

| FEDERAL AID PROJECT NO. | | | |
|-------------------------|--------|-----|-----------|
| F 2B23(180) | | | |
| CONT | SECT | JOB | HIGHWAY |
| 0495 | 05 | 061 | IH 20 LFR |
| DIST | COUNTY | | SHEET NO. |
| TYL | SMITH | | 1 |

DESIGN SPEED = 45 MPH
A.D.T. (2021) = 1051

FINAL PLANS

LETTING DATE: _____
 DATE CONTRACTOR BEGAN WORK: _____
 DATE WORK WAS COMPLETED & ACCEPTED: _____
 FINAL CONTRACT COST: \$ _____
 CONTRACTOR: _____

* REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH BC (1)- 21 THRU BC (12)- 21 AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

**STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION**

**PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT**

FEDERAL AID PROJECT NO. F 2B23(180)
**IH 20 LEFT FRONTAGE ROAD
SMITH COUNTY**

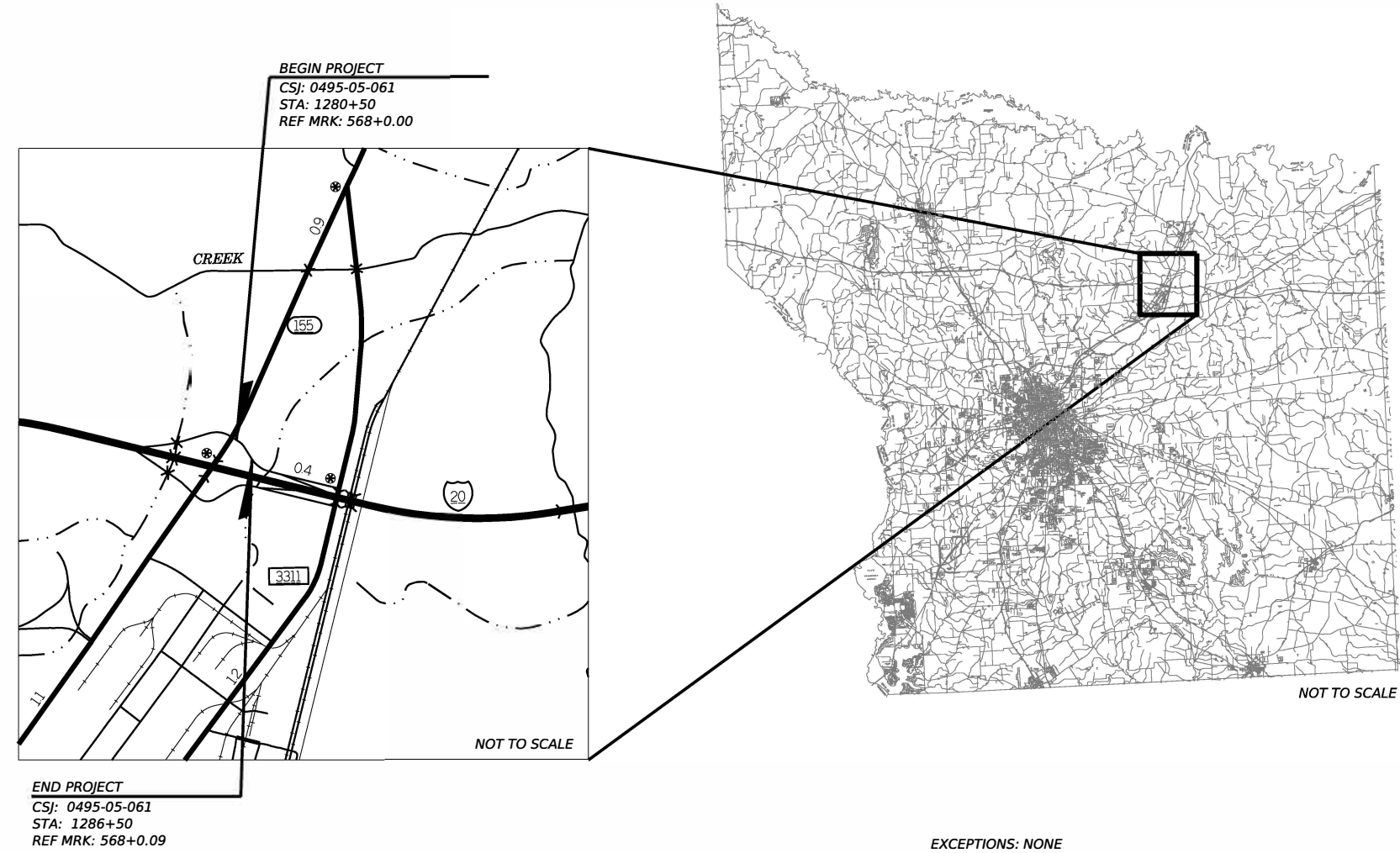
NET LENGTH OF ROADWAY = 600.00 FT. = 0.114 MI.
 NET LENGTH OF BRIDGE = 0,000.00 FT. = 0.000 MI.
 NET LENGTH OF PROJECT = 600.00 FT. = 0.114 MI.

LIMITS: SH 155 INTERSECTION

FOR THE CONSTRUCTION OF AN OVERLAY
 CONSISTING OF ASPHALTIC CONCRETE PAVEMENT, PAVEMENT MARKINGS, SIGNING AND ILLUMINATION

INDEX OF SHEETS

| SHEET NO. | DESCRIPTION |
|-----------|------------------------------|
| 1 | TITLE SHEET |
| 2 | SUPPLEMENTAL INDEX OF SHEETS |



EXCEPTIONS: NONE
 EQUATIONS: IH 20 LFR - 1282+20.30 BK = 1280+28.20 AHD
 RAILROAD CROSSINGS: NONE



RECOMMENDED FOR LETTING: 6/2/2023
 APPROVED FOR LETTING: 6/2/2023

DocuSigned by:
Rolando Mendez
 DISTRICT DESIGN ENGINEER

DocuSigned by:
[Signature]
 DISTRICT ENGINEER

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, JULY 2022)

DATE: 6/1/2023 3:05:26 PM
 FILE: pw://txdot.projectwiseonline.com:TxDOT3/Documents/10 - TYL/Design Projects/049505061/4 - Design/Plan Set/1 - General/IH20LFR_TitleSheet.dgn

CK:
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DocuSigned by:



THE STANDARDS SHEETS SPECIFICALLY IDENTIFIED WITH "##" HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THIS PROJECT.

DocuSigned by:

Eduardo Castaneda, P.E.
A5223B51EF4A408...

6/26/2023

EDUARDO CASTANEDA

DATE



IH 20 LFR
SUPPLEMENTAL
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GENERAL NOTES:**GENERAL.**

Contractor questions on this project are to be addressed to the following individuals:

Paul Schneider

Paul.Scheider@txdot.gov

Travis Singleton

Travis.Singleton@txdot.gov

For Q&A on Proposals navigate to:

<https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors>

Use the dashboard to navigate to the project you are interested in by scrolling or filtering the dashboard using the controls on the left. Hover over the blue hyperlink for the project and click on the link in the window that pops up to view the Q&A.

All relevant project documentation including CTDs and cross sections will still be posted to the districts FTP website.

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

All stockpiles within TxDOT right of way, must not exceed 12 ft. in height and must have 3:1 slope unless otherwise directed. Place stockpiles in a manner that will be outside the horizontal clear zone, will not obstruct traffic or sight distance, and will not interfere with roadway drainage.

Remove all vegetation from pavement edges, intersections, and driveways prior to planing operations, seal coat, or ACP operations. This work will not be paid for directly, but will be subsidiary to the bid items of the Contract.

ATTN: Provide a 20-ft. length per 1-in. depth temporary taper at all transverse joints in the travel lane before opening to traffic. This work will not be paid for directly, but will be subsidiary to the bid items of the Contract.

LITTER PICKUP

Remove litter from the right of way in the project limits a maximum of 3 cycles per year as directed. Litter pickup will not be measured or paid for directly, but will be subsidiary to pertinent Items.

Equipment used for litter pickup must be approved.

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Collect and properly dispose of all litter deposited by construction operations or the traveling public from within the right of way as directed. This includes cans, bottles, paper, plastic items, metal scraps, lumber, etc. Do not dump or stockpile collected litter on Department property.

ITEM 5. CONTROL OF THE WORK

If utility lines need adjustments during construction operations, modify operations and continue the work in a manner that will allow others to make the utility adjustments. Additional working time may be allowed for delays caused by these utility adjustments.

Establish proposed centerlines throughout the project from control points and alignment data as shown on the plans.

Use "Method C" for construction surveying in accordance with Section 5.9.3.

Refer to the horizontal and vertical alignment data summaries for satellite-control point information.

Restrict movement of construction equipment and haul trucks to paved surfaces. Do not cross the median with equipment and haul trucks unless specifically authorized. Use entrance and exit ramps to enter and exit the freeway mainlanes.

Utility locations shown on the plans are approximate. Contact utilities in accordance with Article 5.6., "Cooperating With Utilities."

Verify survey control for accuracy before beginning construction.

Notify the Engineer if there are conflicts with survey control accuracy.

ITEM 6. CONTROL OF MATERIALS

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, submit a notarized original of the TxDOT Construction Material Buy America Certification Form for all items classified as construction materials. This form is not required for materials classified as a manufactured product.

Refer to the Buy America Material Classification Sheet for clarification on material categorization.

The Buy America Material Classification Sheet is located at the link below:

<https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html>

ITEM 7. LEGAL RELATIONS AND RESPONSIBILITIES

Concrete truck drivers and concrete pump operators are required to wash out only in designated areas specifically constructed for eliminating run-off. Dispose of materials in accordance with federal, state, and local requirements.

Maintain positive drainage for permanent and temporary work for the duration of the project. The Contractor will be responsible for any items associated with the temporary or interim drainage and all related maintenance. This work will be subsidiary to various bid items.

The total disturbed area for this project is .137 acres. The disturbed area in this project and the Contractor Project Specific Locations (PSL's) within 1 mile of the project limits for the Contract will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. Obtain any required authorization from the TCEQ for any Contractor PSL for construction support activities on or off the ROW. When the total area disturbed for all projects in the Contract and PSLs within 1 mile of the project limits exceed 5 acres, before disturbance, provide a copy of the Contractor NOI for PSLs on the ROW and within 1 mile of the project limits to the Engineer and to any local government that operates a Municipal Separate Storm Sewer System (MSSS).

In accordance with Article 7.9, provide and maintain adequate, neat and sanitary toilet accommodations within the project limits for employees, including State employees.

No significant traffic generator events identified.

ITEM 8. PROSECUTION AND PROGRESS

Working days will be computed and charged in accordance with Section 8.3.1.1., "Five-Day Workweek."

Prepare the progress schedule as a bar chart.

ITEM 9. MEASUREMENT & PAYMENT

In accordance with Article 9.1., "Measurement of Quantities," furnish the tare and maximum gross weights as well as the volume capacity of all vehicles, trucks, truck-tractors, trailers, semi-trailers, or combination of such vehicles used to deliver materials for this Contract. Also, furnish calculations supporting these weights and capacities. Provide all measurements required for pay a minimum of 2 days before the trucks are used.

ITEM 164. SEEDING FOR EROSION CONTROL

Mow tall vegetation prior to placement of erosion control measures in order to provide optimal growing conditions. This work will not be paid for directly, but will be subsidiary to the bid items of the Contract.

Provide a Bonded Fiber Matrix that meets the current requirements of the Approved Products List for Item 169, "Soil Retention Blanket, Class 1, Type D, Spray Type Blanket," for both permanent and temporary seeding. Install according to manufacturer's recommendations based on a slope steeper than 3:1 with sandy soils. This Item will be paid for under Item 164.

ITEM 166. FERTILIZER

Place fertilizer at the rate of 1 lb. per 9 sq. yd. on areas prepared for seeding.

ITEM 168. VEGETATIVE WATERING

Apply water to all newly placed sod or seeded areas the same day of installation. Maintain the sod or seeded areas in a sufficiently watered condition. Do not allow sod or seeded areas to dry out so that water stress is evident.

ITEM 314. EMULSIFIED ASPHALT TREATMENT

Before application, dilute the emulsion with water up to a maximum dilution of 50% at a distribution rate of 0.30 gal. per sq. yd.

ITEM 316. SEAL COAT

During surface treatment application, if existing conditions warrant, vary the lane widths, transitions, and intersection areas as directed.

Perform rolling as directed with equipment complying with Section 210.2.4.2, "Medium Pneumatic Tire." This work will not be paid for directly, but will be subsidiary to pertinent Items.

Do not apply asphalt later than 1 hour before sunset unless otherwise approved.

The Engineer will approve stockpile sites for materials. Locate stockpile site a minimum of 30 ft. from the roadway unless otherwise authorized. Place stockpiles in a manner that will not interfere with access from abutting property and will not obstruct traffic or sight distance. Avoid stockpiling at intersections. Notify the Engineer at least 5 working days prior to stockpiling material to secure approval of the site. The Engineer may approve stockpiling of materials closer

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than 30 ft. from the travelway if adequate barricades and devices are furnished and approved. Keep stockpile clear of debris and vegetative growth as approved.

Keep the material pushed into one pile at each stockpile location. Upon completion of each reference project, provide stockpile sites that are clear of debris and dressed in a manner as approved.

Clearly sign stockpile locations with Contractor's name & project name, as approved. This will not be paid for directly, but will be subsidiary to Item 316.

ITEM 354. PLANING AND TEXTURING PAVEMENT

Use a front-end loader or other suitable equipment at the stockpile site to properly stockpile the planed material as required.

ATTN: Vary planing locations to meet field conditions as directed. Begin and end planing at a sawed or planed vertical joint to provide a smooth transition to existing pavement. Provide a 20-ft. length per 1-in. depth temporary taper at all transverse joints in the travel lane before opening to traffic.

Before opening planed areas to traffic, bevel vertical or near vertical longitudinal faces in the pavement surface.

Furnish a small planing machine as approved for planing small areas and street intersections.

If unsuitable weather or other unexpected conditions do not allow planed areas to be overlaid, provide and maintain warning signs for overnight lane closures in accordance with the traffic control plan sheets until overlay operations are complete.

Retain all RAP generated from this project.

ITEM 502. BARRICADES, SIGNS, AND TRAFFIC HANDLING

The traffic control plan for this Contract consists of: the installation and maintenance of warning signs and other traffic control devices shown on the plans; specification data, which may be included in the general notes; applicable provisions of the Texas Manual on Uniform Traffic Control Devices (TMUTCD); traffic control plan sheets included on the plans; standard BC sheets; Compliant Work Zone Traffic Control Device List, and Item 502 of the standard specifications.

Use ground-mounted sign mounts with two posts for all temporary work zone signs unless otherwise directed.

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Inspect and correct deficiencies each day throughout the duration of the Contract. In accordance with Article 502.4., "Payment," no payment will be made for the month if the Contractor fails to provide or properly maintain signs and devices in compliance with Contract requirements. Temporary warning signs that are visible when conditions do not apply will be considered improper maintenance of signs.

Provide at least one employee on call nights and weekends (or any other time that work is not in progress) for maintenance of signs and traffic control devices. This employee must have an address and telephone number near the project, as approved. Notify the Engineer in writing of the name, address, and telephone number of this employee. The Engineer will furnish this information to local law enforcement officials.

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee available to respond on the project for emergencies and for taking corrective measures within 30 minutes.

Sign all roads intersecting the project in accordance with current BC standards.

Refer to the traffic control plan sheets for traffic handling through the work area. Contractor may vary the signing arrangement and spacing as necessary to fit field conditions; however, any proposed changes in the traffic control plan must be approved before implementation.

When the sequence of work is shown on the plans, the Contractor may submit an alternate proposal for approval. Submit in writing all proposed variations and revisions.

High-visibility safety apparel is required for workers in accordance with the General Notes on current BC standards.

Place and maintain signs, channelizing devices, and flaggers to direct and route traffic at any location and for any period of time as may be required or directed.

When operations require a lane closure, provide cones, vertical panels, drums, signs, flaggers, and flashing arrow panels as necessary to route traffic around the closed lane as shown on the plans and as directed. Lane closures will be limited to one specific lane as directed.

Lane closures will not be allowed before 8 A.M. unless otherwise directed.

Unless otherwise approved, construction operations will not be allowed on Good Friday, Easter weekend, the Friday before Memorial Day thru Memorial Day, July 4th, the Friday before Labor Day thru Labor Day, the Wednesday before Thanksgiving Day thru Sunday, Christmas Eve, Christmas Day, New Year's Eve, New Year's Day, or on any other high traffic days or holidays as determined by the Engineer.

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Erect R4-1 (Do Not Pass) and R4-2 (Pass With Care) signs to mark existing no-passing zones as directed. (These signs will not be required if these zones will not be eliminated during construction.)

Maintain existing roadside signs within this project's limits during this Contract. In order to accommodate the grading or other operations, temporarily relocate these signs in accordance with the TMUTCD as directed. Use ground-mounted sign mounts with two posts for all relocated signs unless otherwise directed. This work will not be paid for directly, but will be subsidiary to Item 502.

Provide truck-mounted attenuators (TMA) as shown on the appropriate traffic control plan sheets. Provide a letter certifying that all TMA used on this project meet NCHRP 350 or AASHTO Manual for Assessing Safety Hardware (MASH) requirements.

Regulate all construction activities and equipment to minimize inconvenience to the traveling public. At points where it is necessary for trucks to stop, load, or unload, provide warning signs and flaggers to protect the traveling public.

The pavement must be entirely open to traffic each night. Remove or clearly barricade all material stockpiles, equipment left overnight, or any obstruction within 30 ft. of a travelway as approved.

The Contractor Force Account "Safety Contingency" is intended to be used for work zone enhancements that could not be foreseen in the project planning and design stage for the purpose of improving the effectiveness of the Traffic Control Plan. 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.

Provide flaggers at county roads, commercial driveways, and other intersecting roadways deemed necessary by the Engineer to maintain control of the work zone during one-lane two-way operations. Provide communication radios to each flagger in the work zone and the pilot vehicle operator.

Lane closures will not be allowed on IH 20 on Saturday, Sunday, or after 12 P.M. on Friday.

When a culvert extension, inlet construction, or safety end treatment, etc. is within 30 ft. of a travel lane, delineate these areas as shown on current BC standards. In addition, provide a 4-ft. high plastic construction fence at or around any structure or obstruction that would be a hazard to pedestrians unless otherwise approved. Erect fence using a minimum of 4-T-posts, one at each corner of the structure or obstruction.

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Where there is excavation adjacent to the pavement edge, provide adequate warning signs, vertical panels, drums, and lights at the pavement edge as directed. Treat pavement drop-offs created by ACP operations in a similar manner in accordance with the details shown on the plans.

When excavation is required next to a travel lane carrying traffic and widening is not completed by the end of the day's operation, place sufficient backfill against the edge of the travel lane in order to provide a 3:1 slope, unless otherwise permitted on the plans. Provide backfill containing a durable crushed stone type of flexible base or other materials as approved. When work resumes on this excavated area, carefully remove and dispose of the backfill material. Materials and labor for this work will not be paid for directly, but will be subsidiary to the various bid items of the Contract.

Prior to beginning work, the Contractor and Engineer must agree on the allowable length of lane closure.

Provide 3 electronic Portable Changeable Message Sign (PCMS) units adjacent to the mainlanes in advance of each lane closure. PCMS units must be in accordance with Section 6F.60 of the TMUTCD, applicable standards and special provisions. Depending on conditions, message boards may have to be relocated during daily operations. Messages will be in accordance with current BC standards. When not in use, remove PCMS units from the right of way. Measurement and payment for the PCMS noted above will be in accordance with Item 6001. The term "operational" is defined as displaying a message in direct support of current project operations as approved and directed by the Engineer.

Restrict movement of construction equipment and haul trucks to all paved surfaces. Do not allow construction equipment and haul trucks to cross the median unless specifically authorized. Use entrance and exit ramps for ingress and egress to the mainlanes.

All work required by these general notes, except as provided for by Item 502, will not be paid for directly, but will be subsidiary to Item 502 unless otherwise shown on the plans.

ITEM 504. FIELD OFFICE AND LABORATORY

Provide a facility at the asphalt concrete pavement plant for use by the Engineer as a laboratory. This is an existing requirement of Item 6, Article 5, "Plant Inspection and Testing," of the Standard Specifications. Provide a facility meeting the requirements of Item 504. At a minimum meet the requirements of 504.2.2.4, "Ty D Structure (Asphalt Mix Control Laboratory)" and 504.2.2.4.1, "Asphalt Content by Ignition Method." In addition, provide the following: At least one exterior door opening with a 48-in. minimum width. If steps are required to gain access to the facility's 48-in. door, provide a landing dock with minimum dimensions of 60 in. wide by 60 in. deep. The strong floor and landing of the facility should support the weight of all equipment and personnel providing a stable, essentially zero deflection during testing operations, acceptable

to the Engineer. Provide a printer/fax/scan copier capable of printing 8.5" x 11" and 11" x 17" paper sizes and internet connectivity with a minimum of 100 mbps. This facility will be required of all projects with plant produced asphalt concrete pavement.

No direct payment will be made for Engineer field labs. All construction, maintenance, utilities, custodial services, security, and permits necessary to establish and maintain readiness of this facility is the responsibility of the Contractor. This building/facility is required by the standard specifications and is considered a standard part of any asphalt concrete pavement plant producing materials for Department projects.

Furnish a Superpave Gyratory Compactor calibrated in accordance with Tex-241-F for molding production samples. The Superpave Gyratory Compactor will not be paid for directly, but will be subsidiary to the asphalt concrete pavement Items of work.

ITEM 506. TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS

Remove dirt, silt, rocks, debris, and other foreign matter that accumulates in all structures due to project erosion and Contractor's operations. Keep stream channels open at all times. This work will not be paid for directly, but will be subsidiary to this Item.

The total disturbed area for this project is .137 acres. The disturbed area in this project, all project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. Obtain any required authorization from the TCEQ for any Contractor PSLs for the construction support activities on or off right of way. When the total area disturbed for all projects in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, before disturbance, provide a copy of the Contractor NOI for PSLs on the right of way to the Engineer (to the appropriate MS4 operator when on an off-State system route).

The Engineer will provide copies of documents to meet TxDOT's posting requirements. Laminate, post, and maintain these documents at the project limits and at major roadways intersecting the project as directed. Post required Contractor documents in the same manner and location. This work will be subsidiary to Item 506.

ITEM 585. RIDE QUALITY FOR PAVEMENT SURFACES

Ride quality requirements are waived.

ITEM 610. ROADWAY ILLUMINATION ASSEMBLIES

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Texas Department of Transportation (TxDOT) Material Producer List. Category is "Roadway Illumination and Electrical Supplies." Fuse holder is shown on list under Items 610 & 620. Provide 10 amp time delay fuses.

Fabricate steel roadway illumination poles in accordance with TxDOT standards RIP-2019 (Roadway Illumination Poles -2019). Poles fabricated according to RIP-2019 require no shop drawings.

Alternate designs to RIP-2019 or the use of aluminum to fabricate poles will require the submission of shop drawings electronically.

For instructions on submitting shop drawings electronically go to ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf

ITEM 618. CONDUIT

Furnish couplings and connections that are made wrench tight. All conduit must be brought into a ground or junction box and elbowed unless otherwise shown on the plans.

Place conduit in an area not exceeding 2 ft. in any direction from a straight line between terminal points. The minimum depth of the conduit should be 2 ft. except when crossing a roadway where the depth should not be more than 3 ft. nor less than 1 ft. below the bottom of the base material when placed by the jacking or boring method.

Where conduit is to be placed under existing riprap, cut the existing riprap to neat lines as directed and replace to match original condition after conduit placement.

The Contractor may, at his option, substitute high-density polyethylene (HDPE) conduit meeting the specifications of Item 622 for all bores requiring PVC schedule 40 conduit and, when approved by the Engineer, may substitute HDPE for schedule 80 bored conduit. HDPE must be the same size as the PVC conduit shown on the plans. HDPE must be terminated with UL listed fittings. HDPE may be threaded and used with threaded PVC connectors or couplings. HDPE should be extended through the bore in one continuous piece and should be coupled to RMC elbows or to PVC conduit at the bore pits prior to entering ground boxes (if ground boxes are required by the plans). HDPE should not contain conductors during installation in this manner.

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No additional compensation will be paid to the Contractor when HDPE is substituted for this purpose.

The polymer concrete barrier box will not be paid for separately, but will be subsidiary to Item 618, "Conduit."

Use materials from prequalified material producers list as shown on the Material Producer List found on the TxDOT web site. Category is "Roadway Illumination and Electrical Supplies."

ITEMS 618 & 624. CONDUIT & GROUND BOXES

The location of the controller, conductors, conduits, junction boxes and ground boxes are diagrammatic only and may be shifted by the Engineer to accommodate field conditions.

ITEM 620. ELECTRICAL CONDUCTORS

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Material Producer List found on the TxDOT web site. Category is "Roadway Illumination and Electrical Supplies."

Fuse holder is shown on list under Items 610 & 620.

Provide 10 amp time delay fuses.

ITEM 624. GROUND BOXES

All ground boxes will be precast polymer concrete of the size and type specified on the plans.

ITEM 636. SIGNS

Install signs in accordance with the Department of Transportation's "Sign Crew Field Book," latest edition, or as directed.

All signs removed from the project are deemed salvageable and become the property of the Department. Stockpile salvageable material at the Tyler Maintenance Section located at 15986 SH 155 S, TYLER 75703.

ITEM 644. SMALL ROADSIDE SIGN ASSEMBLIES

Sign types for which details are not shown on the plans must conform to "Standard Highway Sign Designs for Texas," latest edition.

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Before construction begins, locate all Texas Reference Marker (TRM) signs and Adopt-a-Highway signs using survey control methods for accuracy. Provide the survey data to the Engineer. If either type of sign is relocated during construction activities, survey the sign location and notify the Engineer before placement of the permanent sign.

Stake all sign locations for approval prior to placement.

ITEM 666. RETROREFLECTORIZED PAVEMENT MARKINGS

Use the spray method for application of the thermoplastic compound for lane lines, barrier lines, edge lines and channelizing lines.

Extrude hot to the pavement surface thermoplastic compound for arrows, stop lines, yield triangles, transverse lines, crosswalk lines, words and symbols.

For lengths greater than 300-ft, provide guide markings that will not leave a permanent mark on the roadway. Have the guide marking material and equipment used for placement approved prior to use. Provide adequate notification for approval of the guide markings prior to placement of the permanent pavement markings.

Provide a crew experienced in the work of installing pilot guideline markings and in the necessary traffic control. Supply all the equipment, personnel, traffic control, and materials necessary for the placement of pilot guideline markings as directed. All work will be in conformance with Part 6 of the TMUTCD.

Correct deficiencies in the alignment of pavement markings at Contractor's expense, as directed. Use a strip seal with aggregate and asphalt types and rates as directed to eliminate the deficient pavement markings.

ITEM 1002. LANDSCAPE AMENITY

Place trash bin as directed by the Engineer. Trash bin must be a front end loaded container, at least 4 cubic yards, made of metal, and lidded.

ITEM 3077. SUPERPAVE MIXTURES

When using crushed gravel as a coarse aggregate for ACP, use 1% lime as an antistripping agent.

Provide coarse aggregate for the final surface course from the same source or blended sources unless otherwise directed.

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Give the State inspector at the spreading and finishing machine one weight ticket for each load of material. When directed, weigh asphaltic concrete loads on public scales to ensure the proper weight of material.

For materials paid for by the ton, provide a summary spreadsheet in accordance with Article 520.2, "Equipment."

Provide minimum Class B coarse aggregate for the surface as listed in the Department's *Bituminous Rated Source Quality Catalog* (BRSQC).

Use an electrical impedance (non-nuclear) measurement gauge to determine mat segregation and joint density for Part V and Part VIII of test procedure Tex-207-F. Do not use nuclear density gauges or thin lift gauges for segregation or joint density determinations. Data reporting for mat segregation and joint density must be performed on Department templates.

All RAP used on this project must be fractionated. If an existing mix design is submitted for use as Warm Mix Asphalt (WMA), then a new trial batch with passing Hamburg Wheel test results is required.

Apply a tack coat with a rate of 0.10 gal/sy of residual asphalt between each layer of ACP pavement unless otherwise directed.

On Table 1, under 3077.2.1.3, the Sand equivalent, % Min is voided and not replaced. The minimum percent for the sand equivalent must be 45 for the combined aggregate.

ITEM 6001. PORTABLE CHANGEABLE MESSAGE SIGN

Provide 3 electronic Portable Changeable Message Sign (PCMS) units adjacent to the mainlanes in advance of each lane closure. PCMS units must be in accordance with Section 6F.60 of the TMUTCD, applicable standards and special provisions. Depending on conditions, one or all message boards may have to be relocated during operations. Messages will be in accordance with current BC standards. When not in use, remove PCMS units from the right of way. Measurement and payment for the PCMS noted above will be in accordance with Item 6001. The term "operational" is defined as displaying a message in direct support of current project operations as approved and directed by the Engineer.

ITEM 6185. TRUCK MOUNTED ATTENUATOR (TMA)

Shadow vehicles with truck mounted attenuator (TMA) are required on the traffic control plan and TCP standards for this project. The Contractor will be responsible for determining if one or more of these traffic control operations will be ongoing at the same time to determine the total

Project Number:

Sheet 3F

County: SMITH

Control: 0495-05-061

Highway: IH 20 LFR

number of TMAs needed for the project. Additional truck mounted attenuators (TMAs) may be required as deemed necessary by the Engineer.

The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.



Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0495-05-061

DISTRICT Tyler
HIGHWAY IH 20

COUNTY Smith

| CONTROL SECTION JOB | | | | 0495-05-061 | | TOTAL EST. | TOTAL FINAL |
|---------------------|-----------|--|------|-------------|-------|------------|-------------|
| PROJECT ID | | | | A00197514 | | | |
| COUNTY | | | | Smith | | | |
| HIGHWAY | | | | IH 20 | | | |
| ALT | BID CODE | DESCRIPTION | UNIT | EST. | FINAL | | |
| | 134-6002 | BACKFILL (TY B) | STA | 11.000 | | 11.000 | |
| | 160-6003 | FURNISHING AND PLACING TOPSOIL (4") | SY | 570.000 | | 570.000 | |
| | 164-6054 | BOND FBR MTRX SEED (PERM)(RURAL)(SAND) | SY | 570.000 | | 570.000 | |
| | 168-6001 | VEGETATIVE WATERING | MG | 7.000 | | 7.000 | |
| | 314-6012 | EMULS ASPH (EROSN CONT)(CSS-1) | GAL | 86.000 | | 86.000 | |
| | 316-6406 | ASPH (AC-20XP, AC-10-2TR, OR AC-20-5TR) | GAL | 2,730.000 | | 2,730.000 | |
| | 316-6407 | AGGR (TY-PD GR-3 OR TY-PL GR-3) | CY | 65.000 | | 65.000 | |
| | 354-6010 | PLAN & TEXT ASPH CONC PAV(0" TO 6") | SY | 299.000 | | 299.000 | |
| | 416-6029 | DRILL SHAFT (RDWY ILL POLE) (30 IN) | LF | 30.000 | | 30.000 | |
| | 500-6001 | MOBILIZATION | LS | 1.000 | | 1.000 | |
| | 502-6001 | BARRICADES, SIGNS AND TRAFFIC HANDLING | MO | 1.000 | | 1.000 | |
| | 506-6038 | TEMP SEDMT CONT FENCE (INSTALL) | LF | 100.000 | | 100.000 | |
| | 506-6039 | TEMP SEDMT CONT FENCE (REMOVE) | LF | 100.000 | | 100.000 | |
| | 610-6218 | IN RD IL (TY SA) 40T-12 (250W EQ) LED | EA | 3.000 | | 3.000 | |
| | 618-6023 | CONDT (PVC) (SCH 40) (2") | LF | 694.000 | | 694.000 | |
| | 618-6047 | CONDT (PVC) (SCH 80) (2") (BORE) | LF | 156.000 | | 156.000 | |
| | 620-6007 | ELEC CONDR (NO.8) BARE | LF | 850.000 | | 850.000 | |
| | 620-6008 | ELEC CONDR (NO.8) INSULATED | LF | 1,700.000 | | 1,700.000 | |
| | 624-6002 | GROUND BOX TY A (122311)W/APRON | EA | 2.000 | | 2.000 | |
| | 644-6001 | IN SM RD SN SUP&AM TY10BWG(1)SA(P) | EA | 2.000 | | 2.000 | |
| | 666-6309 | RE PM W/RET REQ TY I (W)6"(SLD)(100MIL) | LF | 3,562.000 | | 3,562.000 | |
| | 1002-6025 | LANDSCAPE AMENITY (TRASH/RECYCLE BIN) | EA | 1.000 | | 1.000 | |
| | 3077-6035 | SP MIXESSP-CPG76-28 | TON | 2,145.000 | | 2,145.000 | |
| | 6001-6001 | PORTABLE CHANGEABLE MESSAGE SIGN | DAY | 28.000 | | 28.000 | |
| 18 | | EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART) | LS | 1.000 | | 1.000 | |
| | | SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING) | LS | 1.000 | | 1.000 | |

BASIS OF ESTIMATE

| ITEM | DESCRIPTION | RATE | CSJ 0495-05-061 AMOUNT | UNIT | CSJ 0495-05-061 QUANTITY | PROJECT TOTAL | PAY UNIT |
|---------|---|-------------|---------------------------|------|-----------------------------|------------------|-------------|
| [1] 166 | FERTILIZER | 1 LB/9 SY | 570 | SY | 0.032 | 0.032 | TON |
| 168 | VEGETATIVE WATERING | 11 GAL/SY | 570 | SY | 7.00 | 7.00 | MG |
| 314 | EMULS ASPH (EROSN CONT)(CSS-1) | 0.15 GAL/SY | 570 | SY | 86.0 | 86.0 | GAL |
| 316 | ASPH (AC-20XP, AC-10-2TR, OR AC-20-5TR) | 0.42 GAL/SY | 6498 | SY | 2730 | 2730 | GAL |
| 316 | AGGR (TY-PD GR-3 OR TY-PL GR-3) | 1 CY/100 SY | 6498 | SY | 65 | 65 | CY |
| 3077 | SUPERPAVE MIXTURES SP-C PG 76-28 (6") | 660 LB/SY | 6498 | SY | 2145 | 2145 | TON |
| 500 | MOBILIZATION | | 1.00 | LS | 1.00 | 1.00 | LS |
| 502 | BARRICADES, SIGNS AND TRAFFIC HANDLING | | 1.00 | MO | 1.00 | 1.00 | MO |

[1] FOR INFORMATION ONLY.

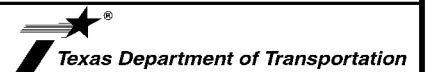
TABULATION OF SURFACE AREAS

| FROM STA | TO STA | LENGTH FT | ITEM 316 | | ITEM 314 | | ITEM 3077 | | REMARKS |
|--------------------------|------------|--------------|-------------|-----------|--|-----------|--|-----------|---------|
| | | | [1] OCST | | [1] EMULS ASPH (EROSN CONT)(CSS-1) | | [1] SUPERPAVE MIXTURES SP-C PG 76-28 | | |
| | | | WIDTH (FT) | AREA (SY) | WIDTH (FT) | AREA (SY) | WIDTH (FT) | AREA (SY) | |
| 1280+50.00 | 1286+50.00 | 600 | VARIABLE | 6498 | 5 | 570 | VARIABLE | 6498 | |
| | | 0 | | 0 | | 0 | | 0 | |
| CSJ 0495-05-061 SUBTOTAL | | | | 6498 | | 570 | | 6498 | |
| PROJECT TOTAL | | | | 6498 | | 570 | | 6498 | |

[1] QUANTITIES INCLUDED IN BASIS OF ESTIMATE.

PORTABLE CHANGEABLE MESSAGE SIGN

| SIGN | LOCATION | ITEM 6001 |
|--------------------------|---|--|
| | | PORTABLE CHANGEABLE MESSAGE SIGN DAYS |
| LOC #1 | TO BE LOCATED AS DIRECTED BY THE ENGINEER | 14 |
| LOC #2 | TO BE LOCATED AS DIRECTED BY THE ENGINEER | 14 |
| CSJ 0495-05-061 SUBTOTAL | | 28 |
| PROJECT TOTAL | | 28 |



**IH 20 LFR
QUANTITY SUMMARY**

| | | | |
|--------------|--------|--------------|-----------|
| © TXDOT 2023 | | SHEET 1 OF 2 | |
| CONT | SECT | JOB | HIGHWAY |
| 0495 | 05 | 061 | IH 20 LFR |
| DIST | COUNTY | SHEET NO. | |
| TYL | SMITH | 5 | |

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DW:
CK:

| ROADWAY SUMMARY | | | | |
|----------------------------|-----------------|-------------------------------------|--------------------------------------|--|
| LOCATION | ITEM 134 | ITEM 160 | ITEM 354 | ITEM 1002 |
| | BACKFILL (TY B) | FURNISHING AND PLACING TOPSOIL (4") | PLAN & TEXT ASPH CONC PAV (0" TO 6") | LANDSCAPE AMENITY (TRASH/ RECYCLE BIN) |
| | STA | SY | SY | EA |
| STA 1280+50 TO STA 1286+50 | 11 | 570 | 299 | 1 |
| CSJ 0495-05-061 SUBTOTAL | 11 | 570 | 299 | 1 |
| PROJECT TOTAL | 11 | 570 | 299 | 1 |

| PERMANENT PAVEMENT MARKINGS | | |
|------------------------------------|---------|---|
| STATION | | 666 |
| | | RE PM W/RET REQ TY I (W)6"(SLD)(100MIL) |
| FROM | TO | LF |
| CSJ 0495-05-061 | | |
| 1280+50 | 1286+50 | 3562 |
| CSJ SUBTOTAL | | 3562 |

| EROSION CONTROL SUMMARY | | | | | |
|--------------------------------|------------|--|----------------------------|----------------------------|---------------------------|
| LOCATION | | ITEM 164 | ITEM 168 | ITEM 506 | |
| FROM | TO | BONDED FBR MTRX SEED (PERM) (RURAL) (SAND) | VEGETATIVE WATERING (PERM) | TEMP | TEMP |
| | | | | SEDMT CONT FENCE (INSTALL) | SEDMT CONT FENCE (REMOVE) |
| STA | STA | SY | SY | LF | LF |
| 1280+50.00 | 1286+50.00 | 570 | 570 | 100 | 100 |
| CSJ 0495-05-061 SUBTOTALS | | 570 | 570 | 100 | 100 |
| PROJECT TOTALS | | 570 | 570 | 100 | 100 |

| SMALL SIGN TABULATION | |
|------------------------------|--|
| LOCATION | ITEM 644 |
| | INSTALL SM RD SN SUP & AM TY10BWG(1) SA(P) |
| EA | |
| CSJ 0495-05-061 SUBTOTAL | |
| 2 | |
| PROJECT TOTAL | |
| 2 | |

NOTE: MULTIPLE MOVE-INS WILL BE REQUIRED TO MAINTAIN ADEQUATE VEGETATION IN COMPLIANCE WITH THE CONSTRUCTION GENERAL PERMIT

NOTE: MULTIPLE MOVE-INS MAY BE REQUIRED FOR PLACEMENT OF PERMANENT SIGNS

| ILLUMINATION SUMMARY | | | | | | | | |
|-----------------------------|------------|-------------------------------------|---------------------------------------|------------------|-------------------------|-------------------------|--------------------|----------------------------------|
| LOCATION | | ITEM 416 | ITEM 610 | ITEM 618 | | ITEM 620 | | ITEM 624 |
| FROM | TO | DRILL SHAFT (RDWY ILL POLE) (30 IN) | IN RD IL TY (SA) 40T-12 (250W EQ) LED | COND | COND | ELEC | ELEC | GROUND BOX TY A (122311) W/APRON |
| | | | | PVC (SCH 40)(2") | PVC (SCH 80)(2") (BORE) | CONDR (NO. 8) INSULATED | CONDR (NO. 8) BARE | |
| STA | STA | LF | EA | LF | LF | LF | LF | EA |
| 1280+50.00 | 1286+50.00 | 30 | 3 | 694 | 156 | 1700 | 850 | 2 |
| CSJ 0495-05-061 SUBTOTALS | | 30 | 3 | 694 | 156 | 1700 | 850 | 2 |
| PROJECT TOTALS | | 30 | 3 | 694 | 156 | 1700 | 850 | 2 |

Texas Department of Transportation

IH 20 LFR

QUANTITY SUMMARY

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SHEET 2 OF 2

| CONT | SECT | JOB | HIGHWAY |
|------|--------|-----------|-----------|
| 0495 | 05 | 061 | IH 20 LFR |
| DIST | COUNTY | SHEET NO. | |
| TYL | SMITH | 6 | |

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SUMMARY OF SMALL SIGNS

| STATION | OFFSET | PLAN SHEET NO. | SIGN NO. | SIGN NOMENCLATURE | SIGN | SIGN DIMENSIONS | TOTAL SQ. FT. | FLAT ALUMINUM (TYPE A) | EXAL ALUMINUM (TYPE G) | SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) | | | | BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) | |
|---------|--------|----------------|----------|-------------------|------|-----------------|---------------|------------------------|------------------------|---|-------|-------------|----------------------|--|-------------------------|
| | | | | | | | | | | POST TYPE | POSTS | ANCHOR TYPE | MOUNTING DESIGNATION | | |
| | | | | | | | | | | | | | PREFABRICATED | | 1EXT or 2EXT = # of Ext |
| 1283+75 | RT | 1 OF 1 | 1 | R6-1L | | 12 X 36 | 9 | X | 10BWG | 1 | SA | P | | | |
| 1284+90 | RT | 1 OF 1 | 2 | D5-2cTL | | 36 X 36 | 9 | X | 10BWG | 1 | SA | P | | | |
| | | | | | | | | | | | | | | | |
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| Square Feet | Minimum Thickness |
|-----------------|-------------------|
| Less than 7.5 | 0.080" |
| 7.5 to 15 | 0.100" |
| Greater than 15 | 0.125" |

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:
<http://www.txdot.gov/>

- NOTE:**
1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.
 2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS) Standard Sheet.
 3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs SMD(GEN).



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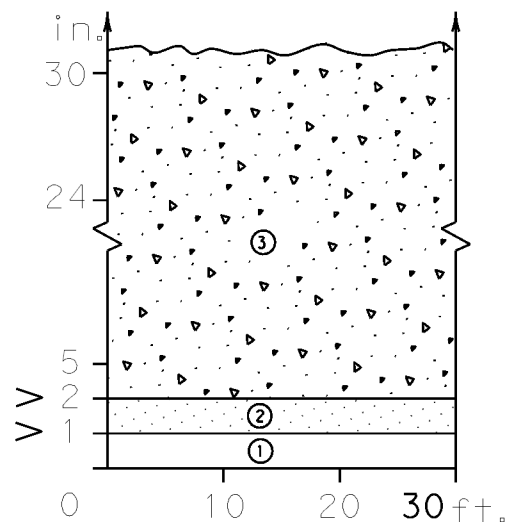
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| CTxDOT May 1987 | |
| REVISIONS: 4-16 8-16 | |



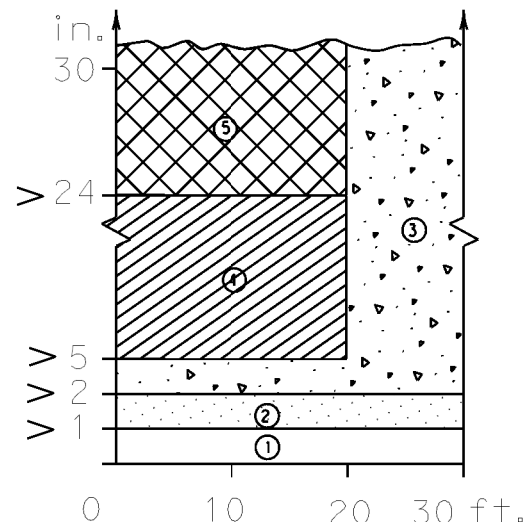
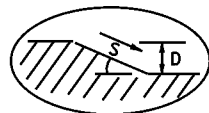
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| IH 20 LFR | | |
| SUMMARY OF SMALL SIGNS | | |
| 2023 | SHEET 1 OF 1 | |
| CONT | SECT | HIGHWAY |
| 0495 | 05 | 061 IH 20 LFR |
| DIST | COUNTY | SHEET NO. |
| TYL | SMITH | 7 |

DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

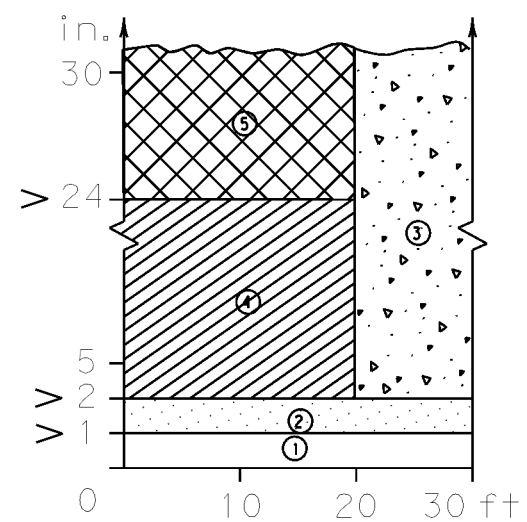
Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet



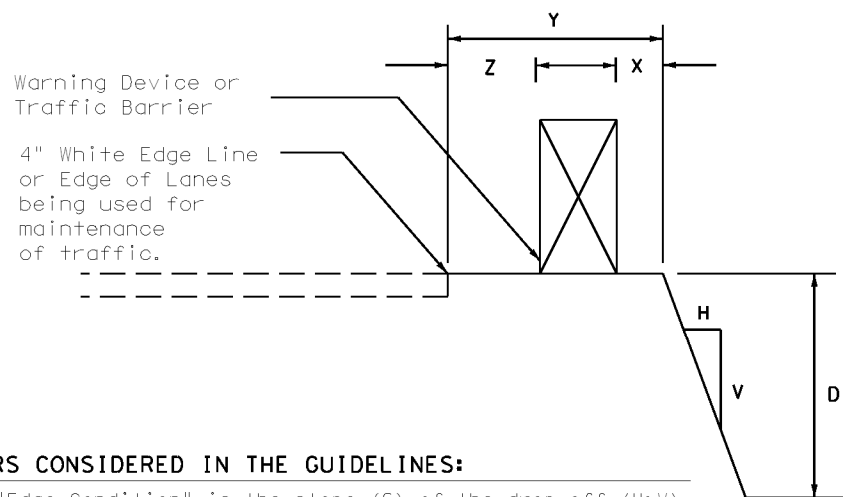
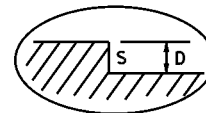
Edge Condition I
S = (3:1) (or flatter)



Edge Condition II
S = ((2.99):1) to (1:1)



Edge Condition III
S is steeper than (1:1)



FACTORS CONSIDERED IN THE GUIDELINES:

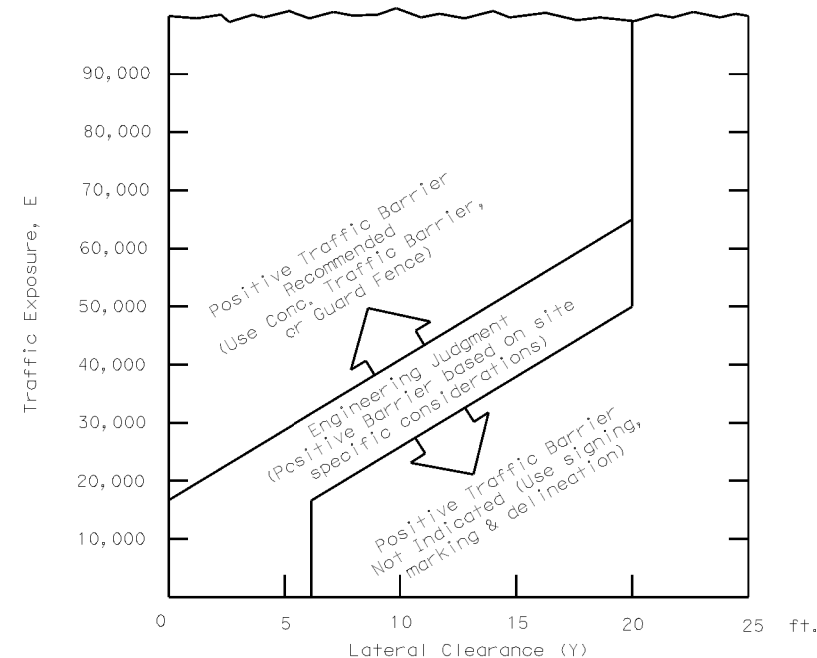
- The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height" is the depth of the drop-off "D".
- Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.
- In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.
- The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.
- If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

| Zone | Treatment Types Guidelines: |
|------|--|
| ① | No treatment |
| ② | CW 8-11 "Uneven Lanes" signs. |
| ③ | CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels. |
| ④ | CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the proferred Edge Condition I. |
| ⑤ | Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors. |

Edge Condition Notes:

- Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.
- Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exceeds 24 inches, the possibility for rollover is greater in most vehicles.
- Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.
- Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

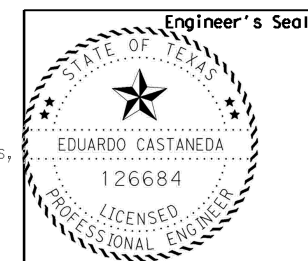
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 ([hatched])



- $E = ADT \times T$
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.
- Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.
- An approved end treatment should be provided for any positive barrier end located within the clear zone.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

DocuSigned by:



6/1/2023

DocuSigned by:

[Signature]



TREATMENT FOR VARIOUS EDGE CONDITIONS

| | | | | |
|-------------------|------------------|-------------|---------|---------------|
| FILE: edgecon.dgn | DW: August 2000 | CK: 0495 05 | DW: 061 | CK: IH 20 LFR |
| REVISIONS | 03-01 08-01 9-21 | TYL | SMITH | 8 |

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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.
- Where highway construction or maintenance work is being undertaken, other than mobile operations as defined by the Texas Manual on Uniform Traffic Control Devices, CSJ limit signs are required. CSJ limit signs are shown on BC(2). The OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits. For mobile operations, CSJ limit signs are not required.
- 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 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.
- Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

- Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.
- Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

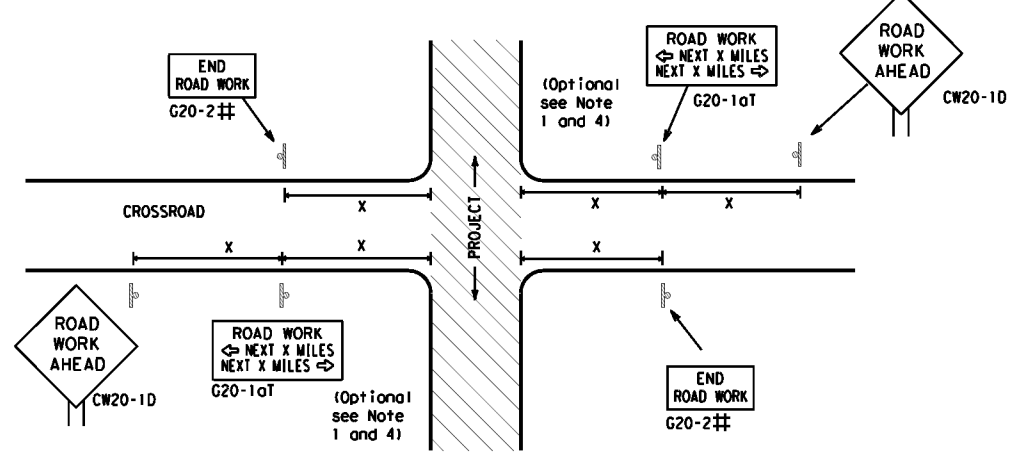
| |
|---|
| THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov |
| COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD) |
| DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) |
| MATERIAL PRODUCER LIST (MPL) |
| ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)" |
| STANDARD HIGHWAY SIGN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

SHEET 1 OF 12

| | | | |
|--|---------------|----------------------------------|--------------------|
|  Texas Department of Transportation | | Traffic Safety Division Standard | |
| BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS | | | |
| BC (1) - 21 | | | |
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| REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21 | DIST: TYL | COUNTY: SMITH | SHEET NO.: 9 |

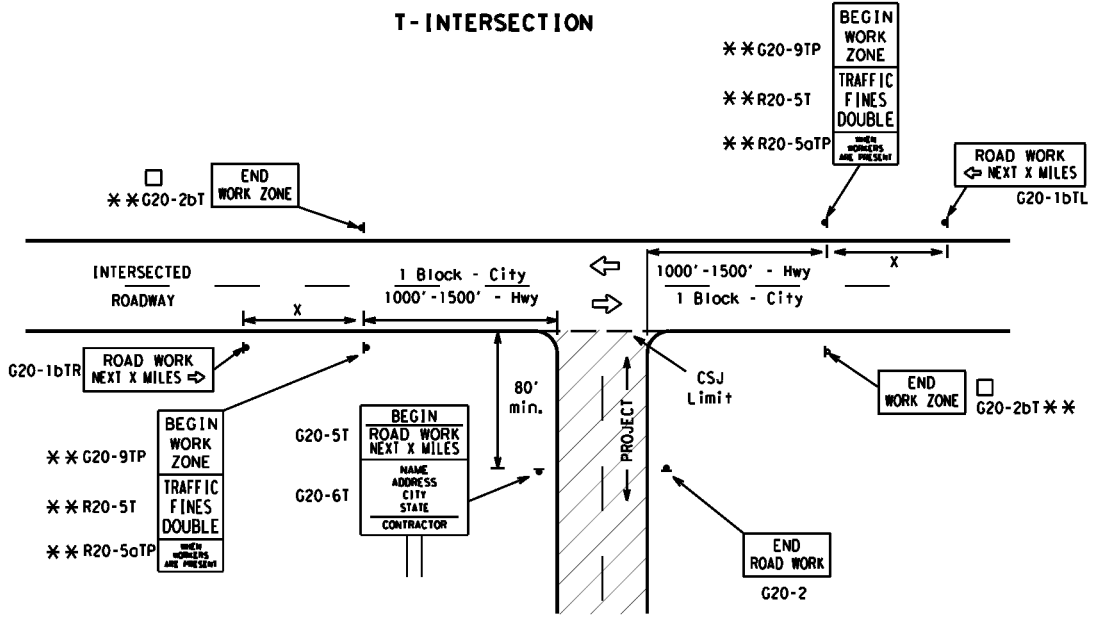
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TYPICAL LOCATION OF CROSSROAD SIGNS



- ## 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 as per TMUTCD Part 5. 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 Δ Spacing "x" Feet (Apprx.) |
| CW20 ⁴ | 48" x 48" | 48" x 48" | 30 | 120 |
| CW21 | | | 35 | 160 |
| CW22 | | | 40 | 240 |
| CW23 | | | 45 | 320 |
| CW1, CW2, CW7, CW8, CW9, CW11, CW14 | 36" x 36" | 48" x 48" | 50 | 400 |
| 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 |

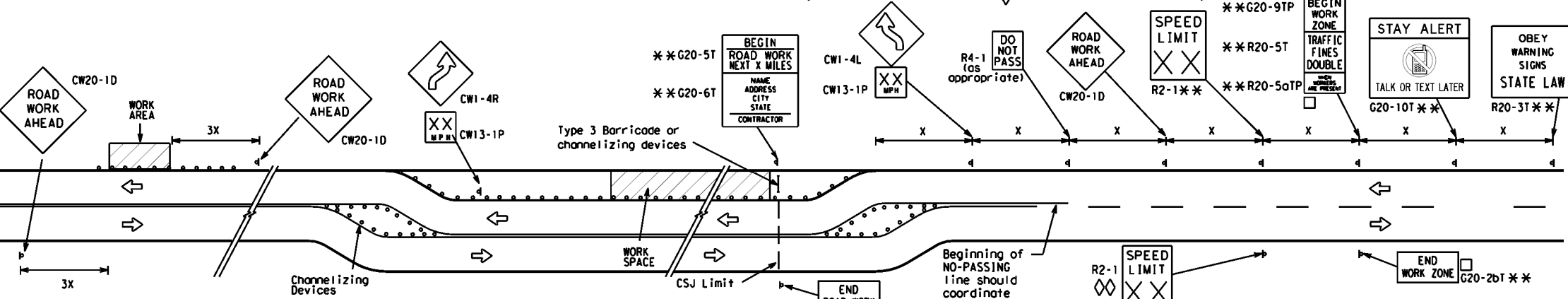
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

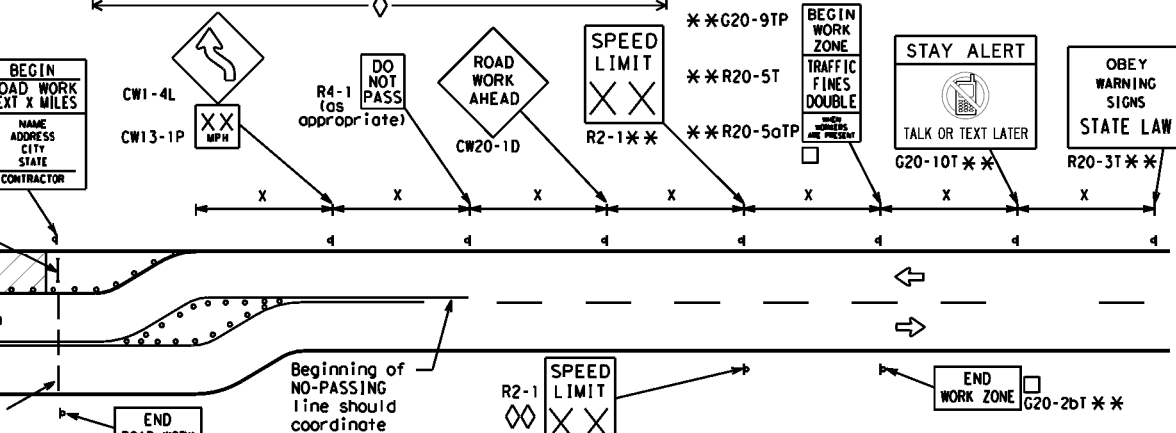
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

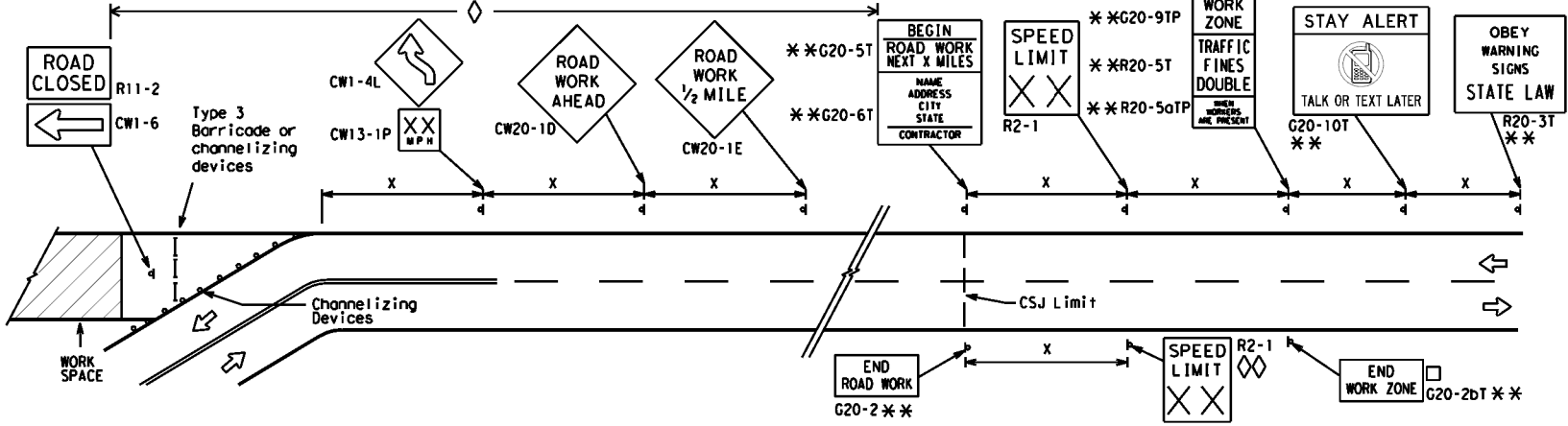


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-1aT) 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.
 - CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
 - 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. |

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Texas Department of Transportation
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

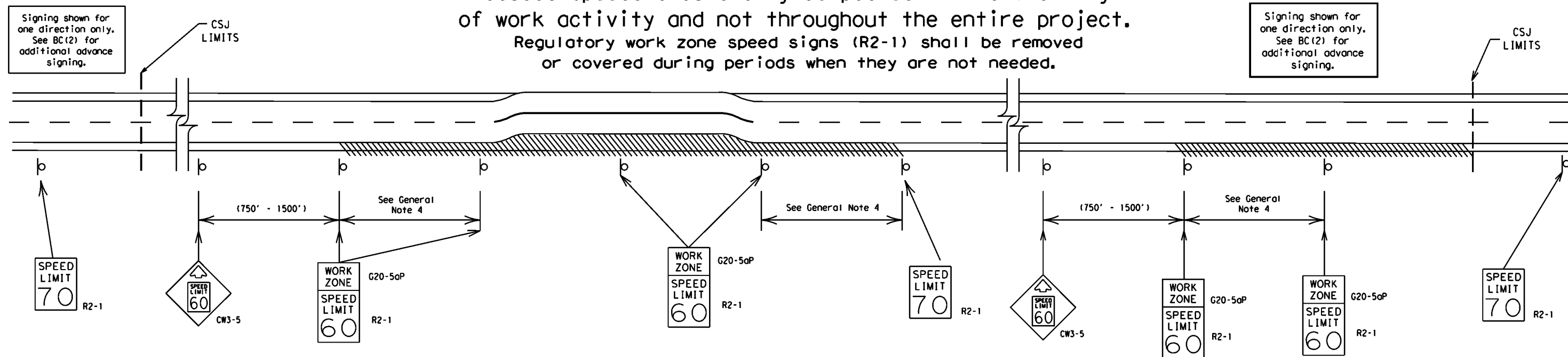
BC (2) - 21

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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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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

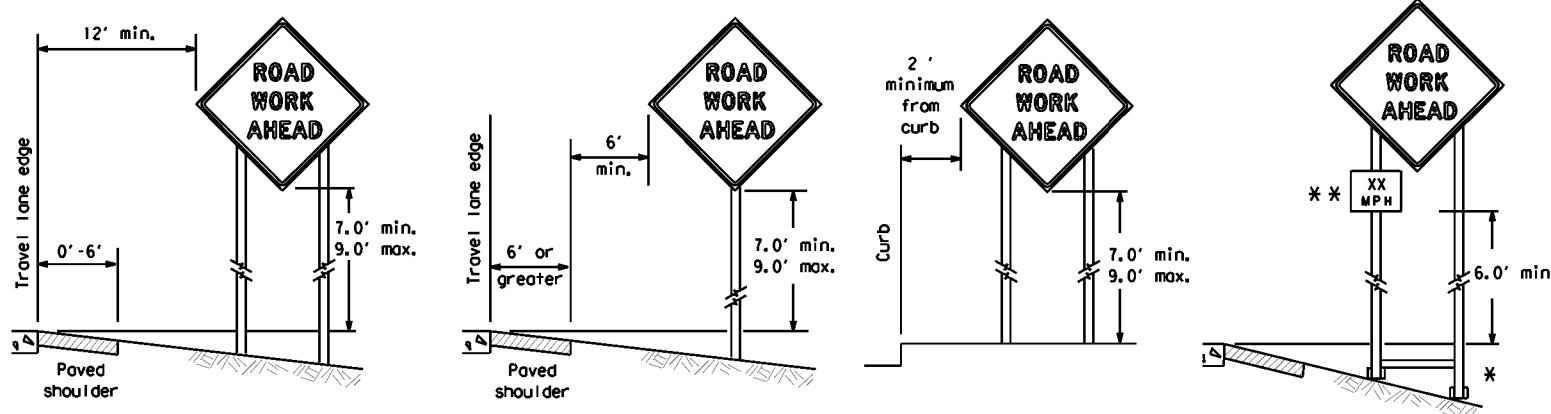
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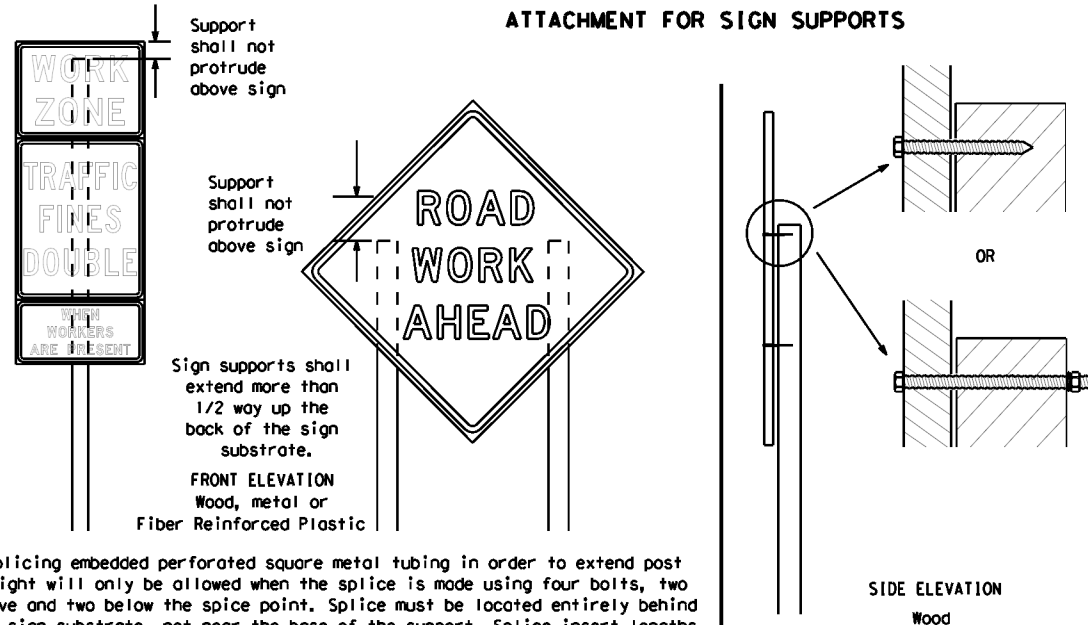
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



* 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



Noils 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.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
- The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
- The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
- The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
- Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
- The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)

- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - Long-term stationary - work that occupies a location more than 3 days.
 - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
- The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

- The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

- All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

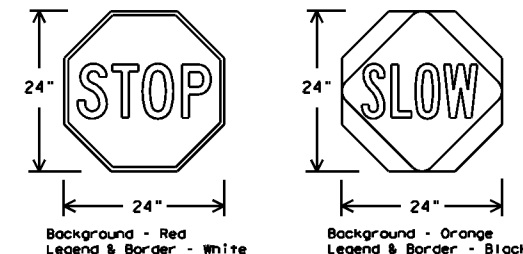
- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

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

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retroreflective when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



| SHEETING REQUIREMENTS (WHEN USED AT NIGHT) | | |
|--|--------|--|
| USAGE | COLOR | SIGN FACE MATERIAL |
| BACKGROUND | RED | TYPE B OR C SHEETING |
| BACKGROUND | ORANGE | TYPE B _{FL} OR C _{FL} SHEETING |
| LEGEND & BORDER | WHITE | TYPE B OR C SHEETING |
| LEGEND & BORDER | BLACK | ACRYLIC NON-REFLECTIVE FILM |

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

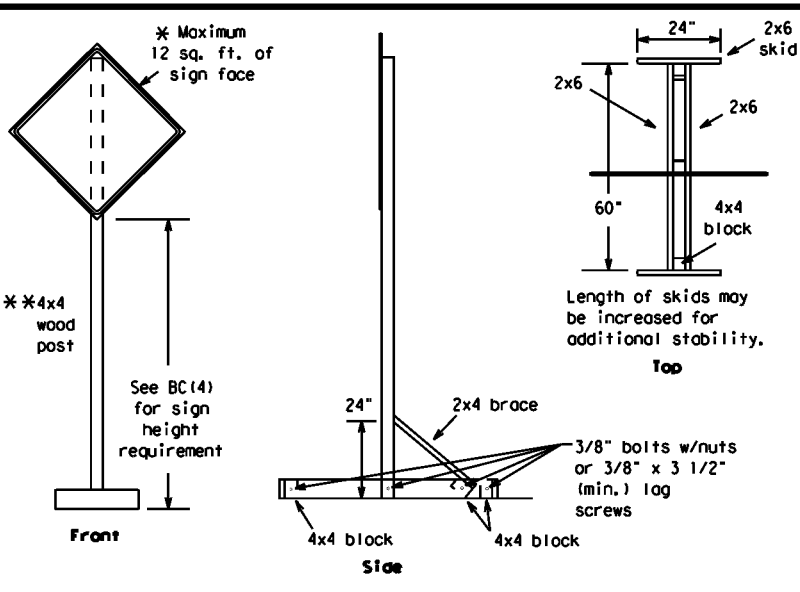
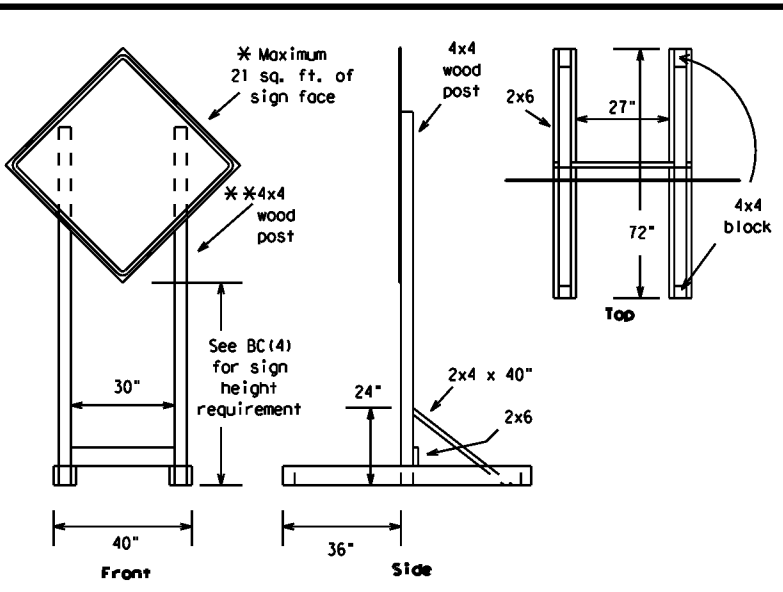
Texas Department of Transportation
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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC (4) - 21

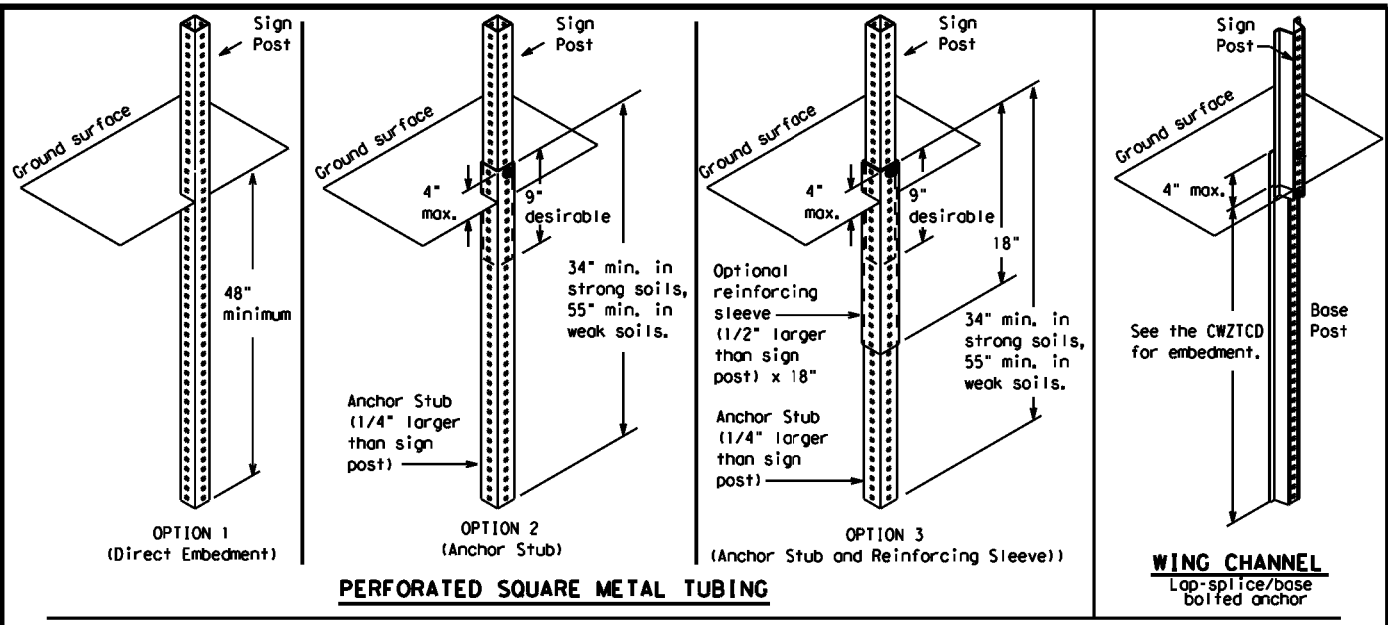
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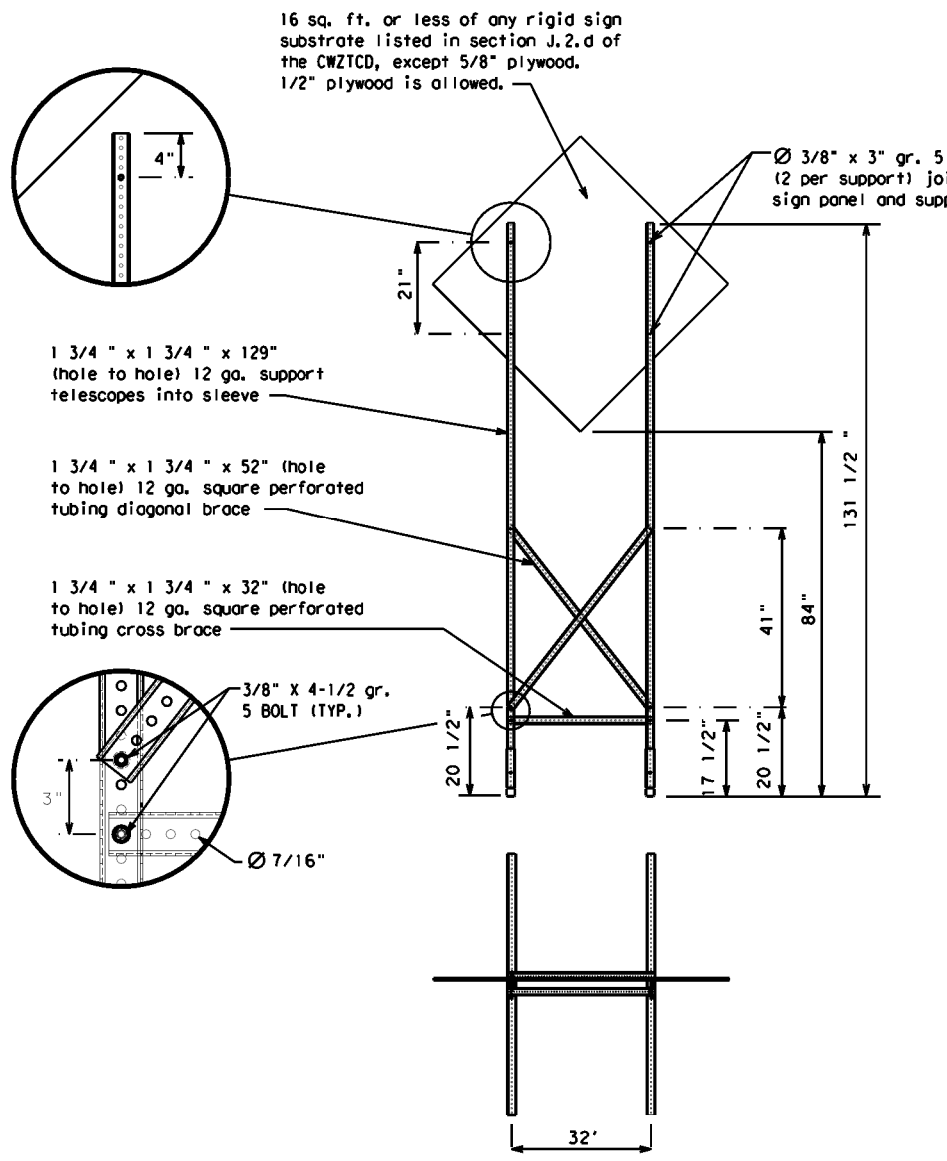
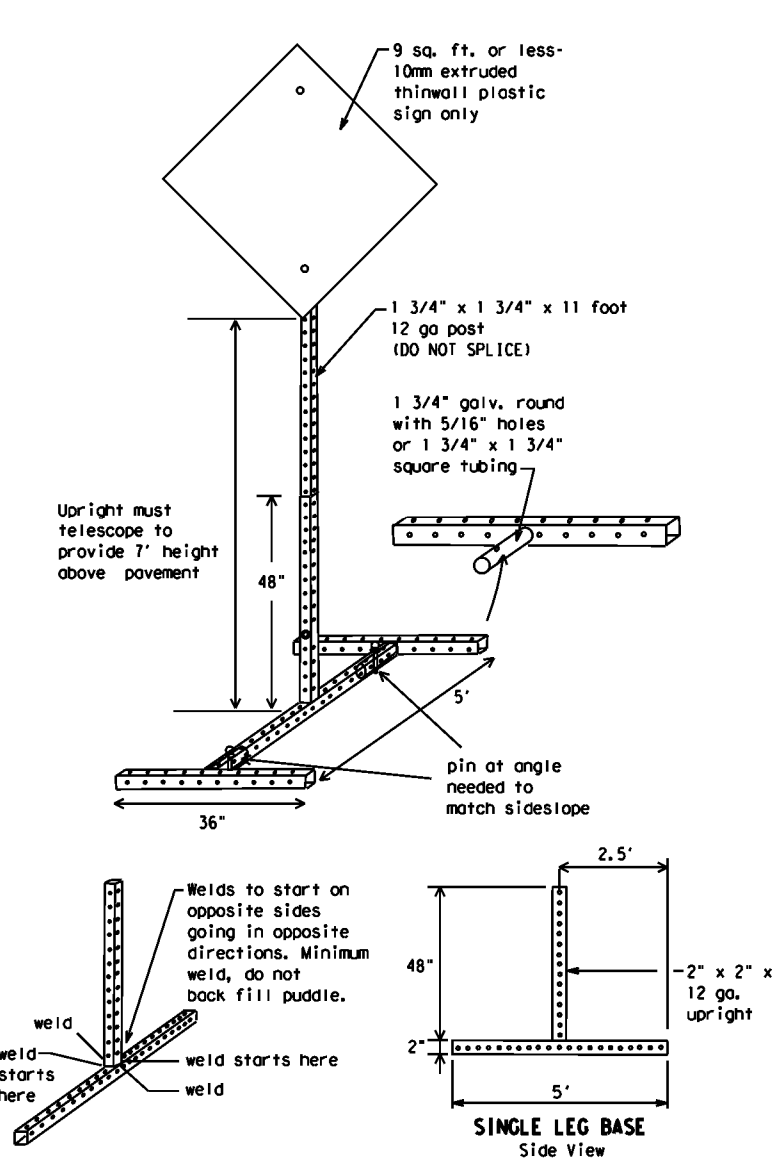
SKID MOUNTED WOOD SIGN SUPPORTS

* 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

* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID 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.

SHEET 5 OF 12



BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

| | | | | |
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| © TxDOT November 2002 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0495 05 | | 061 | IH 20 LFR |
| 9-07 8-14 | DIST | COUNTY | | SHEET NO. |
| 7-13 5-21 | TYL | SMITH | | 13 |

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 * |

Location List

| |
|--------------------------|
| AT FM XXXX |
| BEFORE RAILROAD CROSSING |
| NEXT X MILES |
| PAST US XXX EXIT |
| XXXXXXXX TO XXXXXXX |
| 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 |
| Canal | CANT | North | N |
| Center | CTR | Northbound (route) N | |
| Construction Ahead | CONST AHD | Parking | PKING |
| CROSSING | XING | Road | RD |
| Detour Route | DETOUR RTE | Right Lane | RT LN |
| Do Not | DONT | Saturday | SAT |
| East | E | Service Road | SERV RD |
| Eastbound (route) E | | Shoulder | SHLDR |
| Emergency | EMER | Slippery | SLIP |
| Emergency Vehicle | EMER VEH | South | S |
| Entrance, Enter | ENT | Southbound (route) S | |
| Express Lane | EXP LN | Speed | SPD |
| Expressway | EXPWY | Street | ST |
| XXXX Feet | XXXX FT | Sunday | SUN |
| Fog Ahead | FOG AHD | Telephone | PHONE |
| Freeway | FRWY, FWY | Temporary | TEMP |
| Freeway Blocked | FWY BLKD | Thursday | THURS |
| Friday | FRI | To Downtown | TO DWNTN |
| Hazardous Driving | HAZ DRIVING | Traffic | TRAF |
| Hazardous Material | HAZMAT | Travelers | TRVLR |
| High Occupancy Vehicle | HOV | Tuesday | TUES |
| Highway | HWY | Time Minutes | TIME MIN |
| Hour(s) | HR, HRS | Upper Level | UPR LEVEL |
| Information | INFO | Vehicles (s) | VEH, VEHS |
| It Is | ITS | Warning | WARN |
| Junction | JCT | Wednesday | WED |
| Left | LFT | Weight Limit | WT LIMIT |
| Left Lane | LFT LN | West | W |
| Lane Closed | LN CLOSED | Westbound (route) W | |
| Lower Level | LWR LEVEL | Wet Pavement | WET PVMT |
| Maintenance | MAINT | Will Not | WONT |

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



BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

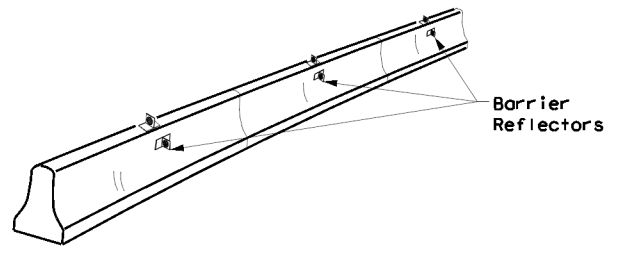
BC (6) - 21

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| © TxDOT November 2002 | CONT: 0495 05 | SECT: 061 | JOB: IH 20 LFR | HIGHWAY |
| REVISIONS | 0495 05 | 061 | IH 20 LFR | |
| 9-07 8-14 | DIST: TYL | COUNTY: SMITH | SHEET NO.: 14 | |
| 7-13 5-21 | | | | |

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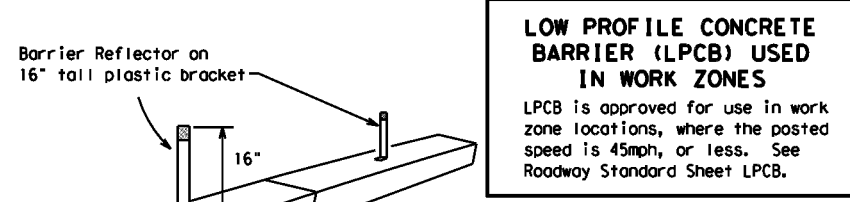
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



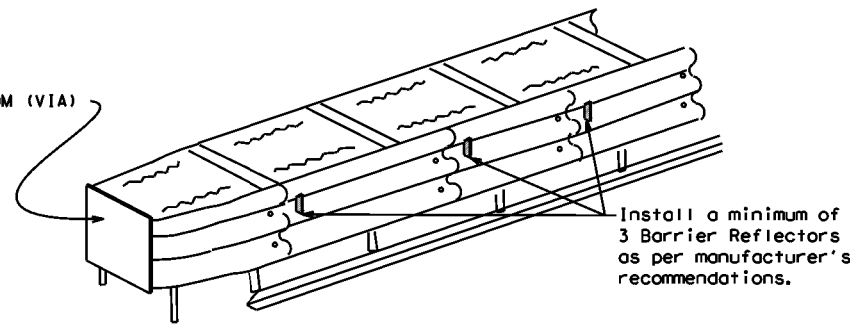
CONCRETE TRAFFIC BARRIER (CTB)

- 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) USED IN WORK ZONES
 LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES
 End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

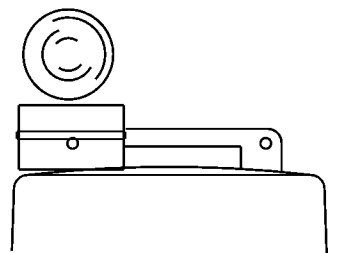
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet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

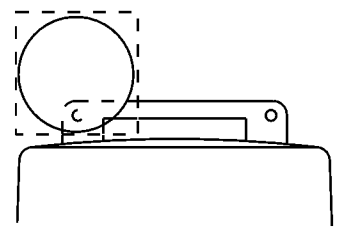
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing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



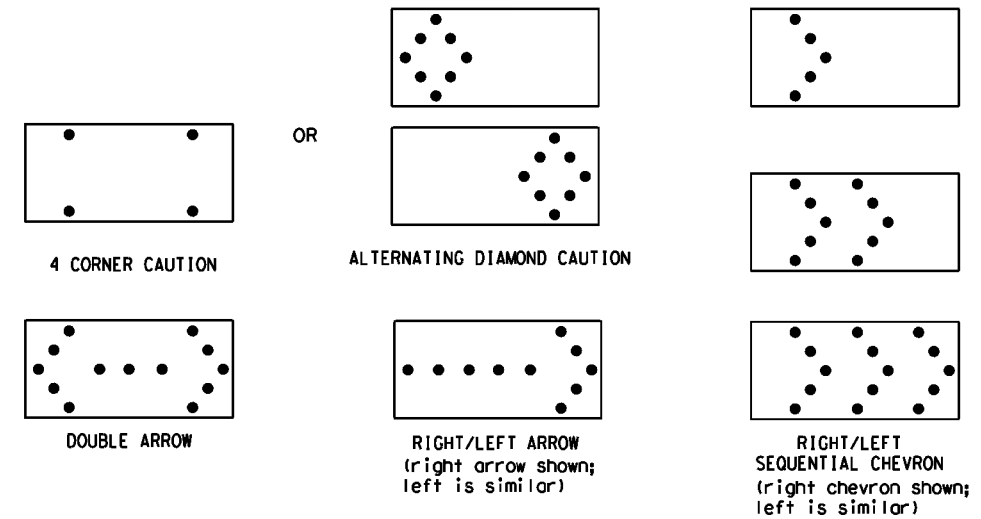
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



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 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.

Texas Department of Transportation
 Traffic Safety Division Standard

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

BC (7) - 21

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| REVISIONS: 9-07 8-14 | | | | |
| 7-13 5-21 | | | | |
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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

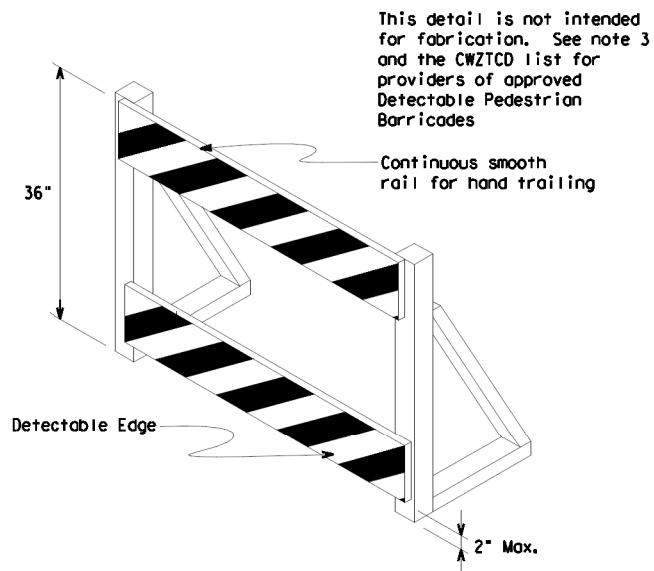
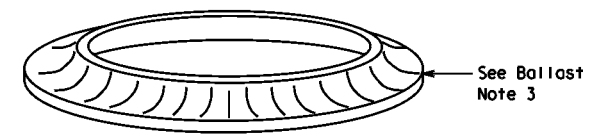
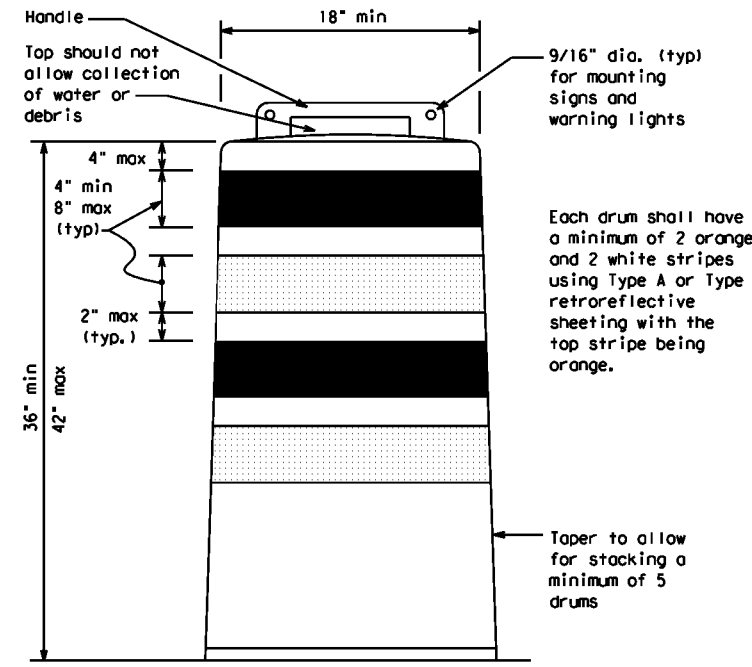
- Pre-qualified plastic drums shall meet the following requirements:
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
 - The body and base shall lock together in such a manner that the body separates from the base when impacted 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 or Type B 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

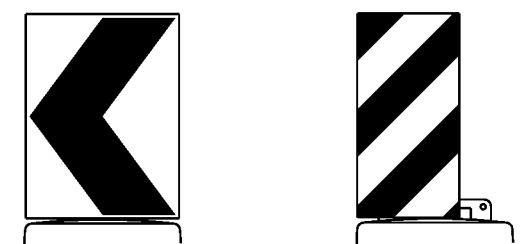
- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other 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.



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

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. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- 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 (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 should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign (Maximum Sign Dimension)
Chevron 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 or Type B. 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



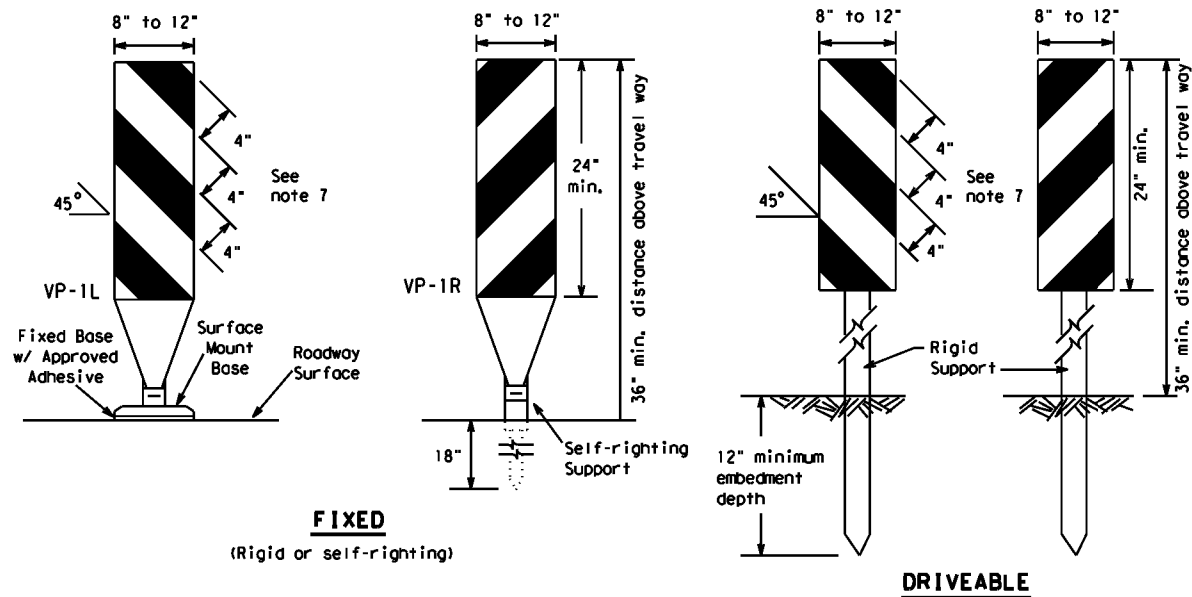
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 21

| | | | | | | | | | |
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| © TxDOT | November 2002 | CONT: | SECT: | JOB: | HIGHWAY | | | | |
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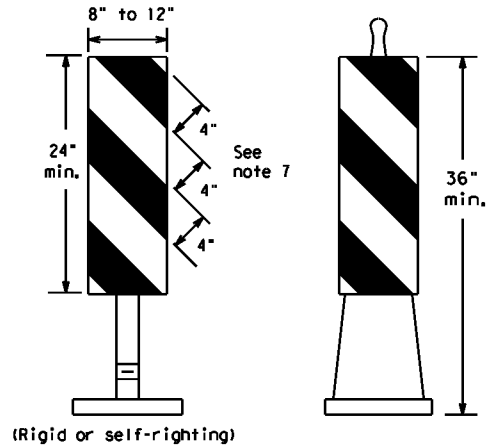
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FIXED
(Rigid or self-righting)

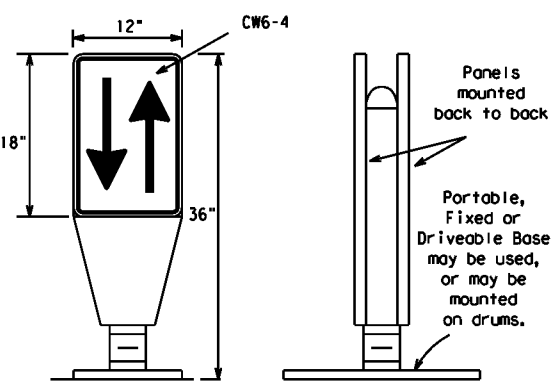
DRIVEABLE



PORTABLE

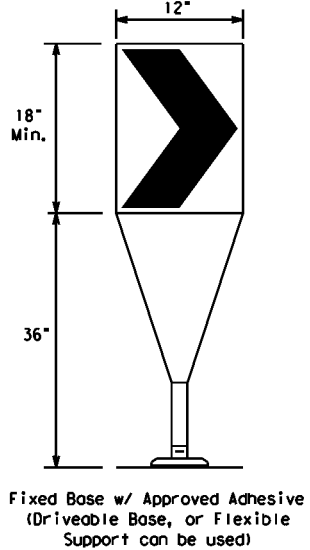
VERTICAL PANELS (VPs)

- 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 for additional requirements on the use 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 or Type B 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.



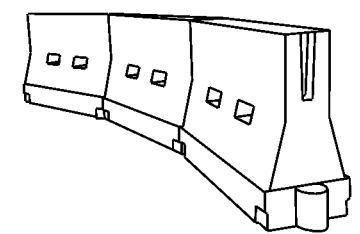
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- 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). Place reflective sheeting 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 Manual for Assessing Safety Hardware (MASH) 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 | Formula | Minimum Desirable Taper Lengths ** | | | Suggested Maximum Spacing of Channelizing Devices | |
|--------------|--------------------------|------------------------------------|------------|------------|---|--------------|
| | | 10' Offset | 11' Offset | 12' Offset | On a Taper | On a Tangent |
| 30 | L = WS ² / 60 | 150' | 165' | 180' | 30' | 60' |
| 35 | | 205' | 225' | 245' | 35' | 70' |
| 40 | | 265' | 295' | 320' | 40' | 80' |
| 45 | L = WS | 450' | 495' | 540' | 45' | 90' |
| 50 | | 500' | 550' | 600' | 50' | 100' |
| 55 | | 550' | 605' | 660' | 55' | 110' |
| 60 | | 600' | 660' | 720' | 60' | 120' |
| 65 | | 650' | 715' | 780' | 65' | 130' |
| 70 | | 700' | 770' | 840' | 70' | 140' |
| 75 | | 750' | 825' | 900' | 75' | 150' |
| 80 | | 800' | 880' | 960' | 80' | 160' |

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 21

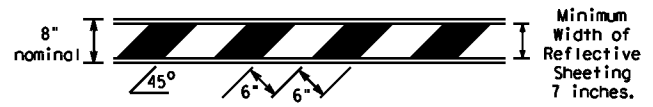
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| REVISIONS | DATE | BY | CHECKED | APPROVED |
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| 7-13 | 5-21 | | | |
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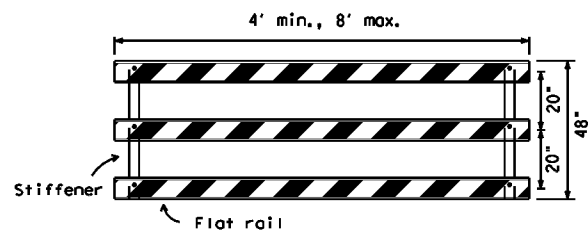
TYPE 3 BARRICADES

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 or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.

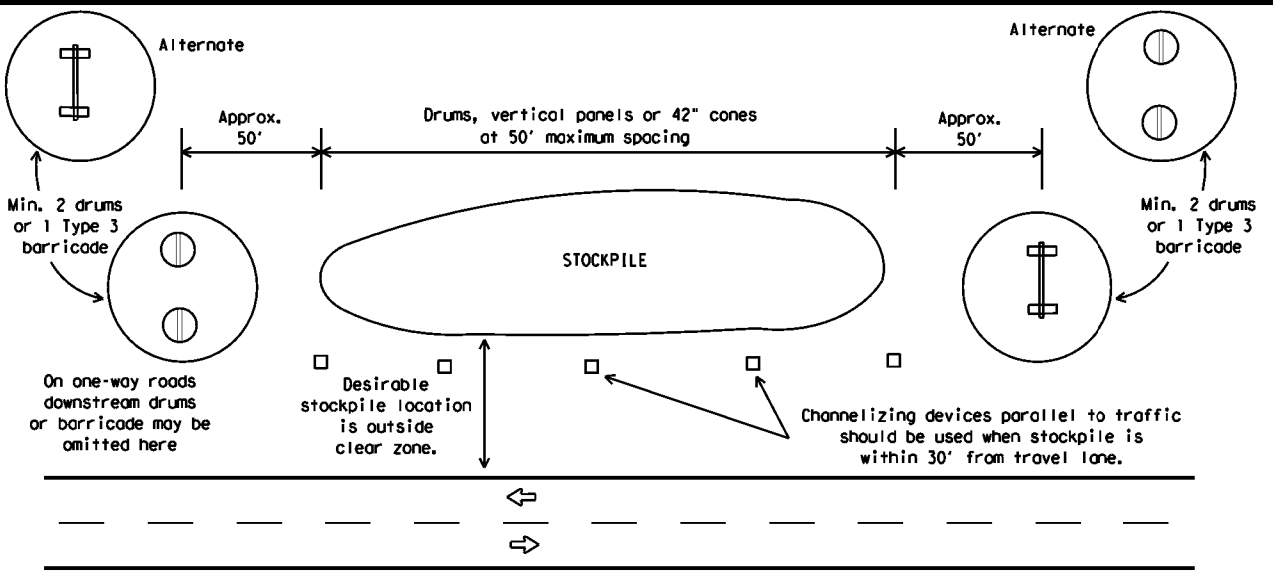


TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



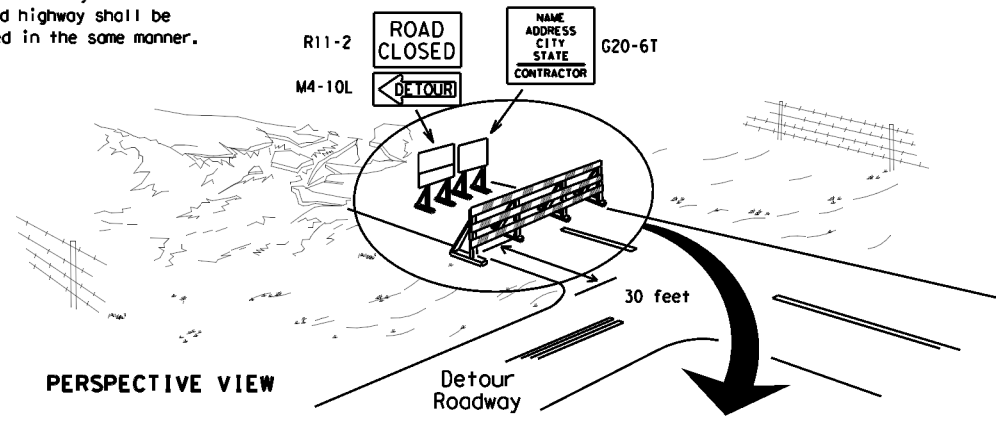
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



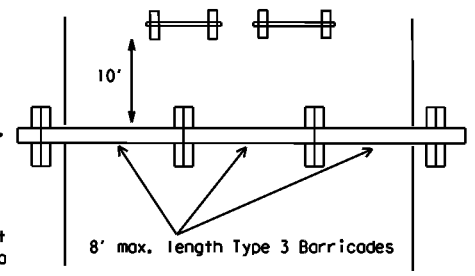
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



PERSPECTIVE VIEW

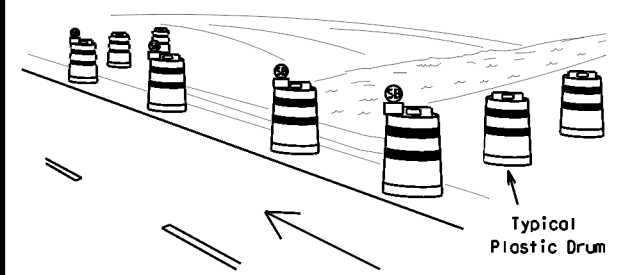
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



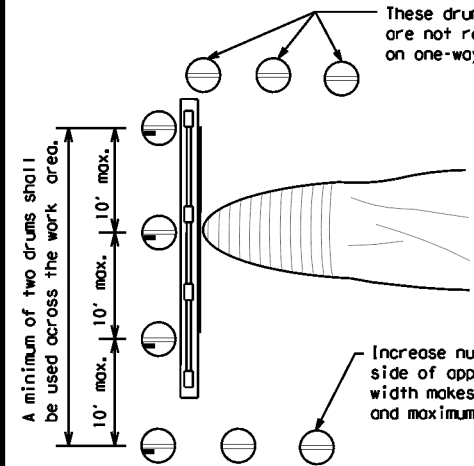
PLAN VIEW

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

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

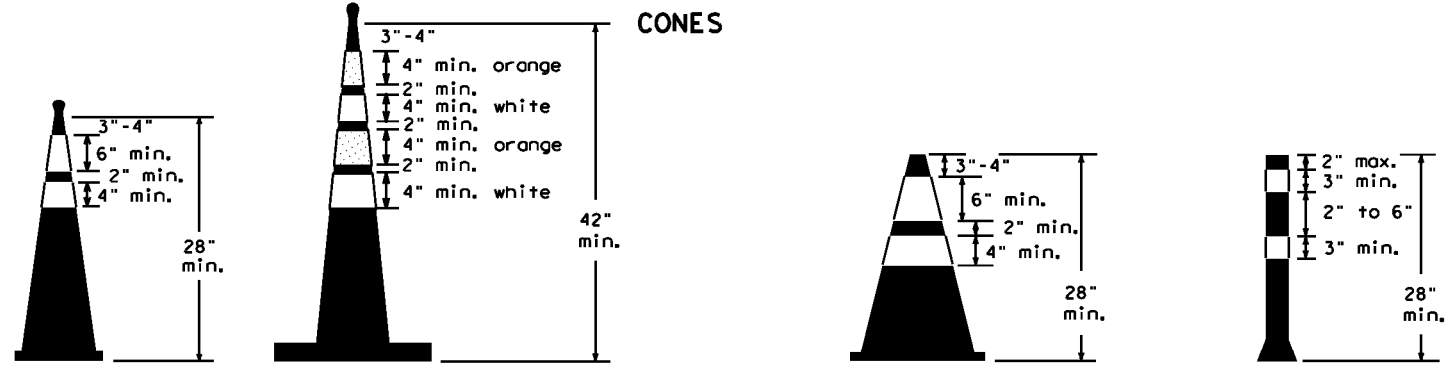


PLAN VIEW

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

| 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



Two-Piece cones

One-Piece cones

Tubular Marker

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

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 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 or Type B.
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.



BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 21

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| REVISIONS | 9-07 8-14 | 7-13 5-21 | DIST: TYL | COUNTY: SMITH |
| | | | | SHEET NO.: 18 |

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.

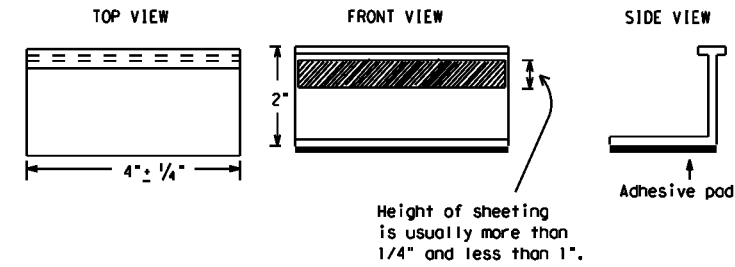
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- 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).

SHEET 11 OF 12



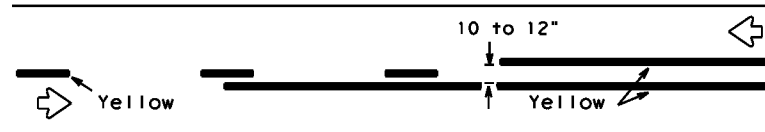
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

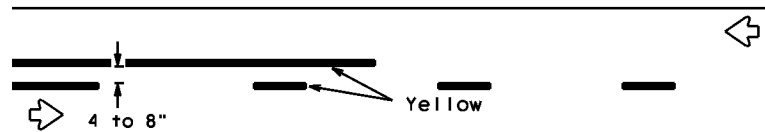
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| © TxDOT February 1998 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | | 0495 05 | 061 | IH 20 LFR |
| 2-98 9-07 5-21 | DIST | COUNTY | SHEET NO. | |
| 1-02 7-13 | TYL | SMITH | 19 | |
| 11-02 8-14 | | | | |

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PAVEMENT MARKING PATTERNS

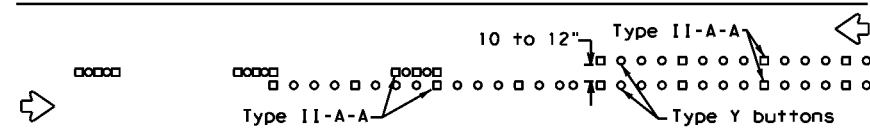


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

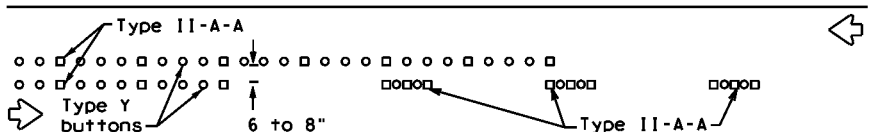


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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.

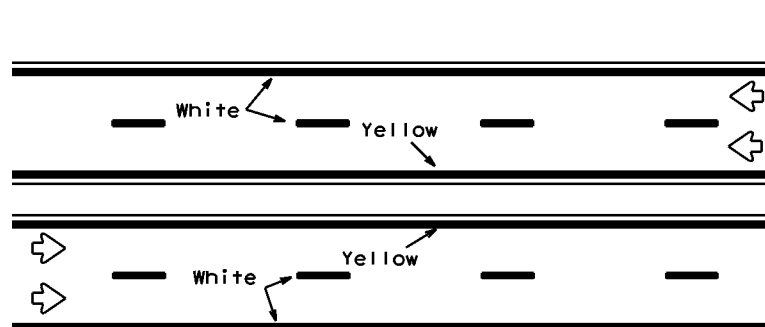


RAISED PAVEMENT MARKERS - PATTERN A



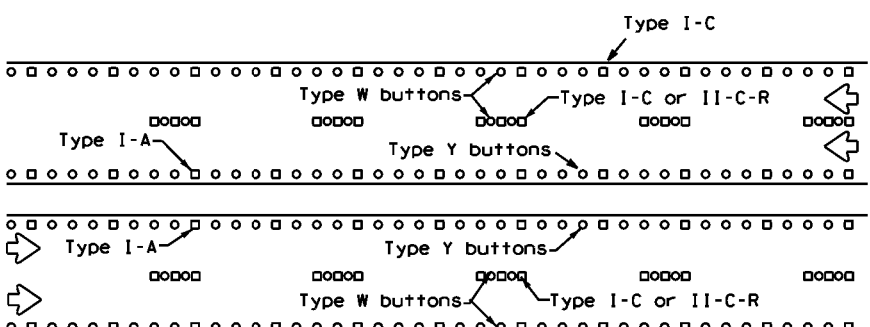
RAISED PAVEMENT MARKERS - PATTERN B

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



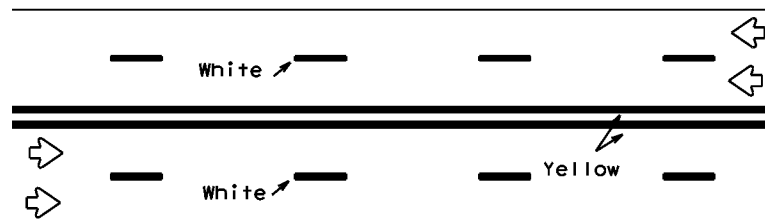
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



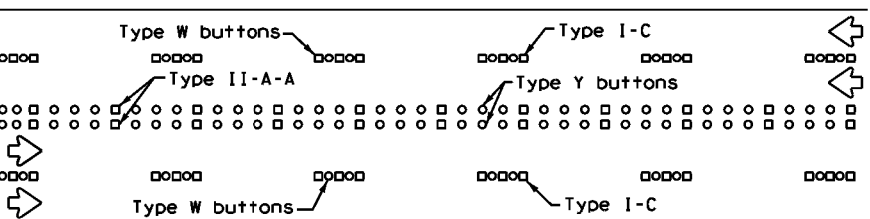
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



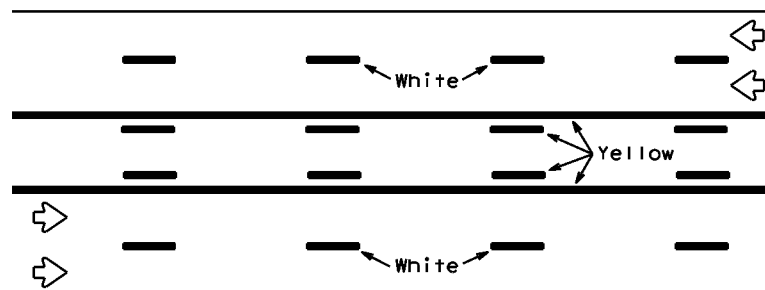
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



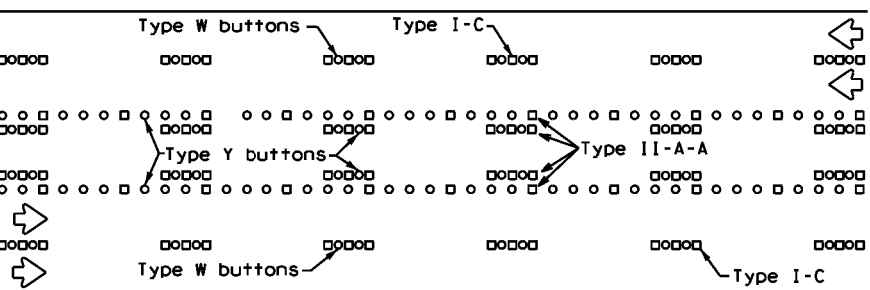
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

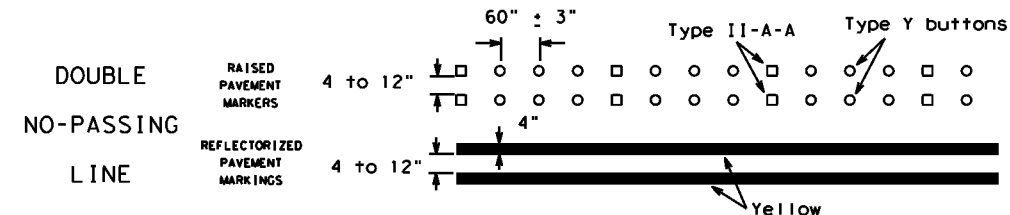
Prefabricated markings may be substituted for reflectorized pavement markings.



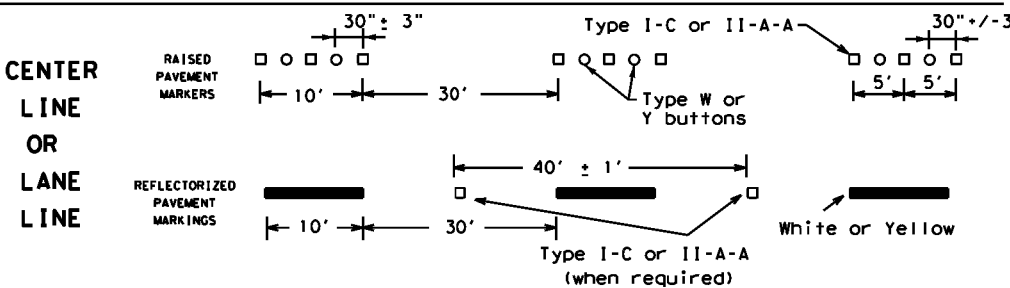
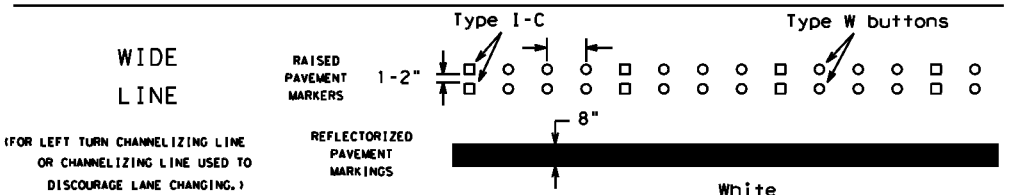
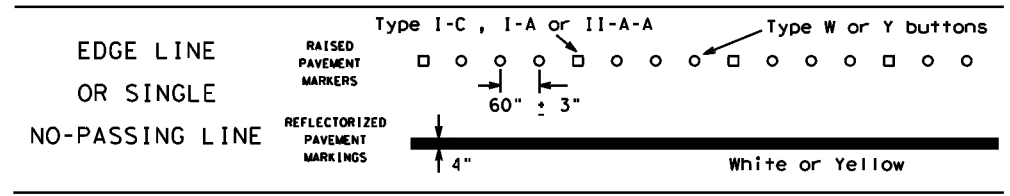
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

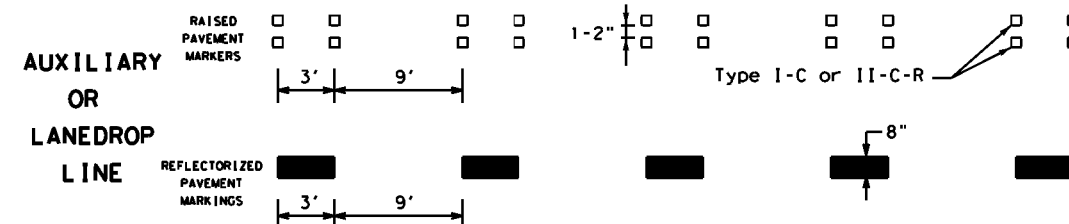
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SOLID LINES

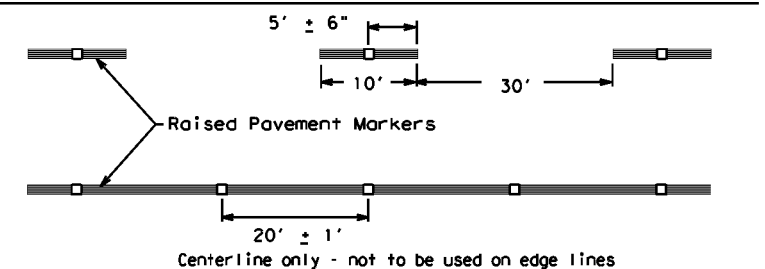


BROKEN LINES



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) - 21

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

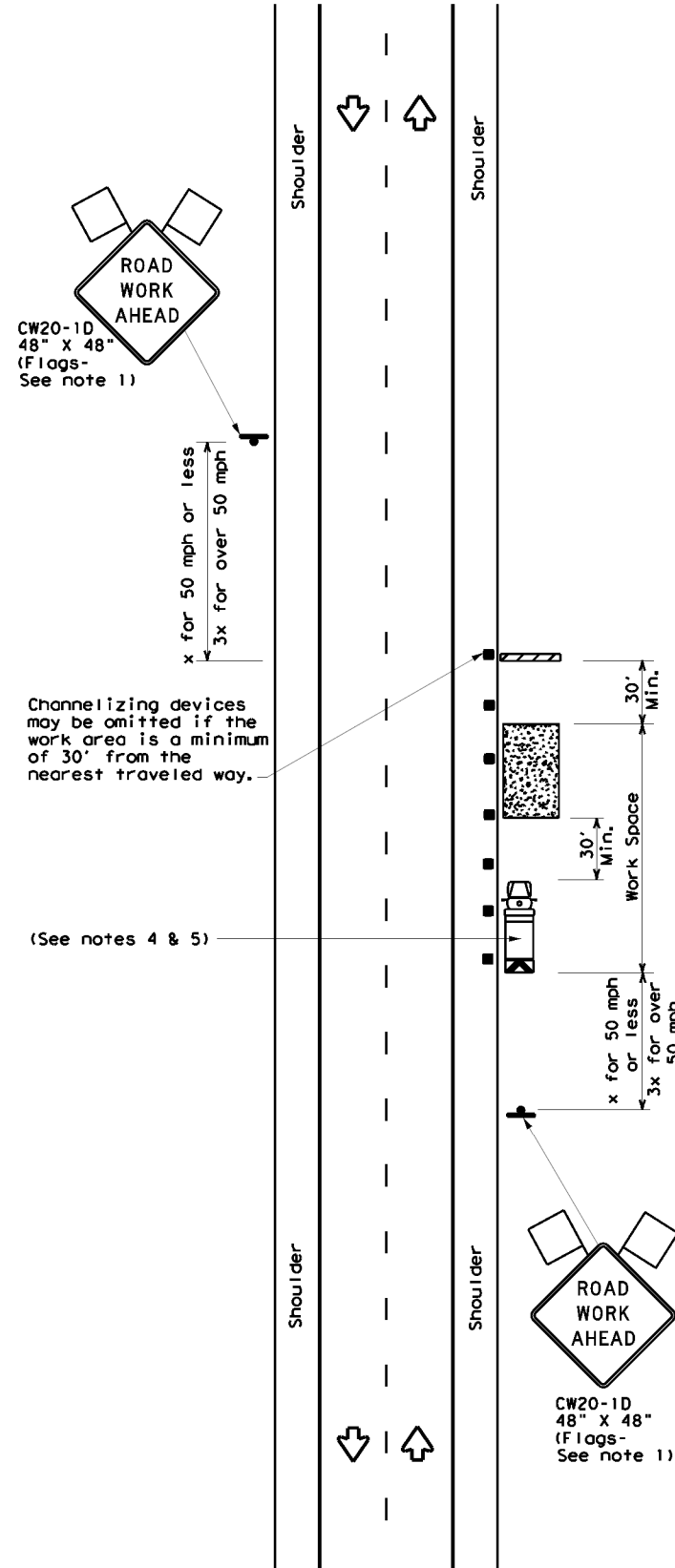
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| © TxDOT February 1998 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0495 05 | 061 | IH 20 LFR | |
| 1-97 9-07 5-21 | DIST | COUNTY | SHEET NO. | |
| 2-98 7-13 | TYL | SMITH | 20 | |
| 11-02 8-14 | | | | |

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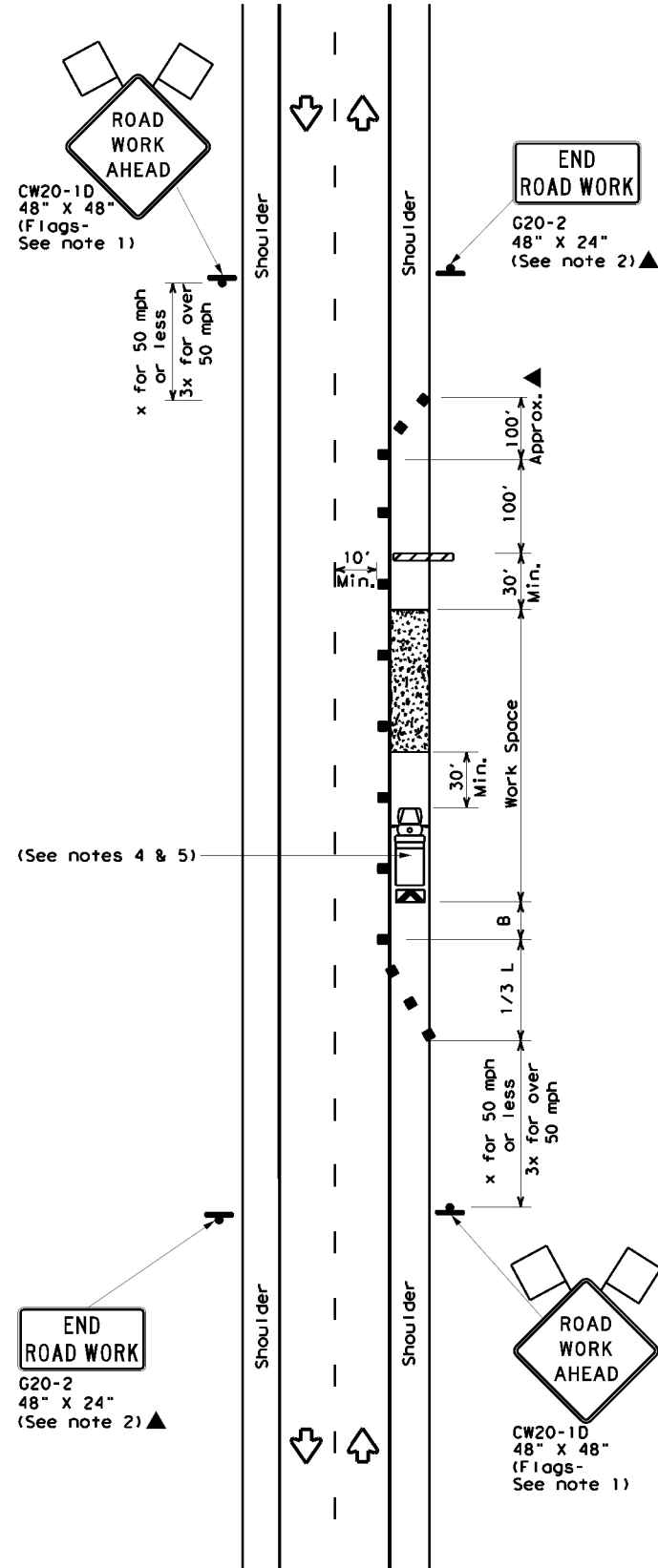
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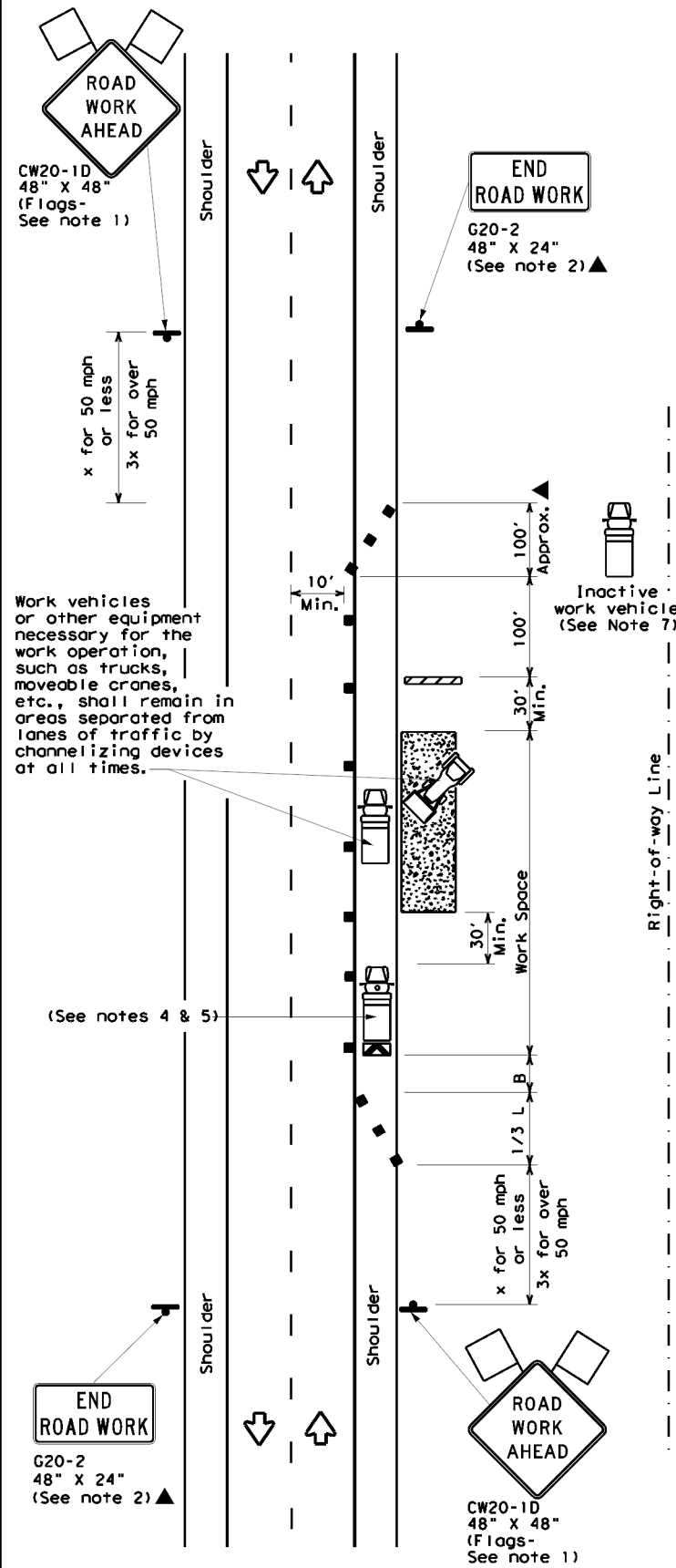
TCP (2-1a)

WORK SPACE NEAR SHOULDER
 Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
 Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
 Conventional Roads

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

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

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

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

GENERAL NOTES

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



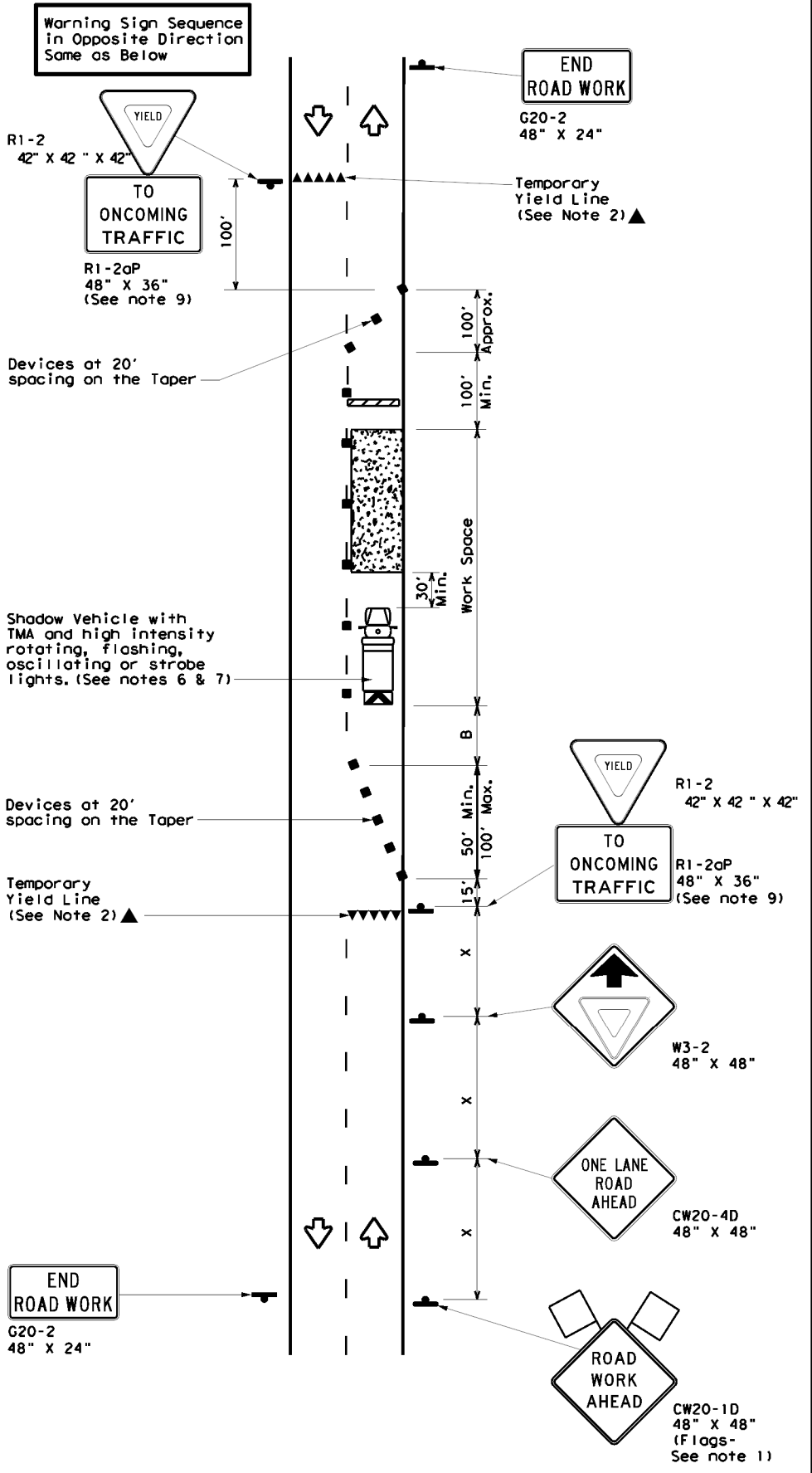
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (2-1) - 18

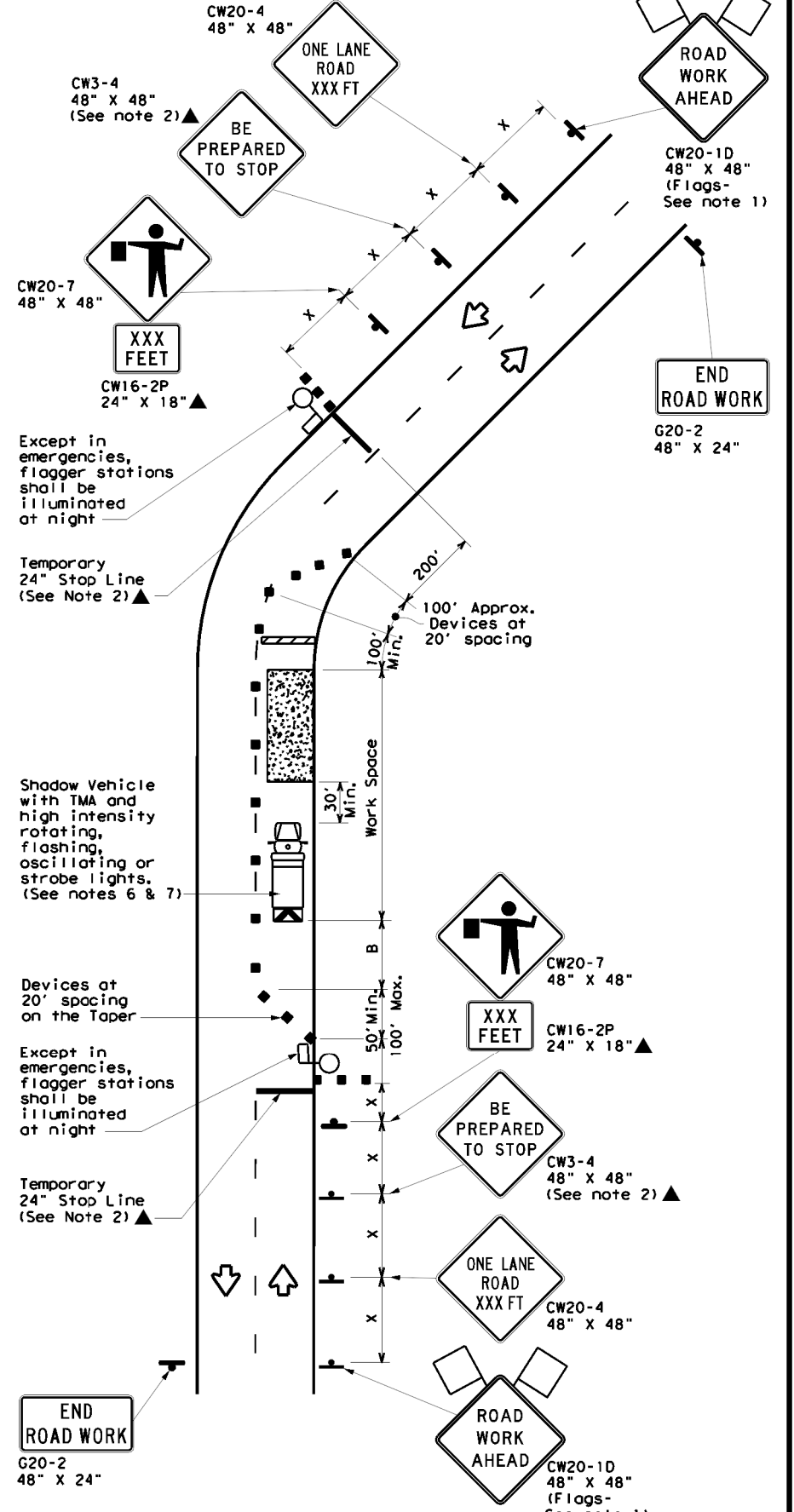
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| © TxDOT | December 1985 | CONT: | 0495 | SECT: | 05 | JOB: | 061 | HIGHWAY: | IH 20 LFR |
| REVISIONS: | | DIST: | | COUNTY: | | SHEET NO.: | | | |
| 2-94 | 4-98 | | | | | | | | |
| 8-95 | 2-12 | | | | | | | | |
| 1-97 | 2-18 | TYL | | SMITH | | | | | 21 |

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TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
 (Less than 2000 ADT - See Note 9)



TCP (2-2b)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH FLAGGERS

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

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

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

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

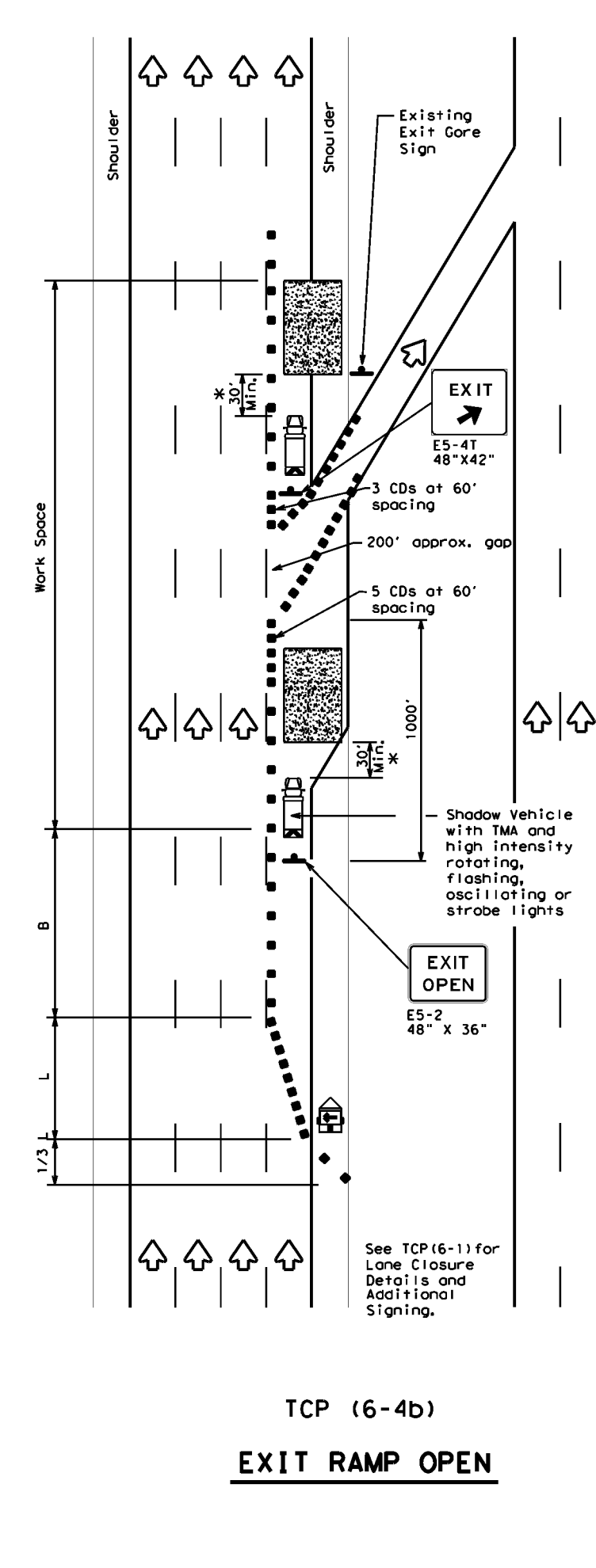
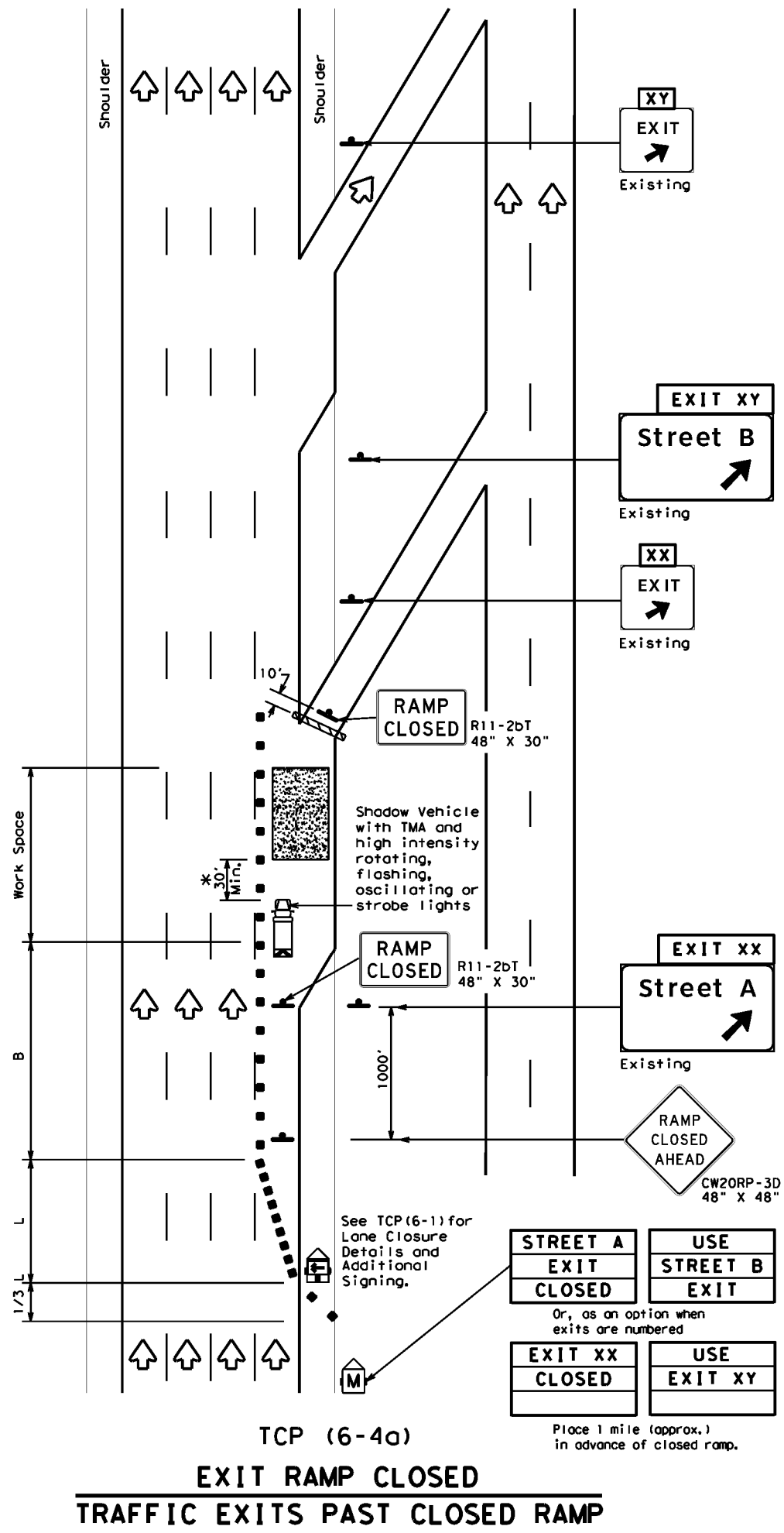
GENERAL NOTES

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

| | | | |
|--|---------------|--------------------------------------|-----------|
| | | Traffic Operations Division Standard | |
| TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL | | | |
| TCP (2-2) - 18 | | | |
| FILE: | tcp2-2-18.dgn | DW: | CK: |
| © TxDOT | REVISIONS | REVISED | DATE |
| | 0495 05 | 061 | 1H 20 LFR |
| | 1-97 2-12 | | |
| | 4-98 2-18 | | |
| DIST: | TYL | COUNTY: | SMITH |
| SHEET NO.: | | | 22 |

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| 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.

Texas Department of Transportation
 Traffic Operations Division Standard

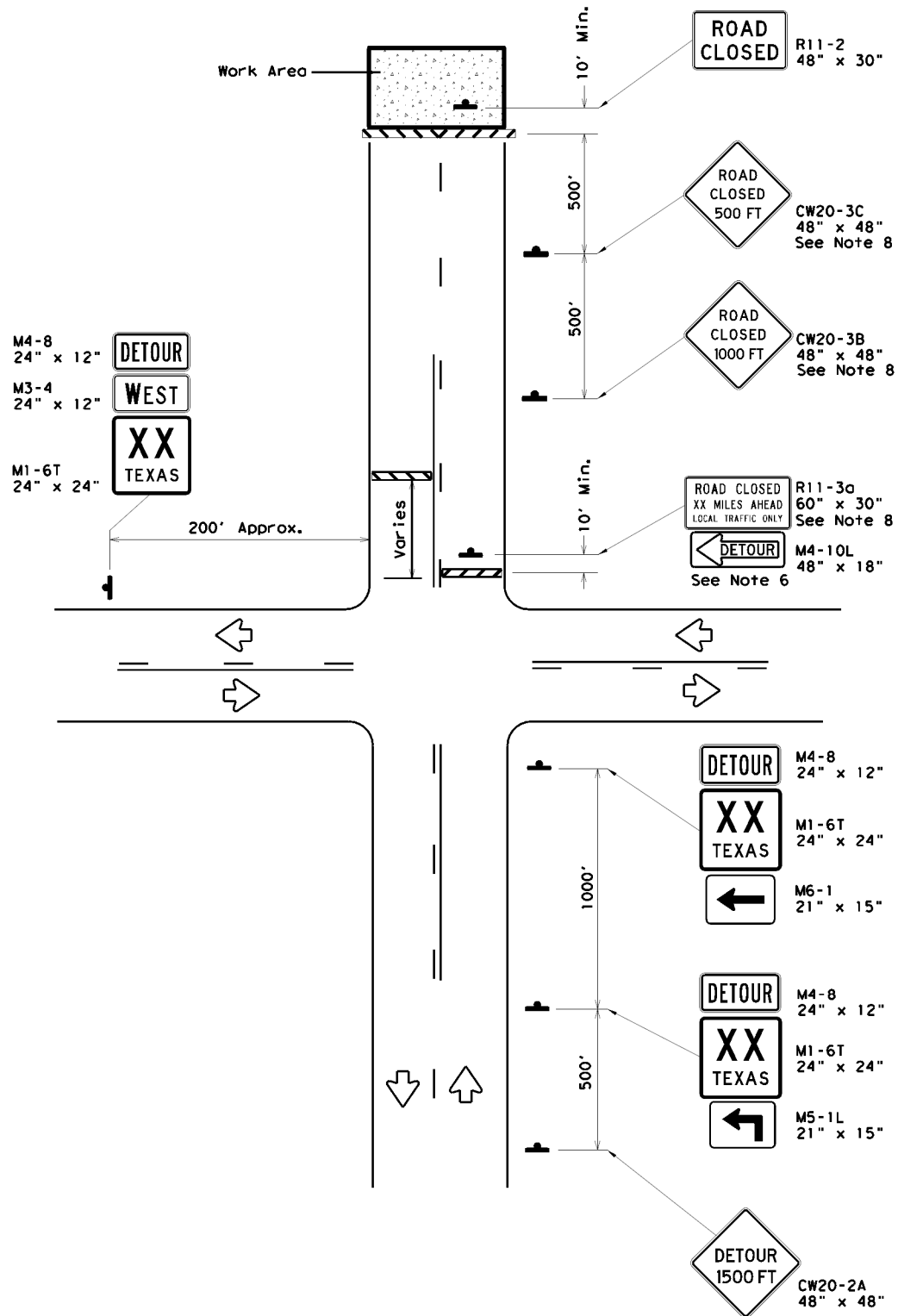
TRAFFIC CONTROL PLAN
WORK AREA AT EXIT RAMP

TCP (6-4) - 12

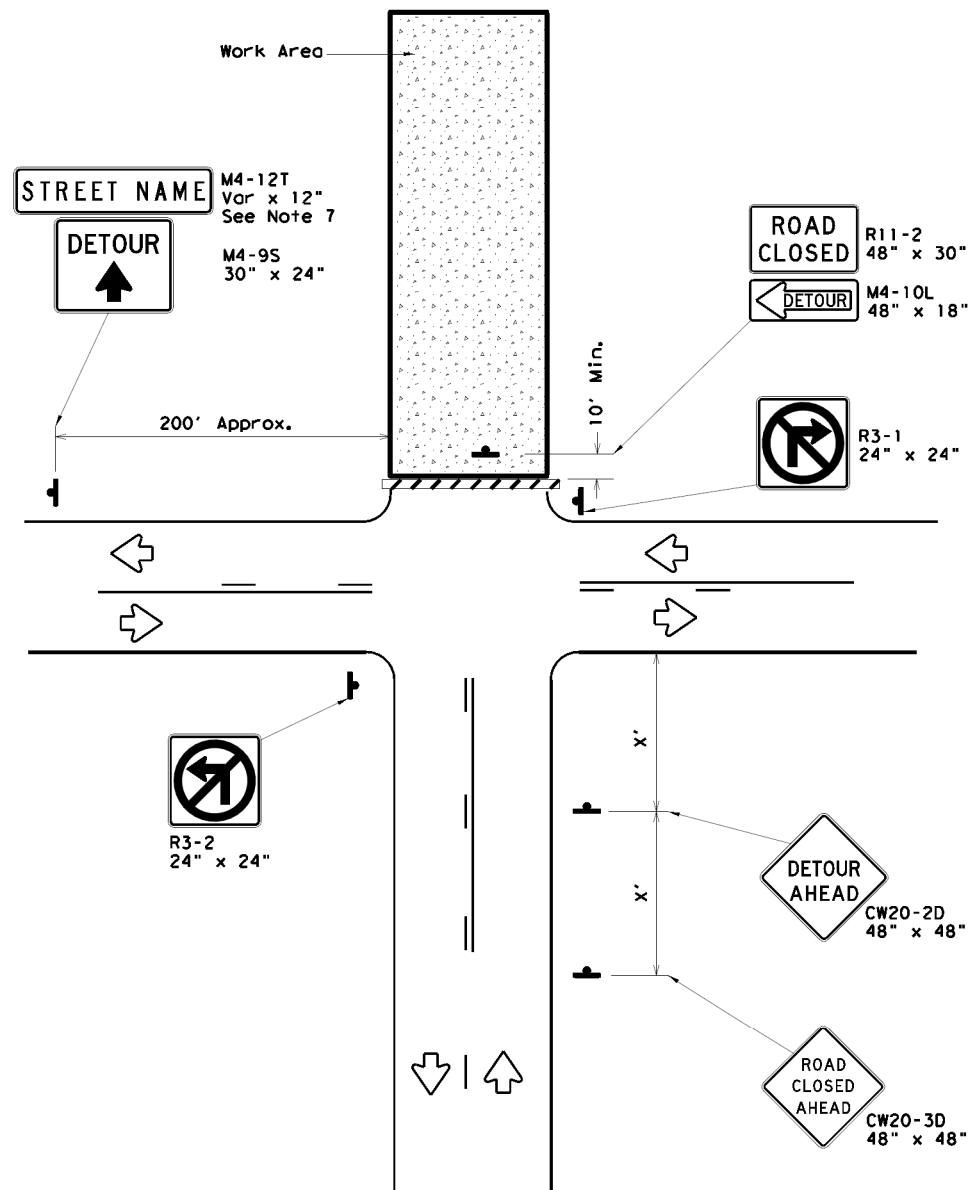
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| ©TxDOT February 1994 | CONT: 0495 05 | SECT: 061 | JOB: IH 20 LFR | HIGHWAY |
| REVISIONS | | | | |
| 1-97 8-98 | DIST: TYL | COUNTY: SMITH | SHEET NO.: 23 | |
| 4-98 8-12 | | | | |

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ROAD CLOSURE BEYOND THE INTERSECTION
 Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION
 Signing for an Un-numbered Route with an Off-Site Detour

| LEGEND | |
|--------|------------------|
| | Type 3 Barricade |
| | Sign |

| Posted Speed # | Minimum Sign Spacing "X" Distance |
|----------------|-----------------------------------|
| 30 | 120' |
| 35 | 160' |
| 40 | 240' |
| 45 | 320' |
| 50 | 400' |
| 55 | 500' |
| 60 | 600' |
| 65 | 700' |
| 70 | 800' |
| 75 | 900' |

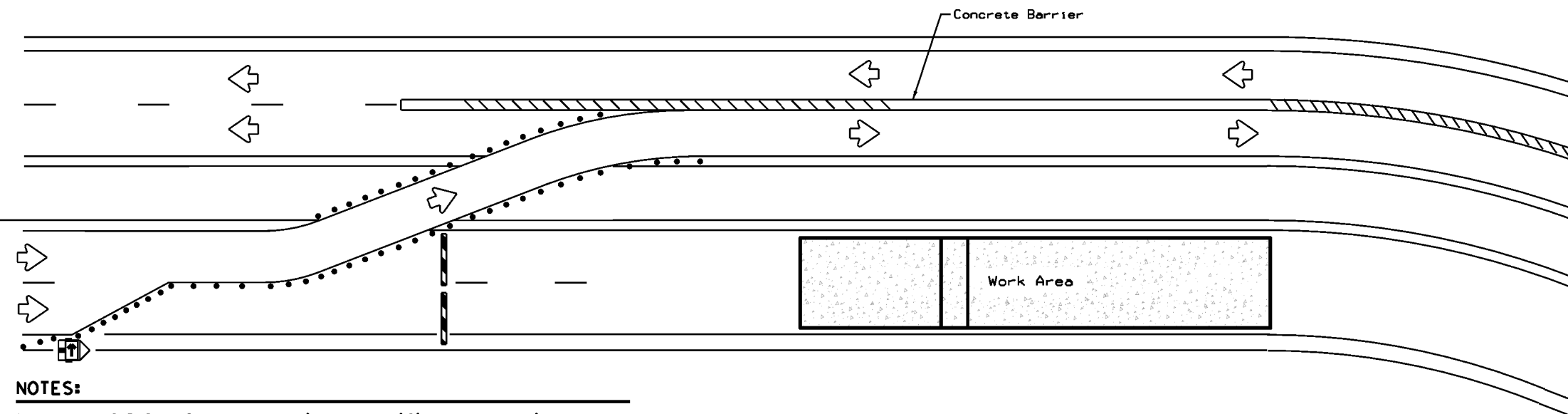
* Conventional Roads Only

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices List (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

| | | | | | |
|---|--------------|-------|-------|--------------------------------------|-----------|
| | | | | Traffic Operations Division Standard | |
| WORK ZONE ROAD CLOSURE DETAILS WZ (RCD) - 13 | | | | | |
| FILE: | wzrcd-13.dgn | DNF: | TxDOT | CHK: | TxDOT |
| © TxDOT | August 1995 | CONT: | SECT: | JOB: | HIGHWAY: |
| REVISIONS | | 0495 | 05 | 061 | IH 20 LFR |
| 1-97 | 4-98 | 7-13 | DIST: | COUNTY: | SHEET NO. |
| 2-98 | 3-03 | | TYL | SMITH | 24 |

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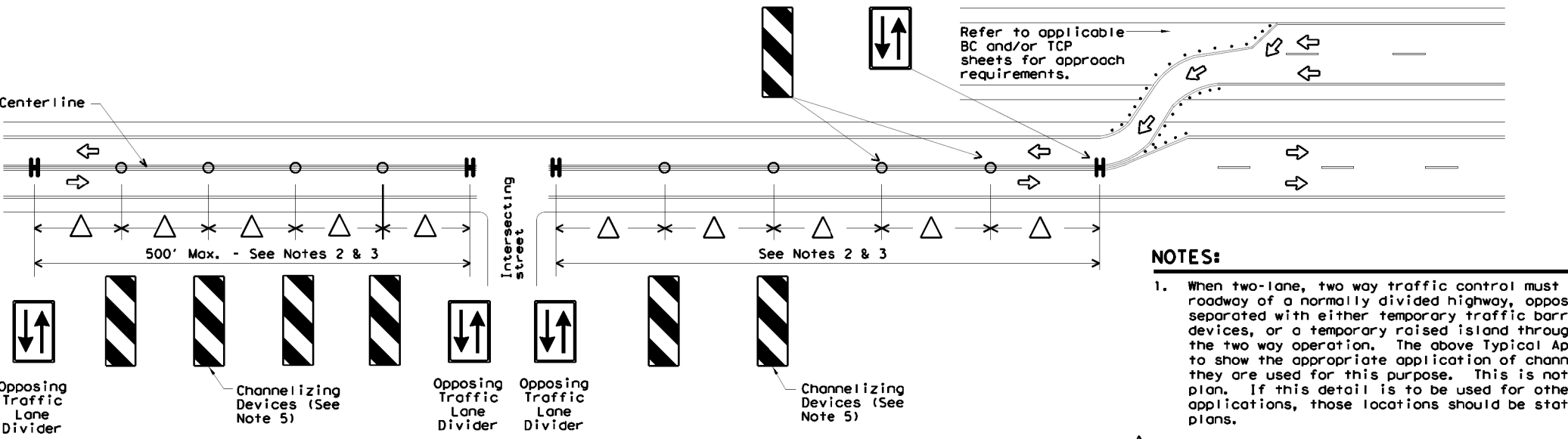
| LEGEND | |
|--------|--------------------------------------|
| | Type 3 Barricade |
| | Channelizing Devices |
| | Trailer Mounted Flashing Arrow Board |
| | Sign |
| | Safety glare screen |

| DEPARTMENTAL MATERIAL SPECIFICATIONS | |
|---|----------|
| SIGN FACE MATERIALS | DMS-8300 |
| DELINEATORS AND OBJECT MARKERS | DMS-8600 |
| MODULAR GLARE SCREENS FOR HEADLIGHT BARRIER | DMS-8610 |

Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
<http://www.txdot.gov/business/resources/producer-list.html>

- NOTES:**
- Length of Safety Glare screen will be specified elsewhere in the plans.
 - The cumulative nominal length of the modular safety glare screen units shall equal the length of the individual sections of temporary concrete traffic barrier on which they are installed so the joint between barrier sections will not be spanned by any one safety glare screen unit.
 - Screen Panel/blades will be designed such that reflective sheeting conforming with Departmental Material Specification DMS-8300, Sign Face Materials, Type B or C Yellow, minimum size of 2 inches by 12 inches can be attached to the edge of the panel/blade. The sheeting shall be attached to one glare screen panel/blade per section of concrete barrier not to exceed a spacing of 30 feet. Barrier reflectors are not necessary when panel/blades are installed with reflective sheeting as described.
 - Payment for these devices will be under statewide Special Specification "Modular Glare Screens for Headlight Barrier."
 - This detail is only intended to show types of locations where Glare Screens would be appropriate. Required signing and other devices shall be as shown elsewhere in the plans.

BARRIER DELINEATION WITH MODULAR GLARE SCREENS



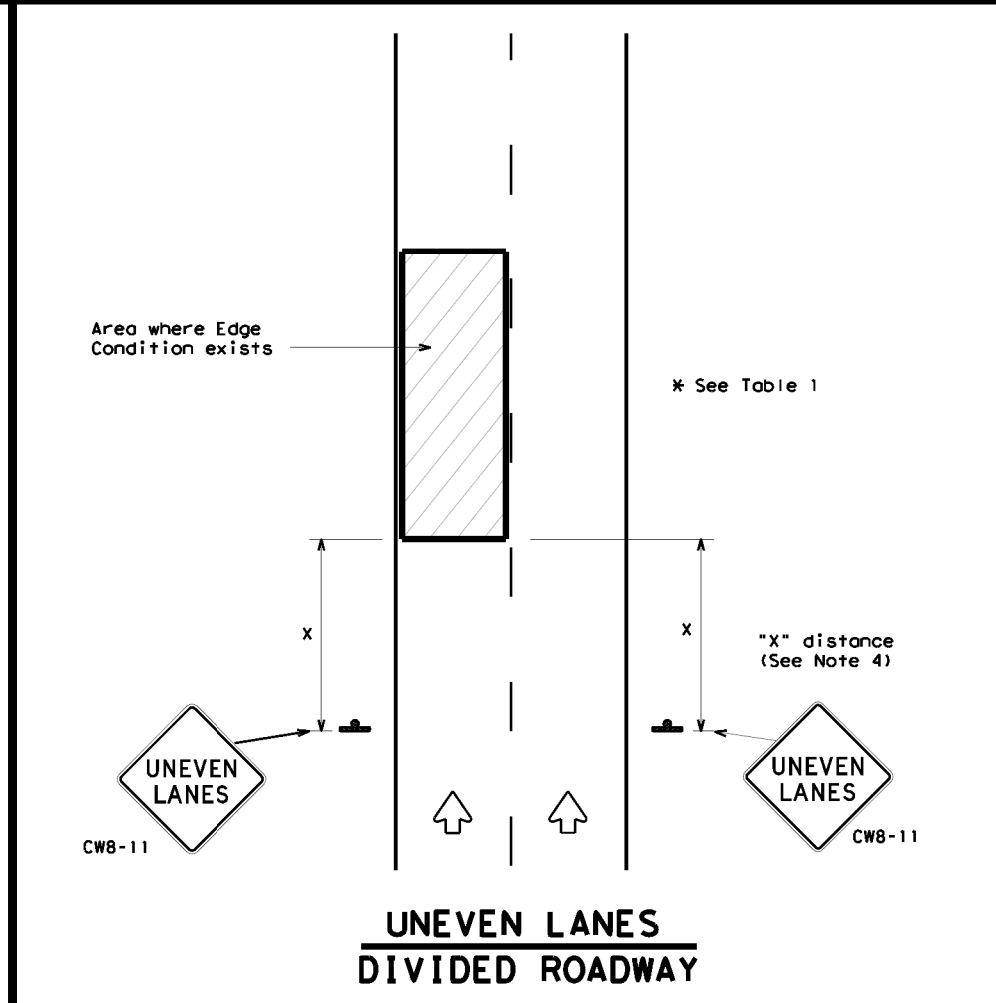
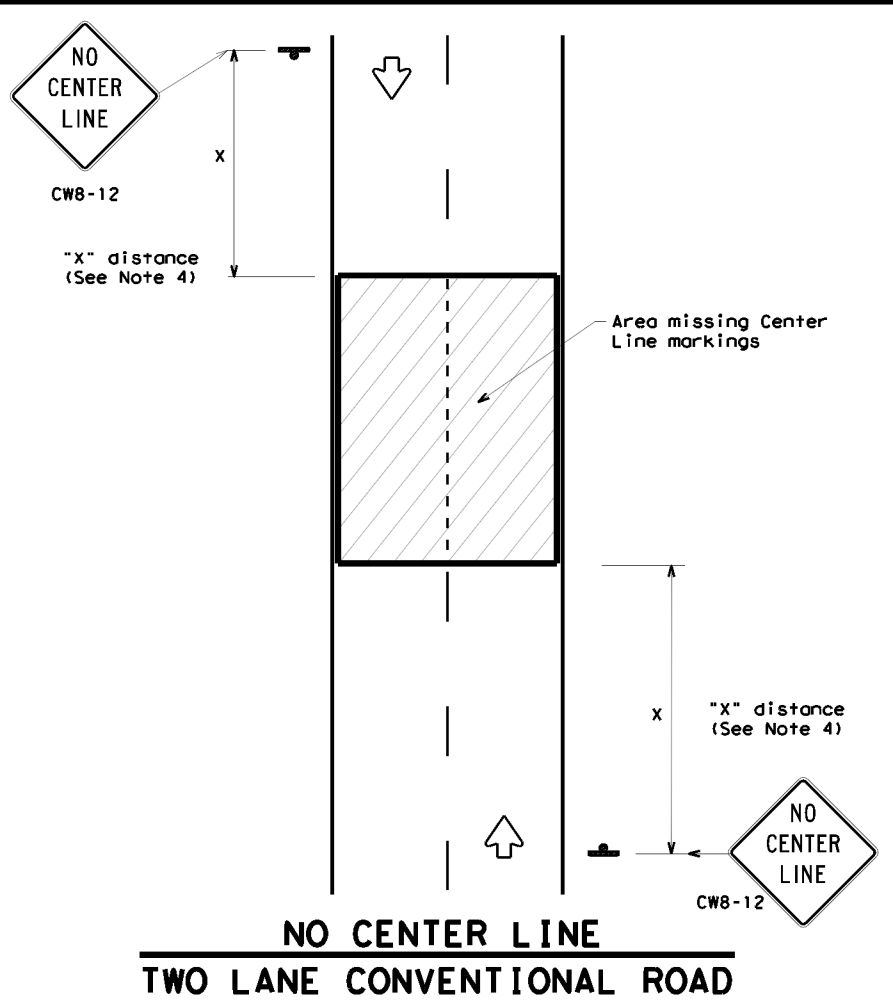
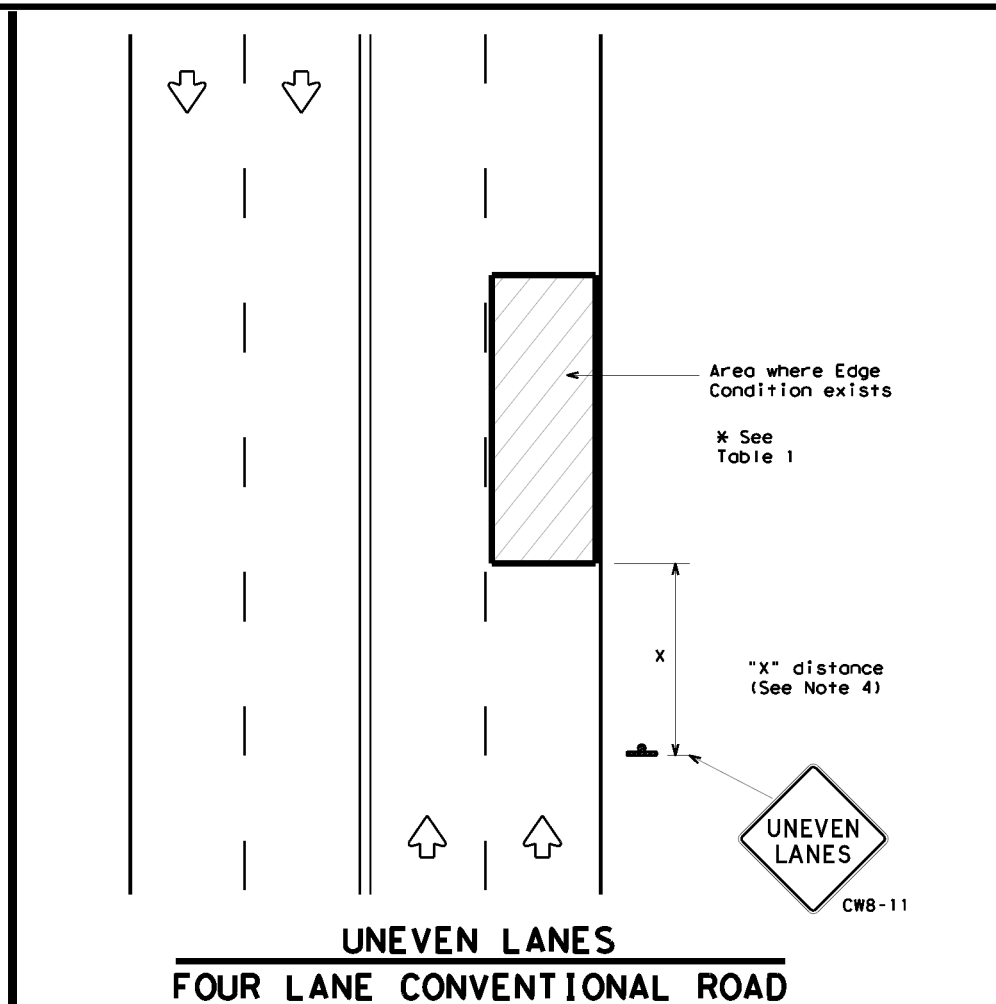
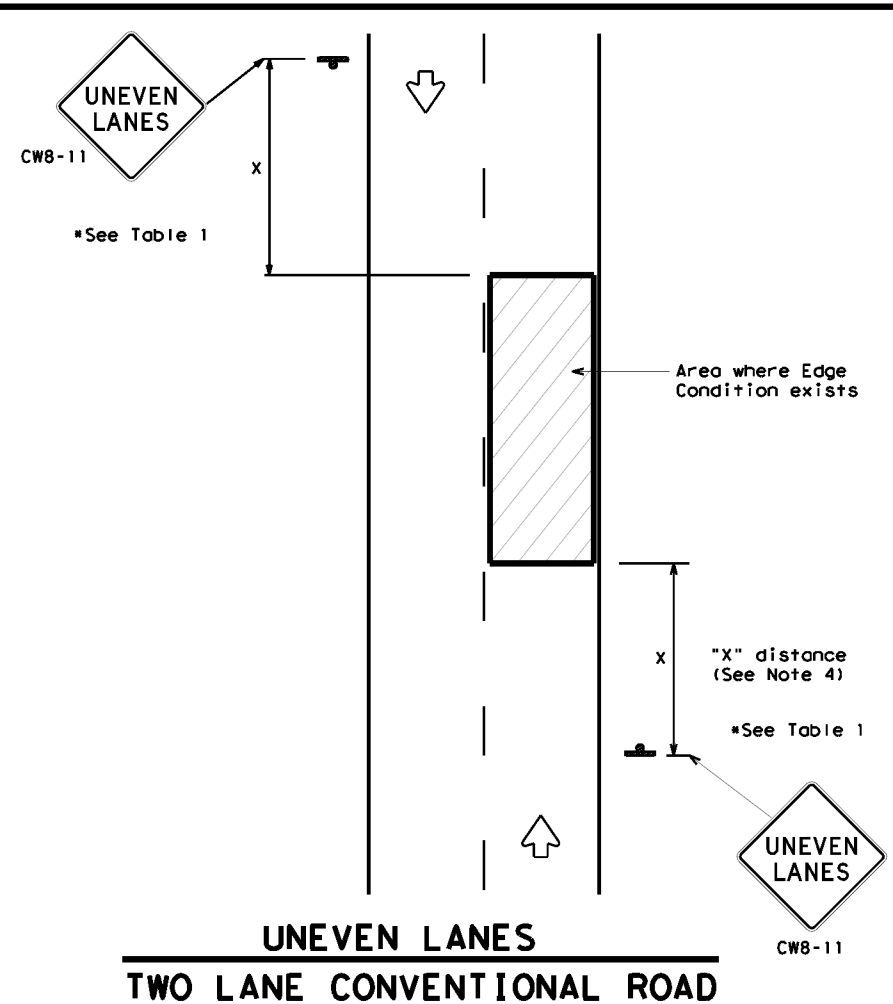
- NOTES:**
- When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
 - Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
 - Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
 - Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
 - Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

VERTICAL PANELS & OPPOSING TRAFFIC LANE DIVIDERS (OTLD) SEPARATING TWO-WAY TRAFFIC ON NORMALLY DIVIDED HIGHWAYS

| | | | |
|---|---------------|--------------------------------------|-----------|
| | | Traffic Operations Division Standard | |
| TRAFFIC CONTROL PLAN TYPICAL DETAILS | | | |
| WZ (TD) - 17 | | | |
| FILE: | wz1d-17.dgn | DNR: | TxDOT |
| © TxDOT | February 1998 | CR: | TxDOT |
| REVISIONS | | DN: | TxDOT |
| 4-98 | 2-17 | CR: | TxDOT |
| 3-03 | | CONT: | 0495 05 |
| 7-13 | | SECT: | 061 |
| | | JOB: | IH 20 LFR |
| | | DIST: | SMITH |
| | | COUNTY: | SMITH |
| | | SHEET NO.: | 25 |

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| DEPARTMENTAL MATERIAL SPECIFICATIONS | |
|---|----------|
| PERMANENT PREFABRICATED PAVEMENT MARKINGS | DMS-8240 |
| TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS | DMS-8241 |
| SIGN FACE MATERIALS | DMS-8300 |

| COLOR | USAGE | SHEETING MATERIAL |
|--------|------------------|---|
| ORANGE | BACKGROUND | TYPE B _{FL} OR TYPE C _{FL} SHEETING |
| BLACK | LEGEND & BORDERS | ACRYLIC NON-REFLECTIVE SHEETING |

GENERAL NOTES

1. If spalling or holes occur, ROUGH ROAD (CW8-8) signs should be placed in advance of the condition and be repeated every two miles where the condition persists.
2. UNEVEN LANES (CW8-11) signs shall be installed in advance of the condition and repeated every mile. Signs installed along the uneven lane condition may be supplemented with the NEXT XX MILES (CW7-3aP) plaque or Advisory Speed (CW13-1P) plaque.
3. NO CENTER LINE (CW8-12) signs and temporary pavement markings as per the WZ(STPM) standard shall be installed if yellow centerlines separating two way traffic are obscured or obliterated. Repeat NO CENTER LINE signs every two miles where the center line markings are not in place. The signs and markings shall remain in place until permanent pavement markings are installed.
4. Signs shall be spaced at the distances recommended as per BC standards.
5. Additional signs may be required as directed by the Engineer. Signs shall remain in place until final surface is applied. Signs shall be considered subsidiary to Item 502 "BARRICADES, SIGNS AND TRAFFIC HANDLING."
6. Signs shall be fabricated and mounted on supports as shown on the BC standards and/or listed on the "Compliant Work Zone Traffic Control Devices" list.
7. Short term markings shall not be used to simulate edge lines.
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition.

| Edge Condition | Edge Height (D) | * Warning Devices |
|----------------|---|-------------------|
| ① | Less than or equal to: 1/4" (maximum-planing) 1/2" (typical-overlay) | Sign: CW8-11 |
| ② | Less than or equal to 3" | Sign: CW8-11 |
| ③ | Distance "D" may be a maximum of 3" if uneven lanes with edge condition 2 or 3 are open to traffic after work operations cease. Uneven lanes should not be open to traffic when "D" is greater than 3". | |

TRAFFIC CONTROL DURING PLANING, OVERLAY AND LEVELING OPERATIONS ARE SHOWN ELSEWHERE IN THE PLANS.

| MINIMUM WARNING SIGN SIZE | |
|--|-----------|
| Conventional roads | 36" x 36" |
| Freeways/expressways, divided roadways | 48" x 48" |

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ (UL) - 13

| | | | | |
|--------------------|------------|------------|------------|-----------|
| FILE: wzu1-13.dgn | DWG: TxDOT | CHK: TxDOT | APP: TxDOT | CR: TxDOT |
| © TxDOT April 1992 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0495 05 | 061 | IH 20 LFR | |
| 8-95 2-98 7-13 | DIST | COUNTY | SHEET NO. | |
| 1-97 3-03 | TYL | SMITH | 26 | |

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Alignment Name: IH20 LFR BL
Alignment Description:
Alignment Style: Alignment\Baseline

| | | Station | Northing | Easting |
|----------|----------------------------|---------------------|-------------|-------------|
| Linear | | | | |
| POT | () | 1277+57.405 R1 | 6863143.982 | 2989755.898 |
| PC | () | 1279+31.441 R1 | 6863184.993 | 2989925.033 |
| | Tangential Direction: | N76°22'12.816"E | | |
| | Tangential Length: | 174.036 | | |
| Circular | | | | |
| PC | () | 1279+31.441 R1 | 6863184.993 | 2989925.033 |
| PI | () | 1280+57.369 R1 | 6863214.667 | 2990047.414 |
| CC | () | | 6862891.925 | 2989996.094 |
| PT | () | 1281+70.020 R1 | 6863148.496 | 2990154.554 |
| | Radius: | 301.56 | | |
| | Delta: | 45°19'46.325" Right | | |
| | Degree of Curvature (Arc): | 18°59'59.259" | | |
| | Length: | 238.579 | | |
| | Tangent: | 125.927 | | |
| | Chord: | 232.405 | | |
| | Middle Ordinate: | 23.288 | | |
| | External: | 25.237 | | |
| | Back Tangent Direction: | N76°22'12.816"E | | |
| | Back Radial Direction: | S13°37'47.184"E | | |
| | Chord Direction: | S80°57'54.022"E | | |
| | Ahead Radial Direction: | S31°41'59.141"W | | |
| | Ahead Tangent Direction: | S58°18'00.859"E | | |
| Linear | | | | |
| PT | () | 1281+70.020 R1 | 6863148.496 | 2990154.554 |
| | EQNBK | 1282+20.300 R1 | 6863122.076 | 2990197.333 |
| | EQNAHD | 1280+28.200 R2 | 6863122.076 | 2990197.333 |
| PC | () | 1280+87.193 R2 | 6863091.077 | 2990247.525 |
| | Tangential Direction: | S58°18'00.859"E | | |
| | Tangential Length: | 109.272 | | |
| Circular | | | | |
| PC | () | 1280+87.193 R2 | 6863091.077 | 2990247.525 |
| PI | () | 1281+45.646 R2 | 6863060.362 | 2990297.258 |
| CC | () | | 6862789.872 | 2990061.499 |
| PT | () | 1282+03.054 R2 | 6863015.289 | 2990334.477 |
| | Radius: | 354.02 | | |
| | Delta: | 18°45'05.070" Right | | |
| | Degree of Curvature (Arc): | 16°11'03.603" | | |
| | Length: | 115.861 | | |
| | Tangent: | 58.453 | | |
| | Chord: | 115.345 | | |
| | Middle Ordinate: | 4.729 | | |
| | External: | 4.793 | | |
| | Back Tangent Direction: | S58°18'00.859"E | | |
| | Back Radial Direction: | S31°41'59.141"W | | |
| | Chord Direction: | S48°55'28.324"E | | |
| | Ahead Radial Direction: | S50°27'04.211"W | | |
| | Ahead Tangent Direction: | S39°32'55.789"E | | |

Alignment Name: IH20 LFR BL
Alignment Description:
Alignment Style: Alignment\Baseline

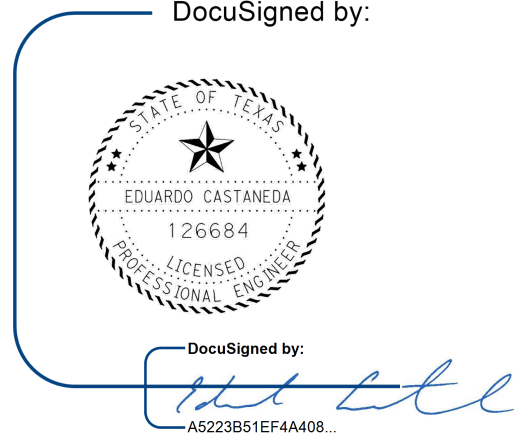
| | | Station | Northing | Easting |
|----------|----------------------------|--------------------|-------------|-------------|
| Linear | | | | |
| PT | () | 1282+03.054 R2 | 6863015.289 | 2990334.477 |
| PC | () | 1284+24.873 R2 | 6862844.249 | 2990475.717 |
| | Tangential Direction: | S39°32'55.789"E | | |
| | Tangential Length: | 221.819 | | |
| Circular | | | | |
| PC | () | 1284+24.873 R2 | 6862844.249 | 2990475.717 |
| PI | () | 1286+15.262 R2 | 6862697.443 | 2990596.945 |
| CC | () | | 6863215.465 | 2990925.258 |
| PT | () | 1287+92.920 R2 | 6862650.48 | 2990781.451 |
| | Radius: | 583 | | |
| | Delta: | 36°10'14.501" Left | | |
| | Degree of Curvature (Arc): | 09°49'39.898" | | |
| | Length: | 368.047 | | |
| | Tangent: | 190.389 | | |
| | Chord: | 361.965 | | |
| | Middle Ordinate: | 28.803 | | |
| | External: | 30.3 | | |
| | Back Tangent Direction: | S39°32'55.789"E | | |
| | Back Radial Direction: | S50°27'04.211"W | | |
| | Chord Direction: | S57°38'03.039"E | | |
| | Ahead Radial Direction: | S14°16'49.710"W | | |
| | Ahead Tangent Direction: | S75°43'10.290"E | | |
| Linear | | | | |
| PT | () | 1287+92.920 R2 | 6862650.48 | 2990781.451 |
| POT | () | 1297+53.327 R2 | 6862413.578 | 2991712.181 |
| | Tangential Direction: | S75°43'10.290"E | | |
| | Tangential Length: | 960.408 | | |

1. All coordinates are based on the Texas Coordinate System, North Central Zone, NAD83. The coordinates shown hereon are in GRID Coordinates and may be converted to surface using a Surface Adjustment Factor of 1.00120.
Units: U.S. Survey Feet
2. The data shown hereon was derived from GPS observations utilizing TxDOT VRS.

Control Point Table

| Name | Northing | Easting | Elevation | Style |
|------------|------------|------------|-----------|-----------|
| TX423.0036 | 6862225.46 | 2989534.49 | 376.33 | Brass Cap |
| TX423.0037 | 6860284.96 | 2988139.31 | 394.84 | Brass Cap |

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6/1/2023

Texas Department of Transportation

IH 20 LFR
HORIZONTAL ALIGNMENT DATA

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| CONT | SECT | JOB | HIGHWAY |
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| DIST | COUNTY | SHEET NO. | |
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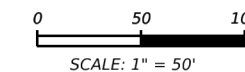
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PI 1281+45.65
 Δ 18°45'05.1" (RT)
 D 16°11'03.6"
 T 58.45'
 L 115.86'
 R 354.02'
 PC 1280+87.19
 PT 1282+03.05

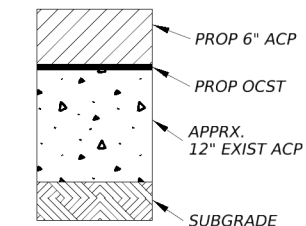
PI 1286+15.26
 Δ 36°10'14.5" (LT)
 D 09°49'39.9"
 T 190.39'
 L 368.05'
 R 583.00'
 PC 1284+24.87
 PT 1287+92.92

LEGEND

-  SEDIMENT CONTROL FENCE
-  TRAFFIC FLOW ARROWS
-  IH 20 NFR
-  PROPOSED ACP SURFACE
-  MILLING AREA
-  SAWCUT LINE
-  FLOW DIRECTION

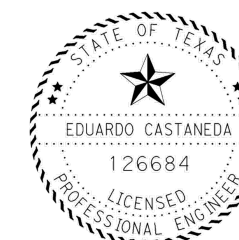


- NOTES:**
1. EXISTING 18" RCP AND SAFETY-END-TREATMENTS TO REMAIN.
 2. LIMITS OF EROSION CONTROL MEASURES TO EXTEND 5' BEYOND PROPOSED PAVEMENT EDGE-OF-PAVEMENT.



DETAIL A

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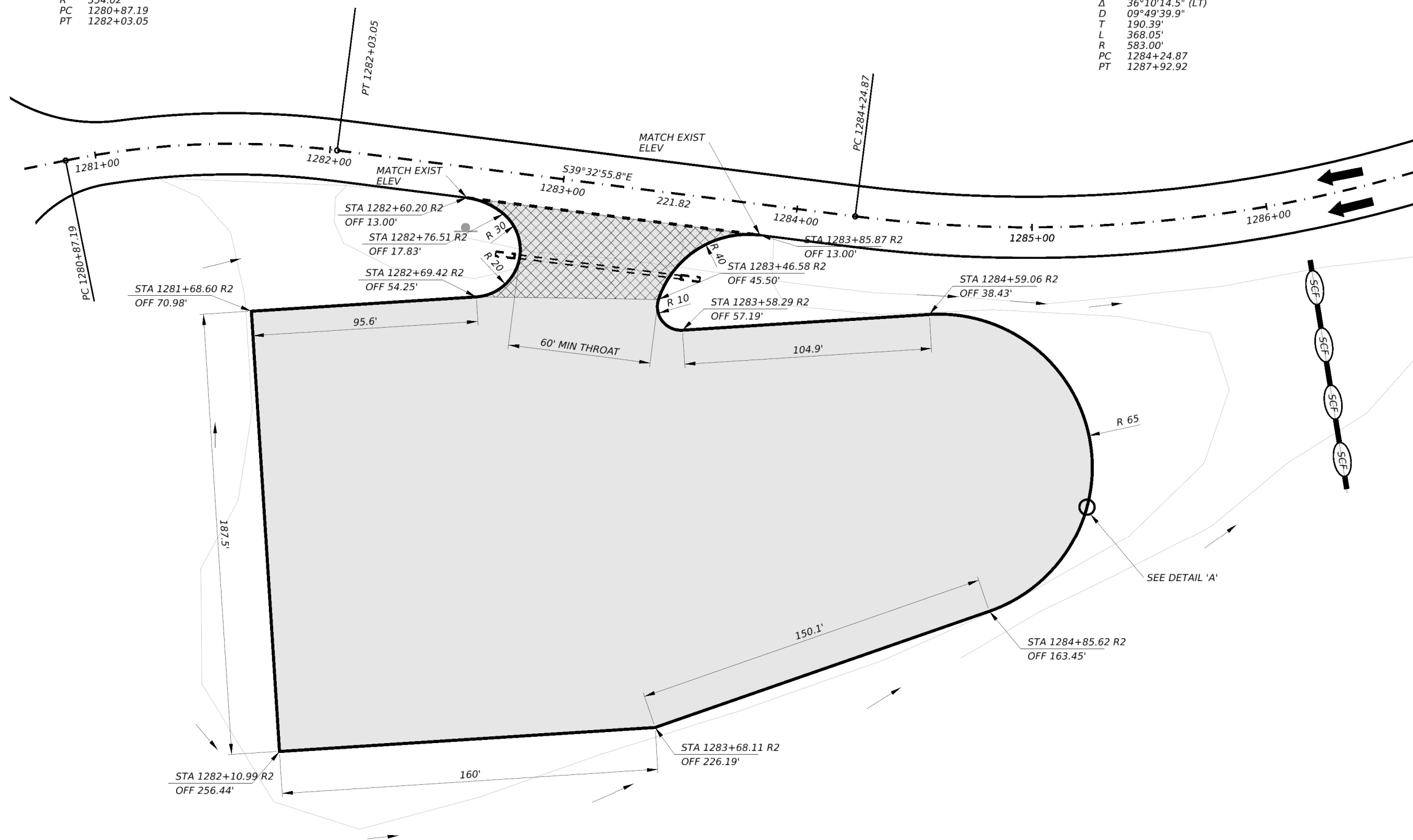
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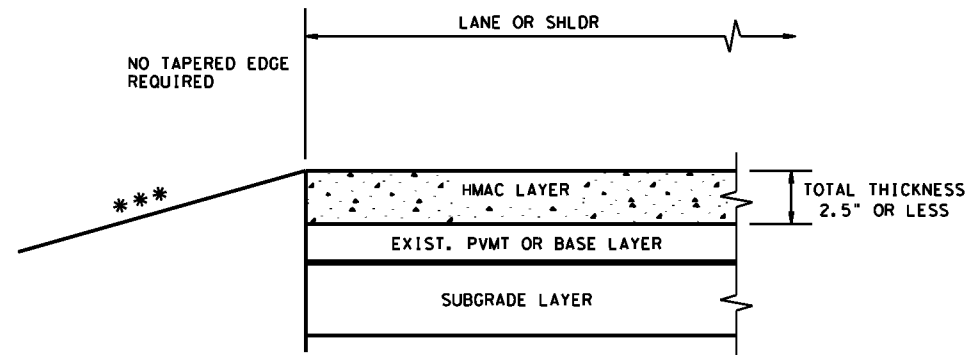
**IH 20 LFR
PLAN LAYOUT**

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| DIST | COUNTY | SHEET NO. | |
| TYL | SMITH | 28 | |



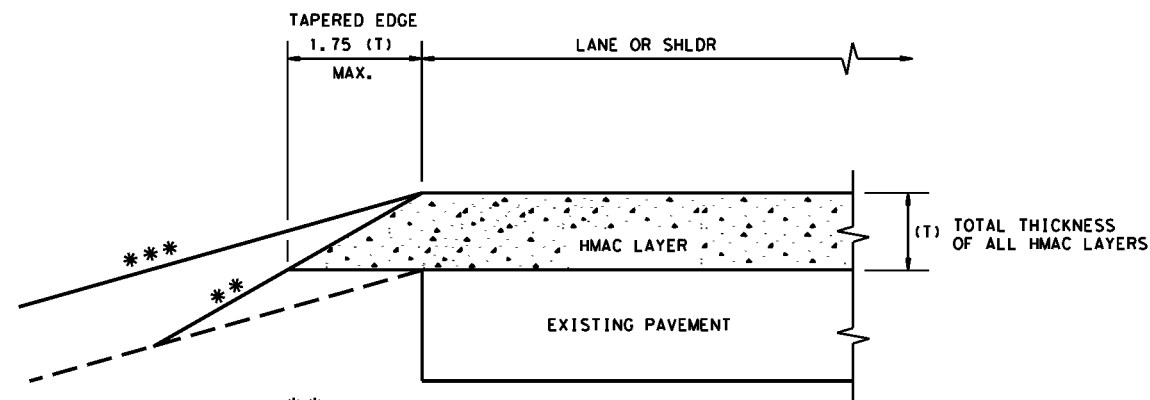
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*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

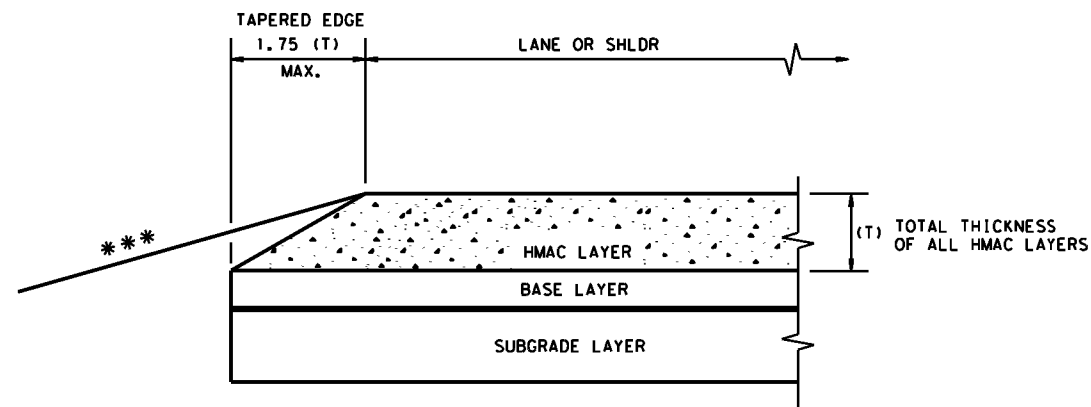
CONDITION - 1
 THIN HMAC SURFACES OR HMAC OVERLAY
 WITH THICKNESS OF 2.5" OR LESS



** EXISTING ROADSIDE EMBANKMENT TO BE GRADED TO PRODUCE A SMOOTH LEVEL SURFACE FOR PLACEMENT OF TAPERED EDGE. THIS WORK IS SUBSIDIARY TO THE VARIOUS BID ITEMS.

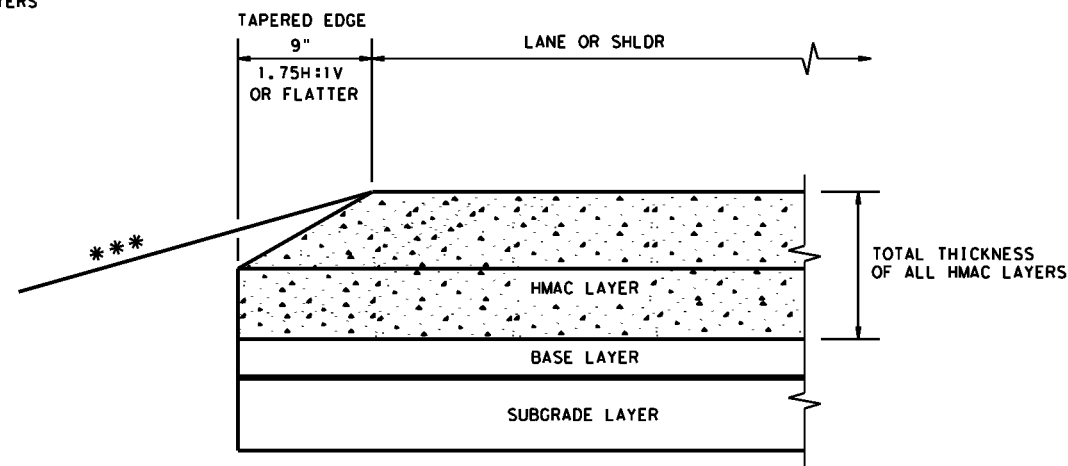
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 2
 OVERLAY OF EXISTING PAVEMENT
 HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 3
 NEW OR RECONSTRUCTED PAVEMENT
 HMAC THICKNESS 2.5" TO 5"



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

CONDITION - 4
 NEW OR RECONSTRUCTED PAVEMENT
 HMAC THICKNESS 5" OR GREATER

(NOT TO SCALE)

GENERAL NOTES

- UNLESS OTHERWISE SHOWN IN THE PLANS, A VERTICAL EDGE IS PERMISSIBLE FOR HMAC PLACED GREATER THAN 5" BELOW THE EDGE OF PAVEMENT AND FOR THICKNESS OF HMAC LESS THAN 2.5".
- FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
- PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
- THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
- THE TAPERED EDGE SHALL BE PRODUCED BY USE OF A SCREED ATTACHMENT CAPABLE OF PRODUCING A SMOOTH COMPACTED SURFACE. ADDITIONAL COMPACTING EFFORT BEHIND THE SCREED IS NOT REQUIRED.

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DocuSigned by:

Eduardo Castaneda

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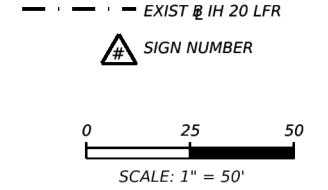
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| | | | | | |
|--|-----------|--------|---------|--------------------------|--|
| | | | | Design Division Standard | |
| TAPERED EDGE DETAILS HMAC PAVEMENT | | | | | |
| TE (HMAC) - 11 | | | | | |
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| REVISIONS | 0495 05 | | 061 | IH 20 LFR | |
| | DIST | COUNTY | | SHEET NO. | |
| | TYL | SMITH | | 29 | |

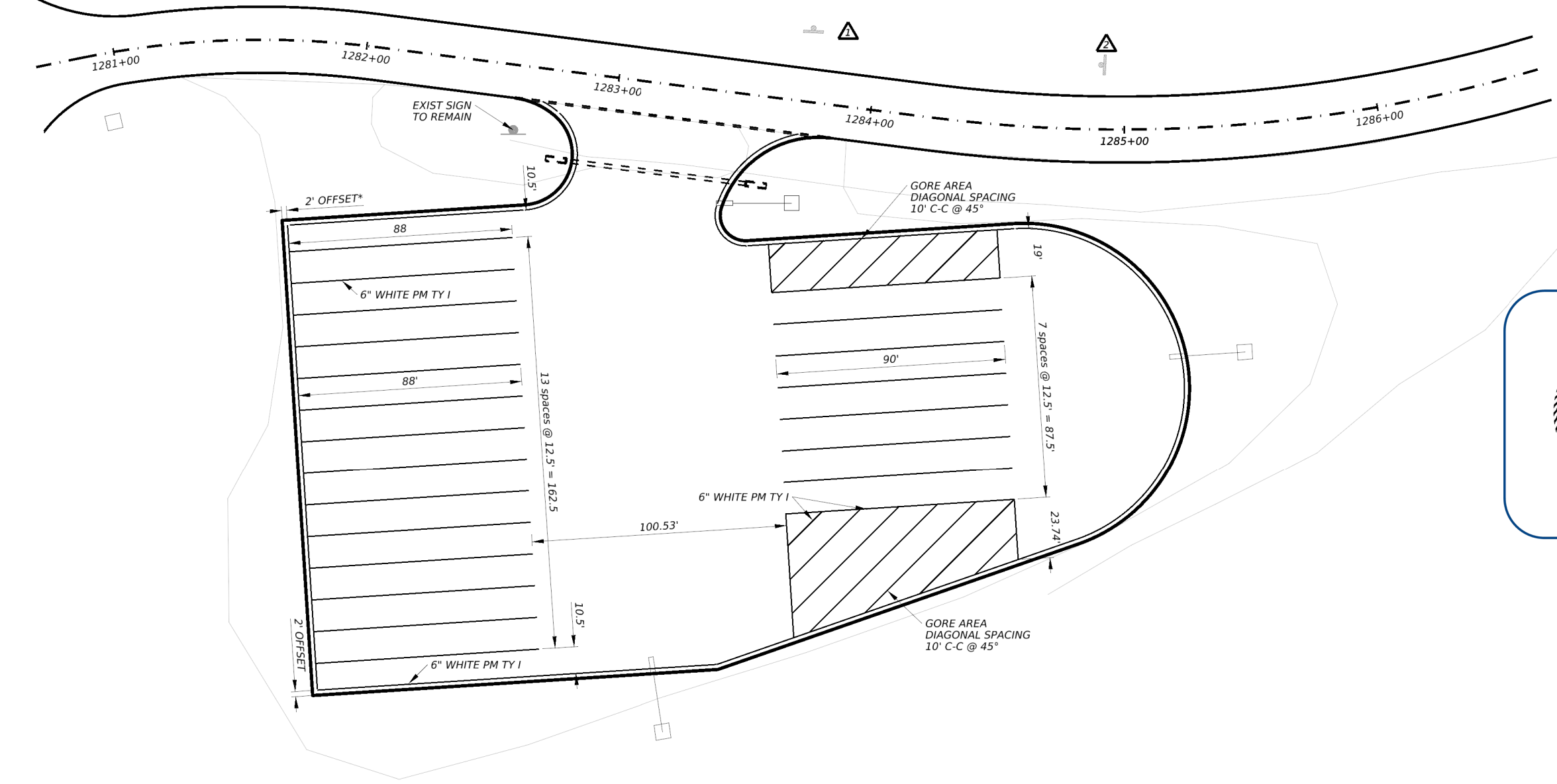
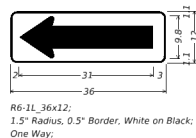
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PLAN LEGEND

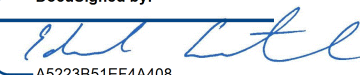


NOTES:
 * - 2' OFFSET AROUND ENTIRE PERIMETER



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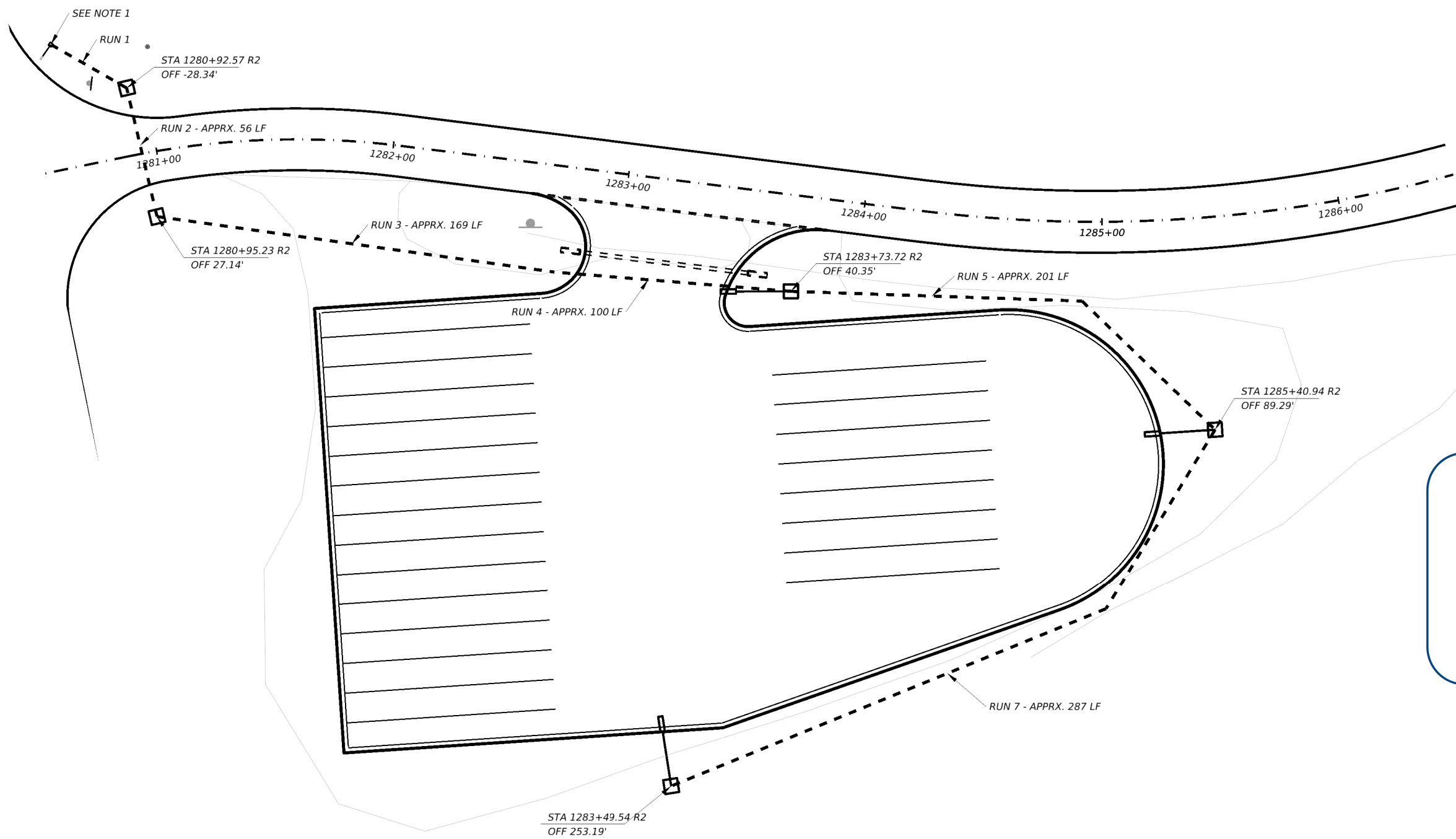
IH 20 LFR
 PAVEMENT MARKING
 & SIGNING LAYOUT

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| CONT | SECT | JOB | HIGHWAY |
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| DIST | COUNTY | SHEET NO. | |
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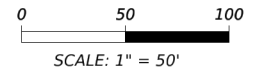
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LEGEND

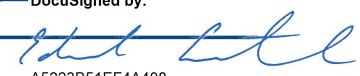
- ← TRAFFIC FLOW ARROWS
- - - - - IH 20 NFR
- PROPOSED ILLUMINATION POLE
- PROPOSED GROUND BOX
- PROPOSED CONDUIT RUN



NOTES:
 1- USE EXISTING SERVICE LOCATED AT INTERSECTION OF IH 20 LFR AND SH 155 ILLUMINATION POLE.

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**IH 20 LFR
 ILLUMINATION LAYOUT**

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| CONT | SECT | JOB | HIGHWAY |
| 0495 | 05 | 061 | IH 20 LFR |
| DIST | COUNTY | SHEET NO. | |
| TYL | SMITH | 31 | |

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| REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS | | | | DELINEATORS | | | | D & OM DESCRIPTIVE CODES | |
|--|--------|--------|--------|--|--------|------------|--------|--------------------------|---|
| DEVICE | SIZE 1 | SIZE 2 | SIZE 3 | SIZE 4 | SINGLE | | DOUBLE | | INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX) NUMBER OF REFLECTORS S = Single D = Double COLOR OF REFLECTORS W = White Y = Yellow R = Red REFLECTOR UNIT SIZE 1 or 2 TYPE OF POST OR DELINEATOR WC = Wing Channel Post YFLX = Yellow Flexible Post WFLX = White Flexible Post BRP = Barrier Reflector TYPE OF MOUNT GND = Embedded (drivable or set in concrete) CTB = Concrete Barrier Mount GF1 or GF2 = Guard Fence Attachment SRF = Surface Mount DIRECTION If Required BI = Bi-Directional BR = Bi-Directional with red on back |
| | | | | | | | | | |
| SHEETING: Yellow, White or Red Type B or C reflective sheeting | | | | SHEETING: Yellow, White or Red Type B or C Reflective Sheeting | | | | | |
| NOTE: 1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (fix). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes. | | | | POST TYPE | | MOUNT TYPE | | | |

| OBJECT MARKERS | | | | | | | | |
|----------------|-----------------------------|-------------------------------|-------|----------|---|-------|-------|---|
| DEVICE | Type 1 (OM-1) | Type 2 (OM-2) | | | Type 3 (OM-3) | | | Type 4 (OM-4) |
| | OM-1 | OM-2X | OM-2Y | OM-2Z | OM-3L | OM-3R | OM-3C | OM-4 |
| | | | | | | | | |
| SHEETING | Yellow-Type B or C Sheeting | Yellow - Type B or C Sheeting | | | Alternating acrylic black and retroreflective yellow - Type B _{FL} or C _{FL} Sheeting | | | Red -Type B _{FL} or C _{FL} Sheeting |
| POST TYPE | TWT | WC | WC | WFLX | TWT | | | TWT |
| MOUNT TYPE | WAS, WAP | GND | GND | GND, SRF | WAS, WAP | | | WAS, WAP |

| DEPARTMENTAL MATERIAL SPECIFICATIONS | |
|--|----------|
| FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES) | DMS-4400 |
| SIGN FACE MATERIALS | DMS-8300 |
| DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS | DMS-8600 |

| BARRIER REFLECTORS (BRF) | | | CHEVRONS | | | | ONE DIRECTION LARGE ARROW | | NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative. |
|--|-----|-----|---|------|----------------------------------|------|----------------------------------|--|--|
| DEVICE | GF1 | GF2 | CTB | W1-8 | | W1-6 | | | |
| | | | | | | | | | |
| SHEETING: Yellow, White, Red | | | SIZE (W x L) | | MOUNTING HEIGHT | | MOUNTING HEIGHT | | |
| NOTE: 1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov. | | | 18"x 24" (Conventional) | | 24"x 30" (Conventional Oversize) | | 48" x 24" (Conventional) | | |
| | | | 30"x 36" (Expressway) | | 36" x 48" (Freeway) | | 60" x 30" (Expressway & Freeway) | | |
| | | | 4'-0" or 7'-0" | | 7'-0" Only | | 7'-0" | | |
| | | | NOTE: 1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies). 2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6). | | | | | | |

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION
D & OM(1)-20

| | | | | |
|---------------------|-----------|-----------|-----------|-----------|
| FILE: dom1-20.dgn | DNR TXDOT | CR: TXDOT | DNR TXDOT | CR: TXDOT |
| © TXDOT August 2004 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0495 05 | | 061 | IH 20 LFR |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. |
| 4-10 7-20 | TYL | SMITH | | 32 |

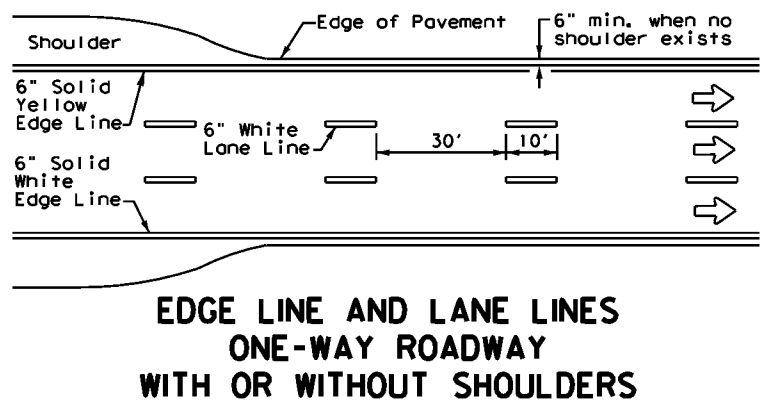
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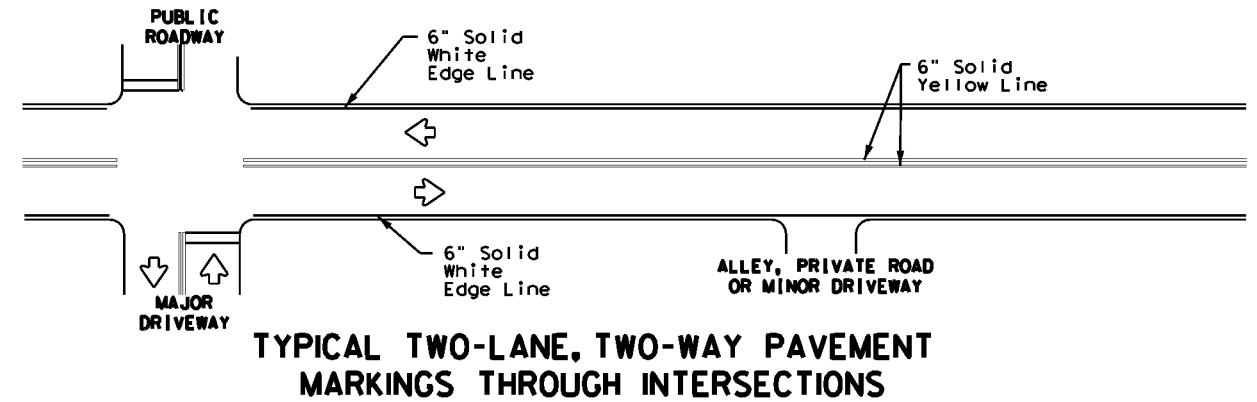
| POST TYPE AND SUPPORT FOUNDATION DETAILS | | | | TYPE OF BARRIER MOUNTS | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|-----------------------------|--|----------------------|---|------------------------|-------------------|-----------|-----------|-----------|-----------|---------------------|------|------|-----|---------|-----------|---------|--|-----|-----------|------------|------|--------|--|-----------|-----------|-----|-------|--|----|
| WING CHANNEL (WC) | FLEXIBLE POSTS (YFLX, WFLX) | | WEDGE ANCHOR SYSTEMS | | GUARD FENCE ATTACHMENT | | | | | | | | | | | | | | | | | | | | | | | | | |
| GND | GND | SRF | WAS | WAP | GF1 | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | EMBEDDED | SURFACE MOUNT | STEEL | PLASTIC | GF2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| NOTES 1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only. 2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499. | | NOTES 1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices. 2. Install per manufacturer's recommendations. 3. Post length may vary to meet field conditions. 4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow. | | NOTE 1. Install per manufacturer's recommendations. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS | | CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN | | DELINEATORS AND TYPE 2 OBJECT MARKERS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NOTE Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller) | | NOTE Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644. | | See general notes 1, 2 and 3. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONCRETE TRAFFIC BARRIER (CTB) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERAL NOTES | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Place delineators on a section of roadway at a consistent distance from the edge of pavement. 2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction. 3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible. 4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation. 5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface. 6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DELINEATOR & OBJECT MARKER INSTALLATION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D & OM(2) - 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| © TxDOT August 2004 | CONT | SECT | JOB | HIGHWAY | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISIONS | 0495 05 | | 061 | IH 20 LFR | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10-09 3-15 | DIST | COUNTY | | SHEET NO. | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4-10 7-20 | TYL | SMITH | | 33 | | | | | | | | | | | | | | | | | | | | | | | | | | |

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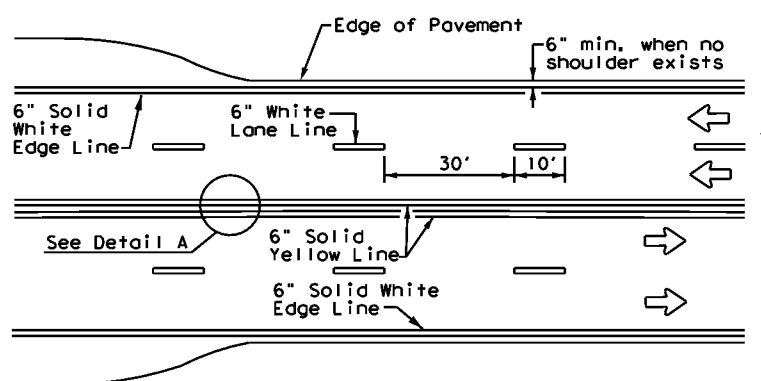
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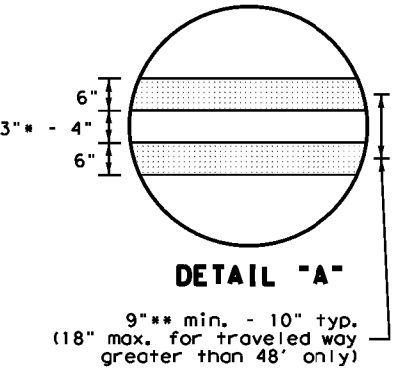
**EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



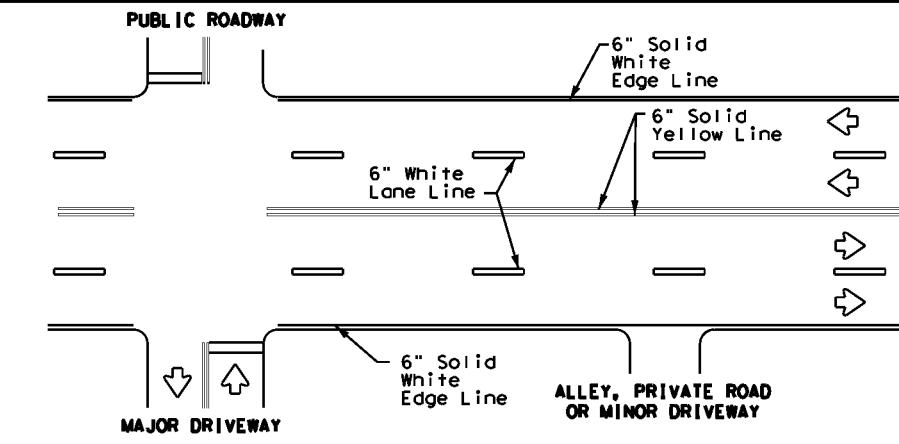
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**



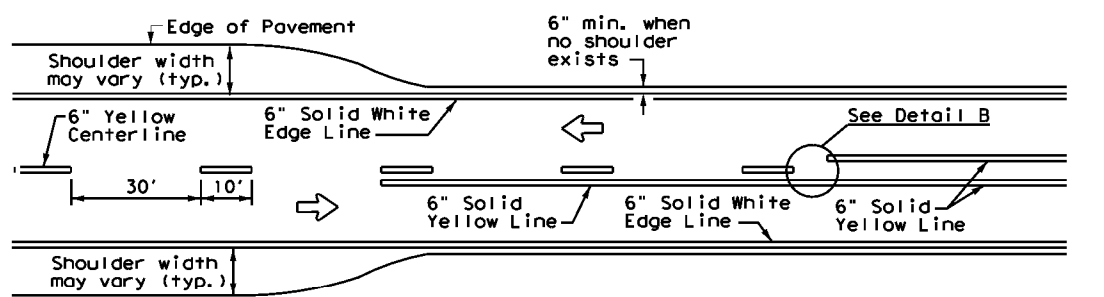
**CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**



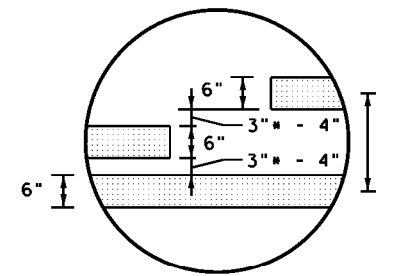
* 2" minimum for restripe projects when approved by the Engineer.
 ** 8" minimum for restripe projects when approved by the Engineer.



**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT
MARKINGS THROUGH INTERSECTIONS**

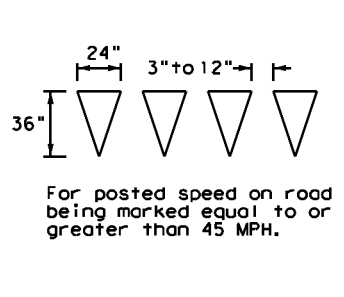


**TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS**

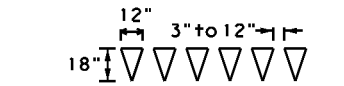


DETAIL "B"
 18" min. - 20" max.
 (16" minimum for restripe projects when approved by the Engineer.)

* 2" minimum for restripe projects when approved by the Engineer.



YIELD LINES



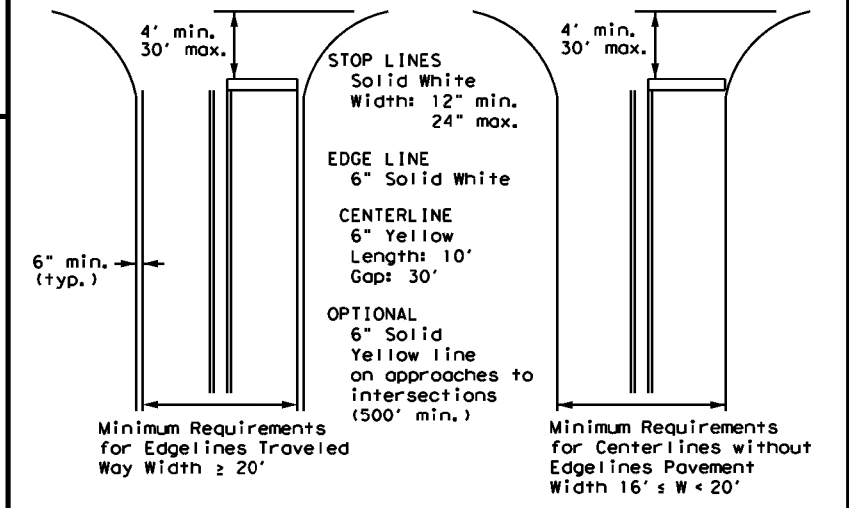
For posted speed on road being marked equal to or less than 40 MPH.

GENERAL NOTES

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

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

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

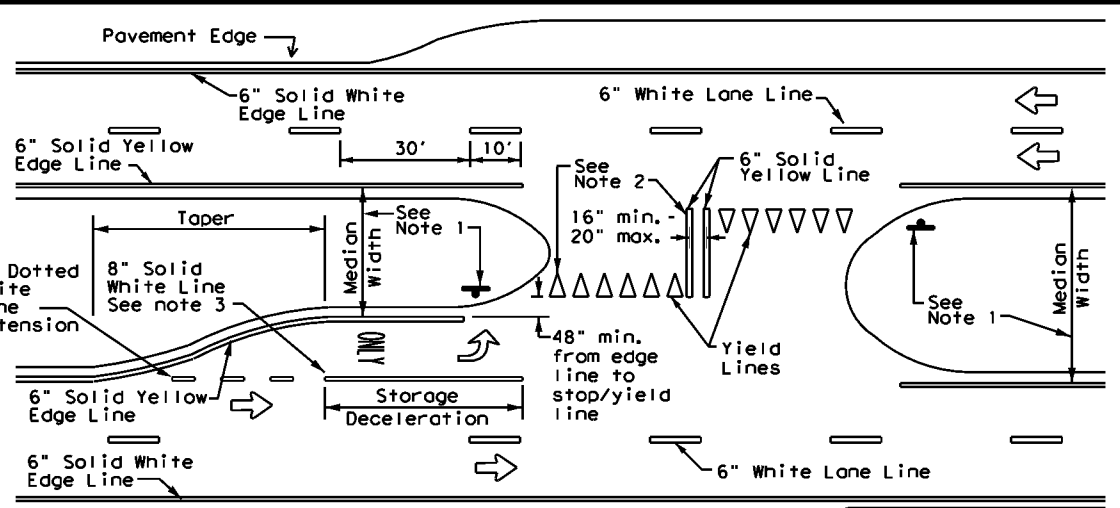


NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

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

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

Texas Department of Transportation Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

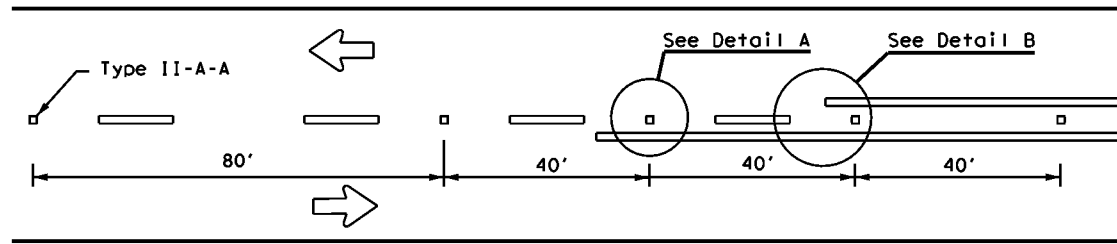
PM(1) - 22

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|-----------------------|------------|-----------|-----|--------------|-----|
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| © TxDOT December 2022 | | | | | |
| CONT: | 0495 05 | SECT: | 061 | HIGHWAY | |
| REVISIONS | | | | | |
| 11-78 | 8-00 | 6-20 | | | |
| 8-95 | 3-03 | 12-22 | | | |
| 5-00 | 2-12 | TYL SMITH | | SHEET NO. 34 | |

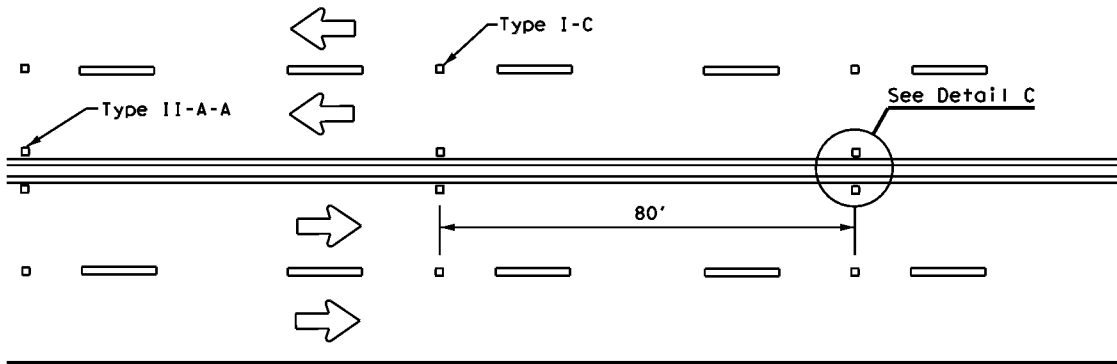
22A

REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

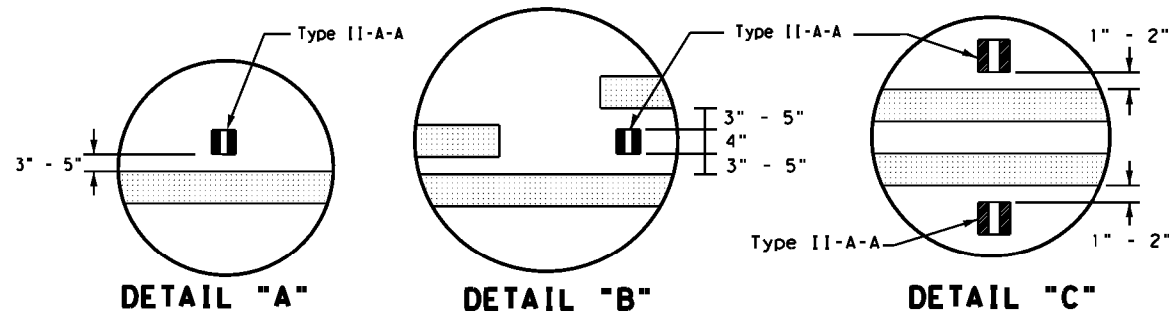
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CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



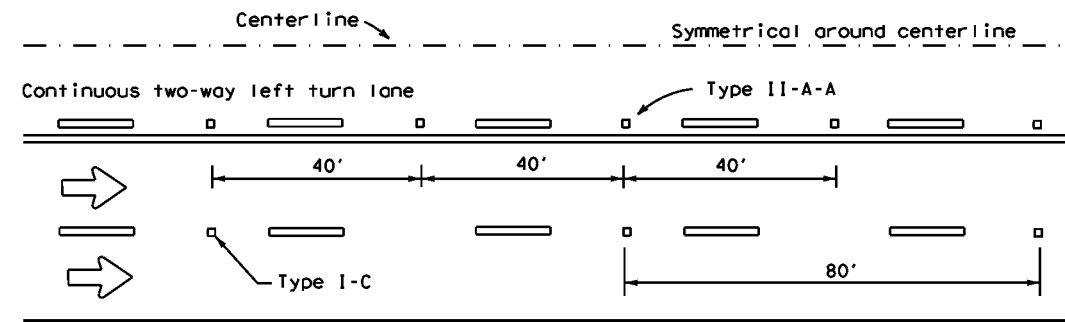
**CENTERLINE & LANE LINES
FOR FOUR LANE TWO-WAY ROADWAYS**



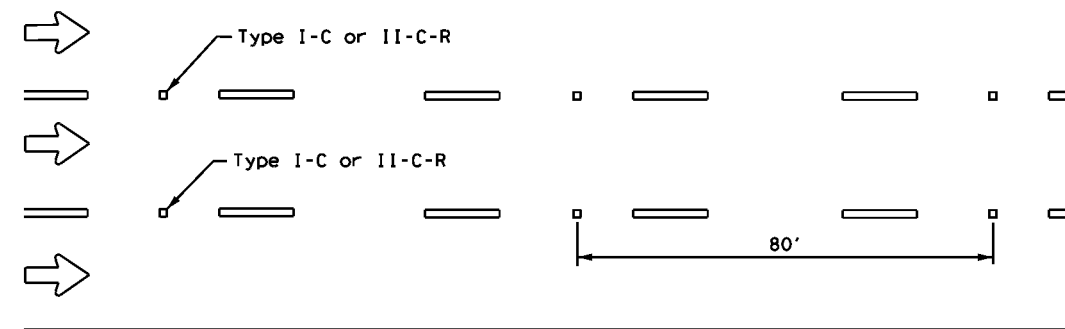
DETAIL "A"

DETAIL "B"

DETAIL "C"

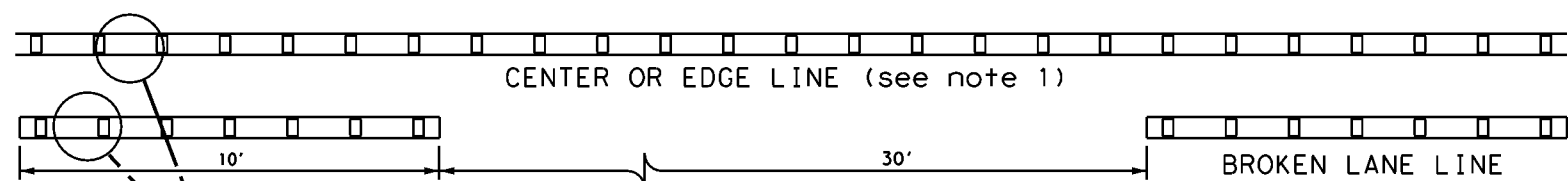


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



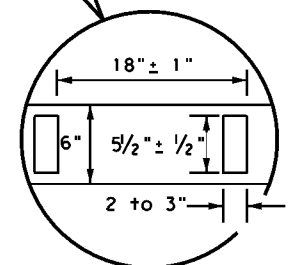
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.
 See Note 3.



CENTER OR EDGE LINE (see note 1)

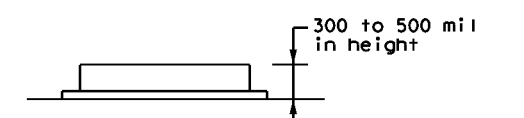
BROKEN LANE LINE



**REFLECTORIZED PROFILE
PATTERN DETAIL**

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

6" EDGE LINE, 6" CENTERLINE
 OR 6" LANE LINE



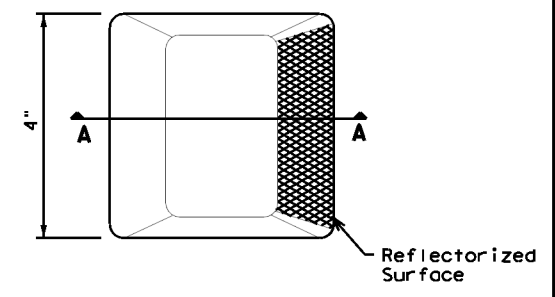
A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

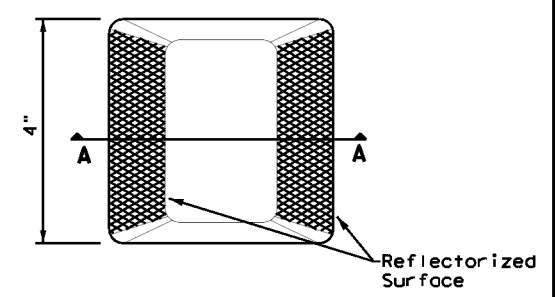
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

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

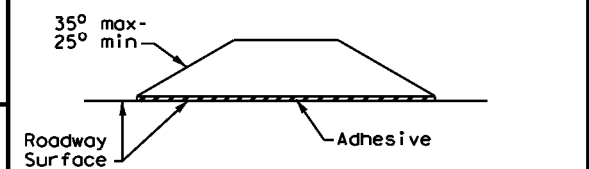
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



**POSITION GUIDANCE USING
RAISED MARKERS
REFLECTORIZED PROFILE
MARKINGS
PM(2) - 22**

| | | | | | | | |
|-----------------------|----------|----------|-----------|-----------|-----------|--------|--------|
| FILE: pm2-22.dgn | DN: 0495 | SECT: 05 | JOB: 061 | DIST: TYL | CK: SMITH | DW: 20 | CK: 35 |
| © TxDOT December 2022 | | | | | | | |
| REVISIONS | | | | | | | |
| 4-77 | 8-00 | 6-20 | IH 20 LFR | | | | |
| 4-92 | 2-10 | 12-22 | | | | | |
| 5-00 | 2-12 | | | | | | |

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

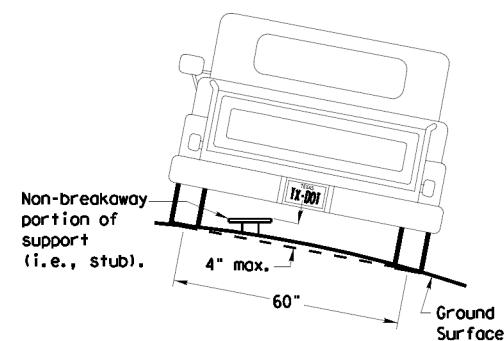
Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
- IF REQUIRED
- TEXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

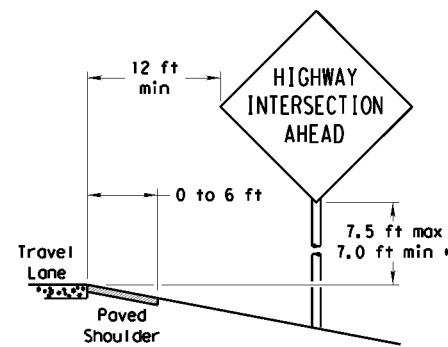
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

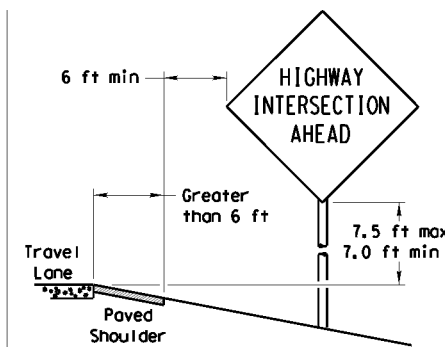
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

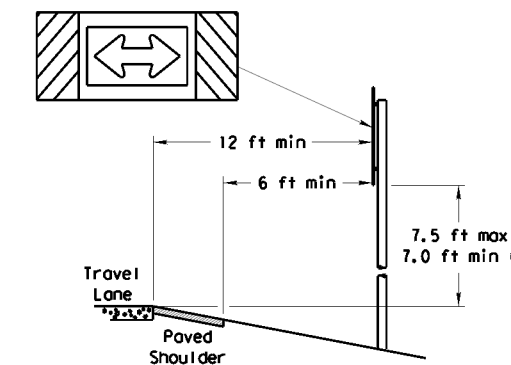
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

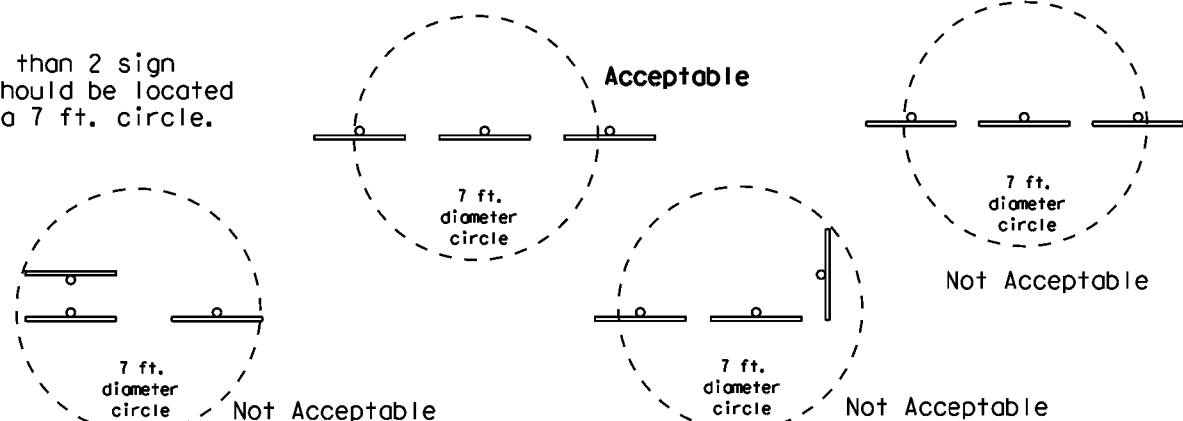
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

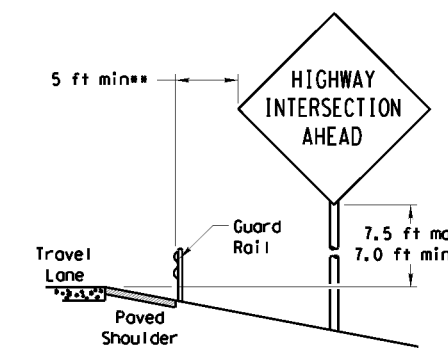


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

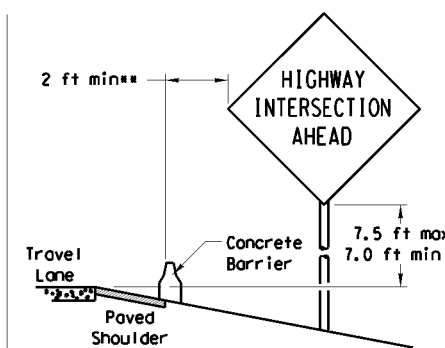
No more than 2 sign posts should be located within a 7 ft. circle.



BEHIND BARRIER



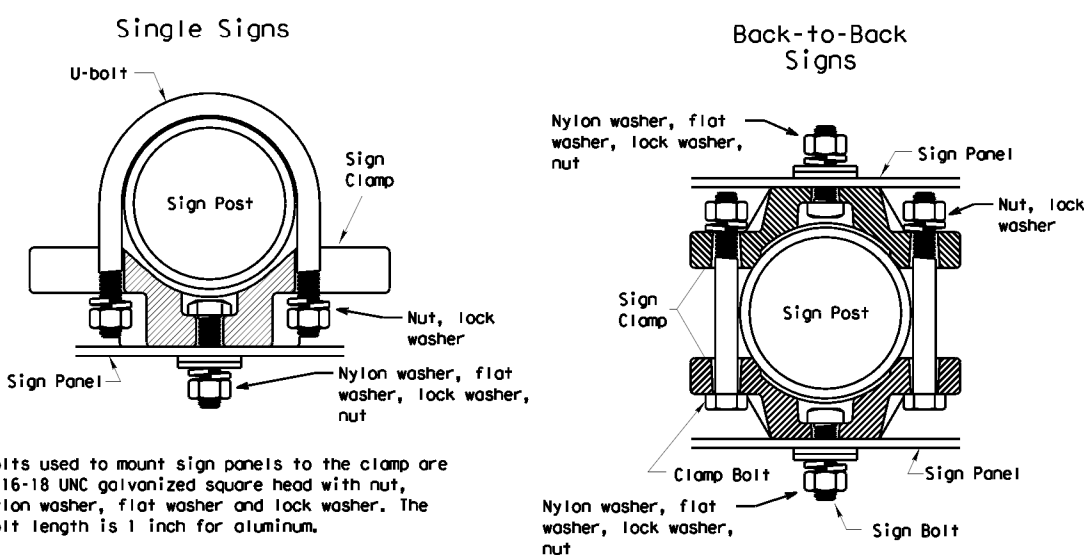
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

TYPICAL SIGN ATTACHMENT DETAIL



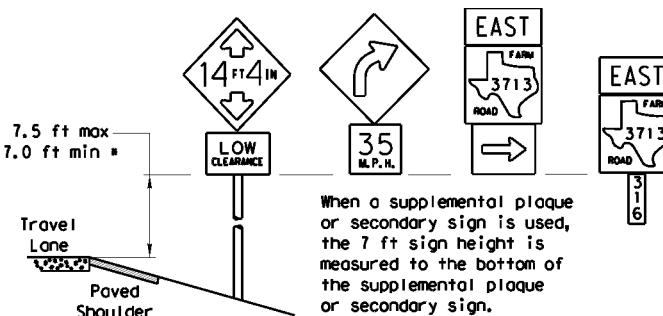
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

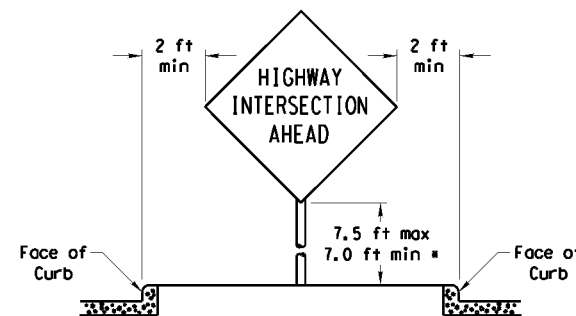
| Pipe Diameter | Approximate Bolt Length | |
|----------------|-------------------------|-----------------|
| | Specific Clamp | Universal Clamp |
| 2" nominal | 3" | 3 or 3 1/2" |
| 2 1/2" nominal | 3 or 3 1/2" | 3 1/2 or 4" |
| 3" nominal | 3 1/2 or 4" | 4 1/2" |

SIGNS WITH PLAQUES

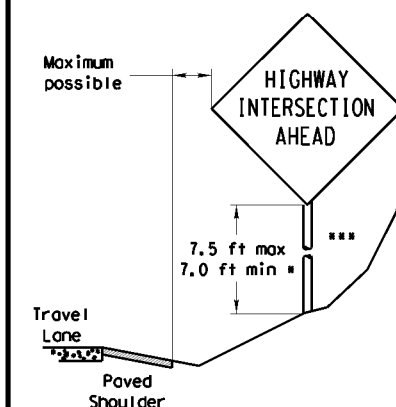


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



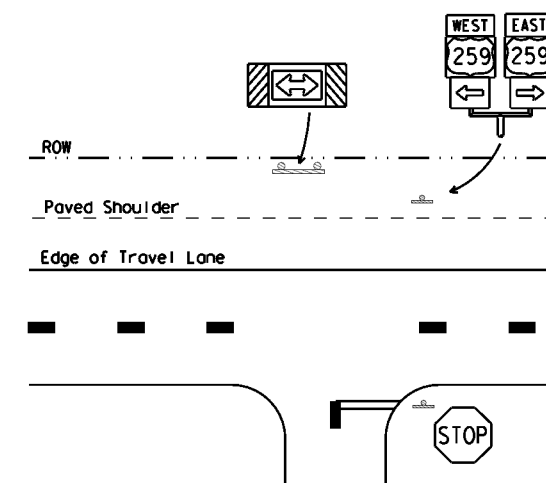
RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
<http://www.txdot.gov/publications/traffic.htm>

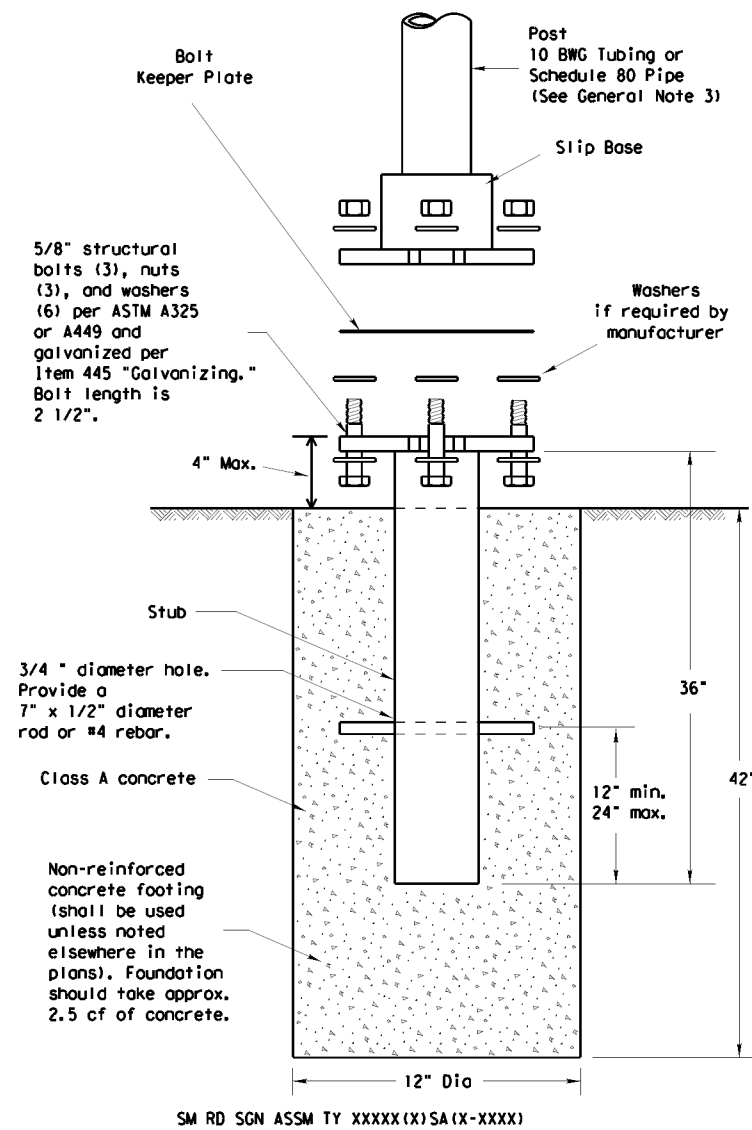
Texas Department of Transportation
 Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

| | | | | | |
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| | | DIST | COUNTY | | SHEET NO. |
| | | TYL | SMITH | | 36 |

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
- Material used as post with this system shall conform to the following specifications:
 - 10 BWC Tubing (2.875" outside diameter)
 - 0.134" nominal wall thickness
 - Seamless or electric-resistance welded steel tubing or pipe
 - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
 - Other steels may be used if they meet the following:
 - 55,000 PSI minimum yield strength
 - 70,000 PSI minimum tensile strength
 - 20% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
 - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
 - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
 - Schedule 80 Pipe (2.875" outside diameter)
 - 0.276" nominal wall thickness
 - Steel tubing per ASTM A500 Gr C
 - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
 - 46,000 PSI minimum yield strength
 - 62,000 PSI minimum tensile strength
 - 21% minimum elongation in 2"
 - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
 - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
 - Galvanization per ASTM A123
- See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

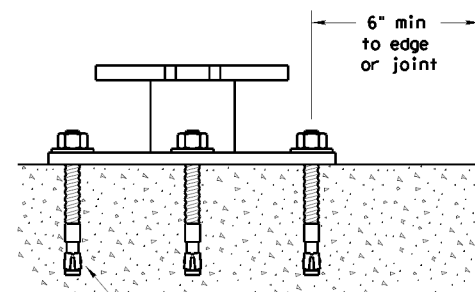
Foundation

- Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
- Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
- Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
- The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support

- Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
- Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



5/8" diameter Concrete Anchor - 8 places (embed a minimum of 5 1/2" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.

SM RD SGN ASSM TY XXXXX(X)SB(X-XXXX)

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

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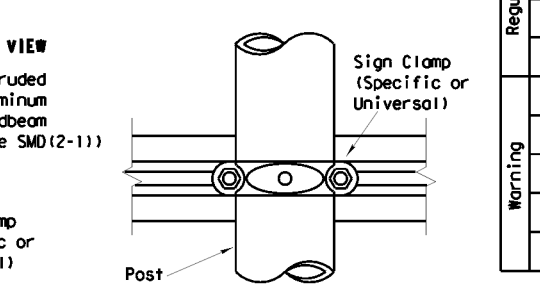
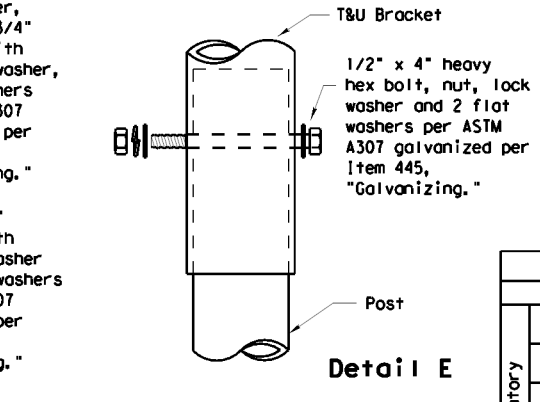
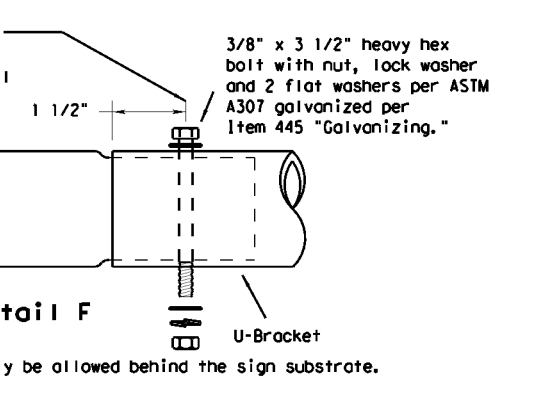
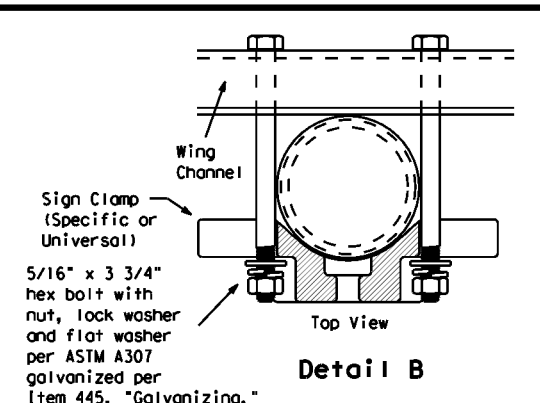
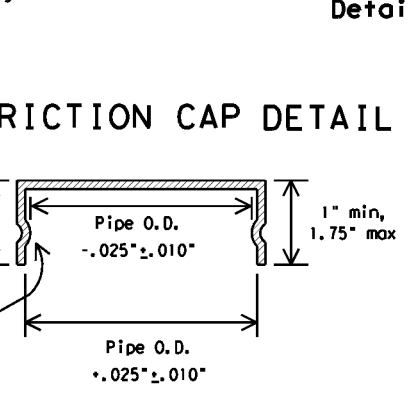
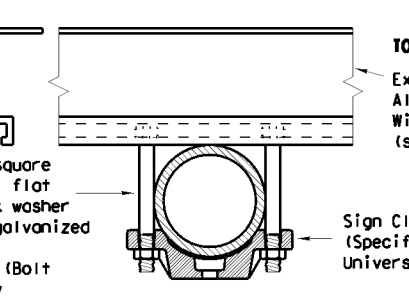
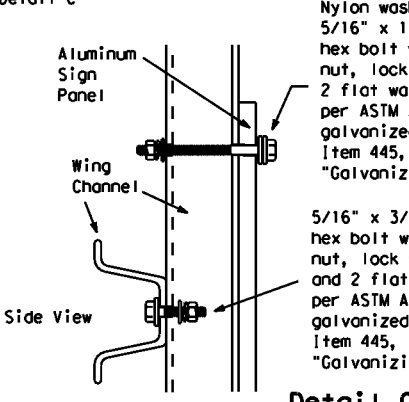
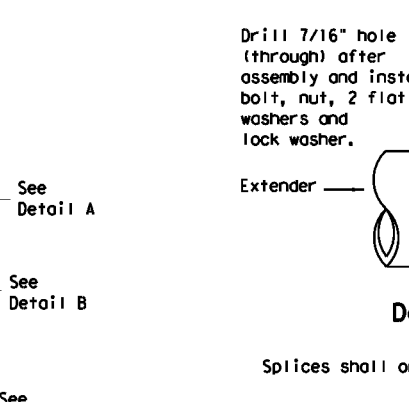
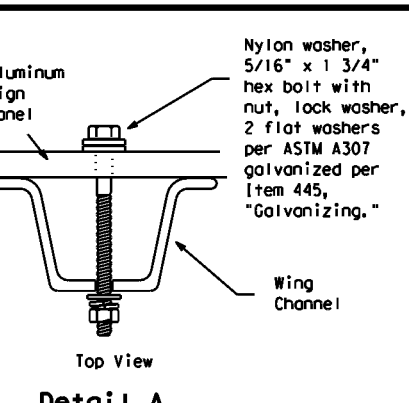
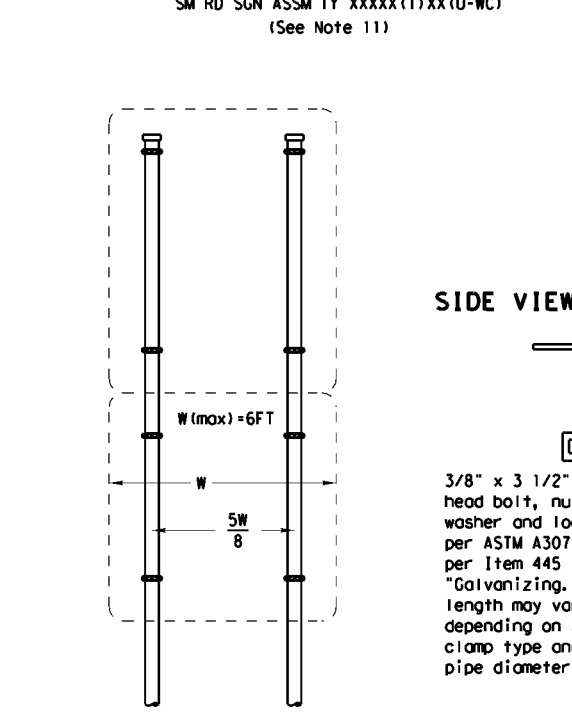
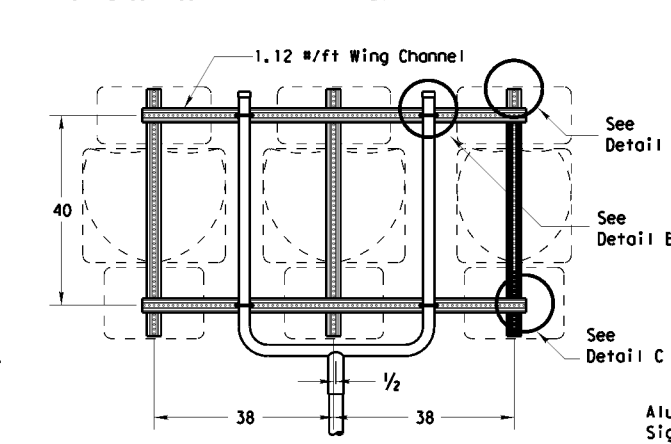
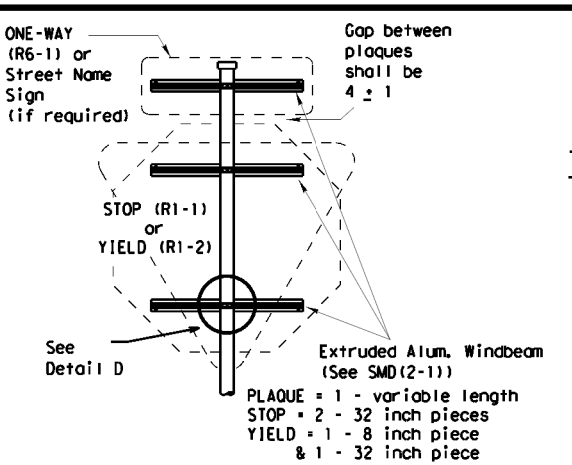
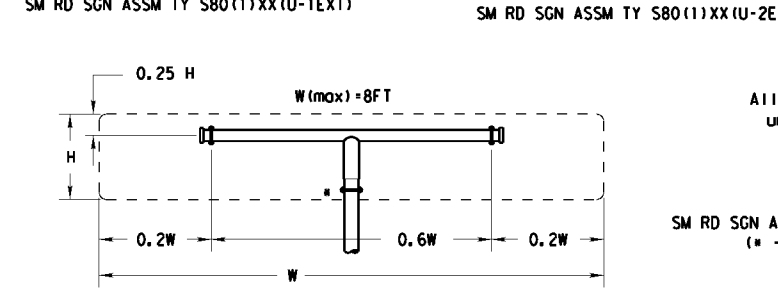
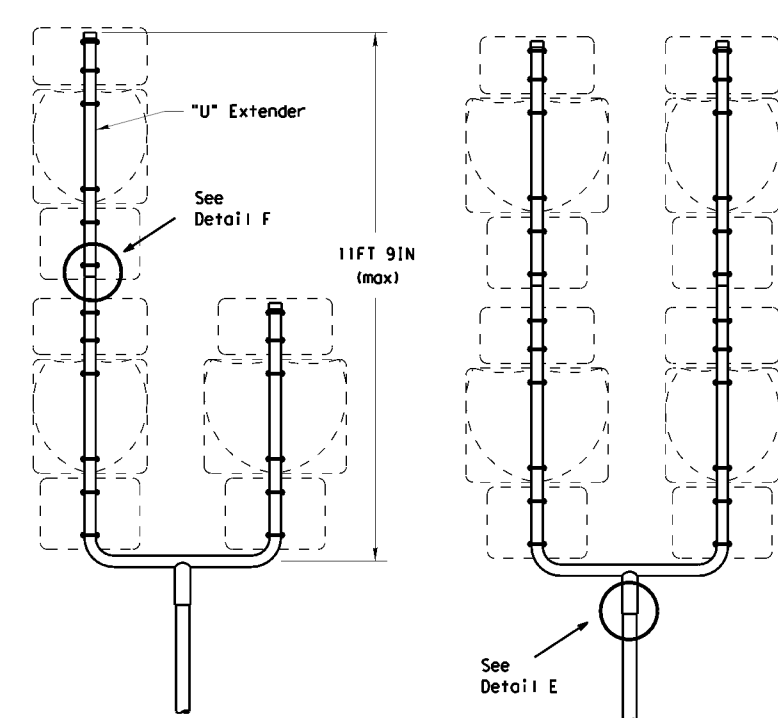
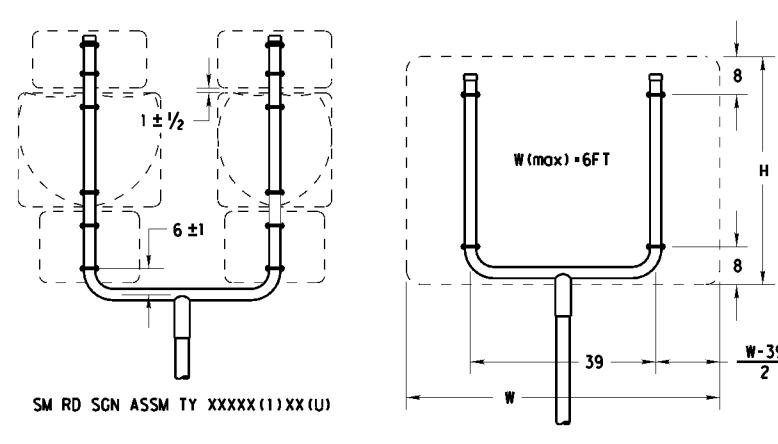
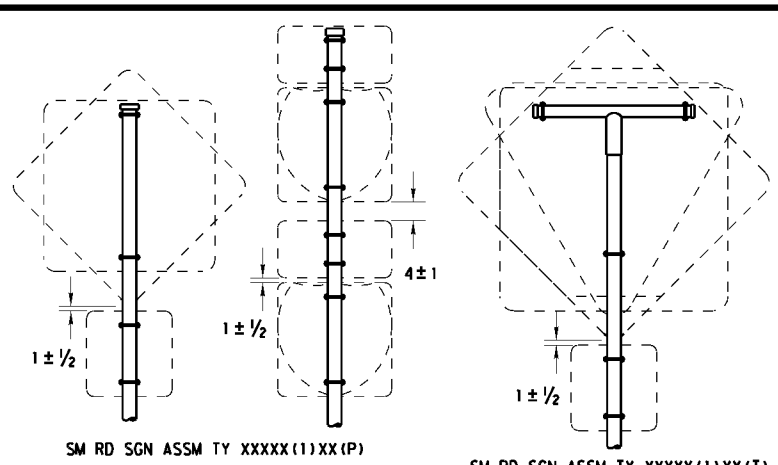
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

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- GENERAL NOTES:**
1.

| SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG | 1 | 16 SF |
| 10 BWG | 2 | 32 SF |
| Sch 80 | 1 | 32 SF |
| Sch 80 | 2 | 64 SF |
 2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
 3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
 4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
 5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
 6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
 7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
 8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
 9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
 10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
 11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
 12. Post open ends shall be fitted with Friction Caps.
 13. Sign blanks shall be the sizes and shapes shown on the plans.

| | | REQUIRED SUPPORT | |
|------------|--|---|---------|
| | | SIGN DESCRIPTION | SUPPORT |
| Regulatory | 48-inch STOP sign (R1-1) | TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM) | |
| | 60-inch YIELD sign (R1-2) | TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM) | |
| | 48x16-inch ONE-WAY sign (R6-1) | TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM) | |
| Warning | 36x48, 48x36, and 48x48-inch signs | TY 10BWG(1)XX(T) | |
| | 48x60-inch signs | TY S80(1)XX(T) | |
| | 48x48-inch signs (diamond or square) | TY 10BWG(1)XX(T) | |
| | 48x60-inch signs | TY S80(1)XX(T) | |
| | 48-inch Advance School X-ing sign (S1-1) | TY 10BWG(1)XX(T) | |
| | 48-inch School X-ing sign (S2-1) | TY 10BWG(1)XX(T) | |
| | Large Arrow sign (W1-6 & W1-7) | TY 10BWG(1)XX(T) | |

Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

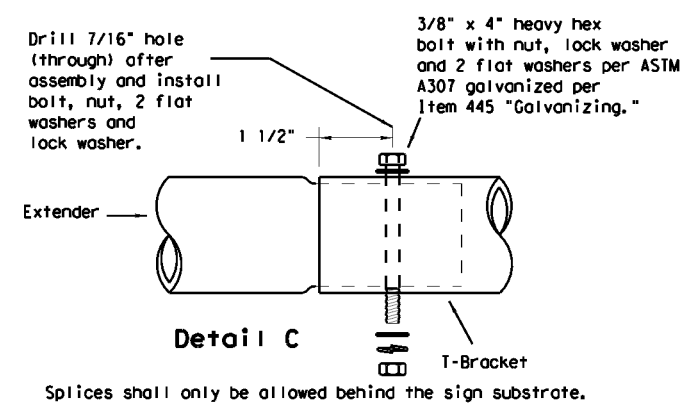
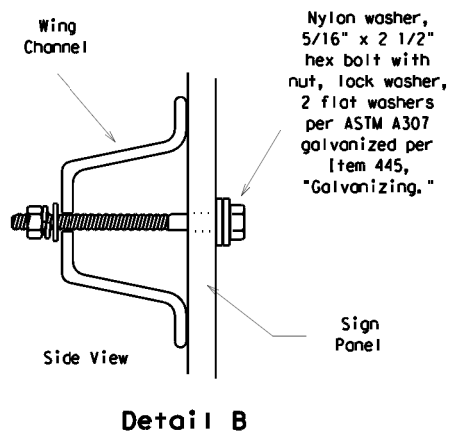
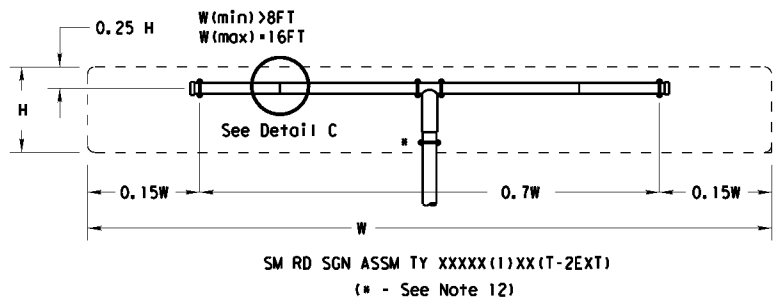
Texas Department of Transportation
 Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM
SMD(SLIP-2)-08

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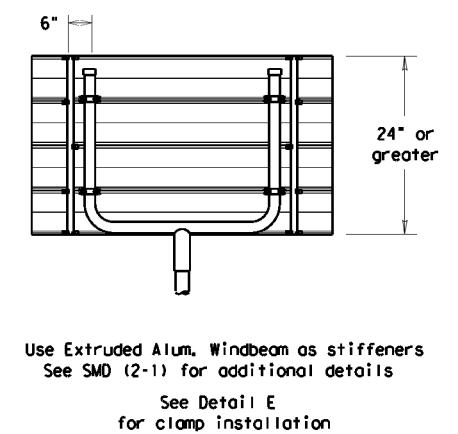
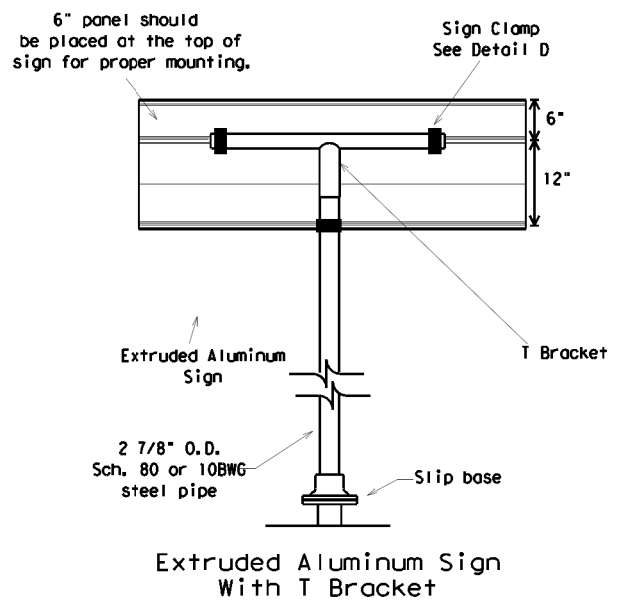
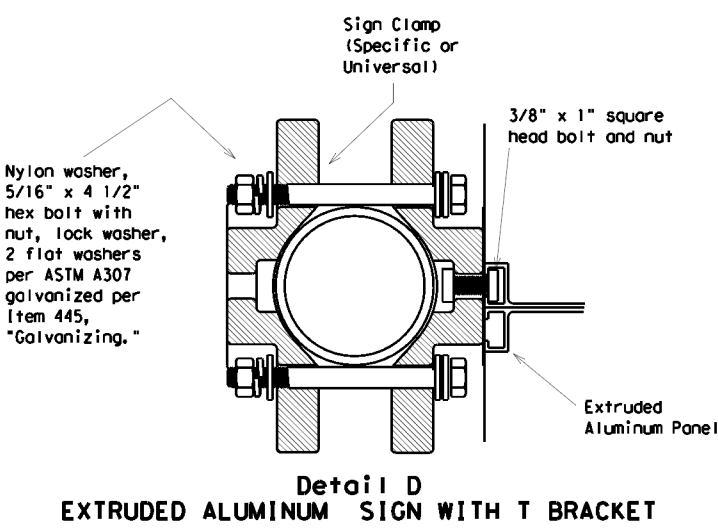
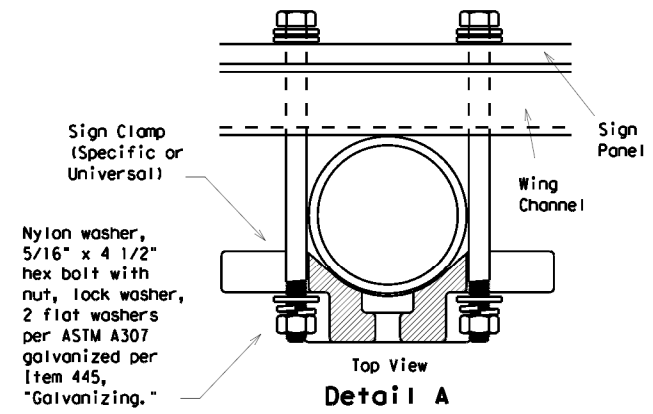
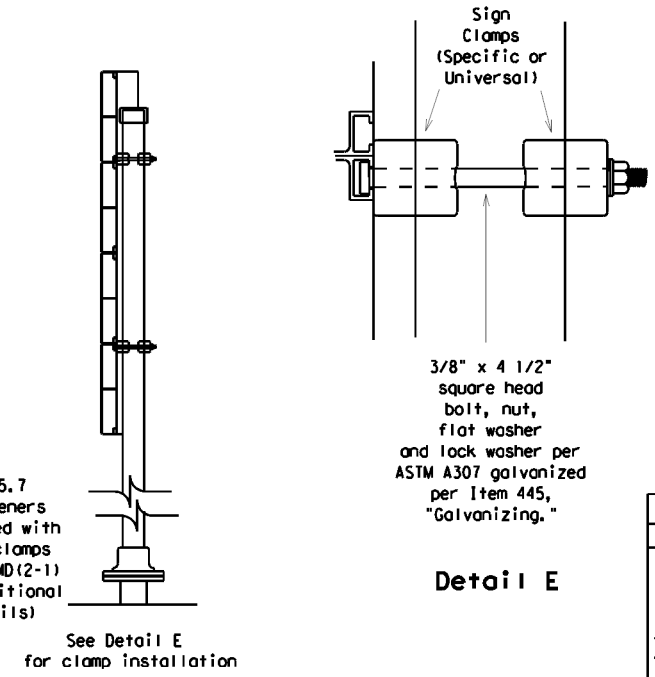
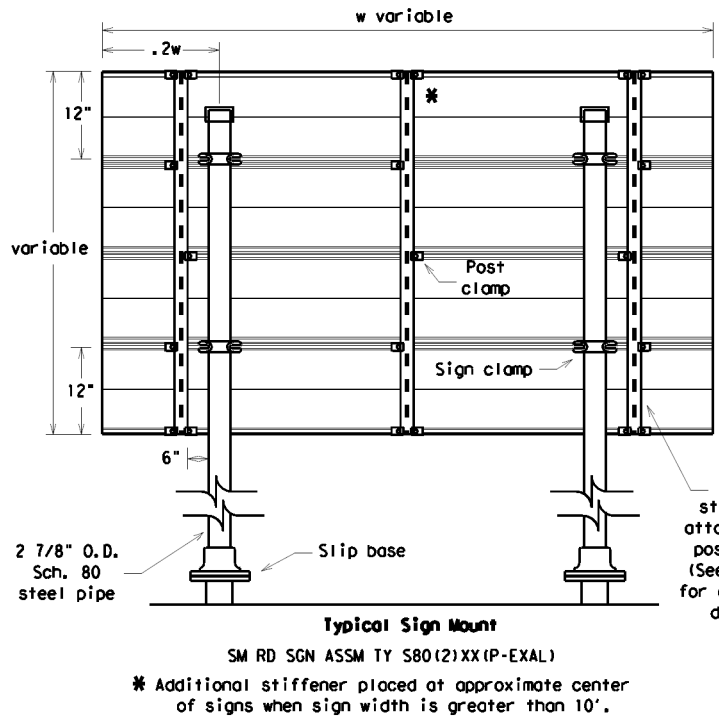
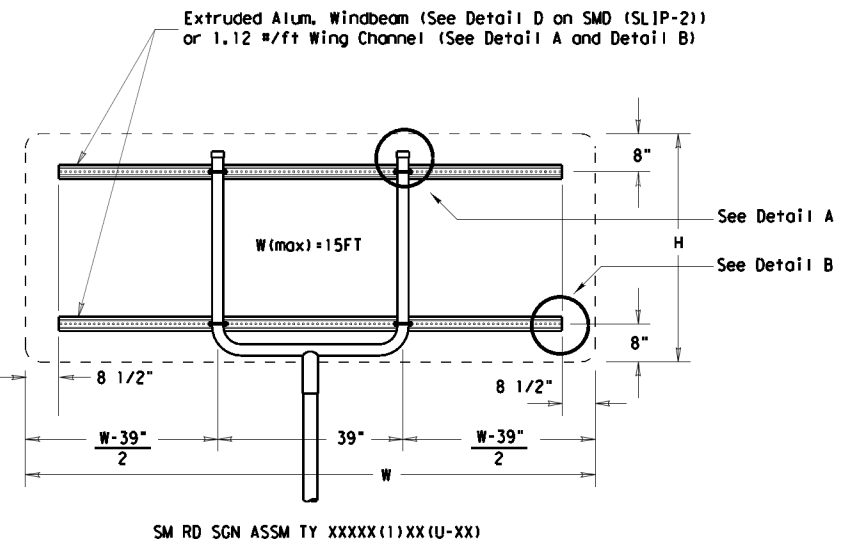
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- GENERAL NOTES:**
1. SIGN SUPPORT # OF POSTS MAX. SIGN AREA

| | | |
|--------|---|-------|
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| 10 BWG | 2 | 32 SF |
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 9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
 10. Sign blanks shall be the sizes and shapes shown on the plans.
 11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
 12. Post open ends shall be fitted with Friction Caps.



| REQUIRED SUPPORT | | |
|------------------|--|---|
| | SIGN DESCRIPTION | SUPPORT |
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| | 60-inch YIELD sign (R1-2) | TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM) |
| | 48x16-inch ONE-WAY sign (R6-1) | TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM) |
| | 36x48, 48x36, and 48x48-inch signs | TY 10BWG(1)XX(T) |
| Warning | 48x60-inch signs | TY S80(1)XX(T) |
| | 48x48-inch signs (diamond or square) | TY 10BWG(1)XX(T) |
| | 48x60-inch signs | TY S80(1)XX(T) |
| | 48-inch Advance School X-ing sign (S1-1) | TY 10BWG(1)XX(T) |
| | 48-inch School X-ing sign (S2-1) | TY 10BWG(1)XX(T) |
| | Large Arrow sign (W1-6 & W1-7) | TY 10BWG(1)XX(T) |

Texas Department of Transportation
 Traffic Operations Division

**SIGN MOUNTING DETAILS
 SMALL ROADSIDE SIGNS
 TRIANGULAR SLIPBASE SYSTEM**

SMD (SLIP-3) - 08

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 9-08 REVISIONS

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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.

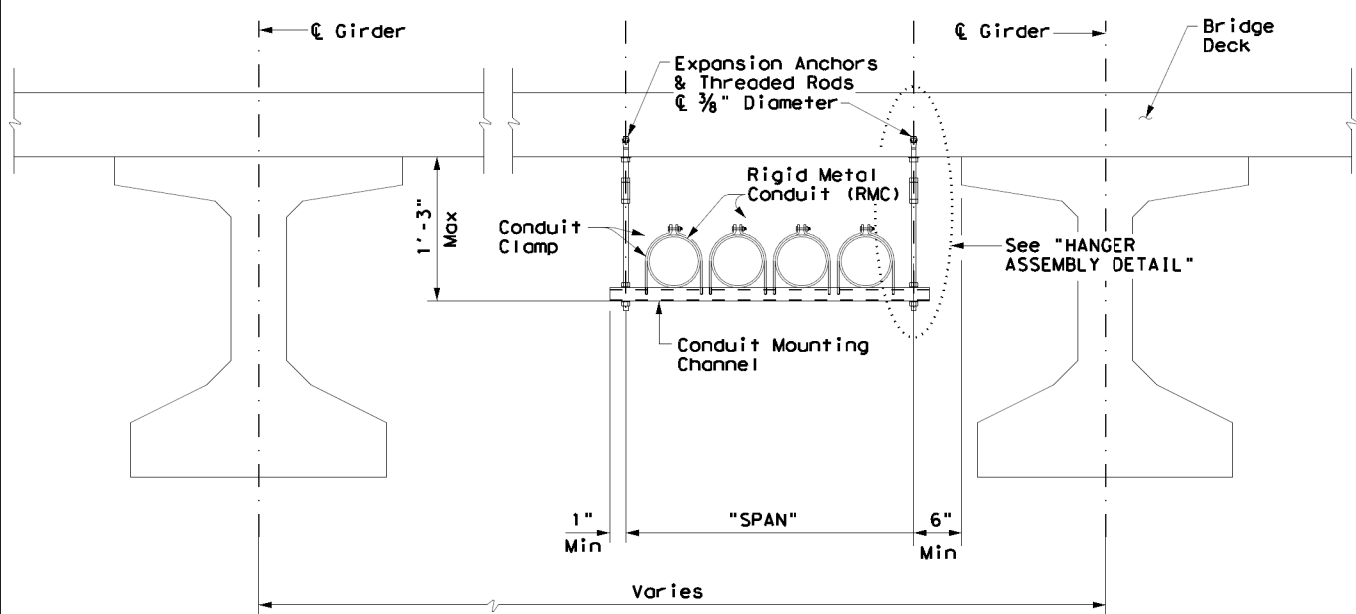
B. CONSTRUCTION METHODS

- 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.

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|  Texas Department of Transportation | | | | Traffic Operations Division Standard | |
| <h1>ELECTRICAL DETAILS CONDUITS & NOTES</h1> | | | | | |
| <h2>ED(1) - 14</h2> | | | | | |
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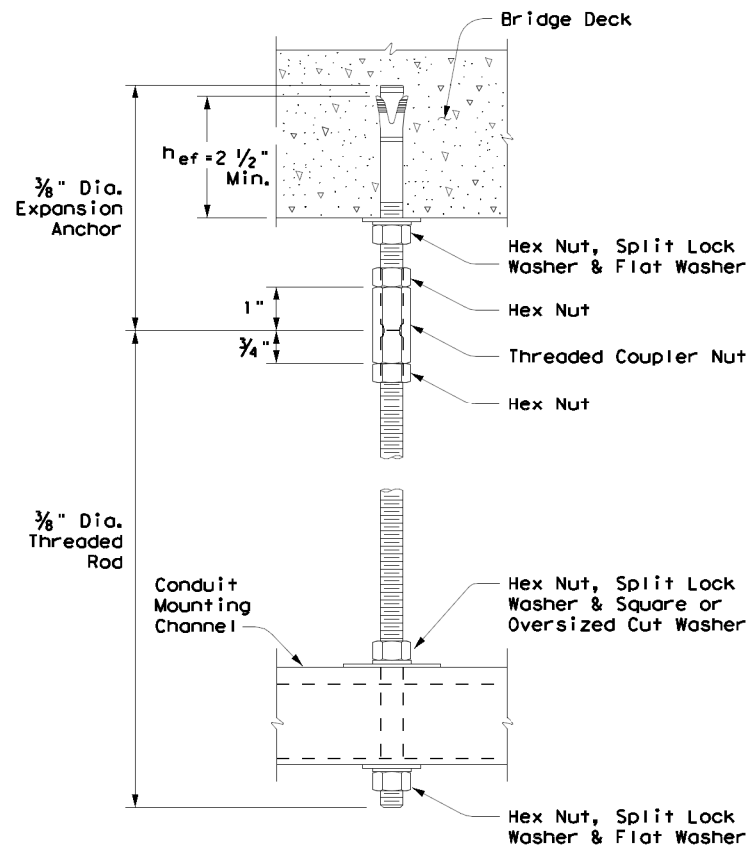
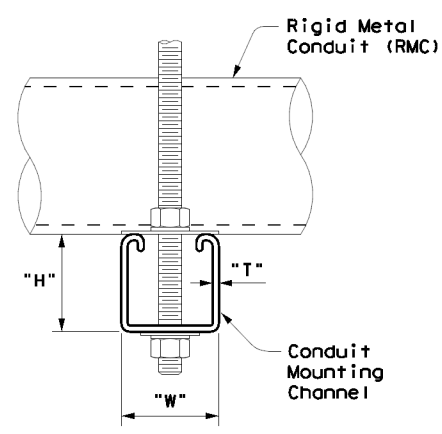
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CONDUIT HANGING DETAIL

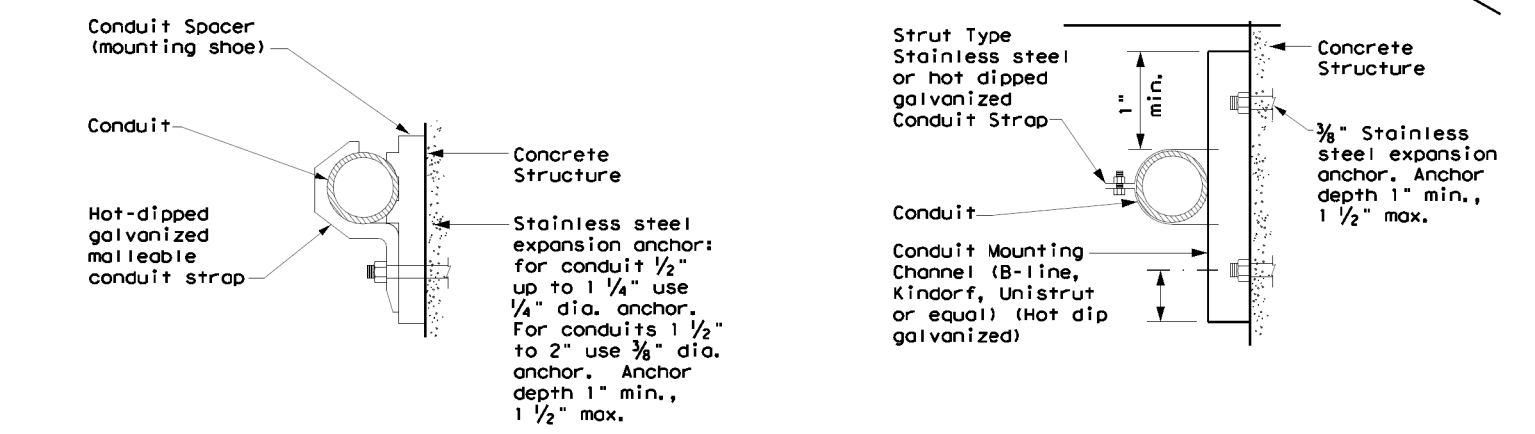
| CONDUIT MOUNTING CHANNEL | | |
|--------------------------|------------------|--------|
| "SPAN" | "W" x "H" | "T" |
| less than 2' | 1 5/8" x 1 3/8" | 12 Ga. |
| 2'-0" to 2'-6" | 1 5/8" x 1 5/8" | 12 Ga. |
| >2'-6" to 3'-0" | 1 5/8" x 2 1/16" | 12 Ga. |

Channels with round or short slotted hole patterns are allowed, if the load carrying capacity is not reduced by more than 15%.



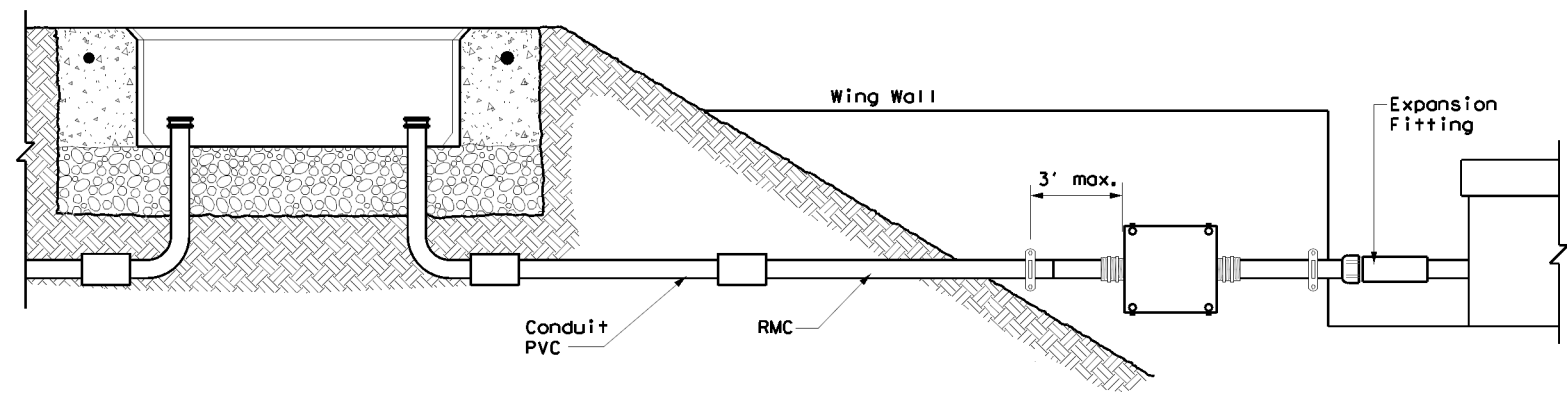
HANGER ASSEMBLY DETAIL

ELECTRIC CONDUIT TO BRIDGE DECK ATTACHMENT



CONDUIT MOUNTING OPTIONS

Attachment to concrete surfaces
 See ED(1)B.2



TYPICAL CONDUIT ENTRY TO BRIDGE STRUCTURE DETAIL

EXPANSION ANCHOR NOTES FOR BRIDGE DECK ATTACHMENT

1. Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). The chosen anchor product shall have a designated ICC-ES Evaluation Report number, and its approval status shall be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.
2. Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.
3. Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environment, both the anchor body and expansion wedge shall be stainless steel.
4. Install anchors as shown on the plans and in accordance with the anchor manufacturer's published installation instructions. Arrange a field demonstration test to evaluate the procedures and tools. The test shall be witnessed and approved by the Engineer prior to furnishing anchors on the structure.
5. Prior to hole drilling, use rebar locator to ensure clearing of existing deck strands or reinforcement. Install anchors to ensure a minimum effective embedment depth, (h_{ef}), as shown. Increase (h_{ef}) as needed to ensure sufficient thread length for proper torquing and tightening of anchors.
6. Use anchors of minimum 1600 Lbs tensile capacity (minimum of steel, concrete breakout, and concrete pullout strengths as determined by ACI 318 Appendix D) at the required minimum embedment depth (h_{ef}). No lateral loads shall be introduced after conduit installation.

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| | | Traffic Operations Division Standard | |
| <h2>ELECTRICAL DETAILS CONDUIT SUPPORTS</h2> | | | |
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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.

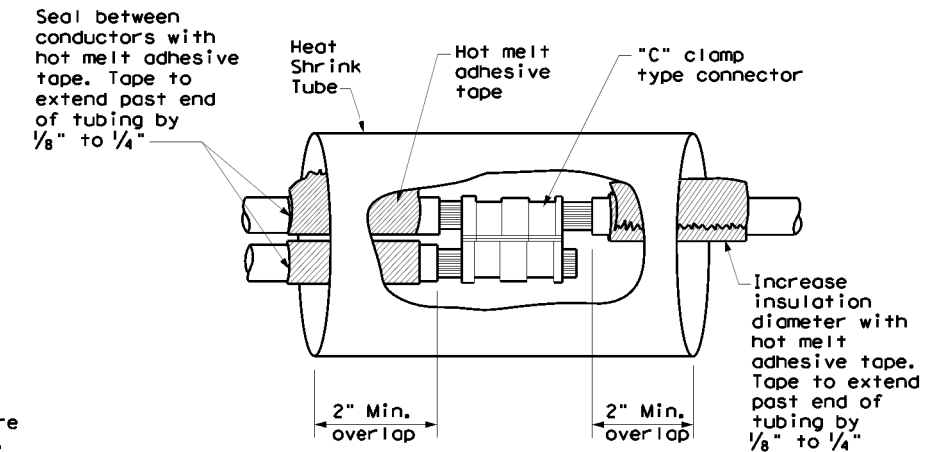
GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

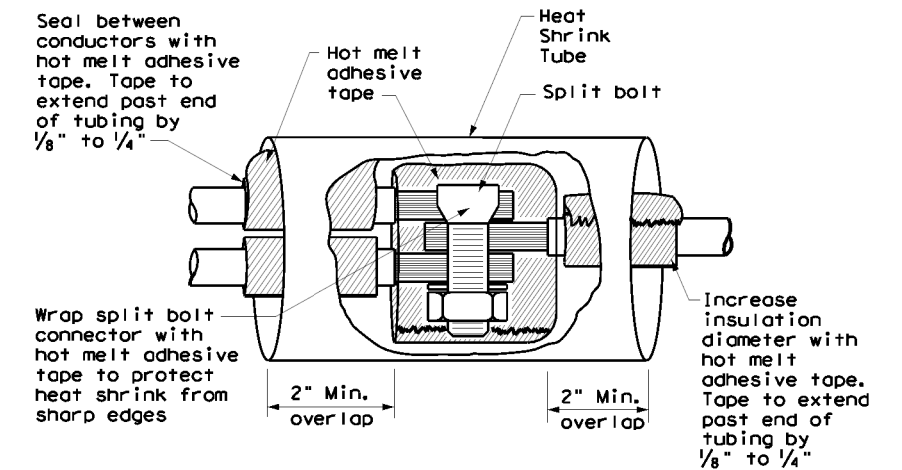
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in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

B. CONSTRUCTION METHODS

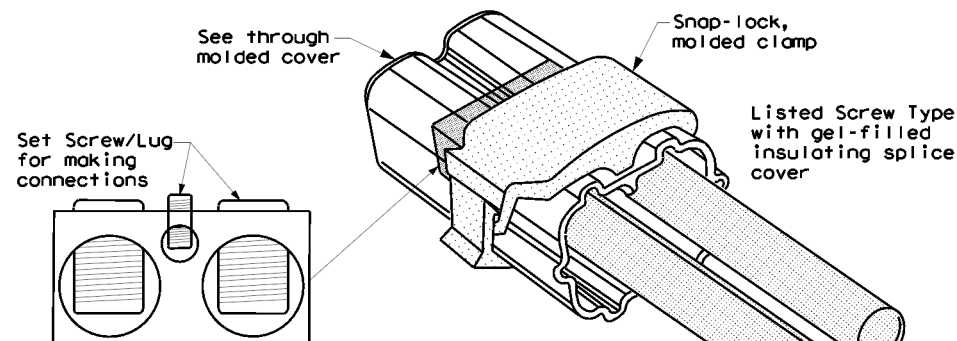
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, 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 1
Compression Type**



**SPLICE OPTION 2
Split Bolt Type**



**SPLICE OPTION 3
Listed Screw Type**

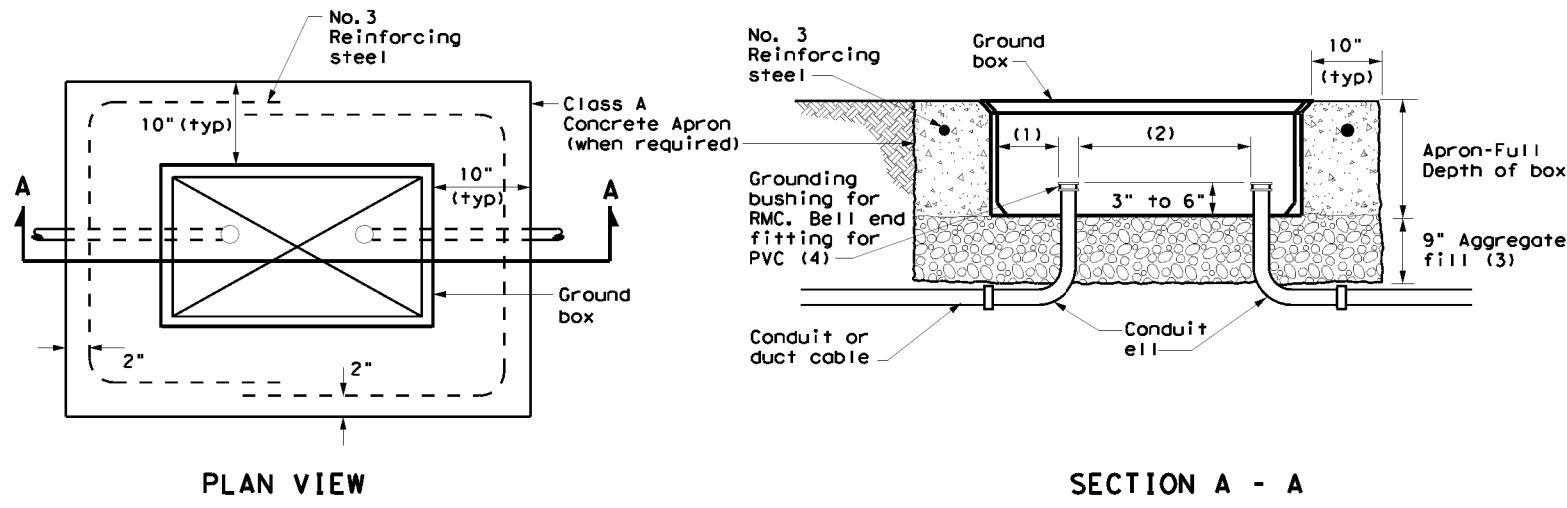
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| Texas Department of Transportation | | | | Traffic Operations Division Standard | |
| <h1>ELECTRICAL DETAILS CONDUCTORS</h1> | | | | | |
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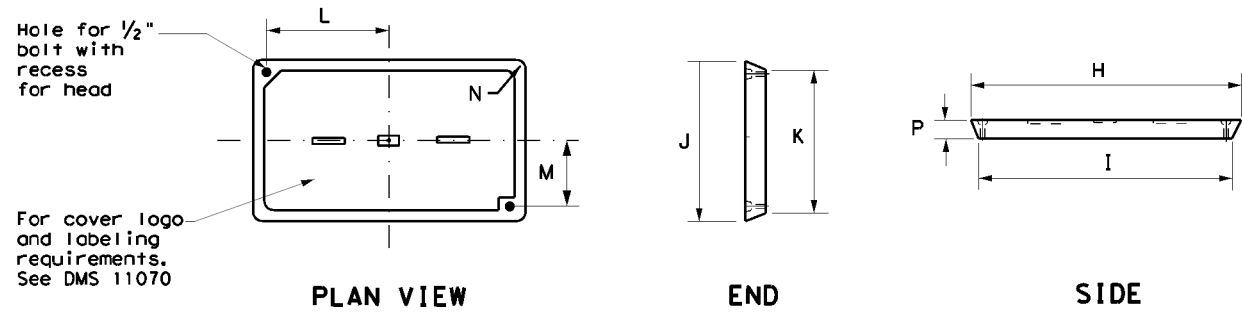


APRON FOR GROUND BOX

- (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.

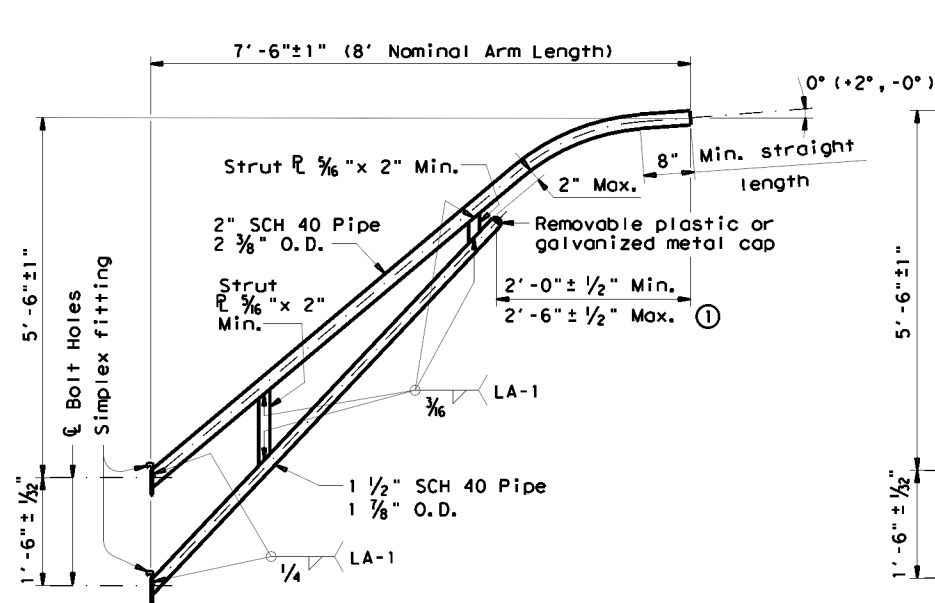
B. CONSTRUCTION METHODS

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.

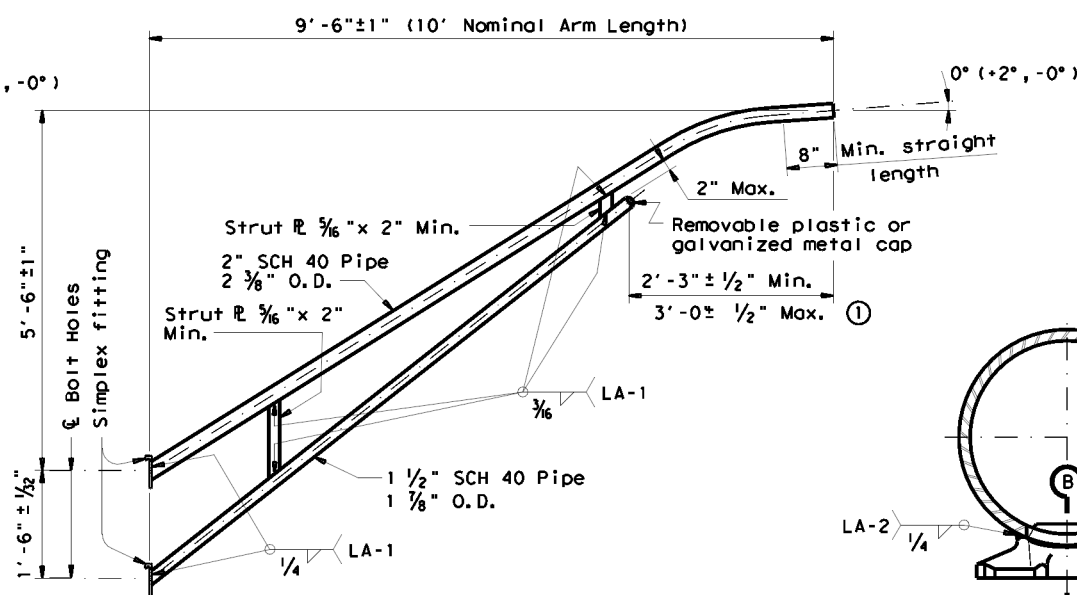
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| | | | | Traffic Operations Division Standard | |
| <h2>ELECTRICAL DETAILS</h2> <h3>GROUND BOXES</h3> <h4>ED(4) - 14</h4> | | | | | |
| FILE: | ed4-14.dgn | DN: | TxDOT | CK: | TxDOT |
| © TxDOT | October 2014 | CONT: | 0495 | SECT: | 05 |
| REVISIONS: | | JOB: | 061 | HIGHWAY: | IH 20 LFR |
| | | DIST: | TYL | COUNTY: | SMITH |
| | | | | SHEET NO.: | 43 |

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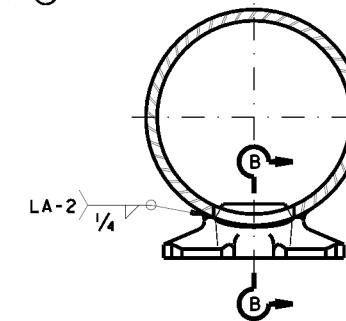
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8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

| MATERIALS | |
|----------------------|---|
| Pole or Arm Simplex | ASTM A27 Gr. 65-35 or A148 Gr. 80-50, A576 Gr. 1021 (3), or A36 (Arm only) |
| Arm Pipes | ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50 (4), or A1011 HSLAS-F Gr. 50 (4) |
| Arm Strut Plates (2) | ASTM A36, A572 Gr. 50 (4), or A588 |
| Misc. | ASTM designations as noted |

- Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

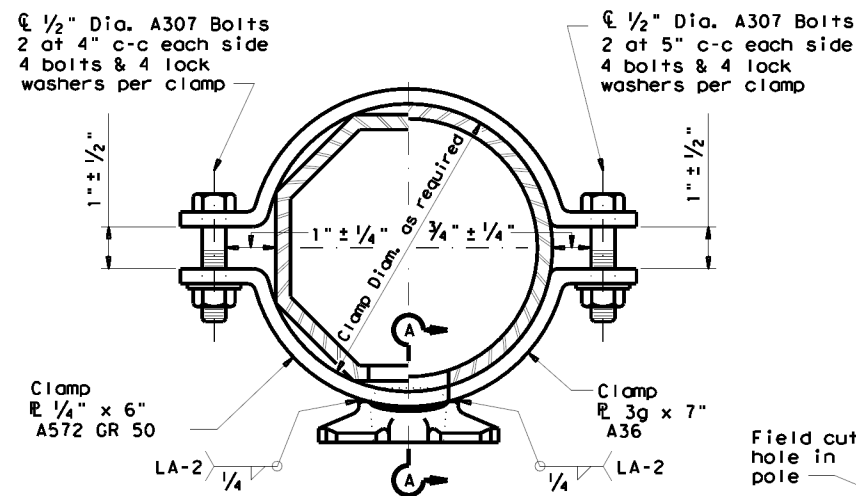
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified Fabricator tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

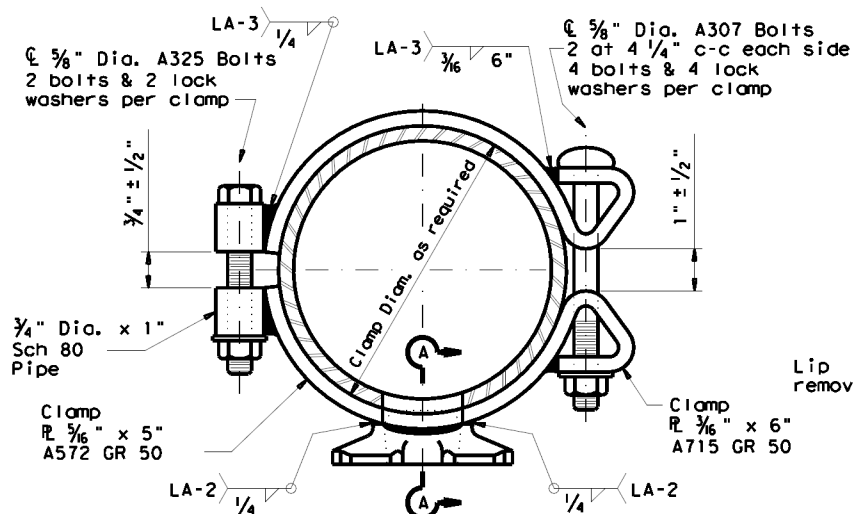
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



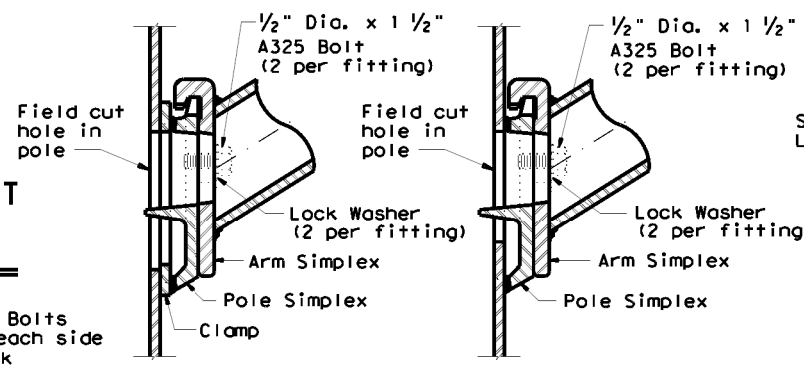
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



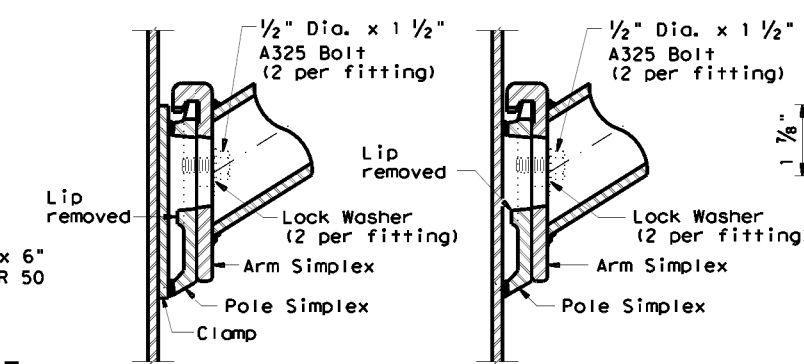
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



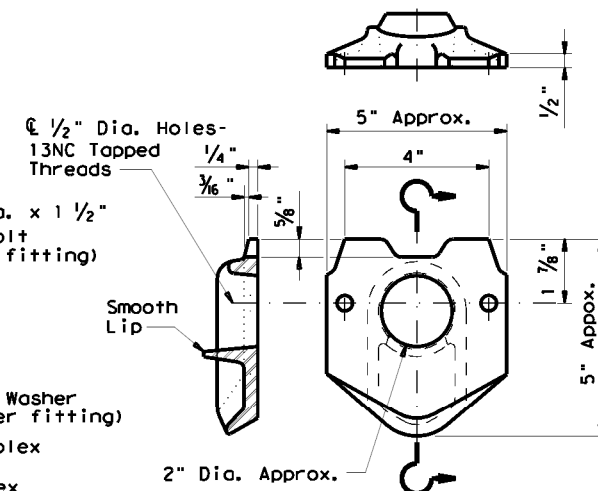
UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

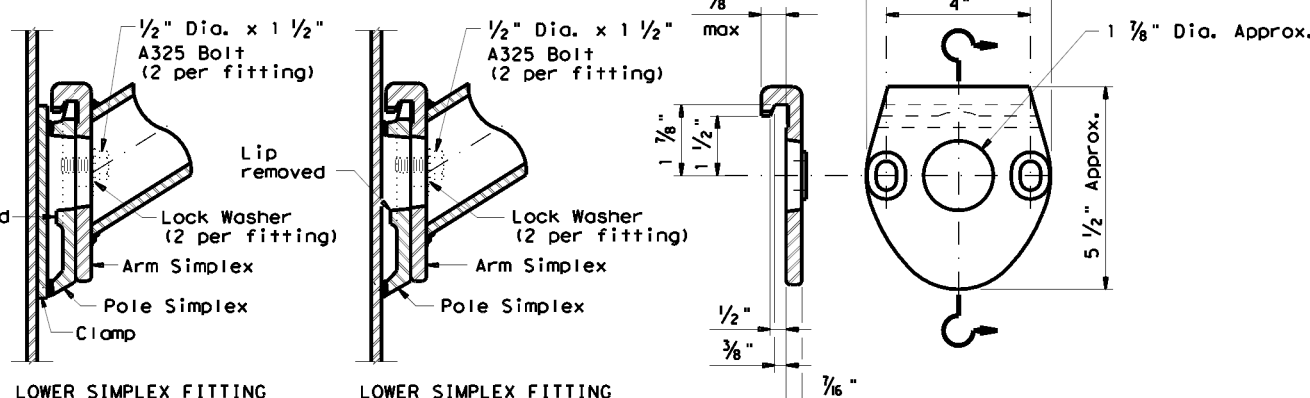


LOWER SIMPLEX FITTING

LOWER SIMPLEX FITTING

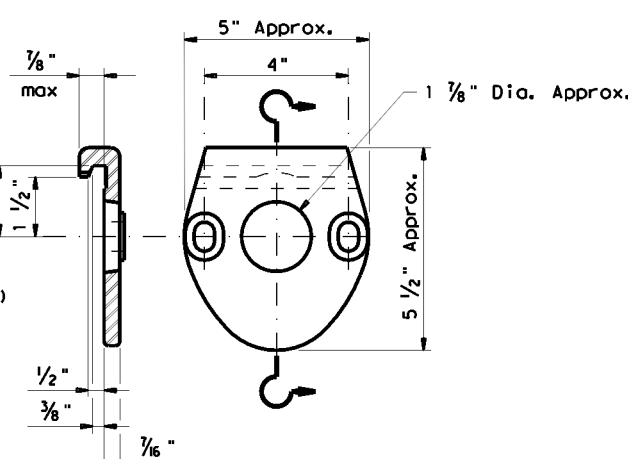


POLE SIMPLEX DETAIL



SECTION A-A

SECTION B-B



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division
STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES
ARM DETAILS
LUM-A-12

| | | | | | |
|---------------------|-----------|---------|---------|---------|-----------|
| © TxDOT August 1995 | | DNR LEH | CK: JSY | DWR LTT | CK: TEB |
| 5-96 | REVISIONS | CONT | SECT | JOB | HIGHWAY |
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| 1-12 | | DIST | COUNTY | | SHEET NO. |
| | | #DB | SMITH | | 46 |

SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

| Nominal Mounting Ht. (ft) | Shoe Base | | | | T-Base | | | | CSB/SSCB Mounted | | | | |
|---------------------------|--------------------------|----|----|---------------|--------------------------|----|----|---------------|--------------------------|----|----|---------------|-----------|
| | Designation | | | Quantity | Designation | | | Quantity | Designation | | | Quantity | |
| | Pole | A1 | A2 | | Pole | A1 | A2 | | Pole | A1 | A2 | | Luminaire |
| 20 | (Type SA 20 S - 4) | | | (150W EQ) LED | (Type SA 20 T - 4) | | | (150W EQ) LED | | | | | |
| | (Type SA 20 S - 4 - 4) | | | (150W EQ) LED | (Type SA 20 T - 4 - 4) | | | (150W EQ) LED | | | | | |
| 30 | (Type SA 30 S - 4) | | | (250W EQ) LED | (Type SA 30 T - 4) | | | (250W EQ) LED | (Type SP 28 S - 4) | | | (250W EQ) LED | |
| | (Type SA 30 S - 4 - 4) | | | (250W EQ) LED | (Type SA 30 T - 4 - 4) | | | (250W EQ) LED | (Type SP 28 S - 4 - 4) | | | (250W EQ) LED | |
| 40 | (Type SA 30 S - 8) | | | (250W EQ) LED | (Type SA 30 T - 8) | | | (250W EQ) LED | (Type SP 28 S - 8) | | | (250W EQ) LED | |
| | (Type SA 30 S - 8 - 8) | | | (250W EQ) LED | (Type SA 30 T - 8 - 8) | | | (250W EQ) LED | (Type SP 28 S - 8 - 8) | | | (250W EQ) LED | |
| | (Type SA 40 S - 4) | | | (250W EQ) LED | (Type SA 40 T - 4) | | | (250W EQ) LED | (Type SP 38 S - 4) | | | (250W EQ) LED | |
| | (Type SA 40 S - 4 - 4) | | | (250W EQ) LED | (Type SA 40 T - 4 - 4) | | | (250W EQ) LED | (Type SP 38 S - 4 - 4) | | | (250W EQ) LED | |
| | (Type SA 40 S - 8) | | | (250W EQ) LED | (Type SA 40 T - 8) | | | (250W EQ) LED | (Type SP 38 S - 8) | | | (250W EQ) LED | |
| | (Type SA 40 S - 8 - 8) | | | (250W EQ) LED | (Type SA 40 T - 8 - 8) | | | (250W EQ) LED | (Type SP 38 S - 8 - 8) | | | (250W EQ) LED | |
| | (Type SA 40 S - 10) | | | (250W EQ) LED | (Type SA 40 T - 10) | | | (250W EQ) LED | (Type SP 38 S - 10) | | | (250W EQ) LED | |
| | (Type SA 40 S - 10 - 10) | | | (250W EQ) LED | (Type SA 40 T - 10 - 10) | | | (250W EQ) LED | (Type SP 38 S - 10 - 10) | | | (250W EQ) LED | |
| | (Type SA 40 S - 12) | | | (250W EQ) LED | (Type SA 40 T - 12) | | | (250W EQ) LED | (Type SP 38 S - 12) | | | (250W EQ) LED | |
| | (Type SA 40 S - 12 - 12) | | | (250W EQ) LED | (Type SA 40 T - 12 - 12) | | | (250W EQ) LED | (Type SP 38 S - 12 - 12) | | | (250W EQ) LED | |
| 50 | (Type SA 50 S - 4) | | | (400W EQ) LED | (Type SA 50 T - 4) | | | (400W EQ) LED | (Type SP 48 S - 4) | | | (400W EQ) LED | |
| | (Type SA 50 S - 4 - 4) | | | (400W EQ) LED | (Type SA 50 T - 4 - 4) | | | (400W EQ) LED | (Type SP 48 S - 4 - 4) | | | (400W EQ) LED | |
| | (Type SA 50 S - 8) | | | (400W EQ) LED | (Type SA 50 T - 8) | | | (400W EQ) LED | (Type SP 48 S - 8) | | | (400W EQ) LED | |
| | (Type SA 50 S - 8 - 8) | | | (400W EQ) LED | (Type SA 50 T - 8 - 8) | | | (400W EQ) LED | (Type SP 48 S - 8 - 8) | | | (400W EQ) LED | |
| | (Type SA 50 S - 10) | | | (400W EQ) LED | (Type SA 50 T - 10) | | | (400W EQ) LED | (Type SP 48 S - 10) | | | (400W EQ) LED | |
| | (Type SA 50 S - 10 - 10) | | | (400W EQ) LED | (Type SA 50 T - 10 - 10) | | | (400W EQ) LED | (Type SP 48 S - 10 - 10) | | | (400W EQ) LED | |
| | (Type SA 50 S - 12) | | | (400W EQ) LED | (Type SA 50 T - 12) | | | (400W EQ) LED | (Type SP 48 S - 12) | | | (400W EQ) LED | |
| | (Type SA 50 S - 12 - 12) | | | (400W EQ) LED | (Type SA 50 T - 12 - 12) | | | (400W EQ) LED | (Type SP 48 S - 12 - 12) | | | (400W EQ) LED | |

| OTHER | | | | |
|-------------|----|----|-----------|----------|
| Designation | | | | Quantity |
| Pole | A1 | A2 | Luminaire | |
| | | | | |
| | | | | |
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GENERAL NOTES:

- All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.
- The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
- Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.
- Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.
 - Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
 - Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, I_w, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, I_w, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
 - Most Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot most arms and luminaires. Poles shall be supplied with most arm combinations as shown in the plans. All most arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
 - Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.
- Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.
 - Meet all of the requirements stated above for optional steel pole designs and the following:
 - Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
 - Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
 - Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
 - Pole components shall be constructed using the following material:
 - Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
 - Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
 - Most Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
 - Most Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
 - Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
 - Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.
- Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.
- Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
 ST: Pole and mast arm must be steel.
 AL: Pole and mast arm must be aluminum.
 SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret. Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

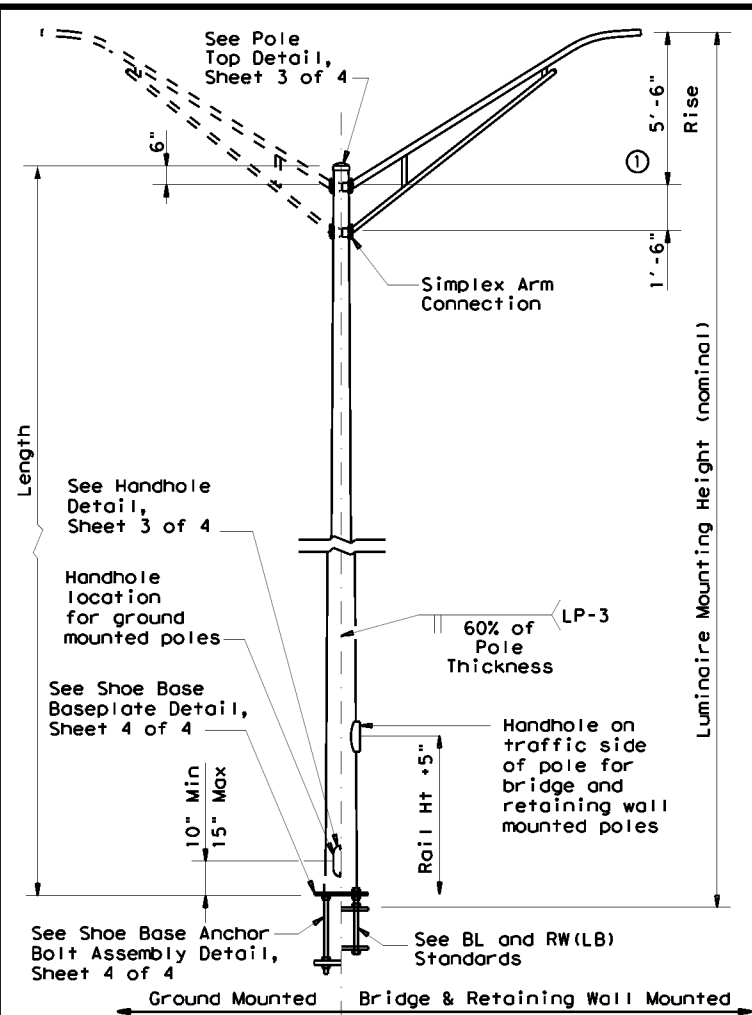
Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

| | | |
|---|------------|---|
| Texas Department of Transportation | | Traffic Safety Division Standard |
| <h2 style="margin: 0;">ROADWAY ILLUMINATION POLES</h2> <h3 style="margin: 0;">RIP(1)-19</h3> | | |
| FILE: r1p-19.dgn | DIN: | CK: |
| © TxDOT January 2007 | CONT: 0495 | SECT: 05 |
| 7-17 | JOB: 061 | HIGHWAY: IH 20 LFR |
| 12-19 | DIST: TYL | COUNTY: SMITH |
| | | SHEET NO. 47 |

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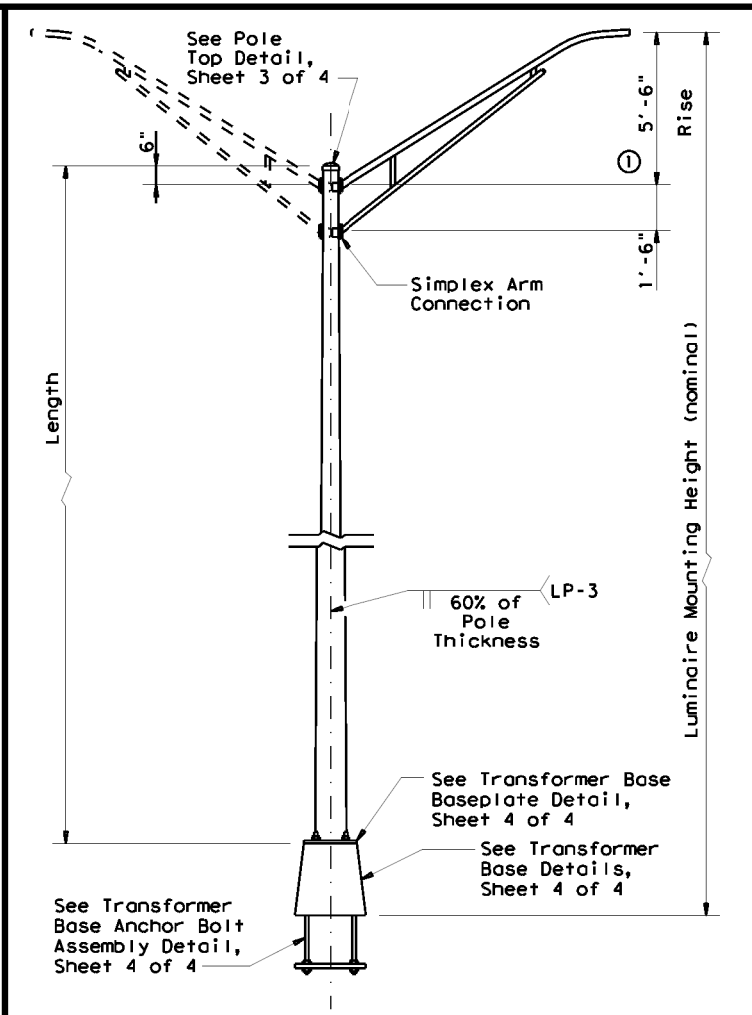
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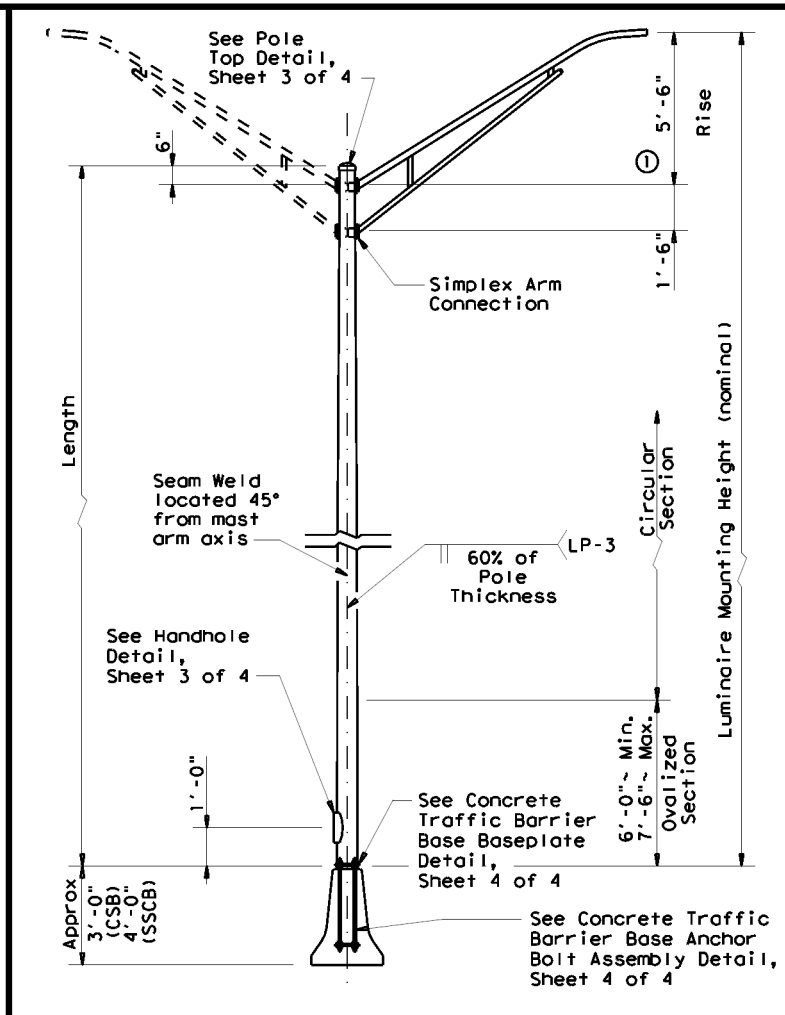
SHOE BASE POLE

| SHOE BASE POLE | | | | | |
|--|--------------------|-------------------|-------------|---------------------|----------------------|
| Luminaire Mounting Height (Nominal) (ft) | Base Diameter (in) | Top Diameter (in) | Length (ft) | Pole Thickness (in) | Design Moment (K-ft) |
| 20.00 | 7.00 | 4.90 | 15.00 | 0.1196 | 7.1 |
| 30.00 | 7.50 | 4.00 | 25.00 | 0.1196 | 13.2 |
| 31.00-39.00 | 8.00 | 4.36-3.24 | 26.00-34.00 | 0.1196 | 20.7 |
| 40.00 | 8.50 | 3.60 | 35.00 | 0.1196 | 20.7 |
| 50.00 | 10.50 | 4.20 | 45.00 | 0.1196 | 30.3 |



TRANSFORMER BASE POLE

| TRANSFORMER BASE POLE | | | | | |
|--|--------------------|-------------------|-------------|---------------------|----------------------|
| Luminaire Mounting Height (Nominal) (ft) | Base Diameter (in) | Top Diameter (in) | Length (ft) | Pole Thickness (in) | Design Moment (K-ft) |
| 20.00 | 7.00 | 5.11 | 13.50 | 0.1196 | 7.1 |
| 30.00 | 7.50 | 4.21 | 23.50 | 0.1196 | 13.2 |
| 31.00-39.00 | 8.00 | 4.57-3.45 | 24.50-32.50 | 0.1196 | 20.7 |
| 40.00 | 8.50 | 3.81 | 33.50 | 0.1196 | 20.7 |
| 50.00 | 10.00 | 3.91 | 43.50 | 0.1196 | 30.3 |



CONCRETE TRAFFIC BARRIER BASE POLE

| CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB) | | | | | | |
|---|--------------------|-------------------|-------------|---------------------|----------------------|---------------|
| Luminaire Mounting Height (Nominal) (ft) | Base Diameter (in) | Top Diameter (in) | Length (ft) | Pole Thickness (in) | Design Moment (K-ft) | |
| | | | | | About C of Rail | Perp. to Rail |
| 28.00 | 9.00 | 5.78 | 23.00 | 0.1196 | 10.3 | 13.2 |
| 38.00 | 9.00 | 4.38 | 33.00 | 0.1196 | 16.6 | 20.8 |
| 48.00 | 10.50 | 4.48 | 43.00 | 0.1345 | 25.1 | 30.5 |

GENERAL NOTES:

- Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
- Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
- Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
- For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
- Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
- Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
- Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
- Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
- Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
- All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
- The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
- Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
- Erect transformer base poles in accordance with sheet RID(1).

MATERIAL DATA

| COMPONENT | ASTM DESIGNATION | MIN. YIELD (ksi) |
|-------------------------------|--|------------------|
| Pole Shaft (0.14"/ft. Taper) | A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 (3), or A1008 HSLAS Gr 50 Cl 2 | 50 |
| Base Plate and Handhole Frame | A572 Gr.50, or A36 | 36 |
| T-Base Connecting Bolts | F3125 Gr A325 | 92 |
| Anchor Bolts | F1554 Gr 55, A193-B7 or A321 | 55 105 |
| Anchor Bolt Templates | A36 | 36 |
| Heavy Hex (H.H.) Nuts | A194 Gr 2H, or A563 Gr DH | |
| Flat Washers | F436 | |

NOTES:

- 2'-6" rise for 4 ft. luminaire arms.
- Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

| DIMENSION | TOLERANCE |
|--|----------------|
| Shaft length | +1" |
| I.D. of outside piece of slip fitting pieces | +1/8", -1/16" |
| O.D. of inside piece of slip fitting pieces | +1/32", -1/8" |
| Shaft diameter: other | +3/16" |
| Out of "round" | 1/4" |
| Straightness of shaft | ±1/4" in 10 ft |
| Twist in multi-sided shaft | 4° in 50 ft |
| Perpendicular to baseplate | 1/8" in 24" |
| Pole centered on baseplate | ±1/4" |
| Location of Attachments | ±1/4" |
| Bolt hole spacing | ±1/16" |

SHEET 2 OF 4

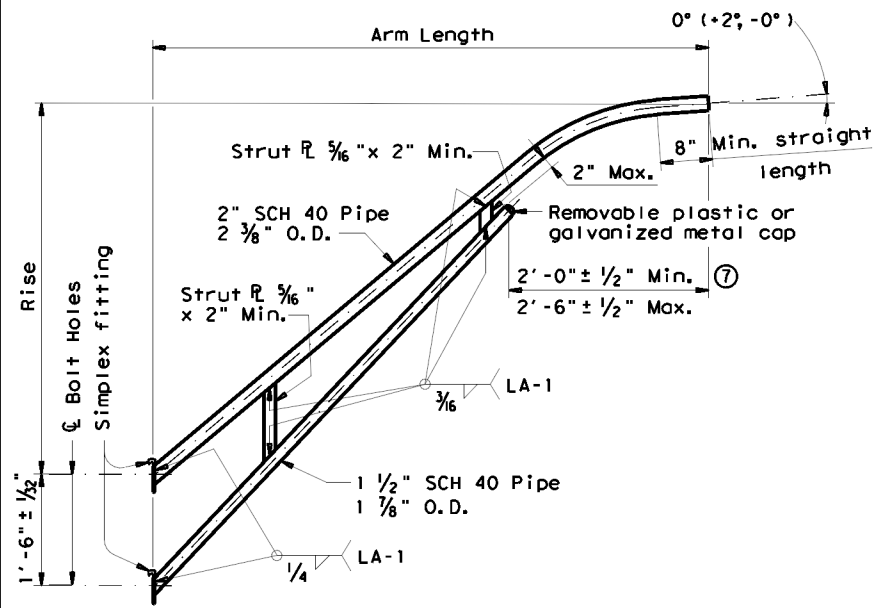


**ROADWAY ILLUMINATION POLES
 RIP(2)-19**

| | | | | |
|----------------------|---------|--------|-----------|---------|
| FILE: r1p-19.dgn | DN: | CK: | DW: | CK: |
| © TxDOT January 2007 | CONT | SECT | JOB | HIGHWAY |
| REVISIONS | 0495 05 | 061 | IH 20 LFR | |
| 7-17 | DIST | COUNTY | SHEET NO. | |
| 12-19 | TYL | SMITH | 48 | |

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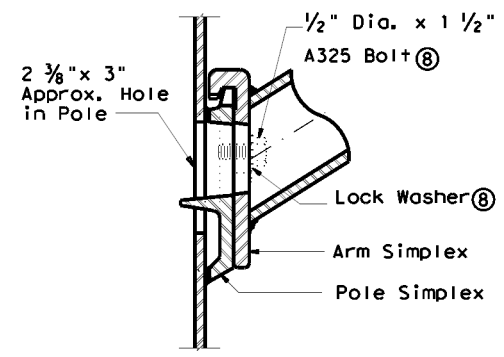
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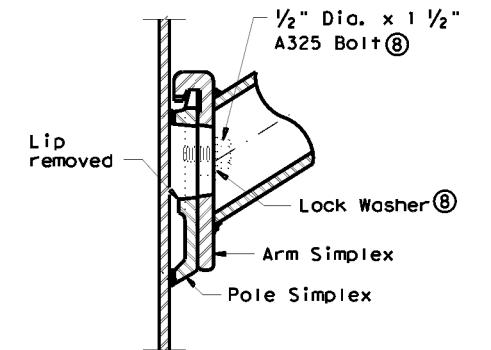
LUMINAIRE ARM

| LUMINAIRE ARM DIMENSIONS | | |
|--------------------------|------------|-------|
| Nominal Arm Length | Arm Length | Rise |
| 4'-0" | 3'-6" | 2'-6" |
| 6'-0" | 5'-6" | 5'-6" |
| 8'-0" | 7'-6" | 5'-6" |
| 10'-0" | 9'-6" | 5'-6" |
| 12'-0" | 11'-6" | 5'-6" |

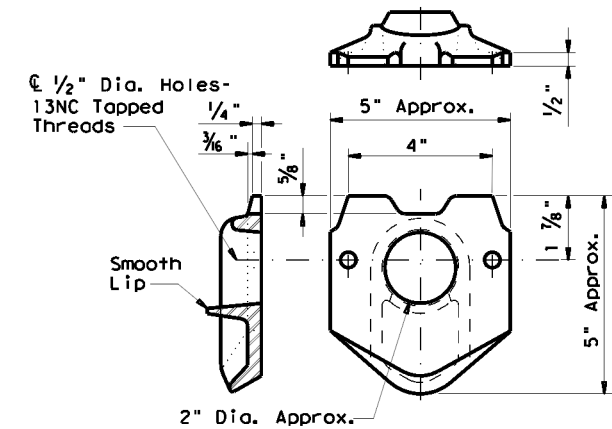
| ARM ASSEMBLY FABRICATION TOLERANCES TABLE | |
|---|-------------|
| DIMENSION | TOLERANCE |
| Arm Length | ±1" |
| Arm Rise | ±1" |
| Deviation from flat | 1/8" in 12" |
| Spacing between holes | ±1/32" |



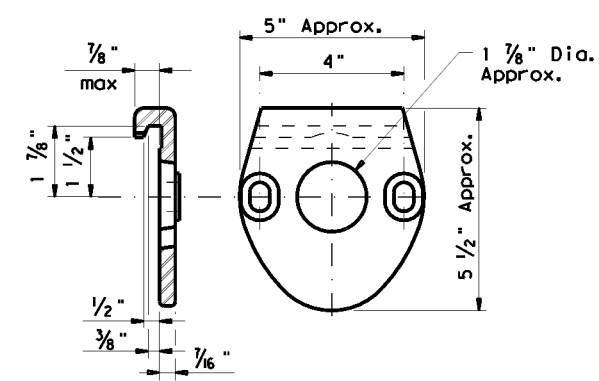
UPPER SIMPLEX FITTING
(Gusset not shown for clarity)



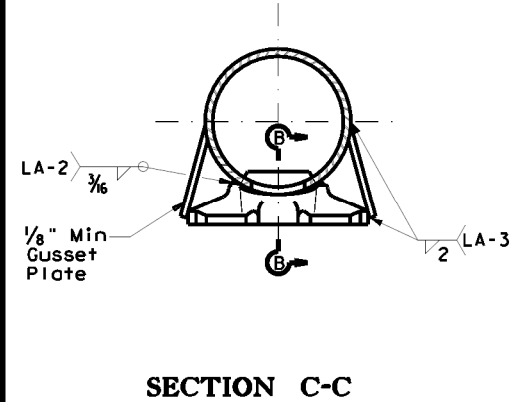
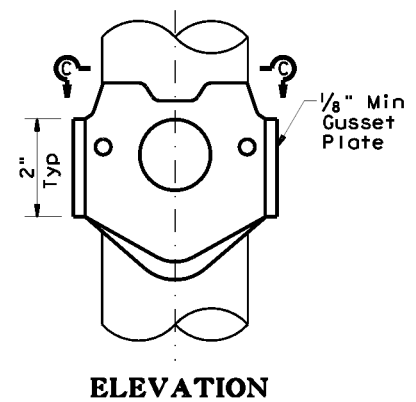
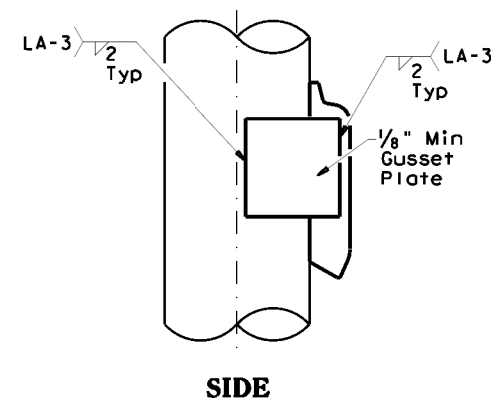
LOWER SIMPLEX FITTING
(Gusset not shown for clarity)
SECTION B-B



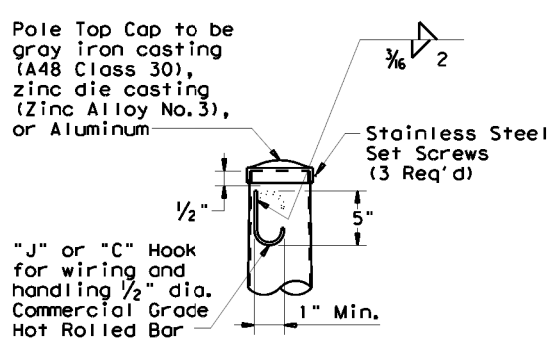
POLE SIMPLEX DETAIL



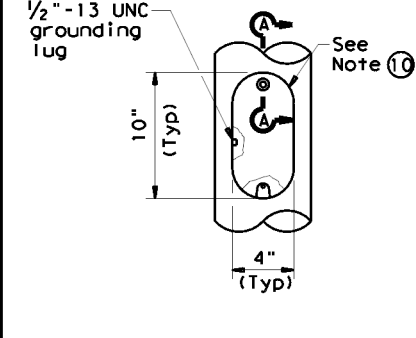
ARM SIMPLEX DETAIL



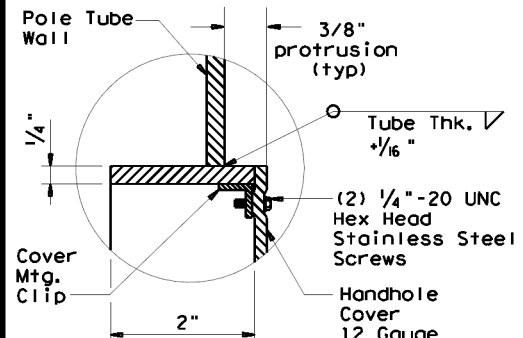
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

NOTES:

- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.
- ⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- ⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.
- ⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.
- ⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS

| | |
|--------------------------------|---|
| Pole or Arm Simplex | ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only) |
| Arm Pipes | ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥ |
| Arm Struts and Gusset Plates ④ | ASTM A36, A572 Gr 50 ⑥, or A588 |
| Misc. | ASTM designations as noted |

SHEET 3 OF 4

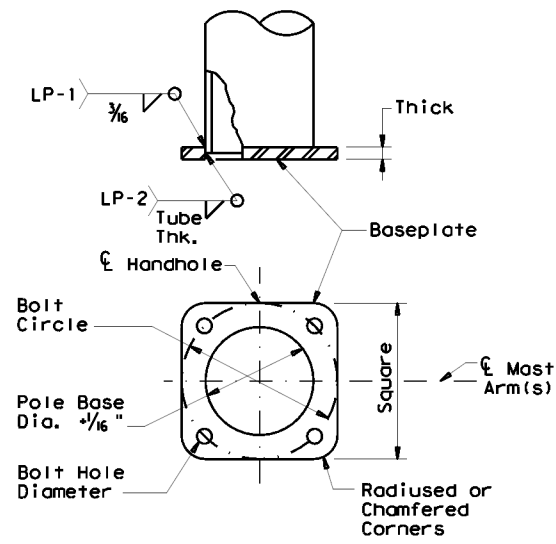


ROADWAY ILLUMINATION POLES
RIP(3)-19

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|----------------------|---------------|---------------|--------------------|
| FILE: r1p-19.dgn | DWG: CKS | DWG: CKS | CKS |
| © TxDOT January 2007 | CONT: 0495 05 | SECT: 061 | HIGHWAY: IH 20 LFR |
| 7-17 12-19 | DIST: TYL | COUNTY: SMITH | SHEET NO.: 49 |

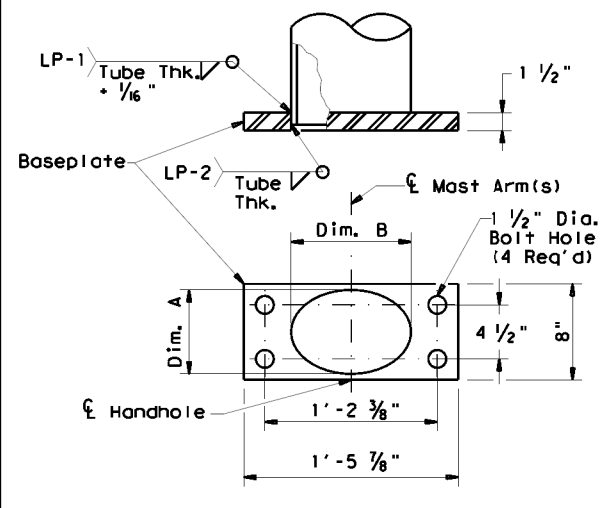
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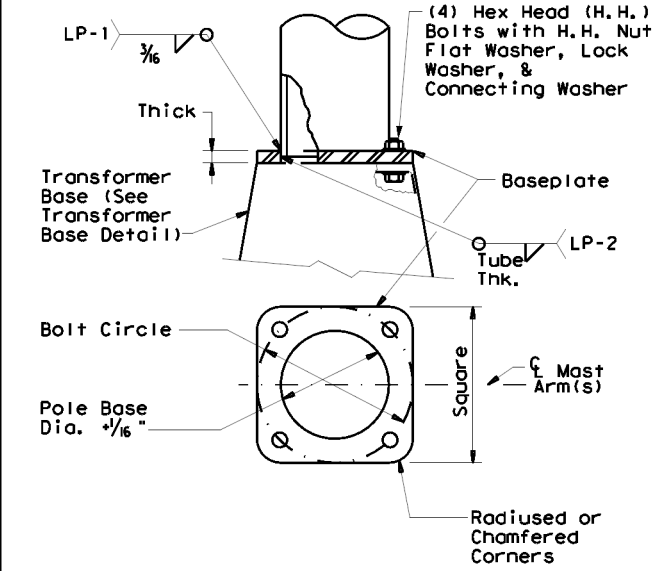
SHOE BASE BASEPLATE

| SHOE BASE BASEPLATE TABLE | | | | |
|----------------------------|-------------|--------|--------|--------------------|
| MOUNTING HEIGHTS (nominal) | BOLT CIRCLE | SQUARE | THICK | BOLT HOLE DIAMETER |
| 20' - 39' | 13" | 13" | 1 1/4" | 1 1/4" |
| 40' | 15" | 15" | 1 1/4" | 1 1/2" |
| 50' | 15" | 15" | 1 1/2" | 1 1/2" |



CONCRETE TRAFFIC BARRIER BASE BASEPLATE

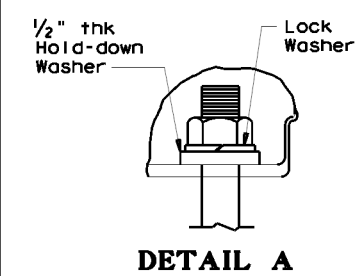
| CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE | | | |
|---|----------------|-----------|------------|
| MOUNTING HEIGHTS (nominal) | POLE DIA. (13) | DIM. A | DIM. B |
| 28' - 38' | 9" | 7" ± 1/4" | 10" ± 1/4" |
| 48' | 10 1/2" | 7" ± 1/4" | 13" ± 1/4" |



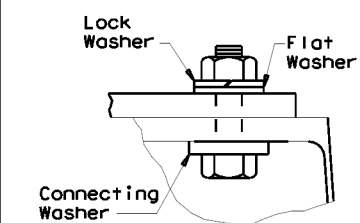
TRANSFORMER BASE BASEPLATE

| TRANSFORMER BASE BASEPLATE TABLE | | | | | | |
|----------------------------------|-------------|--------|--------|----------------------|--------------------|-----------------------|
| MOUNTING HEIGHTS (nominal) | BOLT CIRCLE | SQUARE | THICK | CONNECTING BOLT DIA. | BOLT HOLE DIAMETER | TRANSFORMER BASE TYPE |
| 20' - 39' | 13" | 13" | 1 1/4" | 1" | 1 1/4" | A |
| 40' | 15" | 15" | 1 1/4" | 1 1/4" | 1 1/2" | B |
| 50' | 15" | 15" | 1 1/2" | 1 1/4" | 1 1/2" | B |

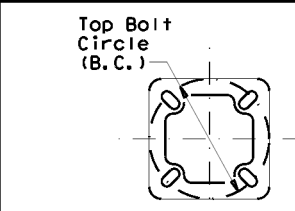
| TRANSFORMER BASE TABLE | | |
|------------------------|----------|-----------|
| TYPE | TOP B.C. | BTM. B.C. |
| A | 13" | 14" |
| B | 15" | 17 1/4" |



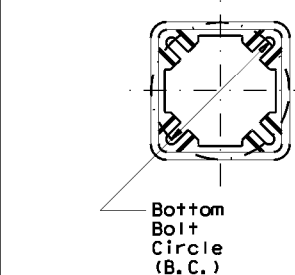
DETAIL A



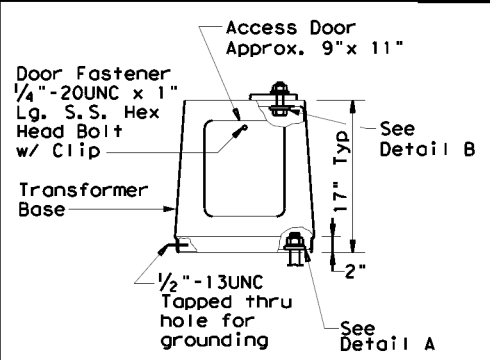
DETAIL B



TOP PLAN

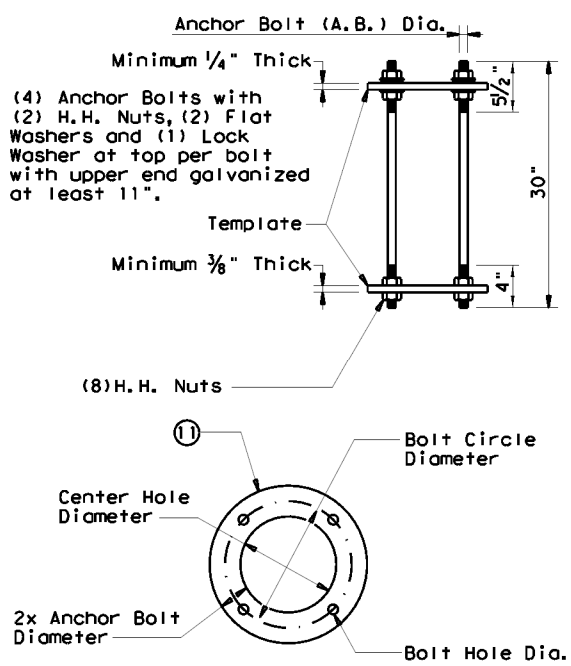


BOTTOM PLAN



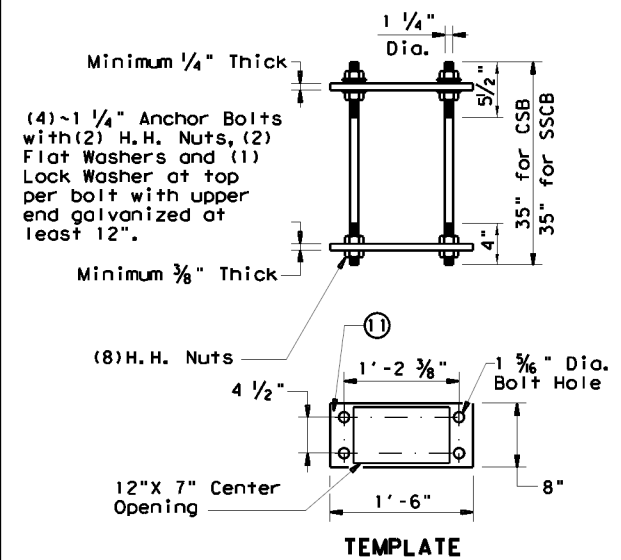
ELEVATION

TRANSFORMER BASE DETAILS



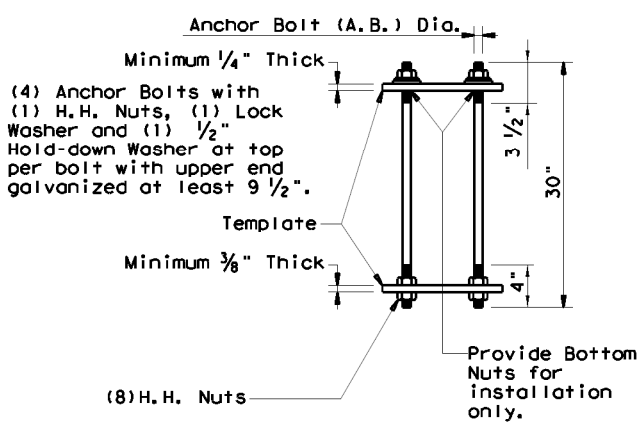
SHOE BASE ANCHOR BOLT ASSEMBLY

| SHOE BASE ANCHOR BOLT ASSEMBLY TABLE | | | | |
|--------------------------------------|-----------|----------------------|--------------------|--------------------|
| MOUNTING HEIGHTS (nominal) | A.B. Dia. | BOLT CIRCLE DIAMETER | CTR. HOLE DIAMETER | BOLT HOLE DIAMETER |
| 20' - 39' | 1" | 13" | 11" | 1 1/16" |
| 40' - 50' | 1 1/4" | 15" | 12 1/2" | 1 3/16" |



CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

| CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY TABLE | | | | |
|--|-----------|----------------------|--------------------|--------------------|
| MOUNTING HEIGHTS (nominal) | A.B. Dia. | BOLT CIRCLE DIAMETER | CTR. HOLE DIAMETER | BOLT HOLE DIAMETER |
| 20' - 39' | 1" | 14" | 12" | 1 1/16" |
| 40' - 50' | 1 1/4" | 17 1/4" | 14 3/4" | 1 3/16" |



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY

GENERAL NOTES:

- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

| ANCHOR BOLT FABRICATION TOLERANCES TABLE | |
|--|-----------|
| DIMENSION | TOLERANCE |
| Length | ± 1/2" |
| Threaded length | ± 1/2" |
| Galvanized length (if required) | - 1/4" |

SHEET 4 OF 4



**ROADWAY ILLUMINATION POLES
RIP(4)-19**

| | | | | |
|---------------------|---------|--------|-----------|---------|
| FILE: rip-19.dgn | CONT | SECT | JOB | HIGHWAY |
| ©TxDOT January 2007 | 0495 05 | 061 | IH 20 LFR | |
| 7-17 12-19 | DIST | COUNTY | SHEET NO. | |
| | TYL | SMITH | 50 | |

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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.
 - 2.
- No Action Required Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.

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 checked="" 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

Action No.

1. No action necessary above those required by the 2014 Texas Standard for Specifications Construction and Maintenance of Highways, Streets & Bridges.
- 2.
- 3.
- 4.

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. No action required beyond above-mentioned specs.
- 2.
- 3.
- 4.

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

- No Action Required Required Action

Action No.

1. Adhere to direction concerning Migratory Birds listed below.
- 2.
- 3.
- 4.

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

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

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

Contact the Engineer if any of the following are detected:

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

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

- Yes No

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

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

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

- Yes No

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

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

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

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

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.


VII. OTHER ENVIRONMENTAL ISSUES

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

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.

| | | | | |
|--|----------------|--------------|------------------|---------|
|  Design Division Standard | | | | |
| ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC | | | | |
| FILE: epic.dgn | DNR TxDOT | CR: RG | DNR VP | CR: AR |
| © TxDOT: February 2015 | CONT | SECT | JOB | HIGHWAY |
| 12-12-2011 (DS) REVISIONS | 0495 05 | 061 | IH 20 LFR | |
| 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. | TYL | SMITH | 51 | |

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION: CONSTRUCT TRUCK PARKING WITH OVERLAY

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0495-05-061

1.2 PROJECT LIMITS:

From: SH 155 INTERSECTION

To:

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 32.4498657, (Long) -95.1882982

END: (Lat) 32.4484403, (Long) -95.1826091

1.4 TOTAL PROJECT AREA (Acres): 0.137

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.137

1.6 NATURE OF CONSTRUCTION ACTIVITY:

OVERLAY

1.7 MAJOR SOIL TYPES:

| Soil Type | Description |
|------------|--|
| SANDY LOAM | ELROSE FINE SANDY LOAM, 3 TO 8 PERCENT SLOPS |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- PSLs determined during preconstruction meeting
- PSLs determined during construction
- No PSLs planned for construction

| Type | Sheet #s |
|------|----------|
| | |
| | |
| | |
| | |
| | |

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

- Mobilization
- Install sediment and erosion controls
- Blade existing topsoil into windrows, prep ROW, clear and grub
- Remove existing pavement
- Grading operations, excavation, and embankment
- Excavate and prepare subgrade for proposed pavement widening
- Remove existing culverts, safety end treatments (SETs)
- Remove existing metal beam guard fence (MBGF), bridge rail
- Install proposed pavement per plans
- Install culverts, culvert extensions, SETs
- Install mow strip, MBGF, bridge rail
- Place flex base
- Rework slopes, grade ditches
- Blade windrowed material back across slopes
- Revegetation of unpaved areas
- Achieve site stabilization and remove sediment and erosion control measures

Other: _____
 Other: _____
 Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- Sediment laden stormwater from stormwater conveyance over disturbed area
- Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- Solvents, paints, adhesives, etc. from various construction activities
- Transported soils from offsite vehicle tracking
- Construction debris and waste from various construction activities
- Contaminated water from excavation or dewatering pump-out water
- Sanitary waste from onsite restroom facilities
- Trash from various construction activities/receptacles
- Long-term stockpiles of material and waste
- Other: _____
- Other: _____
- Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

| Tributaries | Classified Waterbody |
|-----------------------|----------------------------------|
| 0506C - WIGGINS CREEK | UNCLASSIFIED - FRESHWATER STREAM |
| | |
| | |
| | |
| | |
| | |

* Add (*) for impaired waterbodies with pollutant in ().

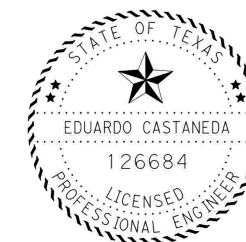
1.12 ROLES AND RESPONSIBILITIES: TxDOT

- Development of plans and specifications
- Perform SWP3 inspections
- Maintain SWP3 records and update to reflect daily operations
- Other: _____
- Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- Day To Day Operational Control
- Maintain schedule of major construction activities
- Install, maintain and modify BMPs
- Other: _____
- Other: _____

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DocuSigned by:

Eduardo Castaneda
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6/24/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)



Sheet 1 of 2

| | | | | |
|-------------------|-------------|--------|-------------|-----------|
| FED. RD. DIV. NO. | PROJECT NO. | | | SHEET NO. |
| | | | | 52 |
| STATE | STATE DIST. | COUNTY | | |
| TEXAS | STATE DIST. | SMITH | | |
| CONT. | SECT. | JOB | HIGHWAY NO. | |
| 0495 | 05 | 061 | 1H 20 LFR | |

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- Protection of Existing Vegetation
- Vegetated Buffer Zones
- Soil Retention Blankets
- Geotextiles
- Mulching/ Hydromulching
- Soil Surface Treatments
- Temporary Seeding
- Permanent Planting, Sodding or Seeding
- Biodegradable Erosion Control Logs
- Rock Filter Dams/ Rock Check Dams
- Vertical Tracking
- Interceptor Swale
- Riprap
- Diversion Dike
- Temporary Pipe Slope Drain
- Embankment for Erosion Control
- Paved Flumes
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- Biodegradable Erosion Control Logs
- Dewatering Controls
- Inlet Protection
- Rock Filter Dams/ Rock Check Dams
- Sandbag Berms
- Sediment Control Fence
- Stabilized Construction Exit
- Floating Turbidity Barrier
- Vegetated Buffer Zones
- Vegetated Filter Strips
- Other: _____
- Other: _____
- Other: _____
- Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

| Type | Stationing | |
|-------------------|------------|---------|
| | From | To |
| PERMANENT SEEDING | 1281+00 | 1286+00 |
| | | |
| | | |
| | | |
| | | |
| | | |

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- Excess dirt/mud on road removed daily
- Haul roads dampened for dust control
- Loaded haul trucks to be covered with tarpaulin
- Stabilized construction exit
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- Chemical Management
- Concrete and Materials Waste Management
- Debris and Trash Management
- Dust Control
- Sanitary Facilities
- Other: _____
- Other: _____
- Other: _____
- Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

| Type | Stationing | |
|------------------------|------------|---------|
| | From | To |
| SEDIMENT CONTROL FENCE | 1286+00 | 1286+50 |
| | | |
| | | |
| | | |
| | | |
| | | |

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- Fire hydrant flushings
- Irrigation drainage
- Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- Potable water sources
- Springs
- Uncontaminated groundwater
- Water used to wash vehicles or control dust
- Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.


2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

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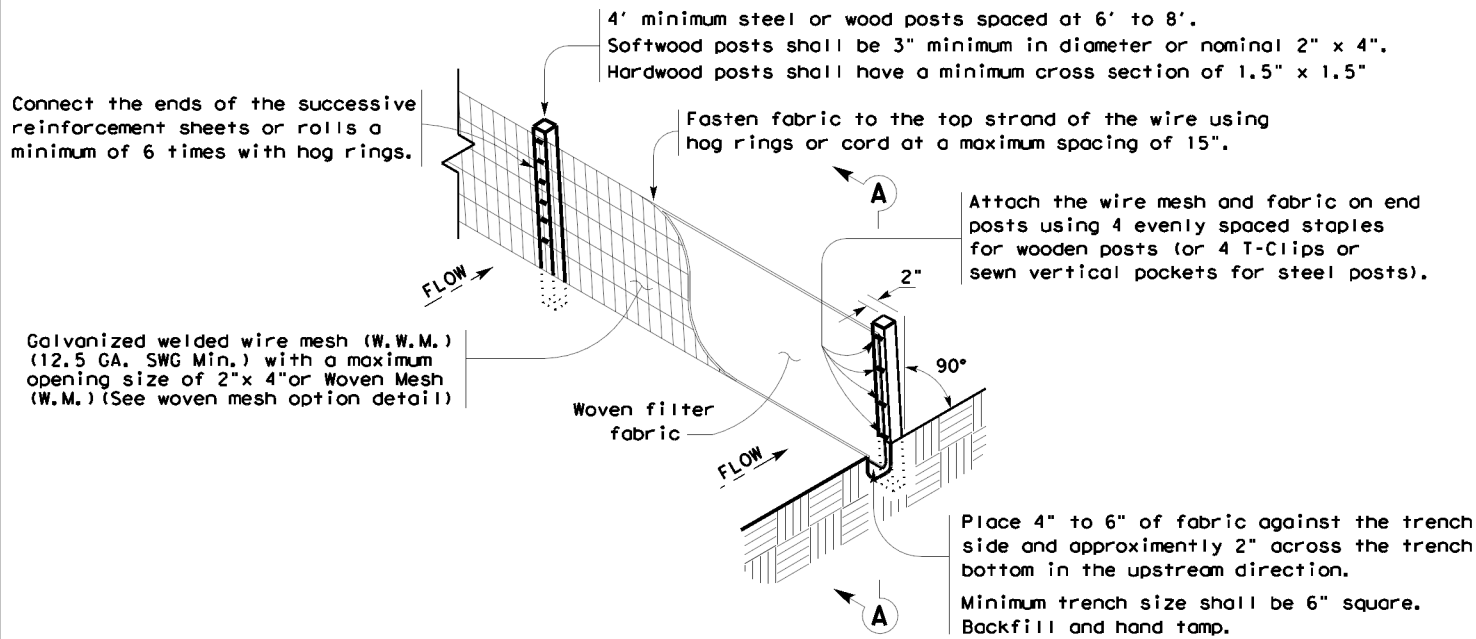


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STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

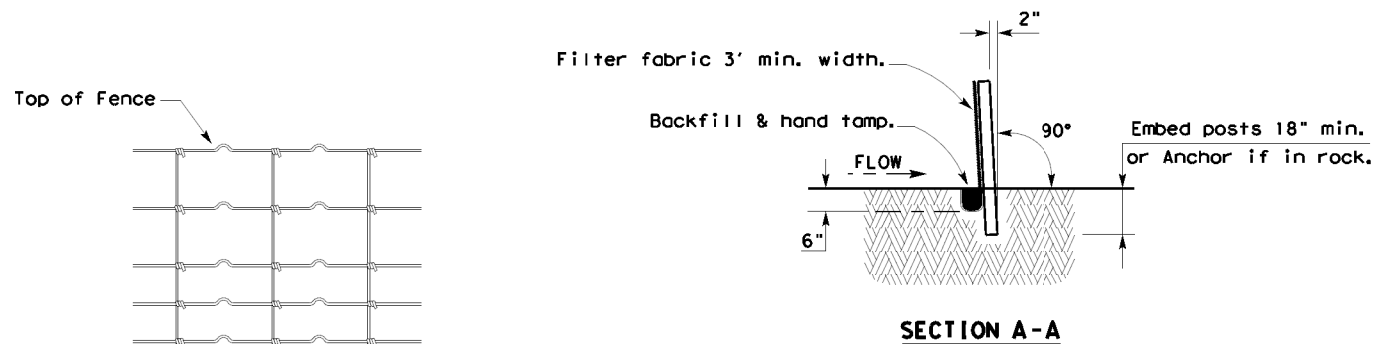
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| FED. RD. DIV. NO. | PROJECT NO. | | | SHEET NO. |
| | SEE TITLE SHEET | | | 53 |
| STATE | STATE DIST. | COUNTY | | |
| TEXAS | | SMITH | | |
| CONT. | SECT. | JOB | HIGHWAY NO. | |
| 0495 | 05 | 061 | 1H 20 LFR | |

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TEMPORARY SEDIMENT CONTROL FENCE

SCF



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

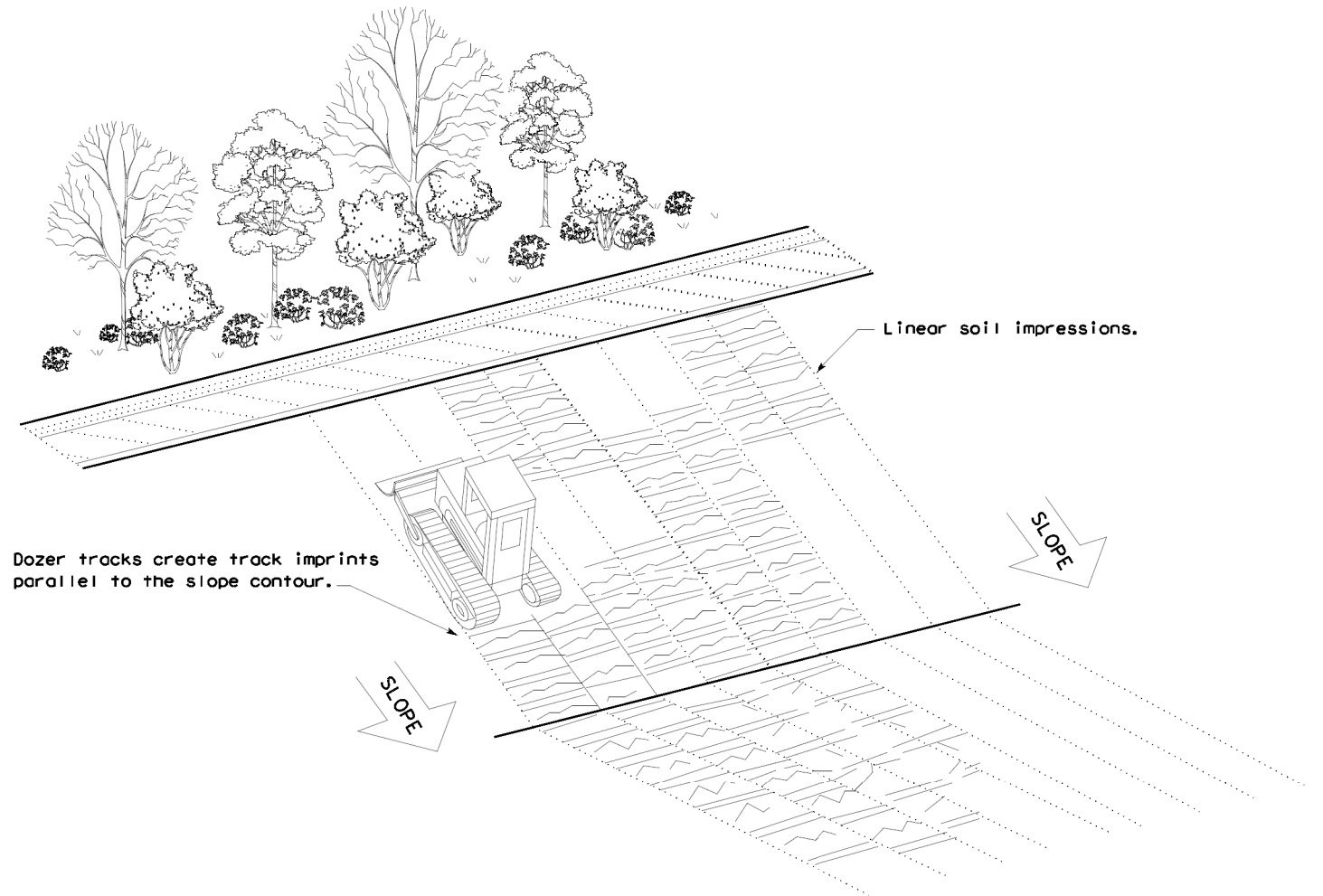
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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

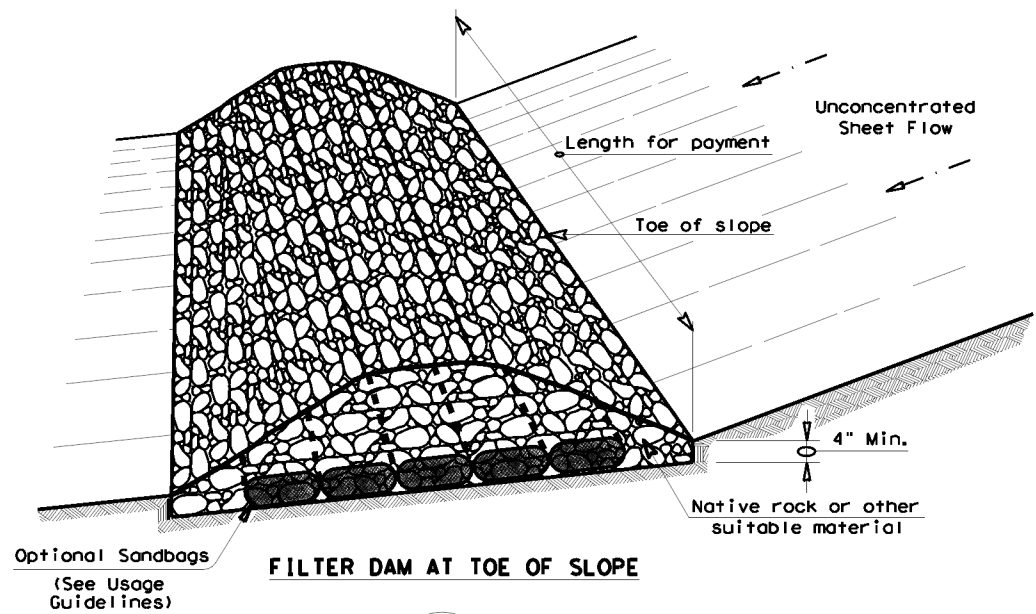


VERTICAL TRACKING

| | | | | | |
|--|-----------|--------|-----------|--------------------------|--|
| | | | | Design Division Standard | |
| TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING EC(1) - 16 | | | | | |
| FILE: ec116 | DNR TXDOT | CK: KM | DNR VP | DNR/CK: LS | |
| © TXDOT: JULY 2016 | CONT | SECT | JOB | HIGHWAY | |
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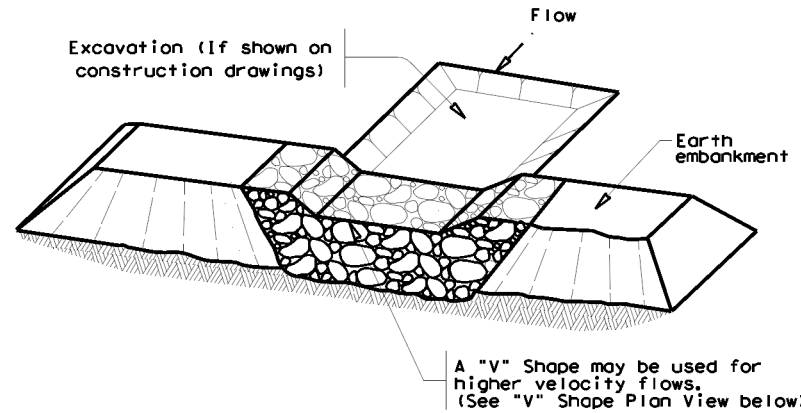
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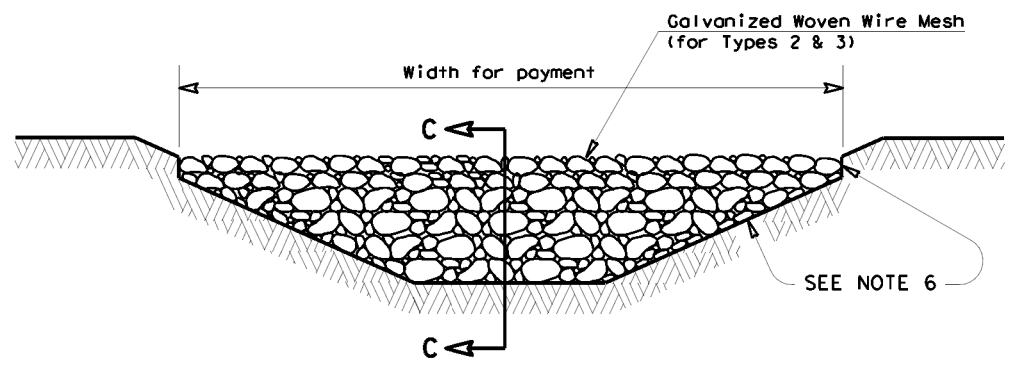
FILTER DAM AT TOE OF SLOPE

RFD1



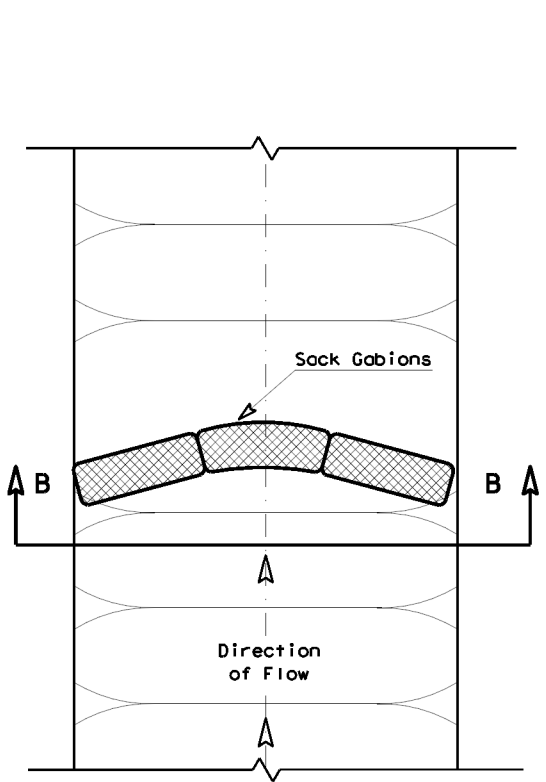
FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2

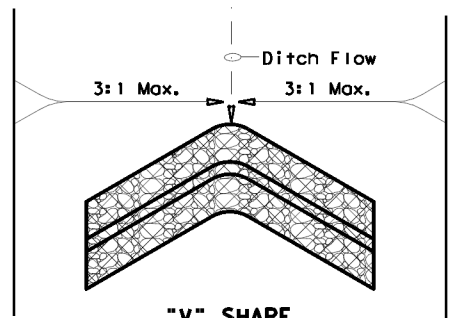


FILTER DAM AT CHANNEL SECTIONS

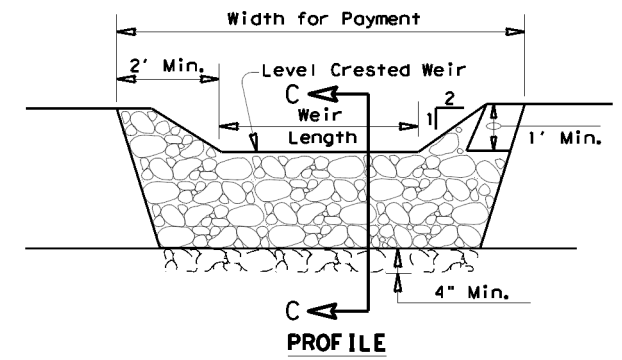
RFD1 OR RFD2 OR RFD3



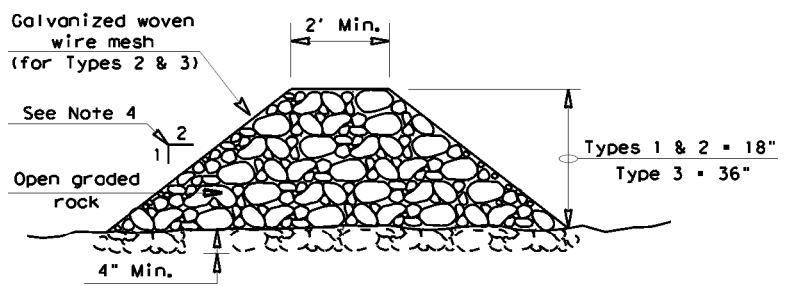
PLAN VIEW



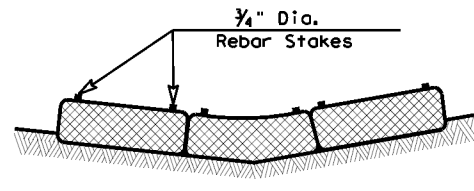
"V" SHAPE PLAN VIEW



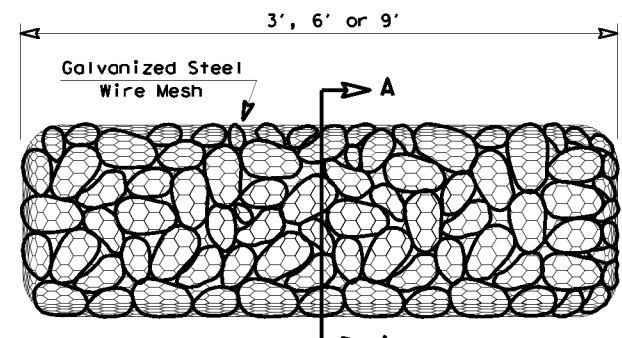
PROFILE



SECTION C-C

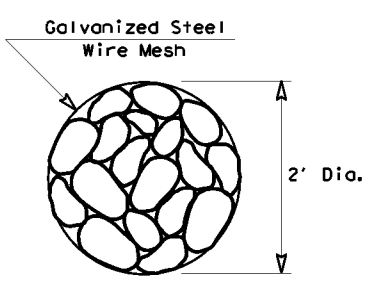


SECTION B-B



TYPE 4 (SACK GABIONS)

RFD4



SECTION A-A

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT² of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximately 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with 3/4" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 1/2" x 3 1/4".
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

- Type 1 Rock Filter Dam — RFD1 —
- Type 2 Rock Filter Dam — RFD2 —
- Type 3 Rock Filter Dam — RFD3 —
- Type 4 Rock Filter Dam — RFD4 —

| | | | |
|---|-------------|--------------------------|-----------|
| | | Design Division Standard | |
| TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES ROCK FILTER DAMS EC(2) - 16 | | | |
| FILE: ec216 | DNR TxDOT | CK: KM | DWR: VP |
| © TxDOT: JULY 2016 | CONT. SECT. | JOB | HIGHWAY |
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