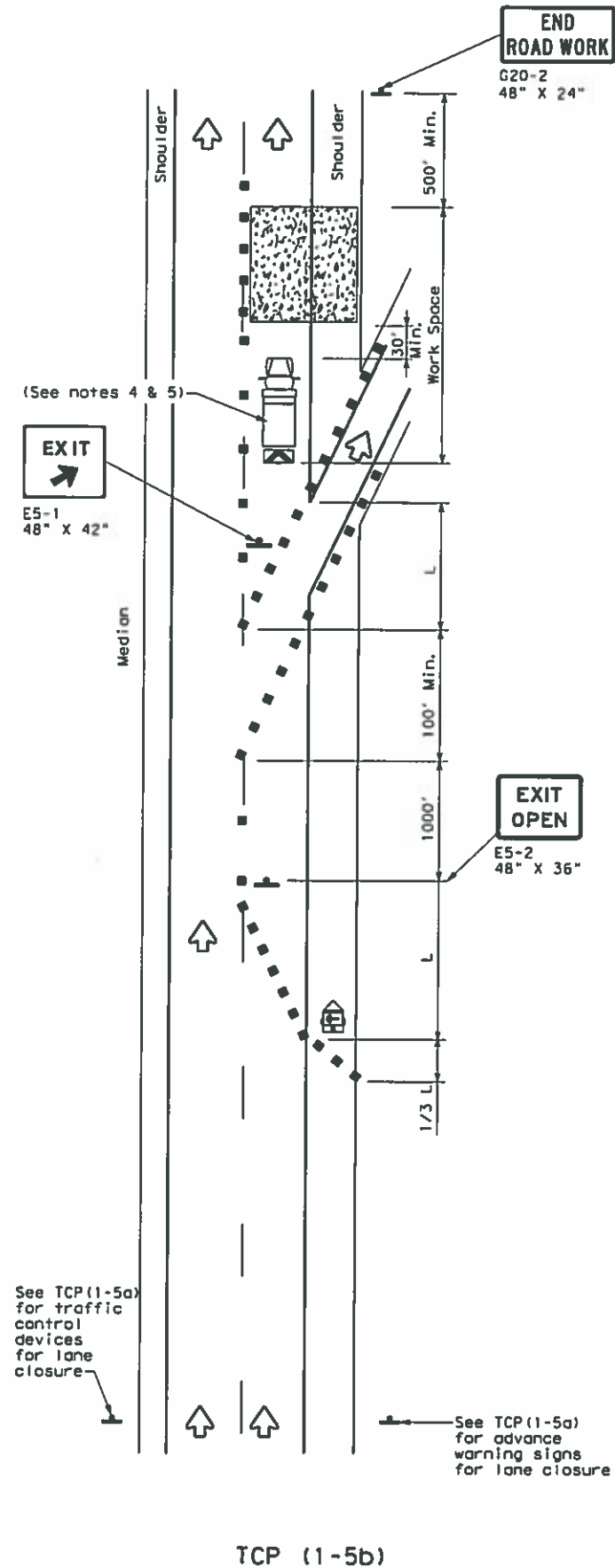
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©	TxDOT	December 1985	CON	SECT	JOB
2-94	4-98	8-95	2-12	1-97	2-18
REVISONS	6378	71	001	IH 45, ETC.	
DIST	COUNTY		SHEET NO.		
HOU	MONTGOMERY		21		

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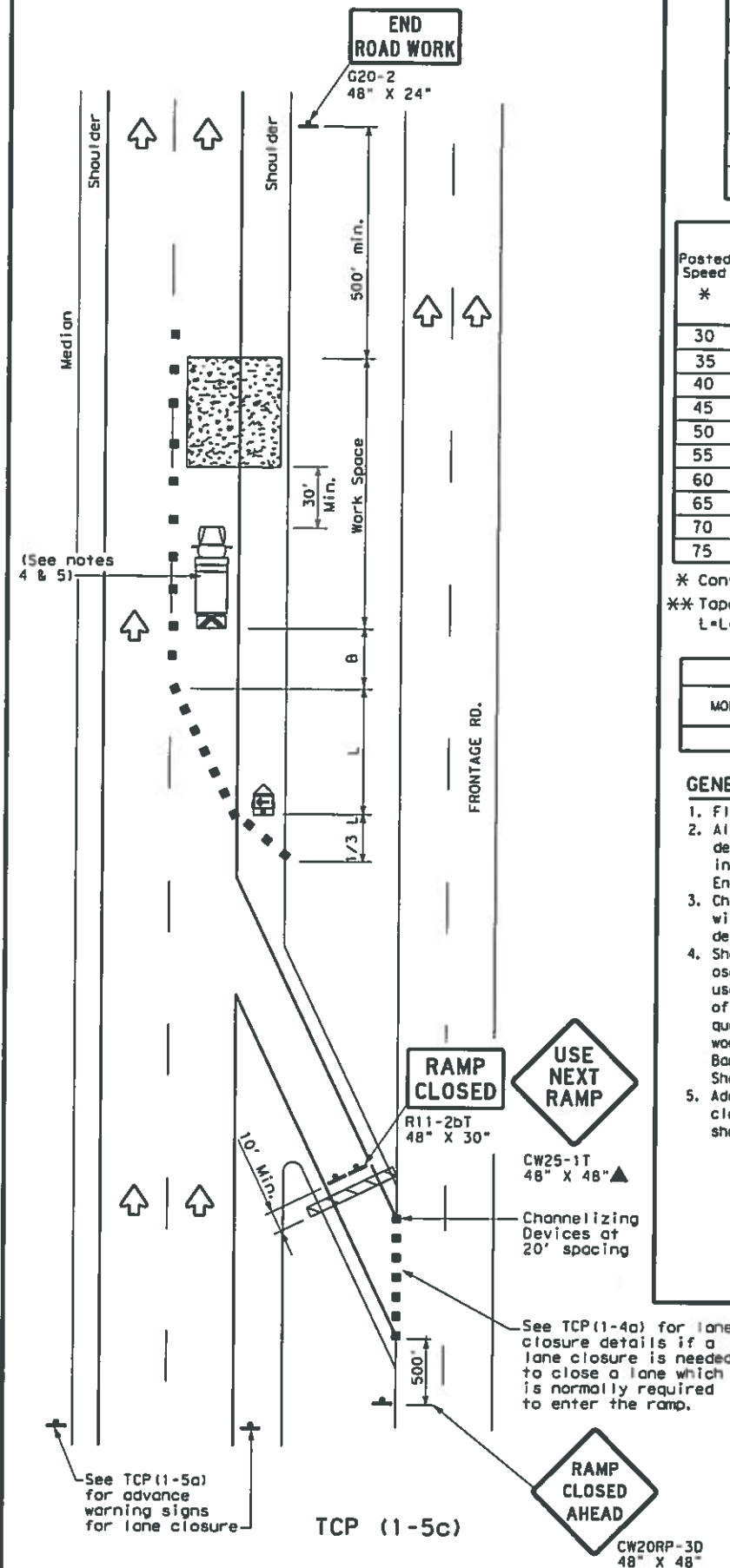
DATE: FILE:



TCP (1-5a) ONE LANE CLOSURE



TCP (1-5b) LANE CLOSURE NEAR EXIT RAMP



TCP (1-5c) LANE CLOSURE NEAR ENTRANCE RAMP

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing *x- Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
		✓		

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
  - Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation  
 Traffic Operations Division Standard

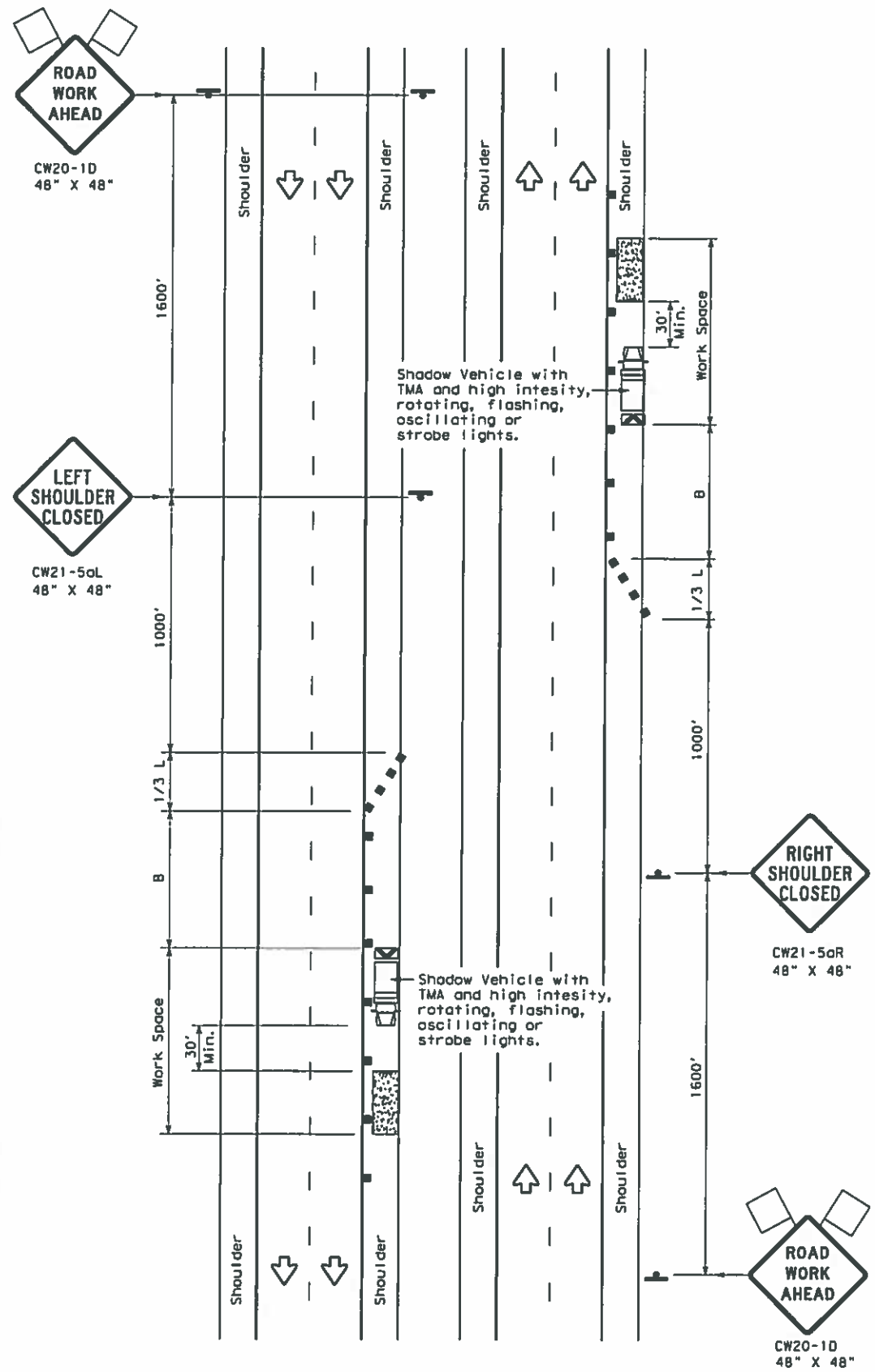
TRAFFIC CONTROL PLAN  
 LANE CLOSURES FOR  
 DIVIDED HIGHWAYS

TCP (1-5) - 18

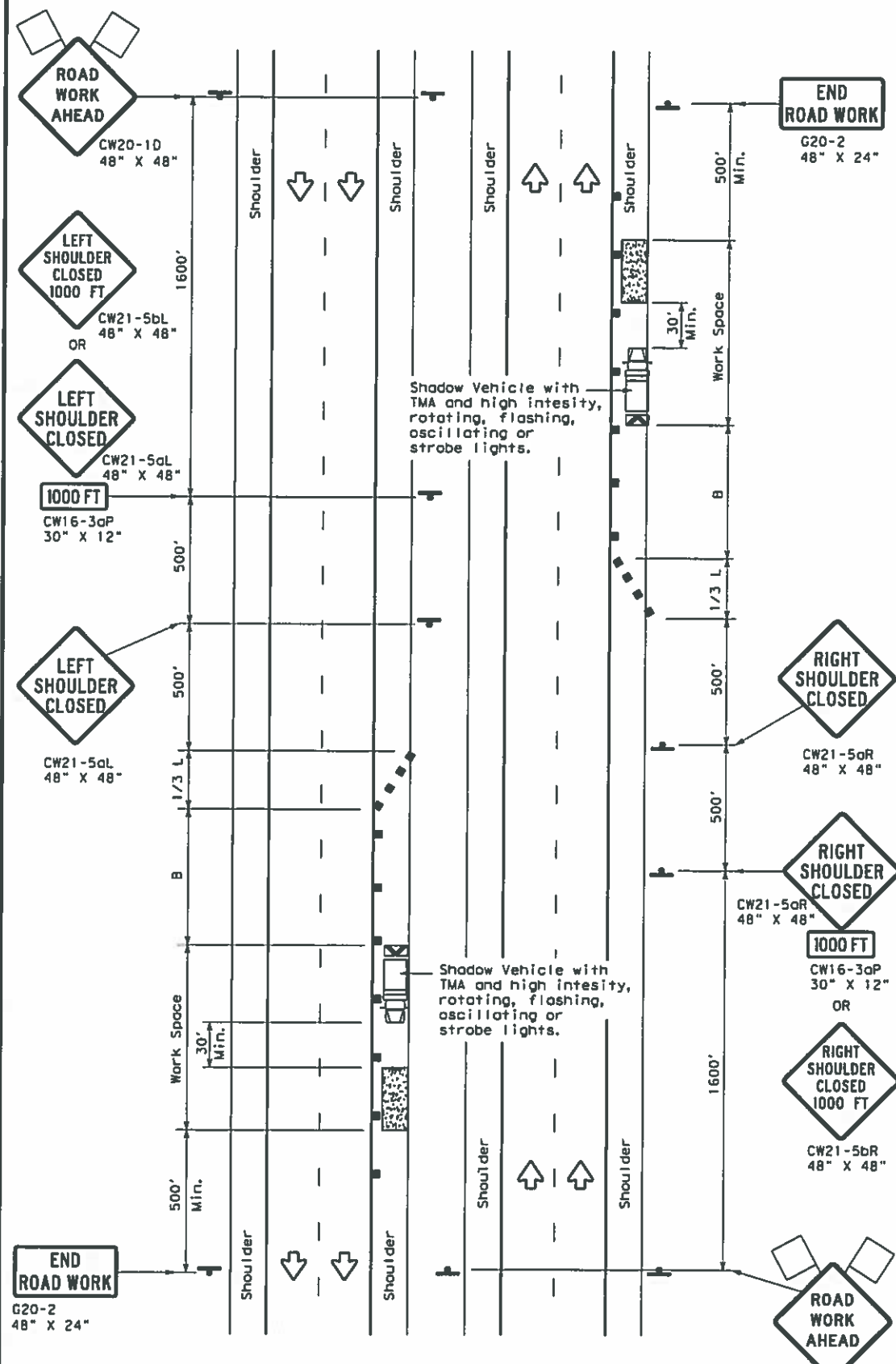
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2-18	REVISIONS	DIST: HOU	COUNTY: MONTGOMERY	SHEET NO.: 22	

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DATE: FILE:



TCP (5-1a)  
WORK AREA ON SHOULDER



TCP (5-1b)  
WORK AREA ON SHOULDER

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP (5-1a)	TCP (5-1b)	TCP (5-1b)	

- GENERAL NOTES**
1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
  2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

Texas Department of Transportation  
 Traffic Operations Division Standard

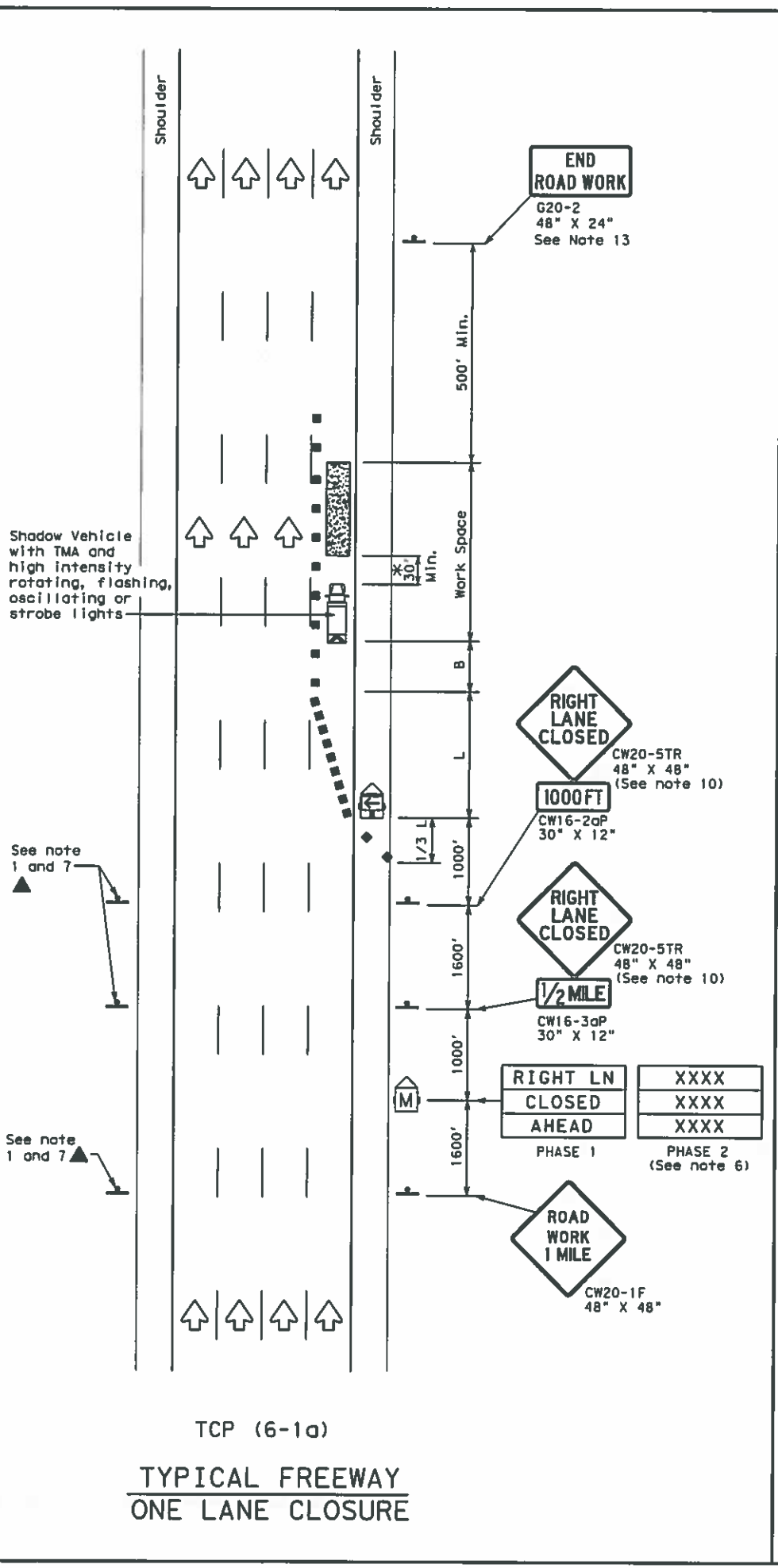
TRAFFIC CONTROL PLAN  
 SHOULDER WORK FOR  
 FREEWAYS / EXPRESSWAYS

TCP (5-1) - 18

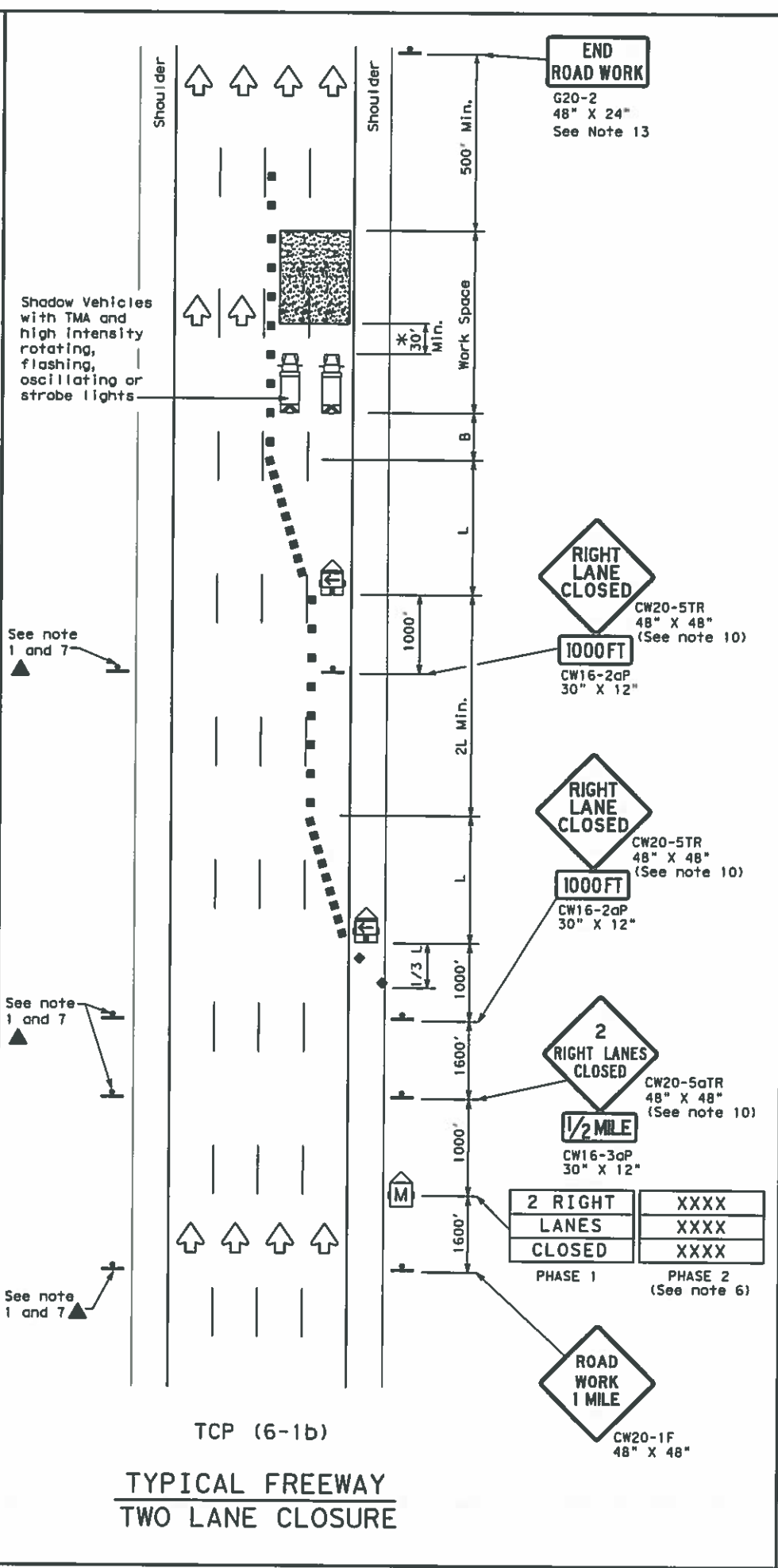
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© TxDOT	REVISIONS	8376	71	001
2-18	DIST: HOU	COUNTY: MONTGOMERY	SHEET NO.: 23	

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DATE: FILE:



TCP (6-1a)  
TYPICAL FREEWAY  
ONE LANE CLOSURE



TCP (6-1b)  
TYPICAL FREEWAY  
TWO LANE CLOSURE

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\*Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset(FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- Drums or 42" cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
- All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
- The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
- Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
- Phase 2 of the PCMS MESSAGE should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
- Duplicate construction warning signs should be erected on the median side of freeways where median width will permit and traffic volume justifies the signing.
- The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
- Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
- Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
- When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
- For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Texas Department of Transportation  
Traffic Operations Division Standard

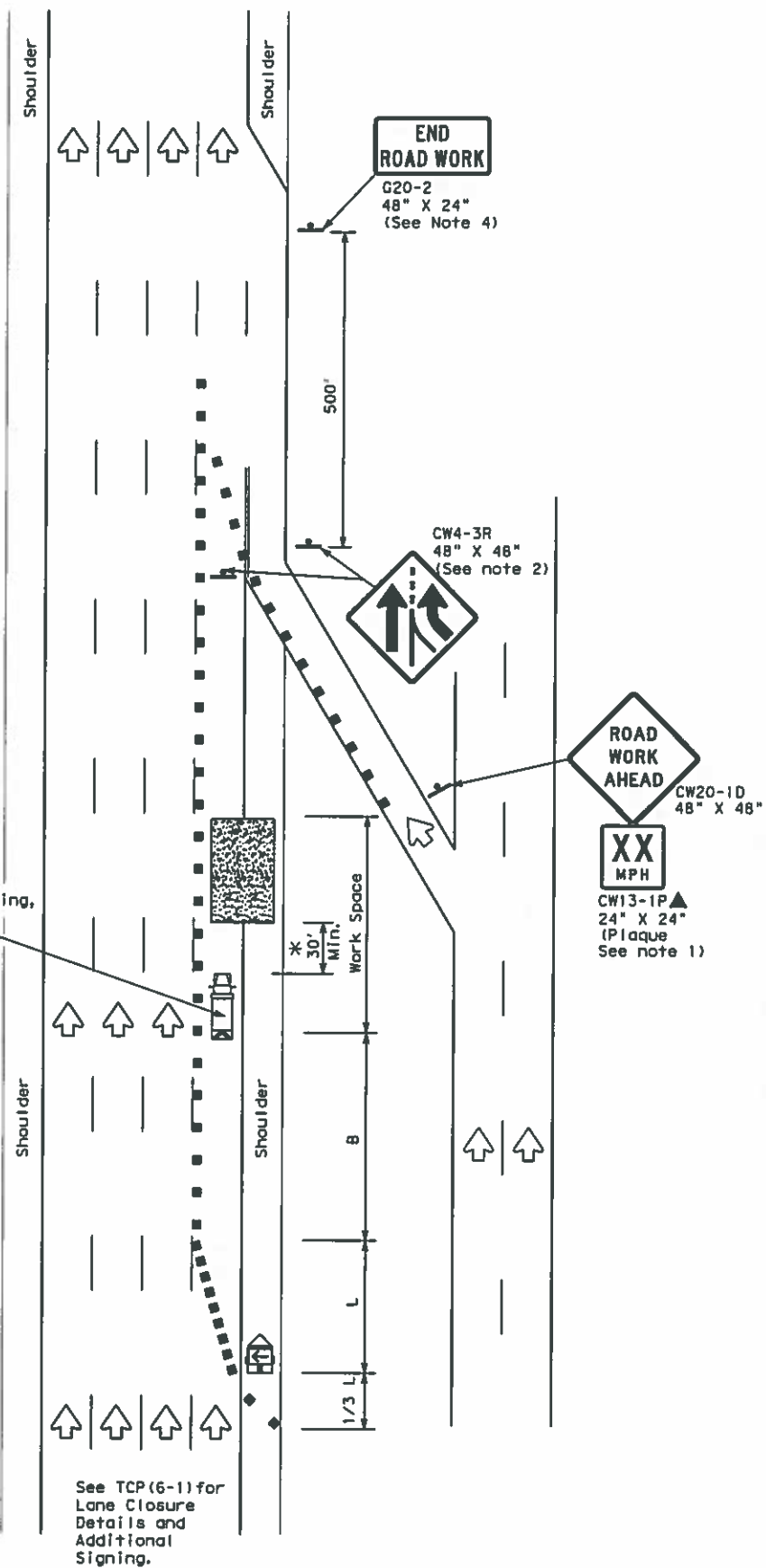
TRAFFIC CONTROL PLAN  
FREEWAY LANE CLOSURES

TCP (6-1)-12

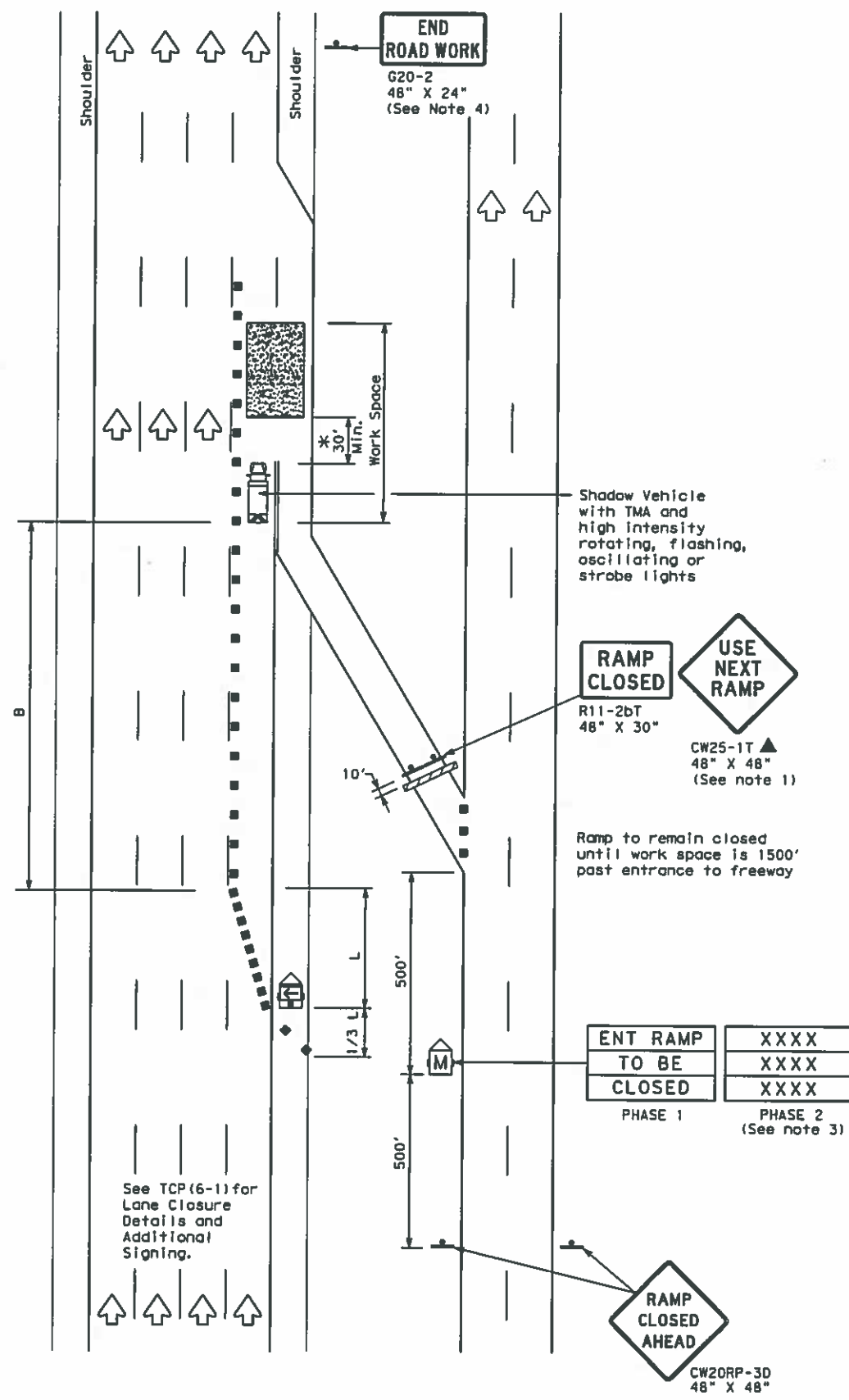
FILE: tcp6-1.dgn	DATE: TxDOT	BY: TxDOT	CHK: TxDOT	CR: TxDOT
©TxDOT February 1998	COM: SECT	JOB	HIGHWAY	
8-12	REVISIONS	6378 71	001	IH 45, ETC.
	DIST	COUNTY	SHEET NO.	
	HOU	MONTGOMERY	24	

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DATE: FILE:



TCP (6-2a)  
ENTRANCE RAMP OPEN  
WORK WITHIN 500' OF RAMP



TCP (6-2b)  
ENTRANCE RAMP CLOSED

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\*Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainline can be seen from both roadways.
- See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
Traffic Operations Division Standard

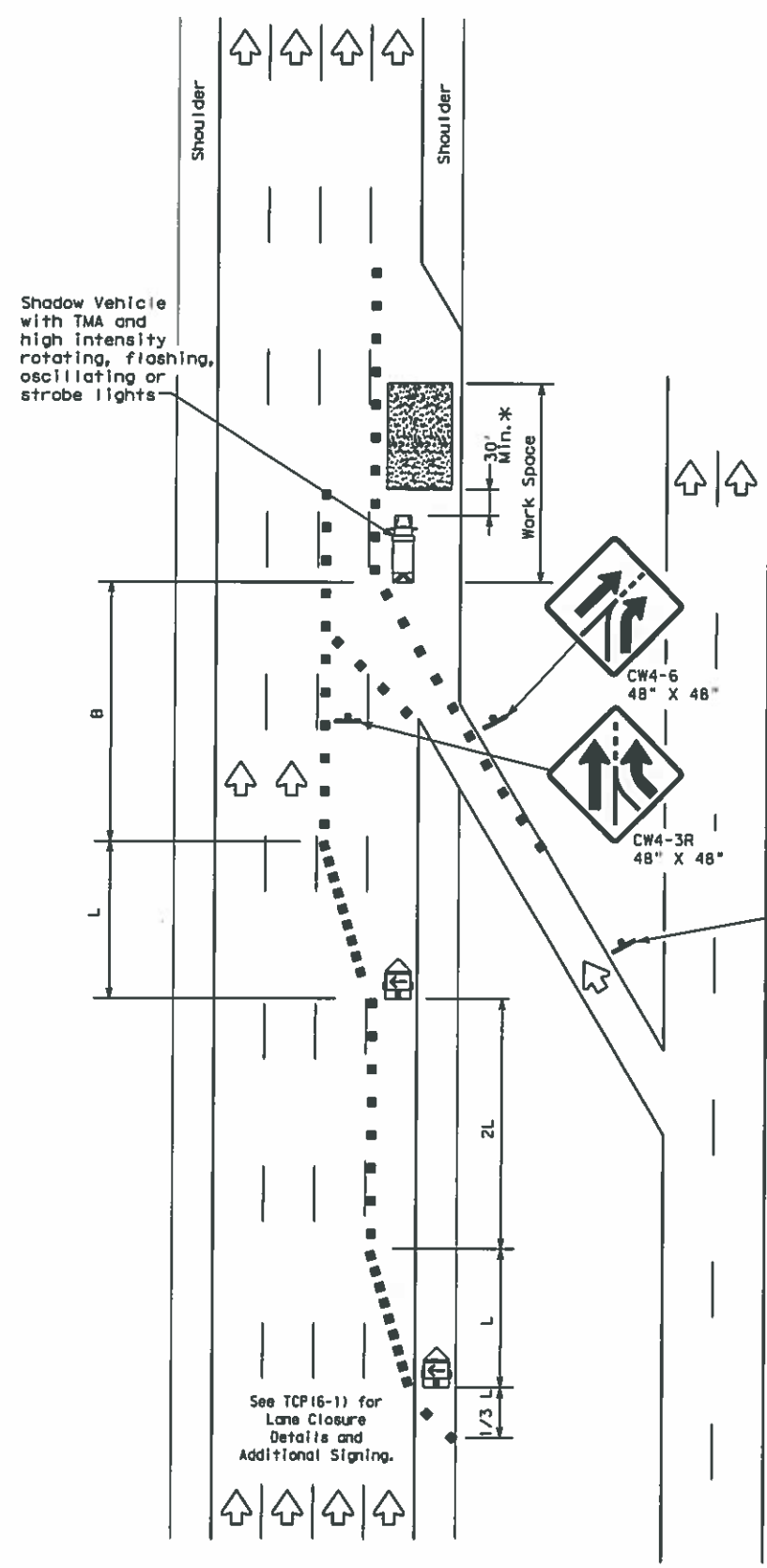
TRAFFIC CONTROL PLAN  
WORK AREA NEAR RAMP

TCP (6-2) - 12

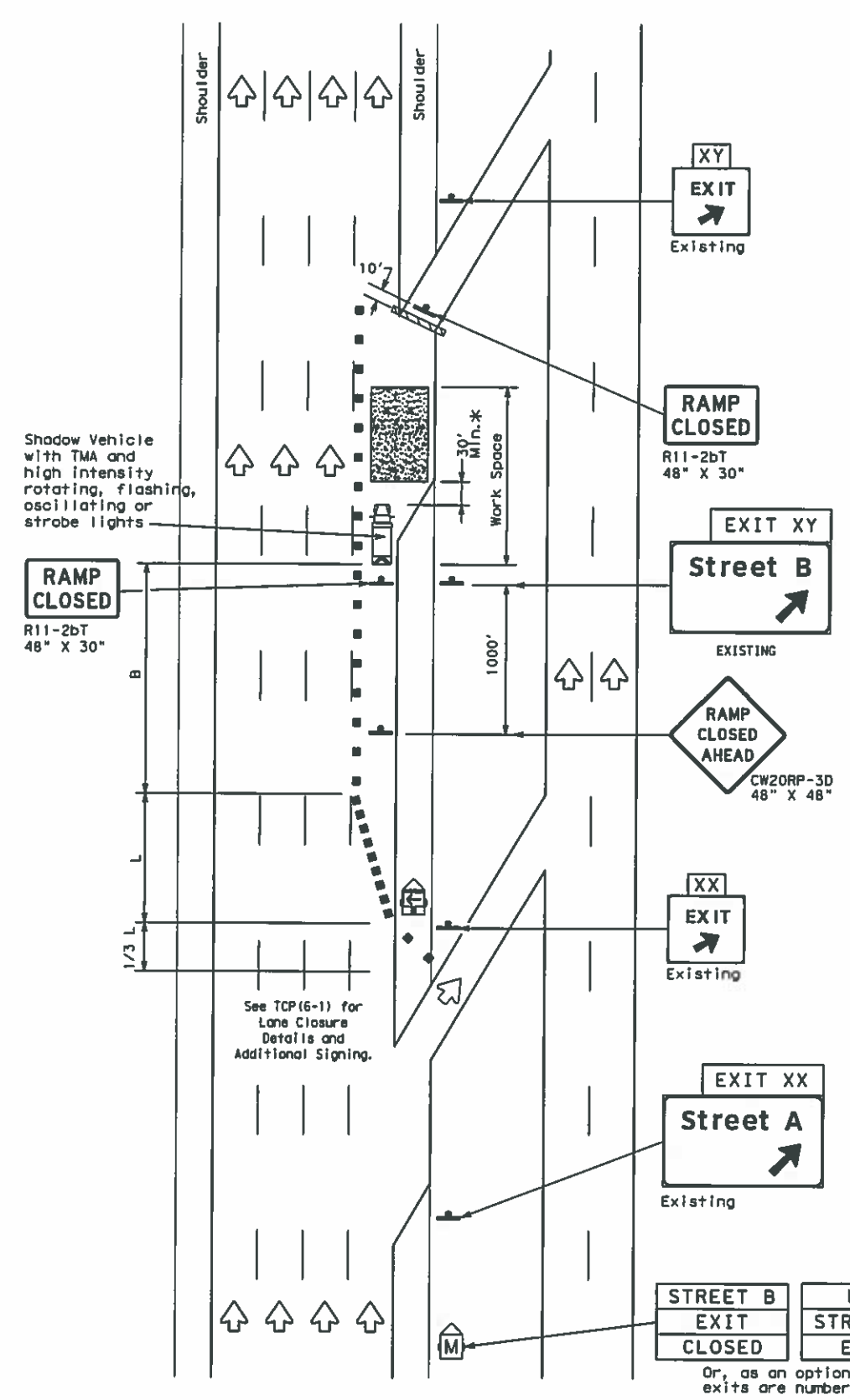
FILE: tcp6-2.dgn	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS				
1-97 8-98	6376	71	001	IH 45, ETC.
4-98 8-12	HOU	MONTGOMERY		SHEET NO. 25



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TCP (6-3a)  
ENTRANCE RAMP OPEN



TCP (6-3b)  
EXIT RAMP CLOSED  
TRAFFIC EXITS PRIOR TO CLOSED RAMP

STREET B EXIT CLOSED	USE STREET A EXIT
EXIT XY CLOSED	USE EXIT XX

Or, as an option when exits are numbered

Place 1 mile (approx.)  
in advance of Street A  
exit.

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\*Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES:  
1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
Traffic Operations Division Standard

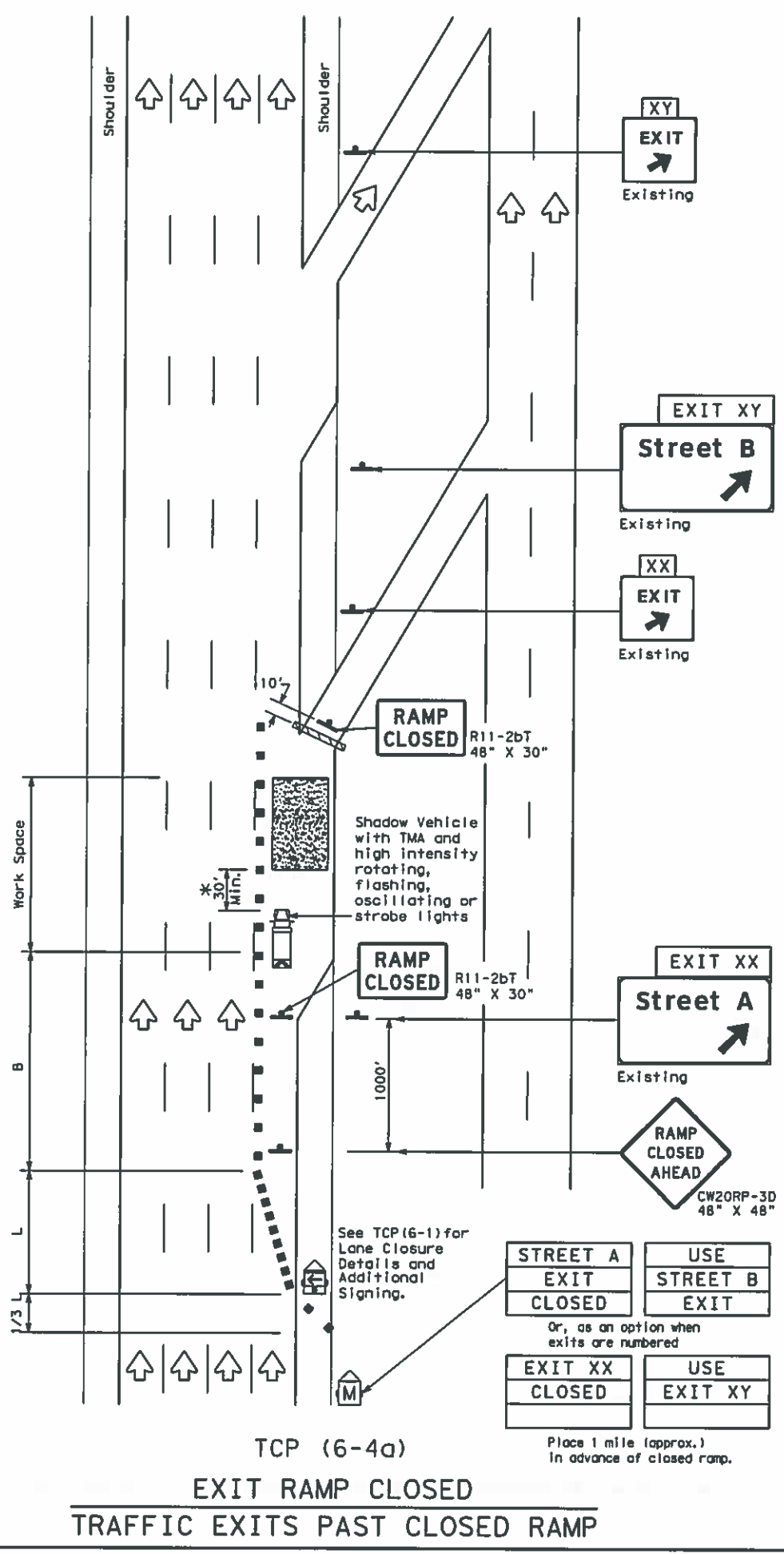
TRAFFIC CONTROL PLAN  
WORK AREA BEYOND RAMP

TCP (6-3) - 12

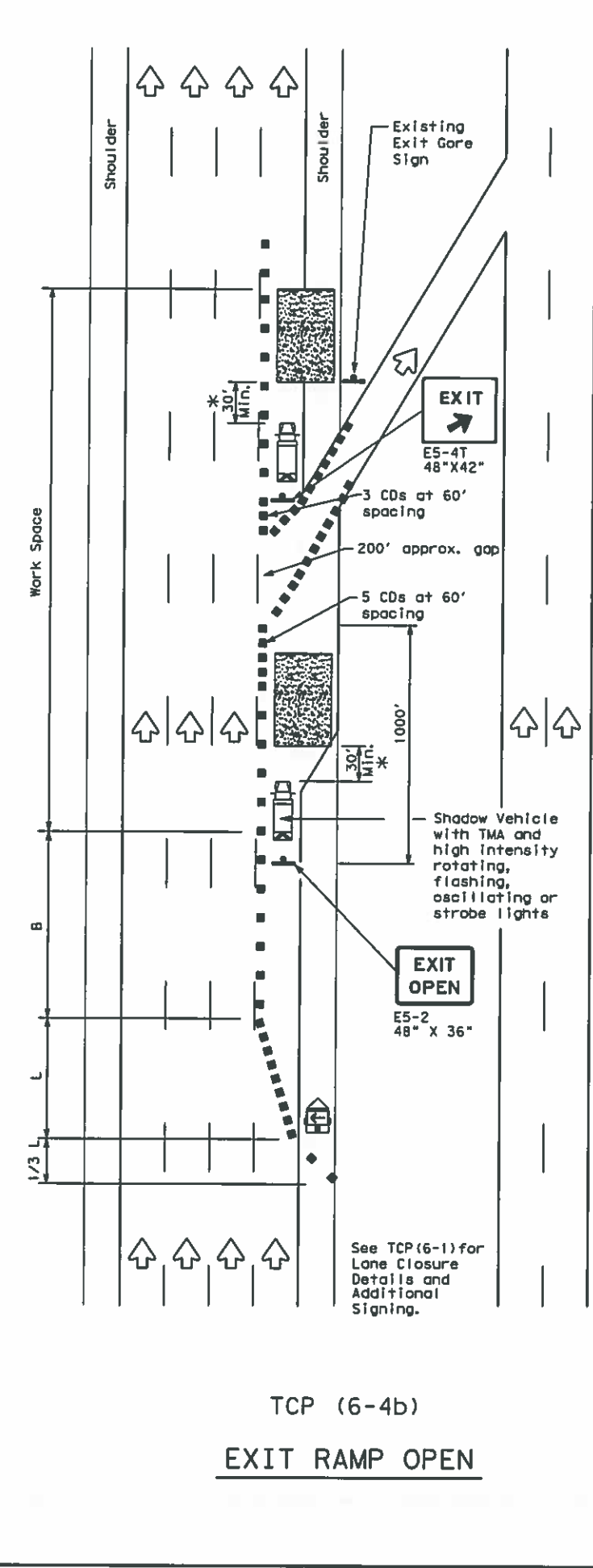
FILE: tcp6-3.dgn	DATE: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
©TxDOT February 1994	COM: SECT	JOB	HIGHWAY	
REVISIONS	6376	71	001	IH 45, ETC.
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	MONTGOMERY	26	

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DATE: FILE:



TCP (6-4a)  
EXIT RAMP CLOSED  
TRAFFIC EXITS PAST CLOSED RAMP



TCP (6-4b)  
EXIT RAMP OPEN

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

- GENERAL NOTES**
- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
  - See 8C Standards for sign details.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
Traffic Operations Division Standard

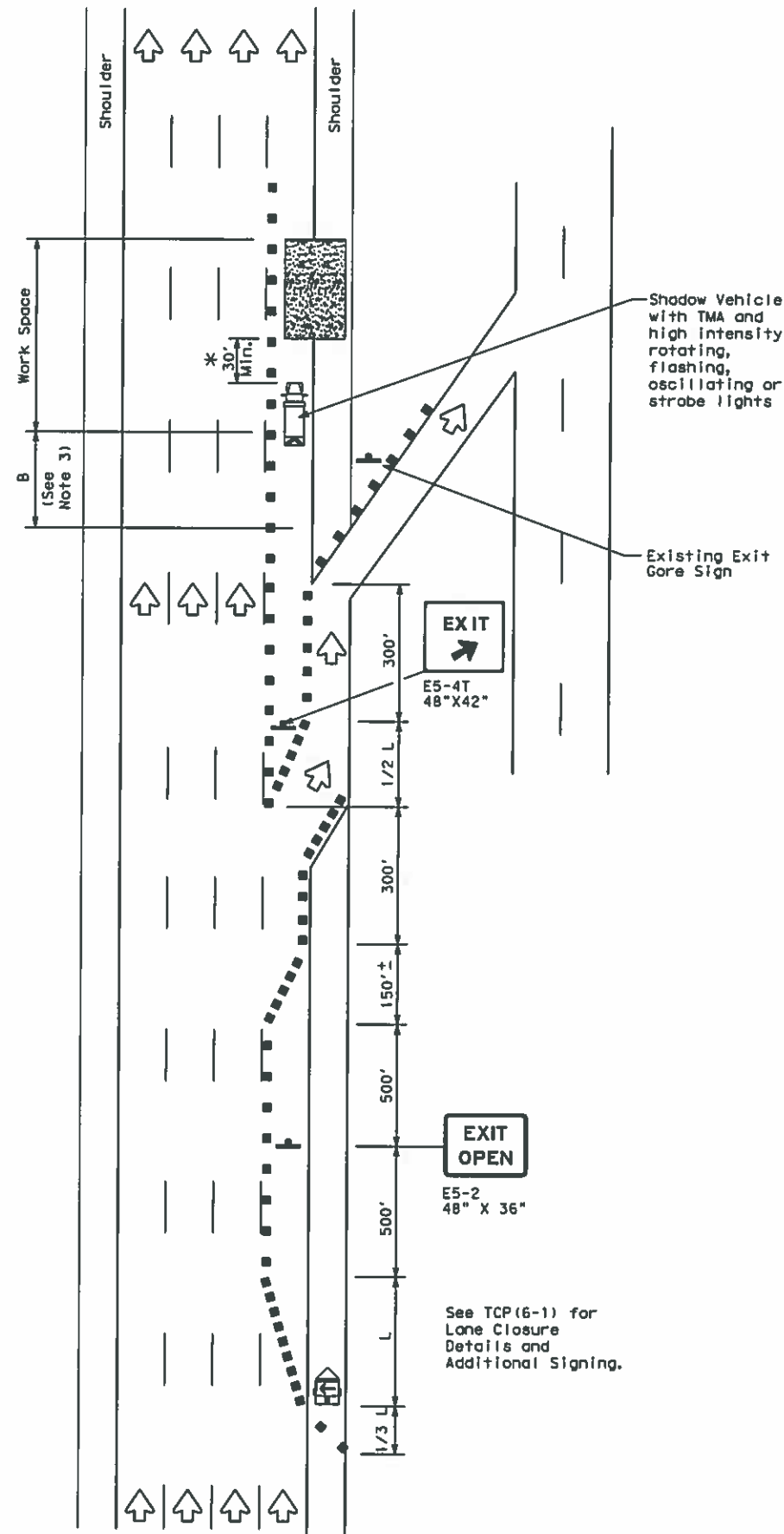
TRAFFIC CONTROL PLAN  
WORK AREA AT EXIT RAMP

TCP (6-4) - 12

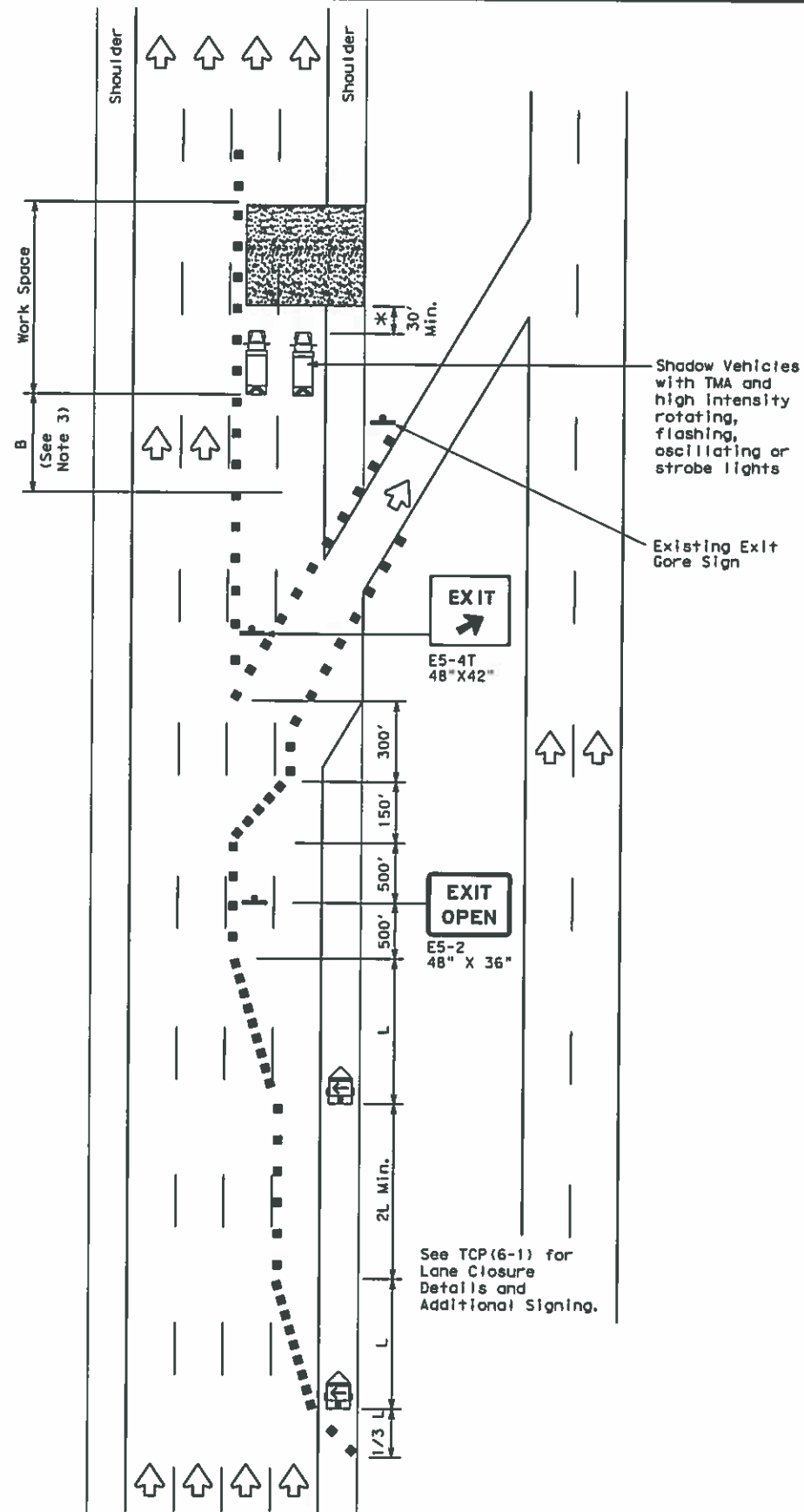
FILE: tcp6-4.dgn	DW: TxDOT	CR: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1994	CDMT	SECT	JOB	HIGHWAY
REVISIONS				
1-97 8-98	6376	71	001	IH 45, ETC.
4-98 8-12	DIST	COUNTY	SHEET NO.	
	HOU	MONTGOMERY	27	

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DATE:  
FILE:



TCP (6-5a)  
EXIT RAMP OPEN



TCP (6-5b)  
EXIT RAMP OPEN  
TWO LANE CLOSURE WITHIN  
1500' PAST EXIT RAMP

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- See BC standards for sign details.
- If adequate longitudinal buffer length "B" does not exist between the work space and the exit ramp, consideration should be given to closing the ramp.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation  
Traffic Operations Division Standard

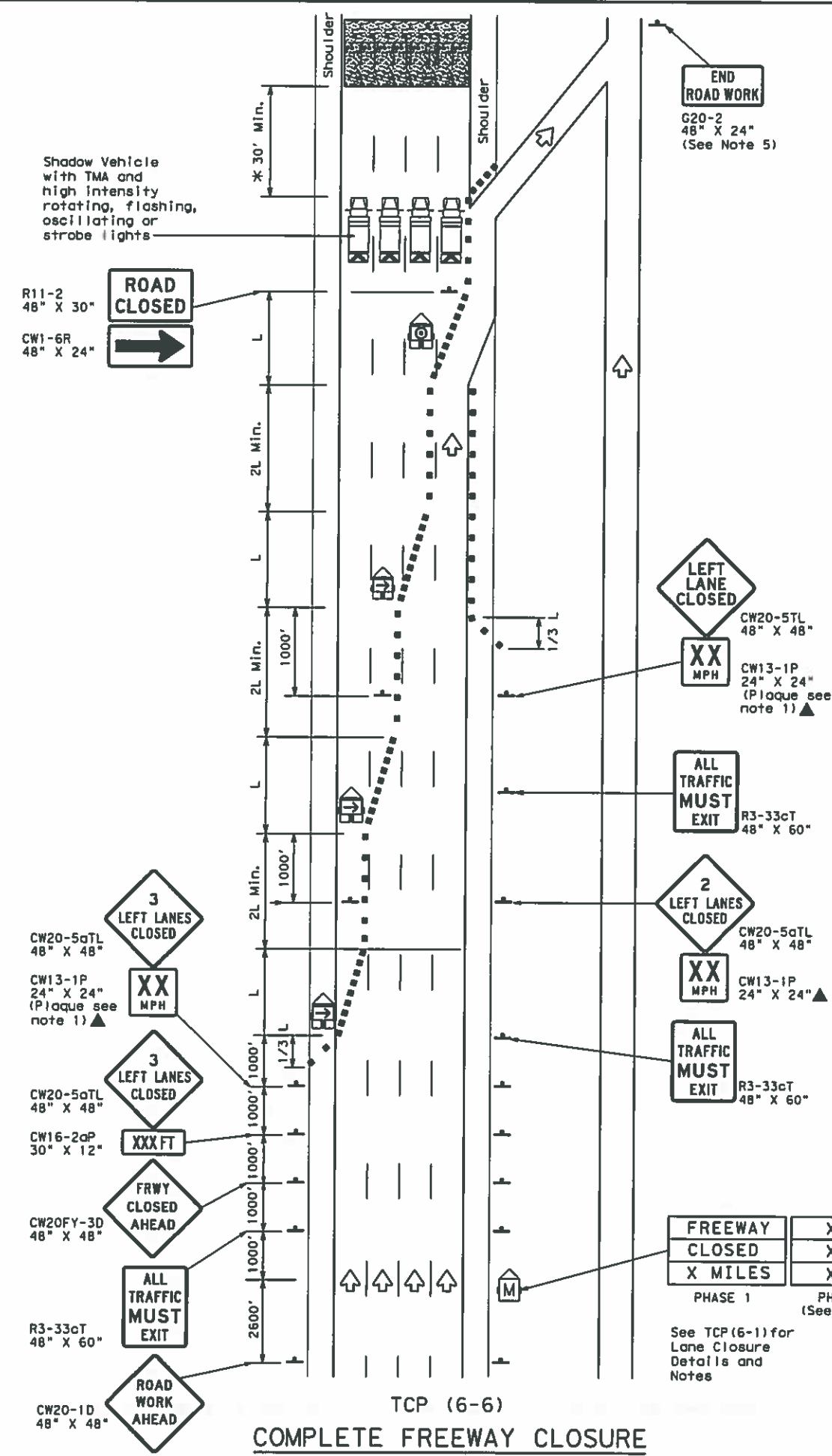
TRAFFIC CONTROL PLAN  
WORK AREA BEYOND EXIT RAMP

TCP (6-5) - 12

FILE: tcp6-5.dgn	DN: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
© TxDOT February 1998	CDM	SECT	JOB	HIGHWAY
REVISIONS	6376	71	001	IH 45, ETC.
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	HOU	MONTGOMERY	28	

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DATE: FILE:



LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Flashing Arrow Board in Caution Mode		Traffic Flow
	Sign		

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\*Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

GENERAL NOTES

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE RIGHT," recommended speed, delay, exit information, or other specific warnings.
- Where queuing is anticipated beyond signing shown, additional PCMS signs, other warning signs, devices or Law Enforcement Officers should be available to warn approaching high speed traffic of the end of the queue, as directed by the Engineer.
- Entrance ramps located from the advance warning area to the exit ramp should be closed whenever possible.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\*A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

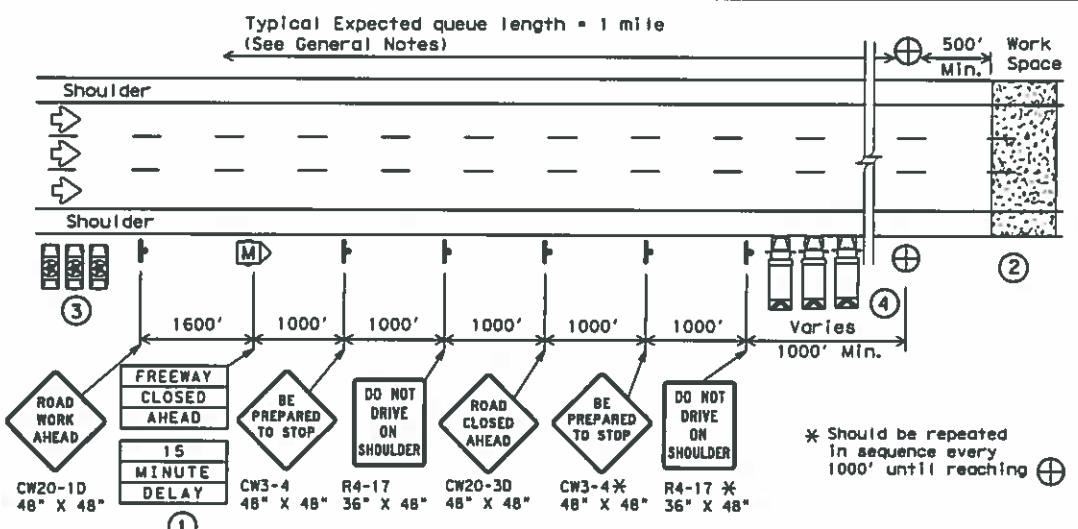


TRAFFIC CONTROL PLAN  
FREEWAY CLOSURE

TCP (6-6) - 12

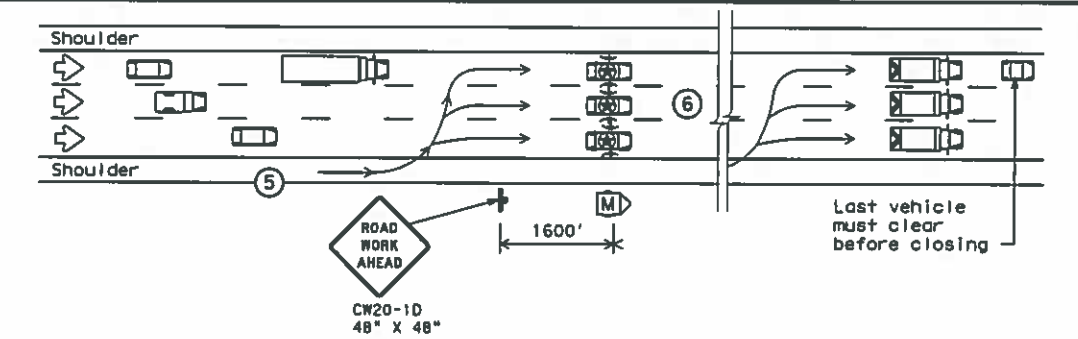
FILE: tcp6-6.dgn	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT	DATE: TxDOT
©TxDOT February 1994	COM: 6376	SECT: 71	JOB: 001	HIGHWAY: IH 45, ETC.
REVISIONS	DIST: 1-97 8-98	COUNTY: 4-98 8-12	SHEET NO.:	
	HOU	MONTGOMERY		29

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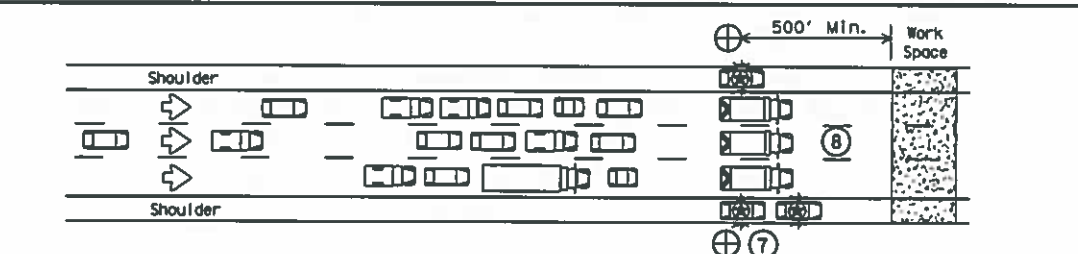
### 1 STARTING POSITION

- ① Traffic control devices should be installed or located near their intended position prior to beginning temporary roadway closure sequence. Duplicate signs should be erected on the median side of the roadway when median width permits. Warning signs should not be placed on the paved shoulders that will be used by the WARNING LEOV, or where movement of the LEOVs or barrier vehicles will be impeded.
- ② Prior to beginning the roadway closure sequence, all equipment, materials, personnel, and other items necessary to complete the work should be gathered near the work area. Entrance ramps located in the area where a queue is expected to build should be closed.
- ③ There should be one LEOV for every lane to be controlled, plus a minimum of one to warn traffic approaching a queue. An additional lead law enforcement officer is desirable to remain with the Engineer's or Contractor's point of contact (POC) during the operation in order to improve communication with all LEOVs involved.
- ④ One barrier vehicle with a Truck Mounted Attenuator and amber or blue and amber high intensity flashing/oscillating/strobe lighting shall be used for each lane to be closed.



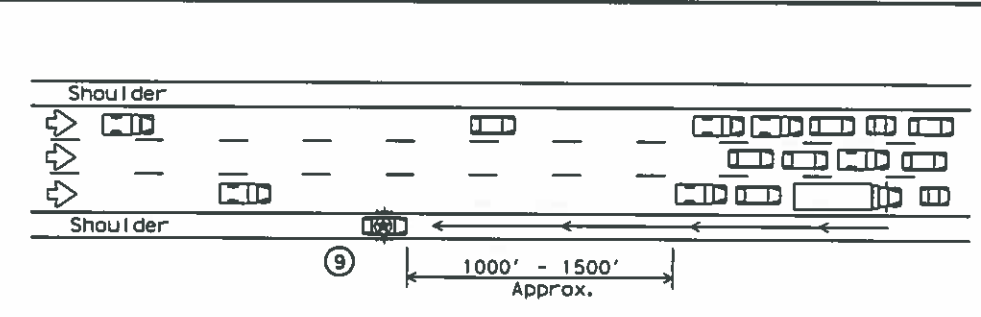
### 2 REDUCING SPEED OPERATION

- ⑤ Starting position of the LEOVs should be in advance of the most distant warning signs.
- ⑥ Once the LEOVs have achieved an abreast blocking formation while traveling toward the CP, emergency lights and headlights should be turned "ON". The LEOVs should maintain formation, not allow traffic to pass, and begin to decelerate. The LEOVs should continue to decelerate, giving the barrier vehicles opportunity to be staged upstream of the work space after traffic has cleared. The LEOVs should then continue to decelerate slowly until bringing traffic to a stop near the barrier vehicles.



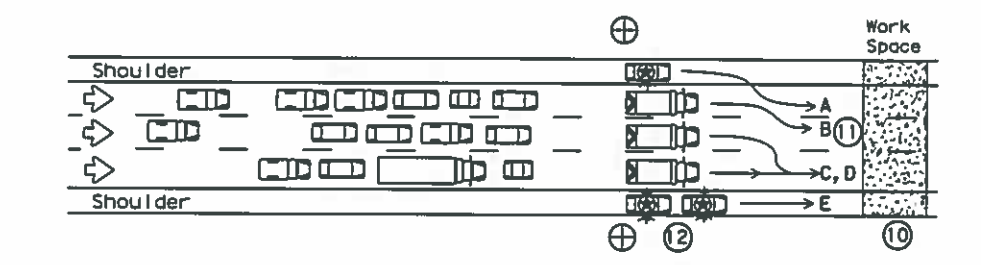
### 3 ALL TRAFFIC STOPPED AT CP

- ⑦ Once traffic is stopped the LEOVs should park on the shoulders with emergency lighting "ON" in order to provide law enforcement presence at the closure and keep shoulders blocked ahead of the work space. They should stay in radio contact with the WARNING LEOV.
- ⑧ The barrier vehicles should be parked, one in each lane, the parking brake set, with the high visibility flashing/oscillating/strobe lighting "ON," and the transmission in gear.



### 4 WARNING THE TRAFFIC QUEUE

- ⑨ The WARNING LEOV should proceed to the right shoulder of the roadway, with emergency lights on approximately 1000' in advance of the traffic queue (stopped traffic) as the queue develops. When determined that limited sight distance situations (crest of hills, sharp roadway curvature, etc.) may occur to motorists approaching the queue, the WARNING LEOV may proceed 1/4 mile or more in advance of the queue.



### 5 RELEASING STOPPED TRAFFIC

- ⑩ All equipment, materials, personnel, and other items should be removed from the roadway and maintain an adequate clear zone.
- ⑪ When the roadway is clear for traffic, the LEOV should proceed forward from the left shoulder followed by the barrier vehicles, from left to right, as shown alphabetically in the plan view.
- ⑫ The LEOV or LEOVs on the right shoulder may remain on the shoulder until satisfied that traffic is moving satisfactorily before merging or proceeding.
- ⑬ LEOVs and barrier vehicles should re-group at their respective starting positions if necessary.

LEGEND			
■	Channelizing Devices	⊕	Control Position (CP)
M	Portable Changeable Message Sign (PCMS)	⊠	Barrier Vehicle with Truck Mounted Attenuator
Ⓜ	Law Enforcement Officer's Vehicle (LEOV)	←	Traffic Flow

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓			

### GENERAL NOTES

1. All traffic control devices shall conform with the latest edition of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). Additional guidelines for traffic control devices may be found in the TMUTCD. Signs conflicting with the roadway closure sequence should be completely removed or covered. Additional traffic control devices may be required for closure of access roads, cross streets, exit and entrance ramps as directed by the Engineer.
2. Law enforcement officers and all workers involved should review and understand all procedures before the roadway closure sequence begins. Pre-work meetings may be held for this purpose. Local emergency services and media should have advance notification of roadway closure, expected dates and approximate times of closures.
3. Law enforcement officers shall be in uniform and have jurisdiction in the locale of the work area. An additional WARNING Law Enforcement Officer's Vehicle (LEOV) may be used on the median side of the roadway where median shoulder width permits (See sequence #9).
4. The roadway closure should be during off-peak hours, as shown in the plans, or as directed by the Engineer.
5. Work should be limited to approximately 15 minutes maximum duration unless otherwise directed by the Engineer based on existing roadway conditions. If the work is not complete within 15 minutes, or if the end of the traffic queue extends past the most distant advance warning signs, the work area should be cleared of all equipment, materials, personnel, and other items, and the roadway reopened. When the queue has dissipated and the traffic flow appears normal the roadway closure sequence may be repeated.
6. For traffic volumes greater than 1000 Passenger Cars Per Hour Per Lane (PCPHPL), or for roadway closures that exceed 15 minutes, see details elsewhere in the plan.
7. If traffic queues beyond the advance warning signs during one road closure sequence, the advance warning should be extended prior to repeating the road closure sequence. When possible, PCMS signs should be located in advance of the last available exit prior to the closure to allow motorists the choice of an alternate route.

THIS PLAN IS INTENDED TO BE USED AT LOCATIONS/TIMES WHEN TRAFFIC VOLUMES ARE LESS THAN 1000 PASSENGER CARS PER HOUR PER LANE.



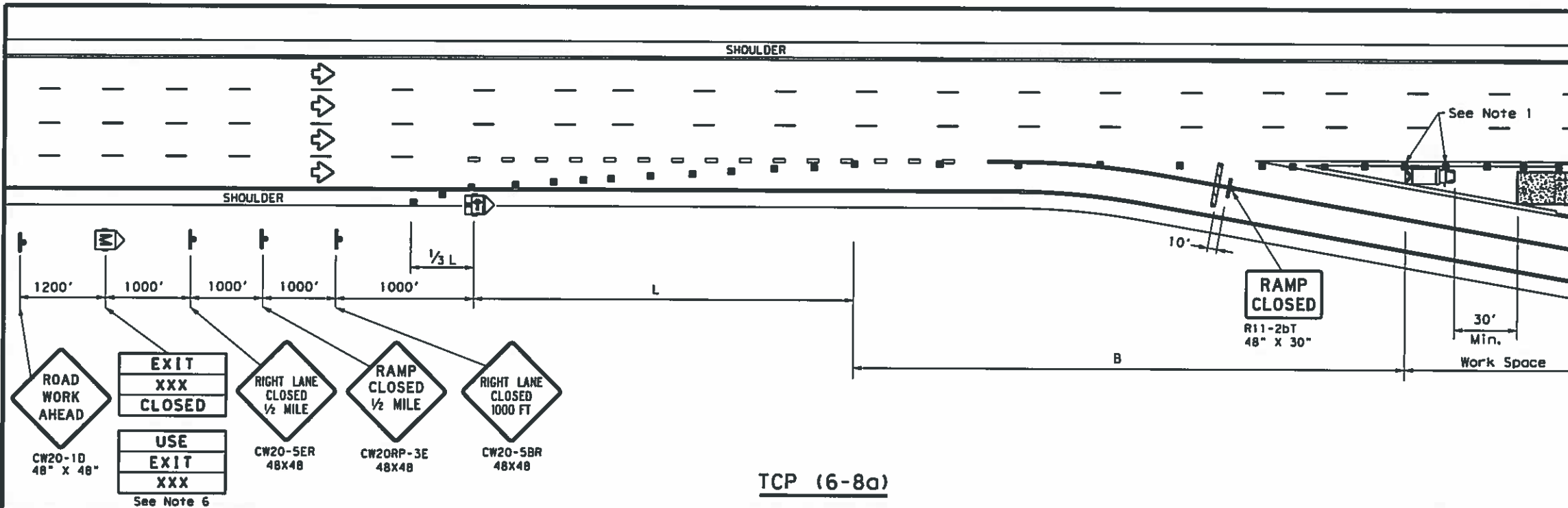
## TRAFFIC CONTROL PLAN SHORT DURATION FREEWAY CLOSURE SEQUENCE

TCP (6-7) - 12

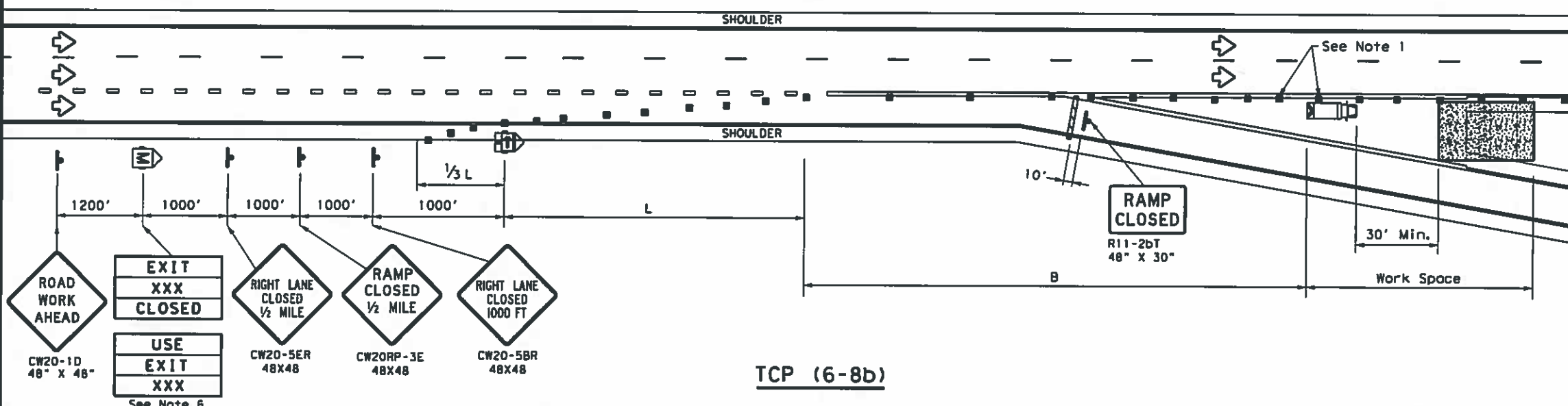
FILE: tcp6-7.dgn	DATE: 1-97	REV: 8-12	JOB: 6378 71 001	HIGHWAY: IH 45, ETC.
© TxDOT February 1998	CONTRACT: 6378	SECTION: 71	COUNTY: MONTGOMERY	SHEET NO.: 30
1-97 8-12 4-98	207			

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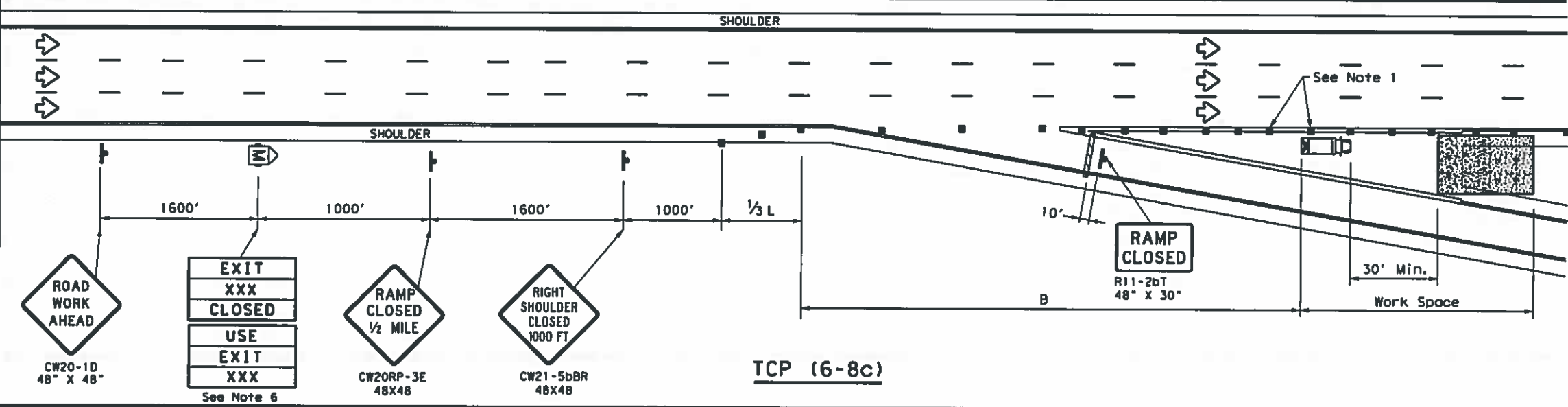
DATE: FILE:



TCP (6-8a)



TCP (6-8b)



TCP (6-8c)

**LEGEND**

	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT)  
 S=Posted Speed (MPH)

**TYPICAL USAGE**

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- Place channelizing devices in the gore at 20' spacing.
  - See the Standard Highway Sign Design for Texas (SHSD) for sign details.
  - The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
  - When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) for traffic control details.
  - Truck mounted attenuator is required.
  - The PCMS may be omitted if replaced with a "RAMP CLOSED" AHEAD (CW2ORP-3D) Sign.
  - Roadway ADT should be greater than 10,000.

Texas Department of Transportation  
 Traffic Operations Division Standard

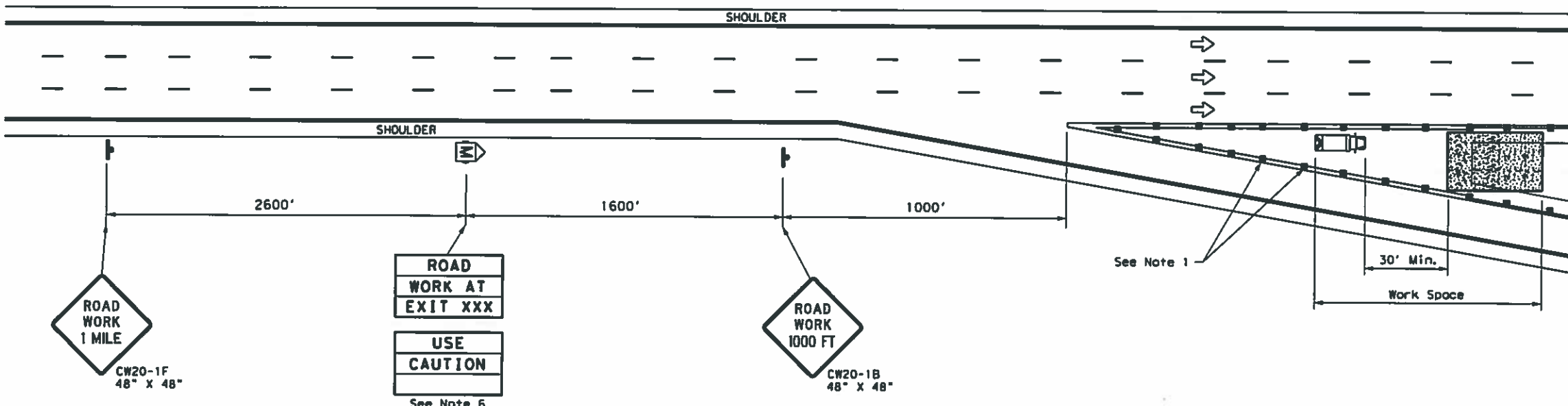
**WORK IN EXIT GORE FOR ADT GREATER THAN 10,000**

**TCP (6-8) - 14**

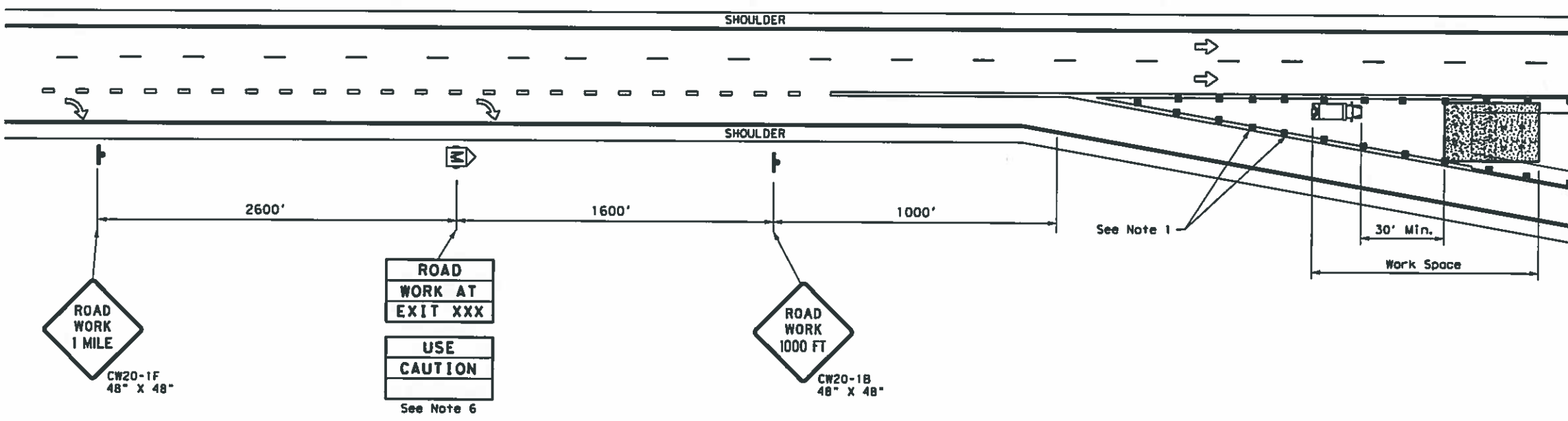
FILE: tcp6-8.dgn	OWN TxDOT	CR TxDOT	DN TxDOT	CR TxDOT
© TxDOT February 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	8376	71	001	IH 45, ETC.
	DIST	COUNTY	SHEET NO.	
	HOU	MONTGOMERY		31

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DATE:  
FILE:



TCP (6-9a)



TCP (6-9b)

LEGEND			
	Type 3 Barricade		Channelizing Devices (CDs)
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

\*\* Taper lengths have been rounded off.  
L=Length of Taper (FT) W=Width of Offset (FT)  
S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

- GENERAL NOTES**
- Place channelizing devices in the gore at 20' spacing.
  - See the Standard Highway Sign Design for Texas (SHSD) for sign details.
  - The PCMS may be omitted when a permanent DMS sign is available in an appropriate location to display a similar message as called for on the PCMS.
  - When it is determined that a through lane should be closed in addition to the exit ramp, refer to TCP(6-4) and TCP(6-8) for traffic control details.
  - Truck mounted attenuators are required.
  - The PCMS may be omitted if replaced with a "ROAD WORK 1/2 MILE" (CW20-1E).
  - Roadway ADT should be less than 10,000.

Texas Department of Transportation  
Traffic Operations Division Standard

**WORK IN EXIT GORE  
FOR ADT LESS THAN 10,000**

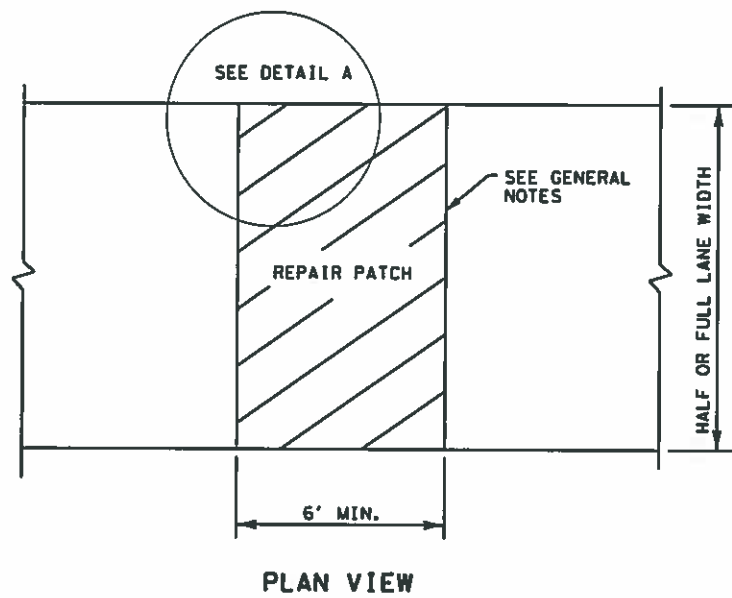
**TCP (6-9) - 14**

FILE: tcp6-9.dgn	DATE: February 2014	BY: 6376	CHK: 71	APP: 001	REV: IH 45, ETC.
REVISIONS		DIST: HOU	COUNTY: MONTGOMERY	SHEET NO: 32	

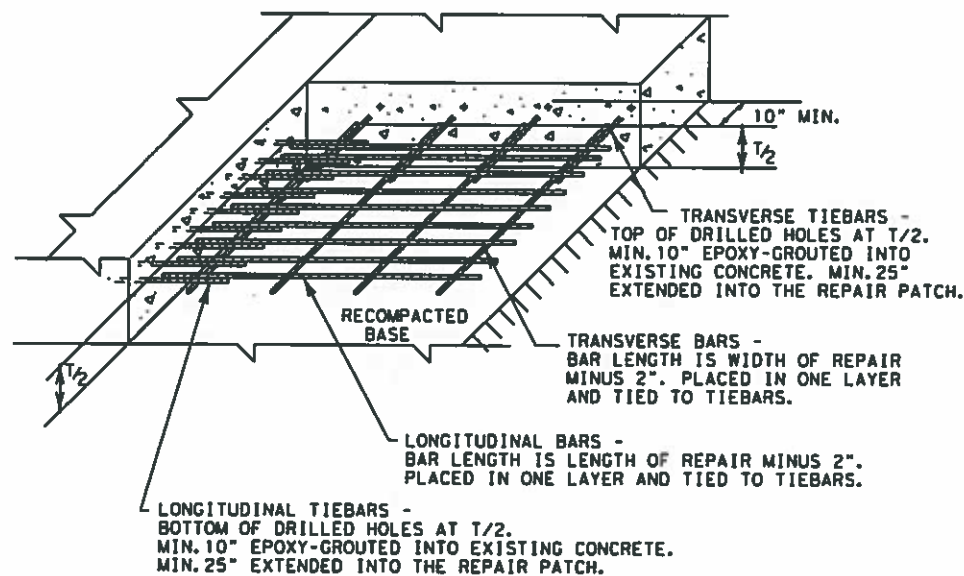
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TABLE NO. 1 STEEL BAR SIZE AND SPACING						
TYPE PAVEMENT	SLAB THICKNESS AND BAR SIZE		LONGITUDINAL*		TRANSVERSE*	
			REGULAR BARS	TIEBARS	BARS	TIEBARS
	T (IN.)	BAR SIZE	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)
CRCP	6.0	#5	7.5	7.5	24	24
	6.5		7.0	7.0		
	7.0		6.5	6.5		
	7.5		6.0	6.0		
	8.0	#6	9.0	9.0	24	24
	8.5		8.5	8.5		
	9.0		8.0	8.0		
	9.5		7.5	7.5		
	10.0		7.0	7.0		
	10.5		6.75	6.75		
	11.0		6.5	6.5		
	11.5		6.25	6.25		
≥12.0	6.0	6.0				
JRCP	<8.0	#5	24.0	12.0	24	24
	≥8.0	#6	24.0	12.0	24	24
CPCD	<8.0	#5	NONE	12.0	NONE	24
	≥8.0	#6	NONE	12.0	NONE	24

\* USE 12" SPACING AS FIRST AND LAST SPACING AT END OR SIDE FOR ALL BARS.



PLAN VIEW



DETAIL A  
GROUTED TIEBARS & REINFORCEMENT

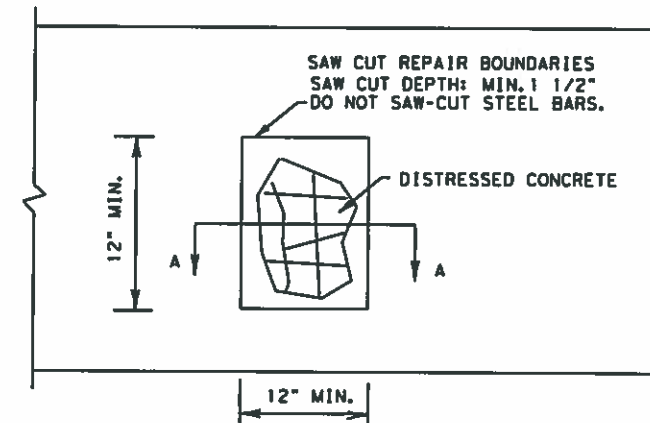
FULL-DEPTH REPAIR OF CRCP, JRCP, AND CPCD

GENERAL NOTES

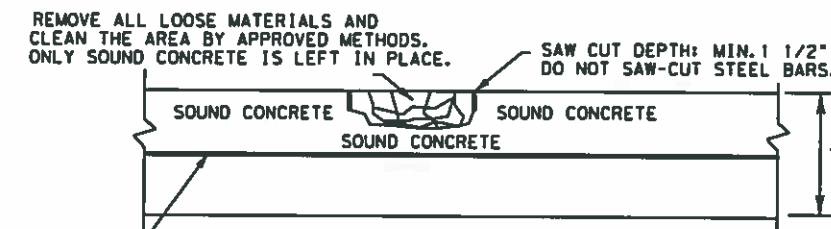
- ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
- MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
- FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
- AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
- ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
- THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
- EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

GENERAL NOTES

- ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
- THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
- EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



PLAN VIEW



LONGITUDINAL STEEL BARS:

- \*REPAIR AREAS MAY BE ADJUSTED AFTER REMOVING DISTRESSED CONCRETE. SWITCH THE HALF-DEPTH REPAIR TO FULL-DEPTH REPAIR IF EXPOSED EXISTING LONGITUDINAL BARS ARE DEFICIENT, AS APPROVED. COMPENSATION WILL BE MADE FOR UNEXPECTED VOLUMES OF REPAIR AREAS OR CHANGES IN SCOPE OF WORK.
- \*INCREASE THE REPAIR AREA AND PERFORM A FULL-DEPTH REPAIR AS DIRECTED IF LONGITUDINAL STEEL BARS WERE DAMAGED BY THE REMOVAL OPERATIONS. NO ADDITIONAL COMPENSATION WILL BE MADE.

SECTION A-A  
HALF-DEPTH REPAIR

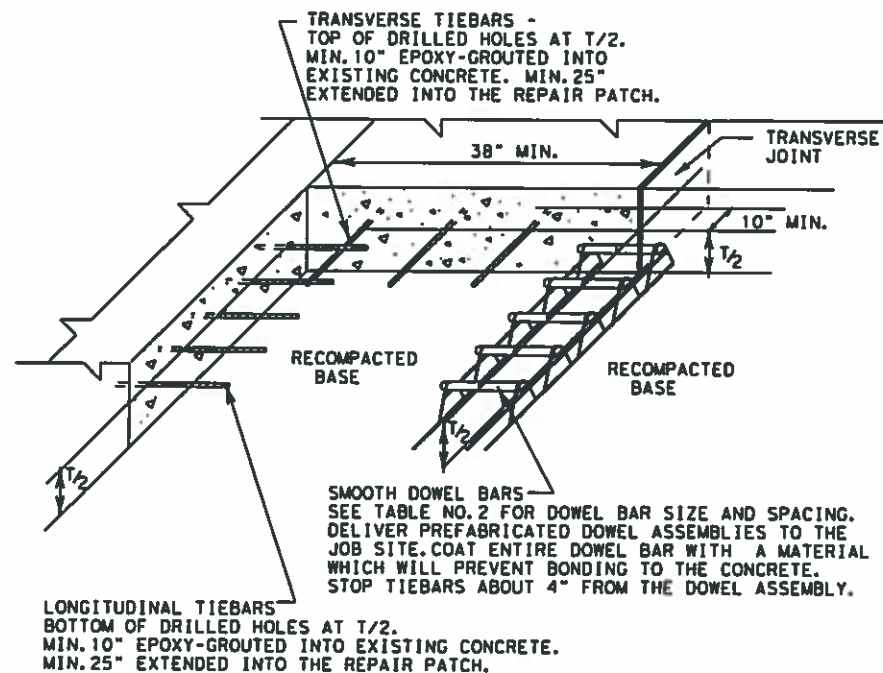
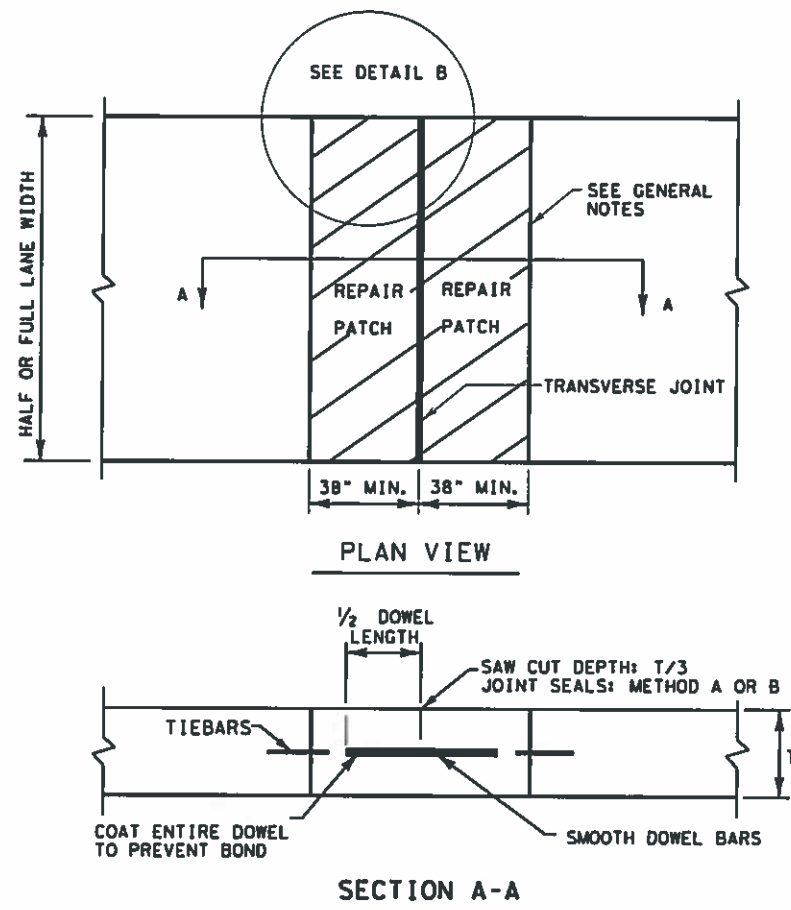
SHEET 1 OF 2

		Design Division Standard	
<b>REPAIR OF CONCRETE PAVEMENT</b>			
<b>REPCP-14</b>			
FILE: redcp14.dgn	DATE: TxDOT	DATE: HC	DATE: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB
REVISIONS	6376	71	001
DIST	HO	COUNTY	MONTEGOMERY
			SHEET NO. 33



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DATE: FILE:



**DETAIL B**  
GROUTED TIEBARS & DOWELS

**REPAIR OF TRANSVERSE JOINT OF CPCD**

**GENERAL NOTES**

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."
8. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.

TABLE NO. 2 DOWELS (SMOOTH BARS)			
PAVEMENT THICKNESS (INCHES)	SIZE AND DIA.	LENGTH (IN.)	SPACING (IN.)
<10	#8 (1 IN.)	18.0	12.0
≥10	#10 (1 1/4 IN.)		

SHEET 2 OF 2

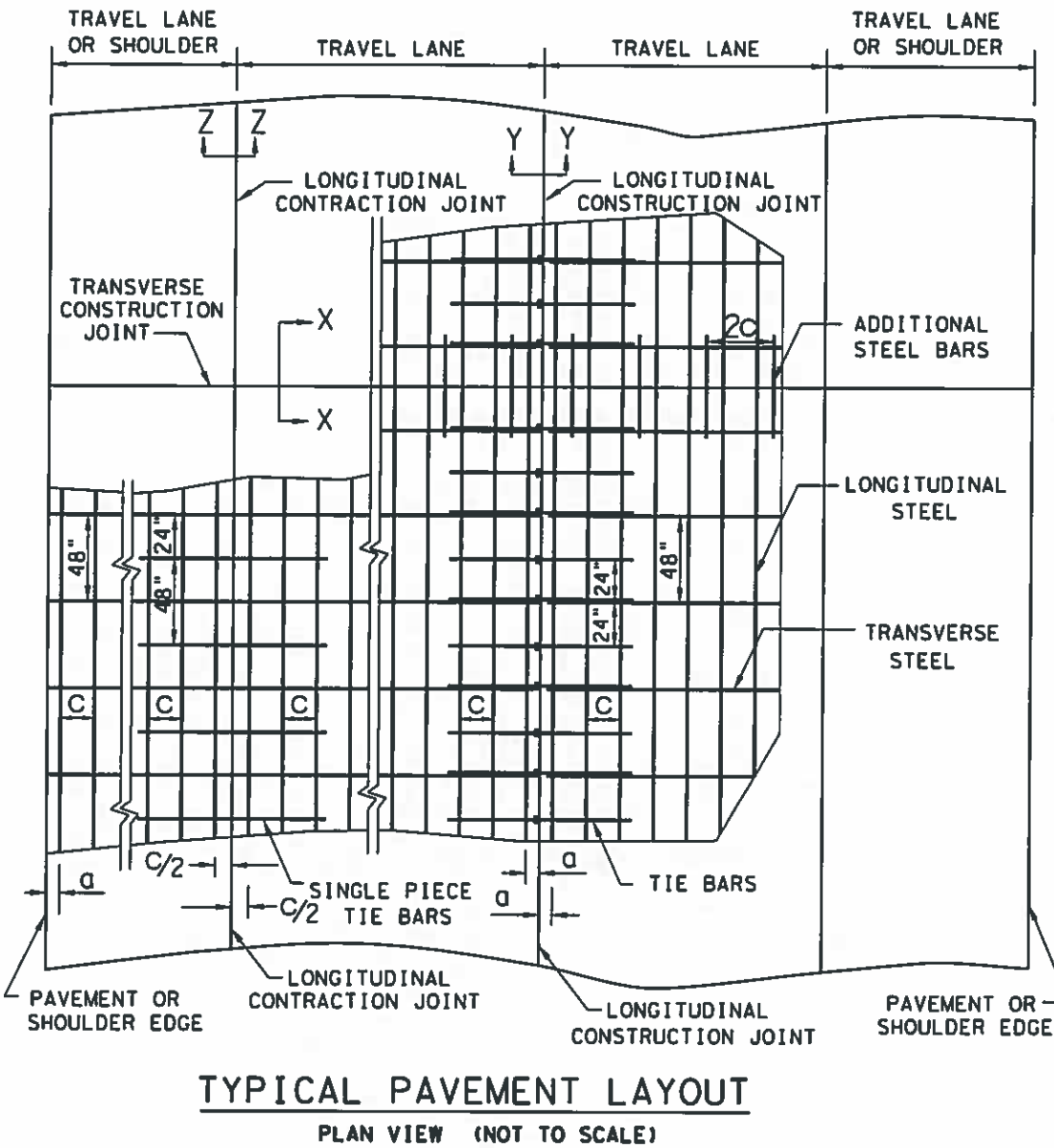
		Design Division Standard	
<b>REPAIR OF CONCRETE PAVEMENT</b>			
<b>REPCP-14</b>			
FILE: repcp14.dgn	DN: TxDOT	DN: HC	DN: HC
© TxDOT: DECEMBER 2014	CONT	SECT	JOB
REVISIONS	6376	71	001
	DIST	COUNTY	SHEET NO.
	HOU	MONTGOMERY	34

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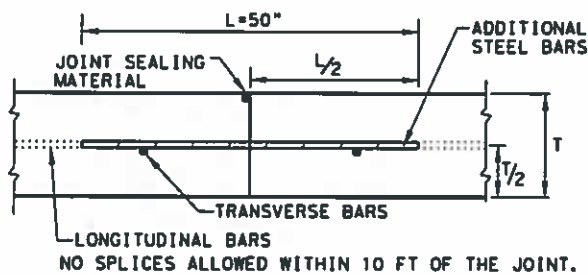
DATE: FILE:

TABLE NO. 1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING D (IN.)	SPACING 2 x C (IN.)	LENGTH L (IN.)
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
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

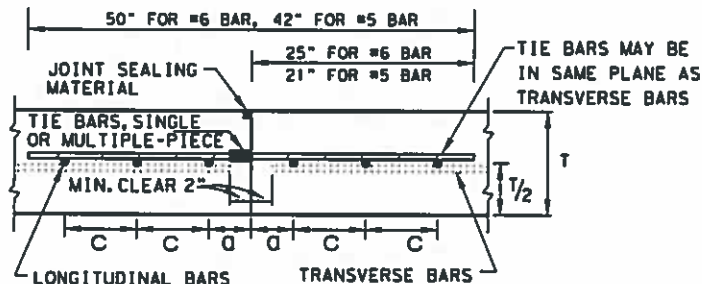
TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



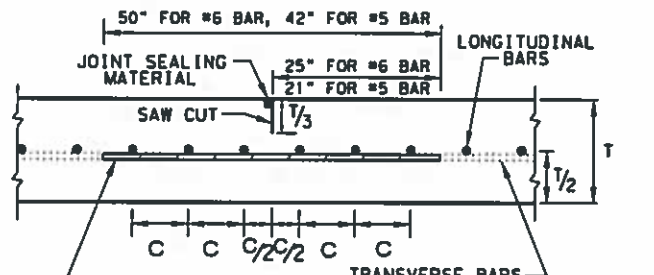
- ### GENERAL NOTES
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
  2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (COTE) OF NOT MORE THAN  $5.5 \times 10^{-6}$  IN/IN/°F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
  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) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO. 1 AND TABLE NO. 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
  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 (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
  7. 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.
  8. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
  9. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
  10. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
  11. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TRANSVERSE CONSTRUCTION JOINT  
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT  
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT  
SECTION Z - Z

SHEET 1 OF 2

Design Division Standard

## CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

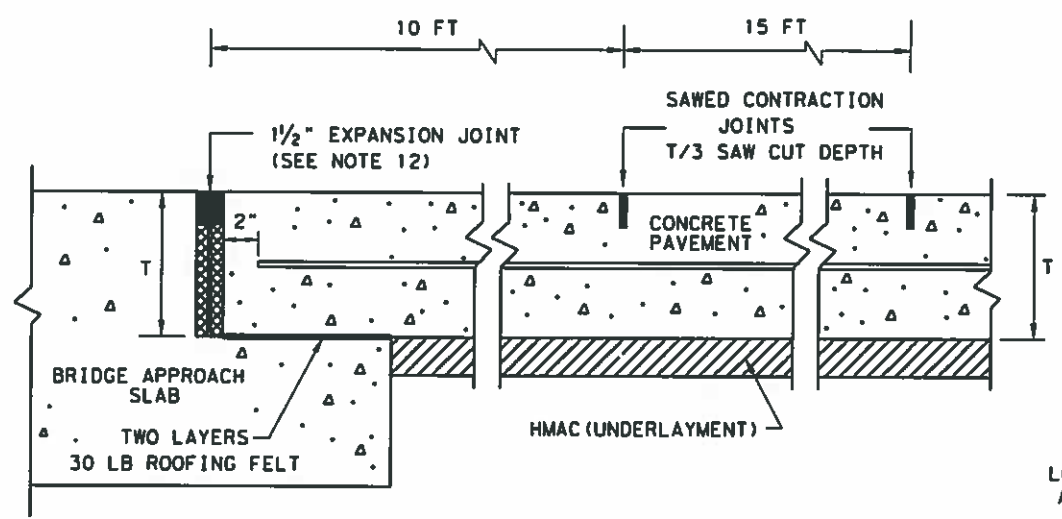
### ONE LAYER STEEL BAR PLACEMENT

### T - 7 TO 13 INCHES

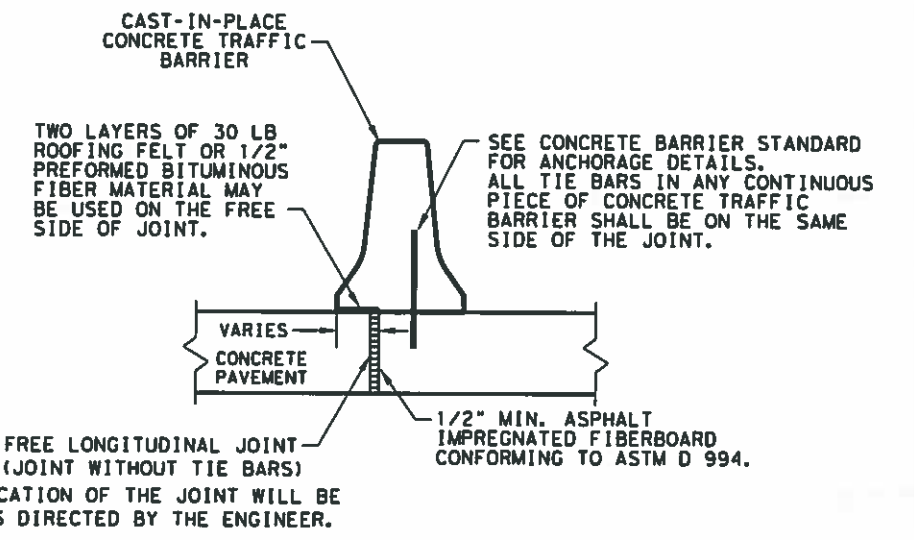
## CRCP (1) - 20

FILE: crcp120.dgn	DRN: TxDOT	CR: RM	DRN: AN	CR: VP
© TxDOT: APRIL 2020	CDT	SECT	JOB	HIGHWAY
10/10/2011 ADD CH #12	6378	71	001	IH 45, ETC.
04/09/2013 REMOVE 4" AND 6.5" ADD CTE REQUIREMENTS	DIST	COUNTY	SHEET NO.	
05/05/2017 COTE AS RATED 4.3	HOU	MONTGOMERY	35	

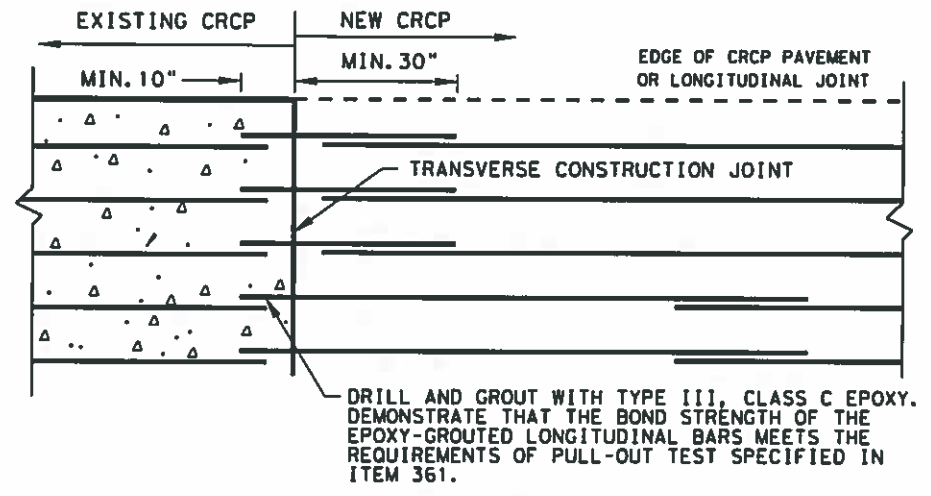
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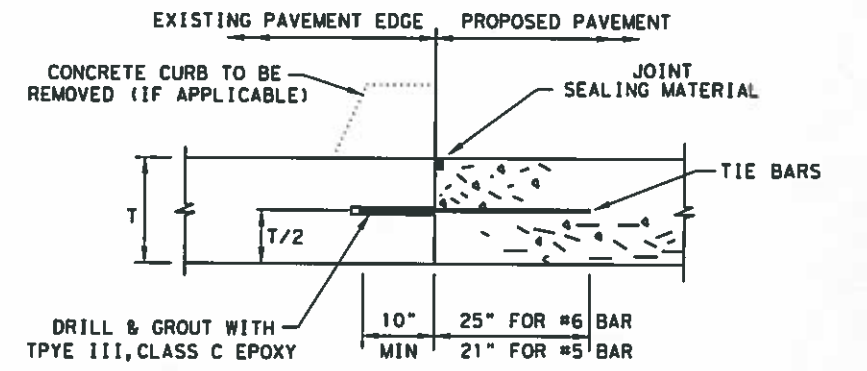
**TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH**



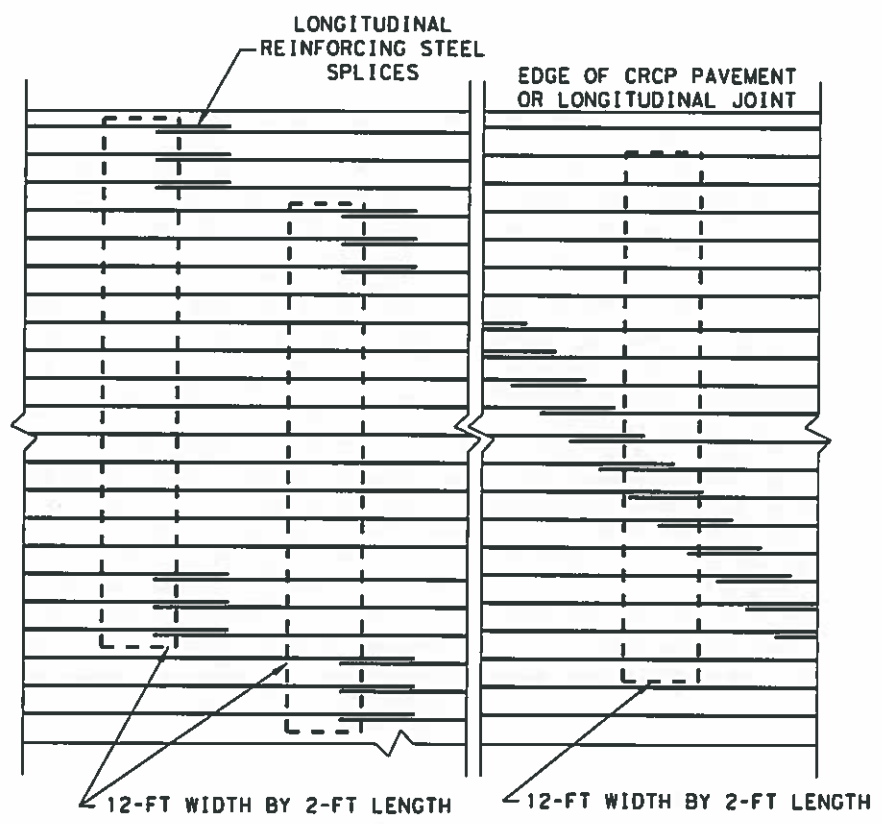
**FREE LONGITUDINAL JOINT DETAIL**



**OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)**

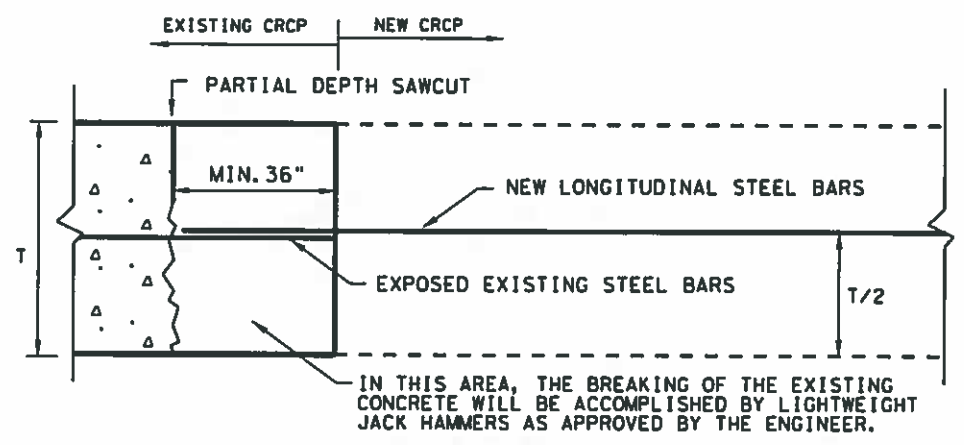


**LONGITUDINAL WIDENING JOINT DETAIL**



STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

**EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)**



**OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP**

		Design Division Standard	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT ONE LAYER STEEL BAR PLACEMENT T - 7 TO 13 INCHES CRCP (1) - 20</b>			
FILE: crcp120.dgn	DRN TxDOT	CR:EM	DRN AN
© TxDOT: APRIL 2020	CONT SECT	JOB	HIGHWAY
03/16/2020 REMOVED TABLE 1A	REVISIONS	6376 71	001 IH 45, ETC.
	DIST	COUNTY	SHEET NO.
	HOU	MONTGOMERY	38

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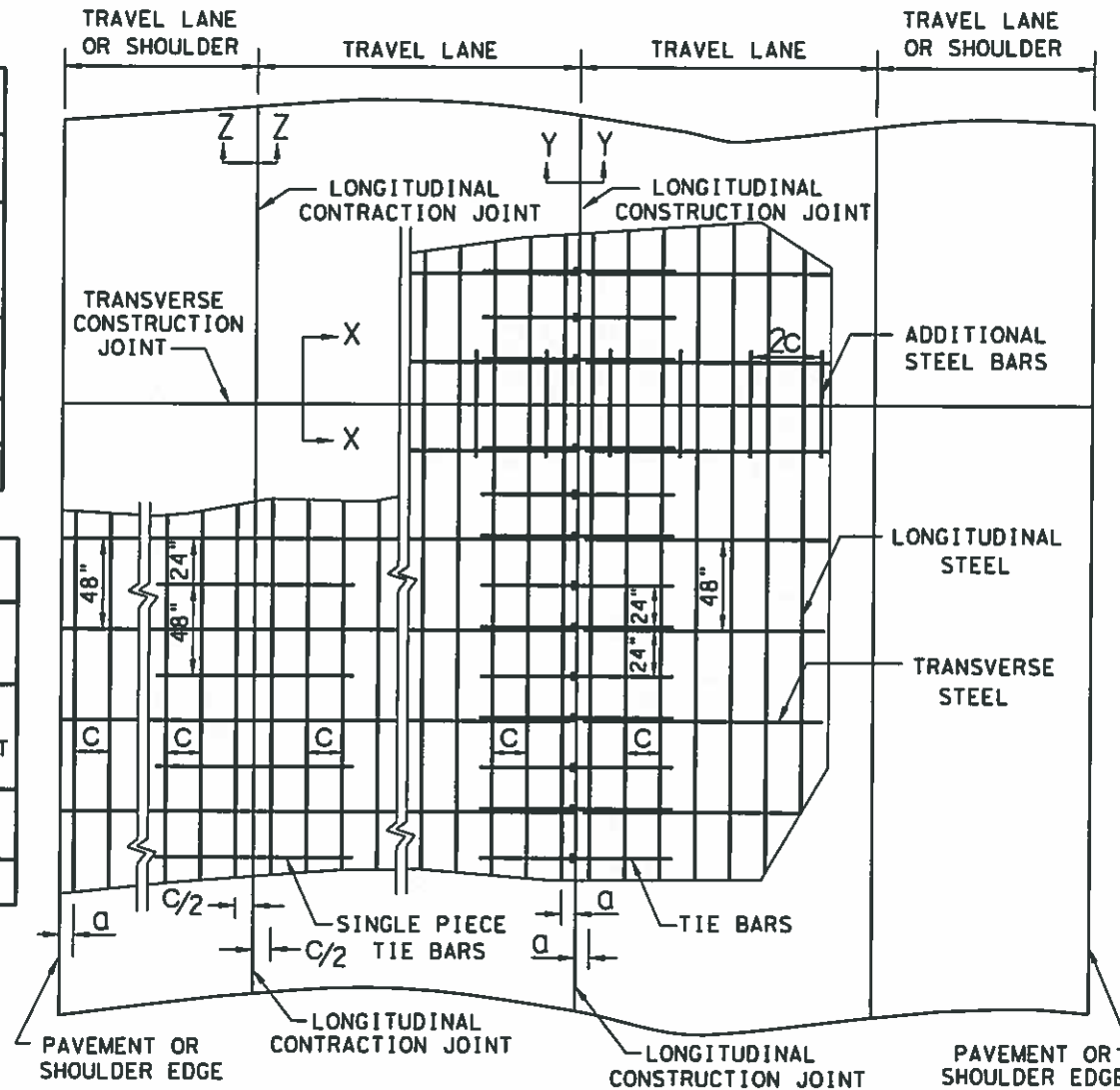
**GENERAL NOTES**

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. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (C<sub>OTE</sub>) OF NOT MORE THAN  $5.5 \times 10^{-6}$  IN/IN/°F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
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) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO.1, TABLE NO.2 AND TABLE NO.3.
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.
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 (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
7. 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.
8. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN.10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
9. OMIT TIE BARS LOCATED WITHIN 18 IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
10. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
11. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

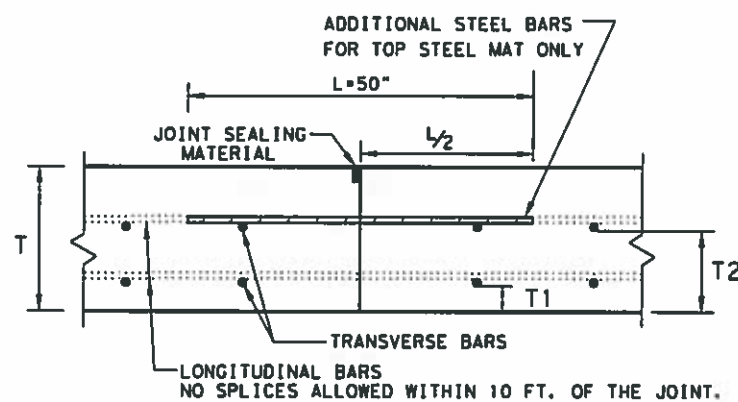
SLAB THICKNESS AND BAR SIZE		FOR BOTH STEEL MATS		FOR TOP STEEL MAT ONLY	
T (IN.)	BAR SIZE	REGULAR STEEL BARS SPACING C (IN.)	FIRST SPACING AT EDGE OR JOINT D (IN.)	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X) SPACING 2 x c (IN.)	LENGTH L (IN.)
14	#6	9.5	3 TO 4	19	50
15	#6	8.5	3 TO 4	17	50

SLAB THICKNESS T (IN.)	FOR BOTH STEEL MATS		FOR LOWER STEEL MAT ONLY		FOR BOTH STEEL MATS	
	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
14 - 15	#5	48	#6	48	#6	24

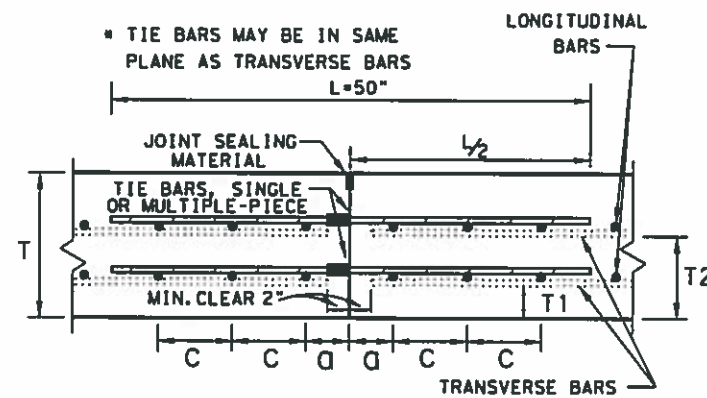
SLAB THICKNESS T (IN.)	LOWER STEEL MAT HEIGHT T1 (IN.)	TOP STEEL MAT HEIGHT T2 (IN.)
14	4.5	8.0
15	5.0	8.5



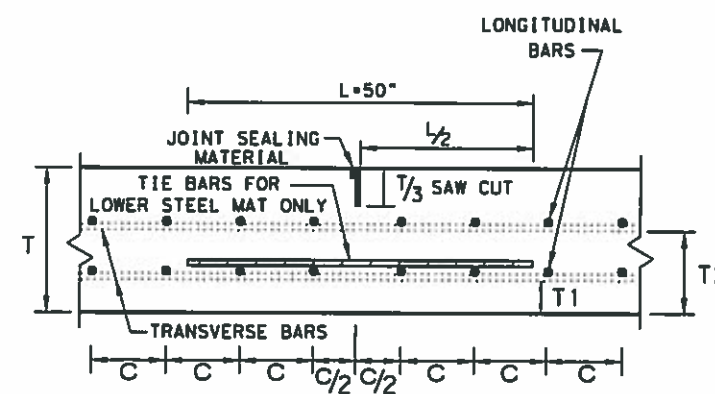
**TYPICAL PAVEMENT LAYOUT**  
PLAN VIEW (NOT TO SCALE)



**TRANSVERSE CONSTRUCTION JOINT**  
SECTION X - X



**LONGITUDINAL CONTRACTION JOINT**  
SECTION Y - Y



**LONGITUDINAL CONTRACTION JOINT**  
SECTION Z - Z

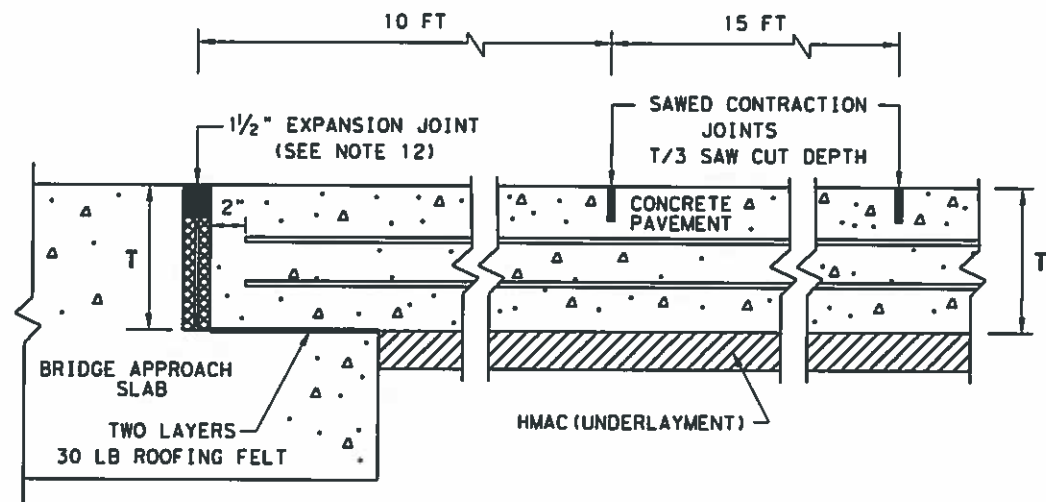
SHEET 1 OF 2

		Design Division Standard	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b> <b>TWO LAYER STEEL BAR PLACEMENT</b> <b>T - 14 &amp; 15 INCHES</b> <b>CRCP (2) - 20</b>			
FILE: crcp220.dgn © TxDOT: APRIL 2020 10/10/2011 ADD DN #12 04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS 04/19/2017 COTE AS RATED 4.3	CON: 6378 SECT: 71 DIST: HOU	CR: KM JOB: 001 COUNTY: MONTGOMERY	DN: AH HIGHWAY: IH 45, ETC SHEET NO.: 37

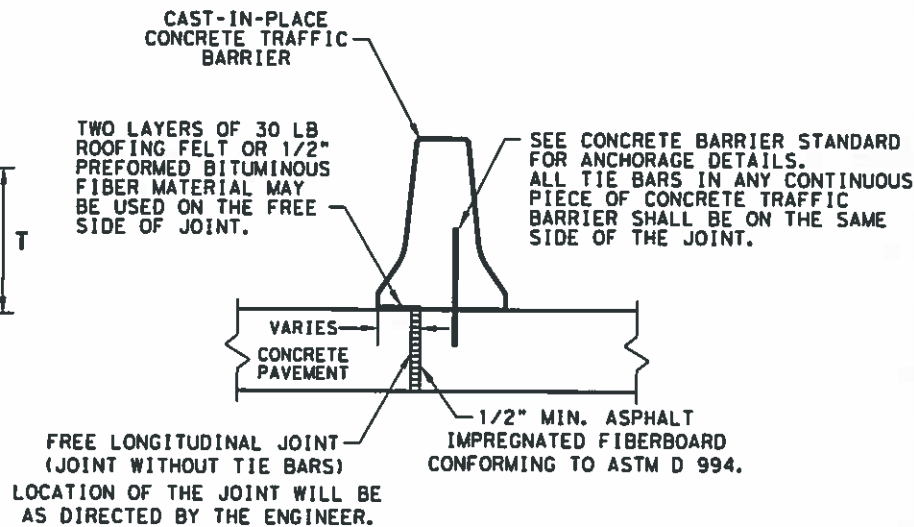
DATE: FILE:

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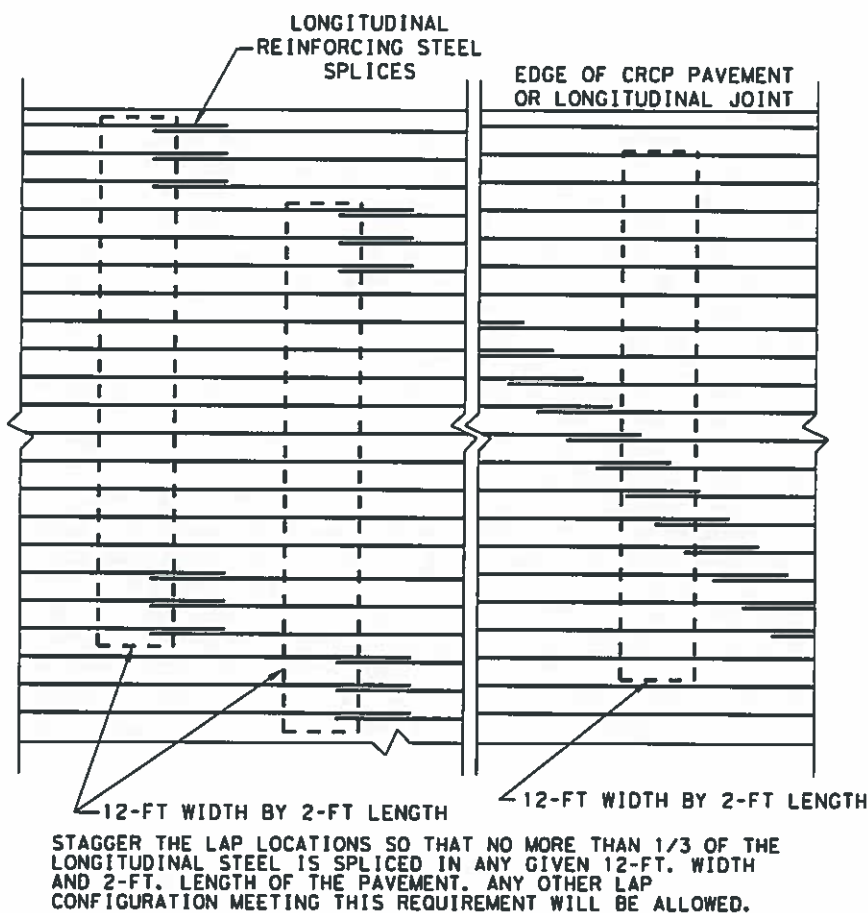
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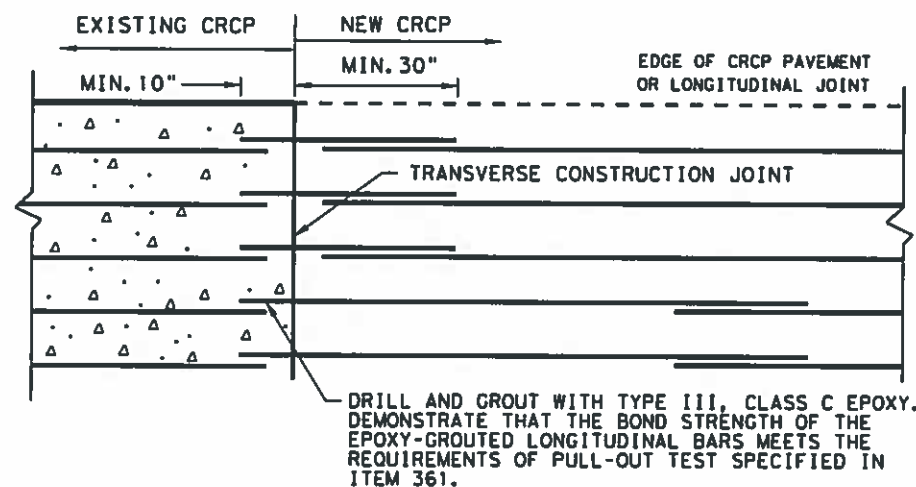
**TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH**



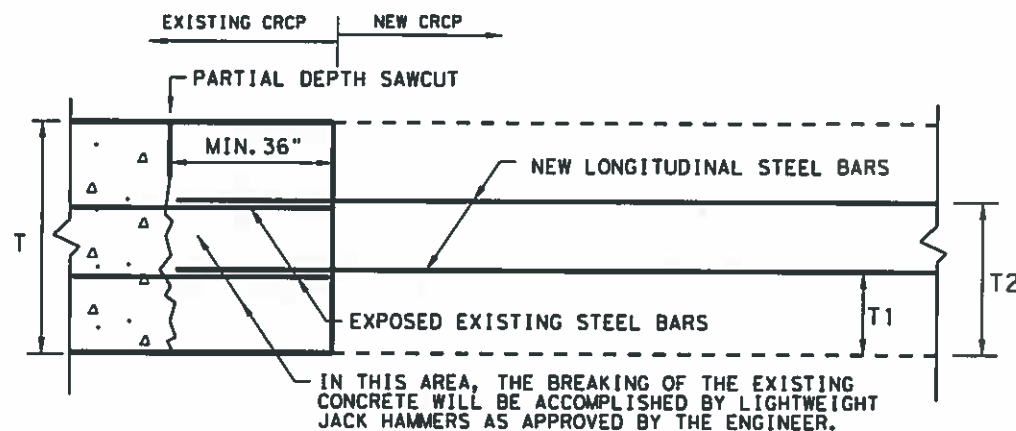
**FREE LONGITUDINAL JOINT DETAIL**



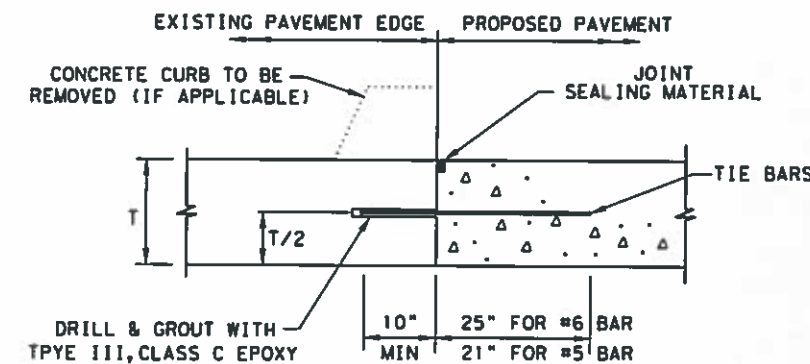
**EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)**



**OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)**



**OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

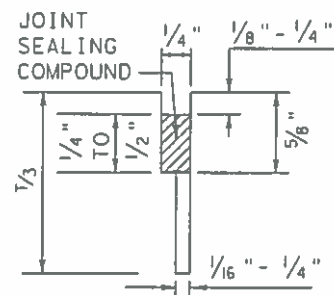
**LONGITUDINAL WIDENING JOINT DETAIL**

SHEET 2 OF 2

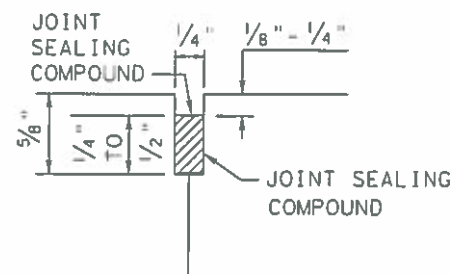
		Design Division Standard	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT TWO LAYER STEEL BAR PLACEMENT T - 14 &amp; 15 INCHES CRCP (2) - 20</b>			
FILE: crcp220.dgn	DRW: TxDOT	CHK: KM	DES: AN
© TxDOT: APRIL 2020	CONT: 6378	SECT: 7.1	JOB: 001
REVISIONS	03/18/2020 REMOVED TABLE 1A	001	IH 45, ETC.
DIS: ST	COUNTY: MONTGOMERY	SHEET NO.:	38

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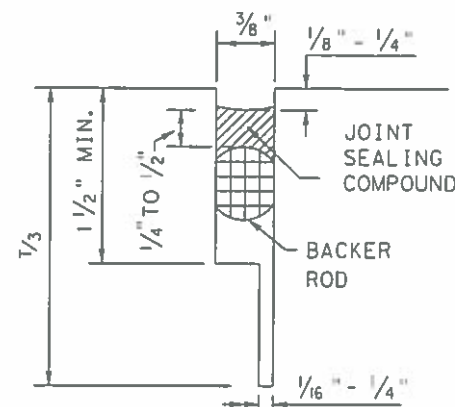
### METHOD B: JOINT SEALING COMPOUND



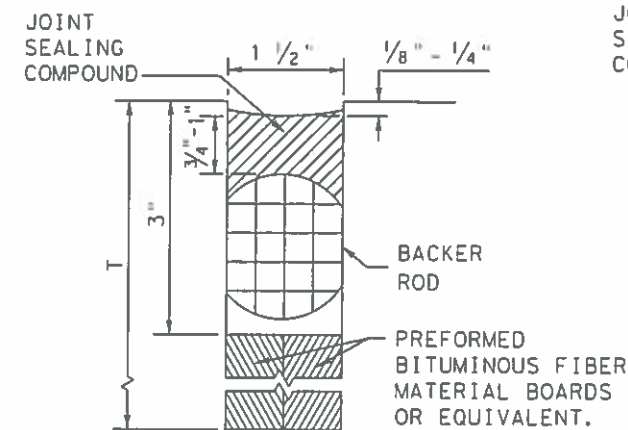
LONGITUDINAL SAWED CONTRACTION JOINT



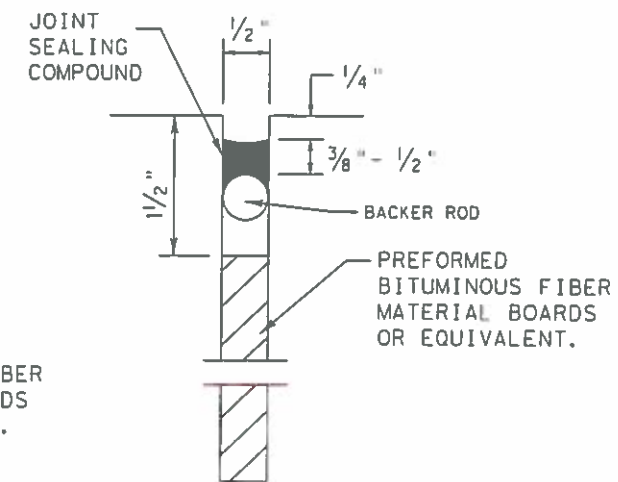
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

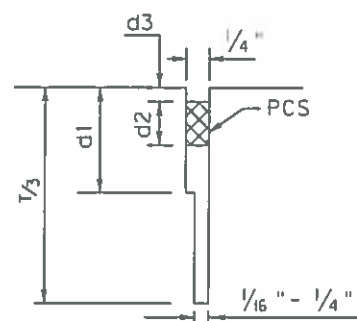


TRANSVERSE FORMED EXPANSION JOINT

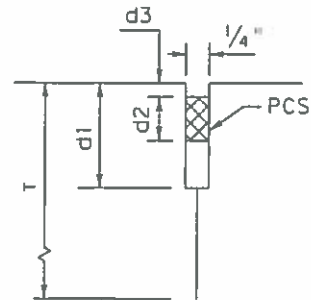


FORMED ISOLATION JOINT

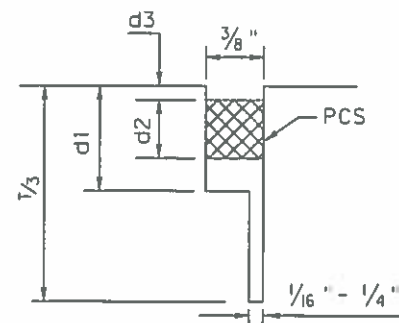
### METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



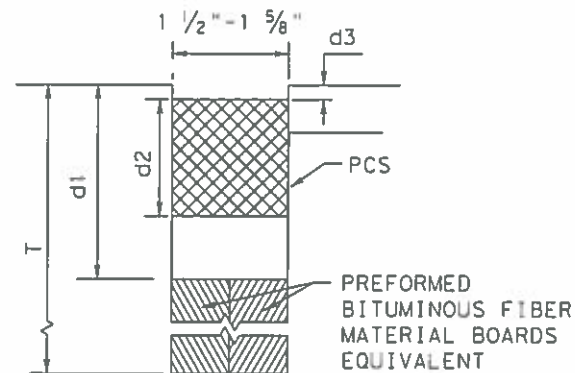
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

### GENERAL NOTES

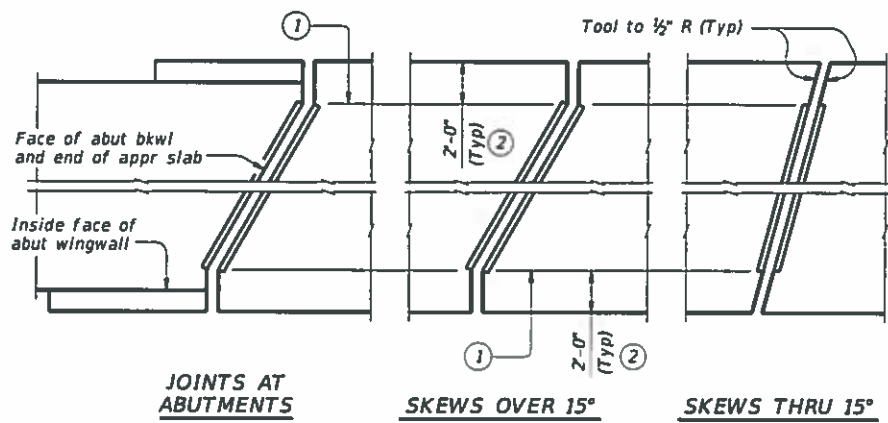
- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
- DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
- REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
- FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
- FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4, 5, 7, OR 8 FOR MAINTAINING EXISTING JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
- ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

		<b>Design Division Standard</b>	
<b>CONCRETE PAVING DETAILS</b> <b>JOINT SEALS</b> <b>JS-14</b>			
FILE: js14.dgn	DN: TxDOT	DN: HC	DN: AN
© TxDOT: DECEMBER 2014	CONT: 6376	SECT: 71	JOB: 001
REVISIONS	6376	71	001
DIST: HOU	COUNTY: MONTGOMERY	HIGHWAY: IH 45, ETC	
		SHEET NO.: 39	

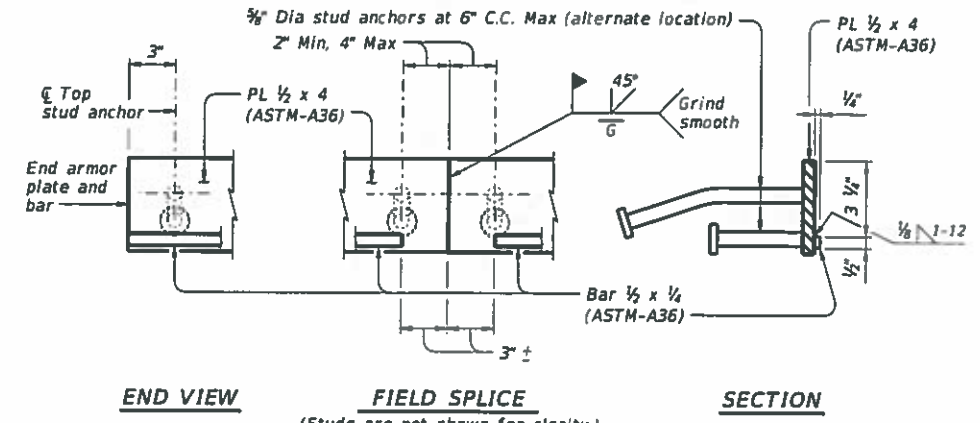
DATE: FILE:

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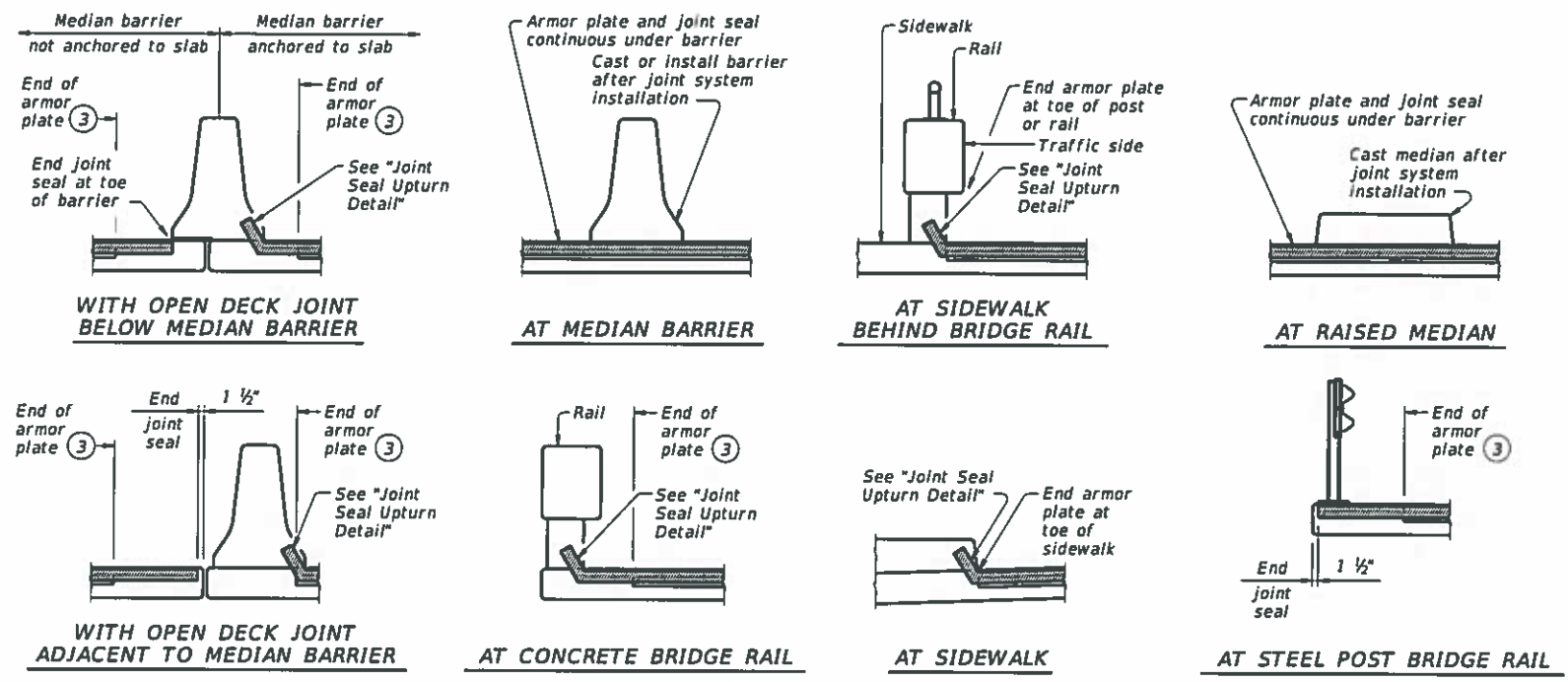
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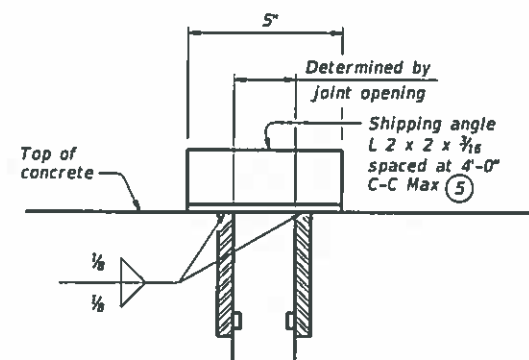
**PLANS OF ARMOR PLATES**



**ELEVATION OF ARMOR PLATE**



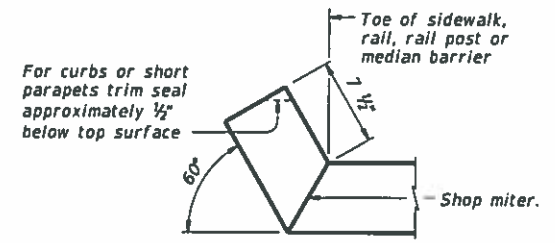
**TYPICAL SECTIONS OF ARMOR PLATES AND SEALS**



**SHOWING ARMOR PLATE**  
(Studs not shown for clarity)

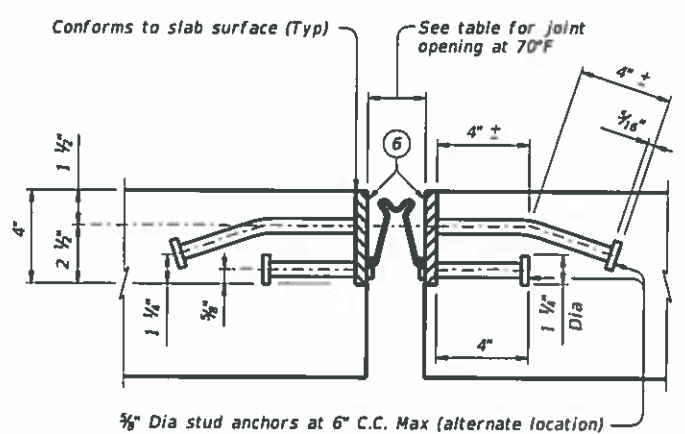
**SHIPPING ANGLE**

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.



**JOINT SEAL UPTURN DETAIL**

Upturn seal only. Terminate armor plates as shown in "Plans of Armor Plates" and "Typical Sections of Armor Plates & Seals."



**JOINT SECTION**

Showing R J Watson strip seal. Other strip seals are similar.

**TABLE OF SEALED EXPANSION JOINT INFORMATION**

MANUFACTURER	STEEL SECTION (7)	STRIP SEAL	
		Seal Type	Joint Opening (8)
D.S. Brown	As shown	V-400	2 1/4"
R.J. Watson	As shown	SF-400	2 1/2"
SSI	As shown	SSS-400	2 1/2"
Watson Bowman Acme	As shown	SPS-400	2"

**REDUCED LONGITUDINAL MOVEMENT RANGE**

SKEW (deg)	JOINT SIZE	
	4"	3.5"
0	4.0"	
15	4.0"	
30	3.5"	
45	2.8"	

**DESIGN NOTES:**  
Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

**FABRICATION NOTES:**

- 1 At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.
- 2 Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.
- 3 See "Plans of Armor Plates".
- 4 Other conditions affecting the joint profile should be noted elsewhere.
- 5 Align shipping angle perpendicular to joint.
- 6 Coat with Manufacturer's supplied epoxy primer above bar before installing sealant.
- 7 Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- 8 These openings are also the recommended minimum installation openings.

**CONSTRUCTION NOTES:**

- Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.
- Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.
- Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.
- Splice and install seal in accordance with the Manufacturer's directions and with the adhesive provided by the Manufacturer.
- Splice in joint seal may be performed in the field.

**GENERAL NOTES:**

- Provide sealed expansion joints in the size and at locations shown on the plans.
- Minimum slab and overhang thickness required for the use of SEJ-B is 6 1/2".

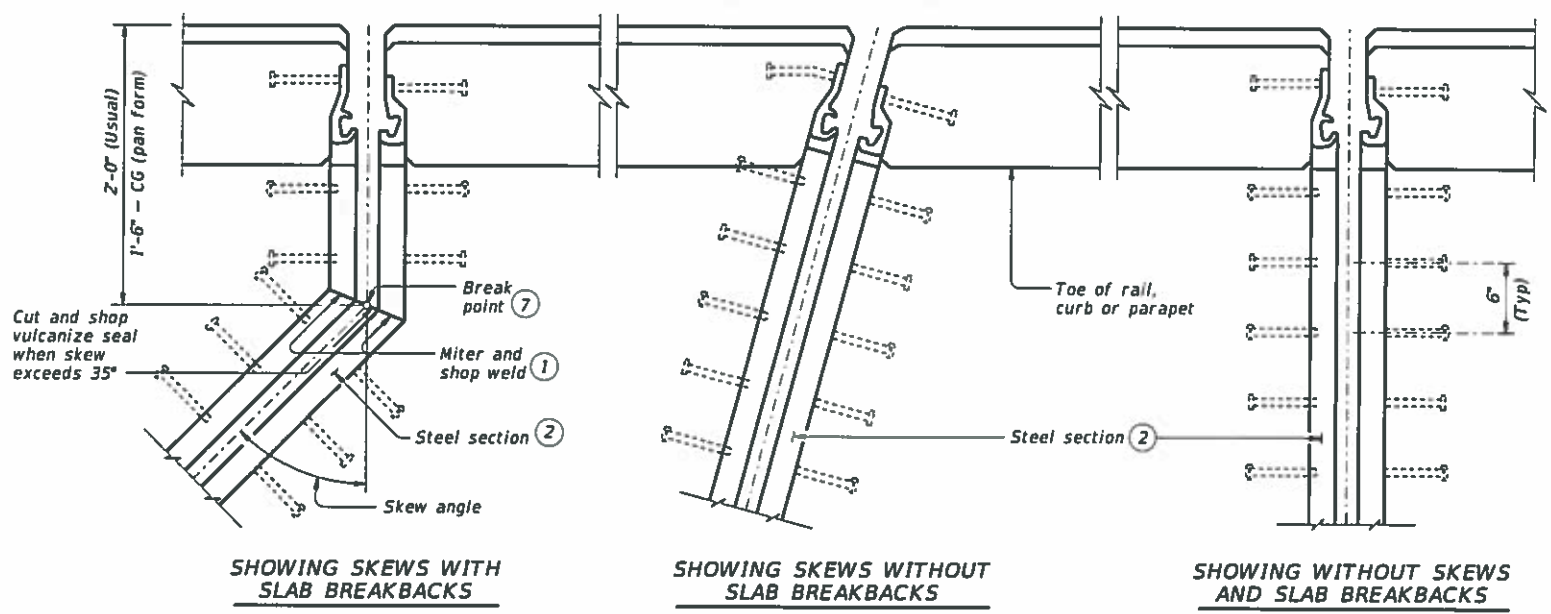
Texas Department of Transportation Bridge Division Standard

**SEALED EXPANSION JOINT TYPE B WITHOUT OVERLAY**

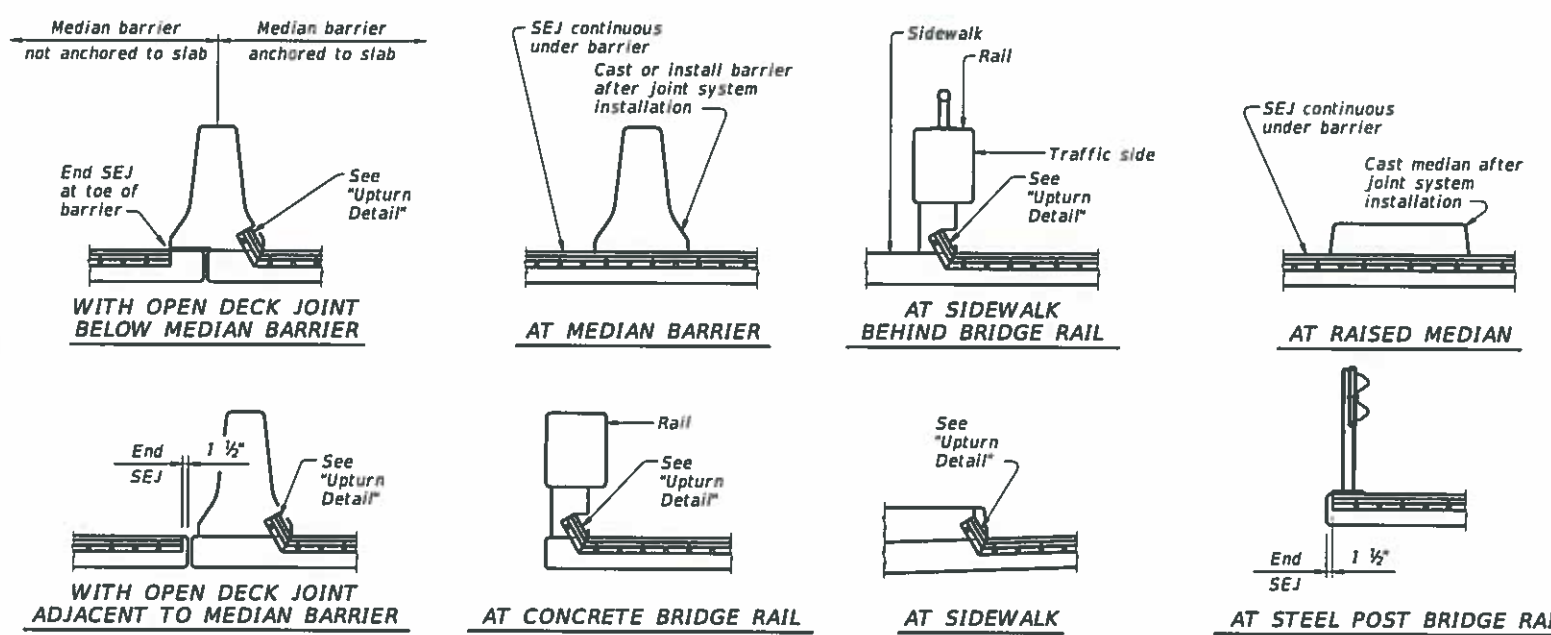
**SEJ-B**

FILE: sejbste1-19.dgn	DATE: TxDOT	DATE: TxDOT	DATE: JTR	DATE: JMH
©TxDOT April 2019	CRNT SECT	JOB	HIGHWAY	
REVISIONS	6378 71	001	IH 45, ETC.	
	DIST	COUNTY	SHEET NO.	
	HOU	MONTGOMERY	40	

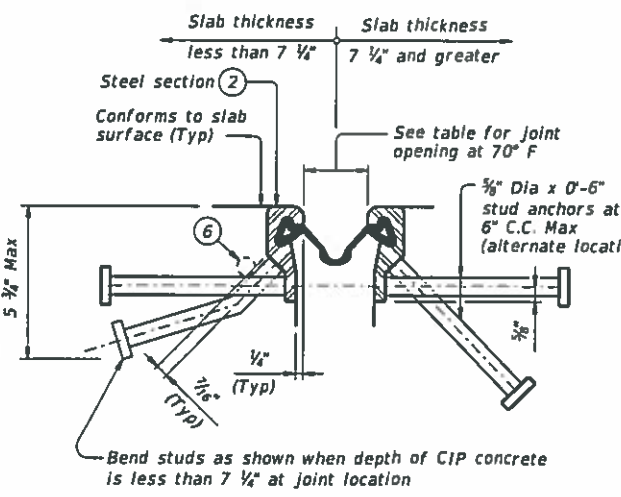
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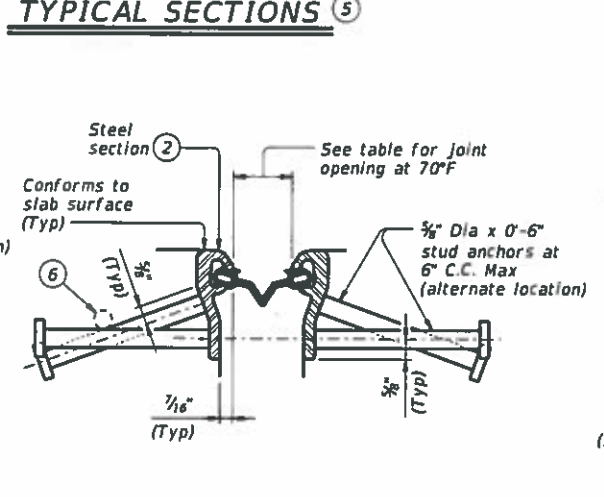
PLANS OF END CONDITIONS



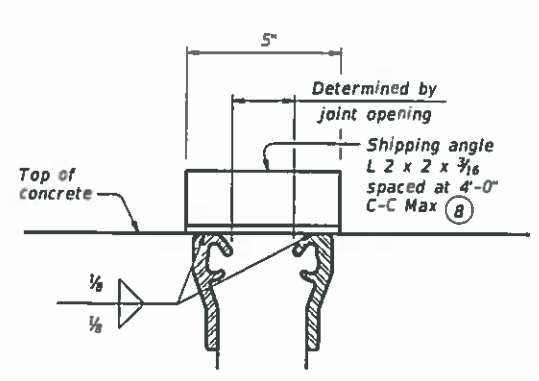
TYPICAL SECTIONS



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHIPPING ANGLE  
An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

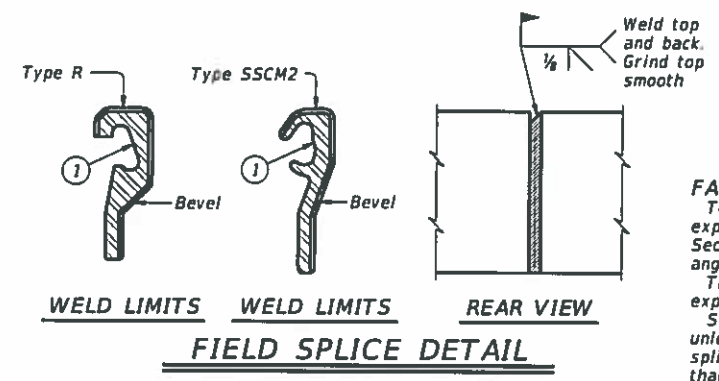
TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION ②	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening ③	Seal Type	Joint Opening ③
D.S. Brown	Type SSCM2	AZR-400	1 3/4"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 3/4"	SE-500	2"

SKEW (deg)	JOINT SIZE	
	4"	5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

DESIGN NOTES:  
Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations. For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

- Remove all burrs which will be in contact with seal prior to making splice.
- Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.
- These openings are also the recommended minimum installation openings.
- Reduce for sidewalk or parapet heights less than 6".
- Other conditions affecting the joint profile should be noted elsewhere.
- Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.
- See Span details for location of break point.
- Align shipping angle perpendicular to joint.



WELD LIMITS FIELD SPLICE DETAIL

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts. The seal must be continuous and included in the price bid for sealed expansion joint. Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max. Weld studs in accordance with AWS D1.1. Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop. Paint the entire steel section with System II or IV primer in accordance with Item 446, "Field Cleaning and Painting Steel", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4. Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint. Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint. Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans. Minimum slab and overhang thickness required for the use of SEJ-M is 6 1/2".

Texas Department of Transportation Bridge Division Standard

## SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

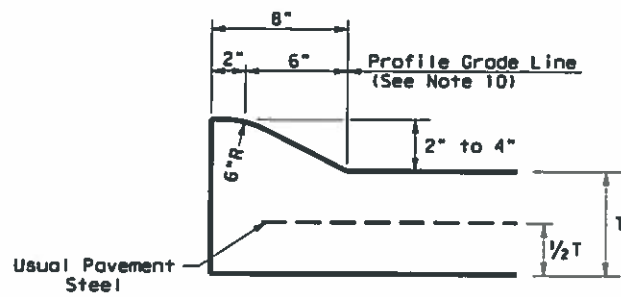
### SEJ-M

FILE: sejste1-19.dgn	DN: TxDOT	CC: TxDOT	DR: JTR	CR: JMH
©TxDOT April 2019	CONT: SECT	JOB: 001	HIGHWAY: IH 45, ETC.	
REVISIONS	6378	71	001	
	DIST: HOU	COUNTY: MONTGOMERY	SHEET NO.: 41	

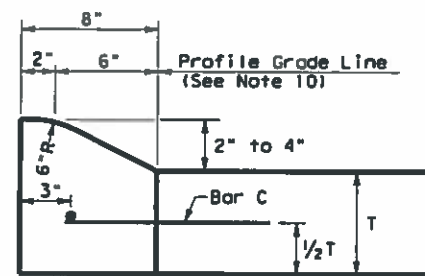


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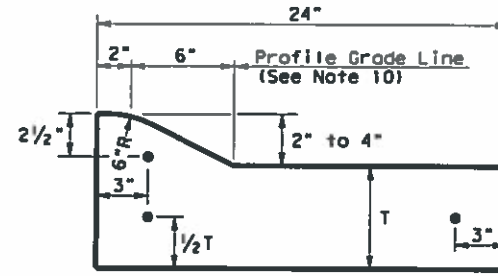
DATE: FILE:



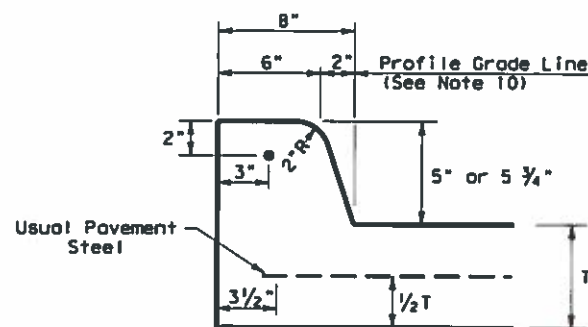
**TYPE I CURB (MONOLITHIC)  
2" - 4" HEIGHT**



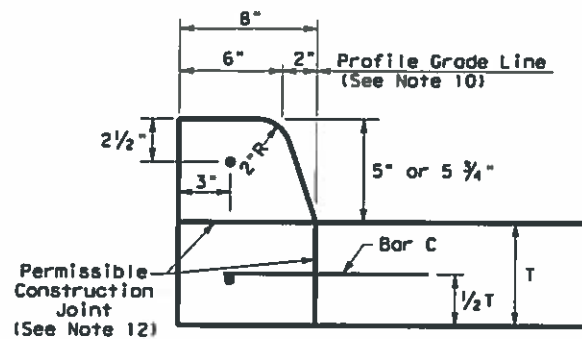
**TYPE I CURB  
2" - 4" HEIGHT**



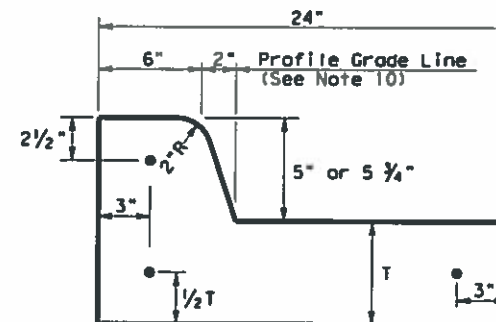
**TYPE I CURB AND GUTTER  
2" - 4" HEIGHT**



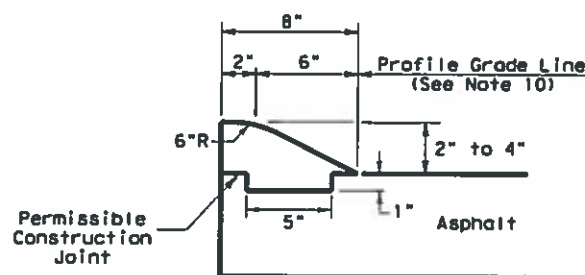
**TYPE II CURB (MONOLITHIC)  
5" - 5 3/4" HEIGHT**



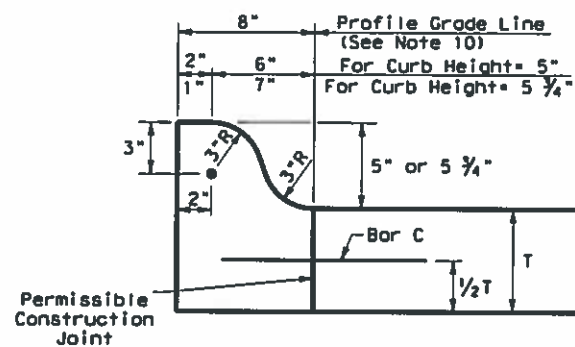
**TYPE II CURB  
5" - 5 3/4" HEIGHT**



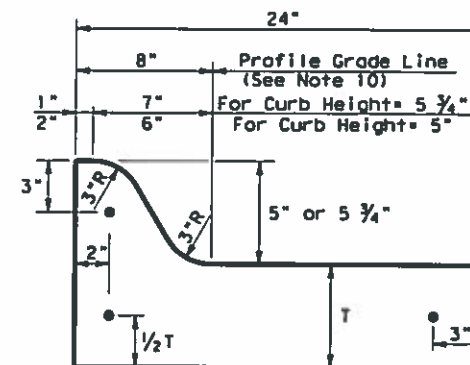
**TYPE II CURB AND GUTTER  
5" - 5 3/4" HEIGHT**



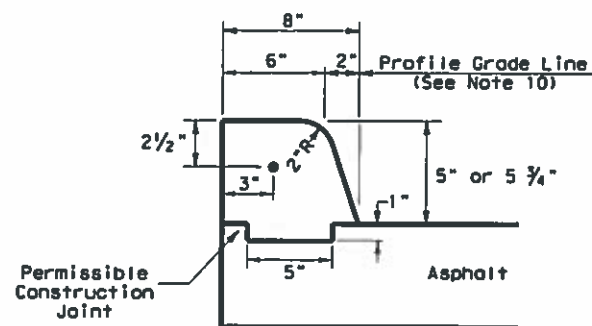
**TYPE III CURB (KEYED)  
2" - 4" HEIGHT**



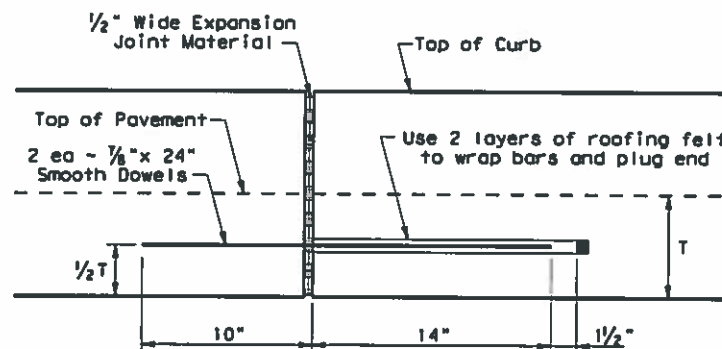
**TYPE IIa CURB  
5" - 5 3/4" HEIGHT**



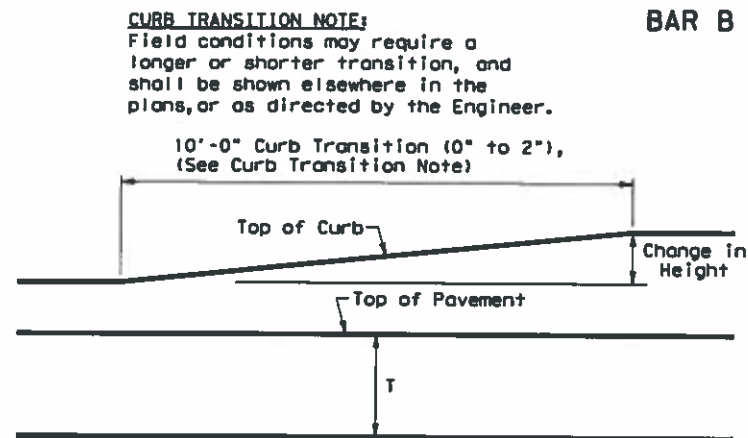
**TYPE IIa CURB AND GUTTER  
5" - 5 3/4" HEIGHT**



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



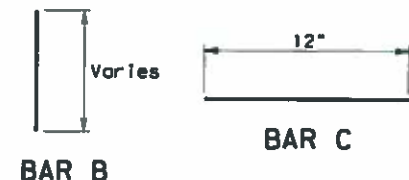
**EXPANSION JOINT DETAIL**



**CURB TRANSITION**  
Note: To be paid for as Highest Curb

**GENERAL NOTES**

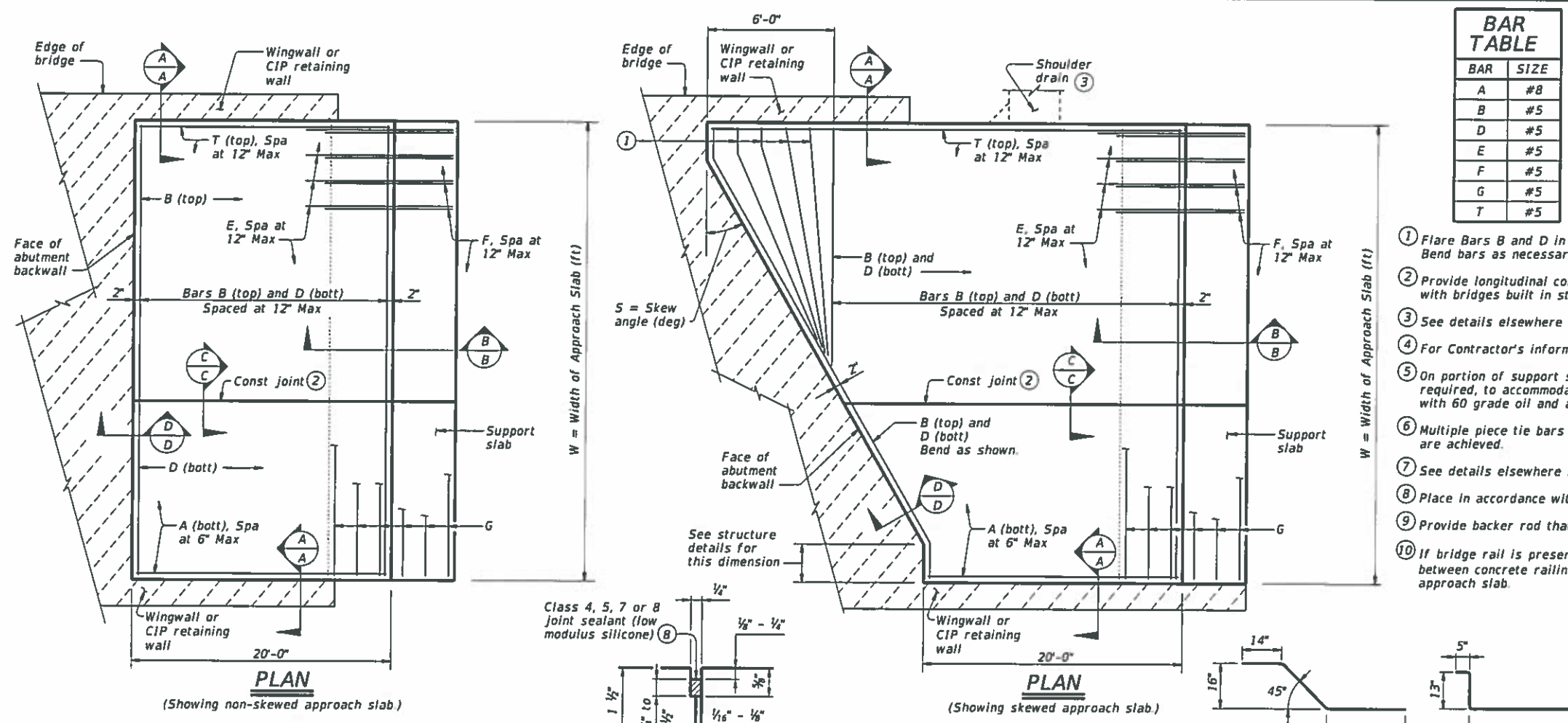
- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- 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 to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
- 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 horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B used as needed to support curb reinforcing steel during concrete placement.



**CURB TRANSITION NOTE:**  
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

		Design Division Standard	
<b>CONCRETE CURB AND GUTTER</b>			
<b>CCCG-21</b>			
FILE: cccq21.dgn	DW: TxDOT	CR: AN	DW: SS
© TxDOT: FEBRUARY 2021	CONT SECT	JOB	HIGHWAY
REVISITONS	6376	71	IH 45, etc.
	DIS	COUNTY	SHEET NO.
HOU	MONTGOMERY		42

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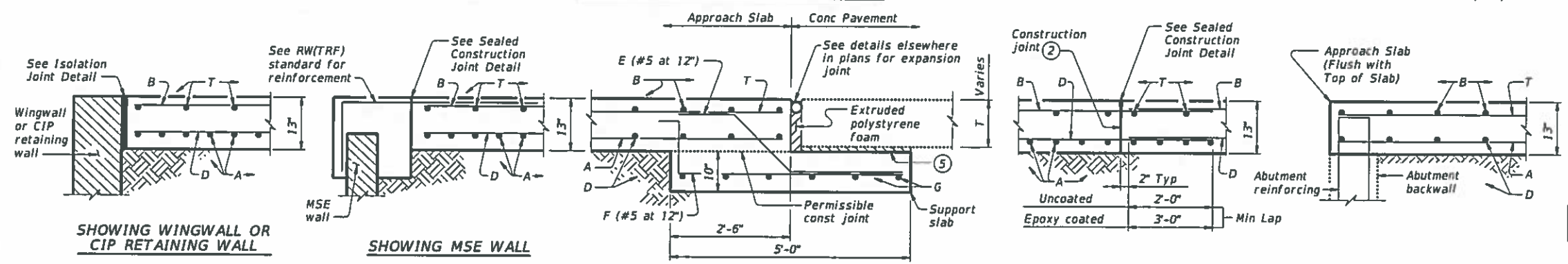


BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

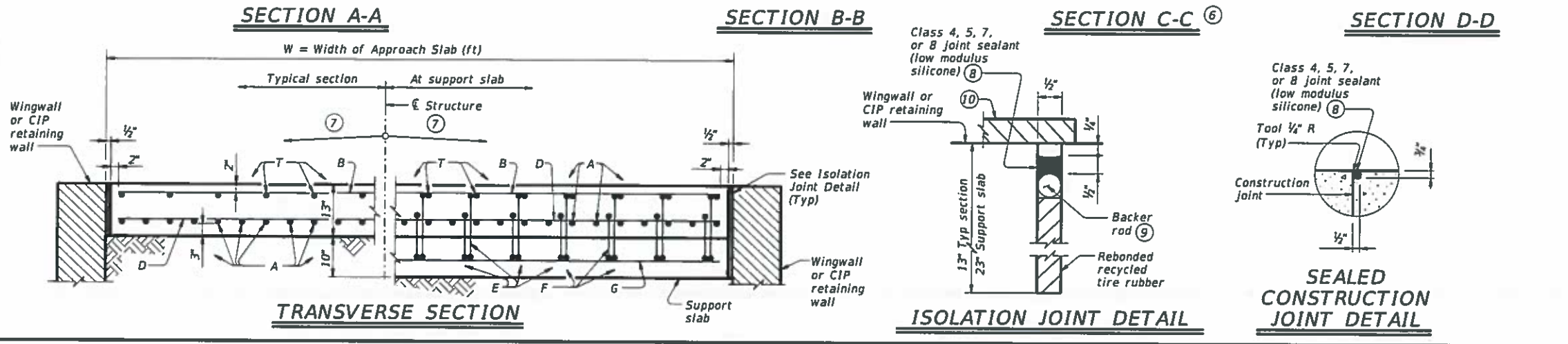
APPROXIMATE QUANTITIES <sup>(4)</sup>	
Reinf steel weight = 8.5 Lbs/SF of Approach Slab = 18.4 Lbs/LF of Support Slab	
Vol of Appr Slab Conc (CY) = 1.057W - 0.008W x T + 0.02W <sup>2</sup> Tan S (Includes Support Slab)	
W = Width of Approach Slab (ft)	
T = Conc Pavement Thickness (in)	
S = Skew Angle (deg)	

- Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
- Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- See details elsewhere in plans for shoulder drain location and details.
- For Contractor's information only. Quantities shown are for one approach slab only.
- On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to accommodate concrete pavement thickness. Smooth trowel finish. Oil top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 30# roofing felt.
- Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- See details elsewhere in plans for required cross-slope.
- Place in accordance with Item 438.
- Provide backer rod that is 25% larger than joint opening and compatible with the sealant.
- If bridge rail is present at the wingwall or CIP retaining wall, place 1/2" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

**LONGITUDINAL SAW CUT JOINT DETAIL**



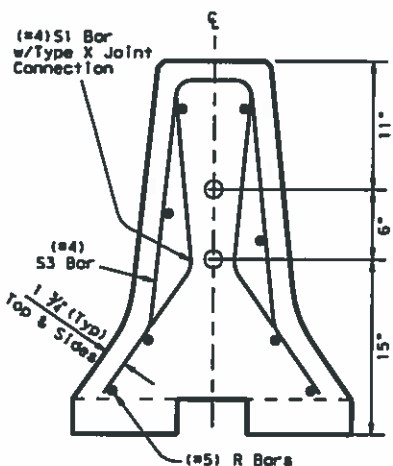
**GENERAL NOTES:**  
 Construct approach slab in accordance with Item 422.  
 Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.  
 Provide Grade 60 reinforcing steel.  
 Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 1/2" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 1/2" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)  
 Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310, "Joint Sealants and Fillers."  
 Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.  
 Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.  
 Cure for 4 days using water or membrane curing per Item 422.  
 All details shown herein are subsidiary to bridge approach slab.  
 Cover dimensions are clear dimensions, unless noted otherwise.  
 Reinforcing bar dimensions shown are out-to-out of bar.



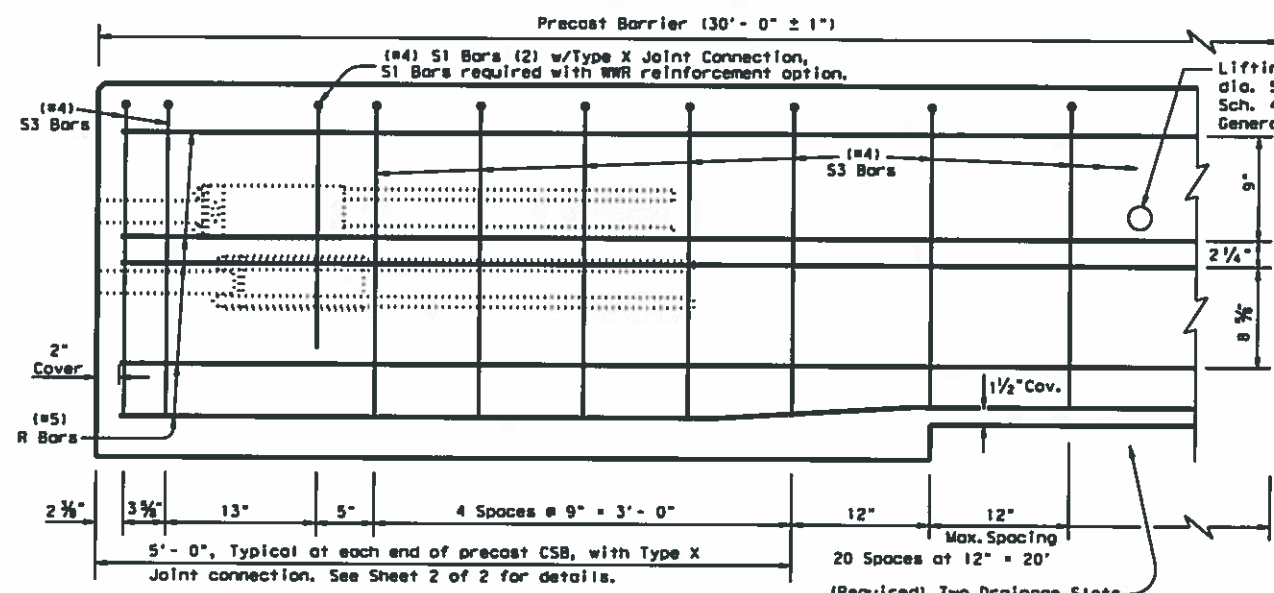
Texas Department of Transportation		Bridge Division Standard	
<b>BRIDGE APPROACH SLAB CONCRETE PAVEMENT</b>			
<b>BAS-C</b>			
FILE: bascs1e1-20.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT
©TxDOT April 2019	CONT	SECT	JOB
REVISIONS	8376	71	001
02-20: Removed stress relieving pad.	DIST	COUNTY	HIGHWAY
HOU	MONTGOMERY		43

DATE: FILE:

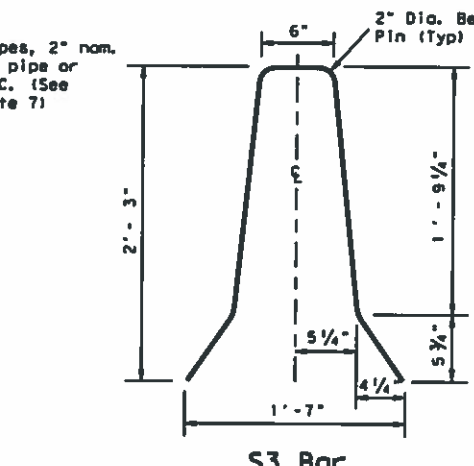
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



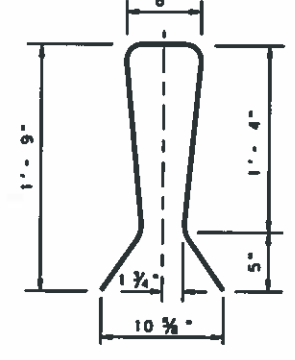
**End View Precast Barrier**  
See sheet 2 of 3 for joint connection Type X



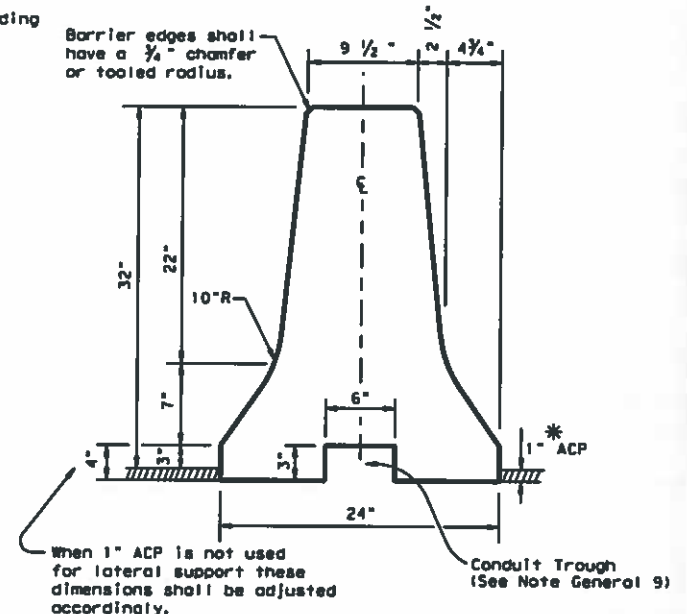
**Reinforcement for Precast (CSB) Concrete Safety Barrier (Type 1)**  
Showing reinforcement for Joint Type X



**S3 Bar**  
#4 Bar



**S1 Bar**  
#4 Bar (2)  
(Joint Type X)

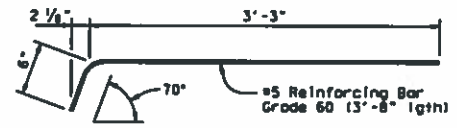


Barrier edges shall have a 1/4" chamfer or tooling radius.

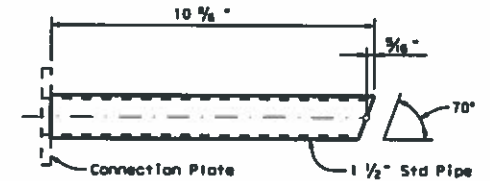
When 1" ACP is not used for lateral support these dimensions shall be adjusted accordingly.

**Concrete Safety Barrier**

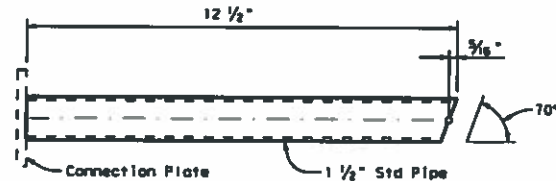
\* When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used. See CSB(6) sheet.



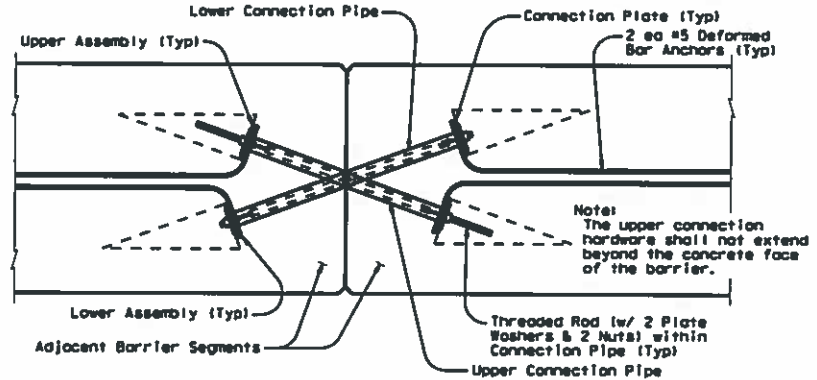
**DEFORMED BAR ANCHOR DETAILS**  
Two (2) Bars required per assembly. Eight (8) required per joint.



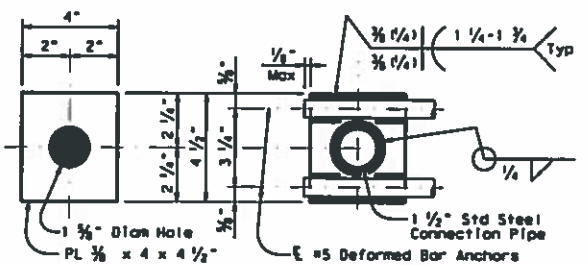
**UPPER CONNECTION PIPE DETAILS**  
One (1) Steel Pipe required per Upper Assembly. Two (2) required per joint.



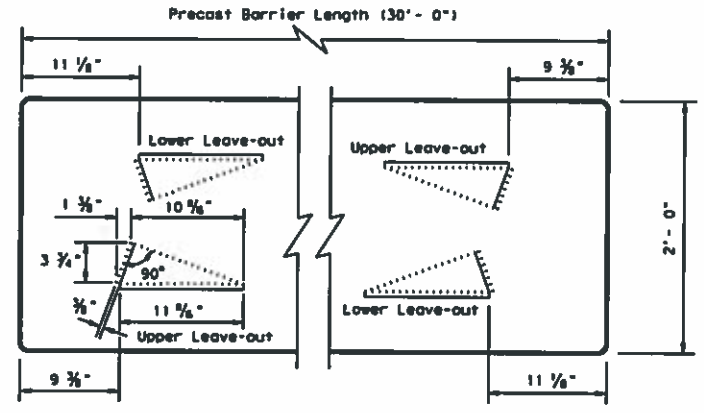
**LOWER CONNECTION PIPE DETAILS**  
One (1) Steel Pipe required per Lower Assembly. Two (2) required per joint.



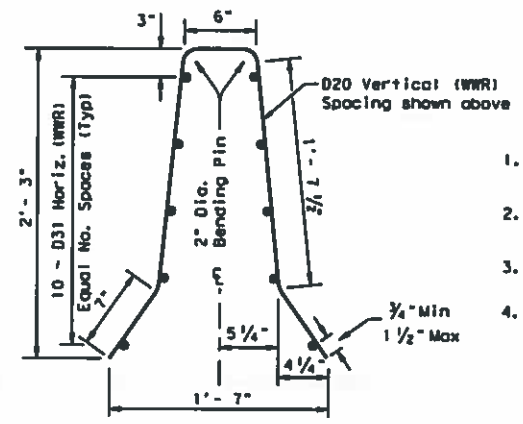
**TYPE X JOINT INSTALLATION DETAIL**  
Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.



**CONNECTION PLATE DETAILS**  
One (1) Plate required per assembly. Four (4) required per joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.

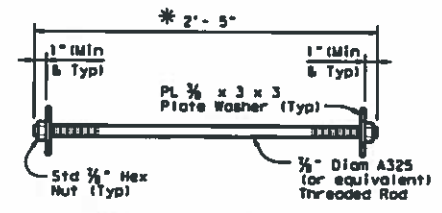


**BARRIER PLAN AT END JOINTS**



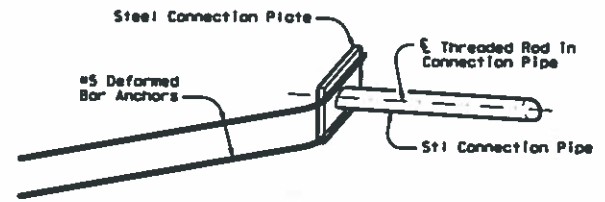
**Welded Wire Reinforcement (WWR) Option for Bars R and S3**

- (WWR) General Notes
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
  - Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
  - All reinforcement shall comply with Item 440, "Reinforcing Steel."
  - Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



**CONNECTION BOLT OR THREADED ROD DETAIL**  
Two (2) Threaded Rods (or Equivalent Hex Hd. Bolts) (w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per joint.

\* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



**ISOMETRIC OF TYPICAL WELDED ASSEMBLY**

Four (4) [2 Upper & 2 Lower] Assemblies required per joint.

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

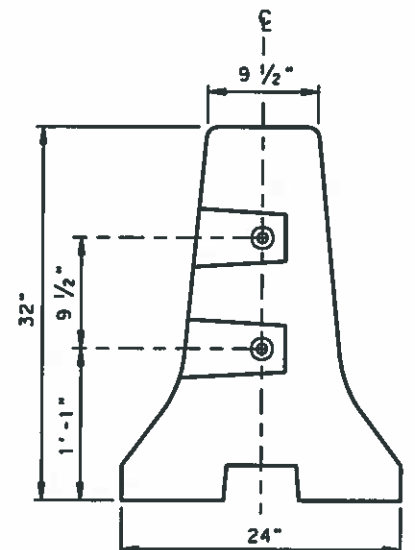
**GENERAL NOTES**

- Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
- All precast barrier edges shall have a 1/4" chamfer or tooling radius.
- All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
- All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
- Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
- Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
- Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.

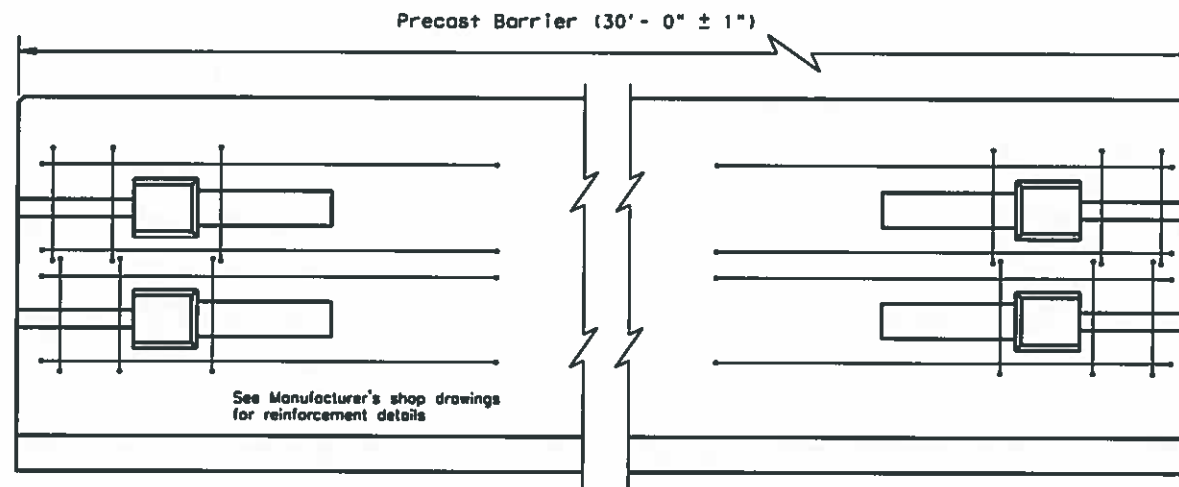
Texas Department of Transportation		Design Division Standard	
<b>CONCRETE SAFETY BARRIER (F-SHAPE)</b>			
PRECAST BARRIER (TYPE 1)			
<b>CSB(1)-10</b>			
FILE: CSB110.dgn	DATE: December 2010	BY: 6376 71	CHK: 001
DESIGNER: TxDOT	SECTION: HIGHWAY	COUNTY: MONTGOMERY	SHEET NO.: 44

DATE: FILE:

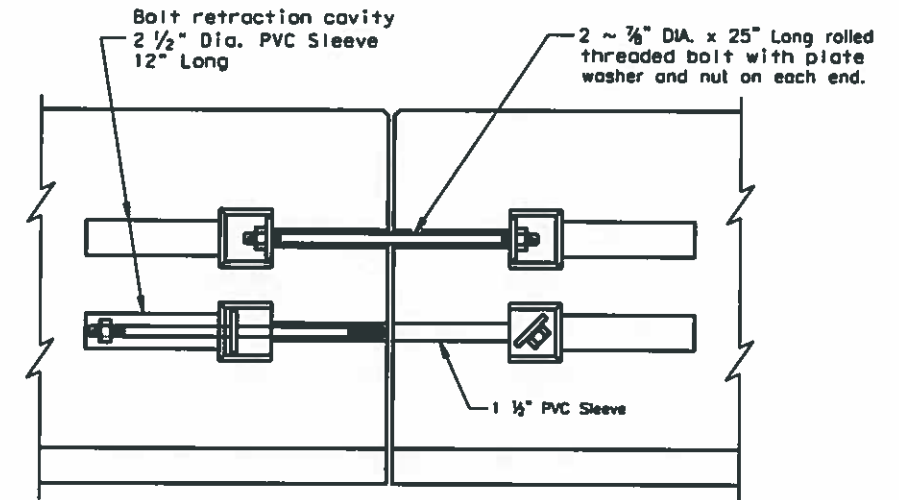
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**END VIEW (CSB) QUICK-BOLT**  
QUICK-BOLT POCKET LOCATIONS

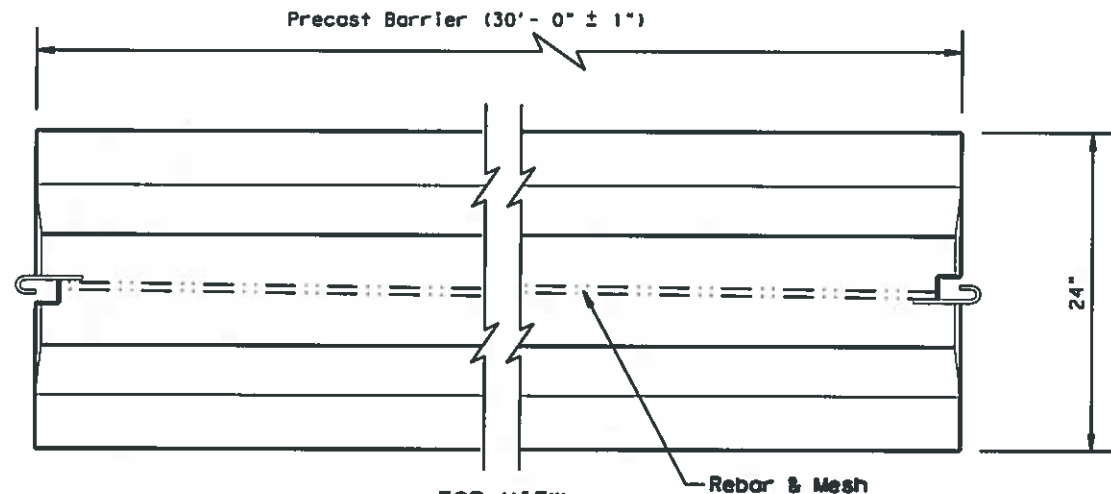


**ELEVATION (CSB) QUICK-BOLT**  
See Manufacturer's shop drawing for additional details

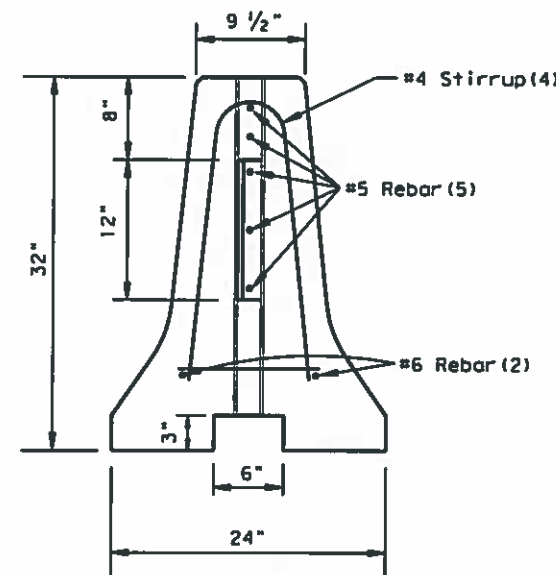


**ELEVATION VIEW SHOWING JOINT CONNECTION**  
**"QUICK-BOLT"**

**Joint Connection (Type Q)**

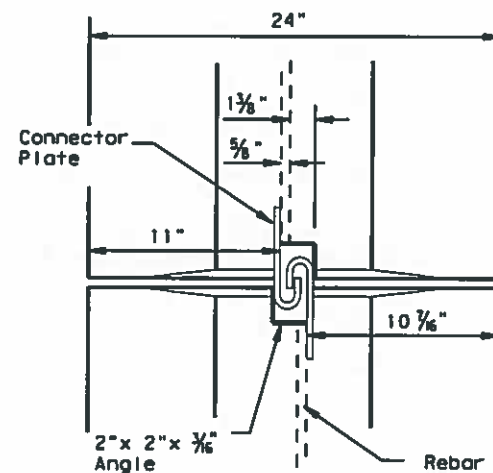


**TOP VIEW**  
**PRECAST (CSB) WITH J-J HOOKS**  
See Manufacturer's shop drawing for additional details



**END VIEW**  
**J-J HOOK CONNECTION**

**Joint Connection (Type J)**



**VIEW FROM ABOVE**  
**J-J HOOK CONNECTION**

**Proprietary Joint Connections (CSB)**

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045  
Quick-Bolt by Bexar Concrete, (210)497-3773

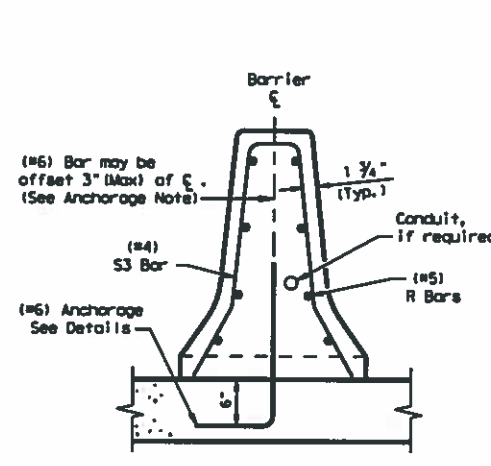
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

SHEET 2 OF 2

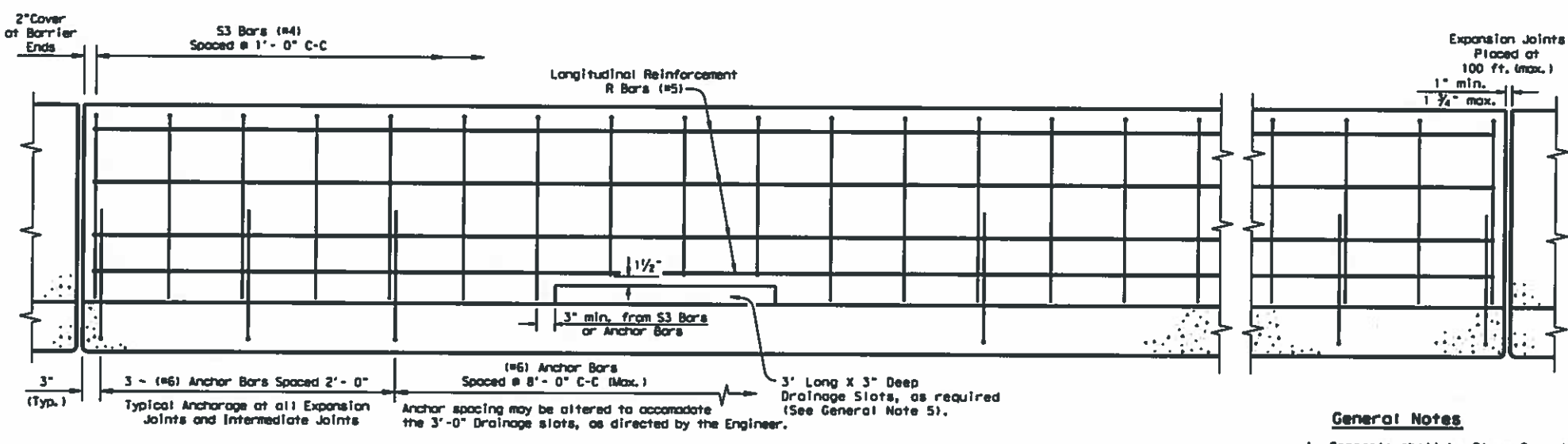
		Design Division Standard	
<b>CONCRETE SAFETY BARRIER (F-SHAPE)</b> <b>PRECAST BARRIER (TYPE 1)</b> <b>CSB(1)-10</b>			
FILE#	CSB110.dgn	DATE	12/01/10
DESIGNED BY	CHK AM	INVD BD	CRK VP
REVISIONS	6378	71	001
DIST	HOU	COUNTY	MONTGOMERY
			45

DATE: FILE:

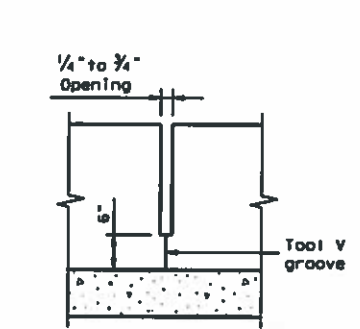
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**END VIEW**  
 Cast-in-Place (CIP) Barrier  
 Barrier is Symmetrical About the Center Line



**ELEVATION VIEW**  
 Cast-in-Place (CSB) on Bridge Decks or  
 Continuously Reinforced Concrete Pavement (CRCP)  
 (Showing Reinforcement and Anchor Requirement)

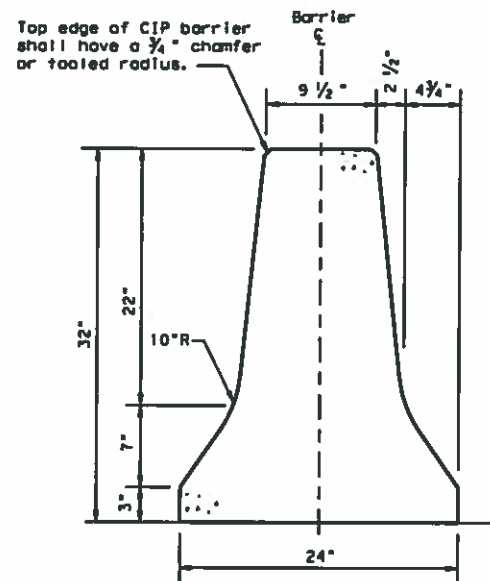


**BRIDGE INTERMEDIATE JOINT DETAIL**  
 Place at all Bent C's, without  
 Exp. Joints and spaced at  
 33 ft. (max.), 10 ft. (min.)

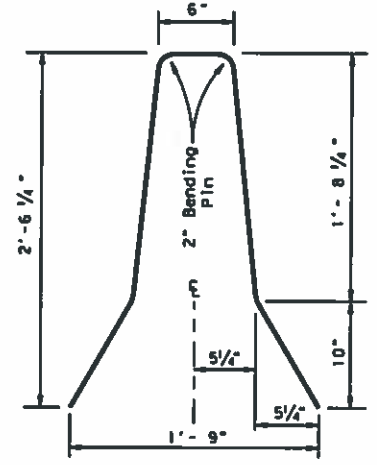
**CRCP EXPANSION JOINT PLACEMENT**  
 Place at all transverse joints  
 or 100 ft. (max.), 10 ft. (min.)

**General Notes**

- Concrete shall be Class C, unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge deck requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, as shown elsewhere in the plans.
- Axis of cast-in-place barrier shall be vertical, except where the roadway is super-elevated, then axis shall be normal to roadway surface.
- Top edges of cast-in-place barrier shall have a 3/4" chamfer or tooled radius.
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the expanded anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Drainage slot depths may be increased 1" to accommodate ACP. Slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the CSB(4) sheet for the proper reinforcement and anchorage.



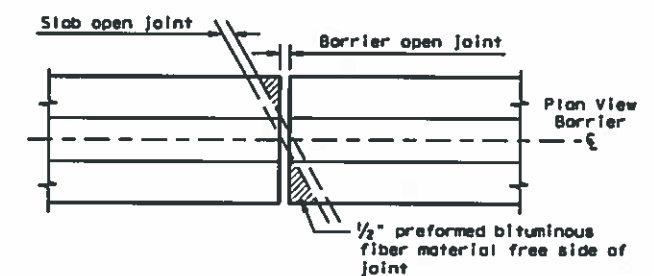
**CONCRETE SAFETY BARRIER (CSB)**



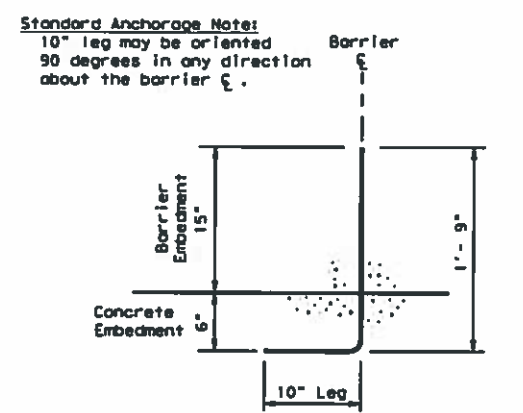
**S3 Bar**  
 (#4) Bar  
 Note: Reinforcement cage may rest on top of the finished grade.

**BARRIER PLACEMENT OVER (CRCP) JOINTS**

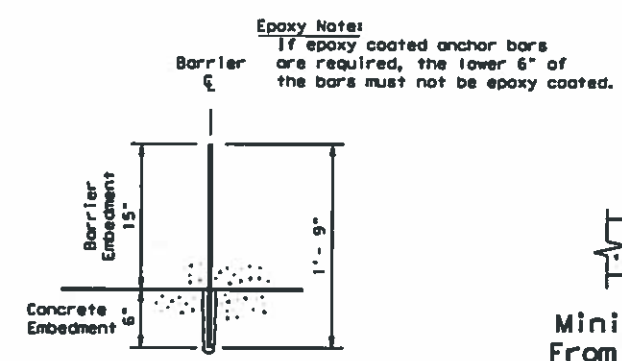
Barrier may be cast over a "Longitudinal" CRCP joint.  
 CRCP Joints (with or without tiebars): Two layers of 30# roofing felt or 1/2" preformed bituminous fiber material.  
 Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



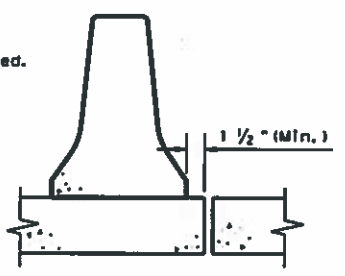
**BARRIER OVER TRANSVERSE OPEN JOINT**



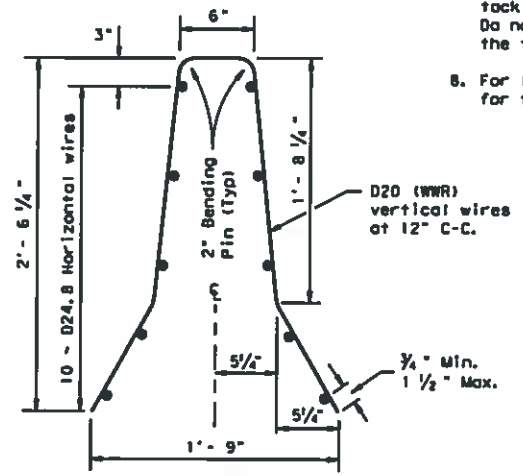
**STANDARD ANCHORAGE**  
 (#6) Bar  
 Concrete Pavement / Bridge Deck Anchorage:  
 Cast-in-Place or Slip-Formed Barrier  
 (See General Note 2)



**'OPTIONAL' ANCHORAGE**  
 (#6) Bar  
 Fresh Insertion method or  
 Type III, Class C Epoxy Method  
 Concrete Pavement / Bridge Deck Anchorage:  
 Cast-in-Place or Slip-Formed Barrier  
 (See General Notes 2 & 5)



**Minimum Edge Distance From Longitudinal Joint**  
 Placement over a longitudinal bridge joint is not recommended.



**Welded Wire Reinforcement (WWR) Option for Bars S and R**

**(WWR) General Notes**

- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
- The welded wire cage at the drainage slots may be cut or bent to accommodate the edge and top clearances, as directed by the Engineer.
- The welded wire splice locations shall have a "minimum" splice lap length of 12".
- Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".

**Cast-In-Place or Slip-Formed (CSB)**

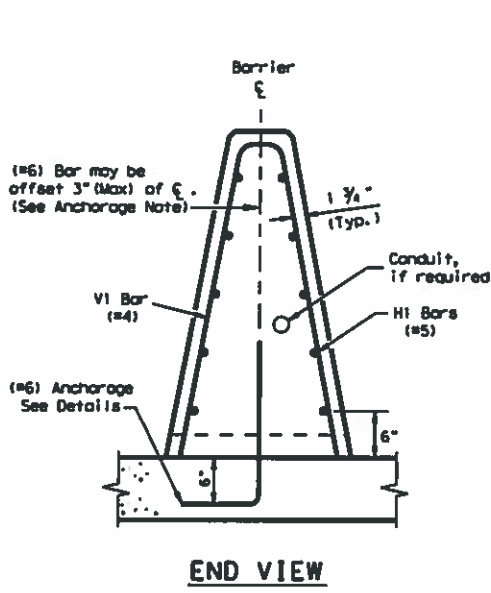
Cast-In-Place barrier may be connected to precast CSB. Joint connection "Types" may be used in Cast-In-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-in-Place (CSB) (F-Shape) is approx. 440 lbs per ft.

		Design Division Standard		
		<b>CONCRETE SAFETY BARRIER (F-SHAPE)</b> <b>CAST-IN-PLACE (TYPE 1)</b> <b>(BRIDGE DECK or CRCP)</b> <b>CSB(3)-16</b>		
FILE: csb316.dgn	DW: TxDOT	CR: HC/AN	DW: BD/VP	CR: KM
© TxDOT January 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	6378	71	001	IH 45, ETC.
CST 01-2016	DIST	COUNTY	SHEET NO.	
	HOU	MONTGOMERY	48	

DATE: FILE:

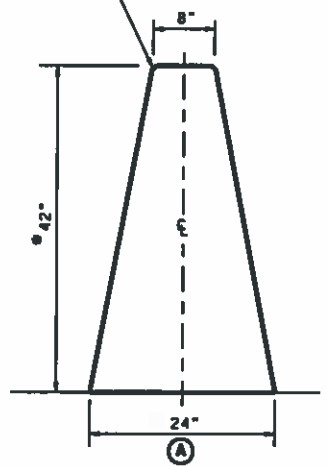
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**END VIEW**  
CAST-IN-PLACE (CIP) BARRIER

Barrier is Symmetrical About the Center Line

Top edges of CIP barrier shall have a 1/4" chamfer or toolled radius.

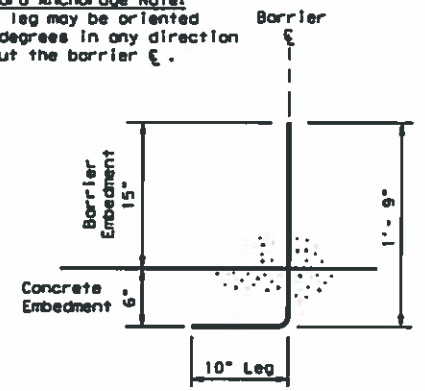


**SINGLE SLOPE CONCRETE BARRIER**  
(SSCB) (42")

* Barrier height (IN.)	Dimensions (IN.)		
	A	B	C
42	24	40 1/4	20 1/2
48	26 1/4	46 1/4	22 3/4
54	28 1/2	52 1/4	25 1/8

\* (SSCB) (42") Barrier height may be increased to 48" or 54". This would increase the barrier and reinforcement dimensions accordingly.

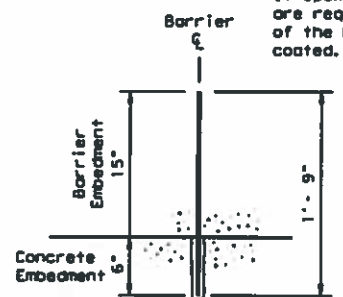
**Standard Anchorage Note:**  
10" leg may be oriented 90 degrees in any direction about the barrier centerline.



**STANDARD ANCHORAGE**

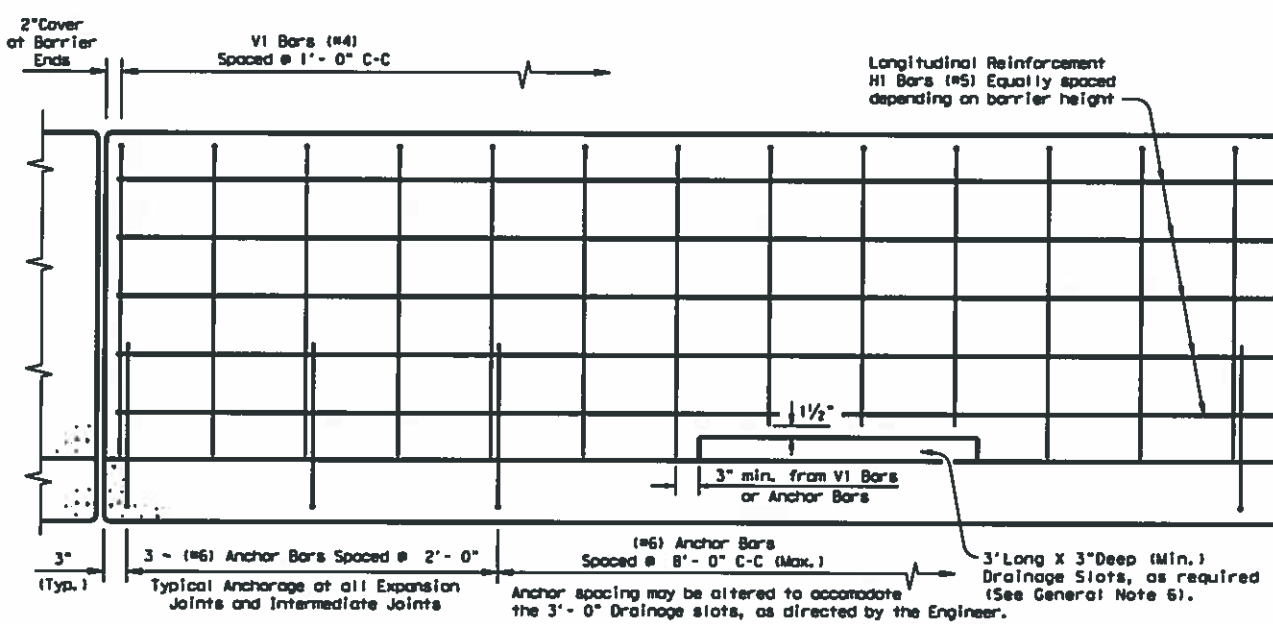
(#6) Bar  
Concrete Pavement / Bridge Deck Anchorage:  
Cast-In-Place or Slip-Formed Barrier  
(See General Notes 2)

**Epoxy Note:**  
If epoxy coated anchor bars are required, the lower 6" of the bars must not be epoxy coated.



**"OPTIONAL" ANCHORAGE**

(#6) Bar  
Fresh Insertion method or Type III, Class C Epoxy Method  
Concrete Pavement / Bridge Deck Anchorage:  
Cast-In-Place or Slip-Formed Barrier  
(See General Notes 2 & 4)



**ELEVATION VIEW**

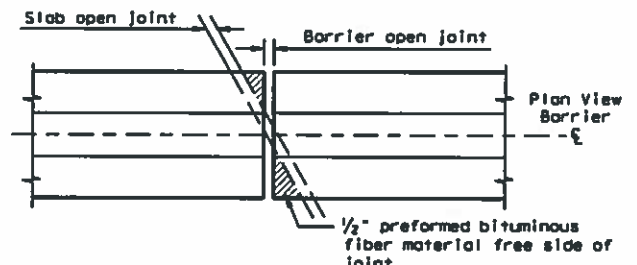
Cast-in-Place (SSCB) on Bridge Decks or Continuously Reinforced Concrete Pavement (CRCP) (Showing Reinforcement and Anchor Placement)

**BARRIER PLACEMENT OVER (CRCP) JOINTS**

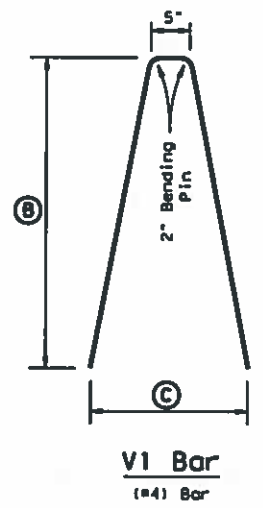
Barrier may be cast over a "Longitudinal" CRCP joint.

CRCP Joints (with or without tiebars): Two layers of 30 lb roofing felt or 1/2" preformed bituminous fiber material.

Barrier Anchorage Note: Anchorage must be located at least 3" from a longitudinal joint.



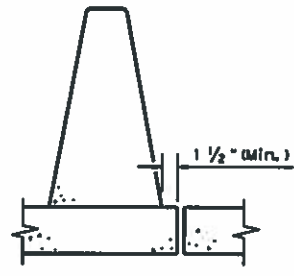
**BARRIER OVER TRANSVERSE OPEN JOINT**



**V1 Bar**  
(#4) Bar

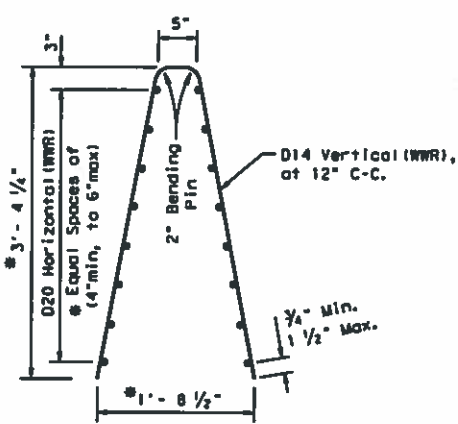
**Welded Wire Reinforcement (WWR) Option for Bars V1 and H1**

- (WWR) General Notes
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
  - Welded wire cage may be cut and bent to accommodate the drainage slots, as directed by the Engineer.
  - Welded wire splice locations shall have a "minimum" splice lap length of 12".
  - Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



**MINIMUM EDGE DISTANCE FROM LONGITUDINAL JOINT**

Barrier placement over a longitudinal bridge joint is not recommended.



**General Notes**

- Concrete shall be Class C. Unless otherwise specified in the plans.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615. If the bridge slab requires epoxy "coated" reinforcement, the barrier and/or anchorage may require the same, if shown elsewhere in the plans.
- These details cover barrier per Item 514, "Permanent Concrete Traffic Barrier".
- Anchorage: The "Optional" Anchor system shall be embedded 6" into fresh concrete or using a Type III, Class C Epoxy anchorage system. Follow the manufacturer's directions for installing the exposed anchor bars. All anchorage shown is the minimum required, and considered subsidiary to the bid item.
- Top edges of CIP barrier shall have a 1/4" chamfer or toolled radius.
- Drainage slot locations (12'-0", C-C Min. Spacing) are shown elsewhere, or as directed by the Engineer. Drainage slot heights on the SSCB may be increased to a maximum of 5 inches, without geometric changes to the barrier face.
- Cast-in-place barrier may be slip formed. Bracing may be tied or tack welded to the reinforcement cage to provide cage stability. Do not weld to anchor bars. The reinforcement cage may rest on the top of the finished grade.
- For locations where lighting is required, see the SSCB(4) sheet for the proper reinforcement and anchorage.

**Cast-In-Place (CIP) or Slip-Formed (SSCB)**

Cast-in-Place barrier may be connected to precast SSCB. Joint connection "Types" may be used in Cast-In-Place barrier, to match the precast barrier connection. (See required connection "Type" elsewhere in the plans)

The weight of Cast-In-Place (SSCB) 42" is approx. 717 lbs per ft.

Texas Department of Transportation  
Design Division Standard

**SINGLE SLOPE CONCRETE BARRIER**  
CAST-IN-PLACE (TYPE 1)  
(BRIDGE DECK OR CRCP)  
**SSCB(1)-16**

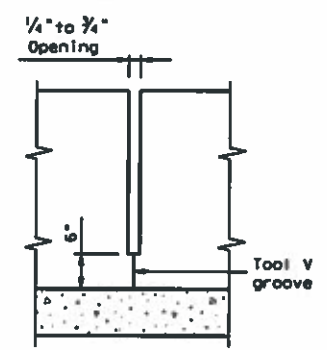
FILE: sscb116.dgn	DATE: 01-2016	DESIGNER: JH	CHECKER: JH	DATE: 01-2016	PROJECT: IH 45, ETC.
REVISIONS	6376	71	001	HOU	MONTGOMERY
COUNTY	SHEET NO.		47		

**INTERMEDIATE JOINT DETAIL**

Place at all Bent E's, without expansion joints and spaced at 33 ft. (max.), 10 ft. (min).

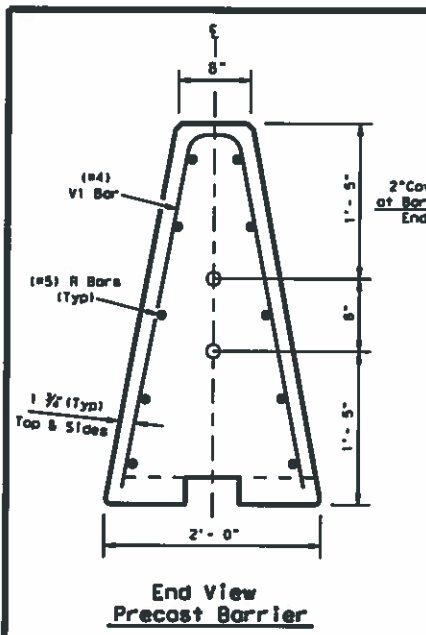
**EXPANSION JOINT PLACEMENT**

Place at all transverse joints or 100 ft. (max.), 10 ft. (min).

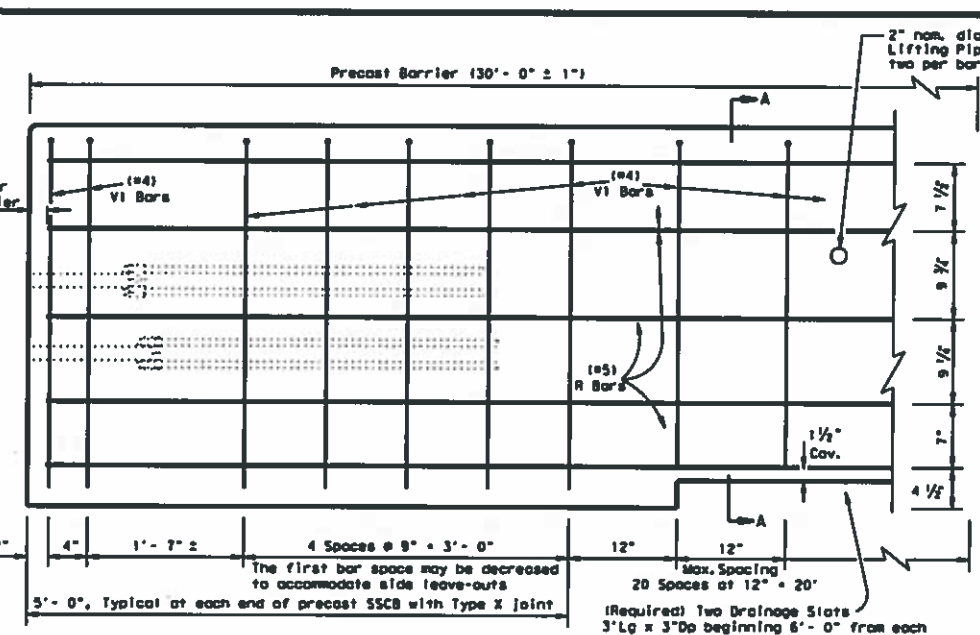


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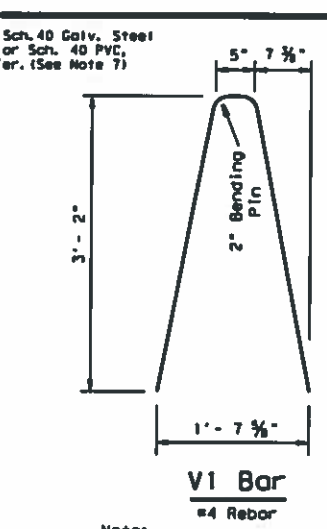
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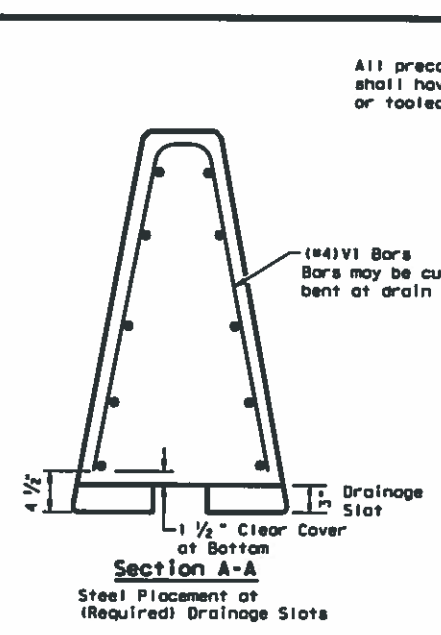
**End View Precast Barrier**  
Pipe locations for Joint Type X connection



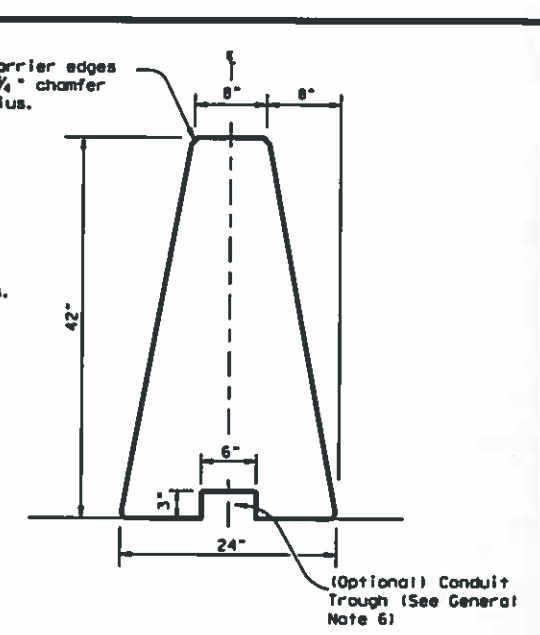
**Reinforcement for Precast (SSCB) Single Slope Concrete Barrier (Type 1)**  
Showing reinforcement for Joint Connection (Type X)



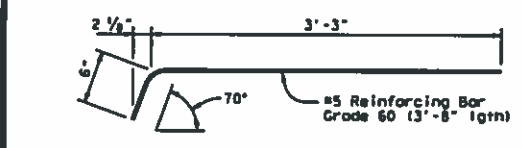
**VI Bar**  
#4 Rebar  
Note: V1 Bars above the drainage slots may be bent to accommodate 1 1/2 inch clear cover as directed by the Engineer.



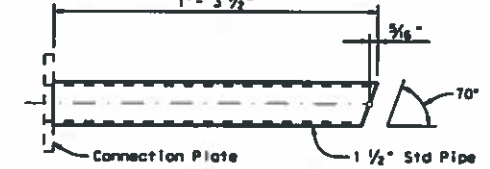
**Section A-A**  
Steel Placement at (Required) Drainage Slots



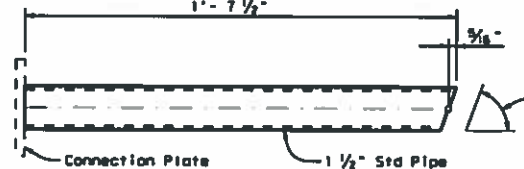
**Single Slope Concrete Traffic Barrier**  
All precast barrier edges shall have a 1/4 inch chamfer or tooled radius.  
Precast SSCB barrier may be connected to cast-in-place SSCB. The joint connection "Types" may be used in the cast-in-place barrier, to match the precast barrier connection.  
(Optional) Conduit Trough (See General Note 6)



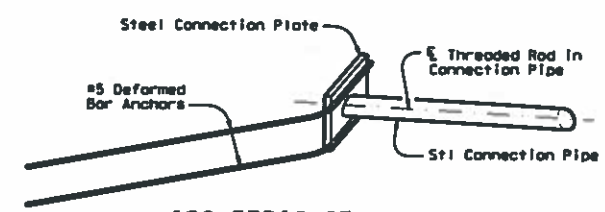
**DEFORMED BAR ANCHOR DETAILS**  
Two (2) Bars required per assembly. Eight (8) required per joint.



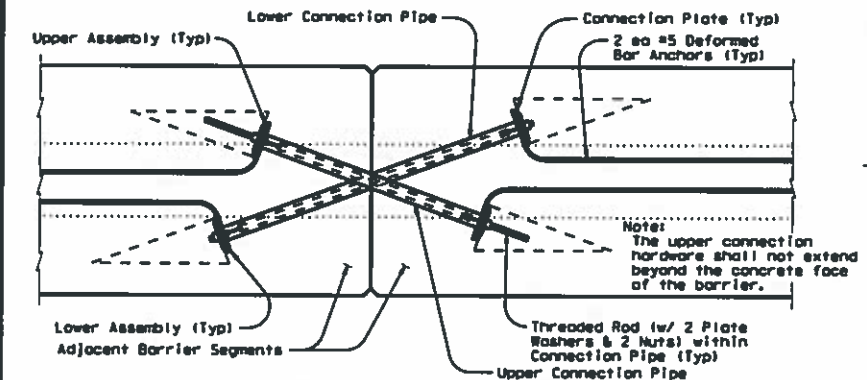
**UPPER CONNECTION PIPE DETAILS**  
One (1) Steel Pipe required per Upper Assembly. Two (2) required per joint.



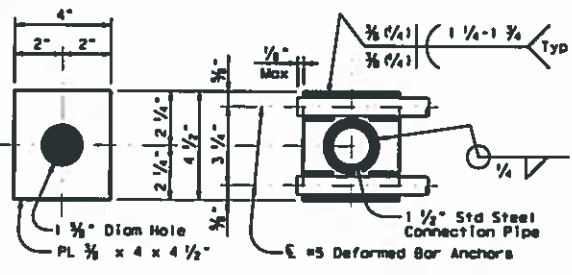
**LOWER CONNECTION PIPE DETAILS**  
One (1) Steel Pipe required per Lower Assembly. Two (2) required per joint.



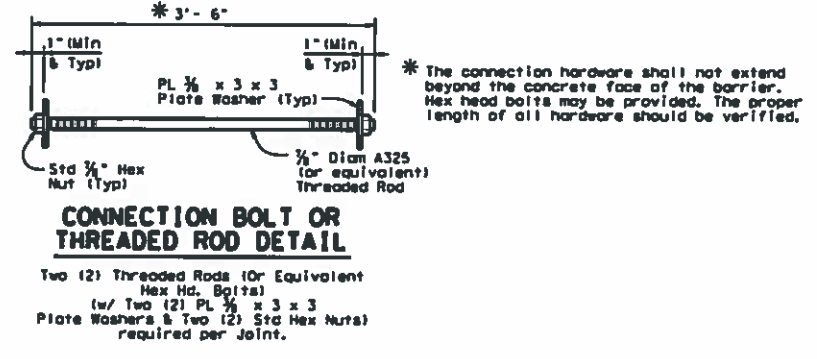
**ISOMETRIC OF TYPICAL WELDED ASSEMBLY**  
Four (4) [2 Upper & 2 Lower] Assemblies required per joint.



**TYPE X JOINT INSTALLATION DETAIL**  
Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

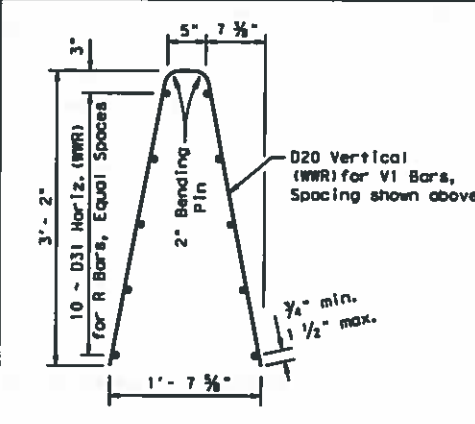


**PLATE DIMENSIONS WELDING DETAILS**  
**CONNECTION PLATE DETAILS**  
One (1) Plate required per assembly. Four (4) required per joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



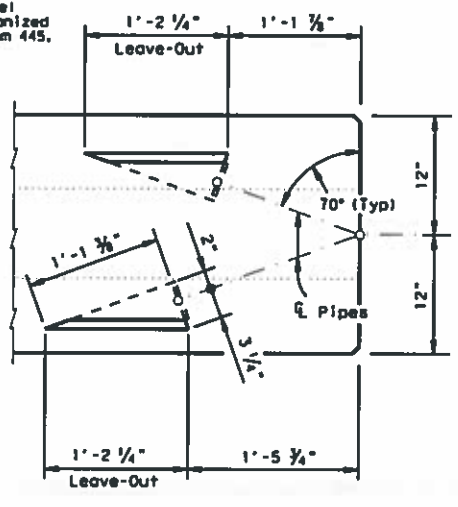
**CONNECTION BOLT OR THREADED ROD DETAIL**  
Two (2) Threaded Rods (or Equivalent Hex Hd. Bolts) w/ Two (2) PL 3/8 x 3 x 3 Plate Washers & Two (2) Std Hex Nuts required per joint.  
\* The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.

Weight of one precast 30 ft. (SSCB) segment = Approx. 10.5 Tons or 717 lbs per ft.



**Welded Wire Reinforcement (WWR) Option for Bars R and VI**

- (WWR) General Notes
- Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
  - Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
  - All reinforcement shall comply with Item 440, "Reinforcing Steel."
  - Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



**BARRIER PLAN AT JOINT**

**General Notes**

- Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
- Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
- Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
- All precast barrier edges shall have a 1/4 inch chamfer or a tooled radius.
- All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
- Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.
- Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
- Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items.
- All steel assemblies shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

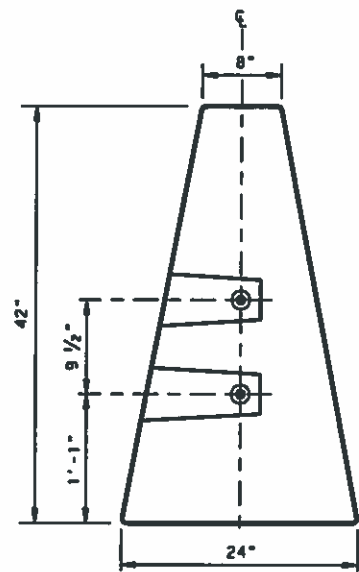
Texas Department of Transportation Design Division Standard

**SINGLE SLOPE CONCRETE BARRIER**  
PRECAST BARRIER (TYPE 1)  
SSCB(2) - 10

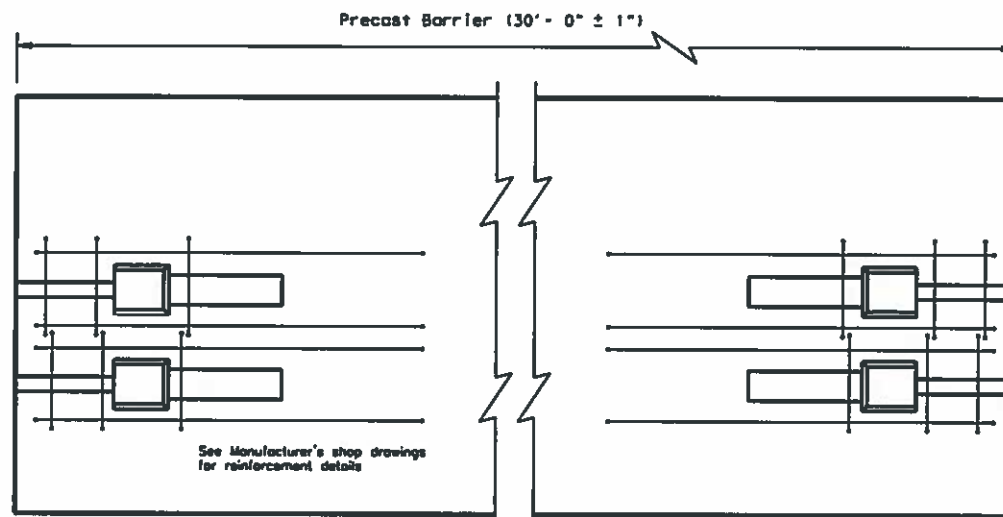
FILE: sscb210.dgn	DR: TxDOT	CR: AM	DR: BD	CR:
©TxDOT December 2010	CON: SECT	JOB:	HIGHWAY	
REVISIONS	6378	71	001	IH 45, ETC.
	SHEET	COUNTY	SHEET NO.	
	HOU	MONTGOMERY	48	

DATE: FILE:

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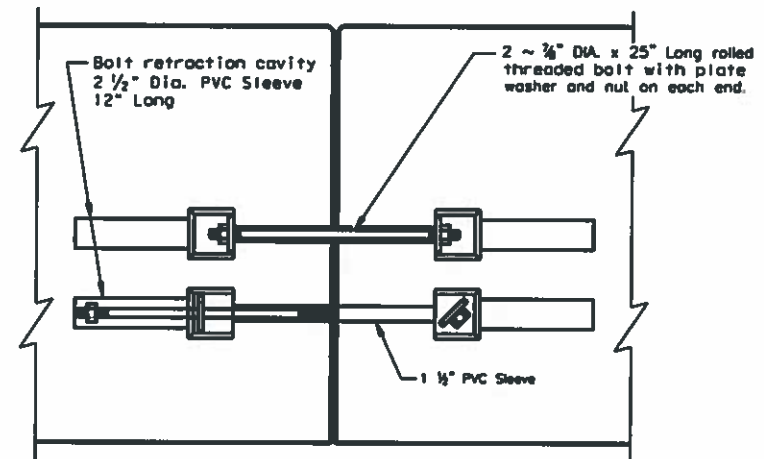


**END VIEW**  
"QUICK-BOLT" POCKET LOCATIONS



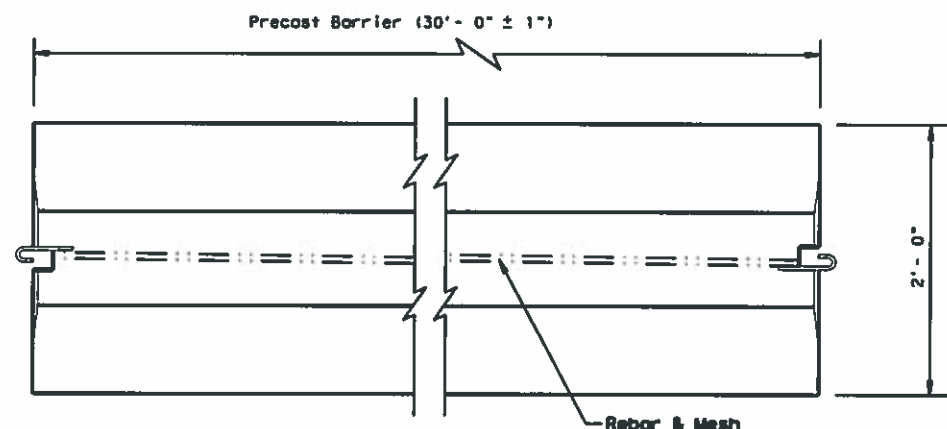
**ELEVATION VIEW**  
"QUICK-BOLT" (SSCB)

See Manufacturer's shop drawing for additional details



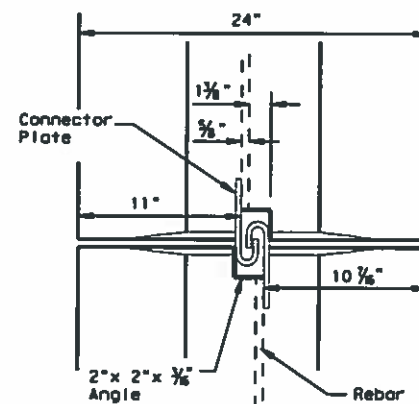
**ELEVATION VIEW SHOWING JOINT CONNECTION**  
"QUICK-BOLT"

**Joint Connection (Type Q)**

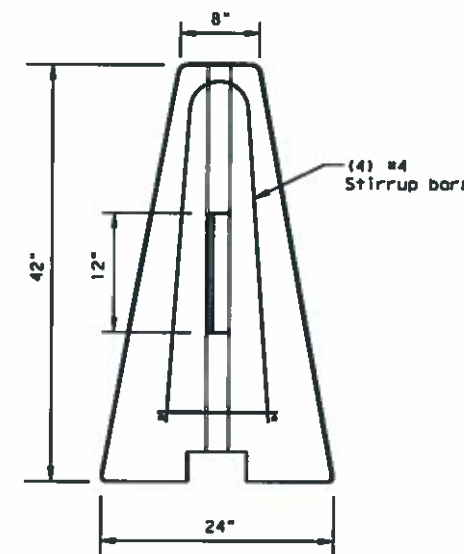


**TOP VIEW**  
PRECAST (SSCB) WITH J-J HOOKS

See Manufacturer's shop drawing for additional details



**VIEW FROM ABOVE**  
J-J HOOK CONNECTION



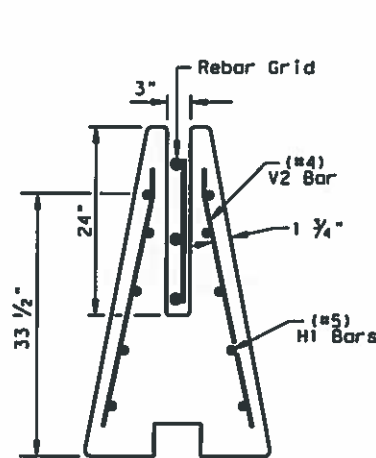
**END VIEW**

**Proprietary Joint Connections (SSCB)**

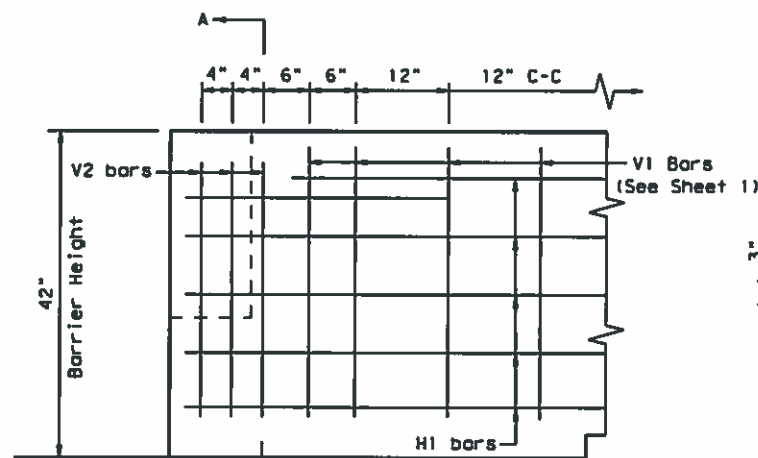
Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045  
Quick-Bolt by Bexor Concrete, (210)497-3773

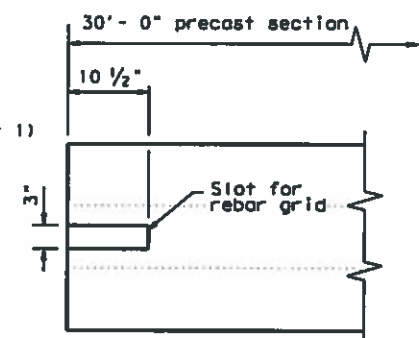
If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.



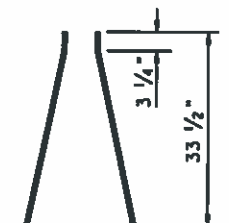
**SECTION A-A**  
Showing (Type R)  
Rebar Grid



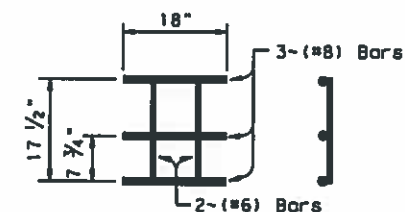
**ELEVATION**  
V1 Bars (See Sheet 1)



**TOP VIEW**  
JOINT CONNECTION  
Typical at both ends of barrier segment



**(#4) V2 BARS**  
6 - two piece bars per barrier segment



**WELDED REBAR GRID**

SHEET 2 OF 2



**SINGLE SLOPE CONCRETE BARRIER**

PRECAST BARRIER  
(TYPE 1)

**SSCB(2) - 10**

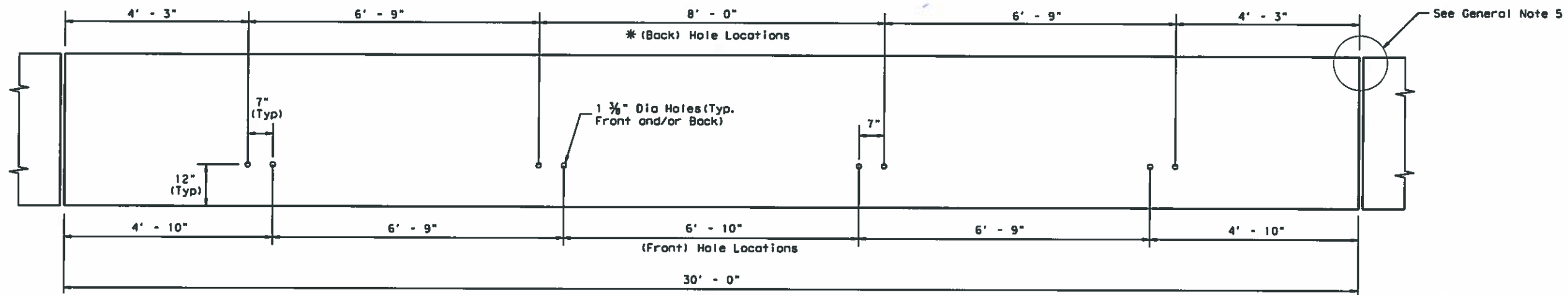
FILE: sscb210.dgn	DRW TxDOT	CHK AM	DRW VP	CHK
© TxDOT December 2010	CONTRACT	SECTION	JOB	HIGHWAY
REVISIONS	6378	71	001	IH 45, ETC.
DIST	COUNTY	SHEET NO.		
HOU	MONTGOMERY	49		

DATE: FILE:

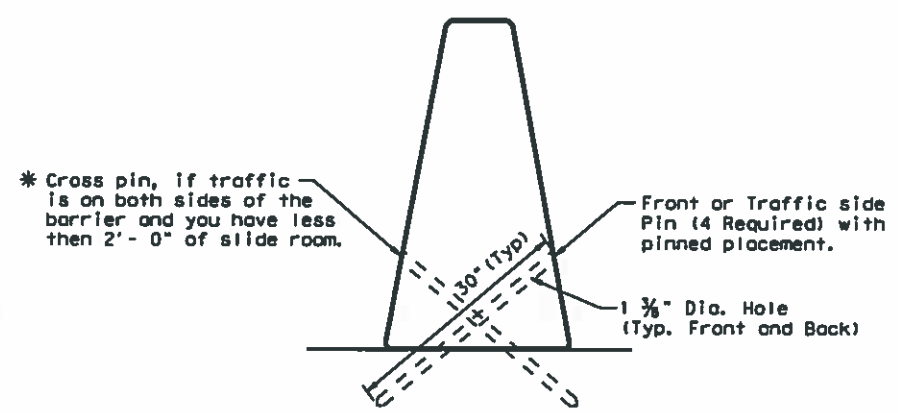


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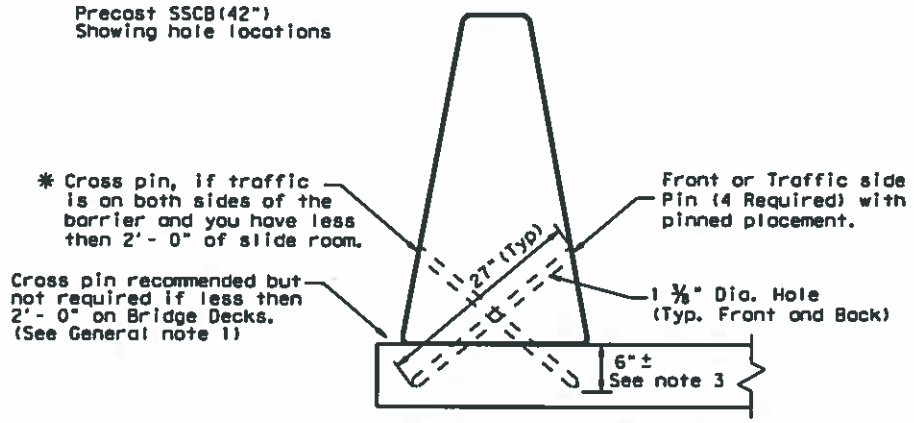
DATE: FILE:



**DETAIL 1**  
Precast SSCB (42")  
Showing hole locations



**DETAIL 2**  
Placement on (ACP)  
Asphalt Conc. Pavement  
or Treated Base Material  
(30" Pin required)



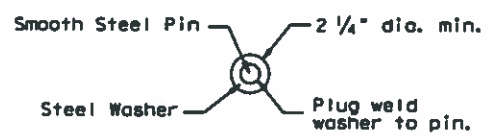
**DETAIL 3**  
Bridge Deck or CRCP  
(27" Pin required).

**GENERAL NOTES**

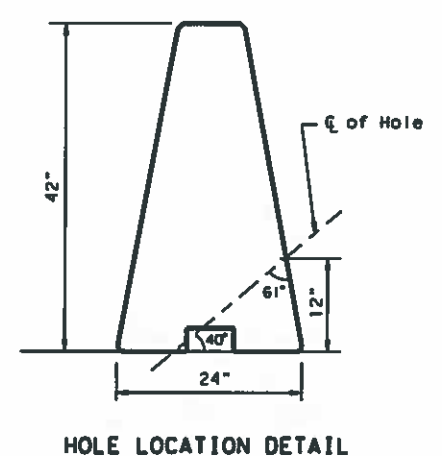
1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less than 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 3/8 in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing through the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 1/4 in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

**CORE DRILLING EXISTING BARRIER**

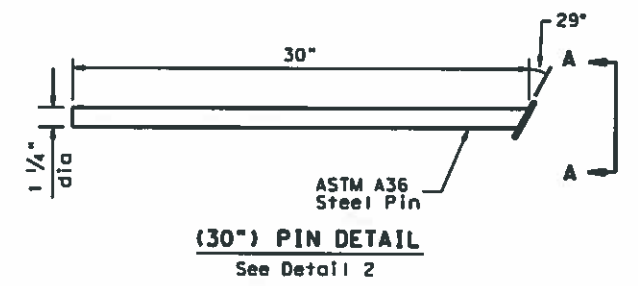
Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding 1/2" shall be patched.



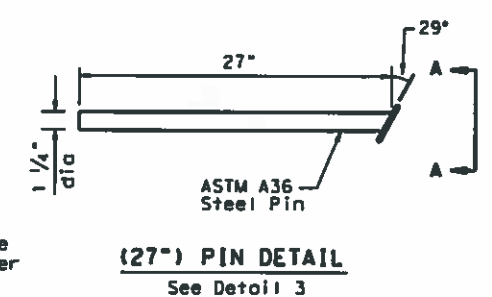
**VIEW A-A**



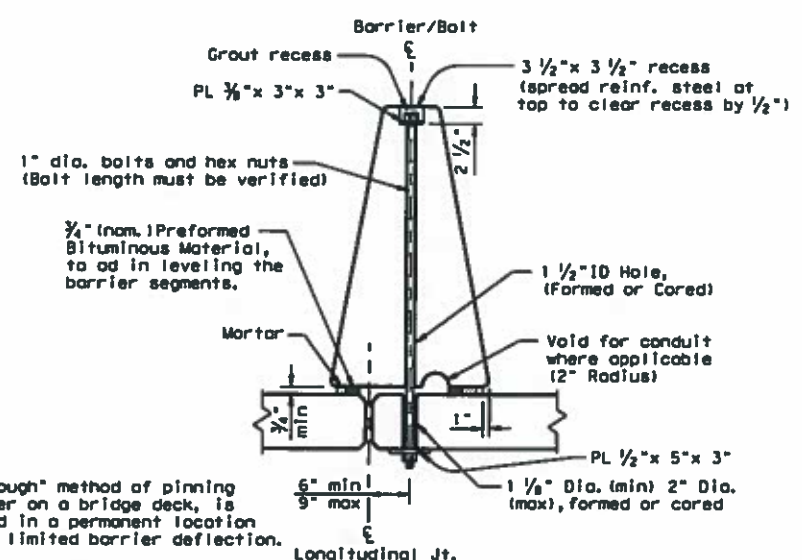
**HOLE LOCATION DETAIL**



**(30") PIN DETAIL**  
See Detail 2

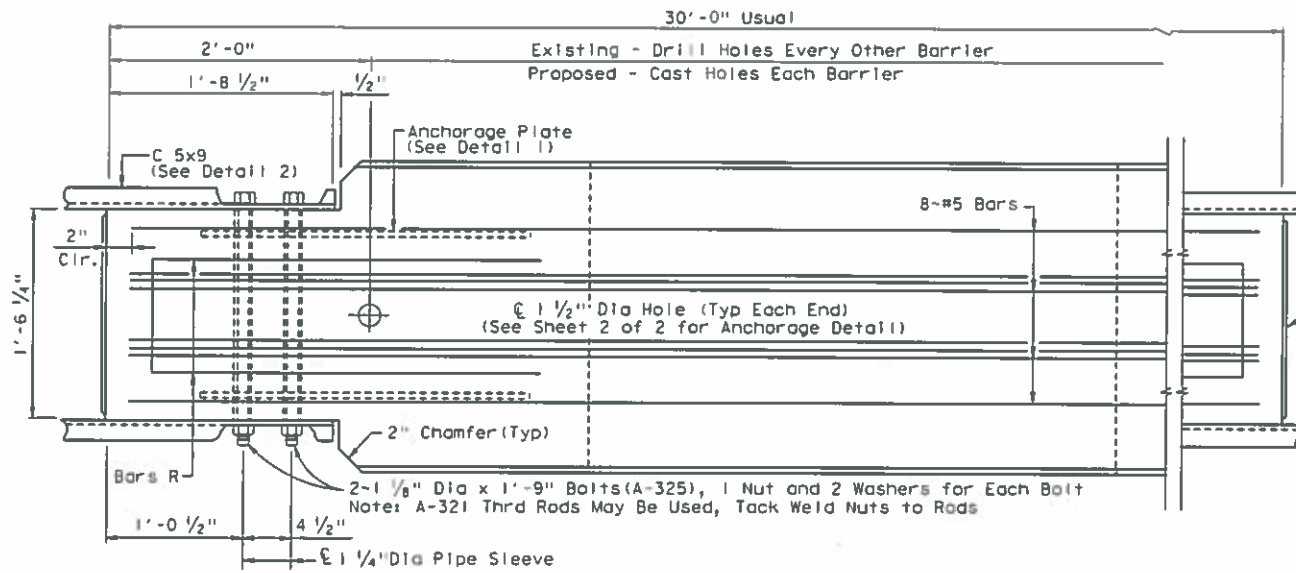


**(27") PIN DETAIL**  
See Detail 3

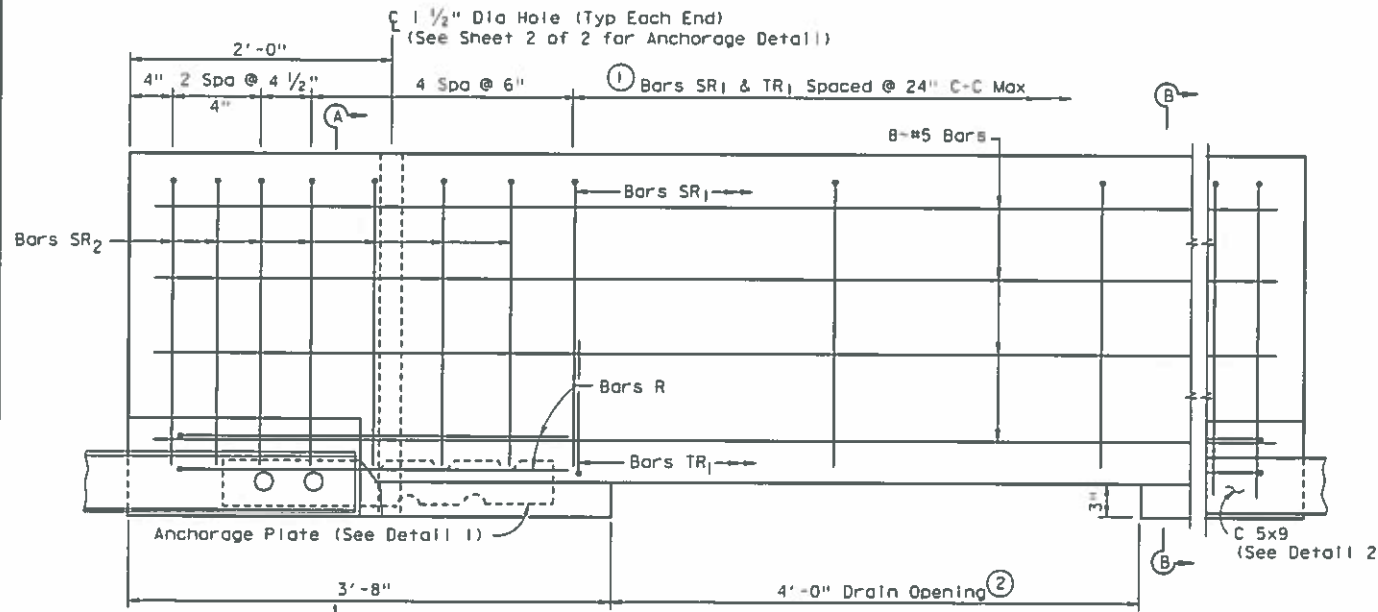


**PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT**  
For bolt through locations, use the (Front) hole locations shown on Detail 1.

		Design Division Standard	
<b>SINGLE SLOPE CONCRETE BARRIER</b> <b>PRECAST BARRIER (TYPE 1)</b> <b>PINNED PLACEMENT</b> <b>SSCB(5) - 10</b>			
FILE#	SSCB510.dgn	DW: TxDOT	CHK: AM
REVISED	December 2010	CDT: SECT	JOB: HIGHWAY
DIST	6378	71	001
COUNTY	MONTGOMERY		SHEET NO. 50



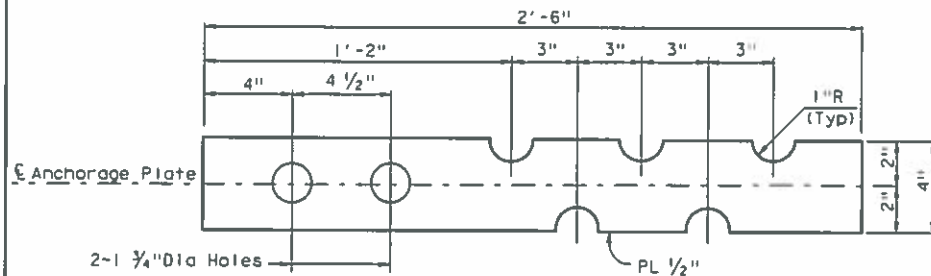
**PLAN**  
(Typ Both Ends)



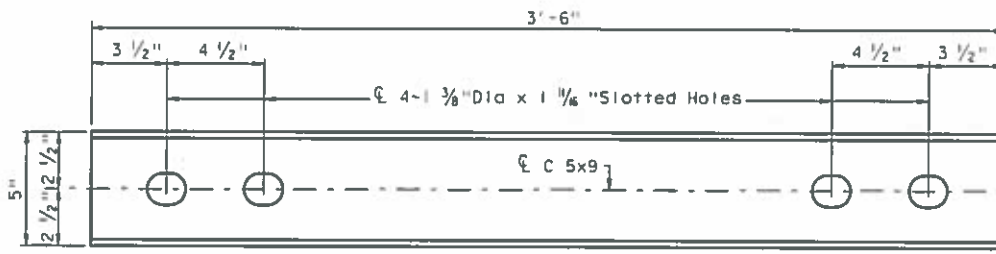
**ELEVATION**  
(Typ Both Ends)

① Omit bars TR1 at drain openings and field cut bars SR1 to clear drain openings by 1/2\".

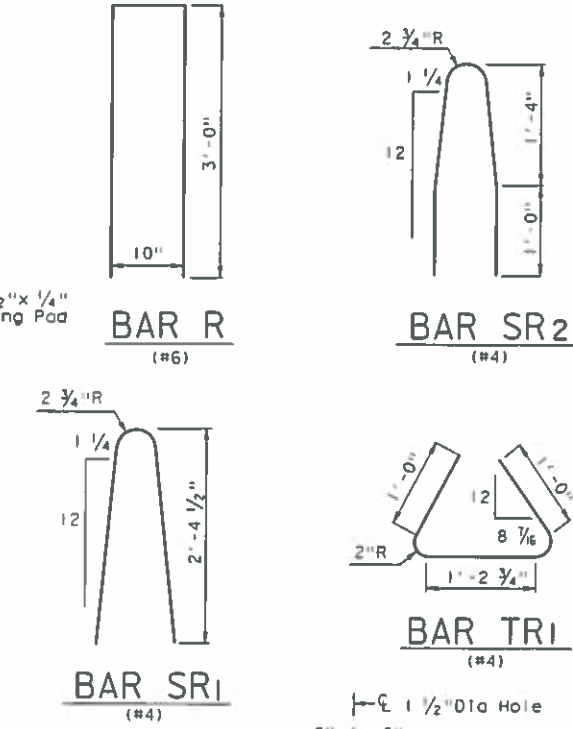
② Drainage openings in the barrier will be provided only where it is necessary to accommodate a flow of water through the barrier. Approval of the engineer will be obtained for location of drainage openings. At all other locations the drainage openings will be omitted and the barrier cast solid. Where drainage openings are required, there will be three 4'-0\"/>



**DETAIL 1**

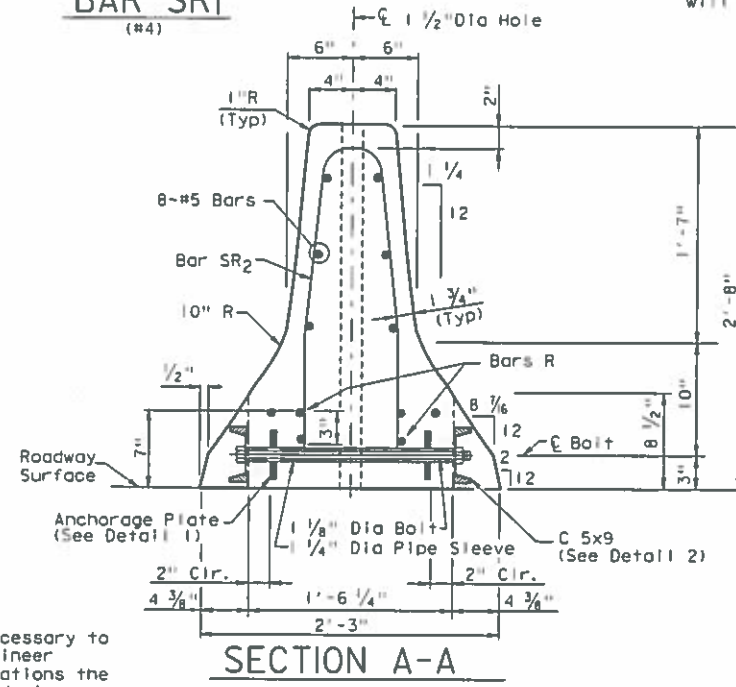


**DETAIL 2**

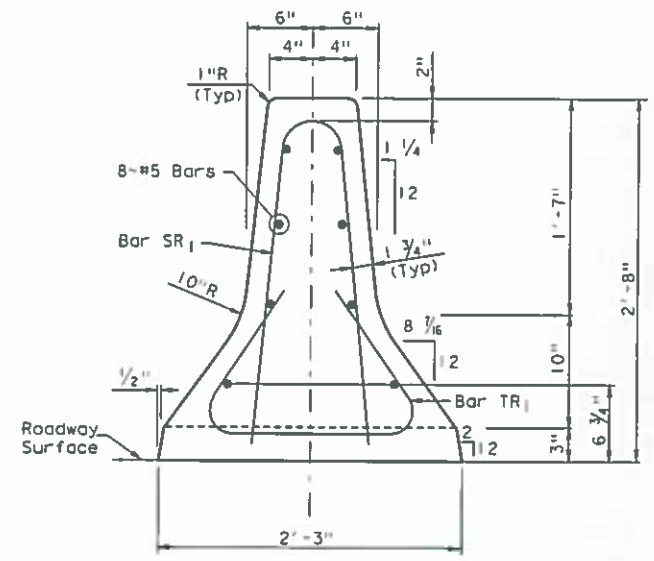


**GENERAL NOTES**

- Channel sections and all steel plates will conform to ASTM designation A36.
- Bearing pads will be made of an elastomeric material with a hardness of 70 durometer and are to be epoxied to barrier unit after casting.
- All concrete will be Class C.
- All reinforcing steel will be Grade 60.
- Each barrier will be delivered with 2 channel shapes (C 5x9) and connecting hardware.
- When barrier is to be placed in a curving alignment, the C 5x9 channel sections may be heated at the mid-point and pre-bent.
- All C 5x9 channels will be hot-dip galvanized in conformance to ASTM designation A123. Bolts, nuts, and washers will be hot-dip galvanized to conform to ASTM designation A153.
- 2\"/>



**SECTION A-A**



**SECTION B-B**

Texas Department of Transportation  
Houston District

**PRECAST CONCRETE TRAFFIC BARRIER**

**PCTB**

APPROXIMATE QUANTITIES FOR A 30 FT. SECTION		
CONCRETE	CY	3.27
REINFORCING STEEL	LBS	390

Approximate weight per foot is 442 Lbs.  
For Contractor's Information Only.

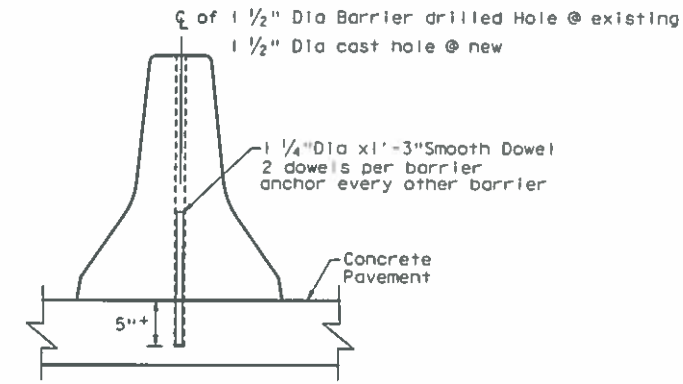
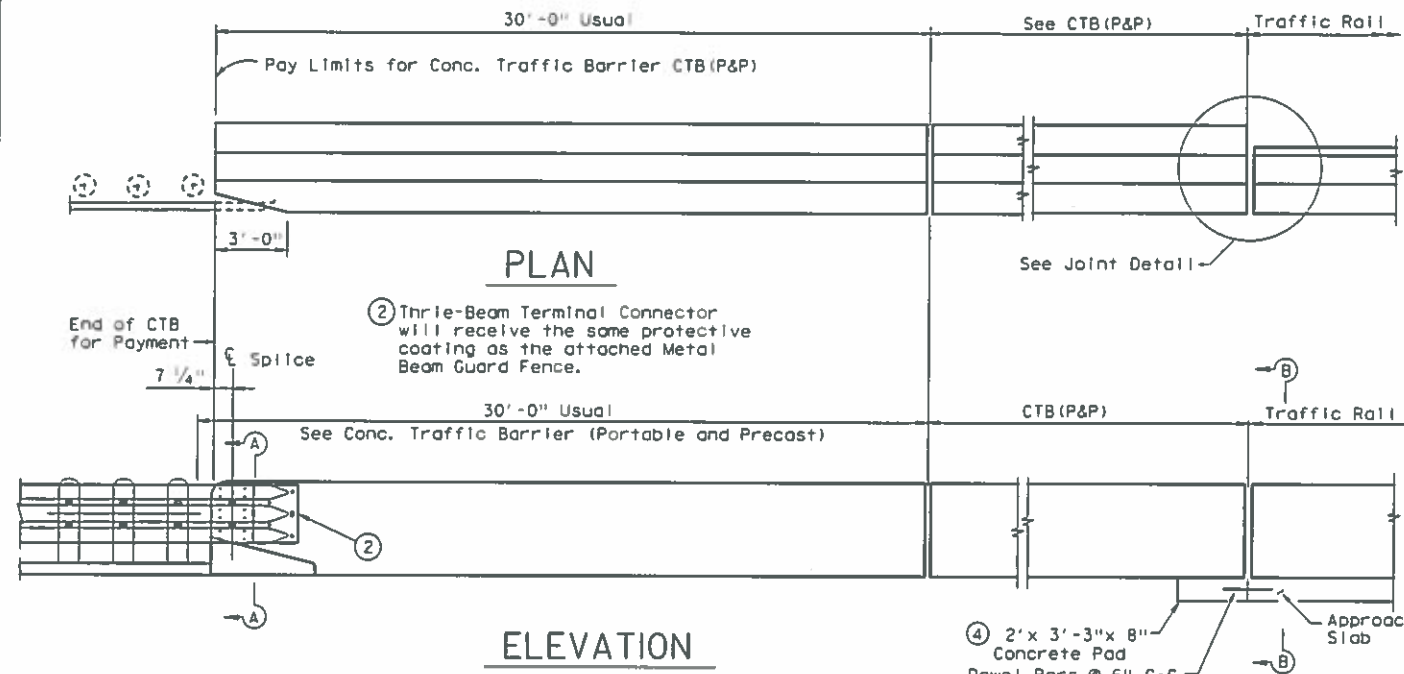
R = Radius  
Dia = Diameter

FILE#	STDC1.DGN	DWg TxDot	CKg TxDot	DWG TxDot	CKg TxDot
© TxDOT	NOV. 2011	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6	RMC	6376-71-001	51
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	6376	71	001	1148 ETC

STDC1.DGN

**CTB DOWEL ANCHORAGE NOTES:**

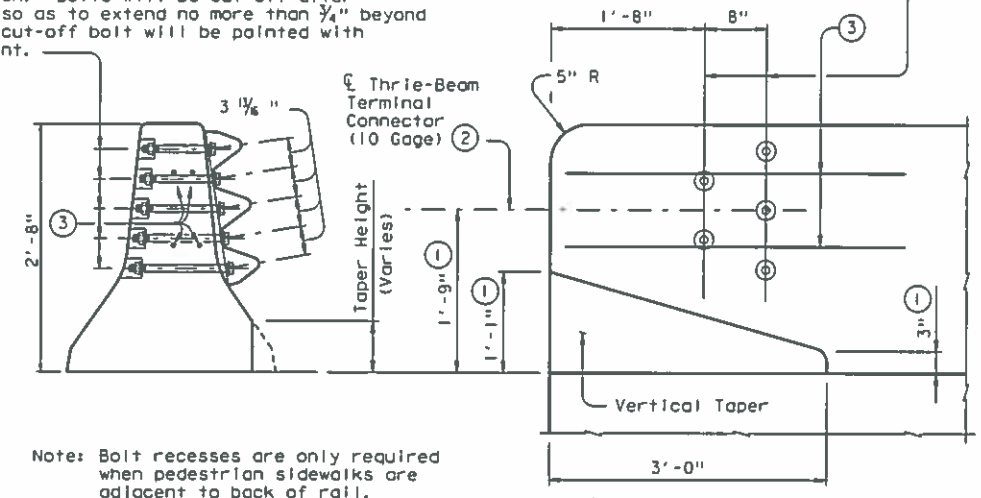
1. These details provide a method of restraining precast concrete barrier to limit lateral movement.
2. Drill the concrete pavement by placing the barrier section on the concrete pavement in the desired location. Then drill the hole into the concrete pavement with the bit passing through the hole in the barrier. Drill the hole in the concrete pavement to a point which is slightly more than 5" below the surface of the concrete pavement.
3. Drilling holes in the barrier, drilling holes in the concrete pavement, fabrication and materials for the 1/4" steel pins, and any repair of the concrete pavement or barrier will be considered as subsidiary to the barrier bid items.



- ④ Concrete pad required on projects design for asphaltic concrete pavement usage

5 - 3/8" Dia A325 Hex Head Bolts with two 1/4" O.D. washers. Place washer under each head and nut. The 5 Terminal Connection Bolts will be tightened in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Bolts will be cut off after installation so as to extend no more than 1/4" beyond nut. End of cut-off bolt will be painted with Zinc-rich paint.

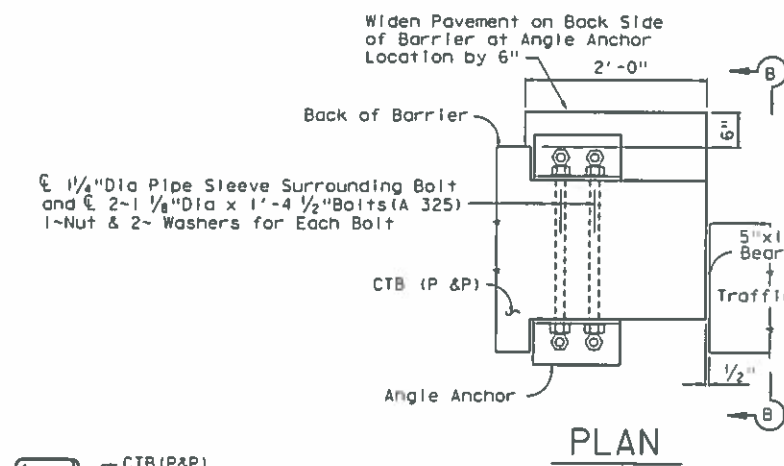
5 - 1" Dia holes and 2 1/2" Dia x 2" deep recesses. Holes and recesses must be formed or cored. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses.



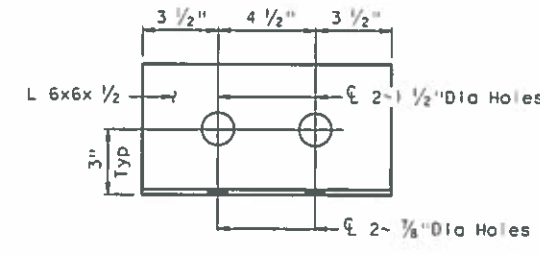
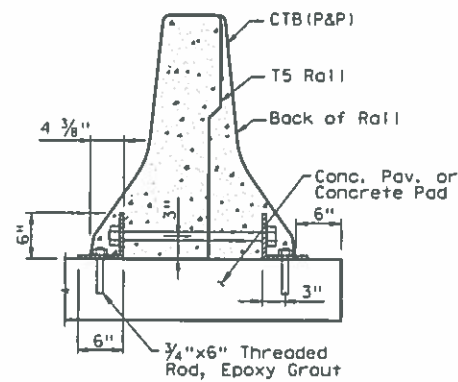
Note: Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

**TERMINAL CONNECTION DETAIL**

- ① Increase 2" for Structures with Overlay.
- ③ 4 additional Bars R(#4) 3'-8" in length will be placed inside Bars S(#5) and centered 2'-0" from end of rail when Terminal Connections are required.



1/4" Dia Pipe Sleeve Surrounding Bolt and 2-1/4" Dia x 1'-4 1/2" Bolts (A 325) 1-Nut & 2- Washers for Each Bolt



**ANGLE ANCHOR**  
Galvanize Per Item 445  
N. T. S.

Texas Department of Transportation  
Houston District

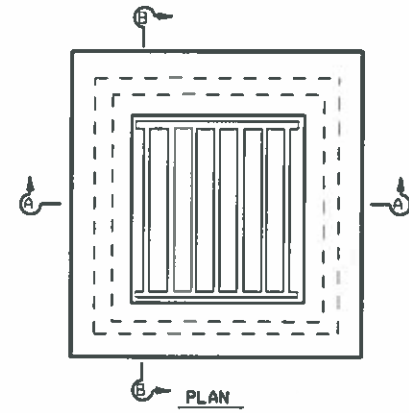
**PRECAST CONCRETE TRAFFIC BARRIER**

PCTB

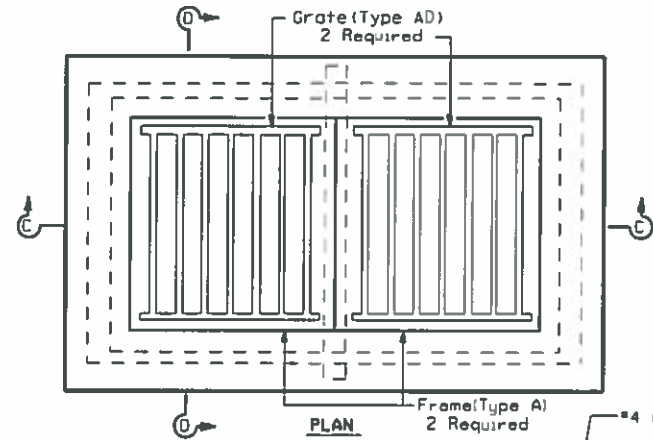
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© TxDOT	NOV. 2011	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOUSTON	6	RMC	6376-71-001	52
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	MONTGOMERY	6376	71	001	RI 45 ETC

R = Radius  
Dia = Diameter

STDC1.DGN



• But Not Less Than Six Inches Over Highest Entering Pipe.  
X = 8' Min to 3'-9' Max



• But Not Less Than Six Inches Over Highest Entering Pipe.  
\*\* For Pipe Diameters 66' And Greater

**GENERAL NOTES:**

Type AD Inlet contains a single frame with grate. Type AAD Inlet contains a double frame and double grate with an I-beam.

Frame and Grates may be gray cast iron.

The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Comp) (Ty AAD) Or Inlet (Stage II) (Ty AD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

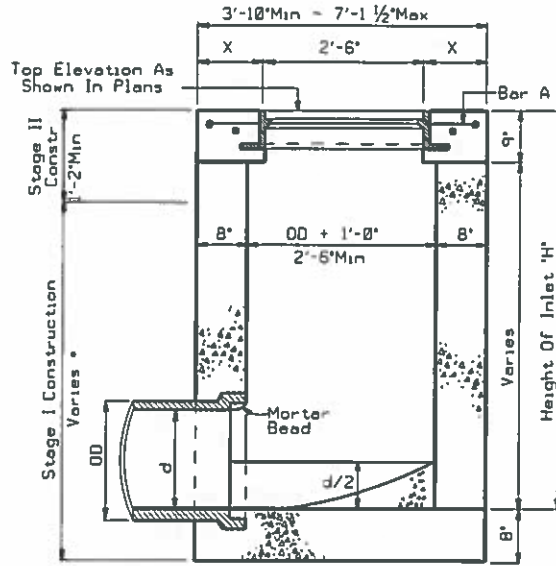
Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where 'D' Exceeds 5'-0".

See Standard or Detail Sheet For Excavation and Backfill Diagrams.

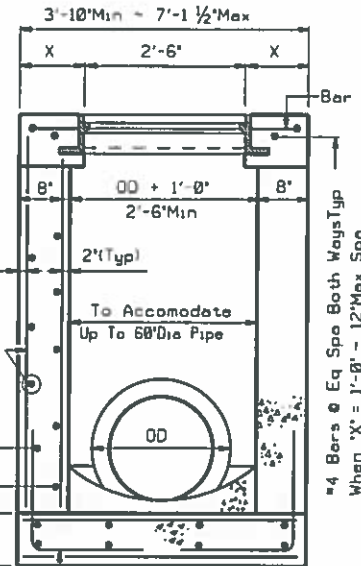
Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

Shop Drawings Will Be Required For Precast Construction Of Inlets.

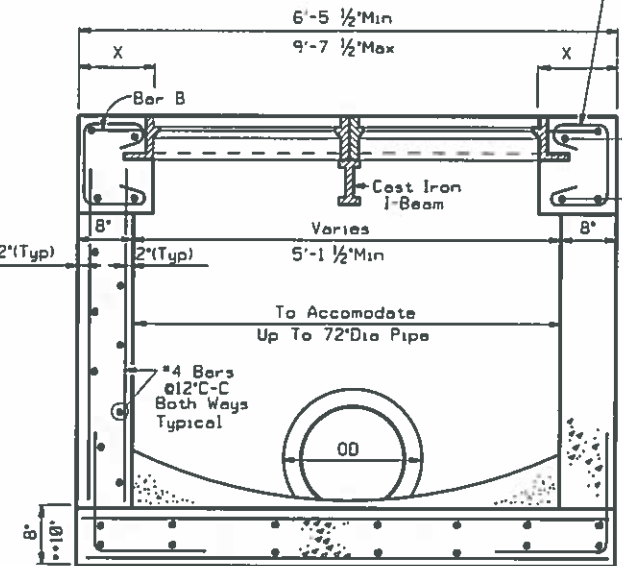
Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed. Bolted grates and frames are a matched set, do not unbolt without 'Match Marking' so that grates and frames are reinstalled as originally built.



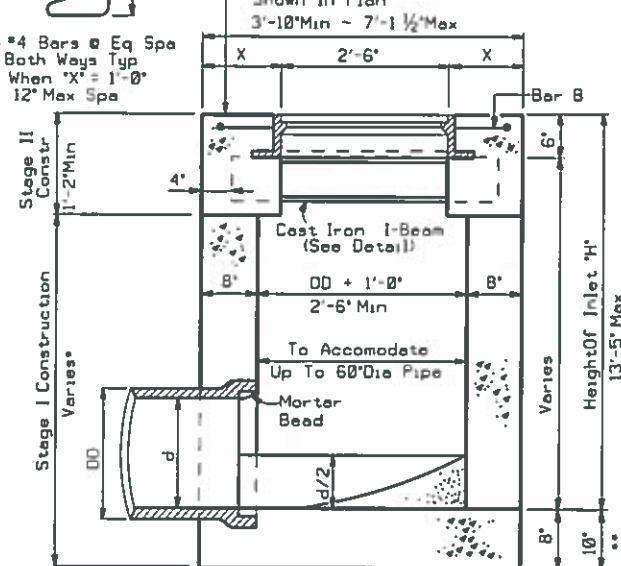
SECTION A-A



SECTION B-B



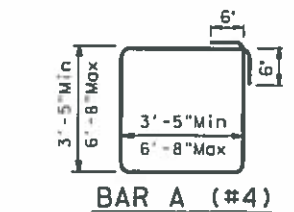
SECTION C-C



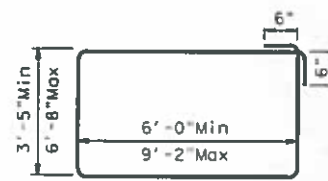
SECTION D-D

**INLET TYPE AD**

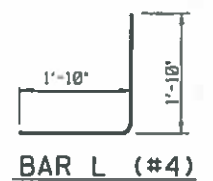
**INLET TYPE AAD**



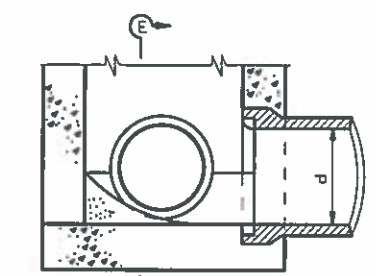
BAR A (#4)



BAR B (#4)

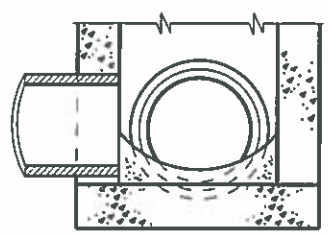


BAR L (#4)

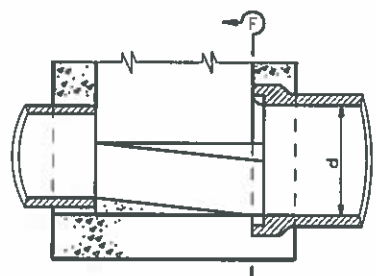


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

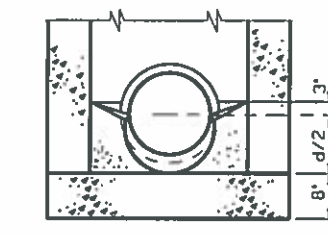


SECTION E-E

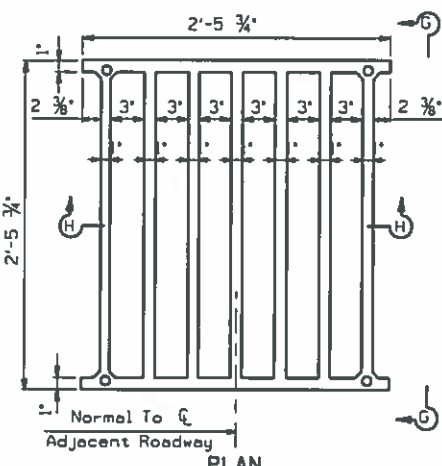


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides



SECTION F-F

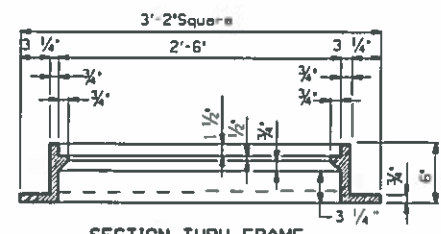


PLAN

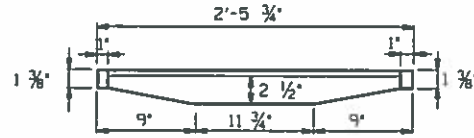
Provide 4 - Stainless Steel Hex Head Bolts per Grate

**FRAME AND GRATE**

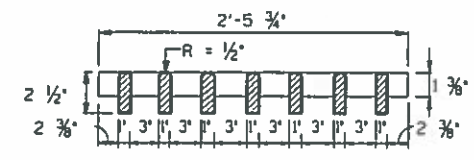
Type AD - Neenah No.3418 or EJIW No.V-4880-2  
Type AAD - Neenah No.3418-2 or EJIW No.V-4881-2



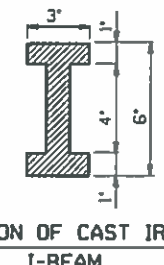
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

d = Diameter  
R = Radius

**NOT FOR TRAFFIC LOADS**



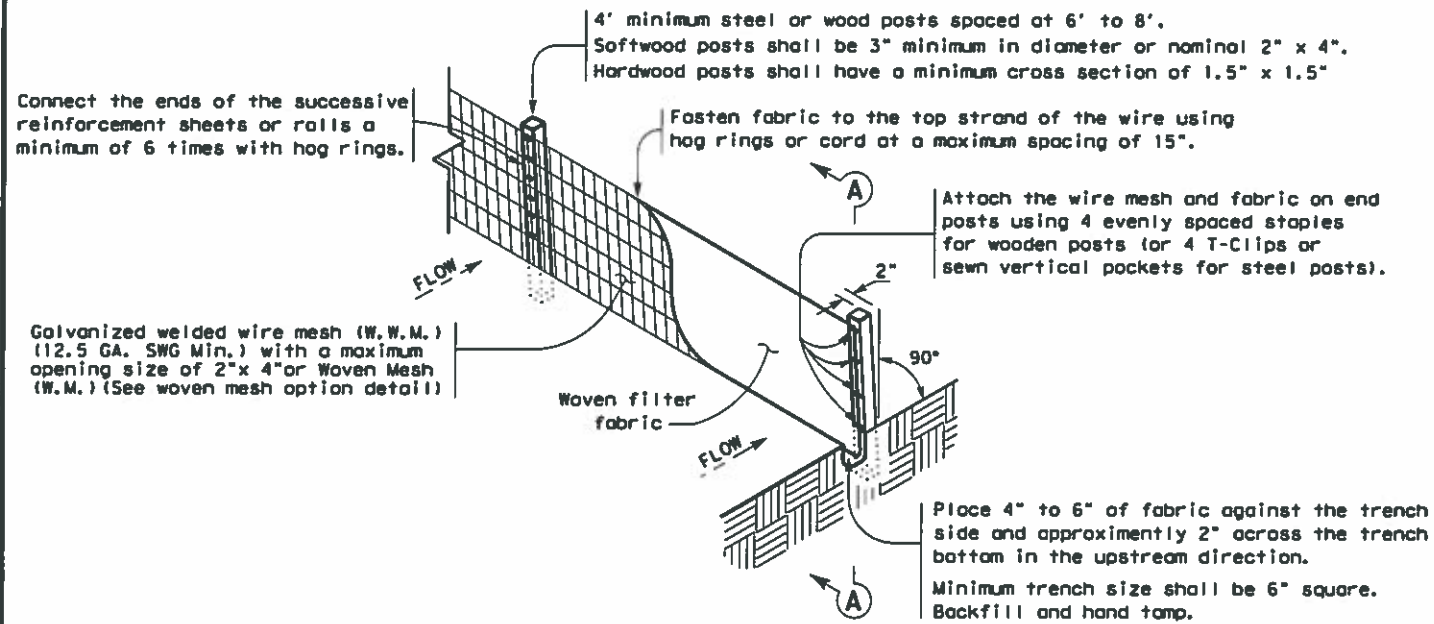
**INLETS TYPE AD & AAD**

**HIL-AD/AAD**

FILE: STDD5.DGN	DATE: 2014	DIST: 6	PROJECT NO: RMC 6376-71-001	SHEET: 53
REVISIONS:	CONTROL:	SECT:	JOB:	HIGHWAY:
	MONTGOMERY	6376	71-001	44 48 ETC

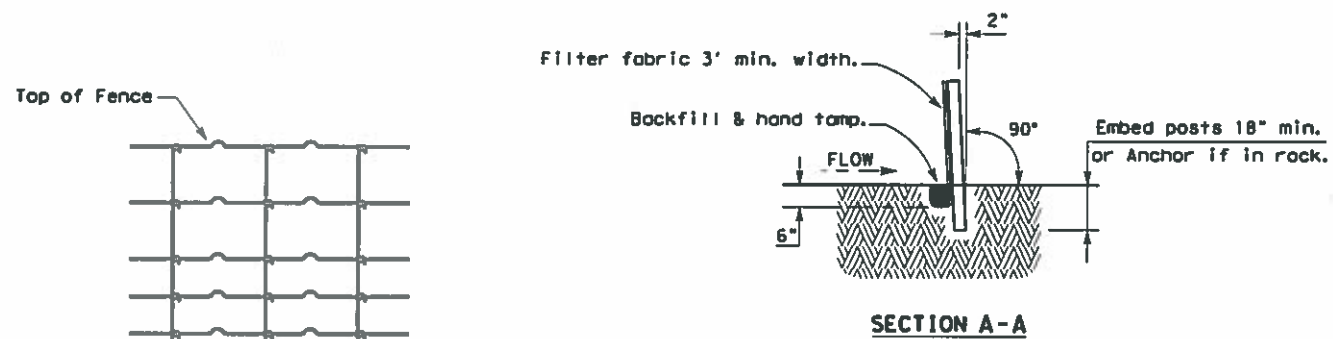
STDD5.DGN

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TEMPORARY SEDIMENT CONTROL FENCE

SCF



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

**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 maximum flow through rate of 100 GPM/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

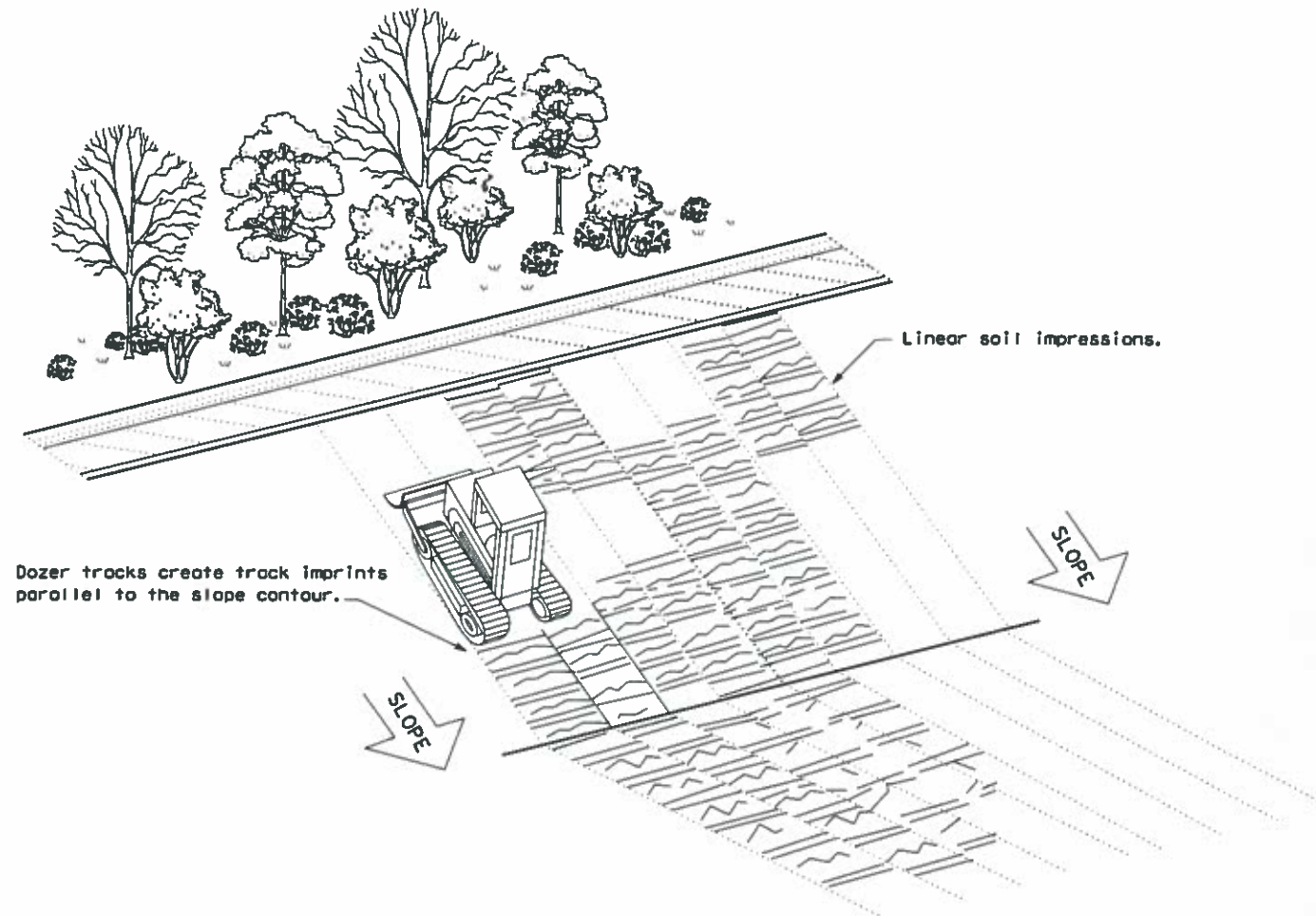
**LEGEND**

Sediment Control Fence

SCF

**GENERAL NOTES**

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

		Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE &amp; VERTICAL TRACKING</b>			
<b>EC(1)-16</b>			
FILE: ec116	DNV TxDOT	CR: KM	DNV VP
© TxDOT: JULY 2016	CON: SECT	JOB	HIGHWAY
REVISIONS			
6376	71	001	IH 45, ETC.
DIST	COUNTY	SHEET NO.	
HOU	MONTGOMERY	54	

DATE FILE