INDEX OF SHEETS

SEE SHEET 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. F 2021(846)

NET LENGTH OF ROADWAY= 23,169.25 ft = 4.388 mi
NET LENGTH OF BRIDGE = 62.00 ft = 0.012 mi
NET LENGTH OF PROJECT= 23,231.25 ft = 4.400 mi

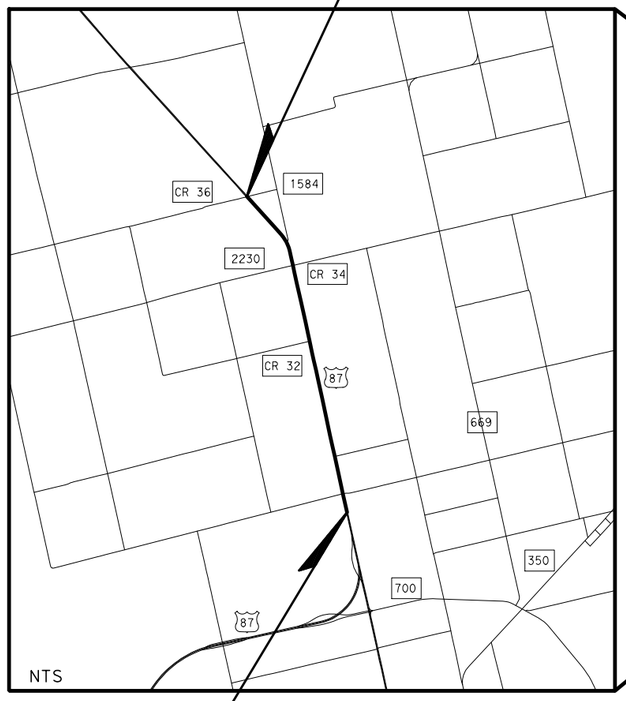
US 87
HOWARD COUNTY

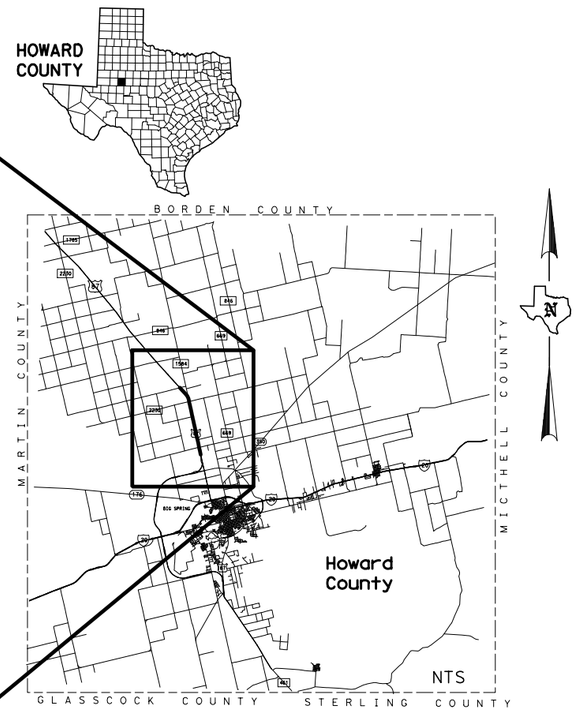
LIMITS: *1750' NORTH OF US 87 TRUCK RELIEF ROUTE TO CR 36*

FOR THE CONSTRUCTION OF: *REHABILITATION OF EXISTING ROAD*

CONSISTING OF: *ROADWAY RECONSTRUCTION AND INSTALL CABLE BARRIER*

END PROJECT
CSJ: 0068-08-067
REF MRK: 368+1.75 mi.
STA: 445+81.25





BEGIN PROJECT
CSJ: 0068-08-067
REF MRK: 374+0.200 mi.
STA: 213+50.00

EXCEPTIONS: *N/A*
EQUATIONS: *N/A*
RAILROAD CROSSINGS: *N/A*

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

DESIGN SPEED = (MAIN LANES) 75 mph
CURRENT A.D.T. (2019) = 9174 vpd
PROJECTED A.D.T. (2039) = 11009 vpd
FUNCTIONAL CLASS = PRINCIPAL ARTERIAL
EXISTING NBI# = 081150006808007, 081150006808008
PROPOSED NBI# = N/A

FHWA TEXAS DIVISION	PROJECT NO.		SHEET NO.
	F 2021(846)		1
STATE	DISTRICT	COUNTY	
TEXAS	ABL	HOWARD	
CONTROL	SECTION	JOB	HIGHWAY NO.
0068	08	067	US 87

FINAL PLANS

LETTING DATE: AUG 2021

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED: _____

DATE WORK WAS ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

CERTIFICATION FOR FINAL PLANS

THIS PROJECT WAS BUILT ACCORDING TO THE PLANS AND SPECIFICATIONS. THESE FINAL PLANS REFLECT THE WORK DONE AND THE QUANTITIES SHOWN THEREON AND ON THE FINAL ESTIMATE ARE FINAL QUANTITIES.

AREA ENGINEER DATE

THE DISTRICT TRAFFIC SAFETY COMMITTEE HAS REVIEWED THE TRAFFIC CONTROL PLAN FOR THIS PROJECT AND IT IS IN COMPLIANCE WITH CURRENT TRAFFIC CONTROL STANDARDS.

DocuSigned by: Casey L. McGee, P.E. 5/28/2021
COMMITTEE CHAIRMAN DATE

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED PROFESSIONAL ENGINEER
5/24/2021
Christopher Hartke

RECOMMENDED FOR LETTING: 5/28/2021
DocuSigned by: Neil Welch
NEIL WELCH, P.E.
AREA ENGINEER

SUBMITTED FOR LETTING: 5/28/2021
DocuSigned by: Christopher Hartke
CHRISTOPHER HARTKE, P.E.
TEAGUE NALL & PERKINS PROJECT MANAGER

RECOMMENDED FOR LETTING: 5/31/2021
DocuSigned by: Michael Haithcock
MICHAEL A. HAITHCOCK, P.E.
DIRECTOR OF T P & D

RECOMMENDED FOR LETTING: 5/28/2021
DocuSigned by: Eric Welch
ERIC WELCH, P.E.
TxDOT PROJECT MANAGER

APPROVED FOR LETTING: 6/1/2021
DocuSigned by: Thomas D. Allbritton, P.E.
THOMAS D. ALLBRITTON, P.E.
DISTRICT ENGINEER

5/24/2021 3:26:46 PM
P:\MSGPTXD2020\TXD2020\US 87 - Energy Sector\PROD_SHEETS\TITLE SHEET.dgn

INDEX OF SHEETS

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET WITH A "#" HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED PROFESSIONAL ENGINEER
6/21/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

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DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	2
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GRPH CHECK	0068	08	067	
JKB				

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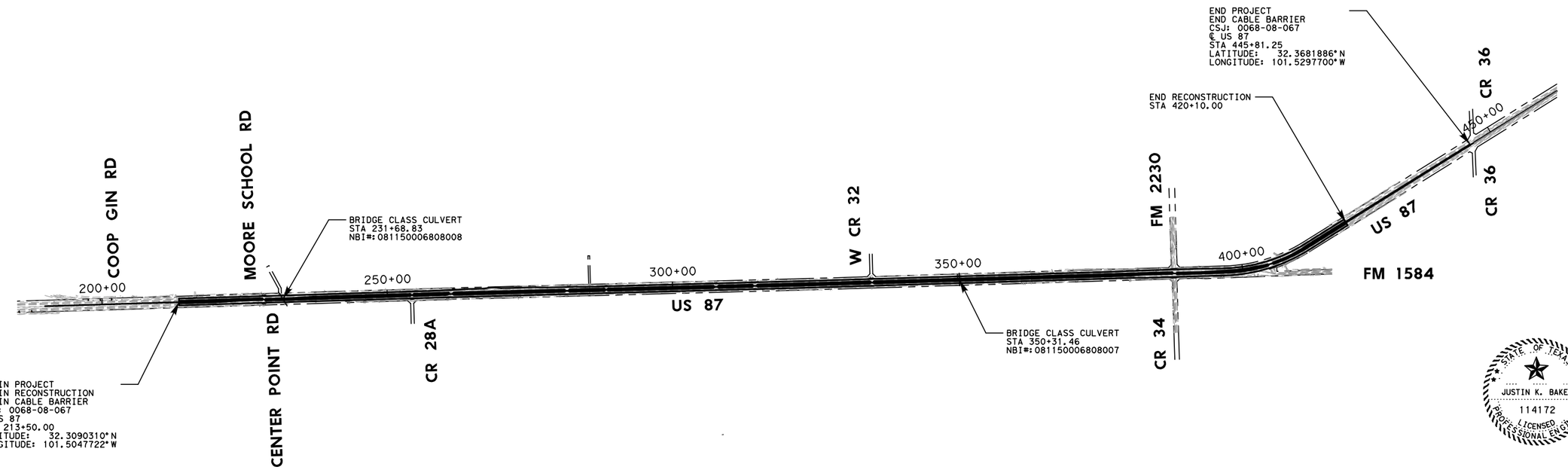

1000 500 0 1000 2000

SCALE: 1" = 100'

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

PROJECT LAYOUT

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
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DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	3
GRAPHICS	CONTROL	SECTION	JOB	
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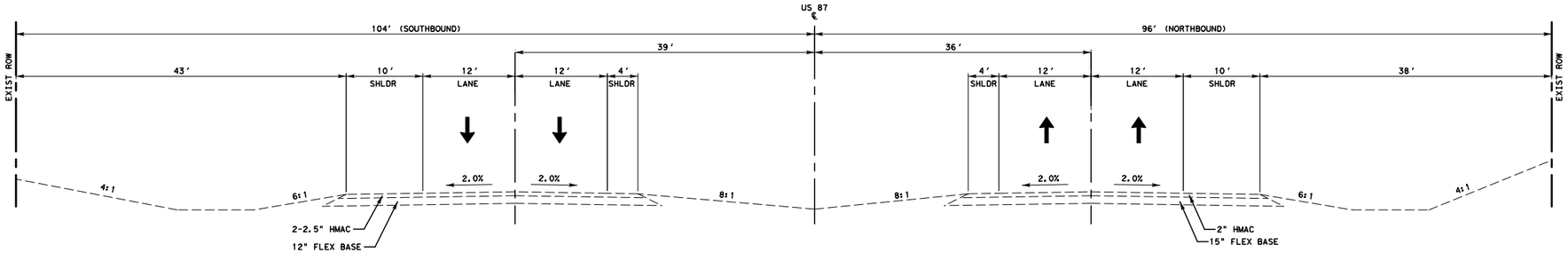
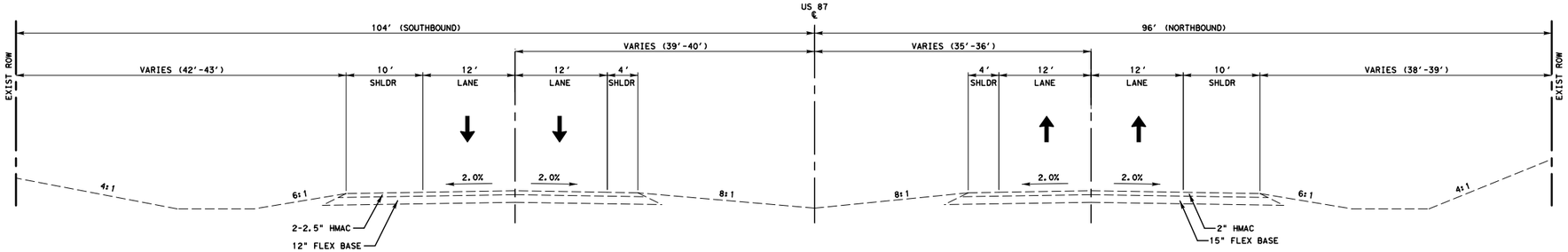


EXISTING US 87 TYPICAL SECTION
STA 213+50 TO STA 220+00



EXISTING US 87 TYPICAL SECTION
STA 220+00 TO STA 224+00

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TYPICAL SECTIONS

(SHEET 1 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	4
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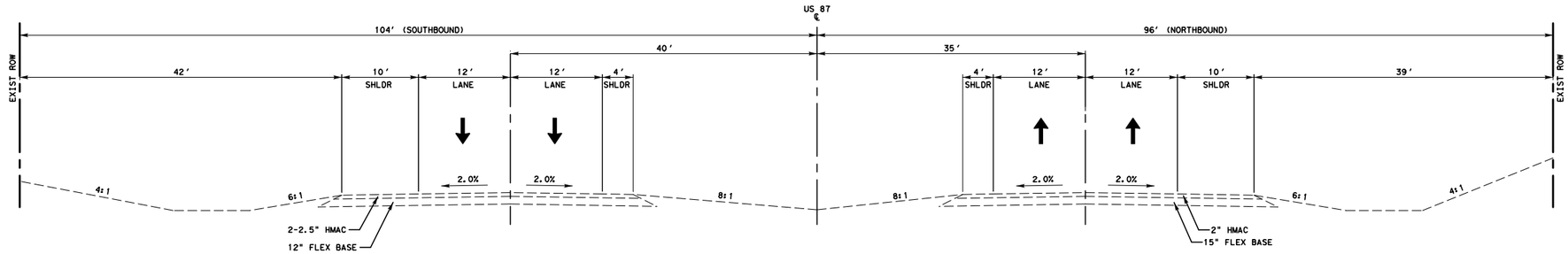

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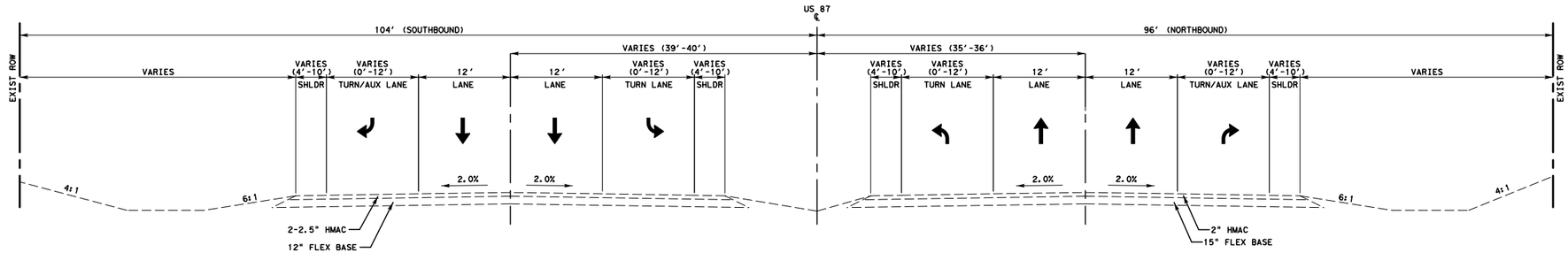

EXISTING US 87 TYPICAL SECTION
STA 220+00 TO STA 228+05 (NB LEFT TURN LANE)
STA 228+70 TO STA 237+00 (SB LEFT TURN LANE)
STA 380+32 TO STA 387+56 (NB LEFT TURN LANE)
STA 380+82 TO STA 387+56 (NB RIGHT TURN LANE)
STA 376+82 TO STA 388+50 (SB AUX LANE)
STA 387+56 TO STA 401+90 (NB AUX LANE)
STA 388+50 TO STA 394+82 (SB RIGHT TURN LANE)
STA 388+50 TO STA 396+82 (SB LEFT TURN LANE)
STA 405+90 TO STA 416+80 (NB AUX LANE)

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/21/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TYPICAL SECTIONS

(SHEET 2 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	5
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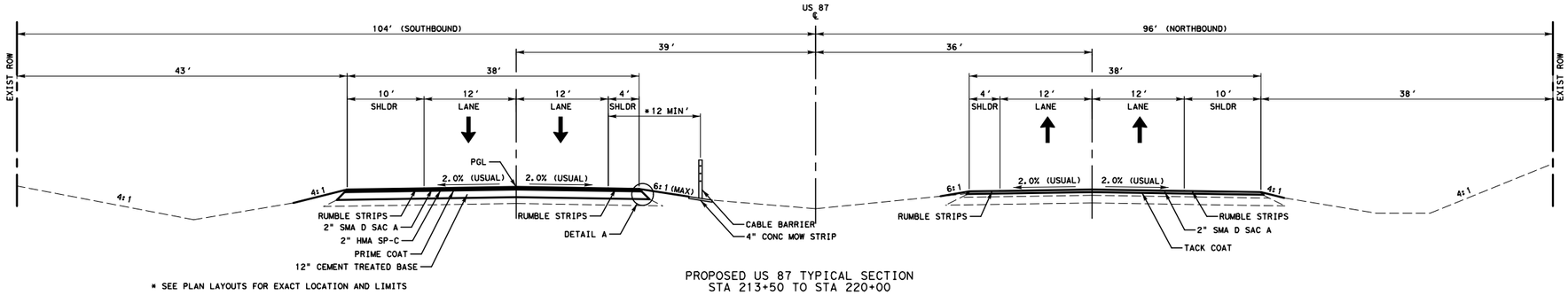
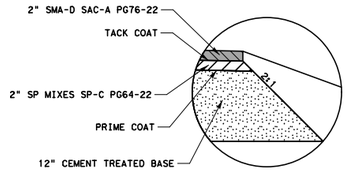


* SEE PLAN LAYOUTS FOR EXACT LOCATION AND LIMITS

PROPOSED US 87 TYPICAL SECTION
STA 213+50 TO STA 220+00



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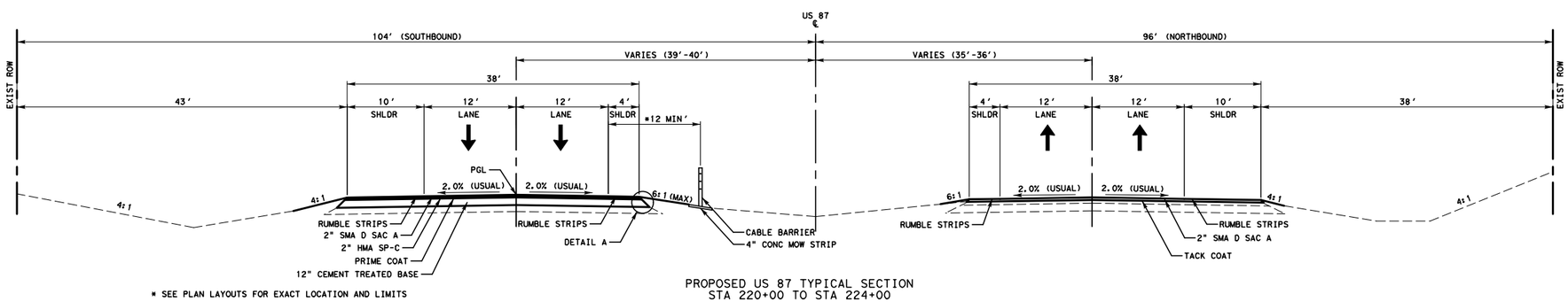

* SEE PLAN LAYOUTS FOR EXACT LOCATION AND LIMITS

PROPOSED US 87 TYPICAL SECTION
STA 220+00 TO STA 224+00

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/21/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TYPICAL SECTIONS

(SHEET 3 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	6
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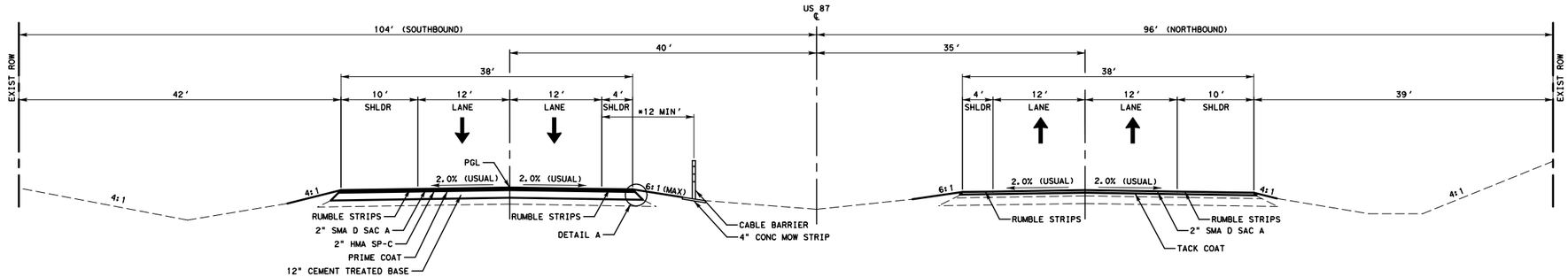
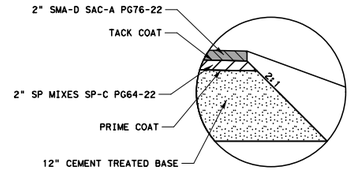


PROPOSED US 87 TYPICAL SECTION
STA 224+00 TO STA 445+81.25



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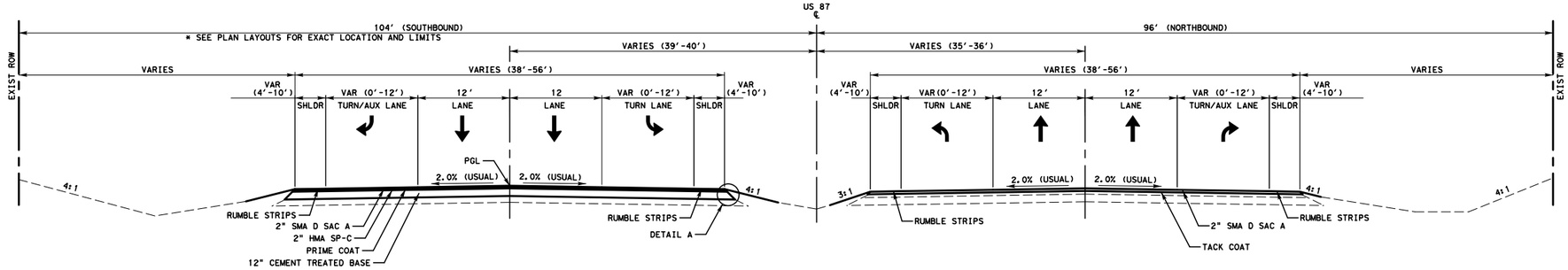

PROPOSED US 87 TYPICAL SECTION
STA 220+00 TO STA 228+05 (NB LEFT TURN LANE)
STA 228+70 TO STA 237+00 (SB LEFT TURN LANE)
STA 380+32 TO STA 387+56 (NB LEFT TURN LANE)
STA 380+82 TO STA 387+56 (NB RIGHT TURN LANE)
STA 376+82 TO STA 388+50 (SB AUX LANE)
STA 387+56 TO STA 401+90 (NB AUX LANE)
STA 388+50 TO STA 394+82 (SB RIGHT TURN LANE)
STA 388+50 TO STA 396+82 (SB LEFT TURN LANE)
STA 405+40 TO STA 412+80 (SB LEFT TURN LANE)
STA 405+90 TO STA 416+80 (NB AUX LANE)

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/21/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

TYPICAL SECTIONS

(SHEET 4 OF 4)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	7
AR	0068	08	067	
GRPH CHECK				
JKB				

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DATE: 5/21/2021 8:52:59 AM jphilipp

Project Number: F 2021(846)
Control: 0068-08-067
County: Howard
Highway: US 87

ABILENE DISTRICT GENERAL NOTES
2014 SPECIFICATIONS

General

Neil Welch, P.E.: Neil.Welch@txdot.gov
Ryan R. Sayles, P.E.: Ryan.Sayles@txdot.gov
(Big Spring Area Office)

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

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

Failure to make necessary corrections to SW3P based on SW3P inspections will be cause for withholding the monthly estimate until such corrections have been made.

Failure to make necessary corrections to traffic control items based on barricade inspections will be cause for withholding the monthly estimate until such corrections have been made.

Provide ingress/egress to the adjacent properties in areas under construction. Phased construction of driveways and streets shall be required to provide uninterrupted access to adjacent properties. Coordinate work with the property owners before beginning any construction in the vicinity of the drive.

Cut neat, straight lines with vertical faces along pavement edges or along joints between existing asphalt or concrete pavement and new pavement perpendicular or parallel to the direction of traffic by methods described in applicable bid items, or as directed. Provide clean edges or joints without jagged appearance or chunks broken out. This work is considered subsidiary to various bid items.

Project Number: F 2021(846)
Control: 0068-08-067
County: Howard
Highway: US 87

Environmental

Endangered and Protected Species Migratory Birds

a. **Bird nesting season is typically 15Feb through 15Sep annually.**
b. The Contractor will avoid disturbing, destroying, removing, or relocating migratory birds and active nests found in trees, culverts, bridges, on the ground, or anywhere they are encountered.
c. Perform all tree trimming and other vegetation clearing activities during the non-breeding season (typically 15Sep-15Feb annually). Perform any inactive nest removal and bird exclusion methods to prevent birds from establishing nests. Phasing of work during construction may be necessary to stay in compliance.
d. When active nests are unexpectedly encountered on-site during construction, the Contractor will stop work and immediately notify the Engineer. Take measures to avoid disturbance of these birds, their occupied nest, eggs, and/or young, in accordance with the Migratory Bird Treaty Act, Texas Parks and Wildlife Code, and TxDOT policy.
e. The Engineer will notify the Contractor when work may resume.
f. The Contractor should be prepared to prevent migratory birds from building nests by utilizing nest prevention methods, such as bird-deterrent netting and bird-repelling sprays and/or gels, between 15Feb and 15Sep. The Contractor can discuss other preventative measures with the Engineer and/or District Environmental Staff.

Best Management Practices

1. Bird BMPs
   a. Not disturbing, destroying, or removing active nests, including ground nesting birds, during the nesting season;
   b. Avoiding the removal of unoccupied, inactive nests, as practicable;
   c. Preventing the establishment of active nests during the nesting season on TxDOT owned and operated facilities and structures proposed for replacement or repair;
   d. Not collecting, capturing, relocating, or transporting birds, eggs, young, or active nests without a permit.

Item 5, "Control of Work"
Use Method C for construction surveying.

All known utilities are identified in the plans, including the crossing of power lines. Use this information to identify potential issues with power poles and power lines prior to bidding. Make necessary arrangements with utility owners regarding temporary protections such as bracing power poles, and de-energizing power lines. The Department will not reimburse the cost of such temporary protections to the Contractor, unless the Engineer determines that inadequate information was available at the time the project was bid. **"Call Before You Dig" "Call 811"**

"Provide notification to the District Signal Shop by telephone at 325-676-6974 and by email at Juan.Salgado@txdot.gov when planning drilling or excavation work in areas where existing TxDOT underground utilities exist." Visual evidence of TxDOT underground utilities in the area include illumination poles, ground boxes, flashing beacons, traffic signals, etc. This notification must be provided 48 hours in advance of performing the work.

Drilled shaft locations or excavation areas must be staked prior to the notification so that the underground utilities can be located in relationship to the proposed work. Preserve and document the marked utility locations to prevent unnecessary secondary notifications. Notify the Engineer of conflicts between proposed work and underground utilities.

Item 7, "Legal Relations and Responsibilities"
The total area disturbed for this project is 8.806 acres. The disturbed area in this project, all project locations in the Contract, and the 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. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the government that operates a separate storm sewer system.

Provide one SW3P Notification Board for this project. Notification Boards are to be placed at locations within the right-of-way but outside the clear zone as directed by the Engineer. Consider this work to be subsidiary to the various bid items of the contract.

No significant traffic generator events identified.

Hard hats are required at all times during construction when construction personnel are in TxDOT Right-of-Way.

Item 8 "Prosecution and Progress"
Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process and/or execute all contracts at the same time.

The Contractor is hereby authorized to begin work prior to the expiration of the number of calendar days provided in the Special Provision to Item 8, Article 8.1. Notify the Engineer in writing of the date to begin work. Time charges will commence when work begins or on the expiration of the number of calendar days provided, whichever occurs first.

Project Number: F 2021(846)
Control: 0068-08-067
County: Howard
Highway: US 87

Maintain and submit a project schedule monthly. Submit to the Engineer the updated project schedule no later than the 25th calendar day of the following month.

Coordinate and update the work schedule with the project inspector daily. Give a minimum of 24 hours of notice to project inspector if work requiring inspection or testing is to be performed. Failure to do so may cause that work to be delayed or postponed if TxDOT personnel are not available. Work performed without suitable inspection, as determined by the Engineer, may be ordered removed and replaced at Contractor's expense.

Additional Liquidated Damages will be increased by the Road User Cost of by $4,494 per day.

Item 9, "Measurement and Payment"
The progress payment period shall end on the 25th of each month, unless directed by the Area Office Engineer. Material on Hand (MOH) is due two business days before estimate cut off.

Item 134, "Backfilling"
Backfill pavement edges no later than 2 weeks after the construction of the final surface.
The contractor shall use RAP millings from the project to backfill pavement edges.

Item 164, "Seed for Erosion Control"
Quantities shown are approximate; limits of the temporary and permanent seeding will be determined during construction.

Temporary seeding will be required in several small areas as work progresses to comply with the storm water pollution prevention plan and may require multiple mobilizations of seeding crew.

Item 168, "Vegetation Watering"
Water rate for this project shall be ¼" of water per acre every two weeks for a 3-month period.

Item 204, "Sprinkling for Dust Control"
Sprinkle for dust control as directed. Payment for this item will be subsidiary to the various bid items.

Item 216, "Proof Rolling"
Perform proof rolling only as directed. Payment for this item will be made only when proof rolling is performed as directed.

Item 346, "Stone Matrix Asphalt"
A minimum of 6.0% asphalt content is required for all SMA mixtures.
Provide additional SGC molds as necessary to allow for proper cooling and testing of laboratory densities.

Furnish aggregate for final surfaces with a surface aggregate classification of "**A**".

The Engineer reserves the right to test all sources even if the source is listed in the Bituminous Source Rated Quality Catalog.

Provide the testing lab samples to calibrate the ignition oven no later than five **(5)** working days prior to mix design verification.

Do not exceed a laydown width of 16’ per pass.

RAP will not be allowed for this project.

The use of a tapered longitudinal joint will be required for pavement thicker than 2 inches.

Use a self-propelled, wheel-mounted material transfer vehicle (MTV) capable of receiving hot mix from the haul trucks separate from the paver on this project. Minimum requirements for the MTV are a storage capacity of approximately 25 tons, a pivoting discharge conveyor, and a means of completely remixing the ACP prior to placement.

Provide PG 64-22 tack coat at a rate of 0.10 gal/sy.

The Contractor will be required to tack 100% of the surfaces with uniform coverage prior to the subsequent lift. The type and grade of tack will be approved by the Engineer prior to use.

Tack all vertical joints unless otherwise directed.

Cement and kiln dust will not be allowed to be used as mineral fillers.

Shoulders shall not be placed prior to adjoining main lanes.

Final surface of driveway shall not be placed prior to adjoining surface.

Item 354, “Planing and Texturing Pavement”
Stockpile all unused planed materials at FM 2599 SE corner approximately 10 miles from the end of the project (32.209720, -101.596179).

Build stockpiles in horizontal layers with a maximum height of 10 feet, as directed. Minimize driving on the stockpile to prevent excessive compaction.

Item 432, “Riprap”
Provide tooled contraction joints at a maximum spacing of 25 feet and ½” fiber board every 150 feet when constructing cable median barrier mow strips. The depth for tooled joints shall be sufficient to ensure cracking at the joints. The depth for fiber board joints shall be the full depth of the mow strip.

Project Number: F 2021(846)
Control: 0068-08-067
County: Howard
Highway: US 87

Provide structural fiber reinforced or conventionally reinforced concrete for formed cable median barrier concrete mow strip.

Meet the following requirements when using structural fiber reinforcement:

- Use Class A Concrete.
- If slip forming, use an approved method that ensures adequate concrete consolidation. Sprinkle and consolidate the subgrade before the concrete is placed. Finish the surface with a wood float or broom finish as approved. Immediately after finishing operation, cure the riprap according to Item 420, “Concrete Structures”.
-

When using conventional reinforcement, meet all requirements in accordance with Article 432.3.1. Concrete Riprap with exception that Class A Concrete is required.

Provide structural fiber reinforced or conventionally reinforced concrete for formed M.B.G.F. concrete mow strip.

Meet the following requirements when using structural fiber reinforcement:

- If slip forming, use an approved method that ensures adequate concrete consolidation. Sprinkle and consolidate the subgrade before the concrete is placed. Finish the surface with a wood float or broom finish as approved. Immediately after finishing operation, cure the riprap according to Item 420, “Concrete Structures”.

Item 496, “Removing Structures”
Contractor to maintain ownership of removed SETs and pipes.

Item 502, “Barricades, Signs and Traffic Handling”
Mobile traffic control in accordance with TCP 3 series will be required for placement of short duration, short term, intermediate term, and long-term traffic control.

Provide the Engineer with written notification seven (7) days in advance of major traffic changes. A major traffic change is defined as the temporary (greater than one day) or permanent relocation of traffic lanes typically in an urban setting. The notice will, at a minimum, include the expected date, time and scope of the traffic change. The Department will utilize the information provided to inform the traveling public of the changes. Failure to provide advance notice, or to provide accurate information, will result in delaying the work until such time that the public has been notified.

Additional signs, barricades and traffic handling may be necessary to complete the work shown herein and will be provided by the contractor as required and will be considered subsidiary to this item.

Provide separate attenuators for each work area within a common lane closure as approved or directed by the Engineer.

Relocate existing roadside signs to temporary supports as approved by the engineer.

All safety appurtenances such as signs, delineators, object markers and route markers will be in place prior to opening each phase of the construction to traffic, unless otherwise directed.

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

The Contractor's person responsible for TCP compliance must be available by local telephone and have a response time within 45 minutes.

Work will not be allowed on both sides of the roadbed at the same time.

Equip all work vehicles within 30 feet of the traveled way with a functioning amber strobe light or rotating beacon visible from all directions.

Repair barricades within the timeline shown on the barricade inspection report. Failure to comply will cease all work until barricades are repaired to the satisfaction of the Department.

Replace all damaged traffic control devices immediately. Remove any damaged traffic control devices from the project within 24 hours.

Conflicting guide signs shall be covered as approved by the Engineer.

Reduced regulatory speed limit signs should only be posted in the vicinity of ongoing work activity as shown on BC (3)-14 and not throughout the entire project. Removing, relocating or covering speed limit signs shall be considered subsidiary to item 502.

Item 504, "Field Office for Laboratory"

Field Laboratory:
Furnish a "Type D" structure for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to the requirements of Item 504, furniture and equipment to be furnished by the Contractor shall include*:*

- eye wash station
- first-aid kit
- two fire extinguishers

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- Provide internet connectivity for use by TxDOT lab testing personnel at all laboratory structures on this project.

Item 508, "Detours"
Upon removal of the detour, shape the area to match adjacent areas and sections as directed.

Item 530, "Intersections, Driveways, and Turnouts"
Excavation and embankment necessary to construct the intersections and driveways according to the details shown elsewhere shall be considered subsidiary to this item.

Item 533, "Milled Rumble Strips"
The milled rumble strips should be placed on shoulder according to rs(1-4)-13 standards and the shoulder widths as shown below.

- Shoulder width of 2 feet or less the rumble strip will begin on the edge line as shown in the standards.
- Shoulder width of greater than 2 feet or less than 6 feet the rumble strip will be centered on the shoulder.
- Shoulder width of greater than 6 feet the rumble strip will begin 2 feet from the edge line.
- Or as directed by the engineer

Item 540, "Metal Beam Guard Fence"
Steel posts for metal beam guard fence may be field cut to proper rail height with a power saw when approved by the engineer.

Core drill 1 ¼ diameter holes through existing slab. Percussion or impact drilling is not permitted. Patch spalls, when directed by the engineer, in accordance with item 429, "Concrete Structure Repair", at the contractor's expense.

Item 585, "Ride Quality for Pavement Surfaces"
The Engineer reserves the right to prohibit corrective work and assess the penalty for each occurrence of localized roughness per Article 585.3.4.2.3.2.

Use pay adjustment schedule 1 (one) for Ride Quality bonus/penalty calculation.

Item 644, "Small Roadside Sign Supports and Assemblies"
Use the latest edition of the "Standard Highway Sign Designs for Texas" for Sign types for which design details are not shown on the plans.

Sign placement shall be in accordance with the latest edition of the TMUTCD & TxDOT's Sign Crew Field Book located at the following addresses.
TMUTCD - https://www.txdot.gov/business/resources/signage/tmutcd.html
TxDOT's Sign Crew Field Book - http://onlinemanuals.txdot.gov/txdotmanuals/sfb/index.htm

Before final sign installation, stake all sign locations for approval by the engineer.

All triangle slip base small sign mounts installed under this item shall utilize clamp type bases.

Remove entire small sign foundation.

Deliver and stockpile all signs to be salvaged to the Big Spring maintenance yard on SH 350, located approximately 5 miles from the end of the project.

Item 658, "Delineator and Object Marker Assemblies"
Delineators and object marker assemblies will use winged channel posts. The winged channel posts will be 1.12 lb/ft and 6.5 ft in length.

All MBGF delineation shall be GF2 mounted on posts.

Use a minimum 2 inch long lag screws with washers to attach flexible GF2 barrier reflectors to wooden post. For steel posts, use an approved adhesive, or other method approved by Engineer.

Item 662, "Work Zone Pavement Markings"
Place work zone pavement markings (flexible tabs) prior to the seal coat operation.

Dispose of tabs and paper in an approved trash receptacle. (Reference Standard **SW3P**, waste material)

Use traffic paint for non-removable work zone pavement markings.

Item 666, "Retro reflectorized Pavement Markings"
Provide a complete system of thermoplastic pavement markings at locations indicated on the plans and as directed by the engineer. The plans are intended to show typical conditions, which can be extended to similar conditions throughout this project as approved or directed.

Establish a true and correct alignment with a method approved by the Engineer. This work will be considered subsidiary.

Item 672, "Raised Pavement Markers"
Provide a complete system of raised pavement markers at locations indicated on the plans and as directed by the engineer. The plans are intended to show typical conditions, which can be extended to similar conditions throughout this project as approved or directed.

Bituminous adhesive shall be used on this project.

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Item 677, "Eliminating Existing Pavement Markings and Markers"
Remove the existing raised pavement markings (RPMs) and profile pavement markings as the work progresses, or as directed by the Engineer. Removal methods shall be approved by the Engineer. Properly dispose of materials removed. Removal of existing profile pavement markings will be paid for directly. Removal of RPMs will not be paid for directly but will be subsidiary to the pertinent bid items.

Item 3077, "Superpave Mixtures"
Furnish aggregate for final surfaces with a minimum surface aggregate classification of "**B**".

Provide an SP-C Fine Mixture with a minimum design VMA of 16.0% and a minimum plant-produced VMA of 15.5%.

The Engineer reserves the right to test all sources even if the source is listed in the Bituminous Source Rated Quality Catalog.

Provide the testing lab samples to calibrate the ignition oven no later than five **(5)** working days prior to mix design verification.

Meet the minimum Hamburg Wheel Test requirements shown below:

- PG 64 or lower – 5,000 passes
- PG 70 – 10,000 passes
- PG 76 – 20,000 passes

Paving operations will not be allowed to begin until TxDOT has tested and obtained passing Hamburg results on the trial batch.

A maximum of 0.50% anti-stripping agent will be allowed for each specified mix type.

Dilution of tack coat is not allowed.

Do not exceed a laydown width of 16' per pass.
Substitute Binders will not be allowed unless RAP or RAS is used in the production of the mixture.

RAS will not be allowed in surface mixes.

A warm mix additive will be required for hotmix hauls over 50 miles.

Unless otherwise directed by the engineer, a warm mix additive will be required when paving during November 1st through March 15th.

The maximum allowable dust / asphalt ratio that will be allowed is 0.6 to 1.2.

The use of a tapered longitudinal joint will be required for pavement thicker than 2 inches.

Use a self-propelled, wheel-mounted material transfer vehicle (MTV) capable of receiving hot mix from the haul trucks separate from the paver on this project. Minimum requirements for the MTV are a storage capacity of approximately 25 tons, a pivoting discharge conveyor, and a means of completely remixing the ACP prior to placement.

Provide PG 64-22 tack coat at a rate of 0.10 gal/sy.

The Contractor will be required to tack 100% of the surfaces with uniform coverage prior to the subsequent lift. The type and grade of tack will be approved by the Engineer prior to use.

Tack all vertical joints unless otherwise directed.

Cement and kiln dust will not be allowed to be used as mineral fillers.

Shoulders shall not be placed prior to adjoining main lanes.
Final surface of driveway shall not be placed prior to adjoining surface.

Item 6185, "Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)"

BASIS OF ESTIMATE FOR STATIONARY TMAs				
		TMA (Stationary)		
Phase	Standard	Required	Additional	TOTAL
1	TCP(2-5)-18	1		1
All	TCP(2-6)-18	1		1
3	TCP(5-1)-18	1		1
Basis of Estimate for Mobile TMAs				
		TMA (Mobile)		
Phase	Standard	Required	Additional	TOTAL
2	TCP(3-2)-13	2		2
3	TCP(3-3)-14	2		2

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The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs needed for the project. The Contractor must get approval from the Engineer for any changes in the number of TMA as shown in the plans.

If a TMA is used for both mobile and stationary traffic control on the same day, it will be paid for as stationary for that day.

QUANTITY SHEET

CONTROLLING PROJECT ID 0068-08-067 **DISTRICT** Abilene **COUNTY** Howard
HIGHWAY US 87

			CONTROL SECTION JOB	**0068-08-067**		TOTAL EST.	TOTAL FINAL
			PROJECT ID	**A00129215**			
			COUNTY	**Howard**			
			HIGHWAY	**US 87**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	105-6002	REMOVING STAB BASE AND ASPH PAV (2")	SY	372.000		372.000	
	110-6001	EXCAVATION (ROADWAY)	CY	6.000		6.000	
	134-6002	BACKFILL (TY B)	STA	413.200		413.200	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY	33,898.000		33,898.000	
	164-6041	DRILL SEEDING (TEMP) (WARM)	SY	16,949.000		16,949.000	
	164-6043	DRILL SEEDING (TEMP) (COOL)	SY	16,949.000		16,949.000	
	168-6001	VEGETATIVE WATERING	MG	570.600		570.600	
	275-6001	CEMENT	TON	1,733.000		1,733.000	
	275-6005	CEMENT TREAT (EXIST MATL)(12")	SY	96,313.000		96,313.000	
	310-6009	PRIME COAT (MC-30)	GAL	19,263.000		19,263.000	
	346-6014	STONE-MTRX-ASPH SMA-D SAC-A PG76-22	TON	20,426.000		20,426.000	
	346-6058	TACK COAT	GAL	18,569.000		18,569.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	91,740.000		91,740.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	29.000		29.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	810.000		810.000	
	459-6007	GABION MATTRESSES (GALV)(12 IN)	SY	34.000		34.000	
	467-6001	SET (PIPE RUNNER ASSEMBLY)	EA	4.000		4.000	
	467-6003	SET (REPLACE PIPE RUNNER ASSEMBLY)	EA	1.000		1.000	
	467-6172	SET (TY I)(S= 5 FT)(HW= 3 FT)(4:1) (C)	EA	12.000		12.000	
	467-6240	SET (TY I)(S= 7 FT)(HW= 3 FT)(4:1) (C)	EA	6.000		6.000	
	480-6001	CLEAN EXIST CULVERTS	EA	14.000		14.000	
	496-6005	REMOV STR (WINGWALL)	EA	4.000		4.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	10.000		10.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	800.000		800.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	800.000		800.000	
	508-6001	CONSTRUCTING DETOURS	SY	3,503.000		3,503.000	
	530-6002	INTERSECTIONS (ACP)	SY	604.000		604.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,550.000		1,550.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	68,666.000		68,666.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	275.000		275.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	2.000		2.000	
	540-6020	MTL W - BEAM GD FEN (LOW FILL CULVERT)	LF	50.000		50.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	325.000		325.000	
	542-6002	REMOVE TERMINAL ANCHOR SECTION	EA	2.000		2.000	
	543-6002	CABLE BARRIER SYSTEM (TL-4)	LF	20,505.000		20,505.000	
	543-6020	CABLE BARRIER TERMINAL SECTION (TL-4)	EA	26.000		26.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 0068-08-067 **DISTRICT** Abilene **COUNTY** Howard
HIGHWAY US 87

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0068-08-067**			
		PROJECT ID		**A00129215**			
		COUNTY		**Howard**			
		HIGHWAY		**US 87**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000		2.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	2.000		2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	55.000		55.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	27.000		27.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	5.000		5.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	6.000		6.000	
	644-6018	IN SM RD SN SUP&AM TY10BWG(2)SA(P-EXAL)	EA	1.000		1.000	
	644-6030	IN SM RD SN SUP&AM TYS80(1)SA(T)	EA	3.000		3.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	38.000		38.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	436.000		436.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	41,350.000		41,350.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	2,478.000		2,478.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	2,541.000		2,541.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	4,340.000		4,340.000	
	666-6300	RE PM W/RET REQ TY I (W)4"(BRK)(100MIL)	LF	10,553.000		10,553.000	
	666-6303	RE PM W/RET REQ TY I (W)4"(SLD)(100MIL)	LF	42,981.000		42,981.000	
	666-6315	RE PM W/RET REQ TY I (Y)4"(SLD)(100MIL)	LF	41,455.000		41,455.000	
	668-6018	PREFAB PAV MRK TY B (W)(24")(SLD)	LF	12.000		12.000	
	668-6092	PREFAB PAV MRK TY C (W) (36")(YLD TRI)	EA	176.000		176.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	747.000		747.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	1,450.000		1,450.000	
	3077-6011	SP MIXESSP-CPG64-22	TON	10,091.000		10,091.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	228.000		228.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	22.000		22.000	
	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	

SUMMARY OF ROADWAY ITEMS

LOCATION	105 6002	110 6001	134 6002	275 6001	275 6005	310 6009	346 6014	346 6058	354 6045	432 6045	480 6001
	REMOVING STAB BASE AND ASPH PAV (2")	EXCAVATION (ROADWAY)	BACKFILL (TY B)	CEMENT	CEMENT TREAT (EXIST MATL) (12")	PRIME COAT (MC-30)	STONE-MTRX-ASPH SMA-D SAC-A PG76-22	TACK COAT	PLANE ASPH CONC PAV (2")	RIPRAP (MOW STRIP) (4 IN)	CLEAN EXIST CULVERTS
	SY	CY	STA	TON	SY	GAL	TON	GAL	SY	CY	EA
PLAN & PROFILE LAYOUT (1 OF 18)	222	6	19	76	4222	844	896	814	4011	47	1
PLAN & PROFILE LAYOUT (2 OF 18)			24	110	6125	1225	1284	1167	5863	30	3
PLAN & PROFILE LAYOUT (3 OF 18)	150		24	97	5403	1081	1122	1020	5137	44	1
PLAN & PROFILE LAYOUT (4 OF 18)			24	96	5360	1072	1143	1039	5093	59	2
PLAN & PROFILE LAYOUT (5 OF 18)			24	99	5473	1095	1174	1067	5206	40	
PLAN & PROFILE LAYOUT (6 OF 18)			24	105	5851	1170	1209	1099	5584	40	
PLAN & PROFILE LAYOUT (7 OF 18)			24	97	5389	1078	1145	1041	5122	41	1
PLAN & PROFILE LAYOUT (8 OF 18)			24	96	5333	1067	1115	1013	5067	44	
PLAN & PROFILE LAYOUT (9 OF 18)			24	96	5333	1067	1193	1084	5067	36	
PLAN & PROFILE LAYOUT (10 OF 18)			24	96	5333	1067	1115	1013	5066	44	
PLAN & PROFILE LAYOUT (11 OF 18)			24	96	5333	1067	1144	1040	5067	41	1
PLAN & PROFILE LAYOUT (12 OF 18)			24	96	5333	1067	1115	1013	5067	43	1
PLAN & PROFILE LAYOUT (13 OF 18)			24	96	5333	1067	1115	1013	5067	44	2
PLAN & PROFILE LAYOUT (14 OF 18)			24	97	5386	1077	1120	1019	5119	44	1
PLAN & PROFILE LAYOUT (15 OF 18)			24	118	6561	1312	1438	1307	6303	41	
PLAN & PROFILE LAYOUT (16 OF 18)			24	108	6006	1201	1282	1165	5741	15	
PLAN & PROFILE LAYOUT (17 OF 18)			24	113	6272	1254	1342	1220	6008	43	1
PLAN & PROFILE LAYOUT (18 OF 18)			10.2	41	2267	453	477	433	2153	44	
CABLE BARRIER LAYOUT										70	
PROJECT TOTALS	372	6	413.2	1733	96313	19263	20426	18569	91740	810	14

SUMMARY OF ROADWAY ITEMS

LOCATION	540 6001	540 6016	540 6020	542 6001	542 6002	544 6001	544 6003	543 6002	543 6020	3077 6011
	MTL W-BEAM GD FEN (TIM POST)	DOWNSTREAM ANCHOR TERMINAL SECTION	MTL W - BEAM GD FEN (LOW FILL CULVERT)	REMOVE METAL BEAM GUARD FENCE	REMOVE TERMINAL ANCHOR SECTION	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	CABLE BARRIER SYSTEM (TL-4)	CABLE BARRIER TERMINAL SECTION (TL-4)	SP MIXES SP-C PG64-22
	LF	EA	LF	LF	EA	EA	EA	LF	EA	TON
PLAN & PROFILE LAYOUT (1 OF 18)								895	1	441
PLAN & PROFILE LAYOUT (2 OF 18)								700	2	645
PLAN & PROFILE LAYOUT (3 OF 18)								1200		565
PLAN & PROFILE LAYOUT (4 OF 18)	275	2	50	325	2	2	2	915	2	560
PLAN & PROFILE LAYOUT (5 OF 18)								985	2	573
PLAN & PROFILE LAYOUT (6 OF 18)								980	2	614
PLAN & PROFILE LAYOUT (7 OF 18)								1005	2	563
PLAN & PROFILE LAYOUT (8 OF 18)								1155	1	557
PLAN & PROFILE LAYOUT (9 OF 18)								820	3	557
PLAN & PROFILE LAYOUT (10 OF 18)								1200		557
PLAN & PROFILE LAYOUT (11 OF 18)								1010	2	557
PLAN & PROFILE LAYOUT (12 OF 18)								1060	2	557
PLAN & PROFILE LAYOUT (13 OF 18)								1200		557
PLAN & PROFILE LAYOUT (14 OF 18)								1200		563
PLAN & PROFILE LAYOUT (15 OF 18)								1000	2	693
PLAN & PROFILE LAYOUT (16 OF 18)								1200		632
PLAN & PROFILE LAYOUT (17 OF 18)								950	4	661
PLAN & PROFILE LAYOUT (18 OF 18)								1200		237
CABLE BARRIER LAYOUT								1830	1	
PROJECT TOTALS	275	2	50	325	2	2	2	20505	26	10091

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

LOCATION	** 464	** 467	508 6001	662 6004	662 6034	662 6095	662 6109	677 6001	6001 6002	6185 6002	6185 6005
	RC PIPE (CL III) (24 IN) (RCP) (4:1) (C)	SET (TY II) (24 IN) (RCP) (4:1) (C)	CONSTRUCTING DETOURS	WK ZN PAV MRK NON-REMOV (W) 4" (SLD)	WK ZN PAV MRK NON-REMOV (Y) 4" (SLD)	WK ZN PAV MRK REMOV (Y) 4" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY W	ELIM EXT PAV MRK & MRKS (4")	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LF	EA	SY	LF	LF	LF	EA	LF	EA	DAY	DAY
PHASE 1 (SOUTHBOUND CONSTRUCTION)	1200	4	3503	436	41350	2478		1450			
PHASE 2 (NORTHBOUND CONSTRUCTION)							2541				
PROJECT WIDE									2	228	22
PROJECT TOTALS	1200	4	3503	436	41350	2478	2541	1450	2	228	22

** PAYMENT FOR THIS ITEM IS SUBSIDIARY TO ITEM 508-6001

SUMMARY OF DRIVEWAYS AND INTERSECTIONS * *

	LOCATION/STATION (LT/RT)		EXIST DRWY TYPE	530 6005 DRIVEWAYS (ACP) SY	530 6002 INTERSECTIONS (ACP) (TYPE 1) SY
1	216+34.17	LT	ASPHALT	73	
2	228+26.32	RT	ASPHALT		64
3	228+40.15	LT	ASPHALT		76
4	243+05.59	RT	ASPHALT	82	
5	246+04.89	RT	ASPHALT	39	
6	254+32.28	RT	ASPHALT		56
7	255+06.24	LT	GRAVEL	56	
8	260+55.75	RT	ASPHALT	55	
9	261+66.70	LT	ASPHALT	125	
10	273+04.93	RT	GRAVEL	94	
11	273+05.40	LT	GRAVEL	54	
12	281+33.23	RT	GRAVEL	46	
13	281+82.79	LT	GRAVEL	66	
14	288+35.61	LT	ASPHALT	48	
15	301+98.79	RT	GRAVEL	67	
16	307+59.46	LT	DIRT	61	
17	314+47.96	LT	GRAVEL	137	
18	315+89.70	RT	ASPHALT	46	
19	327+63.62	RT	GRAVEL	93	
20	334+97.76	RT	GRAVEL	70	
21	334+98.96	LT	ASPHALT		74
22	361+60.82	RT	GRAVEL	133	
23	366+60.16	LT	GRAVEL	71	
24	381+61.17	LT	ASPHALT	60	
25	387+90.53	RT	ASPHALT		113
26	387+95.26	LT	ASPHALT		96
27	396+38.83	RT	GRAVEL	74	
28	405+09.73	RT	ASPHALT		125
CSJ: 0068-08-067 OVERALL TOTAL				1550	604

* SEE DRIVEWAY AND INTERSECTION DETAILS

BASIS OF ESTIMATE

ITEM NO	DESCRIPTION	RATE	AREA (SY)	QUANTITY	UNIT
275-6001	CEMENT (3%)	36 LB/SY	96313	1733	TON
310-6009	PRIME COAT (MC-30)	0.2 GAL/SY	96313	19263	GAL
346-6014	STONE-MTRX-ASPH SMA-D SAC-A PG76-22	220 LB/SY	185693	20426	TON
346-6058	TACK COAT	0.1 GAL/SY	185693	18569	GAL
3077-6011	SP MIXES SP-C PG64-22	220 LB/SY	91740	10091	TON

STATE OF TEXAS
CHRISTOPHER M. HARTKE
112377
LICENSED
PROFESSIONAL ENGINEER
5/21/2021
Christopher Hartke

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

QUANTITY SUMMARY

(SHEET 1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	16
AR	0068	08	067	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\E&Q.dgn
DATE: 5/21/2021 8:53:05 AM jphilipp

SUMMARY OF PAVEMENT MARKING ITEMS

LOCATION	533 6001	666 6036	666 6300	666 6303	666 6315	668 6018	668 6092	672 6010
	RUMBLE STRIPS (SHOULDER)	REFL PAV MRK TY I (W)8"(SLD) (100MIL)	RE PM W/RET REQ TY I (W)4"(BRK) (100MIL)	RE PM W/RET REQ TY I (W)4"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)4"(SLD) (100MIL)	PREFAB PAV MRK TY B (W)(24")(SLD)	PREFAB PAV MRK TY C (W) (36")(YLD TRI)	REFL PAV MRKR TY II-C-R
	LF	LF	LF	LF	LF	LF	EA	EA
SIGN & PVMT MRK LAYOUT (1 OF 9)	6,554	835	1,075	4,170	5,008		10	96
SIGN & PVMT MRK LAYOUT (2 OF 9)	8,530		1,200	4,713	4,704		12	60
SIGN & PVMT MRK LAYOUT (3 OF 9)	8,402		1,200	6,691	4,496		40	60
SIGN & PVMT MRK LAYOUT (4 OF 9)	9,161		1,200	4,800	4,639		12	60
SIGN & PVMT MRK LAYOUT (5 OF 9)	8,846		1,200	4,800	4,532		40	60
SIGN & PVMT MRK LAYOUT (6 OF 9)	9,019		1,200	4,700	4,702		16	60
SIGN & PVMT MRK LAYOUT (7 OF 9)	9,332		1,200	4,800	4,800			60
SIGN & PVMT MRK LAYOUT (8 OF 9)	4,546	2,557	1,423	4,769	4,645		20	200
SIGN & PVMT MRK LAYOUT (9 OF 9)	4,276	948	855	3,538	3,929	12	26	91
PROJECT TOTALS	68,666	4,340	10,553	42,981	41,455	12	176	747

SUMMARY OF SIGNING ITEMS

LOCATION	644 6001	644 6002	644 6004	644 6007	644 6018	644 6030	644 6076
	IN SM RD SN SUP&AM TY10BWG(1) SA(P)	IN SM RD SN SUP&AM TY10BWG(1) SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1) SA(T)	IN SM RD SN SUP&AM TY10BWG(1) SA(U)	IN SM RD SN SUP&AM TY10BWG(2) SA(P-EXAL)	IN SM RD SN SUP&AM TYS80(1)SA (T)	REMOVE SM RD SN SUP&AM
	EA	EA	EA	EA	EA	EA	EA
SIGN & PVMT MRK LAYOUT (1 OF 9)	7	4	1			2	8
SIGN & PVMT MRK LAYOUT (2 OF 9)	6	3					3
SIGN & PVMT MRK LAYOUT (3 OF 9)	5	4	1				2
SIGN & PVMT MRK LAYOUT (4 OF 9)	3	2	1				1
SIGN & PVMT MRK LAYOUT (5 OF 9)	5	4					
SIGN & PVMT MRK LAYOUT (6 OF 9)	7	3			1		3
SIGN & PVMT MRK LAYOUT (7 OF 9)	1						1
SIGN & PVMT MRK LAYOUT (8 OF 9)	13	4	1	5		1	13
SIGN & PVMT MRK LAYOUT (9 OF 9)	8	3	1	1			7
PROJECT TOTALS	55	27	5	6	1	3	38

SUMMARY OF EROSION CONTROL ITEMS

LOCATION	164 6001	164 6041	164 6043	168 6001	506 6041	506 6043
	BROADCAST SEED (PERM) (RURAL) (SANDY)	DRILL SEEDING (TEMP) (WARM)	DRILL SEEDING (TEMP) (COOL)	VEGETATIVE WATERING	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	SY	MG	LF	LF
SW3P LAYOUT (1 OF 10)	4953	2476	2477	83.4	340	340
SW3P LAYOUT (2 OF 10)	3081	1541	1540	51.9	60	60
SW3P LAYOUT (3 OF 10)	3040	1520	1520	51.2	20	20
SW3P LAYOUT (4 OF 10)	3204	1602	1602	53.9	60	60
SW3P LAYOUT (5 OF 10)	3026	1513	1513	50.9	40	40
SW3P LAYOUT (6 OF 10)	3322	1661	1661	55.9	180	180
SW3P LAYOUT (7 OF 10)	3315	1657	1658	55.8	60	60
SW3P LAYOUT (8 OF 10)	3225	1613	1612	54.3	20	20
SW3P LAYOUT (9 OF 10)	3777	1888	1889	63.6	20	20
SW3P LAYOUT (10 OF 10)	2955	1478	1477	49.7		
PROJECT TOTALS	33898	16949	16949	570.6	800	800

SUMMARY OF DRAINAGE ITEMS

LOCATION	459 6007	467 6003	496 6005
	GABION MATTRESSES (GALV)(12 IN)	SET (REPLACE PIPE RUNNER ASSEMBLY)	REMOV STR (WINGWALL)
	SY	EA	EA
CULVERT ID: C-227		1	
CULVERT ID: C-231			2
CULVERT ID: C-350	34		2
PROJECT TOTALS	34	1	4

SUMMARY OF BRIDGE ITEMS

CSJ	PLAN PROFILE SHEET	BRIDGE NBI #	DESIGN	BRIDGE LOCATION	STATION		LENGTH	CLEAR RDWY WIDTH	LOADING	432 6002 RIPRAP (CONC)(5 IN)	467 6001 SET (PIPE RUNNER	467 6172 SET (TY I)(S=5 FT) (HW= 3	467 6240 SET (TY I)(S=7 FT) (HW= 3
					BEGIN	END	FT	FT		CY	EA	EA	EA
068-08-067	114	08-115-0-0068-08-008	H-20	US 87 3.7 MI N OF IH 20	231+50.46	231+87.60	37′	N/A	H-20	17	2	12	
068-08-067	115	08-115-0-0068-08-007	H-20	US 87 0.7 MI S OF FM 2230	350+20.43	350+42.45	22′	N/A	H-20	12	2		6
									TOTALS	29	4	12	6

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5/21/2021

FIRM REGISTRATION NO. F-230

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US 87

QUANTITY SUMMARY

(SHEET 2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	17
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\E&Q2.dgn
DATE: 5/21/2021 8:53:06 AM jphillipp

SEQUENCE OF CONSTRUCTION

PRE-PHASE 1

1. PLACE ADVANCE WARNING SIGNS IN ACCORDANCE WITH TXDOT BC STANDARDS.
2. INSTALL TEMPORARY EROSION CONTROL DEVICES AS SHOWN IN SW3P SITE PLAN OR AS DIRECTED BY ENGINEER.
3. INSTALL SETs AND PIPE RUNNERS USING SHOULDER CLOSURES WITH TXDOT STANDARD TCP(5-1)-18.

PHASE 1 (SOUTHBOUND CONSTRUCTION)

1. CONSTRUCT DETOUR PAVEMENT AS SHOWN ON SOUTHBOUND CROSSOVER LAYOUT PRIOR TO PERMANENT PHASE 1 CONSTRUCTION. USE TXDOT STANDARD TCP(2-6)-18 FOR INSIDE LANE CLOSURE ADJACENT TO DETOUR PAVEMENT CONSTRUCTION.
2. PLACE TRAFFIC CONTROL DEVICES, WORK ZONE PAVEMENT MARKINGS AND CONSTRUCTION SIGNS IN ACCORDANCE WITH TRAFFIC CONTROL LAYOUTS, TXDOT STANDARDS AND TMUTCD.
3. SHIFT SOUTHBOUND TRAFFIC TO NORTHBOUND INSIDE LANE USING TXDOT STANDARD TCP(2-5)-18.
4. CONSTRUCT PERMANENT SOUTHBOUND LANES PER PHASE 1 TYPICAL SECTION.
5. CONSTRUCT SIDESTREETS AND DRIVEWAYS WHILE MAINTAINING ACCESS.
6. INSTALL PERMANENT STRIPING AND RUMBLE STRIPS.

PHASE 2 (NORTHBOUND CONSTRUCTION)

1. PLACE TRAFFIC CONTROL DEVICES AND CONSTRUCTION SIGNS IN ACCORDANCE WITH TRAFFIC CONTROL LAYOUTS, TXDOT STANDARDS AND TMUTCD.
2. CONSTRUCT OVERLAY NORTHBOUND LANES IN STAGES PER PHASE 2 TYPICAL SECTION USING DAYTIME LANE CLOSURES TXDOT STANDARD TCP(2-6)-18.
3. PLACE WORK ZONE TABS AFTER OVERLAY IS COMPLETED.
4. CONSTRUCT SIDESTREETS AND DRIVEWAYS WHILE MAINTAINING ACCESS.
5. INSTALL PERMANENT STRIPING AND RUMBLE STRIPS.
6. OPEN ALL LANES OF TRAFFIC.
7. REMOVE DETOUR PAVEMENT.

PHASE 3 (CABLE BARRIER)

1. USING DAYTIME CLOSURES, CLOSE INSIDE LANE ADJACENT TO CABLE BARRIER CONSTRUCTION USING TXDOT STANDARD TCP(2-6)-18 AND CLOSE INSIDE SHOULDER OPPOSITE OF CABLE BARRIER USING TXDOT STANDARD TCP(5-1)-18 WHILE INSTALLING CABLE BARRIER SYSTEM. LIMIT CLOSURES TO 2 MILE SEGMENTS.
2. CLEAN UP PROJECT SITE AND RESTORE DISTURBED AREAS.
3. REMOVE TRAFFIC CONTROL AND EROSION CONTROL DEVICES.

TCP GENERAL NOTES

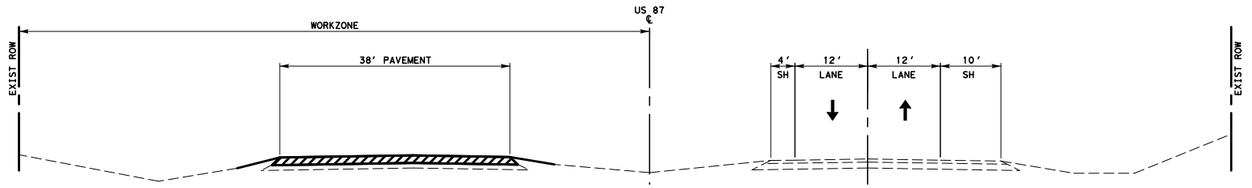
1. SEQUENCE OF PHASE CONSTRUCTION SHALL GENERALLY CONFORM TO AS FOLLOWS. CONTRACTOR SHALL SUBMIT A DETAILED WORK SEQUENCE FOR AN APPROVAL PRIOR TO STARTING ANY WORK.
2. THE CONTRACTOR SHALL MAINTAIN ACCESS TO SIDE STREETS AT ALL TIMES DURING CONSTRUCTION.
3. ACCESS SHALL BE MAINTAINED TO ALL PROPERTY OWNERS AT ALL TIMES DURING CONSTRUCTION UNLESS OTHERWISE APPROVED BY TxDOT AND PROPERTY OWNERS.
4. TEMPORARY PAVEMENT SHALL BE 6" SP-C PG70-22. THE CONTRACTOR SHALL ADD EMBANKMENT TO BUILD UP TEMPORARY ROADBED AS NECESSARY. TEMPORARY PAVEMENT TO BE PAID FOR AS 508-6001 "CONSTRUCTING DETOURS".
5. ALL EXISTING SIGNS ON OPEN ROADWAYS THAT ARE NOT IN CONFLICT WITH THE CONSTRUCTION AND TRAFFIC SHALL REMAIN IN PLACE UNLESS OTHERWISE DIRECTED TxDOT. SIGNS THAT ARE IN CONFLICT, SHALL BE COVERED OR REMOVED, STORED AND REPLACED IN FINAL LOCATION IF NOT BEING REPLACED.
6. CONTRACTOR SHALL ERECT REQUIRED CONSTRUCTION AND TRAFFIC CONTROL SIGNS PRIOR TO CONSTRUCTION.

TCP GENERAL NOTES CONT.

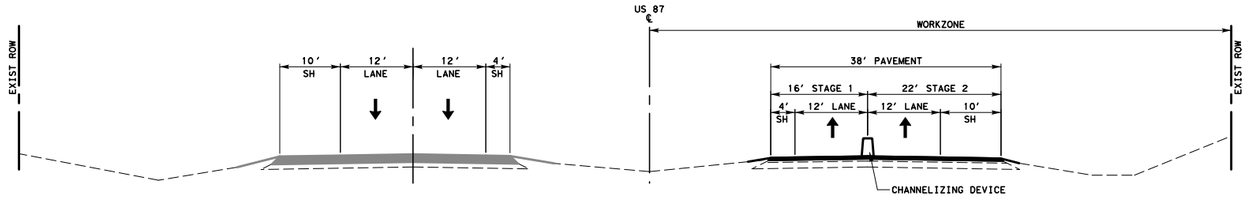
7. CONTRACTOR SHALL COORDINATE PLACEMENT OF FINAL PAVEMENT MARKINGS WITH TxDOT. FINAL PAVEMENT MARKINGS SHALL BE PLACED ON THE FINAL SURFACE COURSE, WHEN APPROVED BY TxDOT.
8. ACCESS TO MAILBOXES MUST BE MAINTAINED DURING ALL PHASES OF CONSTRUCTION.
9. THE CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE DURING CONSTRUCTION.
10. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTURBANCE IS EXPECTED TO OCCUR WITHIN TWO WEEKS.
11. ANY EXISTING PAVEMENT MARKINGS THAT ARE IN CONFLICT WITH TEMPORARY PAVEMENT MARKINGS OF THE CURRENT PHASE SHALL BE REMOVED PRIOR TO OPENING TO TRAFFIC.
12. CONTRACTOR TO USE PAVEMENT MILLING TO BACKFILL PAVEMENT EDGES.

LEGEND

- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE



US 87 TYPICAL SECTION
PHASE 1
SOUTHBOUND CONSTRUCTION



US 87 TYPICAL SECTION
PHASE 2
NORTHBOUND CONSTRUCTION

STATE OF TEXAS
JUSTIN K. BAKER
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LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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TRAFFIC CONTROL SEQUENCE OF CONSTRUCTION

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	18
AR				
GRPH CHECK	0068	08	067	
JKB				

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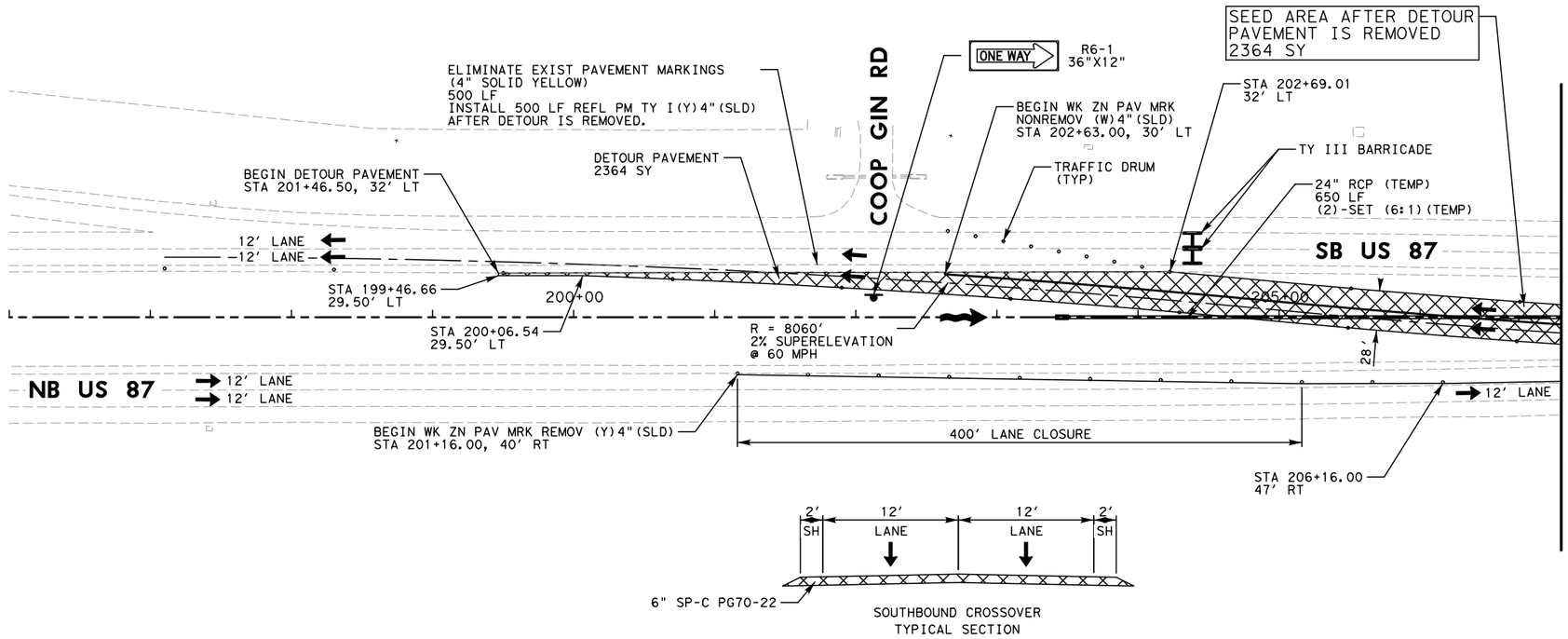
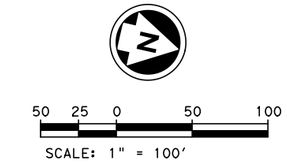


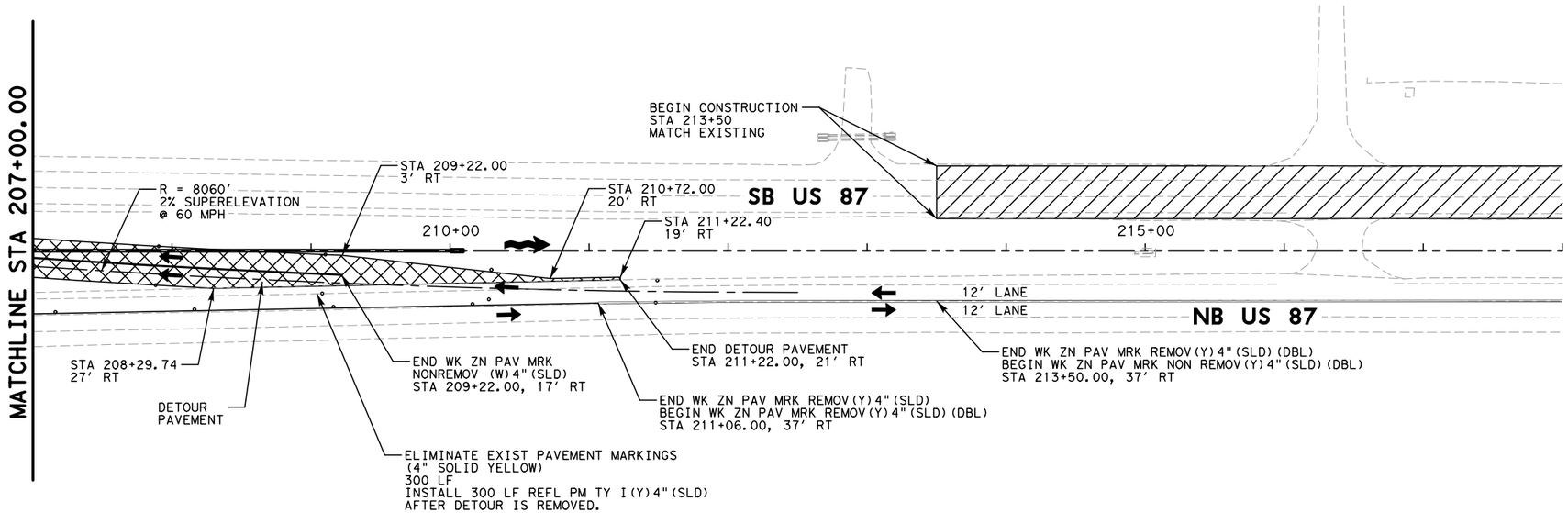


LEGEND

- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- DETOUR PAVEMENT
- TRAFFIC DRUM
- H — TYPE III BARRICADE

NOTES:

1. TEMPORARY PAVEMENT SHALL BE 6" SP-C PG70-22.
2. THE INSTALLATION OF ONE WAY SIGN ACROSS FROM COOP GIN RD WILL BE CONSIDERED SUBSIDIARY TO ITEM 502-6001.



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TRAFFIC CONTROL
SOUTHBOUND CROSSOVER

(SHEET 1 OF 3)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	19
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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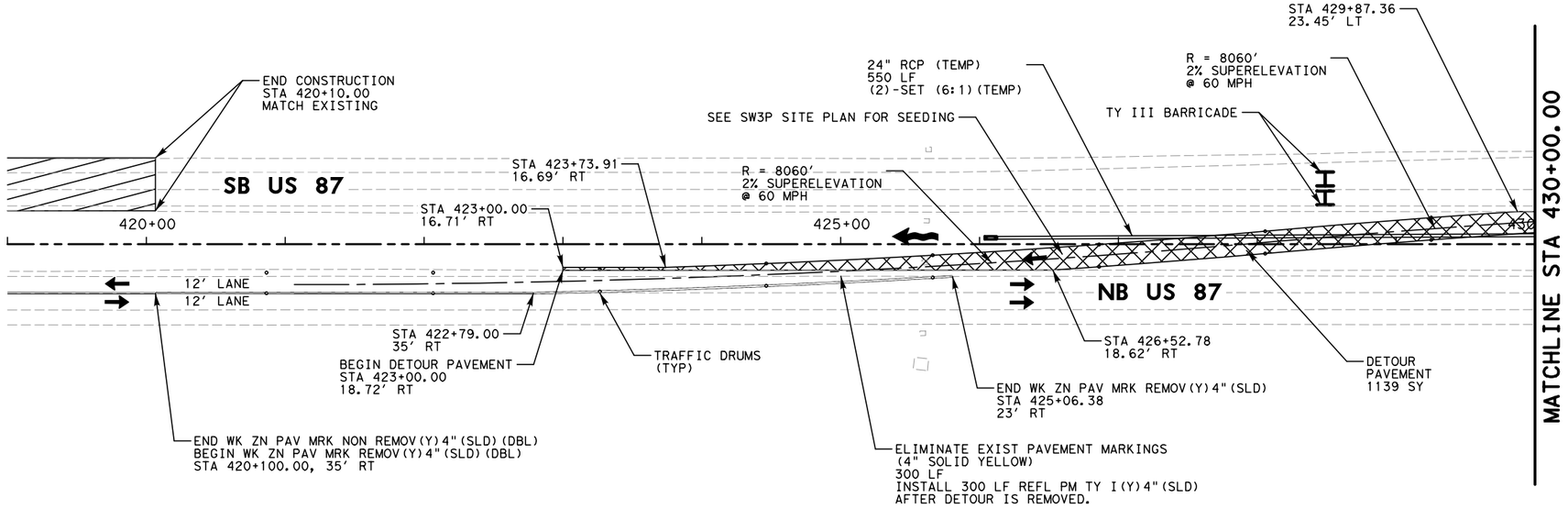
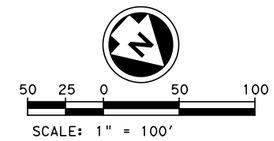


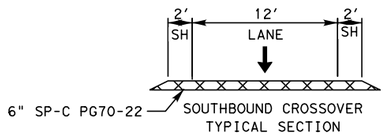


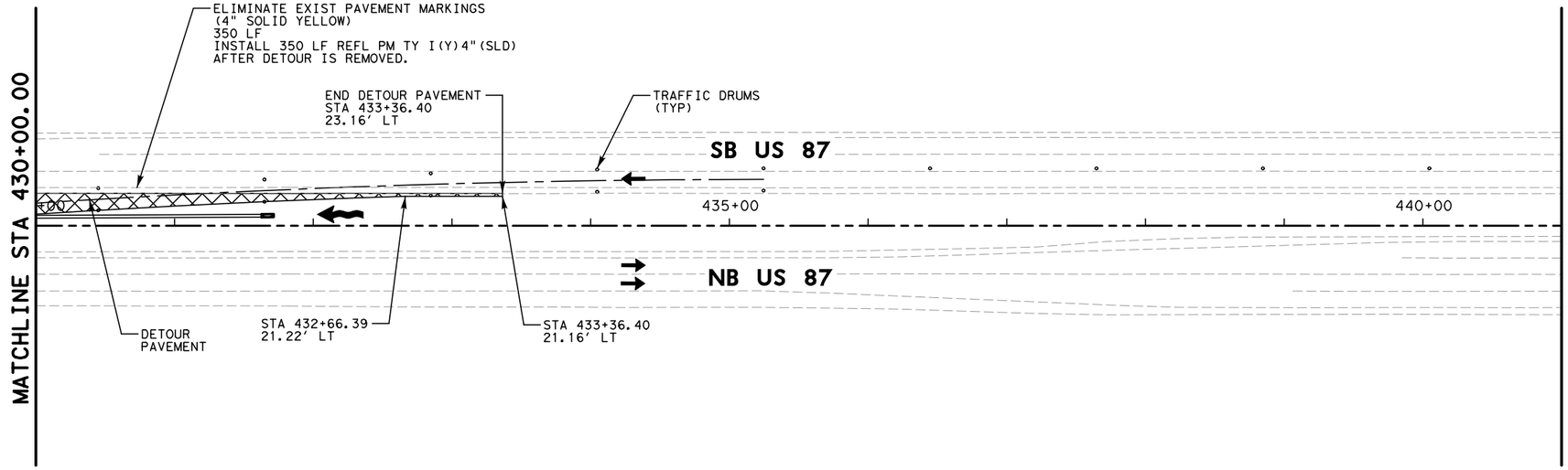
LEGEND

- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- DETOUR PAVEMENT
- TRAFFIC DRUM
- H TYPE III BARRICADE

NOTES:

1. TEMPORARY PAVEMENT SHALL BE 6" SP-C PG70-22.
2. THE INSTALLATION OF ONE WAY SIGN ACROSS FROM COOP GIN RD WILL BE CONSIDERED SUBSIDIARY TO ITEM 502-6001.





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TRAFFIC CONTROL SOUTHBOUND CROSSOVER

(SHEET 2 OF 3)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	20
GRAPHICS	CONTROL	SECTION	JOB	
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GRPH CHECK				
JKB				

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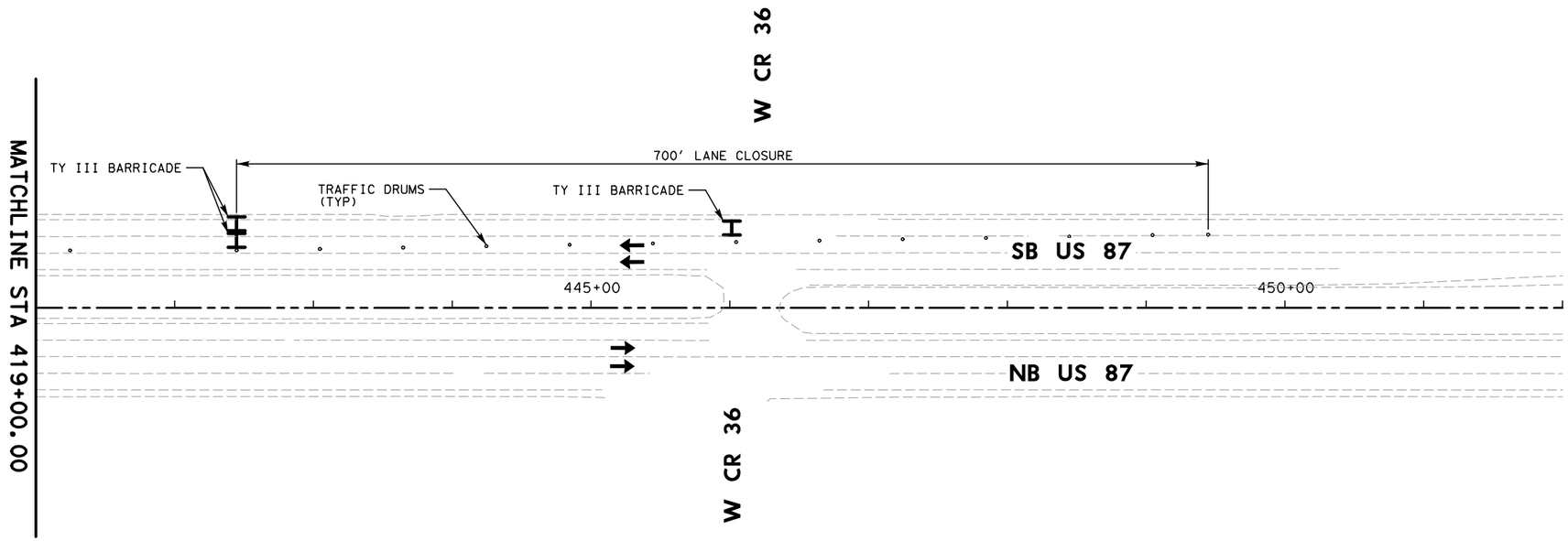

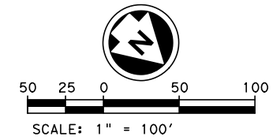

LEGEND

- CONSTRUCTION THIS PHASE
- CONSTRUCTION PREVIOUS PHASE
- DETOUR PAVEMENT
- TRAFFIC DRUM
- H TYPE III BARRICADE

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TRAFFIC CONTROL SOUTHBOUND CROSSOVER

(SHEET 3 OF 3)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	21
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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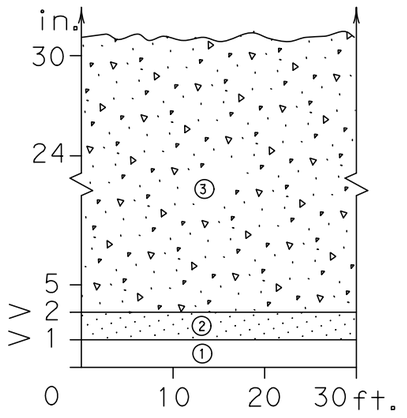
DATE: 5/21/2021 8:53:19 AM jphillpp

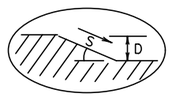
DATE: 5/21/2021 8:53:20 AM
FILE: P:\MSGP\TX020207\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\TCP\edgecon.dgn

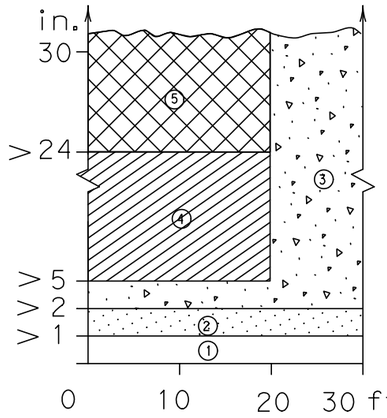
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

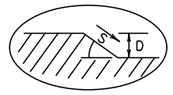


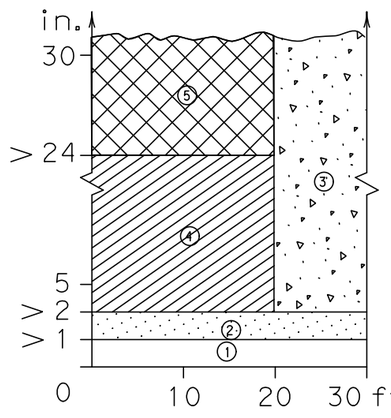
Edge Condition I
S = (3:1) (or flatter)



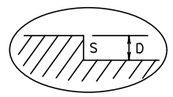


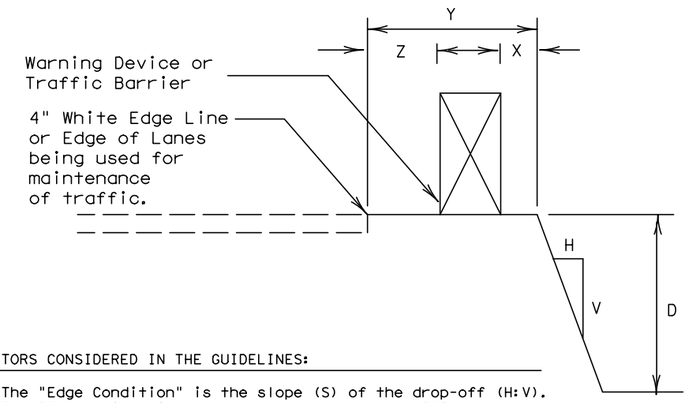
Edge Condition II
S = ((2.99):1) to (1:1)





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





FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. 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.

3. 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.

4. 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.

5. 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	CW 8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge fill may be provided to change the edge slope to that of the preferable Edge Condition I.
⑤	Check indications (Figure-1) for positive 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:

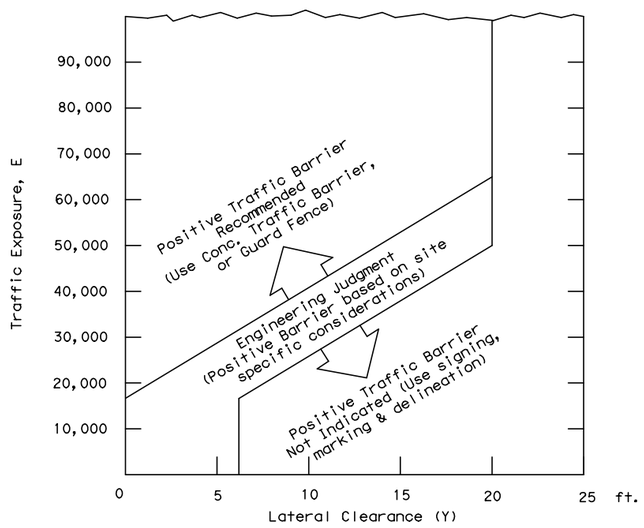
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1to 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" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. 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.

4. 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 (▨)



1 E = ADT x 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.

2 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.

3 An approved end treatment should be provided for any positive barrier end located within a lateral offset of 20 feet from the edge of the travel lane.

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.

Engineer's Seal

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

Date _____

Texas Department of Transportation
Traffic Operations Division

TREATMENT FOR VARIOUS EDGE CONDITIONS

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

1. The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).

2. The development and design of the Traffic Control Plan (TCP)is the responsibility of the Engineer.

3. The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.

4. The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.

5. Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.

6. When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.

7. The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.

8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

9. The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.

10. As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.

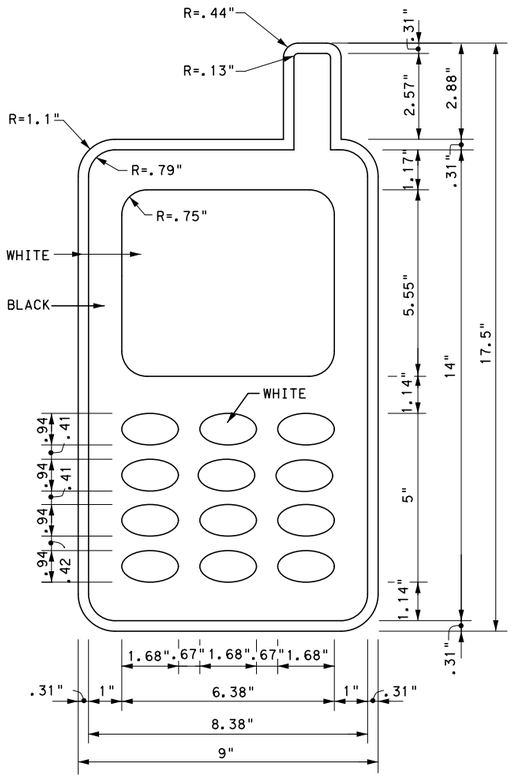
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

12. The Engineer has the final decision on the location of all traffic control devices.

13. Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

1. Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," 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.



3.0" Radius, 1.25" Border, 0.75" Indent, Black on Yellow;
[STAY ALERT] Font: D
3.0" Radius, 1.25" Border, 0.75" Indent, Black on Orange;
[TALK OR TEXT LATER] Font: C specified length;

SIGN DETAIL (G20-10T)

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

Texas Department of Transportation
Traffic Operations Division - TE
Phone (512) 416-3118

THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT 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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
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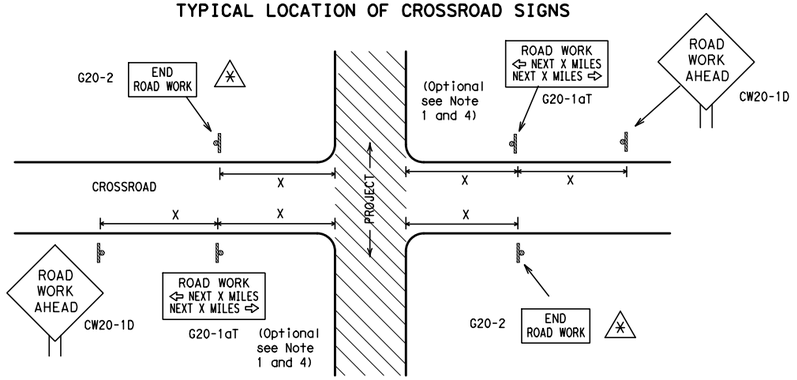
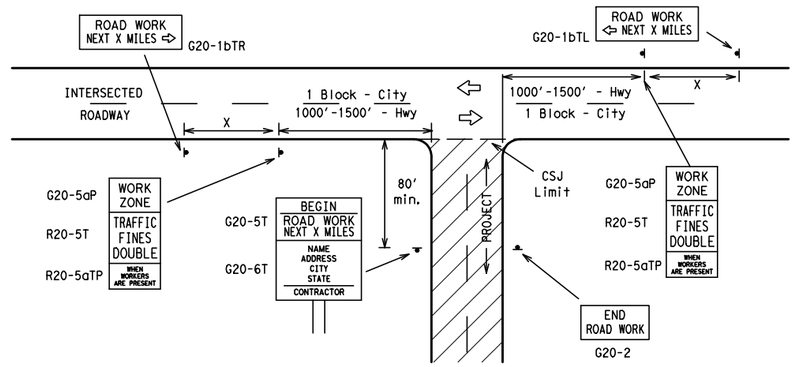
TYPICAL LOCATION OF CROSSROAD SIGNS



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

1. 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.
2. The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK"(G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
3. 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.
4. 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.
5. Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
6. 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

1. 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.
2. 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]

SIZE

Sign Number or Series	Conventional Road	Expressway/ Freeway
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"

SPACING

Posted Speed	Sign Spacing "X" △
MPH	Feet (Apprx.)
30	120
35	160
40	240
45	320
50	400
55	500[2]
60	600[2]
65	700[2]
70	800[2]
75	900[2]
80	1000[2]
✳	✳[3]

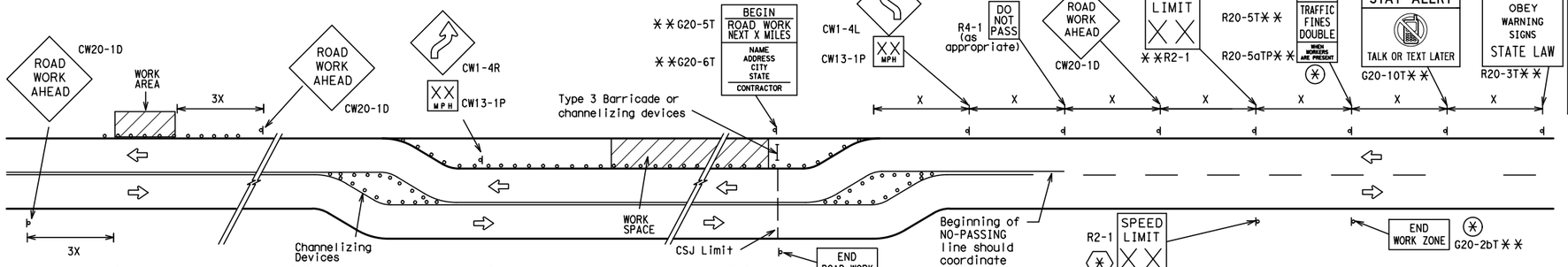
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
5. Only diamond shaped warning sign sizes are indicated.
6. See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

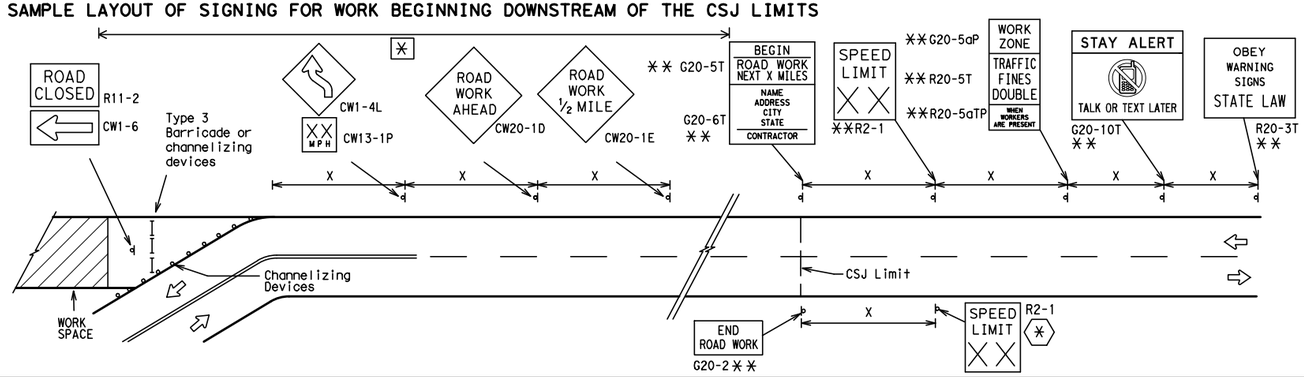
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES"(G20-5T)sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

✳ The "BEGIN WORK ZONE"(G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

✳✳ Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

✳ Area for placement of "ROAD WORK AHEAD" (CW20-1D)sign and other signs or devices as called for on the Traffic Control Plan.

✳ Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

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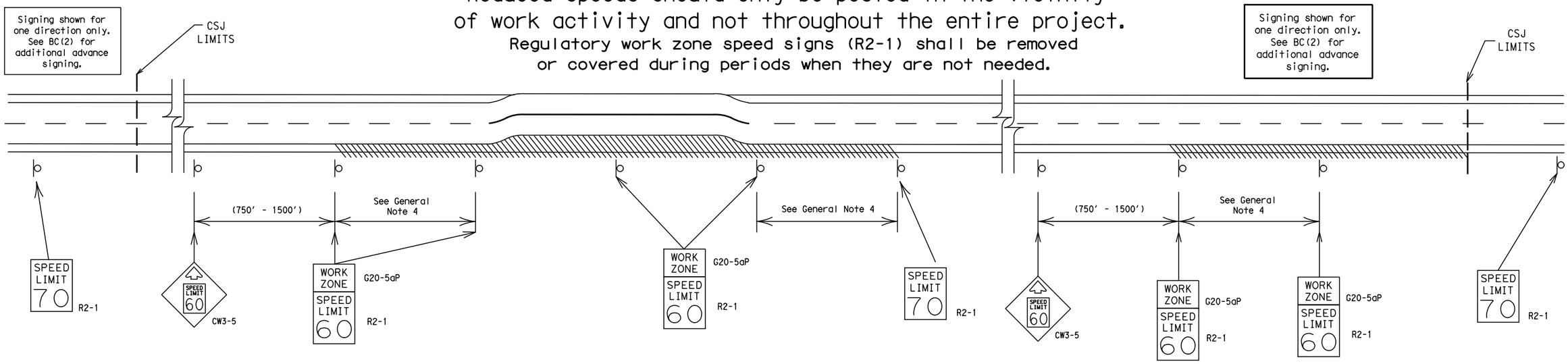
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project.

Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

a) rough road or damaged pavement surface
b) substantial alteration of roadway geometrics (diversions)
c) construction detours
d) grade
e) width
f) other conditions readily apparent to the driver

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

SHORT TERM WORK ZONE SPEED LIMITS

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

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered.
(See Removing or Covering on BC(4)).

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. Law enforcement.
   B. Flagger stationed next to sign.
   C. Portable changeable message sign (PCMS).
   D. Low-power (drone) radar transmitter.
   E. Speed monitor trailers or signs.
9. Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
10. For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

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	ABL	HOWARD		25

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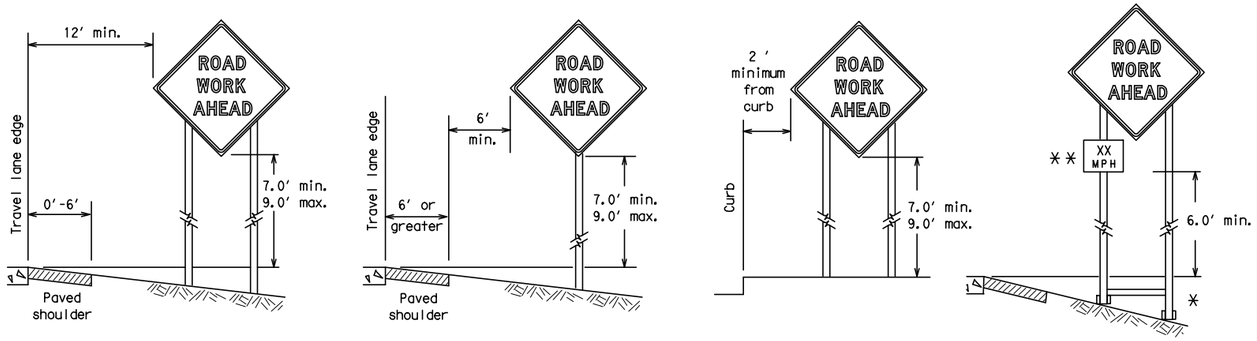
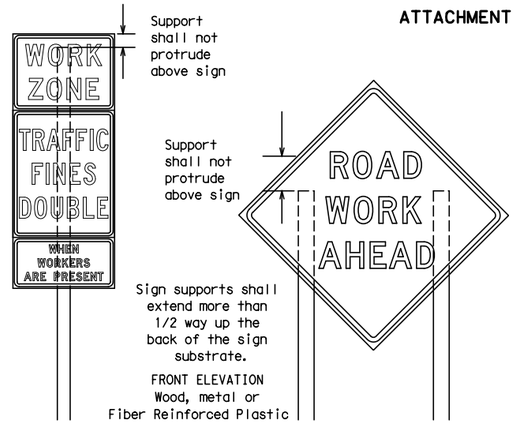
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



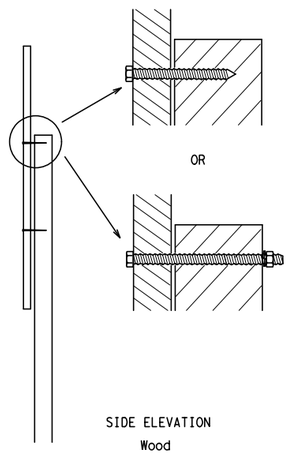
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the spice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

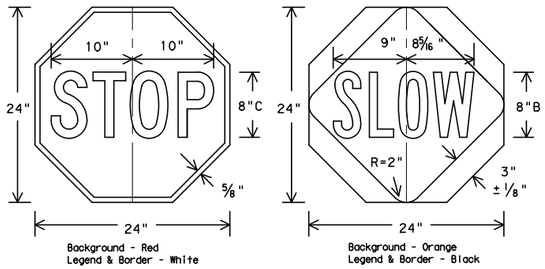


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

Nails 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.

STOP/SLOW PADDLES

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
2. When used at night, the STOP/SLOW paddle shall be retroreflectorized.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6′ to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

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REVISIONS 9-07 8-14 7-13	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		26

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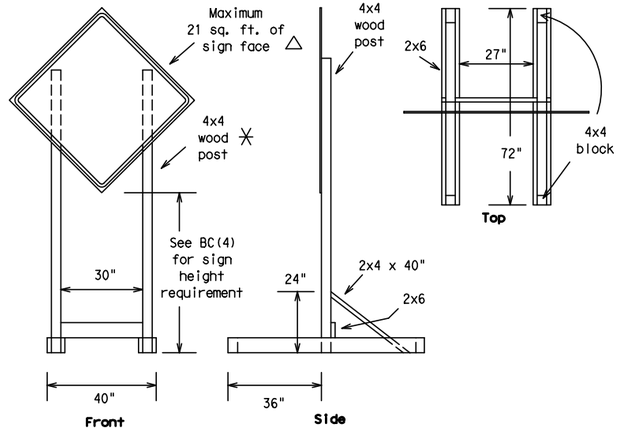
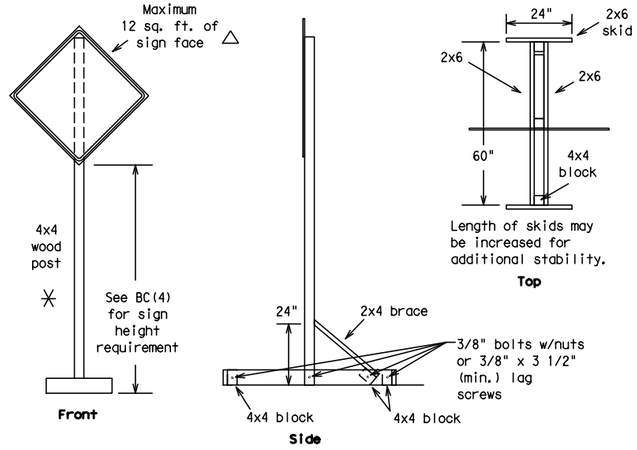
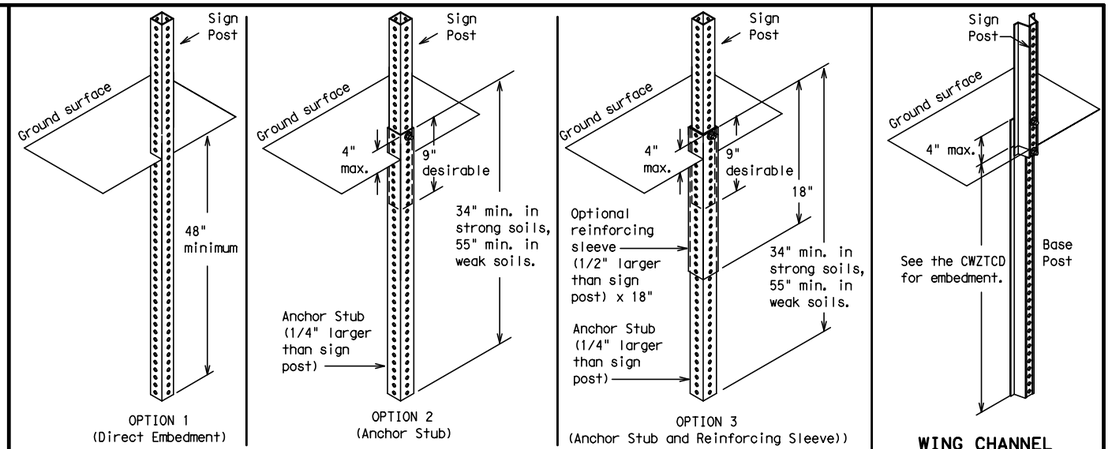




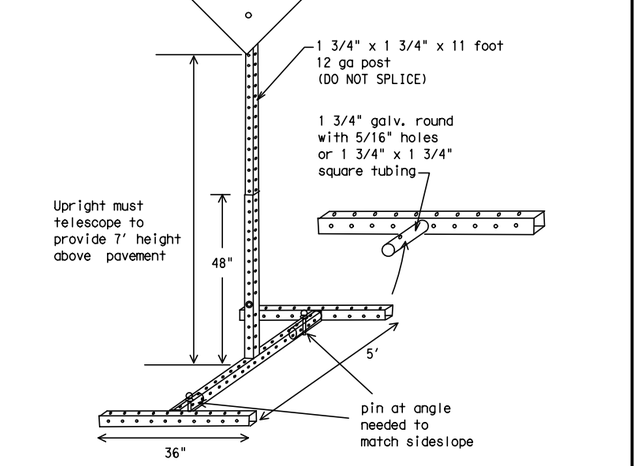
SKID MOUNTED WOOD SIGN SUPPORTS

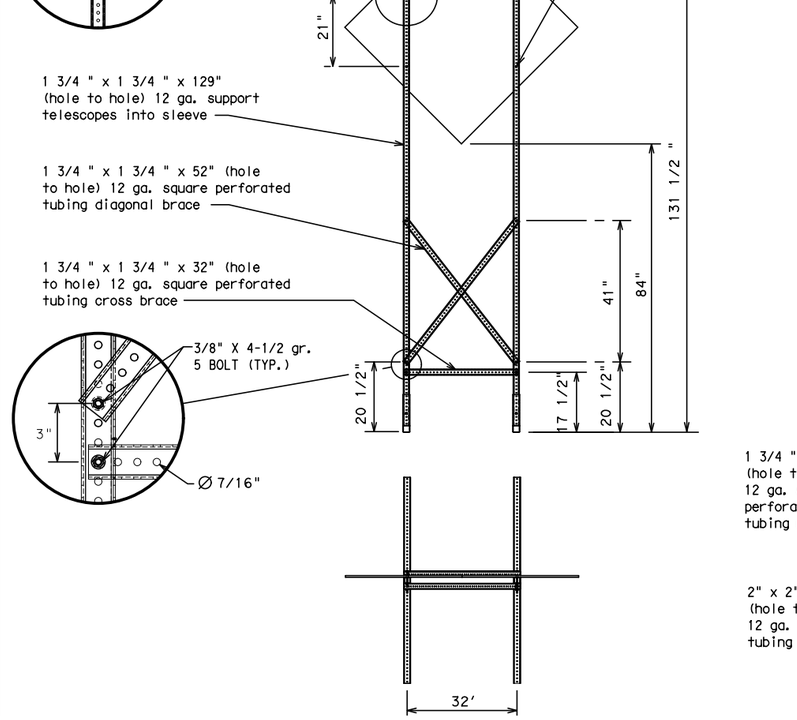
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □

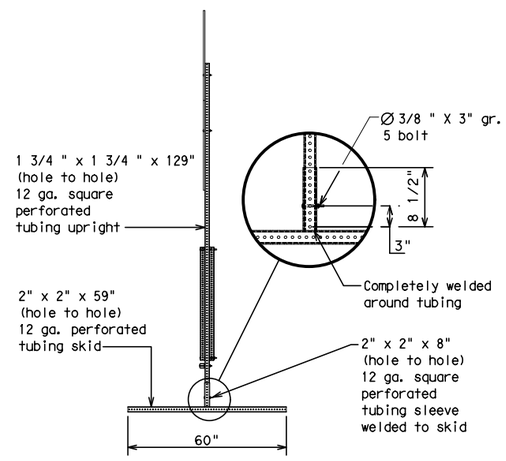


GROUND MOUNTED SIGN SUPPORTS

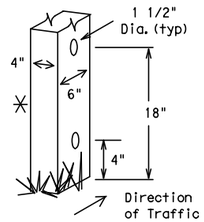
Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS



Nominal Post Size	Number of Posts	Maximum Sq. feet of Sign Face	Minimum Soil Embedment	Drilled Hole(s) Required
4 x 4	1	12	36"	NO
4 x 4	2	21	36"	NO
4 x 6	1	21	36"	YES
4 x 6	2	36	36"	YES

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

1. 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.
2. No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
3. 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.

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ABL	HOWARD		27

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

1. The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
2. 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.
3. 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.
4. Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
5. Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
6. When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
7. 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.
8. 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.
9. Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
10. 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.
11. Do not use the word "Danger" in message.
12. Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
13. Do not display messages that scroll horizontally or vertically across the face of the sign.
14. 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.
15. 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.
16. Each line of text should be centered on the message board rather than left or right justified.
17. If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD
Alternate	ALT
Avenue	AVE
Best Route	BEST RTE
Boulevard	BLVD
Bridge	BRDG
Cannot	CANT
Center	CTR
Construction Ahead	CONST AHD
CROSSING	XING
Detour Route	DETOUR RTE
Do Not	DONT
East	E
Eastbound	(route) E
Emergency	EMER
Emergency Vehicle	EMER VEH
Entrance, Enter	ENT
Express Lane	EXP LN
Expressway	EXPWY
XXXX Feet	XXXX FT
Fog Ahead	FOG AHD
Freeway	FRWY, FWY
Freeway Blocked	FWY BLKD
Friday	FRI
Hazardous Driving	HAZ DRIVING
Hazardous Material	HAZMAT
High-Occupancy	HOV
Vehicle Highway	HWY
Hour(s)	HR, HRS
Information	INFO
It Is	ITS
Junction	JCT
Left	LFT
Left Lane	LFT LN
Lane Closed	LN CLOSED
Lower Level	LWR LEVEL
Maintenance	MAINT

WORD OR PHRASE	ABBREVIATION
Major	MAJ
Miles	MI
Miles Per Hour	MPH
Minor	MNR
Monday	MON
Normal	NORM
North	N
Northbound	(route) N
Parking	PKING
Road	RD
Right Lane	RT LN
Saturday	SAT
Service Road	SERV RD
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	(route) S
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Thursday	THURS
To Downtown	TO DWNTN
Traffic	TRAF
Travelers	TRVLRS
Tuesday	TUES
Time Minutes	TIME MIN
Upper Level	UPR LEVEL
Vehicles (s)	VEH, VEHS
Warning	WARN
Wednesday	WED
Weight Limit	WT LIMIT
West	W
Westbound	(route) W
Wet Pavement	WET PVMT
Will Not	WONT

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT
RIGHT X LANES CLOSED	RIGHT X LANES OPEN
CENTER LANE CLOSED	DAYTIME LANE CLOSURES
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE
EXIT CLOSED	RIGHT LN TO BE CLOSED
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI
XXXXXXXX BLVD CLOSED	

Other Condition List

ROADWORK XXX FT	ROAD REPAIRS XXXX FT
FLAGGER XXXX FT	LANE NARROWS XXXX FT
RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
DETOUR X MILE	ROUGH ROAD XXXX FT
ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
BUMP XXXX FT	US XXX EXIT X MILES
TRAFFIC SIGNAL XXXX FT	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	FORM X LINES RIGHT
DETOUR NEXT X EXITS	USE XXXXX RD EXIT
USE EXIT XXX	USE EXIT I-XX NORTH
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N
TRUCKS USE US XXX N	WATCH FOR TRUCKS
WATCH FOR TRUCKS	EXPECT DELAYS
EXPECT DELAYS	PREPARE TO STOP
REDUCE SPEED XXX FT	END SHOULDER USE
USE OTHER ROUTES	WATCH FOR WORKERS
STAY IN LANE *	

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXX 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

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

1. Only 1 or 2 phases are to be used on a PCMS.
2. The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
3. A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
4. A Location Phase is necessary only if a distance or location is not included in the first phase selected.
5. 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.
6. 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

1. The words RIGHT, LEFT and ALL can be interchanged as appropriate.
2. Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
3. EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
4. Highway names and numbers replaced as appropriate.
5. ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
6. AHEAD may be used instead of distances if necessary.
7. FT and MI, MILE and MILES interchanged as appropriate.
8. AT, BEFORE and PAST interchanged as needed.
9. 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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	ABL	HOWARD		28

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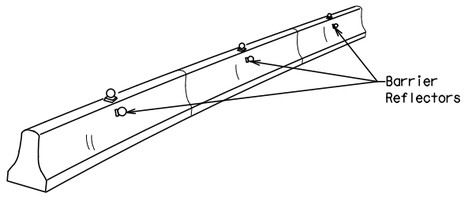
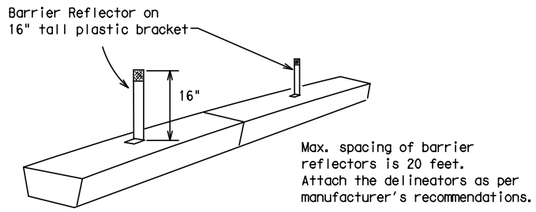
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

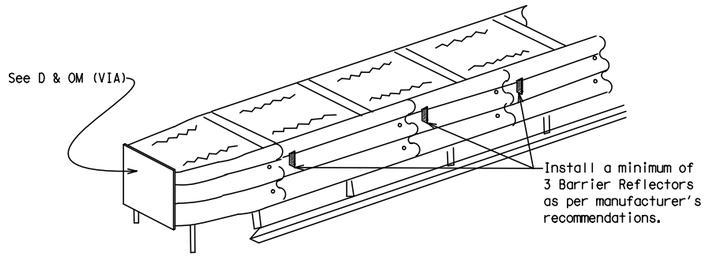


CONCRETE TRAFFIC BARRIER (CTB)

3. 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.
4. 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.
5. When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
6. Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
7. Maximum spacing of Barrier Reflectors is forty (40) feet.
8. Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
9. Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
10. Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
11. Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)

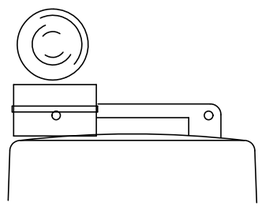


DELINEATION OF END TREATMENTS

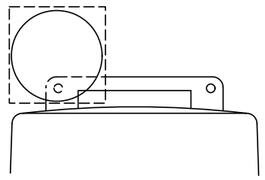
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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

WARNING LIGHTS

1. Warning lights shall meet the requirements of the TMUTCD.
2. Warning lights shall NOT be installed on barricades.
3. Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
4. 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".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. 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.
7. 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.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

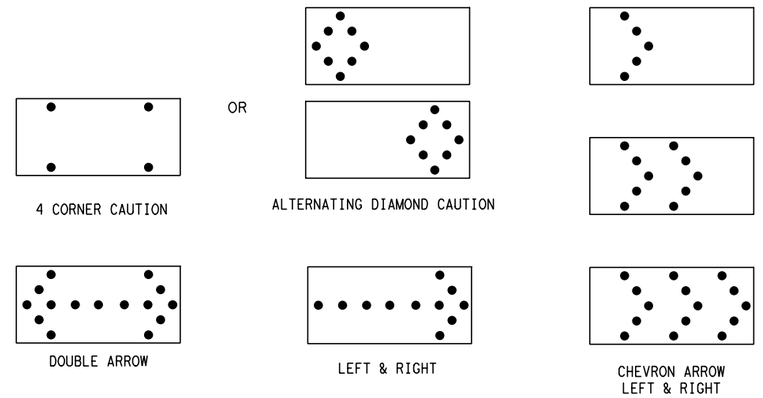
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing 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.
4. 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.
5. Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
6. Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
7. 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

1. 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.
2. 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.
3. The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
4. Round reflectors shall be fully reflectorized, including the area where attached to the drum.
5. 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.
6. 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.
7. When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
8. The warning reflector should be mounted on the side of the handle nearest approaching traffic.
9. The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

1. 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.
2. 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.
3. 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.
4. The Flashing Arrow Board should be able to display the following symbols:



5. The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
6. The straight line caution display is NOT ALLOWED.
7. 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.
8. 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.
9. The sequential arrow display is NOT ALLOWED.
10. The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
11. The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
12. A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
13. 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.
14. Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. 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.
6. 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 Operations Division Standard

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

BC(7)-14

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REVISIONS 9-07 8-14 7-13	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		29

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GENERAL NOTES

1. For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
2. 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.
3. 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.
4. 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).
5. 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.
6. 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:

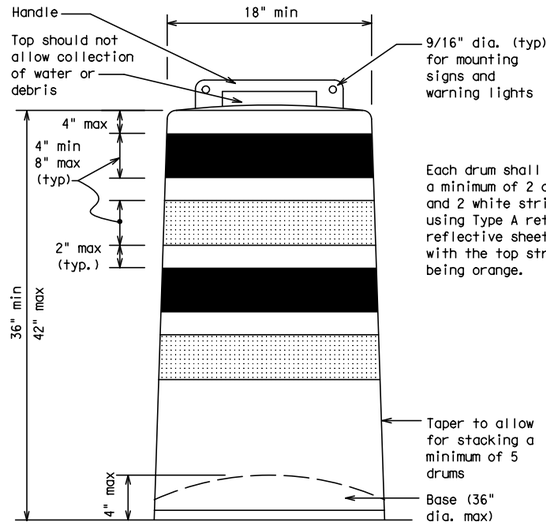
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
3. 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.
4. 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.
5. 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.
6. 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.
7. 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.
8. Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
9. Drum body shall have a maximum unballasted weight of 11 lbs.
10. Drum and base shall be marked with manufacturer's name and model number.

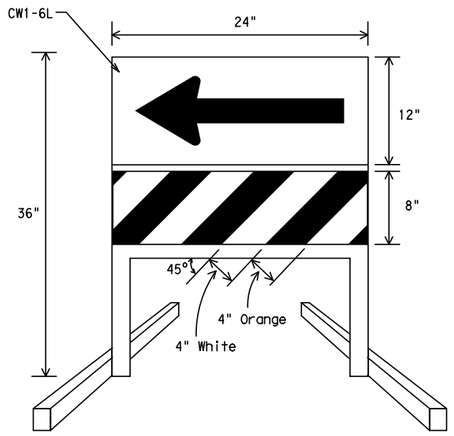
RETROREFLECTIVE SHEETING

1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
2. 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

1. 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.
2. 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.
3. Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
4. 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.
5. 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.
6. Ballast shall not be placed on top of drums.
7. Adhesives may be used to secure base of drums to pavement.





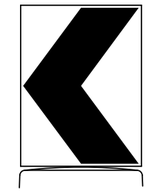
DIRECTION INDICATOR BARRICADE

1. The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
2. If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
3. The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
4. Double arrows on the Direction Indicator Barricade will not be allowed.
5. Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

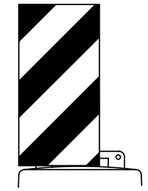
This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades

DETECTABLE PEDESTRIAN BARRICADES

1. 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.
2. Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
3. 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.
4. Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
5. Warning lights shall not be attached to detectable pedestrian barricades.
6. Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign
(Maximum Sign Dimension)
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24"
Vertical Panel
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

1. Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
2. 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.
3. Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
4. 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.
5. Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
6. Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
7. 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.
8. 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.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

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REVISIONS	0068	08	067	US 87
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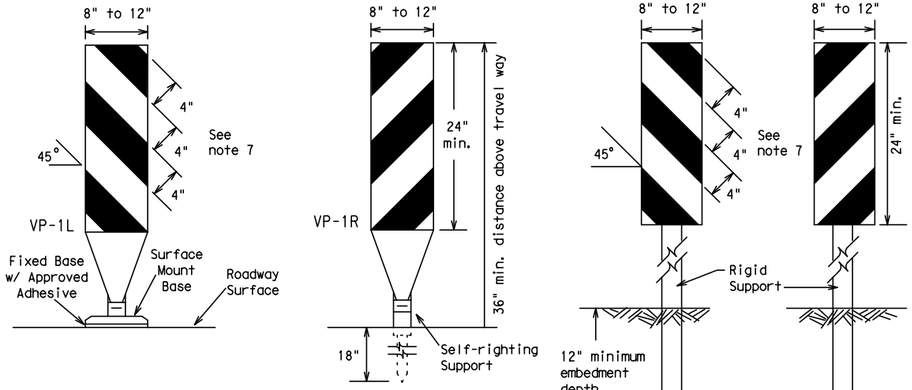
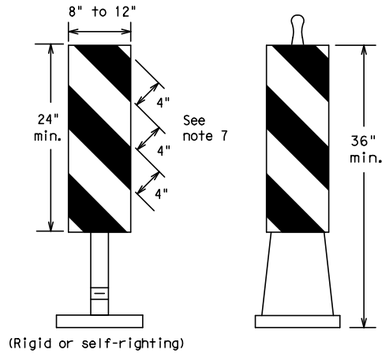


FIXED
(Rigid or self-righting)

DRIVEABLE

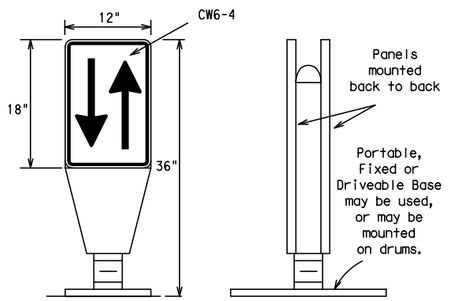


(Rigid or self-righting)

PORTABLE

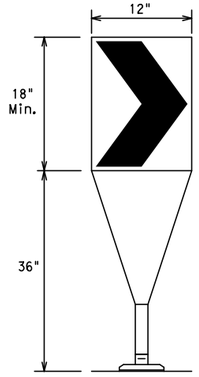
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
3. VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
4. VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
5. Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
6. Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
7. Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



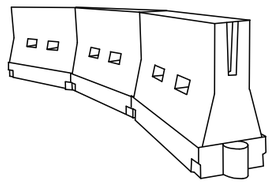
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

1. LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
2. LCDs may be used instead of a line of cones or drums.
3. LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
4. LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
5. LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
6. LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long 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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10′ Offset	11′ Offset	12′ Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent
30	$L=\frac{WS^2}{60}$	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

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

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	ABL	HOWARD		31

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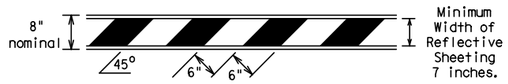
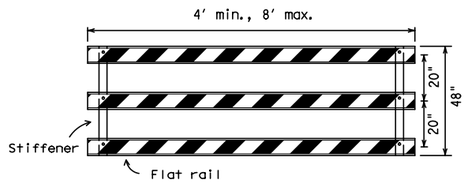
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.



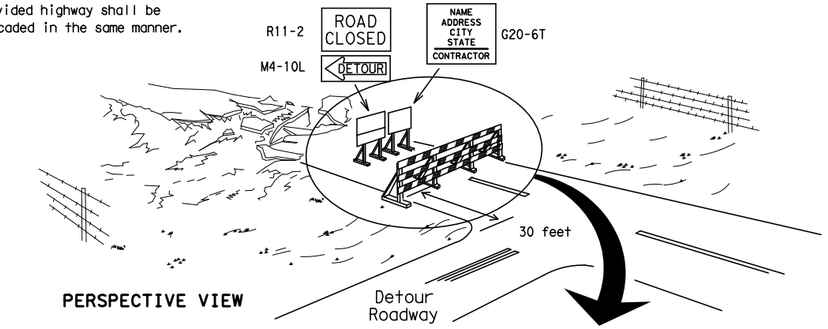
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

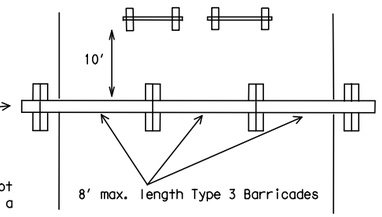
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

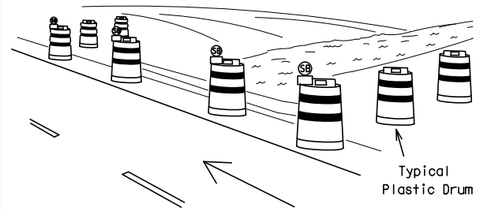
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

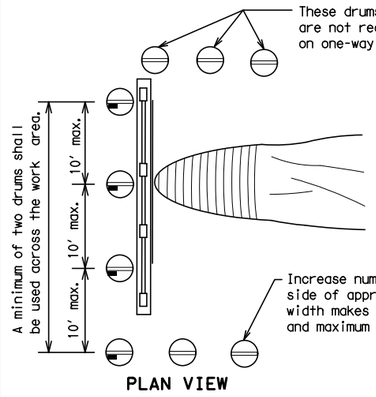
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

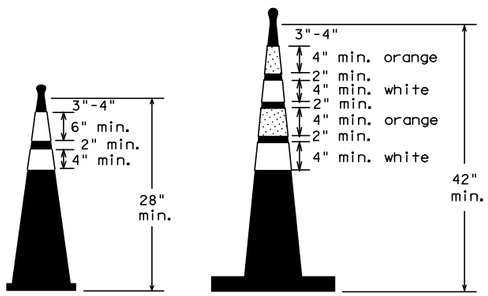
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

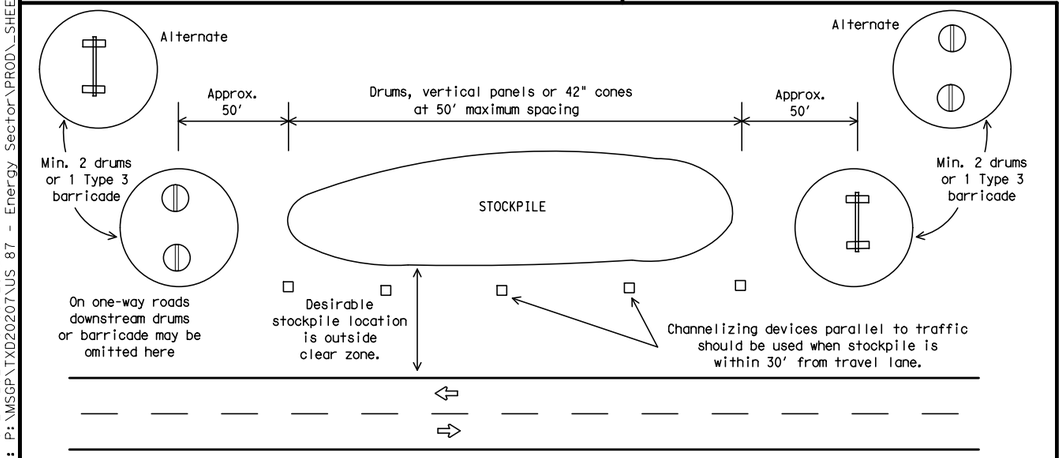
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



28" Cones shall have a minimum weight of 9 1/2 lbs.

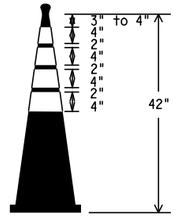
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with an alternate striping pattern: four 4 inch retroreflective bands, with an approximate 2 inch gap between bands. The color of the band should correspond to the color of the edgeline (yellow for left edgeline, white for right edgeline) for which the device is substituted or for which it supplements. The reflectorized bands shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0068	08	067	US 87
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	ABL	HOWARD		32

DATE: 5/21/2021 8:53:28 AM
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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

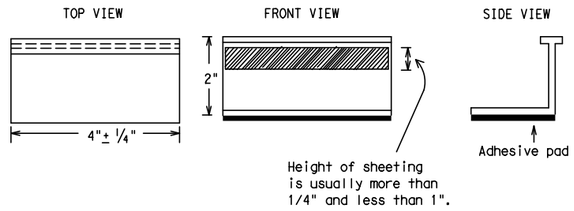
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

1. Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
2. The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
3. Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
4. The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
5. Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
6. Blast cleaning may be used but will not be required unless specifically shown in the plans.
7. Over-painting of the markings SHALL NOT BE permitted.
8. Removal of raised pavement markers shall be as directed by the Engineer.
9. Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
10. 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

1. Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
2. Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
   A. Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
   B. Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
3. Small design variances may be noted between tab manufacturers.
4. See Standard Sheet WZ(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

1. Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
2. All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
3. Adhesive for guidemarks shall be bituminous material 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).

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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11-02 8-14				

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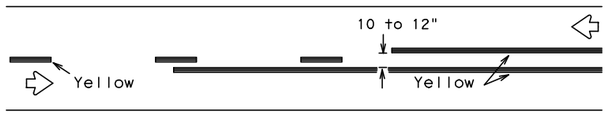
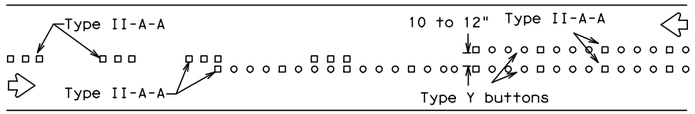
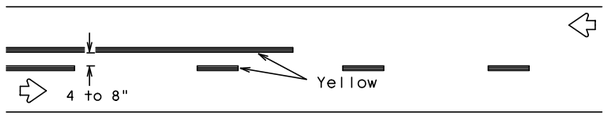
PAVEMENT MARKING PATTERNS



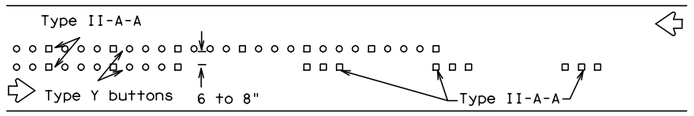
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



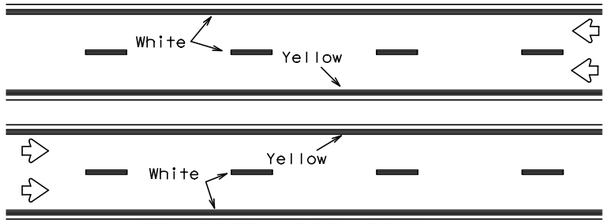
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



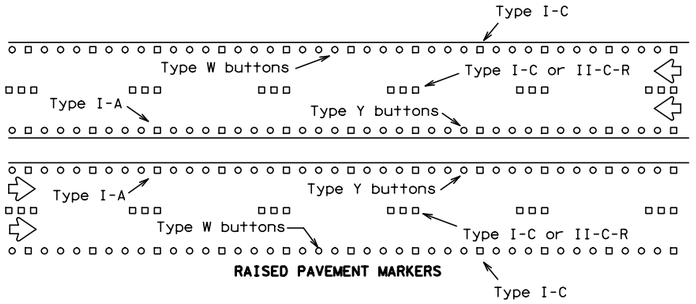
RAISED PAVEMENT MARKERS - PATTERN B

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

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



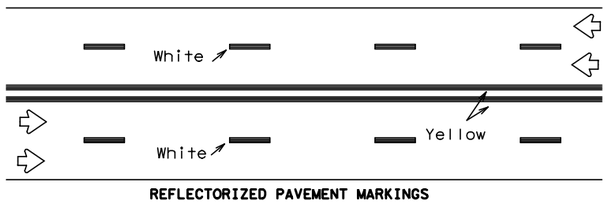
REFLECTORIZED PAVEMENT MARKINGS



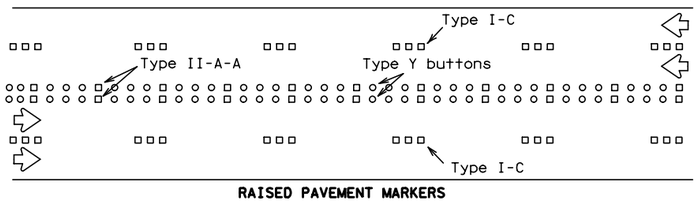
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



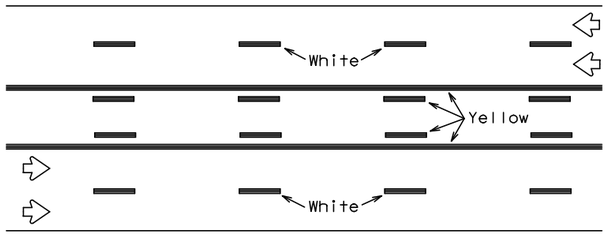
REFLECTORIZED PAVEMENT MARKINGS



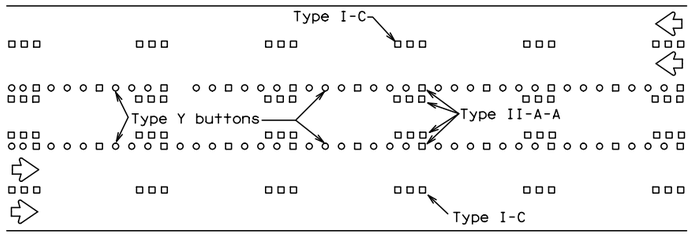
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

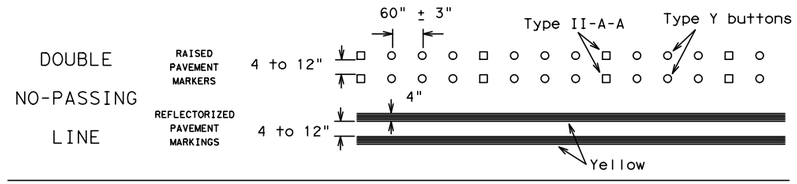
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

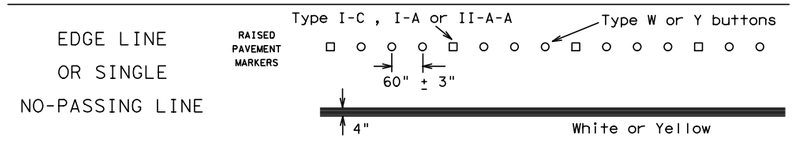
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

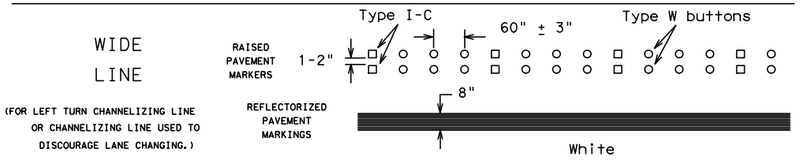


EDGE LINE OR SINGLE NO-PASSING LINE



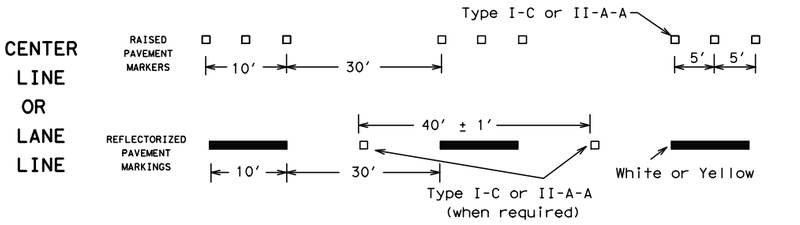
WIDE LINE

(FOR LEFT TURN CHANNELIZING LINE OR CHANNELIZING LINE USED TO DISCOURAGE LANE CHANGING.)

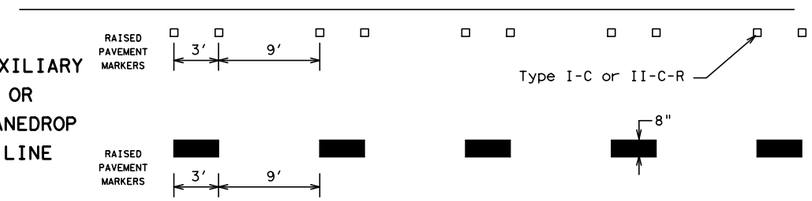


BROKEN LINES

CENTER LINE OR LANE LINE

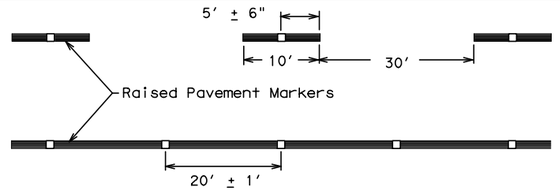


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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."

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2-98 7-13	ABL	HOWARD		34
11-02 8-14				

106

DATE: 5/21/2021 8:53:30 AM
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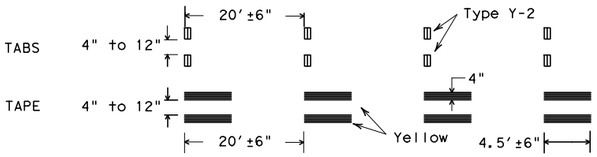
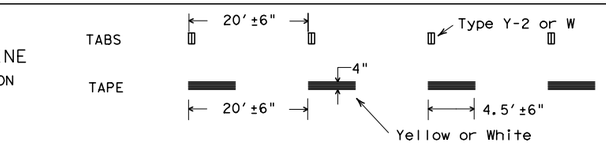
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

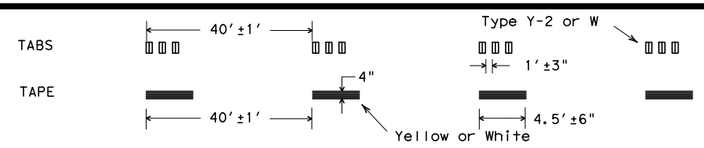


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



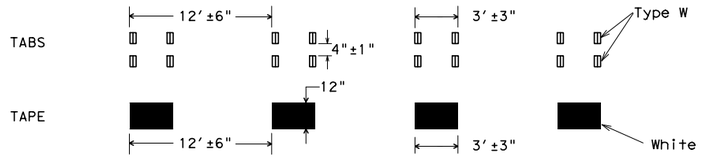
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

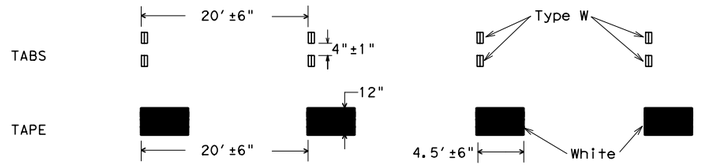


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



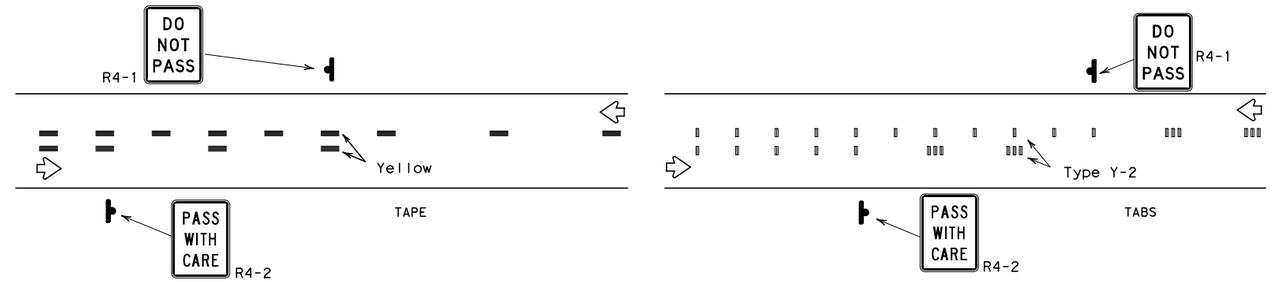
NOTES:

1. Short term pavement markings may be prefabricated markings (stick down tape) or temporary flexible-reflective roadway marker tabs unless otherwise specified elsewhere in plans.
2. Short term pavement markings shall NOT be used to simulate edge lines.
3. Dimensions indicated on this sheet are typical and approximate. Variations in size and height may occur between markers or devices made by manufacturers, by as much as 1/4 inch, unless otherwise noted.
4. Temporary flexible-reflective roadway marker tabs will require normal maintenance replacement when used on roadways with an ADT per lane of up to 7500 vehicles with no more than 10% truck mix. When roadways exceed these values, additional maintenance replacement of devices should be planned.
5. No segment of roadway open to traffic shall remain without permanent pavement markings for a period greater than 14 calendar days. The Contractor will be responsible for maintaining short term pavement markings until permanent pavement markings are in place. When the Contractor is responsible for placement of permanent pavement markings, no segment of roadway shall remain without permanent pavement markings for a period greater than 14 calendar days unless weather conditions prohibit placement. Permanent pavement markings shall be placed as soon as weather permits.
6. For two lane, two-way roadways, DO NOT PASS signs shall be erected to mark the beginning of sections where passing is prohibited and PASS WITH CARE signs shall be erected to mark the beginning of sections where passing is permitted. Signs shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and may be used to indicate the limits of no-passing zones for up to 14 calendar days. Permanent pavement markings should then be placed.
7. For low volume two lane, two-way roadways of 4000 ADT or less, no-passing lines may be omitted when approved by the Engineer. DO NOT PASS and PASS WITH CARE signs shall be erected (see note 6).
8. For exit gores where a lane is being dropped place wide gore markings or retroreflective channelizing devices to guide motorist through the exit. If channelizing devices are to be used it should be noted elsewhere in the plans. One piece cones are not allowed for this purpose.

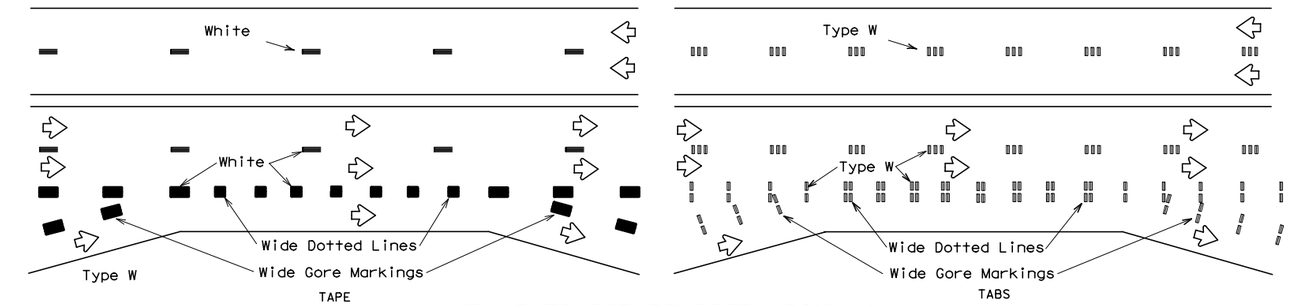
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

1. Temporary flexible-reflective roadway marker tabs detailed on this sheet will be designated Type Y-2 (two amber reflective surfaces with yellow body); Type Y (one amber reflective surface with yellow body); and Type W (one white or silver reflective surface with white body). Additional details may be found on BC(11).
2. Tabs shall meet requirements of Departmental Material Specification DMS-8242.
3. When dry, tabs shall be visible for a minimum distance of 200 feet during normal daylight hours and when illuminated by automobile low-beam head light at night, unless sight distance is restricted by roadway geometrics.
4. No two consecutive tabs nor four tabs per 1000 feet of line shall be missing or fail to meet the visual performance requirements of Note 3.

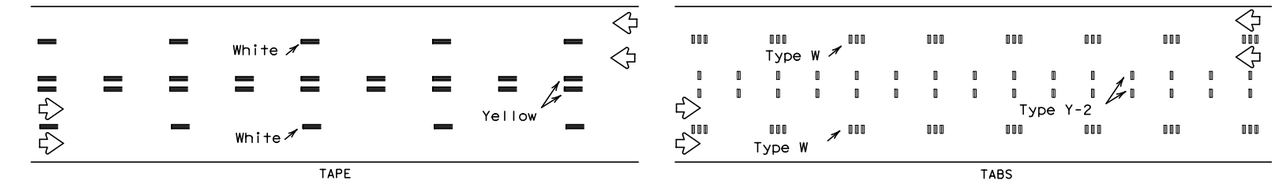
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



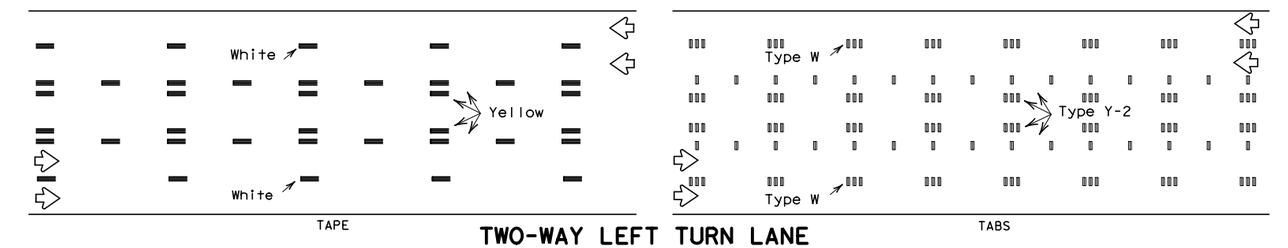
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



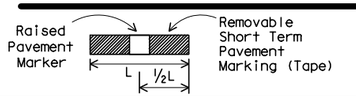
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



If raised pavement markers are used to supplement REMOVABLE short term markings, the markers shall be applied to the top of the tape at the approximate mid length of the tape. This allows an easier removal of raised markers and tape.

PREFABRICATED PAVEMENT MARKINGS

1. Temporary Removable Prefabricated Pavement Markings shall meet the requirements of DMS-8241.
2. Non-removable Prefabricated Pavement Markings shall meet the requirements of either DMS-8240 "Permanent Prefabricated Pavement Markings" or DMS-8243 "Temporary Costruction-Grade Prefabricated Pavement Markings."

RAISED PAVEMENT MARKERS

1. All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and DMS-4200.

DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS) & MATERIAL PRODUCER LISTS (MPL)

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:
   http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
1-97		DIST	COUNTY		SHEET NO.
3-03		ABL	HOWARD		35
7-13					

111

DATE: 5/21/2021 8:53:31 AM
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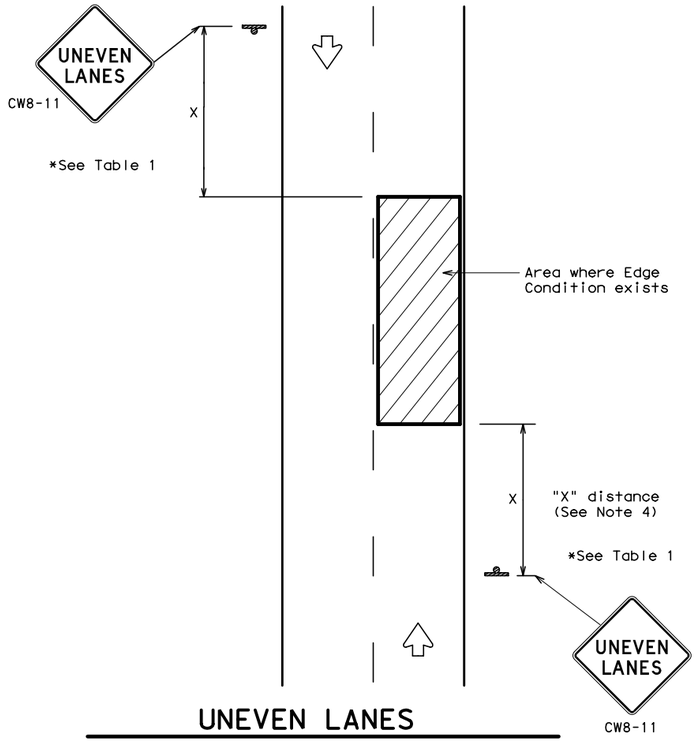
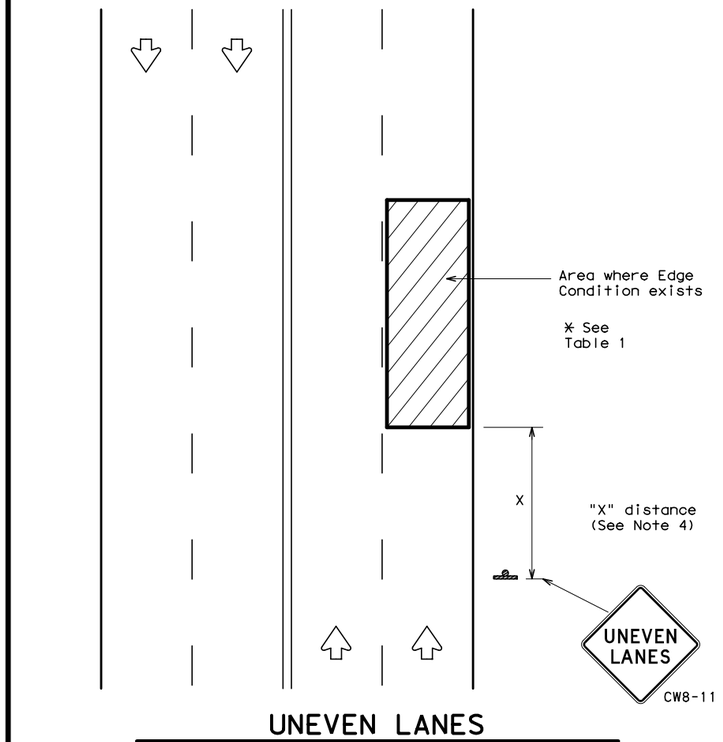
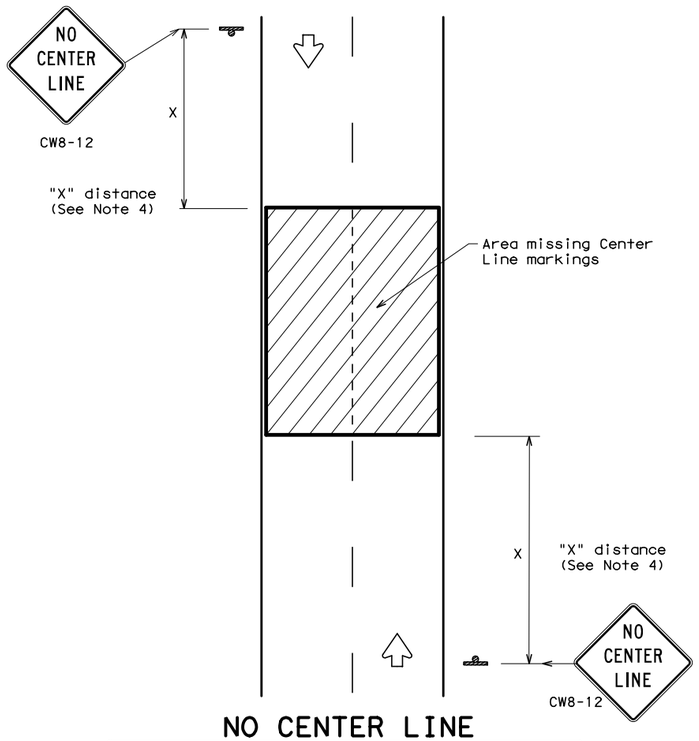


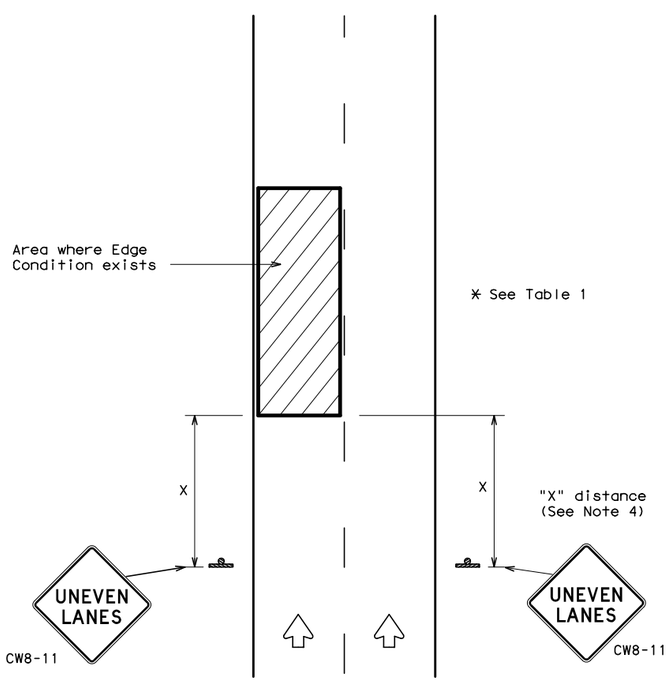
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

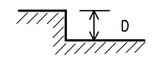
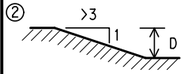
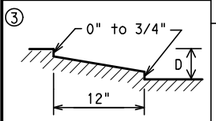
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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.

TABLE 1

Edge Condition	Edge Height (D)	* Warning Devices
① 	Less than or equal to: 1¼" (maximum-planing) 1½" (typical-overlay)	Sign: CW8-11
	Distance "D" may be a maximum of 1 1/4 " for planing operations and 2" for overlay operations if uneven lanes with edge condition 1 are open to traffic after work operations cease.	
② 	Less than or equal to 3"	Sign: CW8-11
③  Notched Wedge Joint	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

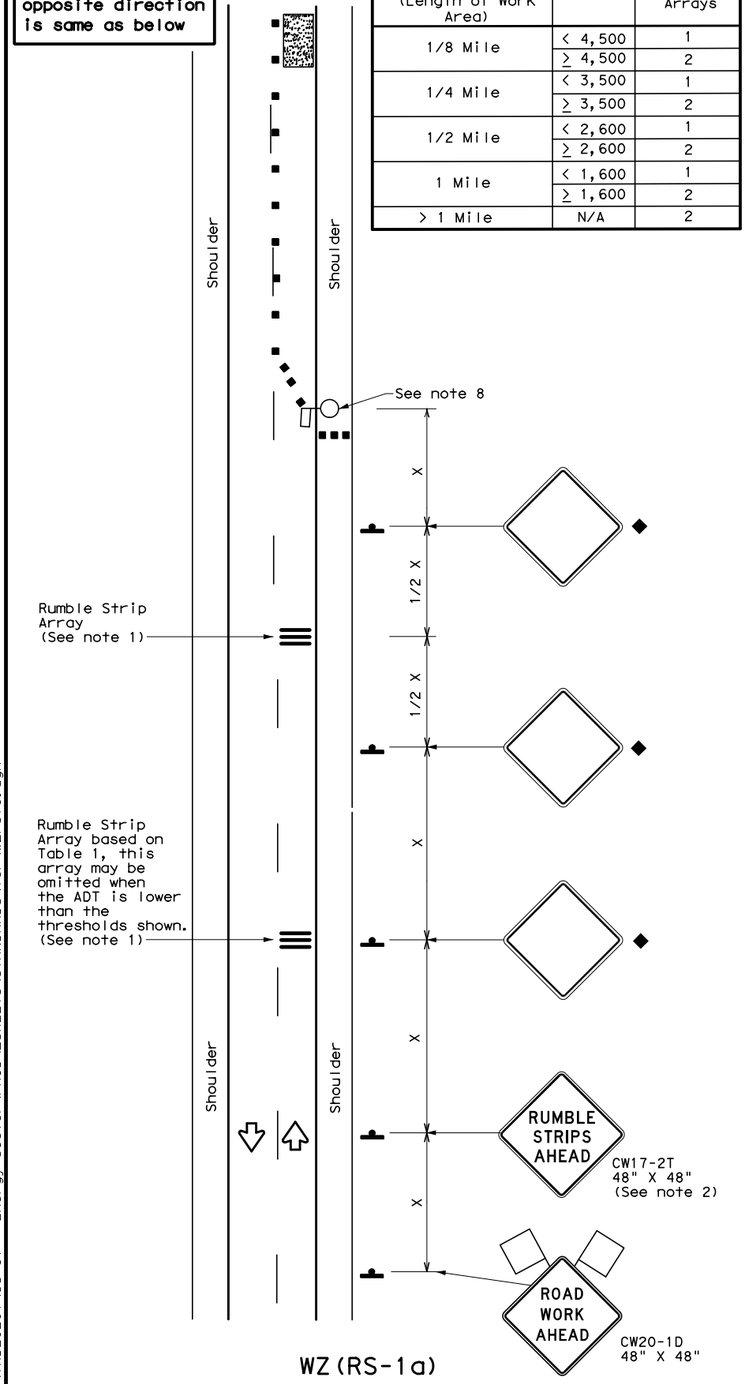
WZ(UL)-13

FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	ABL	HOWARD		36

DATE: 5/21/2021 8:53:32 AM
FILE: P:\WSGP\TXD2020T\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\TCP\wzrs16.dgn

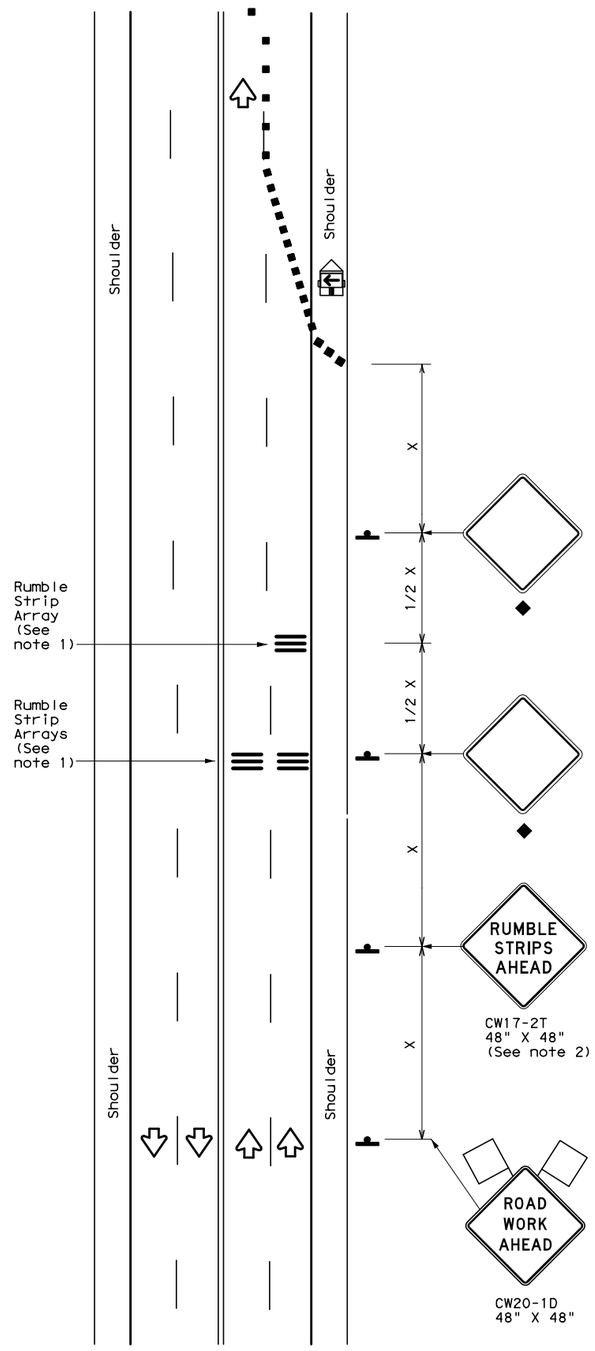
Warning sign and rumble strip sequence in opposite direction is same as below

TABLE 1		
Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

1. Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
2. The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
3. Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
4. Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
5. Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
6. Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
7. This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
8. The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
9. Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

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

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

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

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

◆ **Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.**

TABLE 2	
Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

Texas Department of Transportation
Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
2-14	DIST	COUNTY		SHEET NO.
4-16	ABL	HOWARD		37

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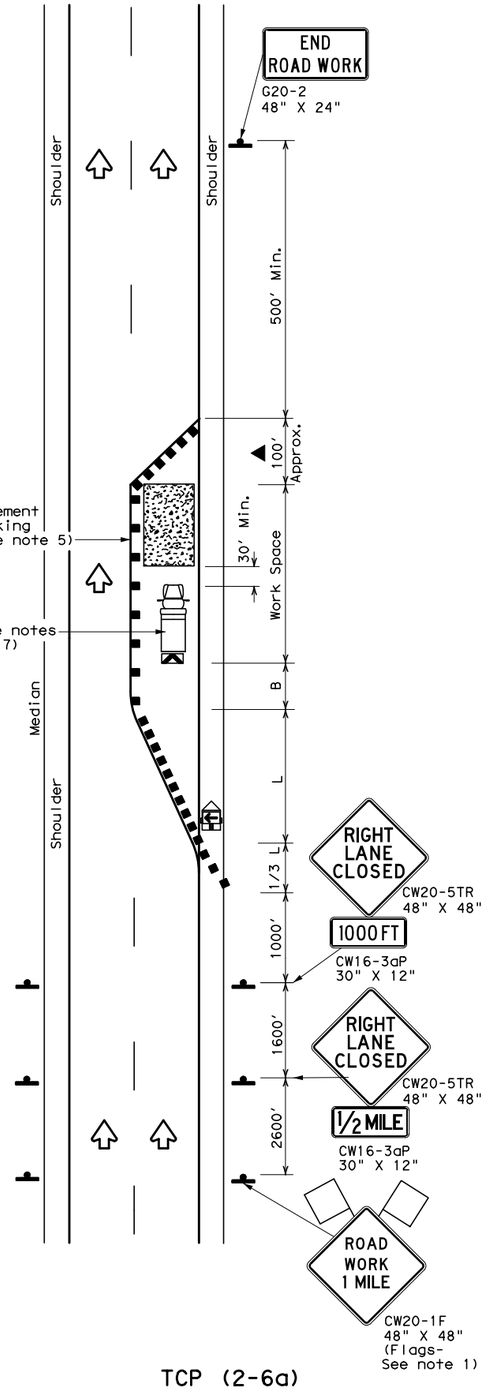
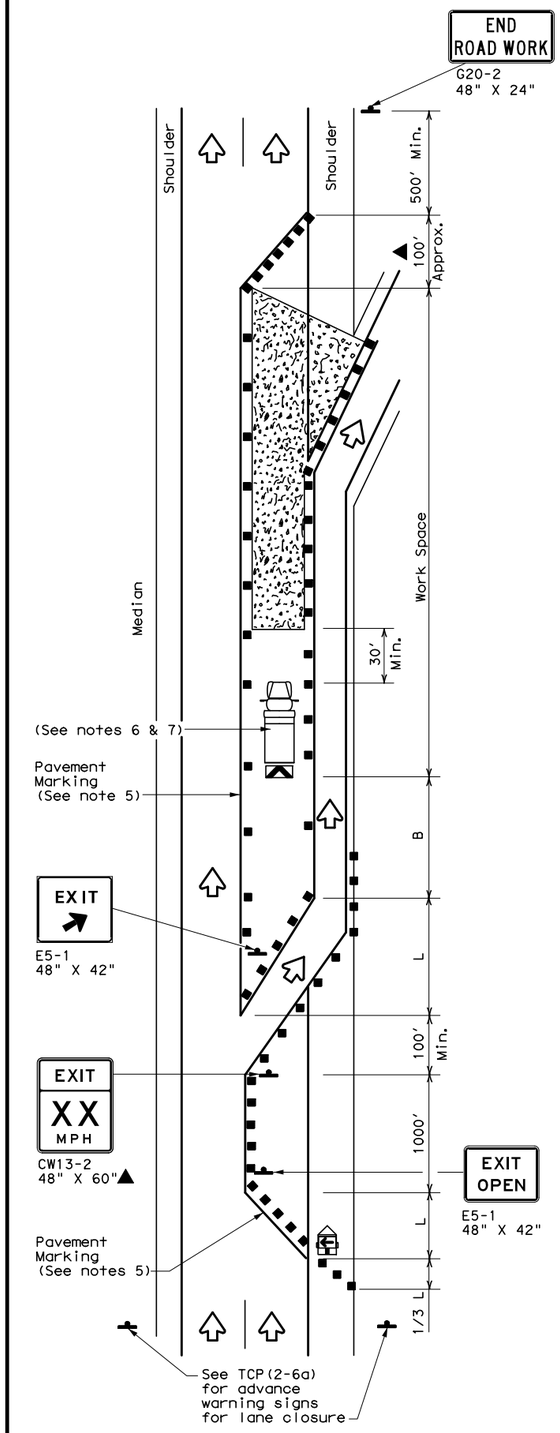


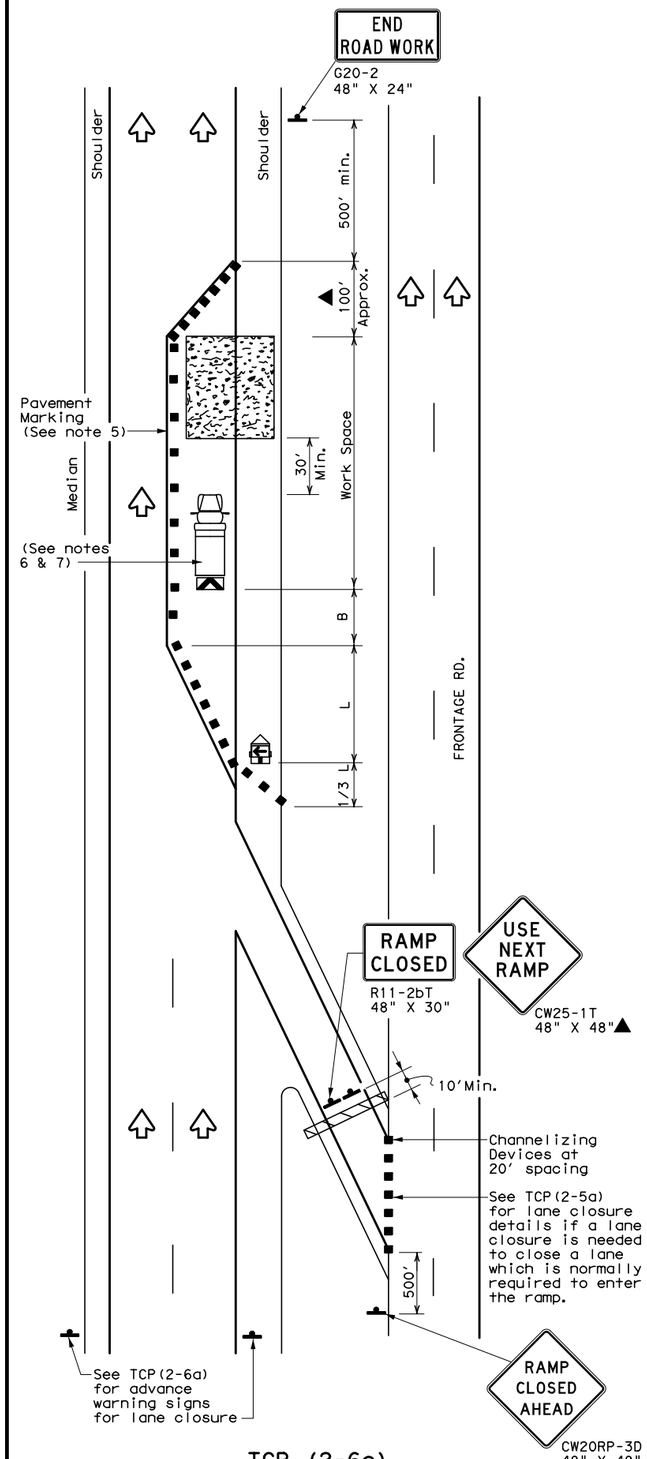
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. 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.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on Intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. 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.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ABL	HOWARD		38
1-97 2-18				

DATE: 5/21/2021 8:53:35 AM
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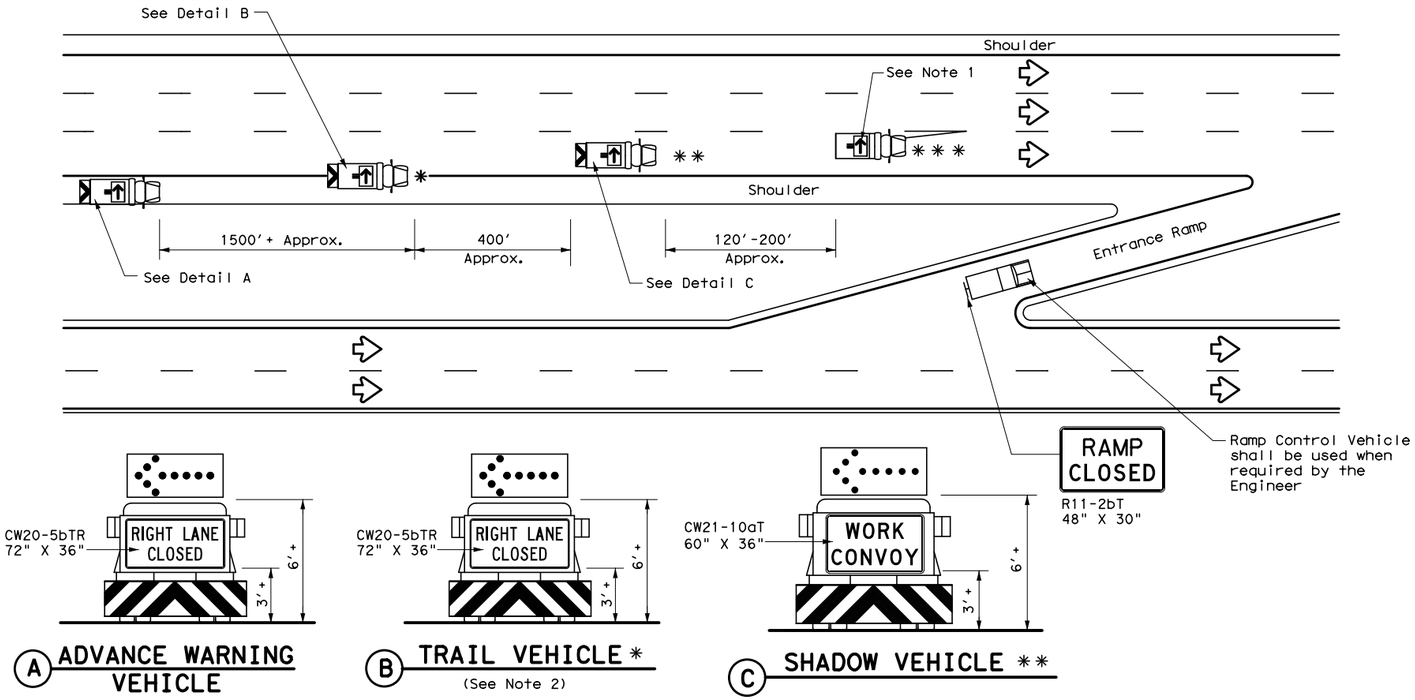
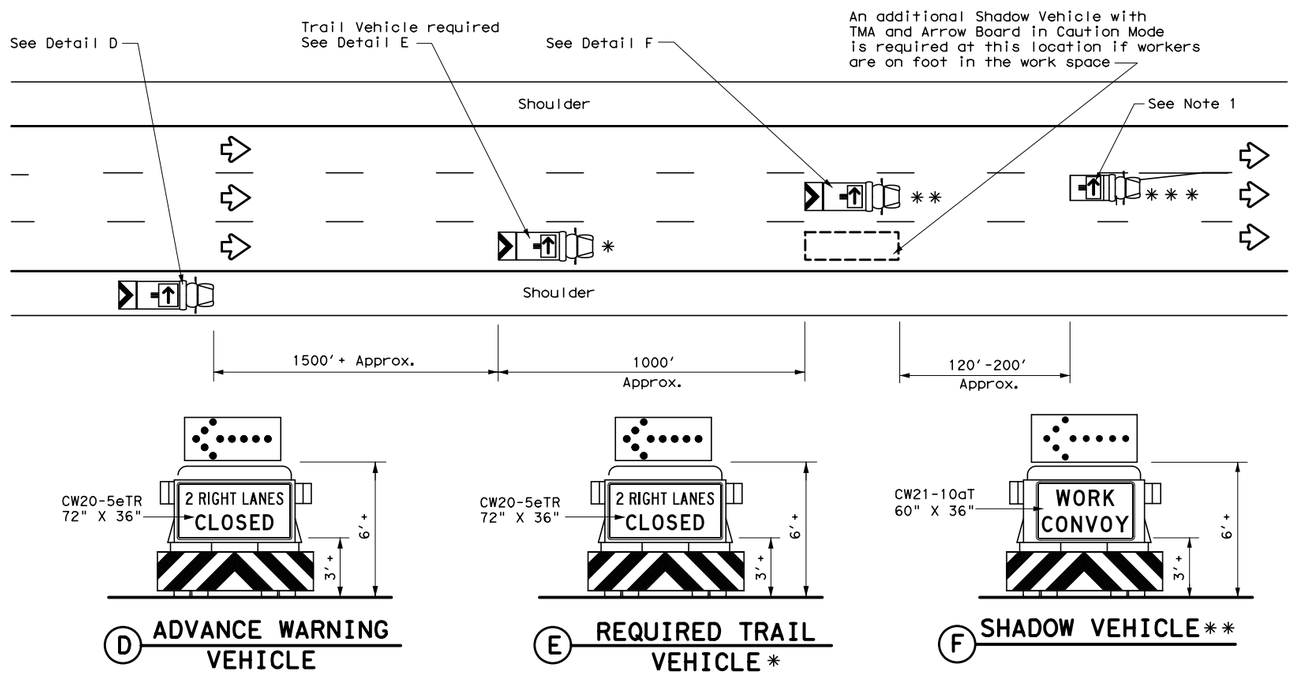


RIGHT LANE CLOSURE ON DIVIDED HIGHWAY - TCP(3-2a)



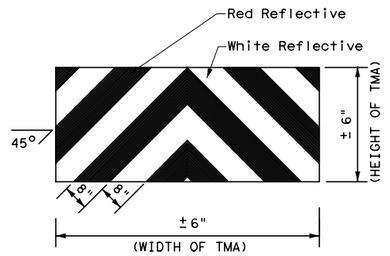
INTERIOR LANE CLOSURE ON MULTI-LANE DIVIDED HIGHWAY - TCP(3-2b)

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

1. ADVANCE WARNING, TRAIL and SHADOW vehicles shall be equipped with Type B or Type C flashing arrow boards as per the Barricade and Construction (BC) standards. Arrow boards on WORK vehicles will be optional based on the type of work being performed. The arrow boards shall be operated from inside the vehicle.
2. For TCP(3-2a) the Engineer will determine if the TRAIL VEHICLE is required based on prevailing roadway conditions, traffic volume, and sight distance restrictions. All other vehicles shown for both TCP(3-2a) and TCP(3-2b) are required.
3. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
4. The use of truck mounted attenuators (TMA) on the ADVANCE WARNING, SHADOW, and TRAIL vehicles are required.
5. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DMS 8300, Type A.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE may vary according to terrain, work activity and other factors.
9. Standard 48" X 48" diamond shaped warning signs with the same message as those shown may be used where adequate mounting space exists.
10. The signs shown should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or a truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board, must be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
12. The principles on this sheet may be used to close lanes from the left side of the roadway considering the number of lanes, shoulder width, sight distance, and ramp frequency.
13. Signs and flashing arrow board modes shall be appropriately altered when implementing left lane closures or interior closures which close the left lanes.
14. The Advance Warning Vehicle may straddle the edgeline when shoulder width makes it necessary.



STRIPING FOR TMA

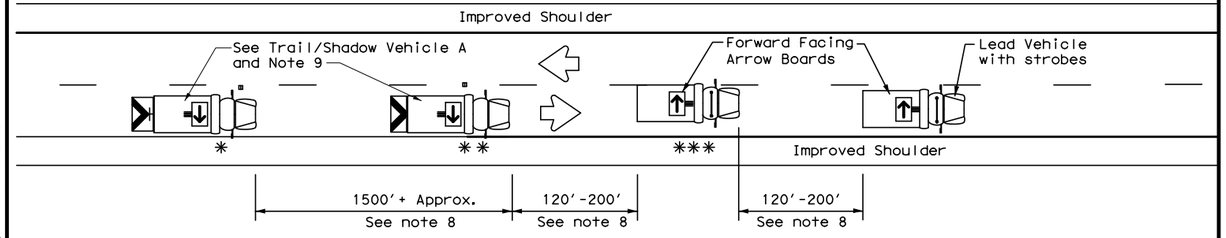
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS DIVIDED HIGHWAYS

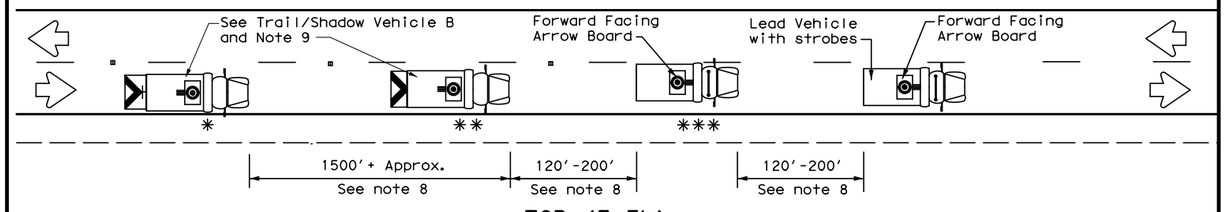
TCP(3-2)-13

FILE: tcp3-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ABL	HOWARD		39
1-97				



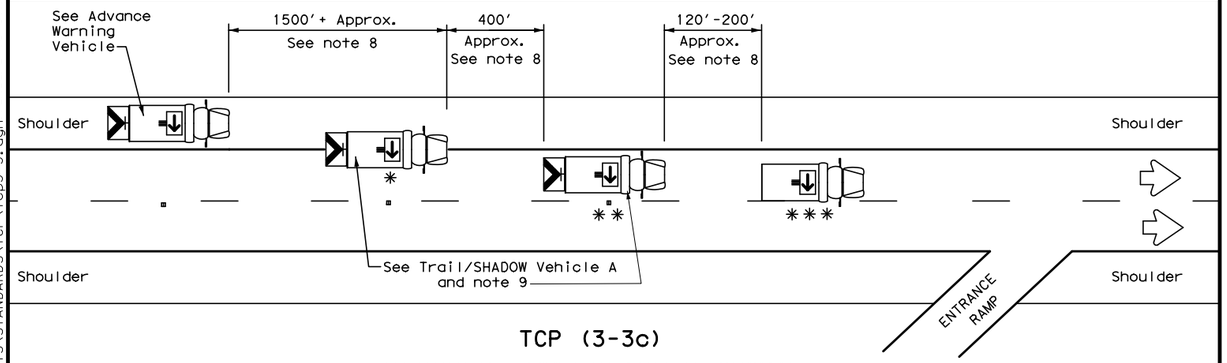
TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS (WORK ON TRAVEL LANE)



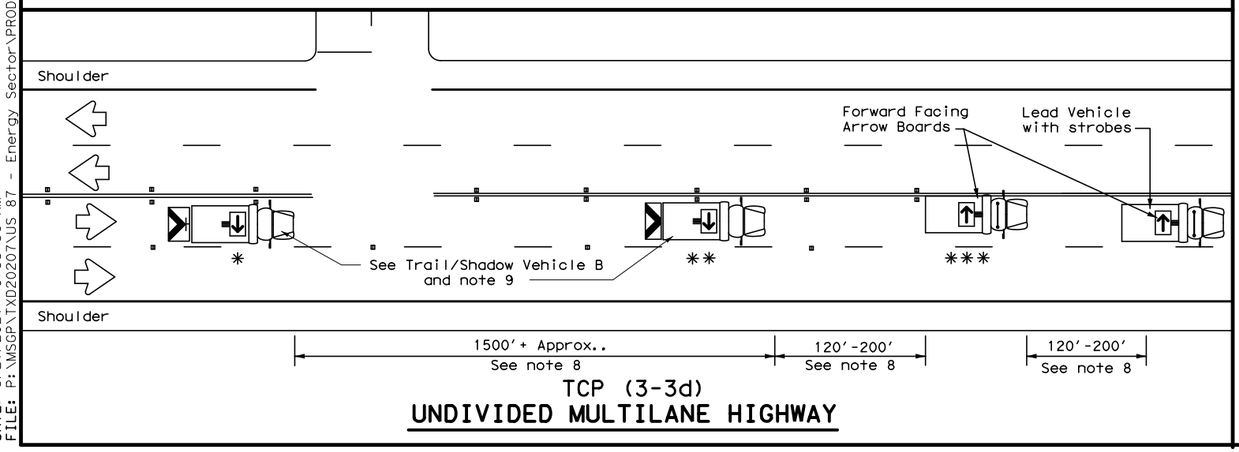
TCP (3-3b)

TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS (WORK ON TRAVEL LANE)



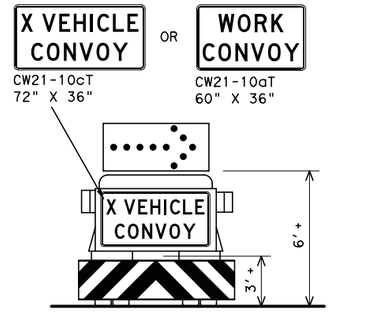
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



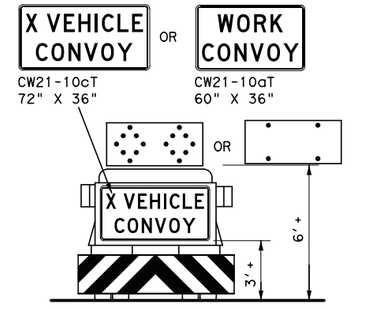
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



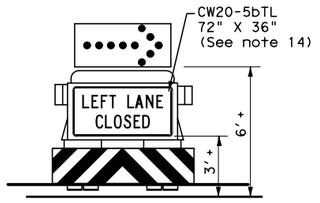
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

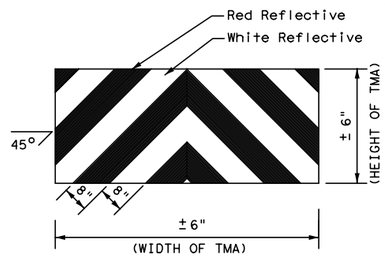


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
***	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		CAUTION (Alternating Diamond or 4 Corner Flash)

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used on two way roads the WORK vehicle must have an arrow board. For divided roadways, the arrow board on the WORK vehicle is optional based on the type of work being performed. The Engineer will determine if the LEAD vehicle and/or TRAIL vehicle are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.
2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating, or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE, ADVANCE WARNING and TRAIL VEHICLE are required.
4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.
5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.
6. Each vehicle shall have two-way radio communication capability.
7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.
8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.
9. X VEHICLE CONVOY (CW21-10cT) or WORK CONVOY (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" x 48" diamond shaped WORK CONVOY (CW21-10T) or X VEHICLE CONVOY (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The X VEHICLE CONVOY sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.
10. For divided highways with two or three lanes in one direction, the appropriate LEFT LANE CLOSED (CW20-5bTL), RIGHT LANE CLOSED (CW20-5bTR), or CENTER LANE CLOSED (CW20-5dT) sign should be used on the Advance Warning Vehicle. As an option, a portable changeable message sign (PCMS) or truck mounted changeable message sign (TMCMS) with a minimum character height of 12", and displaying the same legend may be substituted for these signs. An appropriate directional arrow display, simulating the size and legibility of the flashing arrow board may be used in the second phase of the PCMS/TMCMS message. When this is done, the arrow board will not be required on the Advance Warning Vehicle.
11. A double arrow shall not be displayed on the arrow board on the Advance Warning Vehicle.
12. For divided highways with three or four lanes in each direction, use TCP(3-2).
13. Standard diamond shape versions of the CW20-5 series signs may be used as an option if the rectangular signs shown are not available.
14. The Advance Warning Vehicle may straddle the edgeline when Shoulder width makes it necessary.
15. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a DO NOT PASS (R4-1) sign should be placed on the back of the rearmost protection vehicle.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ABL	HOWARD		40
1-97 7-14				

DATE: 5/21/2021 8:53:36 AM
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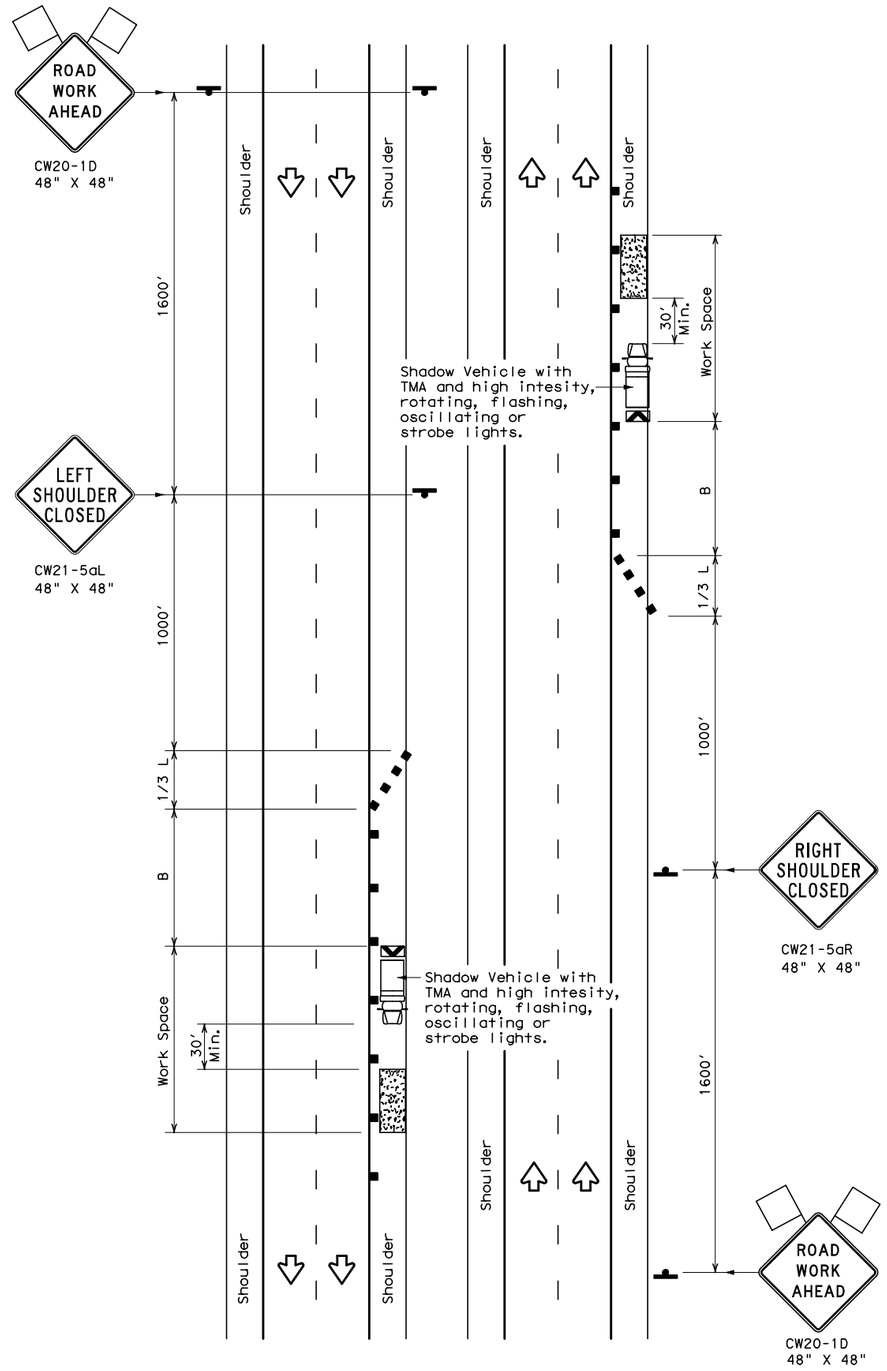
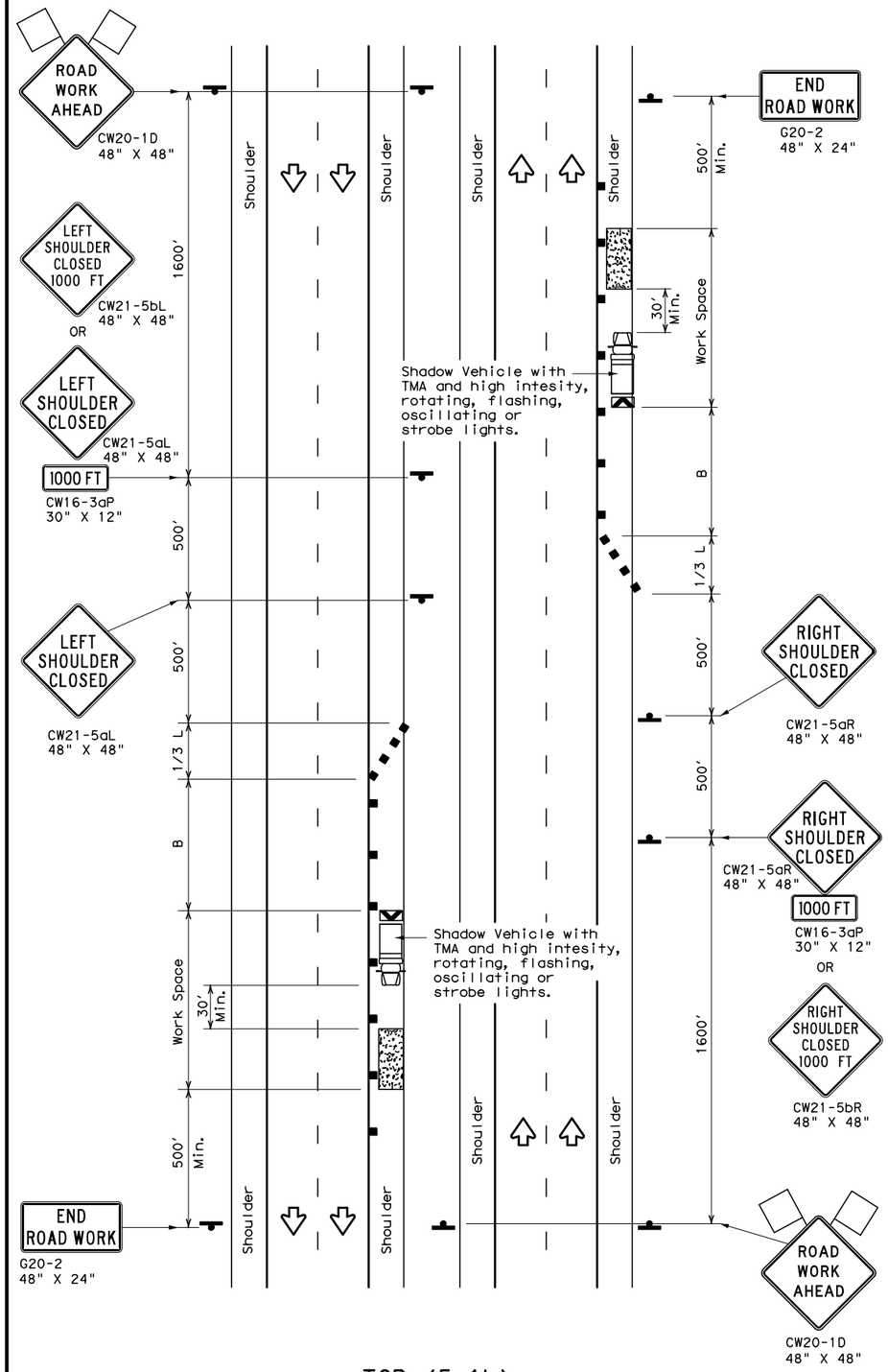


TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

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

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

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

TCP(5-1)-18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
2-18	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		41

DATE: 5/21/2021 8:53:37 AM
FILE: P:\WSGP\TXD2020\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\TCP\tcp5-1-18.dgn

GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY DURING SEPTEMBER 2020 UTILIZING THE TXDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK, AND IS CORRECTLY SHOWN HEREON.

Timothy A. Frost
Registered Professional Land Surveyor
No. 5316

TEAGUE NALL & PERKINS
5237 N. RIVERSIDE DR., SUITE 100
FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

9/25, 2020

Coordinates shown hereon refer to the Texas Coordinate System of 1983 (North Central Zone; NAD83(2011) EPOCH 2010.00) as derived locally from TxDOT's VRS Network via Real Time Kinematic (RTK) methods. An average Combination Factor of 1.00021 was used to scale grid coordinates and distances to surface. All coordinates shown are surface.

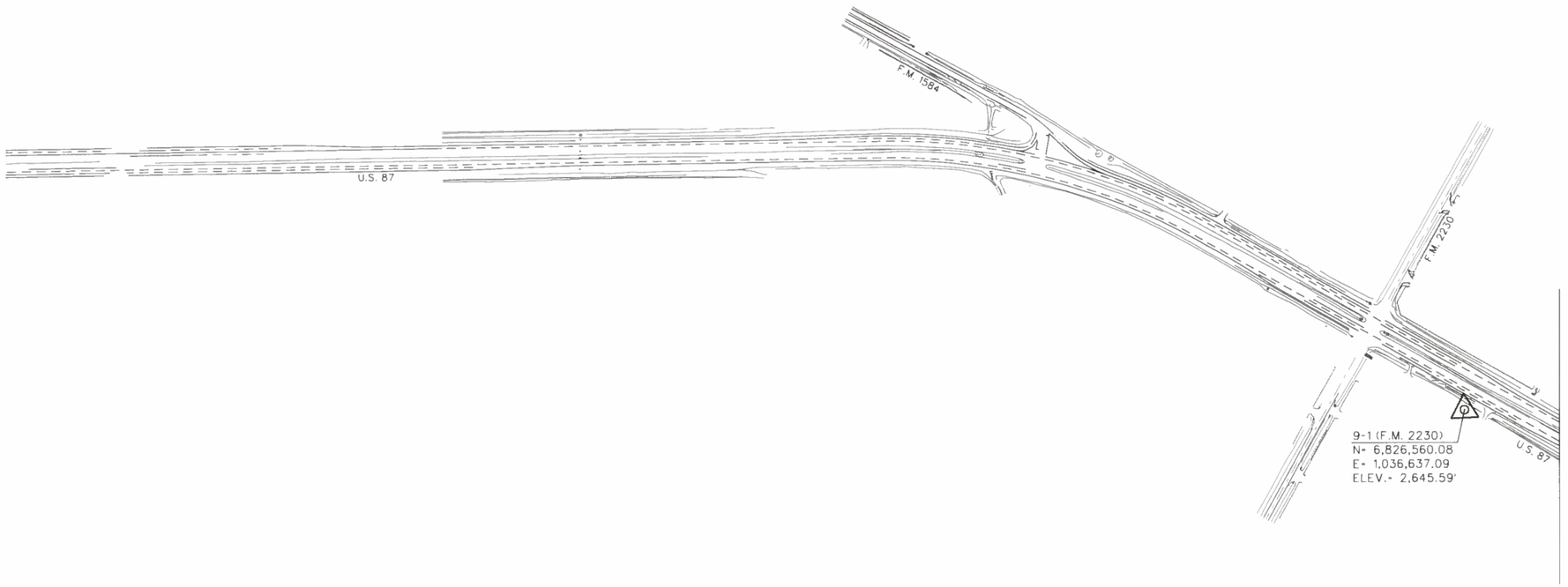
The elevations shown are NAVD88 and were derived from the above RTK observations. Orthometric heights were calculated by applying the Geoid 12B model to the ellipsoid heights.

PRIMARY CONTROL INDEX

SCALE: N/A

SHEET 1 OF 4

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	42
CHECK	CONTROL	SECTION	JOB	
	0068	08	067	



N

GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'

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FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

STATE OF TEXAS
REGISTERED
Timothy A. Frost
5316
PROFESSIONAL
LAND SURVEYOR

9/22/2020

Coordinates shown hereon refer to the Texas Coordinate System of 1983 (North Central Zone; NAD83(2011) EPOCH 2010.00) as derived locally from TxDOT's VRS Network via Real Time Kinematic (RTK) methods. An average Combination Factor of 1.00021 was used to scale grid coordinates and distances to surface. All coordinates shown are surface.

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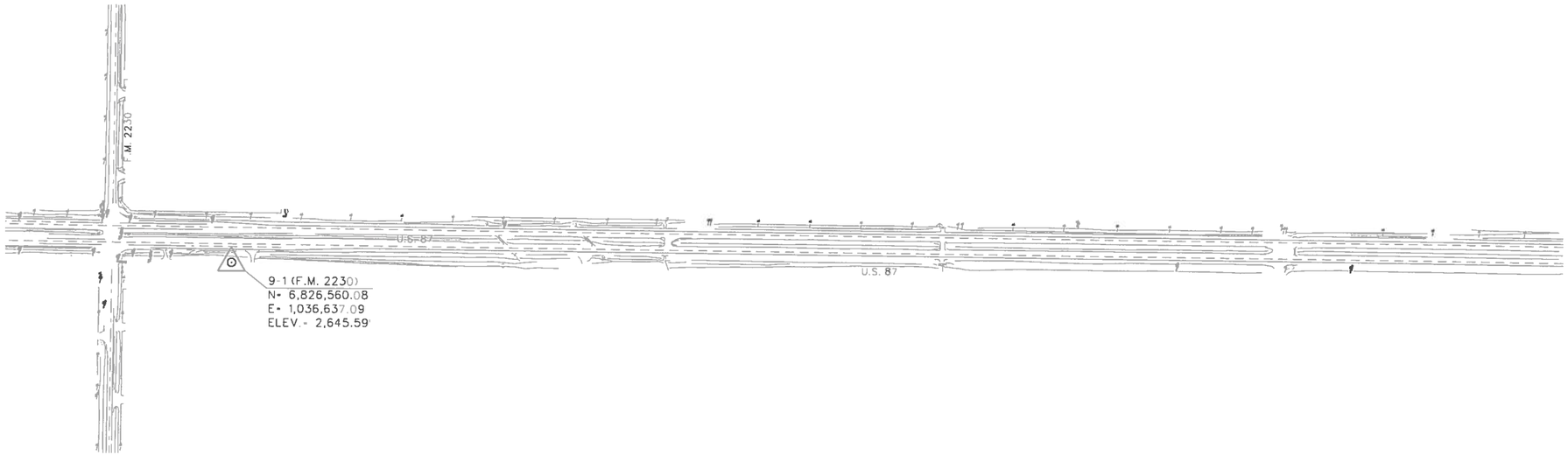
PRIMARY CONTROL INDEX

SCALE: N/A

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	43
CHECK	CONTROL	SECTION	JOB	
	0068	08	067	



N

GRAPHIC SCALE

0' 300' 600' 1200' 2400'

1" = 600'

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FORT WORTH, TEXAS 76137

TBPLS FIRM NO. 100116-01

STATE OF TEXAS
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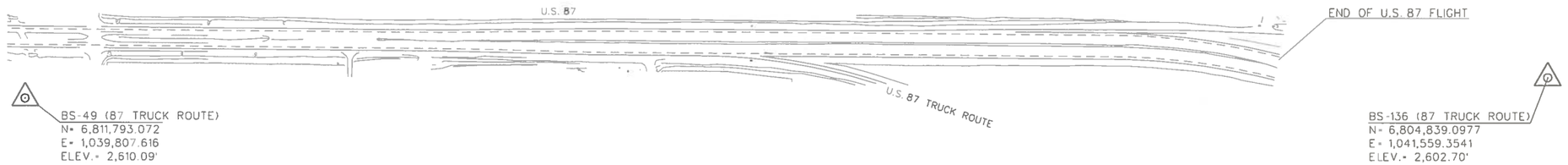
PRIMARY CONTROL INDEX

SCALE: N/A

SHEET 3 OF 4

DESIGN	FED.RD DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
GRAPHICS	6	SEE TITLE SHEET		US 87
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	44
CHECK	CONTROL	SECTION	JOB	
	0068	08	067	



GRAPHIC SCALE

0' 300' 600' 1200' 2400'

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TBPLS FIRM NO. 100116-01

STATE OF TEXAS
REGISTERED
Timothy A. Frost
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9/26/2020

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Texas Department of Transportation

PRIMARY CONTROL INDEX

SCALE: N/A

SHEET 4 OF 4

DESIGN	FED.RD DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY
GRAPHICS	6	SEE TITLE SHEET		
	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK	TEXAS	ABILENE	HOWARD	45
CHECK	CONTROL	SECTION	JOB	
	0068	08	067	

PROPOSED US 87 - HORIZONTAL ALIGNMENT

Beginning chain P_US87 description

Point 87001 N 6,807,808.3106 E 1,041,015.2337 Sta 190+00.00

Course from 87001 to 87002 N 12° 49′ 22.16" W Dist 266.9327

Point 87002 N 6,808,068.5863 E 1,040,955.9915 Sta 192+66.93

Course from 87002 to 87003 N 12° 50′ 22.16" W Dist 6,887.4048

Point 87003 N 6,814,783.7814 E 1,039,425.4688 Sta 261+54.34

Course from 87003 to 87004 N 12° 37′ 22.16" W Dist 6,248.8280

Point 87004 N 6,820,881.5739 E 1,038,059.9004 Sta 324+03.17

Course from 87004 to PC P_US871 N 12° 50′ 02.59" W Dist 7,279.8245

		Curve Data				
Curve P_US871						
P.I. Station		404+56.44	N	6,828,733.6574	E	1,036,271.0426
Delta	=	30° 13′ 03.10"	(LT)			
Degree	=	2° 00′ 00.00"				
Tangent	=	773.4498				
Length	=	1,510.8769				
Radius	=	2,864.7900				
External	=	102.5735				
Long Chord	=	1,493.4275				
Mid. Ord.	=	99.0278				
P.C. Station		396+82.99	N	6,827,979.5303	E	1,036,442.8474
P.T. Station		411+93.87	N	6,829,298.8477	E	1,035,743.0421
C.C.			N	6,827,343.1802	E	1,033,649.6270
Back	= N	12° 50′ 02.59" W				
Ahead	= N	43° 03′ 05.69" W				
Chord Bear	= N	27° 56′ 34.14" W				

Course from PT P_US871 to PC P_US872 N 43° 03′ 05.69" W Dist 16,322.2087

		Curve Data				
Curve P_US872						
P.I. Station		576+49.97	N	6,841,323.9707	E	1,024,509.1774
Delta	=	1° 20′ 19.95"	(RT)			
Degree	=	0° 30′ 00.00"				
Tangent	=	133.8935				
Length	=	267.7749				
Radius	=	11,459.1600				
External	=	0.7822				
Long Chord	=	267.7688				
Mid. Ord.	=	0.7822				
P.C. Station		575+16.08	N	6,841,226.1294	E	1,024,600.5807
P.T. Station		577+83.85	N	6,841,423.9209	E	1,024,420.0852
C.C.			N	6,849,048.7991	E	1,032,974.2409
Back	= N	43° 03′ 05.69" W				
Ahead	= N	41° 42′ 45.74" W				
Chord Bear	= N	42° 22′ 55.71" W				

Course from PT P_US872 to PC P_US873 N 41° 42′ 45.74" W Dist 12,664.7682

		Curve Data				
Curve P_US873						
P.I. Station		707+15.25	N	6,851,077.0931	E	1,015,815.5818
Delta	=	5° 19′ 43.93"	(RT)			
Degree	=	1° 00′ 00.00"				
Tangent	=	266.6358				
Length	=	532.8872				
Radius	=	5,729.5800				
External	=	6.2008				
Long Chord	=	532.6952				
Mid. Ord.	=	6.1941				
P.C. Station		704+48.62	N	6,850,878.0519	E	1,015,993.0002
P.T. Station		709+81.51	N	6,851,291.7512	E	1,015,657.4156
C.C.			N	6,854,690.4910	E	1,020,270.0781
Back	= N	41° 42′ 45.74" W				
Ahead	= N	36° 23′ 01.81" W				
Chord Bear	= N	39° 02′ 53.77" W				

Course from PT P_US873 to 87005 N 36° 23′ 01.81" W Dist 6,183.6429

Point 87005 N 6,856,269.9621 E 1,011,989.3295 Sta 771+65.15

Course from 87005 to PC P_US874 N 36° 22′ 48.11" W Dist 1,230.4098

PROPOSED US 87 (CONT.)- HORIZIONTAL ALIGNMENT

		Curve Data				
Curve P_US874						
P.I. Station		785+94.25	N	6,857,420.5357	E	1,011,141.6723
Delta	=	3° 58′ 20.36"	(LT)			
Degree	=	1° 00′ 00.00"				
Tangent	=	198.6957				
Length	=	397.2323				
Radius	=	5,729.5780				
External	=	3.4442				
Long Chord	=	397.1527				
Mid. Ord.	=	3.4422				
P.C. Station		783+95.56	N	6,857,260.5657	E	1,011,259.5263
P.T. Station		787+92.79	N	6,857,571.9572	E	1,011,013.0195
C.C.			N	6,853,862.1335	E	1,006,646.6398
Back	= N	36° 22′ 48.11" W				
Ahead	= N	40° 21′ 08.47" W				
Chord Bear	= N	38° 21′ 58.29" W				

Course from PT P_US874 to PC P_US875 N 40° 21′ 08.47" W Dist 20,195.7296

		Curve Data				
Curve P_US875						
P.I. Station		992+95.25	N	6,873,196.4139	E	997,737.9532
Delta	=	6° 07′ 43.82"	(LT)			
Degree	=	1° 00′ 00.00"				
Tangent	=	306.7344				
Length	=	612.8838				
Radius	=	5,729.5780				
External	=	8.2047				
Long Chord	=	612.5916				
Mid. Ord.	=	8.1929				
P.C. Station		989+88.52	N	6,872,962.6587	E	997,936.5596
P.T. Station		996+01.40	N	6,873,407.6290	E	997,515.5253
C.C.			N	6,869,252.8349	E	993,570.1799
Back	= N	40° 21′ 08.47" W				
Ahead	= N	46° 28′ 52.29" W				
Chord Bear	= N	43° 25′ 00.38" W				

Course from PT P_US875 to PC P_US876 N 46° 28′ 52.29" W Dist 10,282.4850

		Curve Data				
Curve P_US876						
P.I. Station		1101+25.70	N	6,880,654.5842	E	989,883.8471
Delta	=	4° 50′ 00.29"	(RT)			
Degree	=	1° 00′ 00.00"				
Tangent	=	241.8141				
Length	=	483.3413				
Radius	=	5,729.5780				
External	=	5.1006				
Long Chord	=	483.1980				
Mid. Ord.	=	5.0960				
P.C. Station		1098+83.89	N	6,880,488.0728	E	990,059.1982
P.T. Station		1103+67.23	N	6,880,835.2783	E	989,723.1497
C.C.			N	6,884,642.8668	E	994,004.5436
Back	= N	46° 28′ 52.29" W				
Ahead	= N	41° 38′ 52.00" W				
Chord Bear	= N	44° 03′ 52.14" W				

Course from PT P_US876 to 87006 N 41° 38′ 52.00" W Dist 6,047.5883

Point 87006 N 6,885,354.3036 E 985,704.2276 Sta 1164+14.82

Ending chain P_US87 description

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

HORIZONTAL ALIGNMENT DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	46
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\GAD01.dgn
DATE: 5/21/2021 8:53:41 AM jphilipp

NB US 87 VERTICAL ALIGNMENT DATA					
VPI STATION	VPI ELEV	G1	G2	K	LENGTH
213+50.00	2,611.84	-	1.4059	-	-
214+00.00	2,612.55	1.4059	0.5682	-	-
214+55.00	2,612.86	0.5682	0.1258	-	-
215+55.00	2,612.98	0.1258	0.3022	-	-
220+15.00	2,614.37	0.3022	-0.2126	-	-
224+60.00	2,613.43	-0.2126	0.0384	-	-
225+00.00	2,613.44	0.0384	-0.2319	-	-
226+05.00	2,613.20	-0.2319	-0.5151	-	-
226+55.00	2,612.94	-0.5151	0.2098	-	-
227+35.00	2,613.11	0.2098	-0.5501	-	-
228+00.00	2,612.75	-0.5501	0.3781	-	-
228+55.00	2,612.96	0.3781	-0.1106	-	-
229+50.00	2,612.86	-0.1106	0.3699	-	-
230+05.00	2,613.06	0.3699	-0.4623	-	-
230+55.00	2,612.83	-0.4623	0.1877	-	-
231+50.00	2,613.01	0.1877	-0.0196	-	-
233+50.00	2,612.97	-0.0196	-0.4354	-	-
234+05.00	2,612.73	-0.4354	0.2757	-	-
235+05.00	2,613.00	0.2757	-0.1332	-	-
236+05.00	2,612.87	-0.1332	0.1064	-	-
237+05.00	2,612.98	0.1064	-0.0005	-	-
241+05.00	2,612.97	-0.0005	-0.4356	-	-
241+55.00	2,612.76	-0.4356	0.1185	-	-
244+55.00	2,613.11	0.1185	-0.0079	-	-
246+05.00	2,613.10	-0.0079	0.4574	-	-
248+00.00	2,613.99	0.4574	0.6454	-	-
253+00.00	2,617.22	0.6454	0.4831	-	-
257+00.00	2,619.15	0.4831	0.3651	-	-
259+55.00	2,620.08	0.3651	0.2451	-	-
264+05.00	2,621.19	0.2451	-0.2282	1057	500
268+05.00	2,620.27	-0.2282	-0.0654	-	-

NB US 87 VERTICAL ALIGNMENT DATA CONT.					
VPI STATION	VPI ELEV	G1	G2	K	LENGTH
271+00.00	2,620.08	-0.0654	-0.3522	-	-
272+00.00	2,619.73	-0.3522	0.1832	-	-
272+80.00	2,619.87	0.1832	-0.1623	-	-
278+00.00	2,619.03	-0.1623	0.0215	-	-
283+75.00	2,619.15	0.0215	0.1695	-	-
285+75.00	2,619.49	0.1695	0.0383	-	-
288+25.00	2,619.59	0.0383	0.1827	-	-
291+75.00	2,620.23	0.1827	0.1292	-	-
305+75.00	2,622.04	0.1292	-0.1454	-	-
306+75.00	2,621.89	-0.1454	0.1709	-	-
308+40.00	2,622.17	0.1709	0.2631	-	-
310+85.00	2,622.82	0.2631	0.465	-	-
323+50.00	2,628.70	0.465	0.5713	-	-
328+50.00	2,631.56	0.5713	-0.0831	1223	800
345+25.00	2,630.16	-0.0831	0.2365	-	-
350+80.00	2,631.48	0.2365	0.0735	-	-
352+20.00	2,631.58	0.0735	0.2411	-	-
362+25.00	2,634.00	0.2411	0.1522	-	-
366+80.00	2,634.70	0.1522	0.2232	-	-
375+85.00	2,636.72	0.2232	0.3228	-	-
378+80.00	2,637.67	0.3228	0.6212	-	-
384+00.00	2,640.90	0.6212	1.2149	842	500
386+50.00	2,643.94	1.2149	1.2149	-	-
386+80.00	2,644.30	1.2149	1.3396	-	-
389+80.00	2,648.32	1.3396	1.5356	-	-
400+55.00	2,664.83	1.5356	0.0371	667	1000
413+85.00	2,665.32	0.0371	-0.1915	-	-
414+85.00	2,665.13	-0.1915	0.1158	-	-
418+30.00	2,665.53	0.1158	-0.0887	-	-
419+60.00	2,665.41	-0.0887	-0.2329	-	-
420+10.00	2,665.30	-0.2329	-	-	-

STATE OF TEXAS
JUSTIN K. BAKER
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LICENSED
PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

NORTHBOUND VERTICAL ALIGNMENT DATA

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	47
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	08	067	
JKB				

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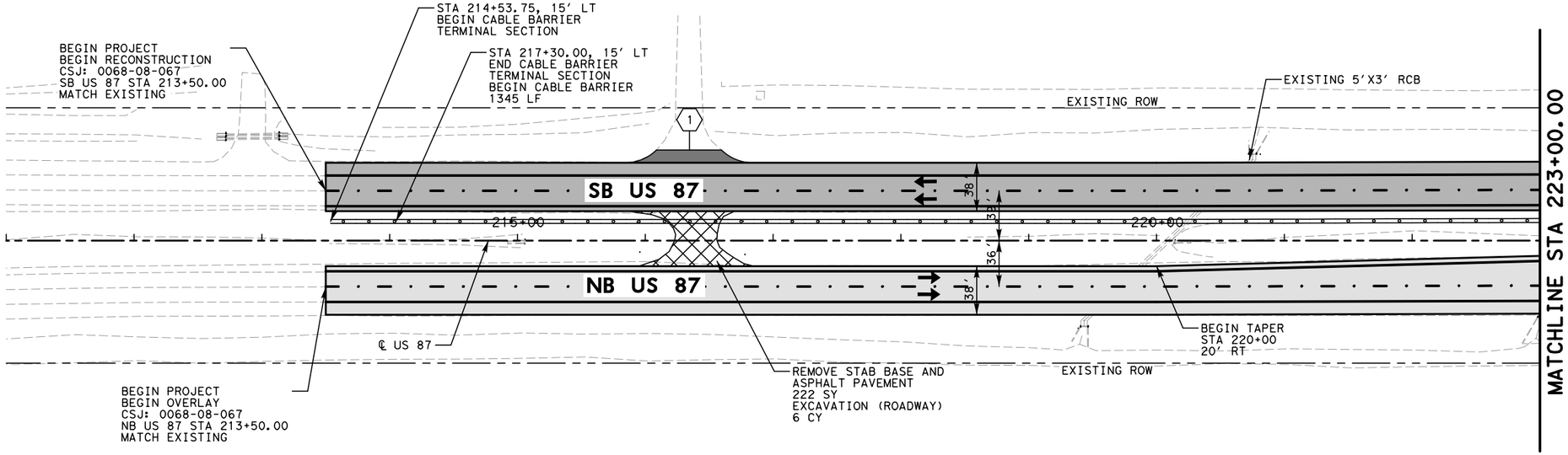

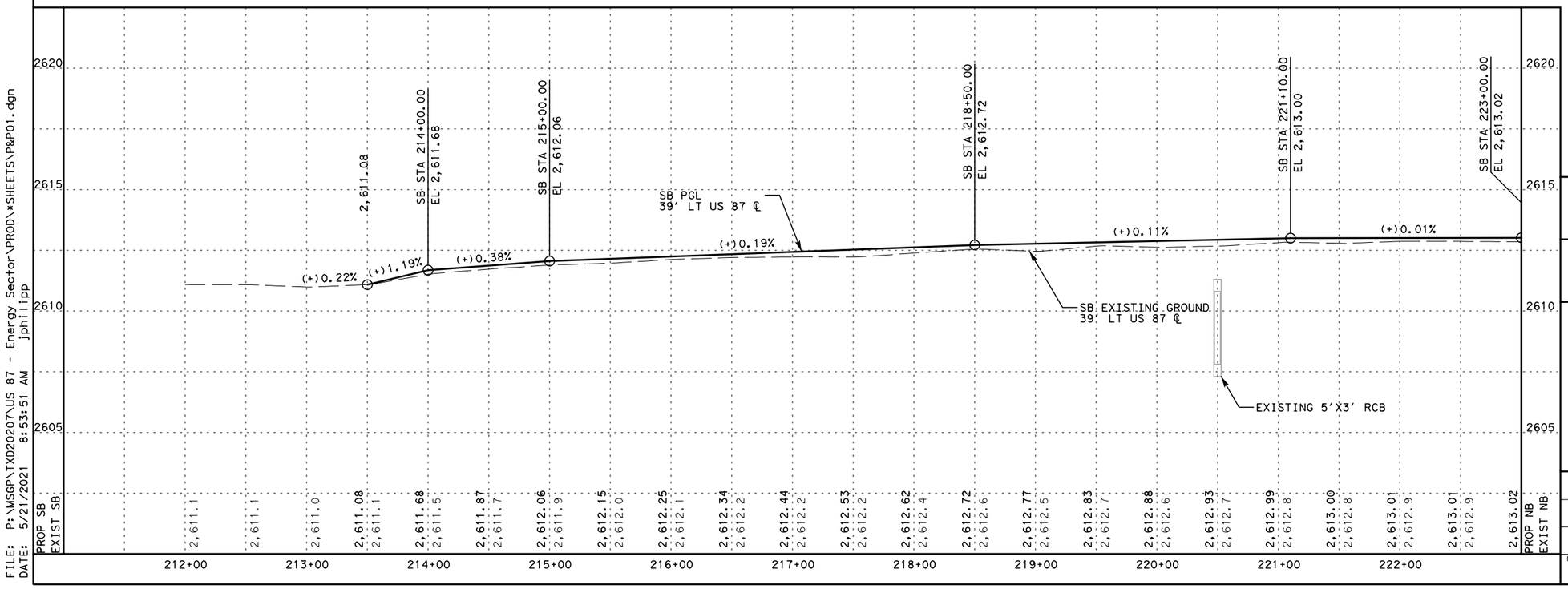

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DATE: 5/21/2021 8:53:51 AM jphillpp

50 25 0 50 100
SCALE: 1" = 100'

2.5 1.25 0 2.5 5
SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

1. SEE ROADWAY DETAILS FOR ADDITIONAL DRIVEWAY AND SIDESTREET INFORMATION.
2. CROSSOVERS WILL BE INCLUDED IN THE SMA OVERLAY QUANTITY.
3. THE CONTRACTOR SHALL LOCATE ANY UTILITIES THAT CROSS THE CABLE BARRIER.
4. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.

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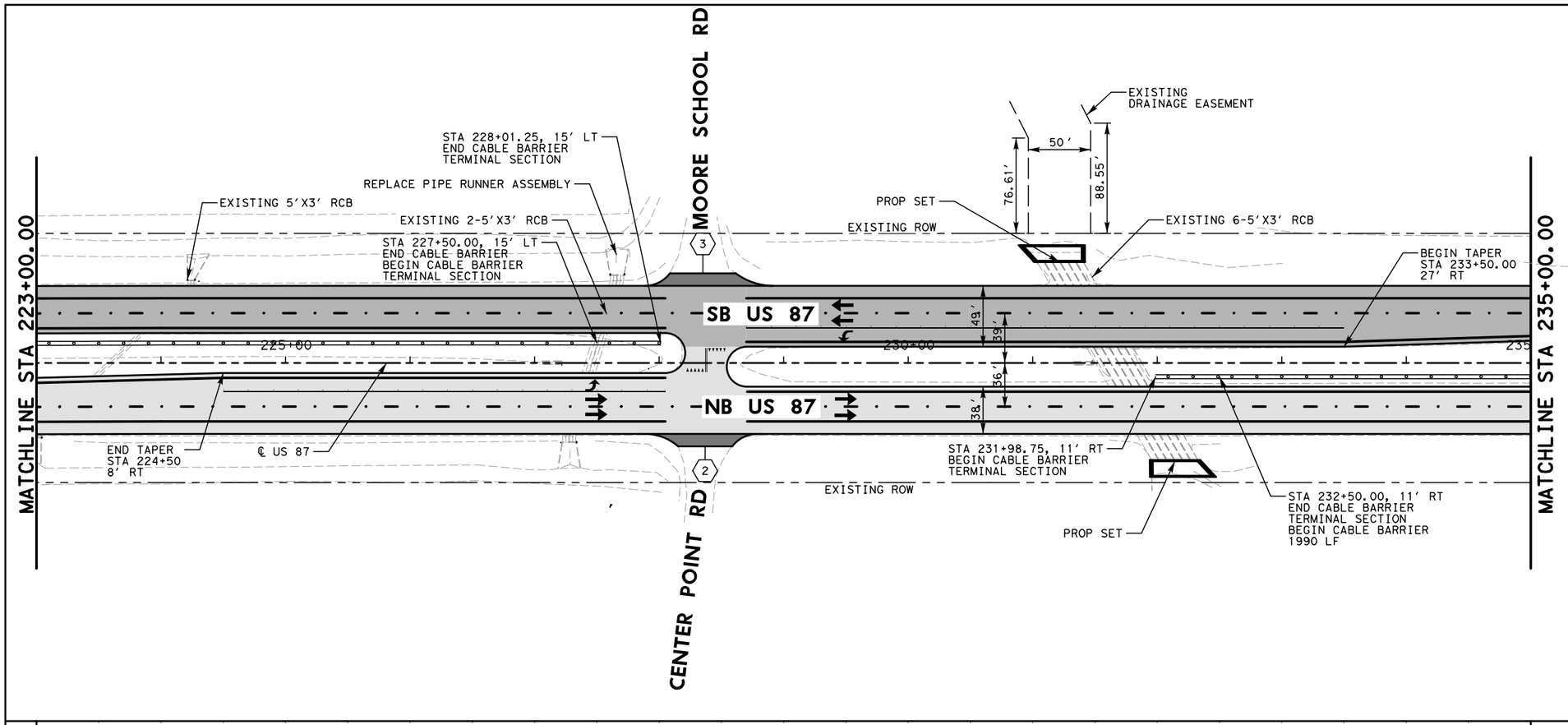
US 87

PLAN AND PROFILE LAYOUT

(SHEET 1 OF 18)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	48
AR				
GRPH CHECK	0068	08	067	
JKB				



50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

1. SEE ROADWAY DETAILS FOR ADDITIONAL DRIVEWAY AND SIDESTREET INFORMATION.
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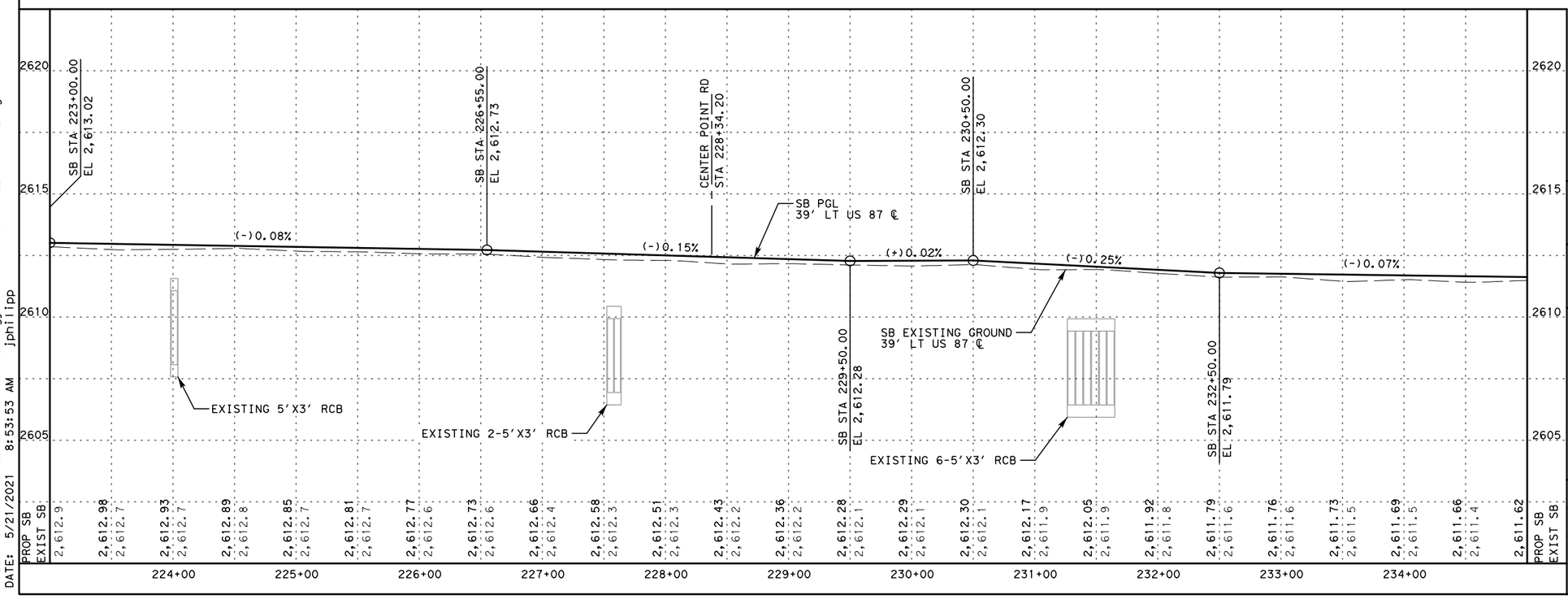

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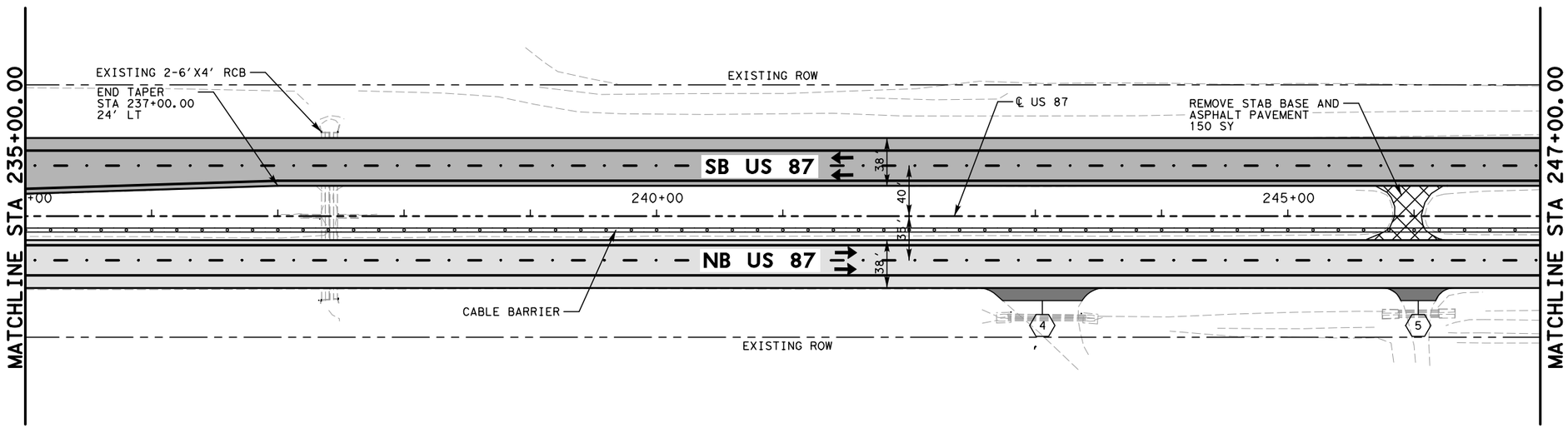
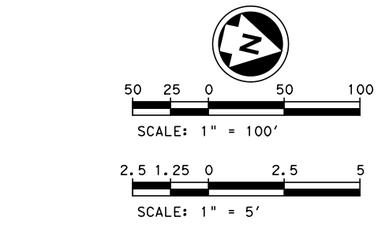
US 87

PLAN AND PROFILE LAYOUT

(SHEET 2 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	49
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				





LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

1. SEE ROADWAY DETAILS FOR ADDITIONAL DRIVEWAY AND SIDESTREET INFORMATION.
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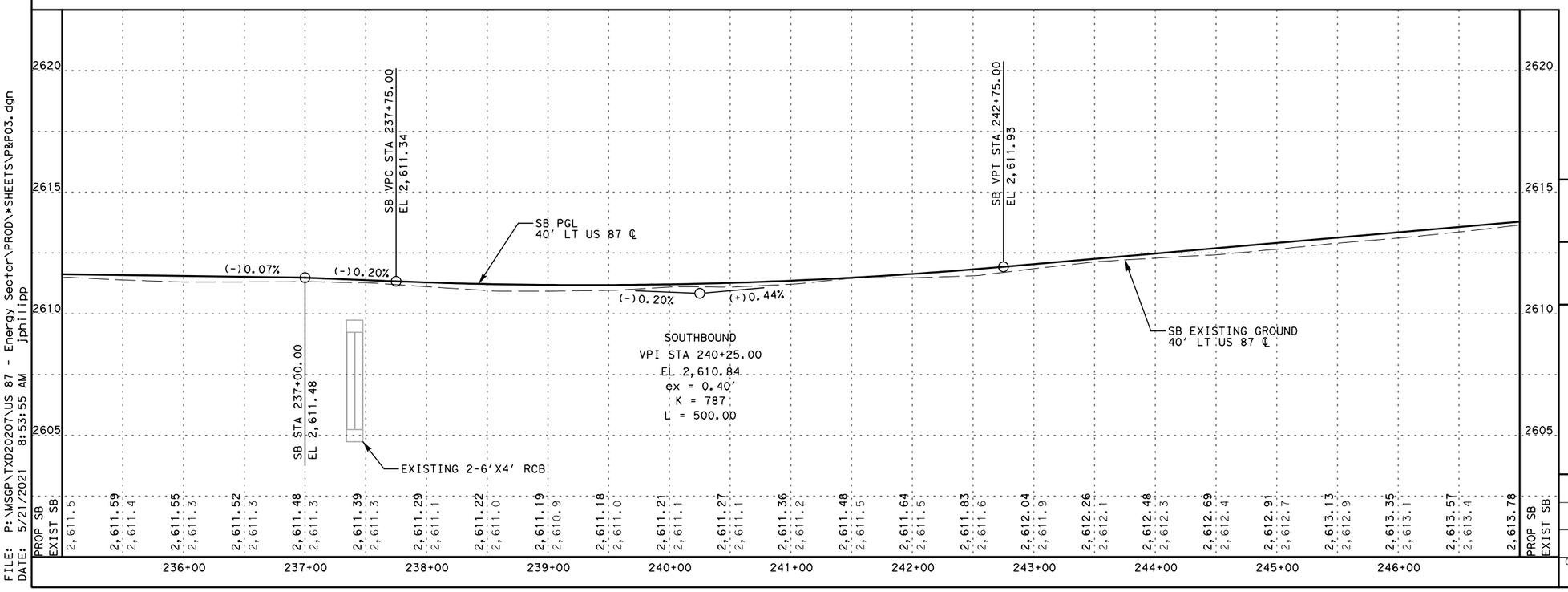
4. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.



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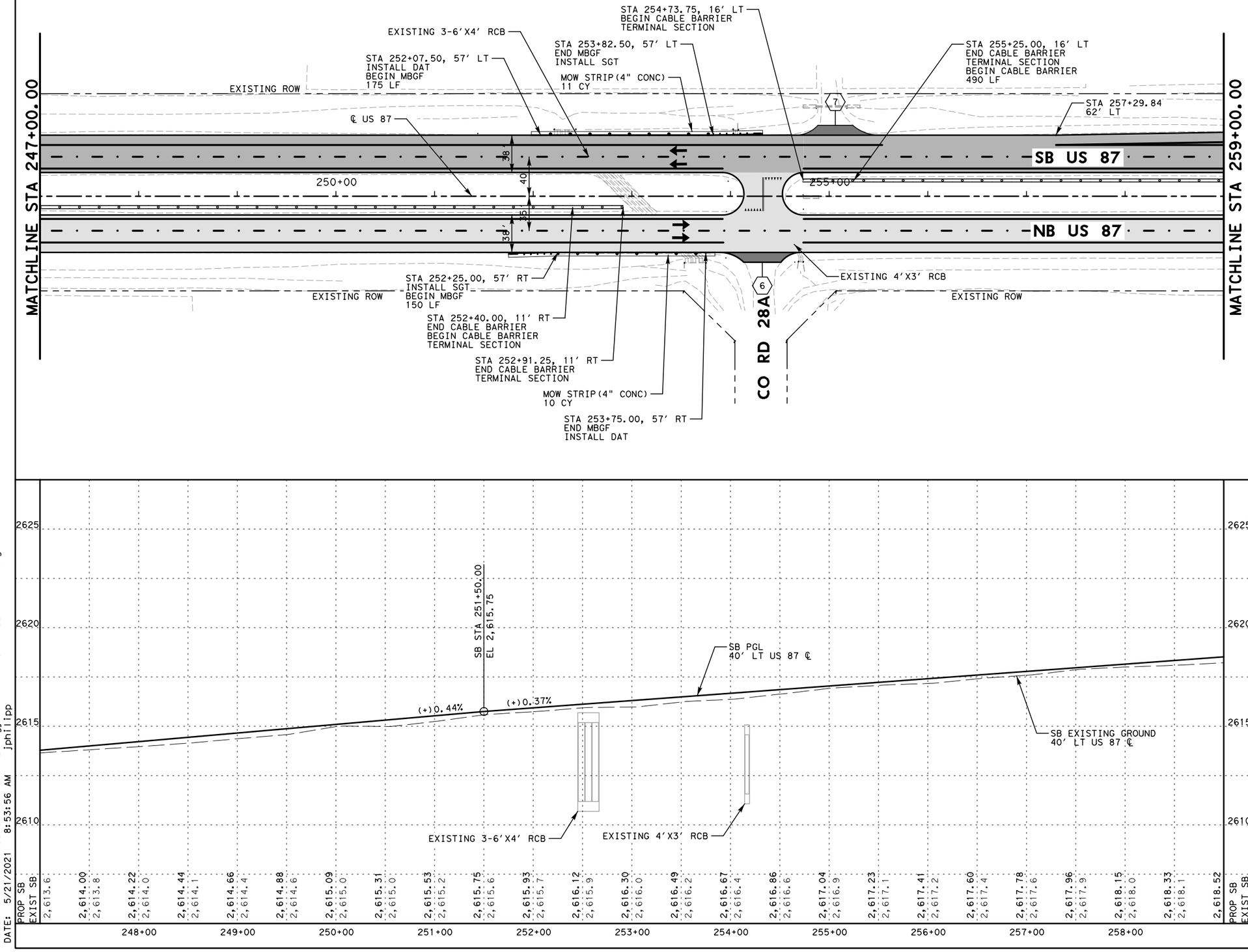
US 87

PLAN AND PROFILE LAYOUT

(SHEET 3 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	50
AR				
GRPH CHECK	0068	08	067	
JKB				



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50 25 0 50 100
SCALE: 1" = 100'

2.5 1.25 0 2.5 5
SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

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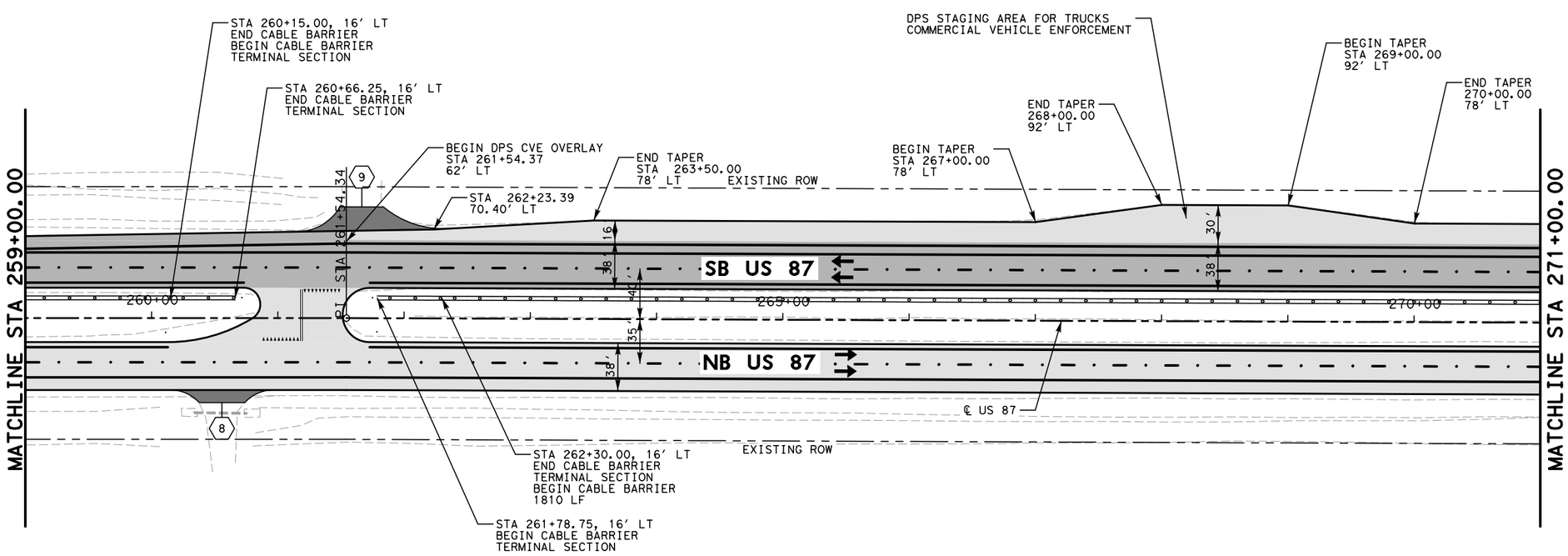
PLAN AND PROFILE LAYOUT

(SHEET 4 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	51
GRPH CHECK				
JKB				



50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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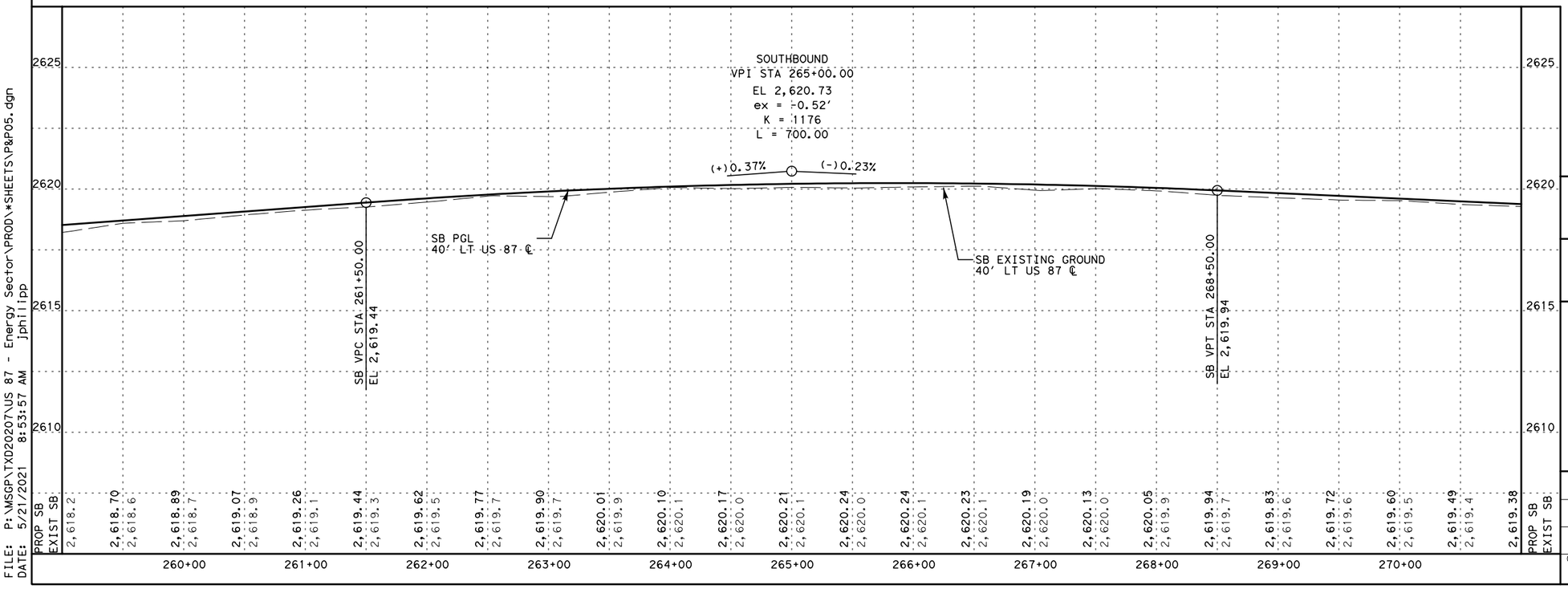

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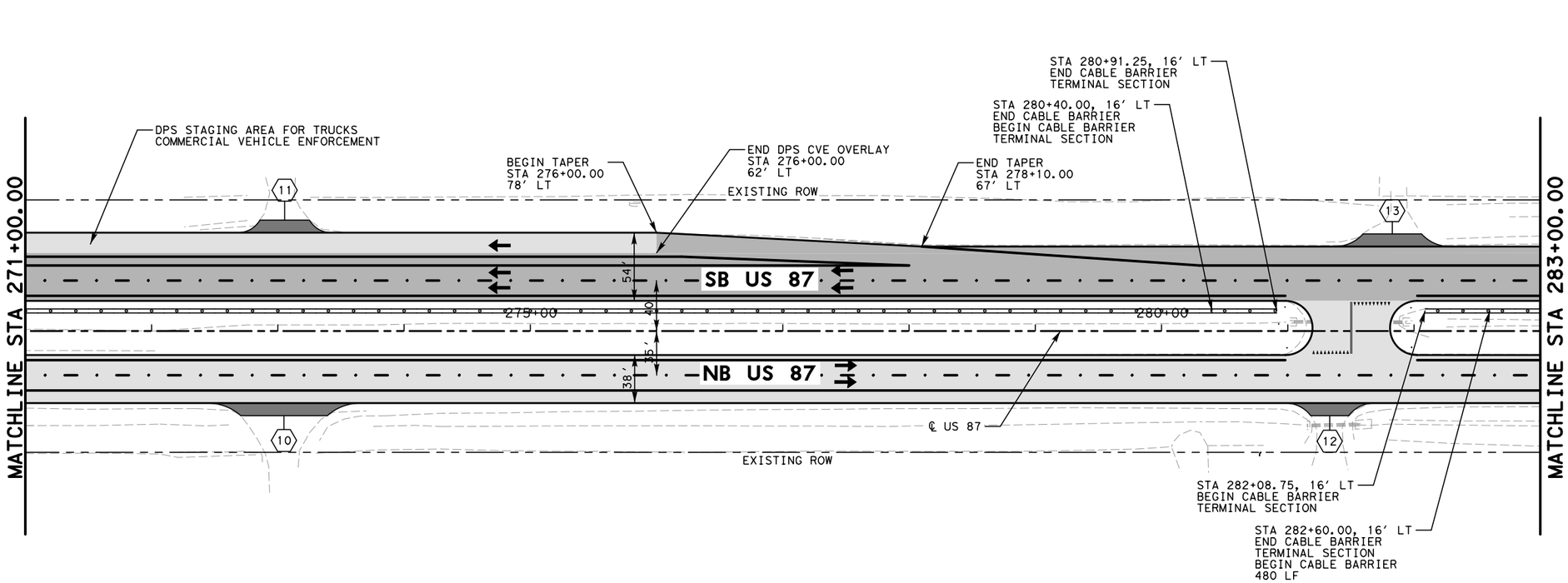
PLAN AND PROFILE LAYOUT

(SHEET 5 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	52
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				



SCALE: 1" = 100'

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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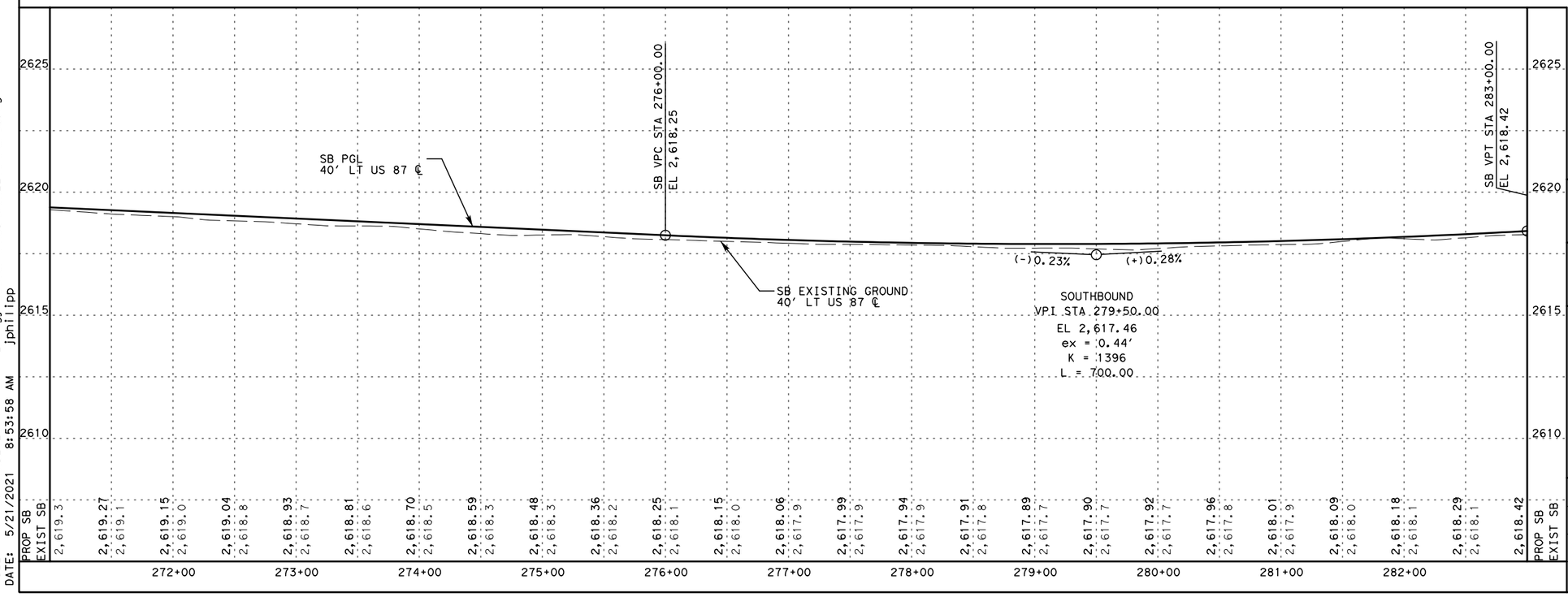

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Texas Department of Transportation

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PLAN AND PROFILE LAYOUT

(SHEET 6 OF 18)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	53
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

JUSTIN K. BAKER
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STATE OF TEXAS
5/21/2021

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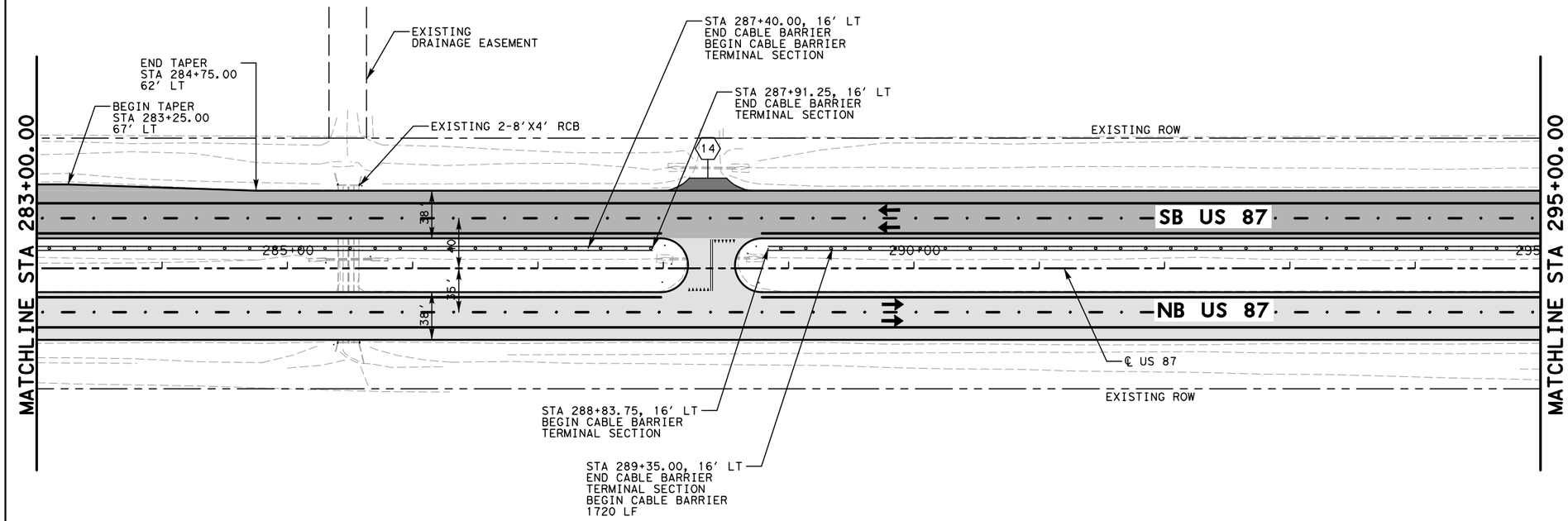

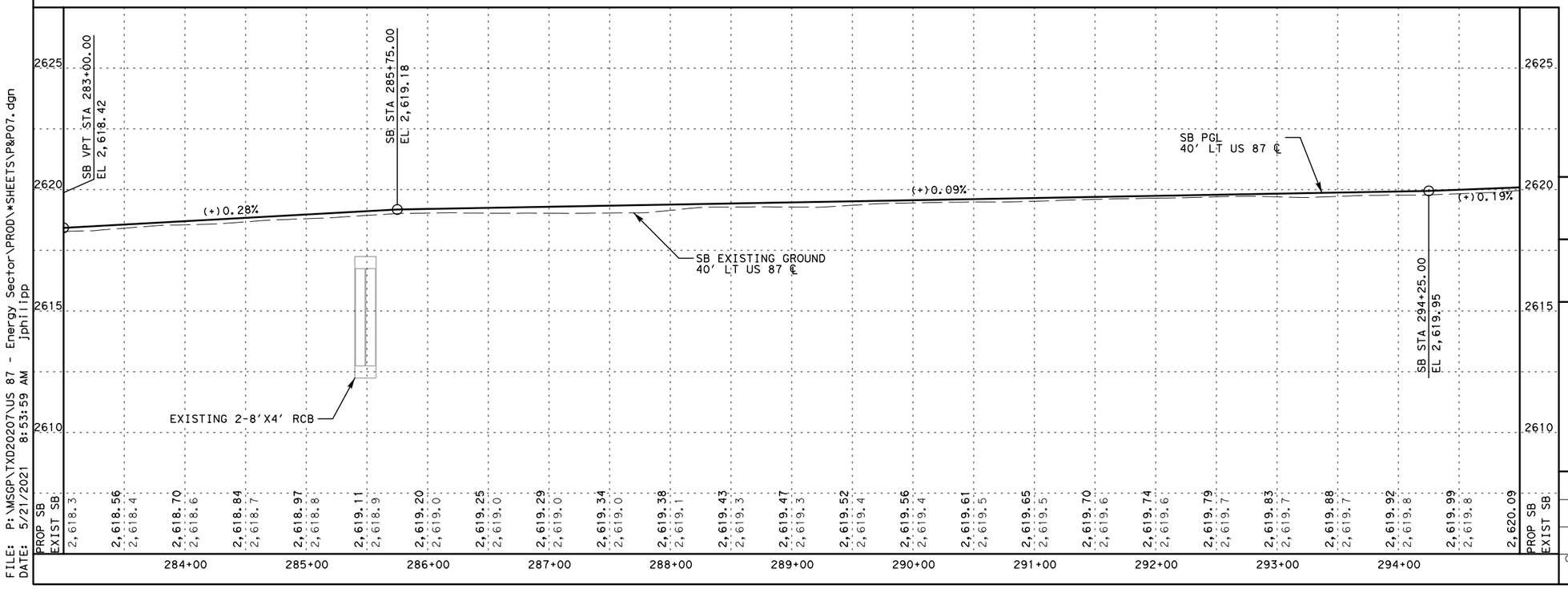

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SCALE: 1" = 100'

2.5 1.25 0 2.5 5
SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
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NOTES

1. SEE ROADWAY DETAILS FOR ADDITIONAL DRIVEWAY AND SIDESTREET INFORMATION.
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STATE OF TEXAS
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5/21/2021

FIRM REGISTRATION NO. F-230

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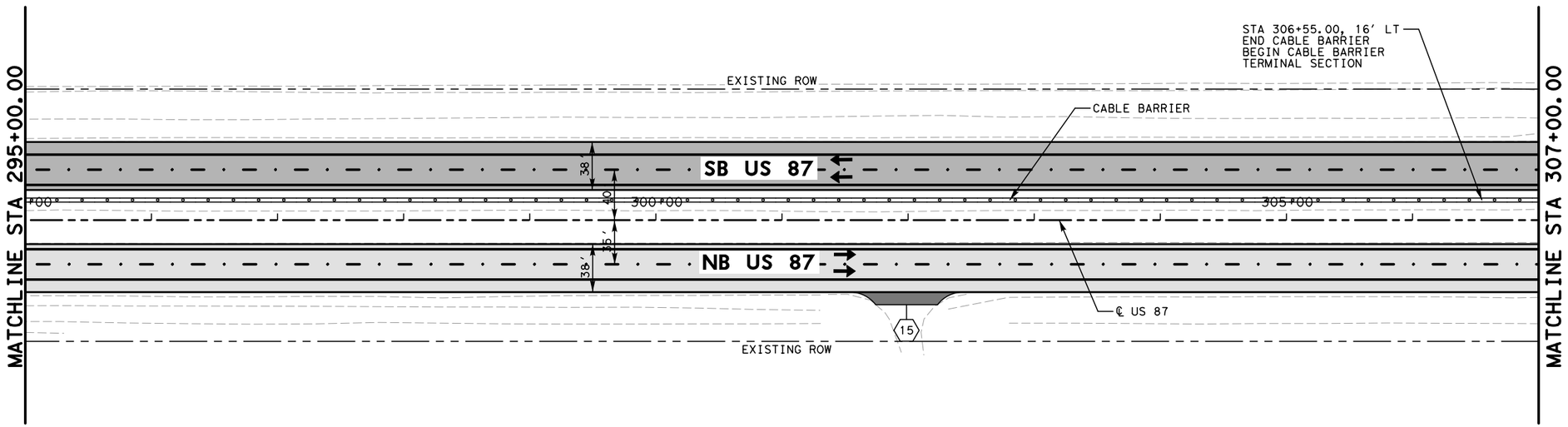
Texas Department of Transportation

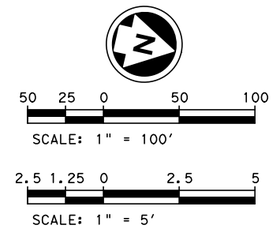
US 87

PLAN AND PROFILE LAYOUT

(SHEET 7 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	54
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				





LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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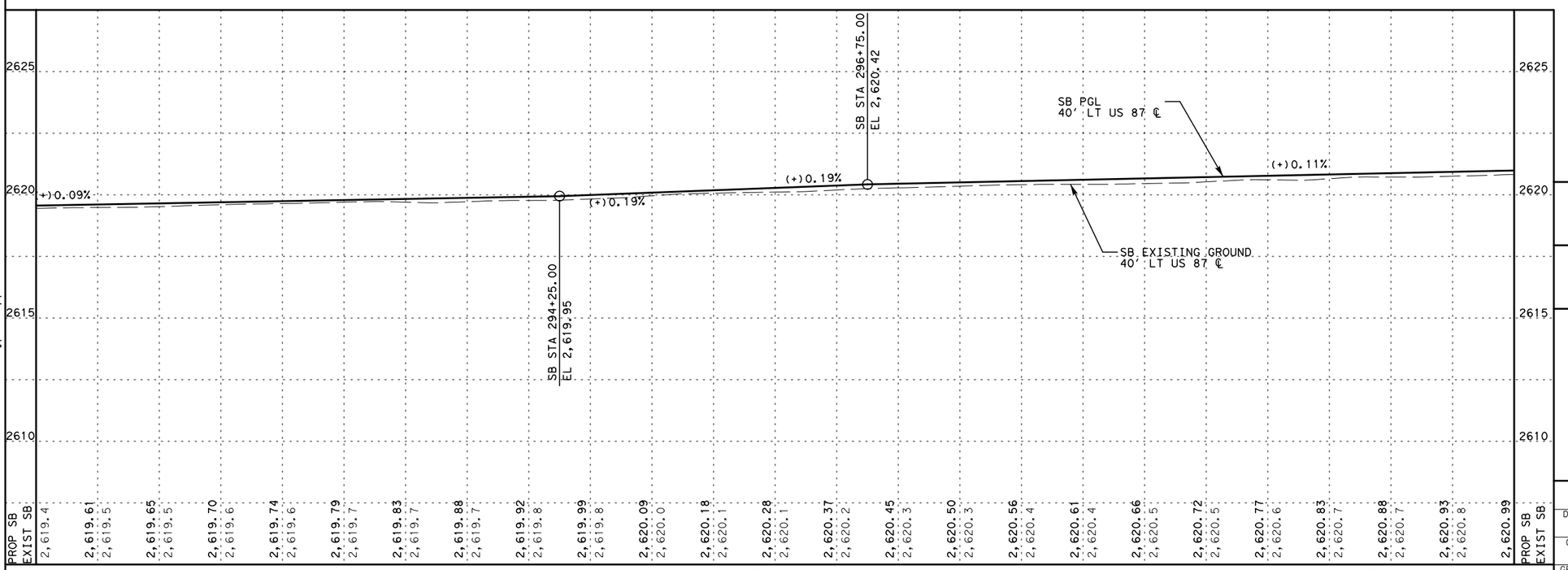

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PLAN AND PROFILE LAYOUT

(SHEET 8 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	55
AR	0068	08	067	
GRPH CHECK				
JKB				

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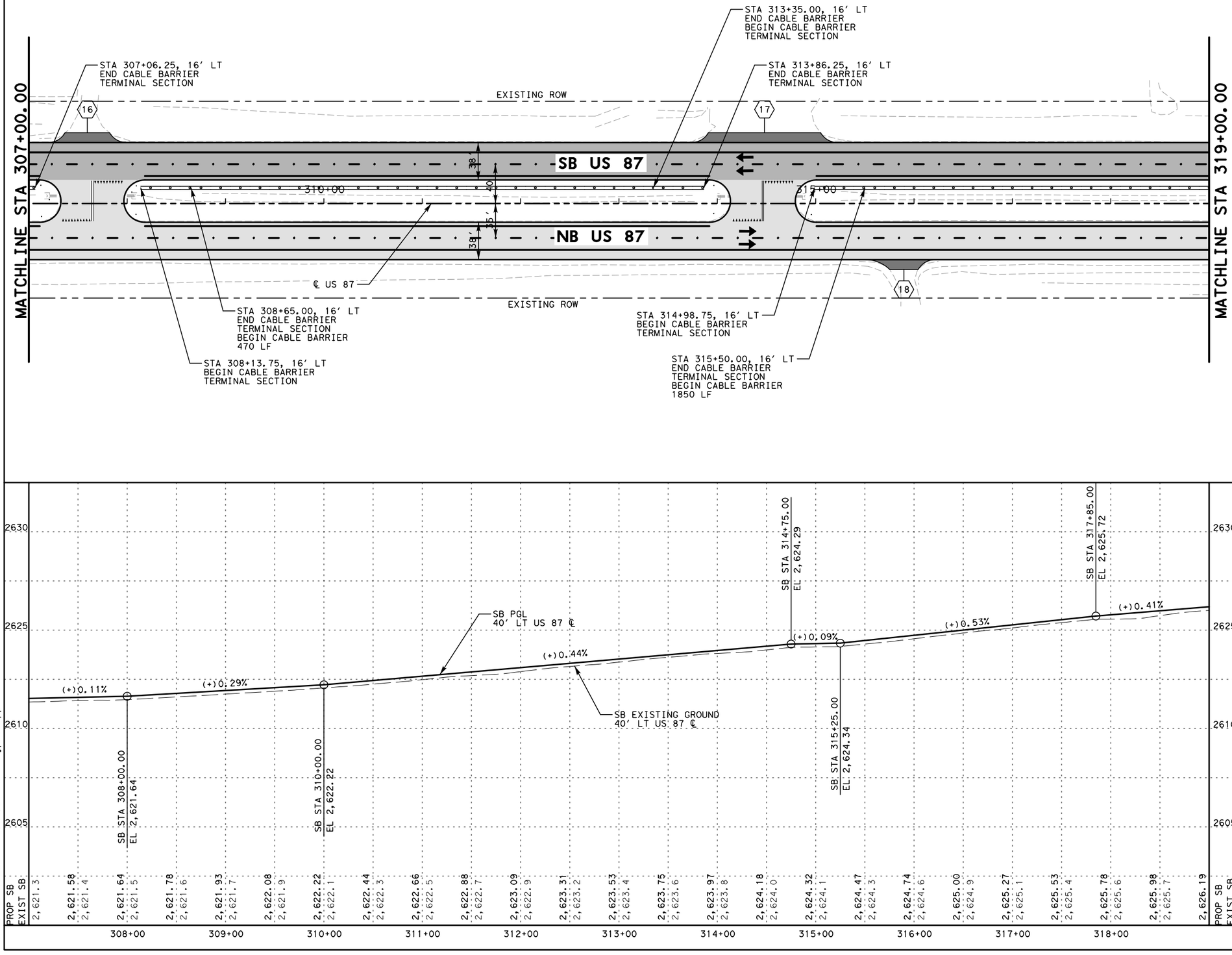

50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

1. SEE ROADWAY DETAILS FOR ADDITIONAL DRIVEWAY AND SIDESTREET INFORMATION.
2. CROSSOVERS WILL BE INCLUDED IN THE SMA OVERLAY QUANTITY.
3. THE CONTRACTOR SHALL LOCATE ANY UTILITIES THAT CROSS THE CABLE BARRIER.
4. THE CONTRACTOR SHALL PLACE CABLE BARRIER FOOTINGS TO AVOID ANY OBSTRUCTIONS INCLUDING UTILITIES, CULVERTS, ETC.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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US 87

PLAN AND PROFILE LAYOUT

(SHEET 9 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	56
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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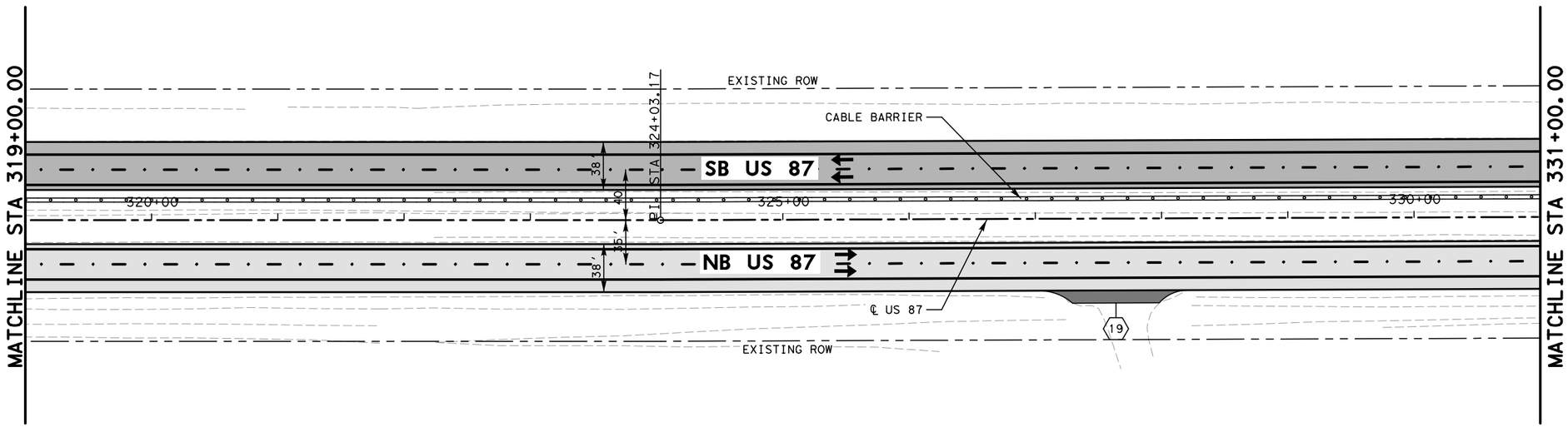

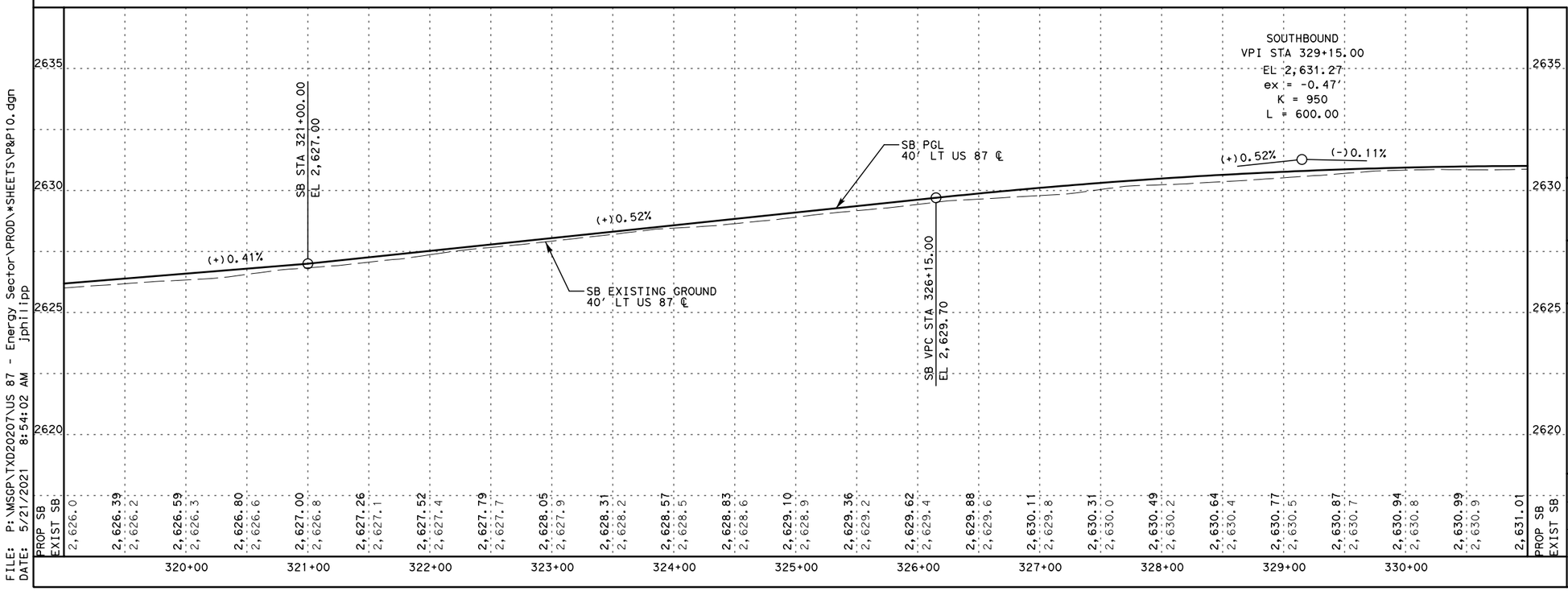

50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

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US 87

PLAN AND PROFILE LAYOUT

(SHEET 10 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	57
AR				
GRPH CHECK	0068	08	067	
JKB				

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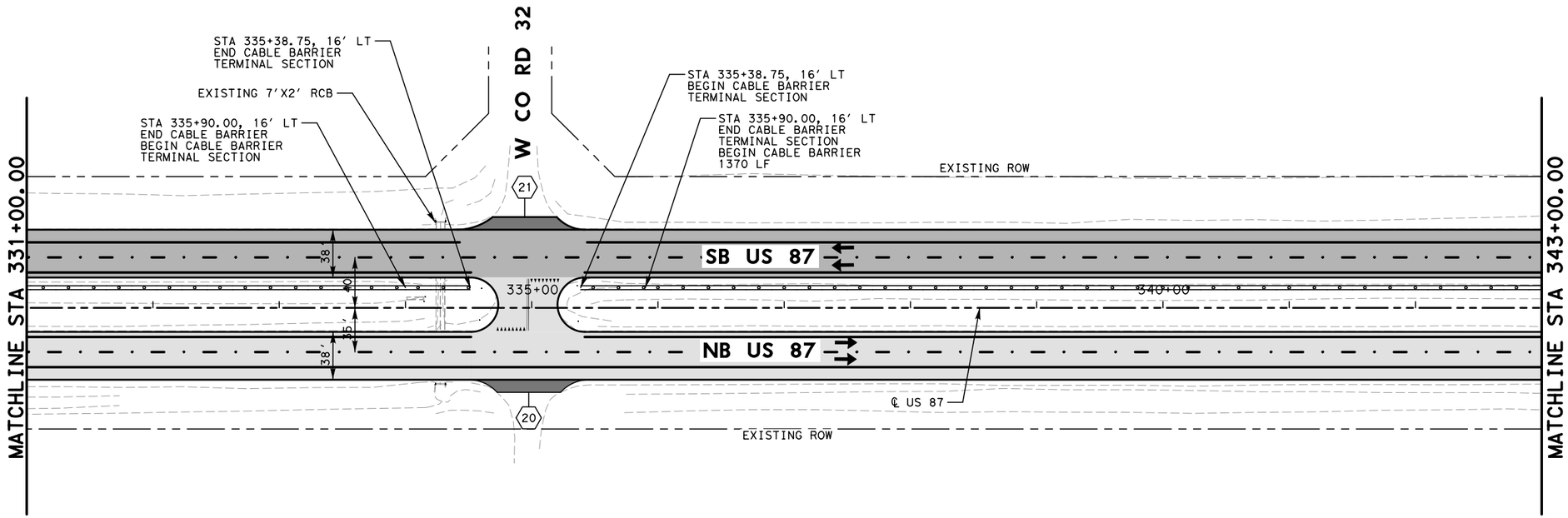

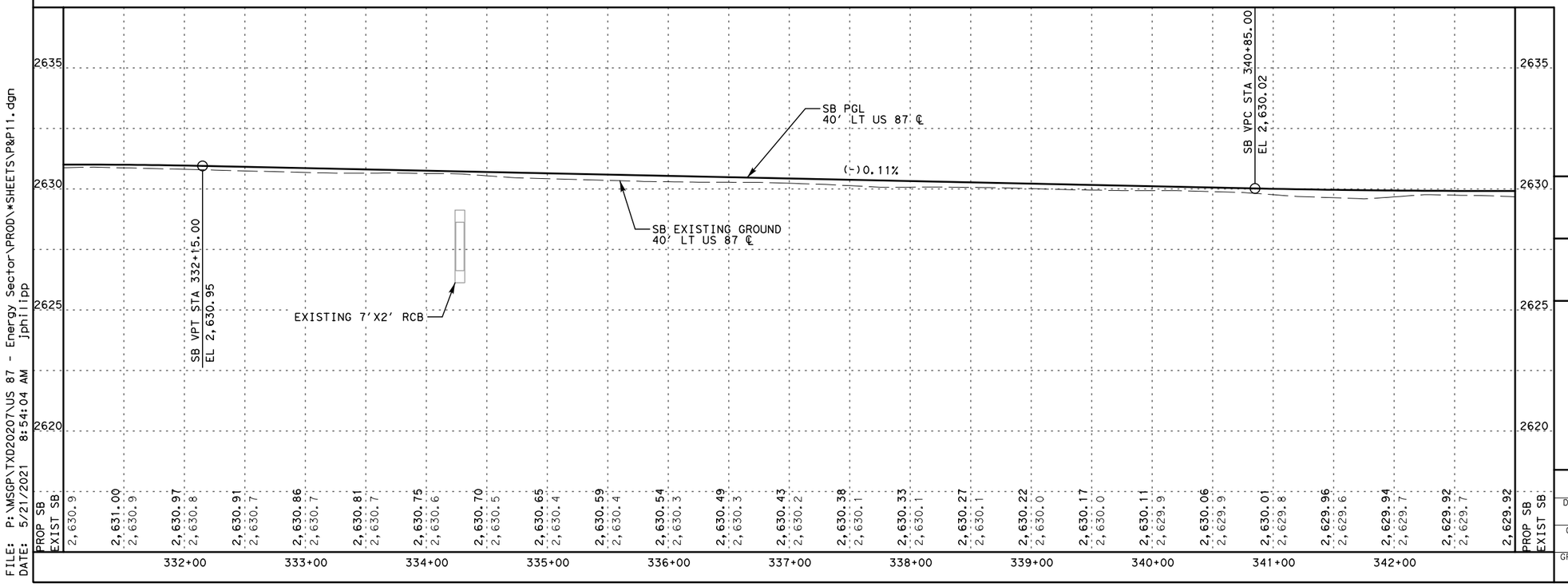

50 25 0 50 100
SCALE: 1" = 100'

2.5 1.25 0 2.5 5
SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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PLAN AND PROFILE LAYOUT

(SHEET 11 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	58
AR				
GRPH CHECK	0068	08	067	
JKB				

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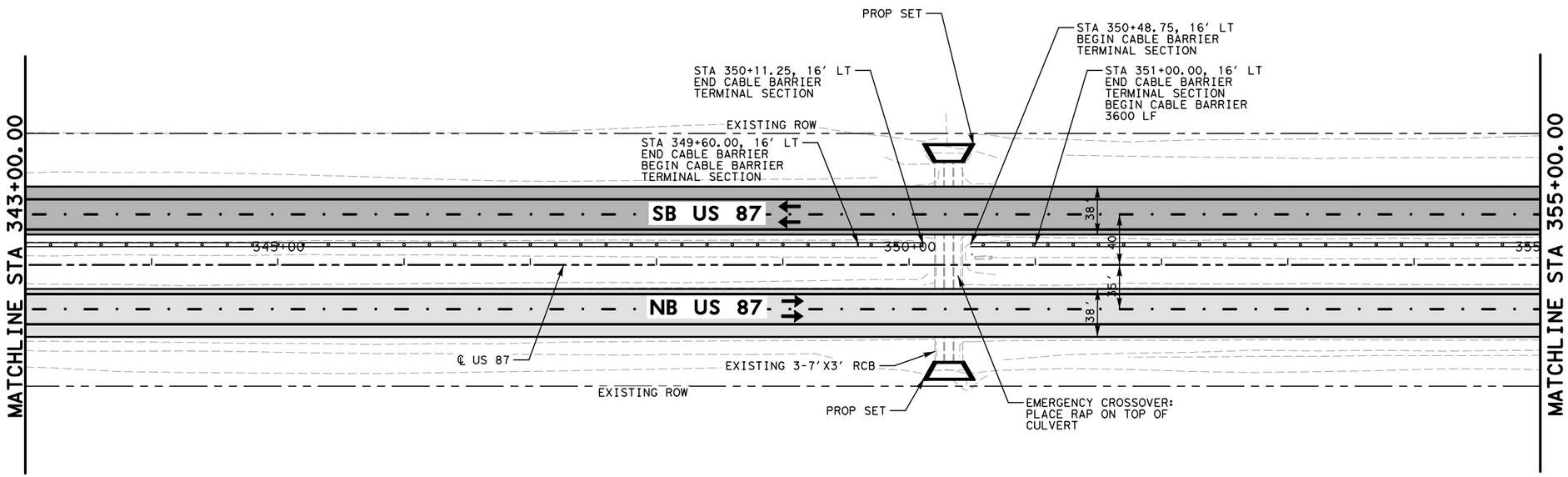

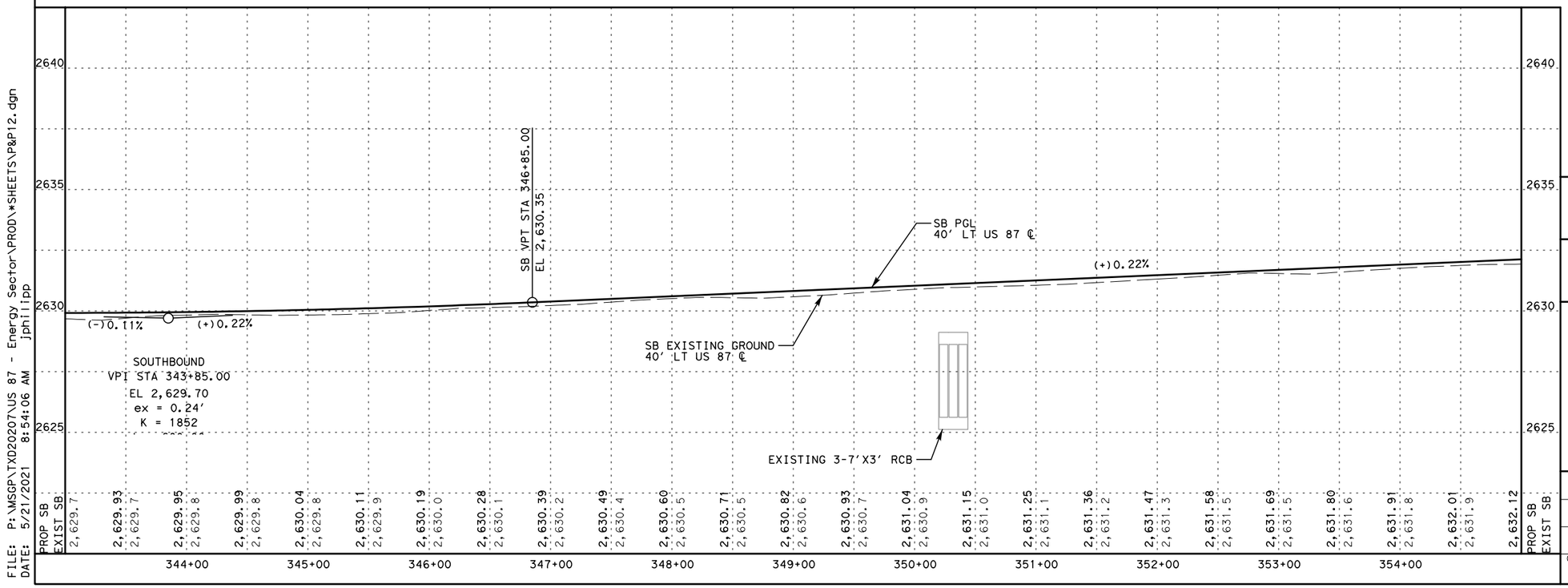

50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
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PLAN AND PROFILE LAYOUT

(SHEET 12 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	59
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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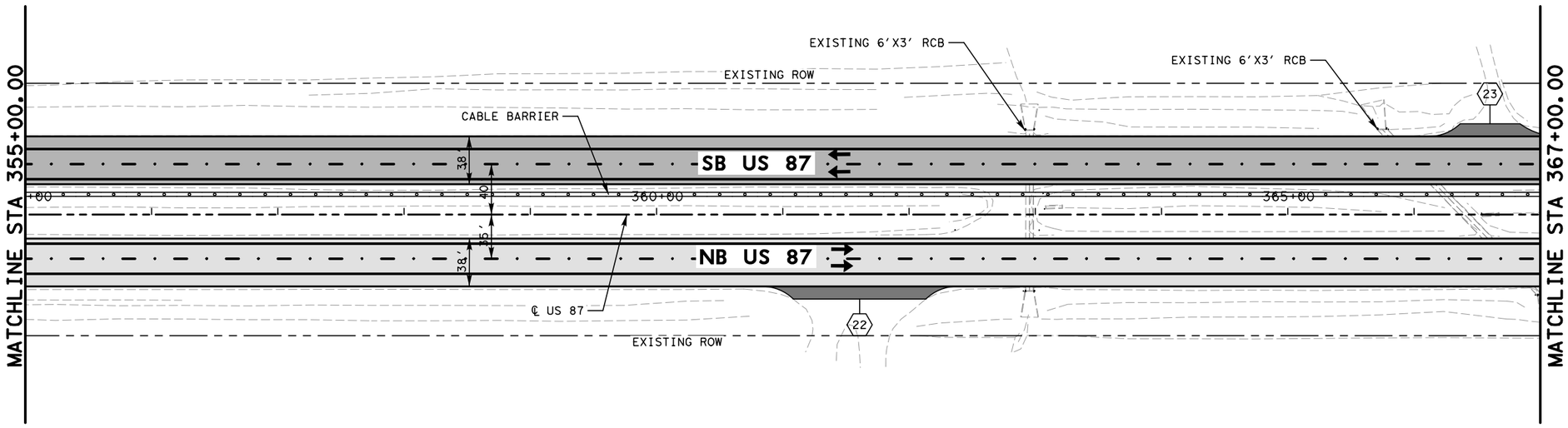

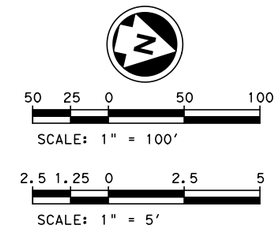

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
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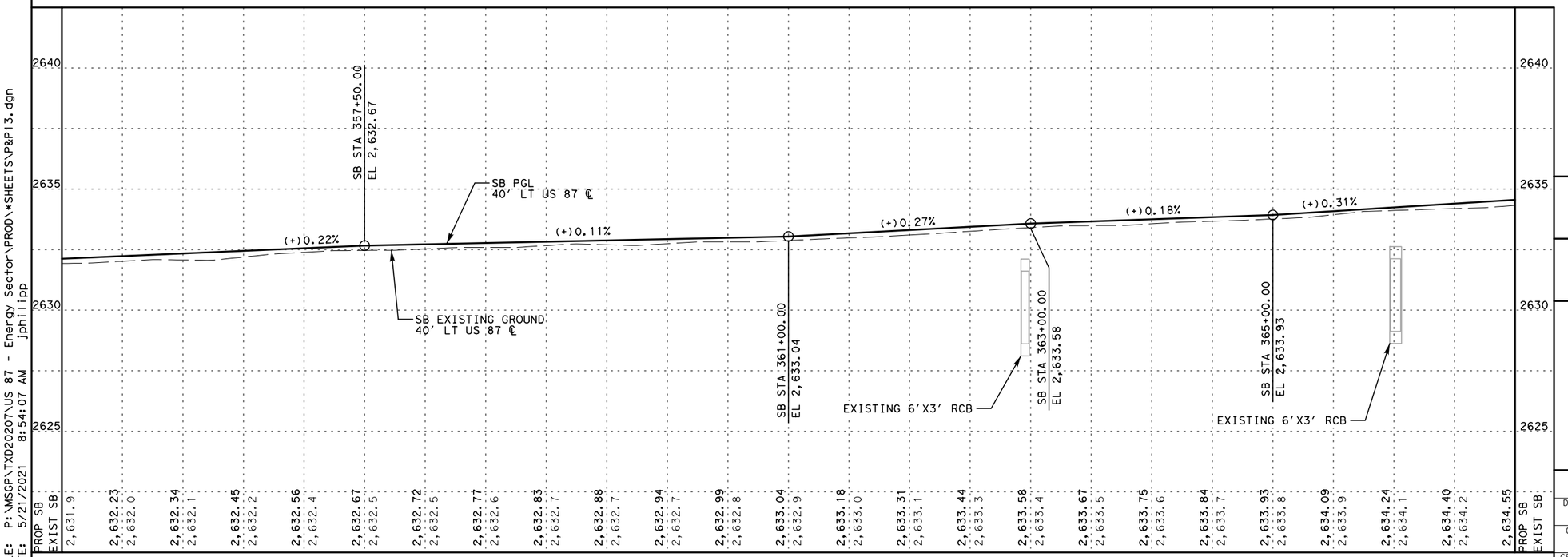

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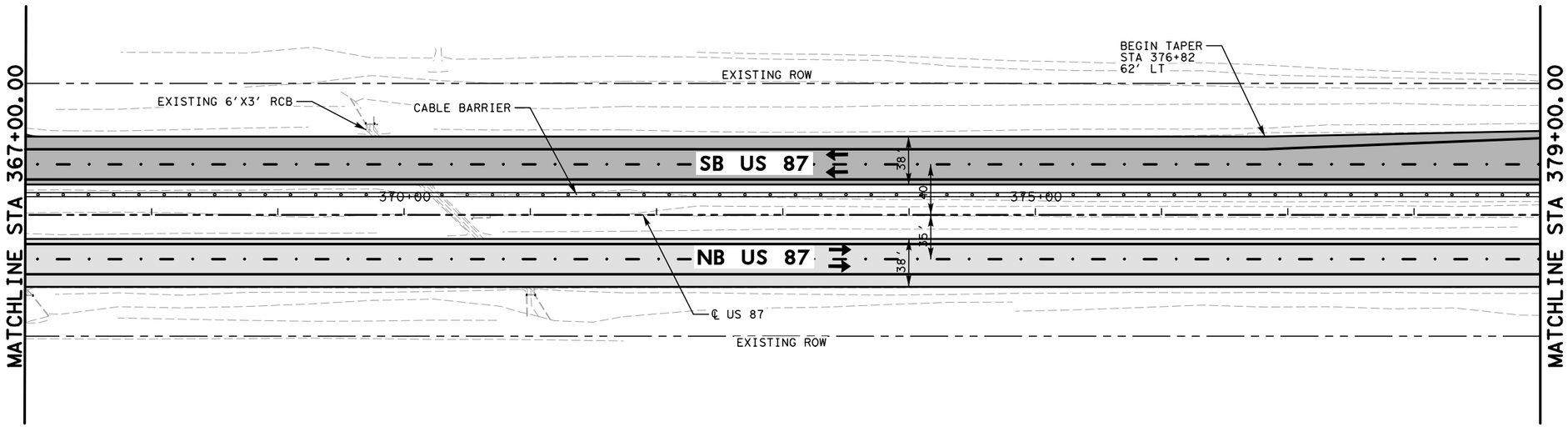
PLAN AND PROFILE LAYOUT

(SHEET 13 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	60
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				



LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
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NOTES

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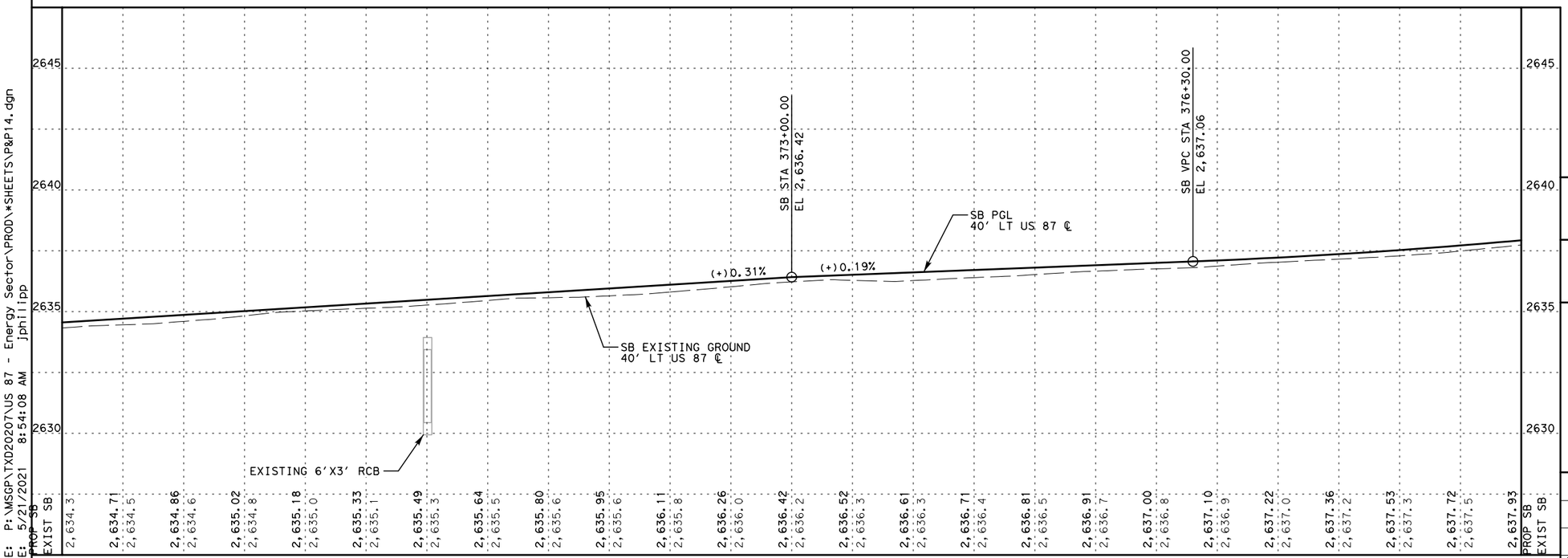

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DATE: 5/21/2021 8:54:08 AM jphillpp

JUSTIN K. BAKER
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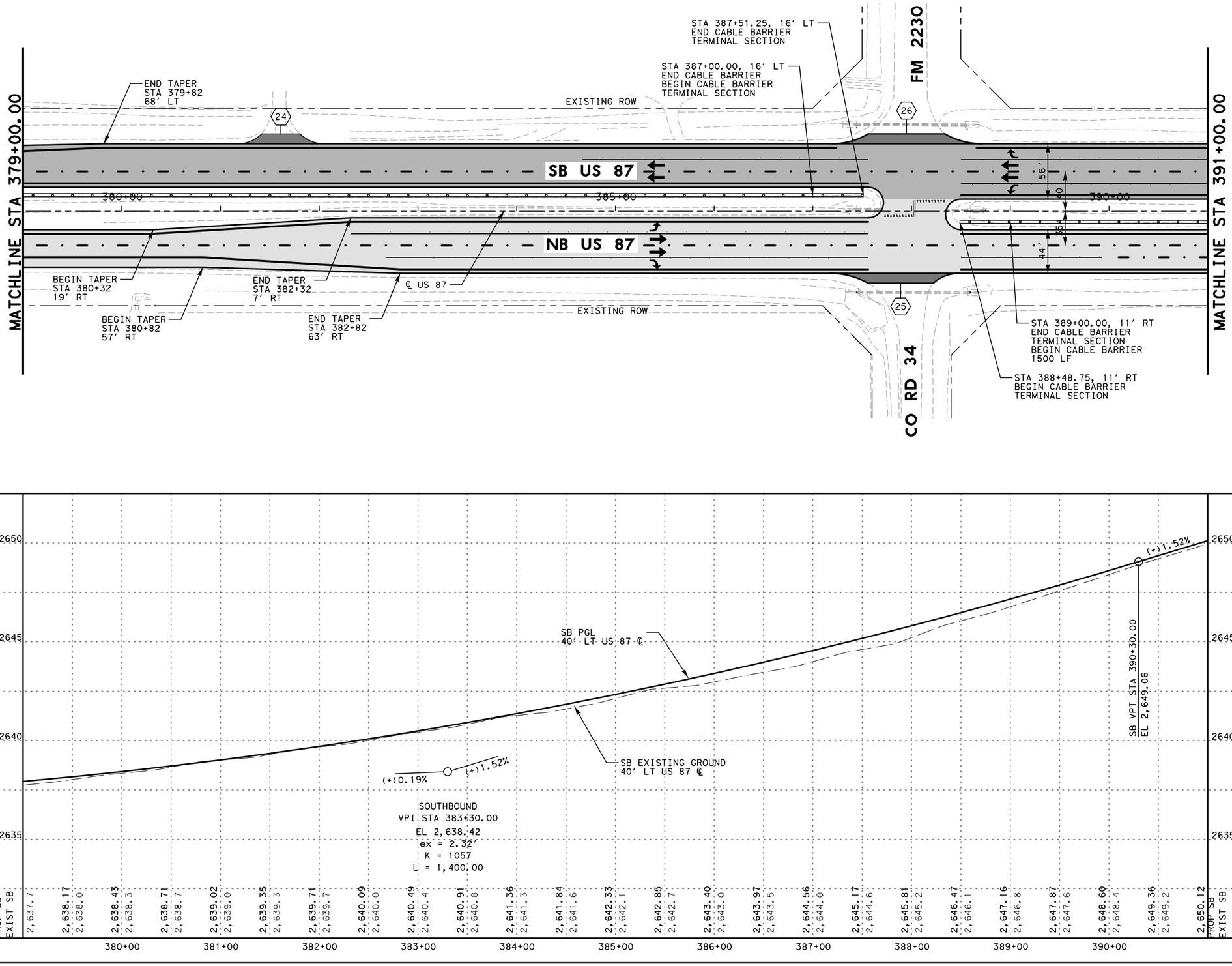
PLAN AND PROFILE LAYOUT

(SHEET 14 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	61
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				



50 25 0 50 100

SCALE: 1" = 100'

2.5 1.25 0 2.5 5

SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
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NOTES

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Texas Department of Transportation

US 87

PLAN AND PROFILE LAYOUT

(SHEET 15 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	62
AR	0068	08	067	
GRPH CHECK				
JKB				

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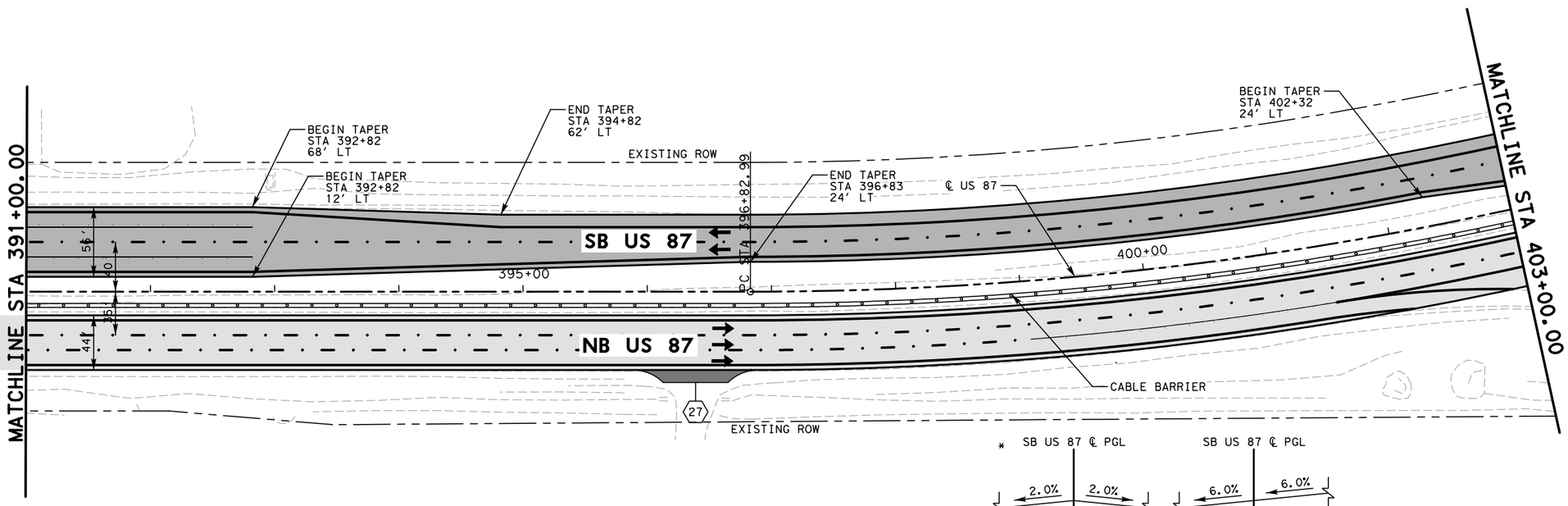
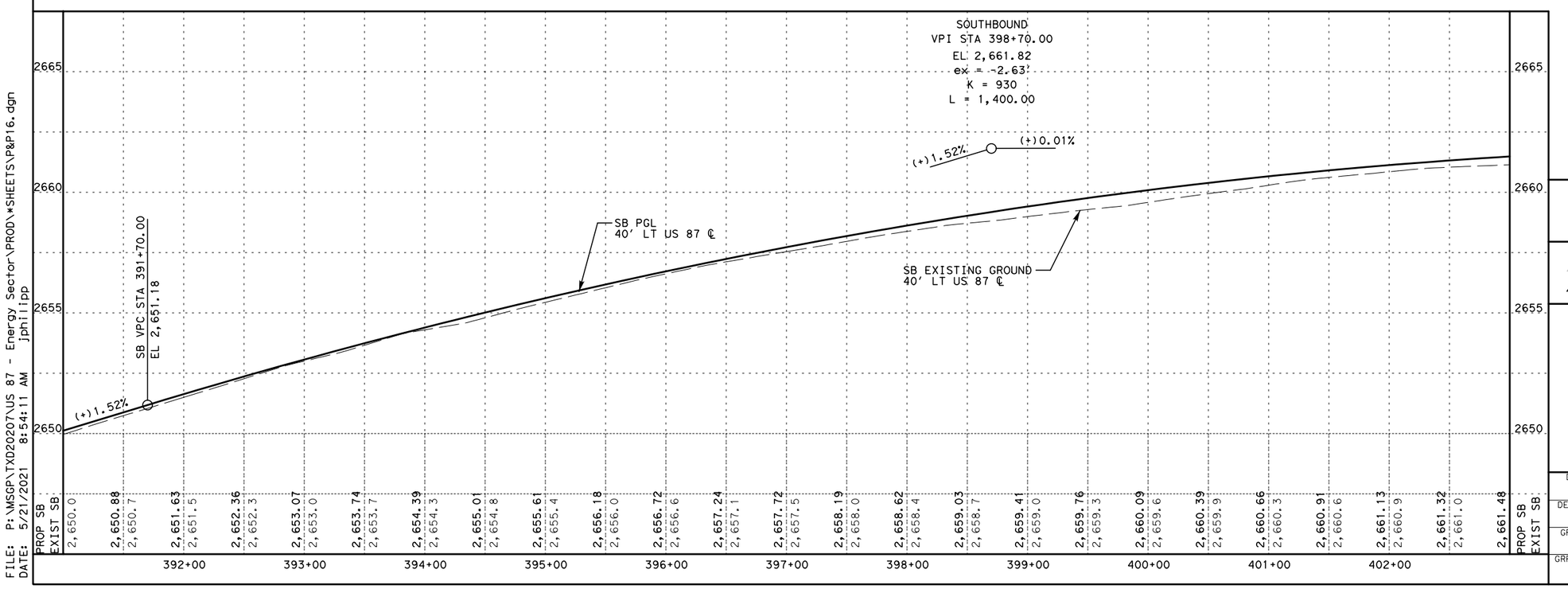
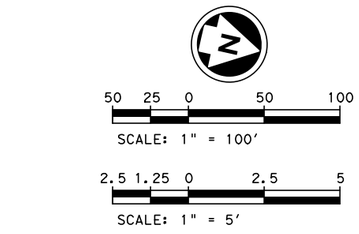
jphillipp



* ADVERSE SLOPE SHALL BE TRANSITIONED TO MATCH 2.0% PRIOR TO ROTATING ENTIRE WIDTH AT SAME RATE TO ACHIEVE PROPOSED SUPERELEVATION





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Texas Department of Transportation

US 87

PLAN AND PROFILE LAYOUT

(SHEET 16 OF 18)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	63
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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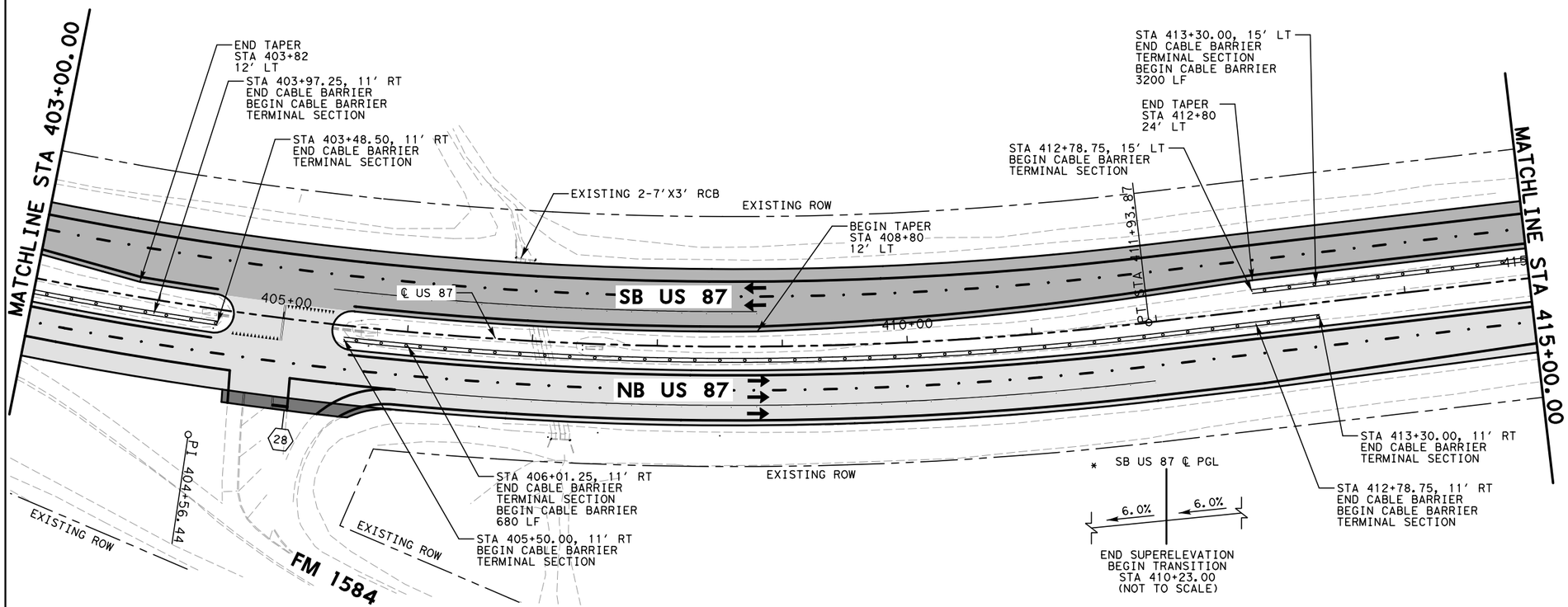

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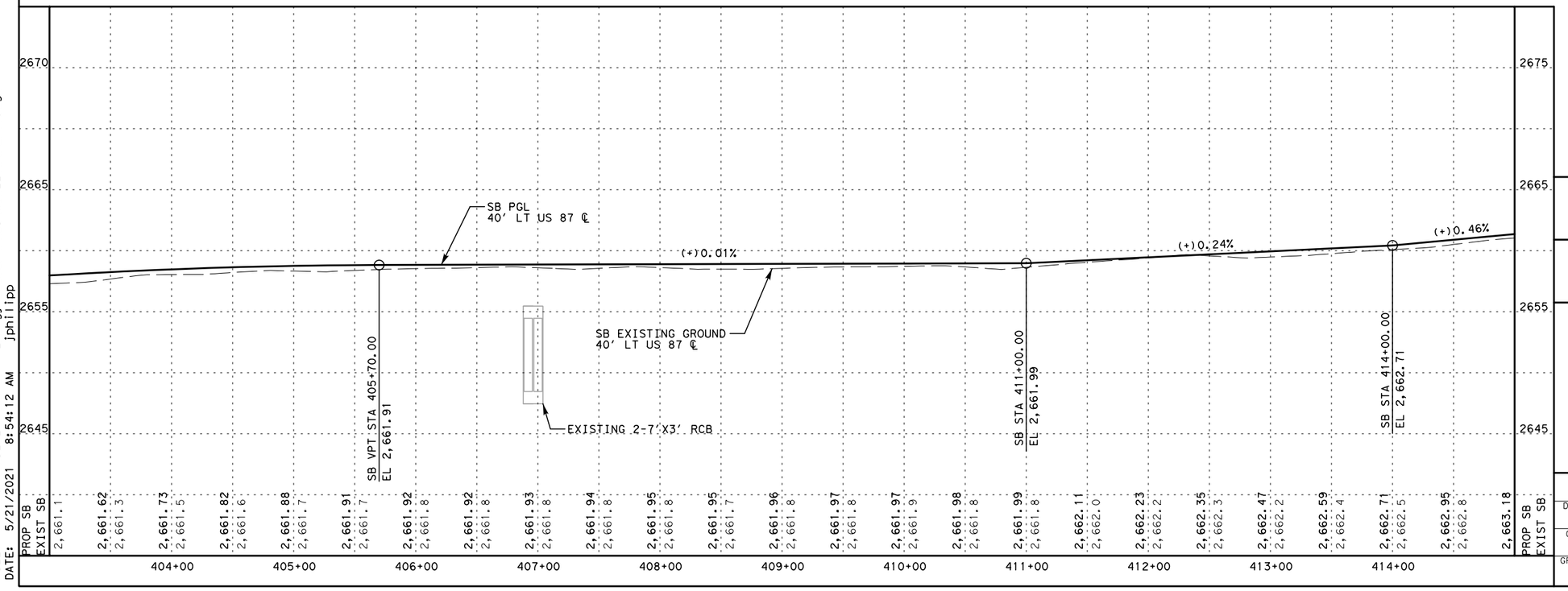

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DATE: 5/21/2021 8:54:12 AM jphilipp

50 25 0 50 100
SCALE: 1" = 100'

2.5 1.25 0 2.5 5
SCALE: 1" = 5'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
- FULL RECONSTRUCTION
- 2" OVERLAY
- PAVEMENT REMOVAL

NOTES

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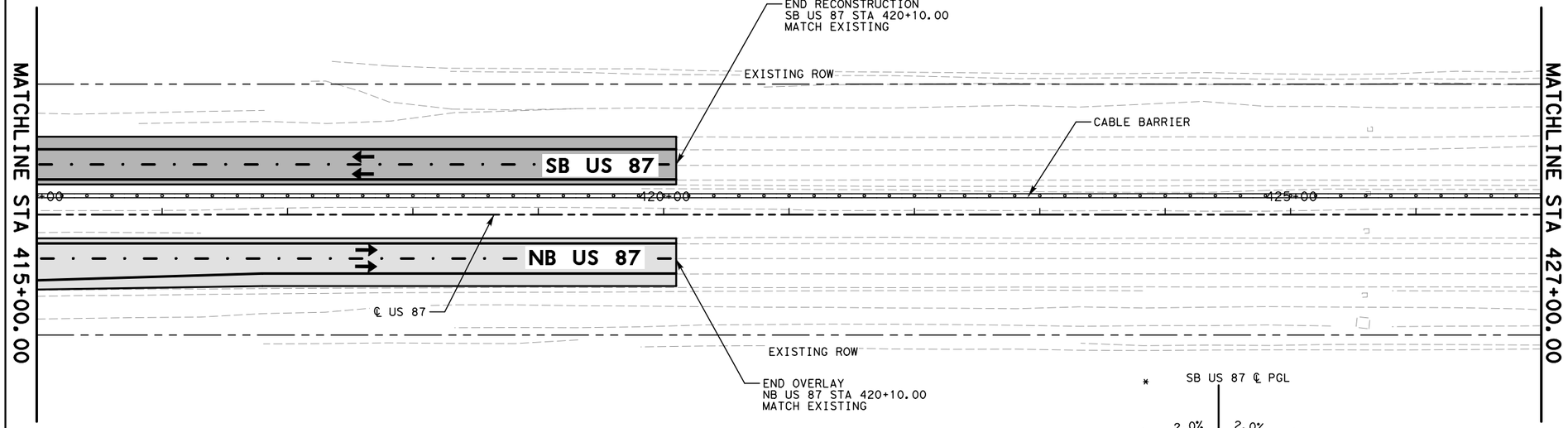
Texas Department of Transportation

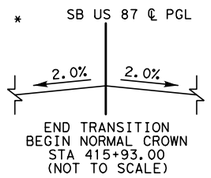
US 87

PLAN AND PROFILE LAYOUT

(SHEET 17 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	64
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				





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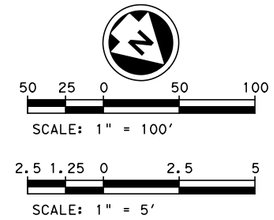

LEGEND

- CABLE BARRIER
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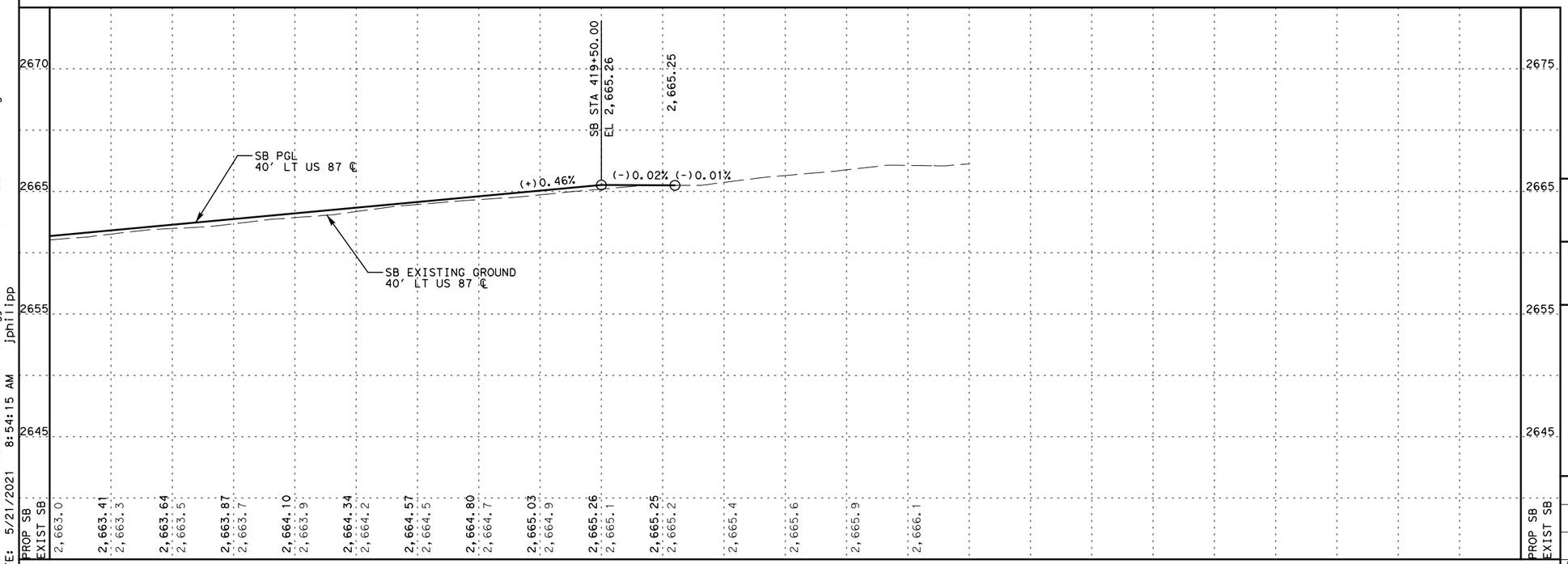

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5/21/2021

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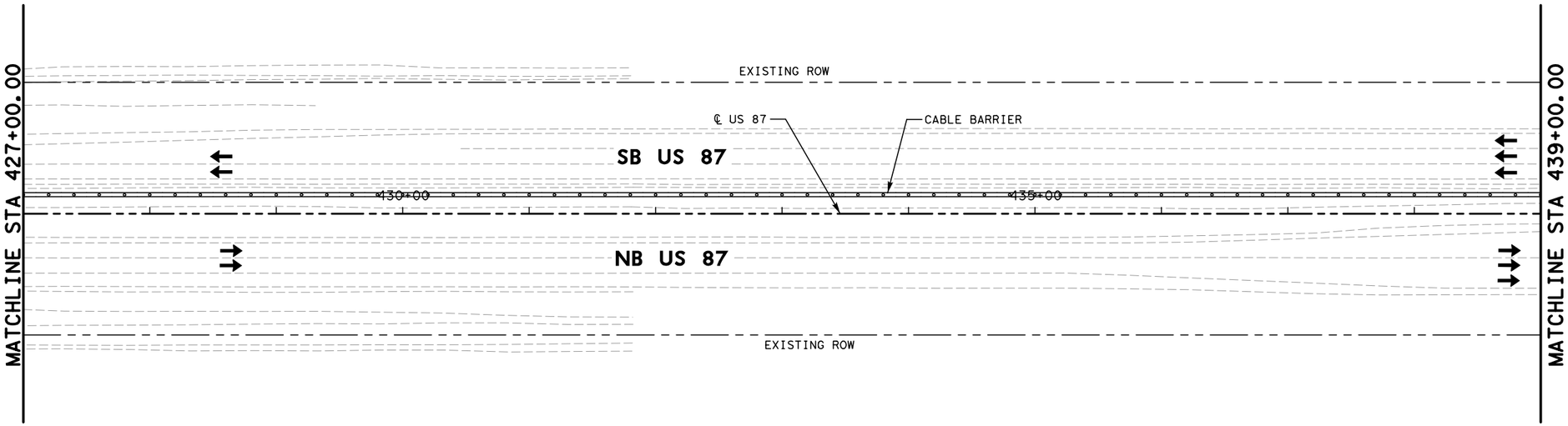
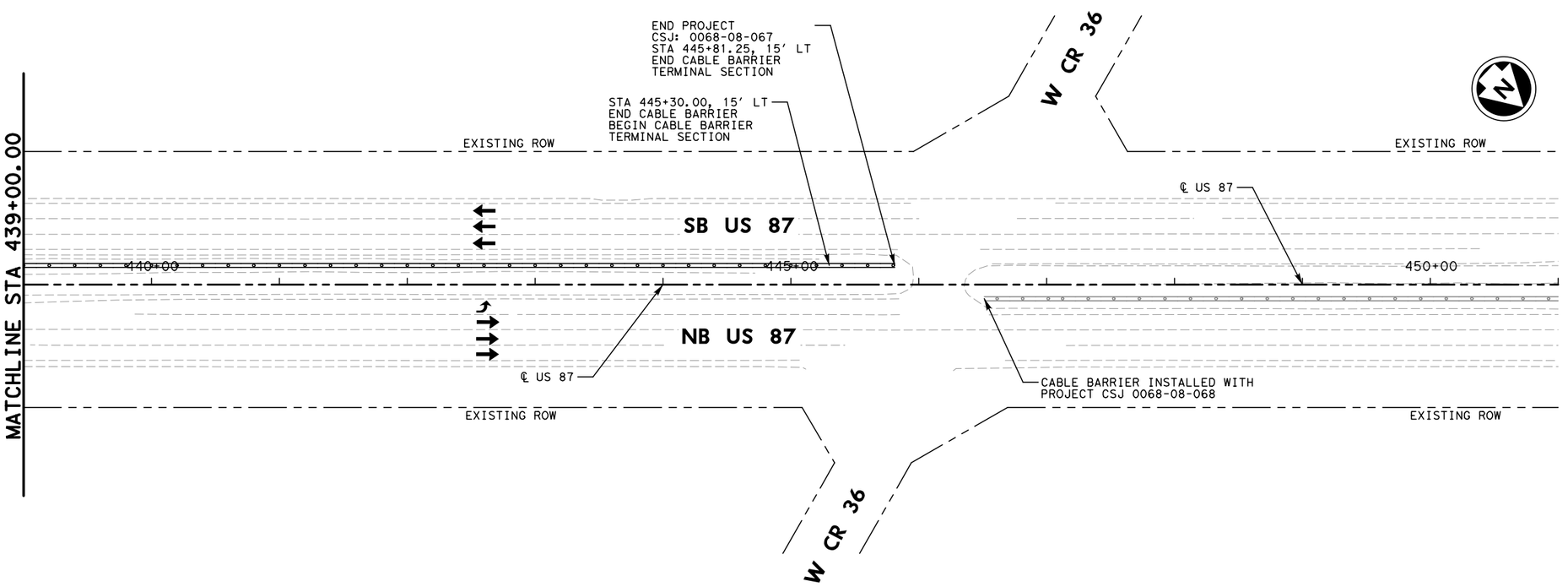
PLAN AND PROFILE LAYOUT

(SHEET 18 OF 18)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	65
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				





50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- CABLE BARRIER
- DIRECTION OF TRAFFIC
- EXISTING ROW
- EXISTING DRAINAGE EASEMENT
- DRIVEWAYS/SIDESTREETS
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5/21/2021

FIRM REGISTRATION NO. F-230

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CABLE BARRIER LAYOUT

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	66
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	08	067	
JKB				

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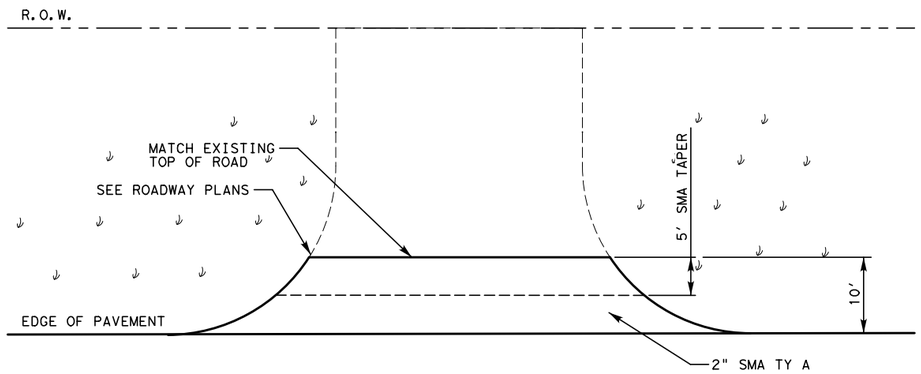
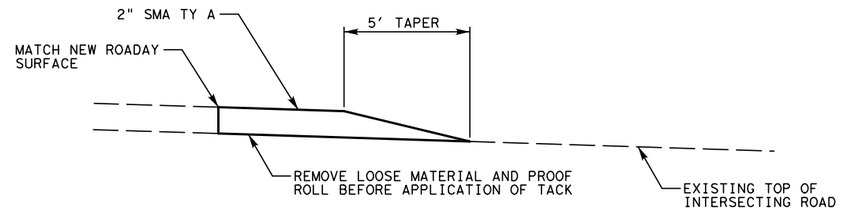
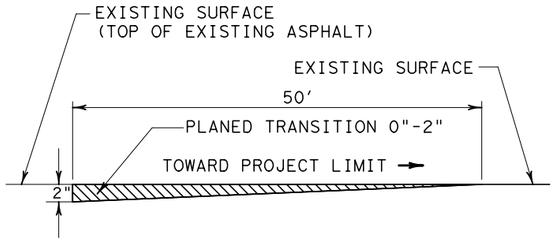


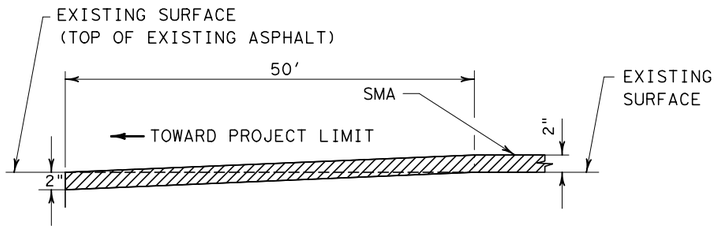
SMA DRIVEWAY/INTERSECTION PLAN VIEW



SMA DRIVEWAY/INTERSECTION SECTION VIEW

DRIVEWAY AND INTERSECTION DETAILS





PLANE TRANSITION DETAIL
(PLANE PAV 0-2")

SMA OVERLAY TAPER DETAIL AT BEGIN & END OF PROJECT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

ROADWAY DETAILS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	67
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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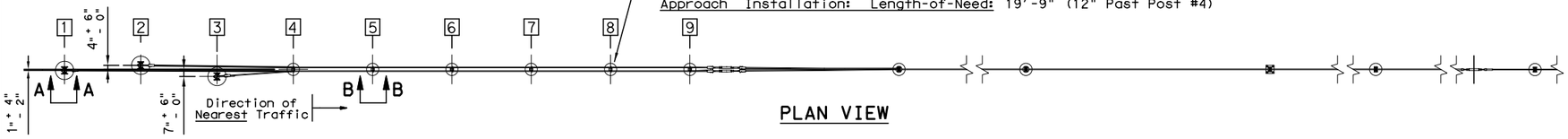
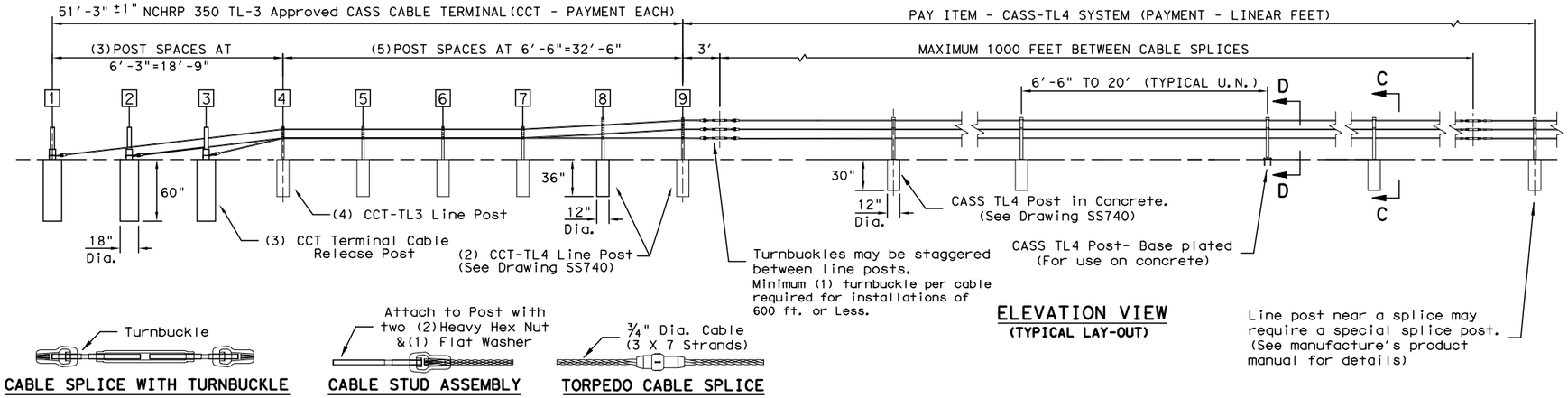
Preferred Installation: Locate post #2 away from nearest traffic.
System has been succesfully tested with opposite installation.

Length-of-Need Cass Cable Terminal (CCT):
Departure Installation: Length-of-Need: 44'-9" (At Post #8)
Approach Installation: Length-of-Need: 19'-9" (12" Past Post #4)



PLAN VIEW



ELEVATION VIEW
(TYPICAL LAY-OUT)

CABLE SPLICE WITH TURNBUCKLE
(OPEN BODY STYLE)

CABLE STUD ASSEMBLY

TORPEDO CABLE SPLICE

GENERAL NOTES

1. This drawing is a general overview of CASS TL-4 Barrier System. See SS-740 (latest version) for specific details of CASS cable terminal (CCT) and cable safety system (CASS) requirements, proper installation, options and specification.
2. CASS is designed for bi-directional traffic flows and can be installed on either side of the median. Contact Trinity (800-527-6050) or consult the design, installation, or repair manual(s) for additional information.
3. All concrete for CASS footings shall be TxDOT class A. If class A or stronger concrete is utilized for the mowstrip, please see chart below for allowable footing depth and sleeve deviations.
4. All posts shall be socketed unless otherwise specified. All cables shall be pre-stretched unless otherwise specified.
5. For payment see Special Specification "Cable Barrier System".
6. CASS-TL4 shall be installed on shoulders or medians with slopes of 6:1 or flatter without obstructions, depressions, etc. That may significantly affect the stability of an errant vehicle. Grading of site and/or appropriate fill materials may be required. The designer/installer shall "Flatten" or "Round" various topographical inconsistencies that could interfere with the ability of the installer to consistently maintain the design height (in relation to the terrain) of the cables. Please consult manual(s) and / or TxDOT Memo(s) for installations in "Ditch Sections".
7. CASS TL-4 post spacing may be modified to avoid obstacles that conflict with the installation of cass-tl4 line posts or to reduce deflection on radiuses. No post space can exceed the maximum post TxDOT space limit of 20'. Reducing or increasing post spacing affects deflection. CASS TL-4 may be laterally transferred at a rate not to exceed 30:1.
8. Post foundations may be drilled through existing pavement. Please see line post foundation chart for minimum footing requirements in various applications.
9. For aesthetic purposes Trinity recommends all sleeves, driven posts, and lower cable release posts to be installed reasonably plumb (approximately 1/8" per foot).
10. CASS TL-4 shall be installed in well-drained, compacted, NCHRP Report 350 Standard soil. If soil does not meet this classification, if solid rock/concrete is encountered below grade or if soil is susceptable to severe freeze/thaw cycles, please contact Trinity about alternate footing design(s). Trinity suggests the use of "Mow strips" for erosion prevention and ease of maintenance / installation.
11. See the Texas MUTCD for proper "Barrier" Delineation.

MOW STRIP DETAIL*			CONCRETE FOOTING CHART		
MOW STRIP	DEPTH	WIDTH	FOOTING	TUBE SLEEVE	REBAR RING
NONE			30" Min.	27" Min.	YES
HMA	6" Min.	3' Min.	27" Min.	15" Min.	NO
HMA	8" Min.	3' Min.	24" Min.	15" Min.	NO
RC	3" Min.	3' Min.	24" Min.	15" Min.	NO

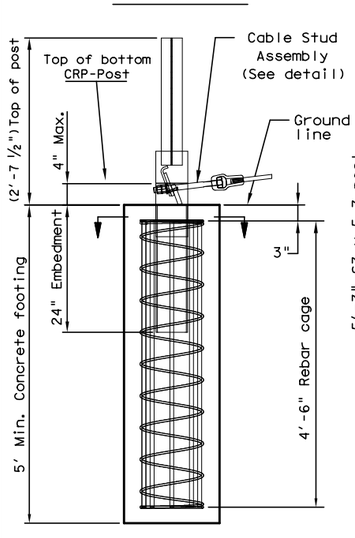
Chart does not apply to Terminal Posts 1 thru 9.
* Mow strip or pavement.
HMA = Hot Mix Asphalt (Not Recycled Asphalt Pavement).
RC = Reinforced Concrete (TxDOT Class A Minimum).

CABLE TENSION CHART	
FAHRENHEIT	PRE-STRETCHED
DEGREES	LB / FORCE
-10	7300
0	7000
10	6600
20	6300
30	6000
40	5600
50	5300
60	5000
70	4600
80	4300
90	4000
100	3600
110	3300
120	3000
130	2700
140	2500
150	2300

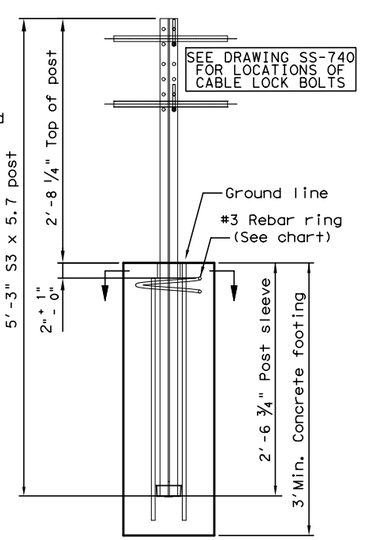
Allowable deviation from chart in tangent sections: +800, -200 pounds/force. Cable tension readings are typically higher in curved cable sections.

Trinity Highway Products, LLC.
2525 Stemmons Freeway
Dallas, TX 75207
Phone: (800) 644-7976

Product.INFO@TRIN.NET



SECTION E-E



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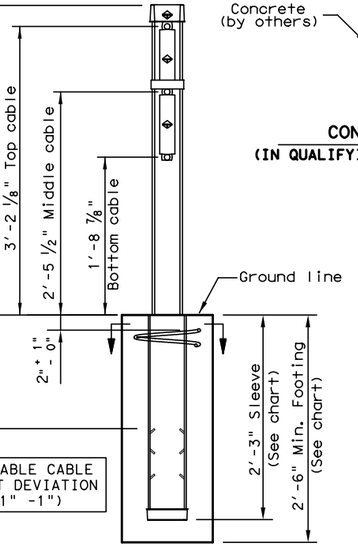
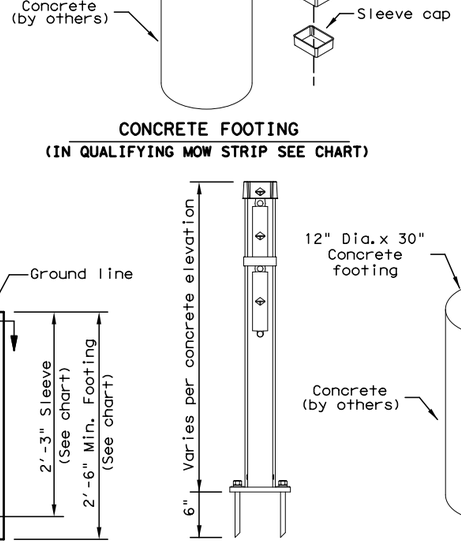


SECTION G-G



CONCRETE FOOTING
(IN QUALIFYING MOW STRIP SEE CHART)

STANDARD POST & CONCRETE FOOTING
(SOCKETED POST)

VIEW A-A
(CABLE RELEASE POST 1-3)

VIEW B-B
(TERMINAL LINE POST 4-7)

SECTION C-C
(SOCKETED POST)

SECTION D-D
(BASE PLATED POST)

Texas Department of Transportation
Design Division Standard

TRINITY CABLE SAFETY SYSTEM (TL-4)

CASS(TL4)-14

FILE: casstl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
©TxDOT: March 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		68

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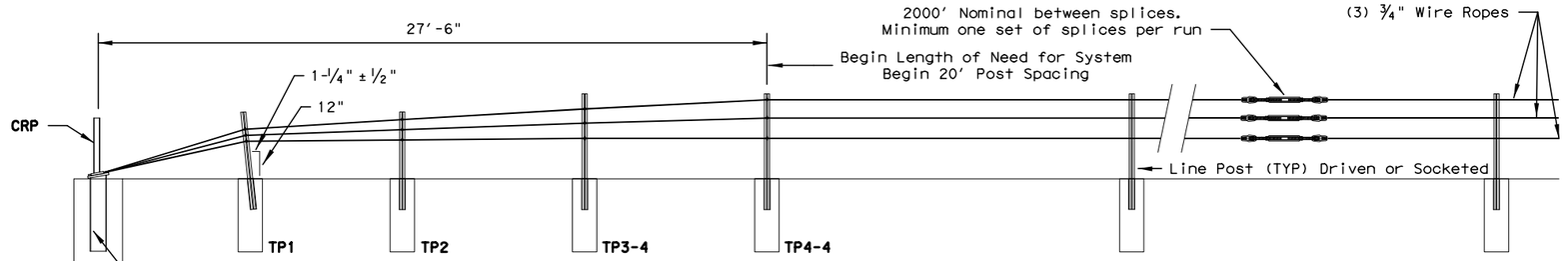
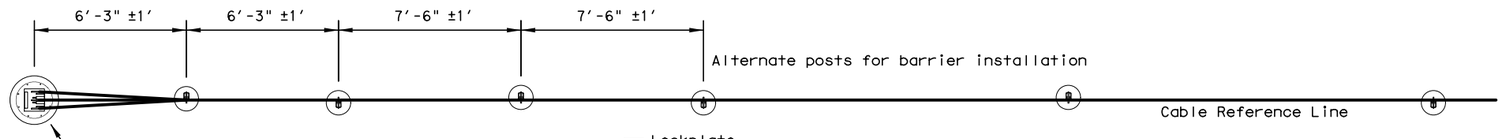
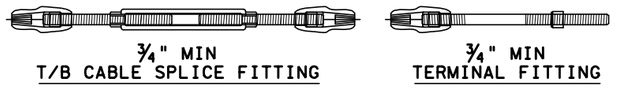
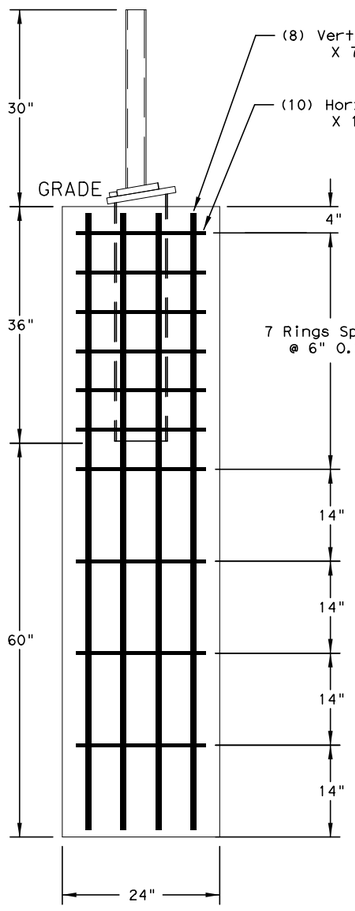
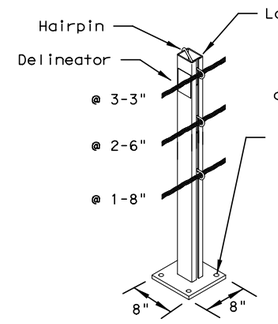




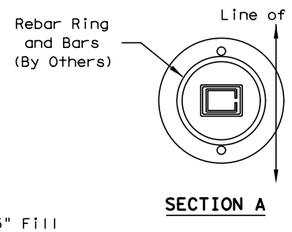




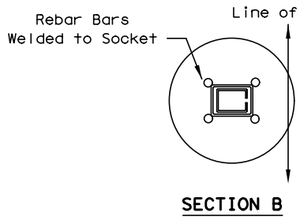
CABLE RELEASE AND ANCHOR POST



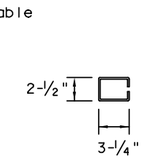
LINE POST
(BASE-PLATED OPTION)
Low-Fill Box Culvert Less than 15" Fill



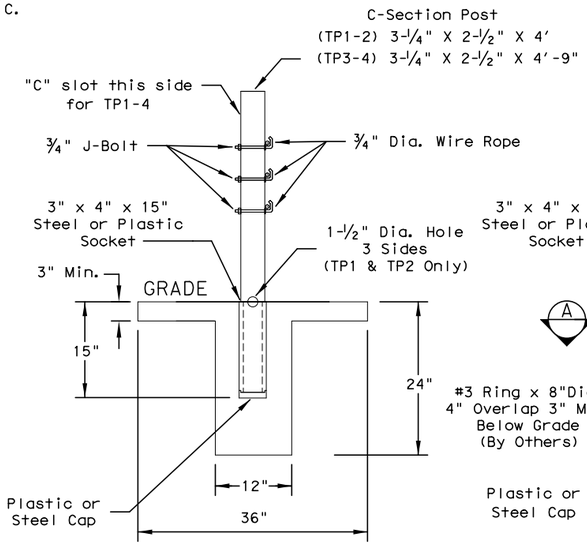
SECTION A



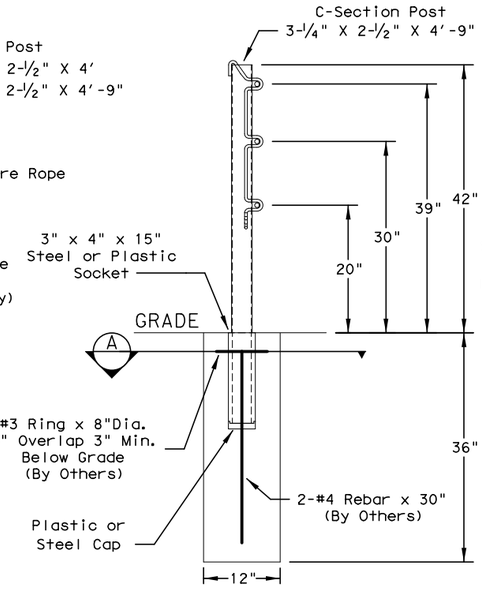
SECTION B



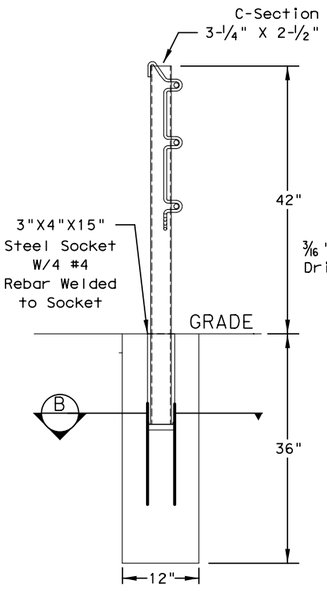
C-SECTION POST



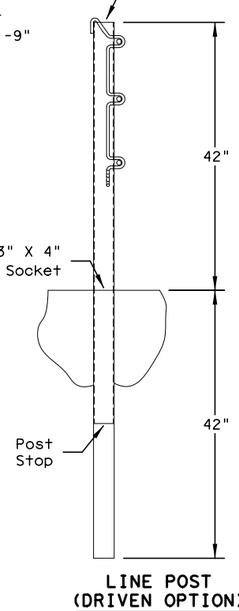
TERMINAL POST
(SHOWN WITH CONCRETE MOWSTRIP)
(Shown with Tube Plate Option)
(See Note 10)



LINE POST SOCKETED
(Shown with Rebar Ring/Bars Socket Option)
(See Note 9)



LINE POST SOCKETED
(Shown with Welded Rebar Socket Option)
(See Note 9)



LINE POST
(DRIVEN OPTION)
(Shown with Driven
Socket Option)
(See Note 9)

GENERAL NOTES

1. For additional information contact Gibraltar, Inc. at 1-800-495-8957, 830-798-5444, or see the manufacturer's product manual.
2. All concrete shall be CLASS A.
3. The Cable Barrier System shall be installed on shoulders or on medians with slopes of 6:1 or flatter. If installed on slopes steeper than 6:1 up to 4:1 the TL-4 system performs as a TL-3 and Gibraltar must be contacted for various guidelines related to placement.
4. The Cable Barrier System is accepted by the FHWA Test Level - 4.
5. See the Texas MUTCD for proper "Barrier" delineation.
6. Rock Clause: Where solid rock is encountered:
   A. For socketed post, continue digging 12" diameter, 15" deep into rock or the required plan depth, whichever comes first.
   B. For driven post, core drill a 4" diameter hole 18" deep into rock or the required plan depth, whichever comes first.
   C. For Anchor post, continue digging 24" diameter, 30" deep into rock or the required plan depth, whichever comes first.
7. Tolerances:
   * LP = 3" out of plumb, at top
   * Cable height = 1"
   * Anchor Post = 5" off of Cable Reference Line
8. The Gibraltar cable barrier system shall be installed in NCHRP Report 350 standard compacted soil. Soil must be well drained.
9. All non-welded rebar by others.
10. Minimum recommended line post foundation.
    A. Without mowstrip, 36" Deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long
    B. With 4" minimum depth hot mix asphalt, 30" deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long.
    C. With 3" minimum depth concrete mowstrip, 24" deep x 12" diameter foundations. (No rebar required)
    D. Direct drive post 42" deep.

CABLE TENSION CHART*	
-10 °F	8000
0 °F	7600
10 °F	7200
20 °F	6800
30 °F	6400
40 °F	6000
50 °F	5600
60 °F	5200
70 °F	4800
80 °F	4400
90 °F	4000
100 °F	3600
110 °F	3200

DEFLECTION	
Deflection	Post Spacing
8'-0"	20 FT
7'-0"	12 FT
6'-8"	10 FT

* Allowable Deviation from Chart +/- 10%

Texas Department of Transportation — Design Division Standard

GIBRALTAR CABLE BARRIER SYSTEM (TL-4)

GBRLTR(TL4)-14

FILE: gbrltrt1414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
© TxDOT: March 2014	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		69

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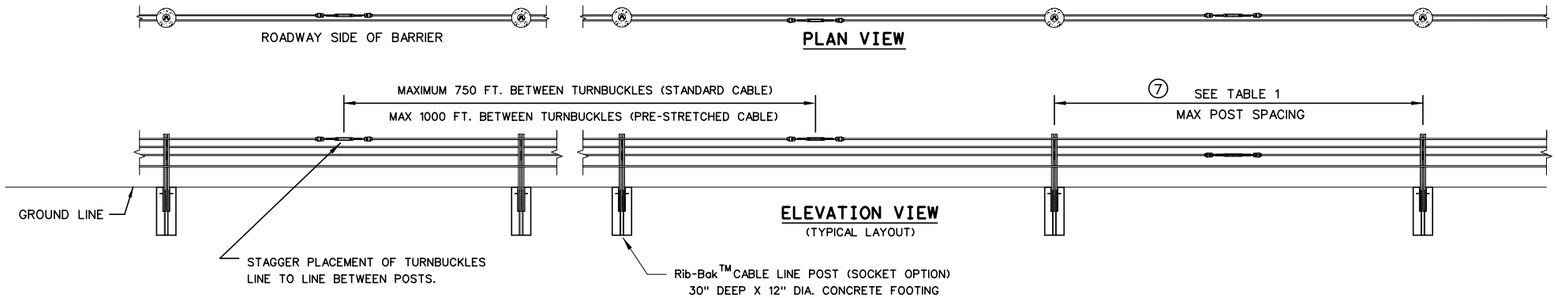
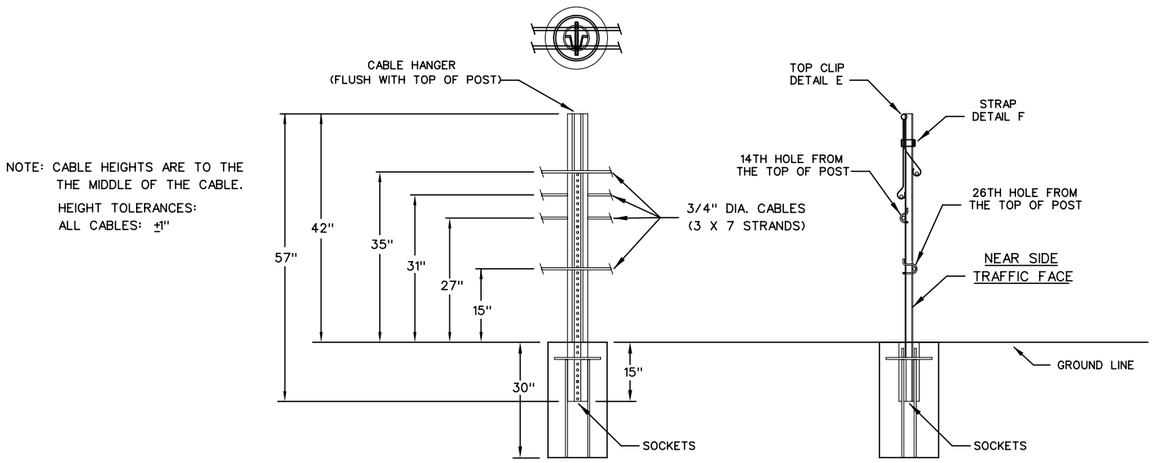
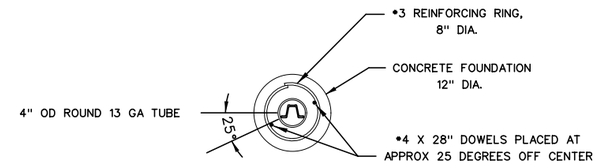
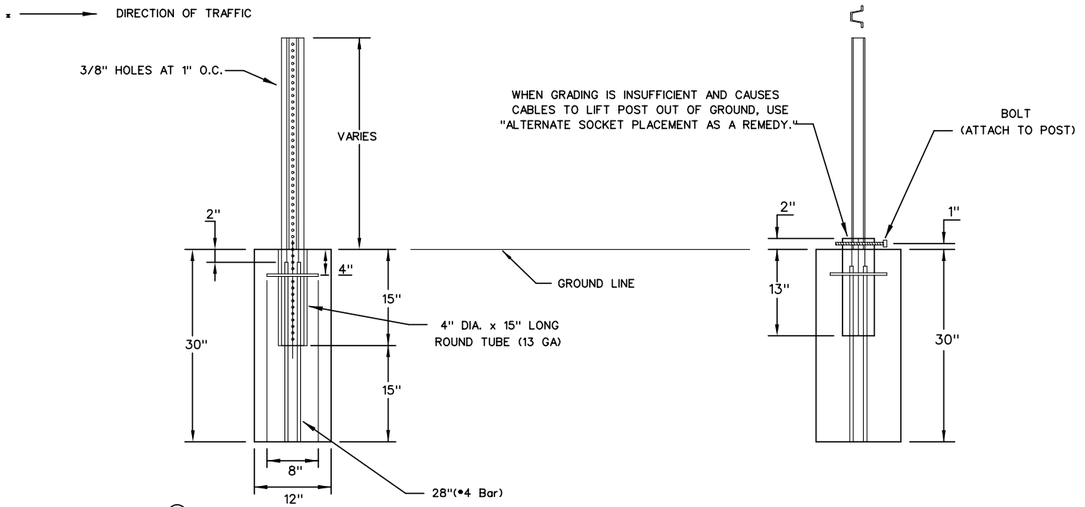




LENGTH OF NEED POSTS
MEDIAN CONFIGURATION

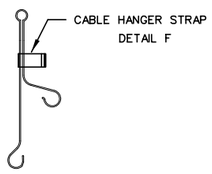
INSTALLATION DETAIL
4 CABLE 6:1



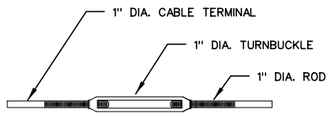


⑪ **SOCKETED POST OPTION**
(TYPE S POST)

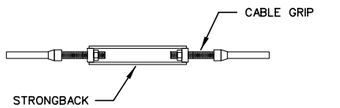
ALTERNATE SOCKET PLACEMENT
(TYPE S POST)



CABLE HANGER BRACKET
DETAIL E
(SUBJECT TO MANUFACTURER'S TOLERANCES)



WEDGED FITTING
TURNBUCKLE DETAIL
(TYPICAL)



STRONGBACK (SELF-SWAGING)
TURNBUCKLE DETAIL
(OPTIONAL)

GENERAL NOTES

1. FOR ADDITIONAL INFORMATION CONTACT YOUR DISTRIBUTOR OR NUCOR STEEL MARION, INC. AT (740) 383-4011.
2. FOR PAYMENT SEE SPECIAL SPECIFICATION "CABLE BARRIER SYSTEM".
3. FOR ADDITIONAL INFORMATION SEE THE MANUFACTURER'S PRODUCT MANUAL.
4. THE NU-CABLE SYSTEM IS DESIGNED FOR BI-DIRECTIONAL TRAFFIC FLOWS. SEE THE MANUFACTURER'S PRODUCT MANUAL FOR PLACEMENT ADJACENT TO GUARDRAIL END TREATMENTS.
5. THE NU-CABLE SYSTEM SHALL BE INSTALLED ON MEDIANS WITH SLOPES OF 6:1 OR FLATTER WITHOUT OBSTRUCTIONS, DEPRESSIONS, ETC: THAT MAY SIGNIFICANTLY AFFECT THE STABILITY OF AN ERRANT VEHICLE.
6. THE NU-CABLE SYSTEM MAY BE INSTALLED ON EITHER SIDE OF THE ROADWAY. Rib-Bak™ CABLE LINE POSTS MAY BE SOCKETED OR DRIVEN DESIGN.
7. THE TL-4 FOR 6:1 SLOPES CAN USE 4• / LF POST. SEE TABLE •1 FOR POST SIZE PER SPACING.
8. SEE (TABLE 2) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR INITIAL INSTALLATION.
9. SEE (TABLE 3) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR MAINTENANCE.
10. FOURTH (LOWEST) CABLE IS NOT OPTIONAL ON THE TL-4 SYSTEM.
11. CONSULT YOUR PROJECT PLAN SHEETS AND CABLE BARRIER SPECIFICATIONS FOR DESIRED SOCKET MATERIAL.
12. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGN IF SOIL TYPES DIFFER.

⑦ TABLE 1

POST SIZE TABLE	
POST SPACING	POST SIZE
0' - 17'-6"	4• / LF X 4' OR 6' POST
17'-6" - 20'	5• / LF X 4' POST

POST SPACING IS PER 8 FOOT DEFLECTION REQUIRMENTS.
CONSULT PRODUCT MANUAL IF GREATER DEFLECTION IS PERMISSIBLE.

⑧ TABLE 2

CABLE TENSION CHART	
INITIAL INSTALL	
F	LBF
120	4624
110	4986
100	5350
90	5713
80	6077
70	6440
60	7167
50	7894
40	8619
30	9346
20	10073
10	10800
0	11525
-10	12252
-20	12979
-30	13706

⑨ TABLE 3

CABLE TENSION CHART	
MAINTENANCE	
F	LBF
120	4021
110	4336
100	4652
90	4968
80	5284
70	5600
60	6232
50	6864
40	7495
30	8127
20	8759
10	9391
0	10022
-10	10654
-20	11286
-30	11918

Texas Department of Transportation
Design Division Standard

NU-CABLE BARRIER SYSTEM (TL-4) (4 CABLE)

NU-CABLE(TL4)-14

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© TxDOT:	CONT	SECT	JOB	HIGHWAY
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	ABL	HOWARD		70

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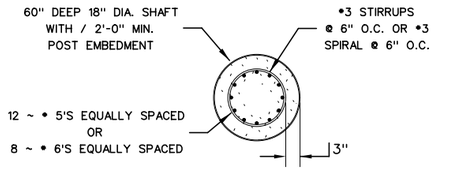
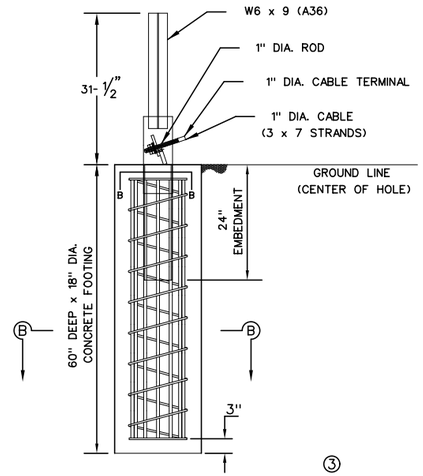
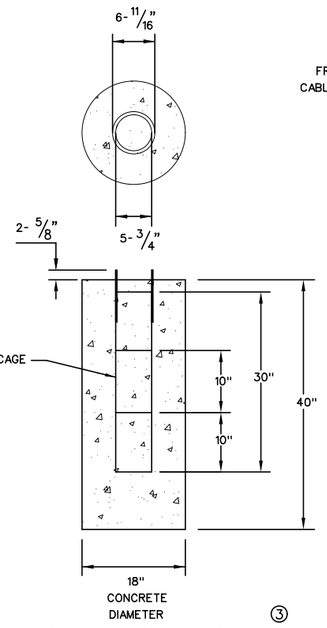


SECTION B-B
(CABLE RELEASE POST)

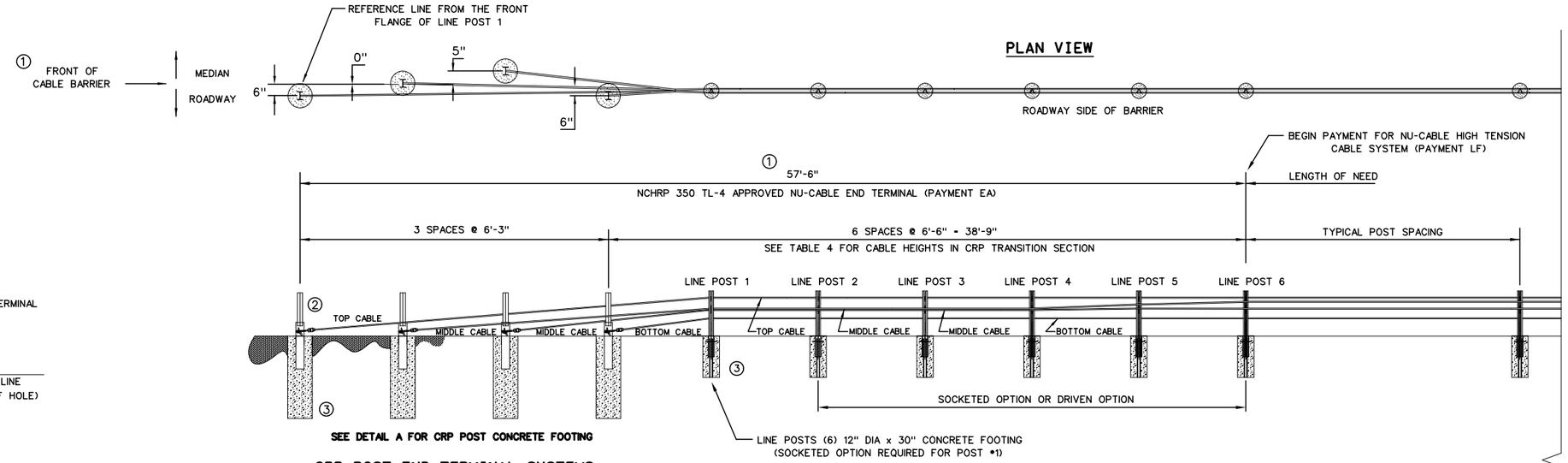


DETAIL A - CRP IN CONCRETE FOOTING
(3000 PSI MIN CONCRETE) ③



DRIVEN SOCKET OPTION

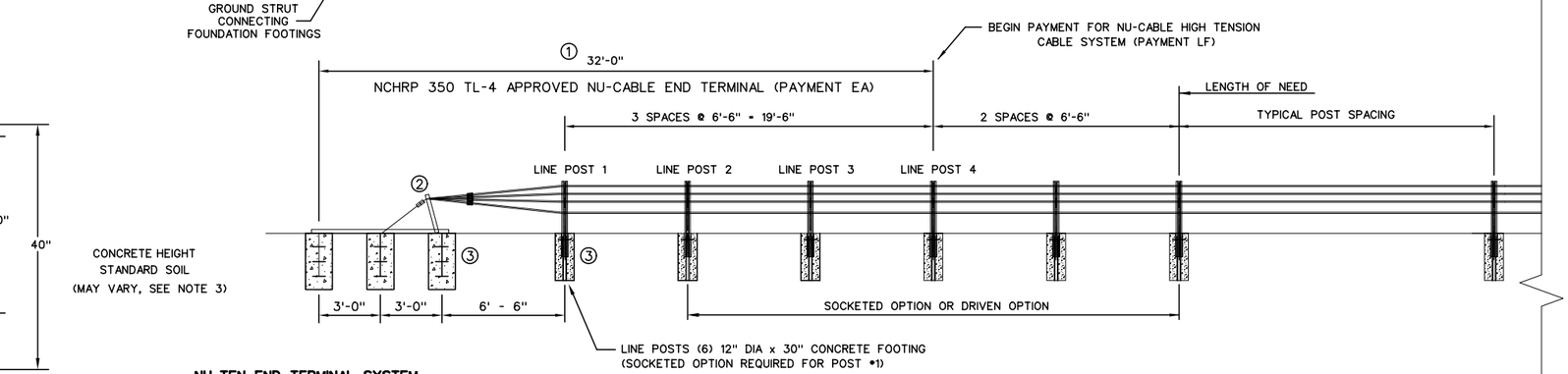
NU-TEN CONCRETE FOOTING DETAIL ③



CRP POST END TERMINAL SYSTEMS

ELEVATION VIEW

① THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT.



CONCRETE HEIGHT STANDARD SOIL (MAY VARY, SEE NOTE 3)

NU-TEN END TERMINAL SYSTEM

ELEVATION VIEW

④ **TABLE 4**

CRP END TERMINAL CABLE HEIGHTS - TL-4						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	34"	34"	34"	34"	34"	34"
UPPER-MIDDLE CABLE	27"	27"	27"	27"	28"	31"
BOTTOM-MIDDLE CABLE	24"	24"	24"	24"	24"	24"
BOTTOM CABLE	15"	15"	15"	15"	15"	15"

NOTES

1. THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT. SYSTEM PAYMENT IS PER EACH (EA). REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL PAYMENT INFORMATION
2. REFER TO INSTALLATION MANUAL FOR CABLE END ASSEMBLY DETAIL.
3. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGNS IF SOIL TYPES DIFFER.
4. SEE TABLE 4 CABLE HEIGHTS IN CRP TRANSITION SECTION.

Texas Department of Transportation | Design Division Standard

NU-CABLE BARRIER SYSTEM (TL-4) (4 CABLE)

NU-CABLE(TL4)-14

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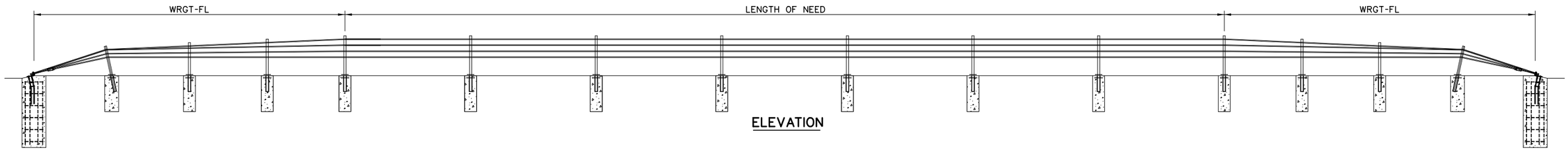
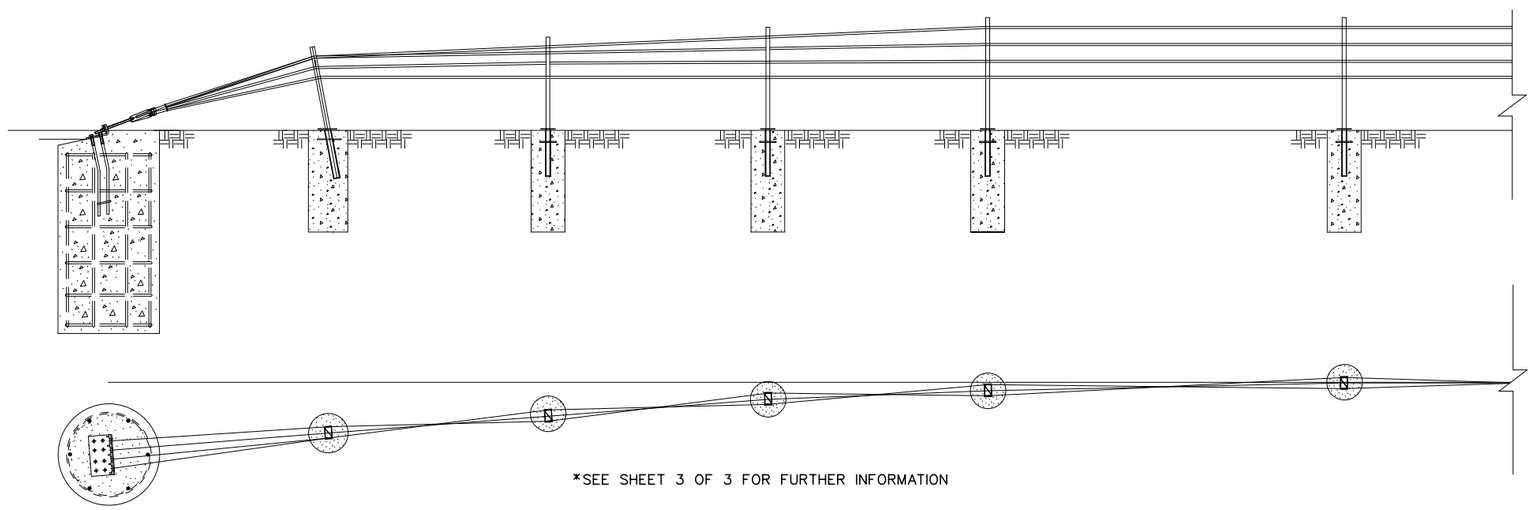


ELEVATION

PLAN

WRGT-FL END ANCHOR



*SEE SHEET 3 OF 3 FOR FURTHER INFORMATION

ROPE TENSION TABLE		
ROPE TEMP (°F)	TENSION (LBS)	TENSION (kN)
0	5700	25.4
5	5550	24.7
10	5400	24.0
15	5250	23.4
20	5100	22.7
25	4950	22.0
30	4800	21.4
35	4650	20.74
40	4500	20.0
45	4350	19.3
50	4200	18.7
55	4050	18.0
60	3900	17.3
65	3750	16.7
70	3600	16.0
75	3450	15.3
80	3300	14.7
85	3150	14.0
90	3000	13.3
95	2850	12.7
100	2700	12.0
105	2550	11.3
110	2400	10.7
115	2250	10.0
120	2100	9.3
125	1950	8.7
130	1800	8.0
135	1650	7.3
140	1500	6.7

*ROPE TENSION: ± 20% AFTER 2-WEEK INTERVAL

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACT MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.
5. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
6. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
7. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
8. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
9. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.
10. TAPER RATES FOR THE BRIFEN WRSF ARE AS FOLLOWS:
    HORIZONTAL: 25:1 MAXIMUM, 50:1 PREFERABLE
    VERTICAL: 25:1 MAXIMUM, 50:1 PREFERABLE

Texas Department of Transportation

Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

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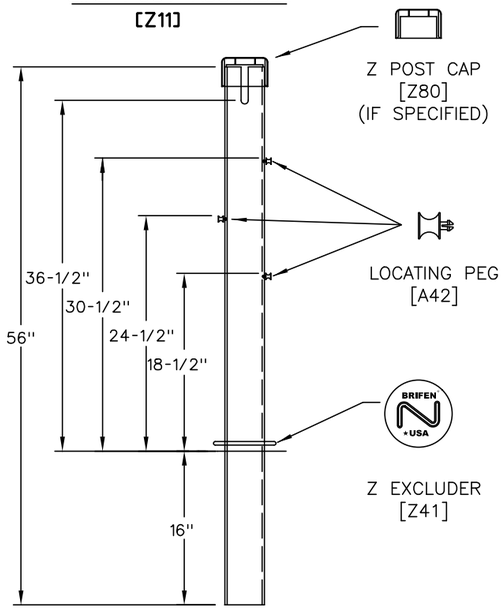
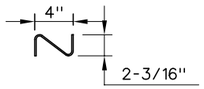
LINE POST ASSEMBLY
[Z11]



ELEVATION

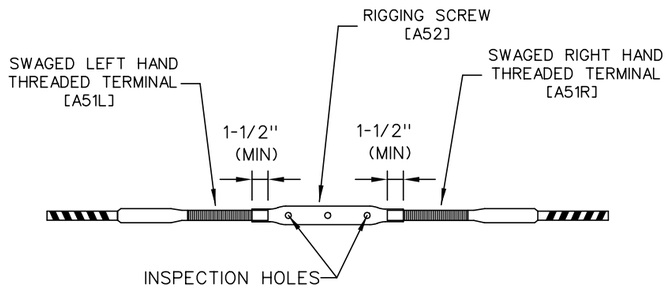


PLAN

NOTES SPECIFIC TO LINE POST ASSEMBLY

1. ROPE HEIGHTS SHALL BE ± 1" TO GROUND LINE.
2. POST SHALL BE ± 4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.

ROPE CONNECTION DETAIL

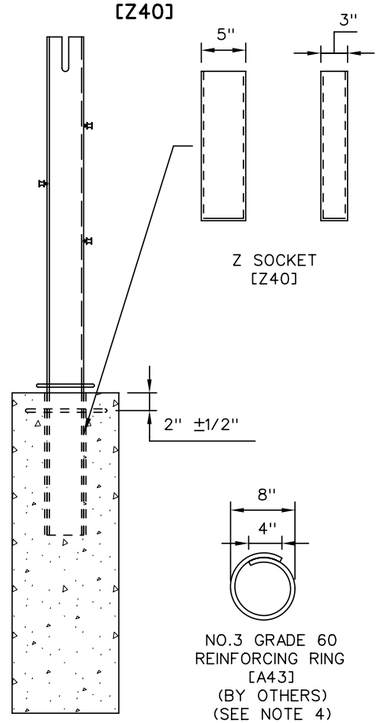


NOTES SPECIFIC TO ROPE CONNECTION DETAIL

1. THE WIRE ROPE TERMINALS SHALL BE THREADED A MINIMUM OF 1-1/2" INTO RIGGING SCREW.
2. AFTER FINAL TENSIONING, THE TERMINALS SHALL BE VISIBLE IN THE INSPECTION HOLES.

SOCKET ASSEMBLY

CONCRETE FOOTING
[Z40]



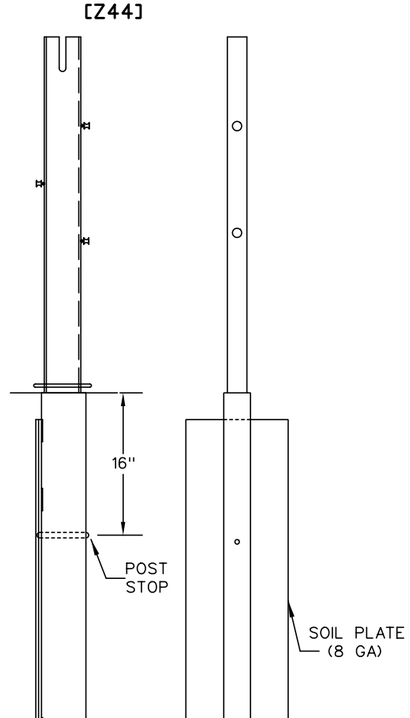
ELEVATION

PLAN

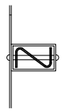
NOTES SPECIFIC TO CONCRETE FOOTING

1. SIZE OF FOOTING WILL BE DETERMINED BY SOIL CONDITIONS, FOUNDATION TYPE AND PROJECT CONDITIONS.
2. CONCRETE BASED ON AGENCY SPECIFICATIONS.
3. CONCRETE BY OTHERS.
4. REINFORCING RING (BY OTHERS) WILL BE USED ACCORDING TO FOUNDATION SIZE AND TYPE. THE REINFORCEING RING MAY BE OMITTED IF THE FOOTING IS PLACED IN A CONTINOUS CONCRETE MOW STRIP.
5. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
6. SOCKET SHALL BE ± 2° OF VERTICAL PLUMB.

DRIVE SOCKET
[Z44]



ELEVATION SIDE



PLAN

NOTES SPECIFIC TO DRIVE SOCKETS

1. SIZE OF SOIL PLATE WILL BE DETERMINED BY SOIL CONDITIONS AND PROJECT CONDITIONS.
2. THE SOIL PLATE SHALL BE PARALLEL TO ROADWAY AND CAN FACE TOWARD OR AWAY FROM THE TRAVEL LANE.
3. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
4. SOCKET SHALL BE ± 2° OF VERTICAL PLUM.
5. SOCKETS SHALL BE DRIVEN IN A MANNER TO NOT DISTORT OR DESTROY THE TOP OF SOCKET TO A DEGREE THAT PLACES THE SOCKET OR LINE POST OUT OF CONSTRUCTION TOLERANCES.

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACTION MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.

Texas Department of Transportation

Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

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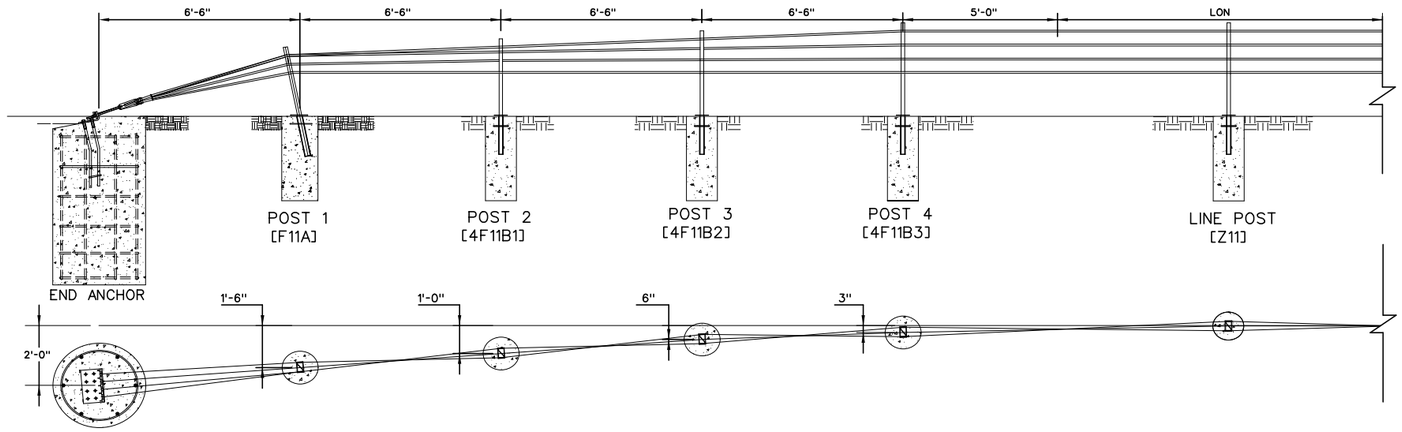
WRGT-FL END ANCHOR LAYOUT



GENERAL NOTES:

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4. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
5. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
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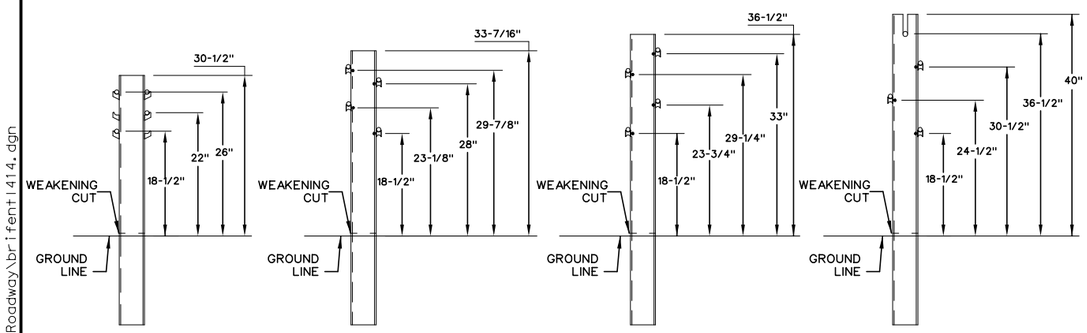
WRGT-FL POST DETAILS

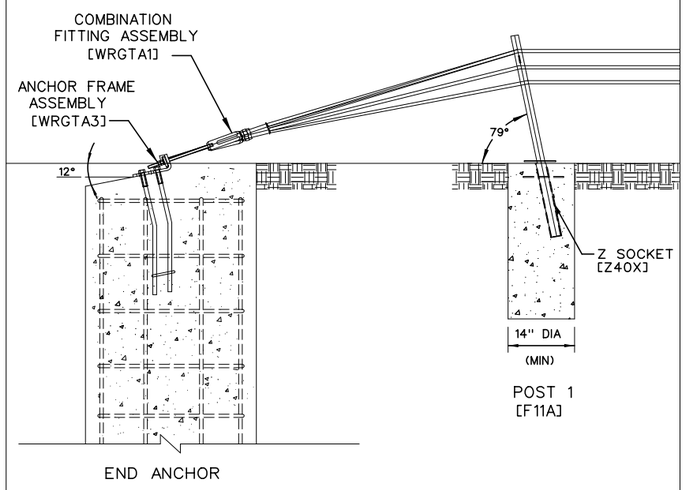


POST 1 [F11AL] | POST 2 [4F11B1L] | POST 3 [4F11B2L] | POST 4 [4F11B3L]

NOTES SPECIFIC TO WRGT-FL POST DETAIL

1. ROPE HEIGHTS SHALL BE ?1" TO GROUND LINE.
2. POST SHALL BE ?4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.
6. Z EXCLUDER (Z41) SHALL BE USED.
7. POST A & SOCKET SHALL BE PLACED 79? (?4?) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
8. POST A SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.
9. FOUNDATIONS FOR POST 2 THRU 4 SHALL BE THE SAME AS THE LINE POST ASSEMBLY'S FOR THE PROJECT.
10. WEAKENED CUTS SHALL FACE END ANCHOR.

END ANCHOR DETAILS

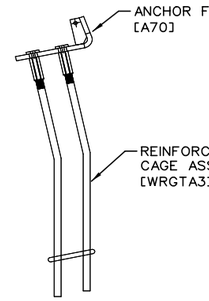


NOTES SPECIFIC TO END ANCHOR DETAIL

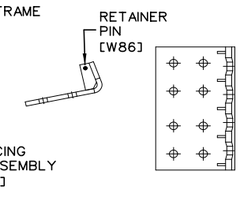
1. THE END ANCHOR ASSEMBLY SHALL BE PLACED 12? (+3?, -1?) BELOW HORIZONTAL PLANE.
2. POST 1 & SOCKET SHALL BE PLACED 79? (?4?) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
3. POST 1 SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.

END ANCHOR COMPONENTS

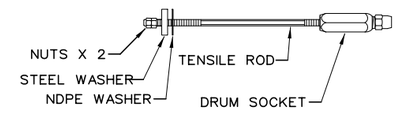
ANCHOR FRAME ASSEMBLY



ANCHOR FRAME [A70]



COMBINATION FITTING [WRGTA1]



SHEET 3 OF 3

Texas Department of Transportation — Design Division Standard

BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

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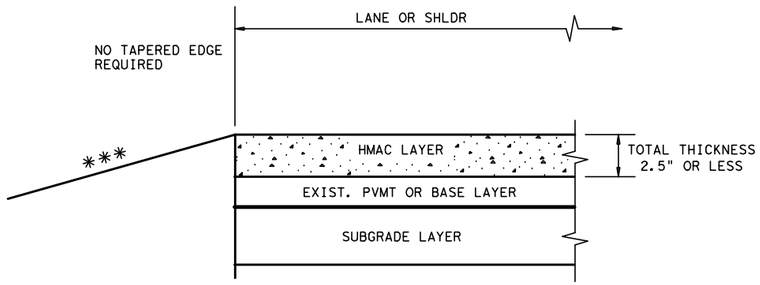
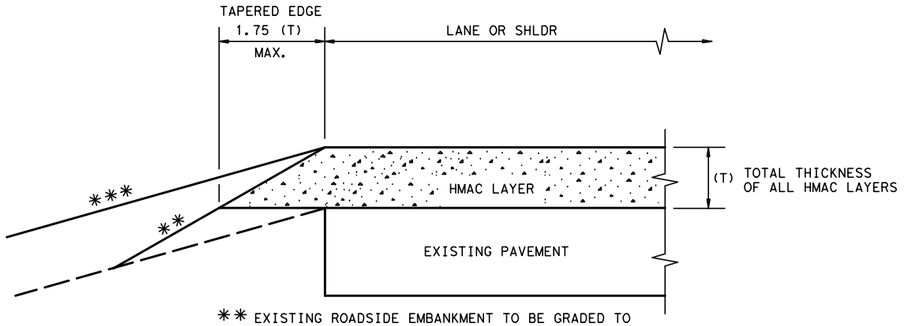


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

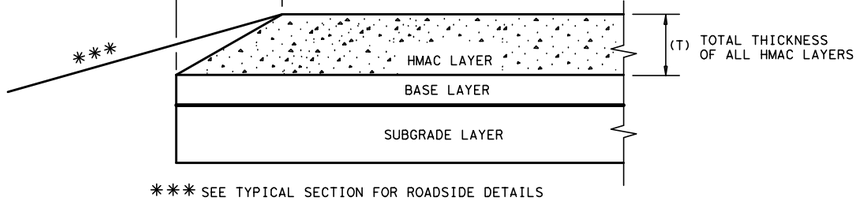
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



** 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.

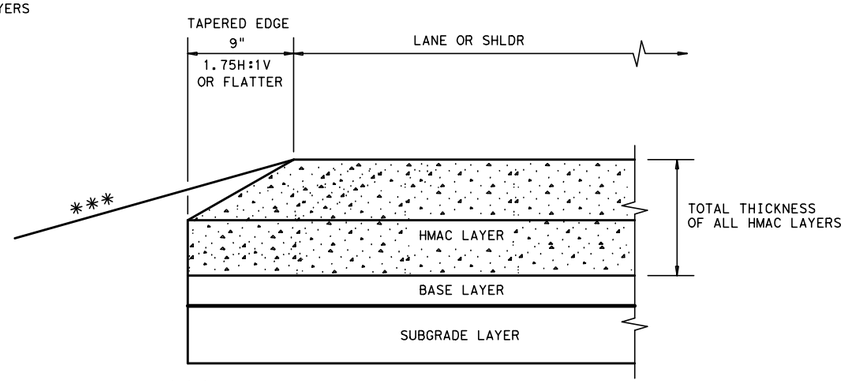
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

1. 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".
2. FOR FURTHER INFORMATION REGARDING THE ROADSIDE AND PAVEMENT DETAILS, SEE TYPICAL SECTIONS.
3. PAYMENT FOR TAPERED EDGE WILL BE IN ACCORDANCE WITH APPLICABLE ITEMS IN THE CONTRACT.
4. THE SLOPE OF THE TAPERED EDGE SHALL BE 1.75H:1V OR FLATTER.
5. 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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TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

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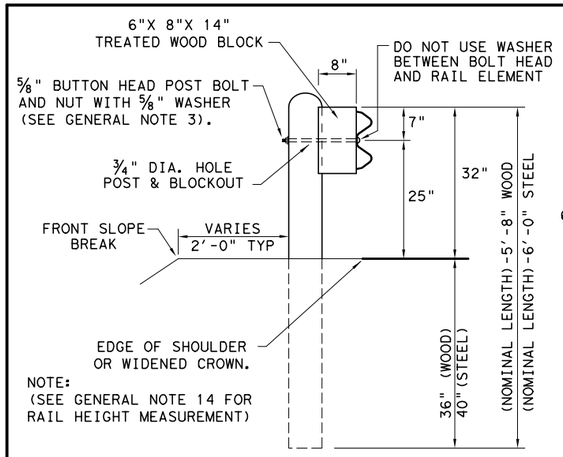
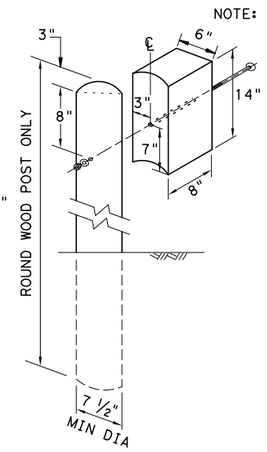
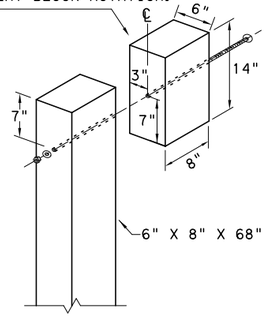


TYPICAL POST PLACEMENT

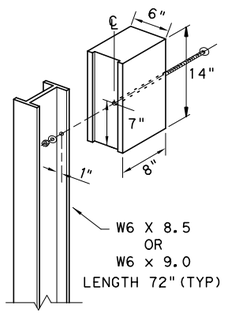


WOOD BLOCK TO ROUND WOOD POST

NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.

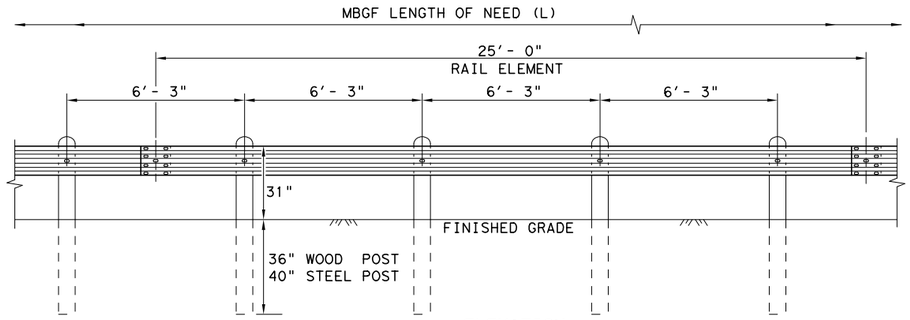


WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

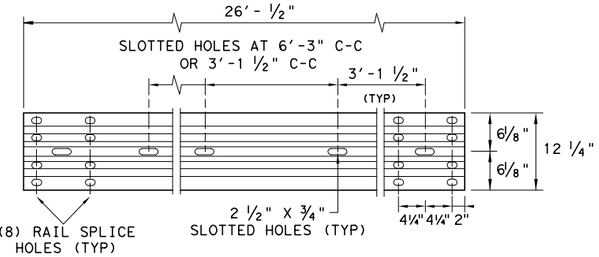
NOTE: ✳✳ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

ELEVATION MID-SPAN RAIL SPLICE

SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

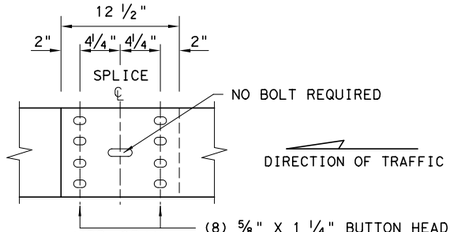
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH — VARIES
FBB01 = 1 ¼"
FBB02 = 2"
⅝"

POST & BLOCK LENGTH
FBB03 = 10"
FBB04 = 18"

BUTTON HEAD BOLT

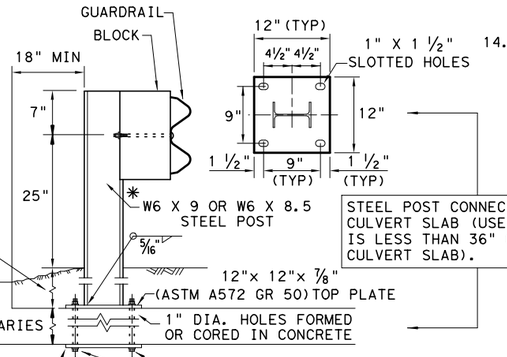
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

MID-SPAN RAIL SPLICE DETAIL

NOTE: GF(31), MID-SPAN RAIL SPLICES ARE REQUIRED WITH 6'-3" POST SPACINGS.



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. ⅞" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 ¼" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE ⅞" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS ¼" MIN. BEYOND NUT.

NOTE: CULVERTS OF 25 FT. OR LESS, SEE GF(31)LS STANDARD FOR "LONG SPAN" OPTION.

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

NOTE: TRANSISTIONS TO BRIDGE RAILS OR TRAFFIC BARRIERS.
SEE GF(31)TL3 TR STANDARD FOR HIGH-SPEED TL-3 TRANSITIONS.
SEE GF(31)TL2 TR STANDARD FOR LOW-SPEED TL-2 TRANSITIONS.

Texas Department of Transportation — Design Division Standard

METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

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	ABL	HOWARD			76	

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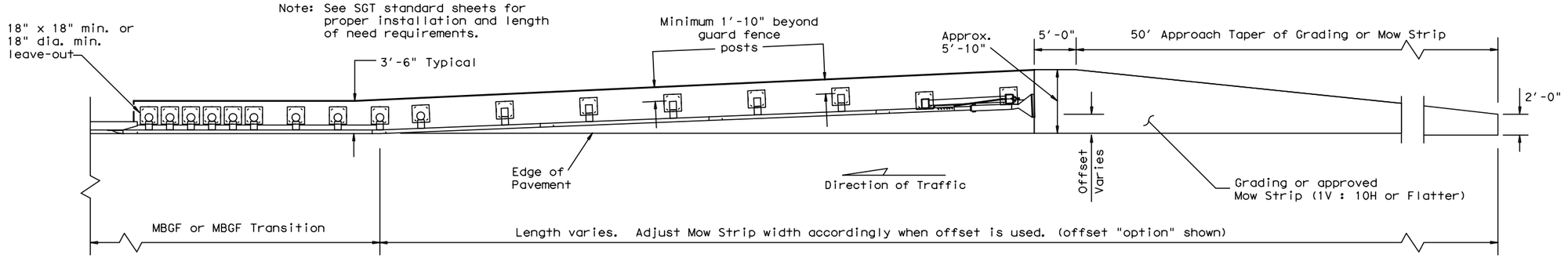
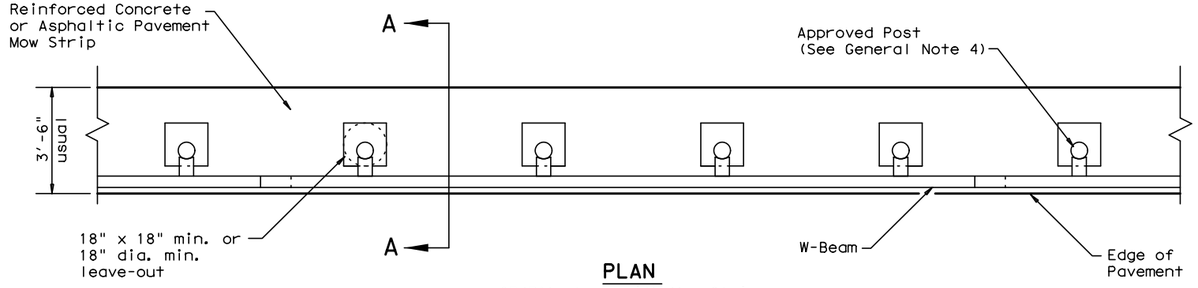
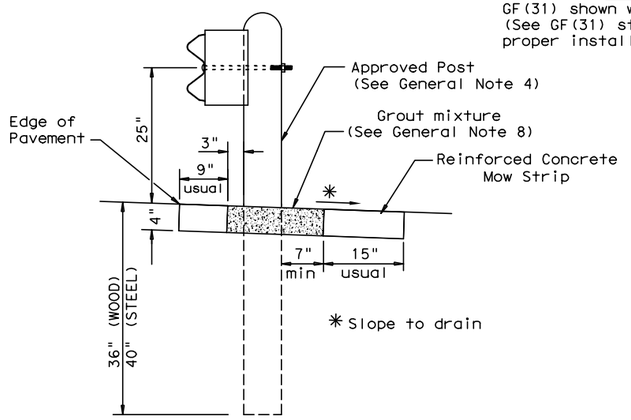


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



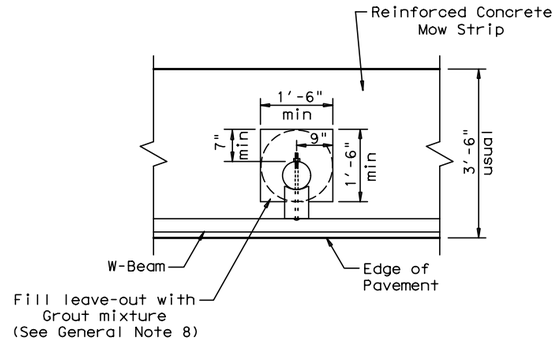
PLAN

GF(31) shown with Mow Strip
(See GF(31) standard sheet for proper installation)



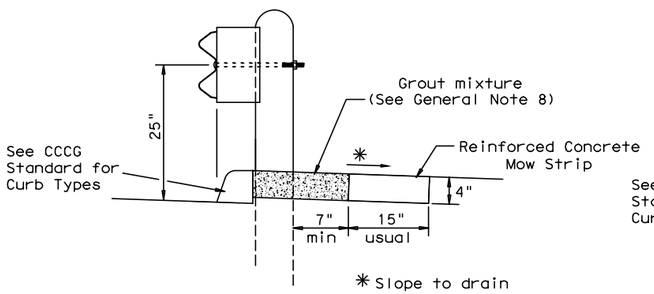
SECTION A-A

Typical



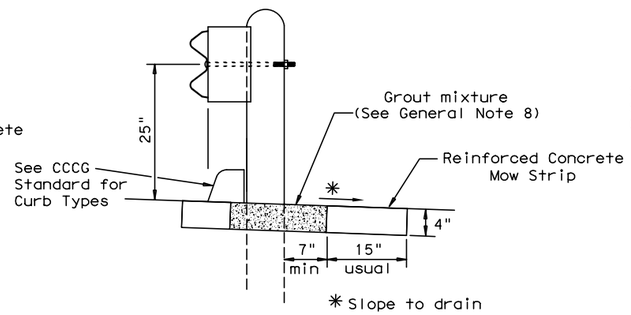
MOW STRIP DETAIL

Reinforced Concrete Mow Strip
with 18" x 18" Square or
18" Dia. minimum leave-out.



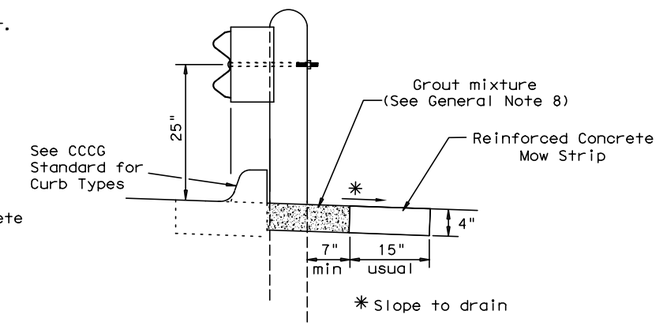
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	ABL	HOWARD		77

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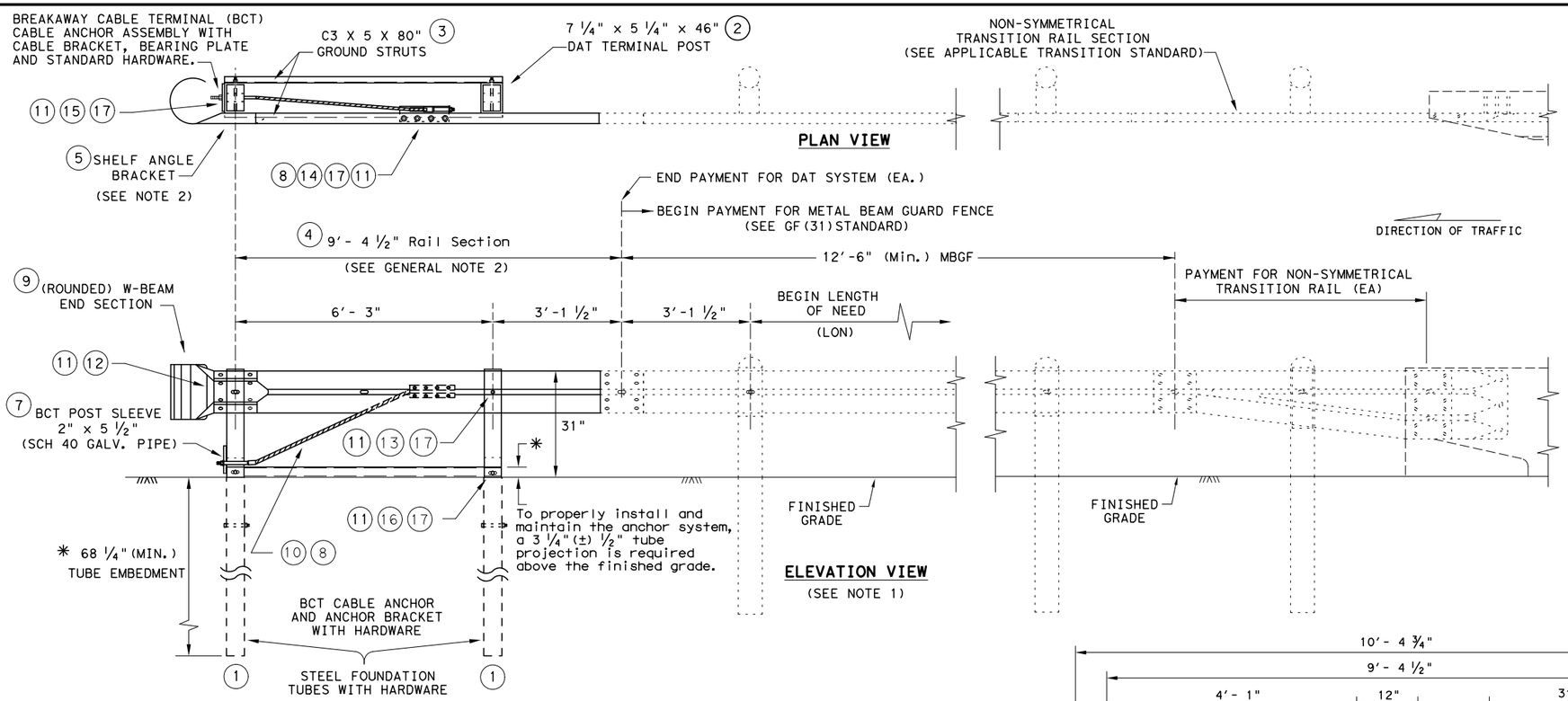


DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

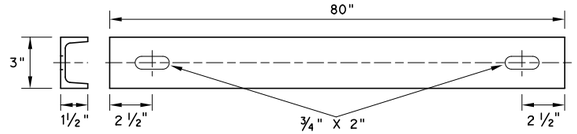
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION

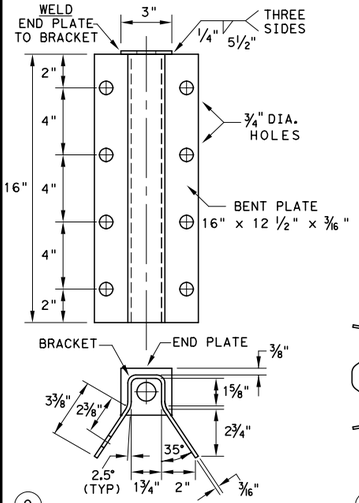
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED) W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, GUARDRAIL	20
(12)	1 1/4" BUTTON HEAD BOLT	4
(13)	10" BUTTON HEAD BOLT	2
(14)	5/8" X 2" HEX HEAD BOLT	8
(15)	5/8" X 8" HEX HEAD BOLT	4
(16)	5/8" X 10" HEX HEAD BOLT	2
(17)	5/8" FLAT WASHER	18

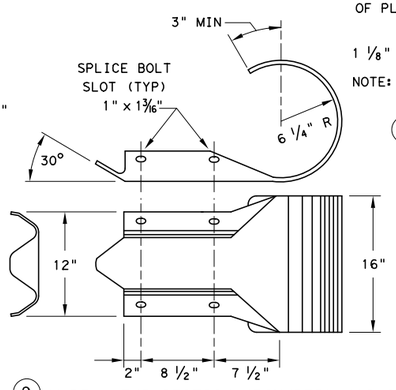
(4) TERMINAL RAIL ELEMENT FOR DAT



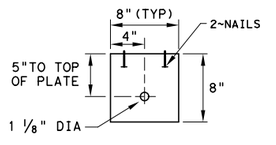
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

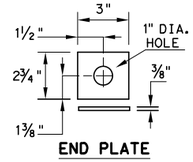


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

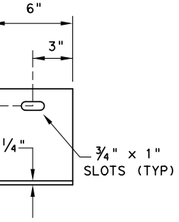


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

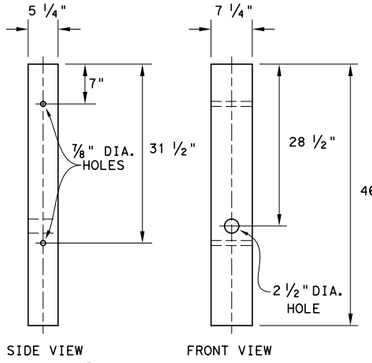
(6) BEARING PLATE
8"x 8"x 5/8" PL



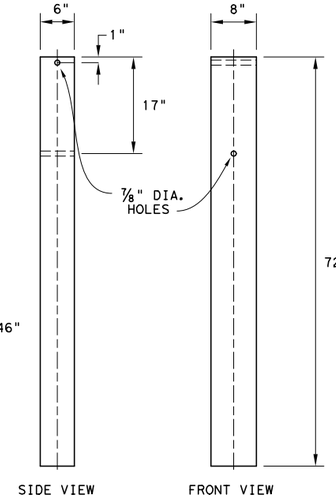
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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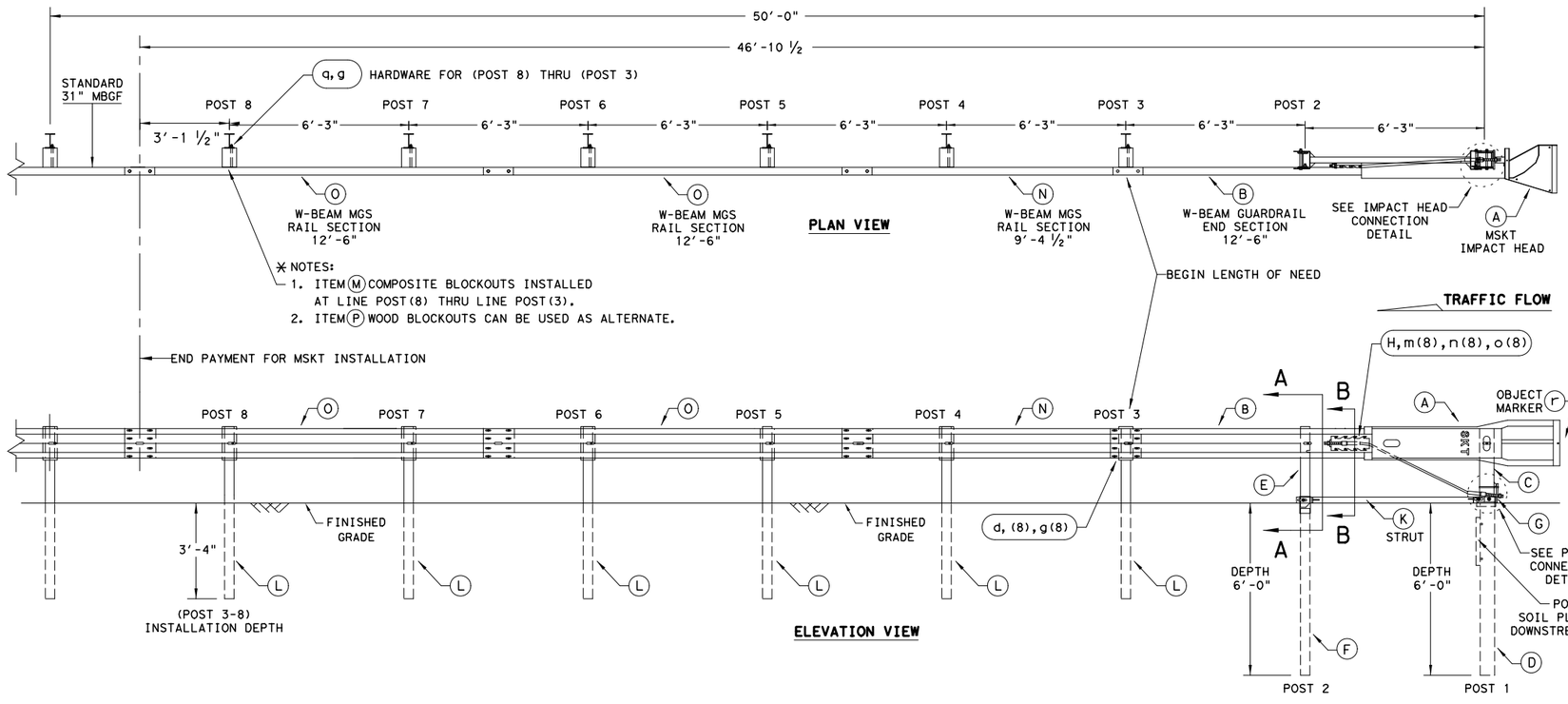


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

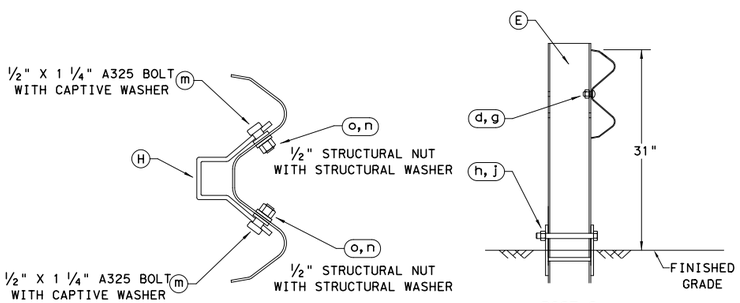
GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435. 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE; MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION~062717).
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
7. A COMPOSITE MATERIAL BLOCKOUTS THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
8. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, & REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
13. THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
14. A DRIVING CAP WITH A TIMBER OR PLASTIC INSERT SHALL BE USED WHEN DRIVING POSTS 3-8 TO PREVENT DAMAGE TO THE GALVANIZING ON TOP OF THE POST. SPECIAL DRIVING CAP TO BE USED ON LOWER POSTS 1 & 2 TO PREVENT DAMAGE TO THE WELDED PLATES.

SEE NOTES: ✳

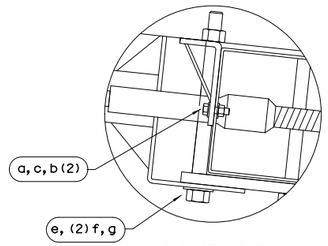
ALTERNATIVE ITEMS NOT SHOWN. ✳✳
✳ ITEM(P) 8" WOOD-BLOCKOUT
✳✳ ITEM(Q) 25'GUARD FENCE PANEL

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x ⅜" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

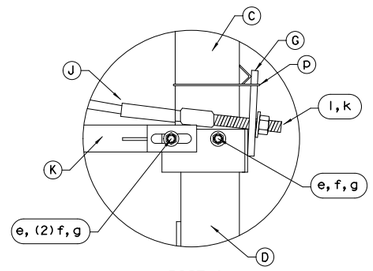


SECTION B-B
ANCHOR BRACKET

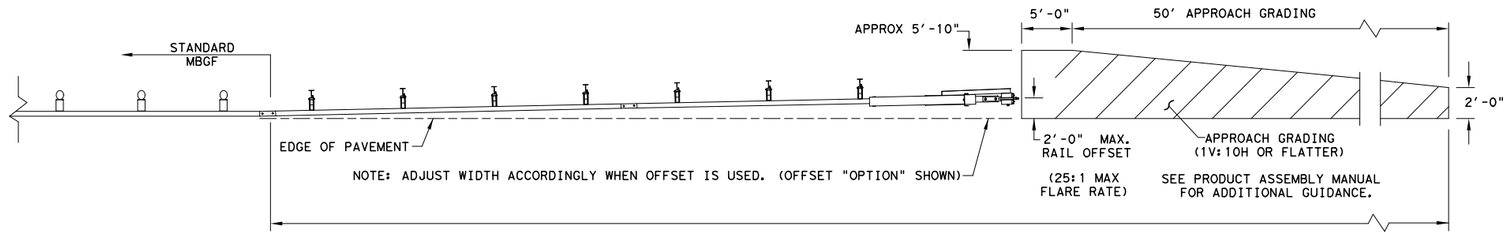
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

TRAFFIC FLOW

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE MSKT END TERMINAL, IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL
MSKT-MASH-TL-3
SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0068	08	067	US 87	
	DIST	COUNTY		SHEET NO.	
	ABL	HOWARD		79	

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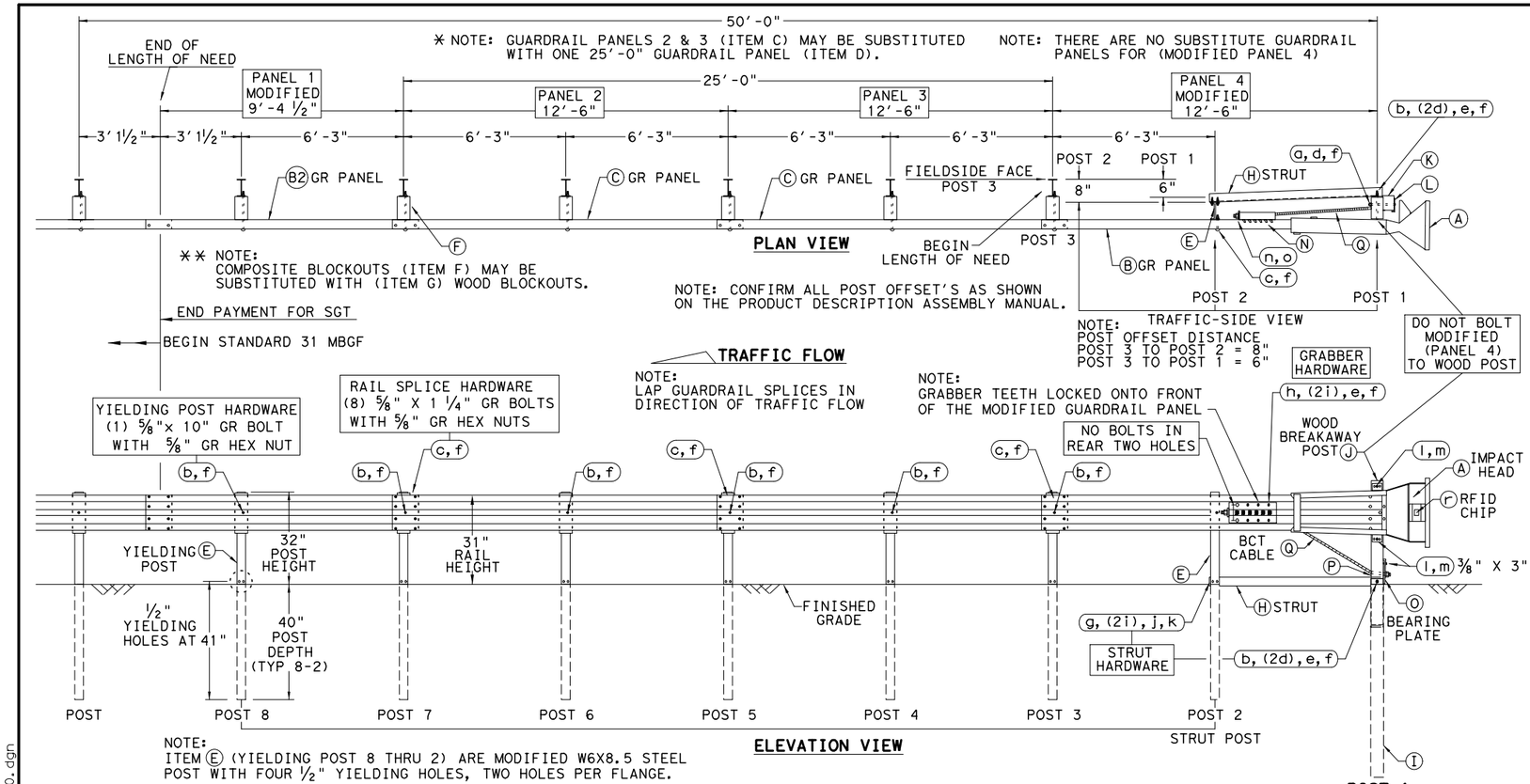
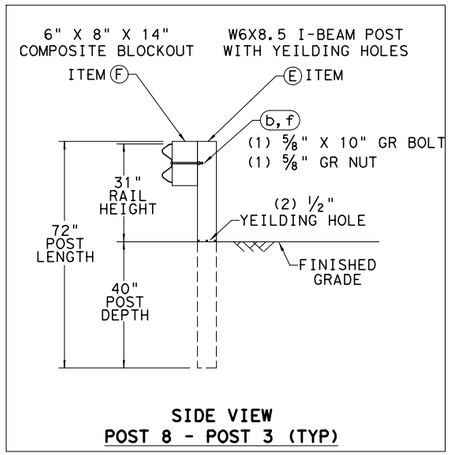


GENERAL NOTES

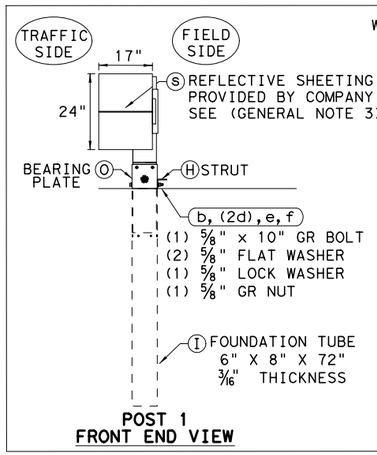
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
		SMALL HARDWARE	
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

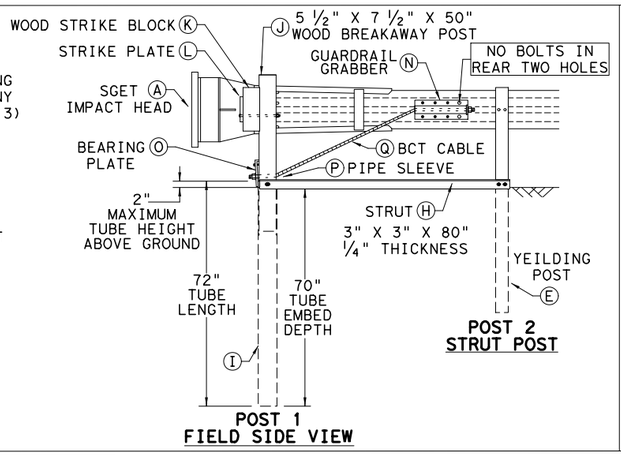
ALTERNATIVE ITEMS
* D
** G
NOTE: SEE PLAN VIEW



SIDE VIEW
POST 8 - POST 3 (TYP)

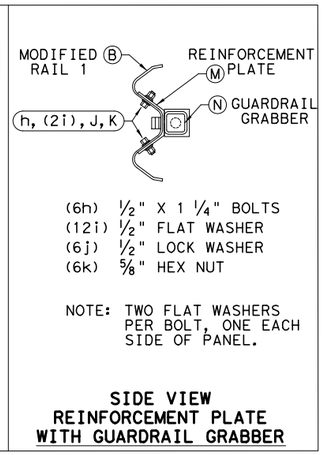


POST 1
FRONT END VIEW

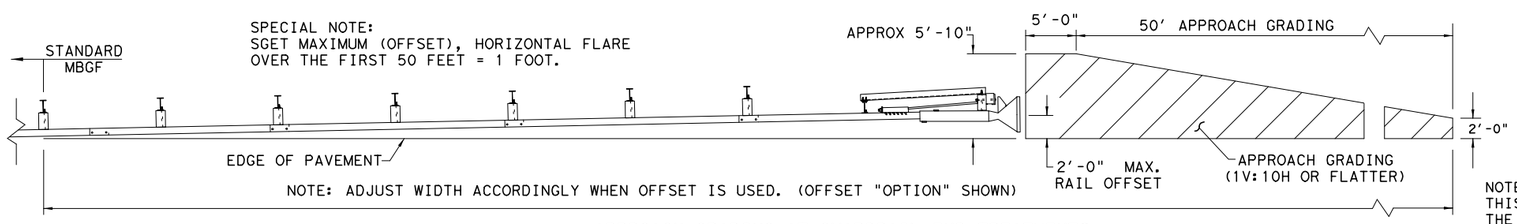


POST 1
FIELD SIDE VIEW

POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

NOTE:
THIS STANDARD IS A BASIC REPRESENTATION OF THE SGET TERMINAL SYSTEM AND IS NOT INTENDED TO REPLACE THE MANUFACTURER'S ASSEMBLY MANUAL.

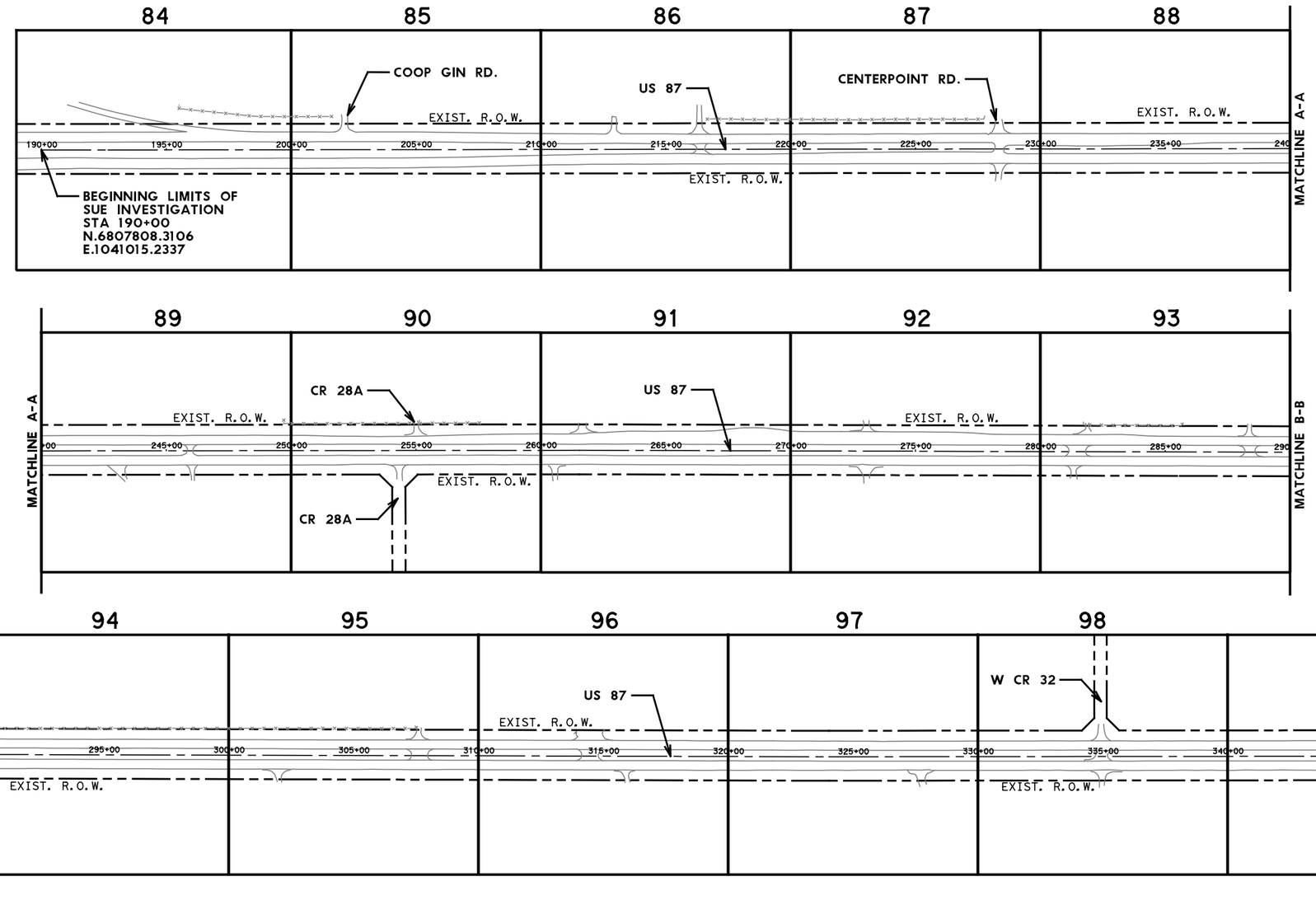
Texas Department of Transportation
Design Division Standard

SPIG INDUSTRY, LLC
SINGLE GUARDRAIL TERMINAL
SGET - TL-3 - MASH
SGT(15)31-20

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		80

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
81-82	EXISTING UTILITY PLANS CONTROL INDEX SHEETS
83	EXISTING UTILITY PLANS GENERAL NOTES/ LEGENDS
84-111	EXISTING UTILITY PLANS



COORDINATES SHOWN HEREON REFER TO THE TEXAS COORDINATE SYSTEM OF 1983 (NORTH CENTRAL ZONE; NAD83(2011) EPOCH 2010.00) AS DERIVED LOCALLY FROM TXDOT'S VRS NETWORK VIA REAL TIME KINEMATIC (RTK) METHODS. AN AVERAGE COMBINATION FACTOR OF 1.00021 WAS USED TO SCALE GRID COORDINATES AND DISTANCES TO SURFACE. ALL COORDINATES SHOWN ARE SURFACE.

THE ELEVATIONS SHOWN ARE NAVD88 AND WERE DERIVED FROM THE ABOVE RTK OBSERVATIONS. ORTHOMETRIC HEIGHTS WERE CALCULATED BY APPLYING THE GEOID 12B MODEL TO THE ELLIPSOID HEIGHTS.

CONTROL POINT 1150033
NORTHING: 985903.42
EASTING: 6885239.21
ELEVATION: 2786.73
FEATURE: MON

CONTROL POINT 1150034
NORTHING: 991009.20
EASTING: 6879493.22
ELEVATION: 2770.23
FEATURE: MON

CONTROL POINT 1150035
NORTHING: 998777.79
EASTING: 6872078.28
ELEVATION: 2751.43
FEATURE: MON

CONTROL POINT 1150036
NORTHING: 1006275.41
EASTING: 6863024.83
ELEVATION: 2685.83
FEATURE: MON

CONTROL POINT 1150037
NORTHING: 1013250.03
EASTING: 6854409.92
ELEVATION: 2661.02
FEATURE: MON

CONTROL POINT 1150038
NORTHING: 1022197.68
EASTING: 6844021.00
ELEVATION: 2621.57
FEATURE: MON

CONTROL POINT 1150039
NORTHING: 1029036.32
EASTING: 6836375.74
ELEVATION: 2648.12
FEATURE: MON

0 125 250 500
SCALE: 1" = 500' HOR.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87

EXISTING UTILITY PLANS

CONTROL INDEX SHEET

(1 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	81
DS	0068	08	067	
GRPH CHECK				
CF				

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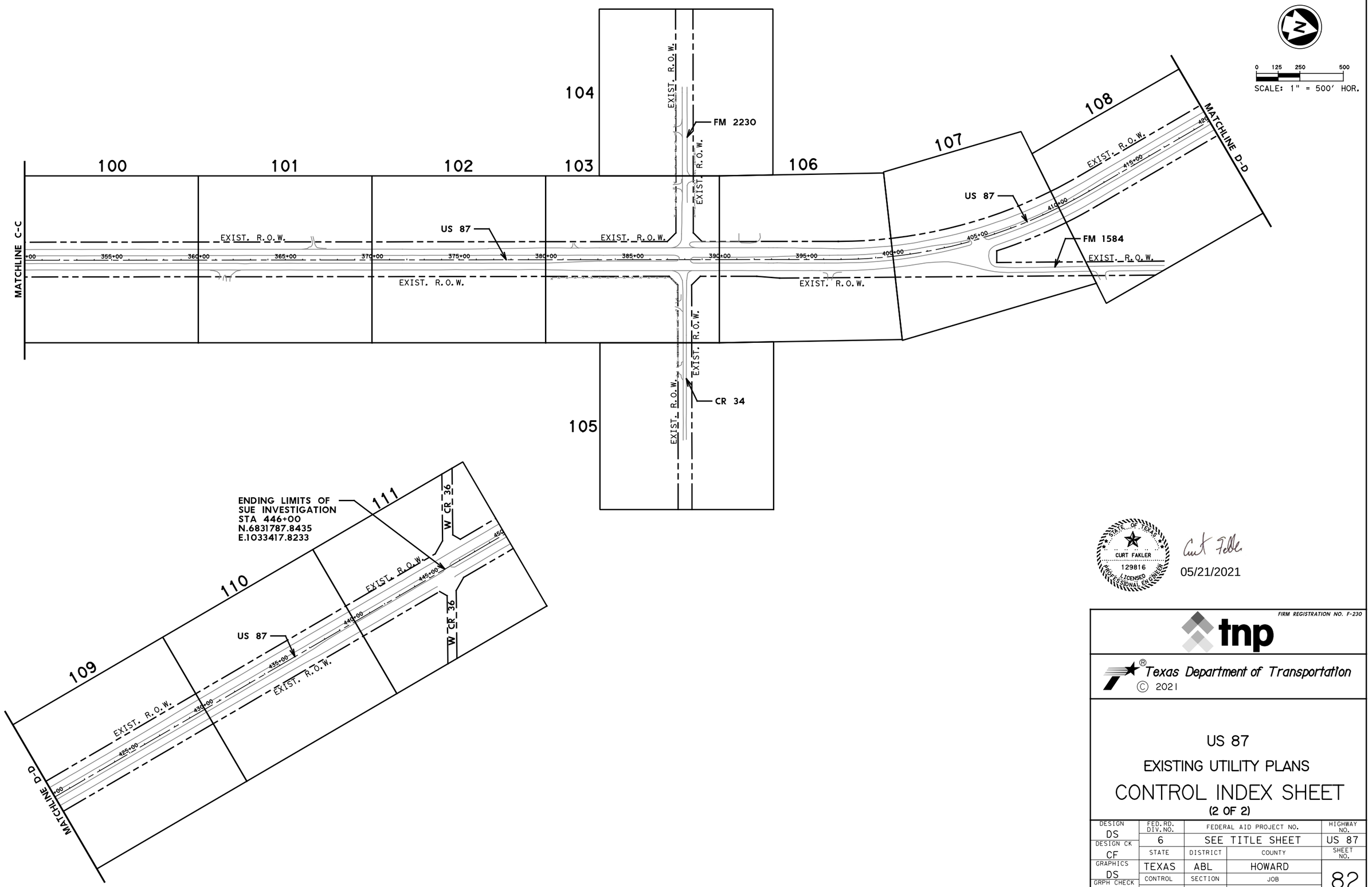

STATE OF TEXAS
CURT FAKLER
129816
LICENSED
PROFESSIONAL ENGINEER

Curt Fakler

05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

EXISTING UTILITY PLANS

CONTROL INDEX SHEET

(2 OF 2)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	82
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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LINESTYLE LEGEND

ELECTRIC — E1 — Oncor
ELECTRIC — E1 (C) — E1 (C) — Oncor
ELECTRIC — E1 (D) — E1 (D) — Oncor
ELECTRIC — E2 — TxDOT
ELECTRIC — E2 (C) — E2 (C) — TxDOT
ELECTRIC — E2 (D) — E2 (D) — TxDOT
ELECTRIC — E3 — Surge Energy *
ELECTRIC — E3 (C) — E3 (C) — Surge Energy *
ELECTRIC — E3 (D) — E3 (D) — Surge Energy *
ELECTRIC — E4 — Private
ELECTRIC — E4 (C) — E4 (C) — Private
ELECTRIC — E4 (D) — E4 (D) — Private
ELECTRIC — E5 — SM Energy
ELECTRIC — E5 (C) — E5 (C) — SM Energy
ELECTRIC — E5 (D) — E5 (D) — SM Energy
ELECTRIC — E6 — Ovintiv
ELECTRIC — E6 (C) — E6 (C) — Ovintiv
ELECTRIC — E6 (D) — E6 (D) — Ovintiv
OVERHEAD ELECTRIC — OHE1 (C) — OHE1 (C) — Oncor
OVERHEAD ELECTRIC — OHE2 (C) — OHE2 (C) — NOT USED
OVERHEAD ELECTRIC — OHE: T (C) — OHE: T (C) — Oncor - Transmission
CABLE TV — CATV1 — NOT USED
CABLE TV — CATV1 (C) — CATV1 (C) — NOT USED
CABLE TV — CATV1 (D) — CATV1 (D) — NOT USED
FIBER OPTIC — FO1 — Wes-Tex Telephone Coop.
FIBER OPTIC — FO1 (C) — FO1 (C) — Wes-Tex Telephone Coop.
FIBER OPTIC — FO1 (D) — FO1 (D) — Wes-Tex Telephone Coop.

FIBER OPTIC — FO2 — AT&T
FIBER OPTIC — FO2 (C) — FO2 (C) — AT&T
FIBER OPTIC — FO2 (D) — FO2 (D) — AT&T
OVERHEAD CATV — OHCATV1 (C) — OHCATV1 (C) — NOT USED
OVERHEAD FIBER OPTIC — OHFO1 (C) — OHFO1 (C) — NOT USED
OVERHEAD FIBER OPTIC — OHFO2 (C) — OHFO2 (C) — NOT USED
OVERHEAD TELEPHONE — OHT1 (C) — OHT1 (C) — Wes-Tex Telephone Coop. *
OVERHEAD TELEPHONE — OHT2 (C) — OHT2 (C) — AT&T
TELEPHONE — T1 — Wes-Tex Telephone Coop.
TELEPHONE — T1 (C) — T1 (C) — Wes-Tex Telephone Coop.
TELEPHONE — T1 (D) — T1 (D) — Wes-Tex Telephone Coop.
TELEPHONE — T2 — AT&T
TELEPHONE — T2 (C) — T2 (C) — AT&T
TELEPHONE — T2 (D) — T2 (D) — AT&T
GAS — G1 — WTG Gas
GAS — G1 (C) — G1 (C) — WTG Gas
GAS — G1 (D) — G1 (D) — WTG Gas
GAS — G2 — Medallion Midstream
GAS — G2 (C) — G2 (C) — Medallion Midstream
GAS — G2 (D) — G2 (D) — Medallion Midstream
GAS — G3 — NuStar Energy
GAS — G3 (C) — G3 (C) — NuStar Energy
GAS — G3 (D) — G3 (D) — NuStar Energy
GAS — G4 — Targa Resources *
GAS — G4 (C) — G4 (C) — Targa Resources *
GAS — G4 (D) — G4 (D) — Targa Resources *

GAS — G5 — Navitas Midstream
GAS — G5 (C) — G5 (C) — Navitas Midstream
GAS — G5 (D) — G5 (D) — Navitas Midstream
GAS — G6 — Enterprise Products *
GAS — G6 (C) — G6 (C) — Enterprise Products *
GAS — G6 (D) — G6 (D) — Enterprise Products *
GAS — G7 — Kinder Morgan *
GAS — G7 (C) — G7 (C) — Kinder Morgan *
GAS — G7 (D) — G7 (D) — Kinder Morgan *
GAS — G8 — Callon Petroleum *
GAS — G8 (C) — G8 (C) — Callon Petroleum *
GAS — G8 (D) — G8 (D) — Callon Petroleum *
GAS — G9 — DCP Midstream
GAS — G9 (C) — G9 (C) — DCP Midstream
GAS — G9 (D) — G9 (D) — DCP Midstream
GAS — G10 — Atmos
GAS — G10 (C) — G10 (C) — Atmos
GAS — G10 (D) — G10 (D) — Atmos
GAS — G11 — NOT USED
GAS — G11 (C) — G11 (C) — NOT USED
GAS — G11 (D) — G11 (D) — NOT USED
GAS — G12 — NOT USED
GAS — G12 (C) — G12 (C) — NOT USED
GAS — G12 (D) — G12 (D) — NOT USED
GAS — G13 — NOT USED
GAS — G13 (C) — G13 (C) — NOT USED
GAS — G13 (D) — G13 (D) — NOT USED

WATER — W1 — Surge Energy
WATER — W1 (C) — W1 (C) — Surge Energy
WATER — W1 (D) — W1 (D) — Surge Energy
WATER — W2 — Diamonback Energy *
WATER — W2 (C) — W2 (C) — Diamonback Energy *
WATER — W2 (D) — W2 (D) — Diamonback Energy *
WATER — W3 — Unknown Owner
WATER — W3 (C) — W3 (C) — Unknown Owner
WATER — W3 (D) — W3 (D) — Unknown Owner
WATER — W4 — H2O Midstream
WATER — W4 (C) — W4 (C) — H2O Midstream
WATER — W4 (D) — W4 (D) — H2O Midstream
WATER — W5 — Alon USA
WATER — W5 (C) — W5 (C) — Alon USA
WATER — W5 (D) — W5 (D) — Alon USA
WASTEWATER — WW1 — NOT USED
WASTEWATER — WW1 (C) — WW1 (C) — NOT USED
WASTEWATER — WW1 (D) — WW1 (D) — NOT USED
STORM SEWER — STM1 — NOT USED
STORM SEWER — STM1 (C) — STM1 (C) — NOT USED
STORM SEWER — STM1 (D) — STM1 (D) — NOT USED

SYMBOL LEGEND

- TEST STATION W/ VENT PIPE
- FIRE HYDRANT
- WATER VALVE BOX
- CATHODIC PROTECTION
- PHOTO TAKEN HERE
- WASTEWATER MANHOLE
- SEWER CLEAN OUT
- STORM MANHOLE
- STORM SEWER INLET
- STORM CLEAN OUT
- GAS MANHOLE
- GAS METER
- GAS VALVE
- GAS TEST STATION
- CATV PEDESTAL
- CATV SERVICE BOX
- TELEPHONE MANHOLE
- TELEPHONE PEDESTAL
- TELEPHONE POLE
- TELEPHONE HAND HOLE
- FIBER OPTIC HAND HOLE
- FIBER OPTIC MARKER POST
- FIBER OPTIC MANHOLE
- UTILITY MARKER POST
- RAILROAD SIGNAL
- WATER MANHOLE
- WATER METER
- WATER VALVE
- ELECTRIC PEDESTAL
- ELECTRIC MANHOLE
- ELECTRIC METER
- HIGH MAST LIGHTING TOWER
- ELECTRIC TRANSFORMER
- TRAFFIC CAMERA
- LUMINAIRE STANDARD
- SIGNAL CONTROL PANEL
- POWER POLE
- POWER POLE WITH RISER
- ILLUMINATION POLE
- GUY ANCHOR
- GUY POLE DEADMAN
- SOLAR PANEL
- TRAFFIC SIGNAL PEDESTAL
- TRAFFIC SIGNAL BOX
- SIGN
- TRAFFIC SIGNAL POLE
- GENERIC MANHOLE
- LEVEL 'A' TEST HOLE
- CONTROL POINT

GENERAL NOTES

SIZE INFORMATION SHOWN IS TAKEN FROM AVAILABLE UTILITY RECORDS.

UTILITY QUALITY LEVEL A:

PRECISE HORIZONTAL AND VERTICAL LOCATION OF UTILITIES OBTAINED BY THE ACTUAL EXPOSURE
(OR VERIFICATION OF PREVIOUSLY EXPOSED AND SURVEYED UTILITIES) AND SUBSEQUENT MEASUREMENT OF SUBSURFACE UTILITIES, USUALLY AT A SPECIFIC POINT.

UTILITY QUALITY LEVEL B:

INFORMATION OBTAINED THROUGH THE APPLICATION OF APPROPRIATE SURFACE GEOPHYSICAL METHODS
TO DETERMINE THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF SUBSURFACE UTILITIES.
QUALITY LEVEL B DATA SHOULD BE REPRODUCIBLE BY SURFACE GEOPHYSICS AT ANY POINT OF THEIR
DEPICTION. THIS INFORMATION IS SURVEYED TO APPLICABLE TOLERANCES DEFINED BY THE PROJECT
AND REDUCED ONTO PLAN DOCUMENTS.

UTILITY QUALITY LEVEL C:

INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE ABOVE-GROUND UTILITY FEATURES
AND BY USING PROFESSIONAL JUDGEMENT IN CORRELATING THIS INFORMATION TO
QUALITY LEVEL D INFORMATION

UTILITY QUALITY LEVEL D:

INFORMATION DERIVED FROM EXISTING RECORDS OR ORAL RECOLLECTIONS.

QUALITY LEVEL LEGEND

WW1 — QUALITY LEVEL B
WW1 (C) — QUALITY LEVEL C
WW1 (D) — QUALITY LEVEL D

CONTACT LIST

COMPANY	UTILITY COORDINATOR	PHONE	E-mail	ADDRESS
Atmos			Map.Requests@atmosenergy.com	
Alon USA	Robert Broussard	432-263-9514	Robert.Broussard@delekus.com	
AT&T	Ken Spencer		KS5595@att.com	
Callon Petroleum	Cody Cowan	719-588-5951	cody.cowan@linequestllc.com	
DCP Midstream	Dwayne Hillman		hillmad@dcpmidstream.com	
Diamondback Energy	Josh Baltzell	43-247-6244	JBaltzell@Diamondbackenergy.com	
Enterprise Products	Angela Sledge		Land_Encroachments@eprod.com	9420 West Sam Houston Parkway North ,Houston, TX 77064-6317
Ovintiv	Clabe Henson	432-221-6411	Clabe.Henson@ovintiv.com	
H2O Midstream	Evan Haight	713-401-9499 x117	evan.haight@h2omidstream.com	2925 Briarpark Drive, Suite 1050 Houston, Texas 77042
Kinder Morgan	Eric Swenson	713-420-5045	Eric_Swenson@kindermorgan.com	
Medallion Midstream	John Hill	432-413-7587	jhill@medallionmidstream.com	
Navitas Midstream	Gerardo Hernandez	832-463-4414	greves@navitas-midstream.com	
NuStar Energy	Brett Walker	210-918-2264	Brett.walker@nustarenergy.com	
Oncor - Distribution	Matt Myrick	817-215-6565	DistributionGIS@oncor.com	115 W 7th Street, Suite 1017 Fort Worth, Texas 76102
Oncor - Transmission	Chris Reily	214-486-4717	OTRANSM1@oncor.com	1616 Woodall Rodgers Freeway Suite 6A-012 Dallas, Texas 75202
SM Energy	Callie Harris	903-681-2127	rockridgel:nelocate@sm-energy.com	
Surge Energy	Rene Rivas	575-659-9767	RRivas@SurgeEnergyA.com	
Targa Resources	LeAnne Hodges	940-229-4294	lhodges@targaresources.com	
Wes-Tex Telephone Coop	David White	432-271-2706	dwhite@westex.coop	711 Scurry Big Spring, TX 79720
West Texas H20	Zach Claybrook	432-556-4153	zach.claybrook@gvty.com	
WTG Gas	Ben Best	432-682-6311	bbest@wtggas.com	

* DOES NOT APPEAR IN THIS PLAN SET.

STATE OF TEXAS — CURT FAKLER — 129816 — LICENSED PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

tnp

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US 87

EXISTING UTILITY PLANS

GENERAL NOTES/LEGENDS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	83
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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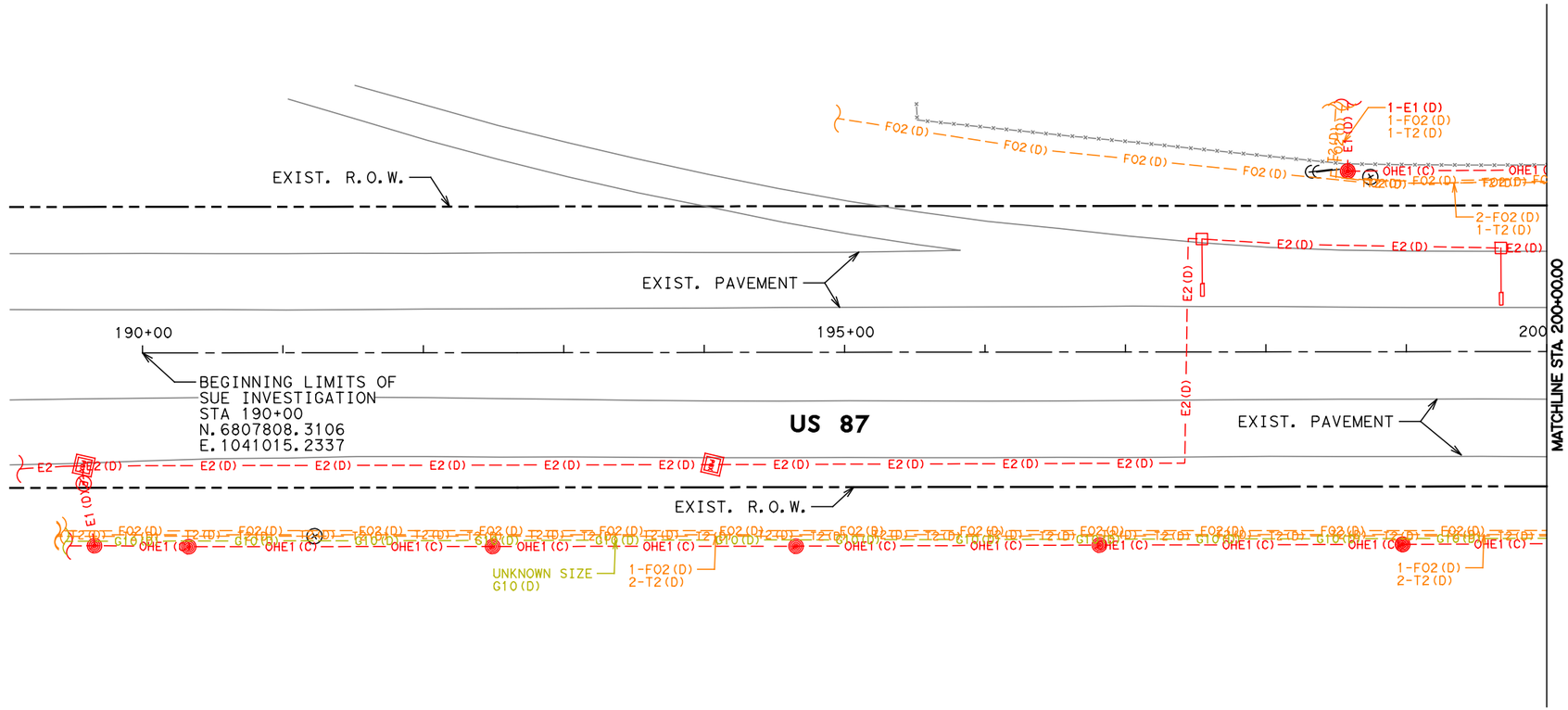

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230
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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. BEGINNING TO STA. 200+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	84
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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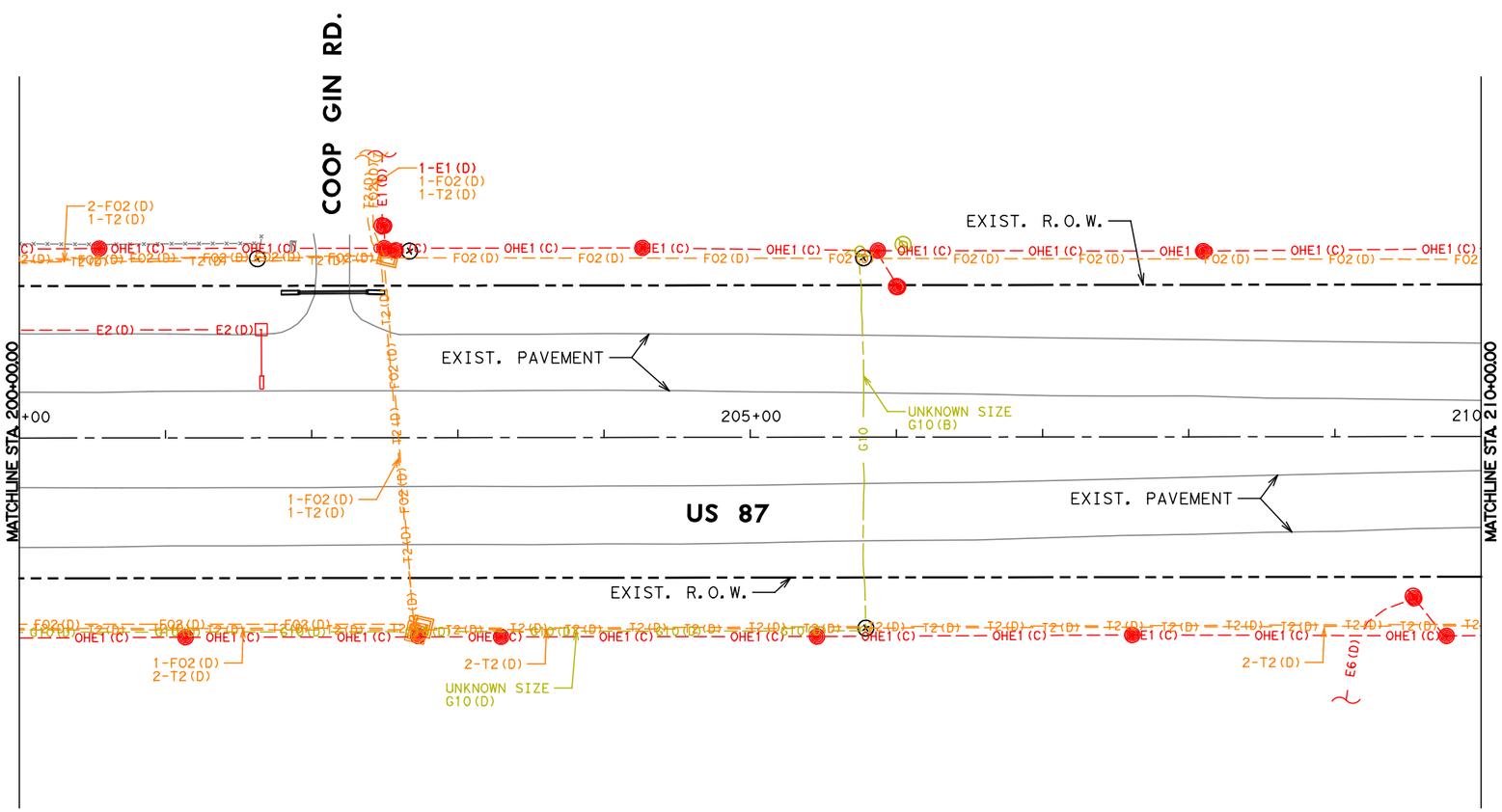

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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STATE OF TEXAS
CURT FAKLER
129816
PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 200+00 TO STA. 210+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	85
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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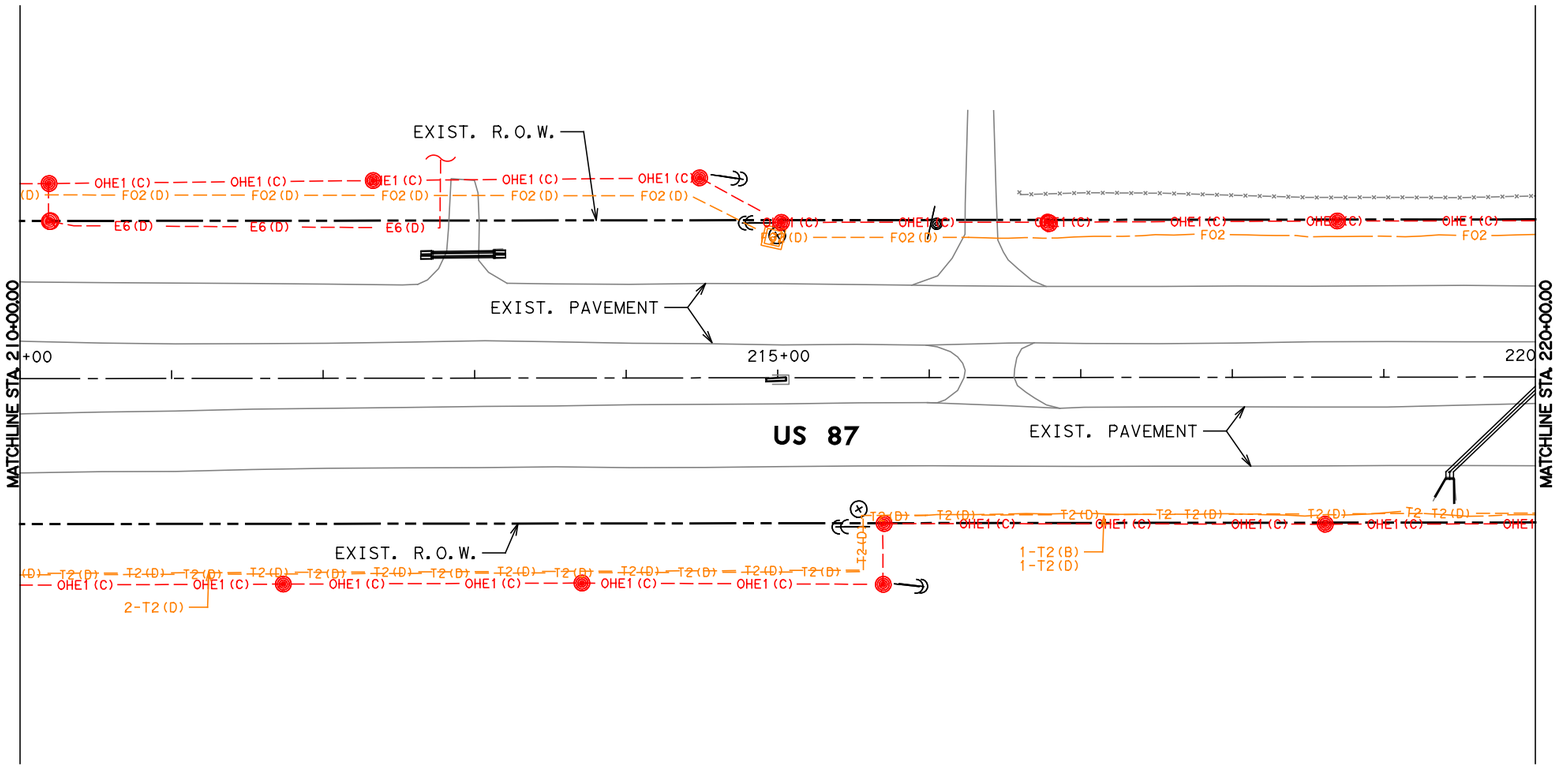

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

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US 87
EXISTING UTILITY PLANS
FROM STA. 210+00 TO STA. 220+00

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	86
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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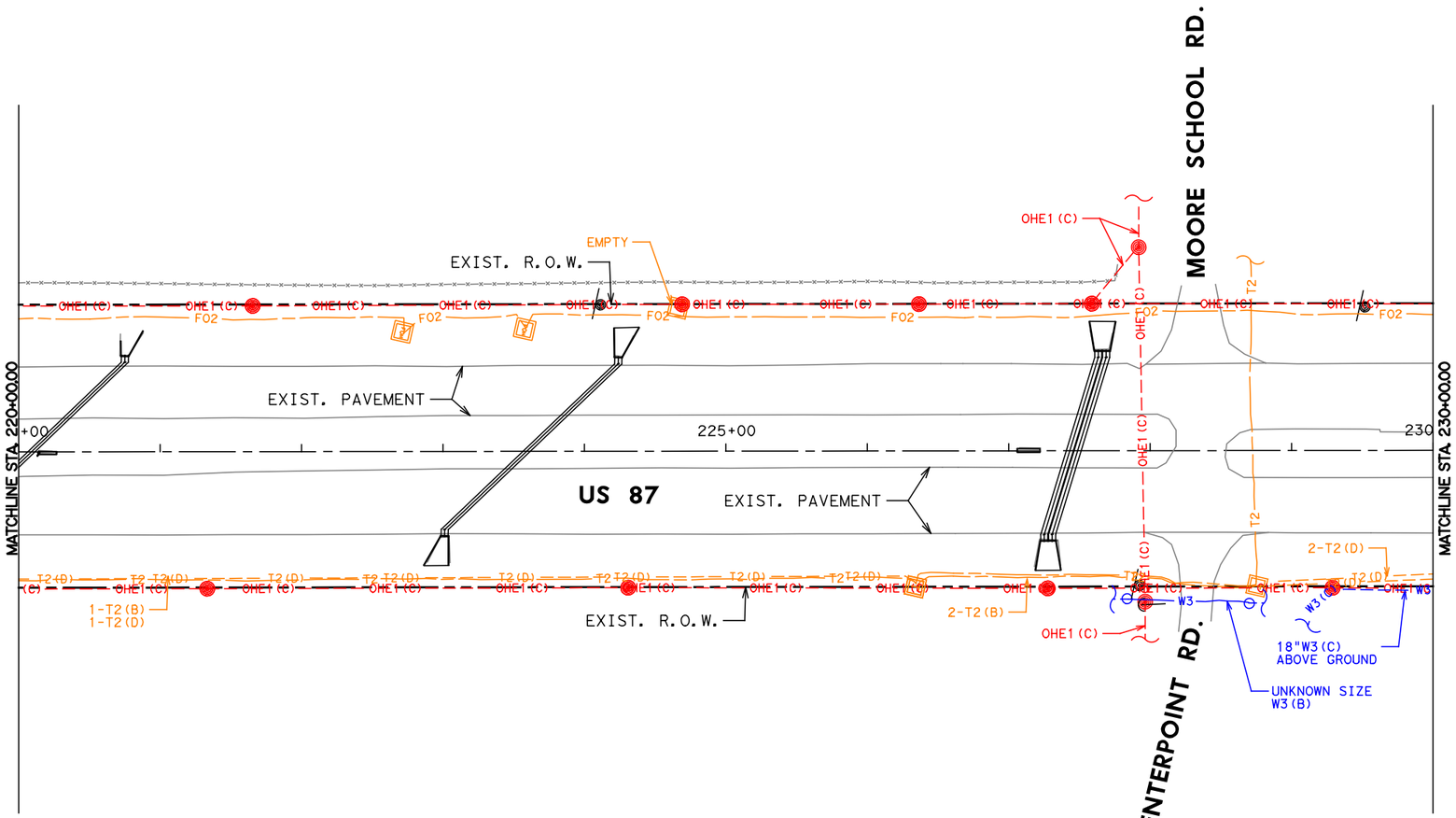

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
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05/21/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 220+00 TO STA. 230+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	87
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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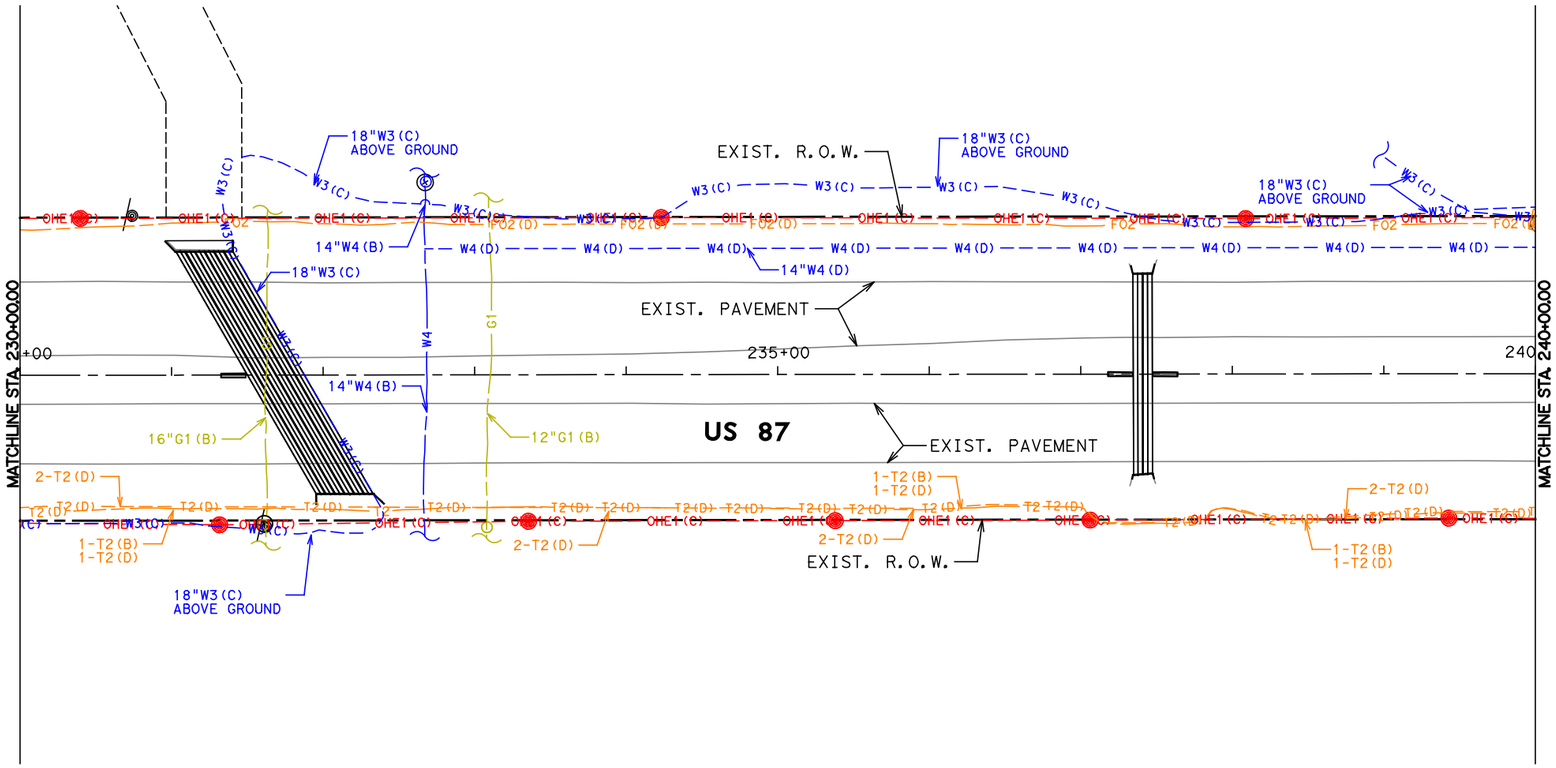

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
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05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 230+00 TO STA. 240+00

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	88
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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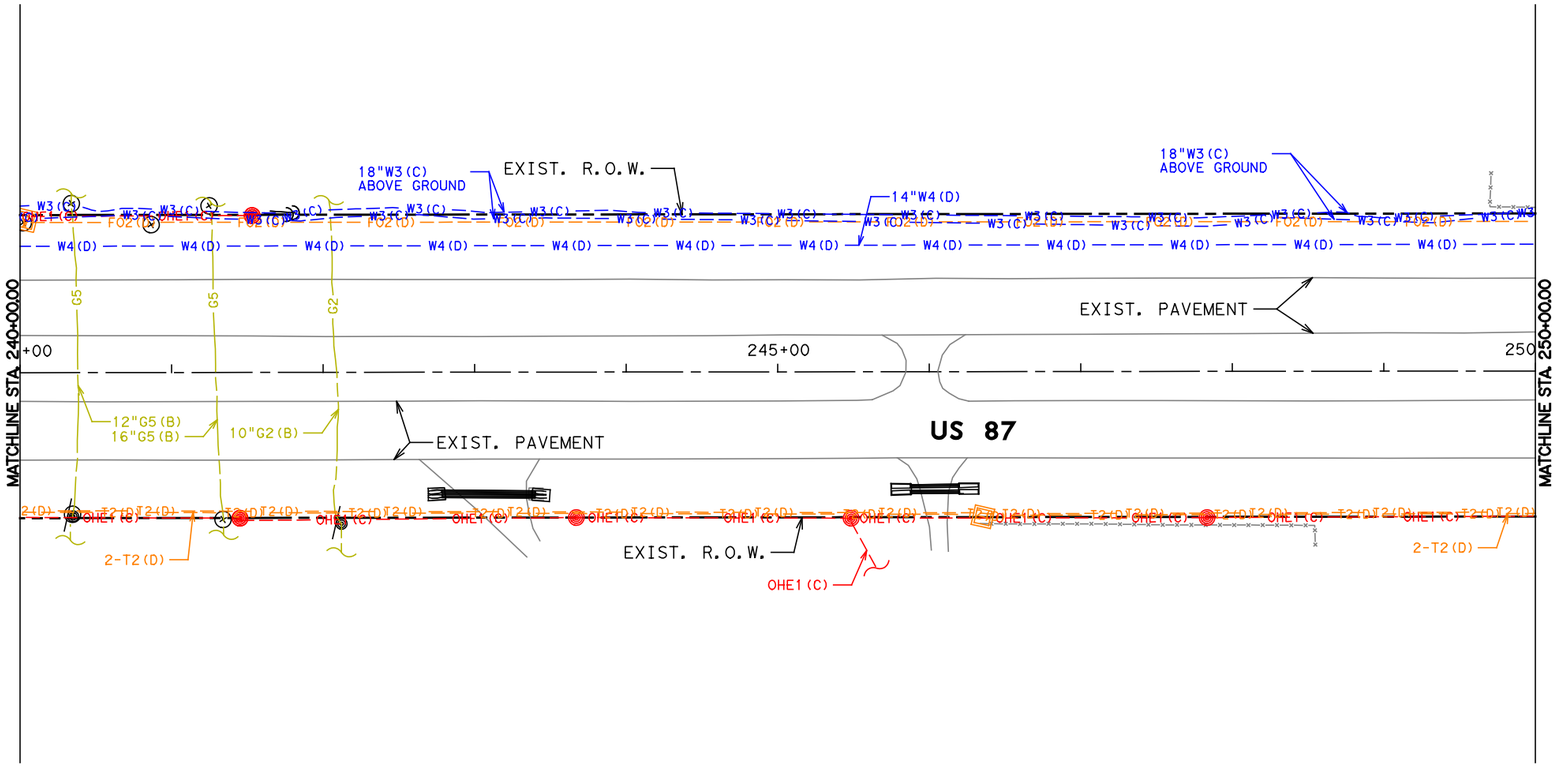

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 240+00 TO STA. 250+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	89
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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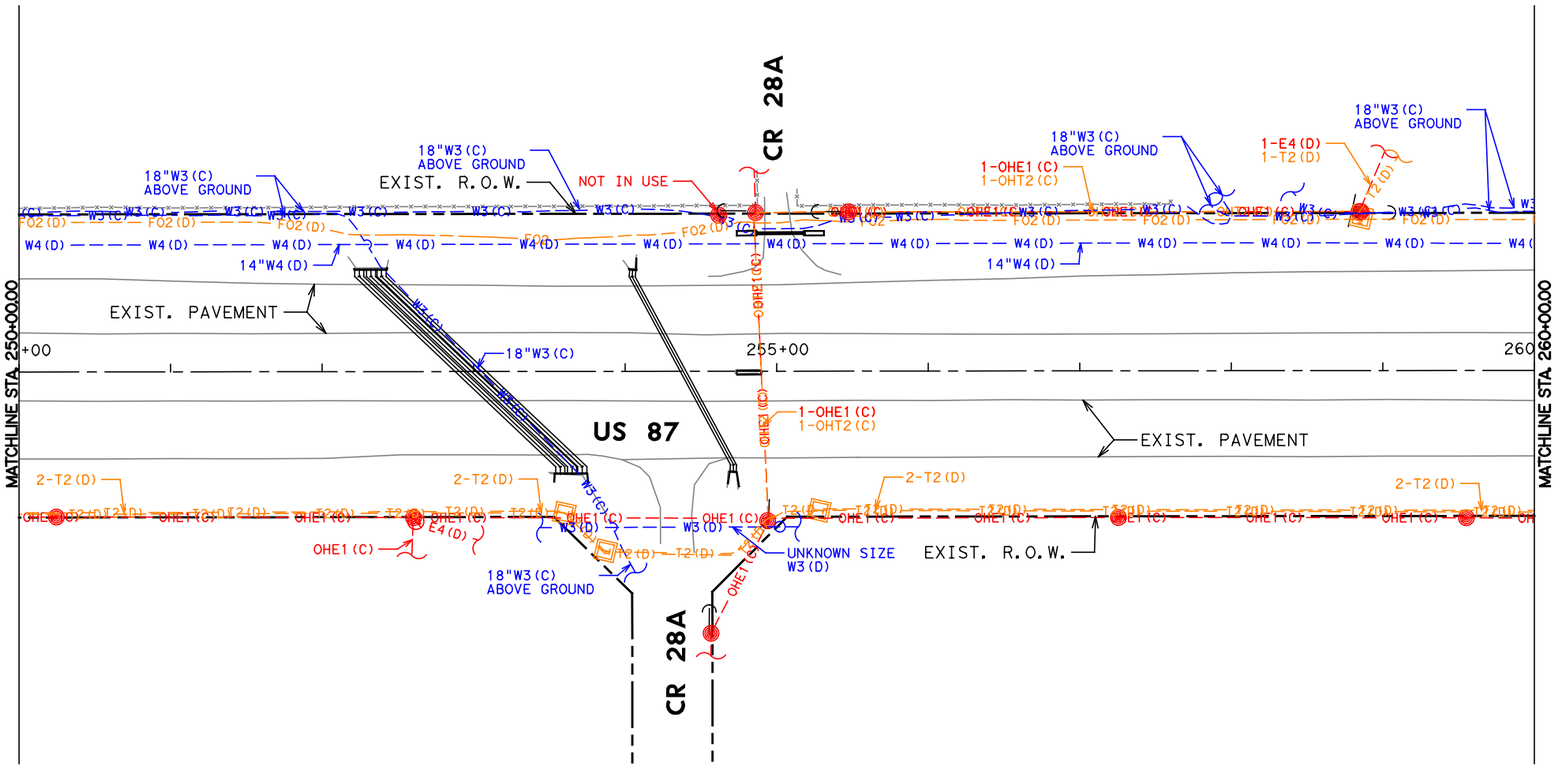

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

0 25 50 100
SCALE: 1" = 100' HOR.

STATE OF TEXAS
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PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 250+00 TO STA. 260+00

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	90
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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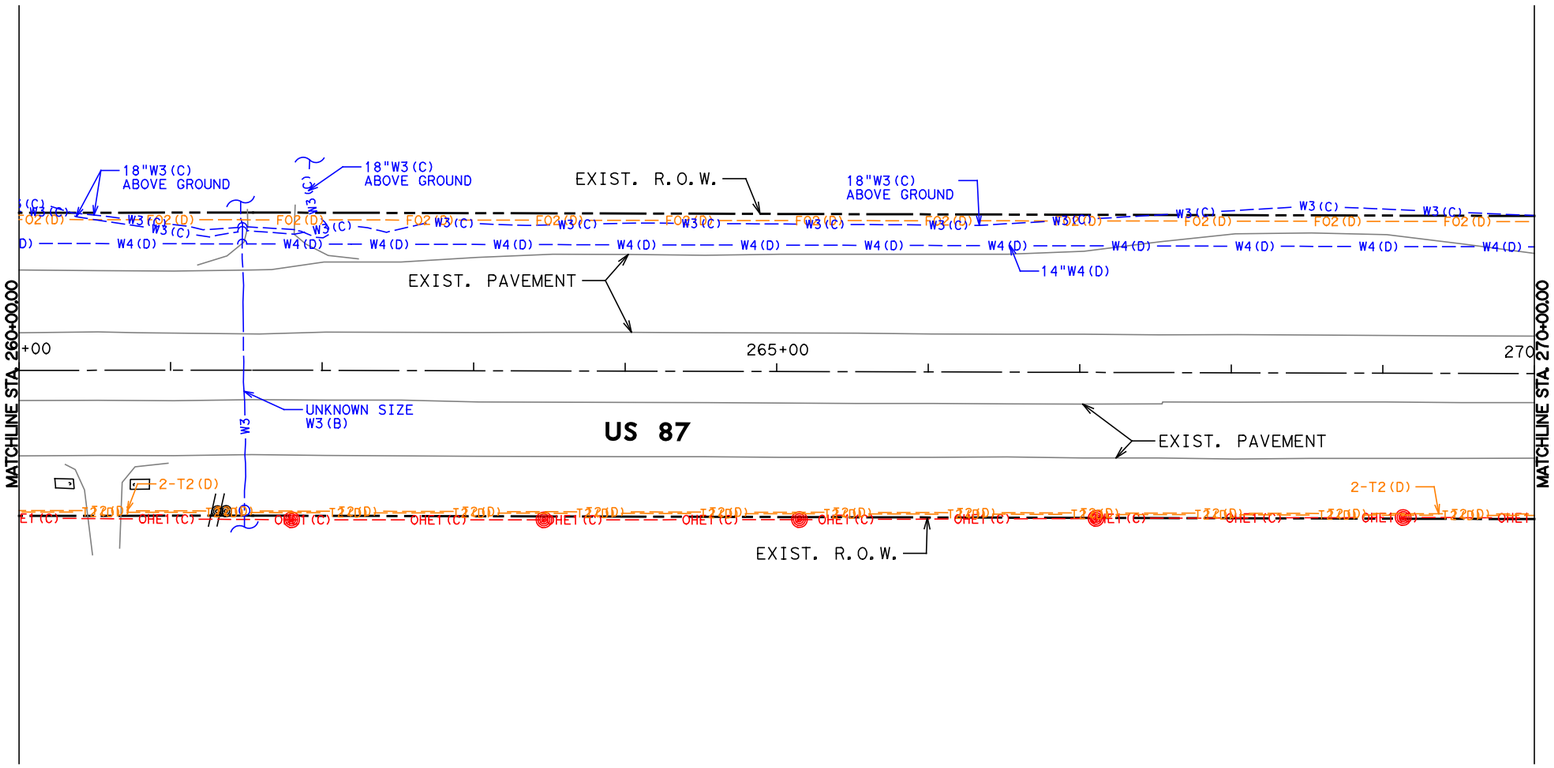

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
CURT FAKLER
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LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 260+00 TO STA. 270+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	91
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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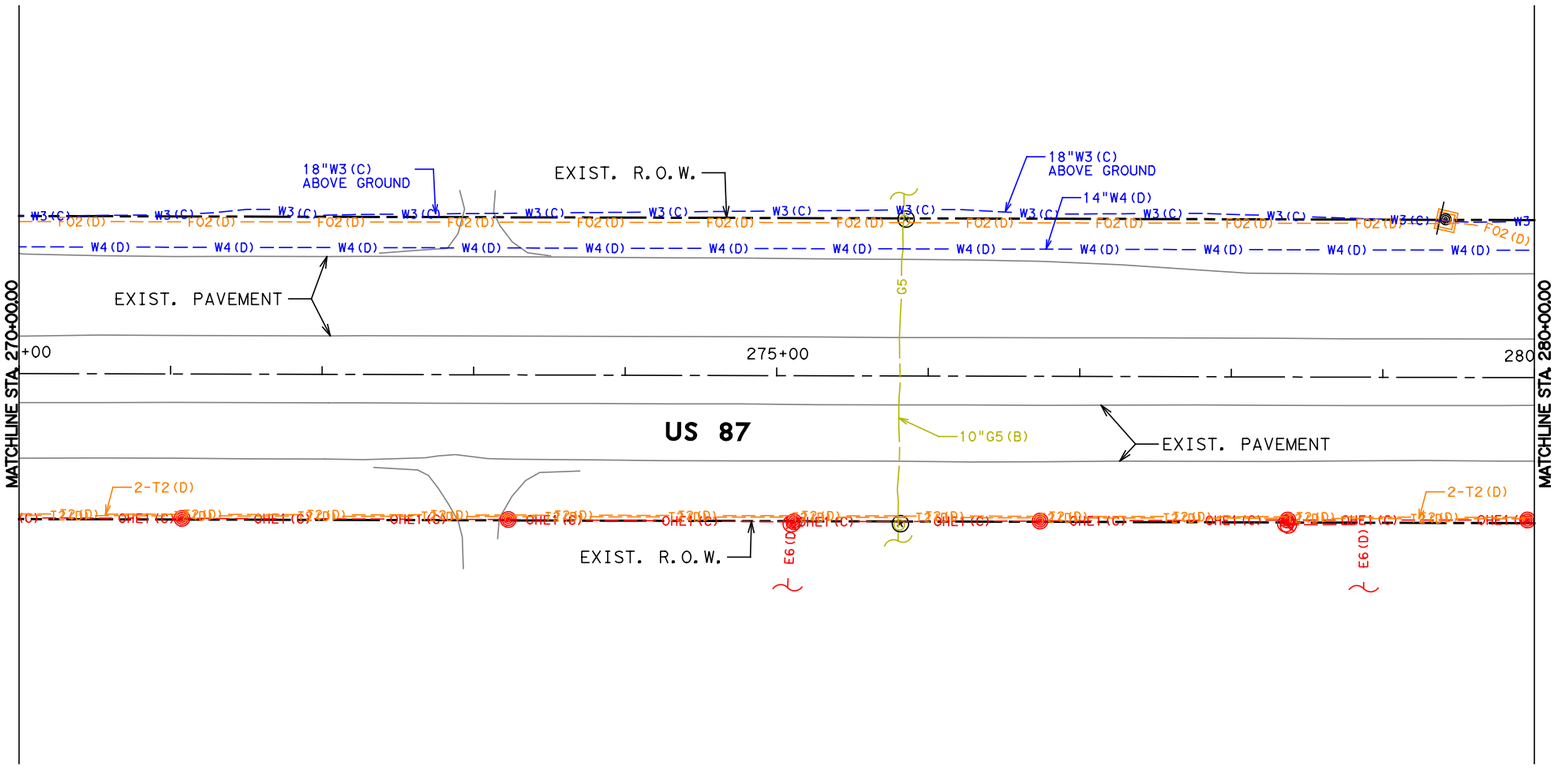

GENERAL NOTES:
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

0 25 50 100
SCALE: 1" = 100' HOR.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 270+00 TO STA. 280+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	92
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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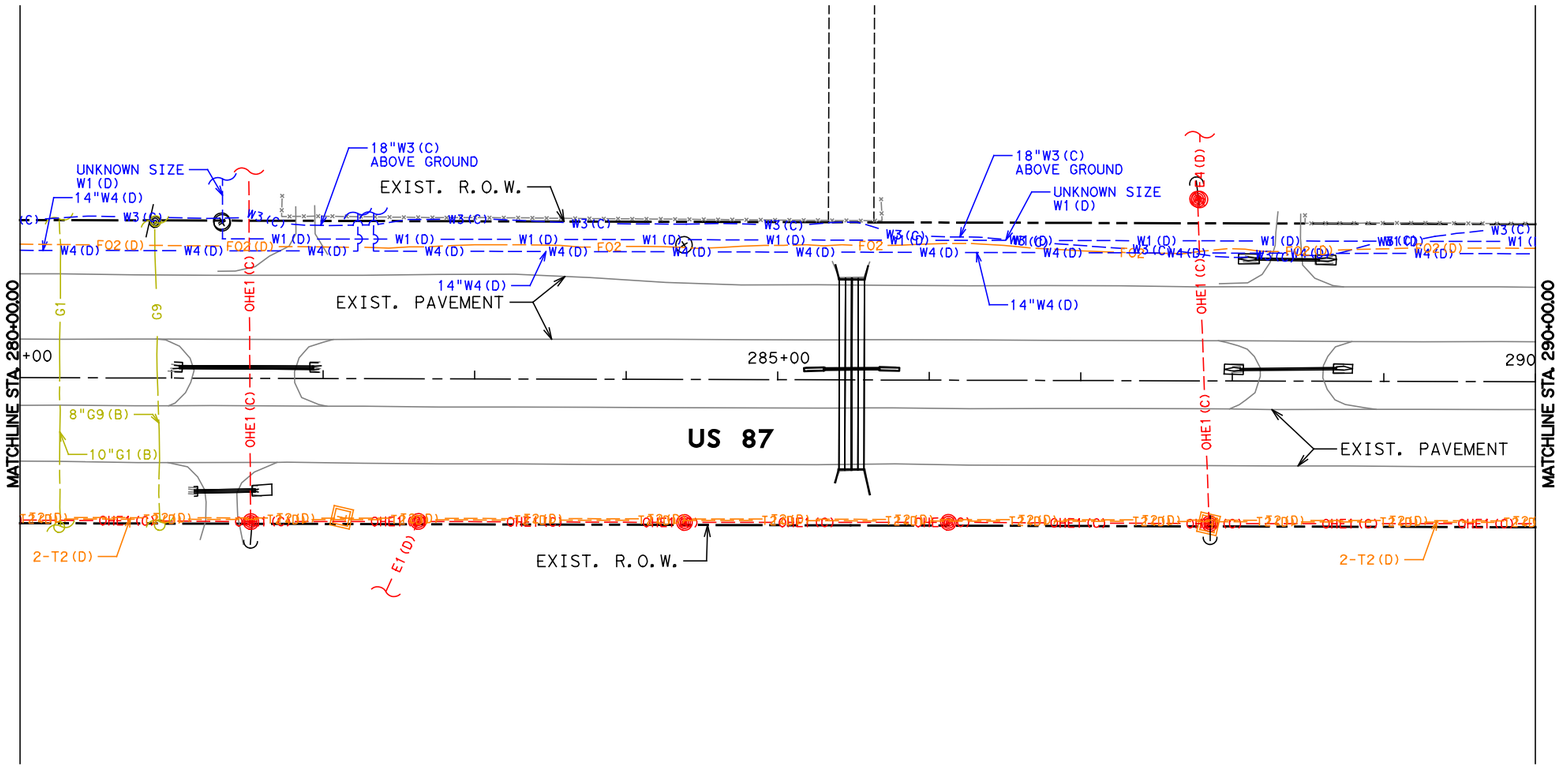

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
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STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 280+00 TO STA. 290+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	93
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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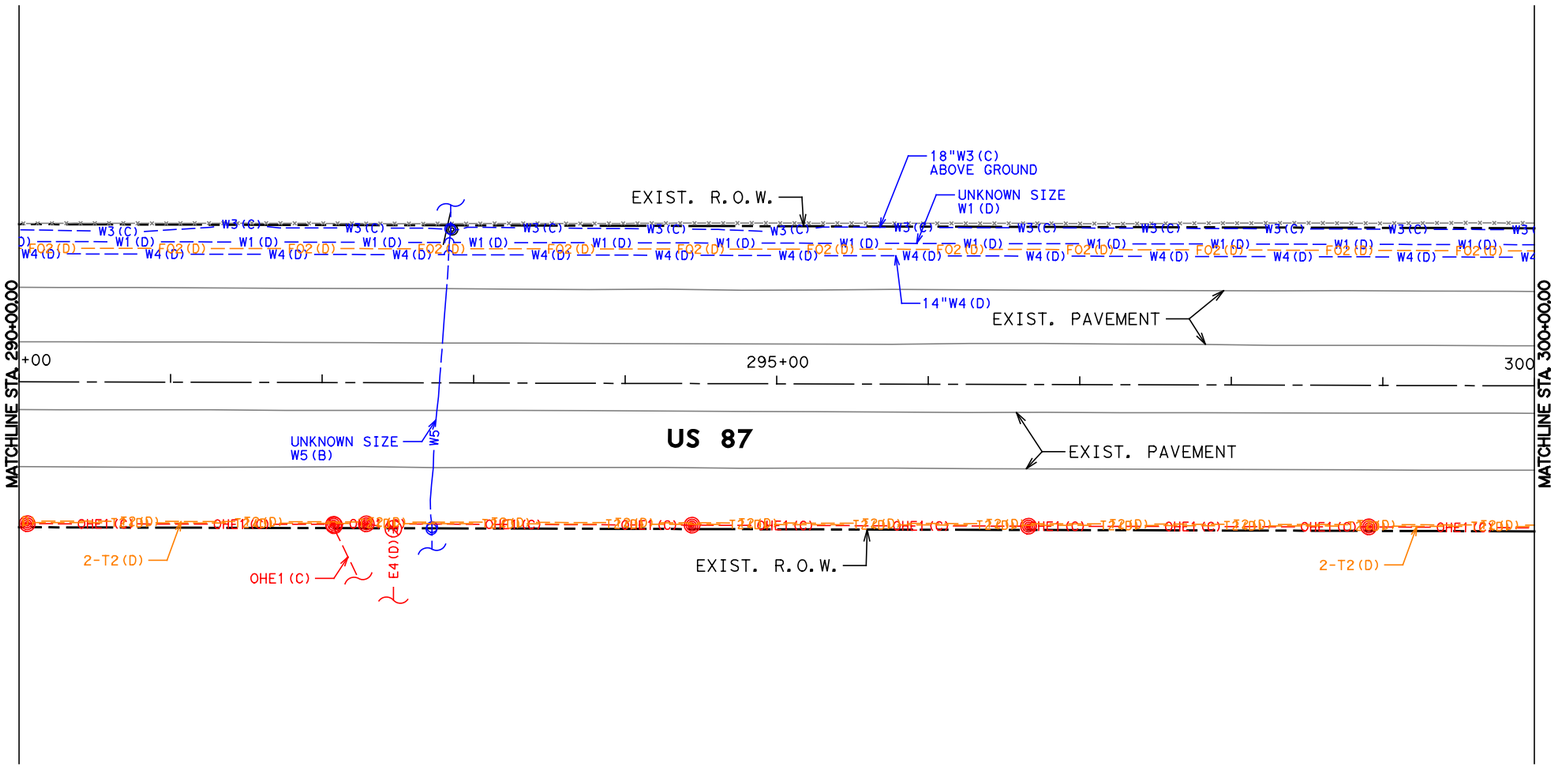

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
CURT FAKLER
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LICENSED PROFESSIONAL ENGINEER

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05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 290+00 TO STA. 300+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	94
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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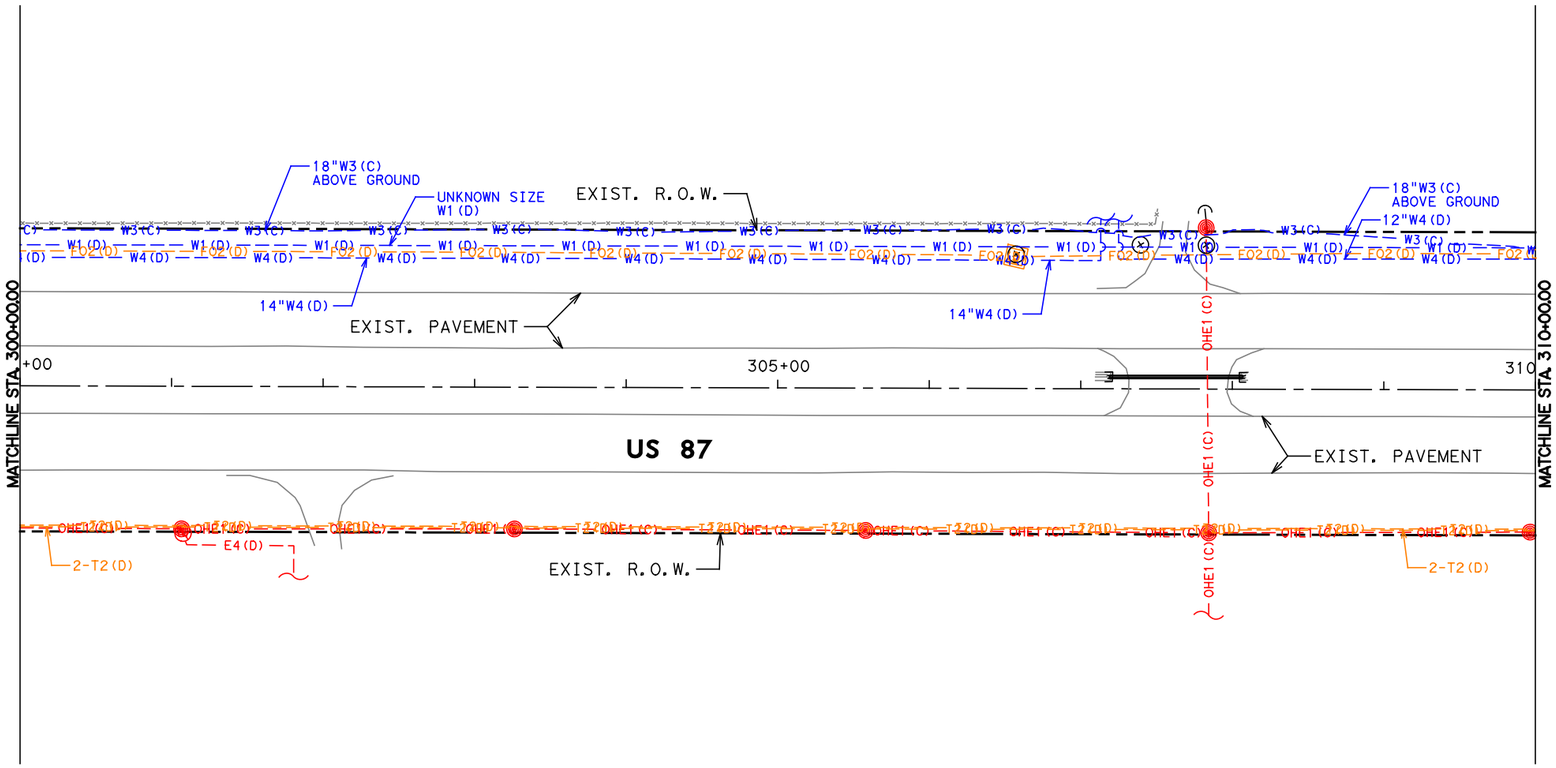

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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STATE OF TEXAS
CURT FAKLER
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05/21/2021

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 300+00 TO STA. 310+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	95
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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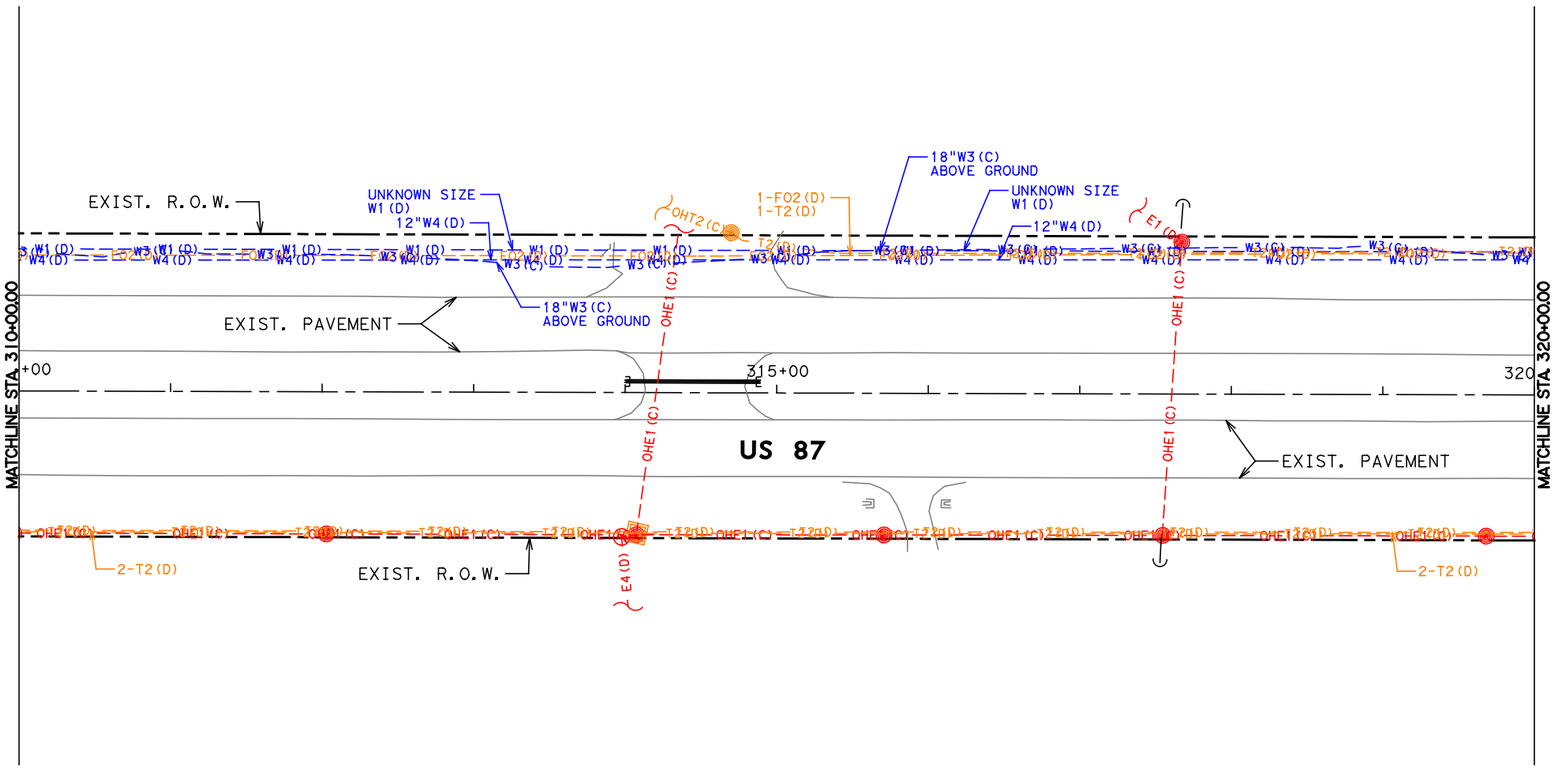

GENERAL NOTES:
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Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 310+00 TO STA. 320+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	96
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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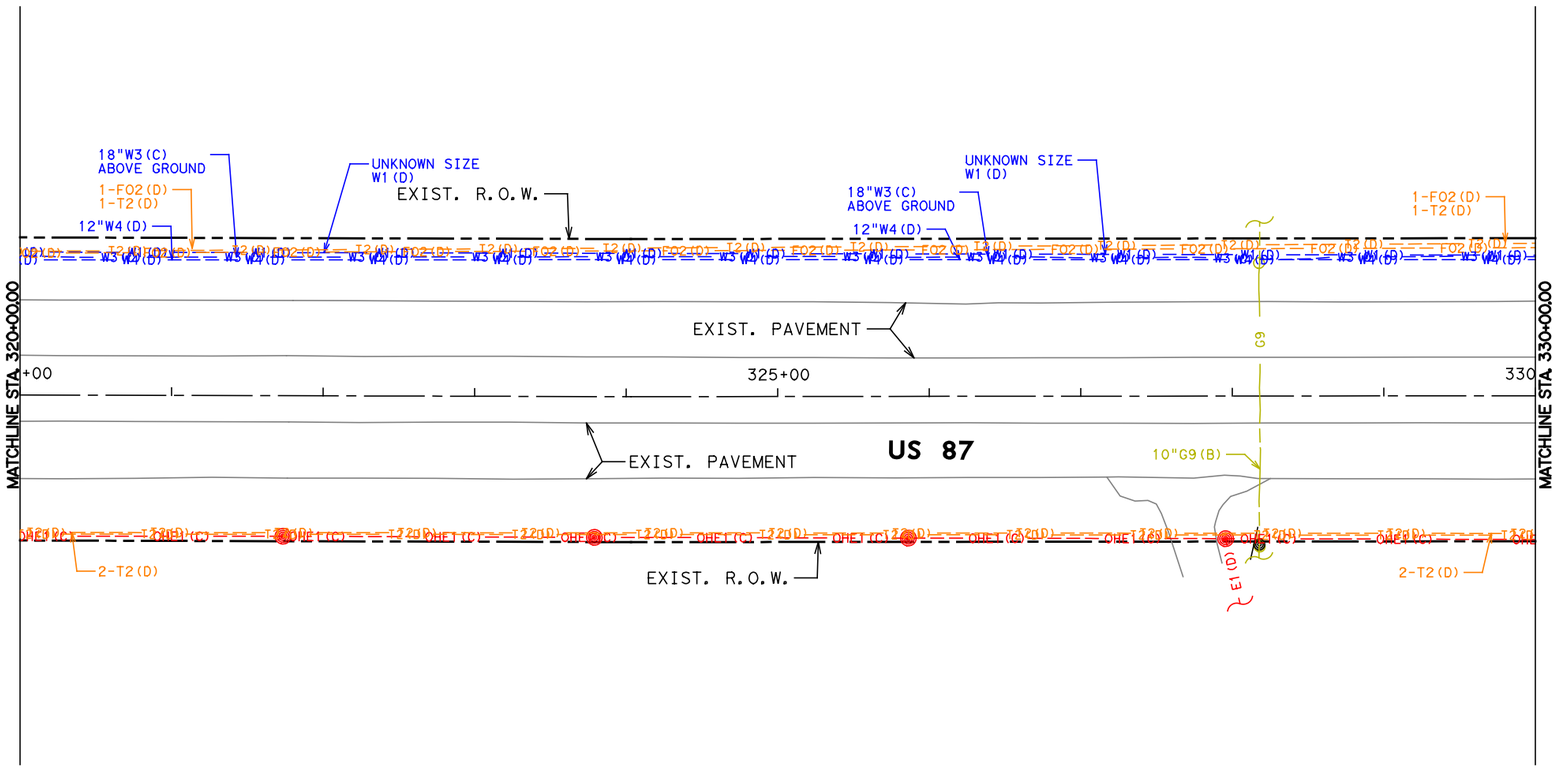

0 25 50 100

SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

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Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 320+00 TO STA. 330+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	97
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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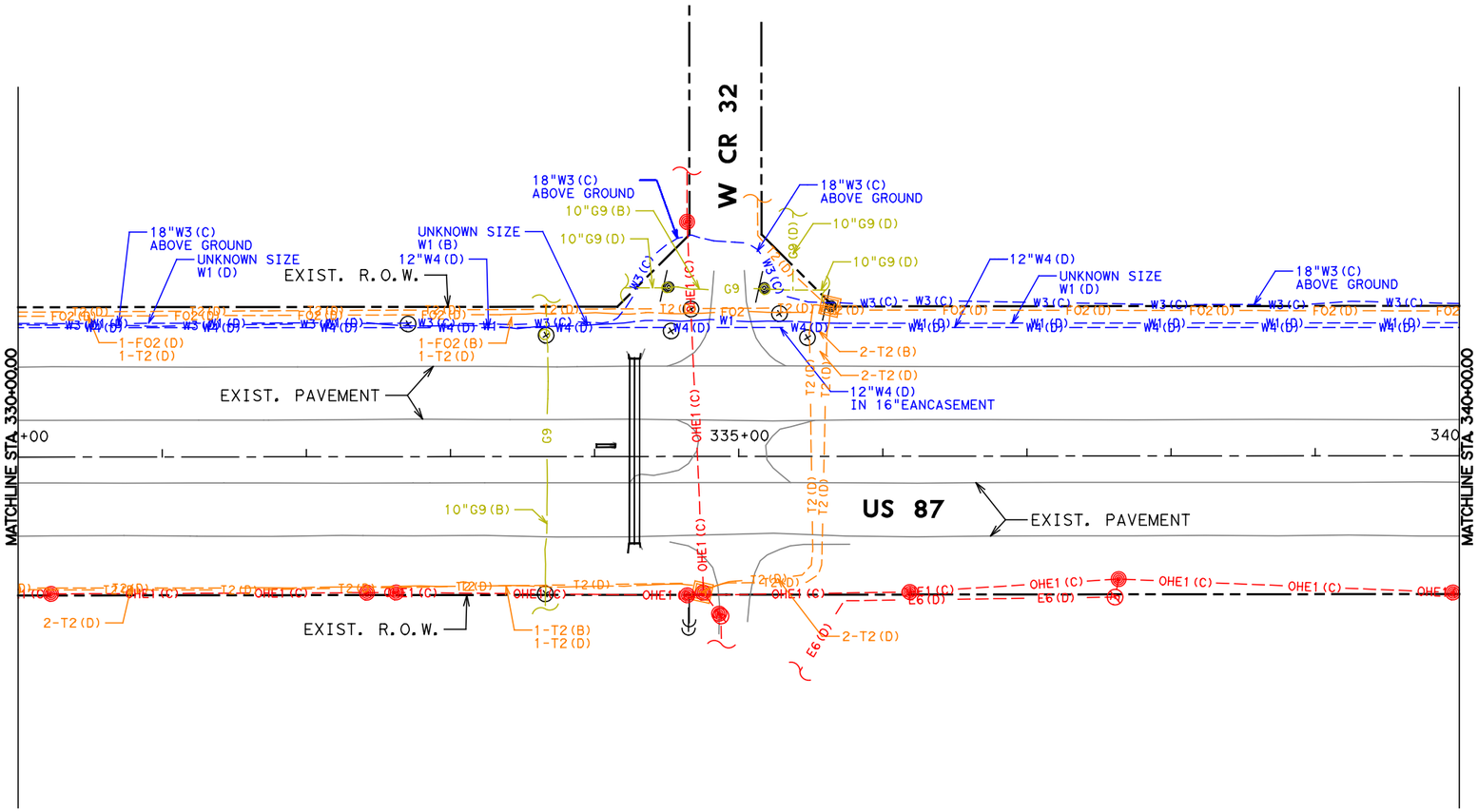

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 330+00 TO STA. 340+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	98
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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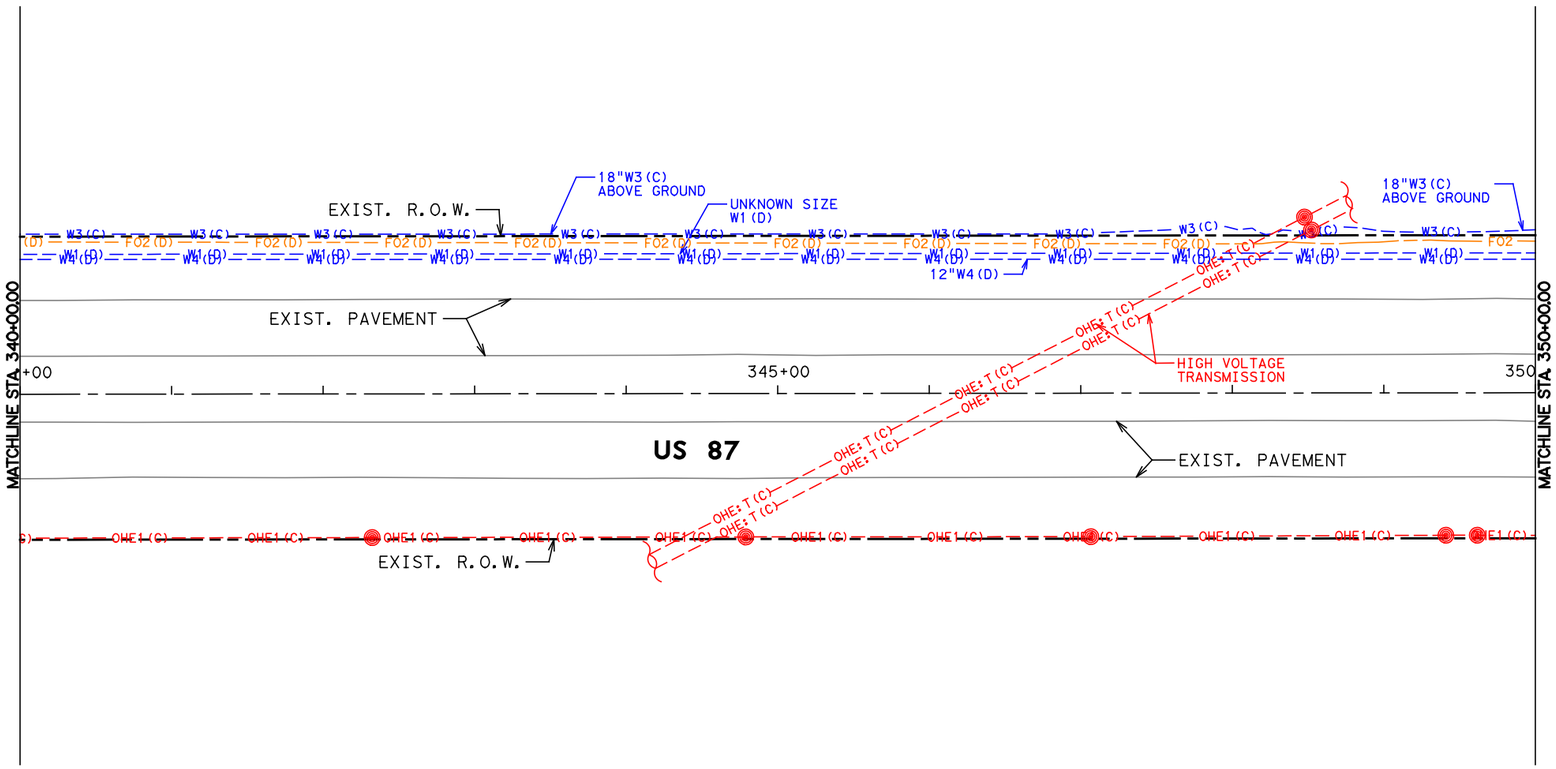

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 340+00 TO STA. 350+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	99
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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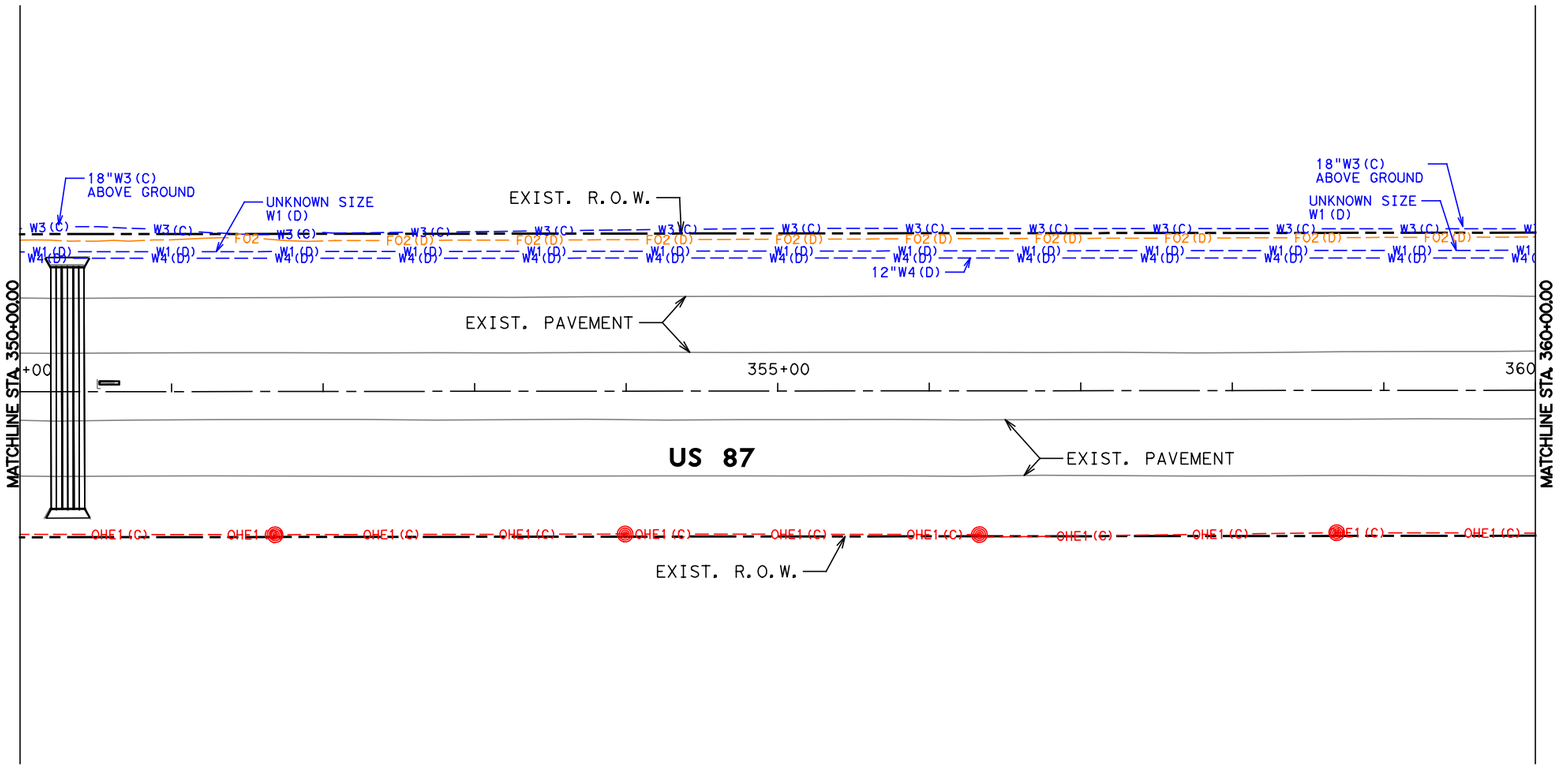

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 350+00 TO STA. 360+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	100
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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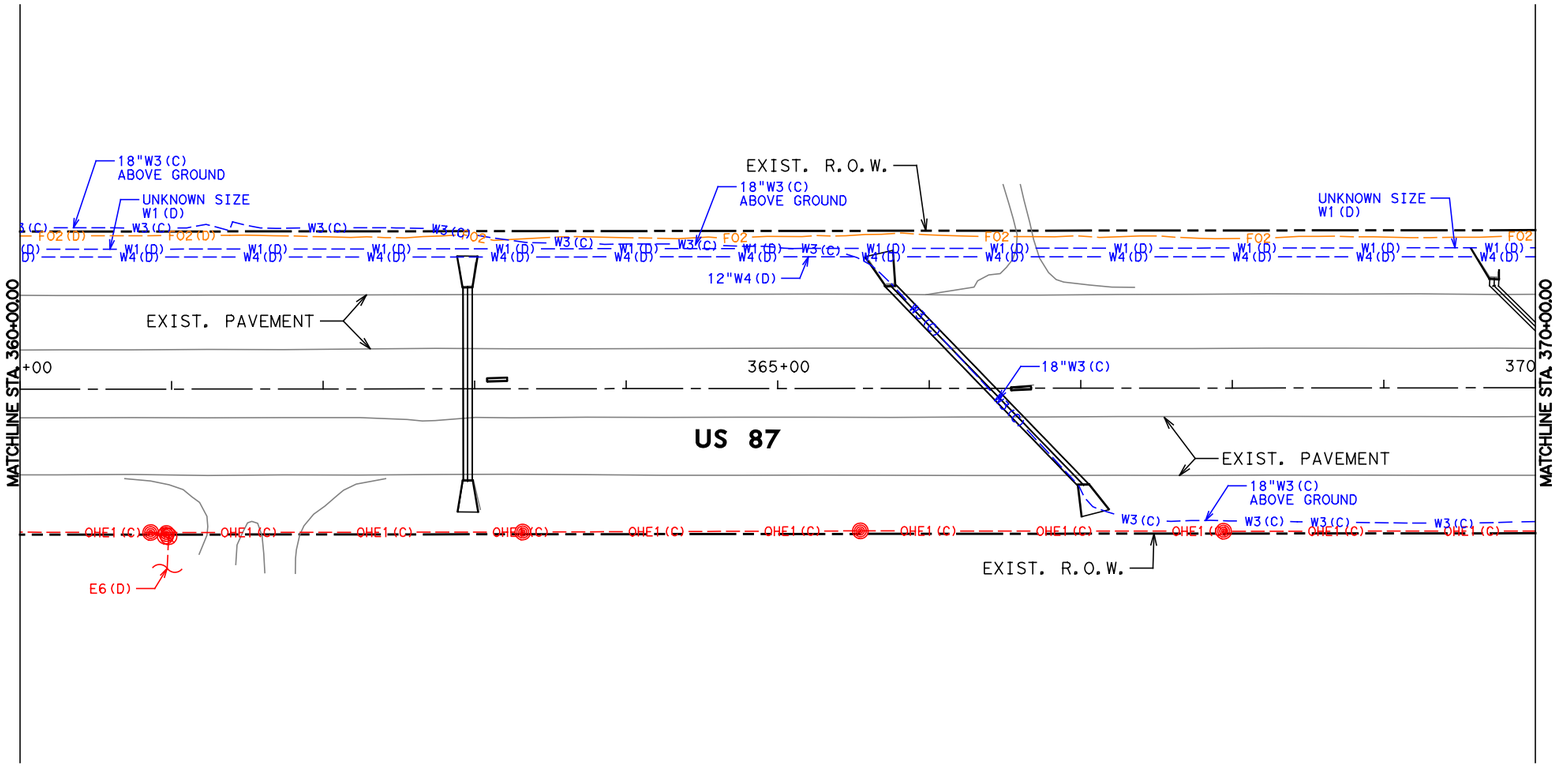

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 360+00 TO STA. 370+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	101
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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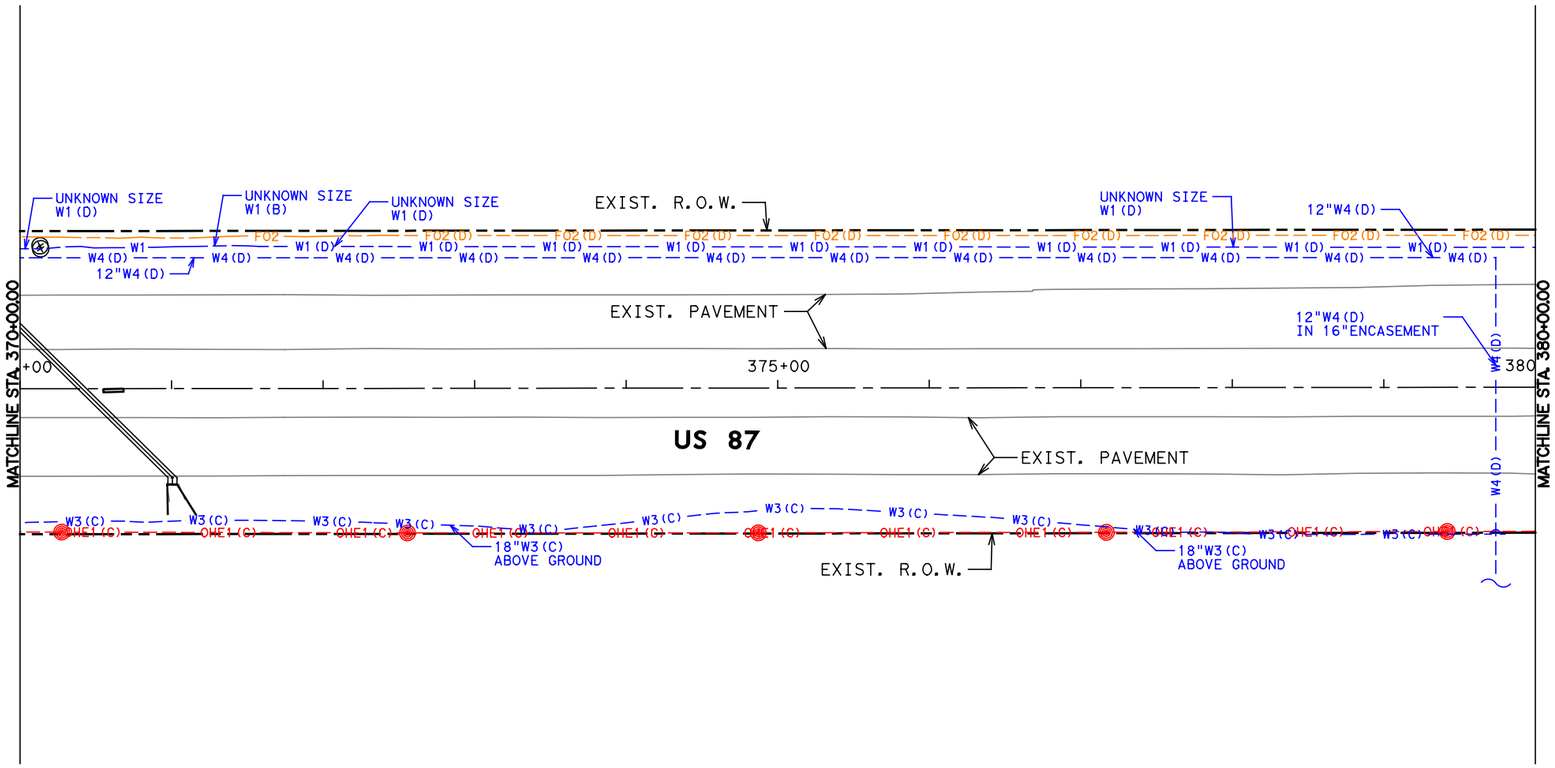

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SCALE: 1" = 100' HOR.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED
PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 370+00 TO STA. 380+00

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	102
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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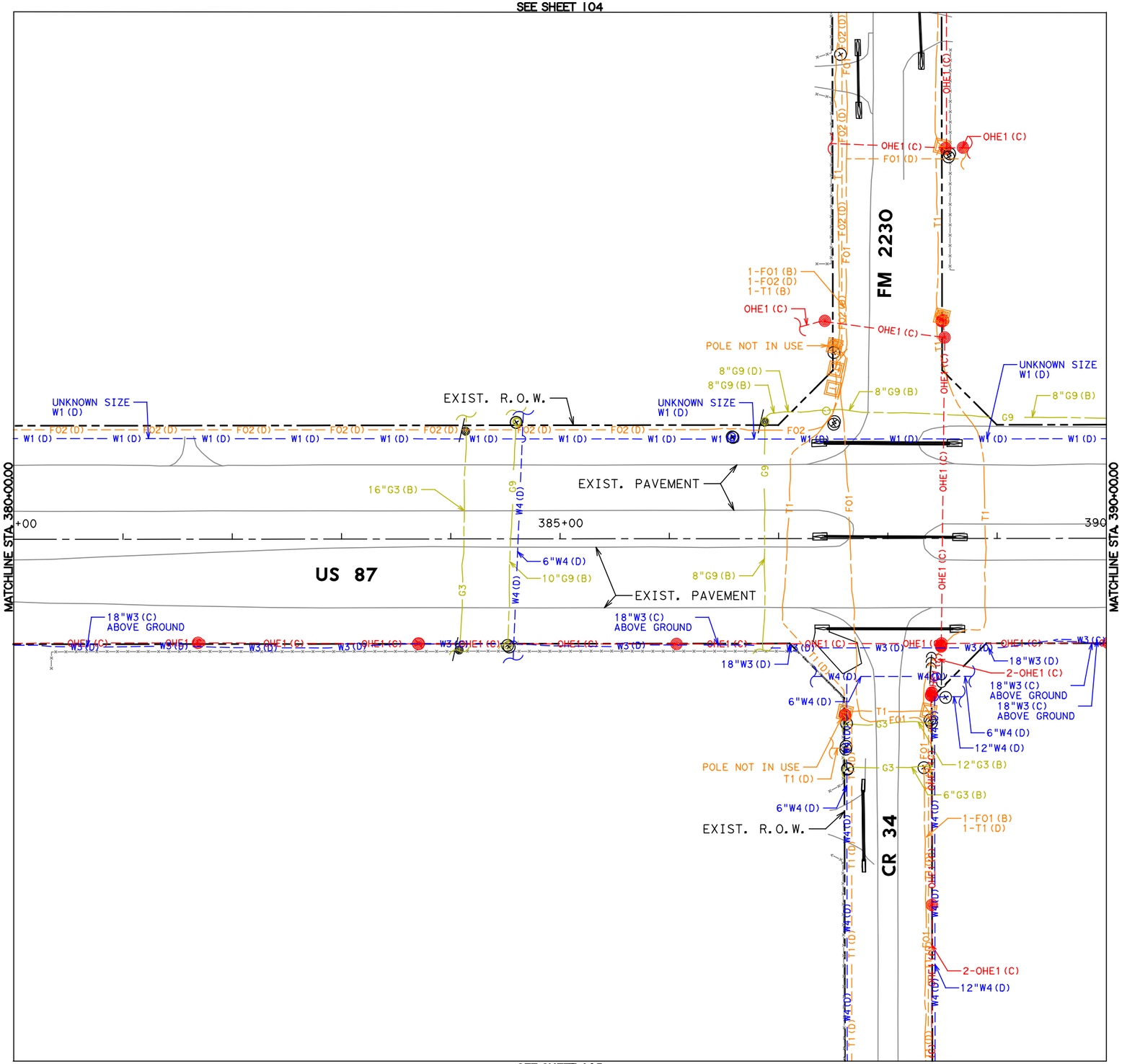

SEE SHEET 105

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation
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US 87
EXISTING UTILITY PLANS
FROM STA. 380+00 TO STA. 390+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	103
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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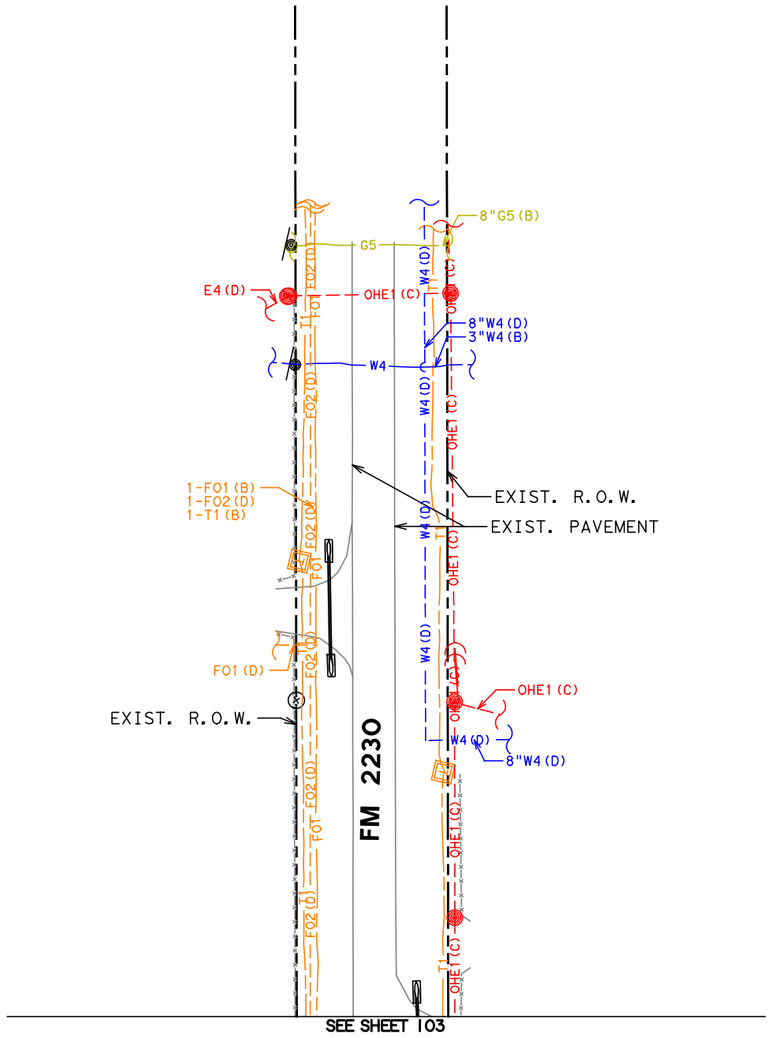

0 25 50 100

SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
2. CONTRACTOR TO VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION AND NOTIFY SUE ENGINEER OF ANY DISCREPANCIES.
3. LINE SIZES ARE DETERMINED FROM BEST AVAILABLE RECORDS.

SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FM 2230 WEST OF US 87

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	104
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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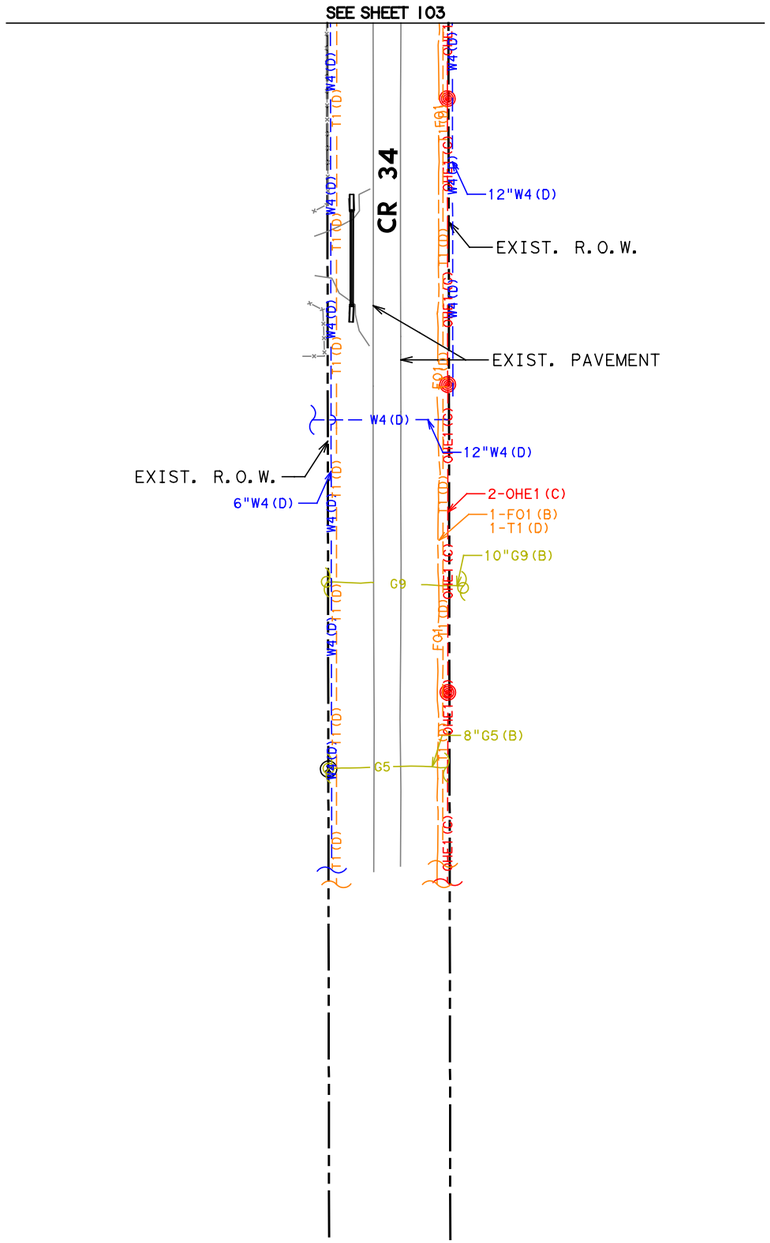

0 25 50 100
SCALE: 1" = 100' HOR.

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1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
CR 34 EAST OF US 87

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	105
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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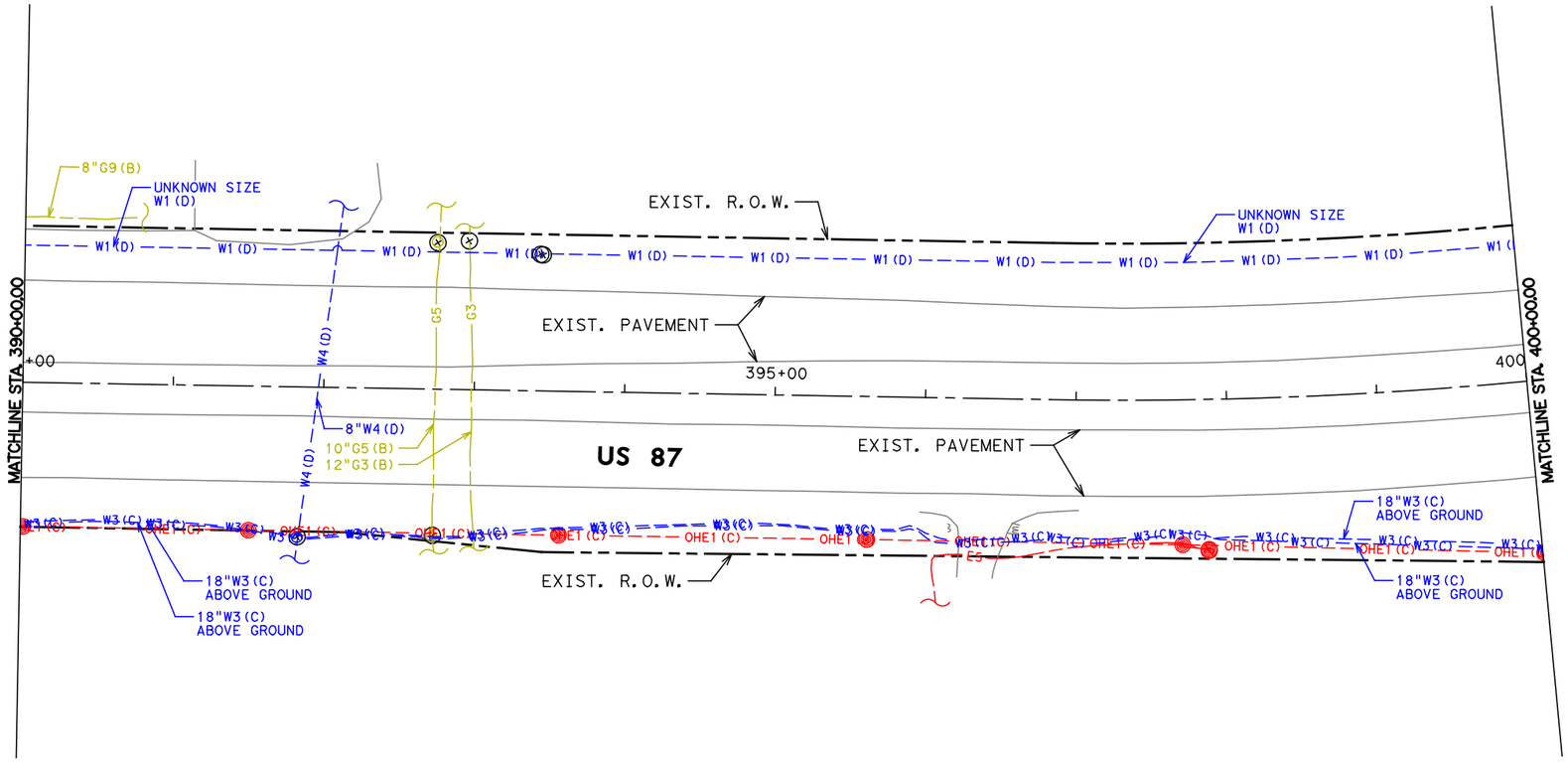

0 25 50 100
SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 390+00 TO STA. 400+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	106
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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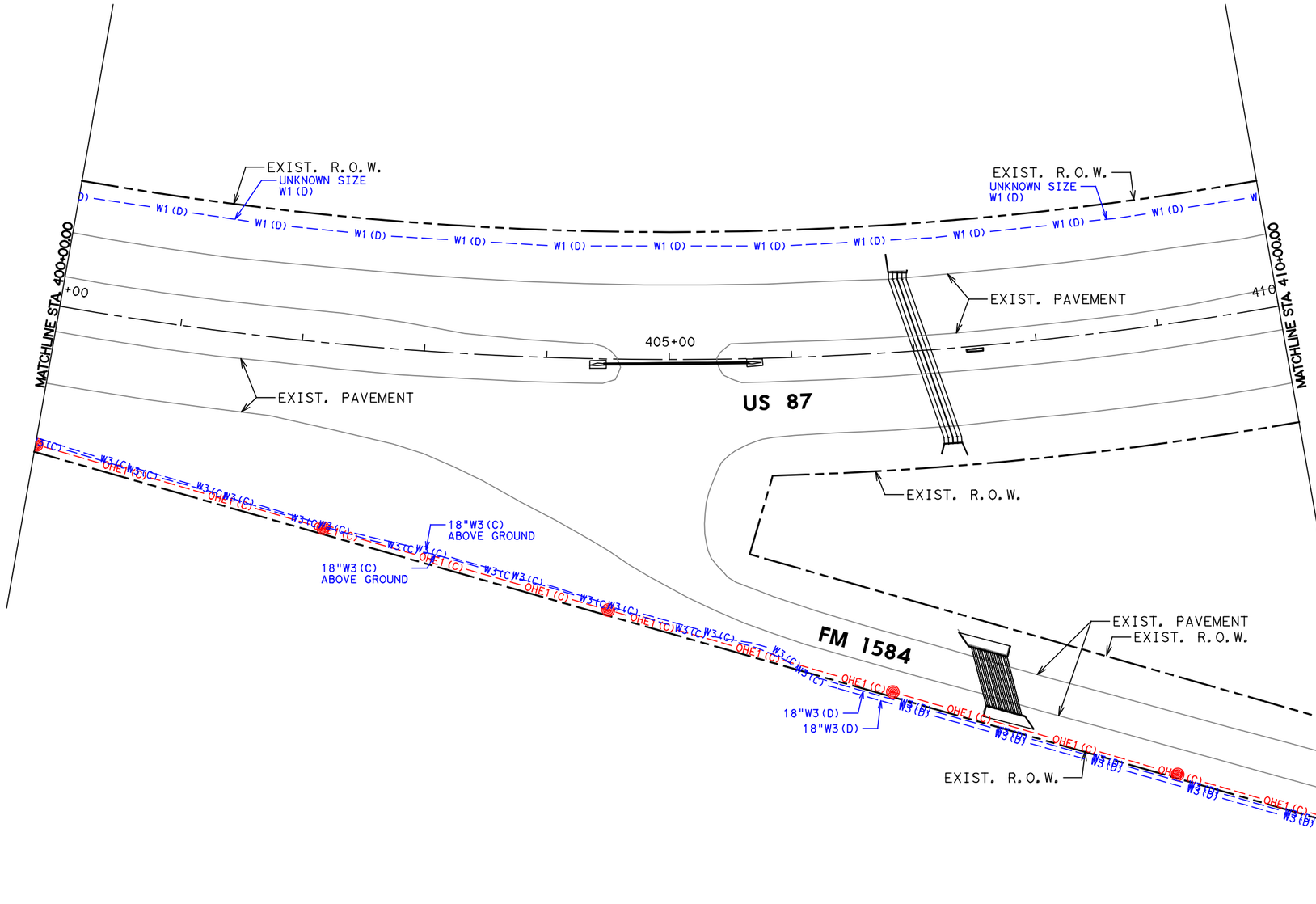

0 25 50 100
SCALE: 1" = 100' HOR.

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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 400+00 TO STA. 410+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	107
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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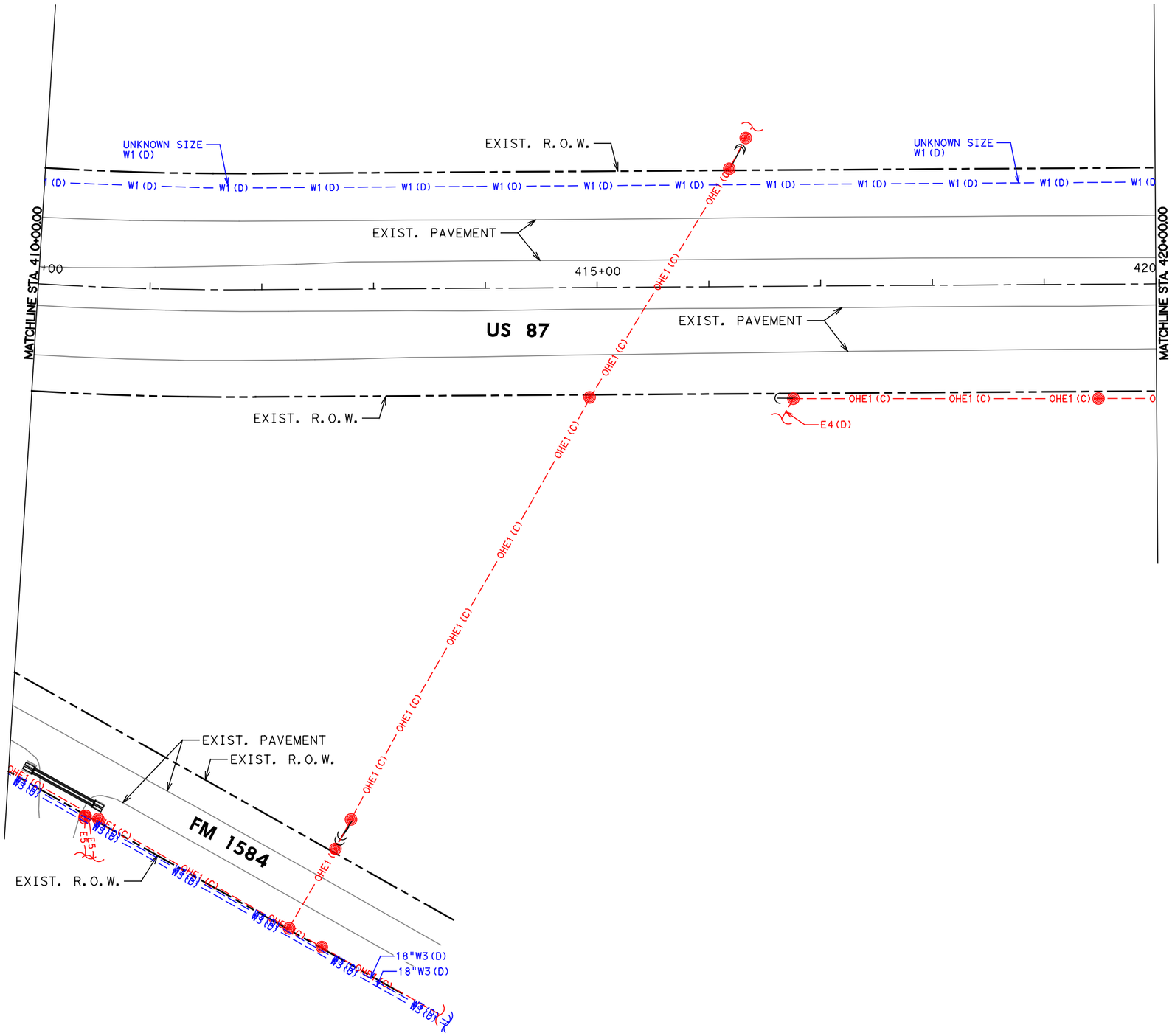

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SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 410+00 TO STA. 420+00

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	108
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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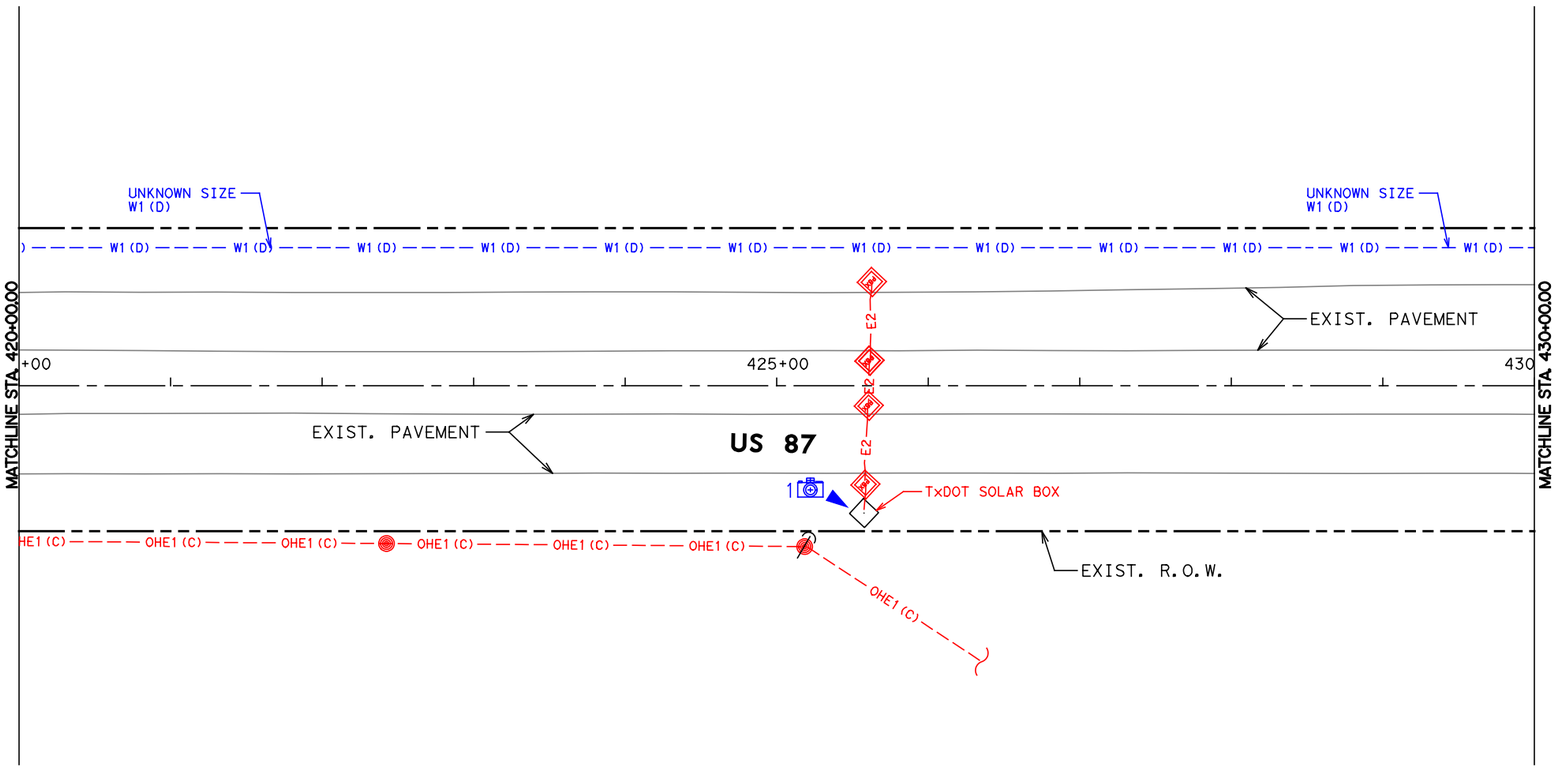

PHOTO 1

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 420+00 TO STA. 430+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	109
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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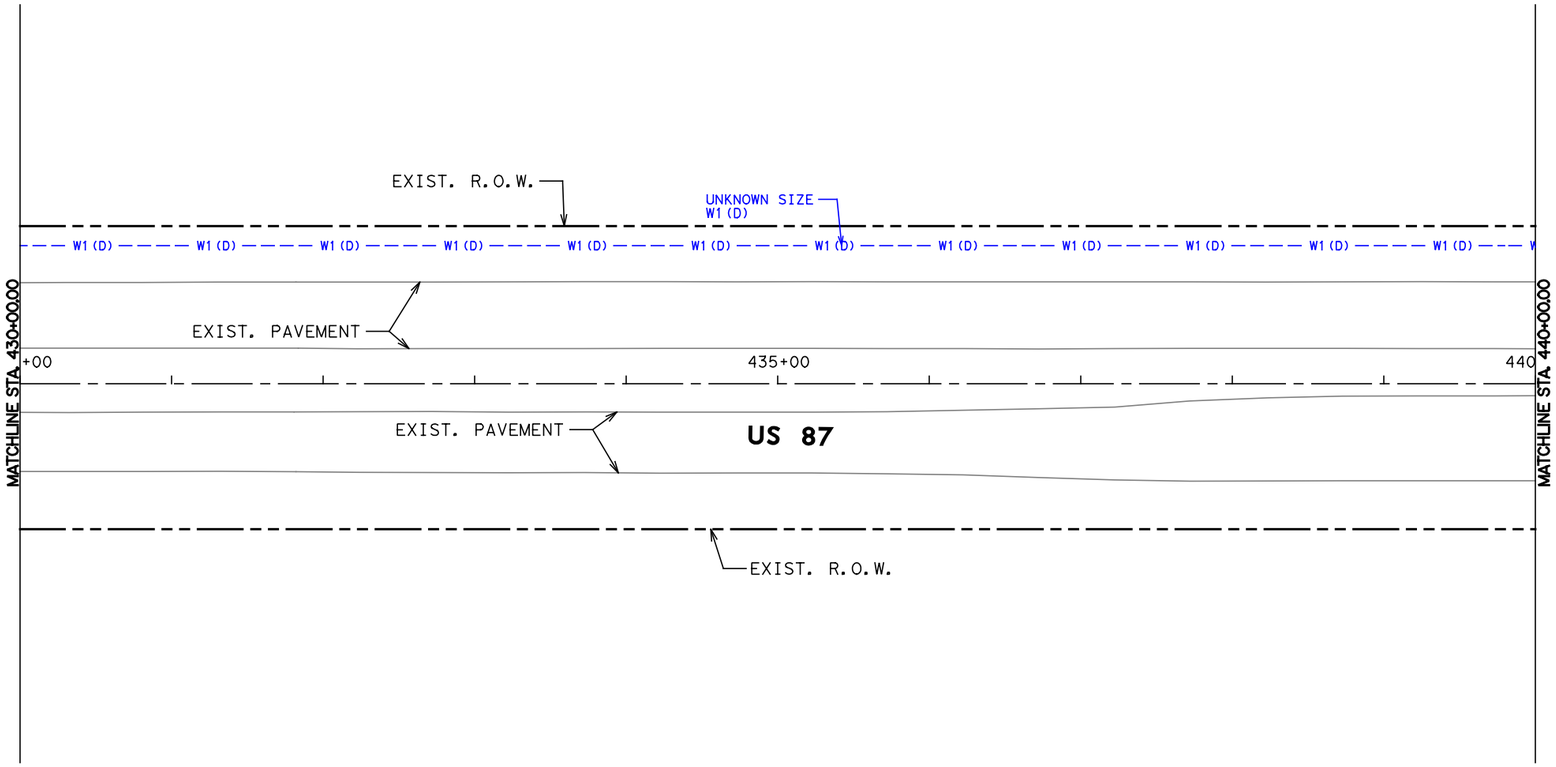

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER

Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 430+00 TO STA. 440+00

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	110
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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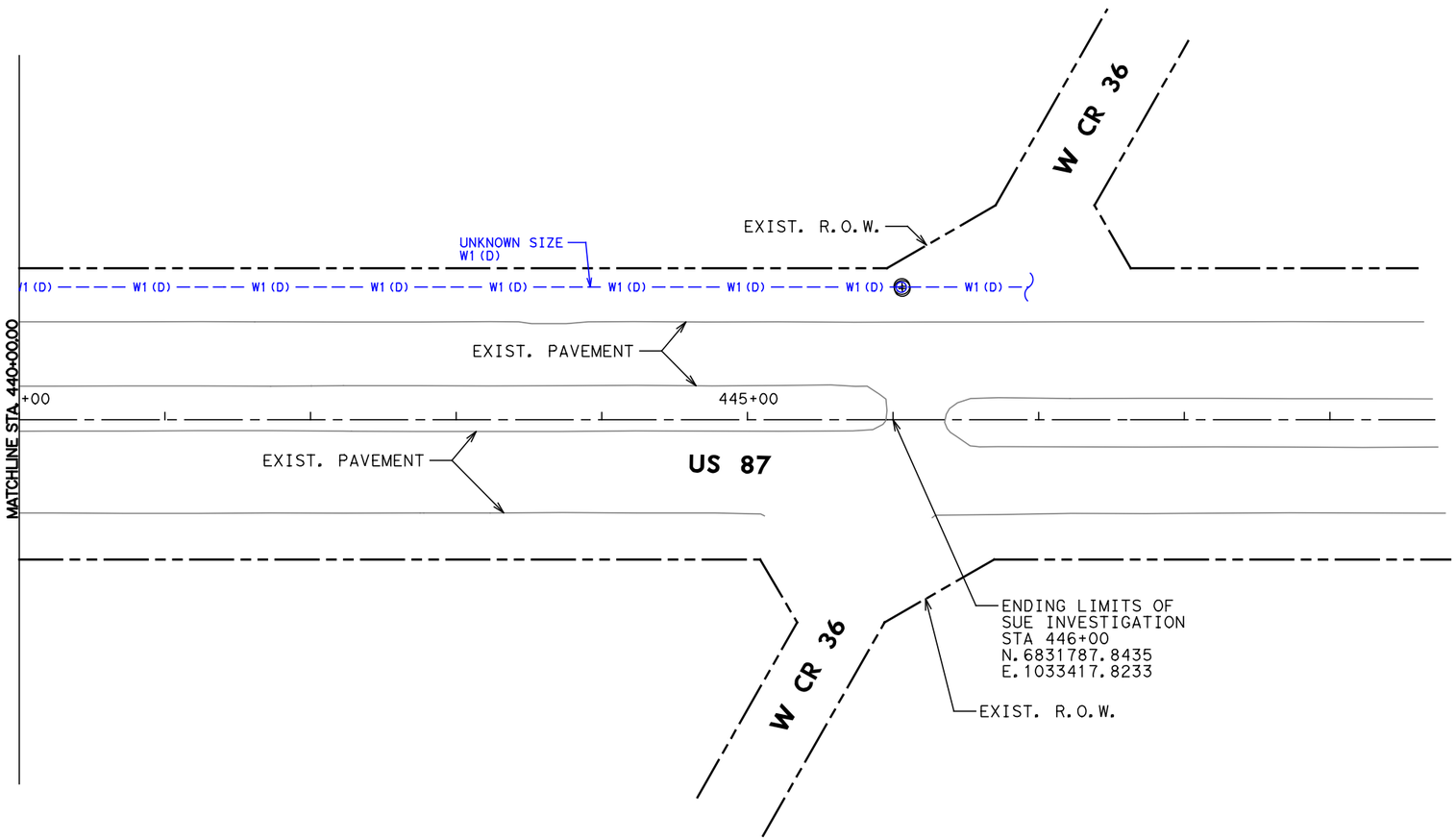

0 25 50 100
SCALE: 1" = 100' HOR.

GENERAL NOTES:
1. LOCATING IRRIGATION SYSTEMS, INDIVIDUAL SERVICES AND STORM DRAIN IS OUTSIDE OF SCOPE OF SUE INVESTIGATION.
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SUE INVESTIGATION FROM STA. 388+00 TO STA. 1161+00 WAS PERFORMED IN JAN 2021.

STATE OF TEXAS
CURT FAKLER
129816
LICENSED PROFESSIONAL ENGINEER
Curt Fakler
05/21/2021

FIRM REGISTRATION NO. F-230
tnp

Texas Department of Transportation

US 87
EXISTING UTILITY PLANS
FROM STA. 440+00 TO ENDING

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
DS	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CF	TEXAS	ABL	HOWARD	111
GRAPHICS	CONTROL	SECTION	JOB	
DS	0068	08	067	
GRPH CHECK				
CF				

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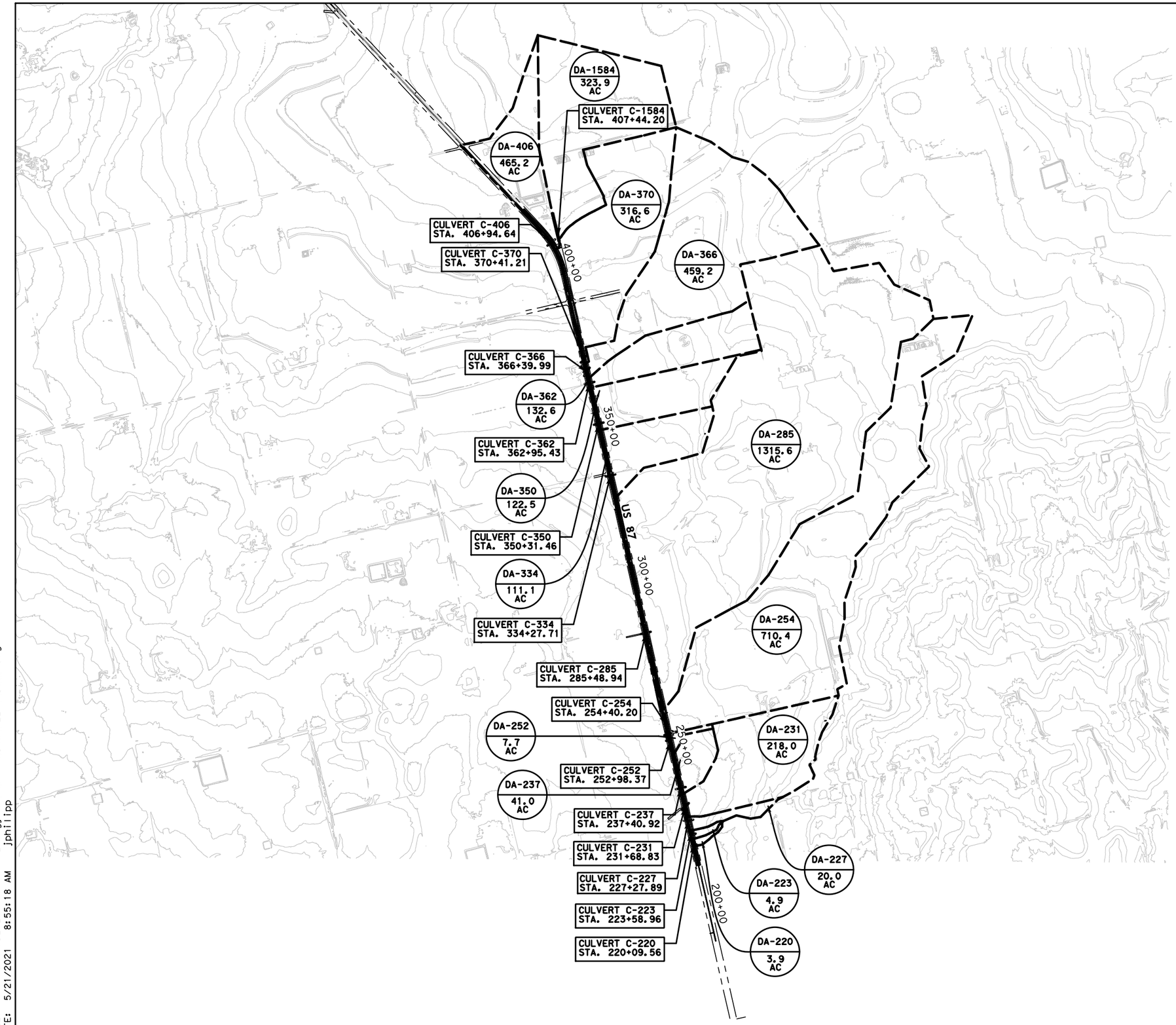

1500 750 0 1500 3000

SCALE: 1" = 3000'

LEGEND

- DIRECTION OF FLOW
- DRAINAGE AREA BOUNDARY
- 5 FT CONTOURS
- DA-XX / XXX.XX AC — DRAINAGE AREA ID / ACREAGE

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation
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US 87

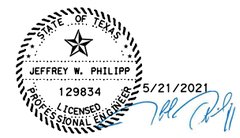
DRAINAGE AREA MAP

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
FR	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
DO	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	112
FR	0068	08	067	
GRPH CHECK				
DO				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\DAM01.dgn
DATE: 5/21/2021 8:55:18 AM jphilipp

DRAINAGE AREA ID	DRAINAGE STRUCTURE ID	EXISTING STRUCTURE	STATION	DRAINAGE AREA (ACRES)	Tc (MIN)	COMPOSITE 'C' VALUE	INTENSITY 25-YR (IN/HR)	INTENSITY 100-YR (IN/HR)	CURVE NUMBER	Q 25-YR (CFS)	Q 100-YR (CFS)	
DA-220	C-220	1 - 5' x 3'	220+09.56	3.9	27	0.4	4.08	5.37		6.4	8.4	
DA-223	C-223	1 - 5' x 3'	223+58.96	4.9	26	0.4	4.17	5.48		8.2	10.8	
DA-227	C-227	2 - 5' x 3'	227+27.89	20.0	35	0.4	3.51	4.65		28.0	37.1	
DA-231	C-231	6 - 5' x 3'	231+68.83	218.0	71	NRCS METHOD			76	311.9	412.7	
DA-237	C-237	2 - 6' x 4'	237+40.92	41.0	31	0.4	3.77	4.98		61.8	81.6	
DA-252	C-252	3 - 6' x 4'	252+98.37	7.7	34	0.4	3.57	4.73		11.0	14.6	
DA-254	C-254	1 - 4' x 3'	254+40.20	710.4	374	NRCS METHOD			78	304.3	437.8	*
DA-285	C-285	2 - 8' x 4'	285+48.94	1315.6	267	NRCS METHOD			82	789.7	1109.2	*
DA-334	C-334	1 - 7' x 2'	334+27.71	111.1	46	0.4	2.96	3.95		131.5	175.5	*
DA-350	C-350	3 - 7' x 3'	350+31.46	122.5	80	0.4	2.03	2.73		99.4	133.7	
DA-362	C-362	1 - 6' x 3'	362+95.43	132.6	51	0.4	2.77	3.70		146.9	196.2	*
DA-366	C-366	1 - 6' x 3'	366+39.99	459.2	160	NRCS METHOD			87	448.5	599.6	*
DA-370	C-370	1 - 6' x 3'	370+41.21	316.6	80	NRCS METHOD			80	410.0	536.0	*
DA-406	C-406	2 - 7' x 3'	406+94.64	465.2	169	NRCS METHOD			76	347.0	488.8	
DA-1584	C-1584	6 - 30"	407+44.20	323.9	149	NRCS METHOD			76	266.9	372.1	*

* FIELD CONDITIONS AND FIELD HISTORY INDICATE NO OVERTOPPING OF THE ROAD OR FLOODING IN THE AREA. POSSIBLE FIELD CONDITIONS NOT RECOGNIZED IN THE HYDRAULIC ANALYSIS APPEAR TO AFFECT THE CAPACITY OF THE CULVERTS THEREFORE, THERE WILL BE NO PROPOSED IMPROVEMENTS TO THESE CULVERTS AT THIS TIME.



FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

DRAINAGE AREA DATA SHEET

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
FR	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
DO	TX	ABL	HOWARD	113
GRAPHICS	CONTROL	SECTION	JOB	
FR	0068	08	067	
GRPH CHECK				
DO				

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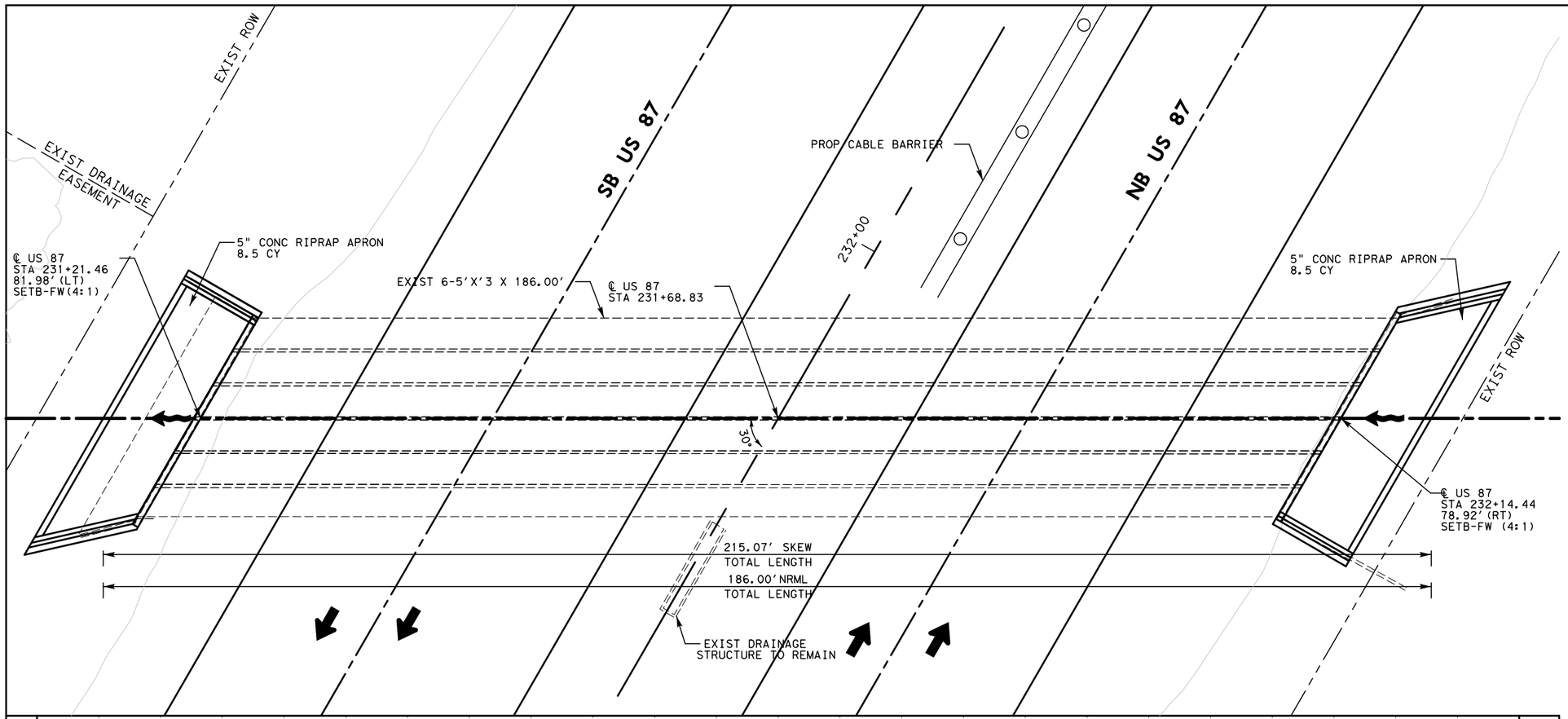
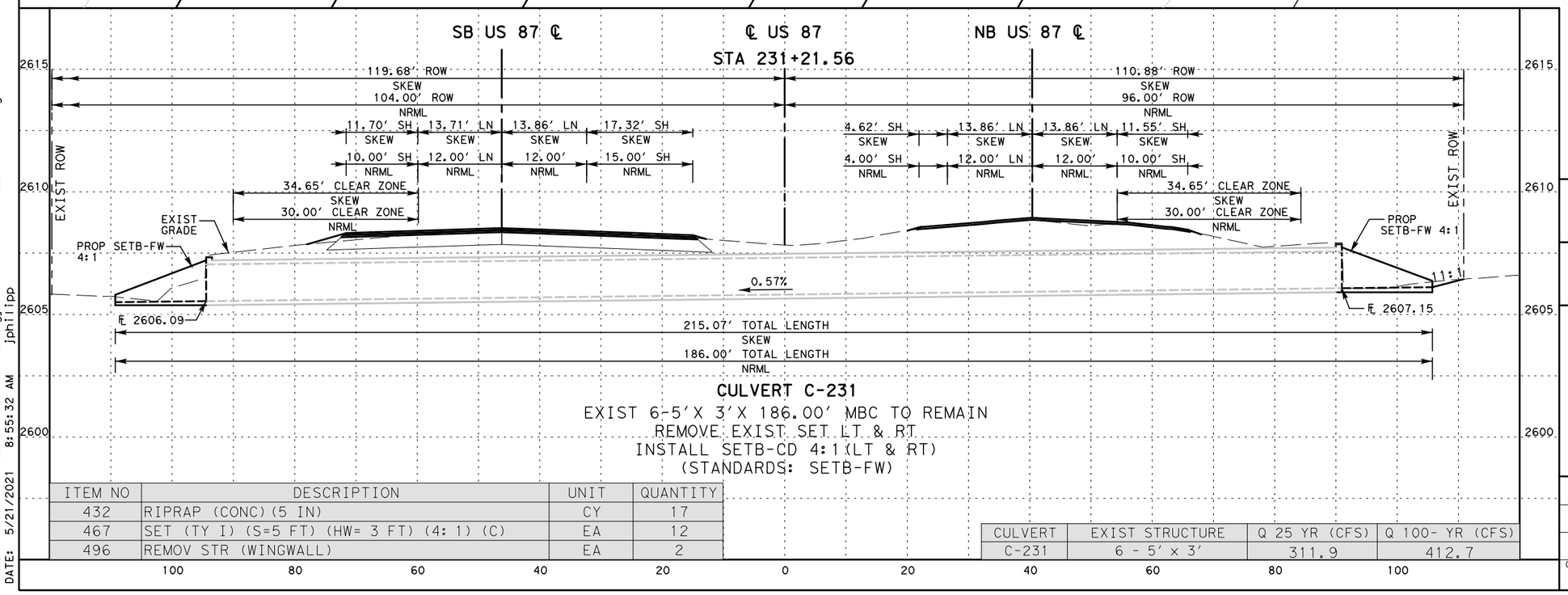


NOTES:

PROPOSED SETS WILL BE CAST-IN-PLACE



CULVERT C-231

EXIST 6-5'X 3'X 186.00' MBC TO REMAIN
REMOVE EXIST SET LT & RT
INSTALL SETB-CD 4:1 (LT & RT)
(STANDARDS: SETB-FW)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
432	RIPRAP (CONC)(5 IN)	CY	17
467	SET (TY I) (S=5 FT) (HW= 3 FT) (4: 1) (C)	EA	12
496	REMOV STR (WINGWALL)	EA	2

CULVERT	EXIST STRUCTURE	Q 25 YR (CFS)	Q 100- YR (CFS)
C-231	6 - 5' x 3'	311.9	412.7

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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US 87

BRIDGE CLASS CULVERT PLAN AND PROFILE CULVERT C-231

NBI No. 08-115-0-0068-08-008

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	114
AR	0068	08	067	
GRPH CHECK				
JKB				

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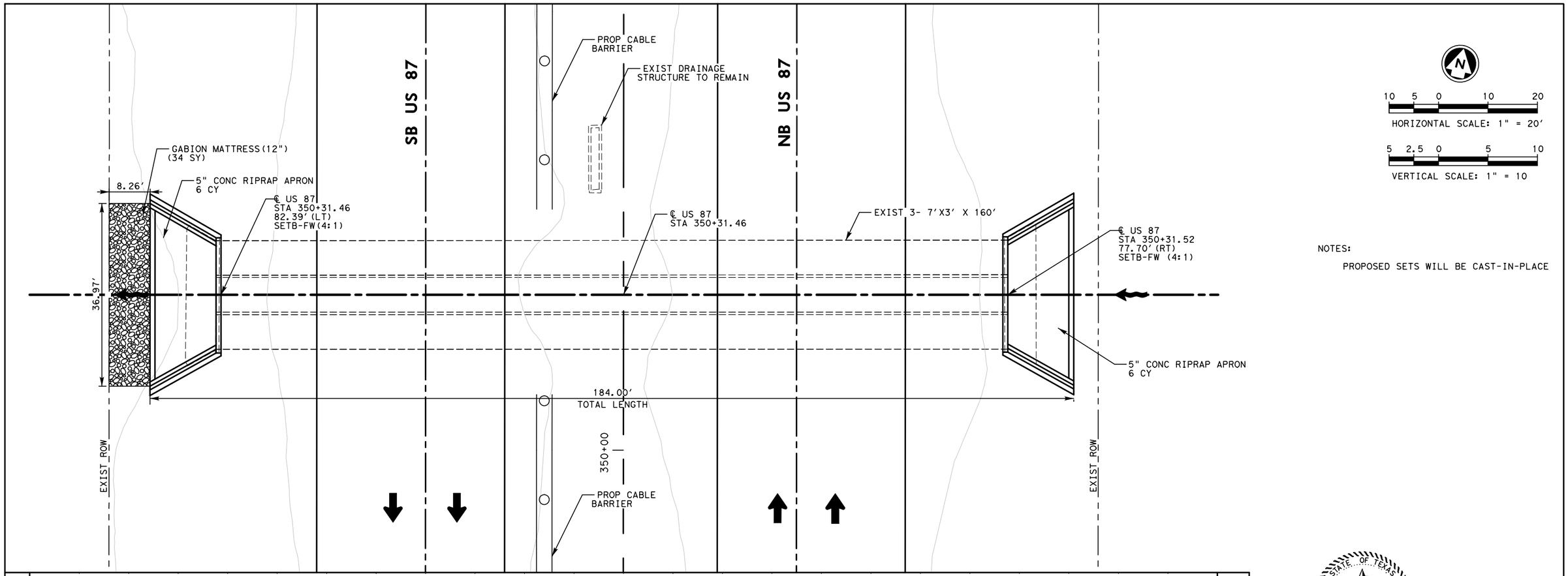
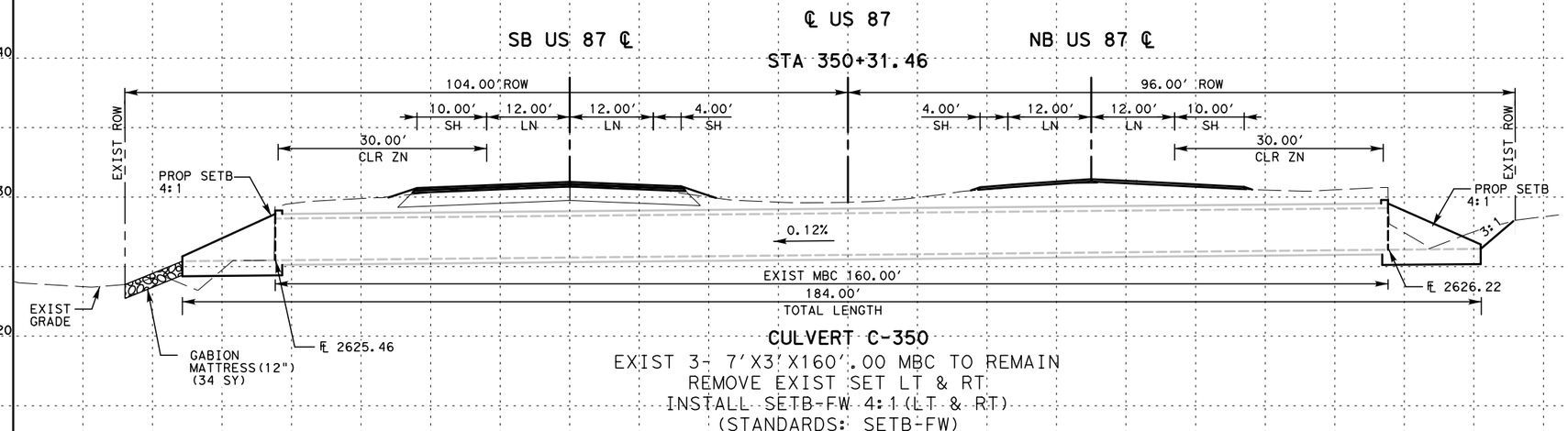


HORIZONTAL SCALE: 1" = 20'

VERTICAL SCALE: 1" = 10

NOTES:

PROPOSED SETS WILL BE CAST-IN-PLACE



CULVERT C-350

EXIST 3- 7'X3'X160'.00 MBC TO REMAIN
REMOVE EXIST SET LT & RT
INSTALL SETB-FW 4:1 (LT & RT)
(STANDARDS: SETB-FW)

ITEM NO	DESCRIPTION	UNIT	QUANTITY
432	RIPRAP (CONC)(5 IN)	CY	12
459	GABION MATTRESSES (GALV)(12 IN)	SY	34
467	SET (TY I) (S=7 FT) (HW= 3 FT) (4: 1)	EA	6
496	REMOV STR (SET)	EA	2

CULVERT	EXIST STRUCTURE	Q 25 YR (CFS)	Q 100- YR (CFS)
C-350	3 - 7' x 3'	99.4	133.7

STATE OF TEXAS
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5/21/2021

FIRM REGISTRATION NO. F-230

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BRIDGE CLASS CULVERT PLAN AND PROFILE CULVERT C-350

NBI No. 08-115-0-0068-08-007

DESIGN	FED.RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	115
AR				
GRPH CHECK	0068	08	067	
JKB				

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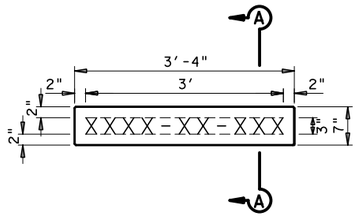
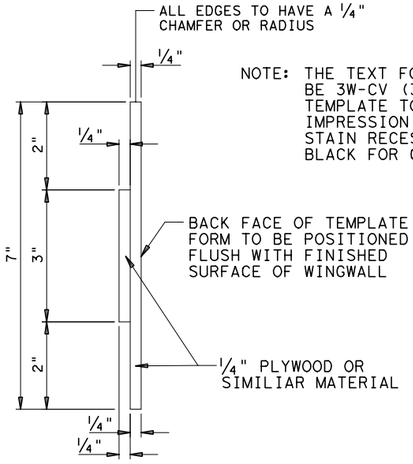
DATE: 5/21/2021 8:55:34 AM jphilipp

STRUCTURE ID TEMPLATES



NOTE: THE SYMBOLS XXXX-XX-XXX REPRESENT THE STRUCTURE NUMBER WHICH IS SHOWN IN THE TABLE TO THE RIGHT.

ALL CHARACTERS ARE REQUIRED, AND ARE TO BE FORMATTED EXACTLY AS SHOWN IN THE STRUCTURE NUMBER COLUMN TO THE RIGHT.

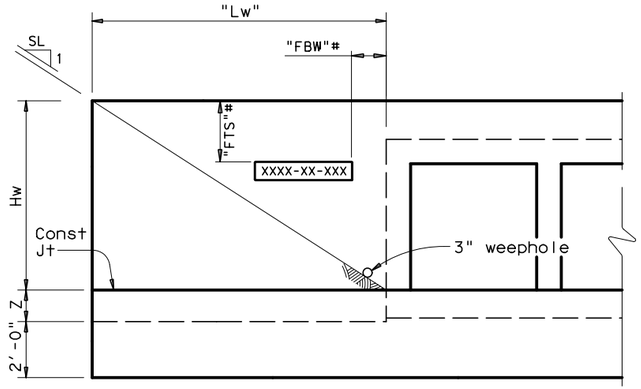


SECTION A-A

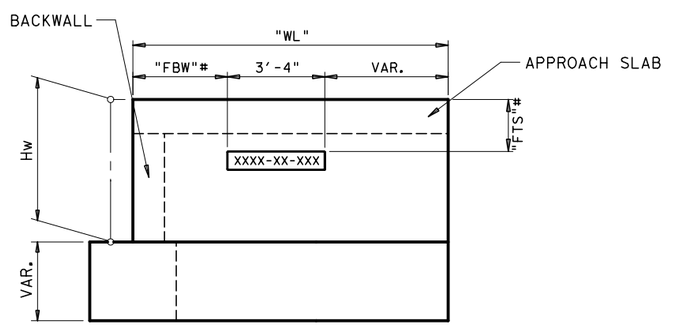
NOTE: THE TEXT FOR ALL TEMPLATES SHOULD BE 3W-CV (3") CLEAR VIEW FONT. TEMPLATE TO PROVIDE A RECESSED IMPRESSION INTO CAST CONCRETE. STAIN RECESSED NUMERAL SURFACES BLACK FOR CONTRAST.

STRUCTURE ID TEMPLATE NUMBERS

NBI NUMBER	LOCATION	STRUCTURE NUMBER	"WL"	"Lw"	"Hw"	"FBW"#	"FTS"#
08-115-0-0068-08-008	US 87 3.7 MI N OF IH 20	0068-08-008	18'	NA	3'-5"	VARIOUS	VARIOUS
08-115-0-0068-08-007	US 87 0.7 MI S OF FM 2230	0068-08-007	15.5'	NA	3'-8"	VARIOUS	VARIOUS

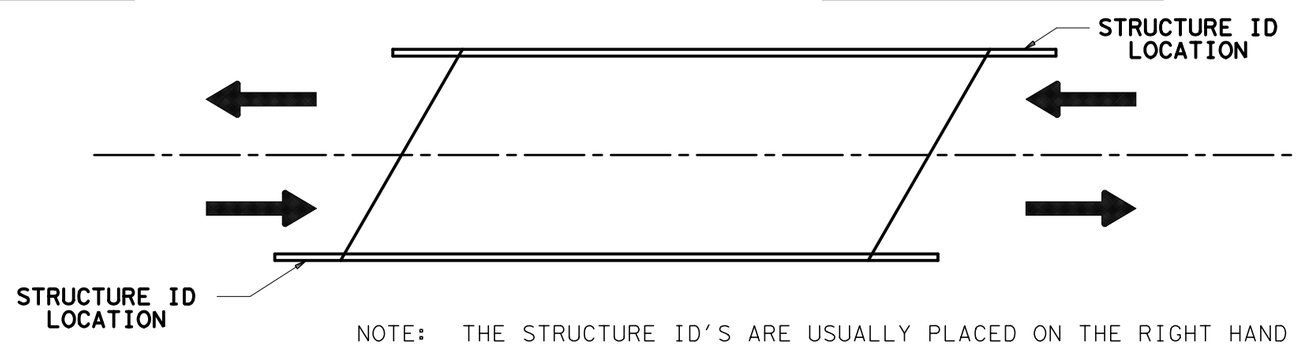


PARALLEL WING ELEVATION



WINGWALL ELEVATION

FIELD LOCATE TO AVOID CONFLICT WITH REINFORCEMENT AND RIPRAP. THE ENGINEER SHALL APPROVE INSTALLATION LOCATION PRIOR TO PLACEMENT.



NOTE: THE STRUCTURE ID'S ARE USUALLY PLACED ON THE RIGHT HAND SIDE OF APPROACHES. THIS PLACES THE ID'S ON DIAGONAL CORNERS. THE STRUCTURE ID'S WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BRIDGE ITEMS.

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
5/21/2021

STRUCTURE ID DETAILS
SIDD-14

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		116
DISTRICT	CONTROL	SECTION	JOB
ABL	068	08	067

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Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°, 15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (C.Y.)	Class "C" Conc (Curb) (2) (C.Y.)	Class "C" Conc (Wingwall) (3) (C.Y.)	Total Wingwall Area (S.F.)
CULVERT C-231 (BOTH)	6 ~ 5'x 3'	4'	SCP-5	SETB-FW-S	30°	4:1	6"	6"	0.25'	3.500'	12.667'	12.667'	17.913'	N/A	55.97'	17.0	0.8	16.4	N/A
CULVERT C-350 (BOTH)	3 ~ 7'x 3'	5'	SCP-7	SETB-FW-0	0°	4:1	8"	8"	0.25'	3.667'	13.333'	7.698'	15.396'	N/A	40.06'	11.4	0.4	14.4	N/A

NOTES:
Skew Angle = 0° for SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standards.
30° Maximum for Safety End Treatment

SL:1 = Horizontal:1 Vertical
Side Slope at culvert for Flared or Straight Wingwalls. Channel Slope for Parallel Wingwalls.
Slope shall be 3:1 or flatter for Safety End Treatments.

T = Box Culvert Top Slab Thickness. Dimension can be found on the applicable Box Culvert Standard.

U = Box Culvert Wall Thickness. Dimension can be found on the applicable Box Culvert Standard.

C = Curb Height.

See applicable wing or end treatment standards for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.
Hw = Height of Wingwall.
A = Distance from Face of Curb to End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
B = Offset of End of Wingwall (Not applicable to Parallel or Straight Wingwalls).
Lw = Length of Longest Wingwall.
Ltw = Length of Culvert Toewall (Not applicable when using Riprap Apron).
Atw = Length of Anchor Toewall (Applicable to Safety End Treatment only).
Total Wingwall Area = Wingwall area in S.F. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) The wall heights shown will be rounded to the nearest Foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the RAC standard, quantities shown must be increased by a factor of 2. If Class "S" concrete is required for the top slab of the culvert, the curb concrete shall also be Class "S". Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wing, footing, culvert toewall (if any), anchor toewall (if any) and wingwall toewall. Riprap apron, culvert and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor shall have the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it shall be the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the Box Culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the Box Culvert Wingwalls and Safety End Treatments.

An Excel 97 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet shall be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
JEFFREY W. PHILIPP
129834
LICENSED PROFESSIONAL ENGINEER
5/21/2021

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		117

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DATE: 5/21/2021 8:55:38 AM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Maximum Wingwall Height Hw (9)	W	X	Y	Z	Variable Reinforcing Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities (3) per ft of wing length (Two~Wings) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WING WALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
D	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
R	#5	6	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	6	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 1 1#2" clear cover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by Lw.

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

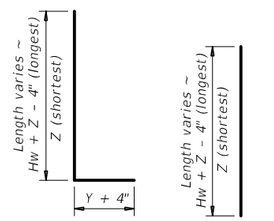
(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extend Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

(9) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

TABLE OF MAXIMUM WING HEIGHTS (9)

Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250' (9)
A = (Hw - 0.333') (SL)
B = (A) (tan (30°))
Lw = (A) ÷ cos (30°))

For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)
For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.500')

Lc = (Ltw) - (2U)
Atw = (Lc) + (2B)
Total Wingwall Area (two wings ~ SF) = (Hw + 0.333') (Lw)

Hw = Height of wingwall (feet)
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

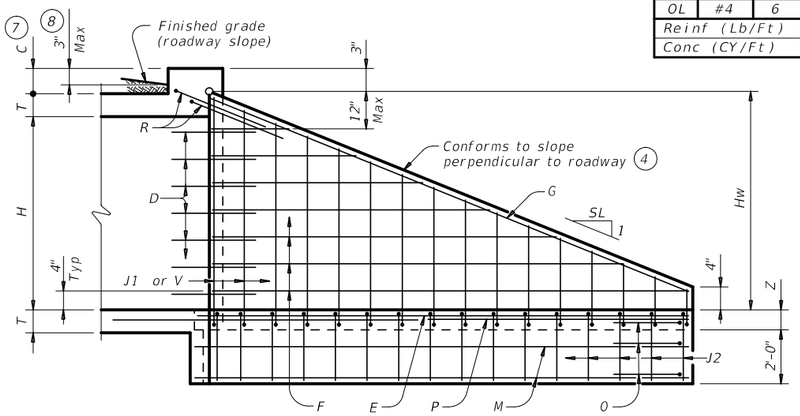
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide Class "C" concrete (f`c = 3,600 psi).
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Provide ASTM A36 steel plates.
Galvanize all steel components, except reinforcing unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".
For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

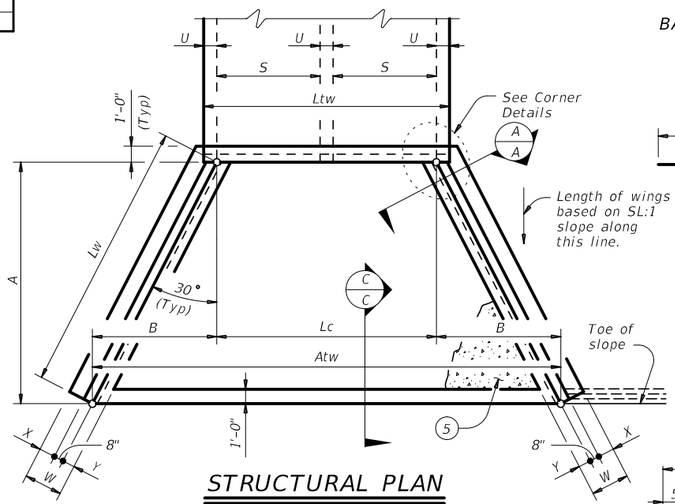
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment.
The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.



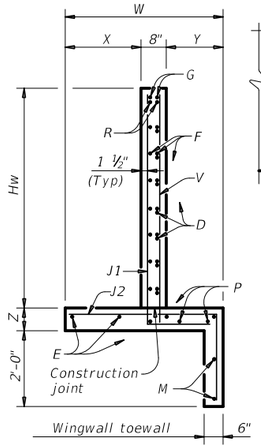
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

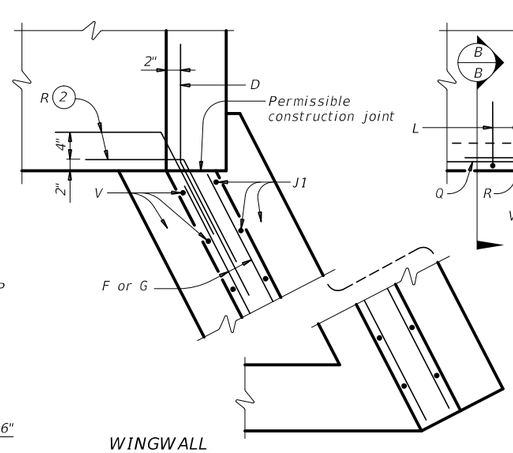


STRUCTURAL PLAN

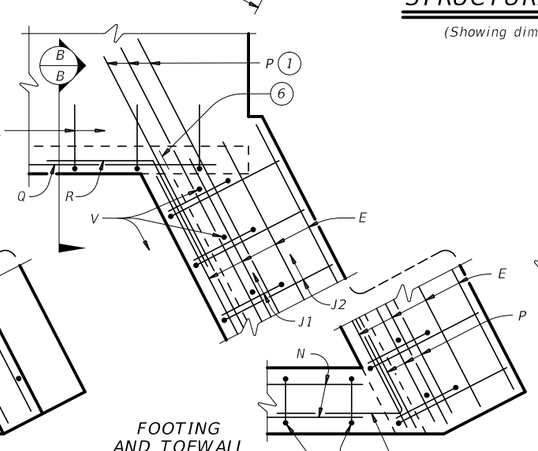
(Showing dimensions.)



SECTION A-A



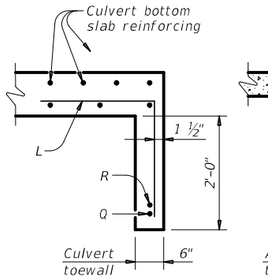
WINGWALL



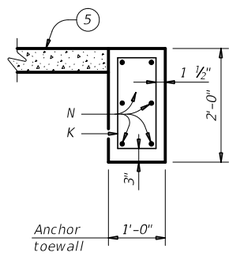
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		118

DATE: 5/21/2021 8:55:39 AM
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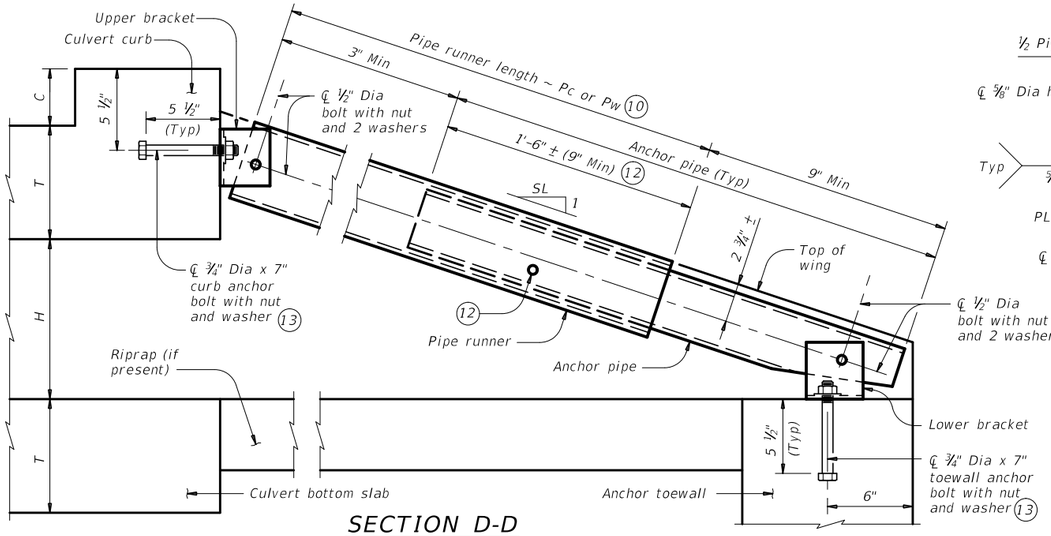
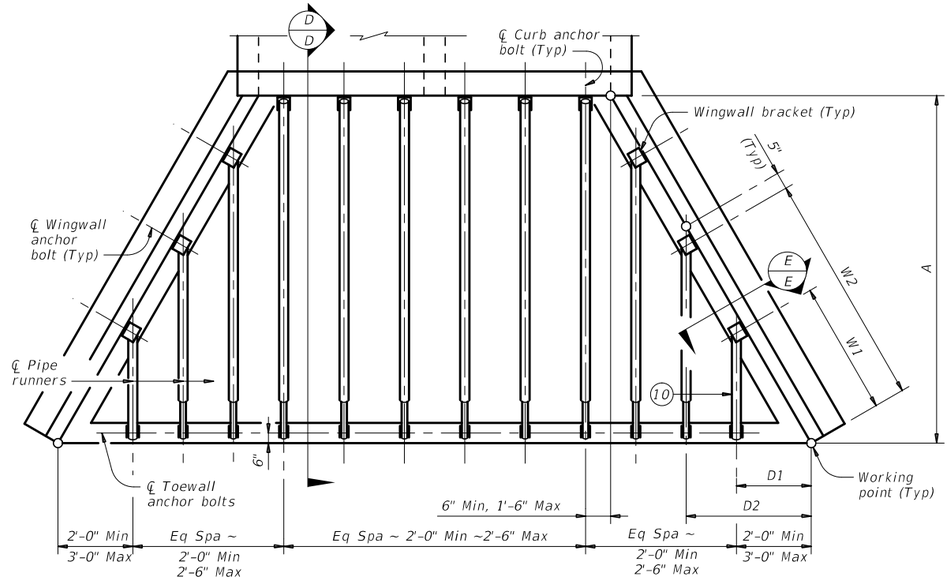
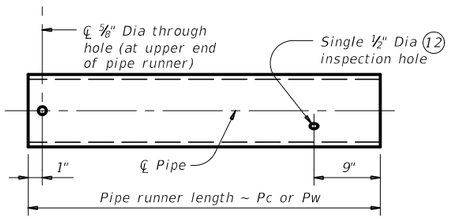


SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)

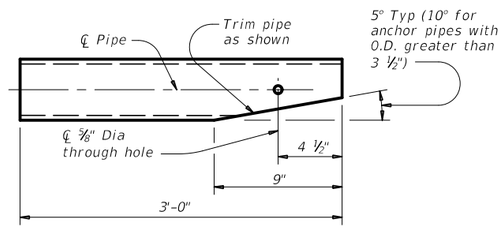


PIPE RUNNER PLAN

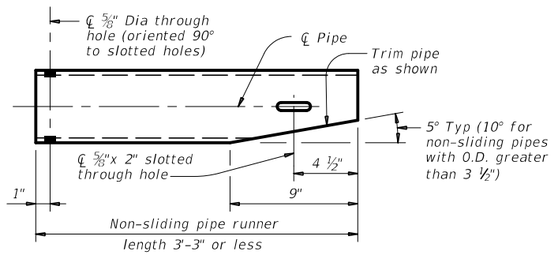


Note: Pipe diameter required for curb pipe runner is also used for wingwall pipe runner.

PIPE RUNNER DETAILS

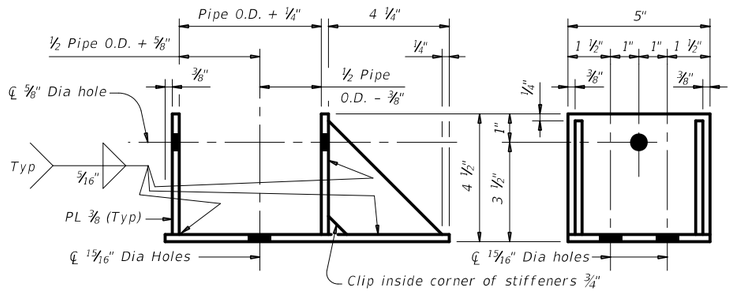


ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

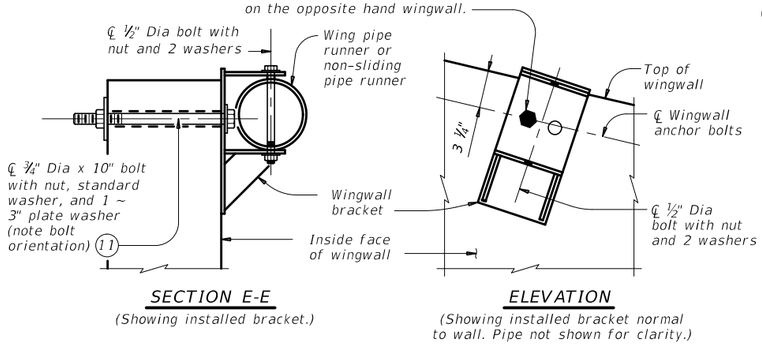
NON-SLIDING PIPE RUNNER DETAILS



ELEVATION

SIDE VIEW

Install ¾" anchor bolt in hole nearest to the culvert curb. Other bolt hole is intended for use on the opposite hand wingwall.



SECTION E-E

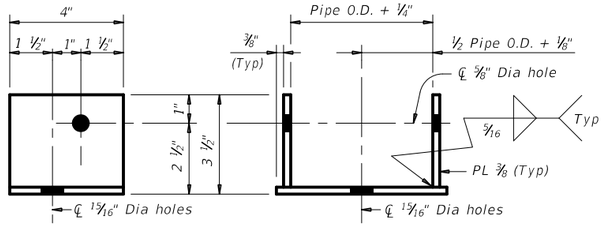
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW

ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(10) If pipe runner length (Pw) is 1'-9" or less replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(11) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(12) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(13) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (2.000) (Dn) - (0.416')
Pwn = (Dn) (K2) - (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) - (0.563')
Pc = (A) (K1) - (1.688')

Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2
3:1	~ 1.054	~ 1.826
4:1	~ 1.031	~ 1.785
6:1	~ 1.014	~ 1.756

n = Wing pipe runner number

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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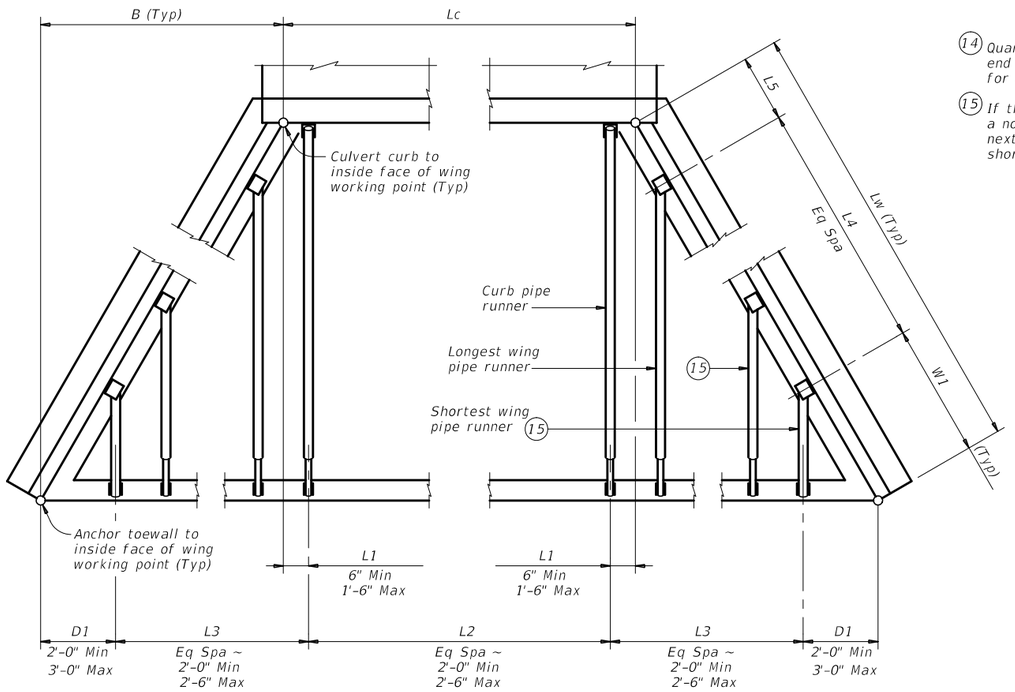
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		119

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (14)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at (Ft)	Overall Length (Ft)		No. Spa	Spa at (Ft)	Overall Length (Ft)		No. Spa	Spa at (Ft)	Overall Length (Ft)		No.	Length (Ft)				Size (3",4" or 5")	Total Length (14) (Ft)	Size (2",3" or 4")	Total Length (14) (Ft)
	(Ft)	(Ft)				(Ft)				(Ft)				(Ft)			(Ft)	(Ft)	(Ft)				
Culvert C-227 (Lt)	11.500'	0.800'	4	2.475'	9.900'	2.000'	3	2.166'	6.498'	3.583'	2	4.332'	8.664'	3.149'	5	12.063'	9.250'	5.375'	3.000'	4"	95.563'	3"	27.000'
Culvert C-350 (Both)	24.667'	1.250'	9	2.463'	22.167'	2.000'	3	2.316'	6.948'	3.583'	2	4.632'	9.264'	2.549'	10	12.063'	9.771'	5.646'	3.000'	4"	314.917'	3"	84.000'



PIPE RUNNER LAYOUT

(14) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(15) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

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SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 0° SKEW BOX CULVERTS TYPE I ~ CROSS DRAINAGE

SETB-FW-0

FILE: setbf0se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		120

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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for One Structure End)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (Two~Wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height (10) Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'- 5"	1'- 0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'- 2"	1'- 6"	1'- 0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'- 8"	1'- 9"	1'- 3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'- 2"	2'- 0"	1'- 6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'- 8"	2'- 3"	1'- 9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'- 2"	2'- 6"	2'- 0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'- 8"	2'- 9"	2'- 3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'- 2"	3'- 0"	2'- 6"	9"	#7	6"	#5	6"	162.29	0.721

TABLE OF WINGWALL REINFORCING (Two~Wings)

Bar	Size	No.	Spa
DL & DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RL	#5	3	~
RS	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

TABLE OF ESTIMATED ANCHOR TOEWALL QUANTITIES

Bar	Size	No.	Spa
K	#4	~	1'-0"
N	#5	6	~
OL	#4	3	~
OS	#4	3	~
Reinf (Lb/Ft)			9.82
Conc (CY/Ft)			0.074

(1) Extend Bars P 3'-0" Min into bottom slab of box culvert.

(2) Adjust to fit as necessary to maintain 11#2" clearcover and 4" Min between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings multiply the tabulated values by 0.5 (A+Lw).

(4) Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, extend construction joints or grooved joints, oriented in the direction of flow, across the full distance of the riprap, at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B is not required.

(6) At Contractor's option, end the culvert toewall flush with wingwall toewall. Adjust reinforcing as needed.

(7) 3" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.

(8) For vehicle safety, reduce curb heights, if necessary, to provide a maximum 3" projection above finished grade. No changes will be made in quantities and no additional compensation will be allowed for this work.

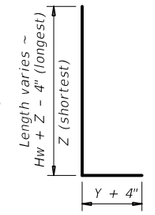
(9) Culvert skew (limit to 15° or 30°)

(10) See Table of Maximum Wing Heights for various slopes. Height is limited based on a 33'-6" maximum safety pipe runner length.

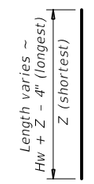
(11) Typical wingwall angle for all skews.

TABLE OF MAXIMUM WING HEIGHTS (10)

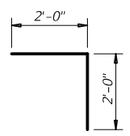
Side Slope	Hw Max
3:1	11'- 5"
4:1	8'-10"
6:1	6'- 1"



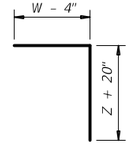
BARS J1



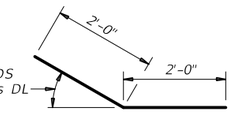
BARS V



BARS L

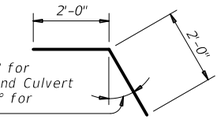


BARS J2



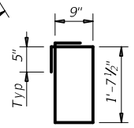
Angle = Culvert Skew for Bars DS and 15° for Bars DL

BARS DS and DL
(DS ~ Short wing and DL ~ Long wing)

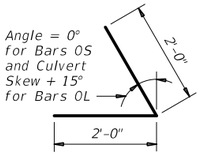


Angle = 0° for Bars RS and Culvert Skew + 15° for Bars RL

BARS RS and RL
(RS ~ Short wing and RL ~ Long wing)



BARS K
(Length = 5'-5")



BARS OS and OL
(OS ~ Short wing and OL ~ Long wing)

WING DIMENSION CALCULATIONS:

Formulas:

Hw = H + T + C - 0.250' (10)
A = (Hw - 0.333') (SL)
B = (A) [tan (θ + 15°)]
Lw = (A) ÷ [cos (θ + 15°)]

For cast-in-place culverts:

Ltw = [(N) (S) + (N + 1) (U)] ÷ (cos θ)

For precast culverts:

Ltw = [(N) (2U + S) + (N - 1) (0.500')] ÷ (cos θ)

Lc = (Ltw) - (2U) ÷ (cos θ)
Atw = (Lc) + (B)
Total Wingwall Area (two wings ~ S.F.) = (0.5) (Hw + 0.333') (Lw + A)

Hw = Height of wingwall (feet)
SL:1 = Side slope ratio (horizontal : 1 vertical)
Lw = Length of wingwall (feet)
Ltw = Culvert toewall length (feet)
Lc = Culvert curb between wings (feet)
Atw = Anchor toewall length (feet)
N = Number of culvert spans
θ = Culvert skew

See applicable box culvert standard for H, S, T, and U values.
See Table of Maximum Wall Heights for limits on Hw.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide Class "C" concrete (f`c = 3,600 psi).

Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".

Provide pipe runners and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Provide ASTM A307 bolts and nuts.

Provide ASTM A36 steel plates.

Galvanize all steel components, except reinforcing unless required elsewherein the plans, after fabrication.

Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

For optional adhesive anchors, install adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing adhesive, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Provide anchorage rods that are clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.

Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

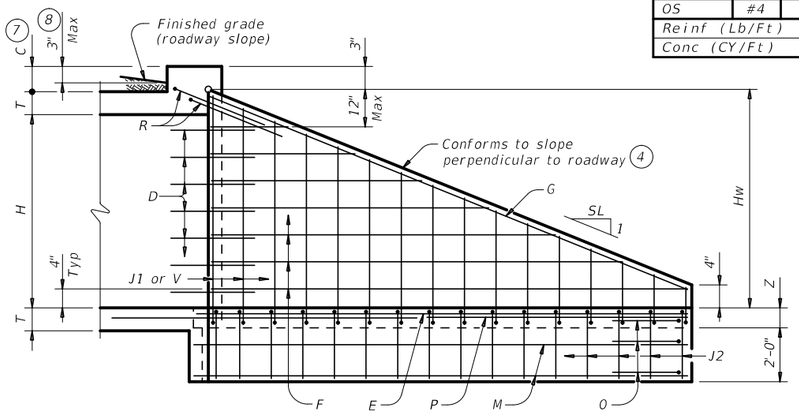
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.

All bolts, nuts, washers, brackets, angles, and pipe runners are considered parts of the safety end treatment for payment

The quantities for pipe runners, reinforcing steel, and concrete, resulting from the formulas given herein are for Contractor's information only.

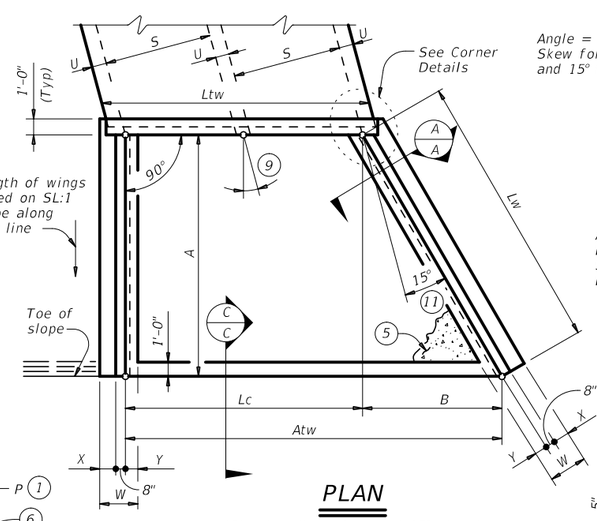
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



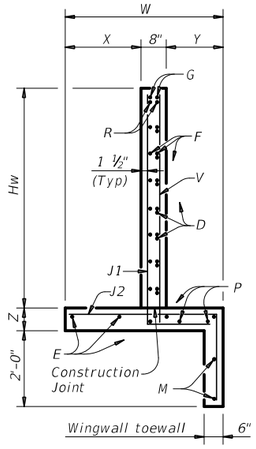
INSIDE ELEVATION OF WINGWALL

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

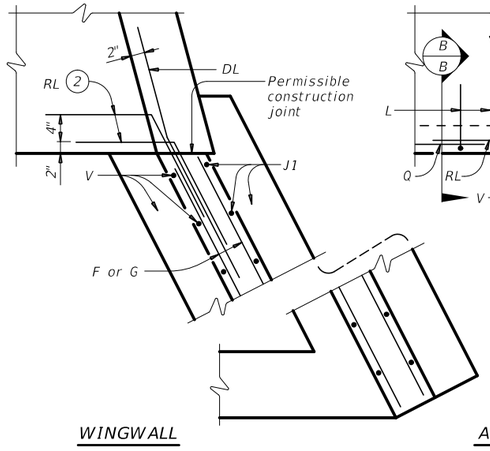


PLAN

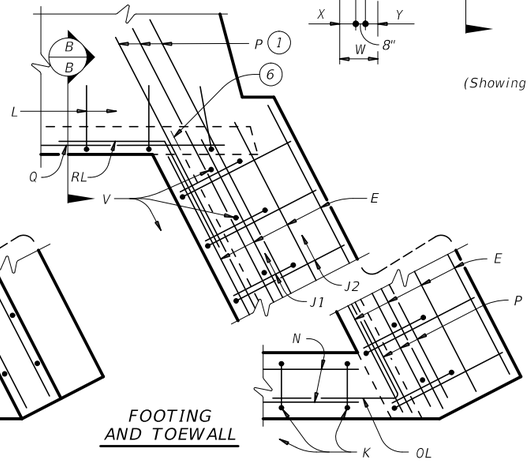
(Showing dimensions and 15° skew.)



SECTION A-A



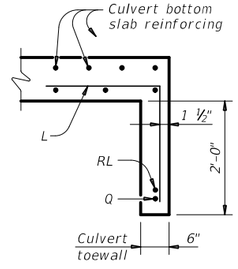
WINGWALL



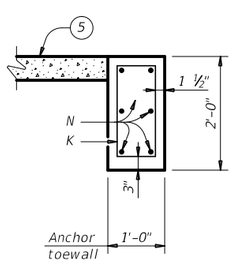
FOOTING AND TOEWALL

CORNER DETAILS

(Culvert and culvert toewall reinforcing not shown for clarity.)



SECTION B-B (5)



SECTION C-C

SHEET 1 OF 3

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		121

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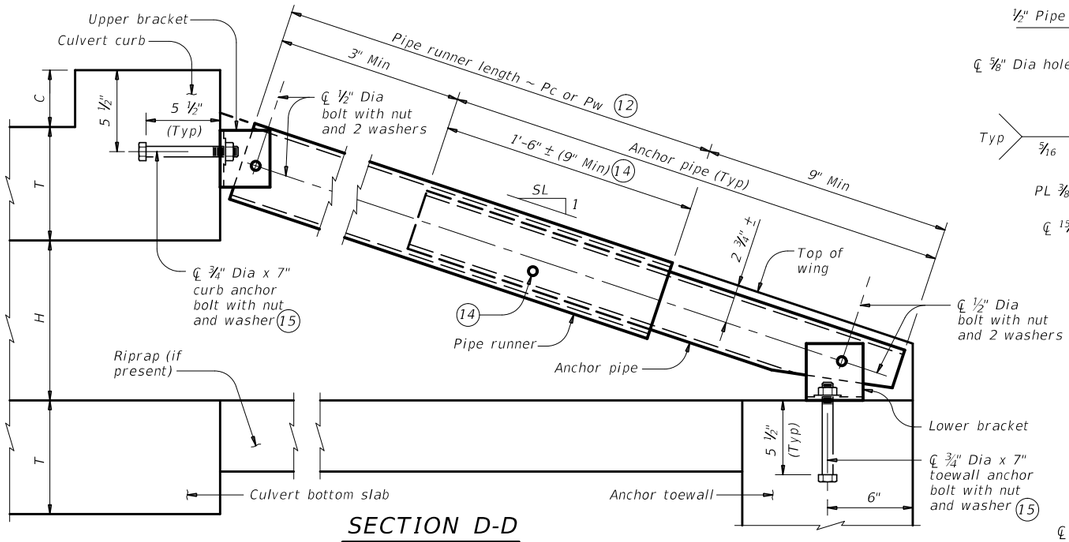
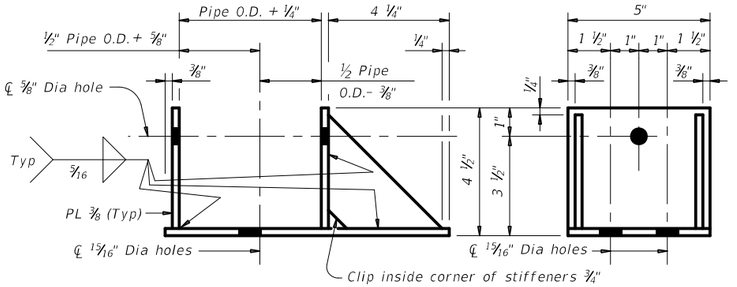


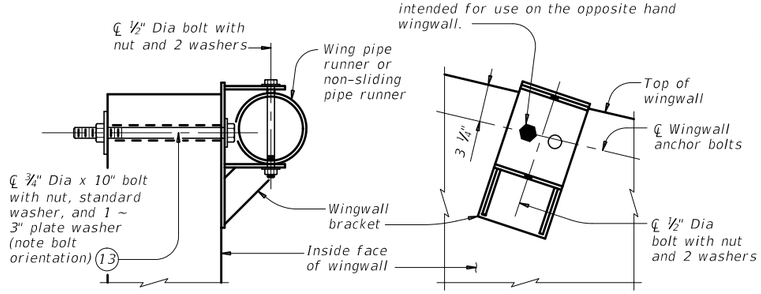
SECTION D-D

(Showing curb pipe runner. Except for upper bracket, wingwall pipe runners are similar.)



ELEVATION

SIDE VIEW



SECTION E-E

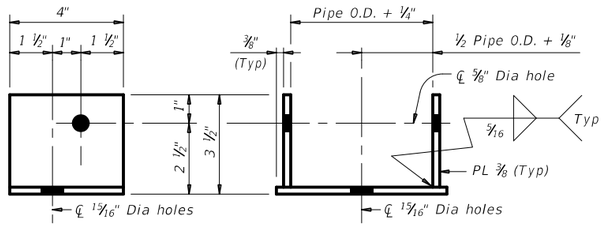
(Showing installed bracket.)

ELEVATION

(Showing installed bracket normal to wall. Pipe not shown for clarity.)

Note: Match wingwall bracket to the upper curb bracket size.

WINGWALL BRACKET DETAILS



SIDE VIEW

ELEVATION

Note: Match upper and lower brackets, except for the brackets used with non-sliding pipe runners, to the required pipe diameters as shown in the table.

UPPER AND LOWER BRACKET DETAILS

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES

Maximum Pipe Runner Length (Pc or Pw)	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
9'-4"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'-0"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
33'-6"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"

(12) If pipe runner length (Pw) is 1'-9" or less, replace the normal pipe runner and anchor pipe with a single non-sliding pipe runner. See Non-Sliding Pipe Runner Details for additional information.

(13) At Contractor's option, ⅞" diameter hole may be formed or cored drilled. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes.

(14) After installation of pipe runner, use the ½" inspection hole to ensure that the lap of the anchor pipe with the pipe runner is adequate.

(15) At Contractor's option, an adhesive anchor may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307, Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 5 ½". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

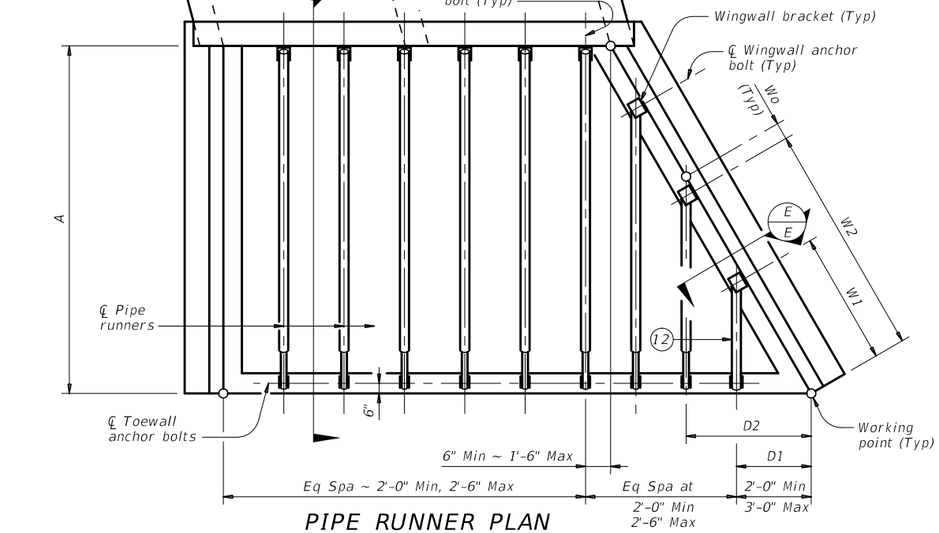
PIPE RUNNER DIMENSION CALCULATIONS:

Wn = (K3) (Dn) – (Wo)
Pwn = (Dn) (K2) – (2.063')
Pw1 Non-Sliding Pipe Runner (If required) = (D1) (K2) – (0.563')
Pc = (A) (K1) – (1.688')

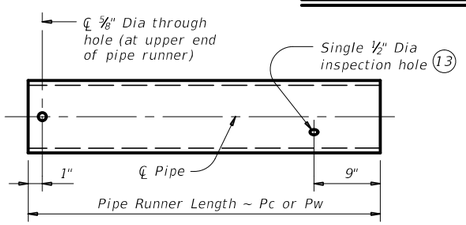
Wn = Distance from working point to centerline anchor bolt measured along bottom inside face of wing (feet)
Dn = Distance from working point to centerline pipe runner measured along outside face of anchor toewall (feet)
Pw = Wingwall pipe runner length (feet)
Pc = Curb pipe runner length (feet)
K = Constant values for use in formulas

Slope SL:1	K1	K2~15° Skew	K2~30° Skew
3:1	~ 1.054	~ 1.826	~ 1.054
4:1	~ 1.031	~ 1.785	~ 1.031
6:1	~ 1.014	~ 1.756	~ 1.014

K3 = 15° Skew ~ 2.000
30° Skew ~ 1.414
n = Wing pipe runner number
Wo = 15° Skew ~ 5"
30° Skew ~ 2 ½"

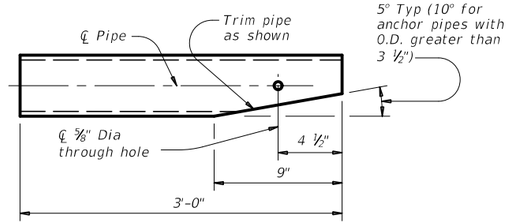


PIPE RUNNER PLAN

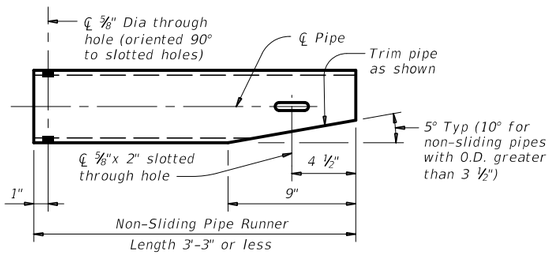


Note: Use pipe diameter required for curb pipe runner for wingwall pipe runner.

PIPE RUNNER DETAILS



ANCHOR PIPE DETAILS



Note: Pipe size is the same as required for curb pipe runner. Adjust the corresponding lower bracket accordingly.

NON-SLIDING PIPE RUNNER DETAILS

Texas Department of Transportation

Bridge Division Standard

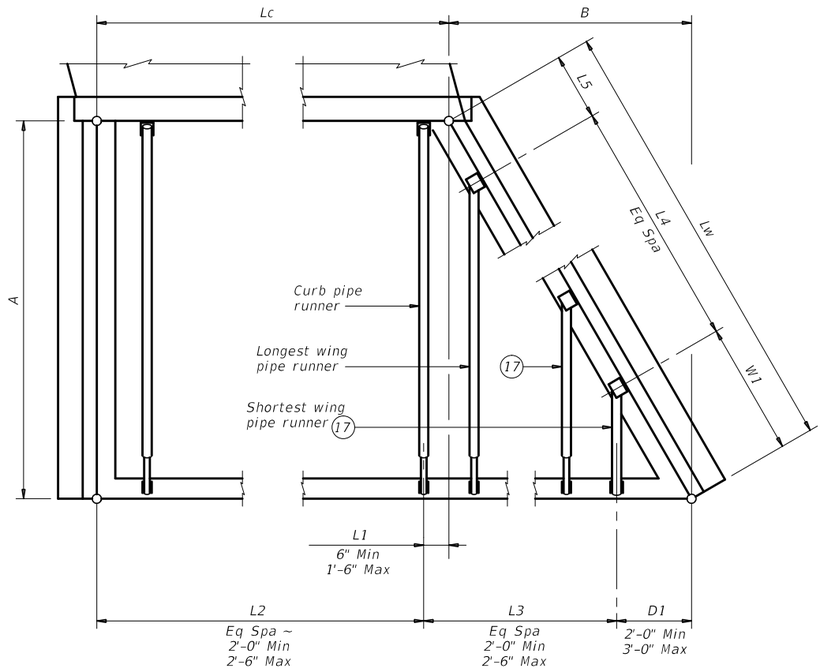
SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		122

Culvert Station and/or Creek name followed by applicable end (Lt, Rt or Both) (16)	Lc	L1	L2			D1	L3			W1	L4			L5	Curb Pipe Runner (Pc)		Longest Wing Pipe Runner (Pw)	Shortest Wing Pipe Runner (Pw)	Non-Sliding Wing Pipe Runner (if applicable)	Curb, Wing, and/or Non-Sliding Pipe Runners		3'-0" Anchor Pipe	
			No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No. Spa	Spa at	Overall Length		No.	Length				Size (3",4" or 5")	Total Length (16)	Size (2",3" or 4")	Total Length (16)
	(Ft)	(Ft)		(Ft)	(Ft)	(Ft)			(Ft)	(Ft)			(Ft)	(Ft)		(Ft)	(Ft)	(Ft)	(Ft)		(Ft)		(Ft)
Culvert C-231 (Both)	43.301'	1.000'	17	2.488'	42.301'	2.000'	5	2.333'	11.667'	2.620'	4	3.299'	13.197'	2.096'	17	11.375'	9.625'	2.396'	1.500'	4"	437.833'	3"	126.000'



PIPE RUNNER LAYOUT

Note: Right forward culvert skew shown, actual culvert skew may be opposite hand.

(16) Quantities shown are for one structure end if Lt or Rt. Quantities shown are for two structure ends if Both.

(17) If the outermost wing pipe runner is a non-sliding pipe runner, consider the next outermost wing pipe runner as the shortest.

SPECIAL NOTE:

This tabular sheet is to be filled out by the culvert specifier and provides information for the construction details and quantities of pipe runners.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Note that the tabular quantities are given for estimating purposes only. It is likely that these quantities will change due to field conditions. Therefore, all dimensions must be verified by the Contractor in the field prior to fabrication of the safety end treatment components.

DATE: 5/21/2021 8:55:43 AM
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SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT WITH FLARED WINGS

FOR 15° AND 30° SKEW BOX CULVERTS
TYPE I ~ CROSS DRAINAGE

SETB-FW-S

FILE: setbfsse-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	ABL	HOWARD		123

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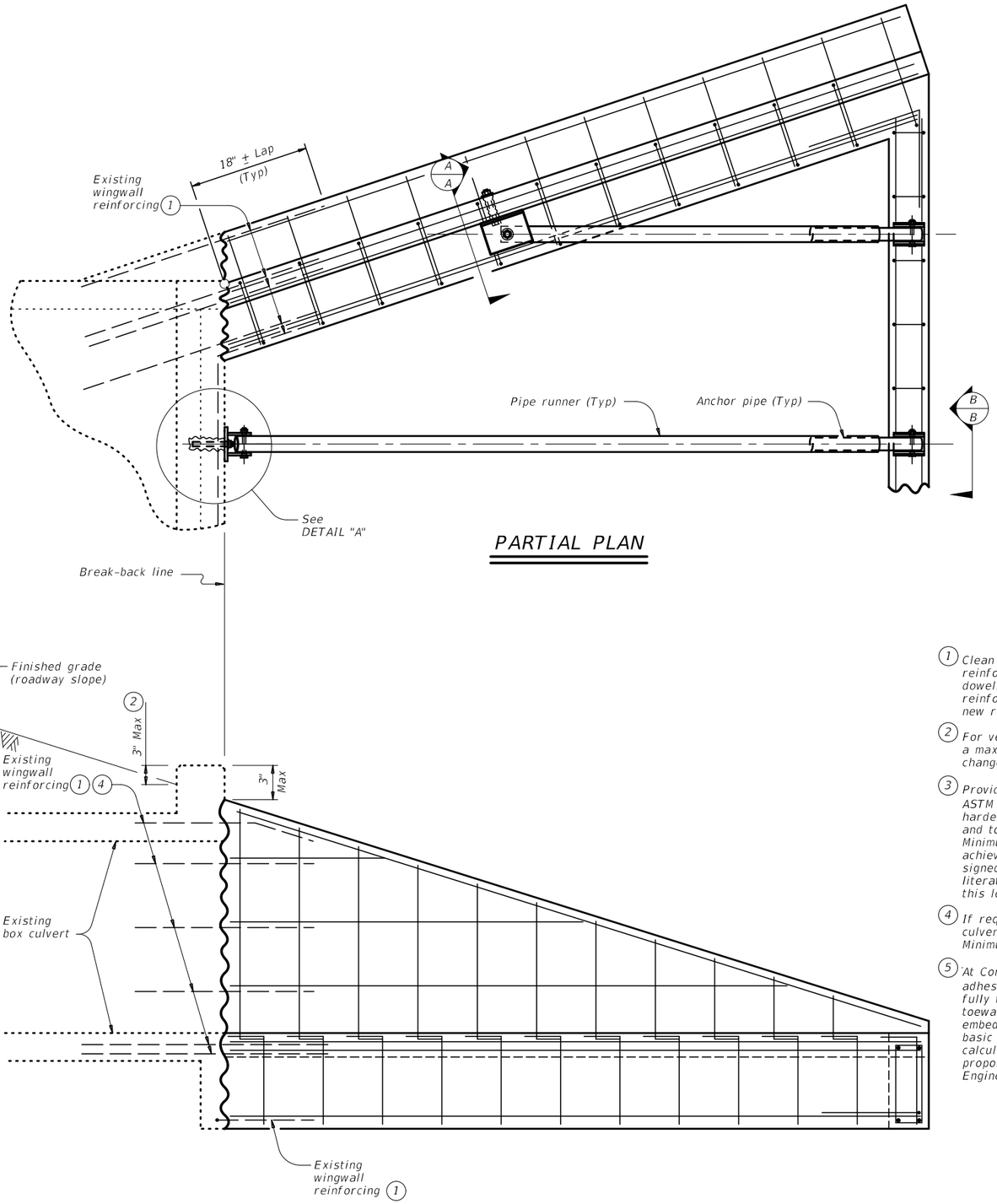
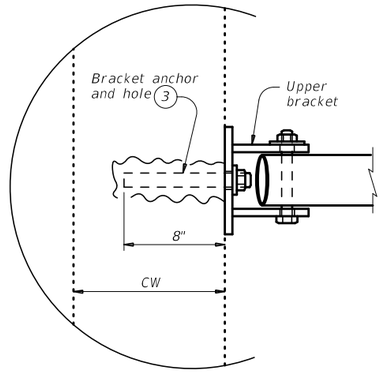
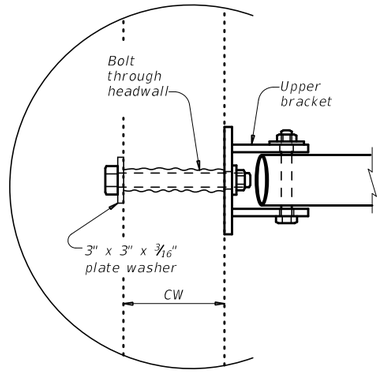


PARTIAL PLAN

ELEVATION

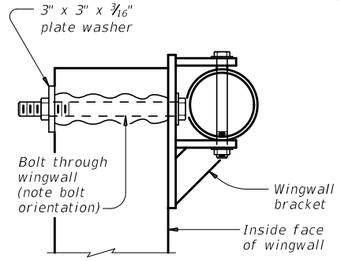


For CW greater than 8"

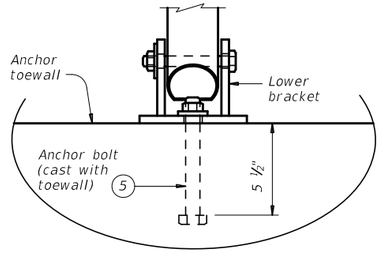


For CW 8" and less

DETAIL "A"



SECTION A-A



SECTION B-B

(1) Clean and straighten existing reinforcing to lap with new reinforcing as shown. The Engineer may require additional dowels to lap with the new reinforcing if the existing reinforcing is damaged or is not suitably located to lap with new reinforcing. These additional dowels must be #5 x 2'-0".

(2) For vehicle safety, reduce curb height, if necessary to provide a maximum 3" projection above finished grade. No quantity changes or additional compensation will be allowed for this work.

(3) Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rod with one hex head nut and one hardened steel washer. Embed threaded rods into curb, wingwall, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

(4) If required, embed wingwall anchor dowels into existing box culvert using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8".

(5) At Contractor's option, adhesive anchors may be used. Provide ¾" Dia adhesive anchors that meet the requirements of ASTM A307 Gr A fully threaded rods. Embed threaded rods into curb, wingwalls, and toewall using a Type III, Class C, D, E, or F anchor adhesive. Minimum embedment depth is 8". Provide anchor adhesive able to achieve a basic bond strength in tension, Nba, of 20 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use.

MATERIAL NOTES:

Install epoxy adhesive anchorages in accordance with the manufacturer's instructions including hole size, drilling equipment and method, hole cleaning equipment and method, mixing and dispensing epoxy, and anchor insertion. Do not alter the manufacturer's mixing nozzle or dispenser. Anchorage bars or bolts must be clean and free of grease, oil, or any other foreign material. Demonstrate hole cleaning method to the Engineer for approval and continue the approved process for all anchorage locations. Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

GENERAL NOTES:

Use these details in conjunction with the SETB standard sheets. Shorten reinforcing Bars D, M, P, and R when utilizing existing reinforcing, as shown. If required, add dowels to lap with new reinforcing, as shown. No increase or decrease to the pay quantities is permitted for these adjustments in the reinforcing steel or concrete quantities.

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

RETROFIT DETAILS FOR EXISTING BOX CULVERTS

SETBR

FILE: setbrste-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: TxDOT
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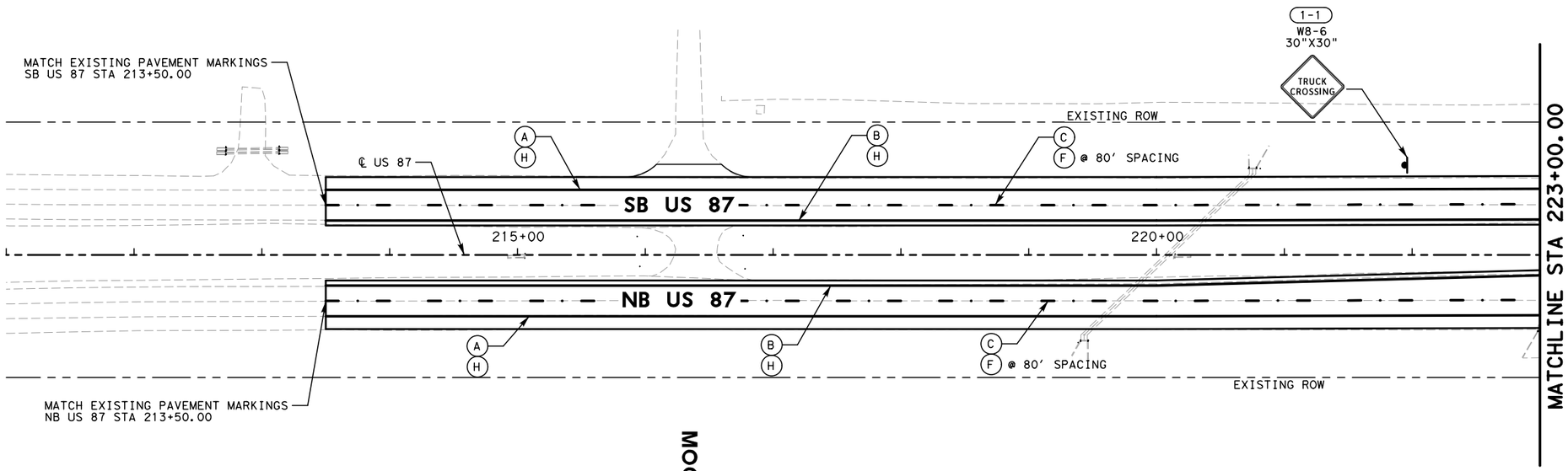
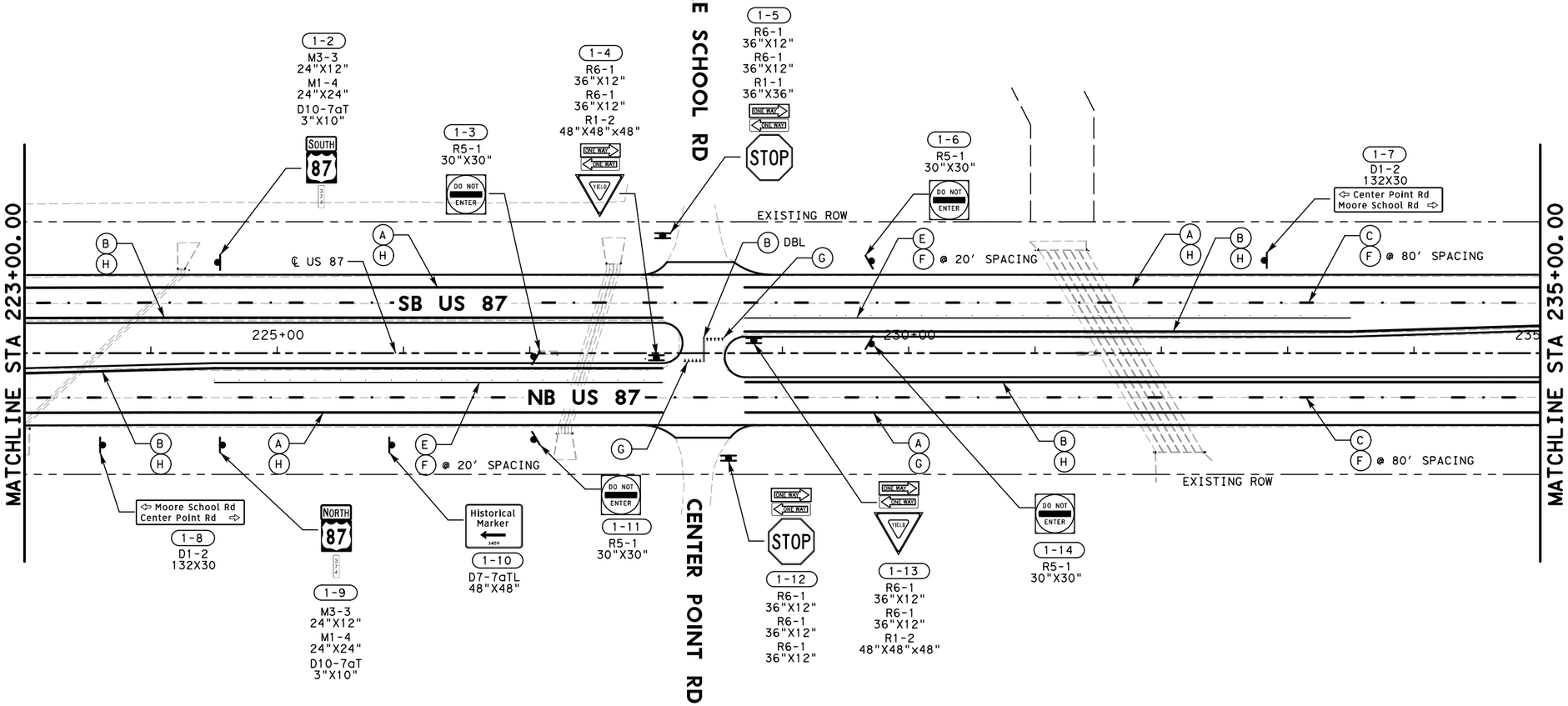
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		124





50 25 0 50 100

SCALE: 1" = 100'

LEGEND
(A) - REFL PM TY I(W)4"(SLD)
(B) - REFL PM TY I(Y)4"(SLD)
(C) - REFL PM TY I(W)4"(BRK)
(D) - PREFAB TY C(W)(24")(SLD)
(E) - REFL PM TY I(W)(8")(SLD)
(F) - REFL MRKR TY II-C-R
(G) - PREFAB TY C(W)(36")(YLD TRI)
(H) - RUMBLE STRIPS (SHOULDER)
PROPOSED SIGN

NOTE:

SEE TRAFFIC CONTROL SOUTHBOUND CROSSOVER SHEETS FOR ADDITIONAL PAVEMENT MARKINGS TO BE PLACED.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED
PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 1 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
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GRPH CHECK				
JKB				

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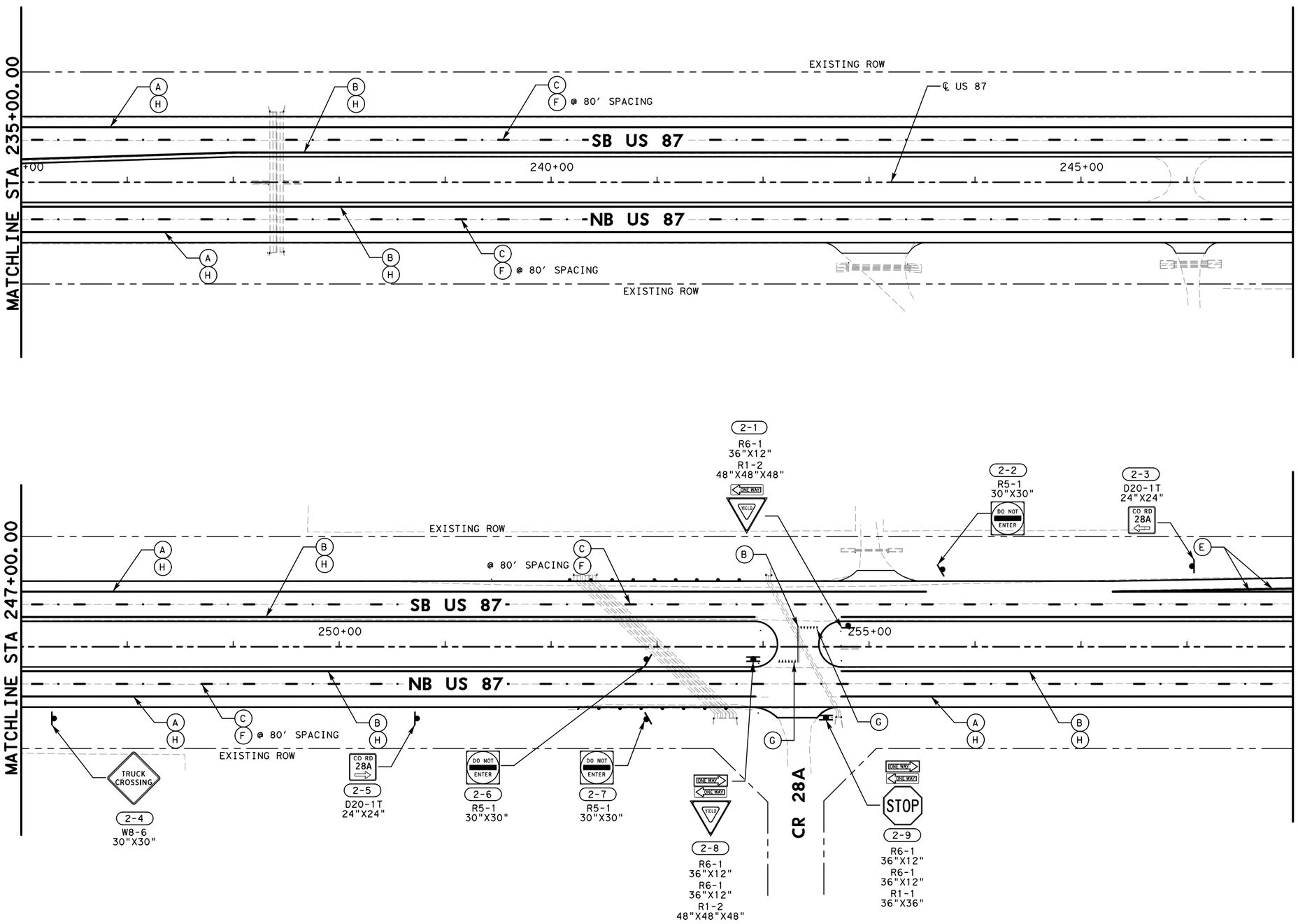

50 25 0 50 100

SCALE: 1" = 100'

LEGEND
(A) - REFL PM TY I(W)4"(SLD)
(B) - REFL PM TY I(Y)4"(SLD)
(C) - REFL PM TY I(W)4"(BRK)
(D) - PREFAB TY C(W)(24")(SLD)
(E) - REFL PM TY I(W)(8")(SLD)
(F) - REFL MRKR TY II-C-R
(G) - PREFAB TY C(W)(36")(YLD TRI)
(H) - RUMBLE STRIPS (SHOULDER)
PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

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Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 2 OF 9)

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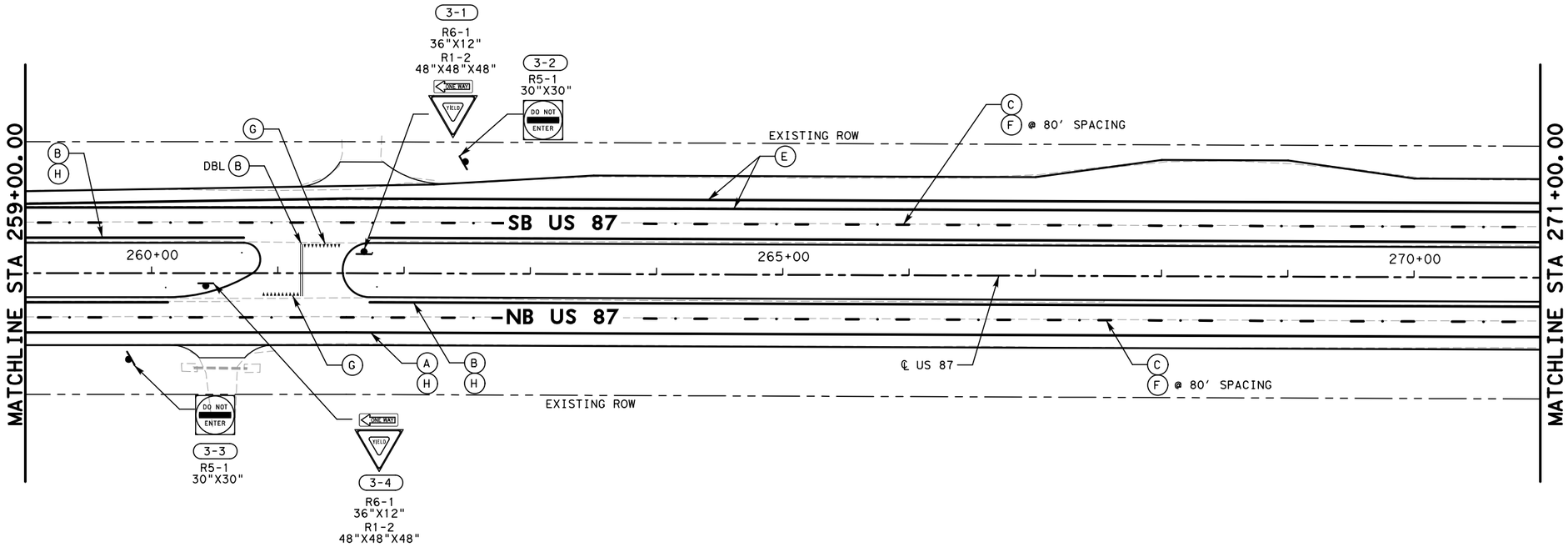

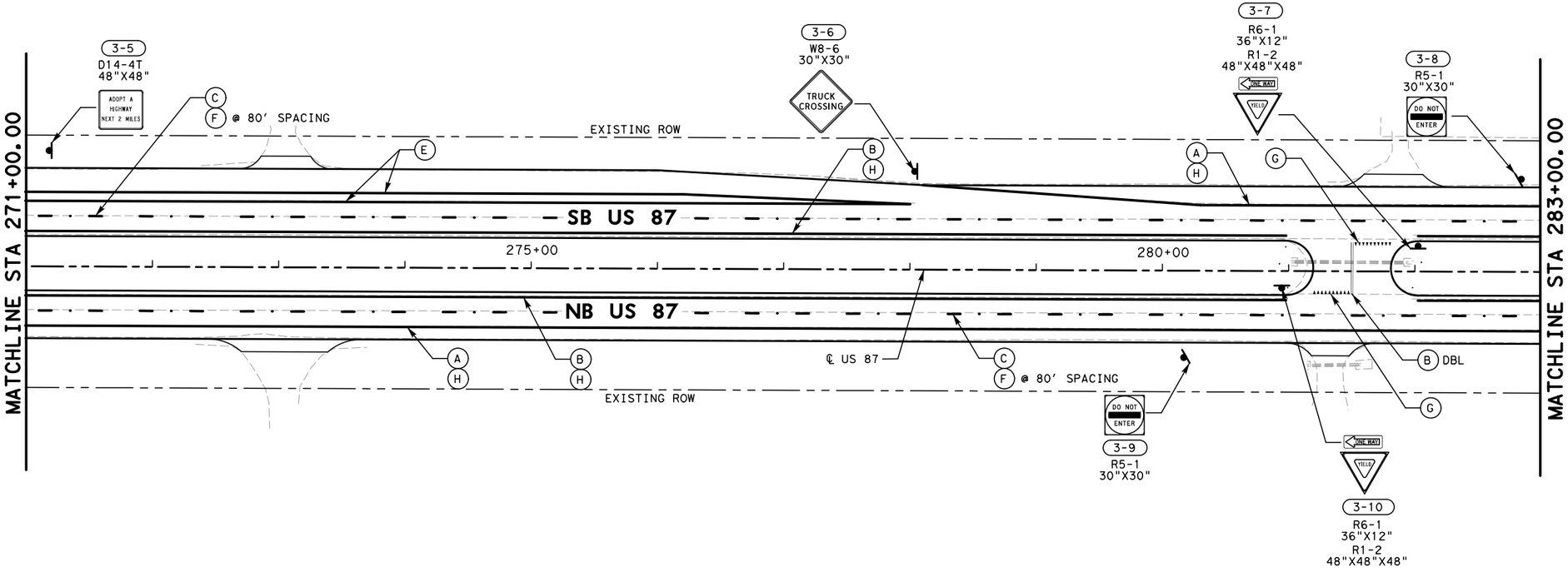

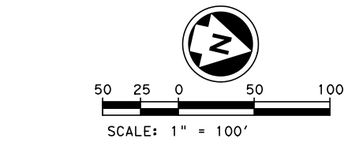

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
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5/21/2021

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US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 3 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
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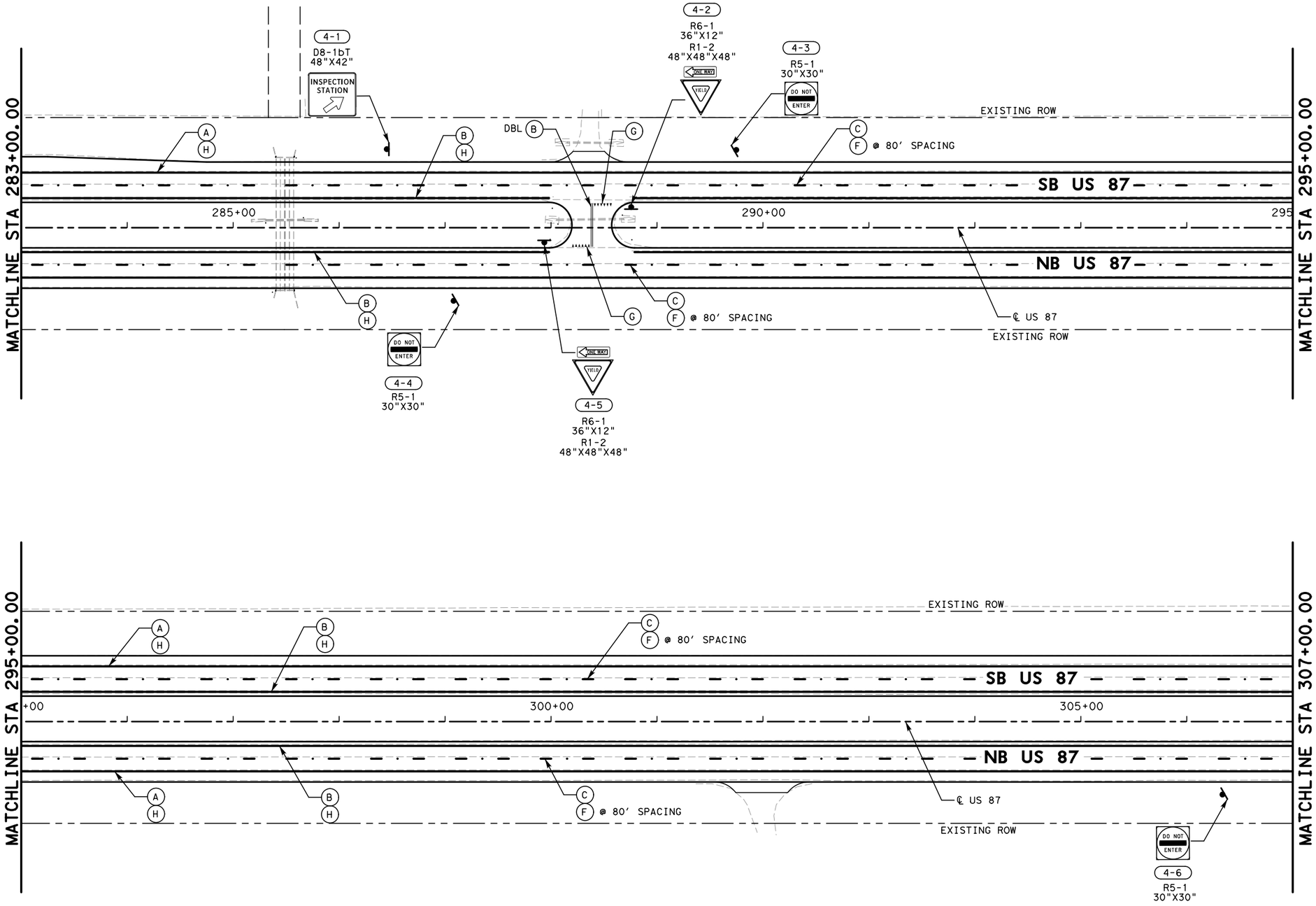

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED
PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 4 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	128
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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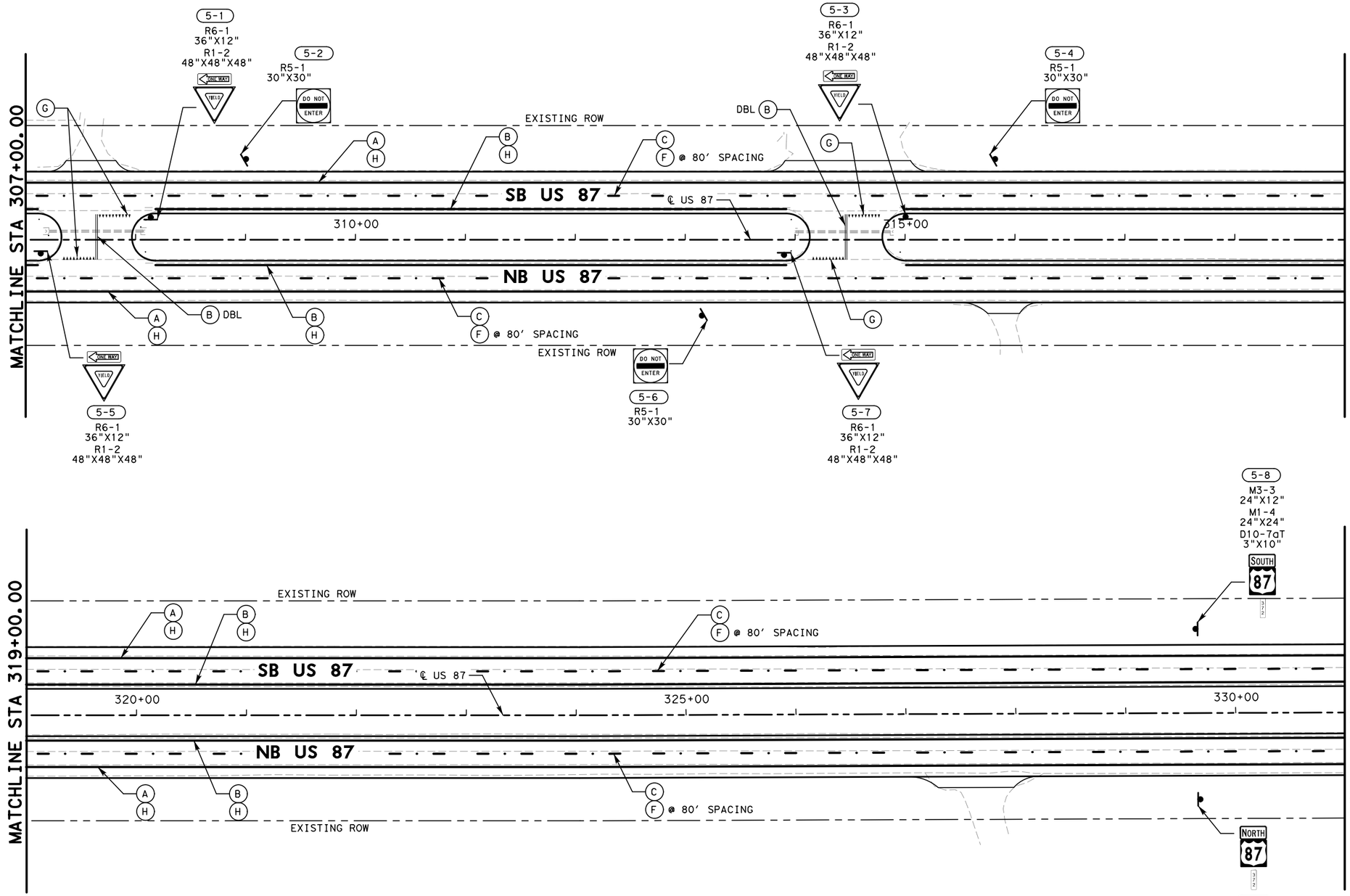

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 5 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	129
AR	0068	08	067	
GRPH CHECK				
JKB				

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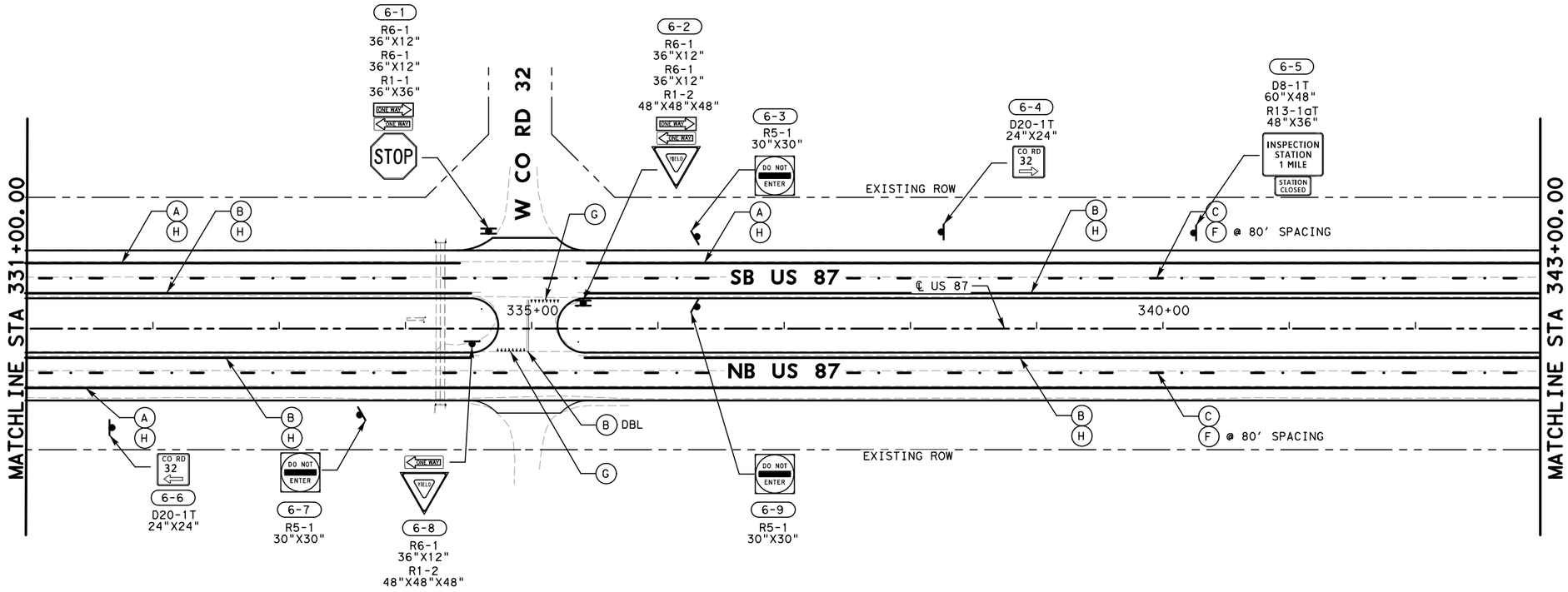

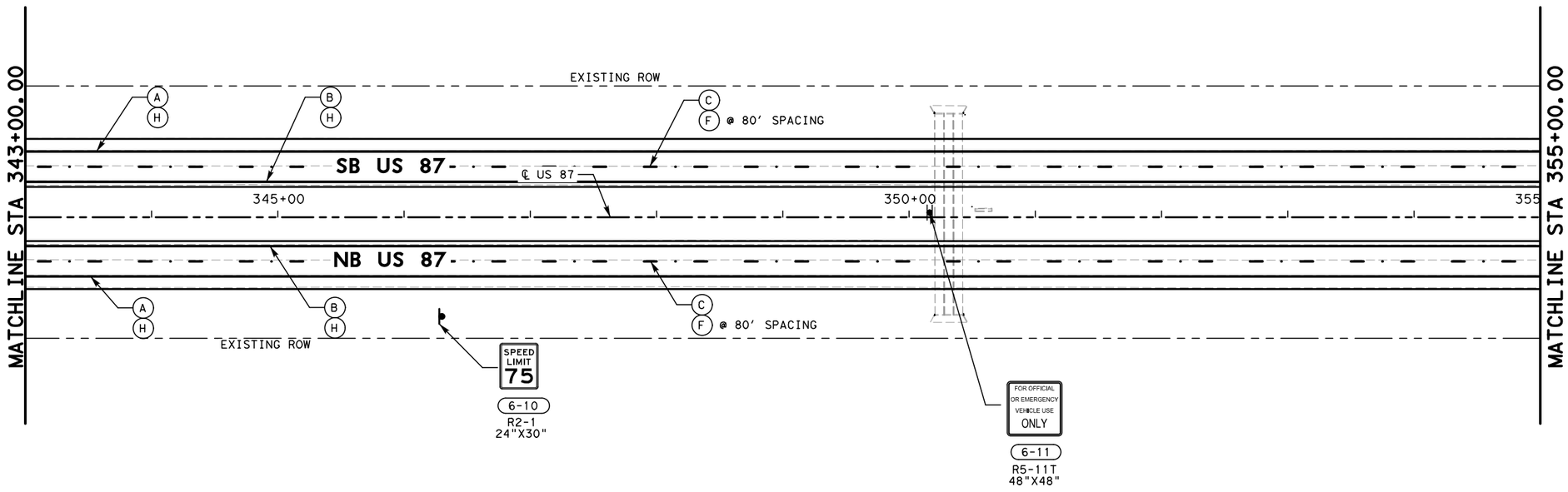

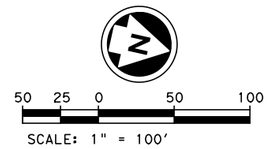

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED
PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 6 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	130
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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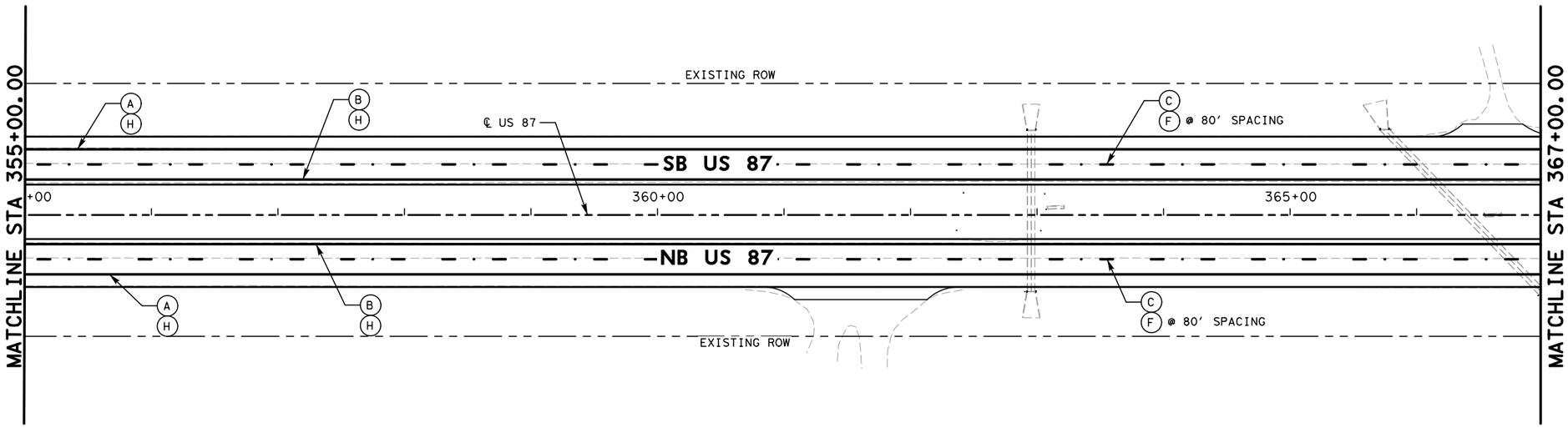

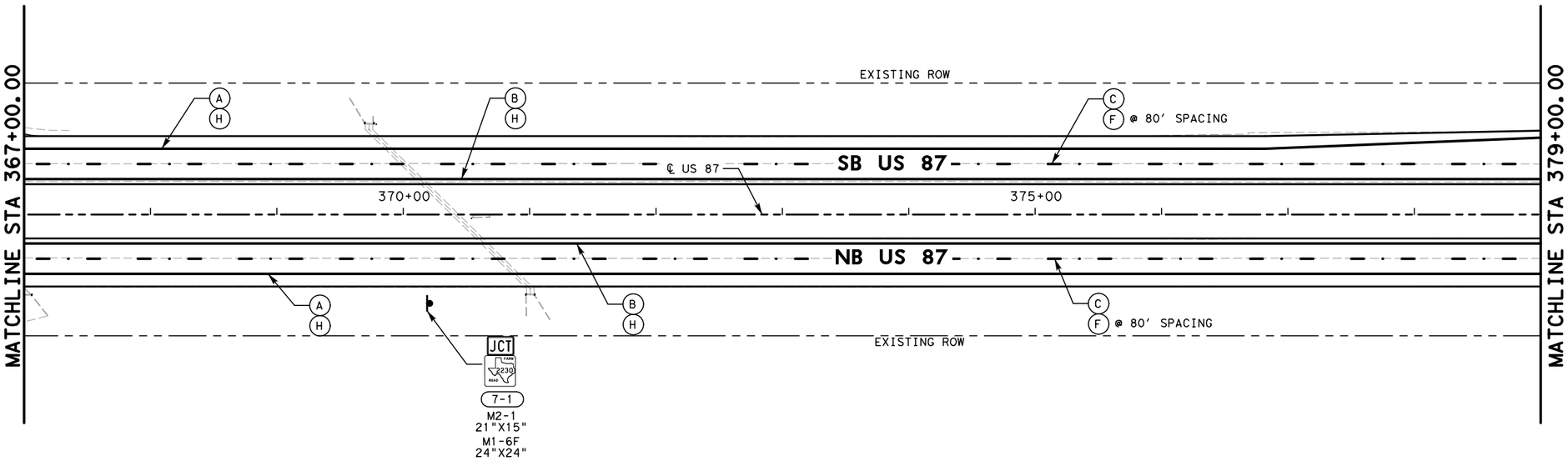

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 7 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	131
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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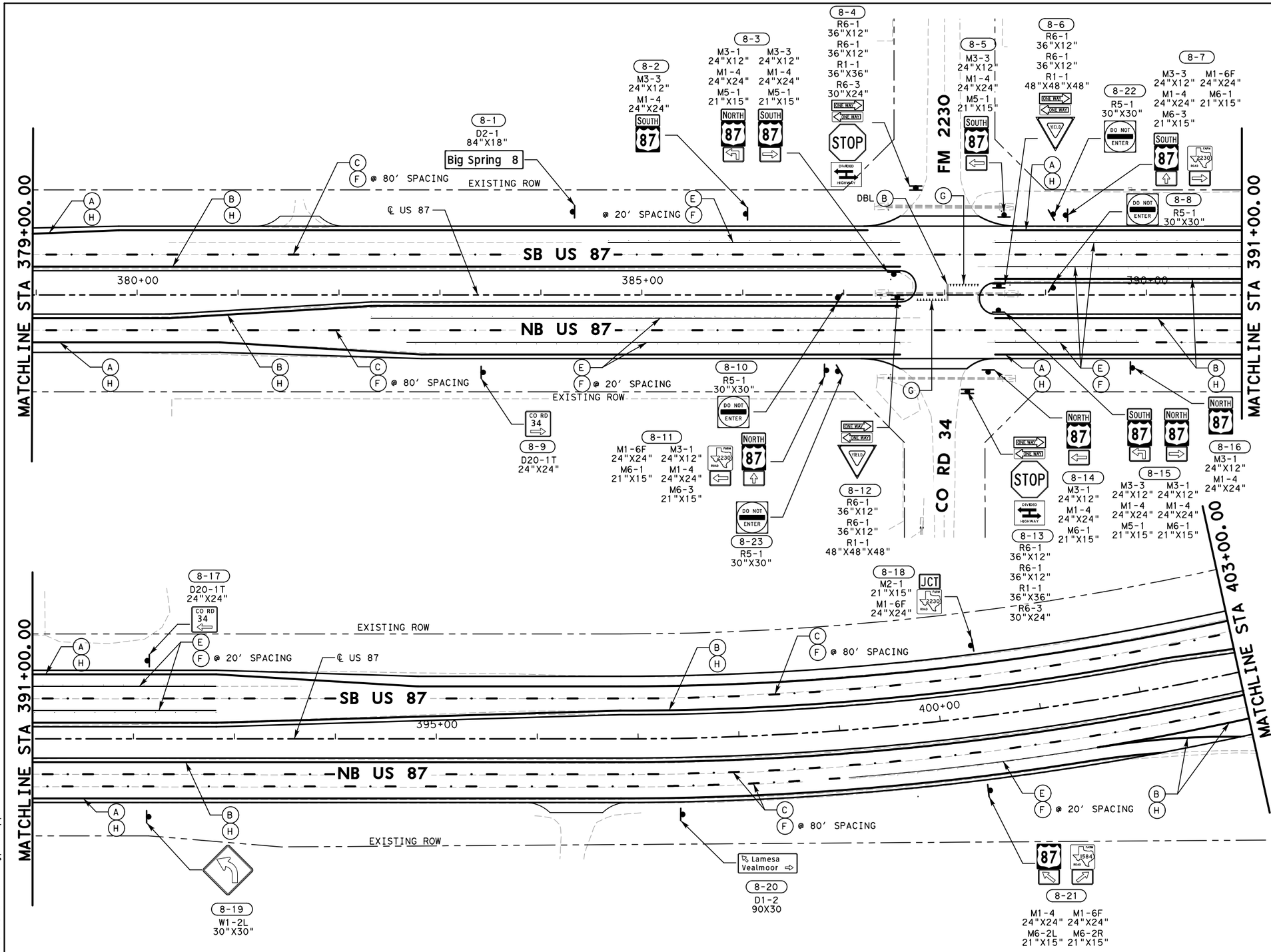

50 25 0 50 100

SCALE: 1" = 100'

LEGEND

- (A) - REFL PM TY I(W)4"(SLD)
- (B) - REFL PM TY I(Y)4"(SLD)
- (C) - REFL PM TY I(W)4"(BRK)
- (D) - PREFAB TY C(W)(24")(SLD)
- (E) - REFL PM TY I(W)(8")(SLD)
- (F) - REFL MRKR TY II-C-R
- (G) - PREFAB TY C(W)(36")(YLD TRI)
- (H) - RUMBLE STRIPS (SHOULDER)
- PROPOSED SIGN

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

tnp

Texas Department of Transportation

US 87

SIGNING AND PAVEMENT MARKING LAYOUT

(SHEET 8 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	132
AR	0068	08	067	
GRPH CHECK				
JKB				

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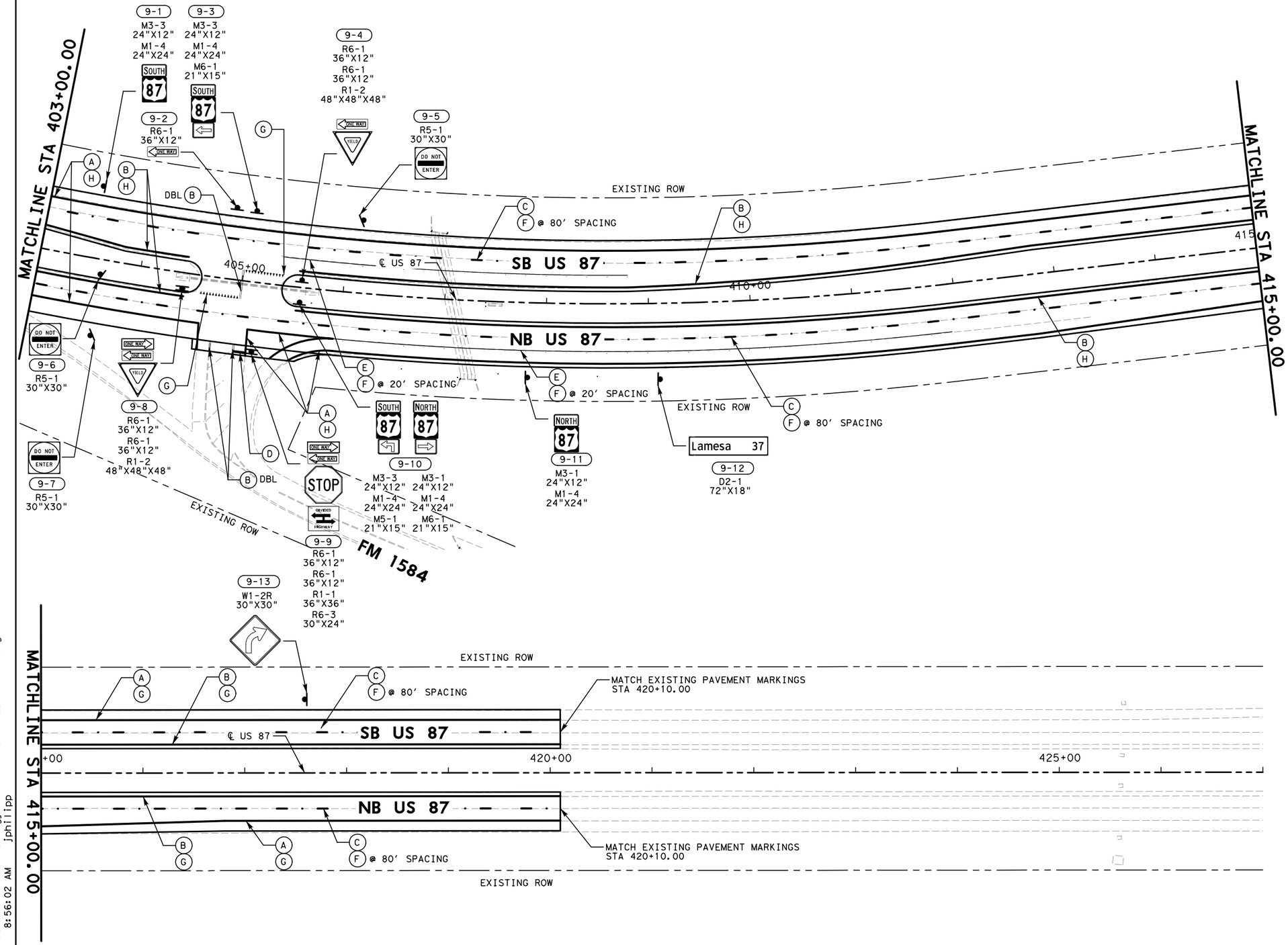
DATE: 5/21/2021 8:56:00 AM jphilipp



50 25 0 50 100

SCALE: 1" = 100'

LEGEND
(A) - REFL PM TY I(W)4"(SLD)
(B) - REFL PM TY I(Y)4"(SLD)
(C) - REFL PM TY I(W)4"(BRK)
(D) - PREFAB TY C(W)(24")(SLD)
(E) - REFL PM TY I(W)(8")(SLD)
(F) - REFL MRKR TY II-C-R
(G) - PREFAB TY C(W)(36")(YLD TRI)
(H) - RUMBLE STRIPS (SHOULDER)
PROPOSED SIGN

NOTE:

SEE TRAFFIC CONTROL SOUTHBOUND CROSSOVER SHEETS FOR ADDITIONAL PAVEMENT MARKINGS TO BE PLACED.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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SIGNING AND PAVEMENT MARKING LAYOUT

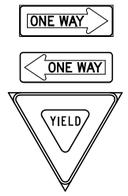
(SHEET 9 OF 9)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	133
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\SPM09.dgn
DATE: 5/21/2021 8:56:02 AM jphillipp

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1 OF 9												
	1	W8-6		30X30	✓		10BWG	1	SA	P		
	2	M3-3 M1-4 D10-7aT		24X12 24X24 3X10	✓		10BWG	1	SA	P		
	3	R5-1		30X30	✓		10BWG	1	SA	P		
	4	R6-1 R6-1 R1-2		36X12 36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	5	R6-1 R6-1 R1-1		36X12 36X12 36X36	✓		10BWG	1	SA	P	BM	
	6	R5-1		30X30	✓		10BWG	1	SA	P		
	7	D1-2		132X30	✓		SCH80	1	SA	T		
	8	D1-2		132X30	✓		SCH80	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 1 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		134

DATE: 5/21/2021 8:56:06 AM
FILE: P:\MSGP\TXD2020?\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1 OF 9												
	9	M3-1	NORTH 87 374	24X12								
		M1-4										
				24X24	✓		10BWG	1	SA	P		
		D10-7aT		3X10								
	10	D7-7aTL	Historical Marker 3459	48X48	✓		10BWG	1	SA	T		
	11	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	12	R6-1	ONE WAY	36X12								
		R6-1	ONE WAY	36X12								
		R1-1	STOP	36X36	✓		10BWG	1	SA	P	BM	
	13	R6-1	ONE WAY	36X12								
		R6-1	ONE WAY	36X12								
		R1-2	YIELD	48X48X48	✓		10BWG	1	SA	P	BM	
	14	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
2 OF 9												
	1	R6-1	ONE WAY	36X12								
		R1-2	YIELD	48X48X48	✓		10BWG	1	SA	P	BM	

ALUMINUM SIGN BLANKS THICKNESS	
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.

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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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 2 OF 14)

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	HOWARD		135

DATE: 5/21/2021 8:56:06 AM
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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
2 OF 9												
	2	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	3	D20-1T	CO RD 28A	24X24	✓		10BWG	1	SA	P		
	4	W8-6	TRUCK CROSSING	30X30	✓		10BWG	1	SA	P		
	5	D20-1T	CO RD 28A	24X24	✓		10BWG	1	SA	P		
	6	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	7	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	8	R6-1 R6-1 R1-2	ONE WAY ONE WAY YIELD	36X12 36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	9	R6-1 R6-1 R1-1	ONE WAY ONE WAY STOP	36X12 36X12 36X36	✓		10BWG	1	SA	P	BM	

ALUMINUM SIGN BLANKS THICKNESS	
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.

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NOTE:

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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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 3 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		136

DATE: 5/21/2021 8:56:07 AM
FILE: P:\MSGP\TXD2020?\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
3 OF 9												
	1	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	2	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	3	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	4	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	5	D14-4T	ADOPT A HIGHWAY NEXT 2 MILES	48X48	✓		10BWG	1	SA	T		
	6	W8-6	TRUCK CROSSING	30X30	✓		10BWG	1	SA	P		
	7	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	8	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	9	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
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.

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NOTE:

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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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 4 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		137

T8

DATE: 5/21/2021 8:56:07 AM
FILE: P:\MSGP\TXD2020?\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
3 OF 9												
	10	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
4 OF 9												
	1	D8-1bT	INSPECTION STATION	48X42	✓		10BWG	1	SA	T		
	2	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	3	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	4	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	5	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	6	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
5 OF 9												
	1	R6-1 R1-2	ONE WAY / YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	

ALUMINUM SIGN BLANKS THICKNESS	
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.

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NOTE:

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 5 OF 14)

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16 8-16	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		138

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
5 OF 9												
	2	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	3	R6-1 R1-2	ONE WAY YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	4	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	5	R6-1 R1-2	ONE WAY YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	6	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	7	R6-1 R1-2	ONE WAY YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	8	M3-3 M1-4 D10-7aT	SOUTH 87 372	24X12 24X24 3X10	✓		10BWG	1	SA	P		
	9	M3-1 M1-4 D10-7aT	NORTH 87 372	24X12 24X24 3X10	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
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Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 6 OF 14)

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0068	08	067	US 87
4-16	DIST	COUNTY		SHEET NO.
8-16	ABL	HOWARD		139

T8

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION PREFABRICATED	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"		TY N TY S
6 OF 9												
	1	R6-1 R6-1 R1-1	ONE WAY ONE WAY STOP	36X12 36X12 36X36	✓		10BWG	1	SA	P	BM	
	2	R6-1 R6-1 R1-2	ONE WAY ONE WAY YIELD	36X12 36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	3	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	4	D20-1T	CO RD 32 ⇨	24X24	✓		10BWG	1	SA	P		
	5	D8-1T R13-1aT	INSPECTION STATION 1 MILE STATION CLOSED	60X48 48X36	✓		10BWG	2	SA	P	EXAL	
	6	D20-1T	CO RD 32 ⇦	24X24	✓		10BWG	1	SA	P		
	7	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	8	R6-1 R1-2	ONE WAY YIELD	36X12 48X48X48	✓		10BWG	1	SA	P	BM	

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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Texas Department of Transportation — Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 7 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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8-16		ABL	HOWARD		140

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
6 OF 9												
	9	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	9	R2-1	SPEED LIMIT 75	30X36	✓		10BWG	1	SA	P		
	10	R5-11T (TWO PANELS)	FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY FOR OFFICIAL OR EMERGENCY VEHICLE USE ONLY	48X48 BACK-TO-BACK	✓		10BWG	1	SA	P		
7 OF 9												
	10	M2-1 M1-6F	JCT FARM 2230 ROAD	21X15 24X24	✓		10BWG	1	SA	P		
8 OF 9												
	1	D2-1	Big Spring 8	84X18	✓		10BWG	1	SA	T		
	2	M3-3 M1-4	SOUTH 87	24X12 24X24	✓		10BWG	1	SA	P		
	3	M3-1 M1-4 M5-1 M3-3 M1-4 M6-1	NORTH 87 SOUTH 87	24X12 24X24 21X15 24X12 24X24 21X15	✓		10BWG	1	SA	U		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 8 OF 14)

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8-16		ABL	HOWARD		141

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
8 OF 9												
		R6-1	ONE WAY	36X12								
		R6-1	ONE WAY	36X12								
	4	R1-1	STOP	36X36	✓		10BWG	1	SA	P	BM	
		R6-3	DIVIDED HIGHWAY	30X24								
		M3-3	SOUTH 87	24X12								
	5	M1-4	SOUTH 87	24X24	✓		10BWG	1	SA	P		
		M6-1	SOUTH 87	21X15								
		R6-1	ONE WAY	36X12								
		R6-1	ONE WAY	36X12								
	6	R1-2	YIELD	48X48X48	✓		10BWG	1	SA	P	BM	
		M3-3	SOUTH 87	24X12								
		M1-4	SOUTH 87	24X24								
		M6-3	SOUTH 87	21X15								
	7				✓		10BWG	1	SA	U		
		M1-6F	FARM 2230 ROAD	24X24								
		M6-1	FARM 2230 ROAD	21X15								
	10	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 9 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		142

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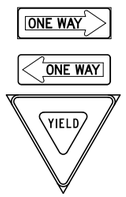
SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
8 OF 9												
	9	D20-1T		24X24	✓		10BWG	1	SA	P		
	10	R5-1		30X30	✓		10BWG	1	SA	P		
	11	M1-6F		24X24								
		M6-1		21X15								
					✓		10BWG	1	SA	U		
		M3-1		24X12								
		M1-4		24X24								
		M6-3		21X15								
	12	R6-1		36X12								
		R6-1		36X12								
		R1-2		48X48X48	✓		10BWG	1	SA	P	BM	
	13	R6-1		36X12								
		R6-1		36X12								
		R1-1		36X36	✓		10BWG	1	SA	P	BM	
		R6-3		30X24								

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 10 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		143

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
8 OF 9												
	14	M3-1 M1-4 M6-1	NORTH 87 ⇦	24X12 24X24 21X15	✓		10BWG	1	SA	P		
	15	M3-3 M1-4 M5-1	SOUTH 87 ⇦	24X12 24X24 21X15	✓		10BWG	1	SA	U		
		M3-1 M1-4 M6-1	NORTH 87 ⇨	24X12 24X24 21X15								
	16	M3-1 M1-4	NORTH 87	24X12 24X24	✓		10BWG	1	SA	P		
	17	D20-1T	CO RD 34 ⇦	24X24	✓		10BWG	1	SA	P		
	18	M2-1 M1-6F	JCT FARM 2230 ROAD	21X15 24X24	✓		10BWG	1	SA	P		
	19	W1-2L	↖	30X30	✓		10BWG	1	SA	P		
	20	D1-2	↖ Lamesa Vealmoor ⇨	90X30	✓		SCH80	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 11 OF 14)

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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8-16	ABL	HOWARD		144

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SUMMARY OF SMALL SIGNS

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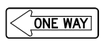
8 OF 9												
	21	M1-4		24X24								
		M6-2L		21X15								
					✓		10BWG	1	SA	U		
		M1-6F		24X24								
		M6-2R		21X15								
	22	R5-1		30X30	✓		10BWG	1	SA	P		
	23	R5-1		30X30	✓		10BWG	1	SA	P		
9 OF 9												
	1	M3-3		24X12								
		M1-4		24X24								
					✓		10BWG	1	SA	P		
	2	R6-1		36X12	✓		10BWG	1	SA	P		
	3	M3-3		24X12								
		M1-4		24X24								
					✓		10BWG	1	SA	P		
		M6-1		21X15								
	4	R6-1		36X12								
		R1-2		48X48X48								
					✓		10BWG	1	SA	P	BM	
	5	R5-1		30X30	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS (SHEET 12 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		145

DATE: 5/21/2021 8:56:10 AM
FILE: P:\MSGP\TXD2020?\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic\sums16.dgn

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
9 OF 9												
	6	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	7	R5-1	DO NOT ENTER	30X30	✓		10BWG	1	SA	P		
	8	R6-1 R6-1 R1-2	ONE WAY ONE WAY YIELD	36X12 36X12 48X48X48	✓		10BWG	1	SA	P	BM	
	9	R6-1 R6-1 R1-1 R6-3	ONE WAY ONE WAY STOP DIVIDED HIGHWAY	36X12 36X12 36X36 30X24	✓		10BWG	1	SA	P	BM	
	10	M3-3 M1-4 M5-1 M3-1 M1-4 M6-1	SOUTH 87 NORTH 87	24X12 24X24 21X15 24X12 24X24 21X15	✓		10BWG	1	SA	U		
	11	M3-1 M1-4	NORTH 87	24X12 24X24	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

(SHEET 13 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		146

18

DATE: 5/21/2021 8:56:10 AM
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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
9 OF 9												
	12	D2-1	Lamesa 37	72X18	✓		10BWG	1	SA	T		
	13	W1-2R		30X30	✓		10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS	
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 General Notes & Details SMD(GEN).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

(SHEET 14 OF 14)

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0068	08	067	US 87
4-16		DIST	COUNTY		SHEET NO.
8-16		ABL	HOWARD		147

18

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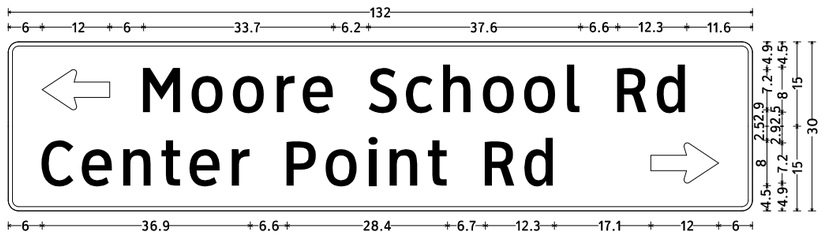
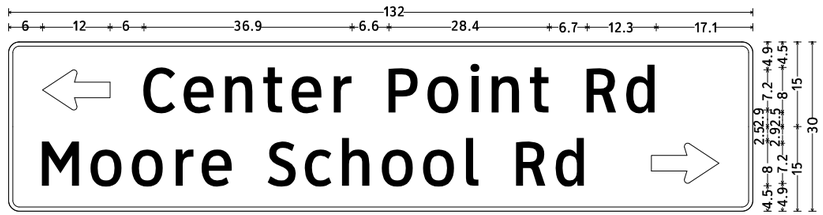


D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°; "Moore School Rd", ClearviewHwy-3-W;

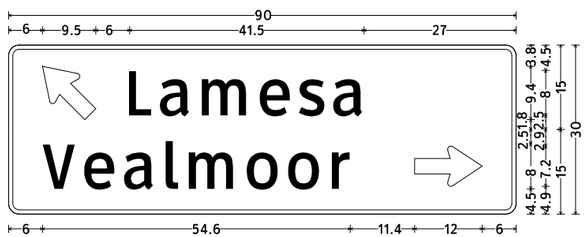
1.9" Radius, 0.8" Border, White on Green;
"Center Point Rd", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0°;



D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°; "Center Point Rd", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Moore School Rd", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0°;



D1-2 8in 45LT-RT;

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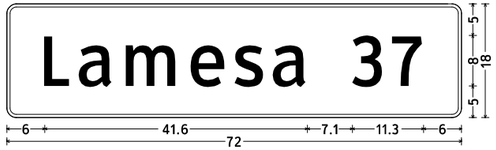
Standard Arrow Custom 12.0" X 7.1" 135°; "Lamesa", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Vealmoor", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0°;

D2-1 8in;
1.5" Radius, 0.5" Border, White on Green;
"Big Spring", ClearviewHwy-3-W; "8", ClearviewHwy-3-W;



D2-1 8in;
1.5" Radius, 0.5" Border, White on Green;
"Lamesa", ClearviewHwy-3-W; "37", ClearviewHwy-3-W;

FIRM REGISTRATION NO. F-230

tnp

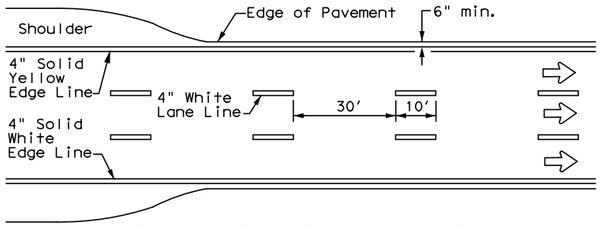
Texas Department of Transportation

US 87

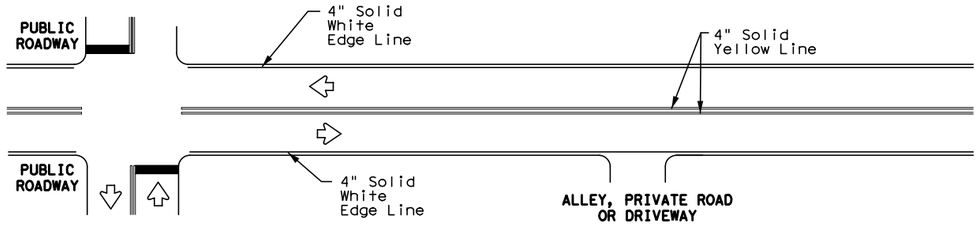
SIGN DETAILS

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	148
AR				
GRPH CHECK	0068	08	067	
JKB				

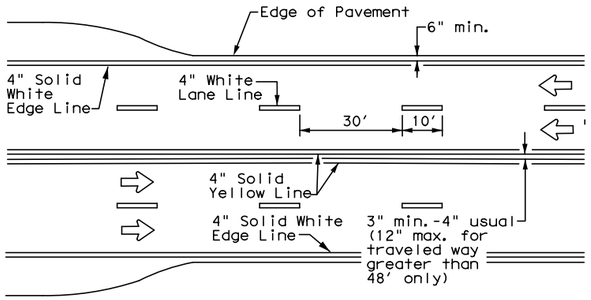
FILE: P:\MSGP\TXD2020?\US 87 - Energy Sector\PROD*SHEETS\SIGNDETAIL.dgn
DATE: 5/21/2021 8:56:12 AM jphilipp



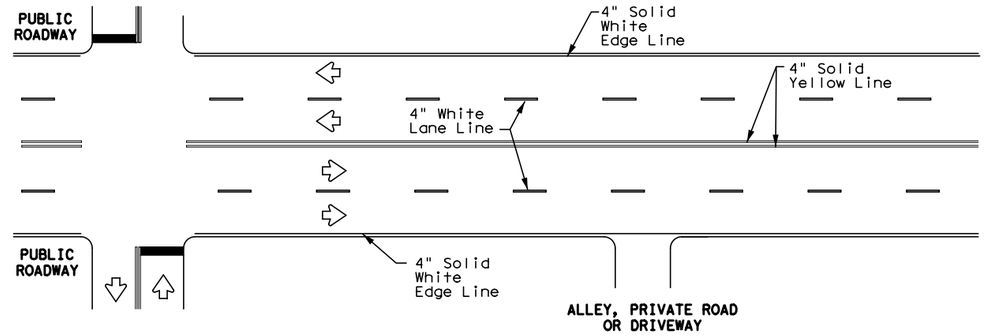
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



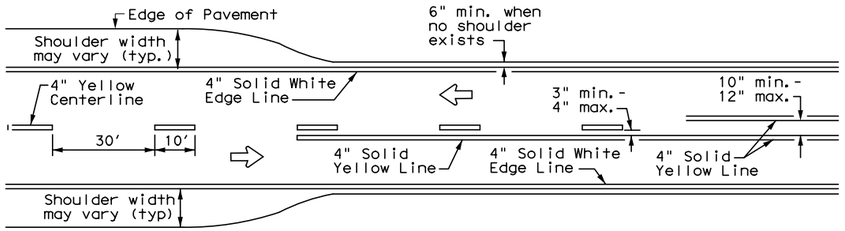
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



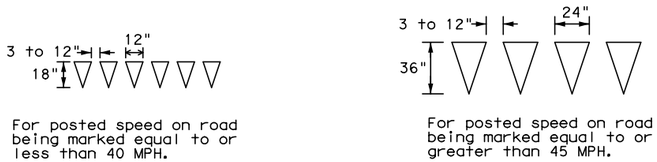
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



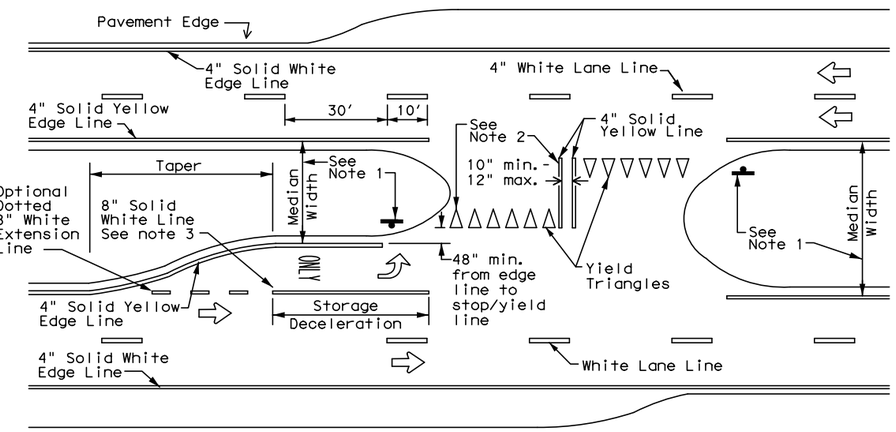
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

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 are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield traingles 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.

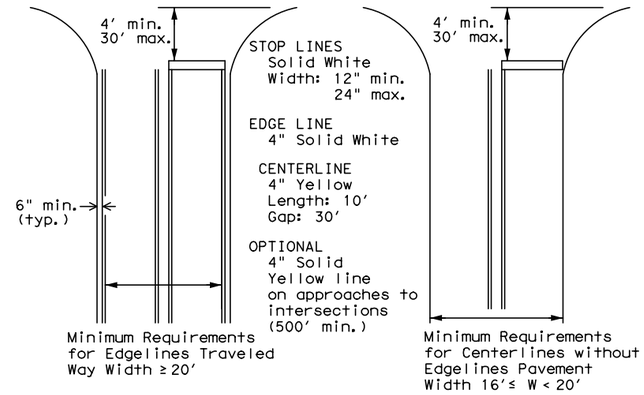
GENERAL NOTES

1. Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0068	08	067	US 87
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	ABL	HOWARD		149

22A

DATE: 5/21/2021 8:56:14 AM
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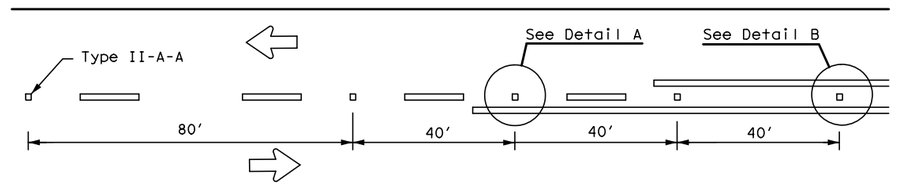
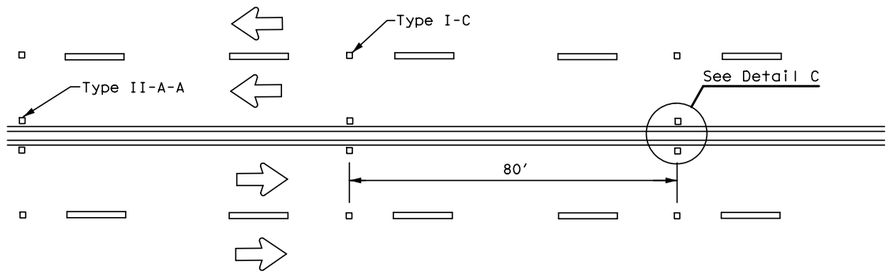
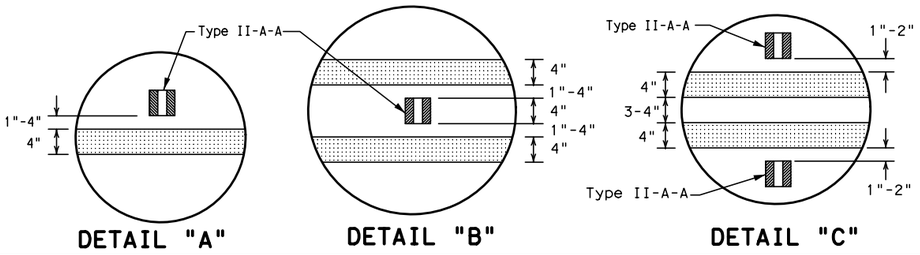
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



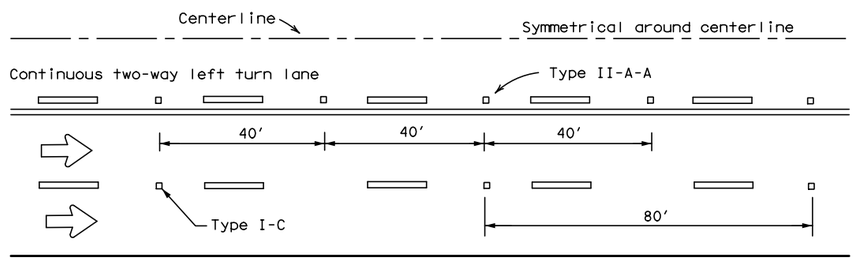
CENTERLINE FOR ALL TWO LANE ROADWAYS



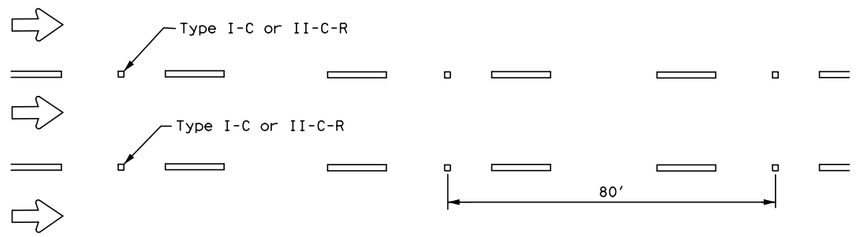
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

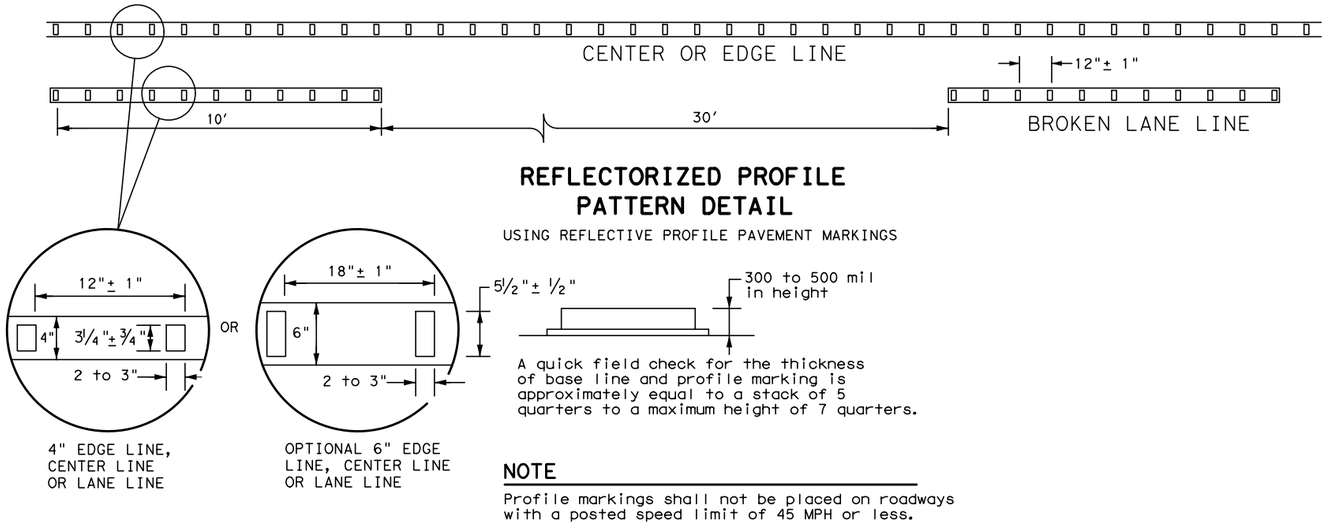


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

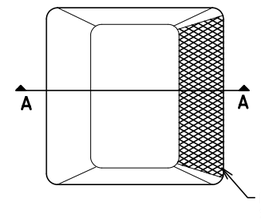
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

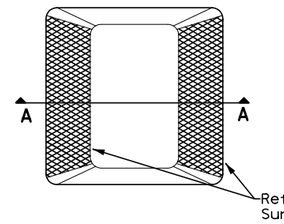
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

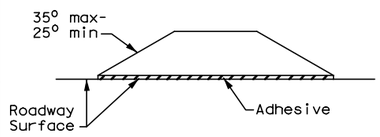
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		150

22B

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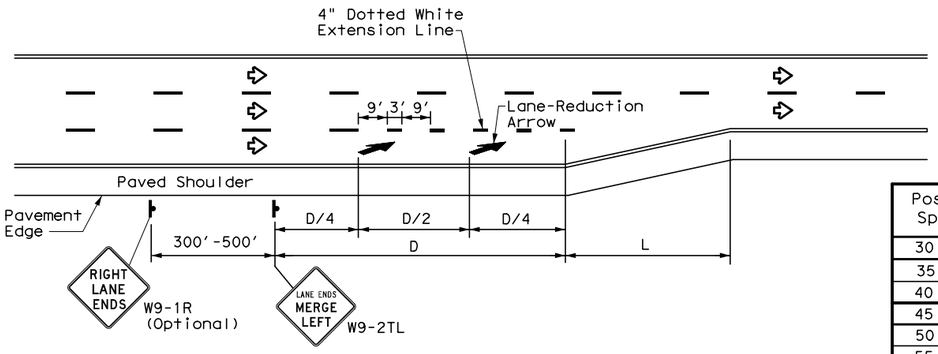
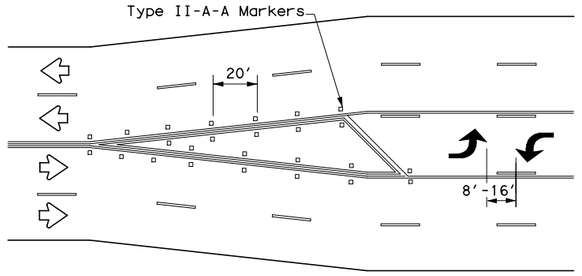


LANE REDUCTION

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L=\frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.



A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

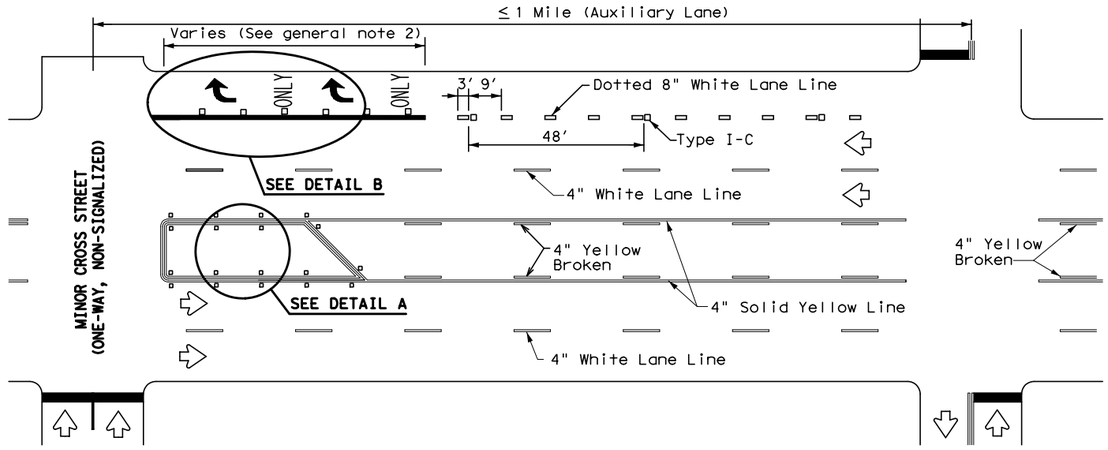
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

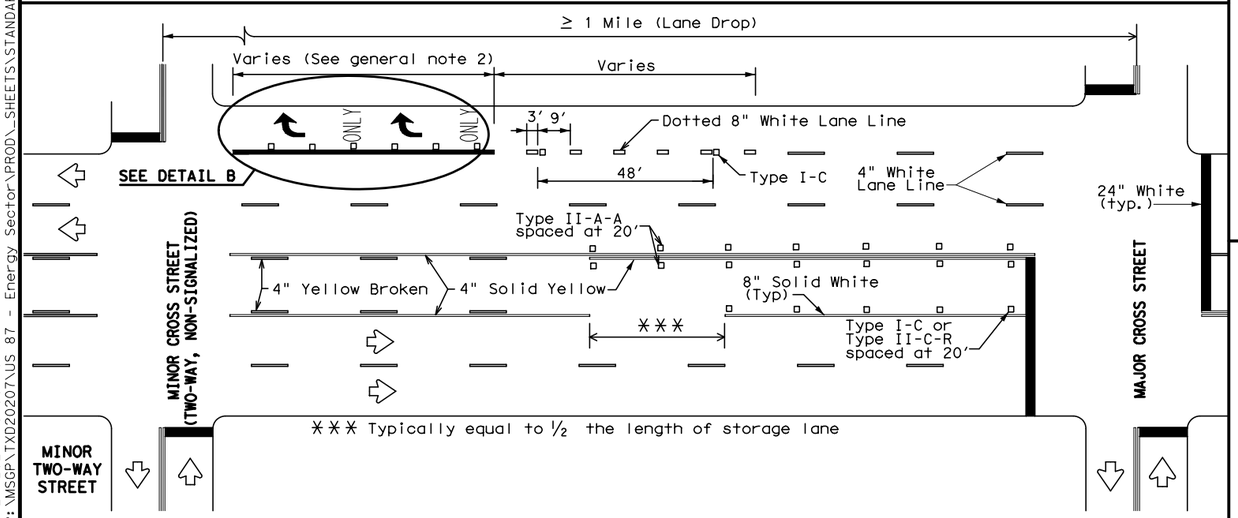
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

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

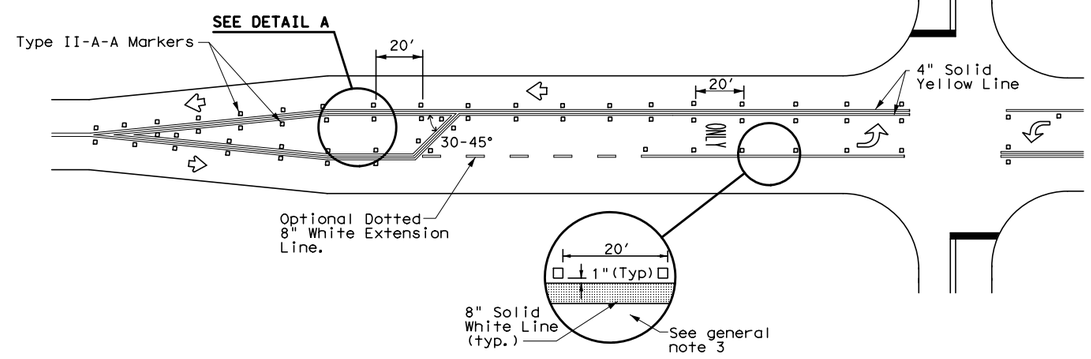
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



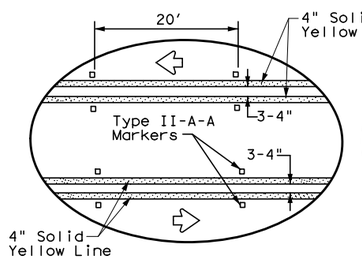
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



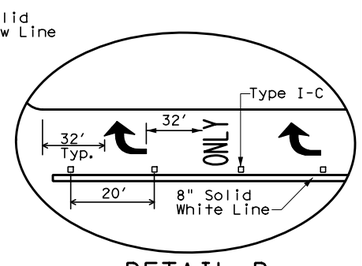
TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



DETAIL A



DETAIL B

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
©TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0068	08	067	US 87
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	ABL	HOWARD		151
3-03 6-20				

22C

DATE: 5/21/2021 8:56:17 AM
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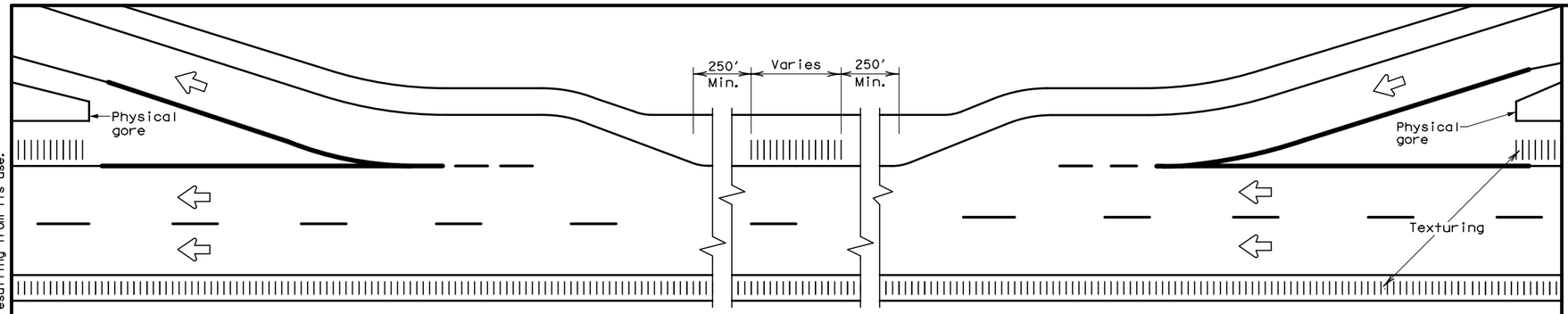
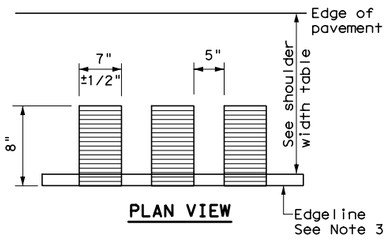


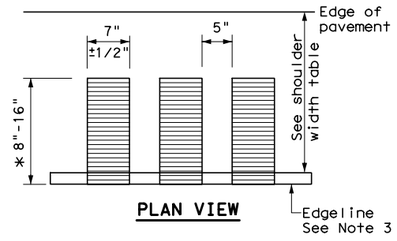
TYPICAL RUMBLE STRIP PLACEMENT AT EXIT AND ENTRANCE RAMPS



PLAN VIEW

PROFILE VIEW
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)

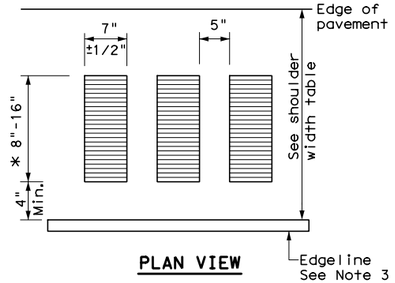


PLAN VIEW

* This distance may vary based on width of shoulder

PROFILE VIEW
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)

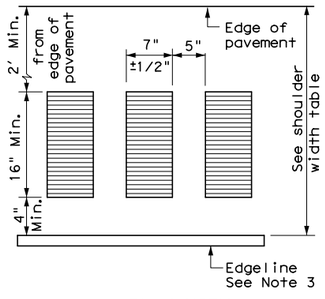


PLAN VIEW

* This distance may vary based on width of shoulder

PROFILE VIEW
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



PLAN VIEW

PROFILE VIEW
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)

GENERAL NOTES

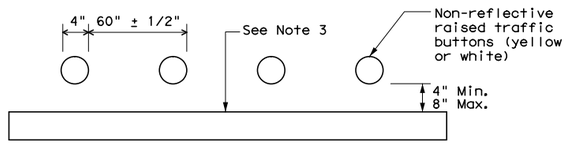
1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the table below for determining what options may be used for edgeline rumble strips.

WHEN INSTALLING MILLED DEPRESSION EDGELINE RUMBLE STRIPS:

5. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
6. Pavement markings can be applied over milled shoulder rumble strips to create an edgeline rumble stripe.
7. Breaks in edgeline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections and driveways with high usage of large trucks when installed on conventional highways.
8. Rumble strips shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
9. Consideration should be given to noise levels when edgeline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inches depth of milled rumble strip may be considered in these areas.
10. On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.

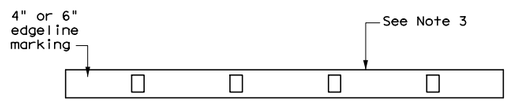
WHEN INSTALLING RAISED OR PROFILE EDGELINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edgeline when used as a rumble strip. The color of the button should match the color of the adjacent edgeline marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. Breaks in edgeline rumble strips using raised traffic buttons shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossing, intersections and driveways with high usage of large trucks when installed on conventional highways.
15. The minimum distance between the edgeline and the buttons should be used if the shoulder is less than 8 feet in width.
16. Raised profile thermoplastic markings used as edgelines may substitute for buttons.



PLAN VIEW
OPTION 5

RAISED EDGELINE RUMBLE STRIPS



PLAN VIEW
OPTION 6

PROFILE EDGELINE MARKINGS

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5 OR 6	Option 1, 2, 3, 5 or 6	Option 2, 4, 5 OR 6

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON FREEWAYS AND DIVIDED HIGHWAYS

RS(1)-13

FILE: rs(1)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-10 10-13	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		152

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)

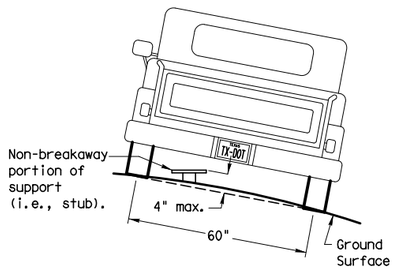
Anchor Type

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
1EXT 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-1))

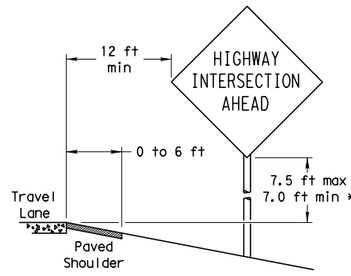
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

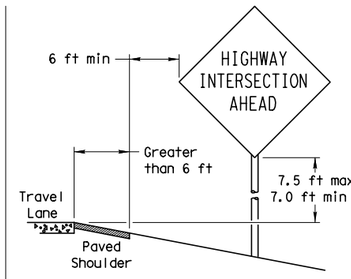
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

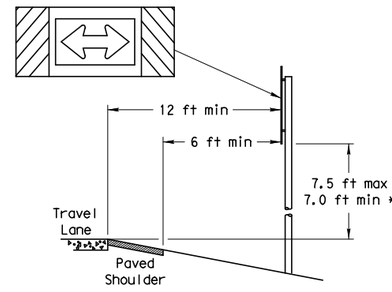
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



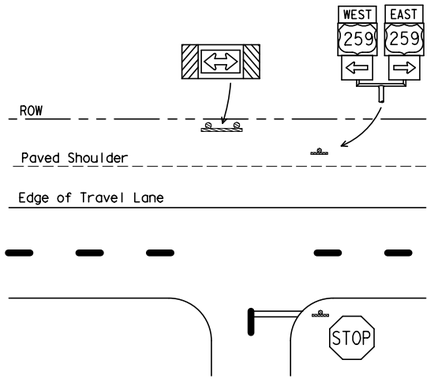
GREATER THAN 6 FT. WIDE

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.

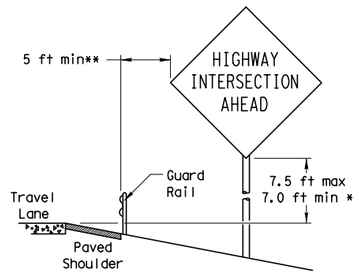
T-INTERSECTION



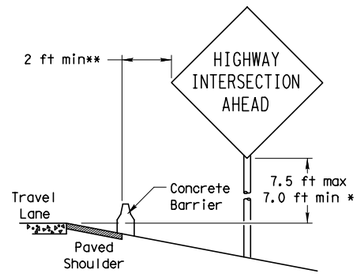
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



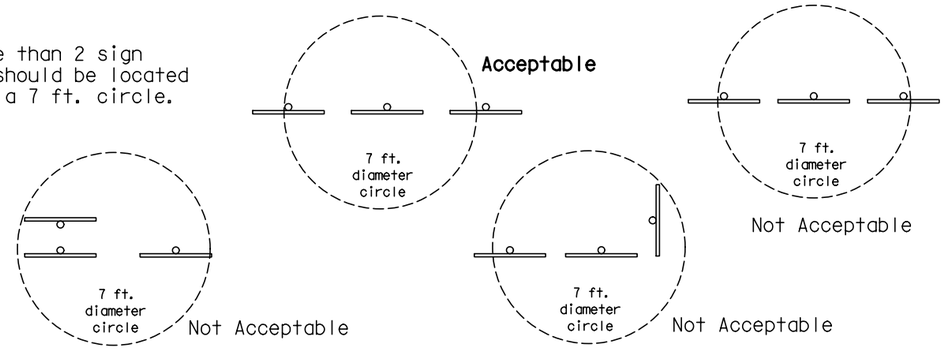
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

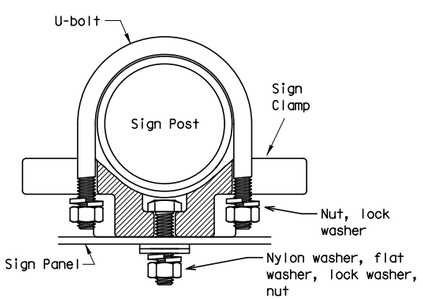
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

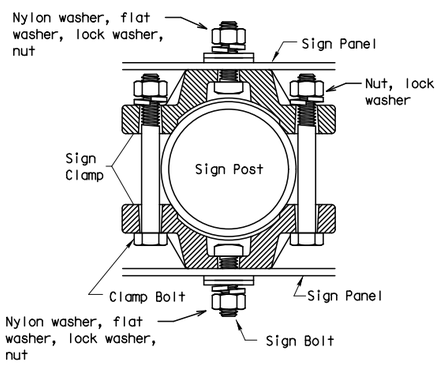


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

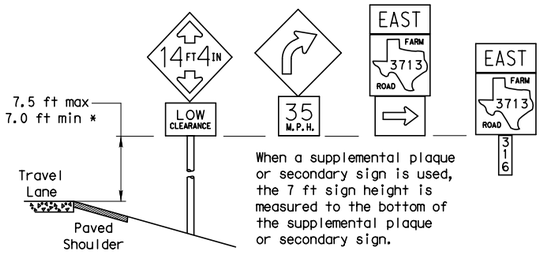
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



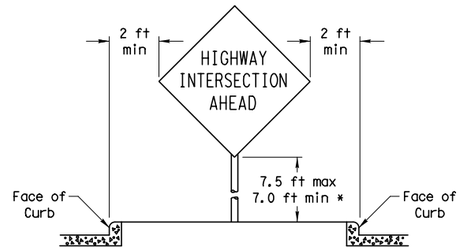
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



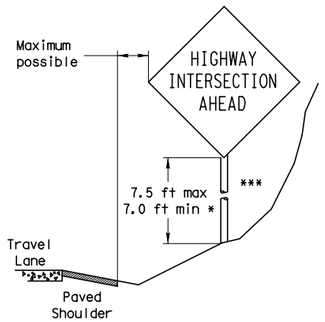
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		153

26A

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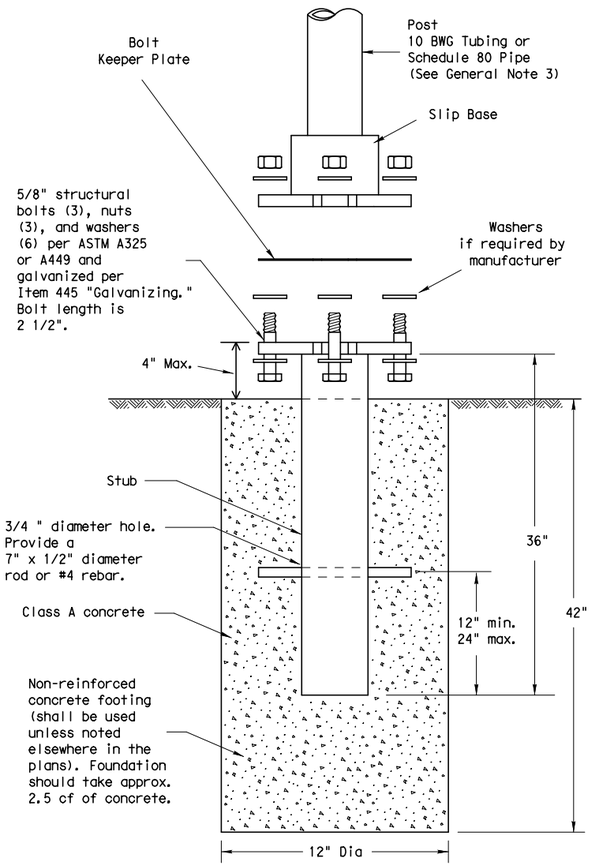
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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:

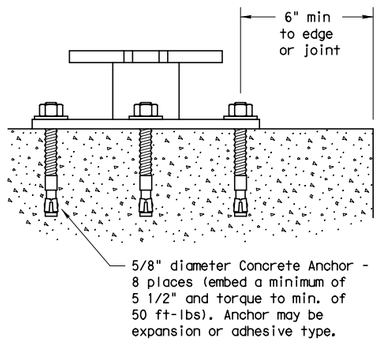
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   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
3. 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
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. 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.
2. 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.
3. 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.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. 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.
2. 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



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, "Epoxies 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.

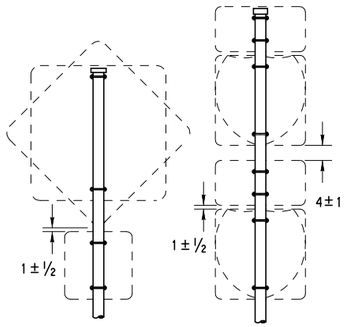
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

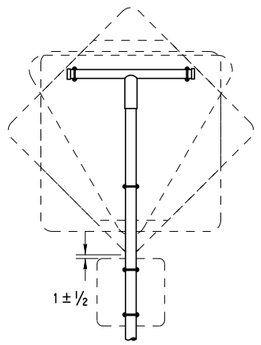
SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS 9-08			

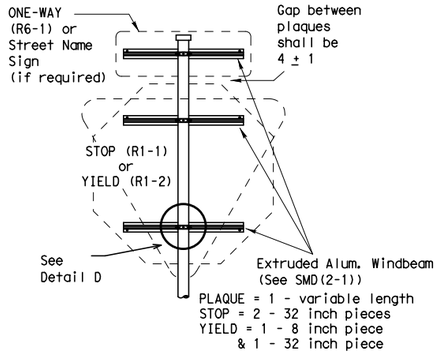
CONT	SECT	JOB	HIGHWAY
0068	08	067	US 87
DIST	COUNTY		SHEET NO.
ABL	HOWARD		154



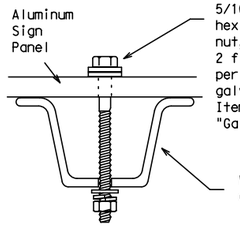
SM RD SGN ASSM TY XXXXX(1)XX(P)



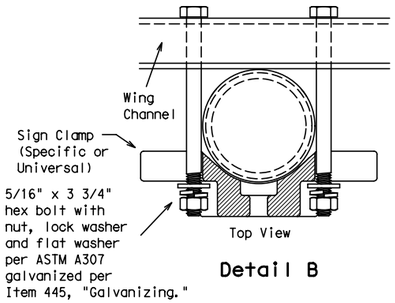
SM RD SGN ASSM TY XXXXX(1)XX(T)



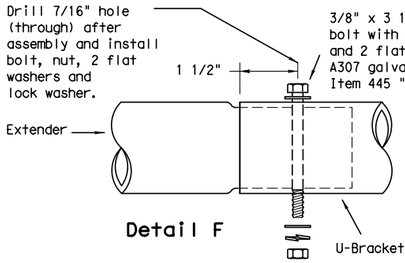
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A

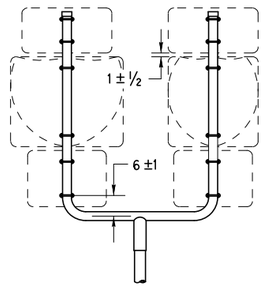


Detail B

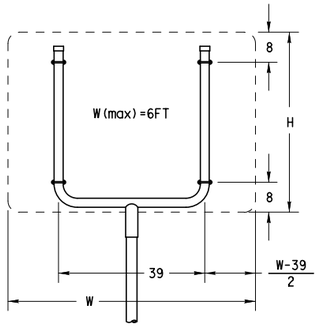


Detail F

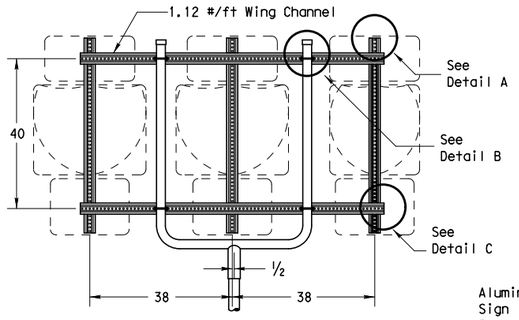
Splices shall only be allowed behind the sign substrate.



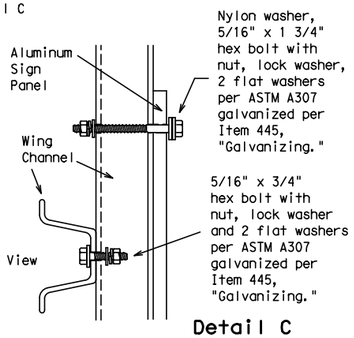
SM RD SGN ASSM TY XXXXX(1)XX(U)



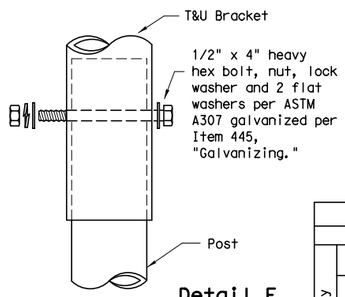
SM RD SGN ASSM TY XXXXX(1)XX(U)



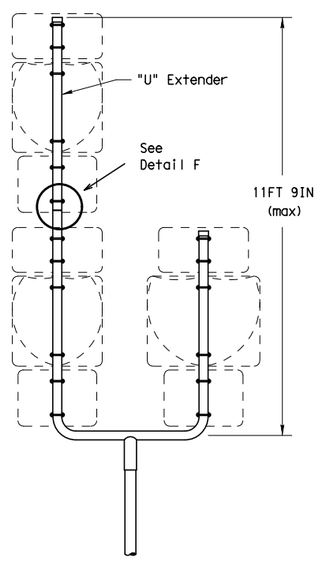
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)



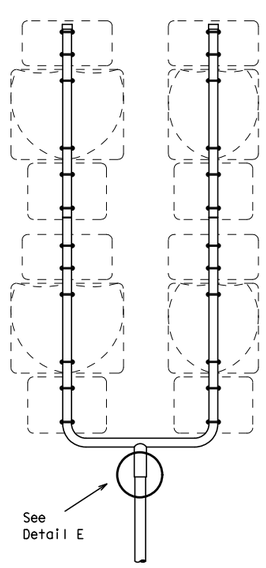
Detail C



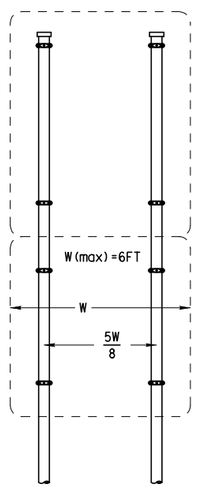
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

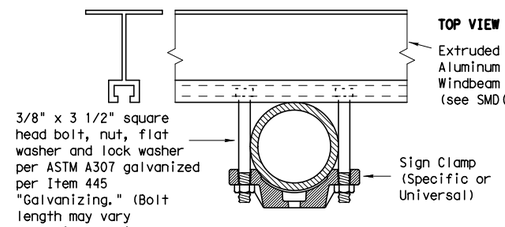


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

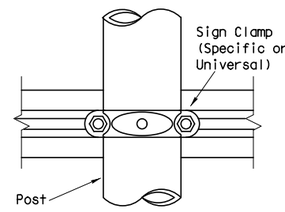


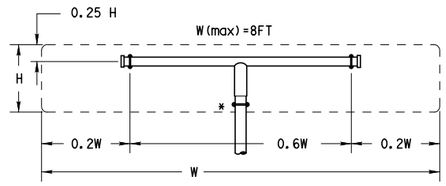
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

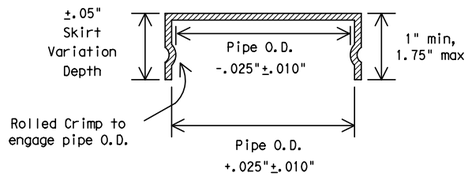




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



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.

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)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	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-2)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
CONT	SECT	JOB	HIGHWAY
0068	08	067	US 87
DIST	COUNTY		SHEET NO.
ABL	HOWARD		155

9-08 REVISIONS

26C

DATE: 5/21/2021 8:56:21 AM
FILE: P:\MSGP\TXD2020\TXUS 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic Items\smds2.dgn

DATE: 5/21/2021 8:56:22 AM
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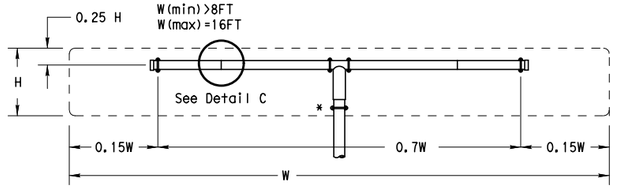
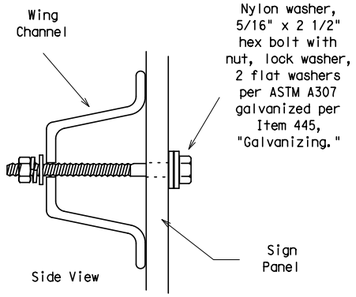
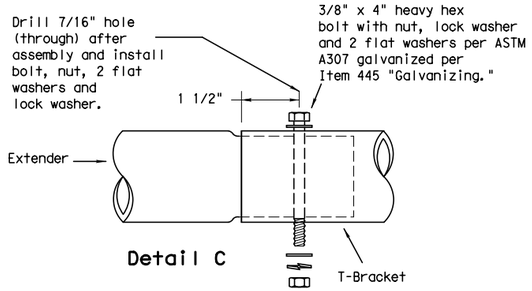


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



Detail B



Detail C

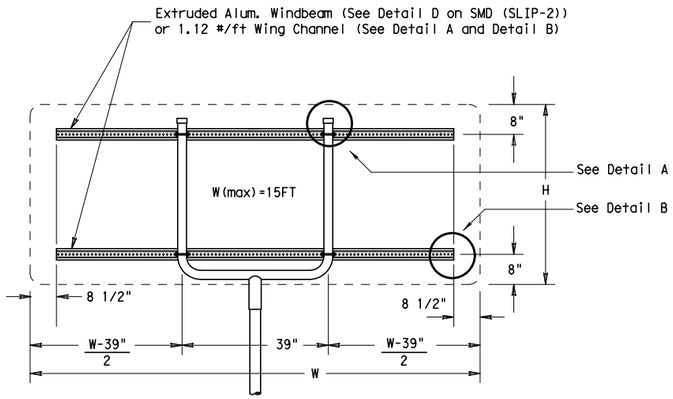
Splices shall only be allowed behind the sign substrate.

GENERAL NOTES:

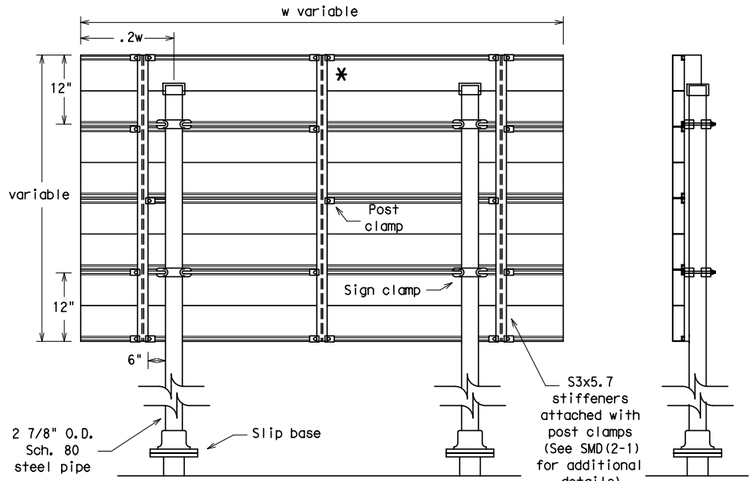
1.

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. 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.



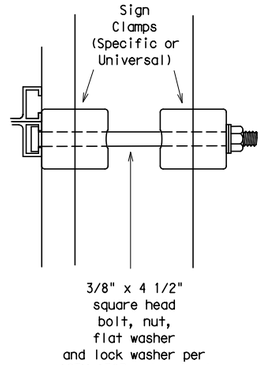
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



Typical Sign Mount

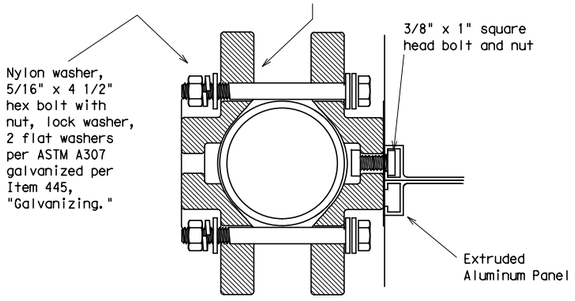
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



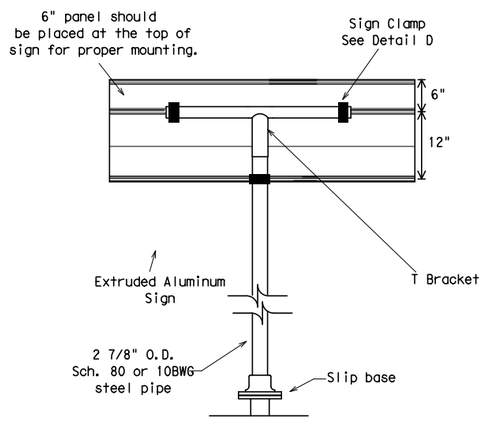
Detail E

See Detail E
for clamp installation

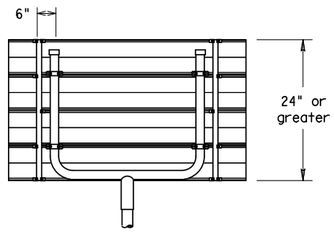


Detail A

Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

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)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	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

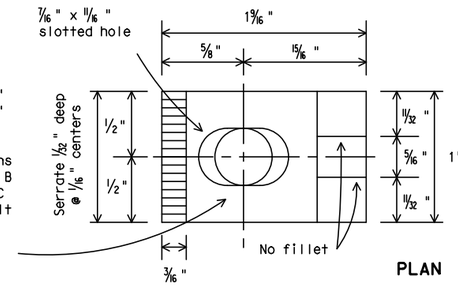
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		156

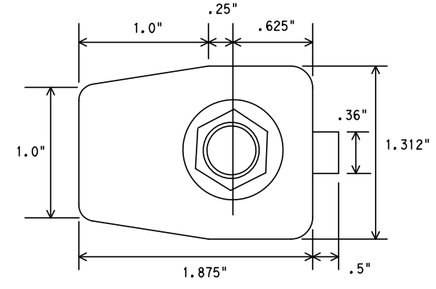
26D

DATE: 5/21/2021 8:56:23 AM
FILE: P:\MSGP\TXD2020\TxDOT\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic Items\smd21-08.dgn

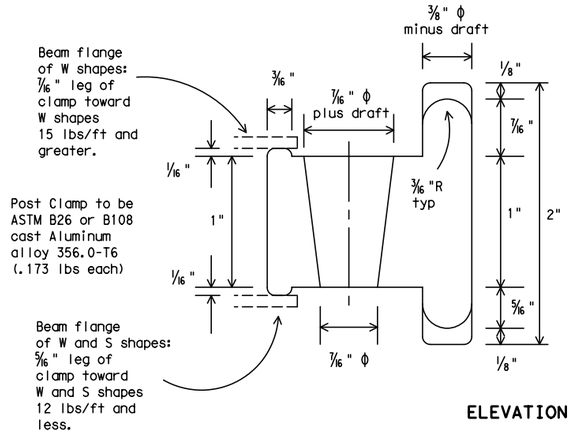
NOTE: centerline of hole for 3/8" diameter squarehead bolt x 2 1/4" long with a flat washer and self-locking nut, or lock washer and hex. nut. Bolt head dimensions shall be in accordance with ANSI B 18.2.1 as referred to in the AISC Manual of steel construction. Bolt assembly shall be galvanized.



PLAN

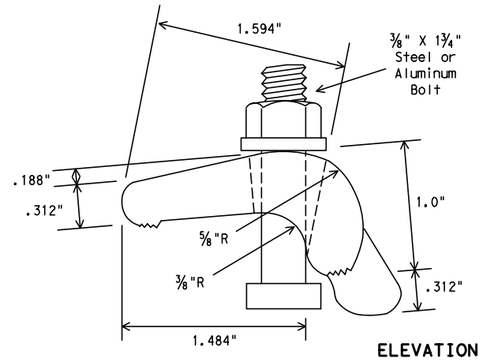


PLAN



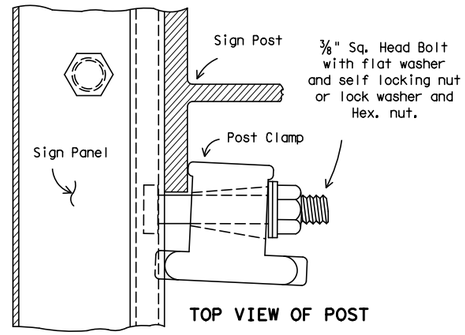
ELEVATION

POST CLAMP DETAIL

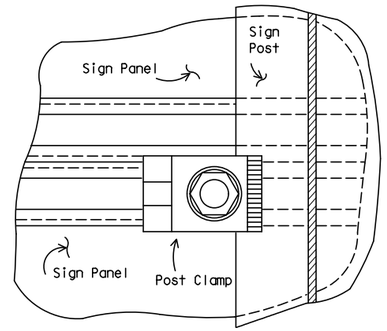


ELEVATION

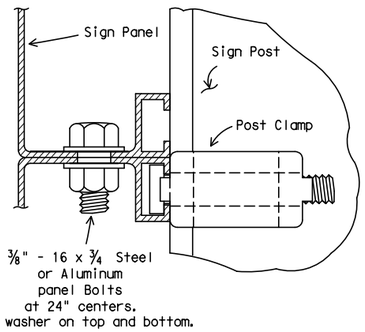
ALTERNATE POST CLAMP DETAIL



TOP VIEW OF POST

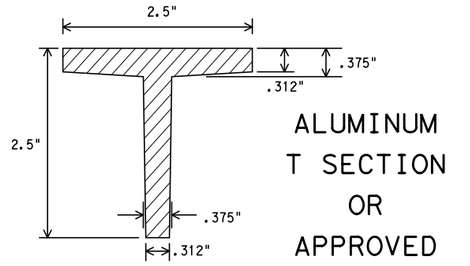


TOP VIEW OF CLAMP



SIDE VIEW OF PANELS

CONNECTION DETAILS

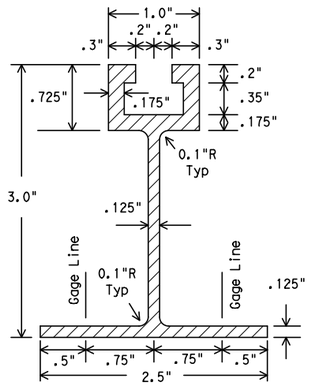


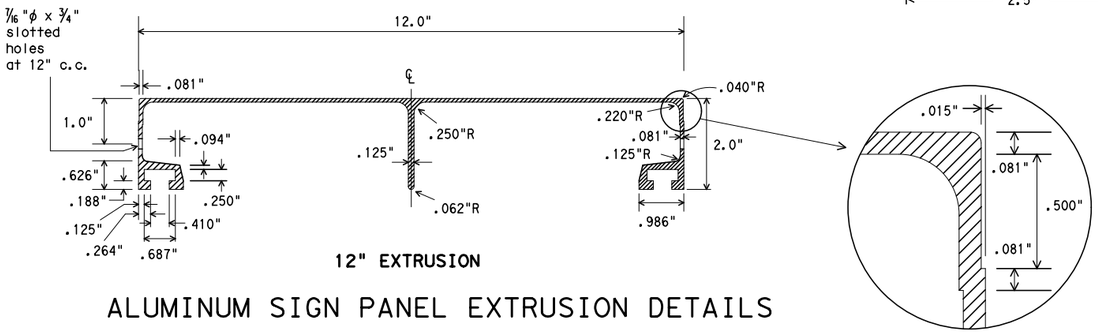
1.912 lbs/ft

ALUMINUM T SECTION OR APPROVED ALTERNATIVE

WINDBEAM CROSS SECTION

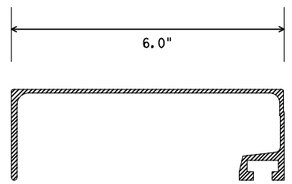
Windbeam to be extruded aluminum (1.175 lbs/ft) or approved alternative



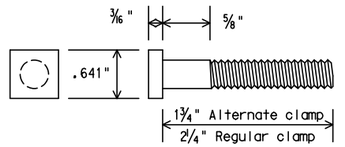


12" EXTRUSION

ALUMINUM SIGN PANEL EXTRUSION DETAILS



6" EXTRUSION



POST CLAMP BOLT DETAIL

DEPARTMENTAL MATERIAL SPECIFICATIONS

SIGN HARDWARE	DMS-7120

GENERAL NOTES:

1. Design conforms with AASHTO Specifications for the design and construction of structural supports for highway signs.
2. Materials and fabrication shall conform to the requirements of the Department material specifications.
3. Structural steel shall be "low-alloy steel" for non-bridge structures per Item 442, "Metal For Structures."
4. For fiberglass substrate connection details, see manufacturer's recommendations.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS- EXTRUDED ALUMINUM SIGN PANELS & HARDWARE

SMD(2-1)-08

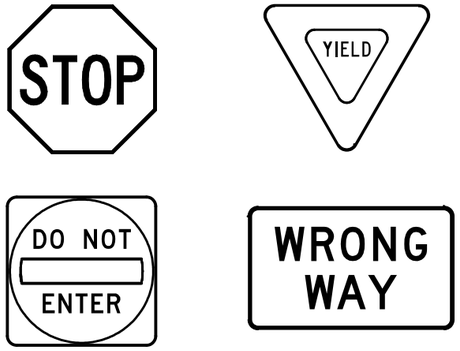
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		157

DATE: 5/21/2021 8:56:24 AM
FILE: P:\MSGP\TXD0207\US 87 - Energy Sector\PROD_SHEETS\STANDARDS\Traffic\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

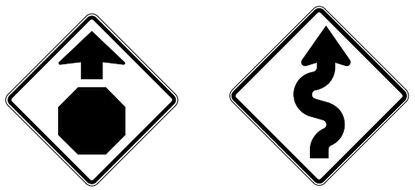
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

http://www.txdot.gov/

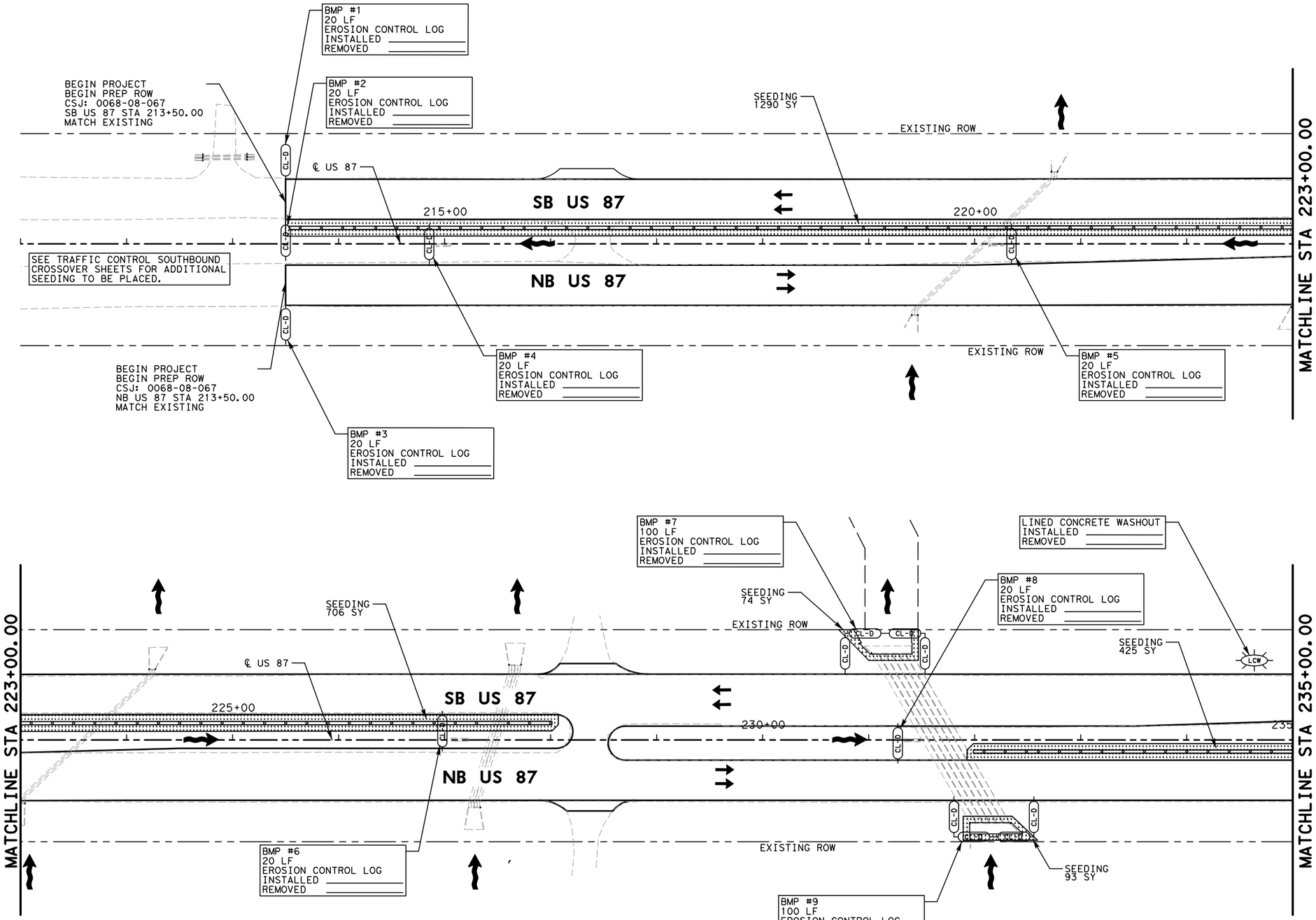
Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		158



50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

NOTE:

SEE TRAFFIC CONTROL SOUTHBOUND CROSSOVER SHEETS FOR ADDITIONAL SEEDING TO BE PLACED.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

FIRM REGISTRATION NO. F-230

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US 87

SW3P
SITE PLAN

(SHEET 1 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	159
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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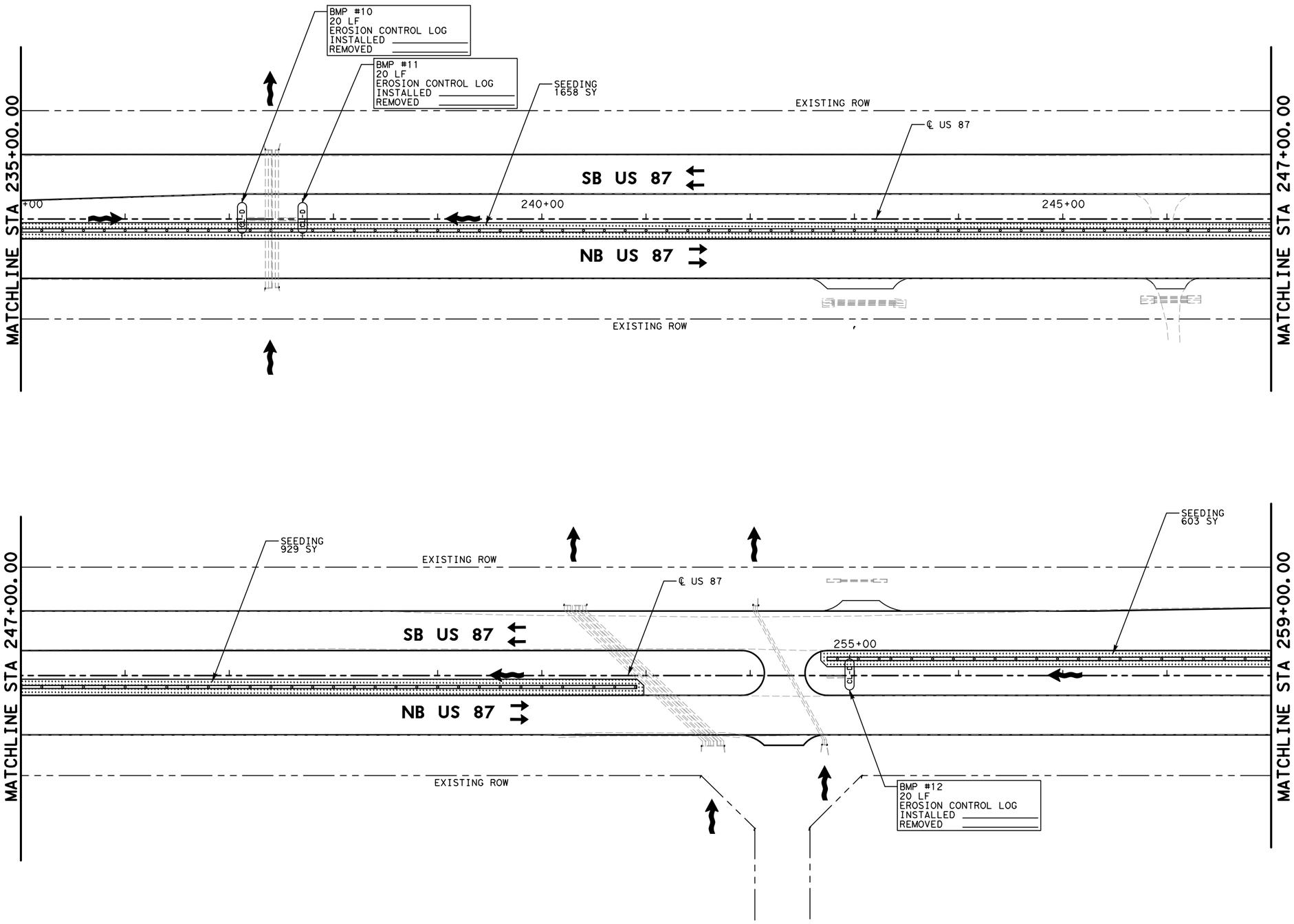
DATE: 5/21/2021 8:56:30 AM jphillpp



50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

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SW3P
SITE PLAN

(SHEET 2 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	160
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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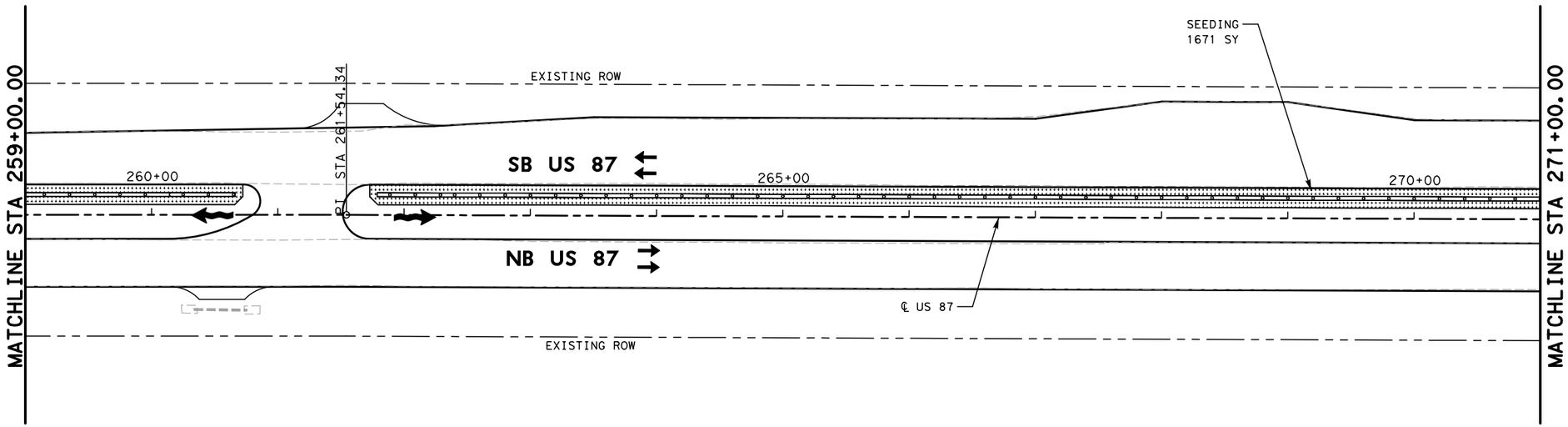

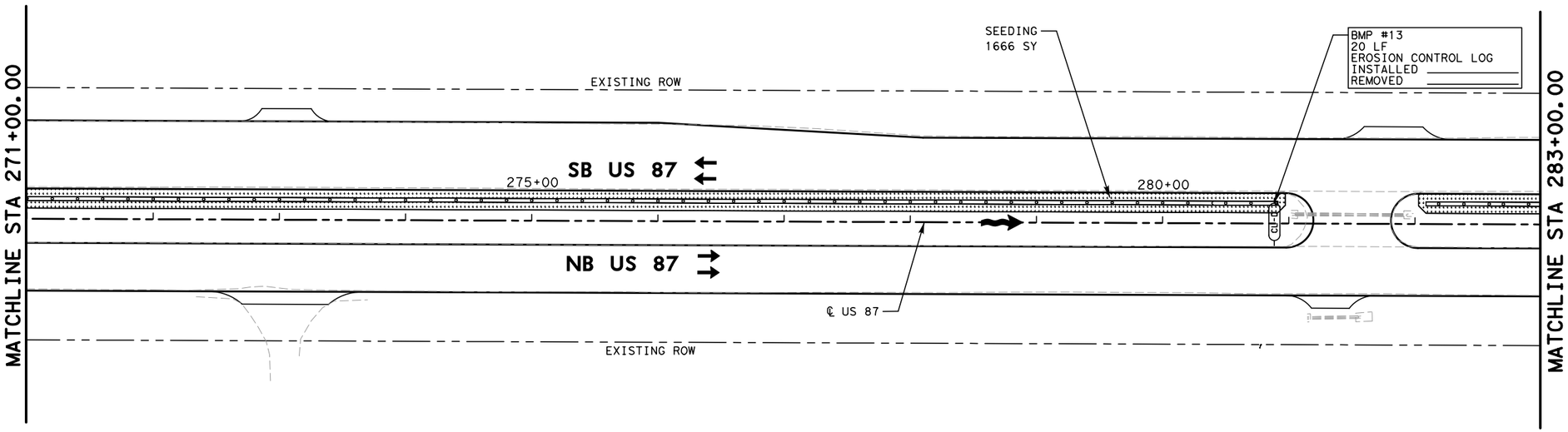

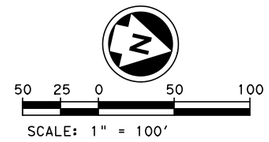

LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\SPP03.dgn
DATE: 5/21/2021 8:56:33 AM jphillpp

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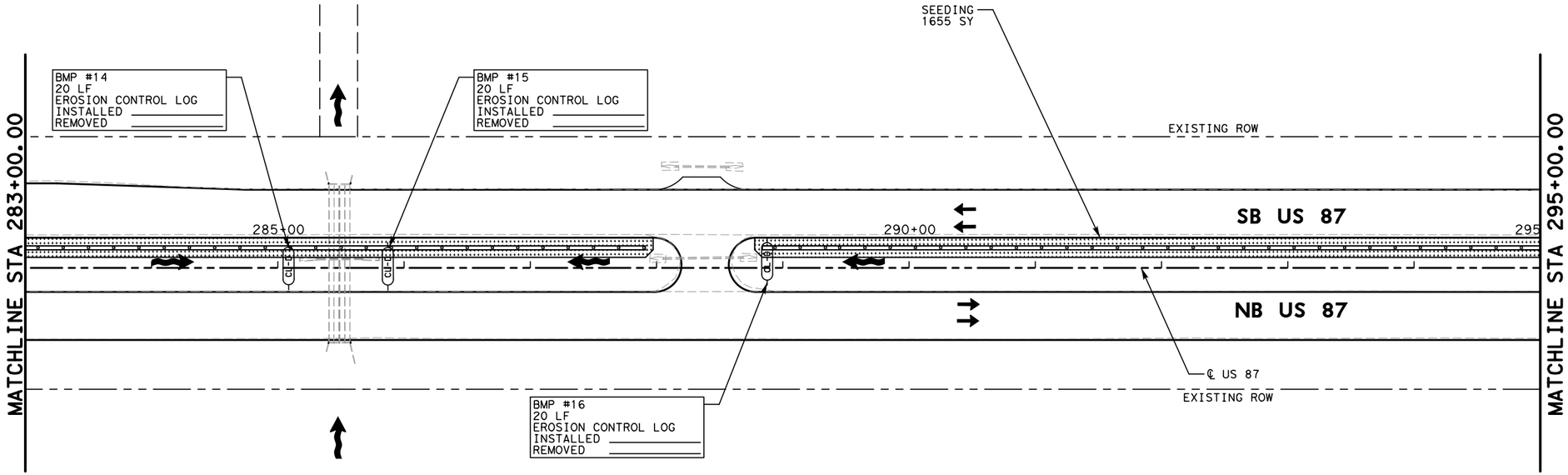
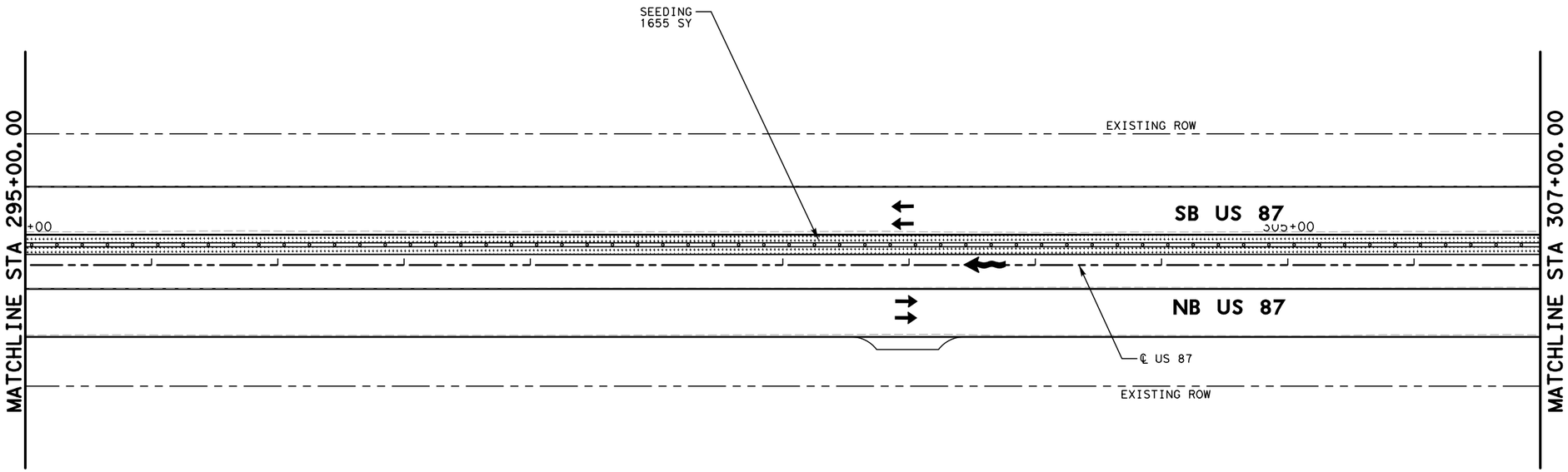
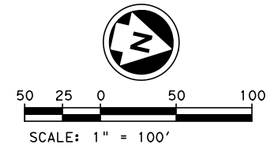
SW3P
SITE PLAN

(SHEET 3 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	161
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				







LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

(SHEET 4 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	162
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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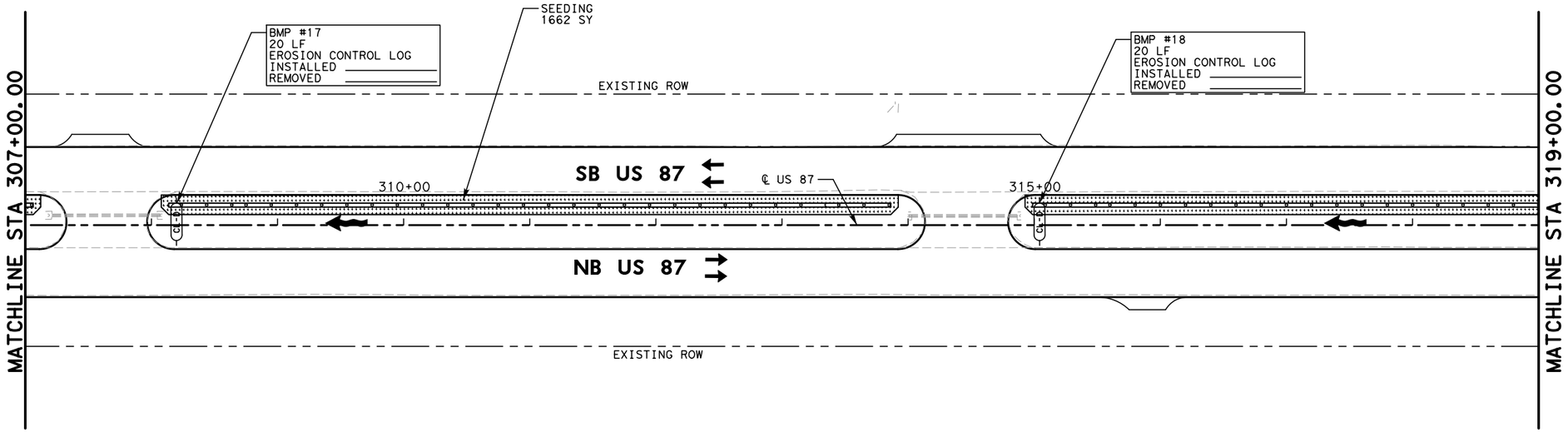

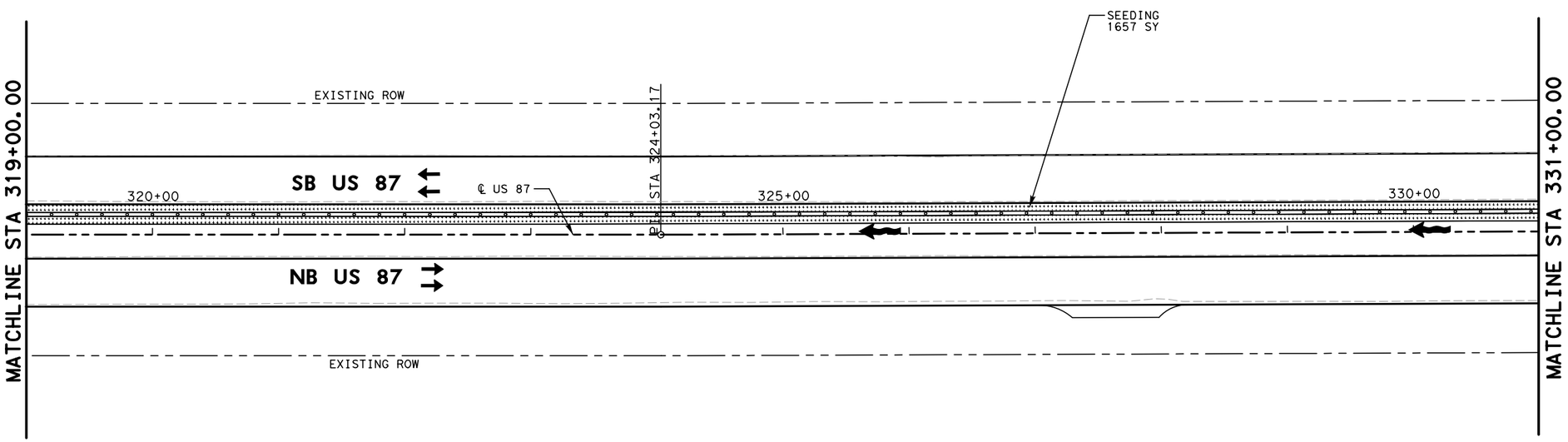

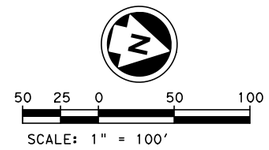

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- SEEDING
- FLOW ARROW
- LCW — LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
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5/21/2021

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SW3P
SITE PLAN

(SHEET 5 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	163
GRAPHICS	CONTROL	SECTION	JOB	
AR				
GRPH CHECK	0068	08	067	
JKB				

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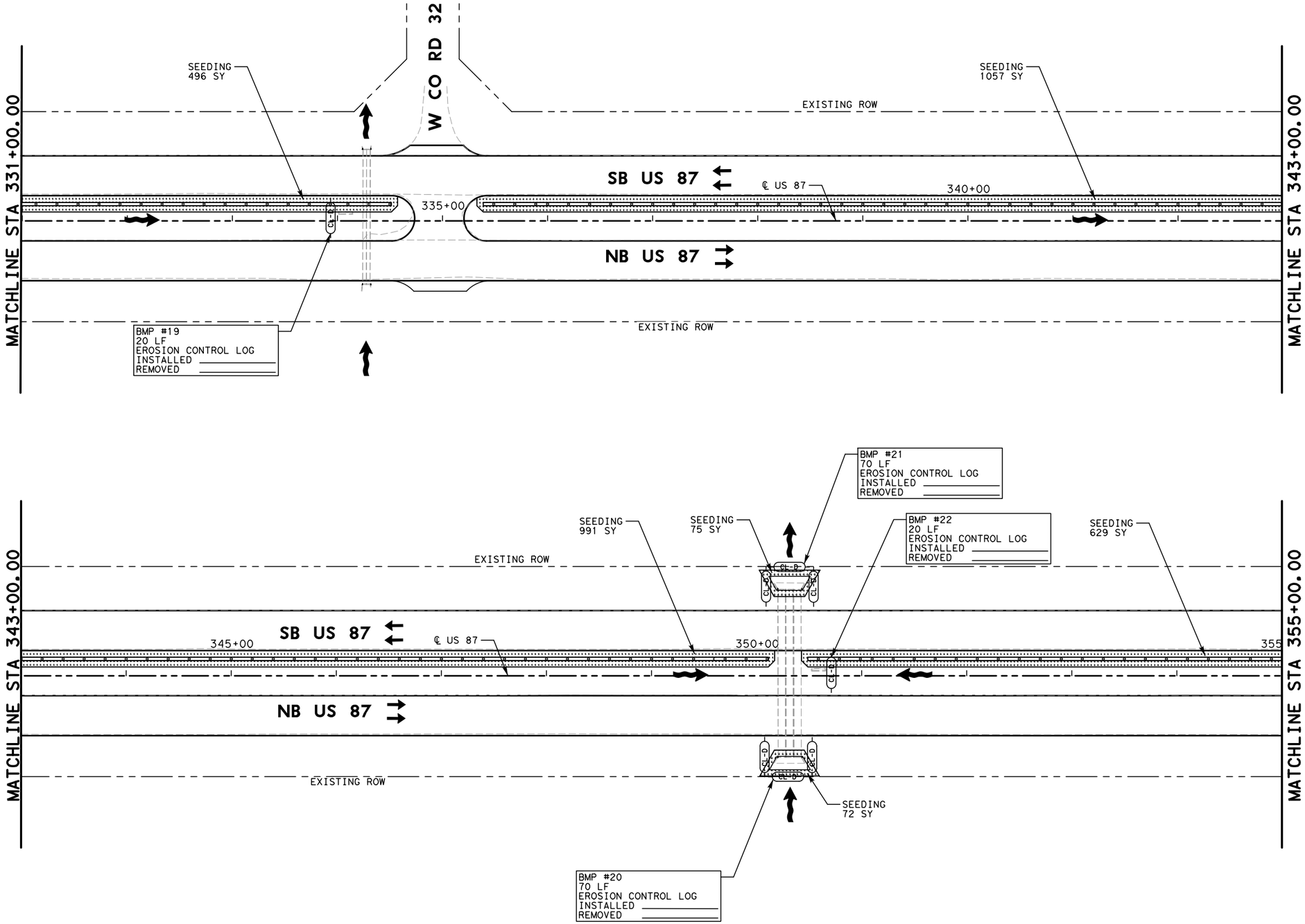

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

STATE OF TEXAS
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5/21/2021

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US 87

SW3P
SITE PLAN

(SHEET 6 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	
AR				164
GRPH CHECK	0068	08	067	
JKB				

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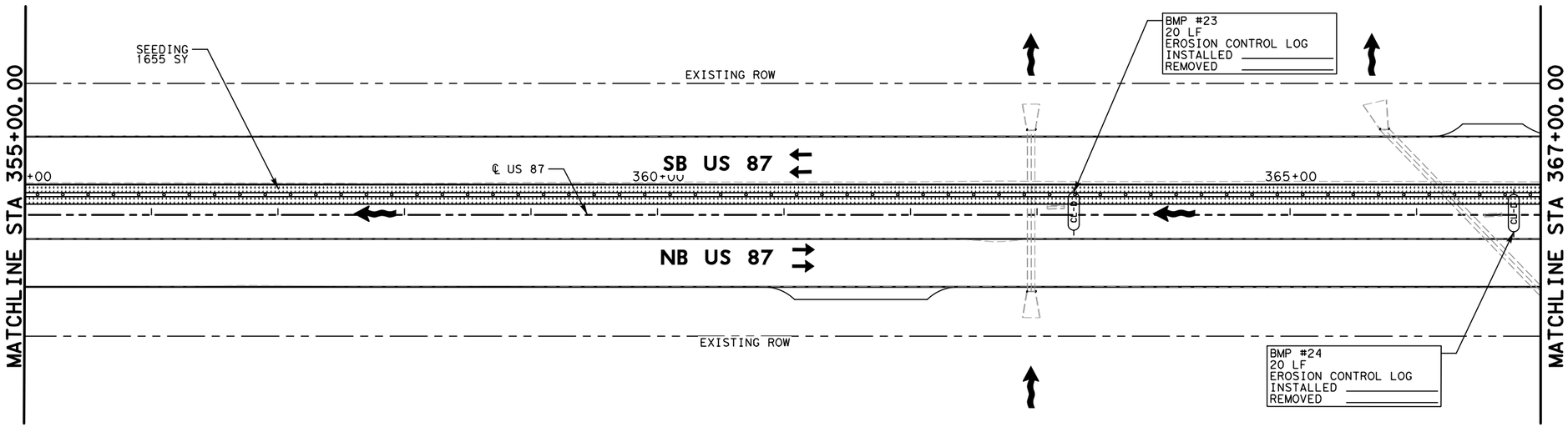
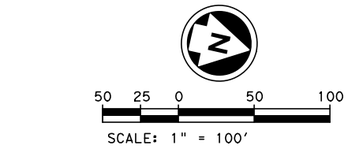
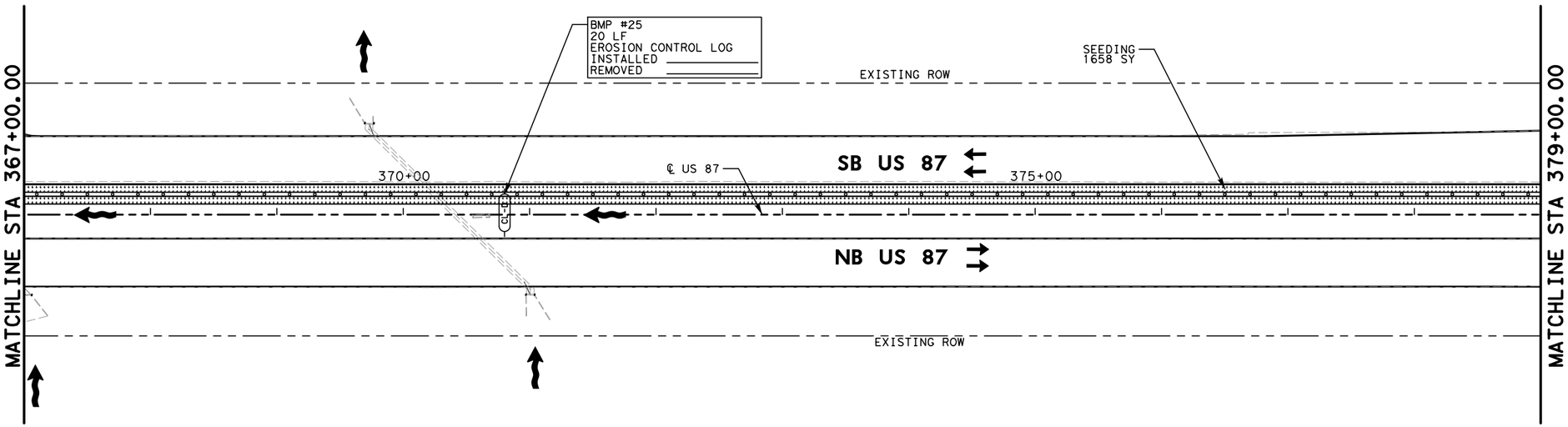




LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT



FIRM REGISTRATION NO. F-230

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SW3P
SITE PLAN

(SHEET 7 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	165
AR				
GRPH CHECK	0068	08	067	
JKB				

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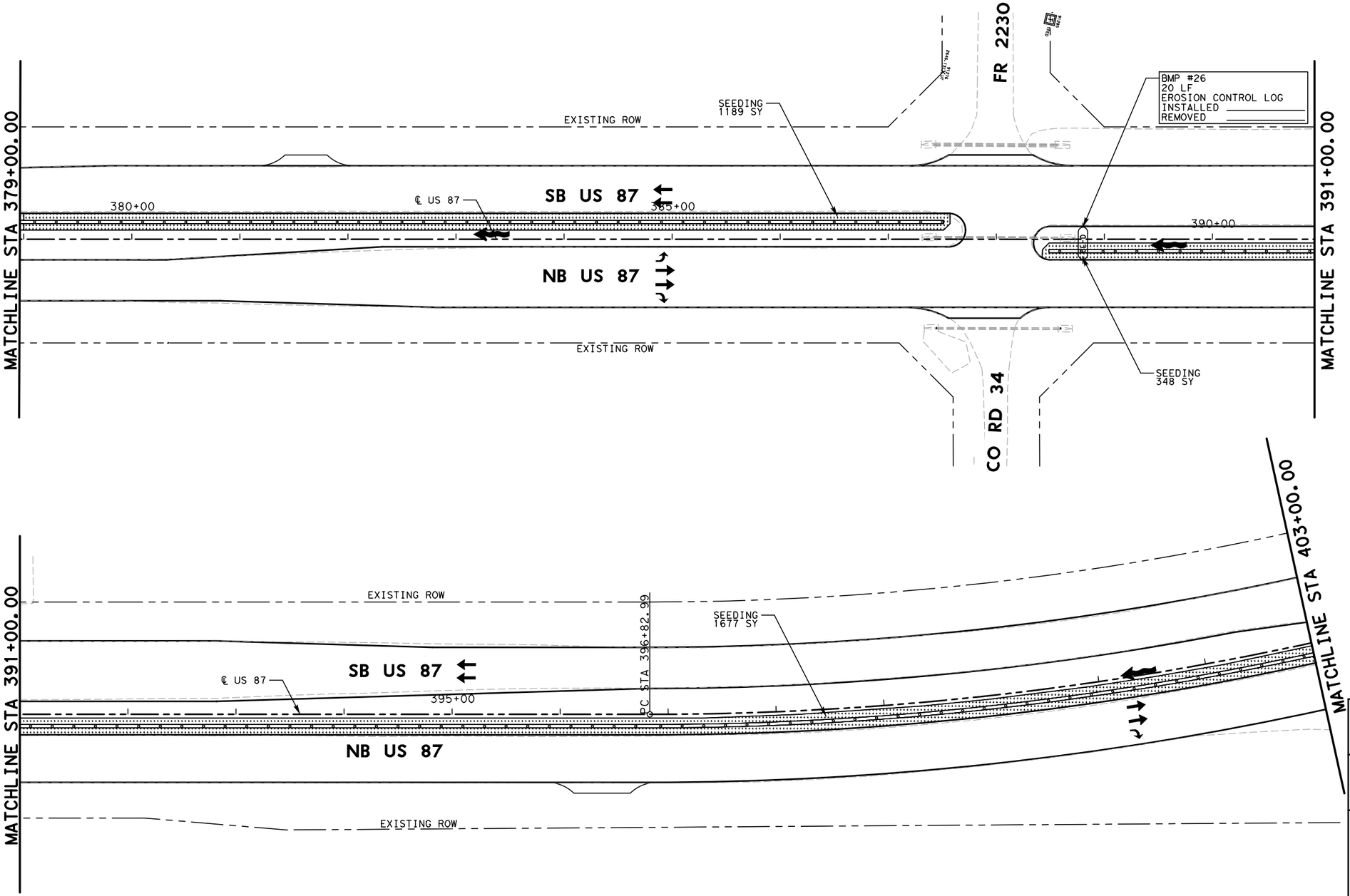

50 25 0 50 100

SCALE: 1" = 100'

LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED
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5/21/2021

FIRM REGISTRATION NO. F-230

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Texas Department of Transportation

US 87

SW3P
SITE PLAN

(SHEET 8 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	166
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

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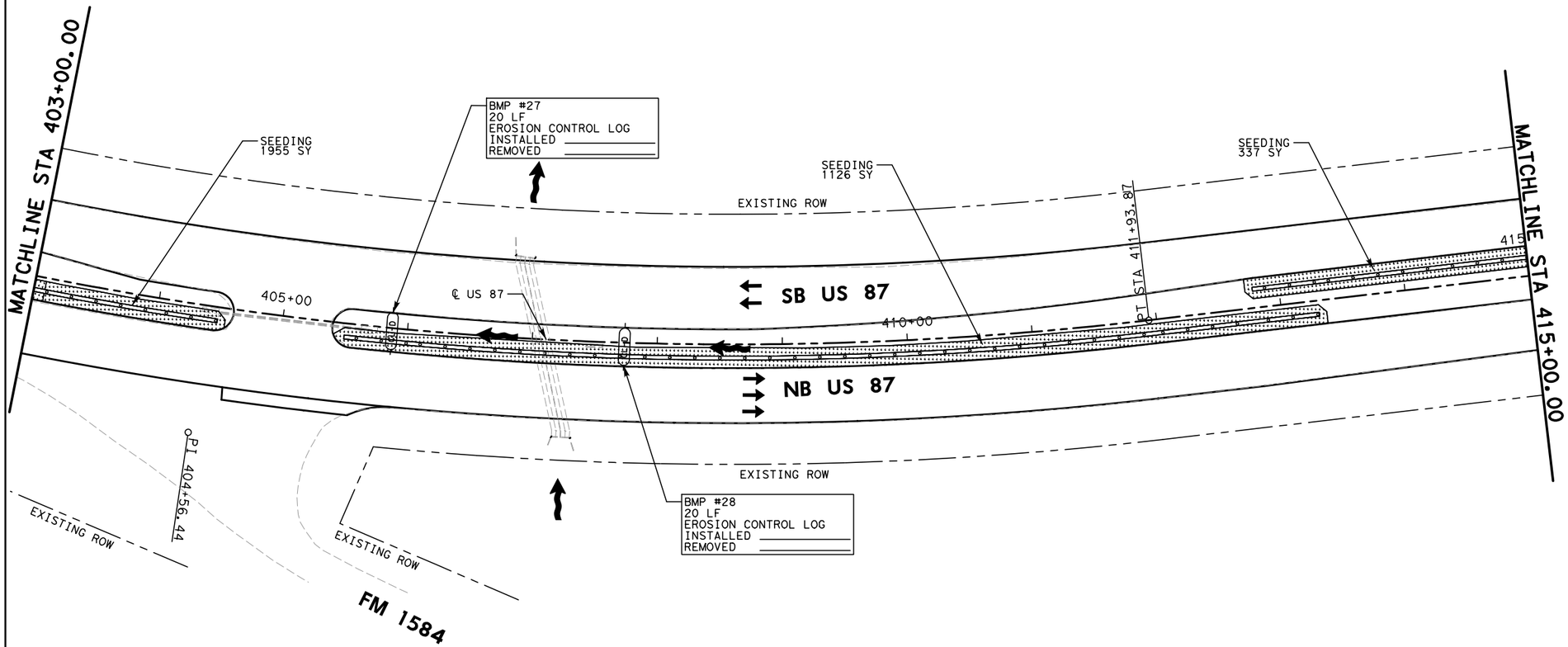
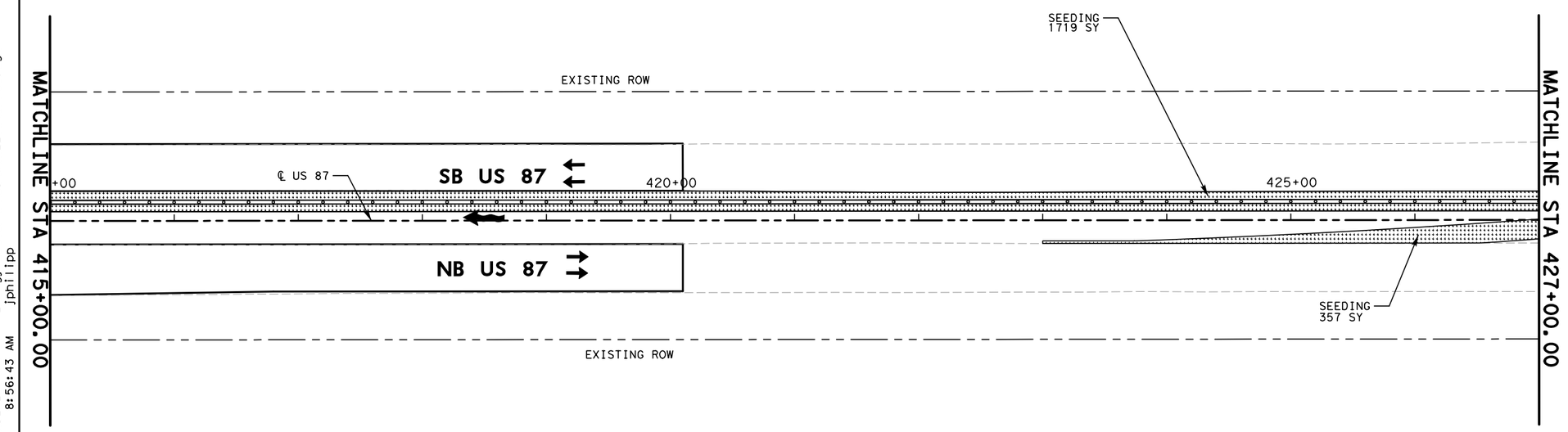
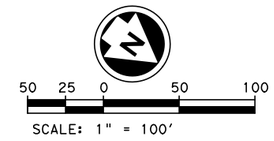
DATE: 5/21/2021 8:56:41 AM jphillipp







LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

NOTE:

SEE TRAFFIC CONTROL SOUTHBOUND CROSSOVER SHEETS FOR ADDITIONAL SEEDING TO BE PLACED.

STATE OF TEXAS
JUSTIN K. BAKER
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LICENSED PROFESSIONAL ENGINEER
5/21/2021

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SW3P
SITE PLAN

(SHEET 9 OF 10)

DESIGN	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	
GRAPHICS	CONTROL	SECTION	JOB	167
AR	0068	08	067	
GRPH CHECK				
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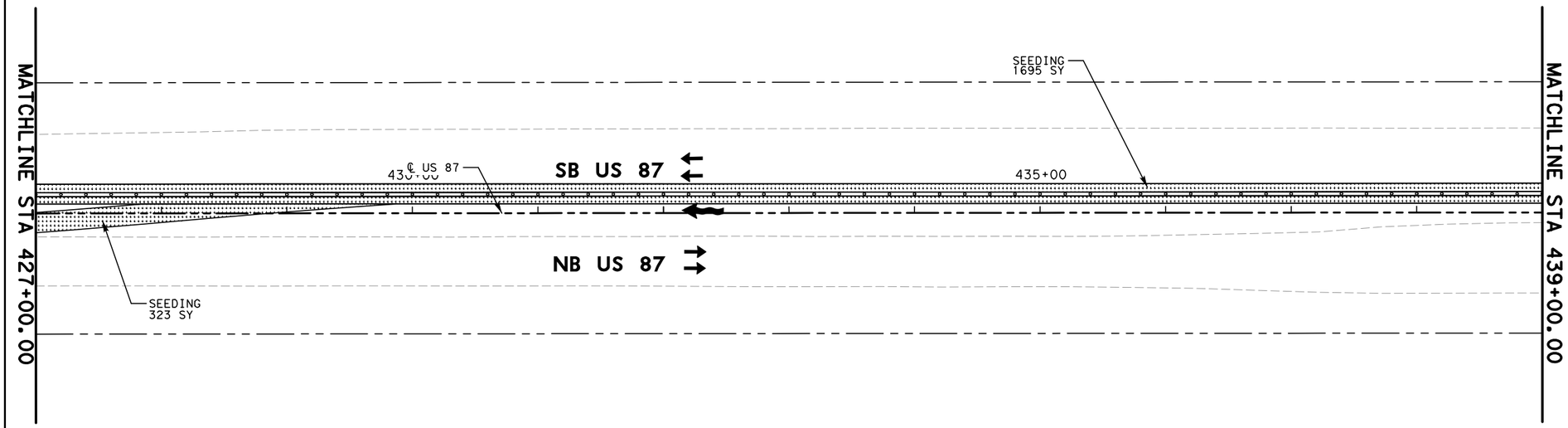
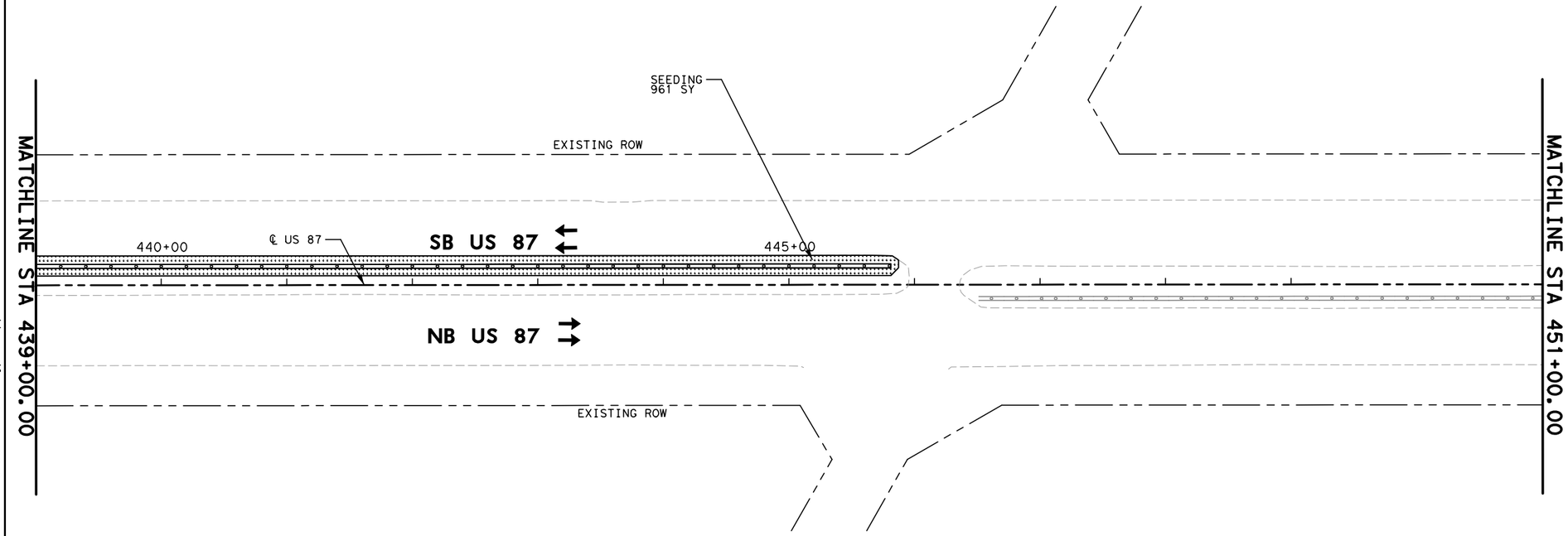
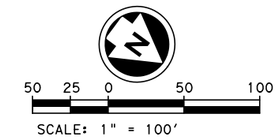
DATE: 5/21/2021 8:56:43 AM jphilipp







LEGEND	
CL-D	EROSION CONTROL LOG DAM
	SEEDING
	FLOW ARROW
LCW	LINED CONCRETE WASHOUT

NOTE:

SEE TRAFFIC CONTROL SOUTHBOUND CROSSOVER SHEETS FOR ADDITIONAL SEEDING TO BE PLACED.

FIRM REGISTRATION NO. F-230

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SW3P
SITE PLAN

(SHEET 10 OF 10)

DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
JKB	6	SEE TITLE SHEET		US 87
DESIGN CK	STATE	DISTRICT	COUNTY	SHEET NO.
CMH	TX	ABL	HOWARD	168
GRAPHICS	CONTROL	SECTION	JOB	
AR	0068	08	067	
GRPH CHECK				
JKB				

FILE: P:\MSGP\TXD20207\US 87 - Energy Sector\PROD*SHEETS\SPP10.dgn
DATE: 5/21/2021 8:56:45 AM jphillipp

SITE DESCRIPTION

PROJECT LIMITS:
THE PROJECT LIMITS SHOWN ON THE TITLE SHEET AND LIMITS OF TXDOT RIGHT OF WAY SHALL ALSO BE THE LIMITS OF COVERAGE OF THE SW3P.

PROJECT LOCATION MAPS: TITLE SHEET

DRAINAGE PATTERNS: DRAINAGE AREA MAPS
<OR POSSIBLY SW3P SITE PLAN>

APPROX. SLOPES ANTICIPATED AFTER MAJOR GRADING AND AREAS OF SOIL DISTURBANCE: TYPICAL SECTIONS

MAJOR CONTROLS AND LOCATIONS OF STABILIZATION PRACTICES: SW3P SITE PLAN

PROJECT SPECIFIC LOCATIONS: TO BE SPECIFIED BY PROJECT FIELD OFFICE AND LOCATED IN THE PROJECT SW3P FILE.

SURFACE WATERS AND DISCHARGE LOCATIONS:
DRAINAGE AND CULVERT LAYOUT SHEETS

TYPICAL AREAS WHICH WILL NOT BE DISTURBED: SW3P SITE PLAN

ENDANGERED SPECIES, DESIGNATED CRITICAL HABITAT AND HISTORIC PROPERTY: EPIC SHEET

ESTIMATED START DATES AND DURATION OF ACTIVITIES IN THE INTENDED SCHEDULE/SEQUENCE OF EARTH-DISTURBING ACTIVITIES: CONTRACT TIME ESTIMATE

NATURE OF ACTIVITY:
RECONSTRUCT/OVERLAY ROADWAY AND INSTALL CABLE BARRIER SYSTEM

MAJOR SOIL DISTURBING ACTIVITIES:
INSTALL CABLE BARRIER SYSTEM

TOTAL PROJECT AREA:
112.49 ACRES

TOTAL AREA TO BE DISTURBED (AT EACH SITE):
8.81 ACRES

WEIGHTED RUNOFF COEFFICIENT BEFORE CONSTRUCTION:
0.4

WEIGHTED RUNOFF COEFFICIENT AFTER CONSTRUCTION:
0.4

EXISTING CONDITION OF SOIL & VEGETATIVE COVER:
NATIVE GRASSES

% OF EXISTING VEGETATIVE COVER:
70%

NAME OF RECEIVING WATERS:
BEALS CREEK
(STREAM SEGMENT 1412B OF COLORADO RIVER)

EROSION AND SEDIMENT CONTROLS

USE "T" OR "P" IN THE BLANKS BELOW IF APPLICABLE (T= TEMPORARY, P= PERMANENT)

SOIL STABILIZATION PRACTICES:

P	BUFFER ZONES	P	PERMANENT PLANTING, SODDING, OR SEEDING
	MULCHING	P	PRESERVATION OF NATURAL RESOURCES
T	TEMPORARY SEEDING		SOIL RETENTION BLANKET
	OTHER		OTHER

OTHER:

DISTURBED AREAS ON WHICH CONSTRUCTION ACTIVITY HAS CEASED (TEMPORARILY OR PERMANENTLY) SHALL BE STABILIZED WITHIN 14 DAYS UNLESS ACTIVITIES ARE SCHEDULED TO RESUME WITHIN 14 DAYS.

FOR CONSTRUCTION PROJECTS, THIS DISTRICT OF THE TEXAS DEPARTMENT OF TRANSPORTATION USES SITEMANAGER, A COMPUTER BASED CONSTRUCTION RECORD-KEEPING SYSTEM, AS PART OF RECORD FOR PROJECT WORK INCLUDING ENVIRONMENTAL RELATED ACTIVITIES. DOCUMENTATION DESCRIBING MAJOR GRADING ACTIVITES, TEMPORARY OR PERMANENT CESSATION OF CONSTRUCTION AND STABILIZATION MEASURE IS PART OF THIS SYSTEM AND IS INCORPORATED BY REFERENCE INTO THIS SW3P.

STRUCTURAL PRACTICES:

	CHANNEL LINERS		DIVERSION DIKE AND SWALE COMBINATIONS
	CURBS AND GUTTERS		DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
	HAY BALES		DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
	PAVED FLUMES		ROCK BEDDING AT CONSTRUCTION EXIT
	PIPE SLOPE DRAINS		STONE OUTLET STRUCTURES
	STORM SEWERS		STORM INLET SEDIMENT TRAP
	SEDIMENT BASINS		TEMPORARY EROSION CONTROL LOGS (BIOLOGS)
	SEDIMENT TRAPS		TIMBER MATTING AT CONSTRUCTION EXIT
	SILT FENCES		VEGETATIVE FILTER STRIPS
	ROCK FILTER DAMS		VELOCITY CONTROL DEVICES
T	EROSION CONTROL LOGS	T	LINED CONCRETE WASHOUT

OFFSITE VEHICLE TRACKING CONTROLS:

	HAUL ROADS DAMPENED FOR DUST CONTROL
	EXCESS DIRT ON ROAD REMOVED DAILY
	LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
	STABILIZED CONSTRUCTION ENTRANCE
	OTHER

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

1. INSTALL EROSION CONTROL LOGS.
2. RECONSTRUCT ROADWAY.
3. SEED DISTURBED AREAS (TEMPORARY AND PERMANENT).
4. REMOVE TEMPORARY SW3P DEVICES AFTER CONSTRUCTION AREA IS STABILIZED.

STORM WATER MANAGEMENT:
NA

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

OTHER EROSION AND SEDIMENT CONTROLS:

MAINTENANCE:
ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE, BUT NO LATER THAN 7 CALENDAR DAYS AFTER THE SURROUNDING EXPOSED GROUND HAS DRIED SUFFICIENTLY TO PREVENT FURTHER DAMAGE FROM HEAVY EQUIPMENT. THE AREAS ADJACENT TO CREEKS AND DRAINAGE WAYS SHALL HAVE PRIORITY FOLLOWED BY DEVICES PROTECTING STORM SEWER INLETS.

INSPECTION:
AN INSPECTION WILL BE PERFORMED BY A TXDOT INSPECTOR EVERY 7 DAYS. AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON THE INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

WASTE MATERIALS:
ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL MEET ALL STATE AND LOCAL CITY SOLID WASTE MANAGEMENT REGULATIONS. ALL TRASH AND CONSTRUCTION DEBRIS FROM THE SITE WILL BE DEPOSITED IN THE DUMPSTER. THE DUMPSTER WILL BE EMPTIED AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION AND THE TRASH WILL BE HAULED TO A PERMITTED LANDFILL. NO CONSTRUCTION WASTE MATERIAL WILL BE BURIED ON SITE. CONSTRUCTION DEBRIS AND LITTER SHOULD BE PICKED UP ON A DAILY BASIS UNLESS OTHERWISE DIRECTED BY THE ENGINEER. WASTE AND DIRT PILES SHOULD BE REMOVED ON A WEEKLY BASIS.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):
NO LONG TERM WATER QUALITY IMPACTS ARE EXPECTED AS A RESULT OF THE PROPOSED PROJECT. SEE THE NEXT PLAN SHEET FOR A LIST OF POTENTIAL POLLUTANTS. IN THE EVENT OF A MAJOR SPILL, NOTIFY THE TXDOT ENGINEER IMMEDIATELY. ALL PERSONNEL WILL BE INSTRUCTED IN THE PROCEDURES FOR SPILL HANDLING AND DISPOSING OF ANY HAZARDOUS MATERIALS THEY WILL BE USING. ALL SPILLS, INCLUDING THOSE OF LESS THAN 25 GALLONS SHALL BE CLEANED IMMEDIATELY AND ANY CONTAMINATED SOIL SHALL BE IMMEDIATELY REMOVED FROM THE SITE AND BE DISPOSED OF PROPERLY. DESIGNATED AREAS SHALL BE DETERMINED BY THE AREA ENGINEER FOR SPOILS DISPOSAL AND MATERIAL STORAGE. THESE AREAS SHALL BE PROTECTED FROM RUN-ON AND RUN-OFF. MATERIALS RESULTING FROM THE DESTRUCTION OF EXISTING ROADS AND BEING REMOVED AND/OR DISPOSED OF BY THE CONTRACTOR WILL BE DONE SO IN ACCORDANCE WITH ALL FEDERAL, STATE, AND LOCAL LAWS, ORDINANCES AND REGULATIONS AND WITH THE APPROVAL OF THE PROJECT ENGINEER. ANY CHANGES TO AMBIENT WATER QUALITY DURING CONSTRUCTION OF THE PROPOSED PROJECT SHALL BE PROHIBITED AND MAY RESULT IN ADDITIONAL WATER QUALITY CONTROL MEASURES, WHICH SHALL BE MITIGATED AS SOON AS POSSIBLE AND SHALL BE REPORTED TO THE TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ) WITHIN 24 HOURS OF BECOMING AWARE OF IMPACTS.

SANITARY WASTE:
ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATION BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

REMARKS:
CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS.
ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICABLE OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING, FALSEWORK PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT PART OF THE FINISHED WORK. DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATER BODY OR STREAMBED.

Texas Department of Transportation

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

NO SCALE

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		169
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	08	067

LIST OF POTENTIAL POLLUTANTS

POTENTIAL POLLUTANT	RELATED SOURCE	CONTROLS
CEMENTATEOUS MATERIAL AND CEMENTATEOUS AGGREGATES (BROKEN CONCRETE)	REMOVAL OF CONCRETE RIPRAP, CULVERT COMPONENTS, BRIDGE COMPONENTS, ETC.	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
MILLED ASPHALTIC CEMENT PAVEMENT (MILLINGS)	OBLITERATION OF ABANDONED ROAD AND PLANING OF ASPHALT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
VIRGIN ASPHALTIC MATERIAL INCLUSIVE OF PRIME OILS, PRECOAT AGGREGATES, AND HOT MIX BITUMINOUS MIXTURES	APPLICATIONS OF PRIME COATS, SEAL COAT, AND PAVING OPERATIONS	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND TCEQ WILL BE IMMEDIATELY NOTIFIED.
CONCRETE, REBAR, WIRE, WIRE FABRIC LUMBER, NAILS, STYROFOAM BLOCK, FIBERBOARD, CURING COMPOUND AND LINSEED OIL	CONSTRUCTION OF CONCRETE BRIDGE COMPONENTS SUCH AS DRILLED SHAFTS, CULVERTS, ABUTMENTS, BENTS, REINFORCED CONCRETE SLABS, RAIL, INLET, CONCRETE TRAFFIC BARRIERS, CURB AND GUTTER, RIPRAP AND SIGN FOUNDATIONS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF. ANY TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO THEIR PREEXISTING CONDITION/ELEVATION.
MASONRY CONCRETE BLOCK, GEOGRID FABRIC, CARDBOARD, AND PLASTIC RAP	CONSTRUCTION OF MODULAR RETAINING WALL SYSTEMS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POSTS, STEEL POSTS, BARRELS, CONES, SIGN BOARDS (ALUMINUM AND PLYBOARD), FASTENERS, NUTS, BOLTS, AND WASHERS	PLACEMENT AND/OR REMOVAL OF BARRICADES, SIGNS AND TRAFFIC CONTROL DEVICES	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WOOD POST, STEEL POST, STEEL FASTENERS, NUTS, BOLTS, AND WASHERS	CONSTRUCTION OF METAL BEAM GUARD FENCE	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
STRUCTURAL STEEL I-BEAM, SIGN BOARDS, AND CONCRETE FOUNDATIONS	REMOVAL OF ROADSIDE SIGN ASSEMBLIES LARGE AND SMALL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
THERMOPLASTIC PAINT, GLASS BEADS, REFLECTIVE TABS, AND RAISED REFLECTIVE PAVEMENT MARKERS	APPLICATION OF PAVEMENT MARKINGS/MARKERS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
PETROLEUM PRODUCTS (SMALL QUANTITIES INTRODUCED BY CONTRACTOR)	EQUIPMENT FAILURE, MAINTENANCE AND REPAIR	ALL EQUIPMENT AND VEHICLE MAINTENANCE SHALL BE PERFORMED IN A DESIGNATED AREA WITH APPROPRIATE MEASURES FOR CONTAINMENT AND PROPER DISPOSAL OF ALL WASTE MATERIALS INCLUDING HYDRAULIC OIL AND OTHER LIQUIDS IN ACCORDANCE STATE AND LOCAL WASTE MANAGEMENT REGULATIONS. ALL MATERIAL STORED PRIOR TO DISPOSAL SHALL BE CONTAINED IN A CONTAINER WITH A SECURE COVER MEETING ALL STATE AND LOCAL WASTE MANAGEMENT REGULATIONS.
ELIGIBLE NON-STORM WATER DISCHARGES INCLUDING BUT NOT LIMITED TO NON-POTABLE WATER AND NON-STORM WATER DISCHARGE	MOISTURE APPLICATIONS FOR DUST CONTROL, DENSITY, VEGETATION WATERING, NON-DETERGENT VEHICLE WASHING, AND AIR CONDITIONING CONDENSATE	THIS MATERIAL SHALL BE APPLIED AT APPROPRIATE RATES FOR CONSTRUCTION PURPOSES WHICH WILL PRECLUDE THESE MATERIALS FROM ENTERING RUNOFF. IN THE EVENT OF ANY UNINTENDED DISCHARGE, CONTROLS TO CONTAIN RUNOFF WILL BE IMMEDIATELY PLACED AND THE NON-POTABLE WATER WILL BE RECOVERED AND PROPERLY STORED FOR REUSE.
SURVEY STAKE, FLAGGING TAPE AND PAINT	SURVEY STAKING, ALIGNMENT ESTABLISHMENT	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
WASTEWATER	WASHOUT AND CLEANOUT OF STUCCO, PAINT, FORM RELEASE OILS, CURING COMPOUNDS AND OTHER CONSTRUCTION MATERIALS	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
SOAPS AND SOLVENTS	VEHICLE AND EQUIPMENT WASHING	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.
UNSUITABLE FILL MATERIAL	EXCAVATION - ROADWAY, SPECIAL AND EROSION CONTROL	THIS CONSTRUCTION WASTE SHALL BE PROPERLY DISPOSED OF IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS. WHEN STORED ON SITE PRIOR TO DISPOSAL, IT SHALL BE CONTAINED SO AS TO ENSURE THAT IT CANNOT ENTER SURFACE RUNOFF.

STATE OF TEXAS
JUSTIN K. BAKER
114172
LICENSED PROFESSIONAL ENGINEER
5/21/2021

Texas Department of Transportation

NO SCALE

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SW3P)

REV. DATE: 02/27/2014

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		170
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	08	067

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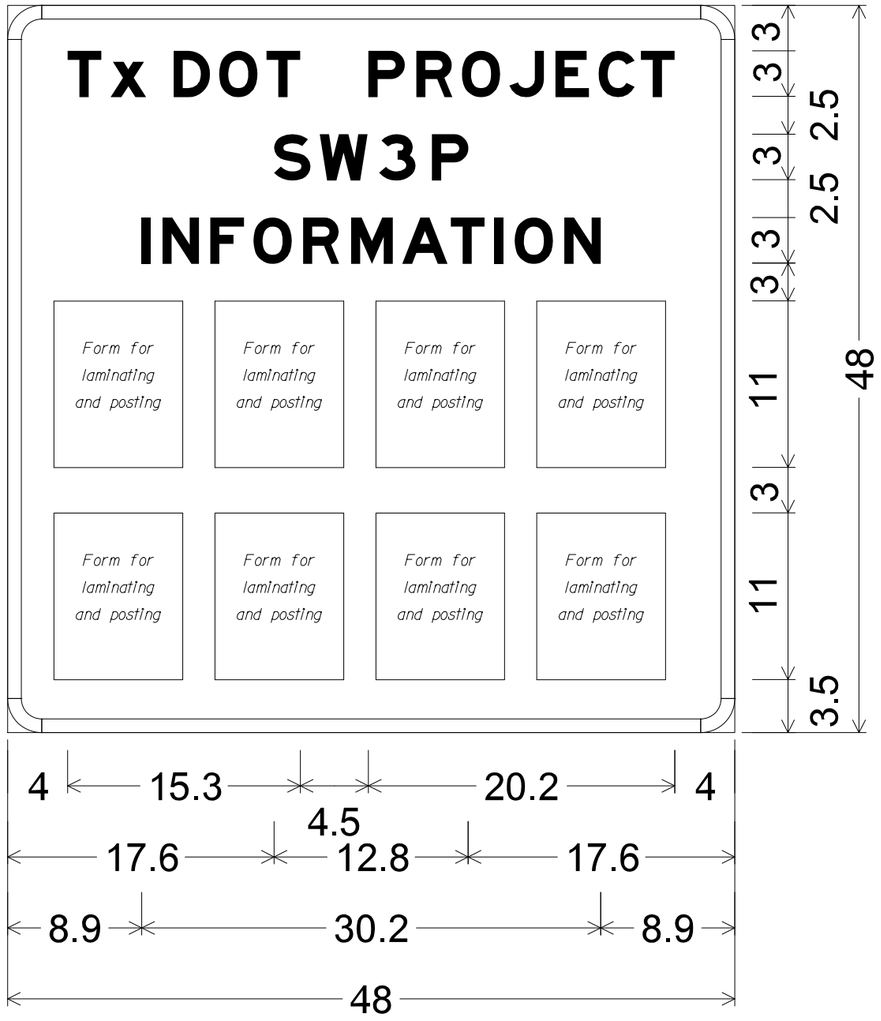

2.3" Radius, 0.9" Border, White on Blue;
[TxDOT PROJECT] E Mod;
[SW3P] E Mod;
[INFORMATION] E Mod;

NOTE:

The Forms needed for laminating and posting to the SW3P Notification Board will be provided by the Engineer. The total number of forms may vary. Notification Boards are to be constructed from Plywood, ½ or ⅝-inch thick, in accordance with TxDOT Departmental Material Specification (DMS)-7100. 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 sign will be placed at a location within the right-of-way but outside the clear zone as directed by the Engineer. This work will not be paid for directly, but will be considered subsidiary to other items.

THIS DOCUMENT IS RELEASED
FOR THE PURPOSE OF PRELIMINARY
REVIEW UNDER THE AUTHORITY OF
JUSTIN K. BAKER, P.E. 114172

DATE: 02-26-2021

IT IS NOT TO BE USED FOR BIDDING,
CONSTRUCTION, OR PERMITTING PURPOSES.

SW3P NOTIFICATION BOARD DETAIL

Texas Department of Transportation

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		US 87
STATE	COUNTY		SHEET NO.
TEXAS	HOWARD		171
DISTRICT	CONTROL	SECTION	JOB
ABL	0068	08	067

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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
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

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

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

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

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

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

1.

2.

3.

4.

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

Best Management Practices:

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

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. COMPLY WITH E.O. 13112 ON USE OF NATIVE VEGETATION.
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. COMPLY WITH MIGRATORY BIRD TREATY ACT FOR PROTECTION OF BIRDS AND NESTS.
2.
3.
4.

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

LIST OF ABBREVIATIONS

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

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

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

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ Yes ☒ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0068	08	067	US 87	
12-12-2011 (DS)	DIST	COUNTY		SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	ABL	HOWARD		172	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.					

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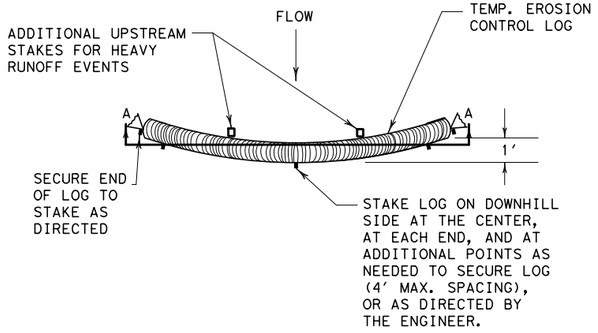
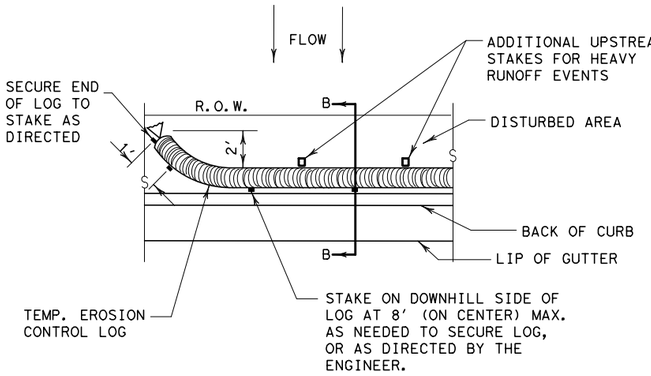
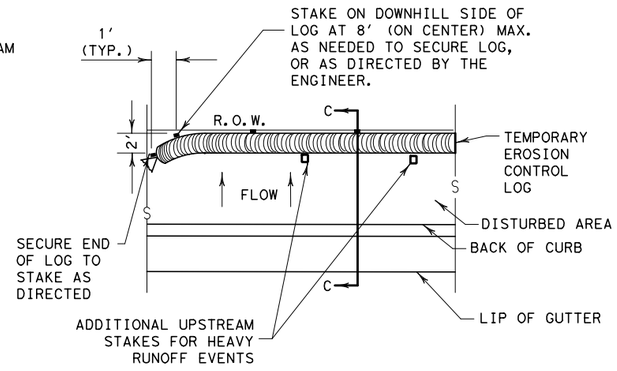


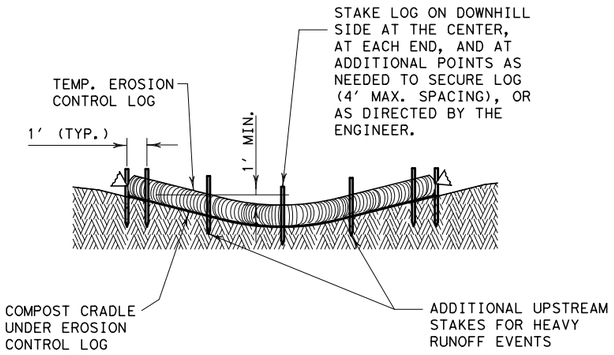
PLAN VIEW



PLAN VIEW



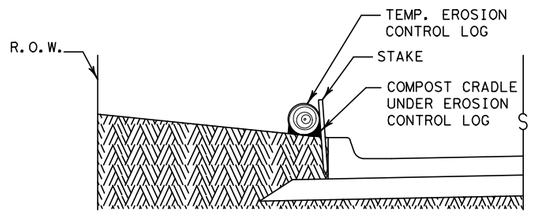
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

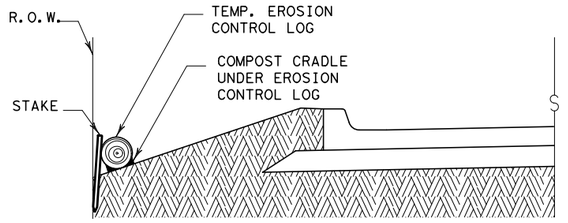
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

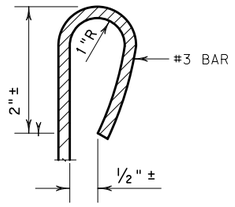
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

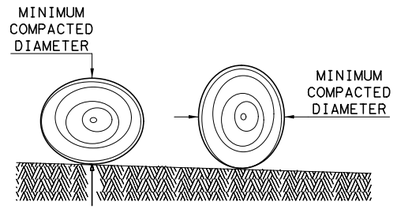
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0068	08	067		US 87	
	DIST	COUNTY			SHEET NO.	
	ABL	HOWARD			173	

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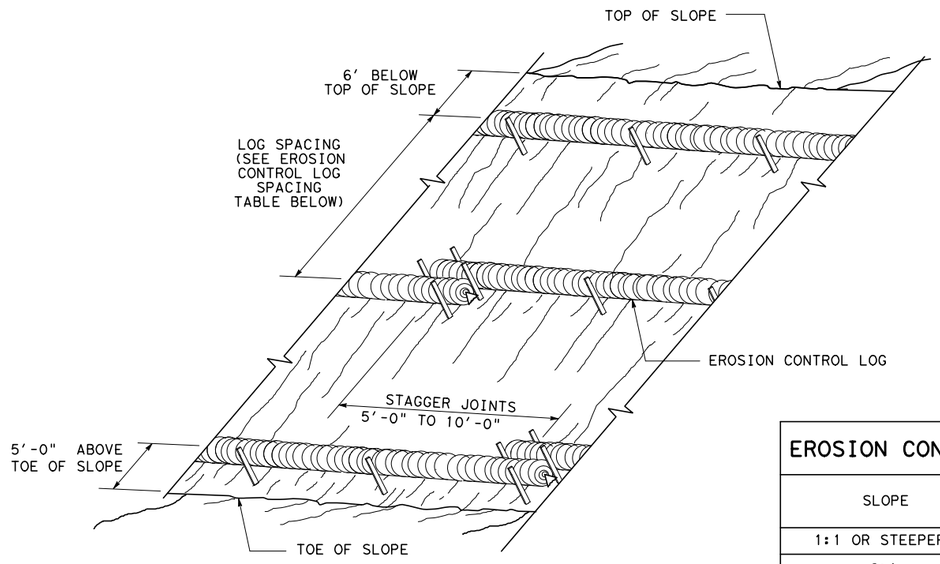
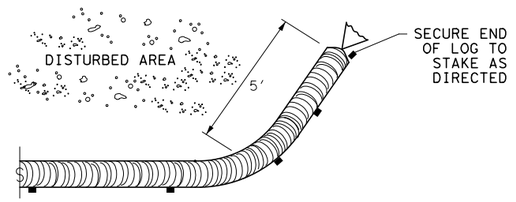


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

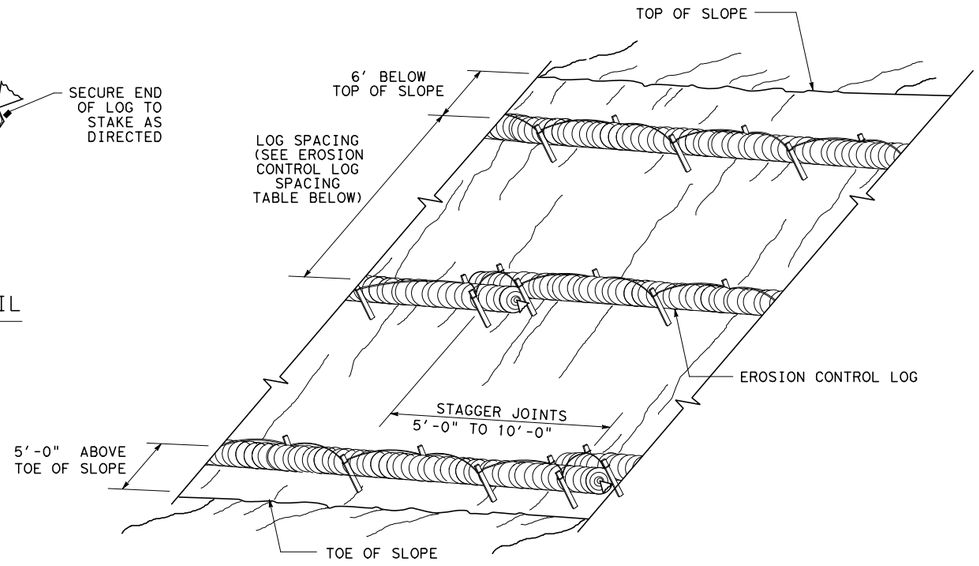
CL-SST



END SECTION RAP DETAIL

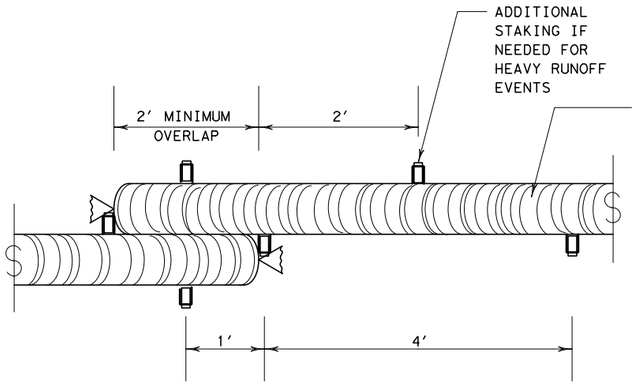
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

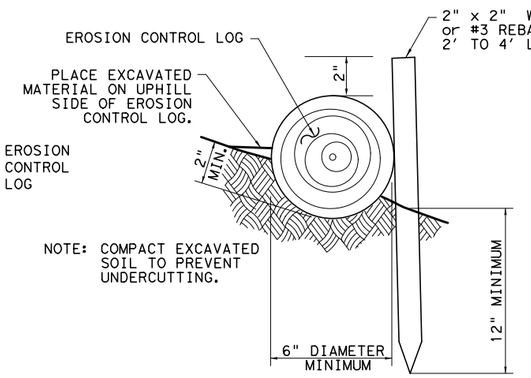
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

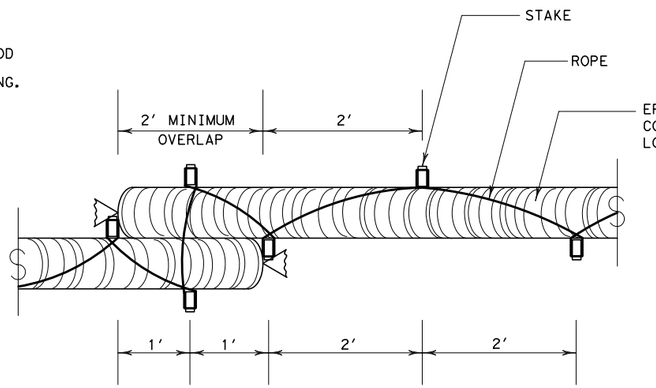


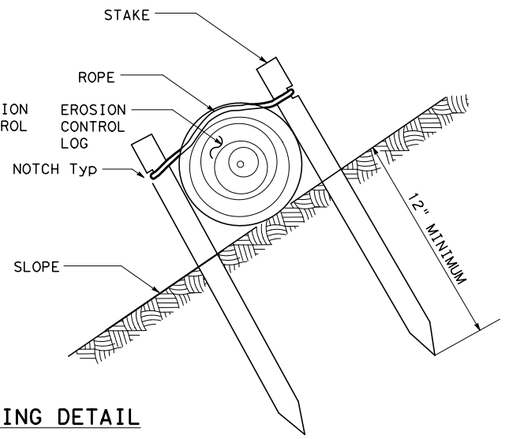


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

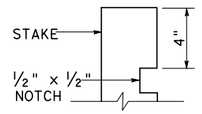
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0068	08	067	US 87	
	DIST	COUNTY		SHEET NO.	
	ABL	HOWARD		174	

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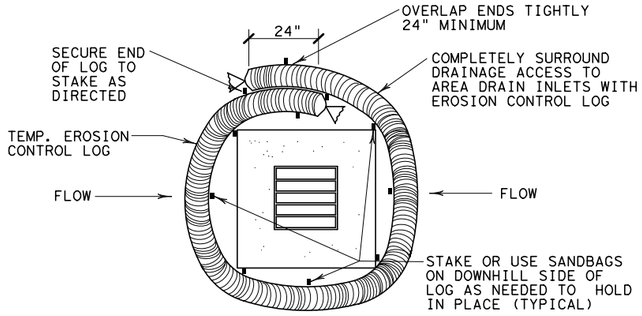
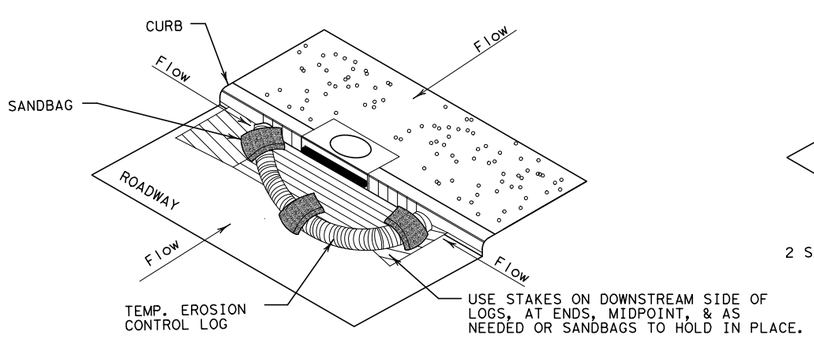


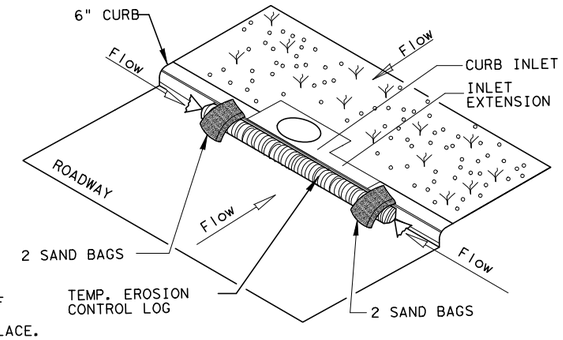
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

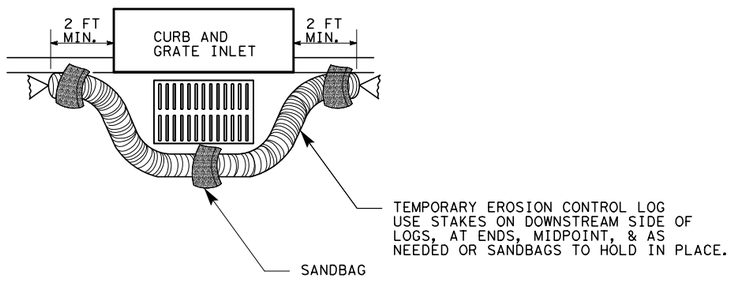
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

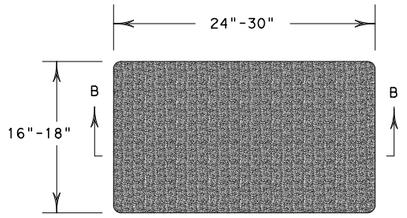
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

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REVISIONS	0068	08	067	US 87
	DIST	COUNTY		SHEET NO.
	ABL	HOWARD		175