

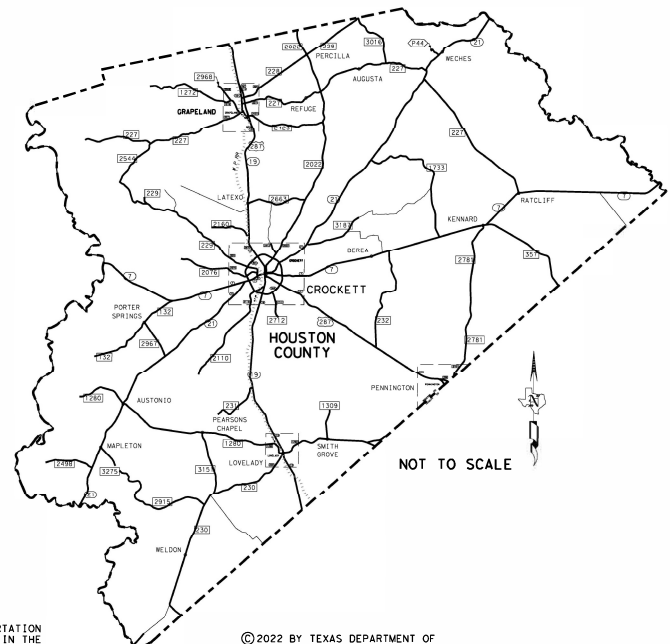
STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FHWA	PROJECT NO.	SHEET NO.
TEXAS	RMC 6411-21-001	1
DIVISION		
STATE	DISTRICT	COUNTY
TEXAS	LFK	HOUSTON
CONTROL	SECTION	JOB
6411	21	001
		US 287, ETC.

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ENVIRONMENTAL	
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PLANS OF PROPOSED
STATE HIGHWAY ROUTINE MAINTENANCE CONTRACT
TYPE OF WORK:
TREE TRIMMING/BRUSH REMOVAL & TREE REMOVAL
RMC 6411-21-001
US 287, ETC.
HOUSTON COUNTY
LIMITS: VARIOUS ROADS WITHIN HOUSTON COUNTY MAINTENANCE SECTION



BARRICADES AND WARNING SIGNS
PROJECT LIMIT BARRICADES WILL NOT BE REQUIRED. THE CONTRACTOR SHALL PROVIDE AND ERECT WARNING SIGNS IN ACCORDANCE WITH THE BARRICADE & CONSTRUCTION STANDARDS, TCP STANDARDS, THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES AND AS DIRECTED.



■ THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

DocuSigned by:
Jeremy King, PE. 6/16/2022
DATE

RECOMMENDED FOR LETTING:
Jeremy King, PE. 6/16/2022
DISTRICT MAINTENANCE ENGINEER DATE
— 51352002PE419844
APPROVED FOR LETTING:
[Signature] 6/16/2022
DIRECTOR OF OPERATIONS DATE

SPECIAL SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION NOVEMBER 1, 2014 AND SPECIAL SPECIFICATION ITEMS INCLUDED IN THE CONTRACT SHALL GOVERN ON THIS PROJECT.

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6/2/2022 12:06:00 PM T:\LKDD\MM\Int Contracts\0-RMC - Rout Ine Maintenance Contracts\FY22 Plans\6411-21-001 Houston Tree & Brush Removal\RMC 6411-21-001 Houston Tree Brush

Project Number: RMC 6411-21-001

Control: 6411-21-001

County: HOUSTON

Highway: US 287, ETC.

Provide adequate flaggers to protect the traveling public. All flaggers shall wear approved hardhats and reflective safety vests while flagging. Safety vests shall be clean and worn fully fastened.

Install "Be Prepared to Stop" (CW20-7B) and "Flagger Ahead" (CW22-7D) signs when flaggers are present. Position the signs where good visibility and traffic control can be maintained.

Provide one high-intensity yellow, rotating dome-light on all equipment such as distributors, spreader boxes, lay-down machines, rollers, backhoes, road graders, loaders, etc. Mount lights high enough to be visible from all directions and operating when the equipment is within 30 ft. of the travel way. On all other equipment such as trucks, trailers, automobiles, etc., use emergency flashers while within the work zone.

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.

Item 752: Tree and Brush Removal

All work, except emergency work, is to be completed between September 15th and March 15th to insure compliance with the Migratory Bird Treaty Act (MBTA). Emergency work is any work required to eliminate a potential hazard(s) to the traveling public or from causing property damage.

The Contractor shall become knowledgeable of the location of utilities within the right-of-way and shall use care when working near them.

The Contractor shall be responsible for contacting all utility companies and locating all underground utilities prior to stump grinding and/or other excavating. The Contractor shall use care when working near these utilities so as not to damage them.

Complete at least 1 mile of tree trimming, brush and tree removal per day.

Trim branches, limbs and brush to a distance of 30 feet from the edge of pavement and a height of 20 feet above the pavement unless otherwise directed. Trimming shall be performed so as to leave a neat and uniform appearance. Quantities shown are for both sides of the roadway.

The equipment used to trim limbs and remove brush shall be approved by the maintenance supervisor. A boom axe will not be allowed when trimming limbs. The Contractor shall remove all existing limbs and small trees on the ground within the limits of brush removal.

Trees to be removed shall be marked by the State with a red, white or orange "X", painted on the trunk. No other trees shall be removed without prior approval from the Engineer.

General Notes

Sheet 2B

Project Number: RMC 6411-21-001

Control: 6411-21-001

County: HOUSTON

Highway: US 287, ETC.

For trimming/ brush removal (channels) clear 50 feet either side of culvert center line and from right-of-way line to right-of-way line. If Waters of the US location, no work shall be performed within the channel and debris or discharge/fill material shall not enter the channel. Equipment used at Waters of the US locations shall not enter the channel under any circumstance.

Remove trees as designated. After the removal of the designated trees, the Contractor may move out, and the remaining tree removal for this contract will be used on an as needed basis. The Engineer will send the Contractor written notification requiring him to move in and begin tree removal each time there are a minimum of 10 trees to be removed and mobilization will be paid for on a callout basis. After completion of the required tree removal the Contractor may again move out, and this procedure will continue for the duration of the contract.

Pick up and remove all trees and limbs felled from right-of-way on the same day, unless otherwise approved.

Remove trees that are already down in the right-of-way. Cut and measure trees that have fallen from private property at the right-of-way line. These trees will be paid for in the same manner as trees that are to be felled and removed.

Grind all limbs and protruding roots. Grind all stumps to a depth of 12 inches below the ground level. Backfill any resulting holes to the level of the surrounding ground. If, in the opinion of the Engineer, stumps on back slope cannot be ground, trees shall be cut flush with surrounding ground line.

The Contractor will be required to furnish materials and make repairs to the existing roadway and right-of-way, including rutting, at any location damaged by the Contractor's operations. This work shall be done in a manner satisfactory to the Engineer and will be considered subsidiary to various bid items.

Remove a tree in increments when cutting the trees at ground level may endanger overhead utility lines or damage private property.

Removal of brush, limbs, debris, and trees less than 4 inches in diameter are considered brush and will be subsidiary to Item 752.

Trees that have fallen onto the right-of-way from private property will be cut and measured at the right-of-way line.

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

Truck Mounted Attenuators (TMA's) shall meet the requirements of this item and the Department's Compliant Work Zone Traffic Control Device List.

Truck Mounted Attenuators (TMA's) as shown on the TCP's shall be used. Whether shown on the TCP's or added by the Department, TMA's shall be paid for under Item 6185, "Truck Mounted Attenuator" for the type of operation being performed.

General Notes

Sheet 2B



CONTROLLING PROJECT ID 6411-21-001

DISTRICT Lufkin
HIGHWAY US0287

COUNTY Houston

Estimate & Quantity Sheet

CONTROL SECTION JOB				6411-21-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00189402			
COUNTY				Houston			
HIGHWAY				US0287			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	500-6033	MOBILIZATION (CALLOUT)	EA	6,000		6,000	
	752-6003	TREE TRIMMING / BRUSH REMOVAL	MI	35,000		35,000	
	752-6005	TREE REMOVAL (4" - 12" DIA)	EA	250,000		250,000	
	752-6006	TREE REMOVAL (12" - 18" DIA)	EA	200,000		200,000	
	752-6007	TREE REMOVAL (18" - 24" DIA)	EA	140,000		140,000	
	752-6008	TREE REMOVAL (24" - 30" DIA)	EA	65,000		65,000	
	752-6009	TREE REMOVAL (30" - 36" DIA)	EA	65,000		65,000	
	752-6010	TREE REMOVAL (36" - 42" DIA)	EA	35,000		35,000	
	752-6011	TREE REMOVAL (42" - 48" DIA)	EA	5,000		5,000	
	752-6012	TREE REMOVAL (48" - 60" DIA)	EA	5,000		5,000	
	6185-6002	TMA (STATIONARY)	DAY	20,000		20,000	

DISTRICT	COUNTY	CCSJ	SHEET
Lufkin	Houston	6411-21-001	3


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SUMMARY OF TREE REMOVAL ITEMS									
LOCATION	ITEM 752								
	TREE TRIMMING/ BRUSH REMOVAL	TREE REMOVAL (4"-12" DIA)	TREE REMOVAL (12"-18" DIA)	TREE REMOVAL (18"-24" DIA)	TREE REMOVAL (24"-30" DIA)	TREE REMOVAL (30"-36" DIA)	TREE REMOVAL (36"-42" DIA)	TREE REMOVAL (42"-48" DIA)	TREE REMOVAL (48"-60" DIA)
	MI	EA	EA	EA	EA	EA	EA	EA	EA
VARIOUS	35	250	200	140	65	65	35	5	5

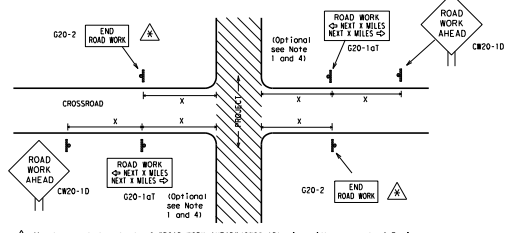
SUMMARY OF TRAFFIC CONTROL ITEMS	
LOCATION	ITEM 6185
	TMA (STATIONARY)
	DAY
VARIOUS	20

* USE TMA WHEN REQUIRED TO DO SO AS OUTLINED BY TCP STANDARDS.

NOTE: ALL QUANTITIES ARE AN ESTIMATE AND SHALL BE VERIFIED IN THE FIELD PRIOR TO BEGINNING OF WORK. NO GUARANTEES ARE MADE AS TO THE AMOUNT OF WORK WHICH WILL BE PERFORMED AT EACH LOCATION.

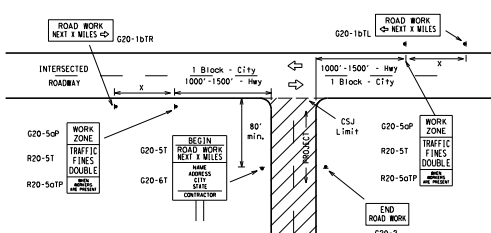
QUANTITY SUMMARIES			
2022 			
CONT	SECT	JOB	HIGHWAY
6411	21	001	US 287, ETC.
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		4

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 an 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" (G20-1a) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
 - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
 - When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



- CSJ LIMITS AT T-INTERSECTION**
- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
 - If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(1D) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bR) signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{15,6}

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Spacing "x"
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23	36" x 36"	48" x 48"	45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14			60	600 ²
			65	700 ²
CW3, CW4, CW5, CW6, CW8-5, CW10, CW12	48" x 48"	48" x 48"	70	800 ²
			75	900 ²
			80	1000 ²

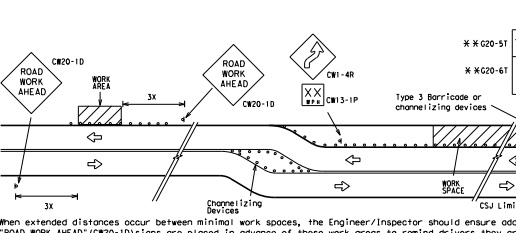
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TDP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

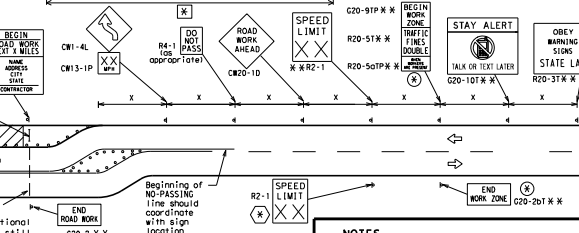
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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



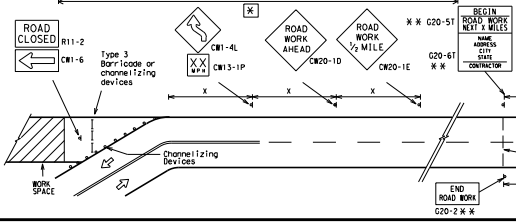
When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



Beginning of NO-PASSING line should coordinate with sign location.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



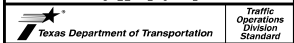
NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5) signs 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" (G20-9P) and "END WORK ZONE" (G20-2b) 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



BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC (2) - 21

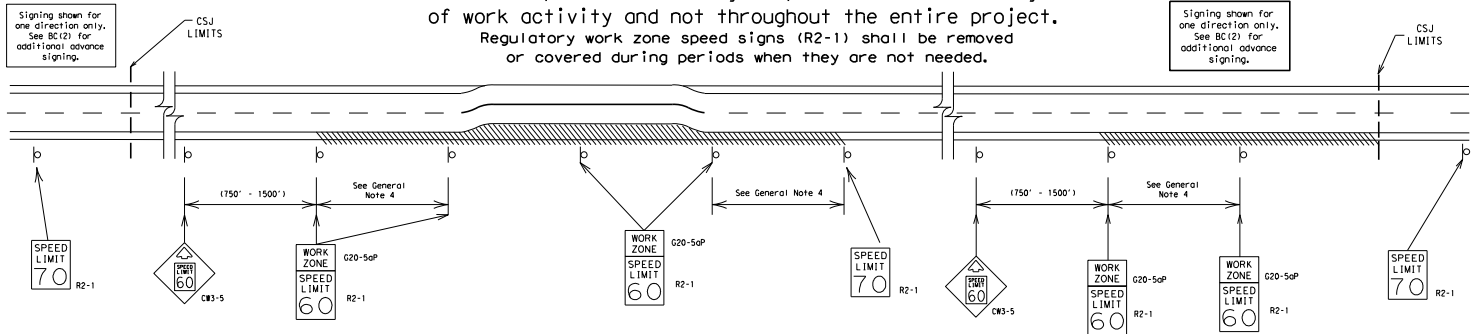
Plan:	bc-14.dgn	Rev:	T007	On:	1/007	By:	T007	On:	1/007
Project:	12007	Sheet:	11	Job:	110000	Scale:		Sheet No.:	6
Revisions:	6411	21	001	US 287, ETC					
Date:	9-07	8-14	1-13	County:	HOUSTON	Sheet No.:			
File:	LFK								

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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- a) rough road or damaged pavement surface
- b) substantial alteration of roadway geometrics (diversions)
- c) construction detours
- d) grade
- e) width
- f) 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 traveled 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

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. 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
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. 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.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
 - A. Low enforcement.
 - B. Flagger stationed next to sign.
 - C. Portable changeable message sign (PCMS).
 - D. Low power (dome) radar transmitter.
 - E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. 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.

SHEET 3 OF 12



Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 21

Field	06-14-09	Rev	11007	Rev	11007	Rev	11007	Rev	11007
©	11007	November	2002	cont	sheet	job		revision	
REVISIONS	6411	21	001	US	287	ETC			
9-07	8-14	01ST		COUNTY					
7-13		LFK		HOUSTON					

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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

- 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.
 - Do not display 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., leaving 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, if 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 TMC/CO.
 - PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (1/3 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 displayed, 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.

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

Phase 1: Condition Lists

Road/Lane/Ramp Closure List	Other Condition List
FREEWAY CLOSED X MILE	ROADWORK XXX FT
ROAD CLOSED AT SH XXX	ROAD REPAIRS XXXX FT
ROAD CLOSED AT FM XXXX	FLAGGER XXXX FT
ROAD CLSD AT FM XXXX	LANE NARROWS XXXX FT
RIGHT X LANES CLOSED	RIGHT LN NARROWS XXXX FT
RIGHT X LANES CLOSED	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	CONST TRAFFIC XXX FT
RIGHT X LANES CLOSED	MERGING TRAFFIC XXXX FT
RIGHT X LANES CLOSED	LOOSE GRAVEL XXXX FT
RIGHT X LANES CLOSED	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	DETOUR X MILE
NIGHT LANE CLOSURES	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	ROADWORK NEXT FRI-SUN
EXIT CLOSED	ROADWORK NEXT FRI-SUN
EXIT CLOSED	BUMP XXXX FT
EXIT CLOSED	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	TRAFFIC SIGNAL XXXX FT
MALL DRIVEWAY CLOSED	LANE SHIFT *
XXXXXXX BLVD CLOSED	

* 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	Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH
TRUCKS FOR US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE
USE OTHER ROUTES	WATCH FOR WORKERS		TONIGHT XX PM- XX AM
STAY IN LANE *			

** 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 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 "Flagger Symbol" (CR20-7) 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(7), for the same size arrow.

WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MIS
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MIN
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Center	CENT	North	N
Center	CTR	Northbound	Troute1 N
Construction	CONST	Parking	PRKNG
Construction Ahead	CONST AHD	Road	RD
CROSSING	XING	Right Lane	RT LN
Detour Route	DETOUR RTE	Saturday	SAT
Do Not	DNNT	Service Road	SERV RD
East	E	Shoulder	SHLDR
Eastbound	Troute1 E	Slippery	SLIP
Emergency	EMER	South	S
Emergency Vehicle	EMER VEH	Southbound	Troute1 S
Entrance	ENT	Speed	SPD
Express Lane	EXP LN	Street	ST
Expressway	EXPWY	Sunday	SUN
XXXX Feet	XXXX FT	Telephone	PHONE
Fog Ahead	FOG AHD	Temporary	TEMP
Freeway	FRWY	Thursday	THURS
Freeway Blocked	FRWY BLKD	To Downtown	TO DWTN
Friday	FRI	Traffic	TRAF
Hazardous Driving	HAZ DRIVING	Travelers	TRVLRS
Hazardous Meter (id)	HAZMET	Tuesday	TUES
High Occupancy	HOV	Time Minutes	TIME MIN
Highway	HWY	Upper Level	UPR LEVEL
Hour(s)	HR HRS	Vehicles (pl)	VEH, VEHs
Information	INFO	Morning	MORN
It Is	ITS	Monday	MON
Junction	JCT	Weight Limit	WT LMIT
Left	L	West	W
Left Lane	LFT LN	Westbound	Troute1 W
Lane Closed	LN CLSD	West Pointment	WT PWT
Lower Level	LWR LEVEL	Will Not	WNT
Maintenance	MAINT		

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

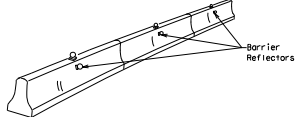
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

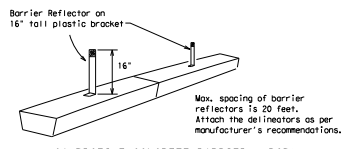
BC (6) - 21

Revised: 06-14-06	Rev: 10007	Rev: 10007	Rev: 10007	Rev: 10007
01/007	November 2002	04/11	2/1	001
REVISIONS		6411	21	001
9-07	8-14	9157	COUNTY	US 287, ETC
1-13		LFK	HOUSTON	SHEET NO. 10

- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DM-8600. A list of prequalified Barrier Reflectors can be found on the Material Producer List web address shown on BC11).
- Color of Barrier Reflectors shall be as specified in the MUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

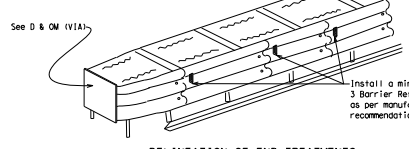


CONCRETE TRAFFIC BARRIER (CTB)



LOW PROFILE CONCRETE BARRIER (LPCB)

- 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 on one end of each CTB. This will allow for attachment of a barrier groove 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 edge line being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible reflective roadway marker tabs shall NOT be used on 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.



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 CRWCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

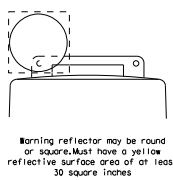
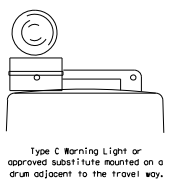
- Warning lights shall meet the requirements of the MUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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 B₁ or G₁ Sheeting meeting the requirements of Departmental Material Specification DM-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 closures, 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.

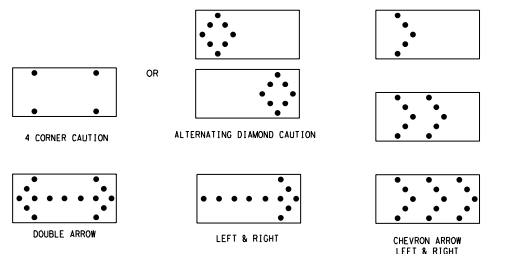
WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

- 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 CRWCD.
- 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 DM-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.



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 POMS 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

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 CRWCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CRWCD 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 on an extended distance from the TMA.

Texas Department of Transportation
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC (7) - 21

Plan No.	06-14-099	Rev	TxDOT	On 10/07	Rev	TxDOT	On 10/07
Rev	01/07	November 2002	CON	1/07	CON	1/07	1/07
REVISIONS		6411	21	001	US	287	ETC
9-01	8-14	9157		COUNTY		SHEET NO.	
1-13		LFK		HOUSTON		1	

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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 shall 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" (CWZCD).
- 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

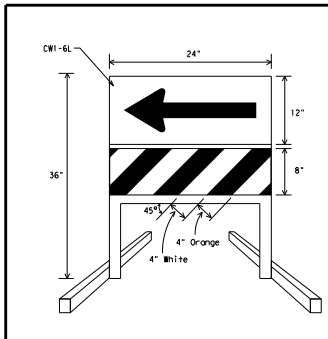
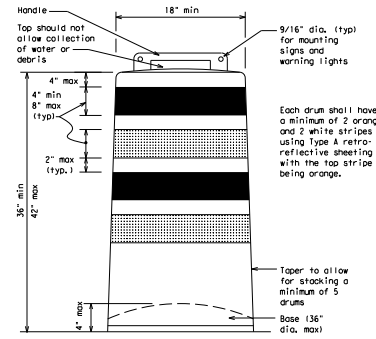
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drum shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
 - The body and base shall lock together in such a manner that the body separates from the base when impacted 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 channelizing 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 3/16 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 ultraviolet 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 device 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 CWZCD 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 ballasts 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.

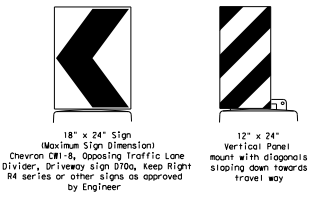


DIRECTION INDICATOR BARRICADE

- 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-6L) sign in the size shown with a black arrow on a background of Type B₁ or Type C₁ Orange retroreflective sheeting above a roll 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 CWZCD List. Ballast shall be as approved by the manufacturer's 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.
- Tube, 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 rolls as shown on BC100 provided that the top roll provides a smooth continuous roll suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign (Maximum Sign Dimension)
Chevron CWI-8, Opposing Traffic Lane Divider, Driveway Sign D100, 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 CWZCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B₁ or Type C₁ 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 symbols) 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 of 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

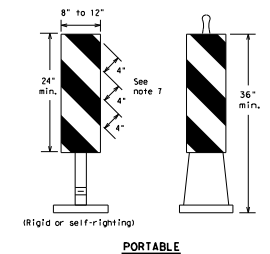
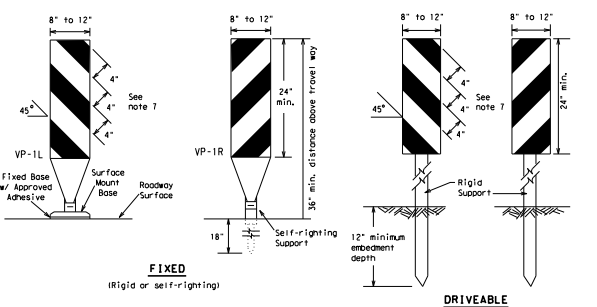
Texas Department of Transportation
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

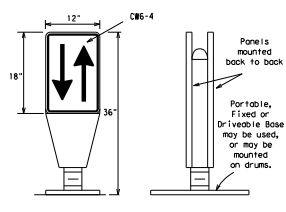
Plan	Dec 14, 2001	Rev	T2007	En	1/2007	Am	1/2007	En	1/2007
Revisions	6411	21	001	US	287	ETC			
4-03	7-13	9-01	8-14	LFK	HOUSTON				

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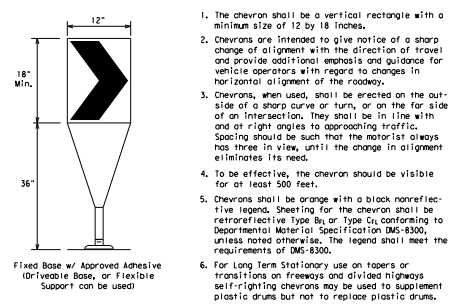
VERTICAL PANELS (VPs)

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
- VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
- VP's used on expressways and freeways or other high speed roadways, may have more than 210 square inches of retroreflective area facing traffic.
- Self-lighting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DM5-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPS.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPS placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B₁ or Type C₁ conforming to Departmental Material Specification DM5-8300, unless noted otherwise. The legend shall meet the requirements of DM5-8300.



CHEVRONS

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black non-reflective legend. Sheeting for the chevron shall be retroreflective Type B₁ or Type C₁ conforming to Departmental Material Specification DM5-8300, unless noted otherwise. The legend shall meet the requirements of DM5-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways self-lighting chevrons may be used to supplement plastic drums but not to replace plastic drums.

GENERAL NOTES

- Work zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-lighting channelizing devices must be specified in the General Notes or other plan sheets.
- Channelizing devices on self-lighting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- The Contractor shall maintain devices in a clean condition and replace damaged, non-reflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- Pavement surfaces shall be prepared in a clean condition and ensure proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

LONGITUDINAL CHANNELIZING DEVICES (LCD)

- LCDs are cross-taper, 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.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(17) when placed roughly parallel to the travel lanes.
- 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

- 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 MCHRP 350 cross-tapering requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve day/night/time visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to 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

Posted Speed #	Formula	Minimum Desirable Taper Lengths M x W			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS/60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40	L = WS	265'	285'	320'	40'	80'
45		450'	495'	540'	45'	90'
50	L = WS	500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60	L = WS	600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70	L = WS	700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80	L = WS	800'	880'	960'	80'	160'
85		850'	945'	1020'	85'	170'

*K 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

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

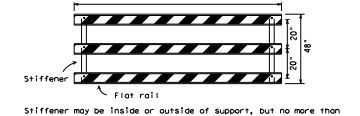
BC (9) - 21

Rev	Date	By	Check	App'd	Job No.	Sheet No.	Total Sheets
1	01/14/09	TL	TJ	TL	12007	1	1
2	11/07/07	November 2002					
REVISIONS							
9-07	8-14	6411	21	001	US 287, ETC		
7-13		LFK			HOUSTON		13

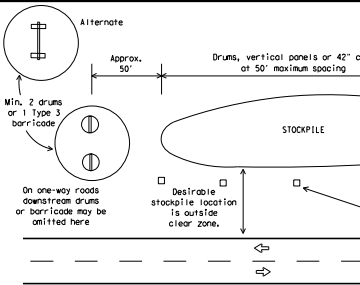
TYPE 3 BARRICADES

1. Refer to the Compliant Mark Zone Traffic Control Devices List (CMZCD) 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 rolls, 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 rolls. 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 rolls 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 resists 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 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.

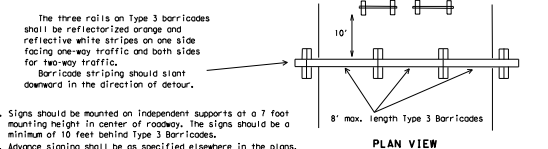
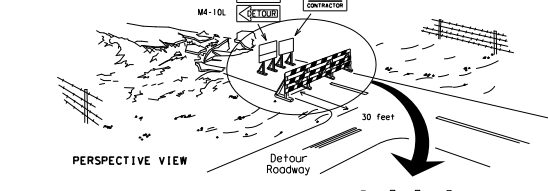
Barricades shall NOT be used as a sign support.



TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

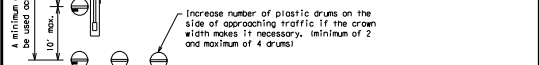
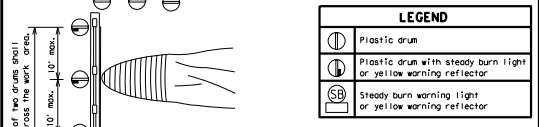
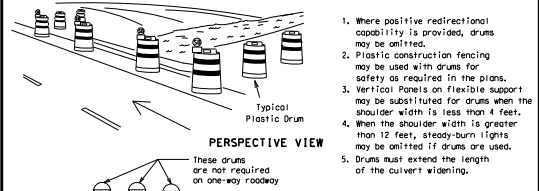


Each roadway of a divided highway shall be barricaded in the same manner.



TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION

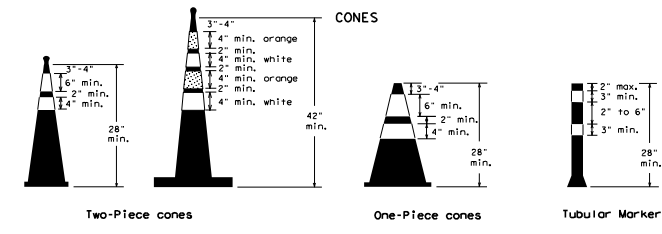
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 barricades.
2. Advance signing shall be as specified elsewhere in the plans.



CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

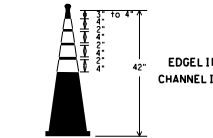
1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder 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



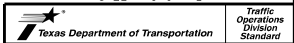
28" Cones shall have a minimum weight of 9 1/2 lbs.
42" 2-piece cones shall have a minimum weight of 30 lbs, including base.

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



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 tees.
2. This device shall not be used to separate lanes of traffic (looping 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 edge-line (yellow for left edge-line, white for right edge-line) 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.

SHEET 10 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 21				
Plan: 05-14-09	Rev: 10/07	Rev: 10/07	Rev: 10/07	Rev: 10/07
01/07	November 2002	04/11	2/1	001
REVISIONS	DATE	BY	CHKD	APP'D
9-07	8-14	9/ST	001	US 287, ETC
7-13		LFK		HOUSTON
LIST				SHEET NO. 14

DISCLAIMER: This drawing is prepared by the Texas Department of Transportation (TxDOT) and is provided for informational purposes only. It is not intended to be used for any purpose other than that for which it was prepared. The user of this drawing is responsible for its proper use and for any errors or omissions. The user of this drawing is also responsible for obtaining all necessary permits and approvals. The user of this drawing is also responsible for obtaining all necessary materials and equipment. The user of this drawing is also responsible for obtaining all necessary labor and services. The user of this drawing is also responsible for obtaining all necessary insurance and bonding. The user of this drawing is also responsible for obtaining all necessary safety and health measures. The user of this drawing is also responsible for obtaining all necessary environmental and cultural resources. The user of this drawing is also responsible for obtaining all necessary historical and archaeological resources. The user of this drawing is also responsible for obtaining all necessary social and economic resources. The user of this drawing is also responsible for obtaining all necessary legal and regulatory resources. The user of this drawing is also responsible for obtaining all necessary technical and scientific resources. The user of this drawing is also responsible for obtaining all necessary financial and human resources. The user of this drawing is also responsible for obtaining all necessary information and data. The user of this drawing is also responsible for obtaining all necessary communication and coordination. The user of this drawing is also responsible for obtaining all necessary documentation and records. The user of this drawing is also responsible for obtaining all necessary training and education. The user of this drawing is also responsible for obtaining all necessary equipment and tools. The user of this drawing is also responsible for obtaining all necessary materials and supplies. The user of this drawing is also responsible for obtaining all necessary labor and services. The user of this drawing is also responsible for obtaining all necessary insurance and bonding. The user of this drawing is also responsible for obtaining all necessary safety and health measures. The user of this drawing is also responsible for obtaining all necessary environmental and cultural resources. The user of this drawing is also responsible for obtaining all necessary historical and archaeological resources. The user of this drawing is also responsible for obtaining all necessary social and economic resources. The user of this drawing is also responsible for obtaining all necessary legal and regulatory resources. The user of this drawing is also responsible for obtaining all necessary technical and scientific resources. The user of this drawing is also responsible for obtaining all necessary financial and human resources. The user of this drawing is also responsible for obtaining all necessary information and data. The user of this drawing is also responsible for obtaining all necessary communication and coordination. The user of this drawing is also responsible for obtaining all necessary documentation and records. The user of this drawing is also responsible for obtaining all necessary training and education. The user of this drawing is also responsible for obtaining all necessary equipment and tools. The user of this drawing is also responsible for obtaining all necessary materials and supplies.

WORK ZONE PAVEMENT MARKINGS

GENERAL

1. 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.
2. Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
3. Additional supplemental pavement marking details may be found in the plans or specifications.
4. Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
5. 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(S1PM).
6. 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.
7. All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

1. Raised pavement markers are to be placed according to the patterns on BC(11).
2. 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

1. Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
2. Non-removable prefabricated pavement markings (fall back) shall meet the requirements of DMS-8240.

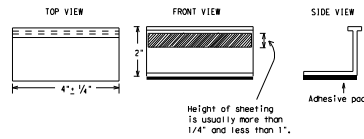
MAINTAINING WORK ZONE PAVEMENT MARKINGS

1. The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
2. 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.
3. 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.
4. 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

1. 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.
2. 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.
3. 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".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. 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.
10. Block-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

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. 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.
 - A. 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.
 - B. 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.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(S1PM) for tab placement on new pavements. See Standard Sheet TOP(T-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
 2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
 3. Adhesive for guidemarks shall be bituminous material not 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).

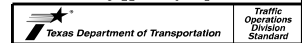
DEPARTMENTAL MATERIAL SPECIFICATIONS

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).

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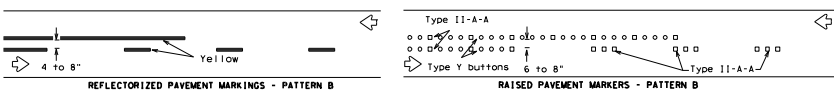
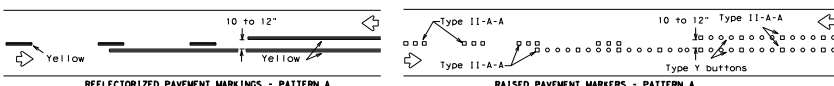


BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11) - 21

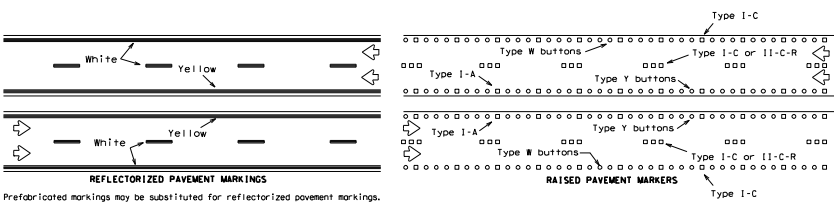
Plan	BC-11-001	Rev	1/001	On 1/001	On 1/001	On 1/001
Rev	1/001	February 1998	cont	1/001	1/001	1/001
REVISED	6411	21	001	US 287, ETC.		
2-88	9-07	9151	COUNTY			
1-02	1-13	11-01	LFK	HOUSTON		15
11-01	8-14					

PAVEMENT MARKING PATTERNS



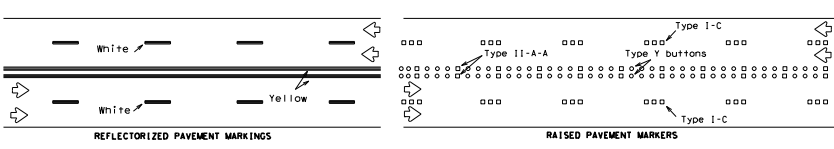
Pattern A is the TxDOT standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

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



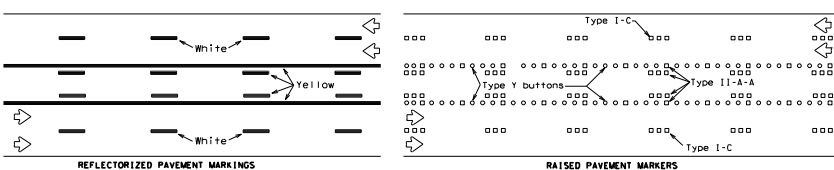
Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



Prefabricated markings may be substituted for reflectorized pavement markings.

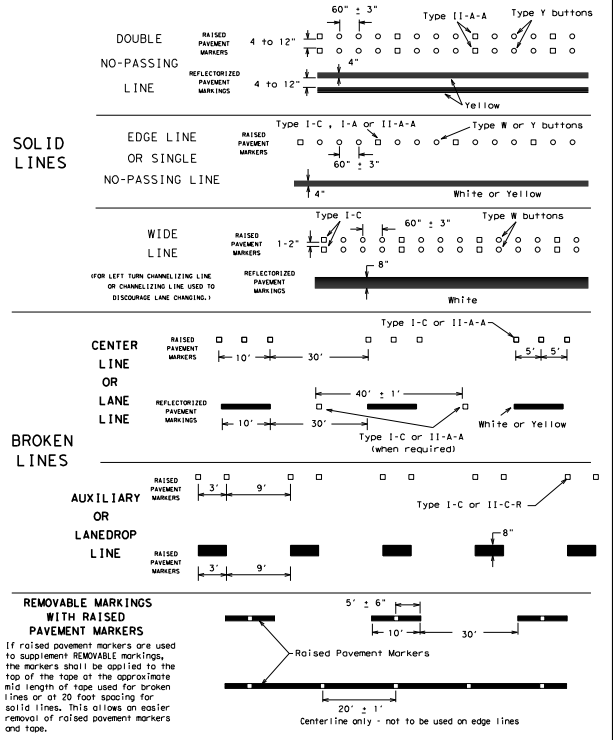
LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS
 If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows for easier removal of raised pavement markers and tape.
 Centerline only - not to be used on edge lines

SHEET 12 OF 12

Texas Department of Transportation Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 21

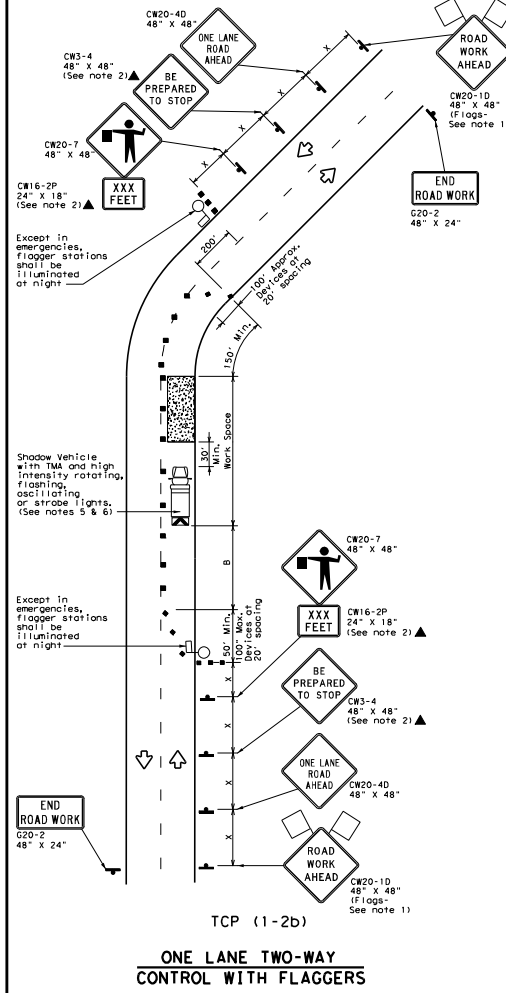
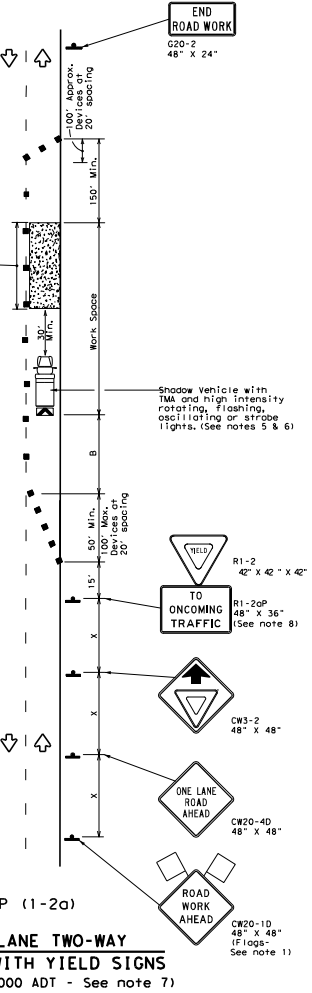
Field	06-14-001	Rev	TxDOT	06-15-001	Rev	TxDOT	06-15-001
Project	February 1998	Cont	1621	Job	001	US 287, ETC	16
Revisions	1-97 9-07	6411	21	Dist	LFK	HOUSTON	
	2-98 7-13						
	11-99 8-14						

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."

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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
	Flagger		Flagger

Posted Speed * X	Formula	Minimum Detachable Taper Lengths ft	Suggested Maximum Spacing of Channelizing Devices ft	Minimum Sign Spacing ft	Suggested Longitudinal Buffer Space ft	Stopping Sight Distance ft
30	$L = \frac{10^3}{S}$	150' 165' 180'	30'	60'	120'	90'
35	$L = \frac{10^3}{S}$	205' 225' 245'	35'	70'	160'	120'
40	$L = \frac{10^3}{S}$	265' 295' 320'	40'	80'	240'	155'
45	$L = \frac{10^3}{S}$	450' 495' 540'	45'	90'	320'	195'
50	$L = \frac{10^3}{S}$	500' 550' 600'	50'	100'	400'	240'
55	$L = \frac{10^3}{S}$	550' 605' 660'	55'	110'	500'	295'
60	$L = \frac{10^3}{S}$	600' 660' 720'	60'	120'	600'	350'
65	$L = \frac{10^3}{S}$	650' 715' 780'	65'	130'	700'	410'
70	$L = \frac{10^3}{S}$	700' 770' 840'	70'	140'	800'	475'
75	$L = \frac{10^3}{S}$	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 CW-4 "BE PREPARED TO STOP" sign may be installed after the CW20-10 "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
 - Sign spacing may be increased or an additional CW20-10 "ROAD WORK AHEAD" sign may be used if advance warning areas of the flagger 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 flagger 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/LOW poppies to control traffic. Flags should be limited to emergency situations.

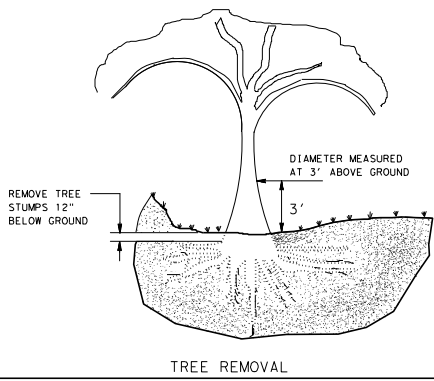
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

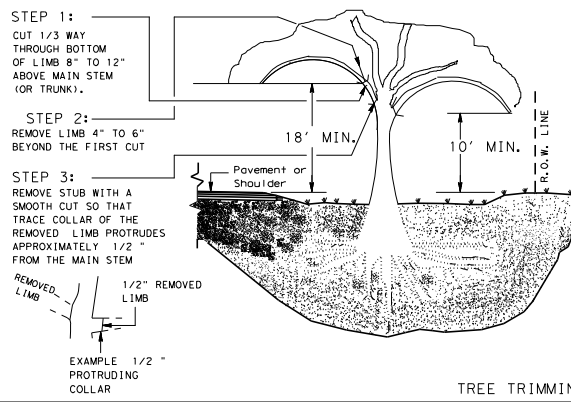
TCP (1-2) - 18

Plan No.	1011-21-18_Sign	Rev.	01
Date	December 1985	Cont. Sect.	21
Author	6411	Dist.	001
Revised	4-90 4-91	County	US 287, ETC.
Revised	2-94 2-12	Dist.	LFK
Revised	2-97 2-18	City	HOUSTON
Sheet No.	18		

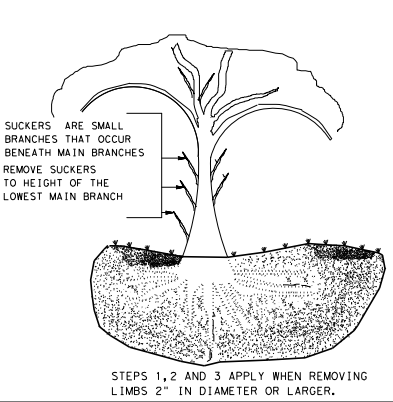
DISCLAIMER: This drawing is governed by the Texas Engineering Practice Act. No warranty of any kind is made by the State of Texas or the Department of Transportation for any use of this drawing other than for the project and location specifically identified on the drawing.



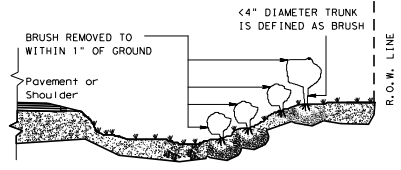
TREE REMOVAL



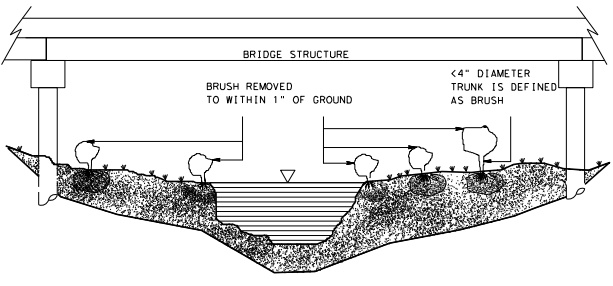
TREE TRIMMING



STEPS 1, 2 AND 3 APPLY WHEN REMOVING LIMBS 2" IN DIAMETER OR LARGER.



BRUSH REMOVAL



BRUSH REMOVAL UNDER BRIDGE AND IN CHANNEL

GENERAL NOTES:

- TREE TRIMMING**
- TRIM AND REMOVE ALL TREE LIMBS ON THE PAVEMENT SIDE OF THE TRUNK 18' ABOVE THE PAVEMENT OR BRIDGE DECK ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.
 - TRIM AND REMOVE ALL TREE LIMBS BETWEEN THE TRUNK AND R.O.W. LINE 10' ABOVE NATURAL GROUND, TERRAIN OR OTHER STRUCTURE ELEVATION, UNLESS OTHERWISE SHOWN ON THE PLANS.
- TREE REMOVAL**
- FOR TREES MARKED FOR REMOVAL, THE DIAMETER OF TREES ARE DETERMINED BY MEASUREMENT OF THE TRUNK CIRCUMFERENCE 3' ABOVE THE GROUND. TREES WITH TRUNKS OF LESS THAN 4" DIAMETER ARE CONSIDERED TO BE BRUSH. TREES WITH MULTIPLE TRUNKS AT THE POINT OF MEASUREMENT ARE MEASURED AND PAID FOR SEPARATELY.
 - MEASUREMENTS FOR PAYMENT OF TREE DIAMETERS ARE DIVIDED INTO THE RANGES SHOWN IN TABLE 1.

PAY ITEM	TREE TRUNK SIZE FOR TREE REMOVAL PAYMENT			
	RANGE FOR PAY ITEMS			
	TRUNK DIAMETER *		TRUNK CIRCUMFERENCE	
LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO	LOWER LIMIT IS GREATER THAN	UPPER LIMIT IS LESS THAN OR EQUAL TO	
752 6005	4	12	12 1/2	37 1/2
752 6006	12	18	37 1/2	56 1/2
752 6007	18	24	56 1/2	75 1/2
752 6008	24	30	75 1/2	94
752 6009	30	36	94	113
752 6010	36	42	113	132
752 6011	42	48	132	151
752 6012	48	60	151	188 1/2
752 6013	60	72	188 1/2	226
752 6019	72	84	226	264
	84	GREATER THAN 84	264	NOT APPLICABLE

*SEE GENERAL NOTE #3.

Maintenance Division Standard

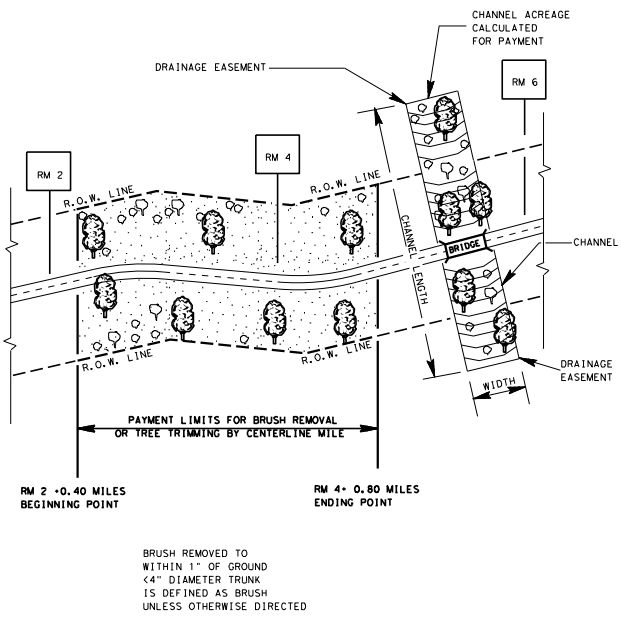
TREE AND BRUSH REMOVAL

TRB-15(1)

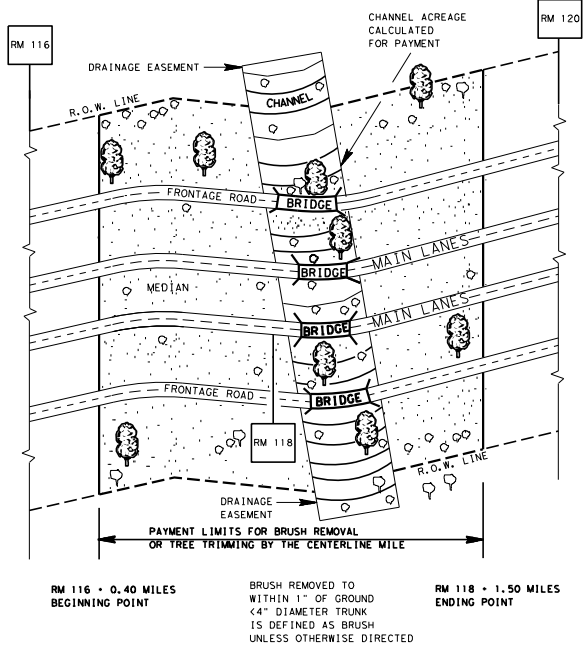
SHEET 1 OF 2

FIELD NO.	DATE	BY	CHKD BY	DATE
01007 MARCH 2015	6411	21	001	US 287, ETC
REVISIONS	DATE	BY	CHKD BY	DATE
Revised Table 1 to 2014 Spec/Floor Plan	0517			
	LFK		HOUSTON	20

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EXAMPLE: UNDIVIDED HIGHWAY



EXAMPLE: DIVIDED HIGHWAY WITH FRONTAGE ROADS

GENERAL NOTES:

TREE TRIMMING AND BRUSH REMOVAL

1. PAYMENT BY THE CENTERLINE MILE IS MADE TO THE NEAREST 1/100 (0.01) MILE.
2. LIMITS OF WORK ARE SHOWN AS DISTANCES FROM REFERENCE MARKERS (RM).
3. PAY ITEMS BY THE CENTERLINE MILE INCLUDE ALL TREE TRIMMING OR BRUSH REMOVAL IN THE RIGHT OF WAY ON BOTH SIDES OF THE HIGHWAY. FOR DIVIDED HIGHWAYS, THE MEDIAN IS INCLUDED. FOR HIGHWAYS WITH FRONTAGE ROADS, THE AREAS BETWEEN THE FRONTAGE ROADS AND MAIN LANES, AND THE AREAS OUTSIDE OF THE FRONTAGE ROADS ARE INCLUDED.
4. BRUSH REMOVAL AND TREE TRIMMING UNDER BRIDGES, IN AND ALONG CHANNELS AND EASEMENTS ARE PAID FOR BY THE ACRE FOR AREAS DESIGNATED ON THE PLANS.



TREE AND BRUSH REMOVAL
TRB-15(2)

NOT TO SCALE		SHEET 2 OF 2	
FILED: TRB-15(2).DCN	ISSUED: APRIL 2015	DESIGNED BY: LJB	CHKD BY: JEO
© TxDOT APRIL 2015	STATE: TEXAS	COUNTY: L.F.K.	FEDERAL AID PROJECT: 21
REVISION: 5/13/2004	LJB	COUNTY: L.F.K.	ROADWAY: 21
REVISION: 9/24/2004	LJB	COUNTY: L.F.K.	ROADWAY: 21
REVISION: APRIL 2015	JEO	HOUSTON	641.21 001 JS 287, ETC

LEVELS DISPLAYED	
1	

