

FHWA TEXAS DIVISION	STATE PROJECT NO. F 2021(431)	SHEET NO. 1.01
STATE	DISTRICT	COUNTY
TEXAS	LBB	Hale
CONTROL	SECTION	JOB
0067	06	060
		HIGHWAY NO. IH0027

ADT-16.410 (2019) 22,974 (2039)
FUNCTIONAL CLASS- INTERSTATE
DESIGN SPEED-N/A

INDEX OF SHEETS

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1. GENERAL	
1.01	TITLE SHEET
1.02	PROJECT INDEX

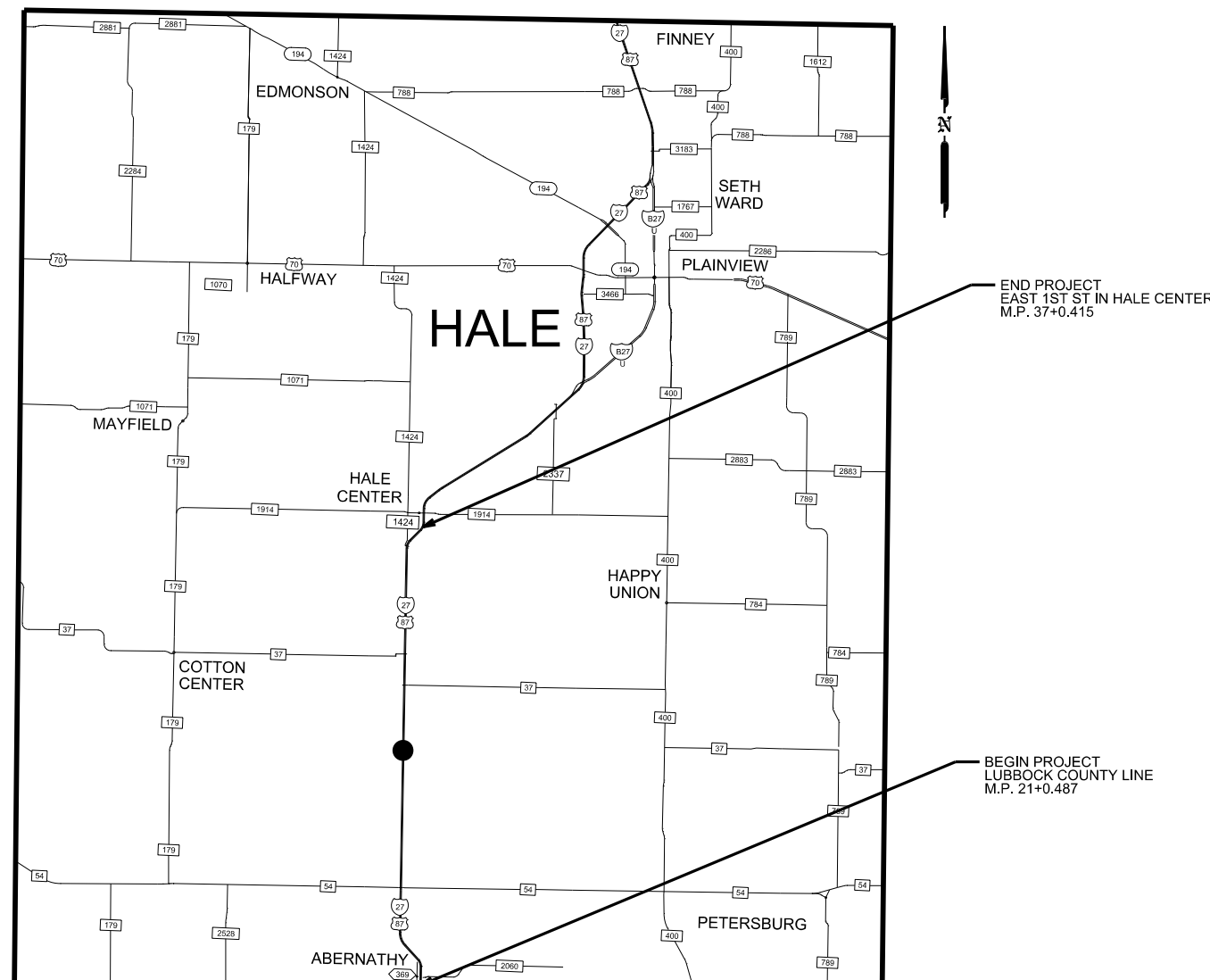
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY, 2012).

STATE OF TEXAS DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F 2021(431)
NET LENGTH OF PROJECT =15.913MI
LIMITS: LUBBOCK COUNTY LINE TO
EAST 1ST STREET IN HALE CENTER

FOR THE CONSTRUCTION OF:
DYNAMIC MESSAGE SIGNS



END PROJECT
EAST 1ST ST IN HALE CENTER
M.P. 37+0.415

BEGIN PROJECT
LUBBOCK COUNTY LINE
M.P. 21+0.487

NO TDLR INSPECTION REQUIRED

● Area of Work
NO EQUATIONS
NO EXCEPTIONS
NO SCALE
NO RAILROADS CROSSINGS

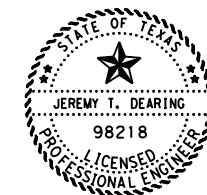


SUBMITTED FOR LETTING:	12/31/2020
DocuSigned by: <i>Jeremy T. Dearing, P.E.</i>	
DISTRICT ENGINEER	12/31/2020
RECOMMENDED FOR LETTING:	
DocuSigned by: <i>Shelley C. Harris, P.E.</i>	
DISTRICT ENGINEER	12/31/2020
APPROVED FOR LETTING:	
DocuSigned by: <i>Steph P. Warner, P.E.</i>	
DISTRICT ENGINEER	12/31/2020

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Jeremy T. Dearing, P.E.

12/31/2020

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE BY A HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

PROJECT INDEX

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6			1.02
STATE	DIST.	County	
TEXAS	LBB	Hale	
CONT.	SECT.	JOB	HIGHWAY NO.
0067	06	060	IH0027
FILE NAME		DATE	
2021 HALE DMS		12/28/2020	

GENERAL NOTES:

General Requirements and Covenants - Items 1 thru 9

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

Name – Jeremy.Dearing@txdot.gov

Terry.Harris@txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the 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/>

All 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, CCSJ/Project Name. Check the FTP site regularly for any updates.

Item 1 – Abbreviations and Definitions

Contract Prosecution – Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A contractor awarded multiple contracts, must be capable and sufficiently staffed to concurrently process any and all contracts at the same time.

Item 2 – Instructions to Bidders

The construction time determination schedule will be posted on the Contractor Q&A FTP site.

Earthwork files and cross-sections will be posted on the Contractor Q&A FTP site.

View the plans on-line or download from the web at:

<http://www.dot.state.tx.us/business/plansonline/agreement.htm>

Choose “I Agree” then, “Click here”, then “State-Let-Construction”, pick the letting month, then “Plans” and then choose the plans set.

Order plans from any of the plan reproduction companies shown on the web at:

[http://www.dot.state.tx.us/business/contractors_consultants/repro_companies.h
tm](http://www.dot.state.tx.us/business/contractors_consultants/repro_companies.htm)

Utilities

Overhead and underground utility installations exist within the project limits.

Item 5 – Control of the Work

Perform construction surveying in accordance with Article 5.9.3, “Method C.”

When deviation from the plans is requested by the Contractor, but not required for installation, the Contractor will bear any additional costs associated with the deviation.

Alter the location of all ground boxes, foundations and structures shown on the plans only as approved by the Engineer in writing. Contact the Engineer prior to installing ground boxes, foundations and structures in order that the Inspector may verify and approve the location.

Restore all disturbed areas due to trenching or any construction activity to a condition equivalent to the original condition within 14 working days from the time work began in the area including all necessary stabilization.

The construction, operation, and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

At the end of each day remove from the ROW, inside or outside the project limits, any excess material and debris resulting from construction.

Correct any deficiencies identified during the final inspection including required paperwork.

Submit all required paperwork within 60 days of project acceptance.

Item 6 – Control of Materials

Transport department furnished material from [Lubbock District Signal Shop](#) subsidiary to the contact bid items.

Use materials from pre-qualified producers. A list of material producers pre-qualified by the Construction Division (CST) of the Texas Department of Transportation (TxDOT) can be found at the following website:

http://www.txdot.gov/business/contractors_consultants/producer_list.htm

In addition to the requirements of the plans and specifications, make all material and equipment furnished, installed, modified, tested, or otherwise used on this contract, and becoming the property of TxDOT, fully functional within the manufacturer normal specifications, warranties, and guarantees. Make any additional functions of the material and equipment normally supplied by the manufacturer, but not specified by TxDOT, completely functional.

County: HALE

Control: 0067-06-060

Highway: IH0027

Sheet 1.03A

Item 7 – Legal Relations and Responsibilities

When applicable, comply with all requirements of the Environmental Permits Issues and Commitments (EPIC) sheets.

Dispose of all waste materials in compliance with local, state, and federal regulations. Submit a list of all approved waste sites to the Engineer for review.

No significant traffic generator events identified.

Item 8 - Prosecution and Progress

This project is to be complete in 60 days and 4 months of barricades in accordance with the contract documents.

The Latest Work Start Date is December 6, 2021.

Monthly schedule updates are a very important aspect of managing the progress of this project. The Engineer may withhold the monthly estimate if the schedule update has not been received.

A bar chart will be required on this project.

Do not begin work before sunrise or end work after sunset unless authorized by the Engineer, and remove all equipment from the roadway before sundown.

Perform any erosion control measures such as seeding or sodding before beginning the next phase, or land, unless otherwise authorized by the Engineer.

Working days will be computed and charged in accordance with Article 8.3.1.4 Standard Workweek.

Shut down operations the working day before the following major traffic generating holidays: January 1st (New Year's); Last Monday in May (Memorial Day); July 4th (Independence Day); First Monday in September (Labor Day); Fourth Thursday in November (Thanksgiving); and December 24th (Christmas Eve).

Payment for final 3% mobilization will be made according to Article 500.3. Timeliness for submittal of required paperwork and correction of deficiencies is a consideration in developing the final contractor evaluation score.

The 90day delay start is for *manufacture of 30FT BAL TEE*.

County: HALE

Control: 0067-06-060

Highway: IH0027

Sheet 1.03A

Item 416 - Drilled Shaft Foundations

Stake all drilled shaft location, and obtain Engineer approval prior to the beginning of any drilled shaft construction.

Item 421 - Hydraulic Cement Concrete

Provide Class C concrete with silica fume.

Class C Fly Ash without silica fume will be allowed in Class A, B, S, and P concrete mix designs as directed by the Engineer.

If Class C fly ash is used, a maximum of 35% will be allowed.

Provide air entrainment in all concrete except for concrete used in drilled shafts and precast concrete members. Target an entrained air content of 4.0% for concrete pavement and 5.5% for all other concrete requiring air entrainment. Ensure the minimum entrained air content is at least 3.0% for all classes of concrete.

The Engineer will perform all concrete job control testing.

The sodium sulfate soundness Test Method TEX-411-A is waived.

Supply 2 – 4' x 8' x 3/4" sheets of plywood, in order to perform required testing procedures at the location of concrete placements.

Use 4-inch by 8-inch cylinder molds for concrete with Grade 3 or smaller coarse aggregate. Supply new cylinder molds and lids subsidiary to the various bid items.

The Engineer will inspect concrete batch plants and trucks for approval.

For this project, the requirements of Article 421.4.8.1, "Certification of Testing Personnel" are waived, except that "Personnel performing these tests are subject to Departmental approval."

Item 427 - Surface Finishes For Concrete

Provide a broom finish on all concrete surfaces.

Item 502 - Barricades, Signs And Traffic Handling

Perimeter signs shall be placed 2 miles north of the project and 2 miles south of the project.

Additional signs and barricades as directed by the Engineer shall be considered subsidiary to Item 502.

Provide flashing portable arrow panels for all lane closures.

Wash the channelizing devices and barricades following each rainfall or snowfall event and at times deemed necessary by the Engineer.

To ensure the safety and convenience of traffic, flaggers may be required when construction machinery is being operated along, across, or adjacent to lanes carrying traffic. If considered necessary by the Engineer, supplemental signs and barricades may be required.

Fill any holes left by barricade or sign supports and restore the area to its original condition.

Barricades, Signs and Traffic Handling is a plan quantity item. If time is suspended, no additional compensation will be made.

Cones or chevrons may be used in lieu of vertical panels at the discretion of the Engineer. Cones cannot be used to separate opposing traffic.

The Contractor shall bid the traffic control plan shown in the plans. Any proposed alterations to the TCP (combining work areas / phasing / etc.) shall be submitted to the Engineer at least 10 days prior to anticipated changes.

Even when not explicitly shown in the project TCP, vertical panels shall be used with an opposing lane divider every 5th panel in accordance with BC(9) for all opposing traffic conditions without a positive barrier.

Square tubing sign supports may be used for temporary construction signs. Aluminum and wood signs may be mounted if the vertical supports are embedded into the ground. Square tubing supports on skids which are typically held in place with sand bags can only support signs made of light weight fluted plastic.

Provide an all-weather surface for all sections of the roadway prior to time suspension as directed by the Engineer. The all-weather surface shall be the original undisturbed asphalt pavement or a one course surface treatment on the constructed roadbed as shown in the typical sections.

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.

Correct all noted deficiencies within 7 calendar days, otherwise, cease all operations until the noted deficiencies are corrected.

Stockpiles that meet the barricade requirements as shown on the BC(10) Standard are required to be erected at the time of material delivery in the Right-of-Way and maintained as long as the stockpile exists. Payment for Material-on-Hand will be withheld from the estimate for inadequate barricades or the failure to maintain barricades on a per stockpile basis as determined by the Engineer.

Like new traffic control devices will be required at the initial setup for all projects or as approved by the Engineer.

Provide flags and a CW8-15P "MOTORCYCLE WARNING" plaque on all CW20-1D "ROAD WORK AHEAD" signs except on side roads.

Use only the work zone speed limit and TCP signs that are relevant to the active work area and as directed. Reset signs for subsequent work phases as work progresses and approved by the Engineer. Reset normal speed limit signs at the ends of work zones.

All bid items and work requiring traffic control is the responsibility of the contractor, even when not explicitly detailed in the plans. Consider this work subsidiary to Item 502.

Item 506 - Temporary Erosion, Sedimentation, and Environmental Controls

No SW3P is required for this project, but should it be determined a plan is needed, it will be developed by the State and implemented by the Contractor.

No N.O.I. is required for this project.

Sediments removed from BMPs shall be paid for by force account. The Contractor shall submit an invoice for the work.

Correct all noted deficiencies within 7 calendar days, otherwise, cease all operations until the noted deficiencies are corrected.

Item 531 - Riprap

Reinforce with #3 rebar on 18" X 18" centers.

No wire mesh allowed.

Item 618 - Conduit

The location of conduit is diagrammatic and may be varied to meet local conditions upon approval of the Engineer. Ensure all couplings and connectors are made wrench tight. Trenching depths shall provide a minimum of 2.5 feet (30 inches) of cover unless otherwise approved by the Engineer. The Contractor must ensure that conduit is not damaged during

trench or bore pit backfilling operations. No conductors shall be pulled through conduit until all backfilling for the conduit run is complete and the template, having a diameter of not less than 75 percent of the inside diameter of the conduit, has been drawn through the conduit. Open ends of all conduit shall be fitted with temporary caps or plugs to prevent entry of dirt or debris during construction operations. A non-metallic pull rope shall be used to pull electrical conductors and traffic signal cables through non-metallic conduit. A minimum of three feet of pull rope shall be neatly left coiled in the ground boxes at each end of the conduit run. The pull rope will not be paid for directly but shall be considered subsidiary to Item 618, "Conduit." After the work is completed, the Contractor shall restore any curbs, walks, driveways or raised concrete medians which have been damaged or disturbed to an equivalent original condition and to the satisfaction of the Engineer. This work shall not be paid for directly but shall be considered subsidiary to Item 618, "Conduit."

Bored conduit runs placed under driveways and streets or highway approaches shall maintain a minimum of 30 inches below the proposed natural ground elevation or 36 inches below the existing driveway or proposed top of pavement backfill and compact trenches the same day or erect plastic fencing to discourage entry into the trenched area by pedestrians or vehicles.

Item 620 – Electrical Conductors

Grounding conductors that share the same conduit, junction box, ground box or structure shall be bonded together at every accessible point in accordance with the electrical detail sheets (ED), and the latest edition of the National Electrical Code.

Use certified persons to perform electrical work. See Item 7 Section 18.1.3 "Electrical Requirements" for additional details.

Install a minimum of 50 feet of electrical conductors from the DMS pole base to the electrical distribution box with the DMS. Coil any slack cable within the DMS.

Include extra cable to provide adequate slack at each ground box, and dynamic message sign as shown in the plans.

Item 628 - Electrical Services

The STATE will be responsible for energy consumed and monthly telephone charges occurred by the new electrical service locations. These charges should be billed to the Texas Department of Transportation, 135 Slaton Highway, Lubbock, TX 79404-5201

Silk screening or other acceptable methods are to be used to label the service enclosures indicating that the power provided is for the ITS System. Labeling service enclosures will be considered subsidiary to the bid Item 628: Electrical Services and will not be paid for directly.

Provide circuit breaker and install when additional circuit from existing electrical service is called for in the plans.

Concrete for service pole foundations, when required, will be Class A and will be in accordance with Item 421: Hydraulic Cement Concrete, except that concrete will not be paid for directly but is to be considered subsidiary to Item 628: Electrical Services. Reinforcing steel for service pole foundations, when required, will be in accordance with Item 440: Reinforcing Steel, except that reinforcing steel will not be paid for directly but is to be considered subsidiary to Item 628: Electrical Services.

Item 687 – Pedestal Pole Assembles

Provide screw-in foundations.

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

Provide 2 TMAs for stationary use for the duration of the project. Stationary TMAs will be used during the various phases of work required for this project. Payment will be made by the day for each TMA used in stationary operations.

Item 6028- Installation of Dynamic Message Sign System

Install DMS equipment furnished by the State. Furnish and install additional conduit, cables, and conductors necessary to complete a functions system. Include all incidental work, material and services not expressly called for the specifications, or not shown on the plans, which may be necessary for a complete and properly functioning system in the price bid for this item. This installation includes all material and services, and incidentals necessary for a complete installation, connected, tested and ready for operation.

DMS boards shall be picked up at 135 Slaton Road Lubbock, Texas 79404

Material Furnished by the State

- LED DMS Field Equipment
- Cellular Modems

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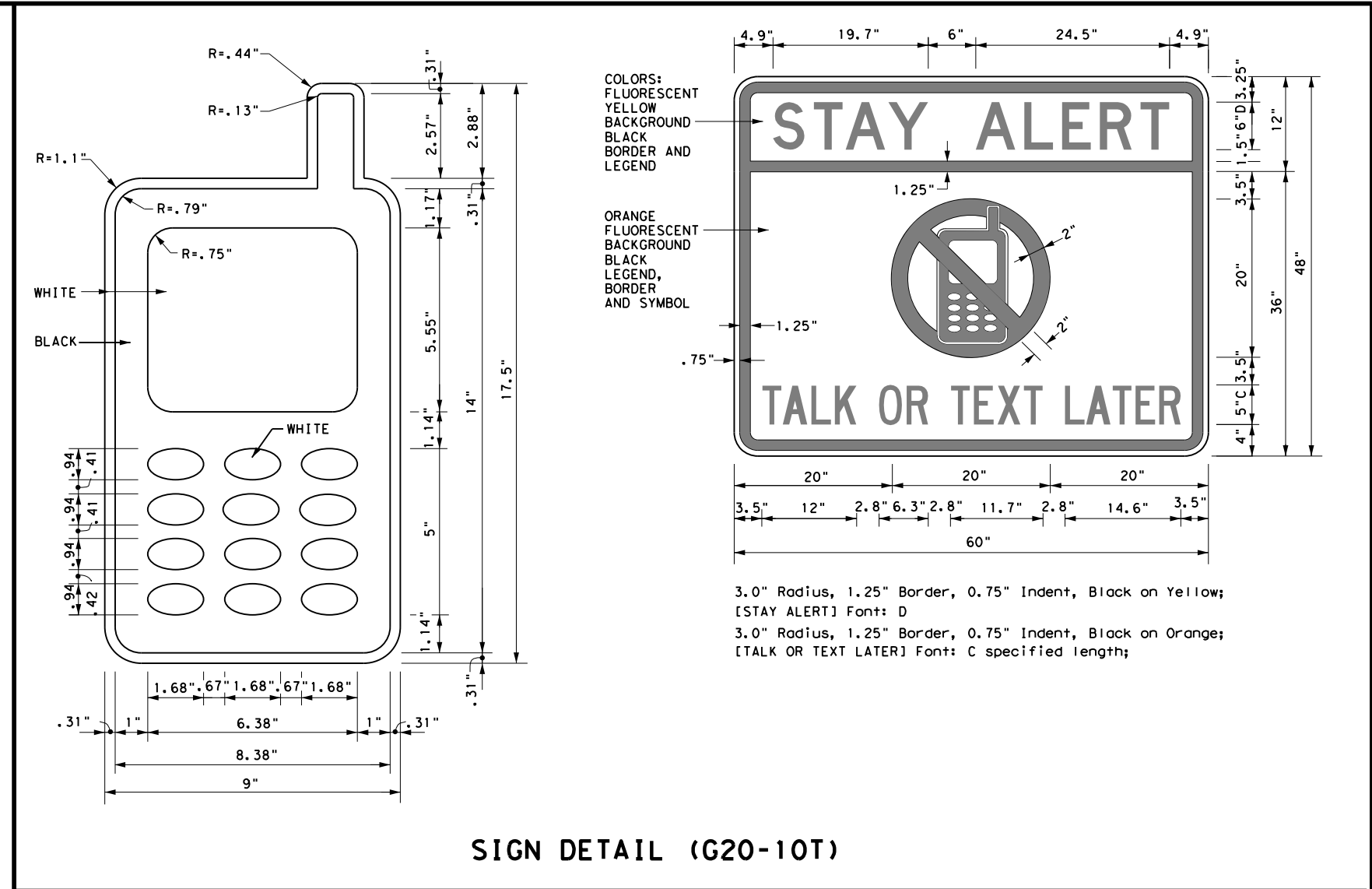
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- 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 (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE 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.



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 http://www.txdot.gov	
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	

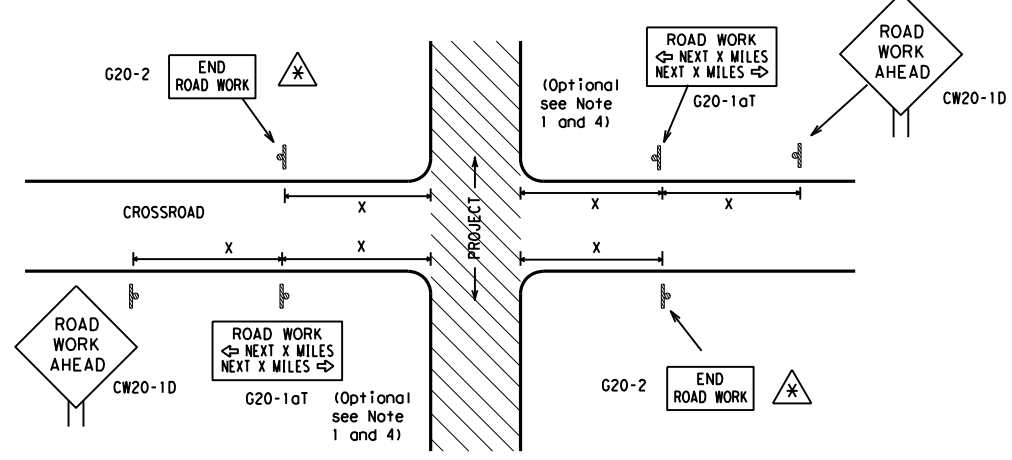
SHEET 1 OF 12

		<i>Traffic Operations Division Standard</i>
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS BC (1) - 14		
FILE: bc-14.dgn © TxDOT November 2002	DNE: TxDOT REVISIONS: 0067 06 4-03 5-10 8-14 9-07 7-13	CK: TxDOT DW: TxDOT JOB: 060 COUNTY: Hale HIGHWAY: IH0027 SHEET NO.: 2.01

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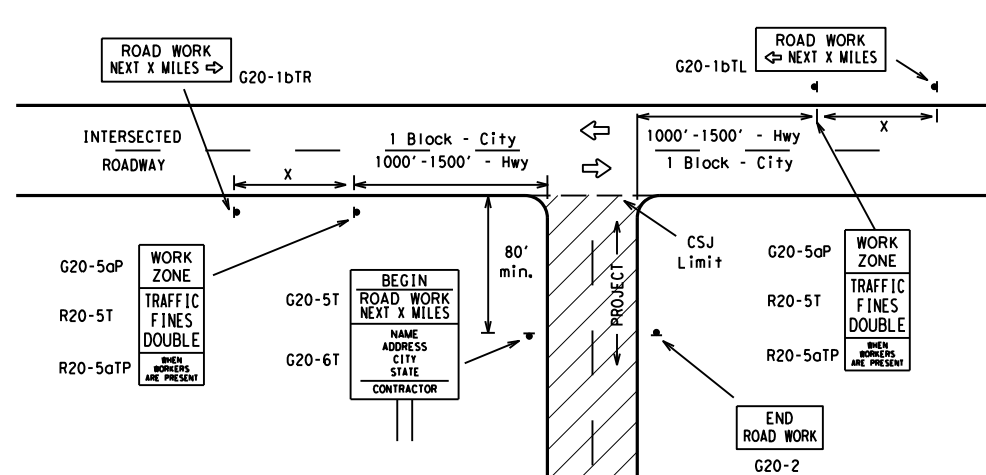
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ⚠ 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^{1,5,6}

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

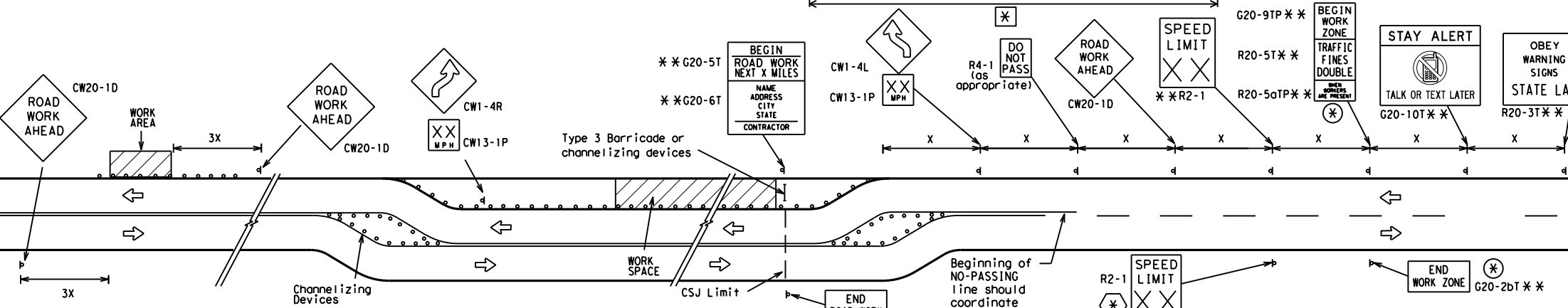
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

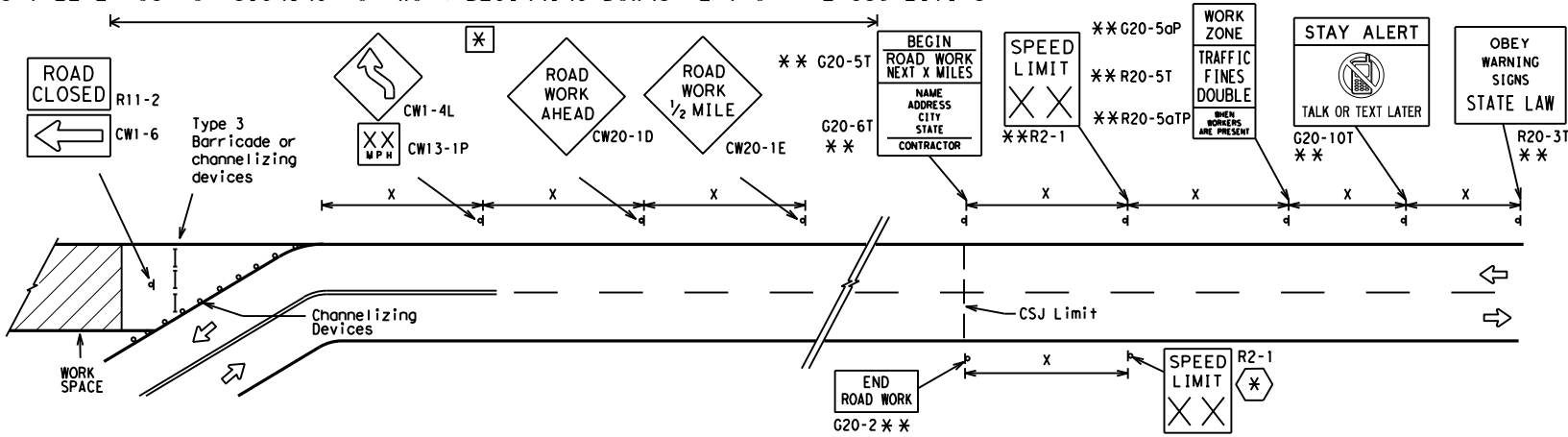
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

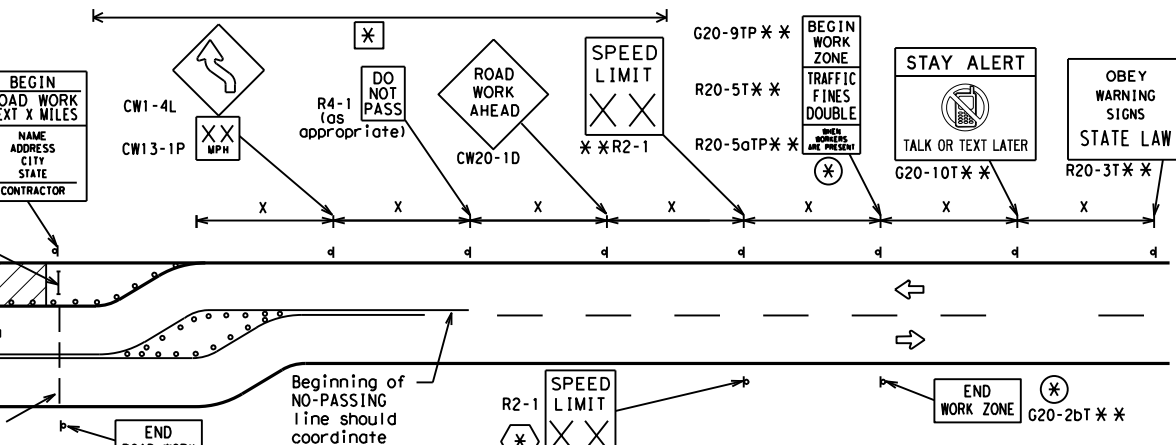


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT 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



BARRICADE AND CONSTRUCTION PROJECT LIMIT

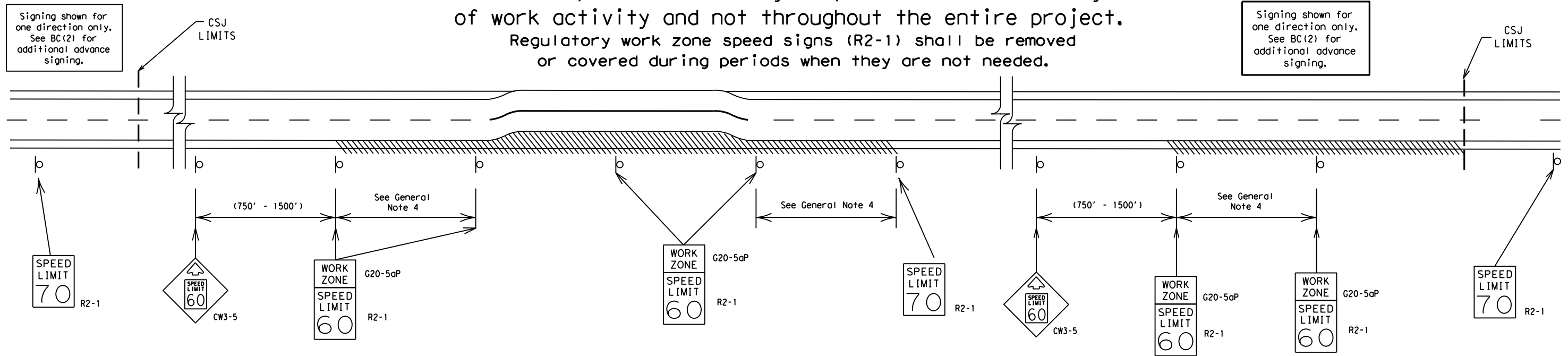
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit 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

- 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.

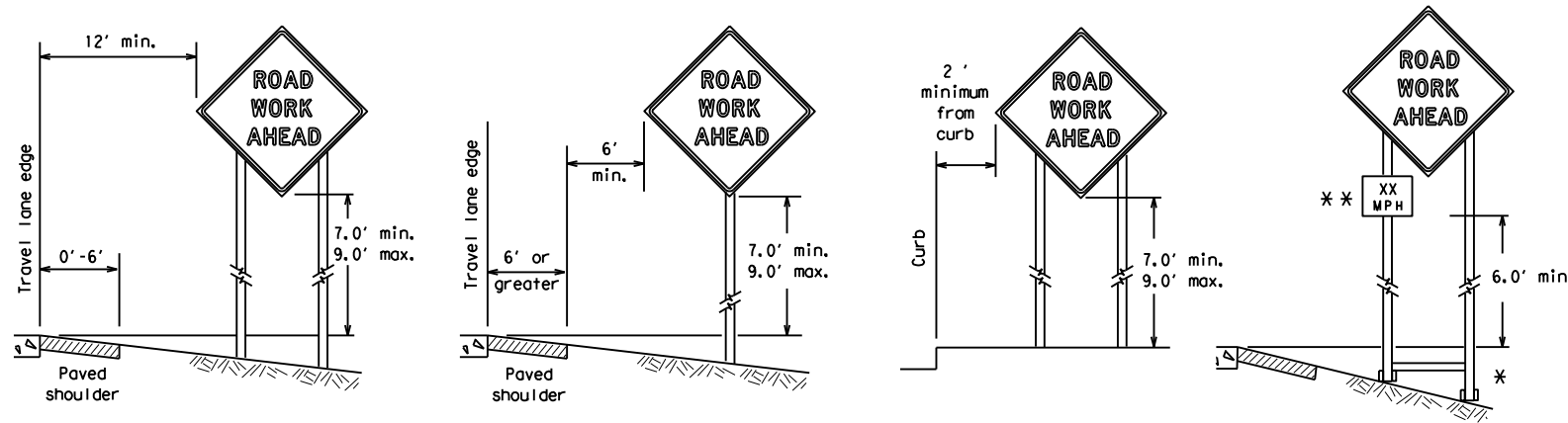
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		Traffic Operations Division Standard	
<h2>BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT</h2>			
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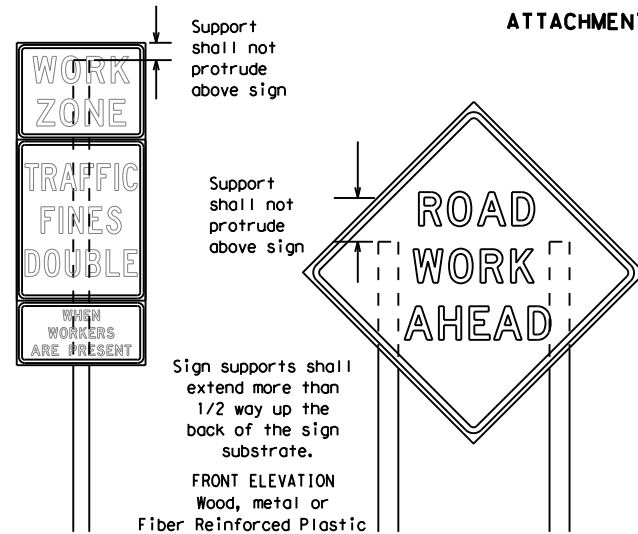
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



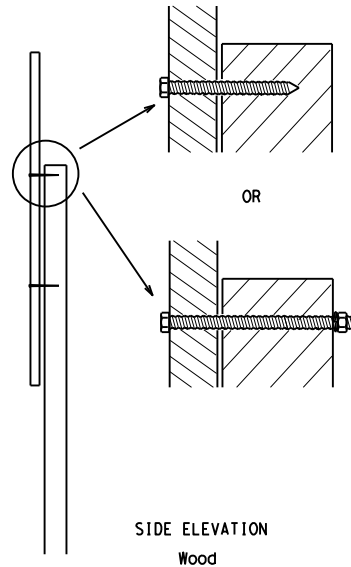
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** 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



Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

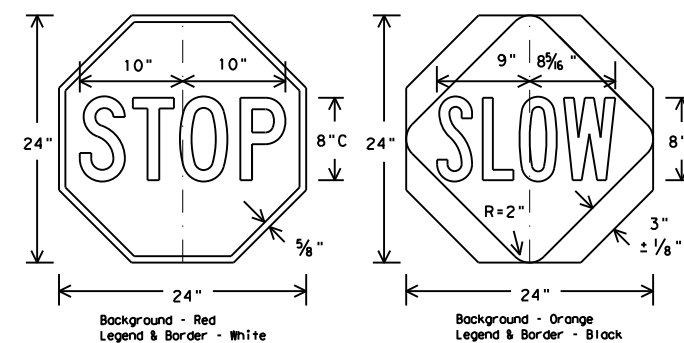


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

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

1. 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.
2. When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. 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

1. 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.
2. 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.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. 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.
5. 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.
6. 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

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
 2. Wooden sign posts shall be painted white.
 3. Barricades shall NOT be used as sign supports.
 4. 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.
 5. 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.
 6. 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.
 7. 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.
 8. 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.
 9. 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)**
1. 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.
 - a. Long-term stationary - work that occupies a location more than 3 days.
 - b. 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.
 - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - d. Short, duration - work that occupies a location up to 1 hour.
 - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

1. 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.
2. 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.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. 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.
5. 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

1. 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

1. 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.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. 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

1. 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).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

1. 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

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. 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.
3. 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.
4. 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.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. 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.
7. 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.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

1. 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.

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

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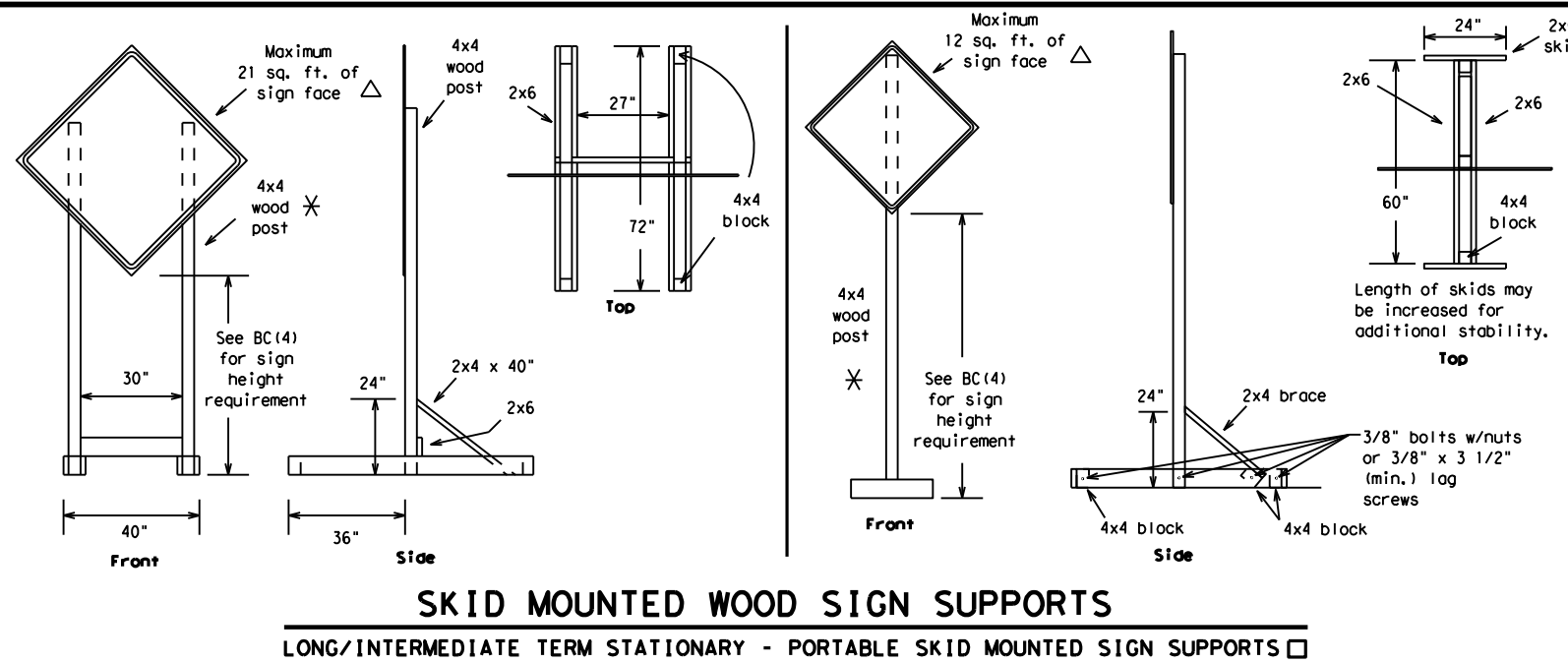
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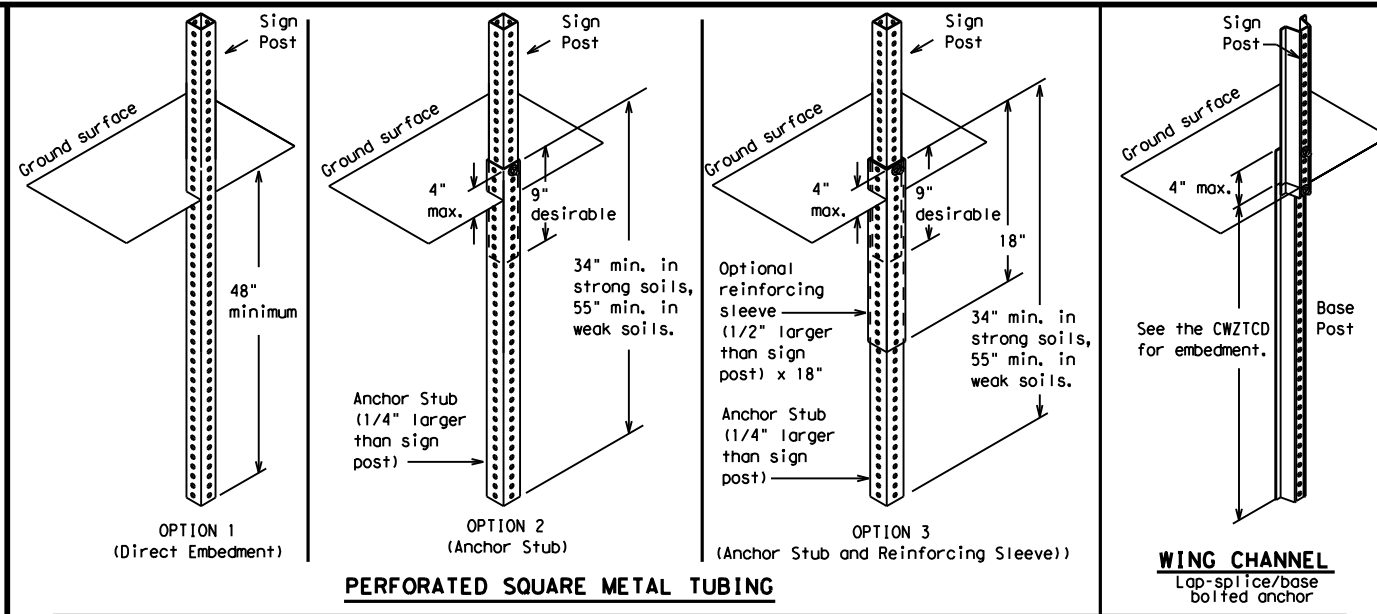
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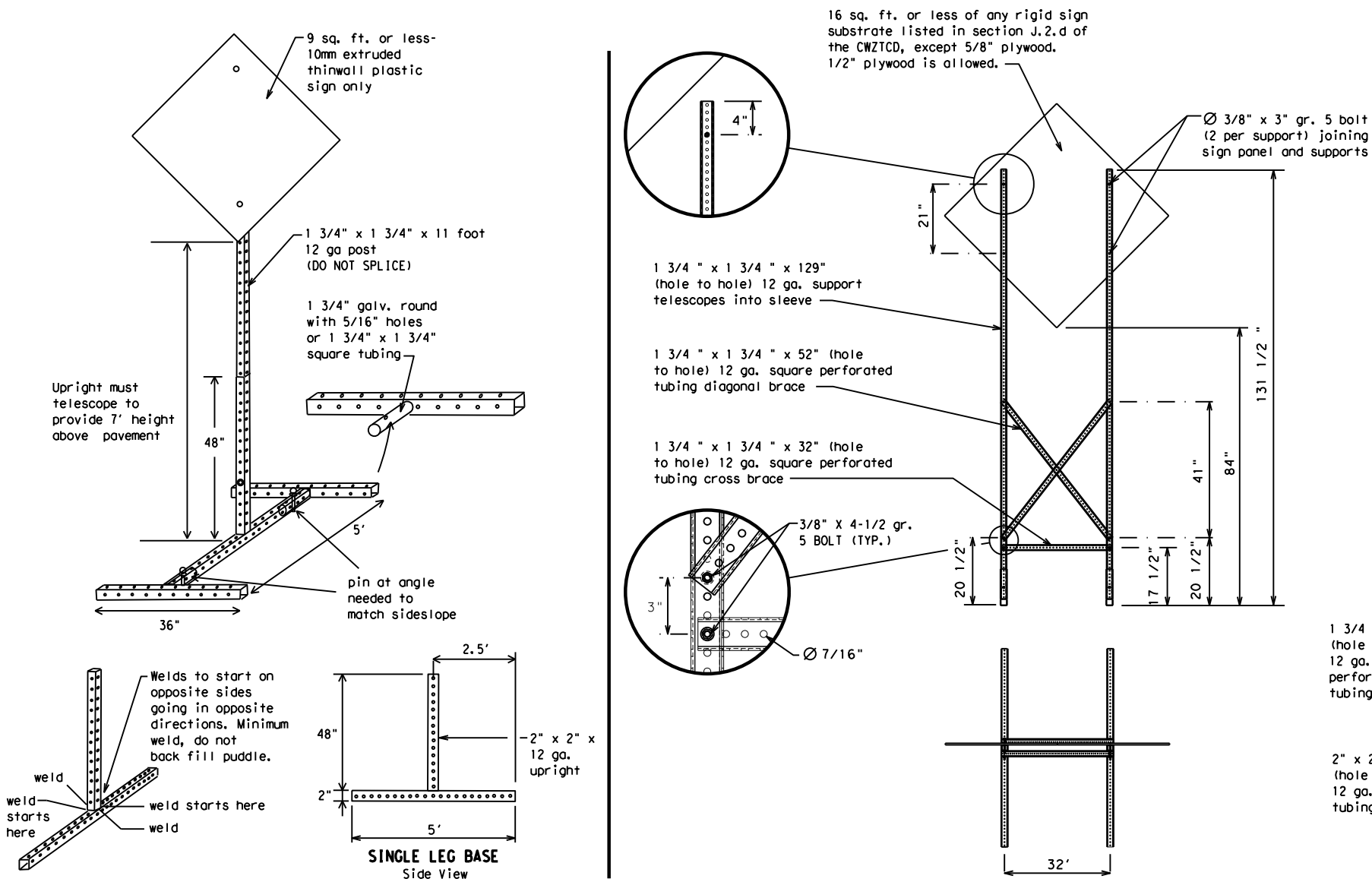
SKID MOUNTED WOOD SIGN SUPPORTS

LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

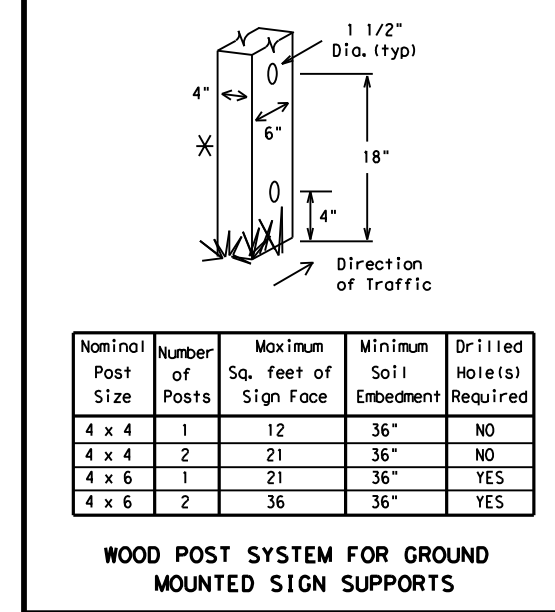


GROUND MOUNTED SIGN SUPPORTS

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.

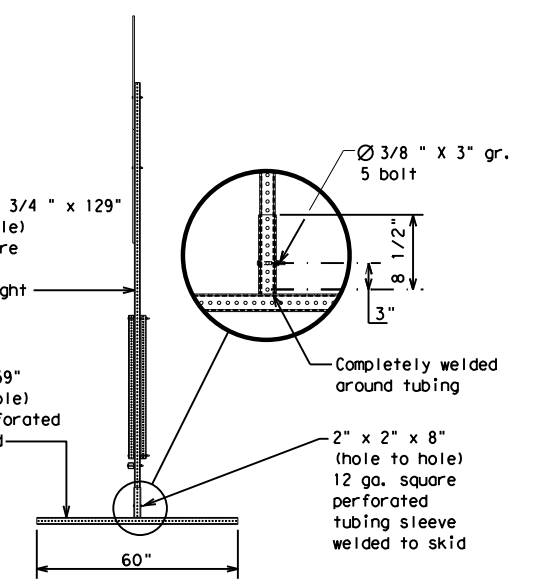


SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS



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

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

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.

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

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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 TMUTCD.
- 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.

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
XXXXXXXX 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 *

FORM X LINES RIGHT
USE XXXXX RD EXIT
USE EXIT I-XX NORTH
USE I-XX E TO I-XX N
WATCH FOR TRUCKS
EXPECT DELAYS
PREPARE TO STOP
END SHOULDER USE
WATCH FOR WORKERS

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX TO XXXXXX
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 "Flagger 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(7), for the same size arrow.

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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
Canot	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 DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Hour(s)	HR, HRS	Time Minutes	TIME MIN
Information	INFO	Upper Level	UPR LEVEL
It Is	ITS	Vehicles (s)	VEH, VEHS
Junction	JCT	Warning	WARN
Left	LFT	Wednesday	WED
Left Lane	LFT LN	Weight Limit	WT LIMIT
Lane Closed	LN CLOSED	West	W
Lower Level	LWR LEVEL	Westbound	(route) W
Maintenance	MAINT	Wet Pavement	WET PVMT
		Will Not	WONT

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



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

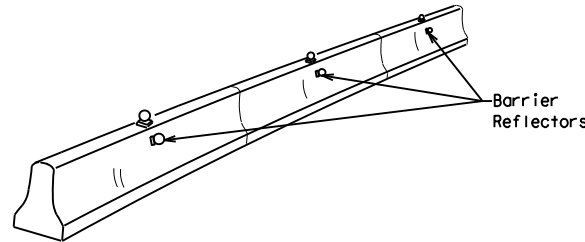
BC (6) - 14

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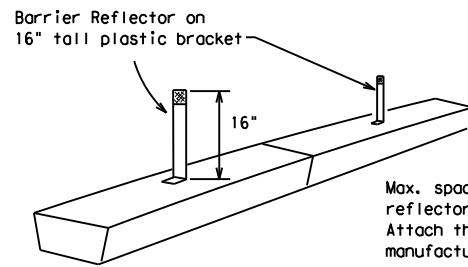
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



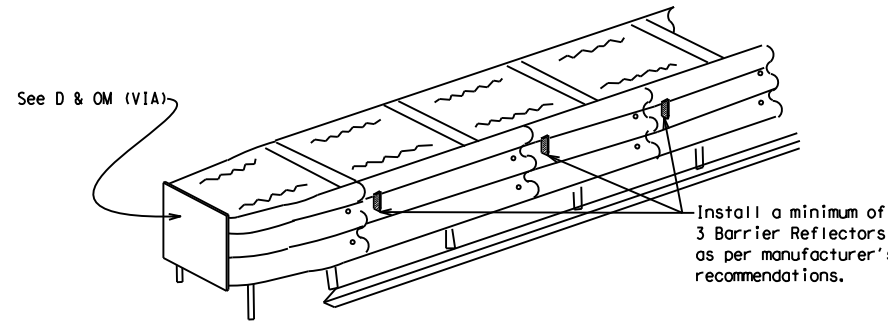
CONCRETE TRAFFIC BARRIER (CTB)

- 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)

Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.



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.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

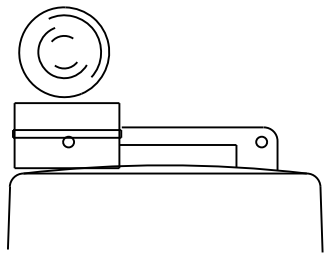
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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_{FL} or C_{FL} 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

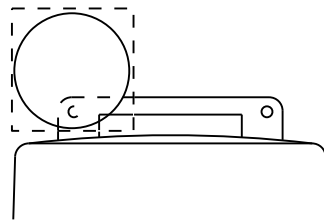
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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



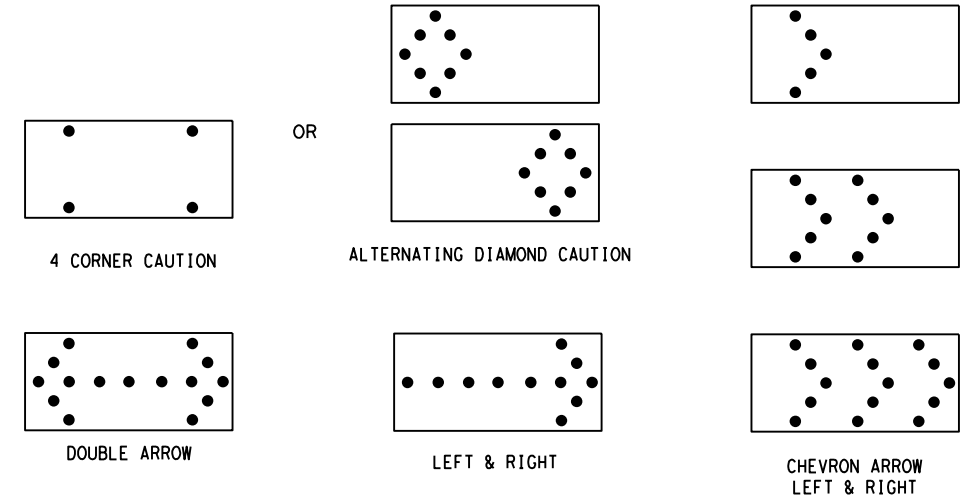
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

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

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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY	SHEET NO.	
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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:

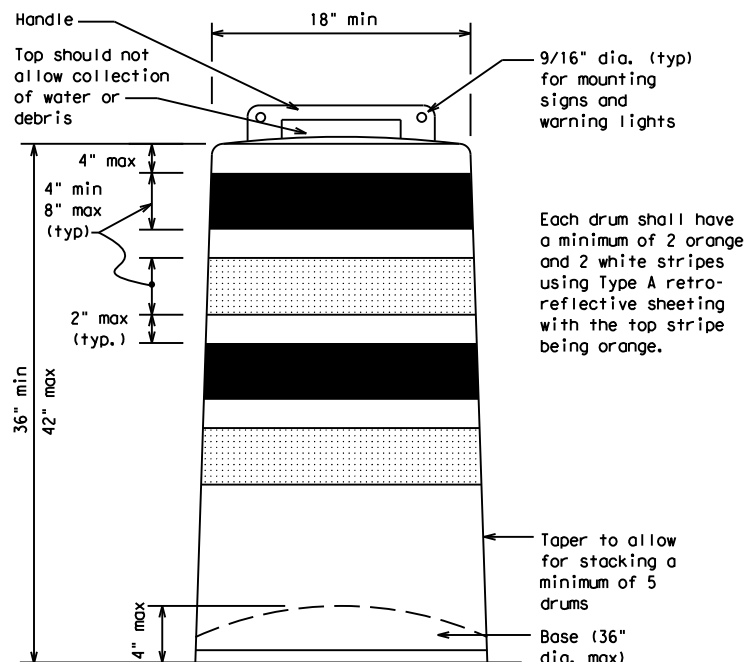
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents 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

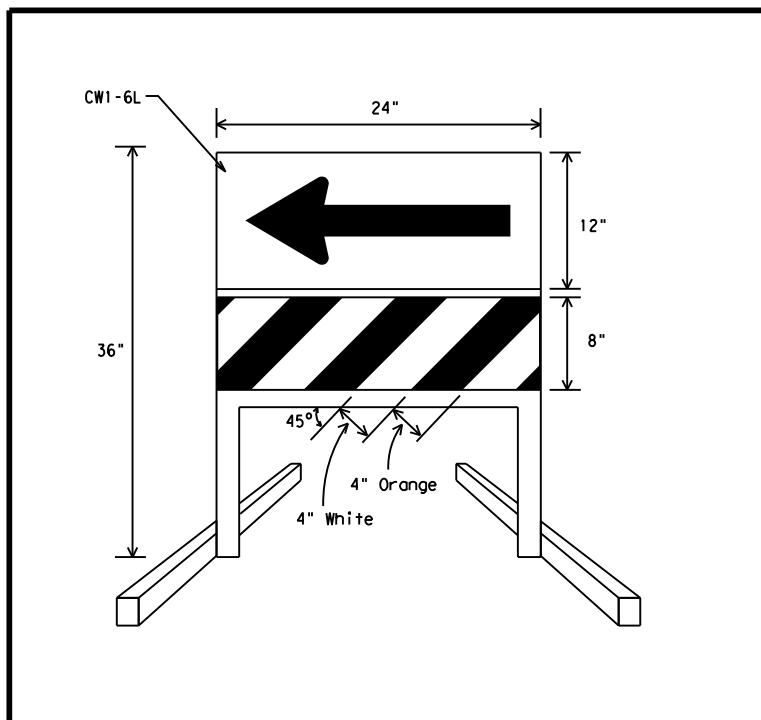
- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable 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.

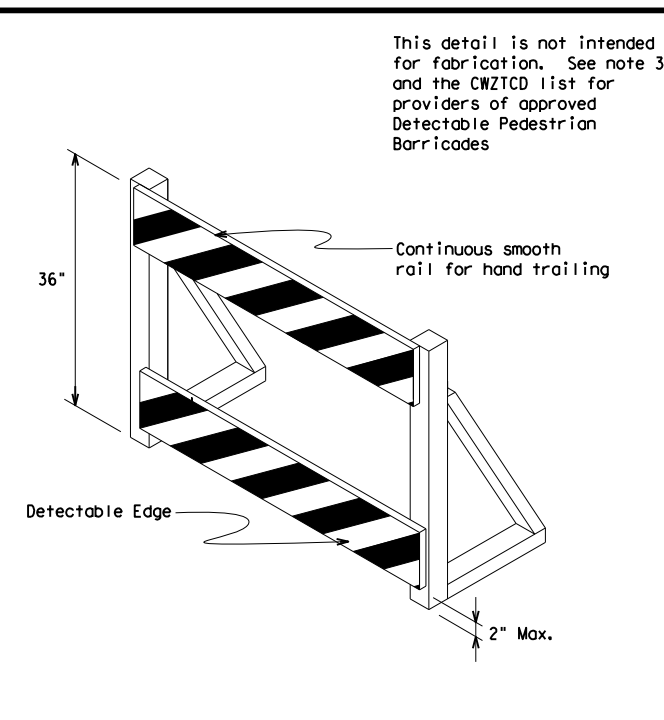


Each drum shall have a minimum of 2 orange and 2 white stripes using Type A retro-reflective sheeting with the top stripe being orange.



DIRECTION INDICATOR BARRICADE

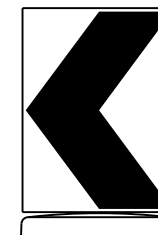
- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The 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_{FL} or Type C_{FL} 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. Sheetting 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.



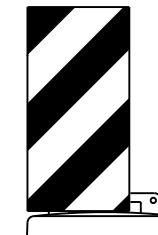
DETECTABLE PEDESTRIAN BARRICADES

- 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.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CWI-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_{FL} or Type C_{FL} 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



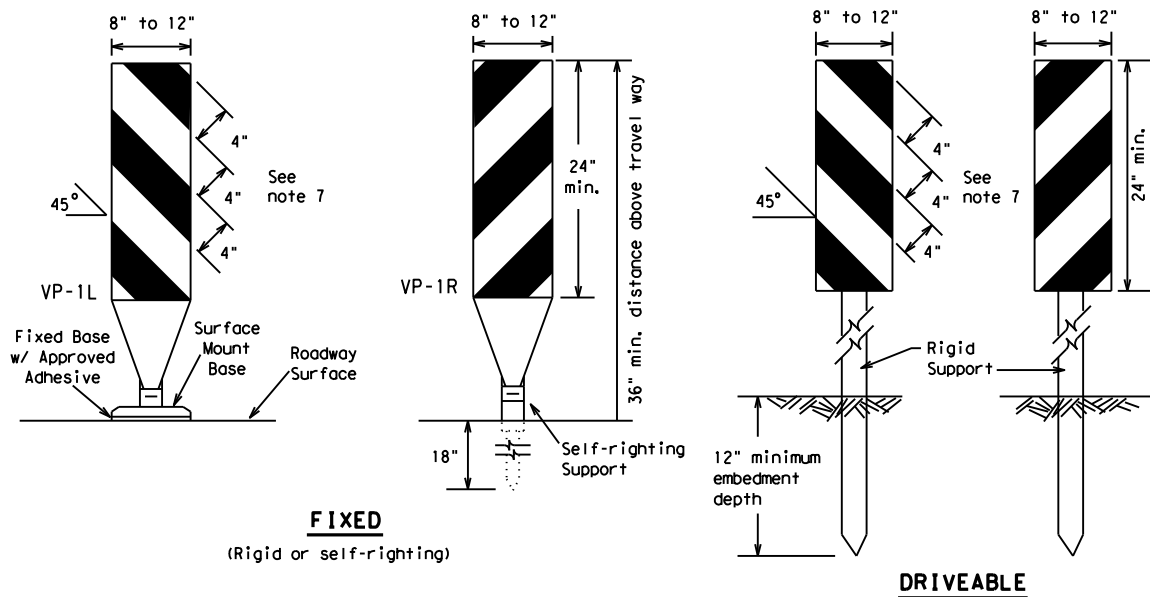
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 14

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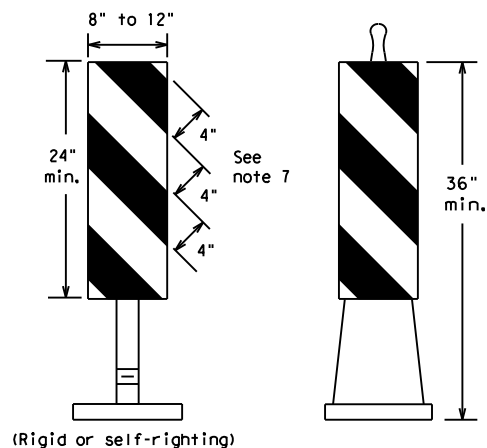
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(Rigid or self-righting)

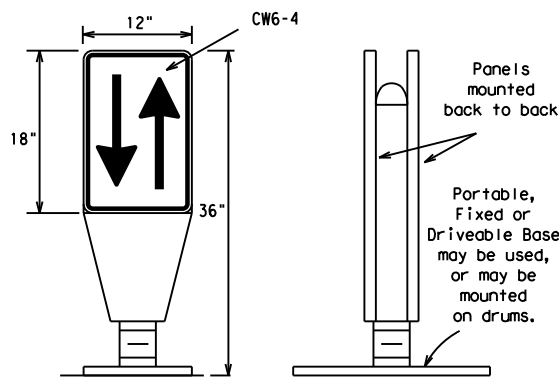
DRIVEABLE



PORTABLE

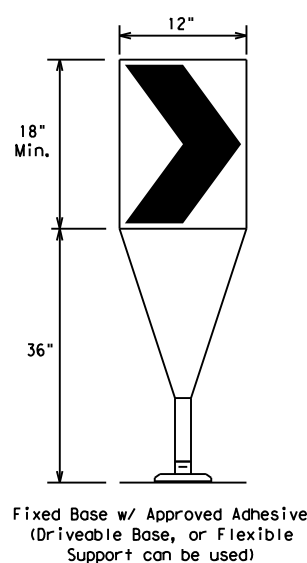
VERTICAL PANELS (VPs)

- 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 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-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.



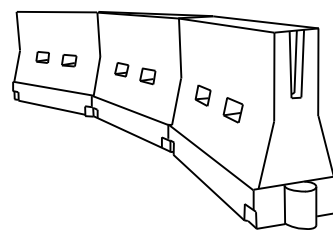
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- 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 B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



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

CHEVRONS



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

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

Posted Speed * S	Formula L = WS ² / 60	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 ² / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40	L = WS	265'	295'	320'	40'	80'
45		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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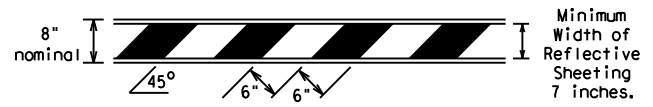
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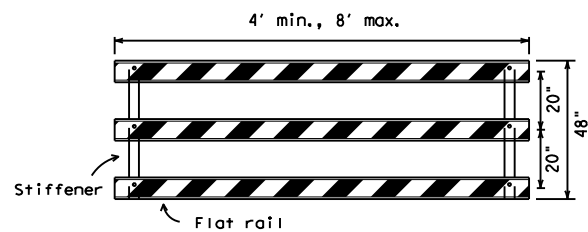
TYPE 3 BARRICADES

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.

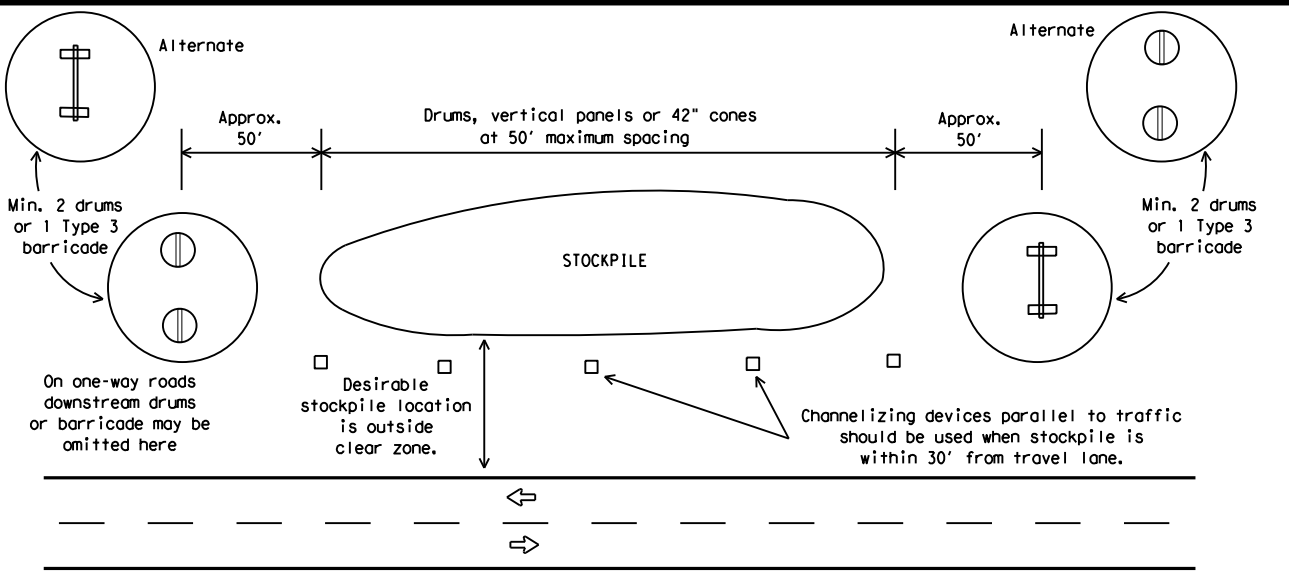


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



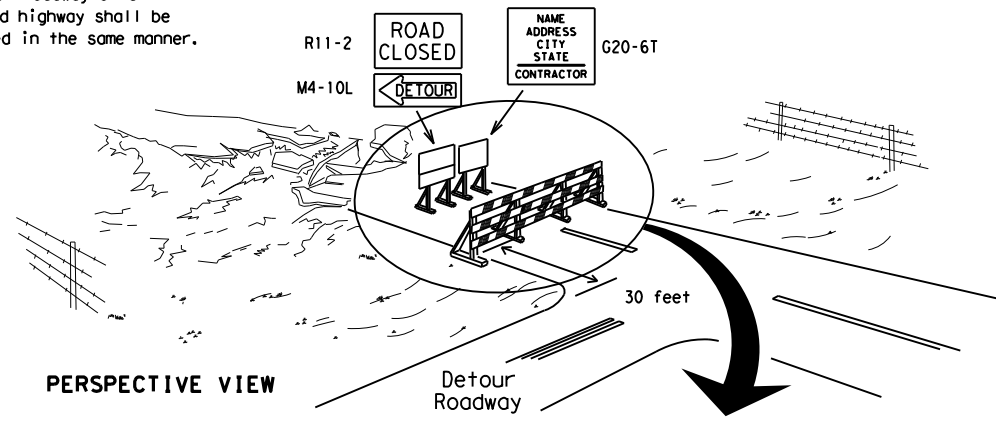
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

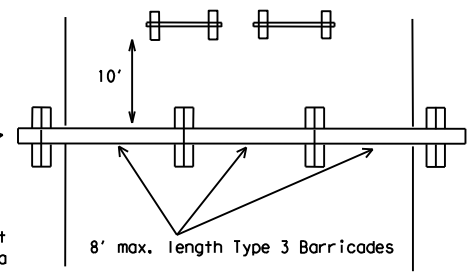
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

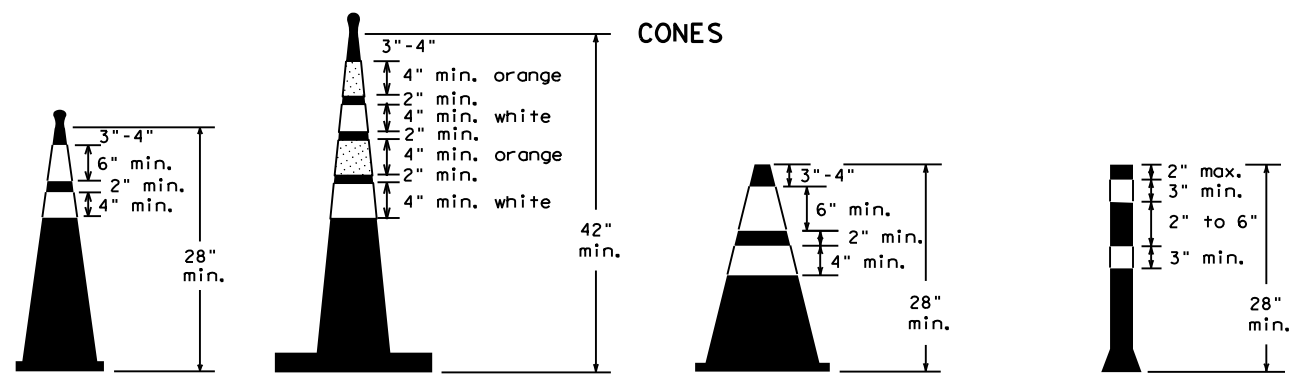
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

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.



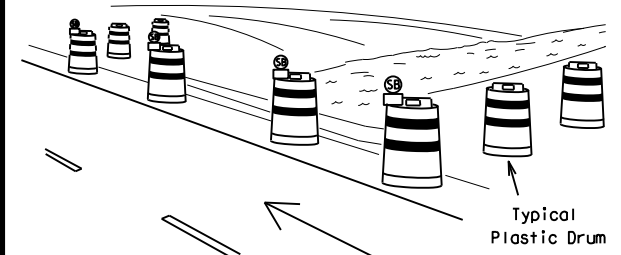
PLAN VIEW

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



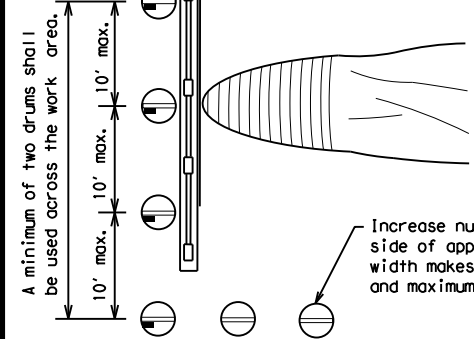
28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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(4). 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.



PERSPECTIVE VIEW

These drums are not required on one-way roadway



PLAN VIEW

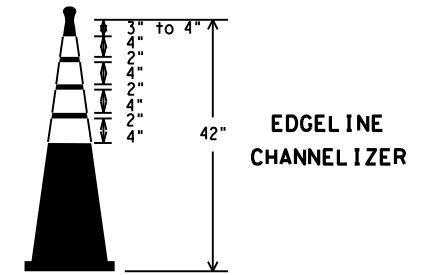
Increase number of plastic drums on the side of approaching traffic if the crown width makes it necessary. (minimum of 2 and maximum of 4 drums)

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

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS

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



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type 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

Texas Department of Transportation Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 14

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WORK ZONE PAVEMENT MARKINGS

GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

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

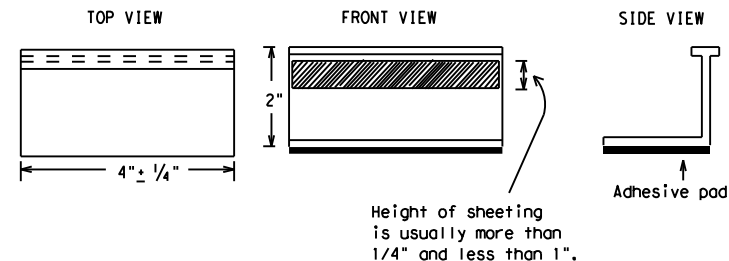
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than 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).

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11) - 14

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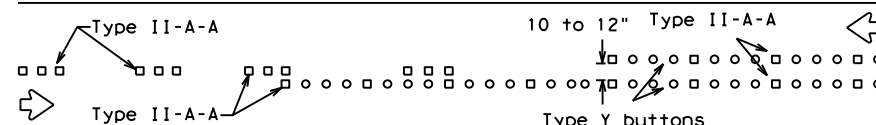
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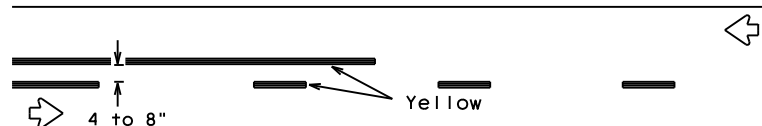
PAVEMENT MARKING PATTERNS



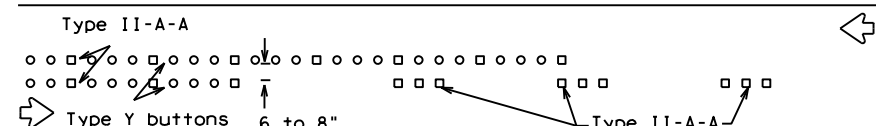
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



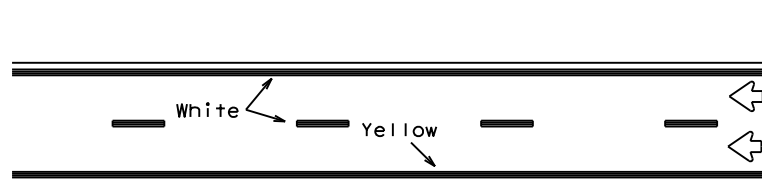
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



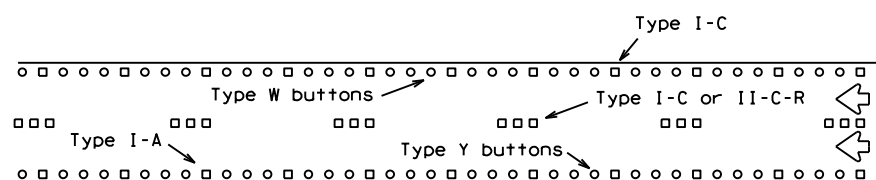
RAISED PAVEMENT MARKERS - PATTERN B

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.

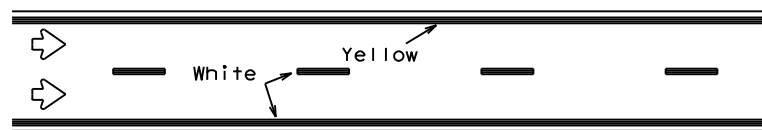
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



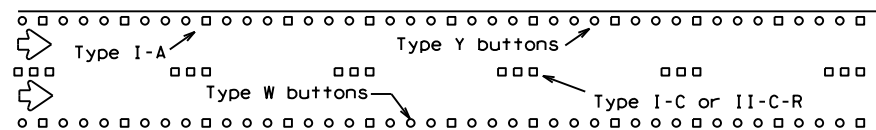
REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS



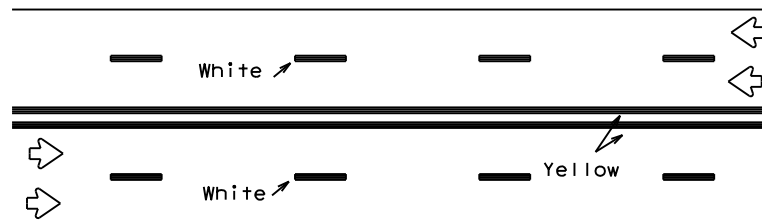
REFLECTORIZED PAVEMENT MARKINGS



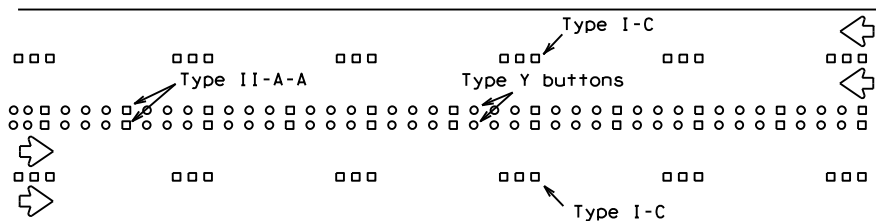
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



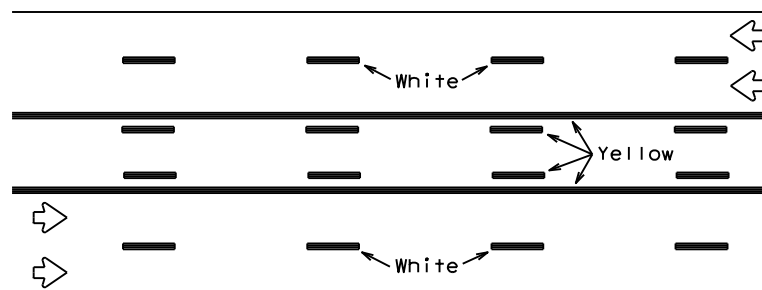
REFLECTORIZED PAVEMENT MARKINGS



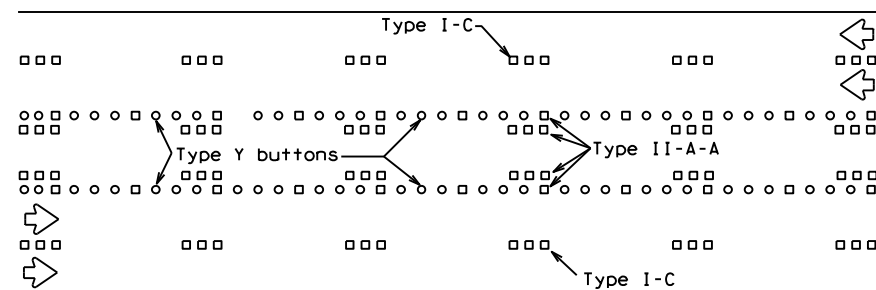
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectORIZED pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

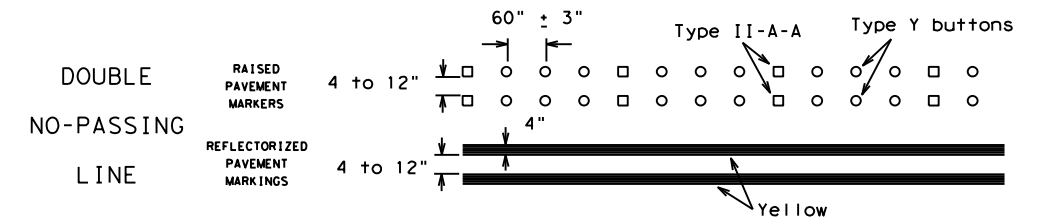


RAISED PAVEMENT MARKERS

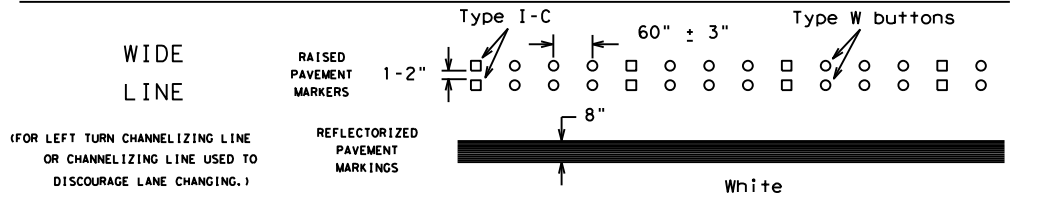
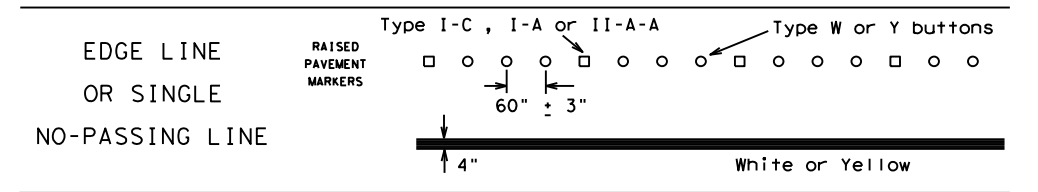
Prefabricated markings may be substituted for reflectORIZED pavement markings.

TWO-WAY LEFT TURN LANE

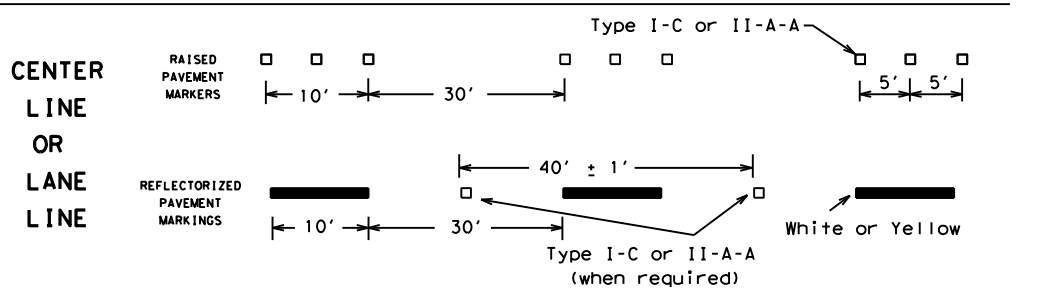
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



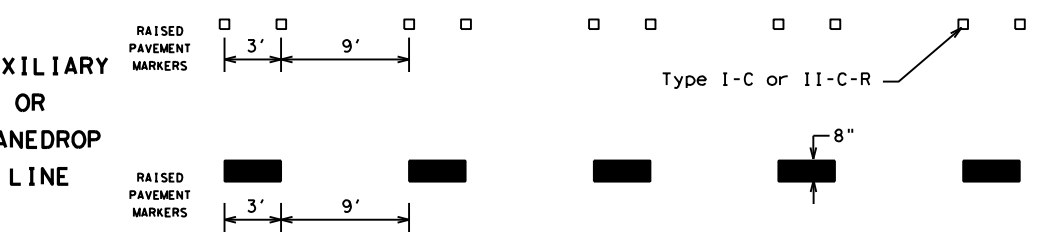
SOLID LINES



BROKEN LINES

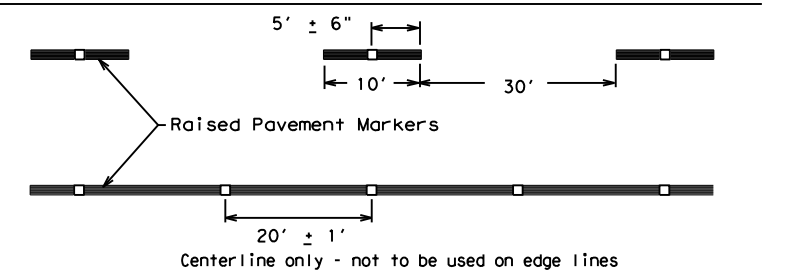


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

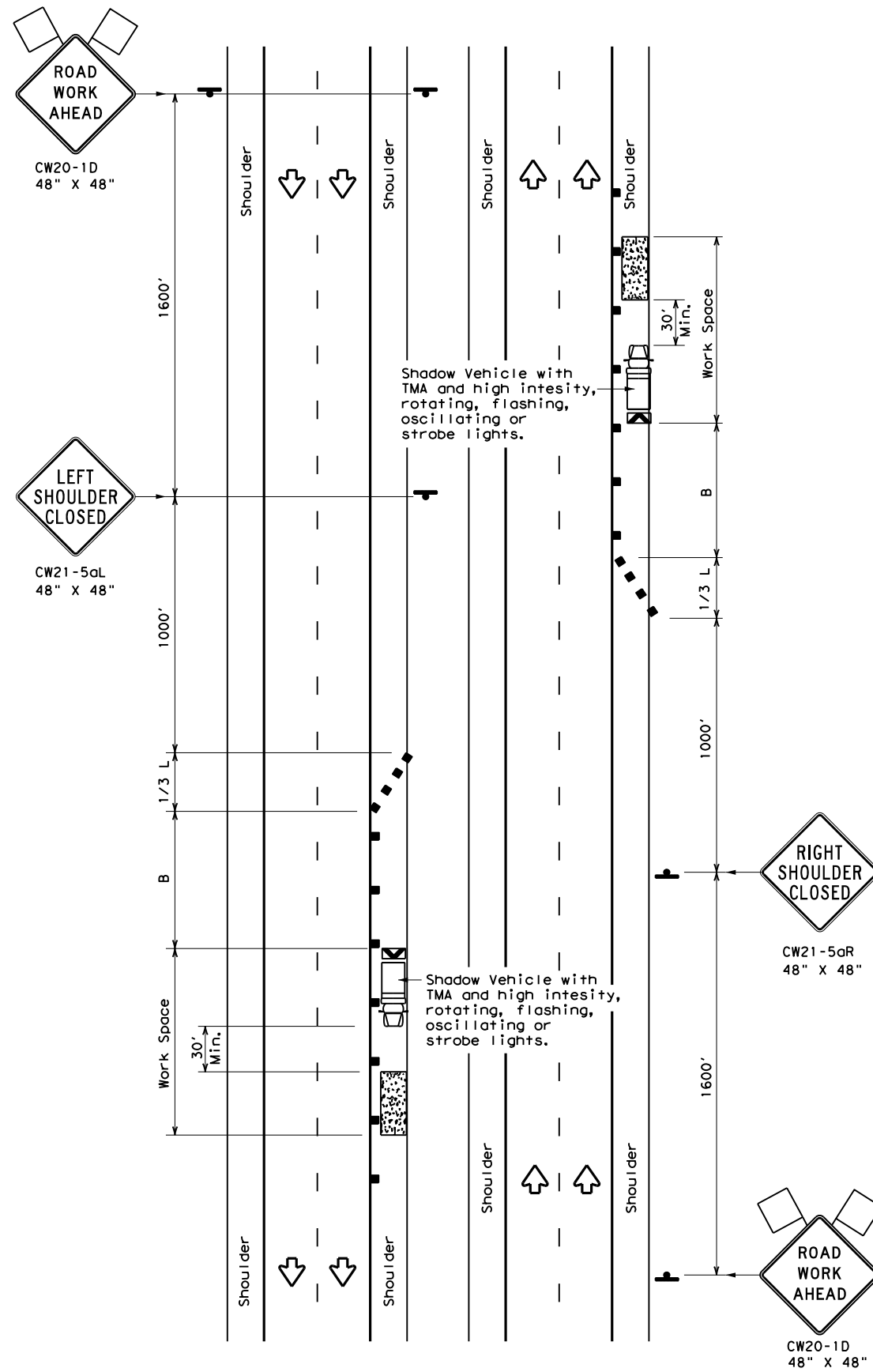
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IHO027
1-97 9-07	DIST	COUNTY	SHEET NO.	
2-98 7-13	LBB	Haile	2.12	
11-02 8-14				

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DATE: 12/28/2020 3:10:58 PM
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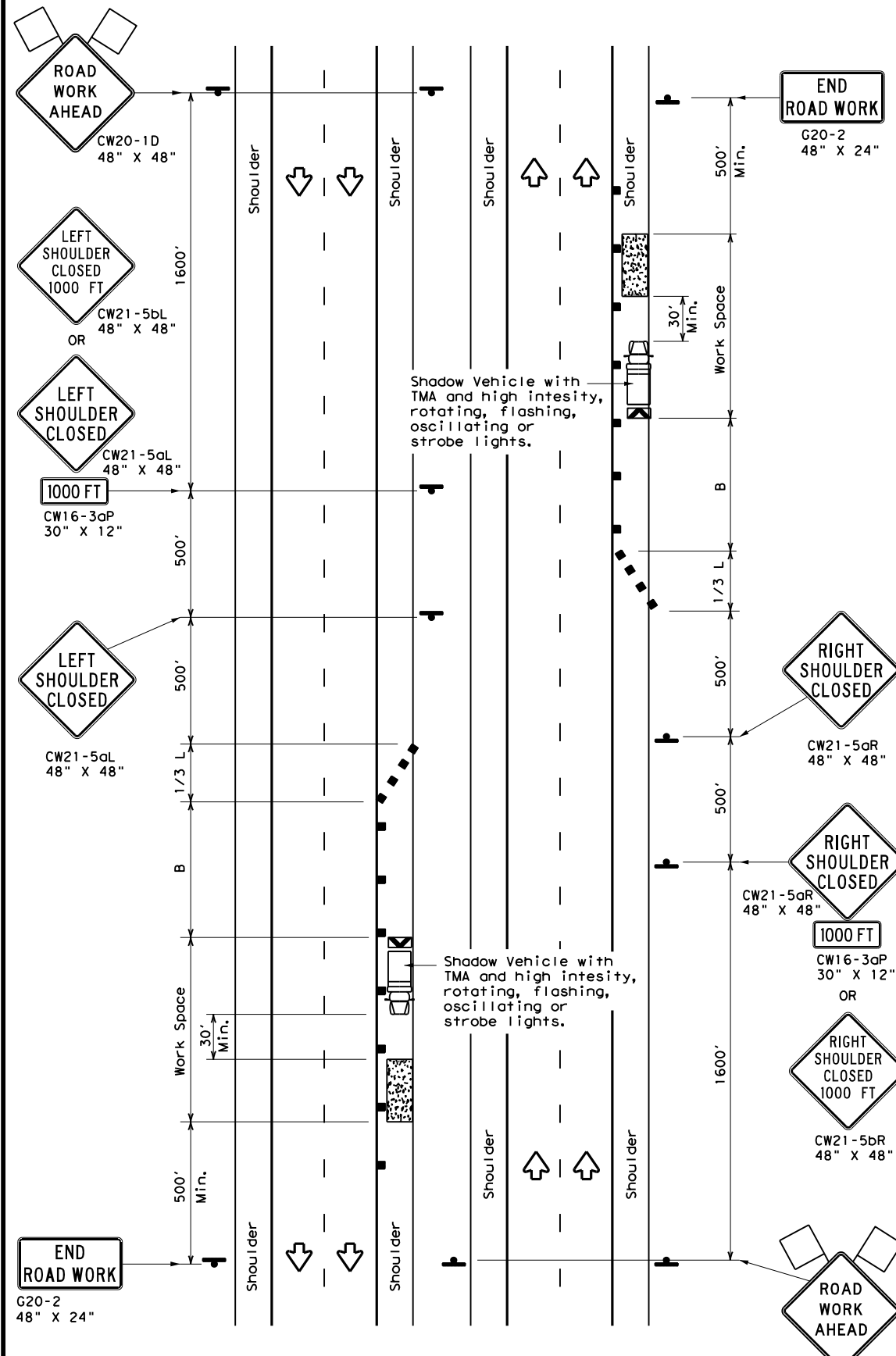
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE: 12/28/2020 3:11:01 PM
 FILE: c:\txdot\pw_online\txdot2\terry_harris\d0472157\tcp5-1-18.dgn



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.



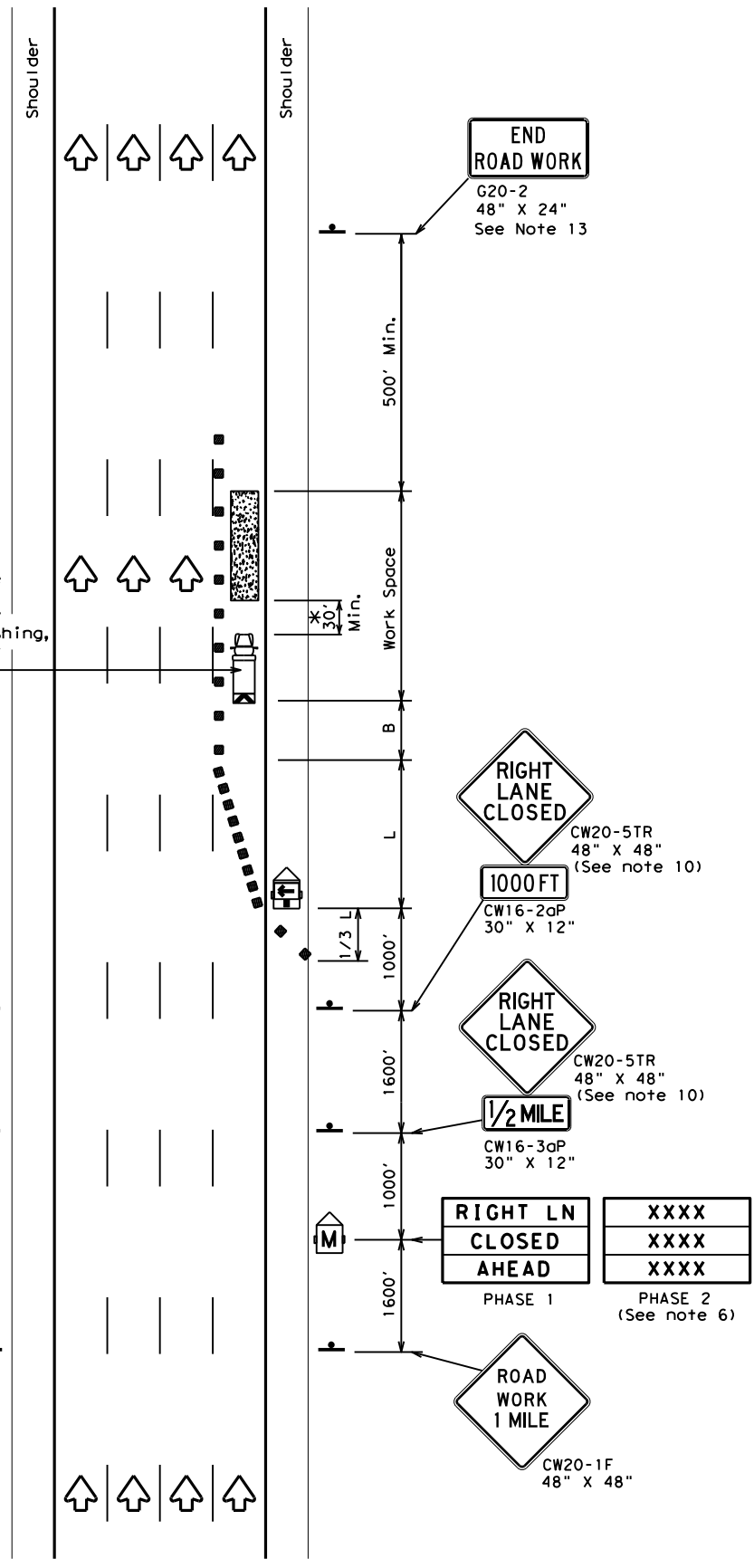
**TRAFFIC CONTROL PLAN
 SHOULDER WORK FOR
 FREEWAYS / EXPRESSWAYS**

TCP (5-1) - 18

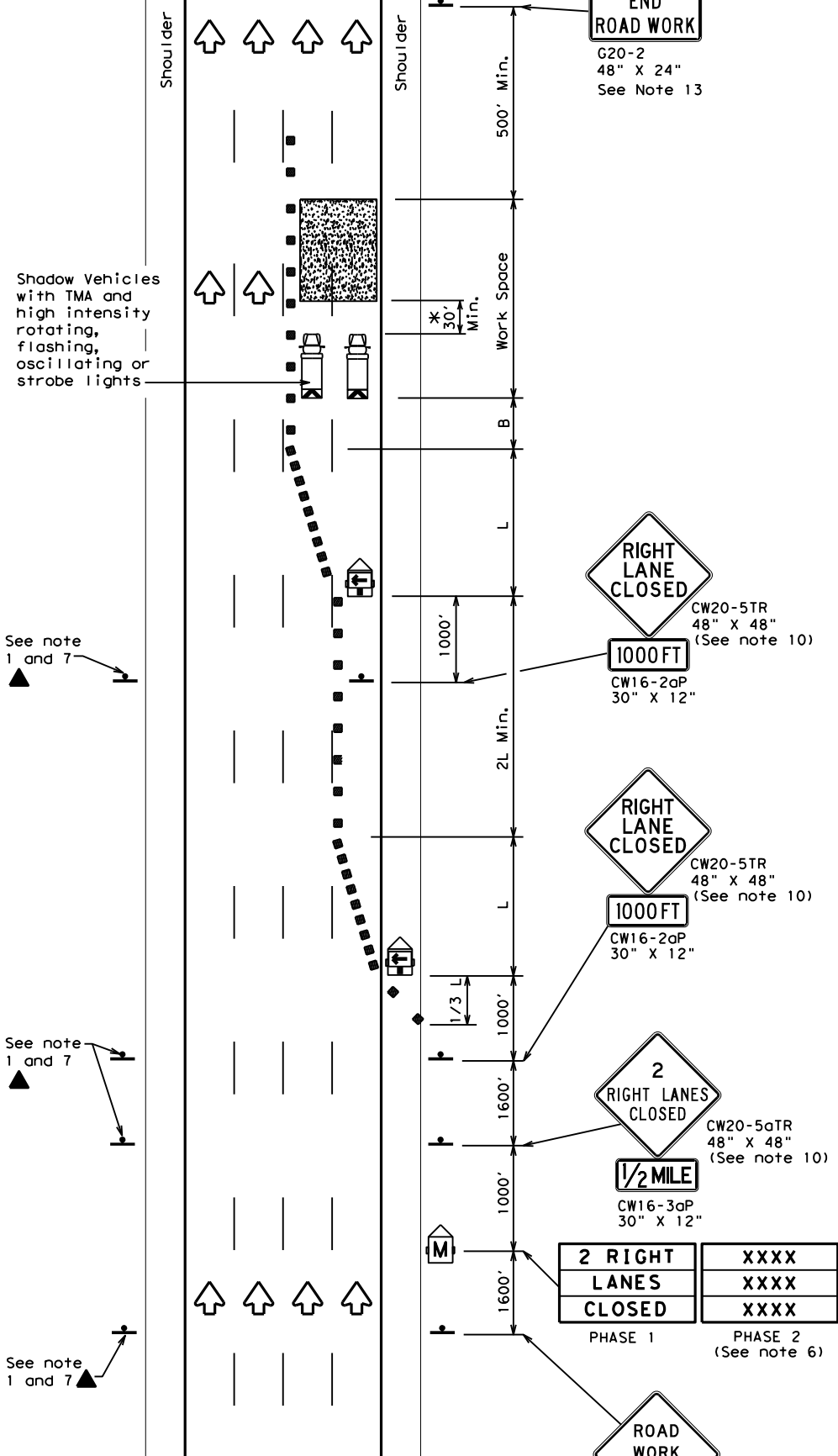
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© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
2-18	REVISIONS	0067 06	060	IHO027
	DIST	COUNTY	SHEET NO.	
	LBB	HaLe	2.13	

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 FILE: c:\txdot\pw_online\txdot2\terry.harris\0472157\tcp6-1.dgn



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 medians 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.



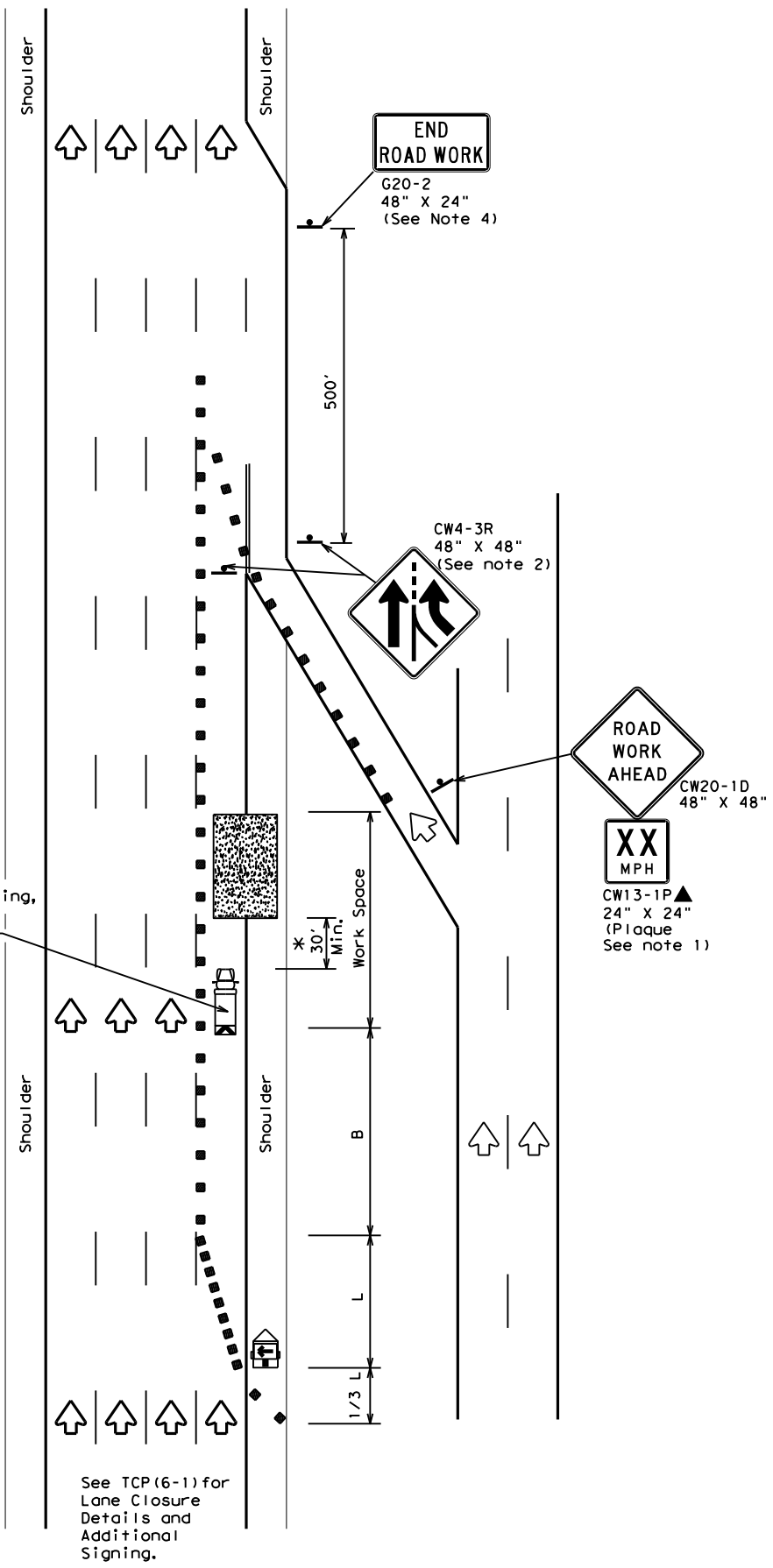
**TRAFFIC CONTROL PLAN
 FREEWAY LANE CLOSURES**

TCP (6-1) - 12

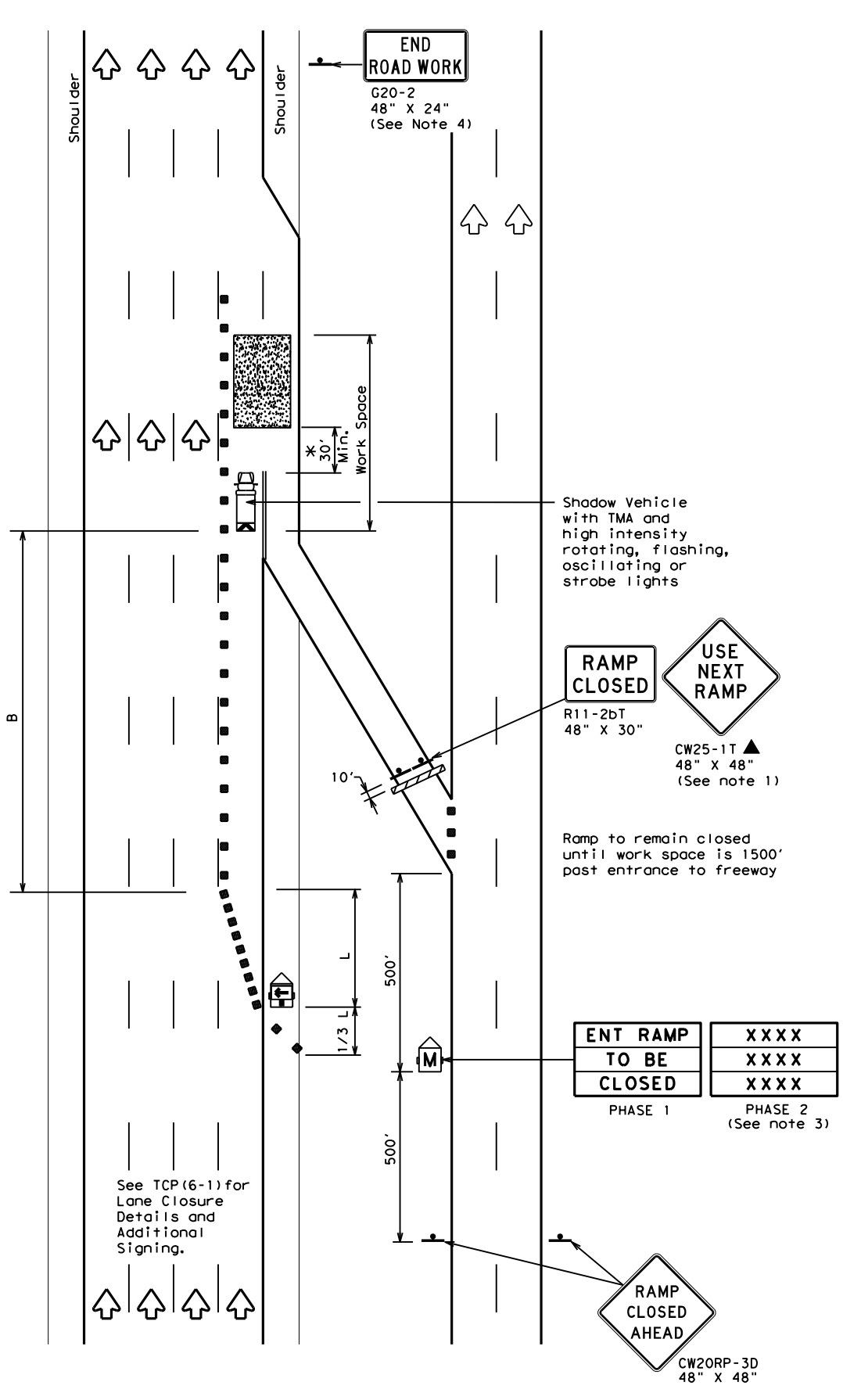
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© TxDOT	February 1998	CONT	SECT	JOB	HIGHWAY				
8-12	REVISIONS	0067	06	060	IHO027				
	DIST	COUNTY		SHEET NO.					
	LBB	Hale		2.14					

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 FILE: c:\txdot\pw_online\txdot2\terry_harris\0472157\tcp6-2.dgn



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 mainlane 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.



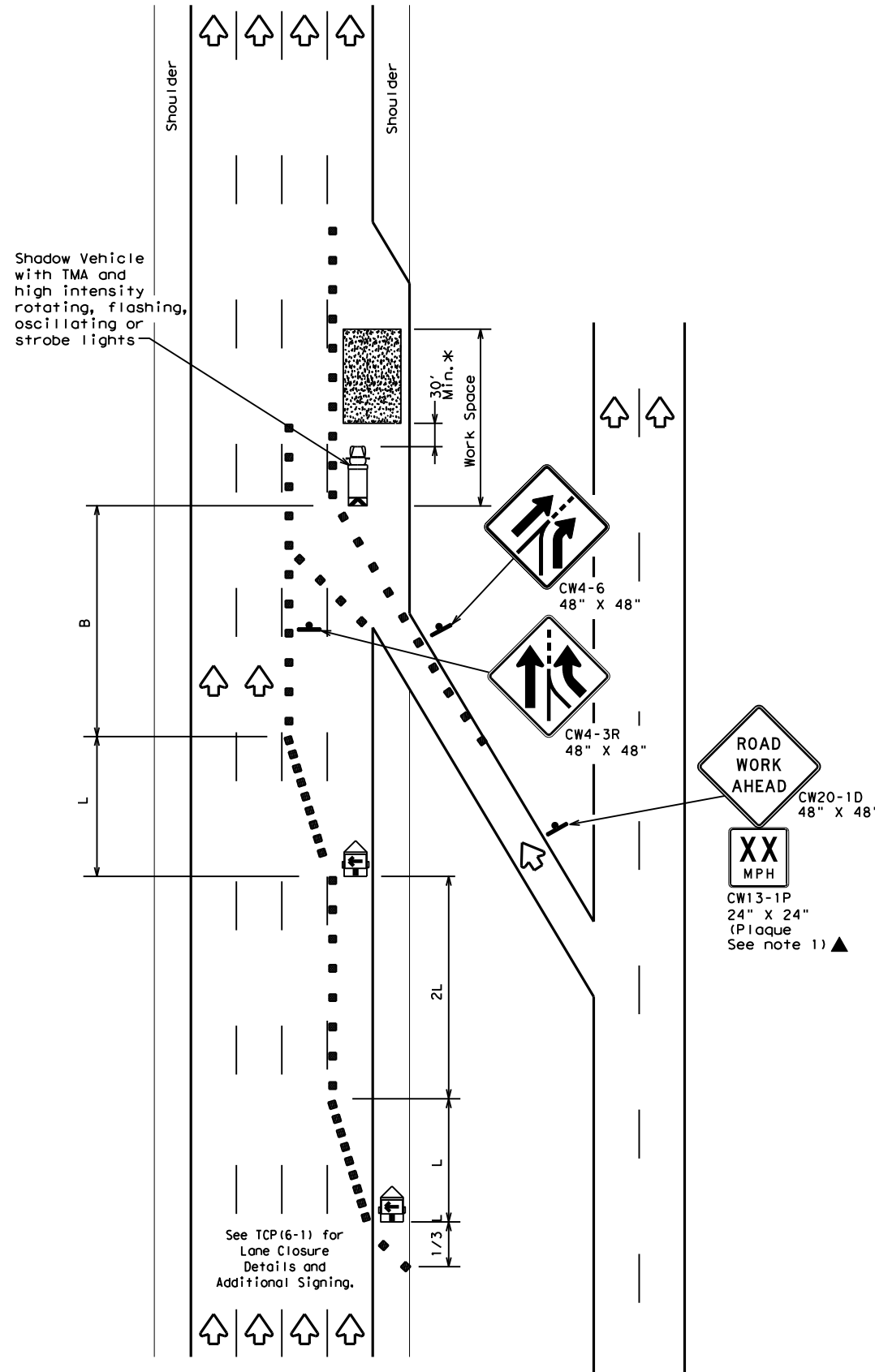
TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP (6-2) - 12

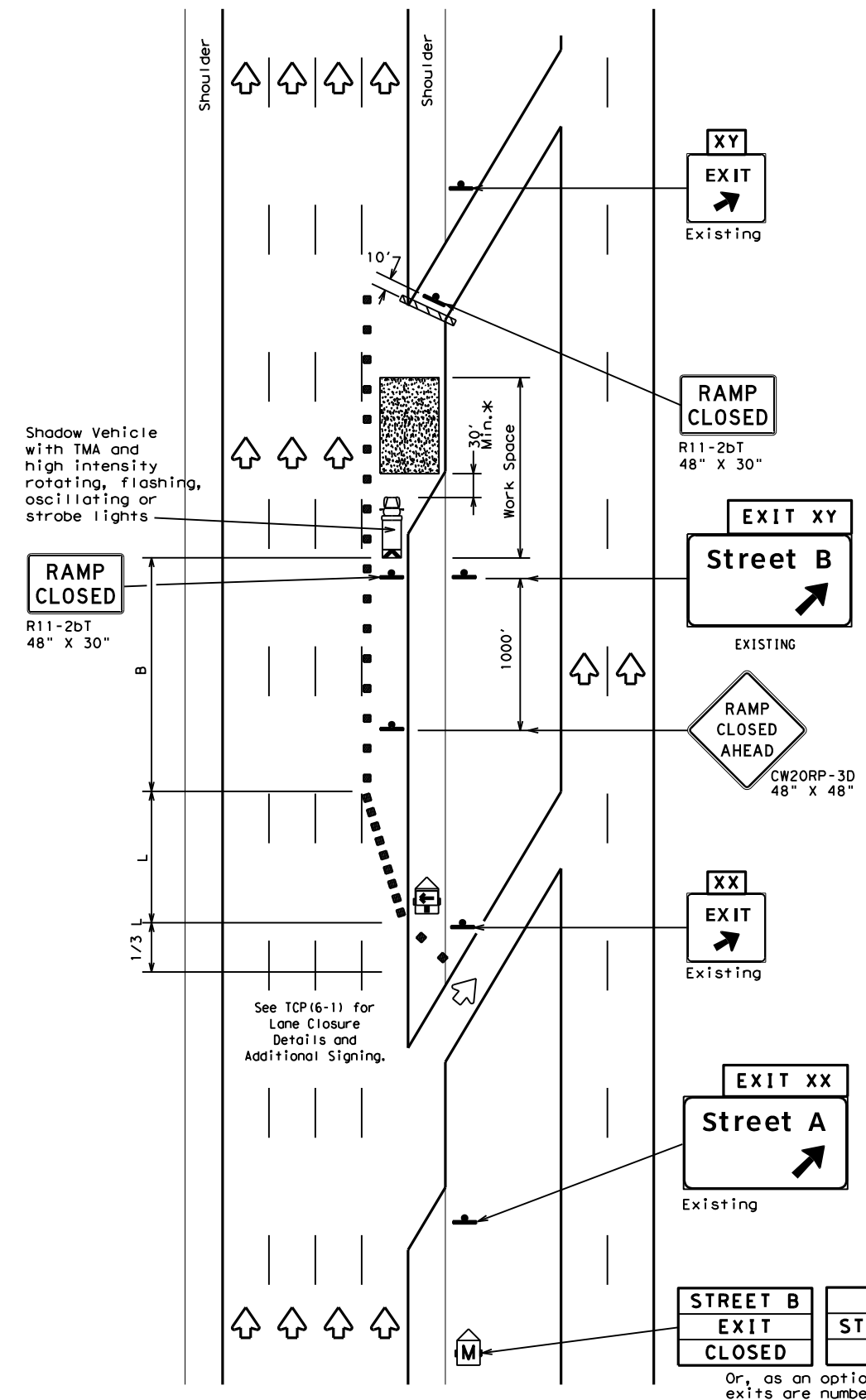
FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IH0027
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	LBB	Hale	2.15	

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DATE: 12/28/2020 3:11:11 PM
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TCP (6-3a)
ENTRANCE RAMP OPEN



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

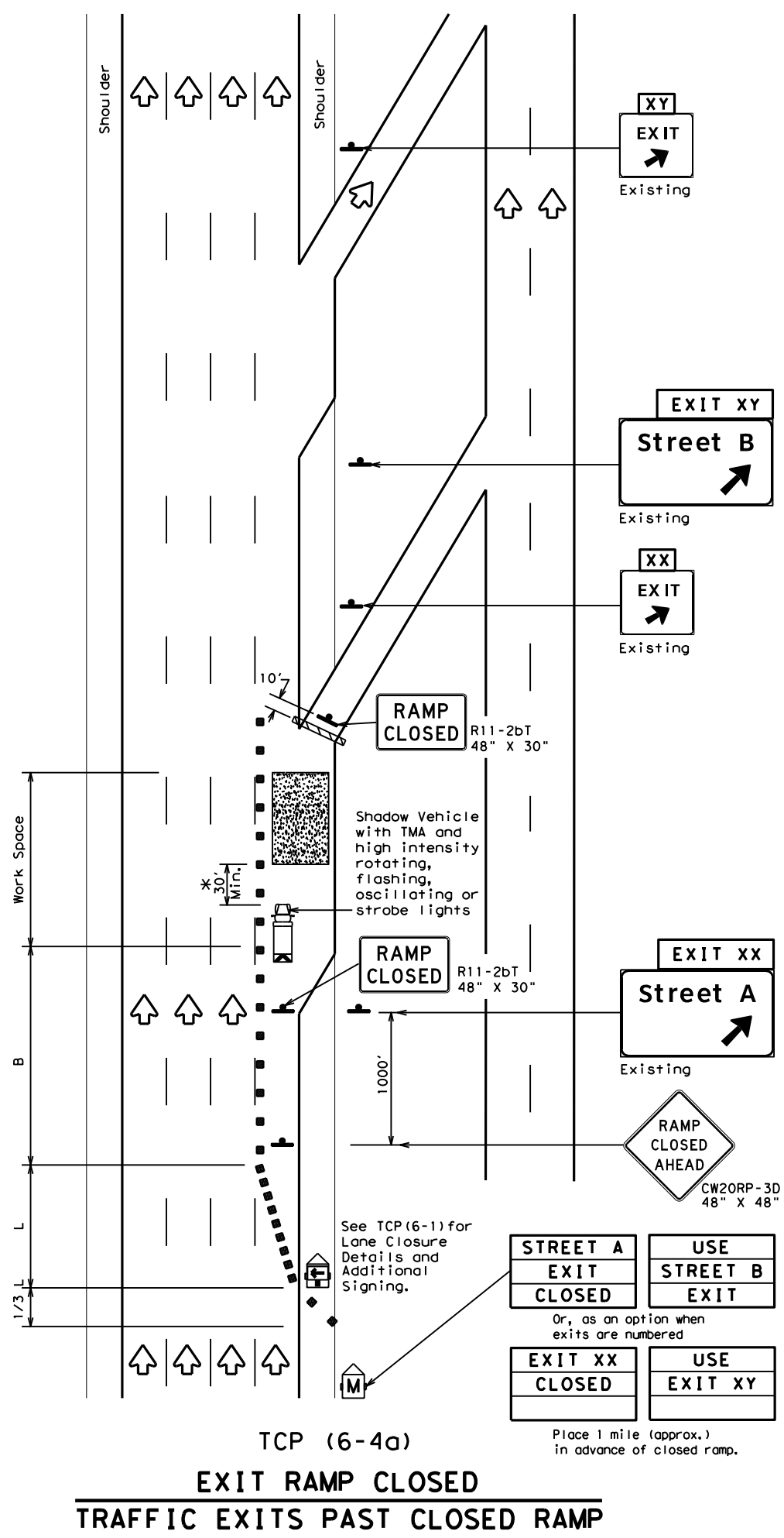
**TRAFFIC CONTROL PLAN
 WORK AREA BEYOND RAMP**

TCP (6-3) - 12

FILE: tcp6-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IHO027
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	LBB	HaLe	2.16	

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DATE: 12/28/2020 3:11:14 PM
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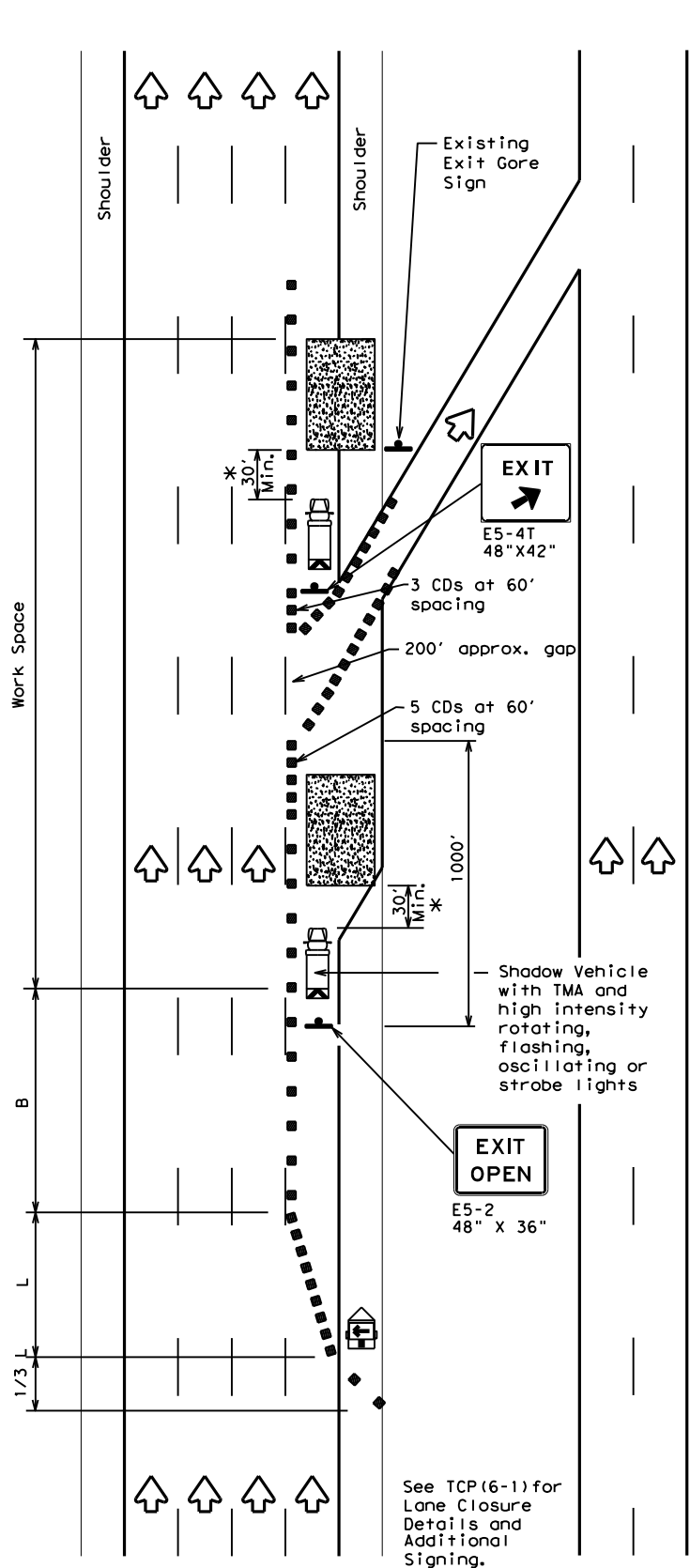


TCP (6-4a)
EXIT RAMP CLOSED
TRAFFIC EXITS PAST CLOSED RAMP

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

Or, as an option when exits are numbered

Place 1 mile (approx.) in advance of 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 BC 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.



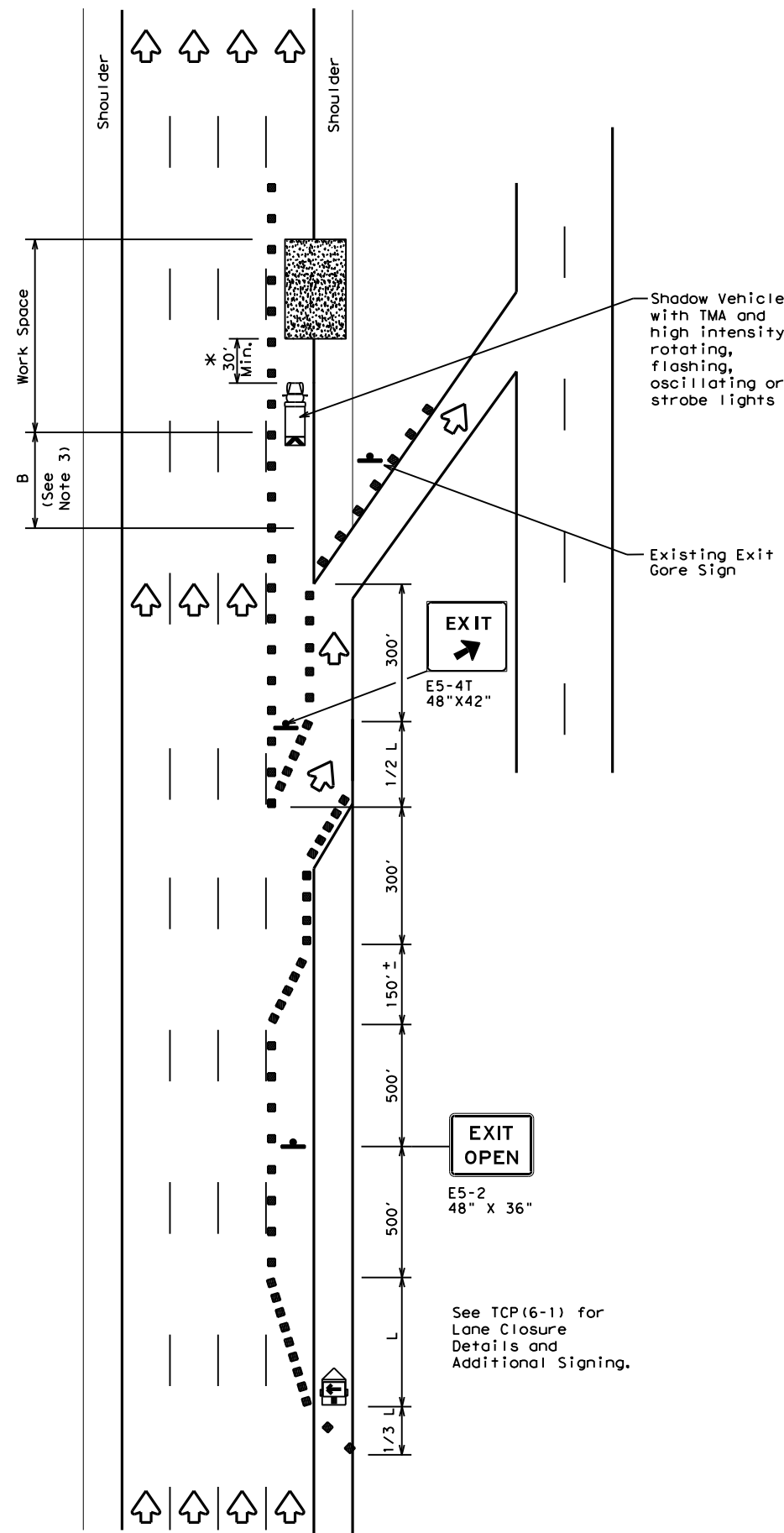
TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP (6-4) - 12

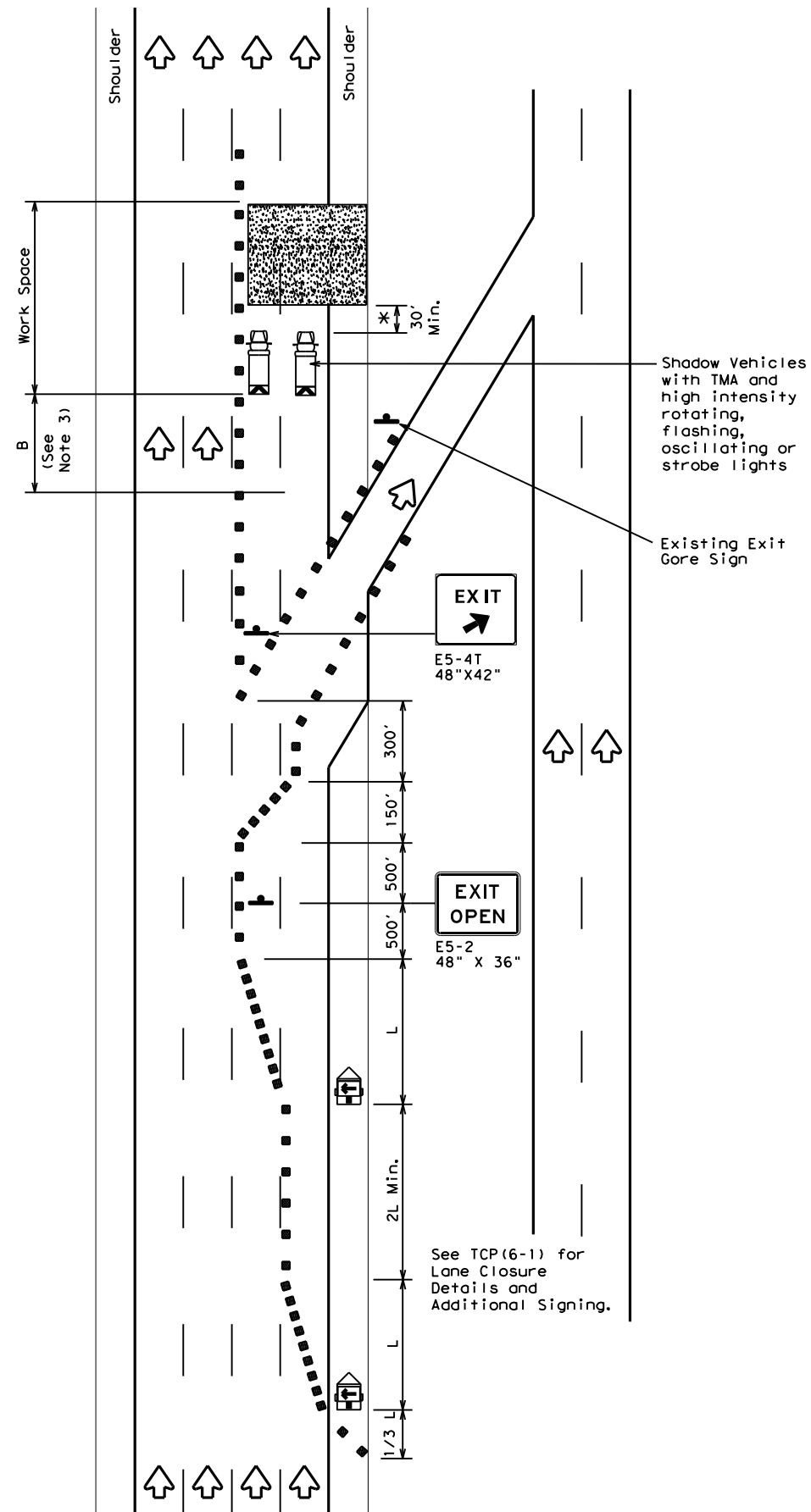
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©TxDOT February 1994	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IH0027
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	LBB	Hale	2.17	

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 FILE: c:\txdot\pw_online\txdot2\terry_harris\0472157\tcp6-5.dgn



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.



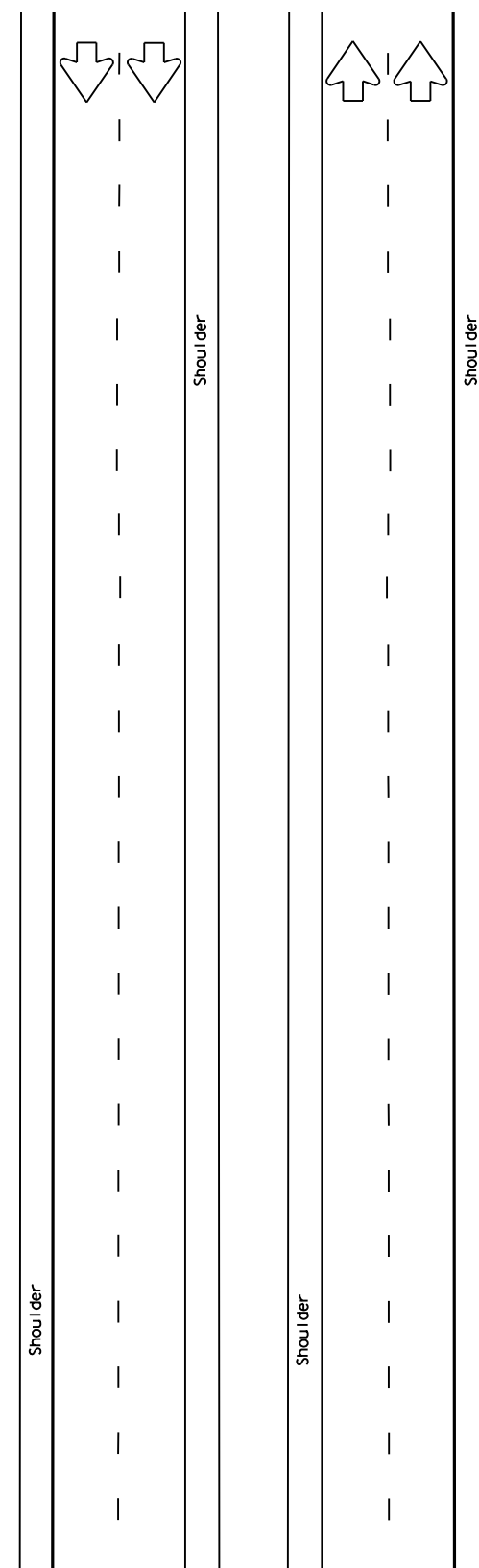
**TRAFFIC CONTROL PLAN
 WORK AREA BEYOND EXIT RAMP**

TCP (6-5) - 12

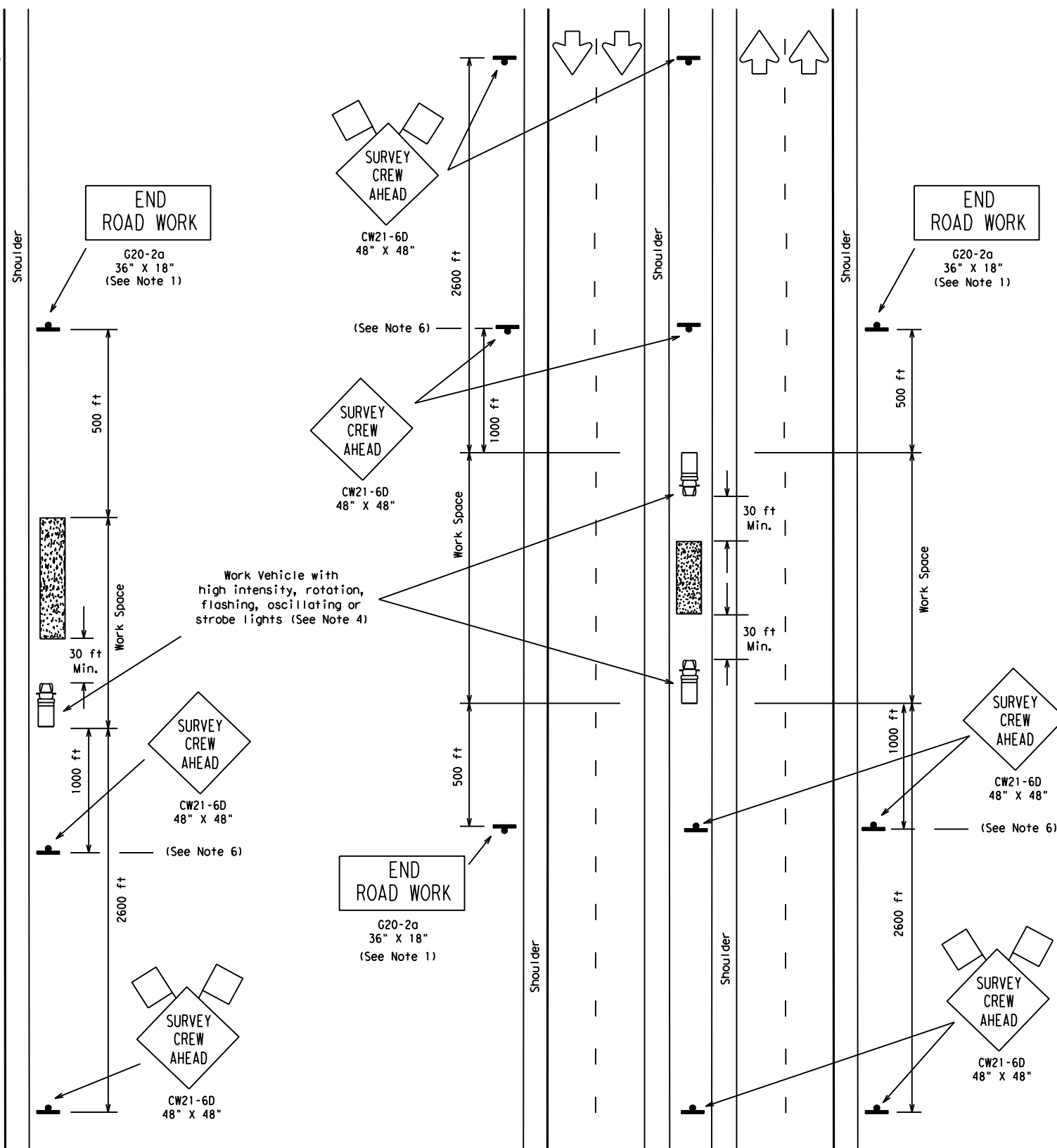
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©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IH0027
1-97 8-98	DIST	COUNTY	SHEET NO.	
4-98 8-12	LBB	HaLe	2.18	

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DATE: 12/28/2020 3:11:20 PM
 FILE: c:\txdot\pww\online\txdot2\terry.harris\0472157\tcps4.dgn



TCP (S-4a)
 WORK OFF RIGHT SHOULDER
 OF DIVIDED ROADWAYS



TCP (S-4b)
 WORK IN MEDIAN
 OF DIVIDED ROADWAYS

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECESSARY PERIODS OF TIME ON THE ROAD SURFACE.

8-18-08 Revision
 Corrected misspelling.

LEGEND

- Type III Barricade
- Channelizing Devices
- Flag
- Heavy Work Vehicle
- Truck Mounted Attenuator (TMA)
- Trailer Mounted Flashing Arrow Panel
- Portable Changeable Message Sign (PCMS)
- Flagger
- Sign Post

Posted Speed * 30 35 40 45 50 55 60 65 70 75	Formula $L = \frac{WS^2}{60}$	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Device		Min. Sign Spacing "x" Distance	Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30		150'	165'	180'	30'	60' - 75'	120'	90'
35		205'	225'	245'	35'	70' - 90'	160'	120'
40		265'	295'	320'	40'	80' - 100'	240'	155'
45		450'	495'	540'	45'	90' - 110'	320'	195'
50		500'	550'	600'	50'	100' - 125'	400'	240'
55		550'	605'	660'	55'	110' - 140'	500'	295'
60		600'	660'	720'	60'	120' - 150'	600'	350'
65		650'	715'	780'	65'	130' - 165'	700'	410'
70		700'	770'	840'	70'	140' - 175'	800'	475'
75		750'	825'	900'	75'	150' - 185'	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
	✓	✓		

DEFINITIONS:
 SHORT DURATION - work that occupies a location up to 1 hour.
 SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

- GENERAL NOTES:
- The G20-2a "END ROAD WORK" sign may be omitted for short duration (less than 1 hour) work.
 - When median work is protected on one side by existing median barriers, signing and protection vehicle may be omitted for the protected direction only.
 - CW20-1D "ROAD WORK AHEAD" signs may be substituted for "SURVEY CREW AHEAD" signs.
 - A Shadow Vehicle with a TMA and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
 - The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.
 - The CW21-6D "SURVEY CREW AHEAD" sign placed at 1000' ahead of the work space is optional, at the discretion of the Engineer. The signs shown at 2600' from the work space are required.
 - Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

Texas Department of Transportation
 Traffic Operations Division

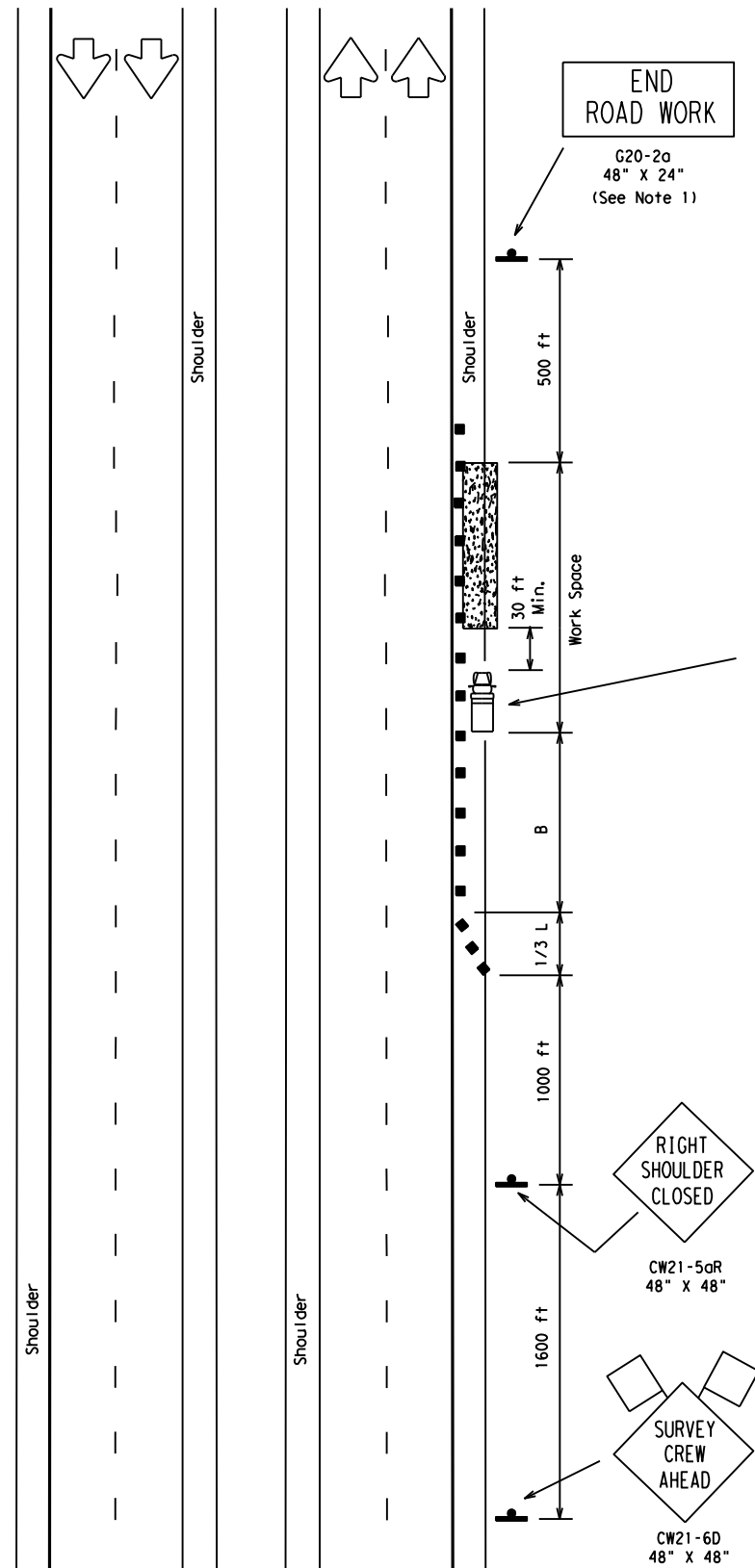
**TRAFFIC CONTROL PLAN
 FOR SURVEYING
 OPERATIONS**

TCP (S-4) - 08A

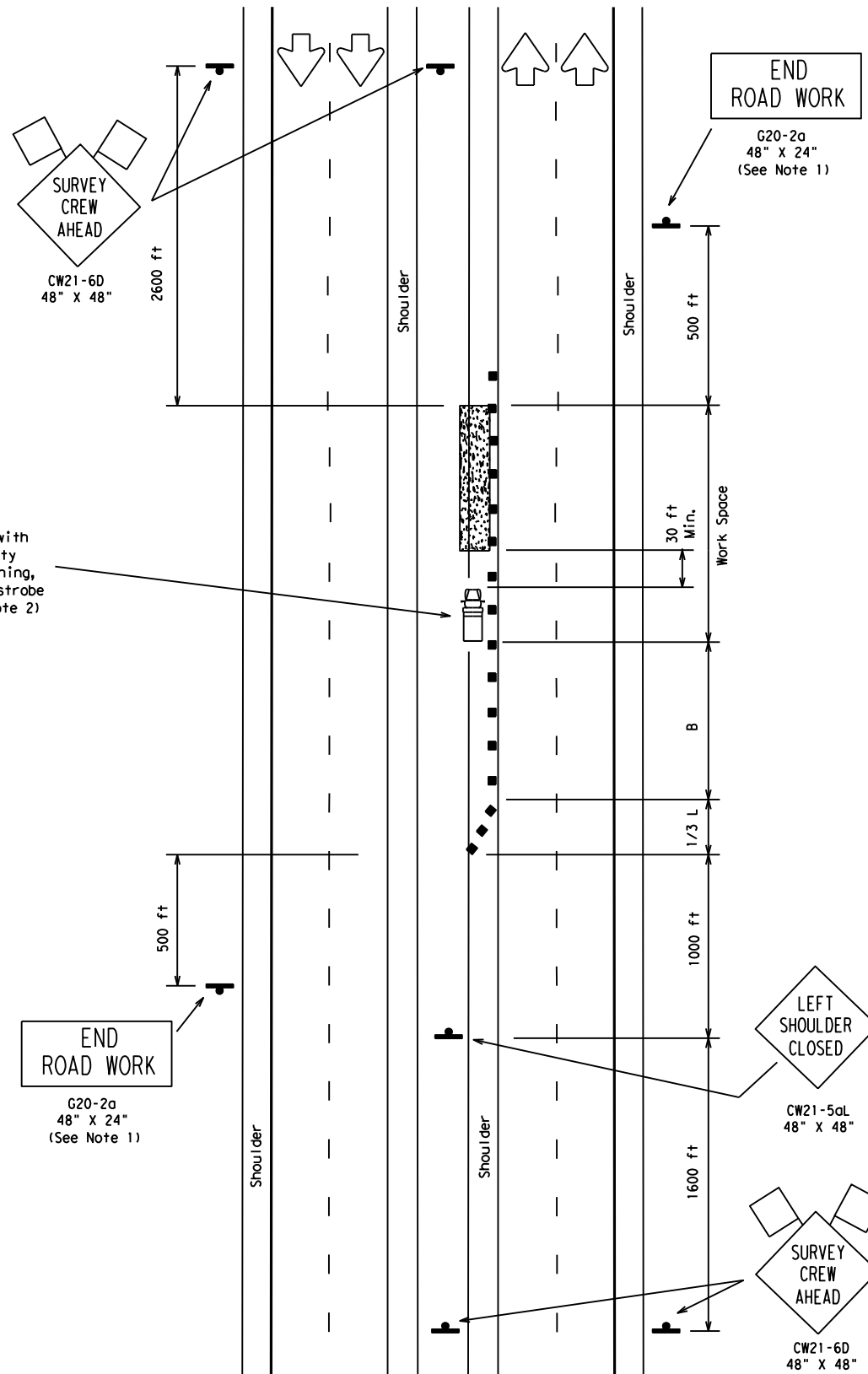
© TxDOT August 2008	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
8-08	REVISIONS	CONT	SECT	JOB	HIGHWAY
		0067	06	060	IHO027
		DIST	COUNTY	SHEET NO.	
		LBB	Hale	2.19	

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TCP (S-5a)
 WORK ON RIGHT SHOULDER
 OF DIVIDED ROADWAYS



TCP (S-5b)
 WORK ON MEDIAN SHOULDER
 OF DIVIDED ROADWAYS

WHENEVER POSSIBLE, SURVEY PARTIES SHOULD AVOID, BY THE USE OF OFFSET LINES, ANY UNNECESSARY PERIODS OF TIME ON THE ROAD SURFACE.

LEGEND

	Type III Barricade		Channelizing Devices		Flag
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)		
	Trailer Mounted Flashing Arrow Panel		Portable Changeable Message Sign (PCMS)		
	Flagger		Sign Post		

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Device		Min. Sign Spacing "x" Distance	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' - 75'	120'	90'
35		205'	225'	245'	35'	70' - 90'	160'	120'
40		265'	295'	320'	40'	80' - 100'	240'	155'
45		450'	495'	540'	45'	90' - 110'	320'	195'
50		500'	550'	600'	50'	100' - 125'	400'	240'
55		550'	605'	660'	55'	110' - 140'	500'	295'
60		600'	660'	720'	60'	120' - 150'	600'	350'
65	650'	715'	780'	65'	130' - 165'	700'	410'	
70	700'	770'	840'	70'	140' - 175'	800'	475'	
75	750'	825'	900'	75'	150' - 185'	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
	✓	✓		

DEFINITIONS:
 SHORT DURATION - work that occupies a location up to 1 hour.
 SHORT TERM STATIONARY - daytime work that occupies a location for more than 1 hour within a single daylight period.

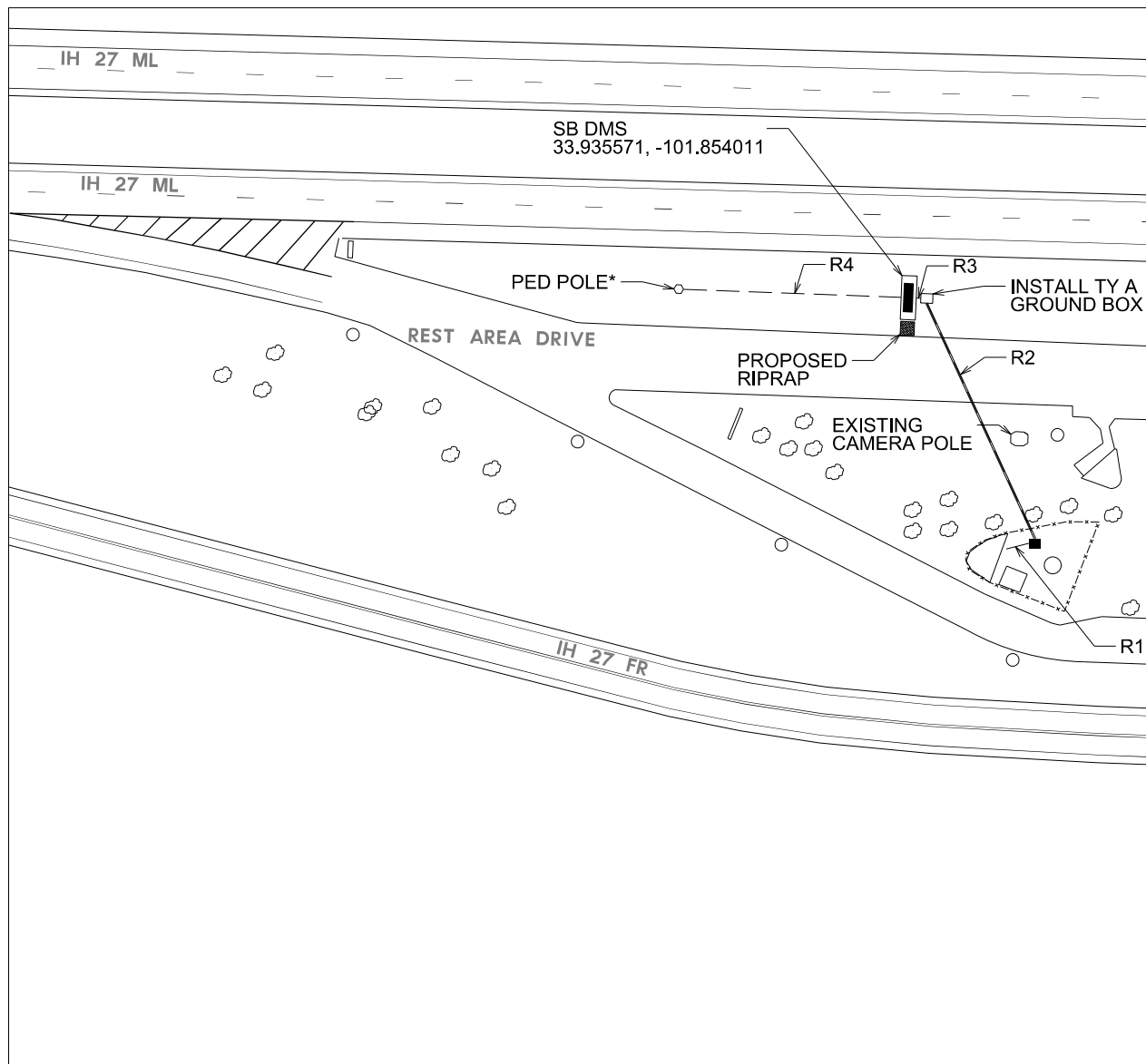
- GENERAL NOTES:
- The G20-2a "END ROAD WORK" sign may be omitted for short duration (less than 1 hour) work.
 - For short duration work, the Shadow Vehicle with TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
 - Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
 - If shoulders are not present, the 1/3L shoulder taper is to be omitted and four channelizing devices shall be placed in front of the arrow panel, perpendicular to traffic.
 - CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
 - The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

Texas Department of Transportation
 Traffic Operations Division

**TRAFFIC CONTROL PLAN
 FOR SURVEYING
 OPERATIONS**

TCP (S-5) -08

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REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0067	06	060		IH0027	
DIST		COUNTY		SHEET NO.	
LBB		Hale		2.20	



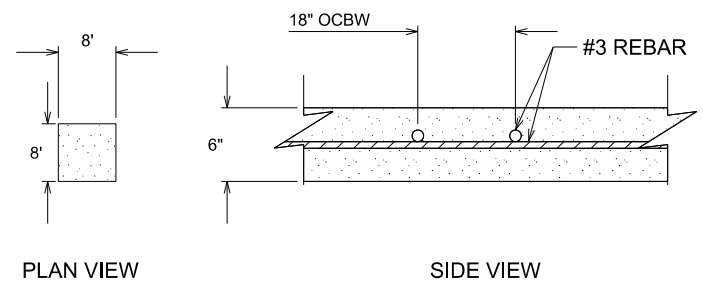
*CAMERA TO BE INSTALLED BY STATE FORCES

SB DMS CABLE AND CONDUIT SUMMARY					
RUN	STATUS	CONDUIT QUANTITY		LENGTH (LF)	CONDUCTOR 1C#4 INSUL (EA)
		2" T (LF) EA	2" B (LF) EA		
R1	EXISTING			100	4
R2	INSTALL		1	150	4
R3	INSTALL	1		10	4
R4	INSTALL	1		125	4
*TOTALS		135	150		1,040

*TOTALS DERIVED FROM LENGTH MULTIPLIED BY QUANTITY

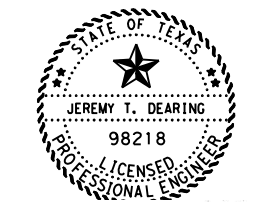
SB DMS SUMMARY			
ITEM NO.	DESCRIPTION	UNITS	QUANTITY
0416 6006	DRILL SHAFT (48 IN)	LF	26
0432 6005	RIPRAP (CONC) (CL A)	CY	1.185
0618 6046	CONDT (PVC) (SCH 80) (2")	LF	135
0618 6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	150
0620 6012	ELEC CONDR (NO.4) INSULATED	LF	1,040
0624 6002	GROUND BOX TY A (122311)W/APRON	EA	1
0628 6152	ELC SRV TY D 120/240 060(NS)SS(N)SP(O)	EA	0
0650 6028	INS OH SN SUP(30 FT BAL TEE)	EA	1
0654 6006	SIGN WALKWAY (48 IN) WITH HNDRL	LF	9.167
0687 6001	PED POLE ASSEMBLY	EA	1
6028 6001	INSTALL DMS (POLE MTD CABINET)	EA	1

RIPRAP (CL A) DETAIL



- NOTES:
1. CONTRACTOR IS RESPONSIBLE FOR MAKING HIS/HER OWN DETERMINATION AS TO THE TYPE AND LOCATION OF UNDERGROUND UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE THERTO.
 2. GPS LOCATION IS FOR REFERENCE ONLY. FINAL LOCATION OF DMS BOARD WILL BE FIELD VERIFIED BY THE ENGINEER.

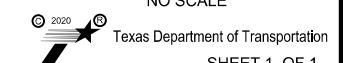
- LEGEND
- - - - - PROPOSED CONDUIT (TRENCH)
 - PROPOSED CONDUIT (BORE)
 - PROPOSED DMS SIGN WITH CONTROLLER
 - ⊕ PROPOSED SERVICE
 - PROPOSED PED POLE
 - EXISTING GROUND BOX



Jeremy T. Dearing, P.E.
12/31/2020
LUBBOCK ITS

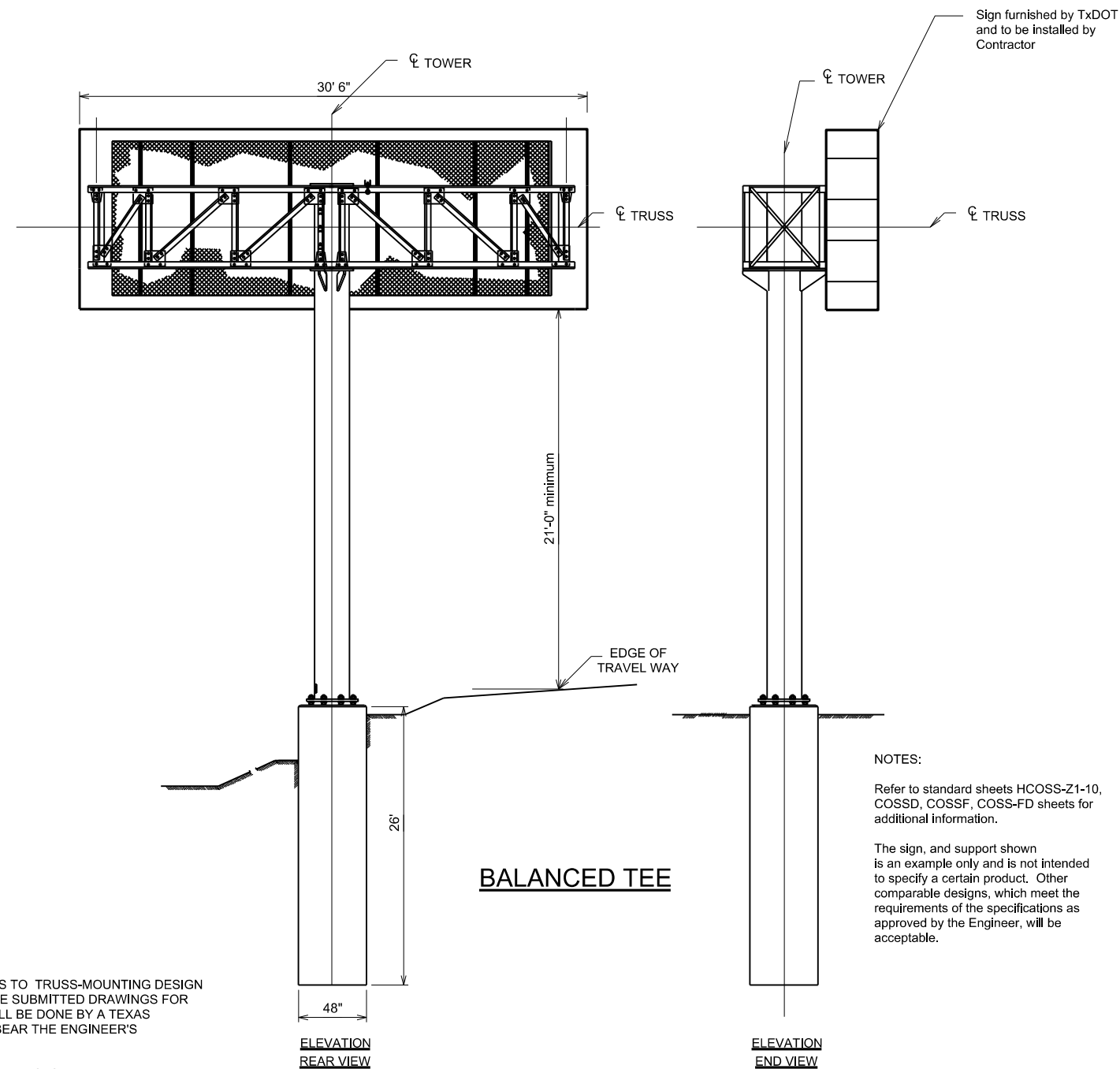
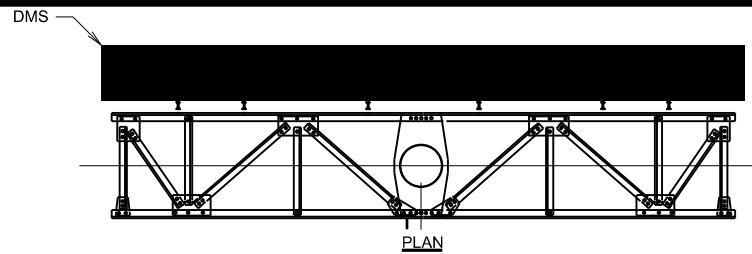
SB DMS

NO SCALE



SHEET NO. 3.02	
STATE	COUNTY
TEXAS	Hale
CONTROL	SECTION
0067	06
JOB	HIGHWAY NO.
060	IH0027

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DESIGN DATA

SPAN LENGTH	30.00 FT
TOWER HEIGHT	30.00 FT
SIGN AREA (SF)	261.00
TORSION (K-FT)	250.41
MOMENT (K-FT)	540.50

STRUCTURE DATA

STRUCTURE CODE	HCOSS-Z1-10
TRUSS SIZE	4.5' X 4.5'
TOWER SIZE	24"

SUMMARY OF DRILLED SHAFT

SIZE	48" DIA X 26'
ANCHOR BOLT SIZE	2' 6" DIA X 5' 2"

- NOTES:
1. THE CONTRACTOR SHALL SUBMIT THE STRUCTURAL DESIGN AND DMS TO TRUSS-MOUNTING DESIGN DETAILS TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THE SUBMITTED DRAWINGS FOR THE STRUCTURAL DESIGN AND DMS TO TRUSS-MOUNTING DESIGN SHALL BE DONE BY A TEXAS REGISTERED PROFESSIONAL ENGINEER, SHALL BE DATED AND SHALL BEAR THE ENGINEER'S SEAL AND SIGNATURE.
 2. PRIOR TO DRILLING SHAFT, THE DEPARTMENT WILL PROVIDE THE CONTRACTOR WITH THE VIEW ANGLE OFFSET FOR THE DMS LOCATION. THIS OFFSET WILL BE REQUIRED BY THE CONTRACTOR TO COORDINATE DRILL SHAFT ORIENTATION WITH THE SIGN MANUFACTURER FOR OPTIMUM DMS VIEW AXIS ALIGNMENT. THE NAME, ADDRESS AND CONTACT PERSON FOR THE DMS MANUFACTURER SHALL BE PROVIDED BY THE DEPARTMENT. PAYMENT SHALL NOT BE MADE DIRECTLY FOR SUCH COORDINATION, OR OTHER INCIDENTALS REQUIRED TO COMPLETE THIS WORK, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE ITEM 416 "DRILLED SHAFT FOUNDATION".
 3. REFER TO STANDARD PLANS HCOSS-Z1-10, COSSD, COSSF, COSS-FD, COSS-SE FOR ADDITIONAL INFORMATION.
 4. ALL DIMENSIONS SHOWN IN FEET UNLESS OTHERWISE SHOWN.
 5. CONTRACTOR SHALL VERIFY ALL ABOVE DIMENSIONS BEFORE FABRICATION.

NOTES:

Refer to standard sheets HCOSS-Z1-10, COSSD, COSSF, COSS-FD sheets for additional information.

The sign, and support shown is an example only and is not intended to specify a certain product. Other comparable designs, which meet the requirements of the specifications as approved by the Engineer, will be acceptable.

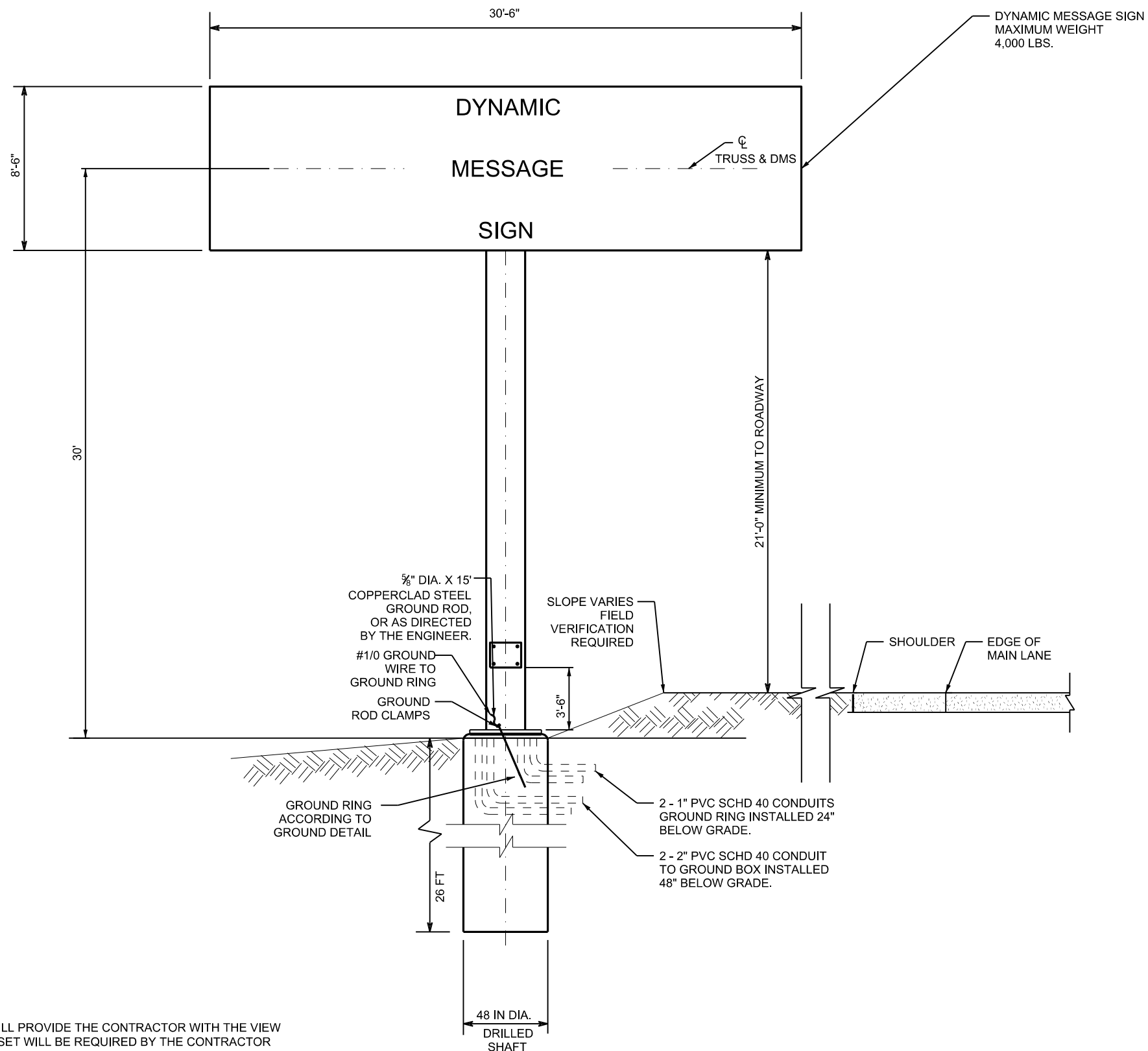


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12/31/2020

OVERHEAD SIGN SUPPORTS FOR NB DMS SB DMS

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PROJECT NO.		SHEET NO.	
		3.03	
STATE	DISTRICT	COUNTY	
TEXAS	18B	Hale	
CONTROL	SECTION	JOB	HIGHWAY NO.
0067	06	060	IH0027



NOTES:
 1. PRIOR TO DRILLING SHAFT, THE DEPARTMENT WILL PROVIDE THE CONTRACTOR WITH THE VIEW ANGLE OFFSET FOR THE DMS LOCATION. THIS OFFSET WILL BE REQUIRED BY THE CONTRACTOR TO COORDINATE DRILL SHAFT ORIENTATION WITH THE SIGN MANUFACTURER FOR OPTIMUM DMS VIEW AXIS ALIGNMENT. THE NAME, ADDRESS AND CONTACT PERSON FOR THE DMS MANUFACTURER SHALL BE PROVIDED BY THE DEPARTMENT. PAYMENT SHALL NOT BE MADE DIRECTLY FOR SUCH COORDINATION, OR OTHER INCIDENTALS REQUIRED TO COMPLETE THIS WORK, BUT SHALL BE CONSIDERED SUBSIDIARY TO THE ITEM 416 "DRILLED SHAFT FOUNDATION".

2. THE FURNISHING AND INSTALLING OF GROUNDING RING, #2/0 AWG GROUND WIRE, GROUND ROD CLAMP, AND ALL OTHER MATERIALS, LABOR, TOOLS, EQUIPMENT, AND INCIDENTALS NECESSARY TO COMPLETE THE GROUNDING OF THE STRUCTURE AS PER NEC SHALL BE SUBSIDIARY TO ITEM 0416.



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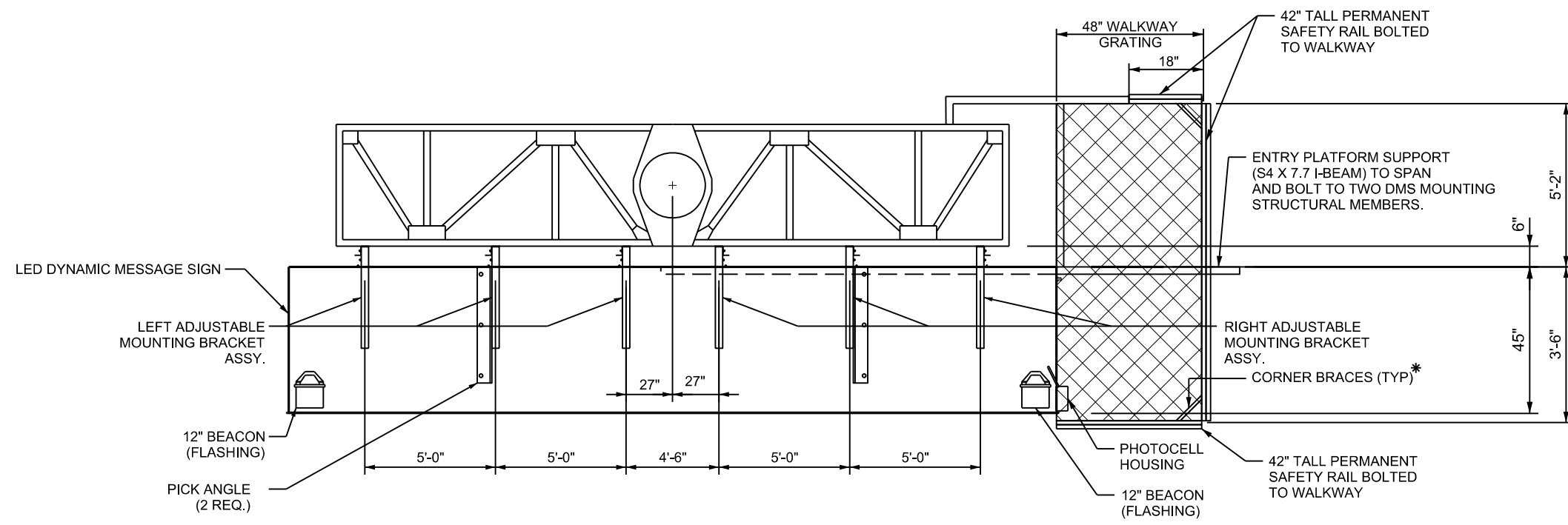
12/31/2020

DYNAMIC MESSAGE SIGN DETAILS

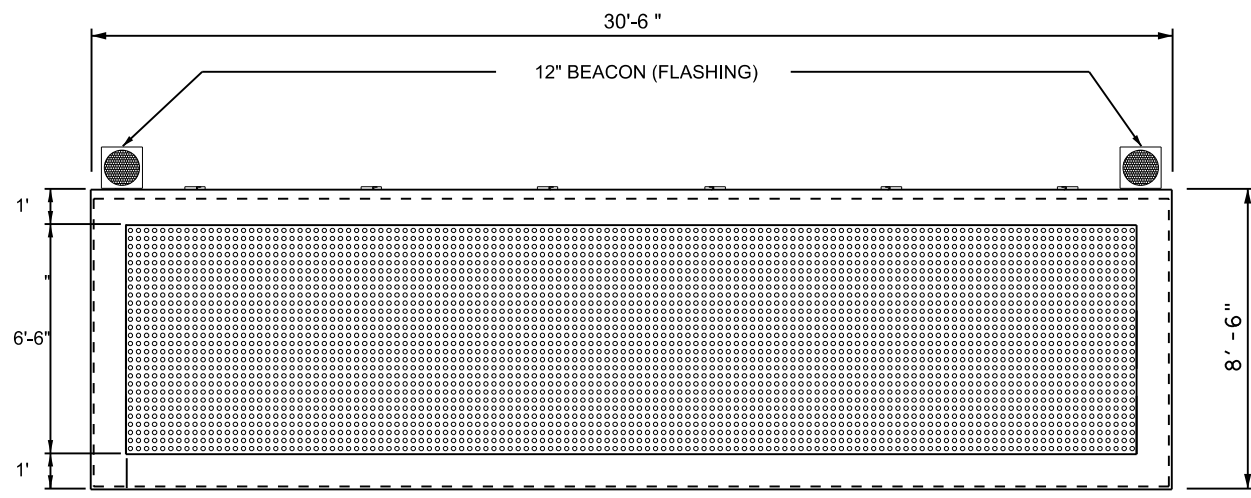
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PROJECT NO.		SHEET NO.	
		3.04	
STATE	DISTRICT	COUNTY	
TEXAS	18B	Hale	
CONTROL	SECTION	JOB	HIGHWAY NO.
0067	06	060	IH0027

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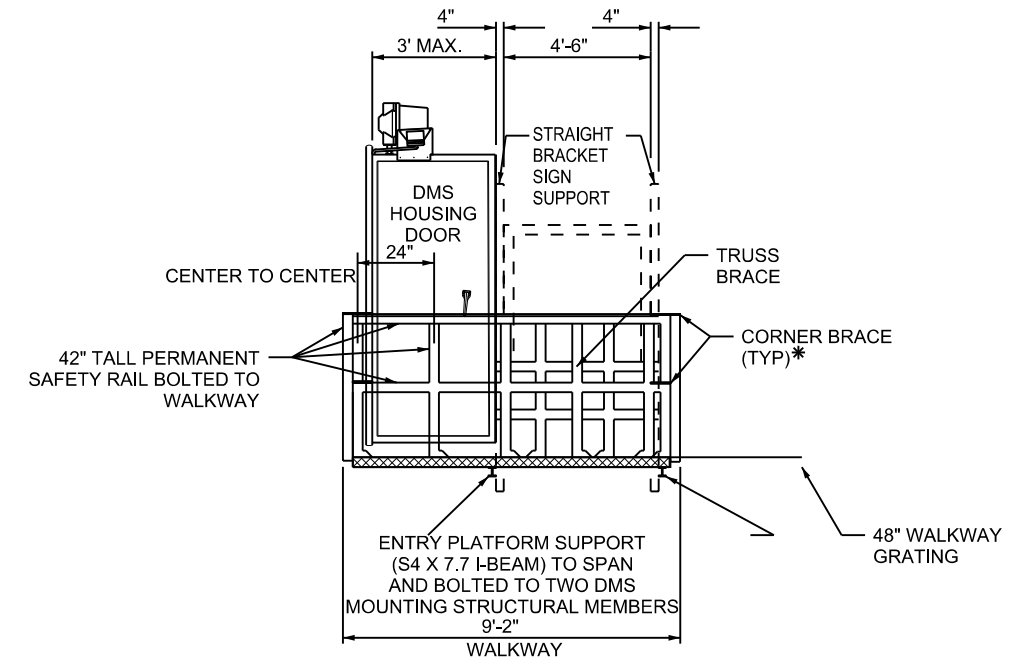


TOP VIEW



FRONT VIEW

DYNAMIC MESSAGE SIGN DETAILS



SIDE VIEW

THE CONTRACTOR SHALL SUBMIT THE STRUCTURAL DESIGN, AND MOUNTING DETAILS FOR THE DMS WALKWAY PLATFORM, WITH 42" TALL PERMANENT SAFETY RAIL, TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION.

SPACING OF HANDRAIL UPRIGHTS (VERTICAL MEMBERS) SHALL NOT EXCEED 24" CENTER TO CENTER. THE CONTRACTOR SHALL SUBMIT THE STRUCTURAL DESIGN, AND MOUNTING DETAILS FOR MOUNTING THE DMS TO THE TRUSS, TO THE ENGINEER FOR APPROVAL PRIOR TO FABRICATION.

THE SUBMITTED DRAWINGS FOR THE STRUCTURAL DESIGN AND MOUNTING DETAILS OF THE DMS WALKWAY PLATFORM, WITH 42" TALL PERMANENT SAFETY RAIL, AND STRUCTURAL DESIGN AND MOUNTING DETAILS FOR MOUNTING THE DMS TO THE TRUSS, SHALL BE DONE BY A TEXAS REGISTERED PROFESSIONAL ENGINEER, SHALL BE DATED AND SHALL BEAR THE ENGINEER'S SEAL AND SIGNATURE.

* TWO CORNER BRACES SHALL BE BOLTED AT A 45° ANGLE TO FRONT AND SIDE PERMANENT SAFETY RAILS. ONE BRACE SHALL BE MOUNTED TO THE TOP RAILS AND THE OTHER TO THE SECOND RAILS.

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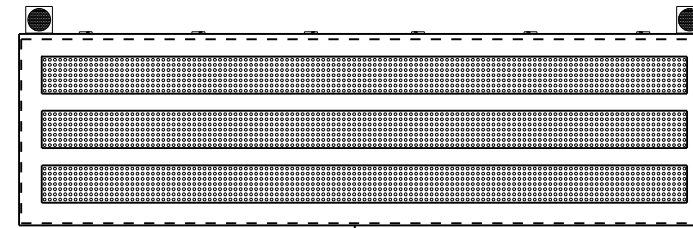
3-31-2021

DYNAMIC MESSAGE SIGN DETAILS

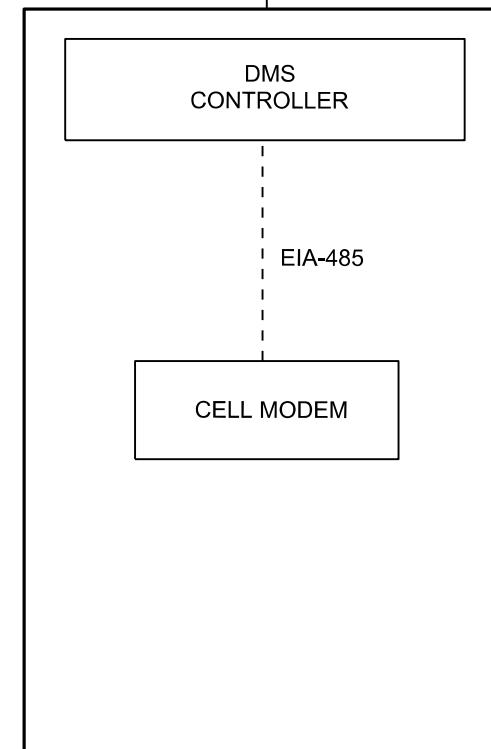
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PROJECT NO.		SHEET NO.	
		3.05	
STATE	DISTRICT	COUNTY	
TEXAS	18B	Hale	
CONTROL	SECTION	JOB	HIGHWAY NO.
0067	06	060	IH0027

NB & SB DMS



DMS CONTROL
CABLES



DMS CABINET



Jeremy T. Dearing, P.E.

12/31/2020

COMMUNICATIONS SYSTEM DIAGRAM

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6				3.06
STATE	DISTRICT	COUNTY		
TEXAS	LBB	Hale		
CONT.	SECT.	JOB	HIGHWAY NO.	
0067	06	060	IH0027	
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ZONE 1 100 MPH WIND

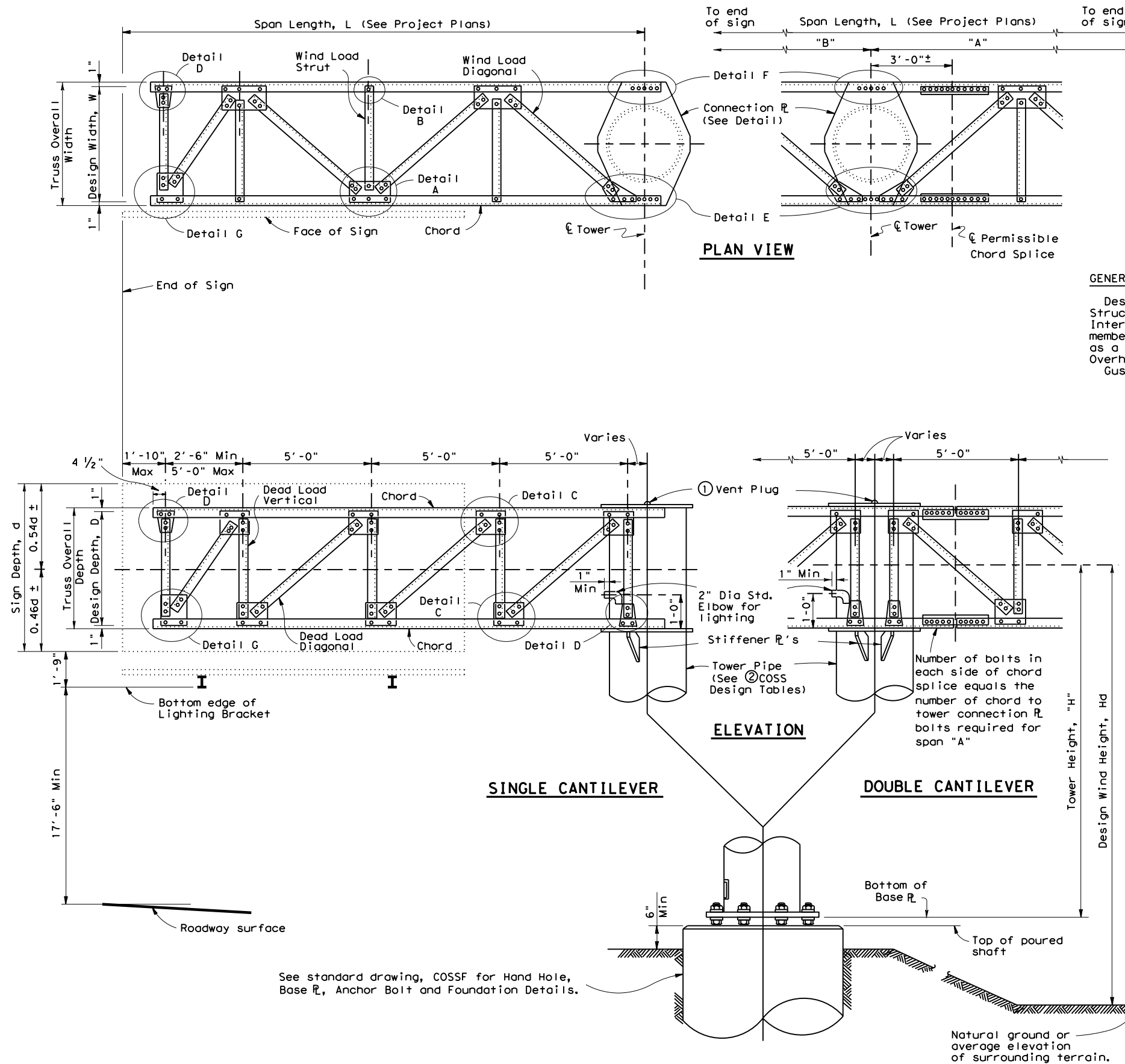
TOWER HEIGHT (ft)	10' SPAN												15' SPAN												20' SPAN												25' SPAN												TOWER HEIGHT (ft)																
	TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS																								
	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)		NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)
25'	16	0.375	0.240	1 1/2	8	21"	25 x 1 3/4	0.2	6.46	27.82	153.70	16	0.531	0.384	1 3/4	8	21 1/2"	26 x 2 1/4	0.5	9.30	62.60	225.51	20	0.438	0.411	2	8	25 3/4"	30 1/2 x 2 1/8	0.8	12.34	111.29	300.38	24	0.469	0.356	2	8	29 3/4"	34 1/2 x 2 1/8	0.9	15.37	173.89	375.94	25'																				
26'	16	0.375	0.250	1 1/2	8	21"	25 x 1 3/4	0.2	6.49	27.82	160.15	16	0.531	0.415	1 3/4	8	21 1/2"	26 x 2 1/4	0.5	9.33	62.60	234.80	20	0.438	0.444	2	8	25 3/4"	30 1/2 x 2 1/8	0.8	12.37	111.29	312.67	24	0.469	0.385	2	8	29 3/4"	34 1/2 x 2 1/8	0.9	15.41	173.89	391.21	26'																				
27'	16	0.406	0.260	1 1/2	8	21"	25 x 1 3/4	0.2	6.52	27.82	166.65	16	0.531	0.448	1 3/4	8	21 1/2"	26 x 2 1/4	0.5	9.36	62.60	244.12	20	0.469	0.449	2	8	25 3/4"	30 1/2 x 2 1/4	0.8	12.41	111.29	325.01	24	0.500	0.391	2	8	29 3/4"	34 1/2 x 2 1/4	0.9	15.46	173.89	406.54	27'																				
28'	16	0.438	0.260	1 1/2	8	21"	25 x 1 3/8	0.2	6.55	27.82	173.18	16	0.656	0.400	2	8	22"	27 x 2 3/8	0.5	9.39	62.60	253.47	20	0.500	0.455	2	8	25 3/4"	30 1/2 x 2 1/4	0.8	12.44	111.29	337.38	24	0.421	0.391	2	8	29 3/4"	34 1/2 x 2 1/4	0.9	15.50	173.89	421.92	28'																				
29'	16	0.469	0.260	1 1/2	8	21"	25 x 1 1/8	0.2	6.58	27.82	179.73	16	0.656	0.429	2	8	22"	27 x 2 3/8	0.5	9.42	62.60	262.85	20	0.500	0.488	2	8	25 3/4"	30 1/2 x 2 1/4	0.8	12.48	111.29	349.80	24	0.451	0.391	2	8	29 3/4"	34 1/2 x 2 1/4	0.9	15.54	173.89	437.35	29'																				
30'	16	0.469	0.270	1 3/4	8	21 1/2"	26 x 1 1/8	0.2	6.61	27.82	186.32	16	0.687	0.441	2	8	22 1/2"	27 x 2 1/2	0.5	9.45	62.60	272.26	20	0.531	0.495	2	8	25 3/4"	30 1/2 x 2 1/4	0.8	12.52	111.29	362.25	24	0.500	0.483	2	8	29 3/4"	34 1/2 x 2 1/4	0.9	15.59	173.89	452.82	30'																				
31'	16	0.290	0.290	1 3/4	8	21 1/2"	26 x 2	0.2	6.64	27.82	192.94	16	0.471	0.471	2	8	22 1/2"	28 x 2	0.5	9.48	62.60	281.70	20	0.562	0.501	2	8	25 3/4"	30 1/2 x 2 3/8	0.8	12.55	111.29	374.75	24	0.531	0.488	2	8	29 3/4"	34 1/2 x 2 3/8	0.9	15.63	173.89	468.35	31'																				
32'	16	0.469	0.310	1 3/4	8	21 1/2"	26 x 2	0.2	6.67	27.82	199.59	16	0.502	0.502	2	8	22 1/2"	28 x 2	0.5	9.50	62.60	291.17	20	0.562	0.534	2 1/4	8	26"	31 x 2 3/8	0.8	12.59	111.29	387.28	24	0.520	0.488	2	8	29 3/4"	34 1/2 x 2 3/8	0.9	15.68	173.89	483.93	32'																				
33'	16	0.500	0.320	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.70	27.82	206.26	16	0.687	0.534	2	8	22 1/2"	27 x 2 1/2	0.5	9.53	62.60	300.68	20	0.562	0.568	2	8	25 3/4"	31 x 2 3/8	0.8	12.63	111.29	399.85	24	0.553	0.488	2	8	29 3/4"	35 x 2 1/4	0.9	15.72	173.89	499.55	33'																				
34'	16	0.500	0.330	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.73	27.82	212.97	16	0.750	0.525	2	8	22"	27 x 2 1/2	0.5	9.56	62.60	310.21	20	0.594	0.573	2	8	25 3/4"	31 x 2 3/8	0.8	12.66	111.29	412.46	24	0.587	0.488	2 1/4	8	30"	35 x 2 3/8	0.9	15.76	173.89	515.23	34'																				
35'	16	0.500	0.350	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.75	27.82	219.70	16	0.750	0.557	2 1/4	8	22 1/2"	28 x 2 3/8	0.5	9.59	62.60	319.77	20	0.594	0.607	2	8	25 3/4"	31 x 2 1/2	0.8	12.70	111.29	425.11	24	0.531	0.622	2 1/2	8	30 1/2"	36 x 2 3/8	0.9	15.81	173.89	530.95	35'																				
36'	16	0.531	0.350	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.78	27.82	226.47	16	0.589	0.589	2	8	22 1/2"	28 x 2 5/8	0.5	9.62	62.60	329.37	20	0.594	0.643	2	8	25 3/4"	31 x 2 5/8	0.8	12.74	111.29	437.80	24	0.562	0.624	2 1/2	8	30 x 2 1/2	36 x 2 1/2	0.9	15.85	173.89	546.71	36'																				
37'	16	0.531	0.370	1 3/4	8	21 1/2"	26 x 2 1/4	0.2	6.81	27.82	233.26	16	0.622	0.622	2	8	22 1/2"	28 x 2 3/4	0.5	9.65	62.60	338.99	20	0.625	0.648	2	8	25 3/4"	31 x 2 5/8	0.8	12.77	111.29	450.53	24	0.562	0.659	2 1/2	8	30 x 2 1/2	36 x 2 1/2	0.9	15.89	173.89	562.53	37'																				
38'	16	0.531	0.390	1 3/4	8	21 1/2"	26 x 2 1/4	0.2	6.84	27.82	240.08	16	0.750	0.656	2	8	22 1/2"	28 x 2 3/4	0.5	9.65	62.60	347.49	20	0.625	0.684	2	8	25 3/4"	31 x 2 5/8	0.8	12.81	111.29	463.29	24	0.562	0.695	2 1/2	8	30 x 2 1/2	36 x 2 1/2	0.9	15.94	173.89	578.39	38'																				
39'	16	0.656	0.350	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.87	27.82	246.94	16	0.843	0.626	2	8	22 1/2"	28 x 2 7/8	0.5	9.71	62.60	358.32	20	0.656	0.689	2	8	25 3/4"	31 x 2 3/4	0.8	12.84	111.29	476.09	24	0.594	0.696	2 1/2	8	30 x 2 5/8	36 x 2 5/8	0.9	15.98	173.89	594.30	39'																				
40'	16	0.656	0.360	1 3/4	8	21 1/2"	26 x 2 1/8	0.2	6.90	27.82	253.82	16	0.843	0.658	2	8	22 1/2"	28 x 2 7/8	0.5	9.74	62.60	368.03	20	0.656	0.725	2 1/4	8	26"	31 x 2 3/4	0.8	12.88	111.29	488.93	24	0.594	0.732	2 1/2	8	30 x 2 5/8	36 x 2 5/8	0.9	16.03	173.89	610.25	40'																				
42'	16	0.656	0.400	2	8	22"	27 x 2 3/8	0.2	6.96	27.82	267.67	16	0.843	0.726	2	8	22"	28 x 3	0.5	9.80	62.60	387.55	20	0.719	0.736	2 1/2	8	26 1/2"	31 1/2 x 2 3/4	0.8	12.95	111.29	514.72	24	0.625	0.770	2 1/2	8	30 x 2 3/4	36 x 2 3/4	0.9	16.11	173.89	642.29	42'																				
44'	16	0.687	0.420	2	8	22"	27 x 2 3/8	0.2	7.02	27.82	281.64	16	1.031	0.675	2	8	22"	28 x 3	0.5	9.85	62.60	407.18	20	0.750	0.779	2 1/2	8	26 1/2"	31 1/2 x 2 3/8	0.8	13.03	111.29	540.66	24	0.656	0.808	2 1/2	8	30 x 2 3/4	36 x 2 3/4	0.9	16.20	173.89	674.52	44'																				
45'	16	0.687	0.440	2	8	22"	27 x 2 3/8	0.2	7.05	27.82	288.67	16	1.218	0.619	2 1/4	8	22 1/2"	28 x 3	0.5	9.88	62.60	417.04	20	0.750	0.814	2 1/2	8	26 1/2"	31 1/2 x 2 3/8	0.8	13.06	111.29	553.68	24	0.688	0.809	2 1/2	8	30 1/2"	36 x 2 3/4	0.9	16.24	173.89	690.71	45'																				

ZONE 1 100 MPH WIND

TOWER HEIGHT (ft)	30' SPAN												35' SPAN												40' SPAN												TOWER HEIGHT (ft)						
	TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS				TOWER PIPE			ANCHOR BOLTS		BASE PLATE	TRUSS	DESIGN LOADS													
	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)	SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)	TORSION T (K-ft)	MOMENT M (K-ft)	O.D. (in)	WALL THICK (in)	DEFL ΔH (in)		SIZE DIA (in)	NO.	BOLT CIR DIA	SIZE (in)	DEFL ΔV (in)	SHEAR V (Kips)
25'	24	0.531	0.475	2 1/4	8	30"	35 x 2 1/4	1.4	18.21	250.41	449.85	30	0.406	0.442	2 1/4	8	36"	41 x 2	1.6	21.34	340.83	529.13	30	0.500	0.502	2 1/2	8	36 1/2"	42 x 2 1/4	2.1	24.18	445.17	606.83	25'									
26'	24	0.531	0.514	2 1/4	8	30"	35 x 2 1/4	1.4	18.25	250.41	467.86	30	0.406	0.478	2 1/4	8	36"	41 x 2	1.7	21.40	340.83	550.13	30	0.500	0.543	2 1/2	8	36 1/2"	42 x 2 1/4	2.2	24.23	445.17	630.43	26'									
27'	24	0.562	0.526	2 1/4	8	30"	35 x 2 3/8	1.4	18.29	250.41	485.93	30	0.438	0.479	2 1/4	8	36"	41 x 2 1/8	1.7	21.45	340.83	571.21	30	0.500	0.586	2 1/2	8	36 1/2"	42 x 2 3/8	2.3	24.29	445.17	654.13	27'									
28'	24	0.562	0.566	2 1/4	8	30"	35 x 2 3/8	1.4	18.34	250.41	504.07	30	0.515	0.515	2 1/4	8	36"	41 x 2 1/8	1.8	21.50	340.83	592.37	30	0.531	0.595	2 1/2	8	36 1/2"	42 x 2 3/8	2.3	24.34	445.17	677.92	28'									
29'	24	0.562	0.607	2 1/4	8	30"	35 x 2 3/8	1.5	18.38	250.41	522.25	30	0.552	0.552	2 1/4	8	36"	41 x 2 1/8	1.8	21.56	340.83	613.61	30	0.531	0.638	2 1/2	8	36 1/2"	42 x 2 3/8	2.3	24.40	445.17	701.81	29'									
30'	24	0.594	0.617	2 1/2	8	30 1/2"	36 x 2 1/2	1.5	18.43	250.41	540.50	30	0.438	0.591	2 1/2	8	36 1/2"	42 x 2 1/4</																									

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GENERAL NOTES:

Design conforms to 1975 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim revisions thereto. Connection details are typical only. Actual size of member and number of bolts will vary. The details on this sheet are intended as a guide only. See "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports" sheets for number of bolts and size of members. Gusset plates to be same thickness as thickest web member in connection.

- ① Note: Cap shall be solid steel sheet $\frac{3}{8}$ " nominal thickness. Drill, tap and plug galvanizing vent. Weld plate to pipe with $\frac{3}{8}$ " weld all around.
- ② For COSS design tables see standard drawing, "Cantilever Overhead Sign Supports" or "High Level Cantilever Overhead Sign Supports".

SHEET 1 OF 2

Texas Department of Transportation
 Traffic Operations Division

**CANTILEVER OVERHEAD
 SIGN SUPPORT DETAILS**

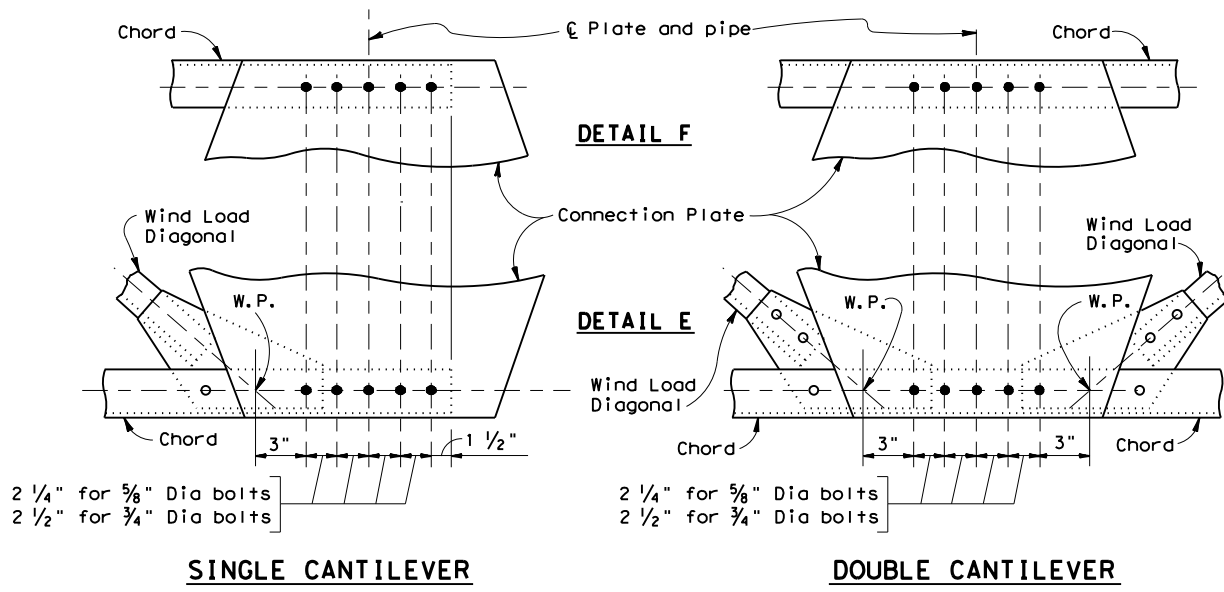
COSSD

© TxDOT November 2007		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0067	06	060		IH0027	
DIST	COUNTY		SHEET NO.		
LBB	Hale		3.08		

66A

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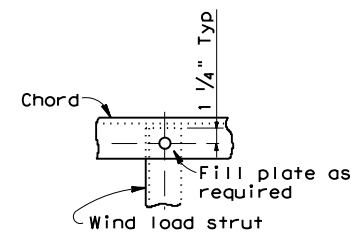


2 1/4" for 5/8" Dia bolts
 2 1/2" for 3/4" Dia bolts

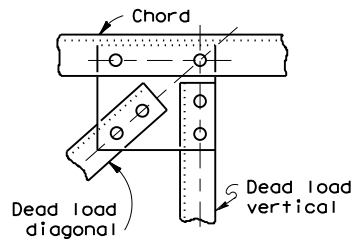
SINGLE CANTILEVER

DOUBLE CANTILEVER

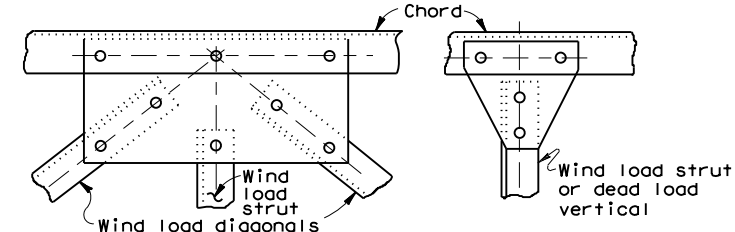
CONNECTION DETAILS



DETAIL B

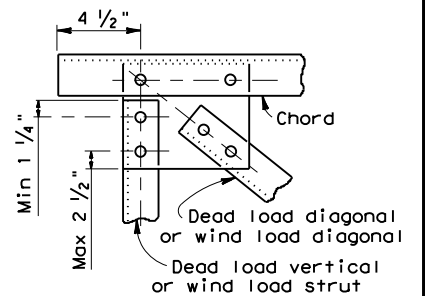


DETAIL C



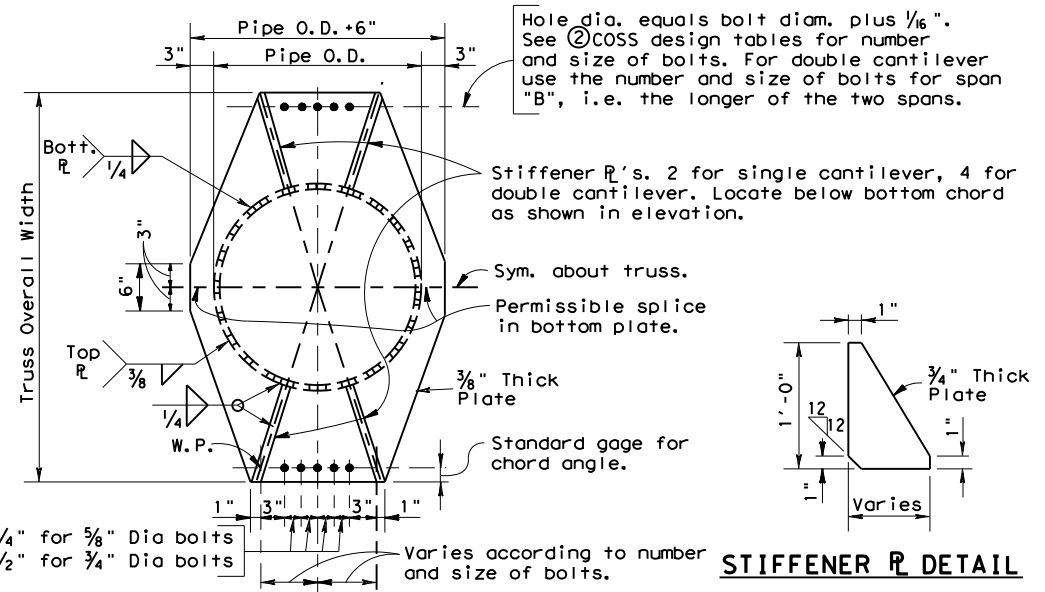
DETAIL A

DETAIL D



DETAIL G

NUMBER OF BOLTS REQD. IN GUSSET PLATE TO CHORD CONNECTION	
TOTAL NO. OF BOLTS IN DIAG'S. IN JOINT	
0	2
2	2
3	3
4	3
5	4
6	4
8	5
10	6



Hole dia. equals bolt diam. plus 1/16". See COSS design tables for number and size of bolts. For double cantilever use the number and size of bolts for span "B", i.e. the longer of the two spans.

Stiffener P's. 2 for single cantilever, 4 for double cantilever. Locate below bottom chord as shown in elevation.

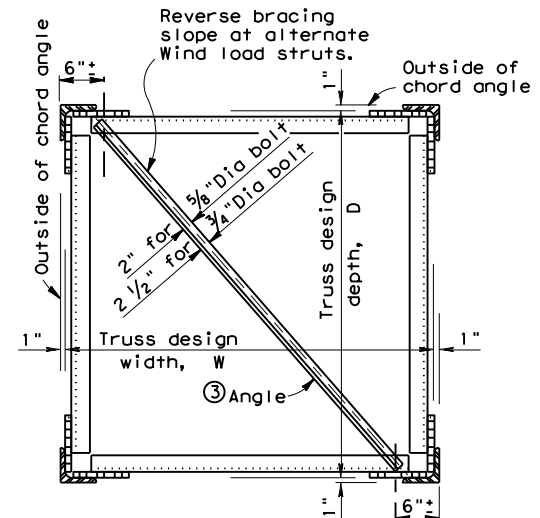
Sym. about truss.
 Permissible splice in bottom plate.

3/8" Thick Plate
 Standard gage for chord angle.

2 1/4" for 5/8" Dia bolts
 2 1/2" for 3/4" Dia bolts

Varies according to number and size of bolts.

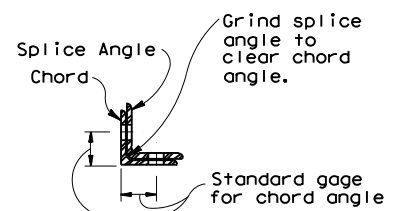
STIFFENER PLATE DETAIL



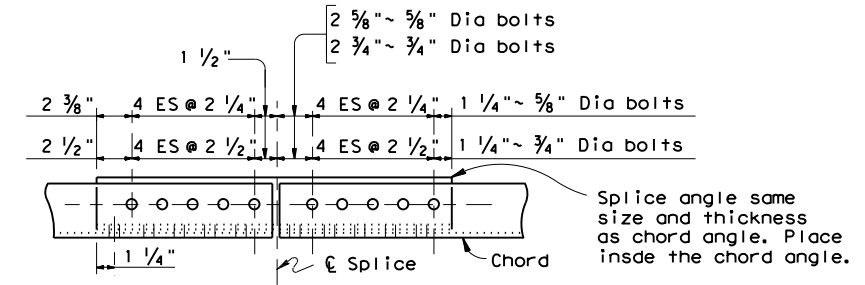
③ 2" x 2" x 3/16" angle for 5/8" Dia bolts [1]
 2 1/2" x 2" x 3/16" angle for 3/4" Dia bolts [1]

TRUSS SECTION

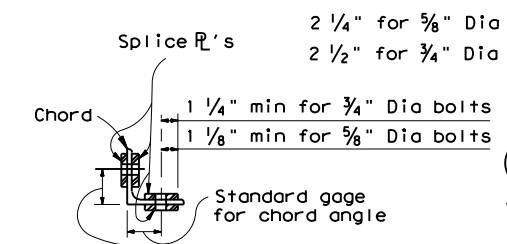
(DIAGONALS NOT SHOWN)



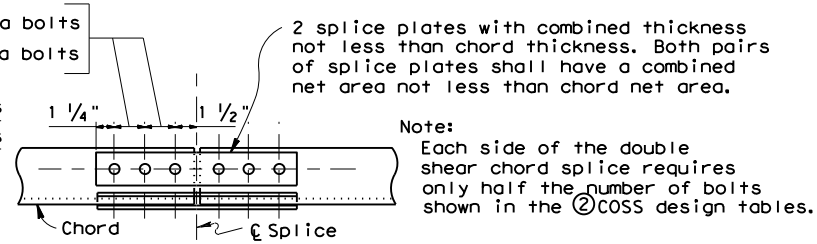
SECTION ON CHORD SPLICE



SINGLE SHEAR CHORD SPLICE



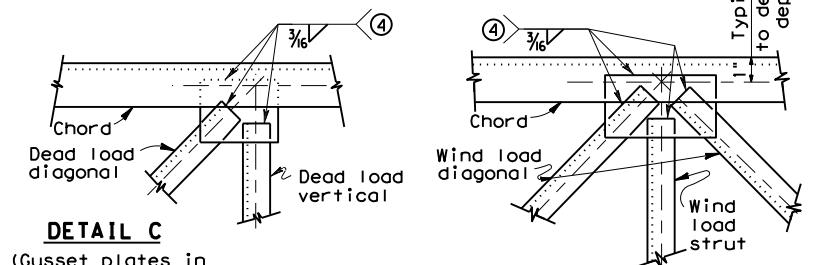
SECTION ON CHORD SPLICE



DOUBLE SHEAR CHORD SPLICE

SPLICE DETAILS

CONNECTION PLATE DETAIL



DETAIL C
 (Gusset plates in other details to be similar)

DETAIL A

ALTERNATE WELDED CONNECTION DETAILS

④ MINIMUM LENGTH OF 3/16" FILLET WELD REQUIRED		
NUMBER OF BOLTS	TO REPLACE 5/8" DIA BOLTS	TO REPLACE 3/4" DIA BOLTS
1	2"	3"
2	4"	6"
3	6"	9"
4	8"	11 1/2"
5	10"	14 1/2"
6	12"	17 1/2"
7	14"	20"

CANTILEVER OVERHEAD SIGN SUPPORT DETAILS

COSSD

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DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	
REVISIONS				
CONTRACT	SECTION	JOB	HIGHWAY	
0067	06	060	IH0027	
DIST	COUNTY	SHEET NO.		
LBB	Hale	3.09		

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Washers shall conform to ASTM F436.

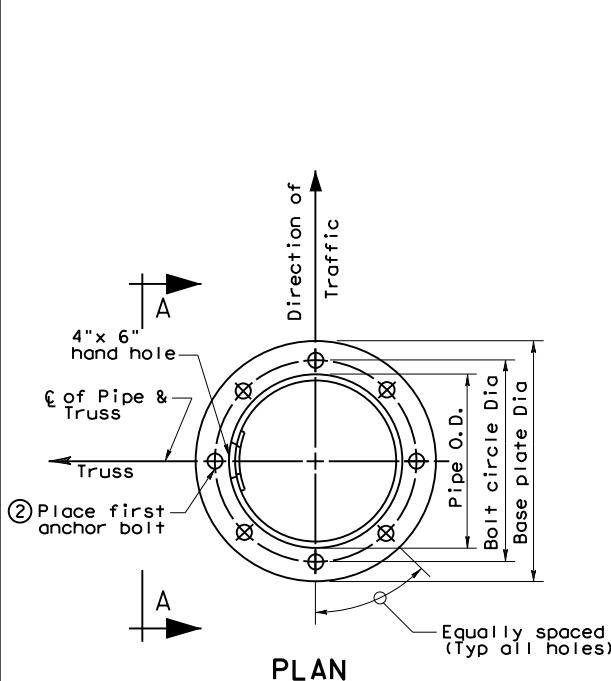
ANCHOR BOLT DIA. d	WASHER DIMENSIONS				HOLE IN BASE PLATE
	OUTSIDE DIAMETER	HOLE DIAMETER	THICKNESS		
			MIN.	MAX.	
1 1/2" or less	2d	d + 1/8"	0.136"	0.177"	d + 1/4"
1 3/4"	2d - 1/8"	d + 1/8"	0.178"	0.280"	d + 3/16"
2"	2d - 1/4"	d + 1/8"	0.178"	0.280"	d + 5/16"
Over 2"	2d - 1/2"	d + 1/8"	0.240"	0.340"	d + 5/16"

ANCHOR BOLT SIZE				
DIA	BOLT LENGTH	THREAD LENGTH	PROJECTION LENGTH	GALVAN. LENGTH
1 1/4"	2'-11"	5"	5 1/4"	11 1/4"
1 3/8"	3'-1"	5 1/2"	5 3/4"	11 3/4"
1 1/2"	3'-4"	6"	6 1/4"	1'-0 1/4"
1 3/4"	3'-10"	7"	7 1/4"	1'-1 1/4"
2"	4'-3"	8"	8 1/4"	1'-2 1/4"
2 1/4"	4'-9"	9"	9 1/4"	1'-3 1/4"
2 1/2"	5'-2"	10"	10 1/4"	1'-4 1/4"
2 3/4"	5'-8"	11"	11 1/4"	1'-5 1/4"
3"	6'-1"	1'-0"	1'-0 1/4"	1'-6 1/4"

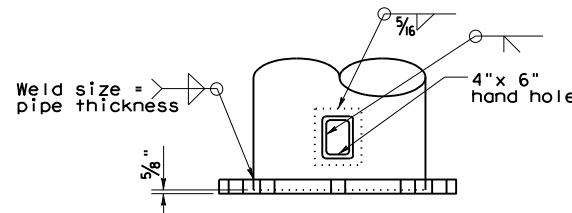
① Anchor Bolt Fabrication Tolerances:
 Bolt Length ~ ±1/2"
 Thread Length ~ ±1/2"
 Galvanized Length ~ -1/4"

ANCHOR BOLT SIZE	PIPE OUTSIDE DIAMETER											
	16"			20"			24"			30"		
	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF	BOLT CIRCLE DIA	DRILLED SHAFT SIZE	DRILLED SHAFT REINF
1 1/4" Dia x 2'-11"	20 1/2"	36" Dia	14-#8 (A)	24 1/2"	36" Dia	14-#8 (A)						
1 3/8" Dia x 3'-1"	20 3/4"	36" Dia	12-#9 (A)	24 3/4"	36" Dia	12-#9 (A)						
1 1/2" Dia x 3'-4"	21"	36" Dia	12-#9 (A)	25"	42" Dia	14-#9 (A)	29"	42" Dia	14-#9 (C)			
1 3/4" Dia x 3'-10"	21 1/2"	36" Dia	10-#10 (A)	25 3/8"	42" Dia	12-#10 (B)	29 3/8"	42" Dia	12-#10 (C)	35 3/8"	48" Dia	16-#10 (C)
2" Dia x 4'-3"	22"	36" Dia	12-#10 (A)	25 3/4"	42" Dia	12-#10 (B)	29 3/4"	48" Dia	16-#10 (C)	35 3/4"	54" Dia	18-#10 (C)
2 1/4" Dia x 4'-9"	22 1/2"	36" Dia	10-#11 (A)	26"	42" Dia	10-#11 (B)	30"	48" Dia	14-#11 (C)	36"	54" Dia	14-#11 (D)
2 1/2" Dia x 5'-2"				26 1/2"	42" Dia	12-#11 (B)	30 1/2"	48" Dia	16-#11 (C)	36 1/2"	54" Dia	16-#11 (D)
2 3/4" Dia x 5'-8"							31 1/2"	48" Dia	18-#11 (D)	37"	54" Dia	20-#11 (D)
3" Dia x 6'-1"										37 1/2"	54" Dia	24-#11 (D)

A = #3 Plain spiral at 6" pitch (Grade 40)
 B = #4 Plain spiral at 6" pitch (Grade 40)
 C = #4 Plain spiral at 6" pitch (Grade 60)
 D = #4 Plain spiral at 3 1/2" pitch (Grade 60)



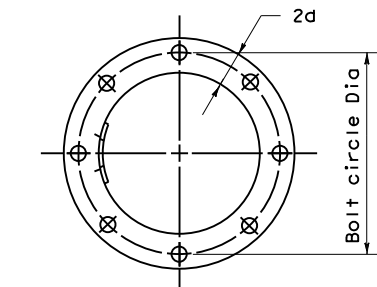
② See "Cantilever Overhead Sign Support" or "High Lever Cantilever Overhead Sign Support" sheets for number and size.



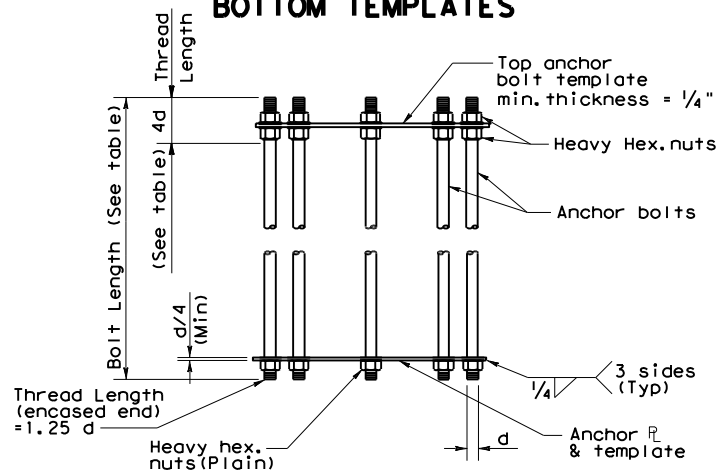
Cut 5" x 7" hole in pipe. Center 4" x 6" hand hole in 3/8" x 8" x 10" back up plate. Provide attachable cover made from section cut from pipe.

③ BASE PLATE & HANDHOLE DETAILS

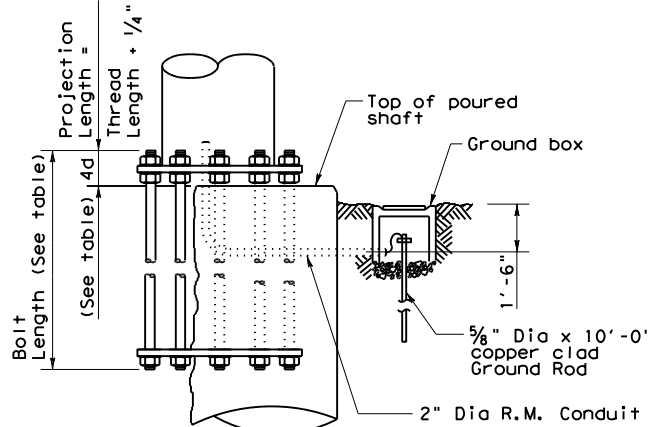
③ See "Cantilever Overhead Sign Support" or "High Level Cantilever Overhead Sign Support" sheets for Diameter and thickness of base plate.



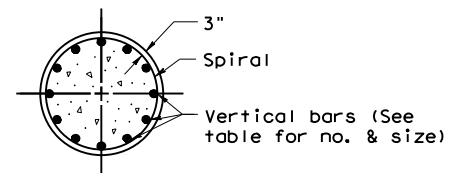
TOP VIEW OF TOP & BOTTOM TEMPLATES



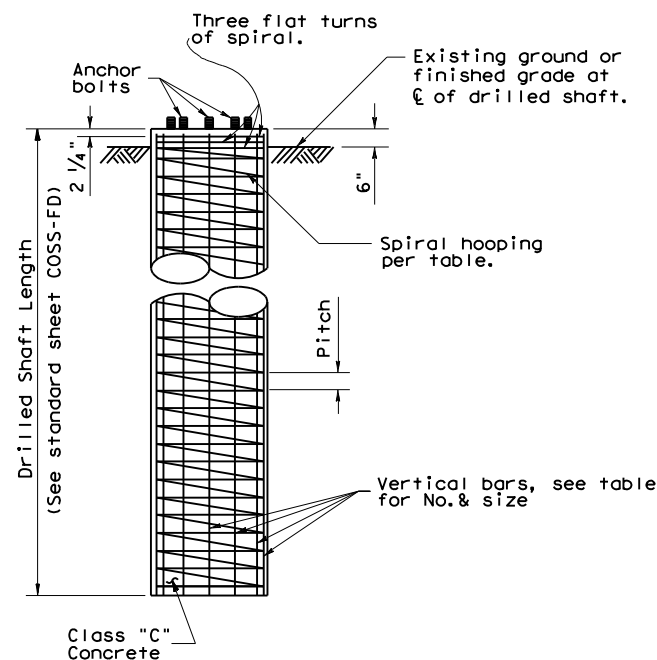
ANCHOR BOLT ASSEMBLY (PRIOR TO INSTALLATION)



BEARING SEAT ELEVATION



SECTION



FOUNDATION DETAIL

GENERAL NOTES:

Concrete shall be Class "C".
 Reinforcing shall conform to Item 440, "Reinforcing Steel".
 Anchor bolts and nuts for anchor bolts shall be "Alloy Steel" per Item 449, "Anchor Bolts".
 Anchor bolts shall be rigidly held in position during concrete placement using steel templates at the top and bottom. The top templates shall be removed after the concrete has set.
 Lubricate and tighten anchor bolts when erecting the structure per Item 449, "Anchor Bolts". After the structure has been aligned in its final position and the anchor bolts have been properly tightened, tack weld anchor bolt nuts to washer, and tack weld washers to base plate. Galvanizing in tack welded areas shall be repaired in accordance with Item 445, "Galvanizing".
 All vertical reinforcing shall be carried to the bottom of the Drilled Shaft.



CANTILEVER OVERHEAD SIGN SUPPORT FOUNDATION

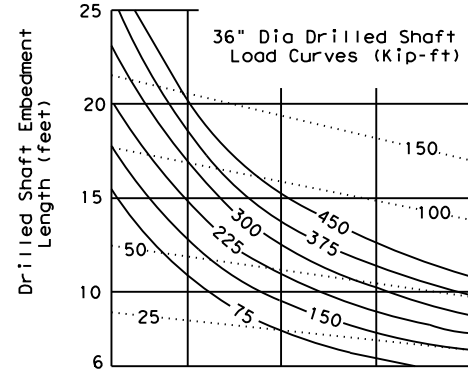
COSSF

© TxDOT November 2007					DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS					CONT	SECT	JOB	HIGHWAY
					0067	06	060	IHO027
					DIST	COUNTY		SHEET NO.
					LBB	Hale		3.10

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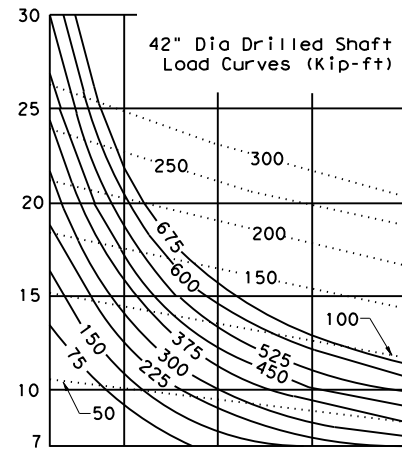
DISCLAIMER:

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①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

- ① ϕ = Angle of internal friction of soil (degrees)
- ② N = Texas cone penetrometer value (blows per ft)
- ④ C(psi) = Cohesive shear strength of soil (psi)
- ⑤ C(psf) = Cohesive shear strength of soil (psf)

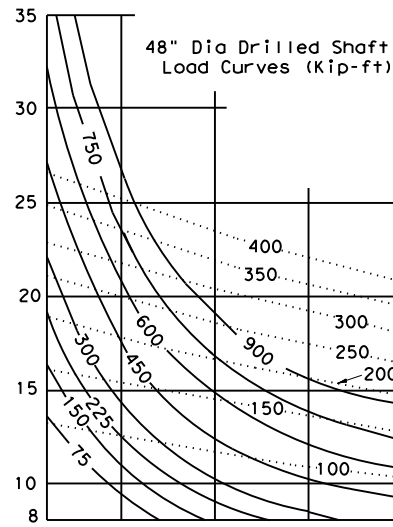


①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

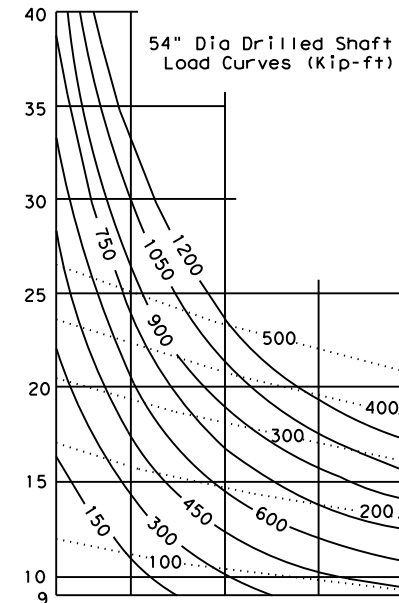
③ **SUBMERGED SAND SOIL (COHESIONLESS)**

Moment _____
 Torsion

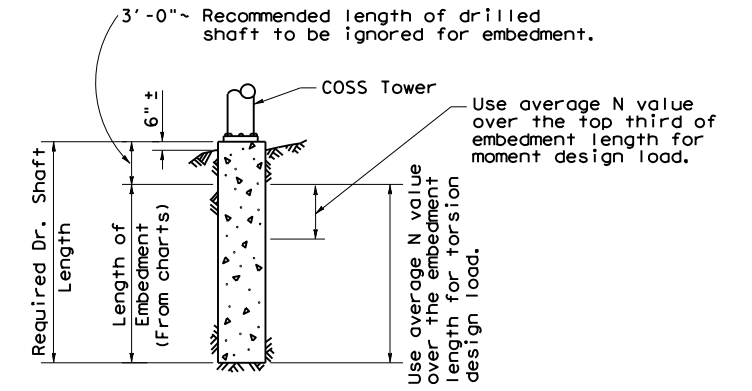
③ Note:
 For unsubmerged sands and clayey sands the charts for clay soil will give a conservative foundation design.



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65



①	28.5°	30°	32°	34°	36°
②	12	21	35	50	65

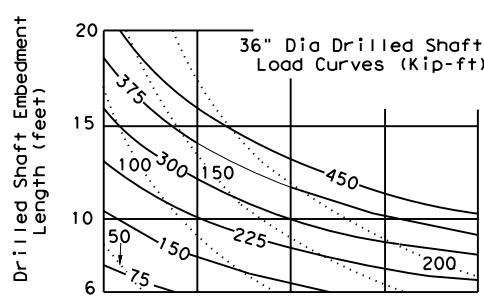


PROCEDURE:

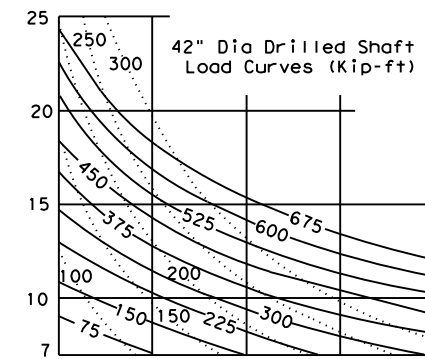
1. Determine design moment and torsion, and the required drilled shaft diameter as outlined in the selection example sheet COSS-SE.
2. Make an initial estimate of the required embedment length.
3. From soil exploration data determine type of soil and average N value or soil property along the upper third of the drilled shaft.
4. Enter chart (for the correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 3.
5. Proceed vertically into chart and locate intersection with design moment. Interpolate between moment curves (solid lines) as needed.
6. From intersection point turn 90° to left and read embedment length along vertical scale.
7. If embedment length differs significantly from estimated value return to step 3 with the embedment length determined in step 6.
8. From soil exploration data determine average N value or soil property over the entire length of the embedment.
9. Enter chart (for correct shaft diameter and soil type) from the bottom at the average N value or soil property determined in step 8.
10. Proceed vertically into chart and locate intersection with design torsion. Interpolate between torsion curves (dashed lines) as needed.
11. From intersection point turn 90° to left and read embedment length along vertical scale.
12. Compute the required length of drilled shaft by adding 3'-0" to longer embedment length required for moment or torsion.

GENERAL NOTES:

These charts are for use with Cantilever Overhead Sign Supports with one shaft per tower.
 Solid curves are base moment in Kip-ft.
 Dash curves are base torsion in Kip-ft.
 Minimum embedment of drilled shaft is two diameters.
 Add 3'-0" to the required embedment length to determine the required length of drilled shaft.



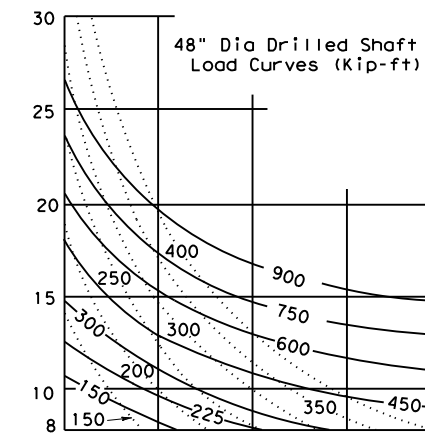
④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



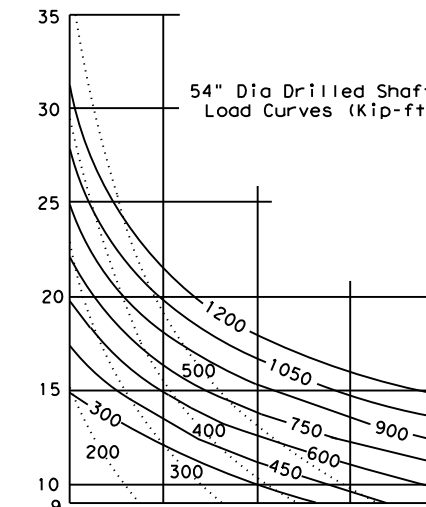
④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50

CLAY SOIL (COHESIVE)

Moment _____
 Torsion



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50



④	4	8	12	16	20
⑤	576	1152	1728	2304	2880
②	10	20	30	40	50

Texas Department of Transportation
 Traffic Operations Division

FOUNDATION EMBEDMENT SELECTION CHARTS

COSS-FD

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REVISIONS					
CONT	SECT	JOB		HIGHWAY	
0067	06	060		IH0027	
DIST	COUNTY		SHEET NO.		
LBB	Hale		3, 11		

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APPLICABLE STANDARDS SHEETS

OVERHEAD SIGN BRIDGE STANDARDS:

- OSB-SE
- OSB-Z#
- OSB-Z#1
- HOSB-Z#
- HOSB-Z1L
- HOSB-Z#1
- OSBT
- OSBC
- OSBC-SC-Z#
- OSBS-SC
- OSB-FD
- OSB-FD-SC

CANTILEVER OVERHEAD SIGN SUPPORT STANDARDS:

- COSS-SE
- COSS-Z#-10
- HCOSS-Z#-10
- COSS-Z21-10
- COSS-Z#&Z#1-10
- COSSD
- COSSF
- COSS-FD

Note: # = Wind Zone number 1, 2, 3 or 4

HIGH MAST ILLUMINATION POLE STANDARDS:

- HMIP-98
- HMIF-98

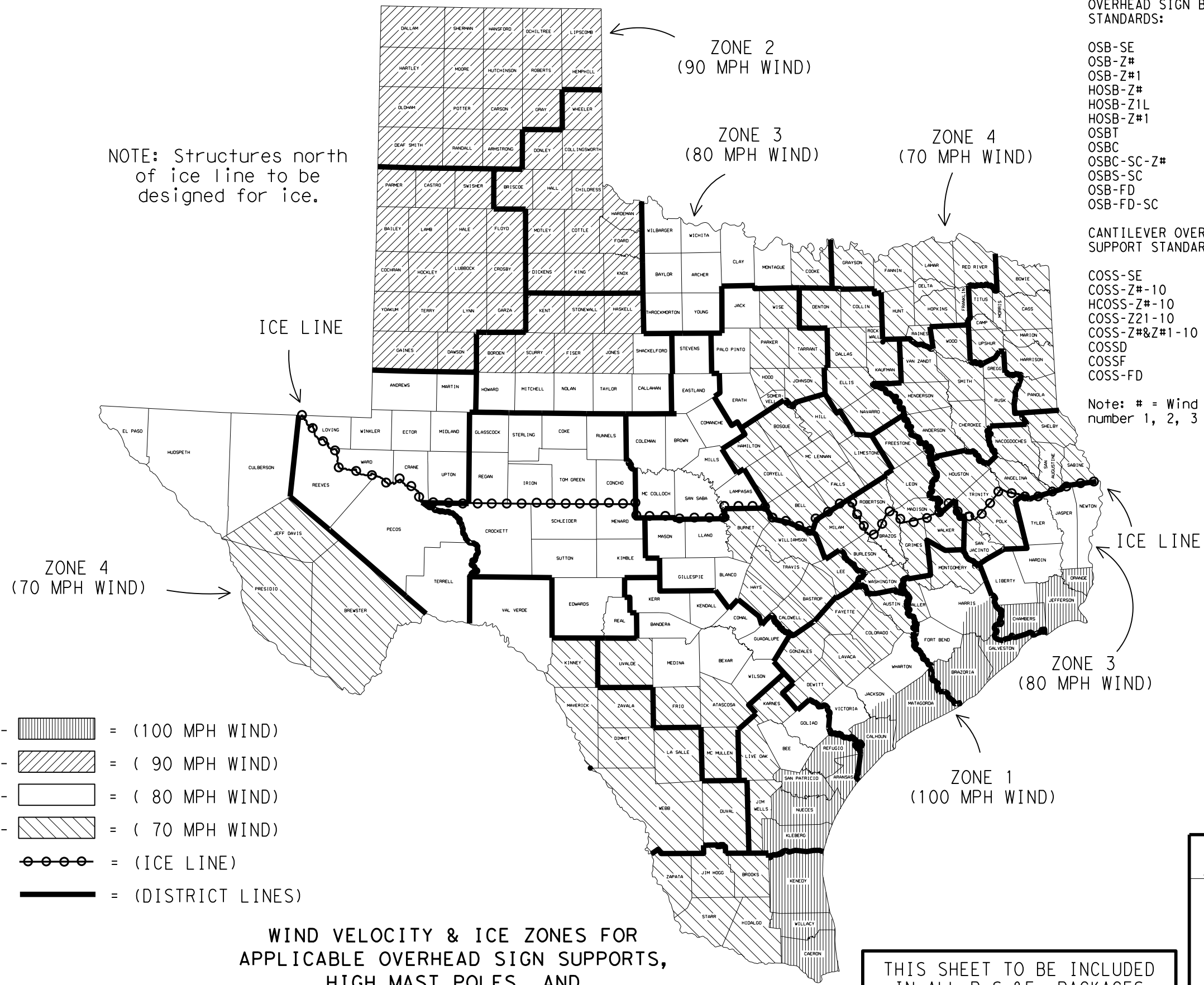
WALKWAYS AND BRACKETS STANDARDS:

- SWW
- SB(SWL-1)

TRAFFIC SIGNAL POLE STANDARDS:

- SP-80
- SP-100
- SMA-80
- SMA-100
- DMA-80
- DMA-100
- MA-C
- MAC (ILSN)
- MAD-D
- TS-FD
- LUM-A
- CFA
- LMA
- TS-C
- MA-DPD

NOTE: Structures north of ice line to be designed for ice.



LEGEND

- ZONE 1 - [diagonal lines] = (100 MPH WIND)
- ZONE 2 - [diagonal lines] = (90 MPH WIND)
- ZONE 3 - [diagonal lines] = (80 MPH WIND)
- ZONE 4 - [diagonal lines] = (70 MPH WIND)
- [dashed line with circles] = (ICE LINE)
- [solid black line] = (DISTRICT LINES)

WIND VELOCITY & ICE ZONES FOR APPLICABLE OVERHEAD SIGN SUPPORTS, HIGH MAST POLES, AND TRAFFIC SIGNAL POLES

Based on 50 Year Mean Recurrence Interval of Fastest Mile Wind Velocity at 33 feet height.

THIS SHEET TO BE INCLUDED IN ALL P.S.&E. PACKAGES CONTAINING ONE OR MORE OF THE APPLICABLE STANDARD SHEETS LISTED HEREON

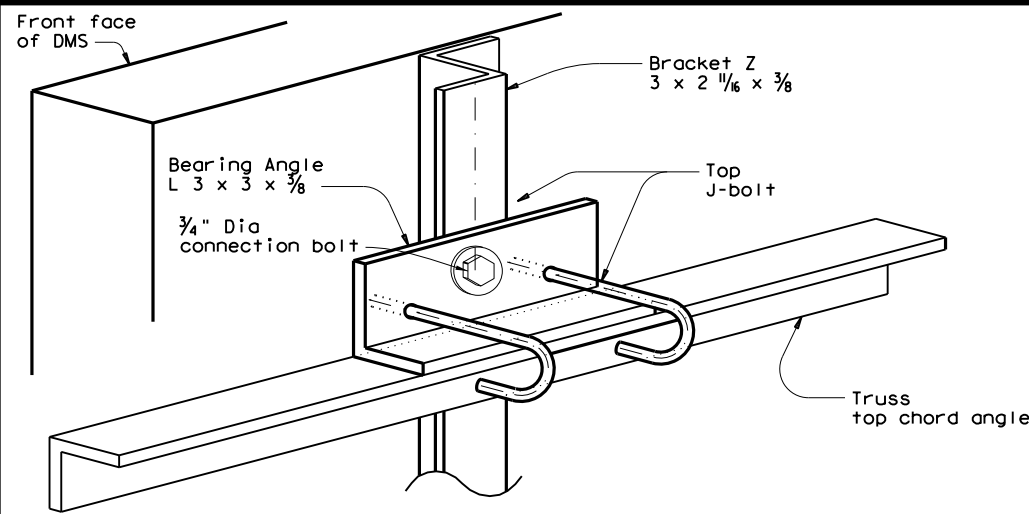
FOR HARRIS CO. ONLY
 Zone line is just North of US 90, around on the North, West and South sides of IH 610 and down the West side of SH 288.

FOR JACKSON CO. ONLY
 Zone line is just North of SH 616.

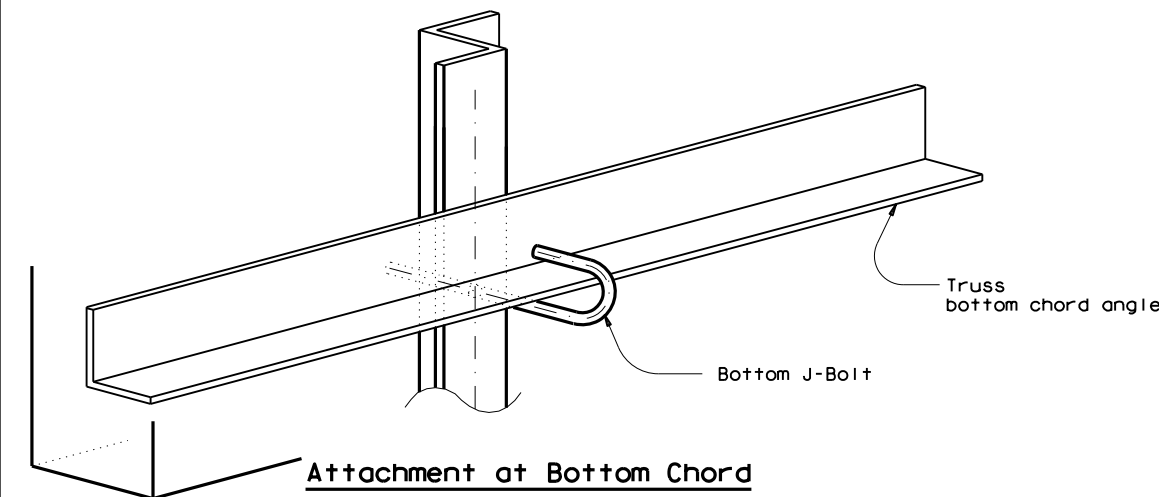
		Traffic Operations Division Standard	
<h2>WIND VELOCITY AND ICE ZONES</h2> <h3>WV & IZ-14</h3>			
FILE: windice.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT April 1996	CONT	SECT	JOB
REVISIONS	0067	06	060
8-14-Added list of applicable standards, restricting use to structures designed for Fastest Mile wind speeds.	DIST	COUNTY	SHEET NO.
LBB		Hale	3.12

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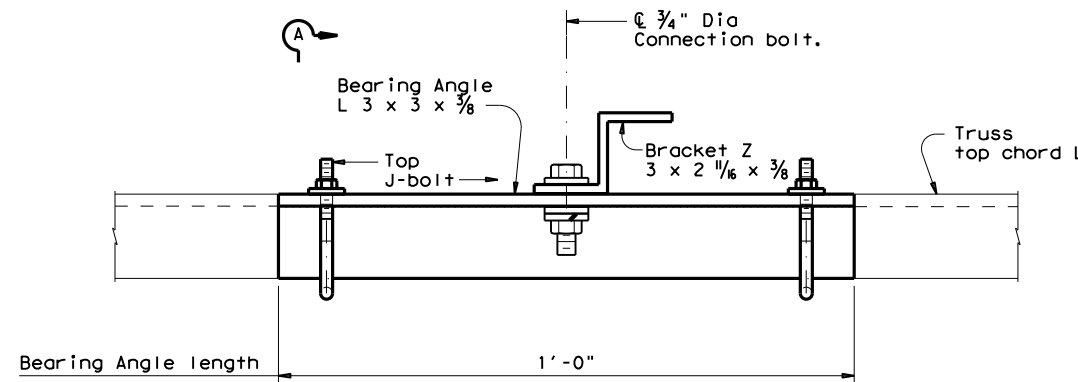
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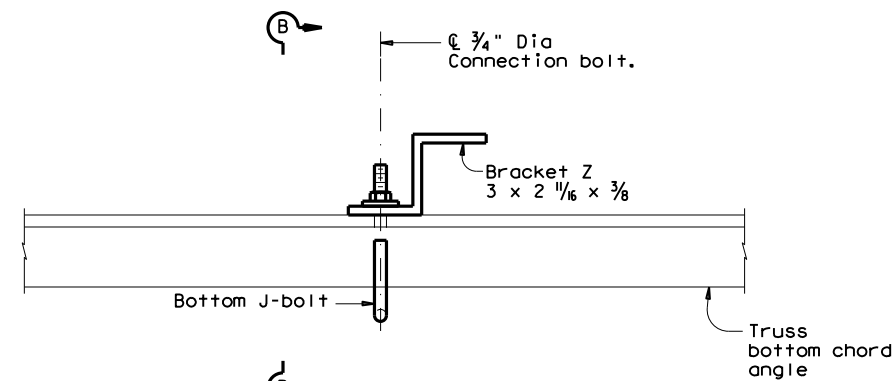
Attachment at Top Chord
 (Showing Chord Angle 3")



Attachment at Bottom Chord
ISOMETRIC VIEW



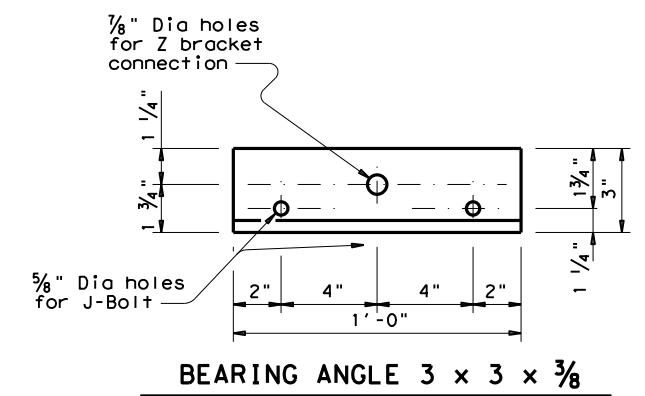
Attachment at Top Chord
 (Showing Chord Angle 3")



Attachment at Bottom Chord
PLAN VIEW

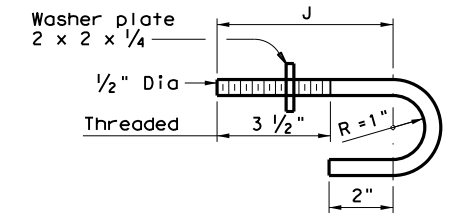
GENERAL NOTES:

- Application of the mounting detailed on Sheet 1 of 3 is limited to a dynamic message sign (DMS) attachment that is not in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
- Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
- All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts except stainless steel shall be galvanized.
- Contractor shall verify applicable field dimensions before fabrication.

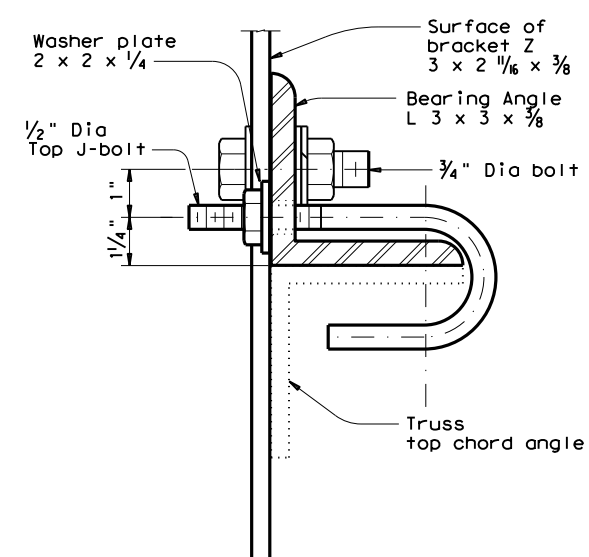


BEARING ANGLE 3 x 3 x 3/8

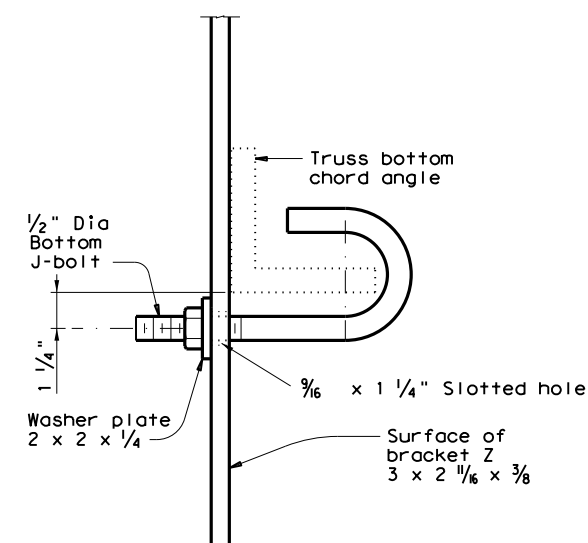
Chord Angle	J
3", 3 1/2", 4"	5 1/2"
5" and 6"	7 1/2"



TOP & BOTTOM J-BOLT



SECTION A-A



SECTION B-B

SHEET 1 OF 3

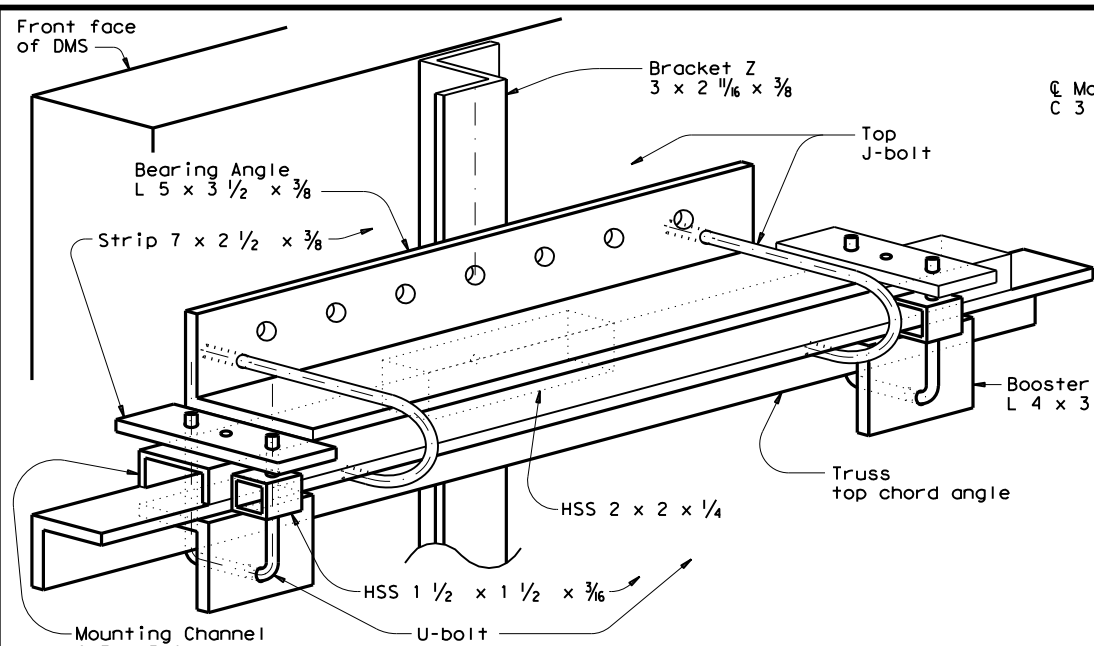


DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (NON BUILD-UP) DMS (TM-1) - 16

FILE: dms-tm-16.dgn	DN: TxDOT	CK: DW: TxDOT	CK:
©TxDOT June 2016	CONT	SECT	HIGHWAY
REVISIONS	0067	06	060 IH0027
	DIST	COUNTY	SHEET NO.
	LBB	HaLe	3.13

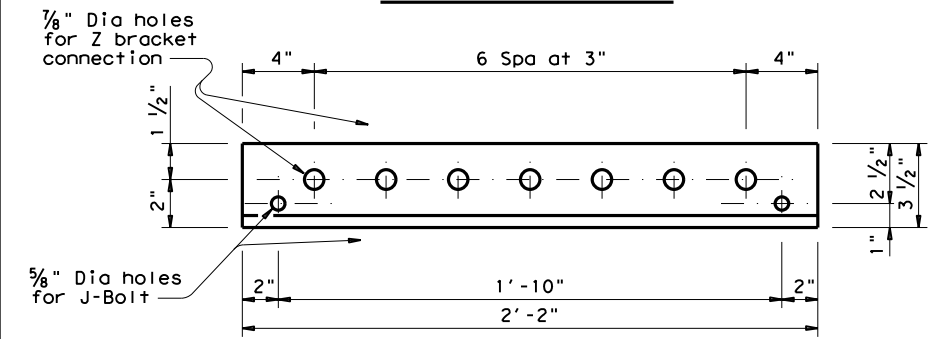
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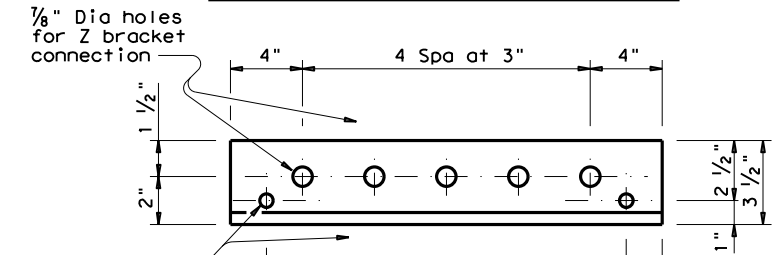


Built-up Attachment at Top Chord
 (Showing Chord Angle 3")

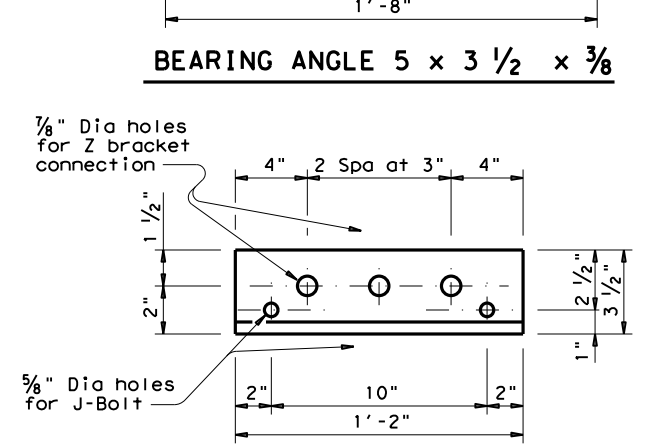
ISOMETRIC VIEW



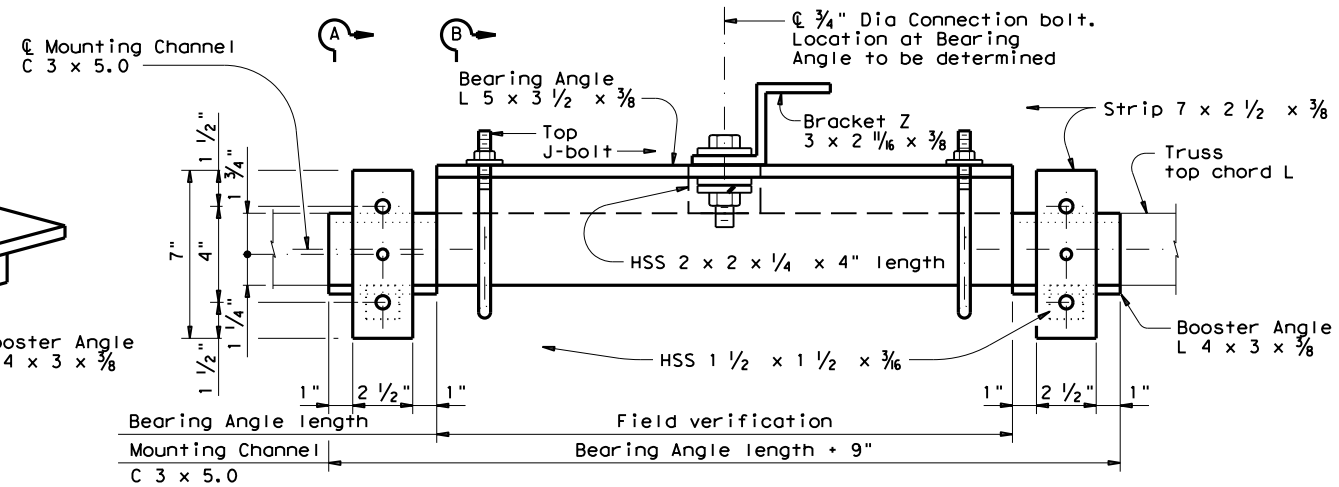
BEARING ANGLE 5 x 3 1/2 x 3/8



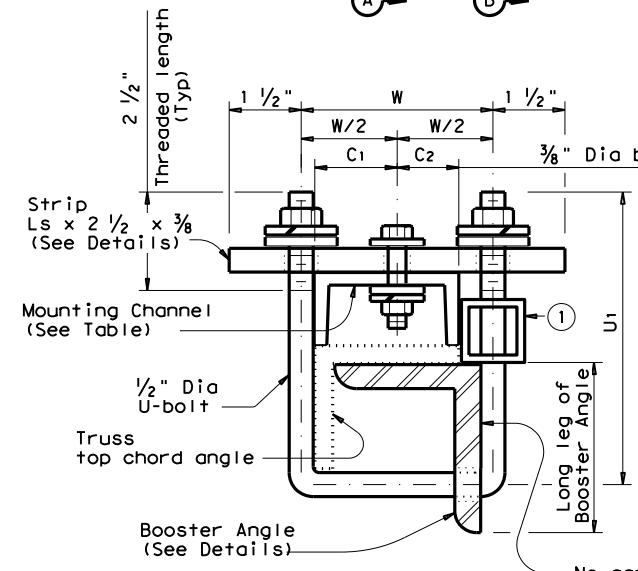
BEARING ANGLE 5 x 3 1/2 x 3/8



BEARING ANGLE 5 x 3 1/2 x 3/8

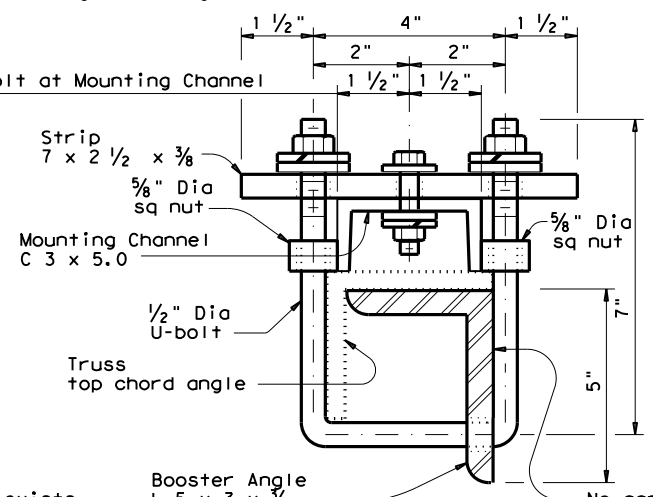


PLAN VIEW (AT TOP CHORD)
 (Showing Chord Angle 3")

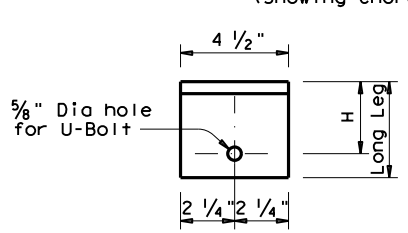


SECTION A-A
 (Showing Chord Angle 3", 4", 5" & 6")

Chord Angle	U1	W	C1	C2	Mounting Channel
3"	7"	4"	1 3/4"	1 1/4"	C3 x 5.0
4"	8"	5"	2 1/4"	1 3/4"	C4 x 7.25
5"	9"	6"	2 3/4"	2 1/4"	C5 x 9.0
6"	10 1/2"	7"	3 1/4"	2 3/4"	C6 x 13

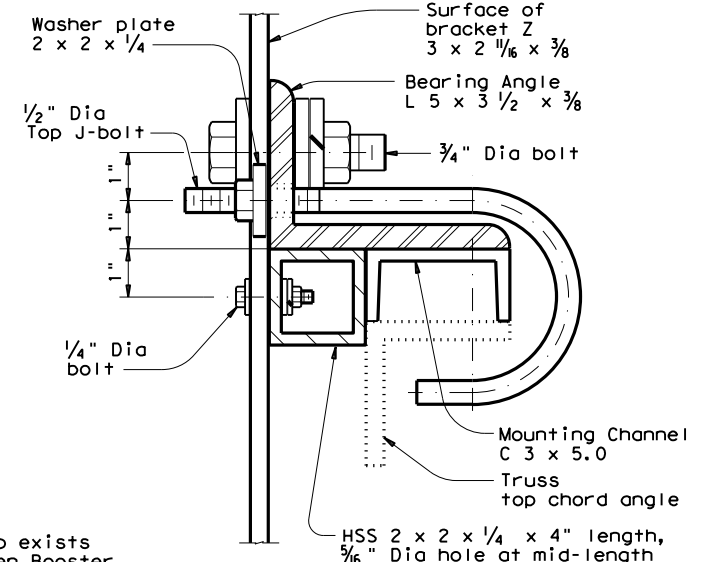


SECTION A-A
 (Showing Chord Angle 3 1/2")

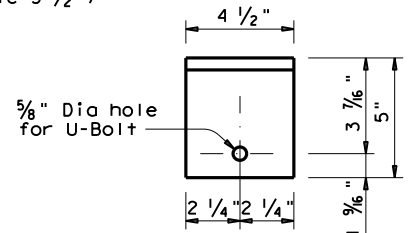


BOOSTER ANGLE
 (For Chord Angle 3", 4", 5" and 6")

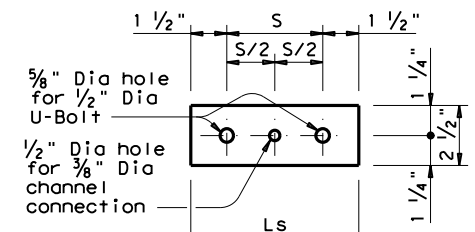
Chord Angle	Booster Angle	H
3"	4 x 3 x 3/8	3"
4"	5 x 3 1/2 x 3/8	3 13/16"
5"	6 x 4 x 3/8	4 13/16"
6"	7 x 4 x 3/8	5 5/8"



SECTION B-B

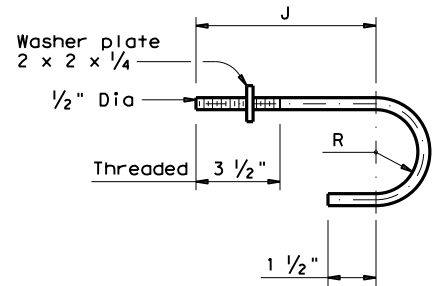


BOOSTER ANGLE 5 x 3 x 3/8
 (For Chord Angle 3 1/2")



Strip Ls x 2 1/2 x 3/8

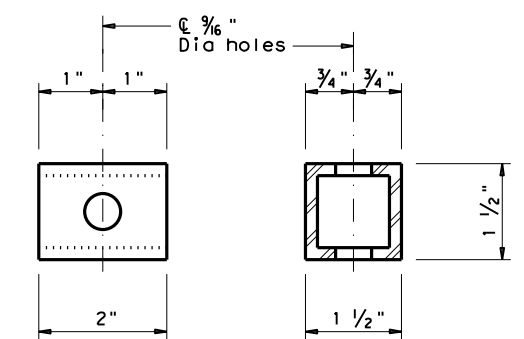
Chord Angle	S	Ls
3"	4"	7"
3 1/2"	4"	7"
4"	5"	8"
5"	6"	9"
6"	7"	10"



TOP J-BOLT

Chord Angle	J	R
3 & 3 1/2"	7"	1 3/4"
4 & 5"	8"	2"
6"	9"	2 1/4"

HSS 1 1/2 x 1 1/2 x 3/8



Texas Department of Transportation Traffic Operations Division Standard

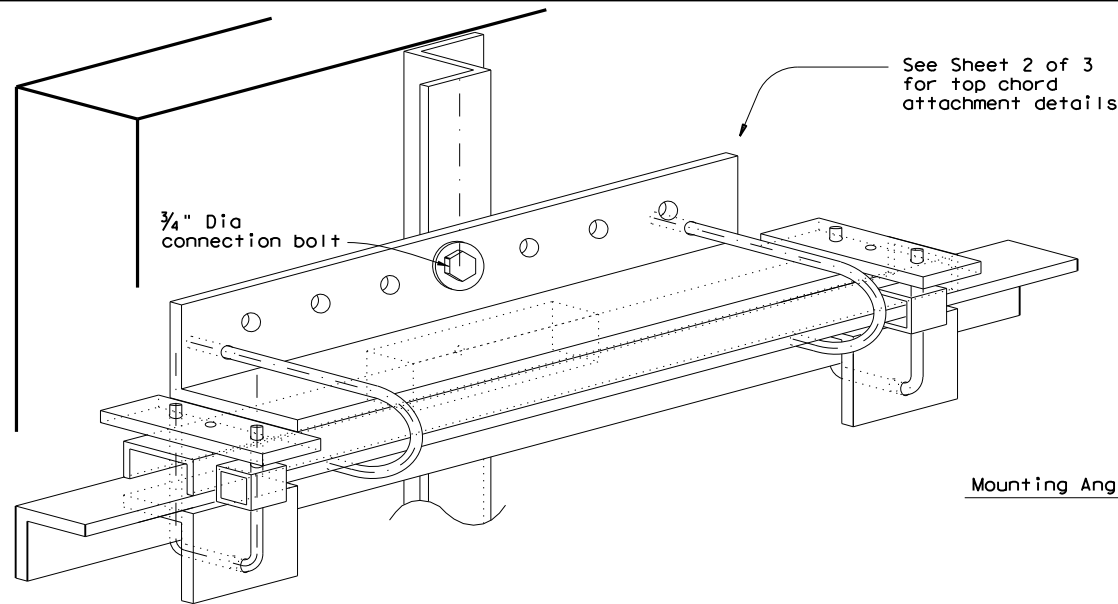
DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)

DMS (TM-2) - 16

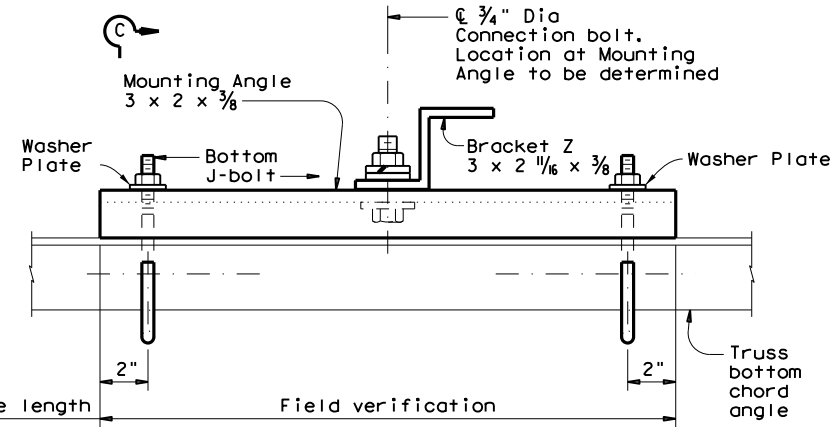
FILE: dms-tm-16.dgn	DWG: TxDOT	CHK: DW: TxDOT	CK:
© TxDOT JUNE 2016	CONT: 0067	SECT: 06	JOB: 060
REVISIONS	LBB	COUNTY: Hale	SHEET NO.: 3, 14

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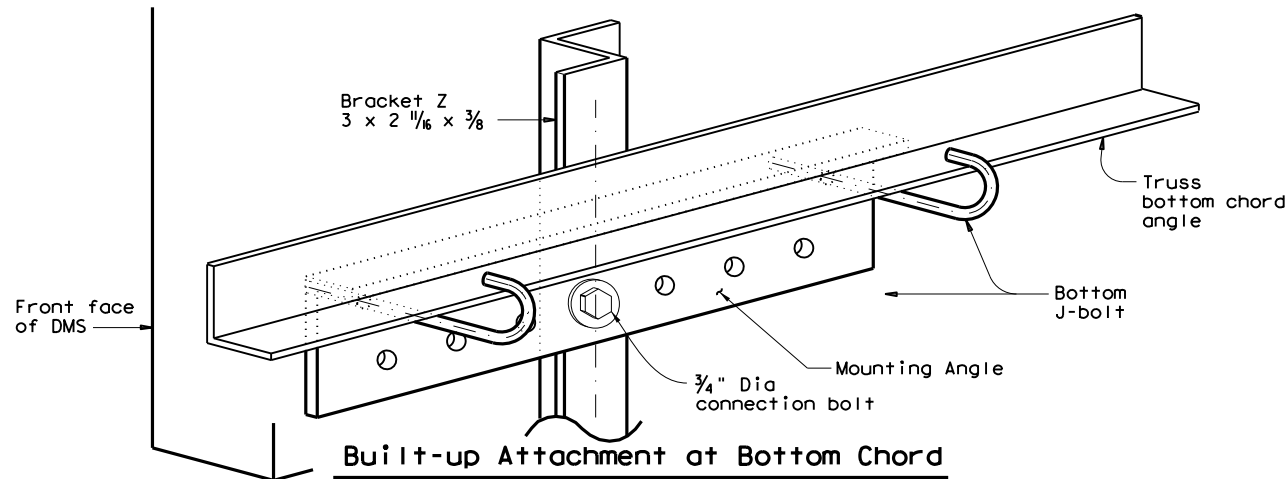
DATE:
FILE:



Built-up Attachment at Top Chord

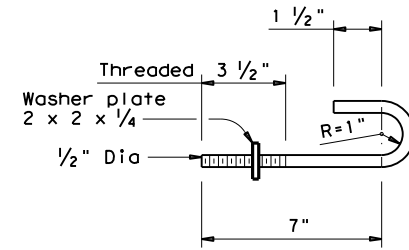


PLAN VIEW (AT BOTTOM CHORD)

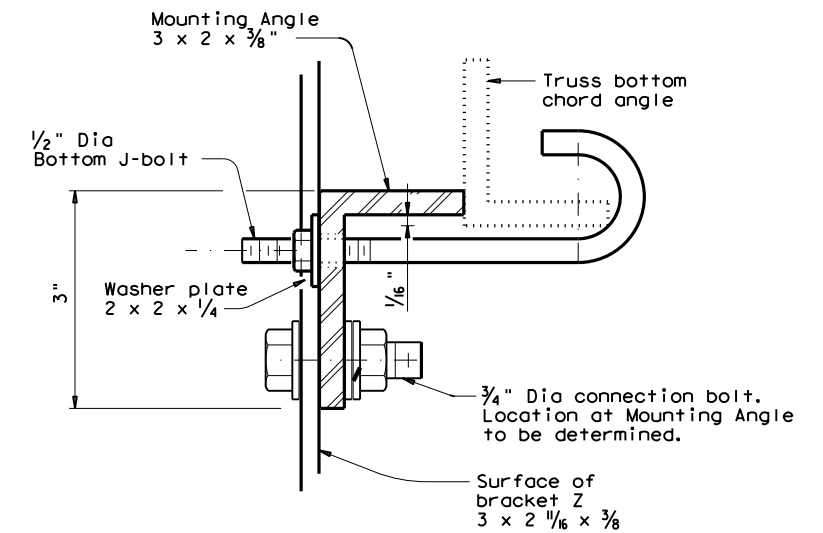


Built-up Attachment at Bottom Chord

ISOMETRIC VIEW



BOTTOM J-BOLT



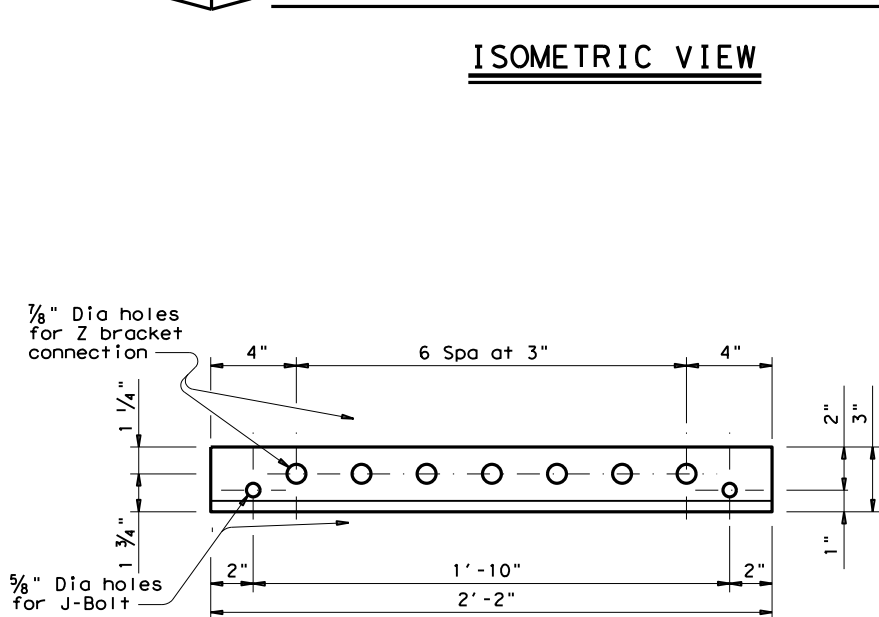
SECTION C-C

SHEET 3 OF 3

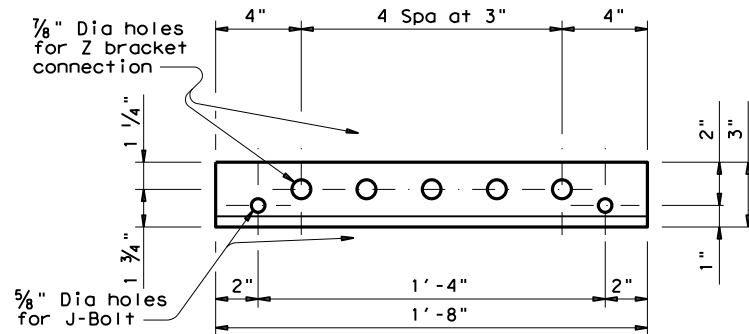
		Traffic Operations Division Standard	
DMS-TO-TRUSS MOUNTING AT OVERHEAD SIGN SUPPORTS (WITH BUILD-UP)			
DMS (TM-3) - 16			
FILE: dms-tm-16.dgn	DN: TxDOT	CK: DW: TxDOT	CK:
© TxDOT JUNE 2016	CONT	SECT	JOB
REVISIONS	0067	06	060
	DIST	COUNTY	SHEET NO.
	LBB	HaLe	3.15

GENERAL NOTES:

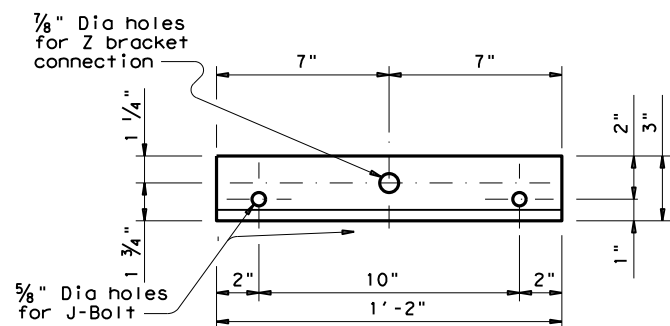
- Application of the built-up detailed on Sheet 2 and 3 of 3 is limited to the dynamic message sign (DMS) attachment which is in conflict with the truss connection bolts at the point(s) of attachment. The overhead sign structure must have adequate capacity to support the DMS. A determination of adequacy shall be made prior to attaching the DMS supports to the truss.
- Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. The Design Sustained Wind Velocity is 100 mph with a gust factor of 1.3. Connections are designed for a DMS weight of 3600 lbs and a design Effective Projected Area (EPA) of 441 sq ft, with the EPA based on a DMS nominal width of 30.5 feet and nominal depth of 8.25 feet plus four top and bottom 1'-8" square flashing beacons. The EPA includes drag coefficients of 1.7 (applied to sign area) and 1.2 (applied to flashing beacon area). A horizontal eccentricity of 1.0 ft from the face of the truss to the center of gravity of the DMS for attachment of DMS is assumed. An even number of Z brackets, spaced at 5 ft max., is assumed to transfer forces through the connection.
- All structural steel shall conform to ASTM A36, A572 Gr 50 or A588. Connection bolts shall conform to ASTM A325 or A449. Each connection bolt shall be provided with 1 heavy hex nut, 2 flat washers, and 1 lock washer. U bolts shall conform to ASTM A307 with 2 hex nuts, 2 flat washers and 2 lock washers. Hollow structural section (HSS) shall conform to ASTM A500, A501, or A847. J bolts and washer plate both shall be Type 304 stainless steel, with bolt minimum yield strength of 50 ksi and an elongation of 16 percent in 2 inches. All parts, except stainless steel shall be galvanized.
- Contractor shall verify applicable field dimensions before fabrication. Various lengths of bearing and mounting angle are provided for suitable mounting. Contractor shall determine the proper bearing and mounting angle length, and the connection along the length at Z bracket to accommodate J-bolt hook. Contractor may substitute HSS for the mounting channel as long as the HSS has equal or greater thickness at the mounting channel. Limit HSS height to achieved mounting clearance.



MOUNTING ANGLE 3 x 2 x 3/8



MOUNTING ANGLE 3 x 2 x 3/8



MOUNTING ANGLE 3 x 2 x 3/8

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GENERAL NOTES FOR ALL ELECTRICAL WORK

- The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
- Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.
- Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
- Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
- When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

- Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
- Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
- Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.



AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

- Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
- Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
- Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
- Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

- Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.
- When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
- Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

- Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
- Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
- Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
- Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
- When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
- Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
- During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
- Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
- Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
- Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
- At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
- Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).
- Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
- File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

			
<p>ELECTRICAL DETAILS CONDUITS & NOTES</p> <p>ED(1) - 14</p>			
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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS) 11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

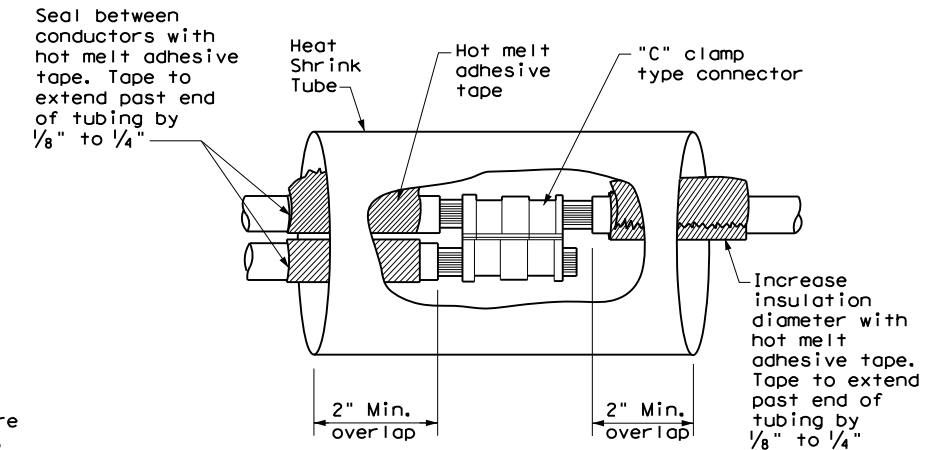
B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.



**SPLICE OPTION 1
Compression Type**

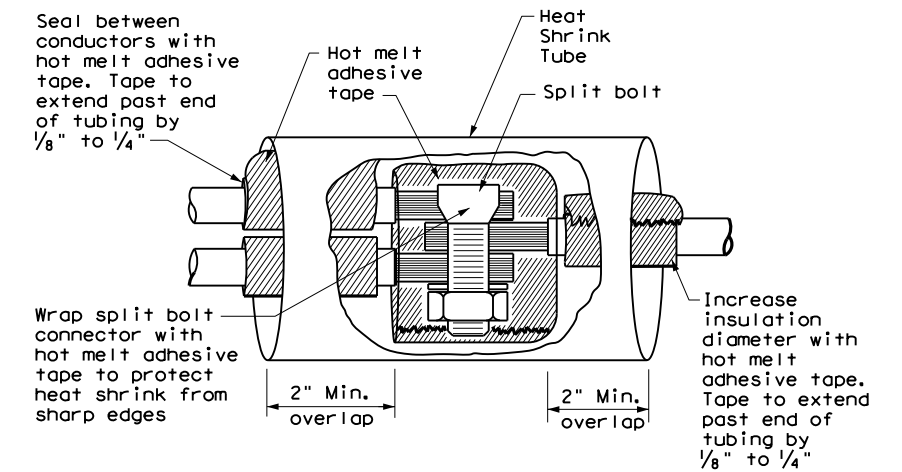
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

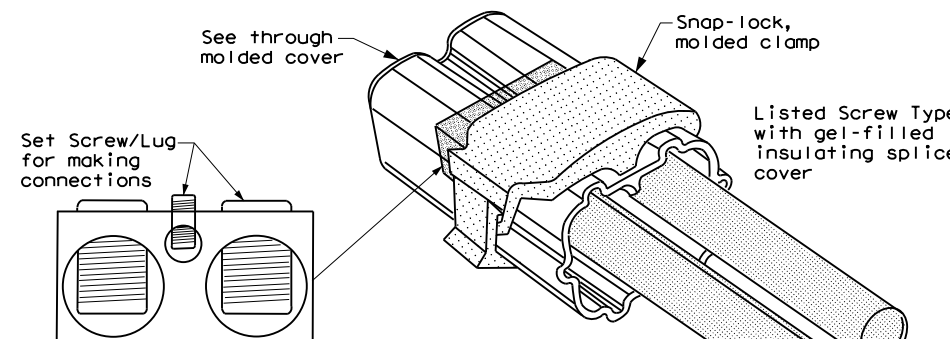
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



**SPLICE OPTION 2
Split Bolt Type**



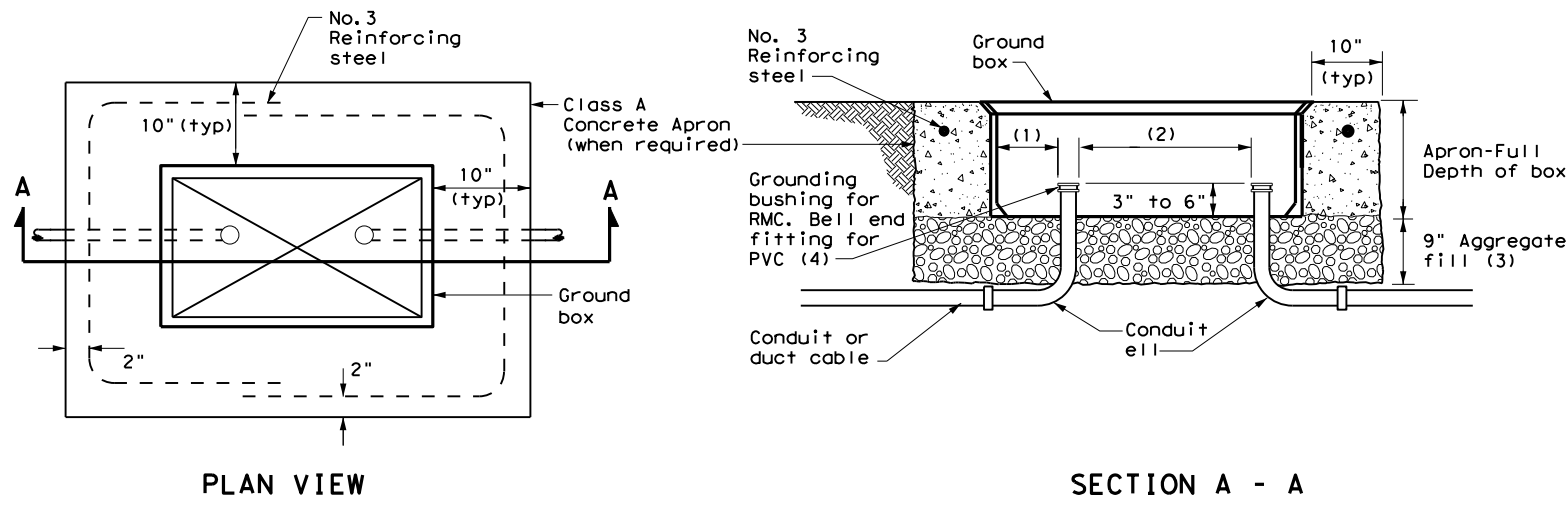
**SPLICE OPTION 3
Listed Screw Type**

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		Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>			
<h2>ED(3) - 14</h2>			
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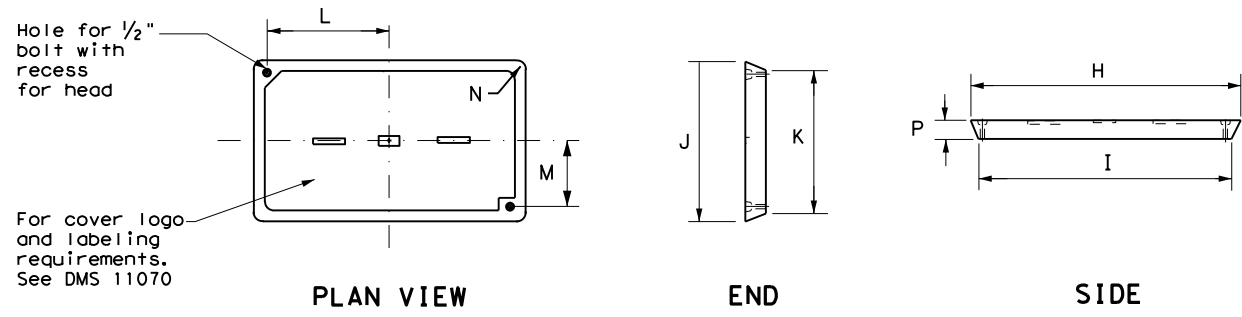


APRON FOR GROUND BOX

- (1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.
- (2) Maintain sufficient space between conduits to allow for proper installation of bushing.
- (3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.
- (4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

GROUND BOX DIMENSIONS	
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS								
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."
2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.
3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.
4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.
2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.
3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.
4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.
5. Temporarily seal all conduits in the ground box until conductors are installed.
6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.
7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.
8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.
9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.
10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.
11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

				Traffic Operations Division Standard	
<h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3> <h4>ED(4) - 14</h4>					
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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
10. Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
12. Ensure all mounting hardware and installation details of services conform to utility company specifications.
13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.
2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photoceII or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

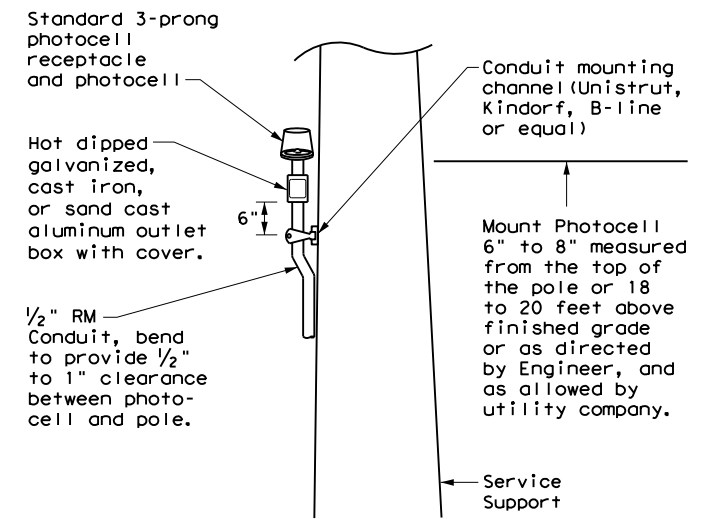
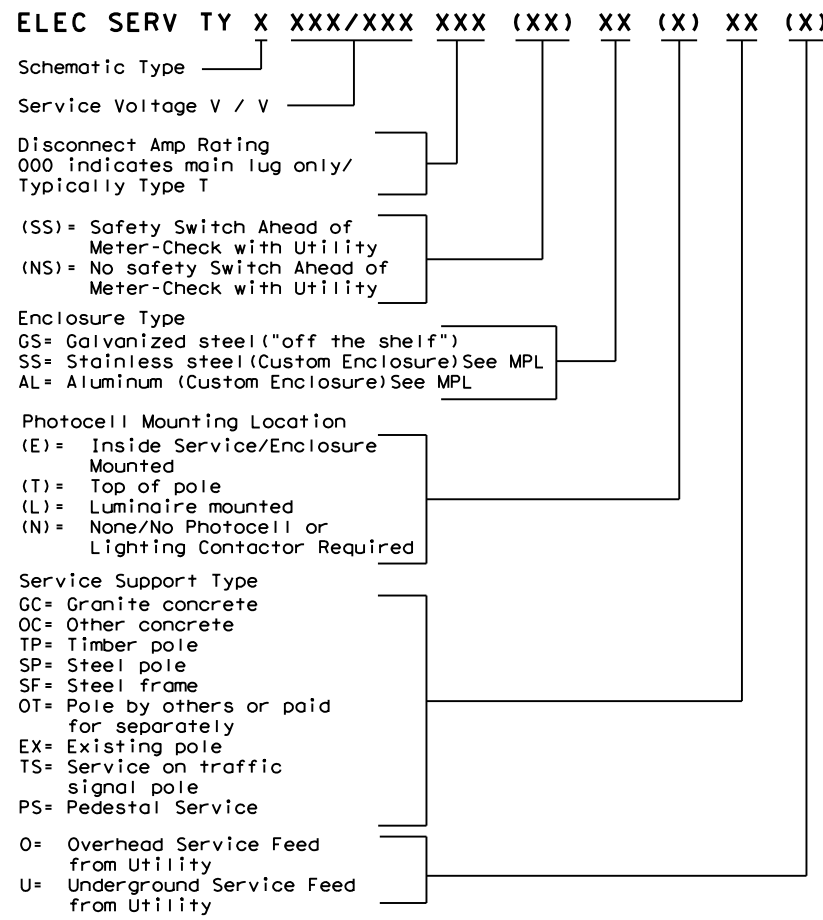
PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit *xSize	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminares	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.
 ** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

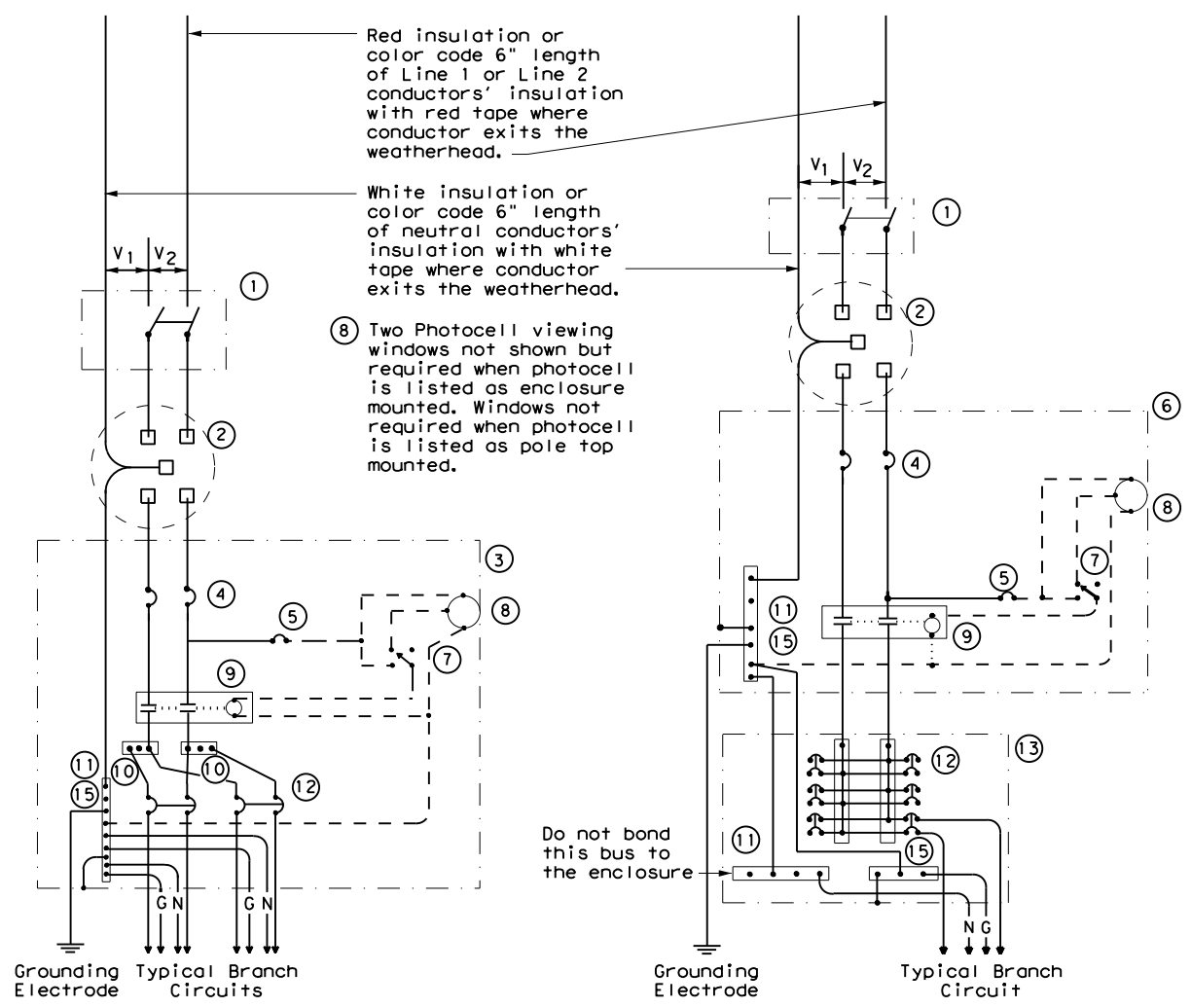
ED(5) - 14

FILE: ed5-14.dgn	DWG: TxDOT	CHK: TxDOT	DWG: TxDOT	CHK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IH0027
	DIST	COUNTY	SHEET NO.	
	LBB	Hale	3.19	

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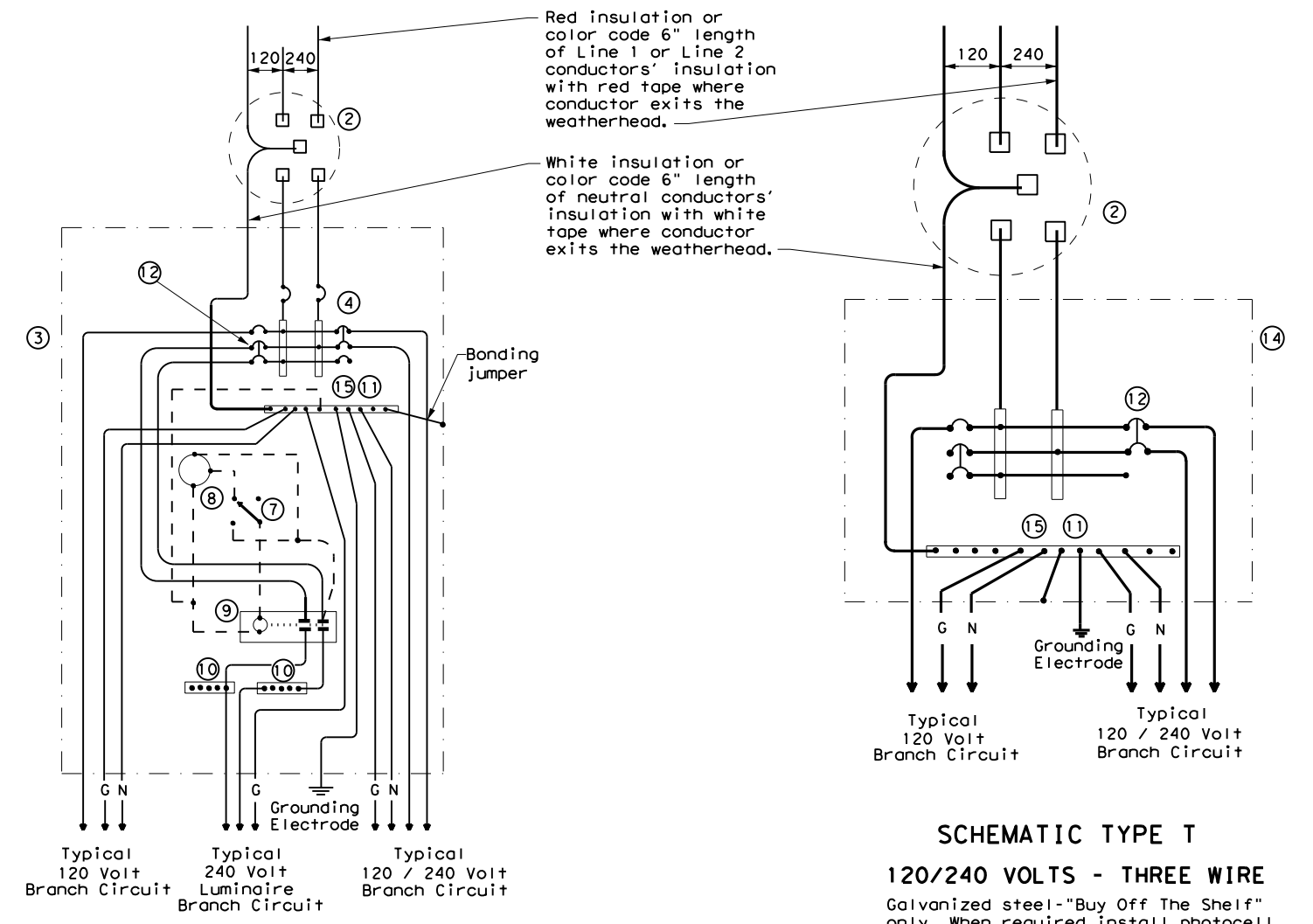
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**SCHEMATIC TYPE A
THREE WIRE**

**SCHEMATIC TYPE C
THREE WIRE**

WIRING LEGEND	
————	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



**SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE**

**SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE**
 Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

				Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES					
ED(6) - 14					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0067	SECT:	06
REVISIONS		JOB:	060	HIGHWAY:	IH0027
DIST:	LBB	COUNTY:	HaLe	SHEET NO.:	3.20

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SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

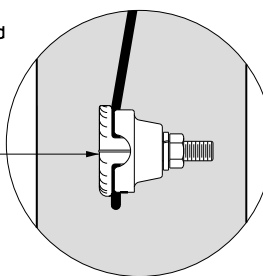
1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ellis in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.
 Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

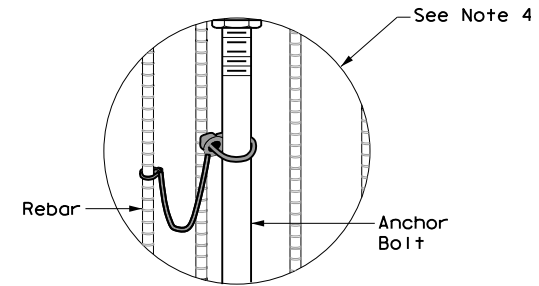
2" to 6" 4" (typ.)
 RMC
 Meter
 Safety Switch
 Inset B
 60" TYP.
 2"
 Class "C" concrete
 RMC
 PVC
 18" Min.
 24 Dia. x 60" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch

WITH SAFETY SWITCH
 WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

Drill, tap, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.

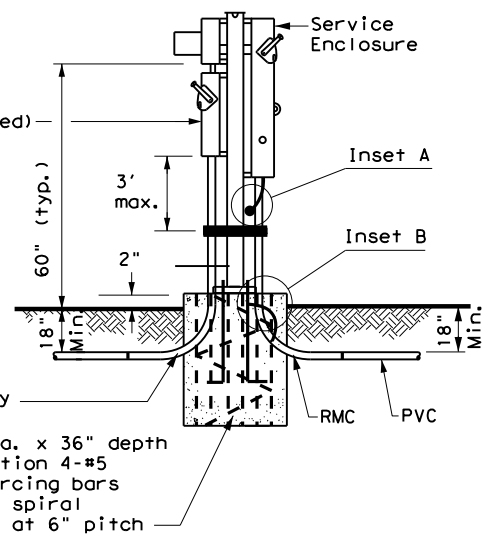


FRONT VIEW
 INSET A

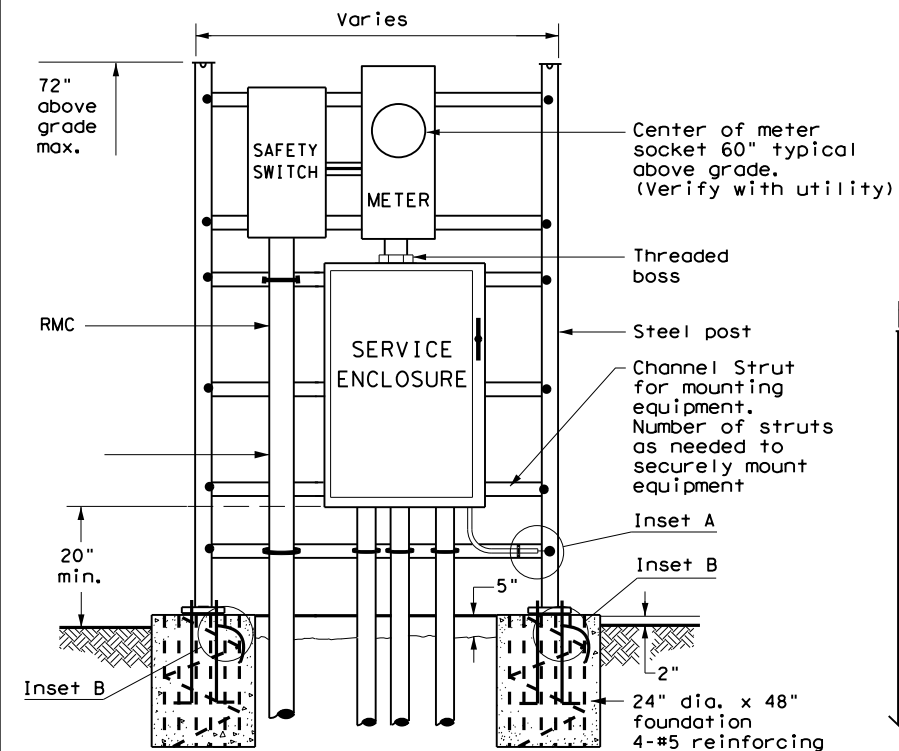


INSET B

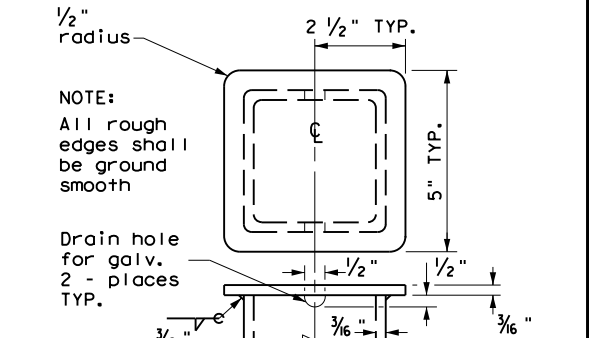
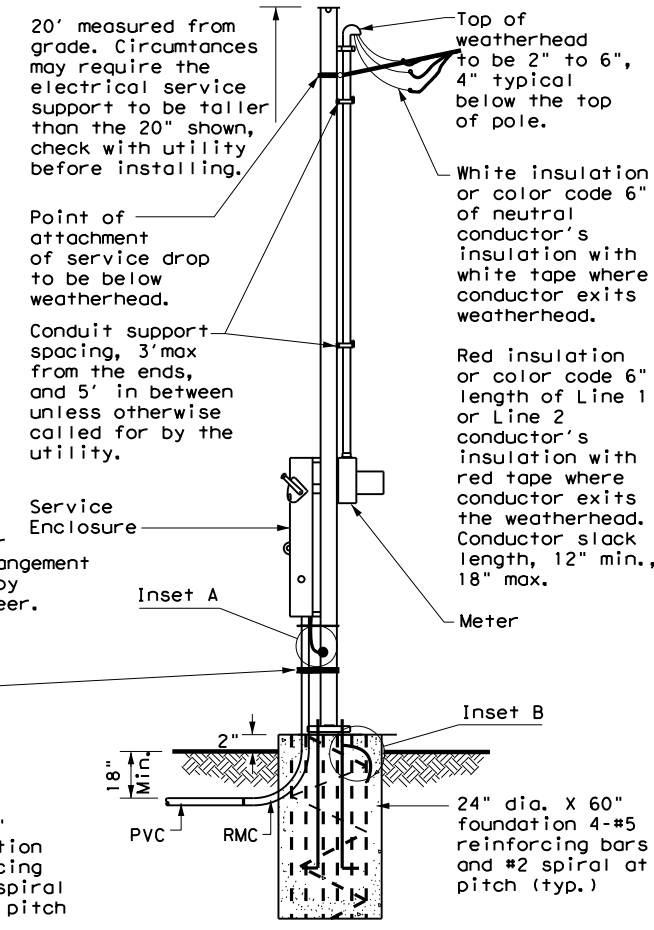
Safety switch (when required)
 60" (typ.)
 3' max.
 2"
 18" Min.
 RMC to utility
 24" dia. x 36" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch



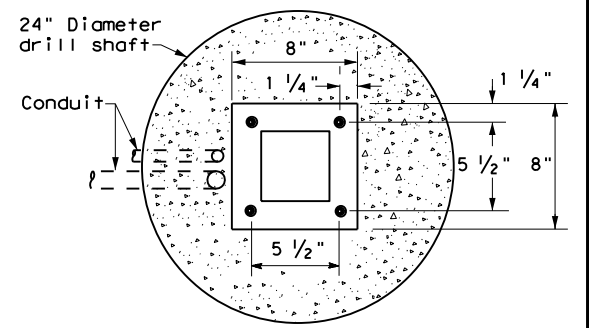
WITH SAFETY SWITCH
 WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



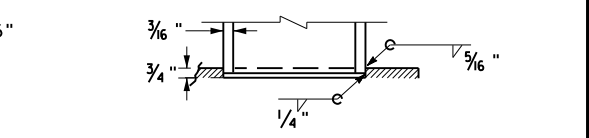
WITH SAFETY SWITCH
 WITHOUT SAFETY SWITCH
SERVICE SUPPORT TYPE SF (U) - UNDERGROUND SERVICE



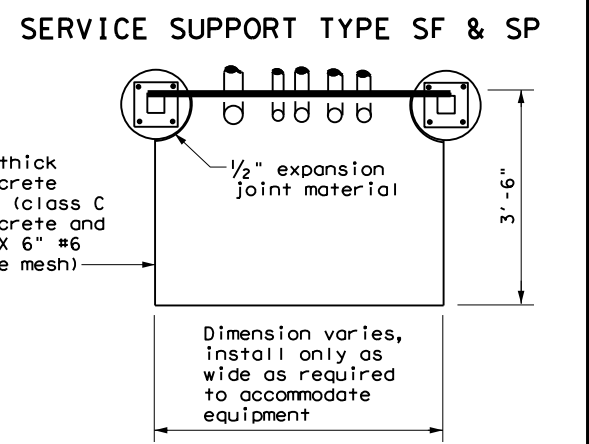
POLE TOP PLATE



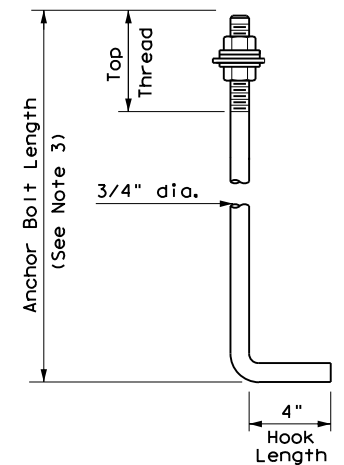
BASE PLATE DETAIL



BOTTOM OF POLE



SERVICE SUPPORT TYPE SF & SP



HOOKED ANCHOR DETAIL

		Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP ED(7)-14			
FILE: ed7-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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REVISIONS	LBB	COUNTY: Hale	SHEET NO.: 3.21

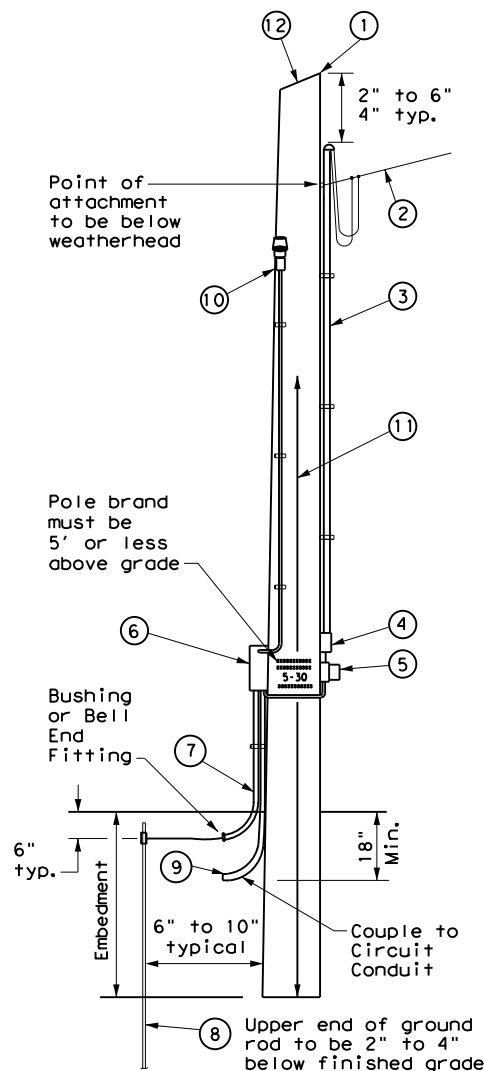
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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to 3/8 in. max. depth and 1 7/8 in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 3/4 in. maximum depth, and 1 1/2 in. to 1 5/8 in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, 1/4 in. minimum diameter by 1 1/2 in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

- 1 Class 5 pole, height as required
- 2 Service drop from utility company (attached below weatherhead)
- 3 Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)
- 4 Safety switch (when required)
- 5 Meter (when required)
- 6 Service enclosure
- 7 6 AWG bare grounding electrode conductor in 1/2 in. PVC to ground rod - extend 1/2 in. PVC 6 in. underground.
- 8 5/8 in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.
- 9 RMC same size as branch circuit conduit.
- 10 See pole-top mounted photocell detail on ED(5).
- 11 When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.
- 12 When required by utility, cut top of pole at an angle to enhance rain run off.

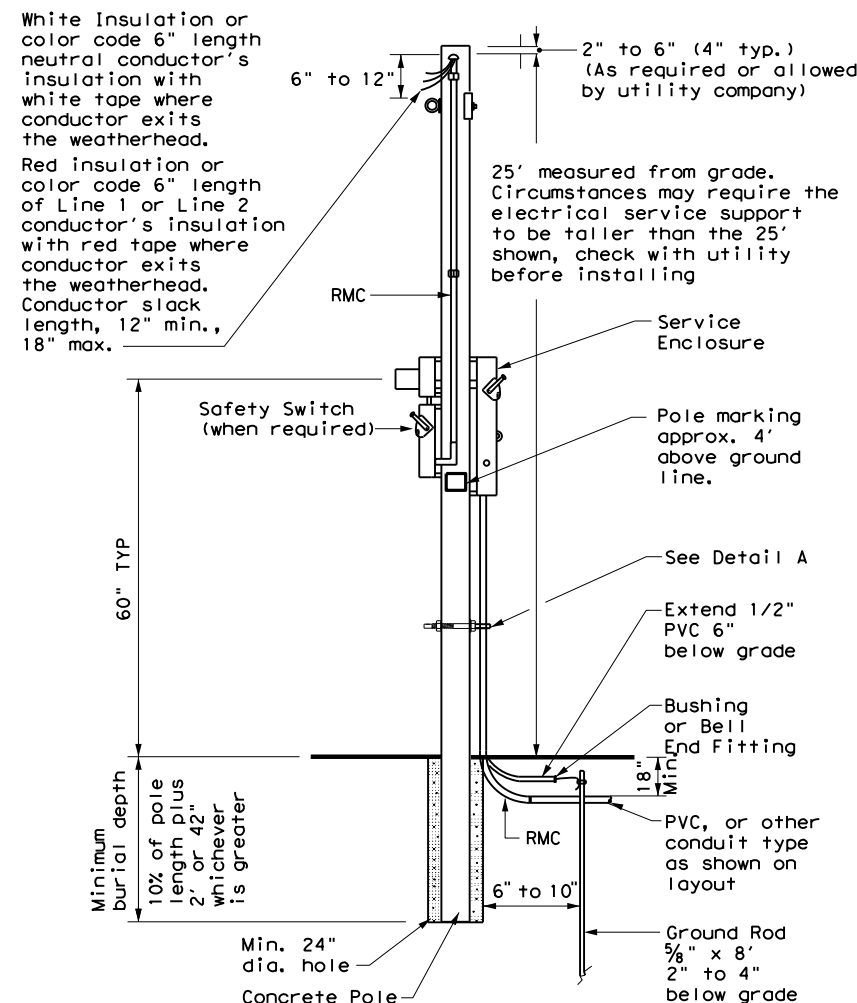


SERVICE SUPPORT TYPE TP (O)

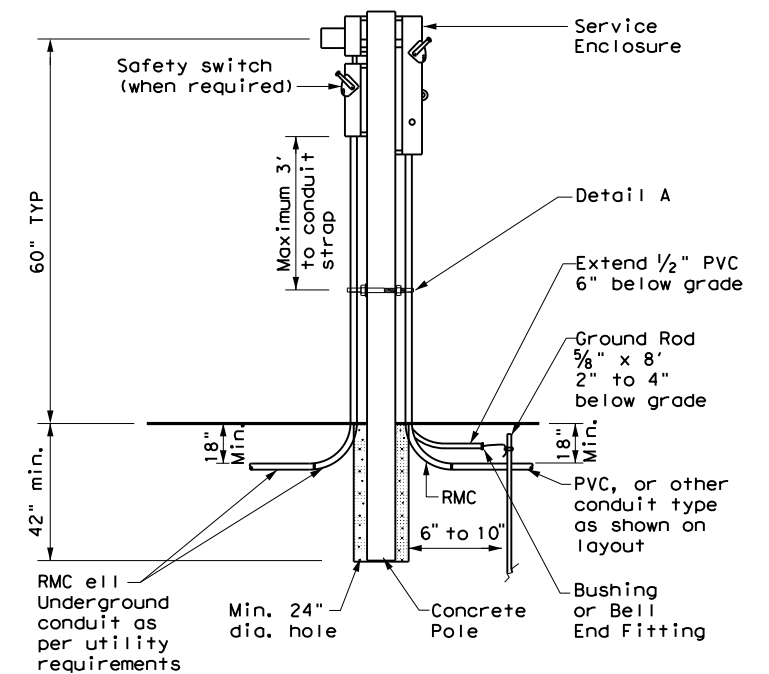
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

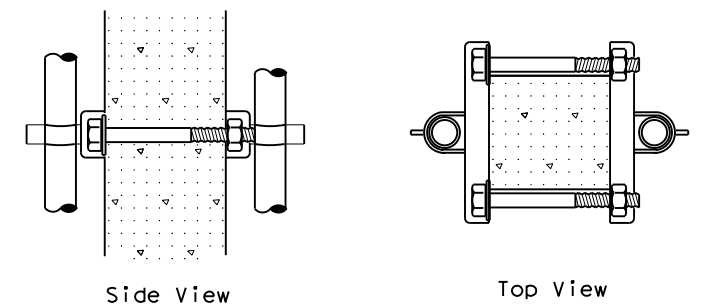
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized or stainless steel channel strut 1 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 in. deep (Unistrut, Kindorf, B-line or equal). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT Overhead (O)



CONCRETE SERVICE SUPPORT Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

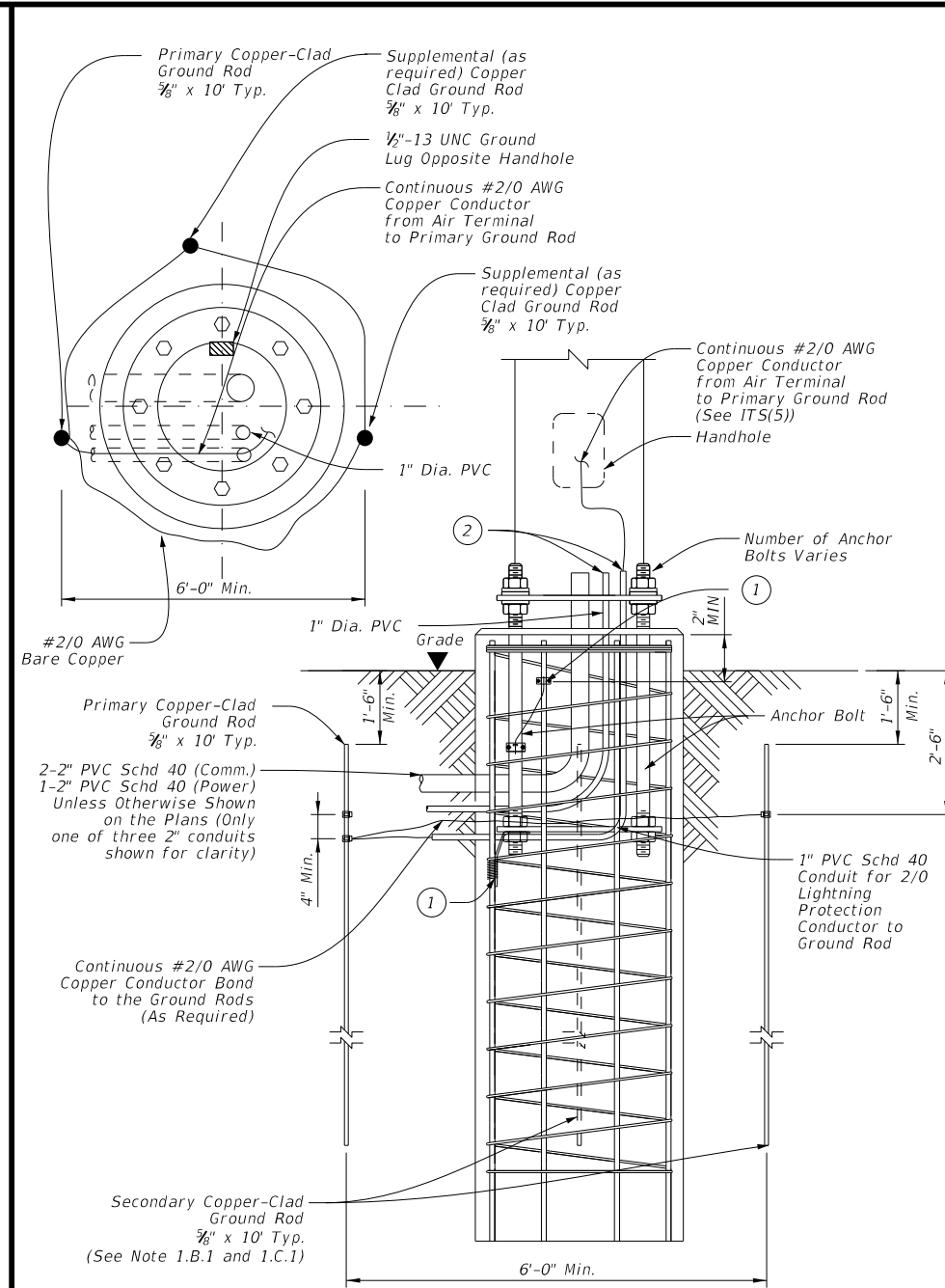
				Traffic Operations Division Standard	
ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP					
ED(10)-14					
FILE:	ed10-14.dgn	DN:	TxDOT	CK:	TxDOT
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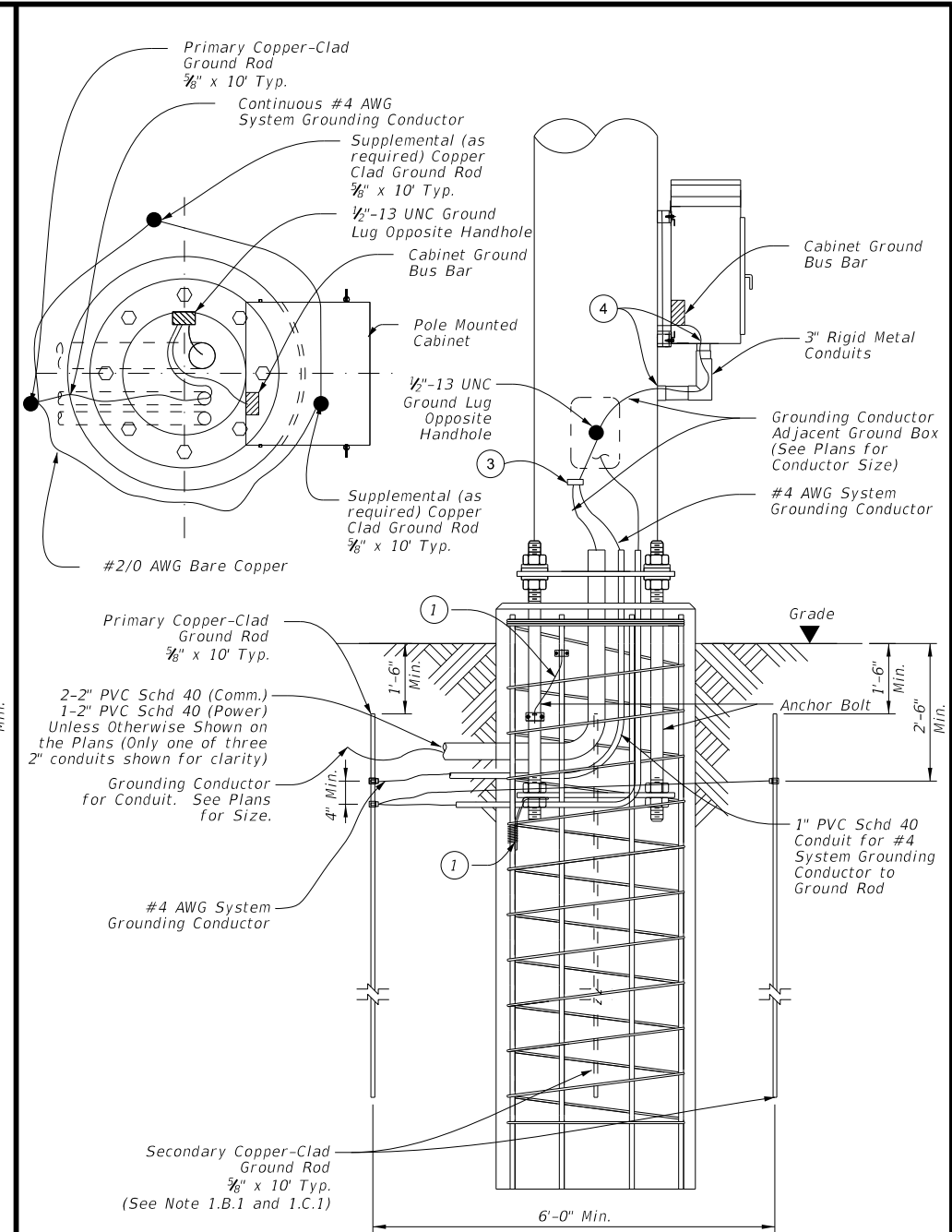
General Notes:

1. Grounding System:
 - A. Description:
 1. Provide ground system consisting of copper wires, ground rods, and concrete-encased grounding electrodes (Ufers), of the configuration shown to minimize potential gradient irregularities, drain leakage, and fault currents to earth.
 - B. Performance:
 1. Provide a grounding system, consisting of a minimum one ground rod, having a resistance not greater than 5 Ohms to ground. Provide up to 2 additional supplemental ground rods if necessary to achieve a resistance not greater than 5 Ohms to ground. If a total of 3 ground rods is needed then install as as part of a ground ring.
 2. If a ground ring is required, provide a minimum conductor length of 20 ft. placed at a minimum depth of 30 in..
 - C. Design Criteria:
 1. The grounding system of the ITS pole may be bonded below grade to the grounding systems of other nearby equipment to meet the specified grounding resistance. A minimum of one ground rod for the ITS pole is still required.
 2. Separately measure the grounding resistance of each system before bonding together below grade.
 3. Only provide UL-approved materials listed for grounding systems.
 4. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture, unless moisture is permanently excluded from the junction of such materials.
 5. Submit product data for the materials and products used to perform the work of this section.
 - D. Materials:
 1. Conductors:
 - a. Bare Ground Conductor:
 - 1) Provide prequalified copper conductors appearing on the Material Producers List according to Item 618.
 2. Ground Compression Connectors:
 - a. Provide molds, thermite packages, and other material for exothermic welding of grounding connections.
 - b. Provide listed compression connectors fully rated to carry 100% of the cable rating and that meet IEEE 837. Provide compression materials from a single manufacturer throughout the project.
 3. Ground Rods:
 - a. Provide copper-clad steel ground rods conforming to the requirements specified in DMS 11040.
 - 1) Diameter: 5/8 in.
 - 2) Length: 10 ft.
 2. Installation:
 - A. Install grounding components and systems in accordance with the requirements specified in IEEE 142.
 - B. System Grounding:
 1. Ground Rods:
 - a. Drive ground rods into the ground until the tops of the rods are a minimum of 18 in. below finished grade.
 - b. If multiple ground rods are needed to meet the minimum resistance of 5 Ohms, space ground rods as evenly as possible, at least 6 feet apart, so conductors will be connected below grade.
 2. Conductors:
 - a. Provide minimum No. 2/0 AWG ground wire for lightning protection from air terminal.
 - b. Provide minimum No. 4 AWG ground wire for system and equipment grounding.
 - c. Using suitable fasteners, securely attach exposed ground wires to structural supports at not more than 2 ft. intervals, where applicable.
 - d. Bends in ground wires greater than 45 degrees are unacceptable.
 3. Cable Connections:
 - a. Use exothermic-welded connections or listed compression connectors for conductor splices and connections between conductors and other components.
 3. Testing:
 - A. Resistance Test:
 1. Test Procedure:
 - a. The ground-resistance measurements of each ground Rod shall be taken.
 - 1) The resistance to ground shall be measured in accordance with the fall-of-potential method specified in IEEE 81 and IEEE 142.
 - 2) Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.
 - b. Test reports shall be prepared that indicate the location of the ground rod, the grounding system, and the resistance and soil conditions at the time the test was performed.
 2. Acceptance Criteria:
 - a. The grounding system must have a resistance not greater than 5 Ohms.
 - b. Do not energize any part of the electrical distribution system prior to the resistance testing of that system's ground rods and grounding system, and submission of the test results for approval.
 3. Inspections:
 - a. Prepare and submit as-built record drawings of the grounding system as installed and test reports for approval.



Grounding System

Not to Scale



Grounding System with Pole Mounted Cabinet

Not to Scale

Reference Notes:

- ① Bond anchor bolts to rebar with #2/0 AWG jumper and two mechanical connectors or by bending No. 3 bar on bottom template as shown and wire tightly with ten turns of No. 10 wire or one mechanical connector. Mechanical connectors shall be UL Listed for concrete encasement.
- ② Cut PVC approximately 1 in. above concrete and install bell or bushing. Align conduit as close as possible to point of attachment to base plate to minimize bends in #2/0 wire.
- ③ Bond grounding conductors via cadweld or mechanical connector, rated for size and number of conductors.
- ④ Provide and install a grounding type bushing on metal conduit terminations. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor.

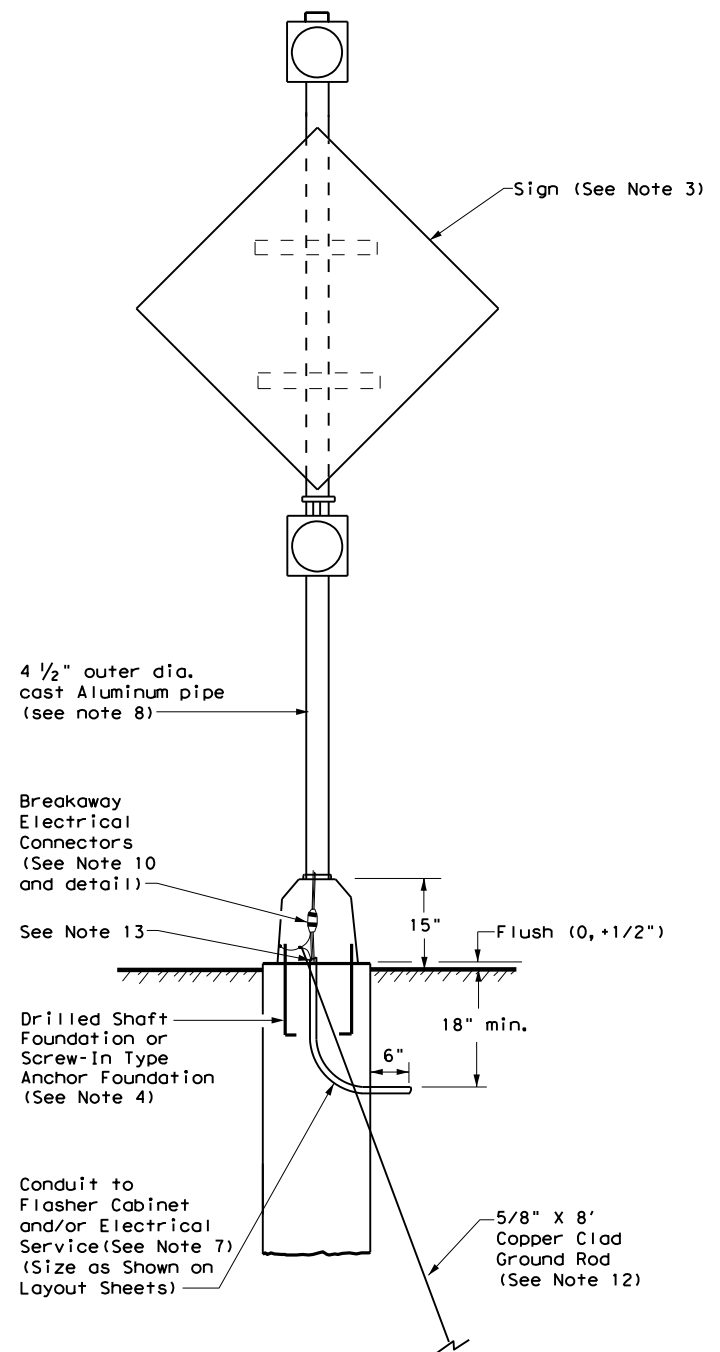
		Traffic Operations Division Standard	
<h2 style="margin: 0;">ITS POLE GROUNDING DETAILS</h2>			
<h3 style="margin: 0;">ITS(19)-17</h3>			
FILE: its(19)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
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7-17	REVISIONS	0067 06	060 IH0027
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	LBB	HaLe	3.23

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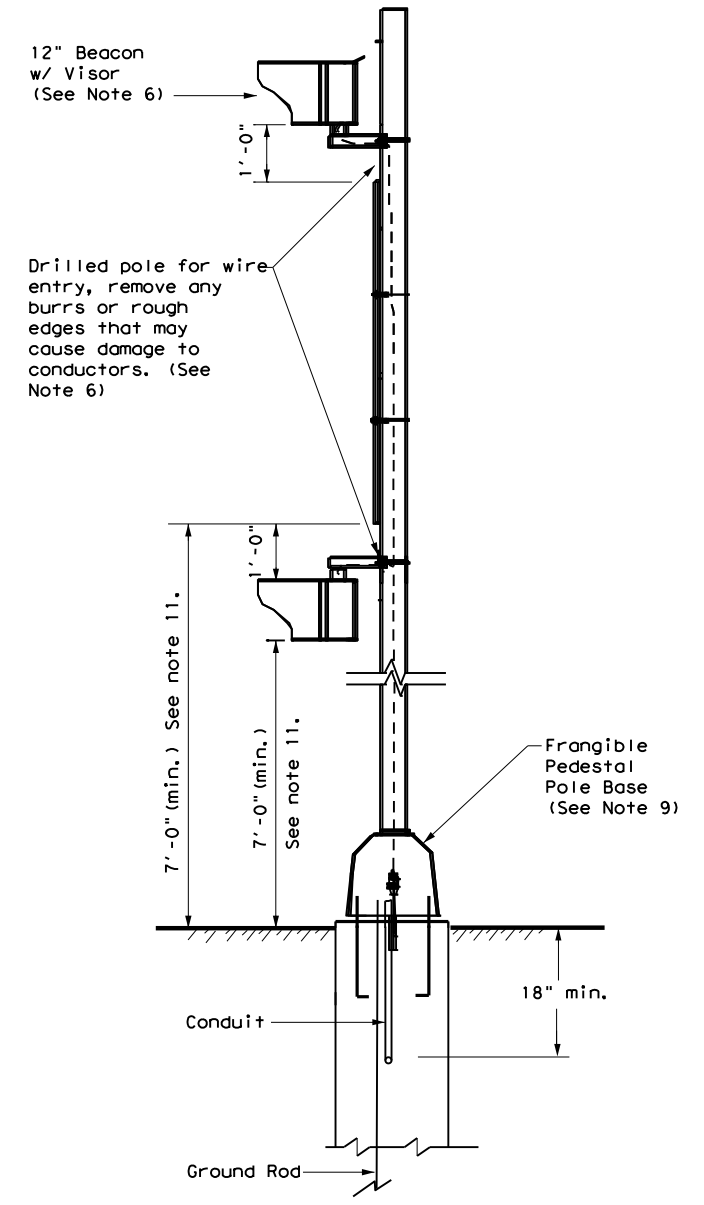
DATE: 12/28/2020 3:12:42 PM
 FILE: c:\txdot\pw_online\txdot2\terry.harris\0472157\rfba-13.dgn

GENERAL NOTES:

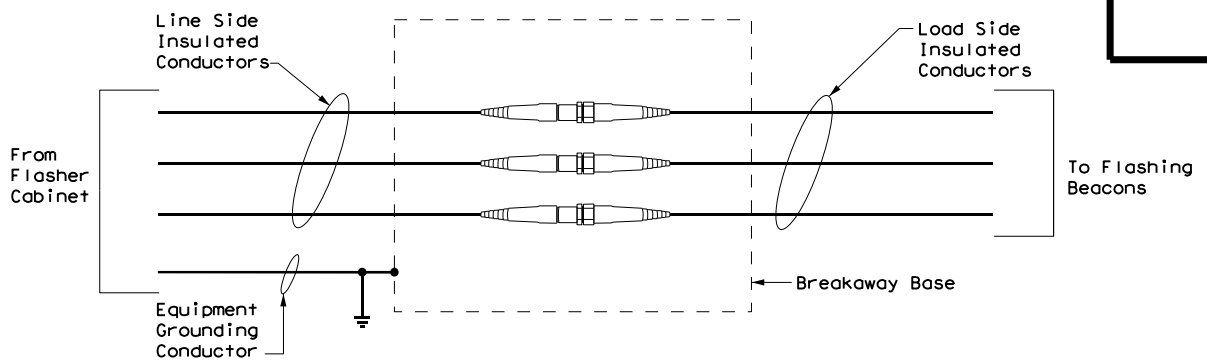
1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
7. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
8. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.
10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug. For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
11. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
12. Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.
13. Ensure height of conduit and ground rod is below top of anchor bolts.



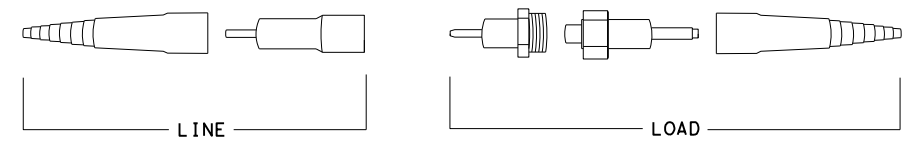
FRONT



SIDE



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



**NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
 EXPLODED VIEW**

Texas Department of Transportation
 Traffic Operations Division Standard

ROADSIDE FLASHING BEACON ASSEMBLY

RFBA-13

FILE: rfba-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0067	06	060	IH0027
5-93 12-04	DIST	COUNTY	SHEET NO.	
10-93 3-13	LBB	HaLe	3.24	
4-98				

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DATE: FILE:

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. N/A
2. No Action Required Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. This project disturbs less than one acre of surface area. The contractor is responsible for any PSL's as defined in the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014 Edition, Item 7, Section 7.7, Page 43). The total disturbed acreage is the combined acreage to be disturbed on the project and any contractor PSL's. This EPIC must be updated if the disturbed area increases to one or more acres during the course of construction. It may become necessary to post a site notice and/or NOI for the project and/or PSL's.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1.
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required
- Required Action

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required
- Required Action

Action No.

1. Comply with Executive Order 13112 on Invasive Plant Species.
2. Comply with TxDOT Executive Memorandum on beneficial landscaping.
3. Comply with temporary and permanent vegetation stabilization protocols of the SW3P.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- No Action Required
- Required Action

Action No.

1. Do not handle or harm Texas horned lizards, prairie dogs, barn swallows or burrowing owls.
2. No prairie dog towns can be damaged or crossed with equipment without approval of the Engineer.
3. No nests of burrowing owls (in prairie dog holes) can be disturbed or damaged between March 1st and July 15th.
4. No nests of barn swallows (likely on structures such as bridges) can be disturbed or damaged between April 15th and July 15th..

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediated area, and contact the Engineer immediately.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corp of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes
- No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes
- No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required
- Required Action

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required
- Required Action

Action No.

1. Maintain equipment muffler systems and work hour restrictions to reduce traffic noise.
2. No PSL's may be located in the prairie dog towns, playa lakes (wet or dry) or stream beds (wet or dry).
3. No dumping of construction material in playa lakes or stream beds regardless of property owner requests.
4. Contractor must obtain historical and archaeological clearances for off-site PSL's.
5. Contractor is responsible for air quality permits for concrete and asphalt batch and similar plants.
6. Contractor is responsible for water appropriation or impoundment TCEQ permits.
7. Contractor will protect environmentally sensitive areas with fencing, work sequencing or scheduling as directed.
8. PSL's beyond the project right-of-way have "individual operator" status under the TPDES Construction General Permit and the Contractor is responsible for the SW3P and any TCEQ permits.
9. No waste material of any type may be placed at any location where it could be washed into a water of the U.S. or a surface water of Texas.
10. Flood elevations will not be increased to a level that would violate flood plain regulations or ordinances.



ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

FILE: epic.dgn	DN: TxDOT	CK: AM	DW: VP	CK: AR
©TxDOT February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0067	06	060	IH 027
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	LBB	HALE	4.01	