SEE SHEET 2 FOR INDEX OF SHEETS

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

FHWA TEXAS DIVISION	PROJECT NO.		SHEET NO.
	F2021(828)		1
STATE	DISTRICT	COUNTY	
TEXAS	LFK	HOUSTON	
CONTROL	SECTION	JOB	HIGHWAY NO.
1875	02	027	FM 2022

FUNCTIONAL CLASS.: RURAL MAJOR COLLECTOR
DESIGN SPEED = 30 MPH
ADT (2019) = 865

***DESIGN SPEED APPLICABLE ONLY TO THE DESIGN ELEMENTS AFFECTED BY THE SCOPE OF THE HSIP PROJECT.**

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

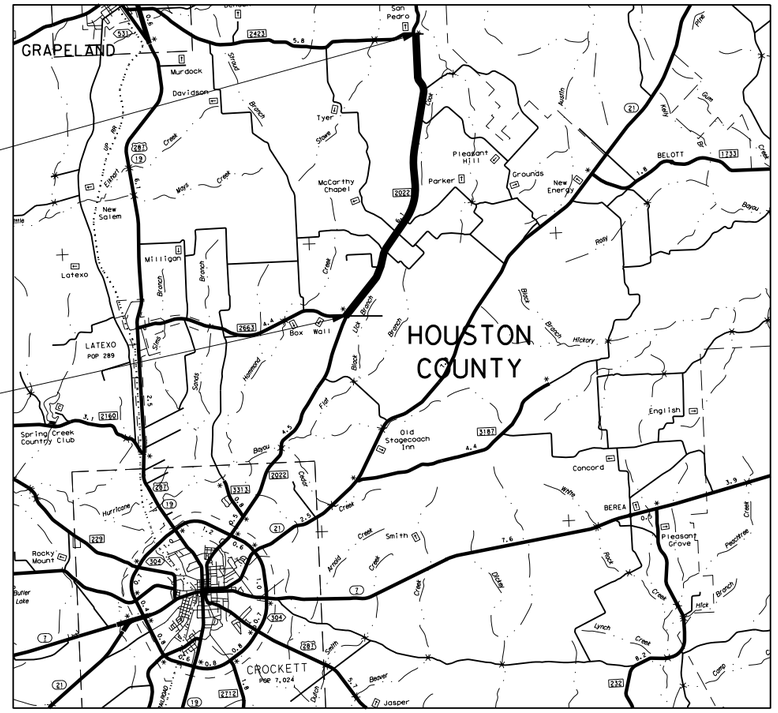
PROJECT F2021(828)

FM 2022
HOUSTON COUNTY

NET LENGTH OF PROJECT = 31968.00 FT. = 6.055 MI.

LIMITS: FROM FM 2423 TO FM 2663

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENT PROJECTS
CONSISTING OF PROVIDE ADDITIONAL
PAVED SURFACE WIDTH



BEGIN PROJECT
CSJ: 1875-02-027
STA 650+83.00
REF MRK 352+1.282
LAT +31.476241
LONG -95.378417
PREVIOUS PROJECT TIE
PROJECT NO. C 1875-2-21
CSJ 1875-02-021
TIE-IN STA 650+83.00

END PROJECT
CSJ 1875-02-027
STA 331+15.00
REF MRK 358+1.325
LAT +31.395710
LONG -95.404818
PREVIOUS PROJECT TIE
PROJECT NO. C 1875-2-21
CSJ 1875-02-021
TIE-IN STA 331+15.00

NOT TO SCALE

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

FINAL PLANS

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

CONSTRUCTION WORK ON THIS PROJECT WAS PERFORMED IN ACCORDANCE WITH PLANS, CONTRACT AND APPROVED CHANGE ORDERS.

_____ DATE _____

BARRICADES AND WARNING SIGNS

PROVIDE AND ERECT BARRICADES AND WARNING SIGNS IN ACCORDANCE WITH THE BARRICADE & CONSTRUCTION STANDARDS, TCP STANDARDS, THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND AS DIRECTED.

RECOMMENDED FOR LETTING: _____

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/1/2021
DISTRICT DESIGN ENGINEER

APPROVED FOR LETTING: _____

DocuSigned by:
Kelly O. Morris, P.E.
F044211639424B4...
6/1/2021
DISTRICT ENGINEER

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

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SHEET	SHEET DESCRIPTION
	GENERAL
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5,5A-5B	QUANTITY SHEET
6-19	QUANTITY SUMMARIES
20-23	SUMMARY OF SMALL SIGNS
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# 36	TCP(2-1)-18
# 37	TCP(2-2)-18
# 38	TCP(3-1)-13
# 39	TCP(3-3)-14
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SHEET	SHEET DESCRIPTION
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# 84	SMD(SLIP-2)-08
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# 86	SMD(TWT)-08
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# 90	PM(1)-20
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# 93	D & OM(2)-20
# 94	D & OM(3)-20
# 95	D & OM(4)-20
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	ENVIRONMENTAL ISSUES
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115	EROSION CONTROL DETAILS
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	ENVIRONMENTAL ISSUES STANDARDS
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# 119	EC(2)-16
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STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

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

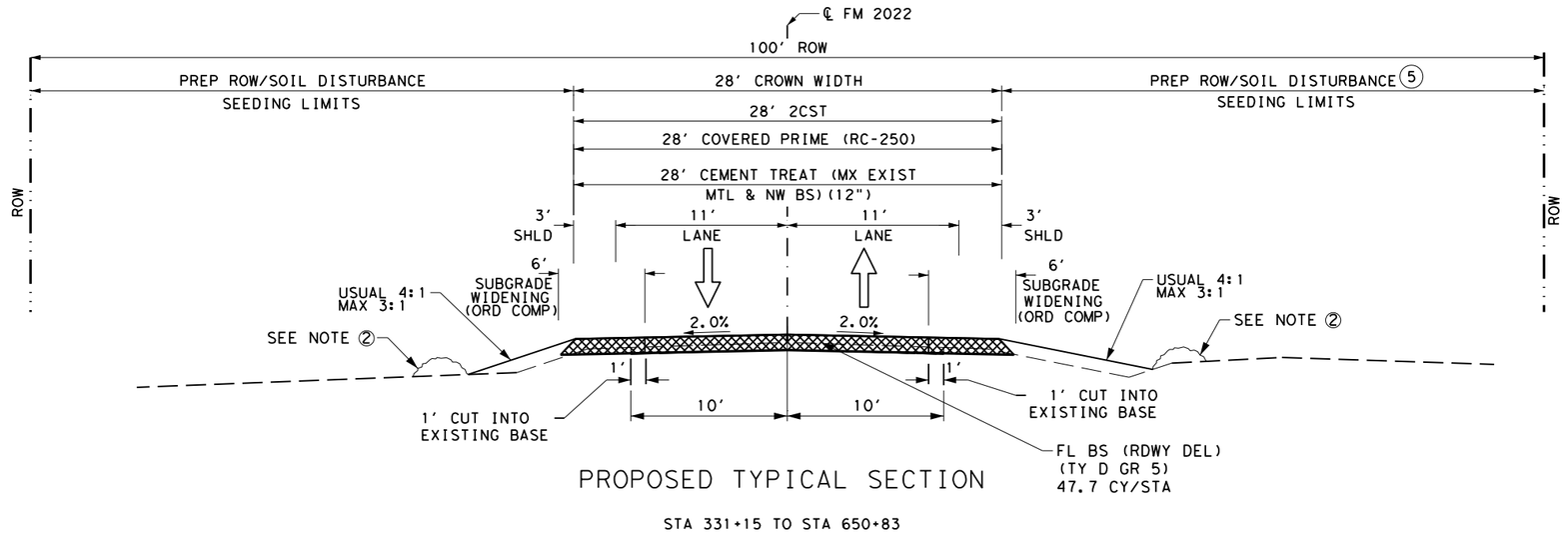
DocuSigned by:
Elizabeth Ortego, P.E.

ELIZABETH ORTEGO, P.E. — DATE: 6/2/2021

INDEX OF SHEETS

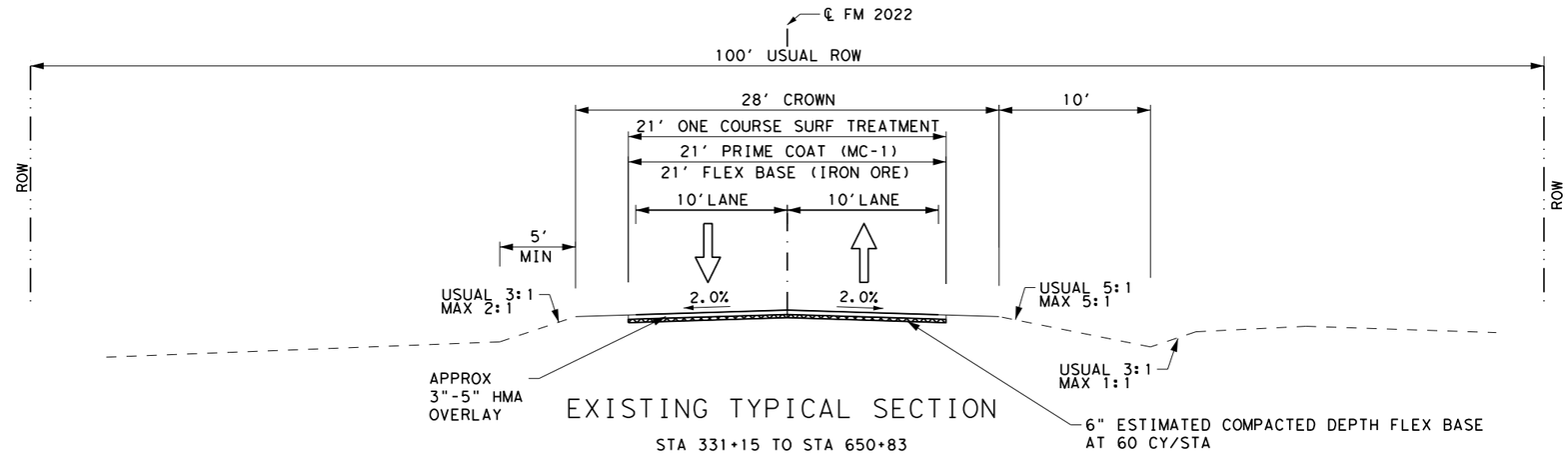
TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	**COUNTY**		**SHEET NO.**
LFK	HOUSTON		2



PROPOSED TYPICAL SECTION

STA 331+15 TO STA 650+83



EXISTING TYPICAL SECTION

STA 331+15 TO STA 650+83

NOTES:

① USE CARE WHEN WIDENING & MIXING OVER CROSS-DRAINAGE STRUCTURES. DEPTH OF WIDENING MAY NEED TO BE REDUCED TO ACCOMMODATE DRAINAGE FEATURES.

② BLADE 4" OF EXISTING TOPSOIL AND WINDROW OUTSIDE WORK AREA, THEN RETURN SLOPES UPON COMPLETION OF ROADWAY WORK. THIS OPERATION WILL BE PAID FOR ONCE UNDER ITEM 150, BLADING. IF ADDITIONAL MATERIAL IS NEEDED TO RETURN SLOPES, THIS WILL BE PAID FOR UNDER ITEM 132, EMBANKMENT (VEH)(ORD COMP)(TY B)(CY) AS DIRECTED.

③ REMOVAL OF EXISTING SURFACE AND/OR BASE WILL BE SUBSIDIARY TO ITEM 112 "SUBGRADE WIDENING".

④ PULVERIZE EXISTING BASE AND SURFACE AND SPREAD ACROSS WIDENED SUBGRADE. A MILLING MACHINE MAY BE REQUIRED TO BREAK DOWN STABILIZED MATERIAL OR HMA. THIS OPERATION WILL NOT BE PAID FOR DIRECTLY, BUT CONSIDERED SUBSIDIARY TO VARIOUS BID ITEMS.

⑤ TRIM OVERHANGING LIMBS TO A HEIGHT OF 60'.

⑥ THERE ARE LOCATIONS WITHIN THE PROJECT LIMITS WHERE TXDOT MAINTENANCE FORCES HAVE REPAIRED BASE FAILURES. THESE LOCATIONS WERE REPAIRED WITH APPROXIMATELY 12"CEMENT TREATED BASE OR HMA. THE LOCATION AND LENGTH OF REPAIRS IS UNKNOWN. REGARDLESS OF EXISTING MATERIAL ENCOUNTERED, SCARIFY AND RESHAPE TO DEPTHS AND WIDTHS SHOWN ON TYPICAL SECTIONS. THERE WILL BE NO ADDITIONAL COMPENSATION FOR AREAS PREVIOUSLY REPAIRED WITH TXDOT MAINTENANCE FORCES.

SEQUENCE OF CONSTRUCTION (STA 331+15 TO STA 650+83):

1. WIDEN SUBGRADE LT & RT.
2. PLACE FL BS (RDWY DEL)(TY D GR 5). PLACE COVERED PRIME WEEKLY AND BKFL PAV. EDGES DAILY.
3. 12" CEM TRT(MX EXIST MTL & NW BS).
4. PLACE LEVEL-UP FULL WIDTH.
5. APPLY 2CST, SEED & FERTILIZE.
6. PLACE FINAL PAVEMENT MARKINGS AND MARKERS.

SCALE 1" = 10'

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

TYPICAL SECTIONS

TEXAS DEPARTMENT OF TRANSPORTATION
©2021

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		3

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GENERAL NOTES:

Existing regulatory, warning and guide signs within project limits are to remain visible to the traveling public at all times. If a sign must be repositioned during construction operations, move and install the sign to an approved location. Use care when working near existing signs and repair or replace signs damaged by work operations. All work involved repositioning existing signs will be subsidiary to various bid items.

Furnish materials and make repairs to the existing roadway at any location damaged by construction operations. This work shall be done in an approved manner and will be subsidiary to various bid items.

Ensure drainage structures and outfall channels constructed on this project are free of silt and debris at the time of project acceptance. Final clean out work will be subsidiary to various bid items.

Maintain adequate surface drainage throughout the project limits during all phases of construction.

Provide suitable access at all times to adjacent businesses, private property and side roads.

When construction work necessitates the moving of mailboxes, temporarily relocate them as necessary to keep them clear of construction operations and convenient for the mail carrier. Mounts for temporarily relocating mailboxes shall conform to the Department's "Compliant Work Zone Traffic Control Device List" or the mailbox standard. Temporary relocation of mailboxes will be subsidiary to various bid items.

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

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

Jesse Sisco Jesse.Sisco@txdot.gov
Praveen Ramanathan Praveen.Ramanathan@txdot.gov

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

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:
https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/
All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Project Mowing

Mow the highway right of way within the project limits a maximum of 3 cycles per year as directed. Mowing will not be measured or paid for directly, but will be subsidiary to various bid items.

Mow at locations where contract work, equipment or stockpiles conflict with TxDOT's mowing operations. Mowing will not be measured or paid for directly, but will be subsidiary to various bid items.

The equipment used for mowing shall consist of approved mowing units capable of mowing on slopes without marring finished slope surfaces or injuring existing growth. The minimum cutting width shall not be less than 5 ft., unless otherwise approved.

Mow all areas of existing vegetation and vegetation placed during the project as directed. The mowing height shall be 5 in. unless otherwise directed. Repair portions of sod or grass that are injured during mowing operations as directed.

Mow as close as possible to all fixed objects, exercising extreme care not to damage trees, plants, shrubs, signs, delineators or other appurtenances which are part of the facility. Hand trim around such objects, unless otherwise specified.

Use safety chains or other manufacturer's safety device to prevent damage to people or property caused by flying debris propelled out from under rotary mowers. Chains shall be a minimum size of 5/16 in. and links spaced side by side around the mower's front, sides and rear. When mowing at the specified cutting height, the chains shall be long enough to drag the ground. If at any time, it is determined mowing or trimming equipment is defective to the point that it may affect the quality of work or create an unsafe condition, then that equipment shall be immediately repaired or replaced.

Litter Pickup

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

In addition to the requirements in Item 5, Section 11, Final Cleanup; remove litter from the right of way at locations where the Contractor may be required to mow. Litter pickup will not be measured or paid for directly, but will be subsidiary to various bid items.

The equipment used for litter pickup shall be approved.

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

For removal of large dead animals, contact nearest TxDOT maintenance section for disposal instructions. Do not bury animal carcasses on State property.

Item 5: Control of the Work

In the event utility lines needing unforeseen adjustments are encountered during construction operations, alter operations and continue to prosecute the contract in such a manner that will allow utility adjustments to be made by others. An extension of working time may be granted for any delays caused by the utility adjustments if deemed necessary.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/bridge.html#design. Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Item 7: Legal Relations and Responsibilities

No significant traffic generator events identified.

This project has a soil disturbance of 5 acres or more.

The Department will be considered a primary operator for Operational Control Over Plans and Specifications as defined in TPDES GP TXR 150000 for construction activities in the right of way. The Department will post a large site notice, file a notice of intent (NOI), notice of change (NOC), if applicable, and a notice of termination (NOT) along with other requirements per TPDES GP TXR 150000 as the entity having operational control over plans and specifications for work shown on the plans in the right of way.

The Contractor will be considered a primary operator for Day-to-Day Operational Control as defined in TPDES GP TXR 150000 for construction activities in the right of way. In addition to the Department's actions, the Contractor shall file a NOI, NOC, if applicable, and NOT and post a large site notice along with other requirements as the entity of having day-to-day operational control of the work shown on the plans in the right of way. This is in addition to the Contractor being responsible for TPDES GP TXR 150000 requirements for on- right of way and off- right of way PSL's. Adhere to all requirements of the SWP3 as shown on the plans.

Dispose of all vegetative matter and any other materials removed from State Right of Way in accordance with applicable environmental laws, rules, regulations and requirements.

Burning locations must be approved by the Engineer prior to beginning. Burning activities must be conducted in compliance with Texas Commission on Environmental Quality (TCEQ) regulations. Notify the Engineer when burning activities will take place.

In order to maintain compliance with Chapter 64 of the Texas Parks and Wildlife Code and Migratory Bird Treaty Act (MBTA), construction activities that may affect nests (i.e. tree

removal, tree limbing, bridge work) shall be conducted outside of the nesting season (March 15 to September 15). In the event birds or active nests (eggs and/or nestlings present) are encountered, contact the engineer prior to conducting work.

Item 8: Prosecution and Progress

For this project, working days will be computed and charged in accordance with Item 8, Section 3.1.4, "Standard Workweek".

Submit monthly progress schedules no later than the 20th calendar day of the month. Failure to comply with this deadline may result in the Engineer withholding progress (monthly) payments.

Provide a Critical Path Method (CPM) Construction Schedule unless otherwise approved.

Item 100: Preparing Right of Way

The equipment used to trim limbs shall be approved. A boom axe will not be allowed.

Item 105: Removing Treated and Untreated Base and Asphalt Pavement

Material removed by this operation will become the property of the Contractor.

Item 132: Embankment

Hauling materials with scrapers across or along existing roadways will not be permitted without written permission.

Drying of material deeper than 6 inches below subgrade elevations will not be permitted without written permission.

Grading required for shaping driveways and side road turnouts for pipe culverts at all access locations, will be subsidiary to various bid items.

All blading, rolling, and scraper work to construct and remove temporary slopes adjacent to pavement drop-offs, will be subsidiary to various bid items.

Compact embankment material used to reshape existing slopes to a density comparable with adjacent undisturbed material to the satisfaction of the Engineer.

Item 150: Blading

Use blading to reshape slopes and ditches as directed.

Item 158: Specialized Excavation Work

Use specialized excavation work at structures to improve drainage as directed.

Item 162: Sodding for Erosion Control

Provide Bermuda block sod unless St. Augustine is the prevailing grass cover at particular placement locations. Provide St. Augustine block sod at those locations.

Item 166: Fertilizer

Fertilize all seeded or sodded areas.

Item 168: Vegetative Watering

Equip water trucks with sprinkler systems capable of watering all of the entire seeded or sodded areas from the roadway.

Water all newly placed sodded or seeded areas at the time of installation. Thereafter, maintain the sodded or seeded areas in a well-watered condition, at no time allow the areas to dry to a condition where water stress is evident.

Item 169: Soil Retention Blankets

In areas designated for soil retention blankets (SRB) in the plans, furnish only spray-on products listed on the Approved Product List for Erosion Control Products based upon the Class and Type specified in the plans. Any substitution to spray –on products must be approved in writing, be listed on the Approved Product List for Erosion Control Products based upon Class and Type, and shall not contain UV degradable, photodegradable or polypropylene materials.

Item 247: Flexible Base

Provide flexible base with a minimum plasticity index of 2.

Provide flexible base material with a minimum Bar Linear Shrinkage of 2% as determined by Test Method Tex-107-E, Part II.

Stockpiling of base material will not be required if testing has been performed and the material has been approved at the source. Deliver approved specified materials to the project.

Compaction requirements for flexible base are ordinary compaction.

Item 275: Cement Treatment (Road-Mixed)

No strength requirement is specified. The target cement content is 3%.

Compact and sprinkle pulverized sections for dust control as directed for traffic use.

Cement treat pulverized sections within 2 days, unless otherwise authorized.

Pulverization and cement treatment of the existing roadway will not be allowed from October 1 through March 31 without written permission.

Provide all profile measurement to the Engineer in electronic data files within 3 days after placement of the prime coat using the format specified in Tex-1001-S. The Engineer will use Department software to evaluate longitudinal profiles to determine areas requiring corrective action. Correct 0.1-mi. sections having an average international roughness index (IRI) value greater than 100.0 in. per mile to an IRI value of 100.0 in. per mile or less for each wheel path, unless otherwise shown on the plans.

No strength requirement is specified. The target cement content is 3%.

Item 302: Aggregates for Surface Treatments

When using Type E, furnish Type E aggregate consisting of crushed stone or natural limestone rock asphalt.

When using Type PE aggregate, furnish Type PE aggregate consisting of precoated crushed stone or natural limestone rock asphalt.

Locate aggregate stockpiles off the highway right of way unless otherwise approved.

Aggregate stockpile locations shall be approved prior to stockpiling.

When directed, flush aggregate stockpiled for surface treatment with water to remove excessive dust particles, in such sequence that will permit free water to drain from the stockpiled aggregate prior to surfacing operations. This work will be subsidiary to various bid items.

Furnish aggregates for the final surfaces of travel lanes with a minimum class A surface aggregate classification.

Item 316: Seal Coat

Apply the covered prime weekly.

Open season for asphalt placement is from May 1 thru August 31. Do not place asphalt outside the open season without written approval.

The uniformity and rate of distribution of asphaltic material will be checked periodically during construction. Apply the seal coat in lane widths unless otherwise directed. Where extra width of surfacing has been provided in transitions and climbing lanes, seal the entire surface width.

Resurface county road turnouts and intersection areas as directed.

Place surface on driveways and other road turnouts prior to placing the final roadway surface.

Cease application of asphalt 2 hr. before sunset unless otherwise directed.

Cure the first course of the surface treatment as directed prior to placing the second course.

Cure the surface treatment as directed prior to placement of the overlay.

Cure the covered prime a minimum of 14 days prior to placement of the surface treatment.

Use precoated aggregate with AC-15P or AC-10-2TR, and use non-precoated aggregate with RC-250 and CRS-2P.

Furnish medium pneumatic tire rollers in accordance Item 210, "Rolling". Provide enough rollers to perform the work as directed.

Sweep all roadways with a powered rotary broom prior to placement of the surface treatment to remove all loose or excess material or debris. After rolling, sweep as soon as aggregate has sufficiently bonded to remove excess. Use a vacuum broom on all roadway sections having curb and gutter and all roadway sections within the city limits of any city.

Item 400: Excavation and Backfill for Structures

Replace excavated material deemed unsuitable for backfilling with material approved by the Engineer, paid for under the pertinent bid items or as extra work. This provision does not apply to excavated materials that are too wet and are replaced for the Contractor's convenience to expedite the work.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use. Additional material will be subsidiary to various bid items.

Item 421: Hydraulic Cement Concrete

The Engineer will provide curing facilities and strength testing equipment for acceptance testing at Houston County Maintenance Facility, 1123 East Loop 304, Crockett, TX 75835.

Item 427: Surface Finishes for Concrete

Provide a rub finish for Surface Area I.

Item 432: Riprap

Stone riprap will require the placement of filter fabric prior to placement of stones.

Welded wire fabric will not be allowed for reinforcing concrete riprap. Reinforcing shall consist of No. 3 or 4 bars meeting the requirements of grade 60 reinforcing steel. Place bars on 12 in. centers in each direction, supported on reinforcing chairs.

Item 462: Concrete Box Culverts and Drains

Provide cast-in-place box culverts.

Limit work on box culverts crossing the roadway to one side of the roadway at a time. No work shall begin on the opposite side of the roadway until backfilling of the first side of the box culvert being extended is complete.

Item 464: Reinforced Concrete Pipe

Lay each private entrance or side road pipe culvert to the line and grade as directed.

At locations where existing driveway pipes are to be removed and replaced, replace the top 6 in. of the existing driveway with material equal to or better than the existing driveway material. This work will be subsidiary to various bid items.

Limit work on pipe culverts crossing the road to one side of the roadway at a time. No work shall begin on the opposite side of the roadway until backfilling the first side of the pipe culvert being extended is complete.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use.

Item 466: Headwalls and Wingwalls

Provide cast-in-place headwalls and wingwalls.

Item 467: Safety End Treatment

Use Type II precast concrete units of the same style and design.

Provide 12 in. deep toewalls on Type II precast safety end treatments.

To improve drainage, grade existing ditch within ten feet of proposed safety end treatment. This work shall be subsidiary to Item 467.

When excavation does not generate enough material to complete the backfill, additional material must be approved prior to use. Additional material will be subsidiary to various bid items.

Check each location where safety end treatments are to be installed to verify pipe lengths shown will produce the desired slope. Extra pipe will be paid for, but removing and replacing safety end treatment units previously installed under this Contract will not be paid for.

Place safety end treatments along the same slope as the pipe.

Item 480: Cleaning Existing Culverts

Certain box culverts will require cleaning to remove silt and other debris. Waters carried by these box culverts have been determined to be waters of the United States and are under jurisdiction of the U.S. Army Corps of Engineers. Silt and other debris removal shall be immediately hauled to an upland location for dumping. Material will not be side cast into either the water channel or its banks. Removal of the sediment is limited to the minimum necessary to restore the waterway to its configuration when the structure was built. No work will be allowed outside of the right-of-way. This work shall also be restricted to a distance of no more than 10 ft. from the end of the structure.

Item 502: Barricades, Signs, and Traffic Handling

Traffic Control Plan (TCP):

Ensure the Contractor's Responsible Person (CRP) or their alternate for Barricades, Signs and Traffic Handling is available at all times and able to receive instructions from the Engineer or authorized Department representative. The CRP shall be a person that is usually at the project site during normal working hours.

For protection of the traveling public, direct traffic through the work area using signs, flaggers and other devices. Required signs are shown in the plans on the Barricade and Construction Standards and Traffic Control Plan Sheets. The latest edition of the "Texas Manual on Uniform Traffic Control Devices" shall also be used as a guide for handling traffic on this project.

Use "Do Not Pass" (R4-1) signs to mark the beginnings of roadway sections where passing is prohibited and use "Pass With Care" (R4-2) signs to mark the beginnings of roadway sections where passing is permitted. Install signs at the time signing for project limits are erected. Sign placement shall be verified and approved.

Install "No Center Line" (CW8-12) signs at 2-mile intervals. Install "Loose Gravel" (CW8-7) and "Next XX Miles" (CW7-3aP) signs as directed prior to the start of surface treatment operations.

Restrict construction work to single lane widths with only minor disruptions in traffic flow. Lane closures shall conform to the Traffic Control Plan for lane closures as shown in the plans. No overnight closures will be permitted.

Limit lane closures for 2 lane roads to 1 mi. in length, unless otherwise approved.

Lane closure lengths can exclude the end tapers.

Plan the sequence of work to minimize the time lane closures are in place. Install lane closures only where construction operations are anticipated to start within 1 hr. and limited to the amount of lane that can be reached by the construction activity within 2 hr. unless otherwise approved.

Provide flashing arrow panels to supplement required signs and devices for lane closures.

Provide temporary rumble strips as shown on work zone rumble strip standards.

Provide a pilot car to lead traffic through the work area. The pilot car will not be paid for directly, but will be subsidiary to various bid items.

Halt traffic during the time asphalt is being applied to the roadway. No vehicles will be allowed to pass the asphalt distributor during asphalt application.

Provide adequate flaggers to protect the traveling public when working on or near a roadway carrying traffic. All flaggers shall wear hardhats and reflective vests.

Install "Be Prepared to Stop" (CW3-4) and "Flagger Ahead" (CW20-7aD) signs when flaggers are present. Position the signs where good visibility and traffic control can be maintained.

Use a flashing arrow board in addition to the required signs to warn motorists of flaggers.

Use additional flaggers at roadway intersections to direct traffic entering the work area, when deemed necessary by the Engineer.

Open all traffic lanes to traffic at the close of work each day.

Install "Pavement Ends" (CW8-3) and "30 mph" (CW13-1P) signs where the paved surface of the road ends. Use flashing arrow panels to supplement these signs during nighttime hours.

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

Install "Shoulder Drop-Off" (CW8-9aT) and "Uneven Lanes" (CW8-11) signs at one-half mile spacings as the hot mix asphalt is placed, unless otherwise directed. Maintain signs until the condition is eliminated.

Install vertical panels or drums at 100-ft. spacings where drop-offs or construction work occurs along edges of existing pavement. Unless otherwise authorized, these shall remain in place until final striping.

Install "Slow Down on Wet Road" (CW8-5aT), "Shoulder Drop-Off" (CW8-17), "Uneven Lanes" (CW8-11), "Bump" (CW8-1) and "Soft Shoulder" (CW8-4) signs during construction as directed.

Restrict construction operations so that no drop off along the edge of pavement will remain overnight.

All blading, rolling and scraper work to construct and remove temporary slopes adjacent to pavement drop-offs, will be considered subsidiary to various bid items.

Notify the Engineer prior to placing any materials or equipment on the right of way. Locate equipment, stockpiles or other materials not in use as far as possible from the driving lanes and in no case closer than 30 ft. unless otherwise authorized. Any equipment, stockpiles, or materials placed within 30 ft. of the driving lane must have adequate signs, barricades or other warning devices as approved. As a minimum place an 8 ft. wide TY III Barricade or barrels on the approach side of each site that is within 30 ft. of the driving lane. Use TY III Barricade or barrels for the site similarly on the departure side if the location is within 30 ft. of the opposing traffic lane.

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.

Texas Transportation Code 547.105 authorizes the use of warning lights to promote safety and provides an effective means of gaining the travelling public's attention as they drive in areas where construction crews are present. In order to influence the public to move over when high risk construction activities are taking place, minimize the utilization of blue warning lights. These lights must be used only while performing work on or near the travel lanes or shoulder where the travelling public encounters construction crews that are not protected by a standard work zone set up such as a lane closure, shoulder closure, or one-way traffic control. Refrain from leaving the warning lights engaged while travelling from one work location to another or while parked on the right of way away from the pavement or a work zone.

Temporary stop lines as shown on TCP (2-2)-18 should be omitted.

Provide an illuminated flagger station when nighttime work is performed.

All workers on TxDOT right-of-way shall wear reflective clothing meeting ANSI Class II requirements during the day and ANSI Class III requirements during the night.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

Locations and types of BMPs may require adjustments prior to or after placement as directed by the Engineer. Adjustments should be made to ensure BMPs are working effectively and maintain compliance with the Construction General Permit. Notify the Engineer prior to making adjustments.

Item 530: Intersections, Driveways, and Turnouts

Welded wire fabric will not be allowed for reinforcing concrete driveways. Use reinforcing steel consisting of No. 3 or 4 bars meeting the requirements of grade 60 reinforcing steel. Place bars on 12 in. centers in each direction, supported on reinforcing chairs.

Unless otherwise directed, install 1/2 in. pre-molded expansion joint material between existing concrete and new concrete.

Item 560: Mailbox Assemblies

Repair and, if necessary, replace mailboxes damaged by construction operations.

The number and type of mailbox assemblies shown in the plans are for estimating purposes; actual quantities may vary.

Use 1 size 3 reflector mounted as directed for single and double mailbox assemblies.

Use 1 strip of reflective sheeting for multiple mailbox assemblies in lieu of the Type 2 object marker shown on the mailbox standards. Each strip shall be approximately 12 in. wide. Use reflective sheeting conforming to DMS-8600.

Item 644: Small Roadside Sign Assemblies

Install adjacent signs with bottom edges at equal heights.

Sign placement shall be in accordance with the "Sign Crew Field Book" and 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. Stake all sign support locations for verification and approval.

Existing supports shall not be reused, and shall become the property of the Contractor.

Salvage all sign blanks to be removed and deliver the same day to TxDOT's facility at Houston County Maintenance Facility, 1123 East Loop 304, Crockett, TX 75835.

Place relocated signs as close as feasible to existing signs, unless placement conflicts with the Sign Crew Field Book.

Prior to ordering signs, advisory speeds at horizontal curves shall be verified by the department.

Wrap red retroreflective tape (NGIP Code 801-49-87-1008) around the support post of all STOP, YIELD, and DO NOT ENTER signs. Tape shall be placed approximately 4 feet above the surface of the edge of the roadway adjacent to the sign and shall be wrapped to a height of 12 inches. The tape and the placement of the tape on the sign posts shall be subsidiary to the sign assembly.

Item 662: Work Zone Pavement Markings

Standard work zone pavement markings shall be paint and glass beads or thermoplastic.

Install short term pavement markings (removable) on the finish course of the overlay immediately following final rolling, offset from lane lines so there will be no conflict with permanent stripes.

Place short term pavement markings on the level-up course of the hot mix asphalt and the existing pavement after planning.

Place short term pavement markings on the surface treatment and level-up course immediately following final rolling.

After placement of permanent striping on the finish course, remove all short term pavement markings.

Furnish Type II glass beads conforming to DMS-8290, “Glass Traffic Beads”, for hot applied thermoplastic and traffic paint markings.

Item 666: Reflectorized Pavement Markings

Remove loose aggregate immediately prior to placing pavement markings.

Place reflectorized pavement markings no sooner than 3 days nor later than 14 days after placement of the surface treatment.

Before construction operations begin, observe and mark existing passing/no passing zones. Passing/no passing zones shall be verified prior to placement of permanent pavement markings.

Furnish Type II glass beads conforming to DMS-8290, “Glass Traffic Beads”, for Type I and II Markings.

Place a minimum of 500 ft. of 4 in. double yellow no passing lines on the approach to all stop condition intersections for two lane roads unless otherwise shown in the plans or directed.

Item 672: Raised Pavement Markers

Place permanent raised pavement markers after permanent striping has been completed.

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

Two (2) TMAs (stationary) will be required for this project.

Two (2) TMAs (mobile) will be required for mobile operations. The contractor will be responsible for determining if multiple operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

County: Houston County **Sheet 4F**

Highway: FM 2022 **Control:** 1875-02-027

QUANTITY SHEET

CONTROLLING PROJECT ID 1875-02-027 **DISTRICT** Lufkin **COUNTY** Houston
HIGHWAY FM 2022

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1875-02-027**			
		PROJECT ID		**A00133637**			
		COUNTY		**Houston**			
		HIGHWAY		**FM 2022**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	319.680		319.680	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	176.000		176.000	
	112-6001	SUBGRADE WIDENING (ORD COMP)	STA	320.000		320.000	
	132-6019	EMBANKMENT (VEHICLE)(ORD COMP)(TY B)	CY	1,526.000		1,526.000	
	150-6001	BLADING	STA	320.000		320.000	
	158-6003	SPEC EXCAV WORK (HYD EXCAVATOR)	HR	32.000		32.000	
	162-6002	BLOCK SODDING	SY	2,171.000		2,171.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	35,520.000		35,520.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	35,520.000		35,520.000	
	164-6021	CELL FBR MLCH SEED(PERM)(RURAL)(SANDY)	SY	71,040.000		71,040.000	
	168-6001	VEGETATIVE WATERING	MG	2,846.000		2,846.000	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	4,000.000		4,000.000	
	169-6006	SOIL RETENTION BLANKETS (CL 2) (TY F)	SY	200.000		200.000	
	204-6003	SPRINKLING (DUST CONTROL)	MG	1,000.000		1,000.000	
	247-6138	FL BS (RDWY DEL) (TY D GR 5)	TON	40,799.000		40,799.000	
	275-6001	CEMENT	TON	1,790.000		1,790.000	
	275-6023	CEMENT TREAT(MX EXST MTL & NW BS)(12")	SY	99,456.000		99,456.000	
	315-6005	FOG SEAL (SS-1 OR CSS-1)	GAL	3,979.000		3,979.000	
	316-6060	ASPH (RC-250)	TON	106.000		106.000	
	316-6417	AGGR (TY E OR L GR 5)	CY	766.000		766.000	
	316-6433	AGGR(TY PE,TY-PL,TY-E,TY-L GR-4)(SAC-B)	CY	905.000		905.000	
	316-6523	ASPH (AC-15P, AC-10-2TR, OR CRS-2P)	TON	390.000		390.000	
	400-6005	CEM STABIL BKFL	CY	55.240		55.240	
	403-6001	TEMPORARY SPL SHORING	SF	3,840.000		3,840.000	
	420-6071	CL C CONC (COLLAR)	EA	6.000		6.000	
	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	CY	95.000		95.000	
	462-6004	CONC BOX CULV (4 FT X 3 FT)	LF	10.000		10.000	
	462-6008	CONC BOX CULV (5 FT X 4 FT)	LF	16.000		16.000	
	462-6010	CONC BOX CULV (6 FT X 3 FT)	LF	18.000		18.000	
	462-6011	CONC BOX CULV (6 FT X 4 FT)	LF	34.000		34.000	
	462-6013	CONC BOX CULV (6 FT X 6 FT)	LF	28.000		28.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	808.000		808.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	116.000		116.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	8.000		8.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	10.000		10.000	
	466-6010	HEADWALL (CH - FW - 0) (DIA= 42 IN)	EA	1.000		1.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	1.000		1.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1875-02-027 **DISTRICT** Lufkin **COUNTY** Houston
HIGHWAY FM 2022

		CONTROL SECTION JOB		**1875-02-027**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00133637**			
		COUNTY		**Houston**			
		HIGHWAY		**FM 2022**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	466-6104	HEADWALL (CH - PW - 0) (DIA= 54 IN)	EA	1.000		1.000	
	466-6139	HEADWALL (CH - PW - S) (DIA= 66 IN)	EA	1.000		1.000	
	466-6153	WINGWALL (FW - 0) (HW=6 FT)	EA	3.000		3.000	
	466-6185	WINGWALL (PW - 2) (HW=10 FT)	EA	1.000		1.000	
	466-6194	WINGWALL (PW - 2) (HW=5 FT)	EA	2.000		2.000	
	466-6195	WINGWALL (PW - 2) (HW=6 FT)	EA	5.000		5.000	
	466-6197	WINGWALL (PW - 2) (HW=8 FT)	EA	2.000		2.000	
	466-6198	WINGWALL (PW - 2) (HW=9 FT)	EA	1.000		1.000	
	467-6358	SET (TY II) (18 IN) (RCP) (4: 1) (C)	EA	4.000		4.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	62.000		62.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	13.000		13.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	6.000		6.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	4.000		4.000	
	467-6450	SET (TY II) (36 IN) (RCP) (4: 1) (C)	EA	1.000		1.000	
	480-6001	CLEAN EXIST CULVERTS	EA	5.000		5.000	
	496-6016	REMOV STR (PIPE)	EA	33.000		33.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	21.000		21.000	
	506-6001	ROCK FILTER DAMS (INSTALL) (TY 1)	LF	1,320.000		1,320.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,320.000		1,320.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	156.000		156.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	156.000		156.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,320.000		1,320.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,320.000		1,320.000	
	530-6004	DRIVEWAYS (CONC)	SY	176.000		176.000	
	530-6005	DRIVEWAYS (ACP)	SY	1,174.000		1,174.000	
	530-6008	TURNOUTS (ACP)	SY	867.000		867.000	
	530-6016	DRIVEWAYS (BASE)	SY	4,239.000		4,239.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	31,588.000		31,588.000	
	560-6007	MAILBOX INSTALL-S (WC-POST) TY 3	EA	38.000		38.000	
	560-6008	MAILBOX INSTALL-D (WC-POST) TY 3	EA	6.000		6.000	
	560-6013	MAILBOX INSTALL-M (TWW-POST) TY 4	EA	2.000		2.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1.000		1.000	
	644-6007	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	EA	11.000		11.000	
	644-6037	IN SM RD SN SUP&AM TYS80(1)SA(U-WC)	EA	2.000		2.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	34.000		34.000	
	644-6061	IN SM RD SN SUP&AM TYTWT(1)WS(T)	EA	1.000		1.000	

QUANTITY SHEET

CONTROLLING PROJECT ID 1875-02-027 **DISTRICT** Lufkin **COUNTY** Houston
HIGHWAY FM 2022

		CONTROL SECTION JOB		**1875-02-027**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00133637**			
		COUNTY		**Houston**			
		HIGHWAY		**FM 2022**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	658-6101	INSTL OM ASSM (OM-2Z)(WFLX)SRF)SRF	EA	44.000		44.000	
	662-6004	WK ZN PAV MRK NON-REMOV (W)4"(SLD)	LF	63,936.000		63,936.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	2,954.000		2,954.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	48.164		48.164	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	9,634.000		9,634.000	
	666-6283	REF PROF PAV MRK TY I(W)4"(SLD)(090MIL)	LF	63,936.000		63,936.000	
	666-6287	REF PROF PAV MRK TY I(Y)4"(SLD)(090MIL)	LF	48,164.000		48,164.000	
	666-6291	REF PROF PAV MRK TY I(Y)4"(BRK)(090MIL)	LF	2,954.000		2,954.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	24.000		24.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	534.000		534.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	2.000		2.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	10.000		10.000	
	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	

ROADWAY SUMMARY

ITEM NO				112	132	150	204	247	275		315	316					
								(1)		(2) (3)		COVERED PRIME		1ST CRSE SURFACE TREAT(4)		2ND CRSE SURFACE TREAT(4)	
STATION TO STATION	LENGTH	WIDTH	AREA	SUBGRADE WIDENING (ORD COMP)	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	BLADING	SPRINKLING (DUST CONTROL)	FL BS (RDWY DEL) (TY D GR 5)	CEMENT	CEMENT TREAT (MX EXST MTL & NW BS)(12")	FOG SEAL (SS-1 OR CSS-1)	ASPH (RC-250)	AGGR (TY E OR L GR 5)	ASPH (AC-15P, AC-10-2TR, OR CRS-2P)	AGGR (TY-PE, E, L OR PL GR 3)	ASPH (AC-15P, AC-10-2TR, OR CRS-2P)	AGGR (TY PE, TY-PL, TY-E, TY-L GR-4) (SAC-B)
							10 GAL/SY	47.7 CY/STA	36 LBS/SY		0.04 GAL/SY	0.25 GAL/SY	1 CY/140 SY	0.50 GAL/SY	1 CY/120 SY	0.42 GAL/SY	1 CY/110 SY
	FT	FT	SY	STA	CY	STA	MG	TON	TON	SY	GAL	TON	CY	TON	CY	TON	CY
331+15.00 TO 650+83.00	31,968	28	99,456	320		320	1,000	38,668	1,790	99,456	3,979	106	766	212	1,106	178	905
SUPERELEVATION CORRECTION					1,218			2,131									
PROJECT TOTALS				**320**	**1,218**	**320**	**1,000**	**40,799**	**1,790**	**99,456**	**3,979**	**106**	**766**	**212**	**1,106**	**178**	**905**

(1) FLEX BASE UNIT WEIGHT ESTIMATE = 135 LBS/CF

(2) 3% CEMENT IS ESTIMATED. ACTUAL PERCENT OF CEMENT TO BE DETERMINED FROM BLENDED SAMPLE.

(3) SCARIFY AND RESHAPE EXISTING MATERIAL SUBSIDIARY TO ITEM 275, "CEMENT TREATMENT (EXIST & NEW)"

(4) USE PRECOATED AGGREGATE WITH AC-15P OR AC-10-2TR, AND USE NON-PRECOATED AGGREGATE WITH RC-250 AND CRS-2P.

(5) USE AS DIRECTED.

$$\text{TONS} = \frac{\text{RATE} * (\text{SGA}) * \text{SY}}{2000}$$

SPECIFIC GRAVITY OF ASPHALT
(SGA) ESTIMATED AT 1.02 * 8.3268

EROSION CONTROL SUMMARY

ITEM NO.	ITEM 164			ITEM 168	ITEM 169		ITEM 506					
				(6)							(7)	
STATION TO STATION	BROADCAST SEED (TEMP) (WARM)	BROADCAST SEED (TEMP) (COOL)	CELL FBR MLCH SEED(PERM)(RURAL) (SANDY)	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 2) (TY F)	SOIL RETENTION BLANKET (CL 1)(TY B)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	ROCK FILTER DAM (TY 1) INSTALL	REMOVE ROCK FILTER DAM	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)
	SY	SY	SY	MG	SY	SY	LF	LF	LF	LF	SY	SY
331+15 TO 650+83	35,520	35,520	71,040	2,842			1,320	1,320	1,320	1,320	156	156
AS DIRECTED			200	4	200	4,000						
PROJECT TOTALS	**35,520**	**35,520**	**71,240**	**2,846**	**200**	**4,000**	**1,320**	**1,320**	**1,320**	**1,320**	**156**	**156**

(6) 2 APPLICATIONS AT 10 GAL/SY

(7) LOCATION OF CONSTRUCTION EXITS MAY REQUIRE ADJUSTMENTS PRIOR TO OR AFTER PLACEMENT AS DIRECTED BY THE ENGINEER.

NOTE: LOCATIONS AND TYPES OF BMP'S MAY REQUIRE ADJUSTMENTS PRIOR TO OR AFTER PLACEMENT AS DIRECTED BY THE ENGINEER. ADJUSTMENTS SHOULD BE MADE TO ENSURE BMP'S ARE WORKING EFFECTIVELY AND MAINTAIN COMPLIANCE WITH THE CONSTRUCTION GENERAL PERMIT. NOTIFY THE ENGINEER PRIOR TO MAKING ADJUSTMENTS.

PREP ROW SUMMARY

ITEM NO.	100
LOCATION	PREPARING ROW
STATION TO STATION	STA
331+15 TO 650+83	319.68
PROJECT TOTAL	**319.68**

QUANTITY SUMMARIES

SHEET 1 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		6

PERMANENT PAVEMENT MARKINGS SUMMARY

STATION TO STATION	LENGTH	ITEM 533	ITEM 666			ITEM 668	ITEM 672	
		RUMBLE STRIPS (CENTERLINE)	SOLID REF PROF PAV MRK TYI(W)4"(SLD)(100MIL)	10'/40' REF PROF PAV MRK TYI(Y)4"(BRK)(100MIL)	SOLID REF PROF PAV MRK TYI(Y)4"(SLD)(100MIL)	SOLID PREFAB PAV MRK TY C (W) (24") (SLD)	1/40' REFL PAV MRKR TY II-A-A	1/80' REFL PAV MRKR TY II-A-A
	FT	LF	LF	LF	LF	LF	EA	EA
331+15 TO 650+83	31,968	31,588	63,936	2,954	48,164	24	296	238
PROJECT TOTALS		**31,588**	**63,936**	**2,954**	**48,164**	**24**	**296**	**238**

WORK ZONE PAVEMENT MARKINGS SUMMARY

ITEM NO.		ITEM 662 (9)				ITEM 6001	ITEM 6185	
STATION TO STATION	LENGTH	SOLID WK ZN PAV MRK NON-REMOV (W)4"(SLD)	SOLID WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	10'/40' WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	2/20' WK ZN PAV MRK SHT TERM (TAB)TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	FT	LF	LF	LF	EA	EA	DAY	DAY
331+15 TO 650+83	31,968	63,936	48,164	2,954	9,634	2	2	10
TOTAL		**63,936**	**48,164**	**2,954**	**9,634**	**2**	**2**	**10**

(9) ONE APPLICATION ON COVERED PRIME, ONE APPLICATION ON 1ST COURSE.

SUMMARY OF SMALL ROAD SIGNS

ITEM NO.	ITEM 644 (10)				
STATION TO STATION	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-WC)	IN SM RD SN SUP&AM TYTWT(1)WS(P)	IN SM RD SN SUP&AM TYTWT(1)WS(T)
	EA	EA	EA	EA	EA
331+15 TO 650+83	1	12	2	34	1
PROJECT TOTALS	**1**	**12**	**2**	**34**	**1**

(10) ALL "STOP, "YIELD", AND "DO NOT ENTER" SIGN SUPPORTS WRAPPED IN RED RETROFLECTIVE TAPE ARE CONSIDERED SUBSIDIARY TO ITEM 644.

QUANTITY SUMMARIES

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		7

SUMMARY OF MAILBOXES & TURNOUTS

ITEM NO		530	560		
LOCATION	OFFSET	TURNOUTS (ACP)	MAILBOX INSTALL-S (WC-POST) TY 3	MAILBOX INSTALL-D (WC-POST) TY 3	MAILBOX INSTALL-M (TWG-POST) TY 4
STATION	LT/RT	SY	EA	EA	EA
340+74	RT	16	1		
351+88	RT	16	1		
366+92	RT	16	1		
369+27	RT	16	1		
384+47	RT	23	1		
389+79	RT	17	1		
390+53	RT	16		1	
392+99	RT	16	1		
397+59	RT	23	1		
409+92	RT	16	1		
418+29	LT	16	1		
420+68	LT	16	1		
450+45	RT	16		1	
455+83	RT	16	1		
455+83	LT	16			
469+83	RT	16			1
471+94	RT	16		1	
476+06	RT	23	1		
480+22	RT	16	1		
481+90	RT	23		1	
488+12	RT	23	1		
491+88	RT	16	1		
496+74	RT	23	1		
500+62	RT	23	1		
503+61	RT	16	1		
510+55	RT	16	1		
534+43	RT	16	1		
535+37	RT	23	1		
537+63	RT	16	1		
543+60	RT	16	1		
546+21	RT	16	1		
SUB-TOTAL		**553**	**25**	**4**	**1**

SUMMARY OF MAILBOXES & TURNOUTS (CONTINUED)

ITEM NO		530	560		
LOCATION	OFFSET	TURNOUTS (ACP)	MAILBOX INSTALL-S (WC-POST) TY 3	MAILBOX INSTALL-D (WC-POST) TY 3	MAILBOX INSTALL-M (TWG-POST) TY 4
STATION	LT/RT	SY	EA	EA	EA
547+92	RT	23		1	
554+87	RT	16			1
561+55	RT	23	1		
564+30	RT	16		1	
570+41	RT	23	1		
584+81	RT	16	1		
588+00	RT	16	1		
589+45	RT	16	1		
590+25	RT	23			
590+91	RT	23	1		
610+57	RT	16	1		
611+63	RT	23	1		
624+45	RT	16	1		
625+36	RT	16	1		
625+41	LT	16	1		
629+92	RT	16	1		
638+76	RT	16	1		
SUB-TOTAL		**314**	**13**	**2**	**1**
PROJECT TOTALS		**867**	**38**	**6**	**2**

NOTE:

A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE AQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APROXIMATE AND SHALL BE CERTIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		8

SUMMARY OF DRIVEWAY PIPES AND SIDE ROAD CULVERTS

ID	(3) APPROX. STATION	OFFSET	EXISTING DRIVEWAY MATERIAL	RCS	DRIVEWAY LENGTH	DRIVEWAY WIDTH	DRIVEWAY RADIUS		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	BLOCK SODDING	VEGETATIVE WATERING	REMOV STR (PIPE)	RC PIPE (CL III)		SET (TY II) (RCP)(6:1)(P)		530 DRIVEWAYS			
										EXIST	PROP				(10 GAL/SY (2 APPS)		18 IN	24 IN	18 IN	24 IN	(CONC)	(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	(BASE)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	EA	LF	LF	EA	EA	SY	SY	SY	SY
(CSJ: 1875 -02-027)																								
D1-A	331+72	LT	ASPH	S	36	25	40	90	NO PIPE			NO STRUCTURE WORK												
D1	331+72	RT	GRAVEL	R	36	12	10	16	18" X 24' RCP W/ SETS			NO STRUCTURE WORK												57
D2	339+92	LT	DIRT	R	36	12	12	12	NO PIPE			NO STRUCTURE WORK												55
D3	340+93	RT	GRAVEL	R	36	14	10	10	18" X 30' RCP W/ SETS	24	26	REMOVE EXIST 18" X 30' W/SET & INSTALL 18" X 30' RCP W/SET		22	0.44	1	30		2					61
D4	342+21	RT	GRAVEL	R	36	11	10	10	18" X 26' RCP W/ SETS			NO STRUCTURE WORK												49
D5	351+97	LT	ASPH	R	36	10	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK										45		
D6	352+15	RT	GRAVEL	R	36	14	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												61
D7	367+17	RT	GRAVEL	R	36	14	10	16	NO PIPE			NO STRUCTURE WORK												
D8	369+02	RT	CONC	R	36	10	10	10	15" X 20' RCP W/ SETS	25	29	REMOVE EXIST 15" X 20' RCP & INSTALL 18" X 20' RCP W/SET	45	22	0.44	1	20		2		45			
D9	372+57	LT	DIRT	R	36	14	10	10	18" X 20' RCP W/ SETS	22	26	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					61
D10	372+66	RT	GRAVEL	R	36	12	10	10	18" X 21' RCP W/ SETS			NO STRUCTURE WORK												53
D11	384+23	LT	DIRT	R	36	12	10	10	18" X 24' RCP W/ SETS	24	26	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	24		2					53
D12	384+74	LT	GRAVEL	R	36	12	20	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												61
D13	389+62	RT	CONC	C	36	18	12	12	18" X 40' RCP W/ SETS	24	28	REMOVE EXIST 18" X 40' W/SET & INSTALL 18" X 40' RCP W/SET	79	22	0.44	1	40		2		79			
D14	390+17	RT	DIRT	R	36	12	10	10	18" X 20' RCP W/ SETS	24	29	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
D15	390+28	LT	GRAVEL	R	36	12	10	10	18" X 24' RCP W/ SETS	23	28	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	24		2					53
D16	390+87	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D17	392+58	RT	DIRT	R	36	14	10	10	15" X 36' RCP W/ SETS	21	23	REMOVE EXIST 15" X 36' W/SET & INSTALL 18" X 36' RCP W/SET		22	0.44	1	36		2					61
D18	393+32	RT	GRAVEL	R	36	12	10	10	18" X 24' RCP W/ SETS	24	27	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	24		2					53
D19	393+32	LT	ASPH	S	36	14	20	20	NO PIPE			NO STRUCTURE WORK											79	
D20	398+08	LT	GRAVEL	R	36	12	10	10	18" X 24' RCP W/ SETS			NO STRUCTURE WORK												53
												SHEET TOTALS	**124**	**198**	**3.96**	**9**	**238**	**0**	**18**	**0**	**124**	**45**	**79**	**829**

NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

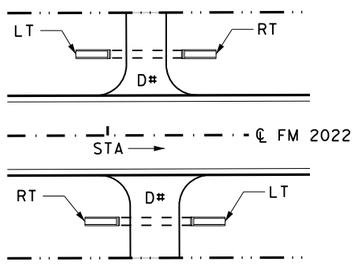
NOTE: ALL DRIVEWAYS PREVIOUSLY SAFTEY TREATED IN 2015. (CSJ: 1875-02-021)

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	11
24"	13
36"	20



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		9

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SUMMARY OF DRIVEWAY PIPES AND SIDE ROAD CULVERTS (CONT)

ID	(3) APPROX. STATION	OFFSET	EXISTING DRIVEWAY MATERIAL	R C S	DRIVEWAY LENGTH	DRIVEWAY WIDTH	DRIVEWAY RADIUS		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	BLOCK SODDING	VEGETATIVE WATERING	REMOV STR (PIPE)	RC PIPE (CL III)		SET (TY II) (RCP)(6:1)(P)		530 DRIVEWAYS			
										EXIST	PROP				(10 GAL/SY (2 APPS)		18 IN	24 IN	18 IN	24 IN	(CONC)	(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	(BASE)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	EA	LF	LF	EA	EA	SY	SY	SY	SY
												(CSJ: 1875-02-027)												
D21	407+41	RT	DIRT	R	36	16	10	10	18" X 26' RCP W/ SETS	21	25	REMOVE EXIST 18" X 26' W/SET & INSTALL 18" X 26' RCP W/SET		22	0.44	1	26		2					69
D22	409+79	RT	GRAVEL	R	36	10	10	10	18" X 26' RCP W/ SETS	21	27	REMOVE EXIST 18" X 26' W/SET & INSTALL 18" X 26' RCP W/SET		22	0.44	1	26		2					45
D23	412+11	LT	DIRT	S	36	18	20	20	18" X 26' RCP W/ SETS	24	27	REMOVE EXIST 18" X 26' W/SET & INSTALL 18" X 26' RCP W/SET		22	0.44	1	26		2					84
D24	412+11	RT	GRAVEL	S	36	20	20	20	18" X 28' RCP W/ SETS	23	27	REMOVE EXIST 18" X 28' W/SET & INSTALL 18" X 28' RCP W/SET		22	0.44	1	28		2					92
D25	418+51	LT	GRAVEL	R	36	12	10	10	18" X 26' RCP W/ SETS	23	25	REMOVE EXIST 18" X 26' W/SET & INSTALL 18" X 26' RCP W/SET		22	0.44	1	26		2					57
D26	421+02	LT	GRAVEL	R	36	10	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												45
D27	421+18	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D28	423+88	LT	DIRT	R	36	12	10	10	18" X 20' RCP W/ SETS	23	26	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
D29	430+12	RT	DIRT	R	36	12	10	10	15" X 20' RCP W/ SETS	26	26	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
D30	431+16	RT	GRAVEL	R	36	12	16	16	18" X 40' RCP W/ SETS			NO STRUCTURE WORK												59
D31	434+95	RT	ASPH	S	36	18	25	20	NO PIPE			NO STRUCTURE WORK											93	
D32	434+98	LT	ASPH	S	36	18	20	25	NO PIPE			NO STRUCTURE WORK											95	
D33	442+18	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D34	448+90	RT	GRAVEL	R	36	12	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												53
D35	449+98	RT	ASPH	S	36	26	30	30	18" X 52' RCP W/ SETS			NO STRUCTURE WORK											139	
D36	450+15	LT	DIRT	R	36	12	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												53
D37	456+05	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D38	456+19	LT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D39	459+68	LT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D40	469+68	RT	GRAVEL	R	36	10	10	10	18" X 26' RCP W/ SETS	23	25	REMOVE EXIST 18" X 26' W/SET & INSTALL 18" X 26' RCP W/SET		22	0.44	1	26		2					45
D41	469+87	LT	DIRT	R	36	12	10	10	18" X 42' RCP W/ SETS	28	31	REMOVE EXIST 18" X 42' W/SET & INSTALL 18" X 42' RCP W/SET		22	0.44	1	42		2					53
D42	472+19	RT	GRAVEL	R	36	12	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												53
D43	473+22	LT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D44	474+69	LT	DIRT	R	36	12	10	10	18" X 18' RCP W/ SETS			NO STRUCTURE WORK												53
D45	476+00	LT	GRAVEL	R	36	12	10	10	18" X 20' RCP W/ SETS	24	27	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
												SHEET TOTALS	**0**	**220**	**4.4**	**10**	**260**	**0**	**20**	**0**	**0**	**0**	**327**	**1222**

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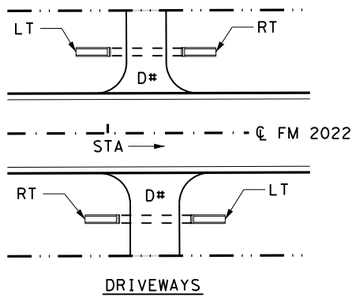
NOTE: ALL DRIVEWAYS PREVIOUSLY SAFTEY TREATED IN 2015. (CSJ: 1875-02-021)

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	11
24"	13
36"	20



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		10

SUMMARY OF DRIVEWAY PIPES AND SIDE ROAD CULVERTS (CONT)

ID	(3) APPROX. STATION	OFFSET	EXISTING DRIVEWAY MATERIAL	R C S	DRIVEWAY LENGTH	DRIVEWAY WIDTH	DRIVEWAY RADIUS		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	BLOCK SODDING	VEGETATIVE WATERING	REMOV STR (PIPE)	RC PIPE (CL III)		SET (TY II) (RCP)(6:1)(P)		530 DRIVEWAYS			
										EXIST	PROP				(10 GAL/SY (2 APPS)		18 IN	24 IN	18 IN	24 IN	(CONC)	(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	(BASE)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	EA	LF	LF	EA	EA	SY	SY	SY	SY
(CSJ:1875-02-027)																								
D46	480+70	RT	ASPH	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK										45		
D47	481+98	LT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D48	488+11	LT	GRAVEL	R	36	12	10	10	15" X 20' RCP W/ SETS	26	28	REMOVE EXIST 15" X 20' RCP & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
D49	492+07	RT	GRAVEL	R	36	12	10	10	18" X 20' RCP W/ SETS	23	25	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					53
D50	496+52	LT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D51	497+11	LT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D52	499+50	LT	DIRT	R	36	12	10	10	18" X 20' RCP W/ SETS			NO STRUCTURE WORK												53
D53	500+62	LT	ASPH	R	36	12	10	10	18" X 30' RCP W/ SETS	25	28	REMOVE EXIST 18" X 30' W/SET & INSTALL 18" X 30' RCP W/SET		22	0.44	1	30		2			53		
D54	502+81	LT	ASPH	R	36	12	10	10	18" X 20' RCP W/ SETS	22	25	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2			53		
D55	504+00	RT	GRAVEL	R	36	12	10	10	18" X 28' RCP W/ SETS			NO STRUCTURE WORK												53
D56	510+21	RT	ASPH	R	36	12	10	10	18" X 28' RCP W/ SETS			NO STRUCTURE WORK										53		
D57	513+50	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D58	518+16	LT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D59	522+14	LT	GRAVEL	R	36	12	10	10	18" X 40' RCP W/ SETS			NO STRUCTURE WORK												53
D60	522+16	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D61	534+74	RT	ASPH	R	36	12	12	12	NO PIPE			NO STRUCTURE WORK										55		
D62	535+35	LT	GRAVEL	R	36	12	12	12	18" X 30' RCP W/ SETS	23	26	REMOVE EXIST 18" X 30' W/SET & INSTALL 18" X 30' RCP W/SET		22	0.44	1	30		2					55
D63	537+73	LT	GRAVEL	R	36	12	12	12	NO PIPE			NO STRUCTURE WORK												55
D64	537+95	RT	GRAVEL	R	36	10	12	12	18" X 20' RCP W/ SETS	22	25	REMOVE EXIST 18" X 20' W/SET & INSTALL 18" X 20' RCP W/SET		22	0.44	1	20		2					47
D65	544+07	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D66	544+12	LT	DIRT	R	36	12	10	10	18" X 24' RCP W/ SETS			NO STRUCTURE WORK												53
D67	545+98	RT	DIRT	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D68	547+36	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D69	548+01	LT	GRAVEL	R	36	14	10	10	NO PIPE			NO STRUCTURE WORK												61
D70	553+12	LT	GRAVEL	R	36	12	10	10	18" X 44' RCP W/ SETS			NO STRUCTURE WORK												53
D71	554+51	RT	GRAVEL	R	36	12	10	10	18" X 30' RCP W/ SETS	23	26	REMOVE EXIST 18" X 30' W/SET & INSTALL 18" X 30' RCP W/SET		22	0.44	1	30		2					53
												SHEET TOTALS	**0**	**154**	**3.08**	**7**	**170**	**0**	**14**	**0**	**0**	**259**	**0**	**1103**

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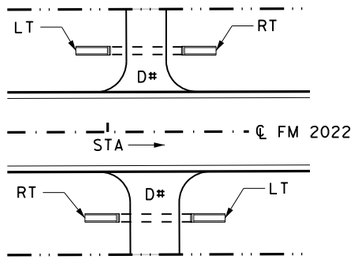
NOTE: ALL DRIVEWAYS PREVIOUSLY SAFTEY TREATED IN 2015. (CSJ: 1875-02-021)

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	11
24"	13
36"	20



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		11

SUMMARY OF DRIVEWAY PIPES AND SIDE ROAD CULVERTS (CONT)

ITEM NO.													104	162 (2)	168	496	464 (1)		467		530			
																					DRIVEWAYS			
ID	(3) APPROX. STATION	OFFSET	EXISTING DRIVEWAY MATERIAL	R C S	DRIVEWAY LENGTH	DRIVEWAY WIDTH	DRIVEWAY RADIUS		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	BLOCK SODDING	VEGETATIVE WATERING	REMOV STR (PIPE)	RC PIPE (CL III)		SET (TY II) (RCP)(6:1)(P)		(CONC)	(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	(BASE)
										EXIST	PROP				(10 GAL/SY (2 APPS)		18 IN	24 IN	18 IN	24 IN				
					FT	FT	LT	RT		FT	FT		SY	SY	MG	EA	LF	LF	EA	EA	SY	SY	SY	SY
(CSJ:1875-02-027)																								
D72	554+90	LT	GRAVEL	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D73	559+58	RT	ASPH	S	36	25	25	25	NO PIPE			NO STRUCTURE WORK											132	
D74	561+65	LT	DIRT	R	36	12	10	10	18" X24' RCP W/ SETS			NO STRUCTURE WORK												53
D75	563+62	RT	ASPH	R	36	12	10	10	18" X22' RCP W/ SETS	22	27	REMOVE EXIST 18" X 22' W/SET & INSTALL 18" X 22' RCP W/SET		22	0.44	1	22		2			53		
D76	565+17	LT	DIRT	R	36	12	10	10	18" X24' RCP W/ SETS			NO STRUCTURE WORK												53
D77	566+62	RT	GRAVEL	R	36	12	10	10	18" X28' RCP W/ SETS			NO STRUCTURE WORK												53
D78	570+45	LT	GRAVEL	R	36	12	12	12	NO PIPE			NO STRUCTURE WORK												55
D79	571+13	RT	DIRT	R	36	12	10	10	18" X48' RCP W/ SETS			NO STRUCTURE WORK												53
D80	574+46	LT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D81	584+99	LT	ASPH	R	36	10	10	10	24" X20' RCP W/ SETS	24	27	REMOVE EXIST 24" X 20' W/SET & INSTALL 24" X 20' RCP W/SET		26	0.52	1		20		2		45		
D82	585+15	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D83	585+94	LT	DIRT	R	36	10	10	10	18" X22' RCP W/ SETS			NO STRUCTURE WORK												45
D84	588+13	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D85	589+16	RT	ASPH	R	36	16	25	25	NO PIPE			NO STRUCTURE WORK										120		
D86	590+81	LT	GRAVEL	R	36	14	20	20	NO PIPE			NO STRUCTURE WORK												76
D87	605+30	LT	ASPH	S	36	12	50	50	NO PIPE			NO STRUCTURE WORK												107
D88	610+42	RT	GRAVEL	R	36	14	10	10	24" X26' RCP W/ SETs	21	27	REMOVE EXIST 24" X 26' W/SET & INSTALL 24" X 26' RCP W/SET		26	0.52	1		26		2				61
D89	611+64	LT	DIRT	R	36	12	10	10	18" X20' RCP W/ SETS			NO STRUCTURE WORK												53
D90	616+12	RT	GRAVEL	R	36	20	25	25	18" X50' RCP W/ SETS			NO STRUCTURE WORK												45
D91	624+64	RT	DIRT	R	36	12	10	10	18" X70' RCP W/ SETS			NO STRUCTURE WORK												53
D92	625+13	RT	CONC	R	36	10	20	20					52								52			
D93	625+70	LT	DIRT	R	36	12	10	10	18" X24' RCP W/ SETS			NO STRUCTURE WORK												53
D94	626+47	RT	DIRT	R	36	12	10	10	18" X26' RCP W/ SETs	25	27	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	26		2					53
D95	630+20	RT	GRAVEL	R	36	10	10	10	18" X24' RCP W/ SETS	25	27	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	24		2					45
D96	632+65	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
D97	635+14	RT	DIRT	R	36	10	10	10	NO PIPE			NO STRUCTURE WORK												45
SHEET TOTALS													**52**	**118**	**2.36**	**5**	**72**	**46**	**6**	**4**	**52**	**218**	**132**	**1136**

NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

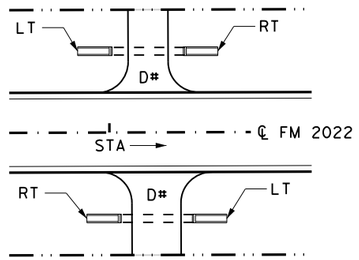
NOTE: ALL DRIVEWAYS PREVIOUSLY SAFTEY TREATED IN 2015. (CSJ: 1875-02-021)

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	11
24"	13
36"	20



DRIVEWAYS

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		12

SUMMARY OF DRIVEWAY PIPES AND SIDE ROAD CULVERTS (CONT)

ID	(3) APPROX. STATION	OFFSET	EXISTING DRIVEWAY MATERIAL	R C S	DRIVEWAY LENGTH	DRIVEWAY WIDTH	DRIVEWAY RADIUS		EXISTING STRUCTURE	OFFSET FROM CL		PROPOSED STRUCTURE	REMOVING CONC (DRIVEWAYS)	BLOCK SODDING	VEGETATIVE WATERING	REMOV STR (PIPE)	RC PIPE (CL III)		SET (TY II) (RCP)(6:1)(P)		DRIVEWAYS			
										EXIST	PROP				(10 GAL/SY (2 APPS)		18 IN	24 IN	18 IN	24 IN	(CONC)	(ACP) (440 LBS/SY)	(ACP) (660 LBS/SY)	(BASE)
					FT	FT	LT	RT		FT	FT		SY	SY	MG	EA	LF	LF	EA	EA	SY	SY	SY	SY
(CSJ:1875-02-027)																								
D98	648+15	LT	ASPH	R	36	12	10	10	18" X24' RCP W/ SETS			NO STRUCTURE WORK										53		
D99	648+16	LT	ASPH	R	36	12	10	10	18" X24' RCP W/ SETS			NO STRUCTURE WORK										53		
D100	648+16	RT	GRAVEL	R	36	12	10	10	NO PIPE			NO STRUCTURE WORK												53
D101	648+34	LT	ASPH	R	36	14	10	10	18" X24' RCP W/ SETS	24	26	REMOVE EXIST 18" X 24' W/SET & INSTALL 18" X 24' RCP W/SET		22	0.44	1	24		2			61		
D102	650+00	LT	ASPH	S	36	24	50	50	24" X48' RCP W/ SETS			NO STRUCTURE WORK												
SHEET TOTALS													**0**	**22**	**0.44**	**1**	**24**	**0**	**2**	**0**	**0**	**114**	**0**	**53**
CSJ: 1875-02-027 TOTAL													**176**	**712**	**14.24**	**32**	**764**	**46**	**60**	**4**	**176**	**636**	**538**	**4343**

NOTE: A FULL TOPOGRAPHICAL SURVEY WAS NOT PERFORMED. STATIONS WERE ACQUIRED USING A DIGITAL MEASURING INSTRUMENT (DMI). THE STATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK.

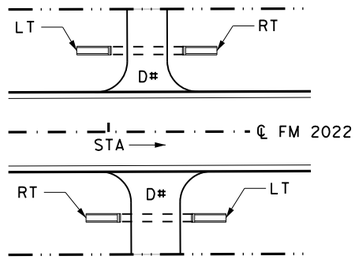
NOTE: ALL DRIVEWAYS PREVIOUSLY SAFTEY TREATED IN 2015. (CSJ: 1875-02-021)

R - RESIDENTIAL
C - COMMERCIAL
S - SIDEROAD

1) PROVIDE 12" DEEP TOEWALL FOR ALL SET'S.

2)

REQUIRED BLOCK SODDING AT EACH SET END	
CULVERT SIZE	SY
18"	11
24"	13
36"	20



DRIVEWAYS

QUANTITY SUMMARIES

SHEET 8 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		13

SUMMARY OF CROSS DRAINAGE STRUCTURES

ITEM NO			400	420	432	462					464			
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	CEM STABIL BKFL	CL C CONC (COLLAR)	RIPRAP (STONE COMMON) (DRY) (12IN)	CONC BOX CULV (4 FT X 3 FT)	CONC BOX CULV (5 FT X 4 FT)	CONC BOX CULV (6 FT X 3 FT)	CONC BOX CULV (6 FT X 4 FT)	CONC BOX CULV (6 FT X 6 FT)	RC PIPE (CL III)			
											(18 IN)	(24 IN)	(30 IN)	(36 IN)
			CY	EA	CY	LF	LF	LF	LF	LF	LF	LF	LF	LF
348+00	18" X 42' RCP W/SET	REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT										8		
377+40	6" X 3' X 40' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) LT; REMOVE EXIST WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) RT			2.5			18						
393+52	6' X 4' X 35' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 10' W/CONC BOX CULV (6 FT X 4 FT), ADD WINGWALL (PW - 2) (HW=5 FT 6 IN) LT; REMOVE EXIST WINGS, EXTEND 8' W/CONC BOX CULV(6 FT X 4 FT), ADD WINGWALL (FW - 0) (HW=5 FT 6 IN) RT							18					
426+00	18" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RCP PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT									4			
434+63	18" X 58' RCP W/SET	CLEAN CULVERT												
434+92	18" X 58' RCP W/SET	CLEAN CULVERT												
451+08	24" X 60' RCP	ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CH-PW-0 DIA = 54(2:1)(C) LT REMOVE 24"X4' JOINT, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CONC COLLAR & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	0.44	2	1.5							8		
467+30	24" X 40' RCP W/SET 15° FWD SKW	REMOVE EXIST SET, EXTEND W/24"X4' RCP PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT										4		
472+85	24" X 48' RCP W/SET 30° FWD SKW	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/24"X6' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT										6		
480+90	24" X 36' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT										4		
496+00	24" X 40' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT										4		
511+74	3-6' X 4' X 40' MC6-1 MCWF-1 BOX CULVERT	REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) LT REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) RT	48		68				48					
521+00	24" X 44' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C) LT; REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C)RT		2								8		
525+95	30" X 50' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/30"X4' RC PIPE (CL III)(30 IN),ADD SET (TYII)(30")(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-FW-0 (DIA=42 IN(2:1) RT		1									4	
		SHEET TOTALS	**48.44**	**5**	**72**	**0**	**0**	**18**	**66**	**0**	**4**	**42**	**4**	**0**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY.
THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT.
DUE CONSIDERATAION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE7151144E...
6/2/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 9 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		14

SUMMARY OF CROSS DRAINAGE STRUCTURES (CONTINUED)

ITEM NO			400	420	432	462					ITEM 464			
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	CEM STABIL BKFL	CL C CONC (COLLAR)	RIPRAP (STONE COMMON) (DRY) (12IN)	CONC BOX CULV (4 FT X 3 FT)	CONC BOX CULV (5 FT X 4 FT)	CONC BOX CULV (6 FT X 3 FT)	CONC BOX CULV (6 FT X 4 FT)	CONC BOX CULV (6 FT X 6 FT)	RC PIPE (CL III)			
											(18 IN)	(24 IN)	(30 IN)	(36 IN)
			CY	EA	CY	LF	LF	LF	LF	LF	LF	LF	LF	LF
532+16	24" X 46' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III) (24 IN), ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT		1								4		
540+75	6' X 6' X 40' SC15°A, FW15°RT FWD SKW BOX CULVERT	REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) LT; REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 8' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) RT	4		14					17				
552+00	30" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1) LT; REMOVE EXIST SET, EXTEND W/30"X4' RC PIPE (CL III)(30 IN), ADD SET (TY II)(30 IN)(RCP)(4:1) RT	0.63		1								4	
560+00	5' X 4' X 41' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") LT; REMOVE EXIST HDWL & WINGS, EXTEND 7' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") RT	0.3		1		16							
570+00	36" X 40' RCP W/SET	REMOVE EXIST PW, EXTEND W/36"X10' RC PIPE (CL III)(36 IN) & CH-PW-0(DIA=36 IN)(2:1) LT; REMOVE EXIST SET, ADD SET (TY II)(36 IN)(RCP)(4:1) RT	0.37											10
577+60	4' X 3' X 59' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4 FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) RT	1.5		4	10								
594+50	6' X 6' X 55' SCNA & FWN	REMOVE EXIST HDWL & WINGS, EXTEND 6' W/CONC BOX CULV (6 FT X 6FT), ADD WINGWALL (PW - 2) (HW=8 FT 6 IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (PW - 2) (HW=10 FT) RT								11				
627+48	30" X 60' RCP W/SET 30°RFS	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-PW-S (DIA=66 IN)(2:1) RT			2									
SHEET TOTALS			**6.8**	**1**	**22**	**10**	**16**	**0**	**0**	**28**	**0**	**4**	**4**	**10**
PROJECT TOTALS			**55.24**	**6**	**94**	**10**	**16**	**18**	**66**	**28**	**4**	**46**	**8**	**10**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATAION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		15

SUMMARY OF CROSS DRAINAGE STRUCTURES (CONTINUED)

ITEM NO.			466										467			
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	HEADWALL (CH-PW-S)	HEADWALL (CH-PW-O)		HEADWALL (CH-FW-O)	WINGWALL (FW - O) (HW=6 FT)	WINGWALL (PW - 2) (HW=5 FT)	WINGWALL (PW - 2) (HW=6 FT)	WINGWALL (PW - 2) (HW=8 FT)	WINGWALL (PW - 2) (HW=9 FT)	WINGWALL (PW - 2) (HW=10 FT)	SET (TY II)			
			(DIA=66 IN)	(DIA=36 IN)	(DIA=54 IN)	(DIA=42 IN)							(18 IN) (RCP) (4:1) (C)	(24 IN) (RCP) (4:1) (C)	(30 IN) (RCP) (4:1) (C)	(36 IN) (RCP) (4:1) (C)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
348+00	18" X 42' RCP W/SET	REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT											2			
377+40	6" X 3' X 40' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) LT; REMOVE EXIST WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) RT						2								
393+52	6' X 4' X 35' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 10' W/CONC BOX CULV (6 FT X 4 FT), ADD WINGWALL (PW - 2) (HW=5 FT 6 IN) LT; REMOVE EXIST WINGS, EXTEND 8' W/CONC BOX CULV(6 FT X 4 FT), ADD WINGWALL (FW - O) (HW=5 FT 6 IN) RT					1		1							
426+00	18" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RCP PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT											2			
434+63	18" X 58' RCP W/SET	CLEAN CULVERT														
434+92	18" X 58' RCP W/SET	CLEAN CULVERT														
451+08	24" X 60' RCP	ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CH-PW-O DIA = 54(2:1)(C) LT REMOVE 24"X4' JOINT, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CONC COLLAR & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT			1									1		
467+30	24" X 40' RCP W/SET 15° FWD SKW	REMOVE EXIST SET, EXTEND W/24"X4' RCP PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT												2		
472+85	24" X 48' RCP W/SET 30° FWD SKW	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/24"X6' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT												2		
480+90	24" X 36' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT												2		
496+00	24" X 40' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT												2		
511+74	3-6' X 4' X 40' MC6-1 MCWF-1 BOX CULVERT	REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) LT REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) RT							2							
521+00	24" X 44' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C) LT; REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C)RT												2		
525+95	30" X 50' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/30"X4' RC PIPE (CL III)(30 IN),ADD SET (TYII)(30")(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-FW-O (DIA=42 IN(2:1) RT				1									1	
		SHEET TOTALS	**0**	**0**	**1**	**1**	**1**	**2**	**3**	**0**	**0**	**0**	**4**	**11**	**1**	**0**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATAION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 11 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		16

SUMMARY OF CROSS DRAINAGE STRUCTURES (CONTINUED)

ITEM NO.			466										467			
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	HEADWALL (CH-PW-S)	HEADWALL (CH-PW-O)		HEADWALL (CH-FW-O)	WINGWALL (FW - O) (HW=6 FT)	WINGWALL (PW - 2) (HW=5 FT)	WINGWALL (PW - 2) (HW=6 FT)	WINGWALL (PW - 2) (HW=8 FT)	WINGWALL (PW - 2) (HW=9 FT)	WINGWALL (PW - 2) (HW=10 FT)	SET (TY II)			
			(DIA=66 IN)	(DIA=36 IN)	(DIA=54 IN)	(DIA=42 IN)							(18 IN) (RCP) (4:1) (C)	(24 IN) (RCP) (4:1) (C)	(30 IN) (RCP) (4:1) (C)	(36 IN) (RCP) (4:1) (C)
			EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA
532+16	24" X 46' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III) (24 IN), ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT												2		
540+75	6' X 6' X 40' SC15°A, FW15°RT FWD SKW BOX CULVERT	REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) LT; REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 8' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) RT								2						
317+25	30" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1) LT; REMOVE EXIST SET, EXTEND W/30"X4' RC PIPE (CL III)(30 IN), ADD SET (TY II)(30 IN)(RCP)(4:1) RT													2	
560+00	5' X 4' X 41' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-O (HW= 5' 6") LT; REMOVE EXIST HDWL & WINGS, EXTEND 7' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-O (HW= 5' 6") RT					2									
570+00	36" X 40' RCP W/SET	REMOVE EXIST PW, EXTEND W/36"X10' RC PIPE (CL III)(36 IN) & CH-PW-O(DIA=36 IN)(2:1) LT; REMOVE EXIST SET, ADD SET (TY II)(36 IN)(RCP)(4:1) RT		1												1
577+60	4' X 3' X 59' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4 FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) RT							2							
594+50	6' X 6' X 55' SCNA & FWN	REMOVE EXIST HDWL & WINGS, EXTEND 6' W/CONC BOX CULV (6 FT X 6FT), ADD WINGWALL (PW - 2) (HW=8 FT 6 IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (PW - 2) (HW=10 FT) RT									1	1				
627+48	30" X 60' RCP W/SET 30 °RFS	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-PW-S (DIA=66 IN)(2:1) RT	1												1	
SHEET TOTALS			**1**	**1**	**0**	**0**	**2**	**0**	**2**	**2**	**1**	**1**	**0**	**2**	**3**	**1**
PROJECT TOTALS			**1**	**1**	**1**	**1**	**3**	**2**	**5**	**2**	**1**	**1**	**4**	**13**	**4**	**1**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY.
THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT.
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STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 12 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		17

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SUMMARY OF CROSS DRAINAGE STRUCTURES (CONTINUED)

		ITEM NO	132	158	162	168	403	480	658
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SPEC EXCAV WORK (HYD EXCAVATOR)	BLOCK SODDING	VEGETATIVE WATERING 10 GAL/SY 2APPS	TEMP SPL SHORING	CLEAN EXIST CULVERTS	INSTL OM ASSM (OM-2Z)(WFLX)SRF) SRF
			CY	HR	SY	MG	SF	LF	LF
348+00	18" X 42' RCP W/SET	REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RC PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT	10	2	80	1.6			2
377+40	6" X 3' X 40' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) LT; REMOVE EXIST WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) RT	8	4	77	1.5	200		2
393+52	6' X 4' X 35' BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 10' W/CONC BOX CULV (6 FT X 4 FT), ADD WINGWALL (PW - 2) (HW=5 FT 6 IN) LT; REMOVE EXIST WINGS, EXTEND 8' W/CONC BOX CULV(6 FT X 4 FT), ADD WINGWALL (FW - 0) (HW=5 FT 6 IN) RT	48		89	1.8	360		2
426+00	18" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(18 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/18"X4' RCP PIPE (CL III)(18 IN) & ADD SET (TY II)(18 IN)(RCP)(4:1)(C) RT	4	2	66	1.3			2
434+63	18" X 58' RCP W/SET	CLEAN CULVERT						1	2
434+92	18" X 58' RCP W/SET	CLEAN CULVERT						1	2
451+08	24" X 60' RCP	ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CH-PW-0 DIA = 54(2:1)(C) LT REMOVE 24"X4' JOINT, EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD CONC COLLAR & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	7	2	66	1.3	80		3
467+30	24" X 40' RCP W/SET 15° FWD SKW	REMOVE EXIST SET, EXTEND W/24"X4' RCP PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	5	2	66	1.3			2
472+85	24" X 48' RCP W/SET 30° FWD SKW	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, EXTEND W/24"X6' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	5	2	61	1.2			2
480+90	24" X 36' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	28	2	57	1.1			2
496+00	24" X 40' RCP W/SET	REMOVE EXIST SET, EXTEND W/24"X4' RC PIPE (CL III)(24 IN) & ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	5	2	57	1.1		1	2
511+74	3-6' X 4' X 40' MC6-1 MCWF-1 BOX CULVERT	REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) LT REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) RT	28		57	1.1	720		2
521+00	24" X 44' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C) LT; REMOVE EXIST SET, ADD CONC COLLAR EXTEND W/24"X4' RC PIPE (CL III)(24 IN), ADD SET (TYII)(24")(RCP)(4:1(C)RT	5	2	66	1.3		1	2
525+95	30" X 50' RCP W/SET	REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/30"X4' RC PIPE (CL III)(30 IN),ADD SET (TYII)(30")(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-FW-0 (DIA=42 IN(2:1) RT	20	2	87	1.7			2
		SHEET TOTALS	**173**	**22**	**829**	**16.3**	**1360**	**4**	**29**

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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
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6/28/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION
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SHEET 13 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST		COUNTY	SHEET NO.
LFK		HOUSTON	18

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SUMMARY OF CROSS DRAINAGE STRUCTURES (CONTINUED)

ITEM NO			132	158	162	168	403	480	658
STATION	EXISTING STRUCTURE	PROPOSED STRUCTURE	EMBANKMENT (VEHICLE) (ORD COMP) (TY B)	SPEC EXCAV WORK (HYD EXCAVATOR)	BLOCK SODDING	VEGETATIVE WATERING 10 GAL/SY 2APPS	TEMP SPL SHORING	CLEAN EXIST CULVERTS	INSTL OM ASSM (OM-2Z)(WFLX)SRF) SRF
			CY	HR	SY	MG	SF	EA	EA
532+16	24" X 46' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CONC COLLAR, EXTEND W/24"X4' RC PIPE (CL III) (24 IN), ADD SET (TY II)(24 IN)(RCP)(4:1)(C) RT	8						2
540+75	6' X 6' X 40' SC15°A, FW15°RT FWD SKW BOX CULVERT	REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) LT; REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 8' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) RT	35		101	2.0	800		2
552+00	30" X 40' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1) LT; REMOVE EXIST SET, EXTEND W/30"X4' RC PIPE (CL III)(30 IN), ADD SET (TY II)(30 IN)(RCP)(4:1) RT	11	2	89	1.8			2
560+00	5' X 4' X 41' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-O (HW= 5' 6") LT; REMOVE EXIST HDWL & WINGS, EXTEND 7' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-O (HW= 5' 6") RT	15		71	1.4	480		2
570+00	36" X 40' RCP W/SET	REMOVE EXIST PW, EXTEND W/36"X10' RC PIPE (CL III)(36 IN) & CH-PW-O(DIA=36 IN)(2:1) LT; REMOVE EXIST SET, ADD SET (TY II)(36 IN)(RCP)(4:1) RT	20	2	97	1.9			2
577+60	4' X 3' X 59' FC-3 BOX CULVERT	REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (4 FT X 3 FT), ADD WINGWALL (PW-2)(HW=5FT 6IN) RT	11	2	60	1.2			2
594+50	6' X 6' X 55' SCNA & FWN	REMOVE EXIST HDWL & WINGS, EXTEND 6' W/CONC BOX CULV (6 FT X 6FT), ADD WINGWALL (PW - 2) (HW=8 FT 6 IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (PW - 2) (HW=10 FT) RT	24		101	2.0	1200		2
627+48	30" X 60' RCP W/SET	REMOVE EXIST SET, ADD SET (TY II)(30 IN)(RCP)(4:1)(C) LT; REMOVE EXIST SET, ADD CH-PW-S (DIA=66 IN)(2:1) RT	11	4	89	1.8		1	3
		SHEET TOTALS	**135**	**10**	**608**	**12.1**	**2480**	**1**	**17**
		PROJECT TOTALS	**308**	**32**	**1437**	**28.4**	**3840**	**5**	**46**

THE STRUCTURES ON THE PROJECT ARE OPERATING AT AN ESTIMATED MINIMUM 5 YEAR FREQUENCY. THE OPERATION OF THESE STRUCTURES WILL NOT BE SIGNIFICANTLY ALTERED BY THIS PROJECT. DUE CONSIDERATAION HAS BEEN GIVEN TO THE EFFECTS OF HEADWATERS AND VELOCITIES ASSOCIATED WITH THE STRUCTURES. ADDITIONAL STUDIES ARE NOT REQUIRED. CAUTION TO BE USED WHEN WORKING OVER CULVERTS.

STATE OF TEXAS
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6/2/2021

QUANTITY SUMMARIES

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 14 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		19

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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: 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
1	S1	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2663)	24 x 24	X		10BWG	1	SA	U		
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM2022)	24 x 24	X							
		M6-4	<ARROW - DUAL LEFT & RIGHT> <AUX. SIGN>	21 x 15	X							
1	S2	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
1	S3	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM2663)	24 x 24	X		TWT	1	WS	P		
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
1	S4	W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36	X		S80	1	SA	U	WC	
1	S5	M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM2022)	24 x 24	X							
1	S6	R2-1	SPEED LIMIT (SPEED) (60 MPH)	30 x 36	X		TWT	1	WS	P		
1	S7	D1-1	LATEXO	72 x 18	X		TWT	1	WS	T		
3	S8	D20-1T	COUNTY ROAD (NUMBER) (CR 1625)(LT)	24 x 24	X		TWT	1	WS	P		
3	S9	D20-1T	COUNTY ROAD (NUMBER) (CR 1625)(RT)	24 x 24	X		TWT	1	WS	P		
3	S10	D7-6aTL	HISTORICAL MARKER 1 MILE ON LEFT (#7052)	48 x 48	X		10BWG	1	SA	U		
3	S11	D14-4T	ADOPT A HWY NEXT (MI) MILES (GROUP NAME) (2)(THE JORDAN FAMILY)	48 x 48	X		10BWG	1	SA	U		
3	S12	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2022)	24 x 24	X		TWT	1	WS	P		
		D10-7AT	<3 DIGIT VERTICAL NUMBER> -358	3 x 10	X							
4	S13	D20-1T	COUNTY ROAD (NUMBER) (CR1630)(LT)(RT)	24 x 24	X		TWT	1	WS	P		
4	S14	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
4	S15	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
4	S16	D20-1T	COUNTY ROAD (NUMBER) (CR1630)(LT)(RT)	24 x 24	X		TWT	1	WS	P		
5	S17	D20-1T	COUNTY ROAD (NUMBER) (1640)(LT)	24X42	X		TWT	1	WS	P		
		D20-5T	COUNTY ROAD (NUMBER) (1535)(RT)	24X42	X							

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

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		20

TB

DATE:
FILE:

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 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	S18	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
5	S19	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
5	S20	D3-3BTL	McCARTER CEMENTERY	54 x 36	X		10BWG	1	SA	U		
5		D3-3BTR	McCARTER CEMENTERY	54 x 36	X							
5	S21	D20-1T	COUNTY ROAD (NUMBER) (1635)(LT)	24 X 42	X		TWT	1	WS	P		
		D20-5T	COUNTY ROAD (NUMBER) (1640)(RT)	24 X 42	X							
5	S22	D20-1T	COUNTY ROAD (NUMBER) (1545)(RT)	24 x 24	X		TWT	1	WS	P		
5	S23	D3-3BTL	PARKER CEMENTERY	54 x 36	X		10BWG	1	SA	U		
		D3-3BTR	PARKER CEMENTERY	54 x 36	X							
5	S25	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
	S24	OMITTED										
6	S26	D20-1T	COUNTY ROAD (NUMBER) (1545)(LT)	24 x 24	X		TWT	1	WS	P		
	S27	OMITTED										
6	S28	D7-7aTL	HISTORICAL MARKER <ARROW LEFT> (#7052)	48 x 48	X		10BWG	1	SA	U		
		D7-7aTR	HISTORICAL MARKER <ARROW RIGHT> (#7052)	48 x 48	X							
7	S29	D14-4T	ADOPT A HWY NEXT (MI) MILES (GROUP NAME) (2)(THE JORDAN FAMILY)	48 x 48	X		10BWG	1	SA	U		
7	S30	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2022)	24 x 24	X		TWT	1	WS	P		
		D10-7AT	<3 DIGIT VERTICAL NUMBER> -356	3 x 10								
7	S31	D7-6aTR	HISTORICAL MARKER 1 MILE ON RIGHT (#7052)	48 x 48	X		10BWG	1	SA	U		
10	S32	D20-1T	COUNTY ROAD (NUMBER) (1650)(RT)	24 x 24	X		TWT	1	WS	P		
10	S33	R1-1	STOP	36 x 36	X		TWT	1	WS	P		
10	S34	D3-3BTL	WHITEHEAD CEMETERY	60 X 36	X		10BWG	1	SA	U		
		D3-3BTR	WHITEHEAD CEMETERY	60 X 36	X							
10	S35	D20-1T	COUNTY ROAD (NUMBER) (1650)(LT)	24 x 24	X		TWT	1	WS	P		

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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7.5 to 15	0.100"
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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

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
4-16	DIST	COUNTY		SHEET NO.
8-16	LFK	HOUSTON		21

18

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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: 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
11	S36	D20-1T	COUNTY ROAD (NUMBER) (1655)(RT)	24 x 24	1		TWT	1	WS	P		
11	S37	R1-1	STOP	36 x 36	1		TWT	1	WS	P		
11	S38	D7-7aTL	HISTORICAL MARKER <ARROW LEFT>	48 x 48	1		10BWG	1	SA	U		
		D7-7aTR	HISTORICAL MARKER <ARROW RIGHT>	48 x 48	1							
	S39	OMITTED										
11	S40	D20-1T	COUNTY ROAD (NUMBER) (1655)(LT)	24 x 24	1		TWT	1	WS	P		
12	S41	D20-1T	COUNTY ROAD (NUMBER) (1660)(LT)	24 x 24	1		TWT	1	WS	P		
12	S42	R1-1	STOP	36 x 36	1		TWT	1	WS	P		
12	S43	D20-1T	COUNTY ROAD (NUMBER) (1660)(RT)	24 x 24	X		TWT	1	WS	P		
12	S44	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2022)	24 x 24	X		TWT	1	WS	P		
		D10-7AT	<3 DIGIT VERTICAL NUMBER> -354	3 x 10	X							
13	S45	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2423)	24 x 24	X							
13	S46	W1-4L	SYMBOL - REVERSE CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE> (50 MPH)	18 x 18	X							
14	S47	R2-1	SPEED LIMIT (SPEED) (60 MPH)	30 x 36	X		TWT	1	WS	P		
14	S48	D1-1	GRAPELAND <ARROW LEFT>	90 X 18	X		10BWG	1	SA	U		
14	S49	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12	X		TWT	1	WS	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2022)	24 x 24	X							
14	S50	M1-6F	<FM SHIELD> FARM ROAD (FM 2423)	24 x 24	X		10BWG	1	SA	U		
		M6-1	<ARROW - HORIZ. STRGHT> <AUX.SIGN>	21 x 15	X							
		M1-6F	<FM SHIELD> FARM ROAD (FM 2022)	24 x 24	X							
		M6-4	<ARROW> - DUAL LEFT & RIGHT> <AUX. SIGN>	21 x 15	X							
14	S51	R1-1	STOP	36 x 36	X		TWT	1	WS	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

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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
14	S52	W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36	X		S80	1	SA	U	WC	
14	S53	M1-6F	<FM SHIELD> FARM ROAD (ROUTE #) (FM 2423)(RT)	24 x 24	X		TWT	1	WS	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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http://www.txdot.gov/

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

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8-16		LFK	HOUSTON		23

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

11. 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 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.

2. Except in emergency situations, flagger stations shall be illuminated when flagging is used at night.

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

1. Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources.

2. Work zone traffic control devices shall be compliant with the Manual for Assessing safety Hardware (MASH).

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

SHEET 1 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

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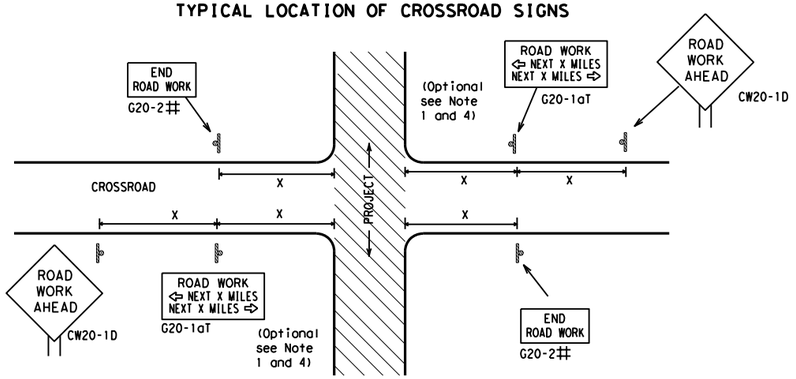
REVISIONS	1875	02	027	FM 2022
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	LFK	HOUSTON		24
5-10 5-21				

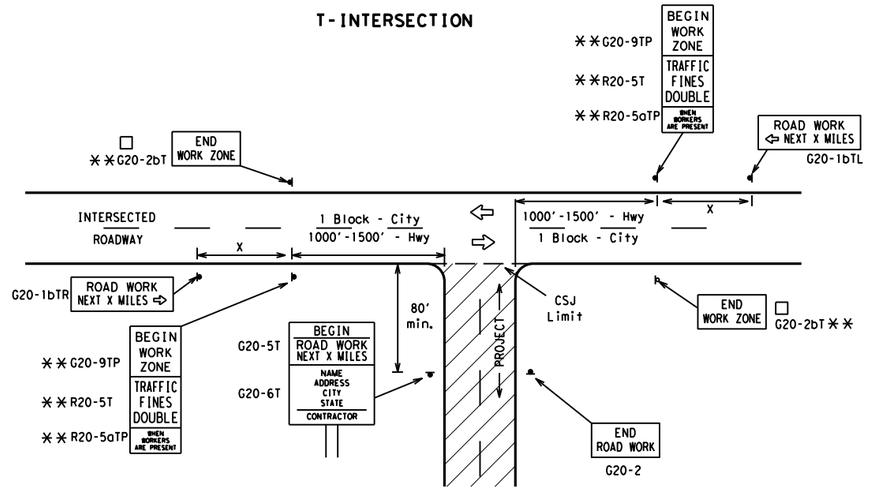
TYPICAL LOCATION OF CROSSROAD SIGNS



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 as per TMUTCD Part 5. 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]

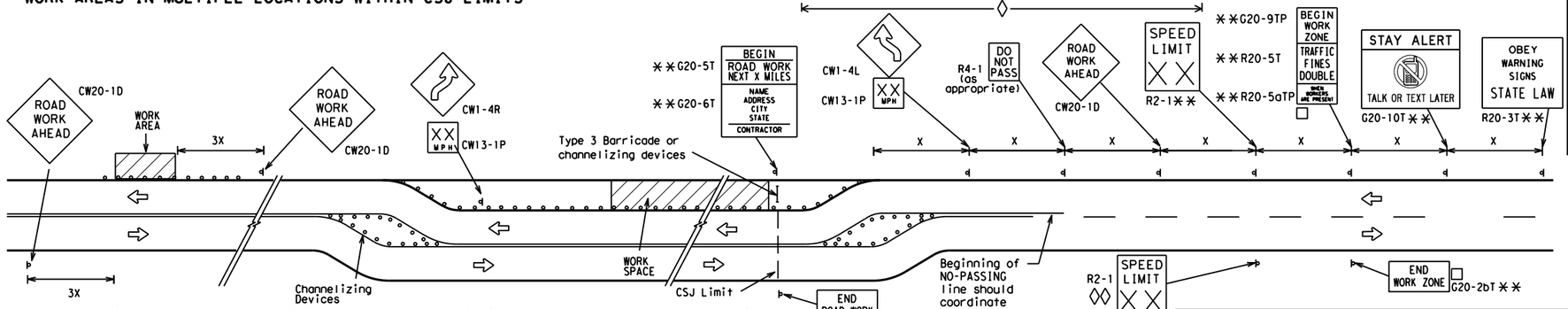
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

△ 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 as per TMUTCD Part 5. 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.

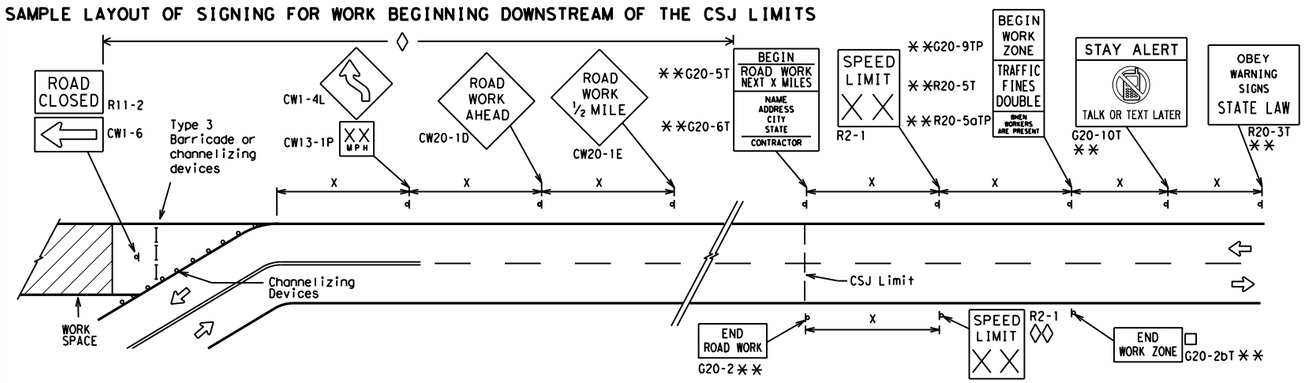
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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.

** CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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7-13 5-21	LFK	HOUSTON		25

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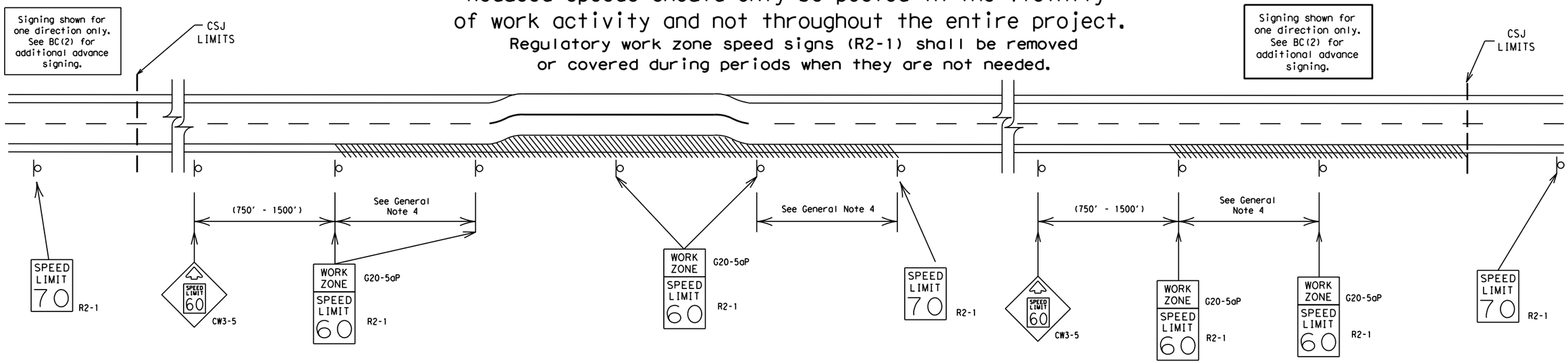
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

1. Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
2. Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
3. Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
4. Frequency of work zone speed limit signs should be:
   40 mph and greater 0.2 to 2 miles
   35 mph and less 0.2 to 1 mile
5. Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
6. Fabrication, erection and maintenance of the"ADVANCE SPEED LIMIT"(CW3-5)sign, "WORK ZONE"(G20-5aP) plaque and the "SPEED LIMIT"(R2-1)signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
7. Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
8. Techniques that may help reduce traffic speeds include but are not limited to:
   A. 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 Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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REVISIONS	1875	02	027	FM 2022
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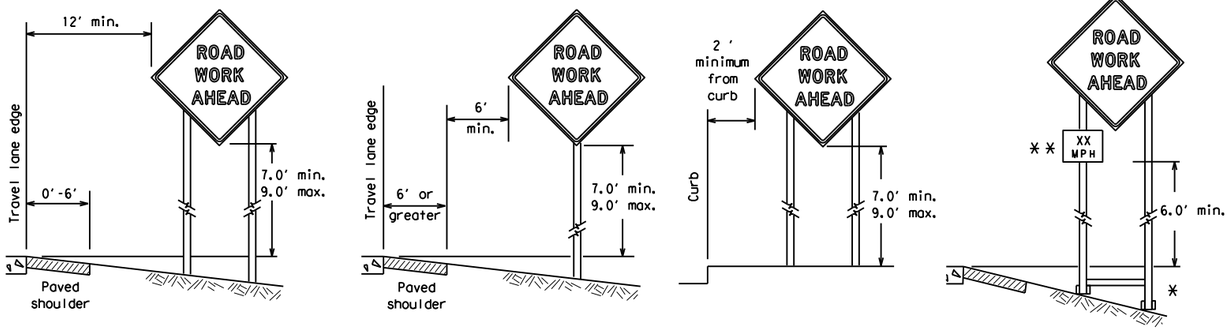
7-13 5-21	LFK	HOUSTON		26

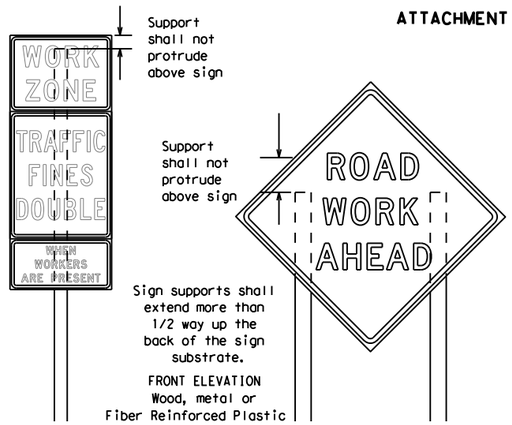
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

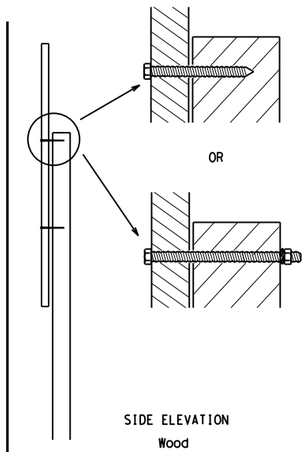


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





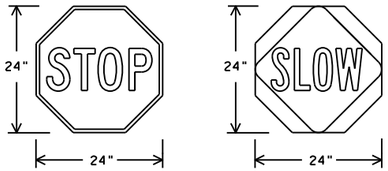
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the 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.

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".
2. STOP/SLOW paddles shall be retroreflectorized when used at night.
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.



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
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. For details for covering large guide signs see the TS-CD standard.
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 standard sheets, TLRS standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
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) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
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 Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON		27

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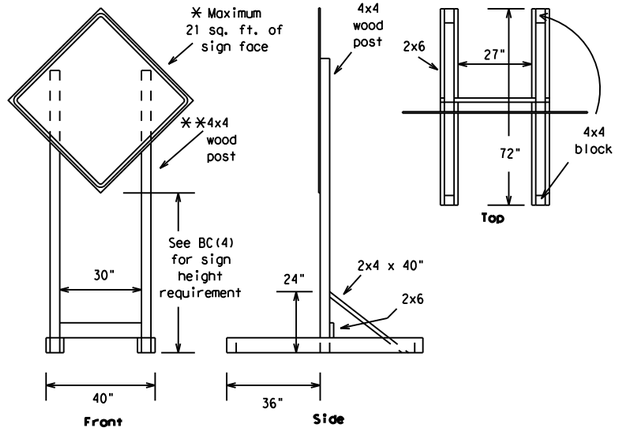
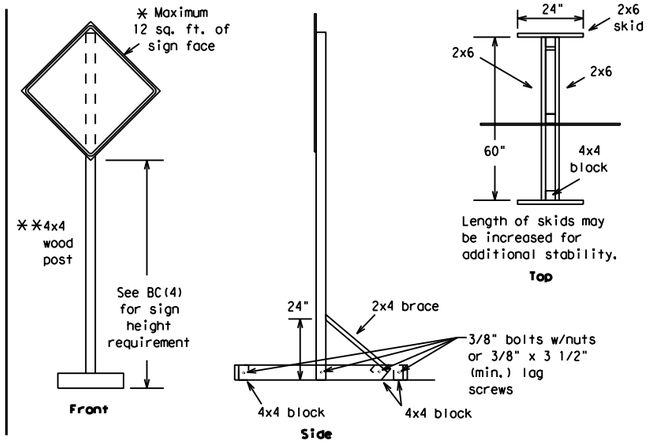
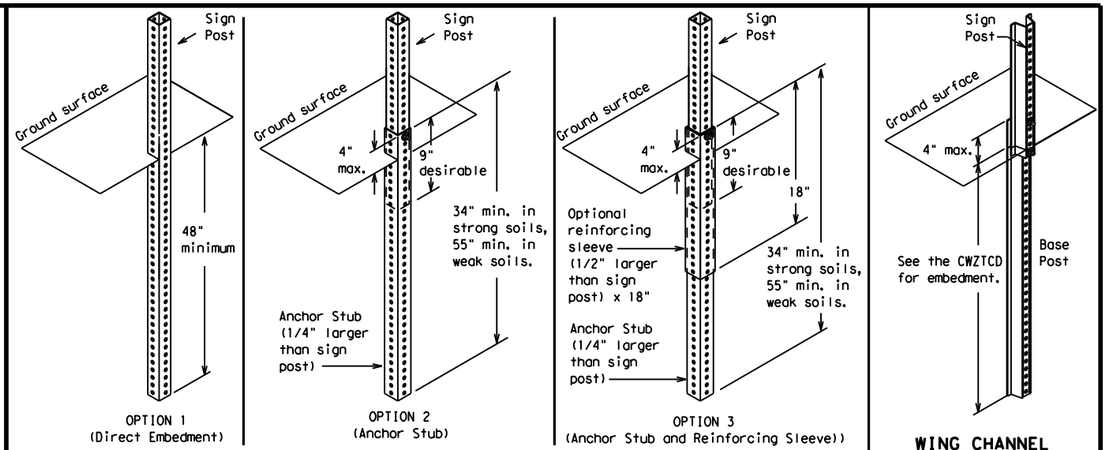




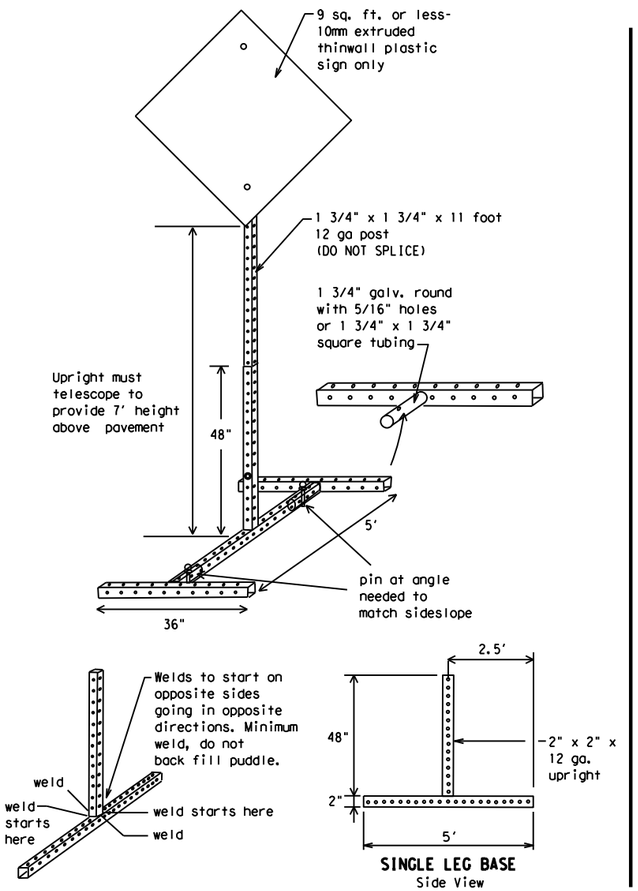
SKID MOUNTED WOOD SIGN SUPPORTS

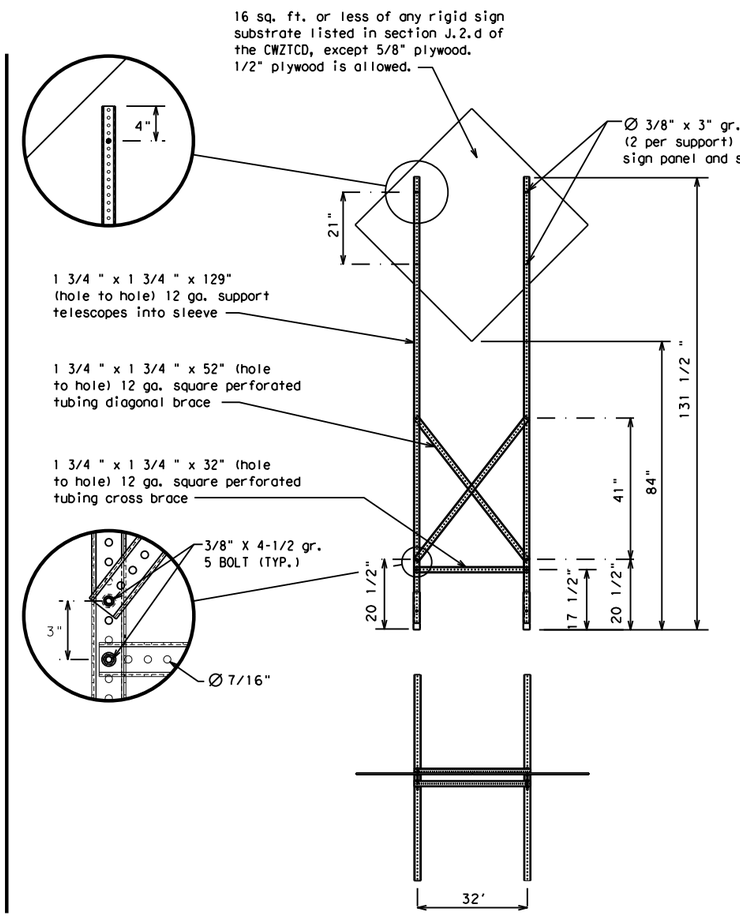
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

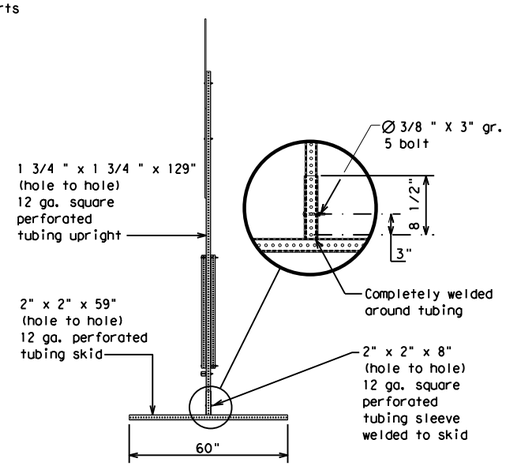


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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.

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BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON		28

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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
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

** 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 Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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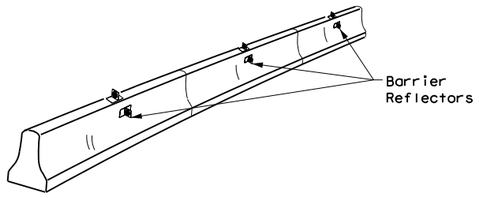
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON		29

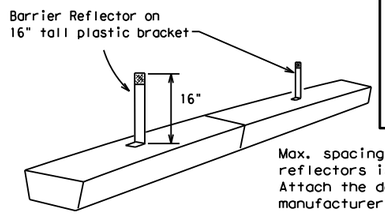
100

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.

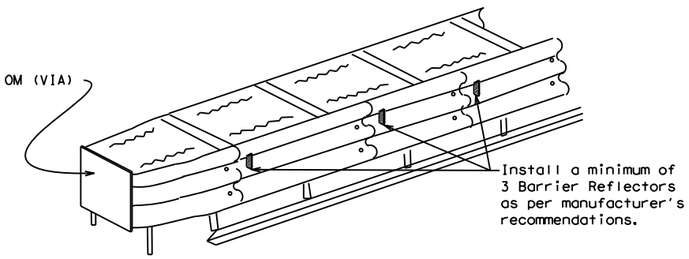


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

LOW PROFILE CONCRETE BARRIER (LPCB)

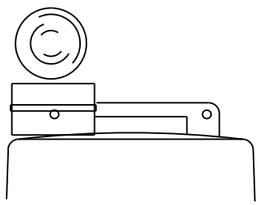


DELINEATION OF END TREATMENTS

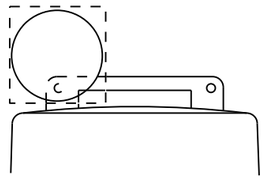
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the apppropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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

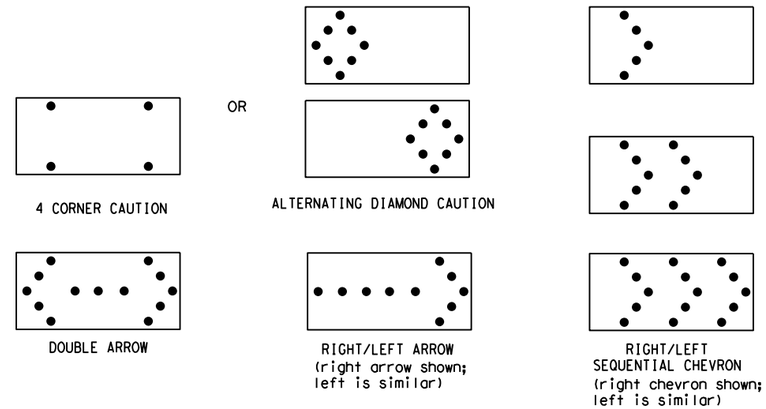
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in 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 Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	LFK	HOUSTON		30

101

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:

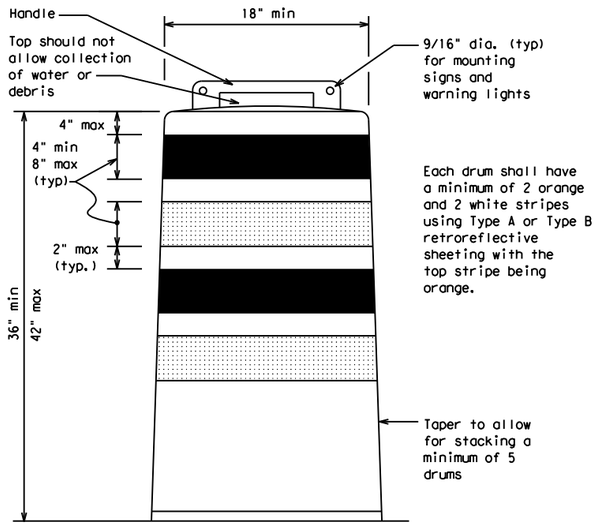
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

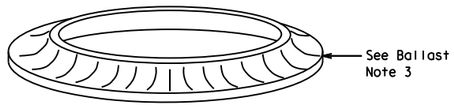
RETROREFLECTIVE SHEETING

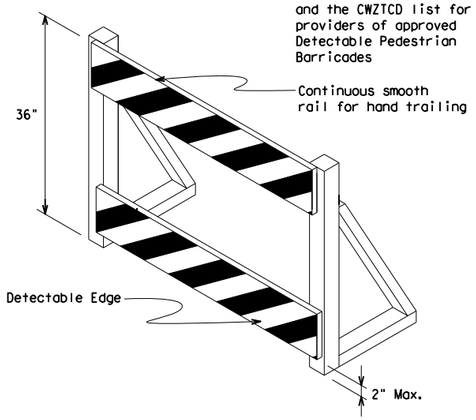
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

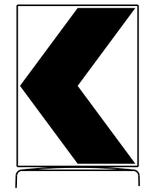




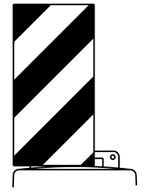


DETECTABLE PEDESTRIAN BARRICADES

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



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

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
4-03 8-14	DIST	COUNTY		SHEET NO.
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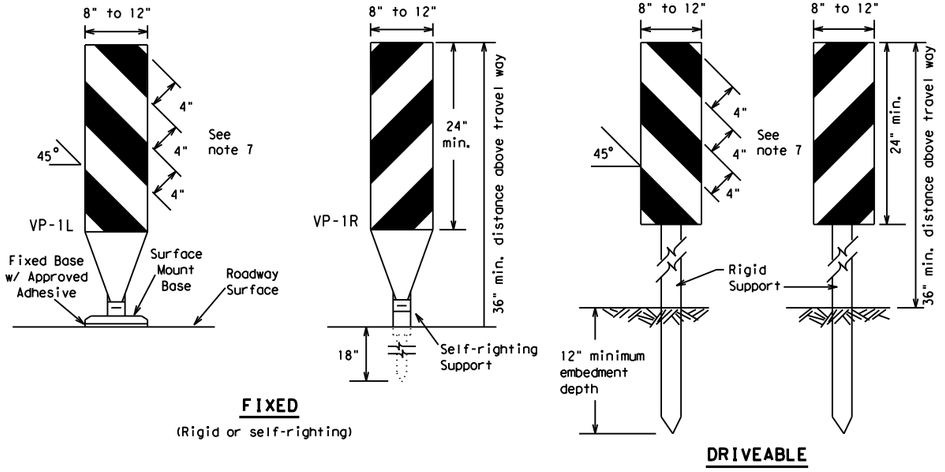
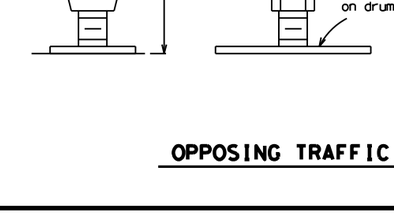


FIXED
(Rigid or self-righting)

DRIVEABLE

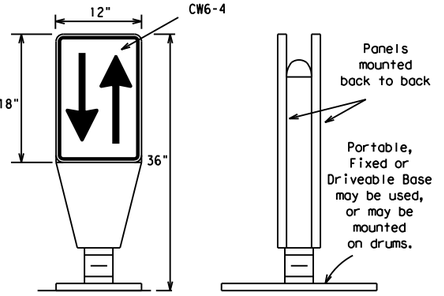


(Rigid or self-righting)

PORTABLE

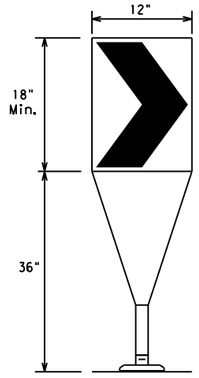
VERTICAL PANELS (VPs)

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 for additional requirements on the use 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 or Type B 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.



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)



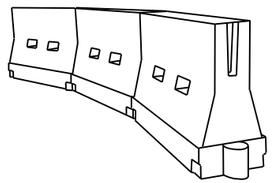
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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). Place reflective sheeting 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 Manual for Assessing Safety Hardware (MASH) 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 Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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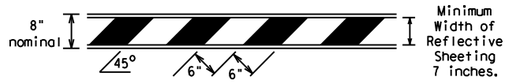
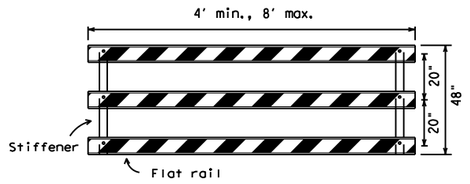
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



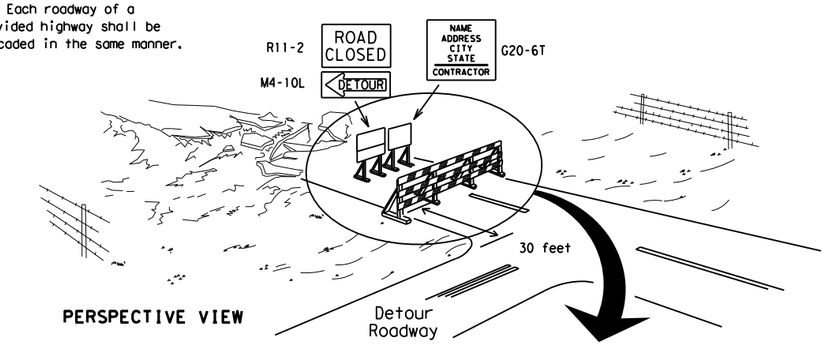
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

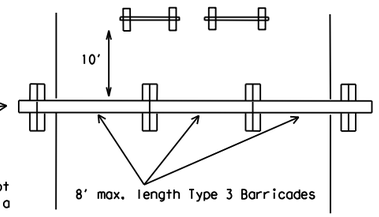
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

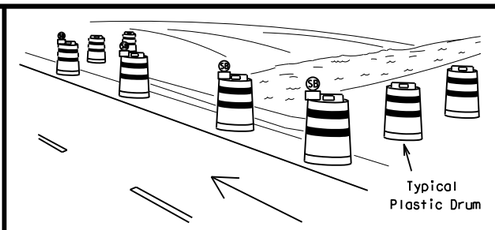
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

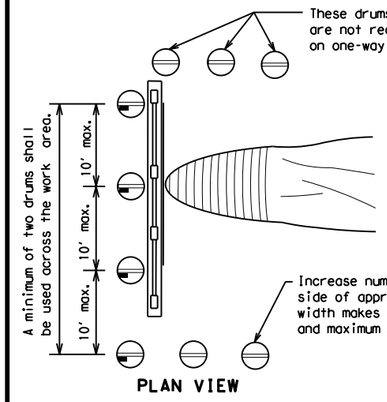
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

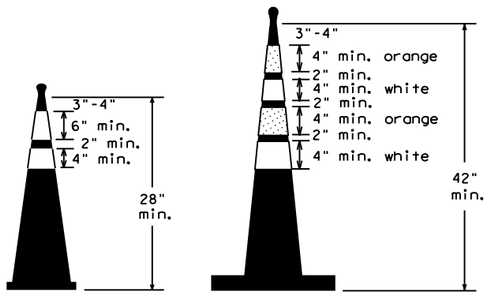
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

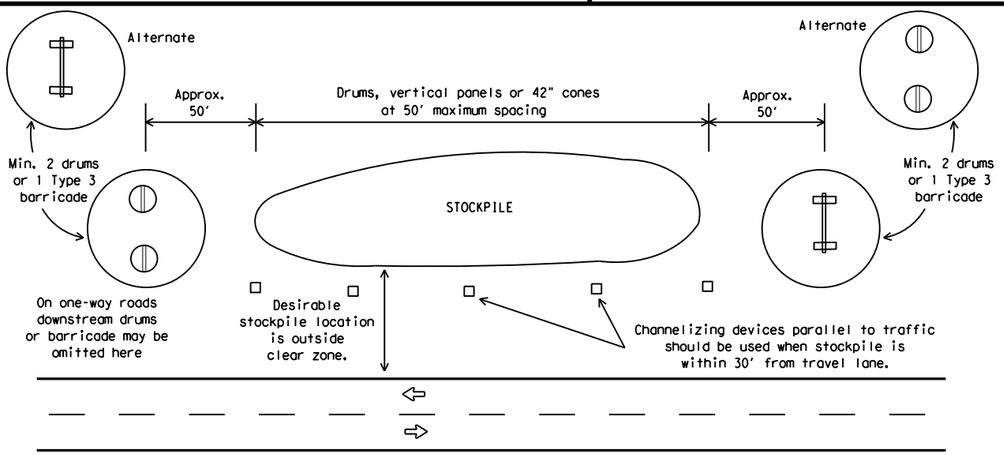
PLAN VIEW

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 shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
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7-13 5-21	LFK	HOUSTON		33

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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.

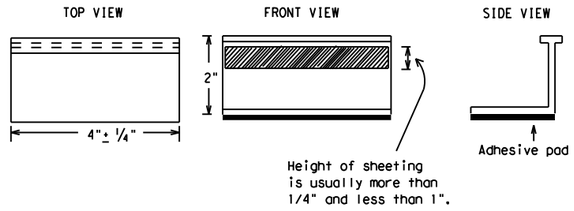
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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11-02 8-14				

105

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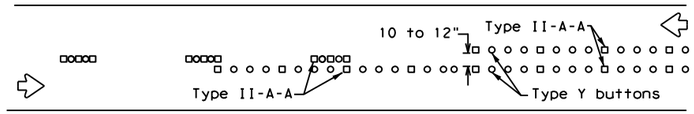
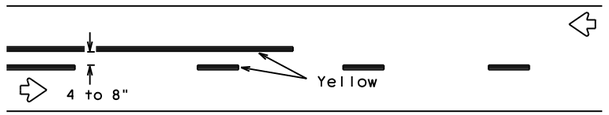
PAVEMENT MARKING PATTERNS

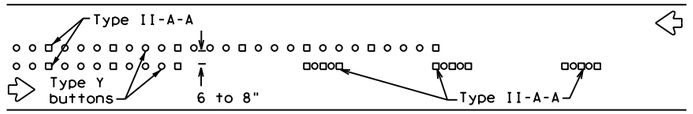
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



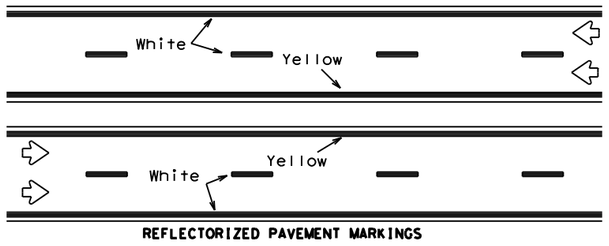
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



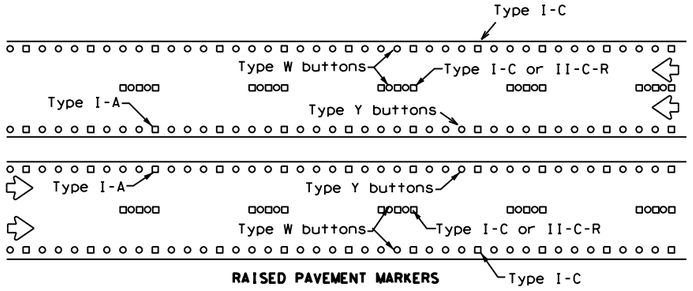
RAISED PAVEMENT MARKERS - PATTERN B

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



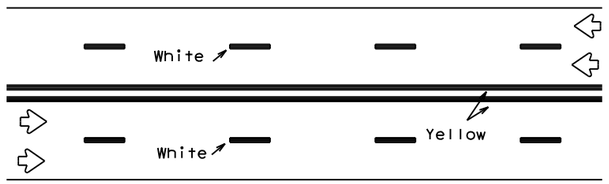
REFLECTORIZED PAVEMENT MARKINGS



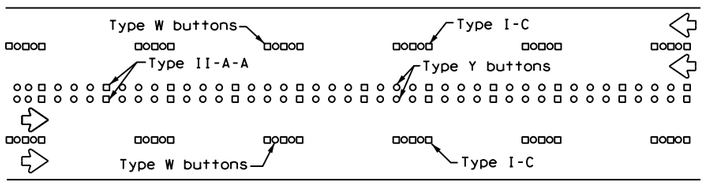
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



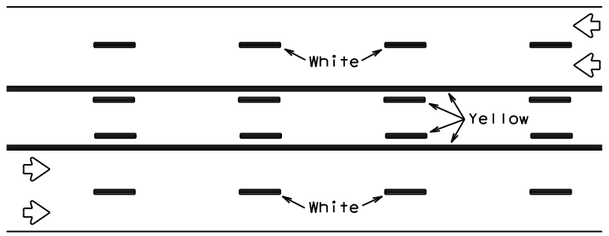
REFLECTORIZED PAVEMENT MARKINGS



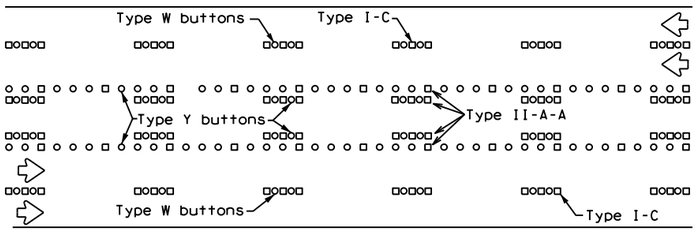
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

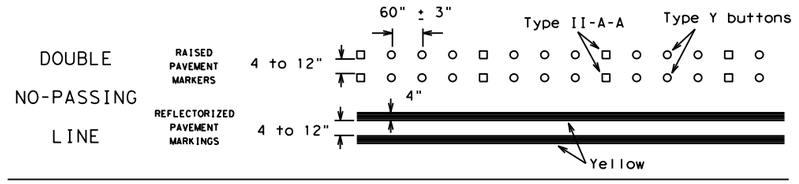
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

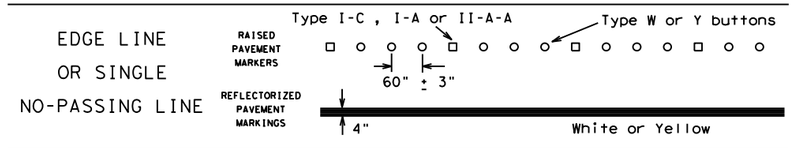
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

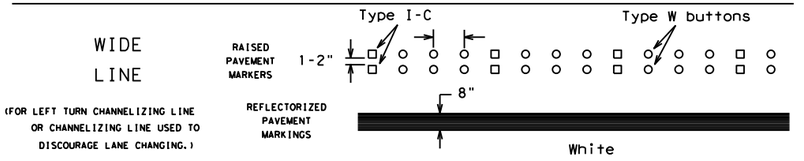


EDGE LINE OR SINGLE NO-PASSING LINE



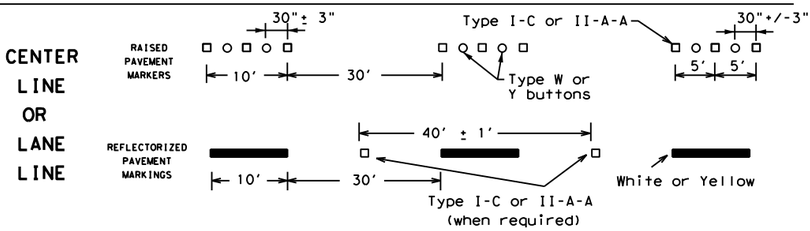
WIDE LINE

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

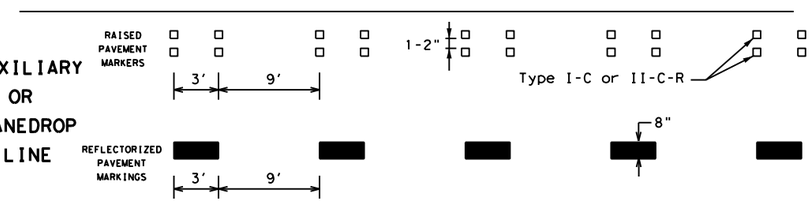


BROKEN LINES

CENTER LINE OR LANE LINE

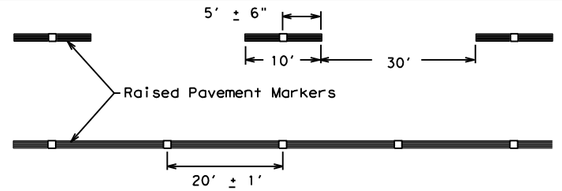


AUXILIARY OR LANEDROP LINE



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 Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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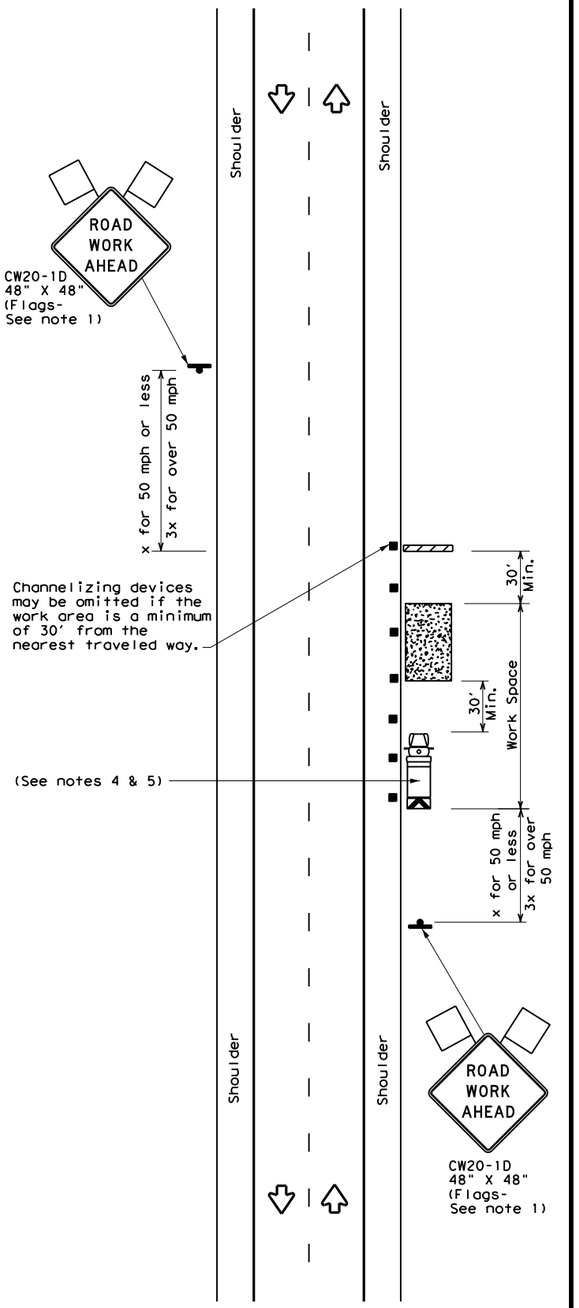
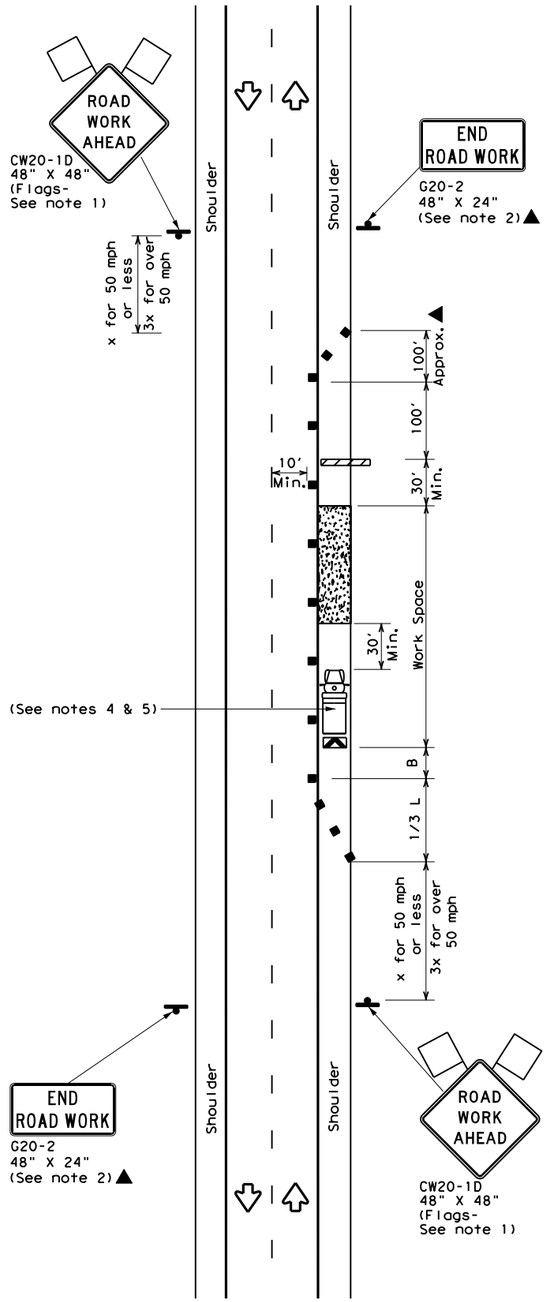


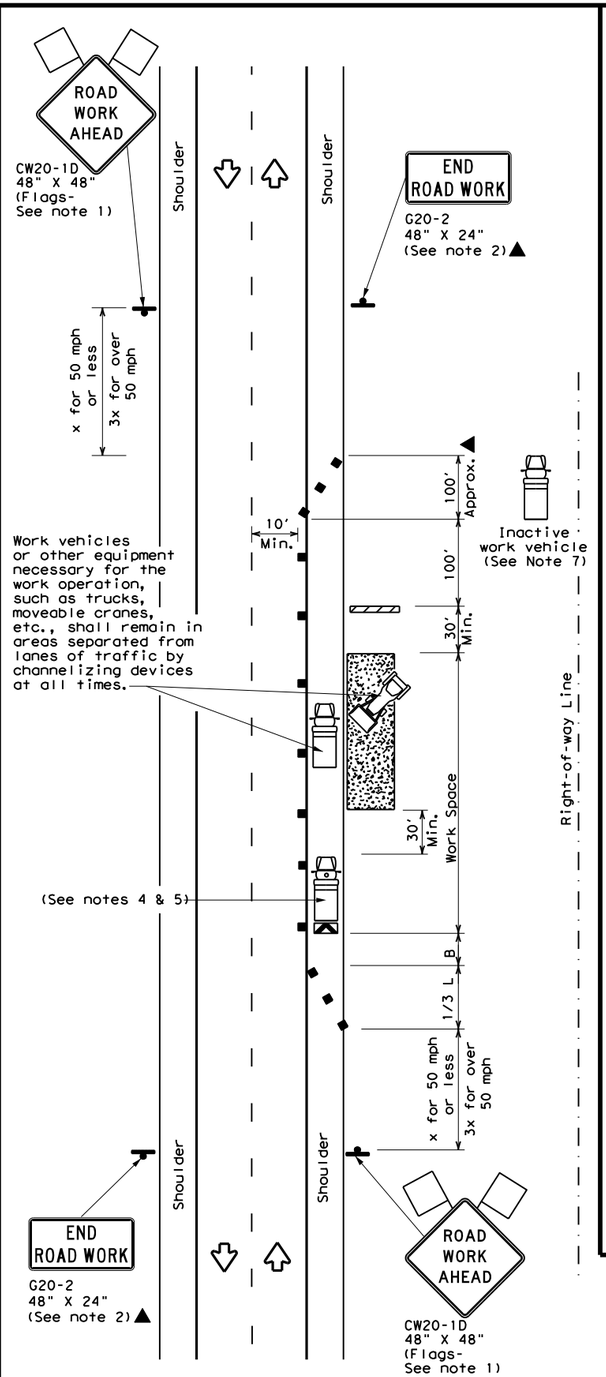
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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 in the plans, or for routine maintenance work, when approved by the Engineer.
3. Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
4. 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.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
6. See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
7. Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
8. CW21-5 "SHOULDER WORK" signs may be used in place of CW21-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
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8-95 2-12	LFK	HOUSTON		36
1-97 2-18				

DATE:
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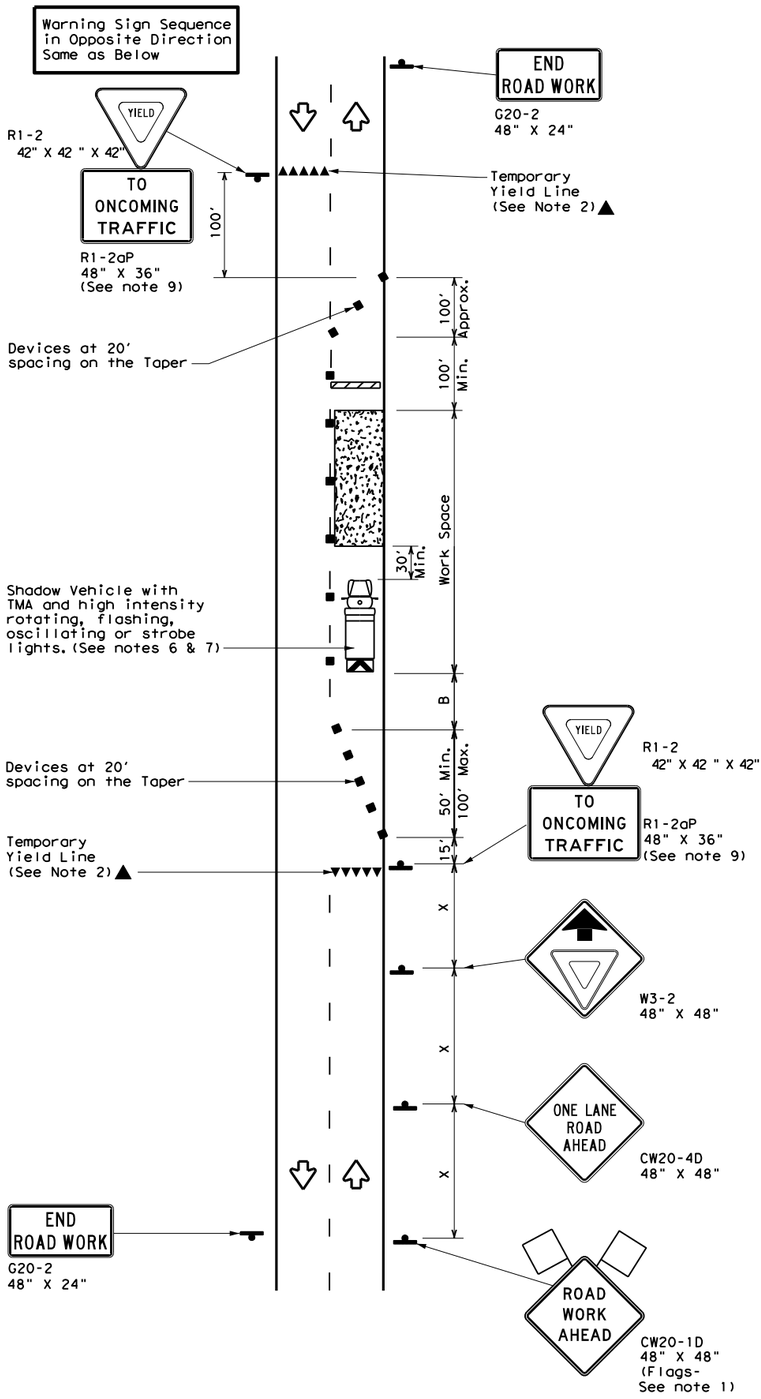
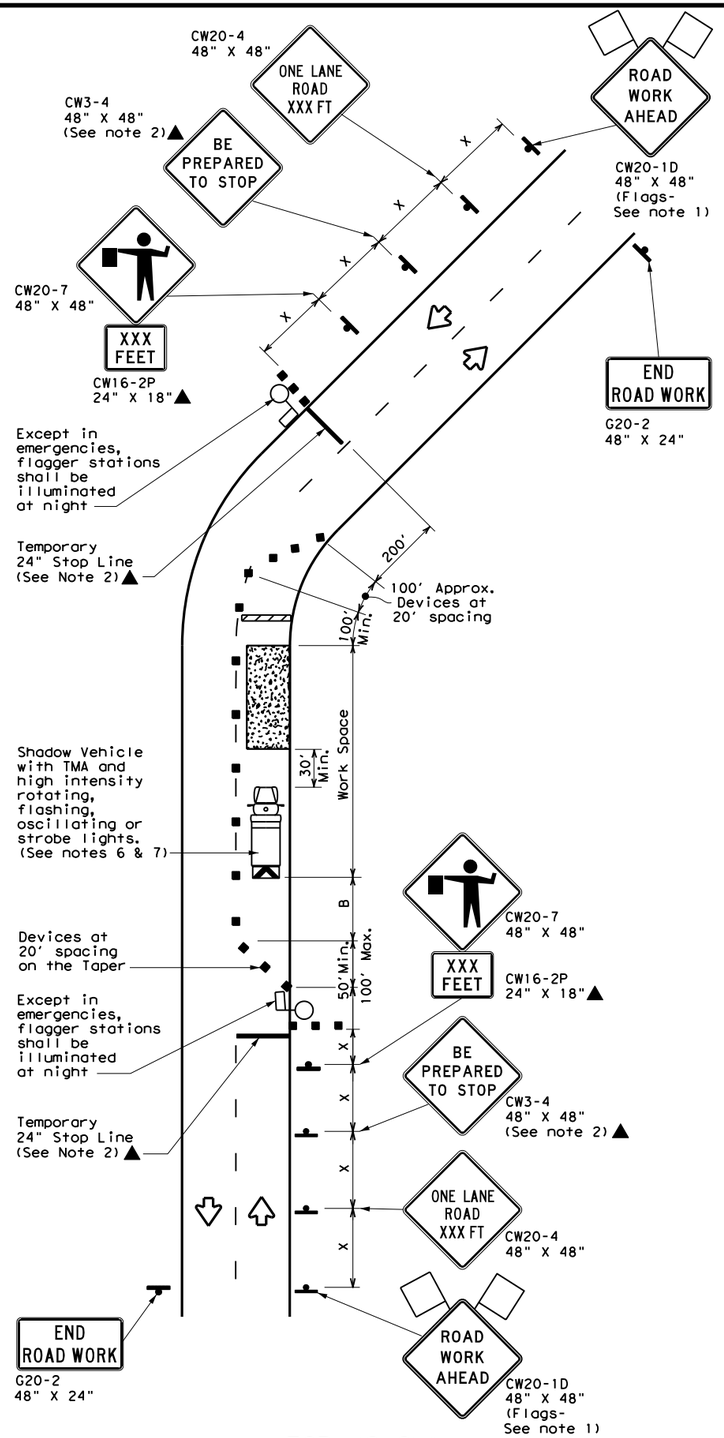


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	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"	Stopping Sight Distance
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L=WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

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

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

GENERAL NOTES

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. The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
4. Flaggers should use two-way radios or other methods of communication to control traffic.
5. Length of work space should be based on the ability of flaggers to communicate.
6. 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 off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-2a)

8. The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
9. The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.

TCP (2-2b)

10. Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
11. If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
12. Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situtations.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
ONE-LANE TWO-WAY
TRAFFIC CONTROL

TCP(2-2)-18

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1875	02	027	FM 2022
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	LFK	HOUSTON		37

DATE:
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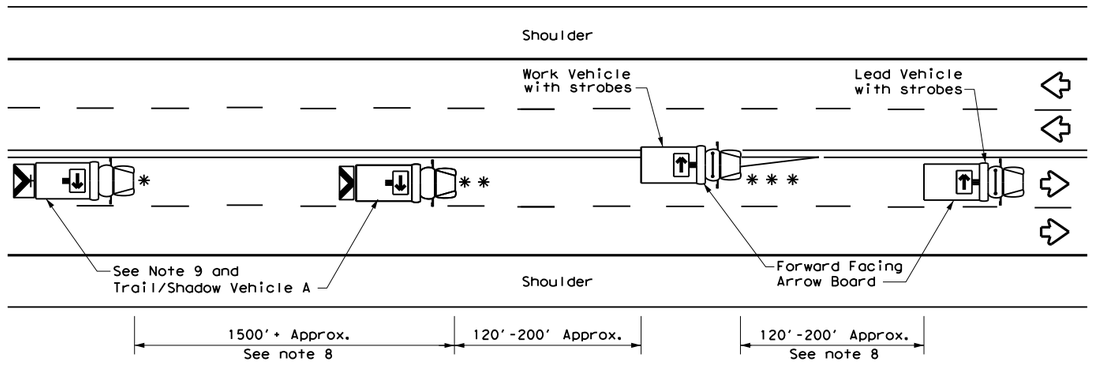
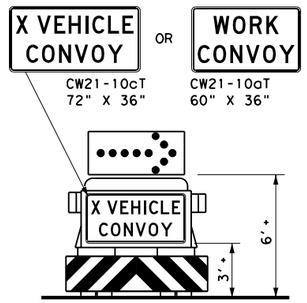


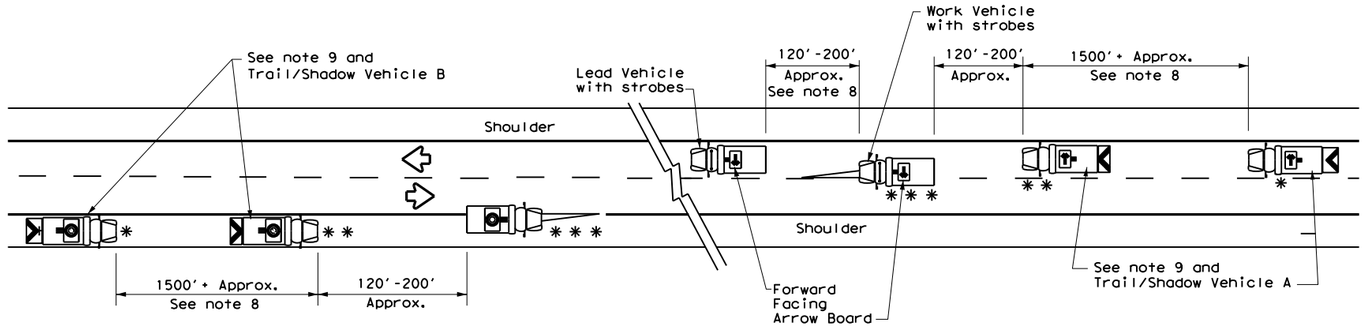
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



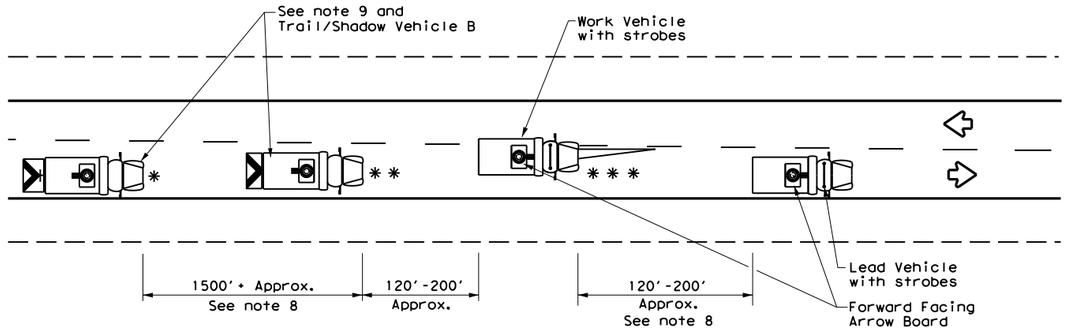
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board



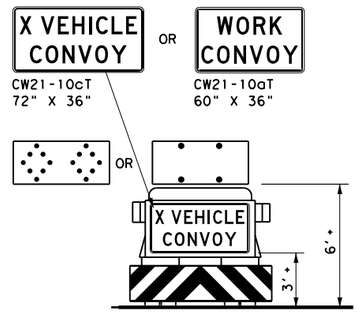
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

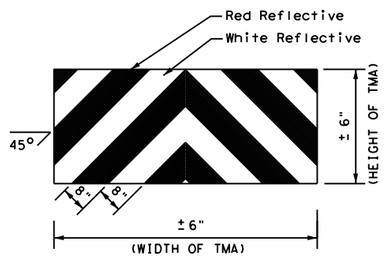
with Flashing Arrow Board in CAUTION display

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 the WORK vehicle must be equipped with an arrow board. 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 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 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 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. 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.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	1875	02	027	FM 2022
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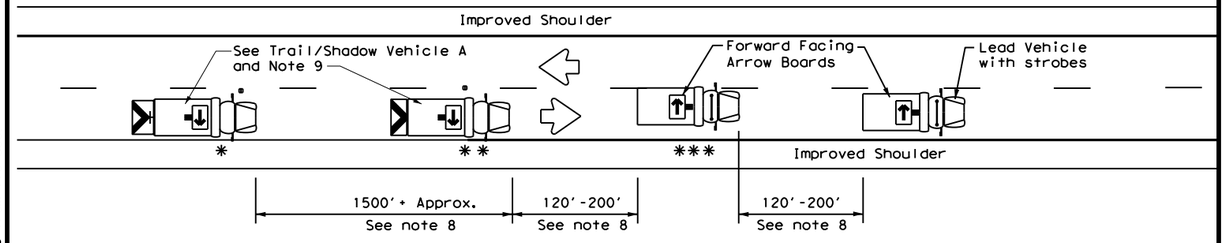
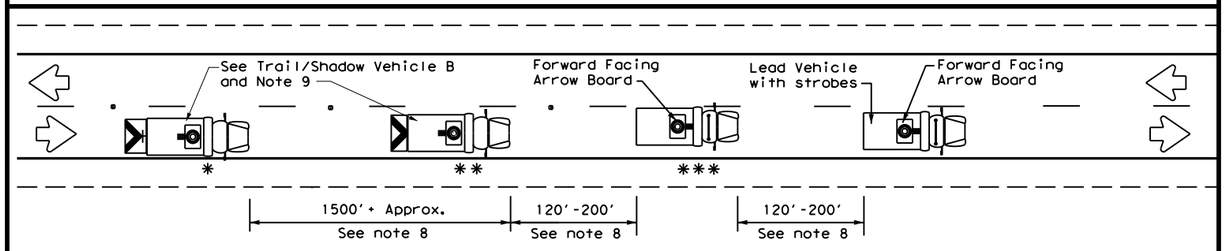


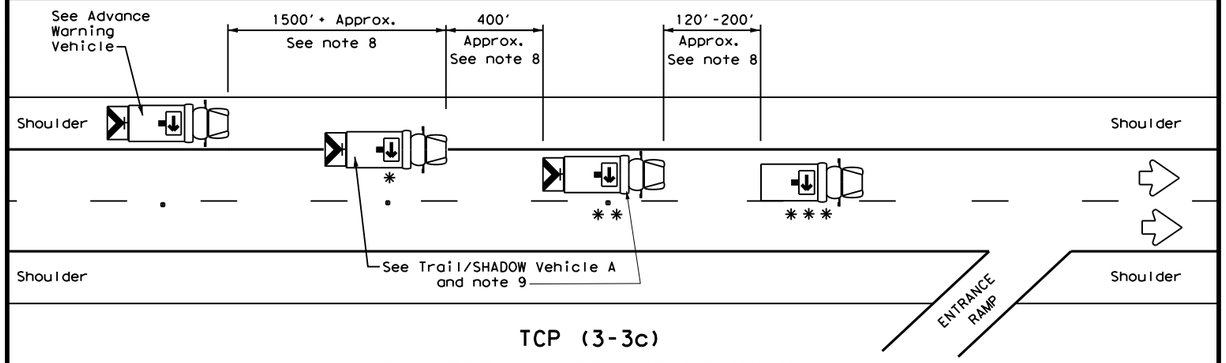
TCP (3-3a)

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



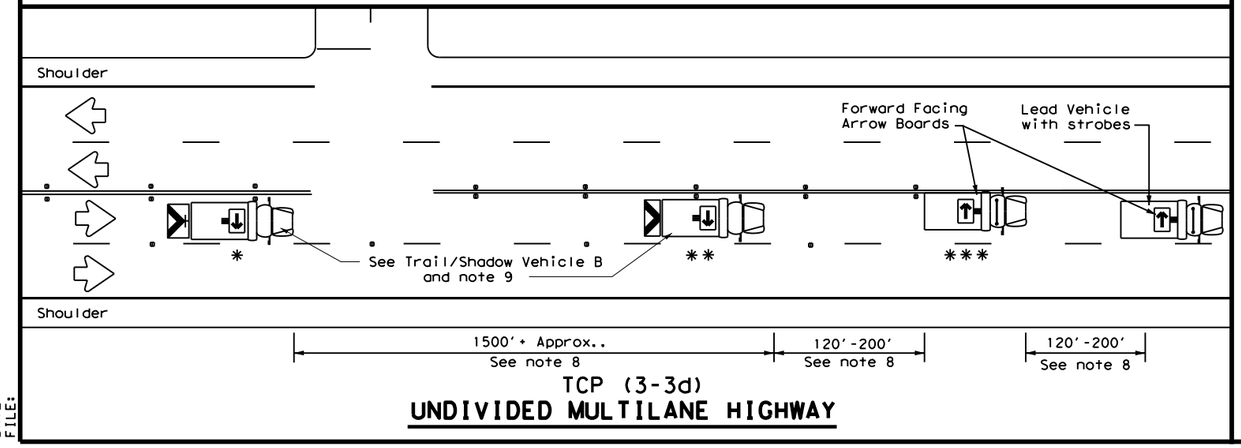
TCP (3-3b)

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



TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY

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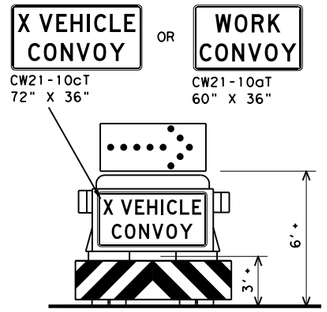
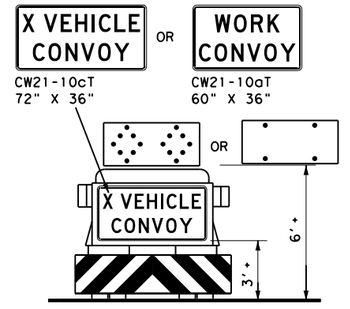


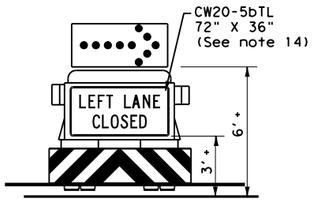
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

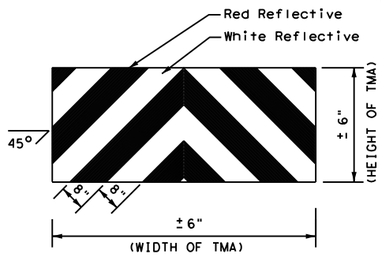


TRAIL/SHADOW VEHICLE B

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

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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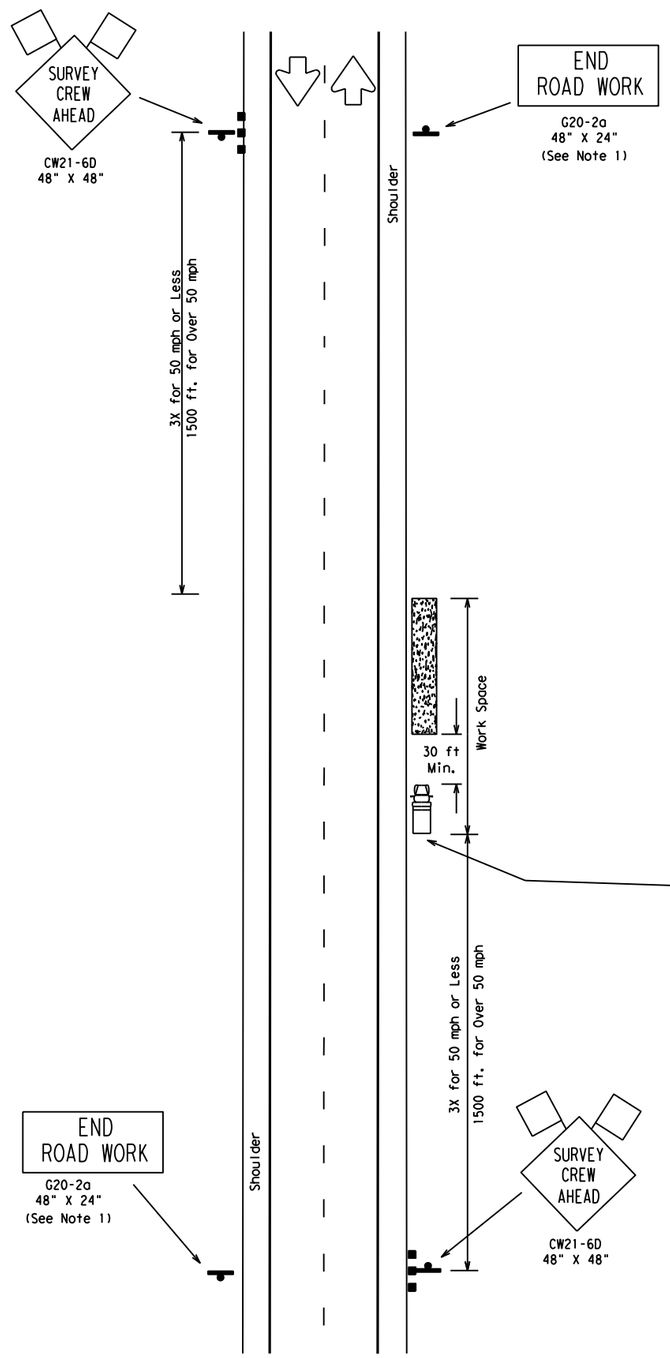
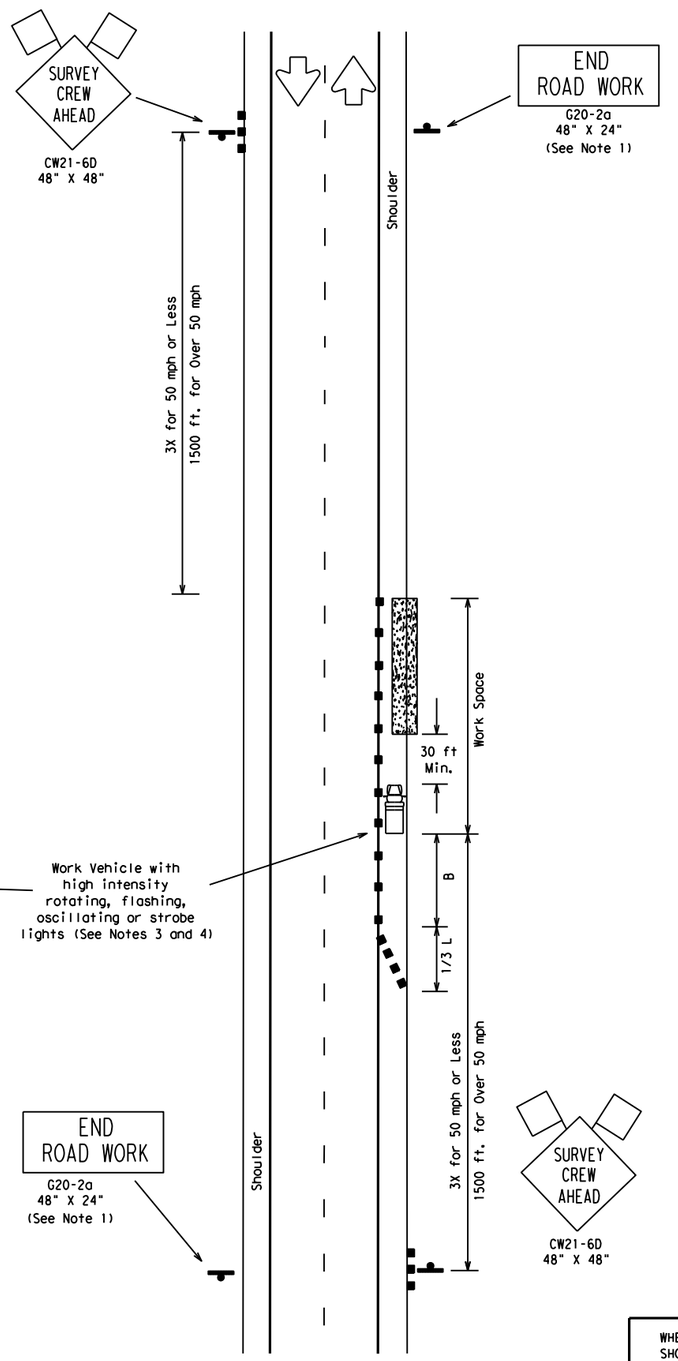


TCP (S-1a)
WORK OFF SHOULDER OR PAVED SURFACE



TCP (S-1b)
WORK ON SHOULDER

LEGEND

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

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

✳ Conventional Roads Only

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

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

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

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Channelizing devices on the shoulder taper and tangent section may be omitted for short duration (less than 1 hour) work.
3. If line-of-sight requirements for surveying operations will preclude the placement of the Work Vehicle to protect workers, the channelizing devices mentioned in Note 2 are required.
4. ⚠ A Shadow Vehicle with a Truck Mounted Attenuator and flashing warning lights/arrow panel in caution mode may be used in lieu of the Work Vehicle to protect the work space.
5. The CW20-1D "ROAD WORK AHEAD" sign may be substituted for the CW21-6D "SURVEY CREW AHEAD" sign.
6. This plan may also be used for shoulder work or off shoulder work for multilane undivided roadways.
7. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-1a)

8. Cones may be placed at edge of pavement adjacent to the work space to enhance safety.

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

8-18-08 Revision
⚠ Corrected misspelling.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-1)-08A

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
187502		027	FM 2022

DIST	COUNTY	SHEET NO.
LFK	HOUSTON	40

DATE:
FILE:

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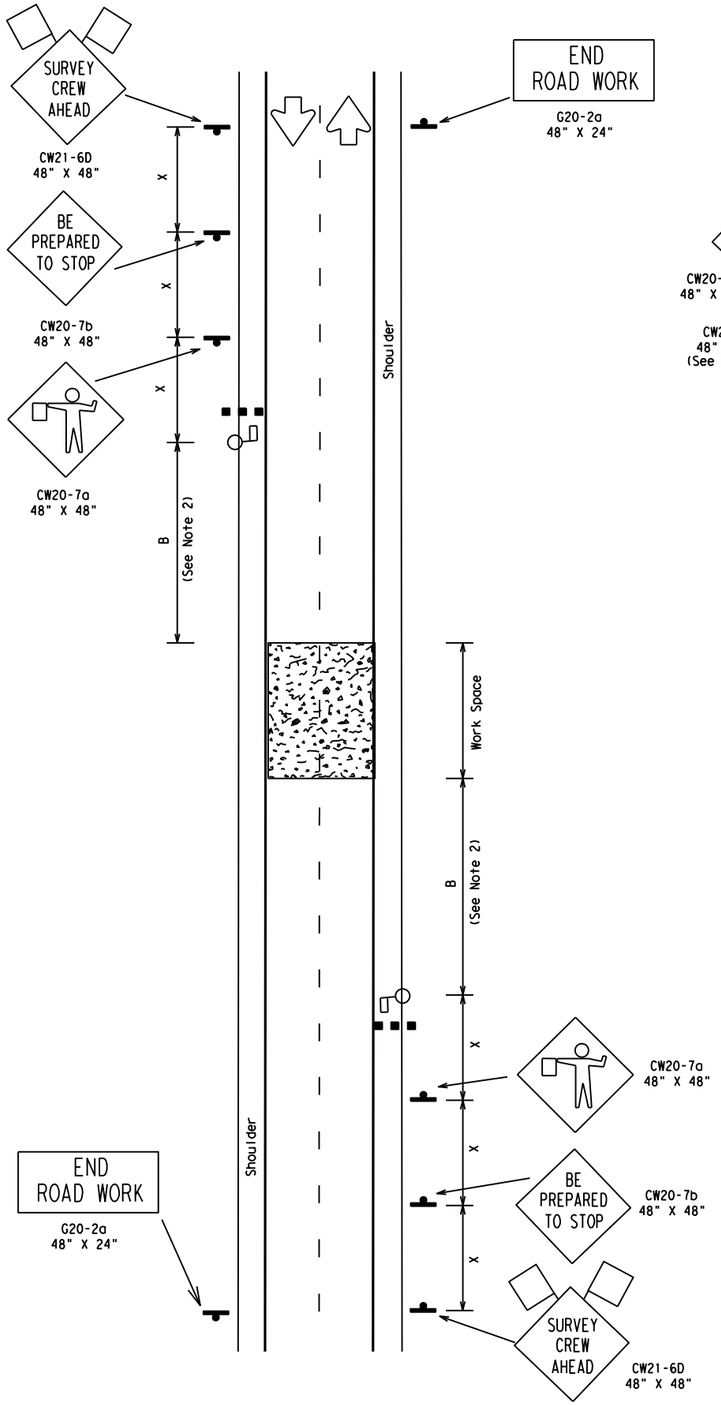
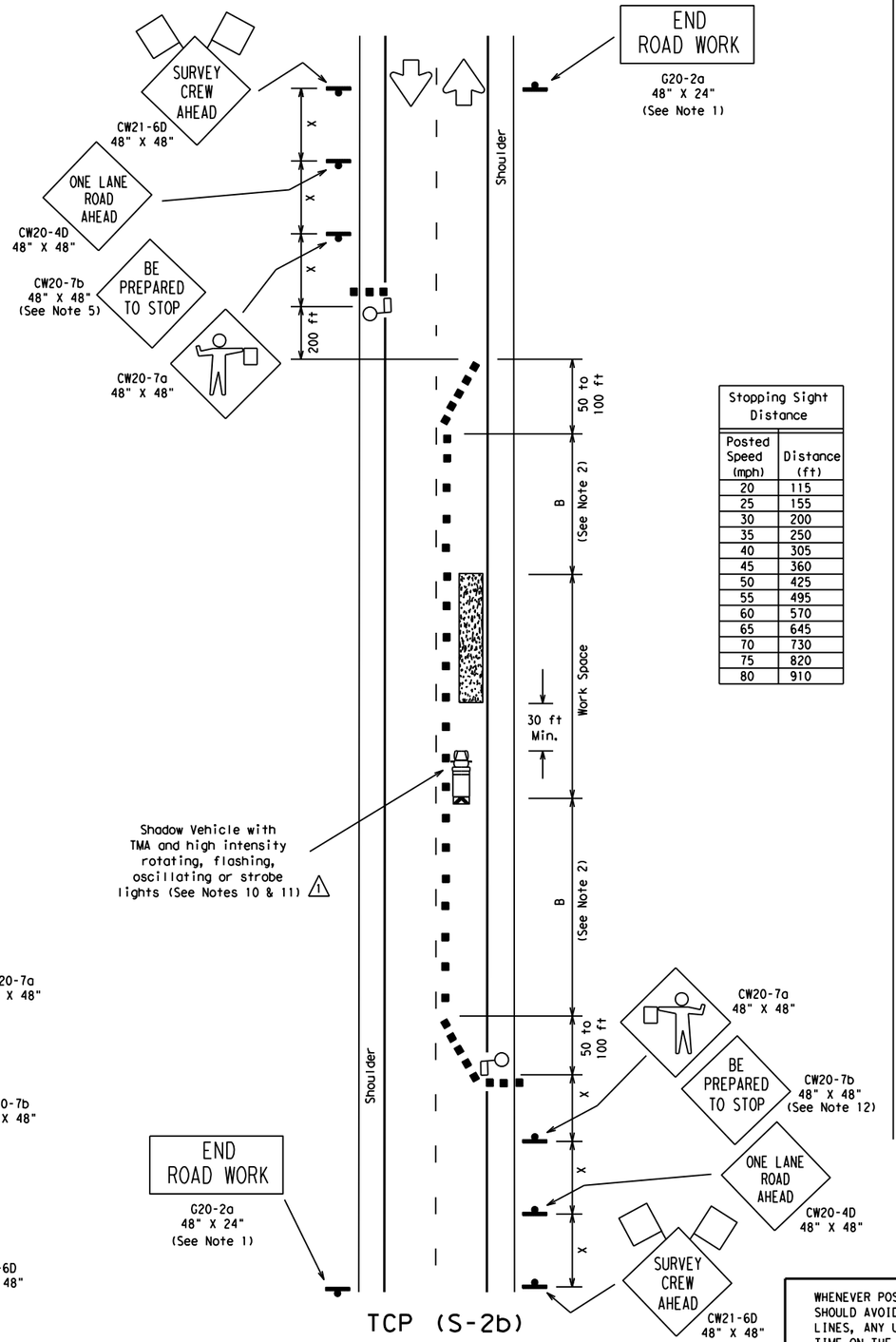


TCP (S-2a)
ROAD CLOSED FOR LESS THAN 20 MINUTES -
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS



TCP (S-2b)
WORK IN ROADWAY
OFF PEAK TRAFFIC HOURS
WITH OR WITHOUT SHOULDERS

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

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

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

* Conventional Roads Only

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

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

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

GENERAL NOTES:
1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Adequate Stopping Sight Distance (see Stopping Sight Distance table) should be maintained from approaching traffic to the flagger or a queue of stopped vehicles. The Buffer Space "B" should be extended around curves or other obstacles, when necessary, to have adequate Stopping Sight Distance to the flagger station.
3. Flaggers should use two-way radios or other means of communication while flagging.
4. The length of the work space should be based on the ability of the flaggers to communicate.
5. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" signs.
6. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads is desirable, but is not required when working less than 15 minutes in area of the side road, as determined by the Engineer.

TCP(S-2a)

7. Road closures shall be less than 20 minutes. Closures less than 5 minutes are desirable.
8. Sign spacing should be increased if traffic repeatedly queues past the CW20-7b "BE PREPARED TO STOP" sign.
9. The surveying instrument should not be located on the paved surface.

TCP (S-2B)

10. For short duration work the Shadow Vehicle with a TMA may be replaced by another Work Vehicle with high intensity rotating, flashing or strobe lights.
11. Shadow Vehicles with a TMA are desirable when workers or equipment are in the work space. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Shadow Vehicle.
12. The CW20-7b "BE PREPARED TO STOP" sign is optional. When used, it should be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign.

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

8-18-08 Revision
1 Corrected referrence to notes.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

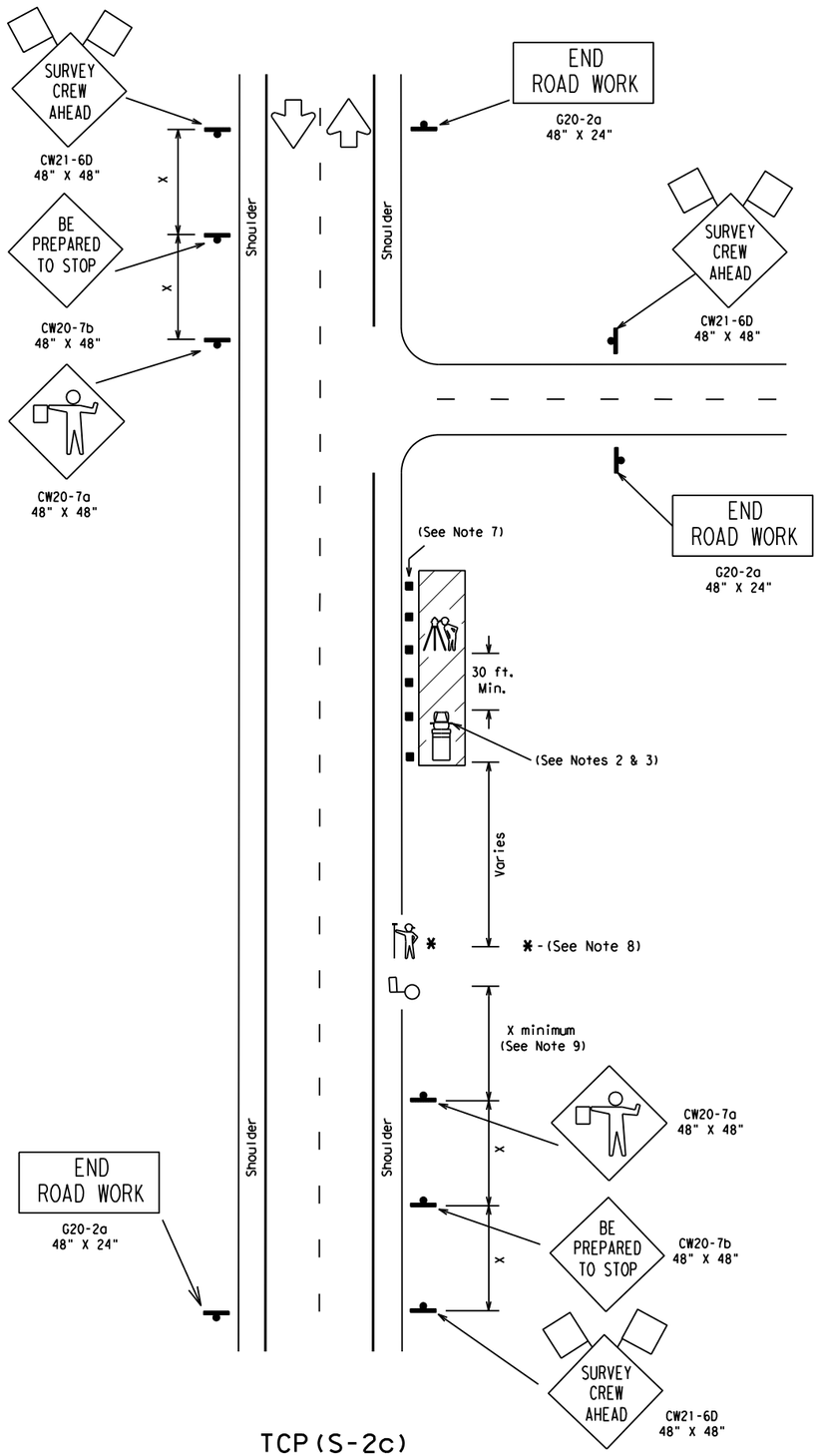
TCP(S-2)-08A

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-08

CONT	SECT	JOB	HIGHWAY
187502		027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		41

DATE:
FILE:



TCP(S-2c)

Stopping Sight Distance	
Posted Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820
80	910

LEGEND

Type III Barricade ■ ■ Channelizing Devices Flag

Work Vehicle Truck Mounted Attenuator (TMA)

Flagger Sign Post Survey Rodman Instrument Person

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

* Conventional Roads Only

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

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

DEFINITIONS:

MOBILE - work that moves continously or intermittently (stopping up to approximately 15 minutes).

SHORT DURATION - work that occupies a location up to 1 hour.

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

GENERAL NOTES:

1. The G20-2a "END ROAD WORK" sign may be placed on the back of the CW21-6D "SURVEY CREW AHEAD" sign or may be omitted for short duration (less than 1 hour) work.
2. Work Vehicle with high intensity rotating, flashing, oscillating or strobe lights should be used to protect work space.
3. When approved by the engineer, Type III barricades or other channelizing devices may be substituted for the Heavy Work Vehicle.
4. CW20-1D "ROAD WORK AHEAD" signs may be substituted for CW21-6D "SURVEY CREW AHEAD" SIGNS.
5. The CW21-6D "SURVEY CREW AHEAD" sign for low volume intersecting side roads may be omitted when approved by the Engineer.
6. The Surveying Instrument shall not be located on the paved surface.
7. Cones at edge of pavement adjacent to instrument person may be omitted when approved by the Engineer.
8. Rodman may only enter roadway when accompanied by flagger and as traffic allows.
9. The distance between the advance warning signs and the work should not exceed a two mile maximum.
10. Flaggers and Survey Crew should use two-way radios or other means of communication.
11. Survey Crew and Flaggers shall wear high-visibility apparel meeting the ANSI 107-2007 standard performance for Class 2 or Class 3 risk exposure.
12. Additional traffic control devices may be required to address local site conditions.
13. Stopping Sight Distance shall be maintained from approaching traffic to the flagger. See "Stopping Sight Distance" table.

SURVEY PARTIES SHOULD AVOID ANY UNNECCESSARY PERIODS OF TIME ON THE ROAD SURFACE.

This TCP is to cover two lane rural type roadways as determined by the Engineer. All other type roadways will be covered by other established Survey TCP'S.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC CONTROL PLAN FOR SURVEYING OPERATIONS

TCP(S-2C)-10

REVISIONS

DN: TXDOT | CK: TXDOT | DW: TXDOT | CK: TXDOT

CONT	SECT	JOB	HIGHWAY
187502		027	FM 2022

DIST	COUNTY	SHEET NO.
LFK	HOUSTON	42

212A

DATE:
FILE:

DISCLAIMER:
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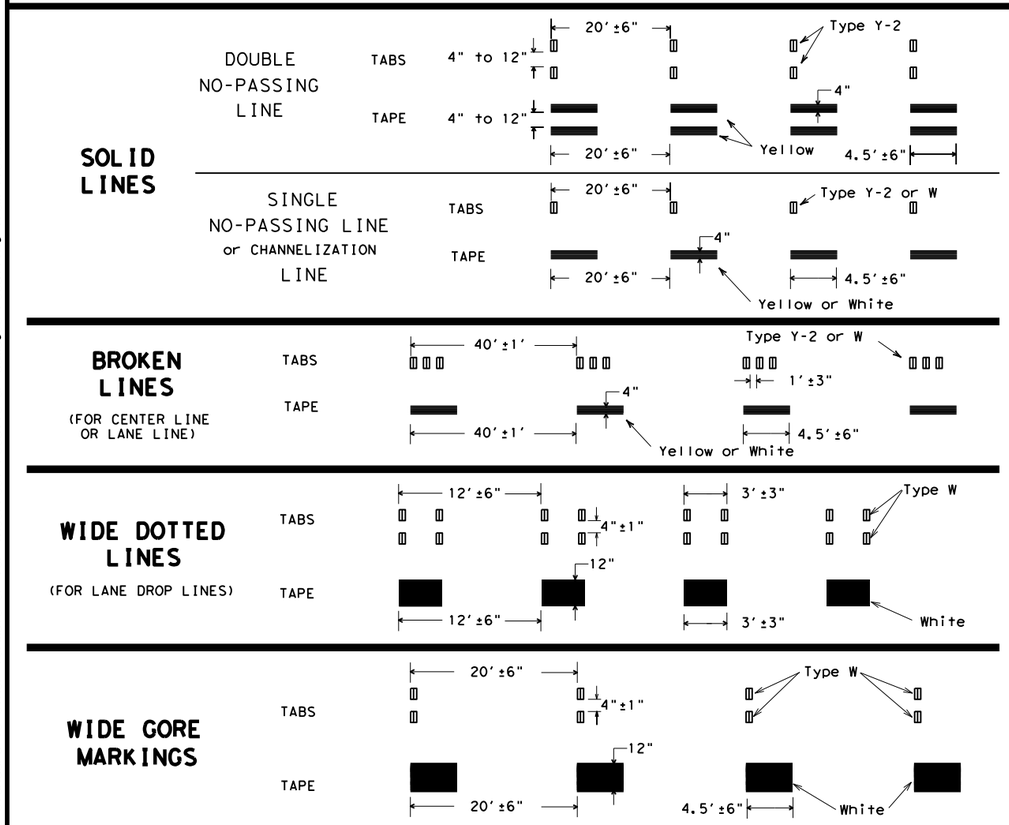
DATE:
FILE:

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



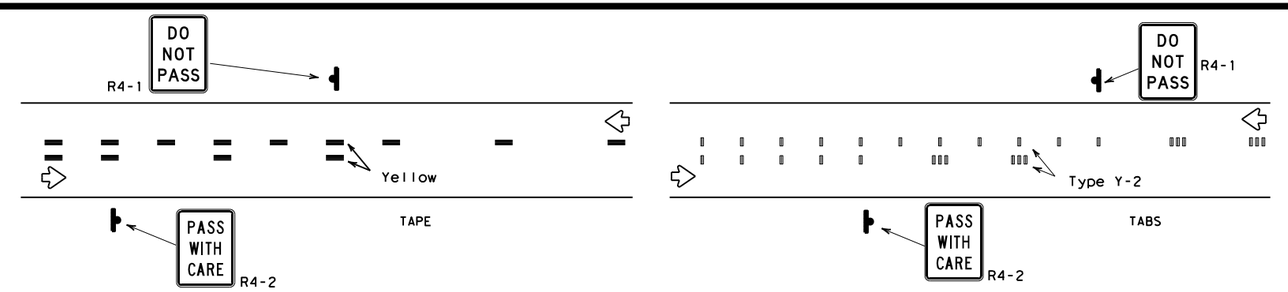
NOTES:

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.

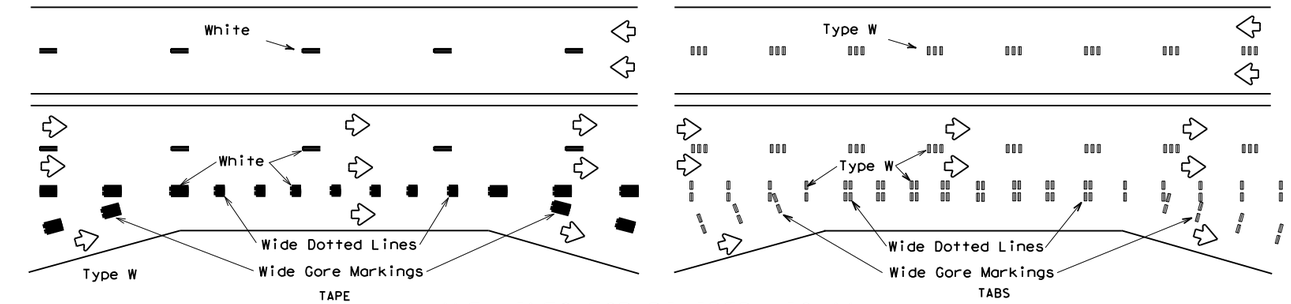
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

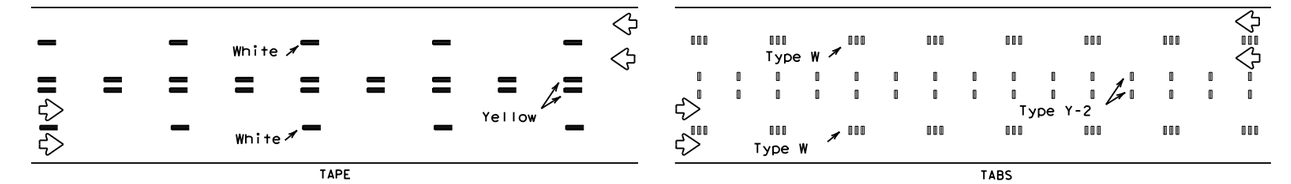
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



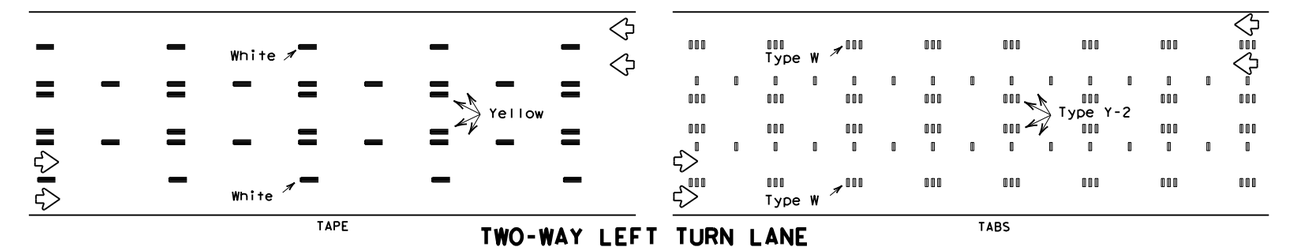
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



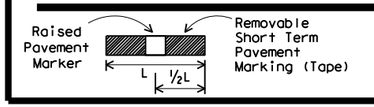
LANE LINES FOR DIVIDED HIGHWAY



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

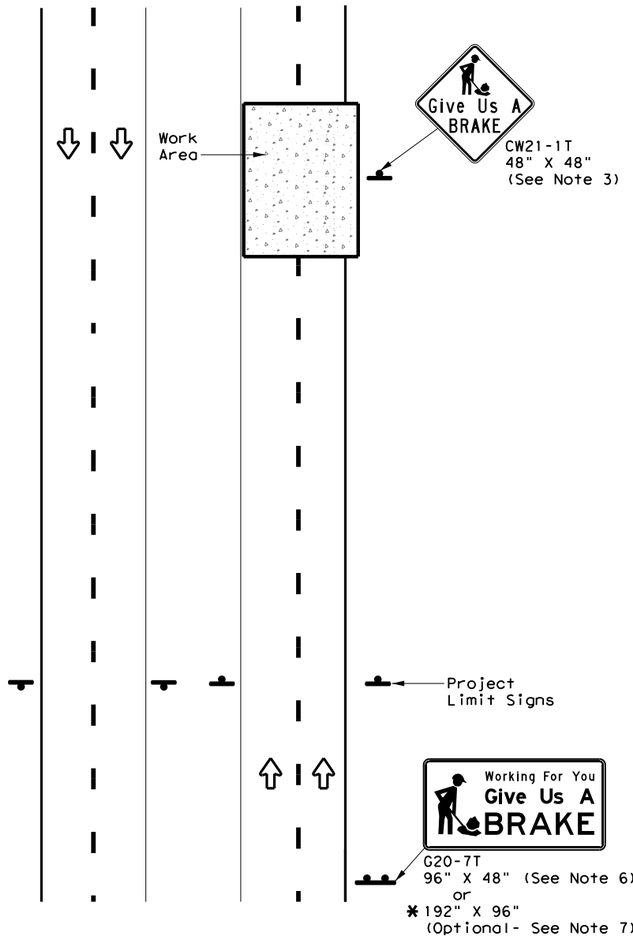
Texas Department of Transportation

Traffic Operations Division Standard

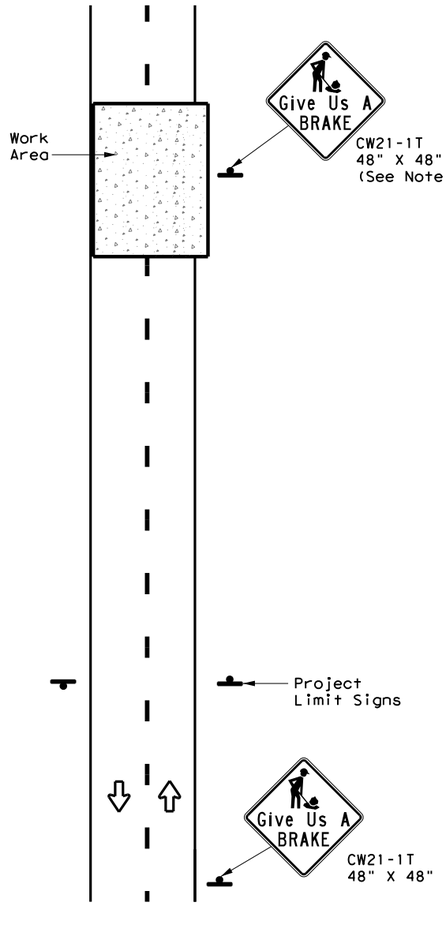
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-13

FILE:	wzstpm-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS		1875	02	027	FM 2022
1-97		DIST	COUNTY		SHEET NO.
3-03		LFK	HOUSTON		43
7-13					



DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

* When the optional larger WORKING FOR YOU GIVE US A BRAKE (G20-7T) 192" x 96" sign is required, the locations shall be noted elsewhere in the plans.

DATE:
FILE:

SUMMARY OF LARGE SIGNS

BACKGROUND COLOR	SIGN DESIGNATION	SIGN	SIGN DIMENSIONS	REFLECTIVE SHEETING	SQ FT	GALVANIZED STRUCTURAL STEEL			DRILLED SHAFT 24" DIA. (LF)
						Size	(LF) ①	(LF) ②	
Orange	G20-7T	Working For You Give Us A BRAKE	96" X 48"	Type B_{FL} or C_{FL}	32	▲	▲	▲	▲
Orange	G20-7T	Working For You Give Us A BRAKE	192" X 96"	Type B_{FL} or C_{FL}	128	W8x18	16	17	12

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B_{FL} OR TYPE C_{FL}
BLACK	LEGEND & BORDERS	NON-REFLECTIVE ACRYLIC FILM

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
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.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

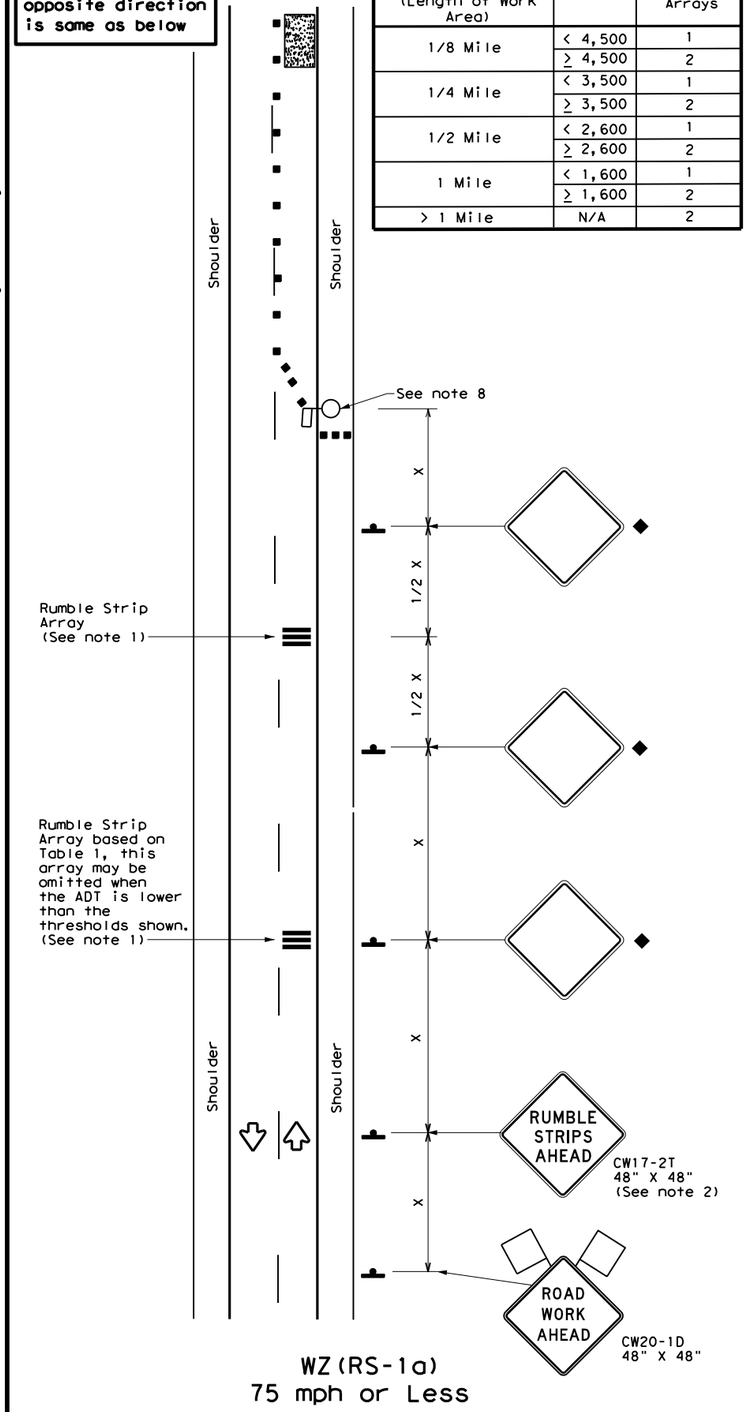
WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	LFK	HOUSTON		44

116

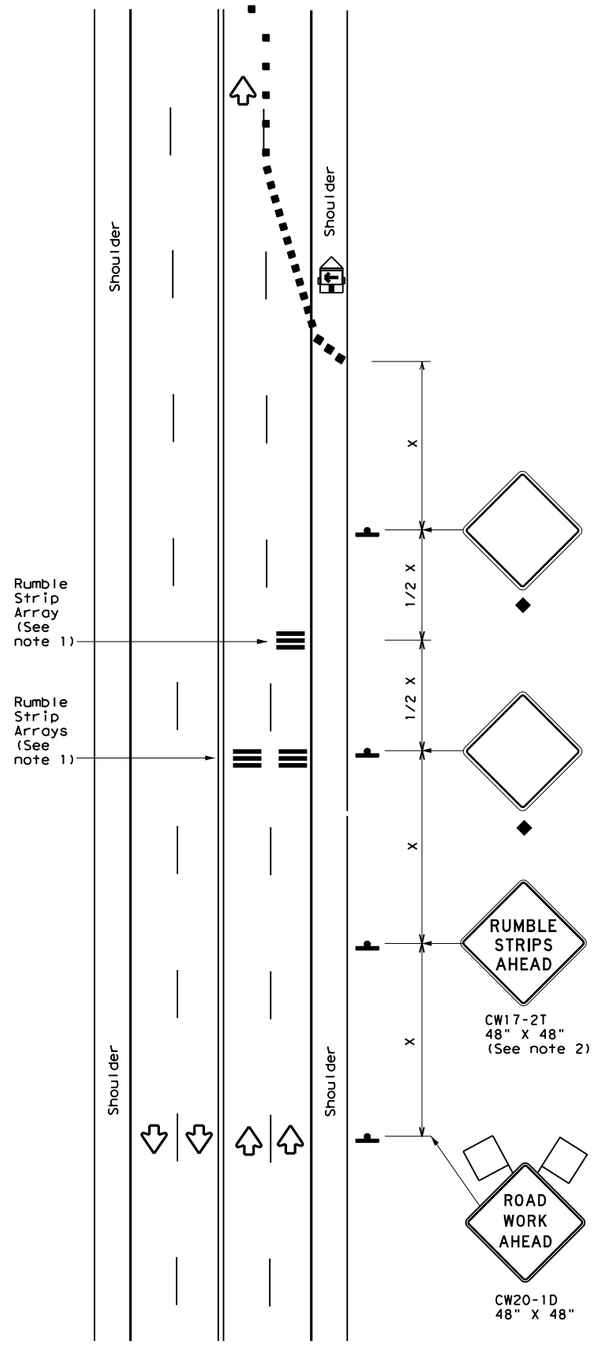
Warning sign and rumble strip sequence in opposite direction is same as below

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	187502		027	FM 2022
2-14	DIST	COUNTY		SHEET NO.
4-16	LFK	HOUSTON		45

DATE:
FILE:

FM 2022 - SUPERELEVATION TABLE

STATION		TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	
BEGIN PROJECT				
	>	-2.00	-2.00	
334+02 END NC				
SUPERELEVATION TRANSITION				
335+66 BEGIN FS				
	>	4.70	-4.70	175 TONS FL BS 100 CY EMBANKMENT
342+19 END FS				
SUPERELEVATION TRANSITION				
343+83 BEGIN NC				
	>	-2.00	-2.00	
363+41 END NC				
SUPERELEVATION TRANSITION				
364+90 BEGIN FS				
	>	4.10	-4.10	175.4 TONS FL BS 100.2 CY EMBANKMENT
368+69 END FS				
SUPERELEVATION TRANSITION				
370+18 BEGIN NC				
	>	-2.00	-2.00	
374+41 END NC				
SUPERELEVATION TRANSITION				
376+24 BEGIN FS				
	>	-5.50	5.50	185.2 TONS FL BS 105.8 CY EMBANKMENT
381+69 END FS				
SUPERELEVATION TRANSITION				
383+52 BEGIN NC				
	>	-2.00	-2.00	
390+91 END NC				
SUPERELEVATION TRANSITION				
392+64 BEGIN FS				
	>	-5.10	5.10	161.2 TONS FL BS 92.1 CY EMBANKMENT
397+04 END FS				
SUPERELEVATION TRANSITION				
398+77 BEGIN NC				
	>	-2.00	-2.00	
403+84 END NC				
SUPERELEVATION TRANSITION				
405+43 BEGIN FS				
	>	4.50	-4.50	201.7 TONS FL BS 115.2 CY EMBANKMENT
416+87 END FS				

FM 2022 - SUPERELEVATION TABLE

STATION		TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)	
418+46 BEGIN NC				
	>	-2.00	-2.00	
442+51 END NC				
SUPERELEVATION TRANSITION				
443+95 BEGIN FS				
	>	-3.90	3.90	94.5 TONS FL BS 54.0 CY EMBANKMENT
452+11 END FS				
SUPERELEVATION TRANSITION				
453+55 BEGIN NC				
	>	-2.00	-2.00	
470+25 END NC				
SUPERELEVATION TRANSITION				
472+18 BEGIN FS				
	>	-5.90	5.90	138.9 TONS FL BS 79.4 CY EMBANKMENT
476+56 END FS				
SUPERELEVATION TRANSITION				
478+49 BEGIN NC				
	>	-2.00	-2.00	
486+18 END NC				
SUPERELEVATION TRANSITION				
487+89 BEGIN FS				
	>	-5.00	5.00	54.1 TONS FL BS 30.9 CY EMBANKMENT
491+08 END FS				
SUPERELEVATION TRANSITION				
492+79 BEGIN NC				
	>	-2.00	-2.00	
507+36 END NC				
SUPERELEVATION TRANSITION				
508+50 BEGIN FS				
	>	2.70	-2.70	253.8 TONS FL BS 145 CY EMBANKMENT
524+69 END FS				
SUPERELEVATION TRANSITION				
525+83 BEGIN NC				
	>	-2.00	-2.00	
582+41 END NC				
SUPERELEVATION TRANSITION				
584+24 BEGIN FS				
	>	-5.50	5.50	236.4 TONS FL BS 135.1 CY EMBANKMENT
596+12 END FS				

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
5/13/2021

SUPERELEVATION DATA

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		46

5/10/2021 9:41:05 AM
c:\txdot\pw*online\txdot3\valejandro.valencia\d0339893\Superelevation Sheets.dgn

FM 2022 - SUPERELEVATION TABLE

STATION		TRAVEL LANE CROSS SLOPE LEFT (%)	TRAVEL LANE CROSS SLOPE RIGHT (%)
597+95 BEGIN NC			
	>	-2.00	-2.00
599+52 END NC			
SUPERELEVATION TRANSITION			
601+35 BEGIN FS			
	>	5.50	-5.50
608+94 END FS			
SUPERELEVATION TRANSITION			
610+77 BEGIN NC			
	>	-2.00	-2.00
633+27 END NC			
SUPERELEVATION TRANSITION			
634+41 BEGIN FS			
	>	-2.70	2.70
641+57 END FS			
END PROJECT			

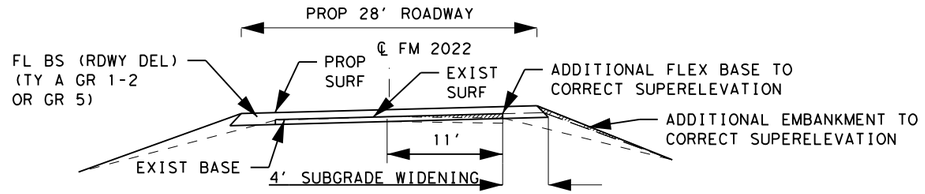
179.4 TONS FL BS

102.5 CY EMBANKMENT

274.8 TONS FL BS

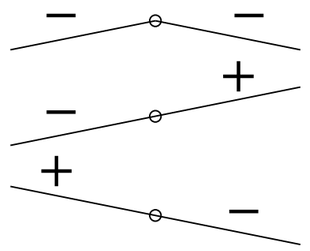
157 CY EMBANKMENT

NC = NORMAL CROWN
FS = FULL SUPERELEVATION
NOTE: ALL TRANSITIONS ARE LINEAR; 60 MPH DESIGN SPEED;
30%RUNOFF WITHIN CURVE; SHOULDER SLOPES MATCH LINES



SUPERELEVATION CORRECTION DETAIL

SIGN CONVENTION



○ AXIS OF ROTATION

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5/13/2021

SUPERELEVATION DATA

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		47

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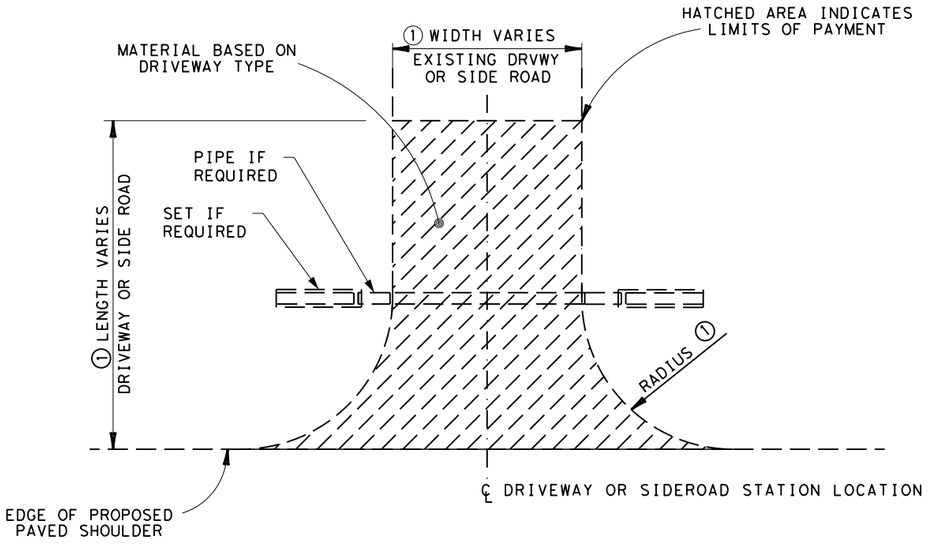
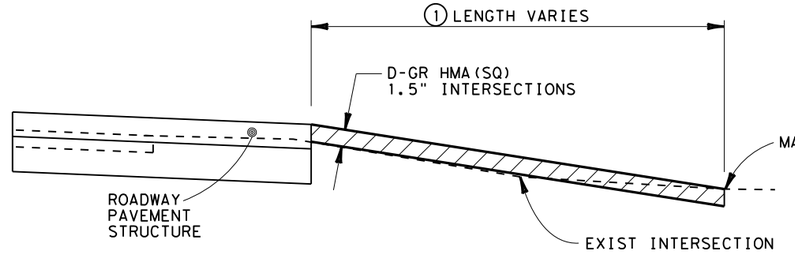
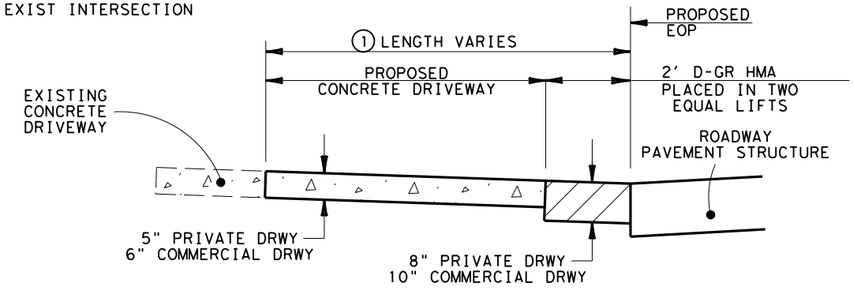
c:\txdot\pw*online\txdot3\valejandro.valencia\d0339893\Superelevation Sheets.dgn



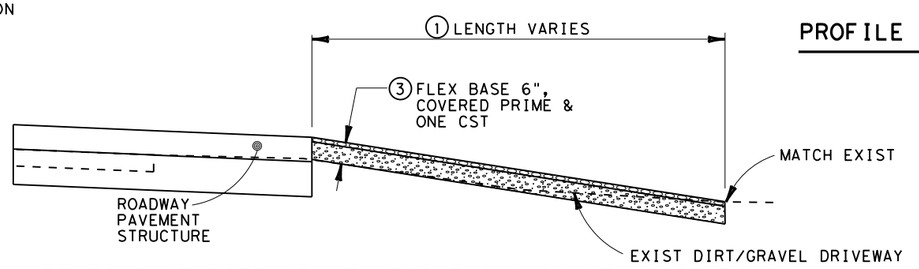
TYPICAL PLAN VIEW OF NON-CONC DRIVEWAYS & SIDE ROADS



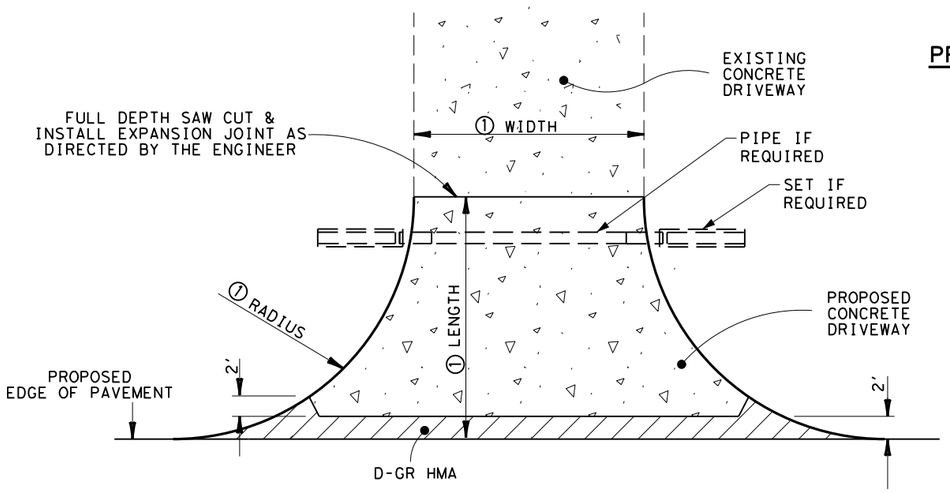
PROFILE OF FM INTERSECTIONS



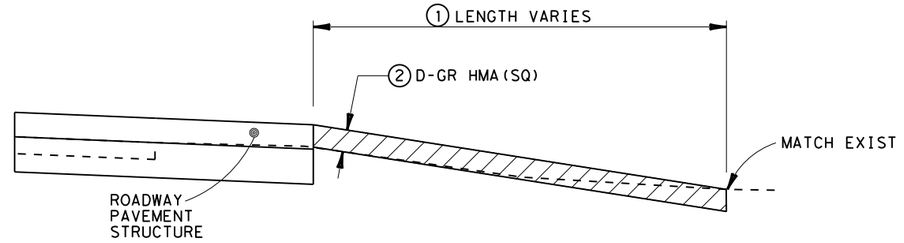
PROFILE OF CONCRETE DRIVEWAYS



PROFILE OF DIRT/GRAVEL DRIVEWAYS/COUNTY SIDE ROADS



TYPICAL PLAN VIEW OF CONCRETE DRIVEWAYS



PROFILE OF ASPHALT DRIVEWAY/COUNTY SIDE ROADS

GENERAL NOTES:

1. CONCRETE SURFACE - USE REINFORCING STEEL CONSISTING OF NO.3 OR 4 BARS MEETING THE REQUIREMENTS OF GRADE 60 REINFORCING STEEL. PLACE BARS ON 12 INCH CENTERS IN EACH DIRECTION, SUPPORTED ON REINFORCING CHAIRS.
2. CONCRETE SURFACE - WELDED WIRE FABRIC WILL NOT BE ALLOWED FOR REINFORCING.
3. CONCRETE SURFACE - UNLESS OTHERWISE DIRECTED, INSTALL 1/2 INCH PREMOLDED EXPANSION JOINT MATERIAL BETWEEN EXISTING CONCRETE AND NEW CONCRETE.
4. PREPARATION AND CONSTRUCTION OF DRIVEWAYS/SIDEROADS SHALL BE PAID FOR UNDER ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS. NO ADDITIONAL PAYMENT WILL BE MADE FOR REMOVAL OF EXISTING GRAVEL AND DIRT DRIVEWAYS. THE NECESSARY EXCAVATION, GRADING, COMPACTION, HMA AND INCIDENTALS WILL BE CONSIDERED SUBSIDIARY TO ITEM 530.
5. D-GR HMA TYPE & RATE AS SHOWN ELSEWHERE IN PLANS. FOR D-GR HMA THICKER THAN 4", PLACE IN 2 LIFTS.

DETAIL NOTES:

① SEE SUMMARY ELSEWHERE IN PLANS FOR LENGTH, WIDTH AND RADIUS.

② THICKNESS SHOWN ELSEWHERE IN THE PLANS.

③ FULL DEPTH HMA MAY BE USED IN LIEU OF FLEX BASE, COVERED PRIME & ONE CST.

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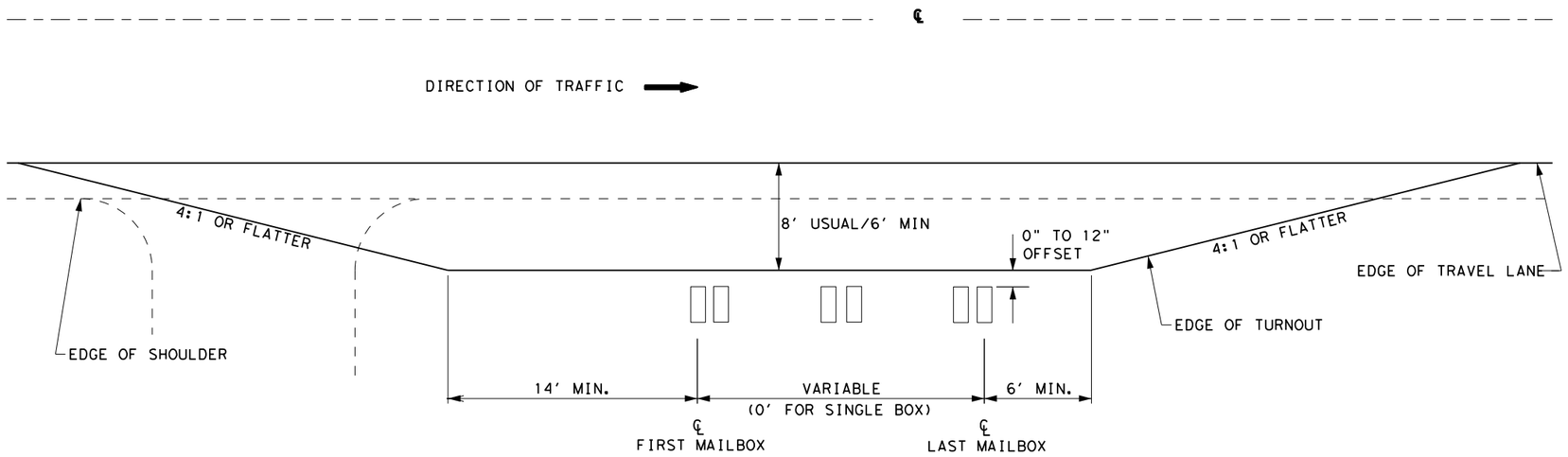
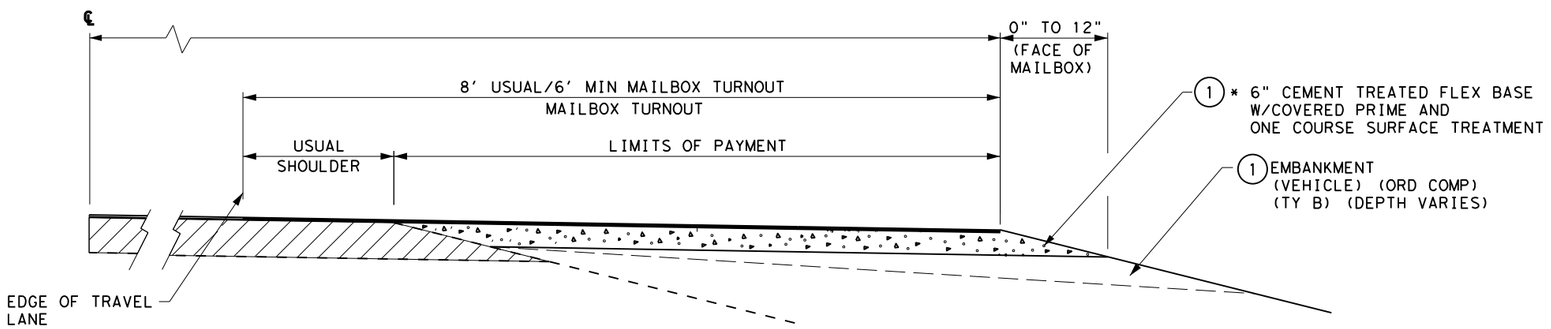
5/13/2021

DRIVEWAY & SIDE ROAD DETAILS

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		48



PLAN



TYPICAL SECTION

(1) SUBSIDIARY TO ITEM 530 (TURNOUTS)

* D-GR HMA TY-D PG64-22 (5") MAY BE USED AT THE OPTION OF THE CONTRACTOR IN LIEU OF CEMENT TREAT, FLEX BASE, COVERED PRIME AND SURFACE TREATMENT.
PLACE IN 2 LIFTS UNLESS OTHERWISE APPROVED.

NOT TO SCALE

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5/13/2021

MAILBOX TURNOUT DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		49

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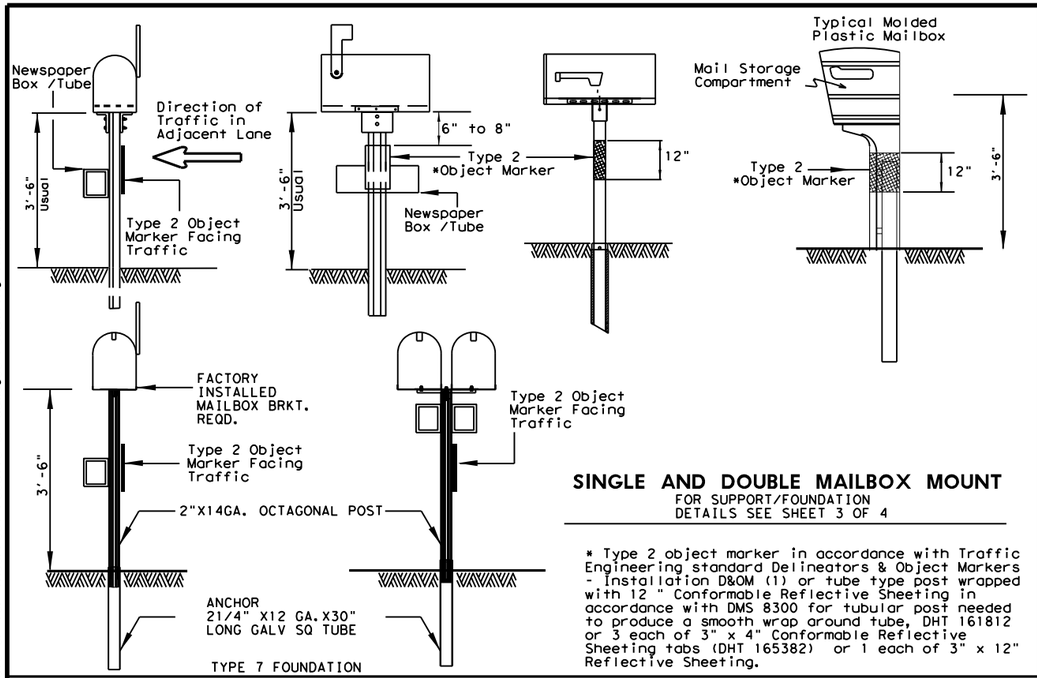


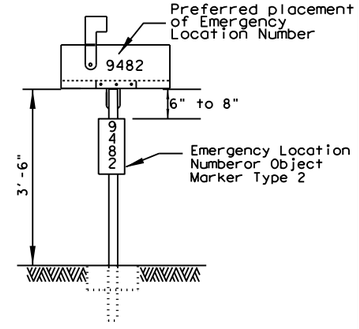
SINGLE AND DOUBLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4

* Type 2 object marker in accordance with Traffic Engineering standard Delineators & Object Markers - Installation D&OM (1) or tube type post wrapped with 12 " Conformable Reflective Sheeting in accordance with DMS 8300 for tubular post needed to produce a smooth wrap around tube, DHT 161812 or 3 each of 3" x 4" Conformable Reflective Sheeting tabs (DHT 165382) or 1 each of 3" x 12" Reflective Sheeting.

Note: Mailbox installations in sidewalk areas shall be in accordance with the latest TxDOT Pedestrian Facilities Curb ramps standard *PED-XX for pedestrian facilities.

*PED-XX: XX is the standard year for example PED- 12 , PED-13,etc.



PLACEMENT OF EMERGENCY LOCATION NUMBER

Location Number shall be placed on: 1. A yellow, type A plate with class 1 flat surface reflective sheeting in accordance with DMS 8600. The color of numbers shall be black. or 2: A green or blue plate with white numbers attached to post beside the object marker. Other contrasting color configuration, as approved , may be used. (Use Same type plate as used for the type 2 Object Marker. Recommended sign size is 6" by 15")

MAILBOX SIZES

TYPICAL MAILBOX SIZE				LIGHT WEIGHT MATERIAL	
				SHEET METAL	**PLASTIC
SIZE	LENGTH (INCHES)	WIDTH (INCHES)	HEIGHT (INCHES)	MAXIMUM WEIGHT (POUNDS)	
SMALL	19 1/2	6	7	5	5
MEDIUM	22 1/2	8	11 1/2	7	7
LARGE	23 1/2*	11 1/2*	13 1/2*	10	10

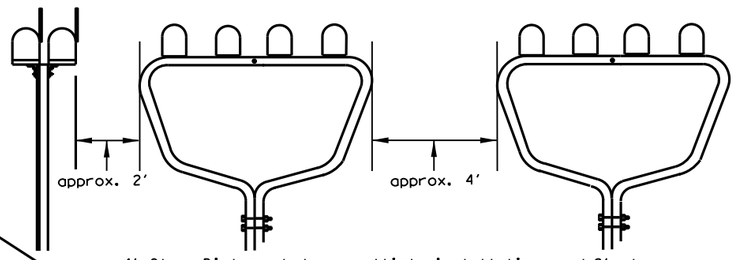
* Maximum allowed dimensions for mailbox
** Excluding Molded Plastic on 4 X 4 Post

LOCKABLE ARCHITECTURAL MAILBOX SIZE (INCHES)					
VIEW	TOP	BOTTOM	FRONT SIDE	BACK SIDE	WEIGHT (POUNDS)
SIDE	18	15	18.3	15	22.4
BACK	11 1/2	11 1/2		15	

SEE TOP RIGHT CORNER OF SHEET 2 OF 4

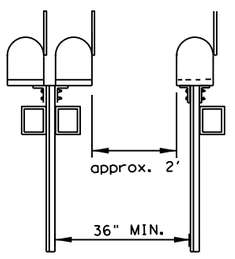
Mailboxes shall be made of light weight sheet metal or light weight plastic. Lockable architectural mailboxes shall meet the requirements of the above table.

Heavy steel, cast iron or decorative mailboxes shall not be used on the state highway system.



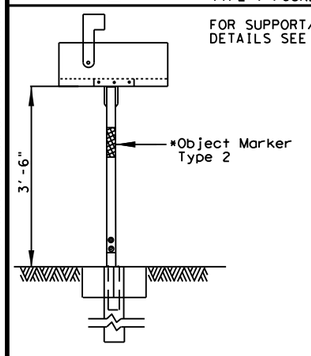
4' Clear Distance between multiple installations and 2' clearance between double or single installations and the multiple installation. DHT #'s 164116 or 149339.

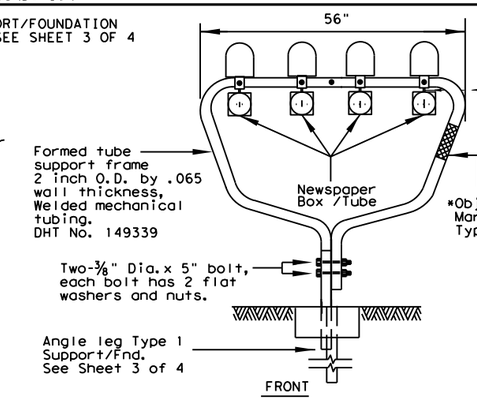
MULTIPLE MAILBOX PLACEMENT

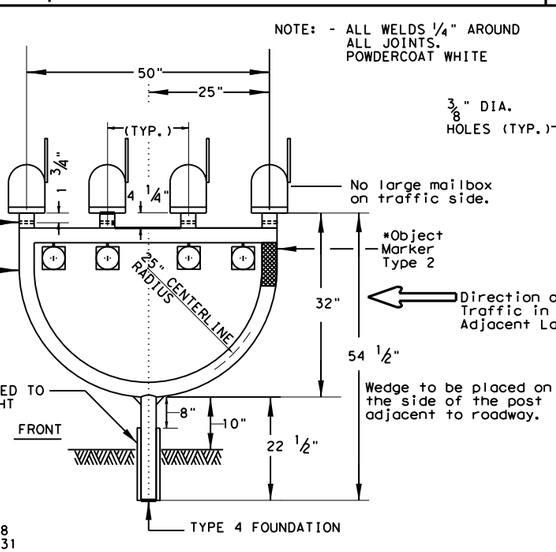


Clear Distance between single or double mounted posts. (Normally when 3 or more mailboxes are in one location, a multiple support is used).

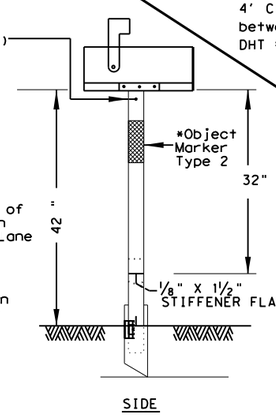
SINGLE & DOUBLE MAILBOX PLACEMENT

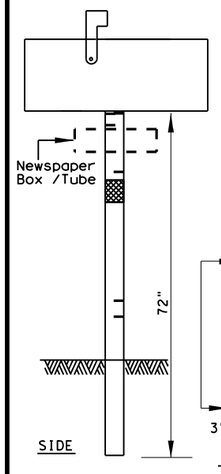


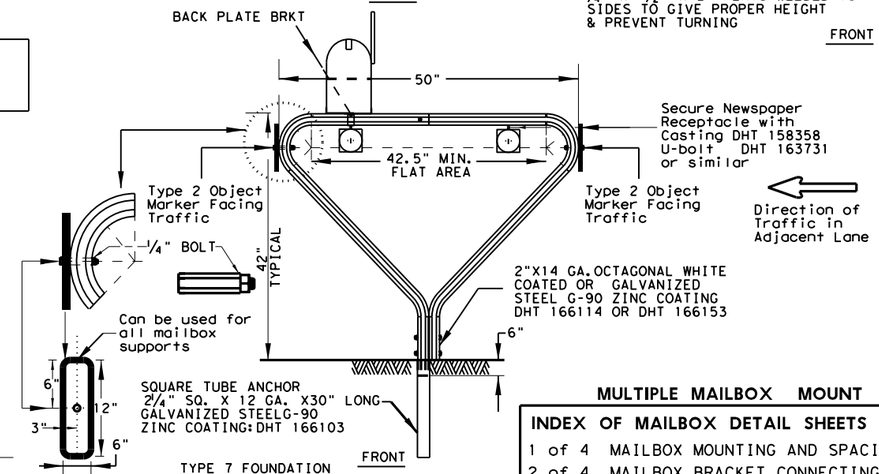




NOTE: - ALL WELDS 1/4" AROUND ALL JOINTS. POWDERCOAT WHITE







DOUBLE AND MULTIPLE MAILBOX MOUNT

FOR SUPPORT/FOUNDATION DETAILS SEE SHEET 3 OF 4
FOR DHT NUMBERS SEE SHEET 4 OF 4

NEWSPAPER RECEPTACLE

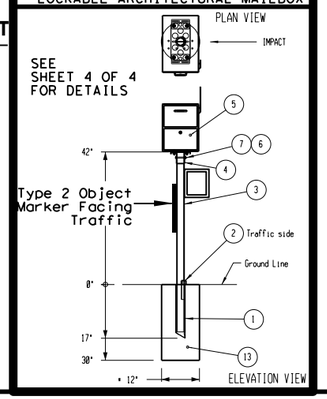
A light weight receptacle for newspaper delivery can be attached to mailbox posts as shown on this page if the receptacle:

- Does not touch the mailbox.
- Does not present a hazard to traffic or delivery of the mail.
- Does not extend beyond the front of the mailbox.
- Does not display advertising, except the publication title.
- Newspaper receptacles on separate supports are prohibited.

MULTIPLE MAILBOX MOUNT

INDEX OF MAILBOX DETAIL SHEETS

LOCKABLE ARCHITECTURAL MAILBOX

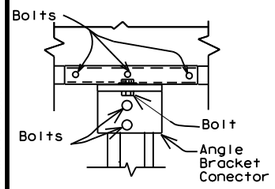


Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND SPACING

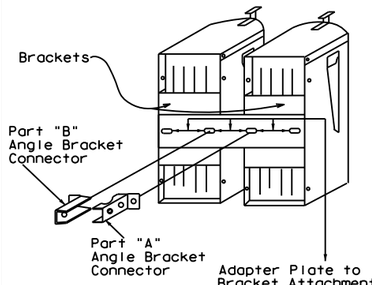
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK: JEO	DW:	CK:
© TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS: Added additional newspaper receptacle for double mailbox support	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		50



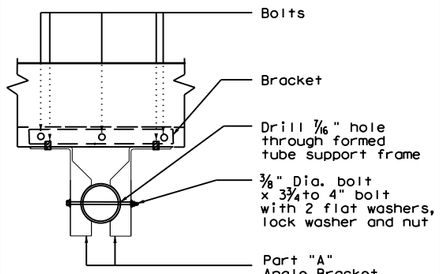
For bolt sizes see details below for "SMALL MAILBOX" and "MEDIUM AND LARGE MAILBOXES"

SINGLE MAILBOX

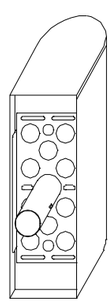


(Not permitted for Large Mailboxes)

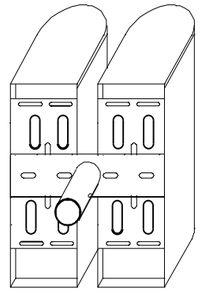
DOUBLE MAILBOX



MULTIPLE MAILBOX



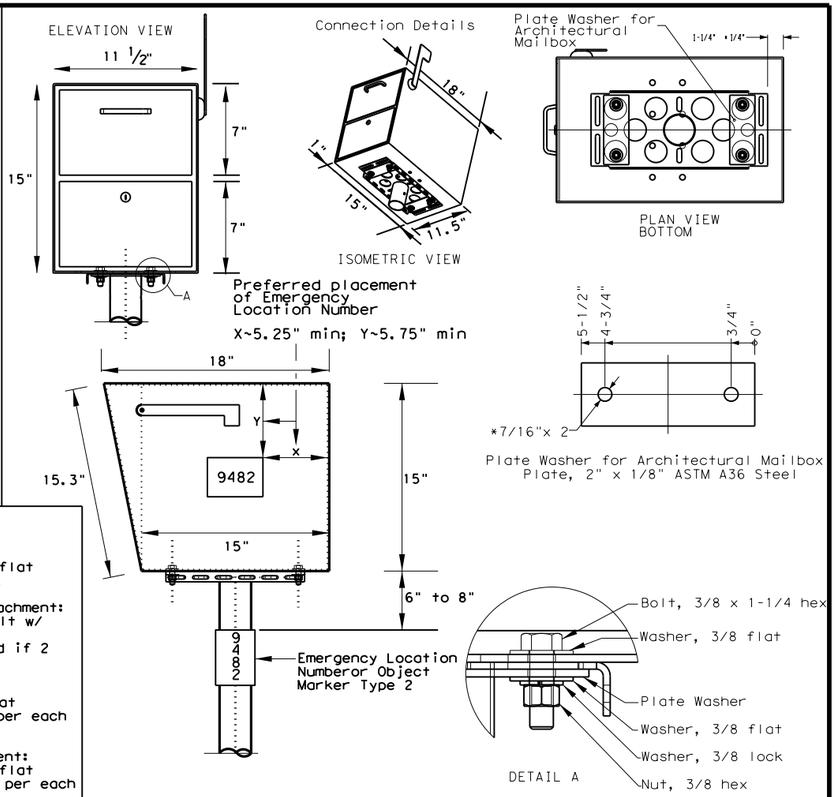
To be used with 2⅜" OD RR or thinwall Steel posts.



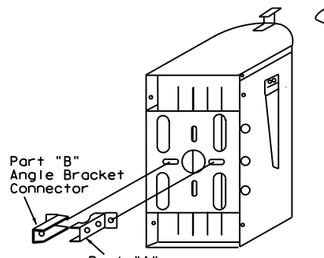
To be used with thinwall Steel posts. Not to be used with RR posts.

WELDED SINGLE MAILBOXBRACKET

WELDED DOUBLE MAILBOX BRACKET WITHADAPTER PLATE



LOCKABLE ARCHITECTURAL MAILBOX CONNECTION DETAILS

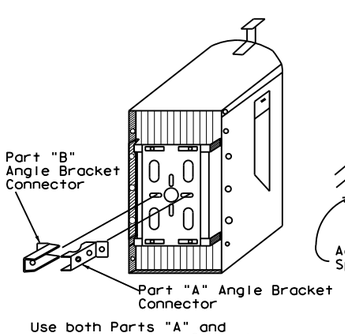


Bracket to mailbox attachment: 6 - ¼" Dia. x ¾" bolt w/ 2 flat washers and nut per each bolt.

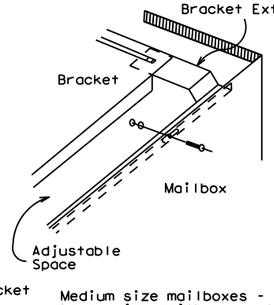
Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt with 2 flat washers, lock washer and nut per each bolt.

Angle to 2 - ⅜" Dia. x 2½" bolt with 2 flat washers, lock washer and nut per each bolt.

SMALL MAILBOX



Use both Parts "A" and "B" Angle Bracket Connectors for Winged Channel Posts



Bracket to mailbox attachment: 6 - ¼" Dia. x ¾" bolt w/2 flat washers and nut per each bolt.

Bracket to bracket extension attachment: 2 - ¼" Dia. x ¾" carriage bolt w/ flat washer, lock washer and nut per bolt (4 bolts required if 2 bracket extensions are used).

Angle to bracket attachment: 2 - ⅜" Dia. x ¾" bolt w/2 flat washers, lock washer and nut per each bolt.

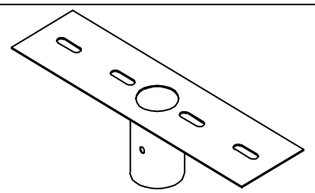
Angle to mailbox support attachment: 2 - ⅜" Dia. x 2½" bolt w/2 flat washers, lock washer, and nut per each bolt.

Medium size mailboxes - one extension bracket
Large size mailboxes - two extension brackets

MEDIUM AND LARGE MAILBOXES

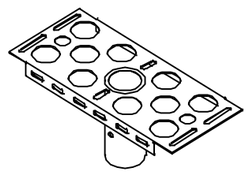
GENERAL NOTES

1. Connecting hardware detailed on this sheet is for the hardware that the Department stocks at the Regional Warehouses. This hardware is available to the contractor only when so stated elsewhere in the plans or specification.
2. Hardware for mounting mailboxes to the support/foundation furnished by industry should be used when shown on the Maintenance Divisions "Approved Products List." Only mailbox hardware that have been crash tested in accordance with NCHRP Report 350, will be on the approved list.
3. Hardware furnished by industry shall be erected in accordance with the manufacturer's recommendation.
4. Bracket and bracket extension shall be constructed of 14 gauge galvanized steel sheet metal.
5. The angles, brackets and adapter plates shall be constructed of 12 gauge galvanized steel sheet metal.
6. Items with evidence of damage to the galvanized coating or wet storage stains (white rust) will not be accepted.



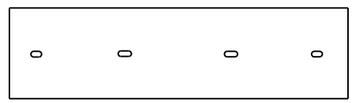
DHT 162323

For use with galvanized thinwall steel posts DHT # 143426 or powder-coated thinwall steel post DHT # 162911.



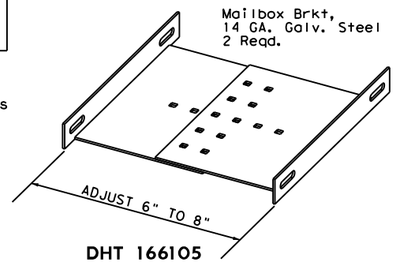
DHT 161443

For use with RCR post DHT # 161442 or galvanized thinwall steel post DHT # 143426 or powder-coated thinwall steel post. DHT # 162911.

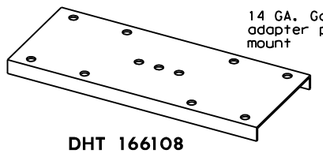


DHT #3789

Used for mounting two Mailboxes on the same post.



DHT 166105

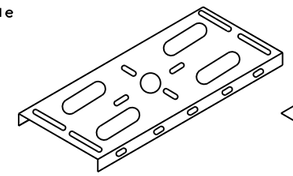


14 GA. Galv. Steel adapter plate for double mount

DHT 166108

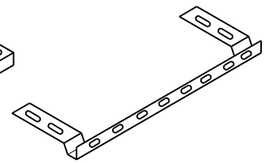
HARDWARE AT TXDOT REGIONAL WAREHOUSES

Brackets and adapter plate shown in this section should be available to the Contractor when stated elsewhere in plans or specifications.



DHT 148939

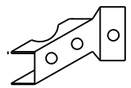
Mailbox Bracket



DHT 148938

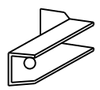
Used for extending 6" wide bracket to attach larger mailboxes.

Bracket Extension



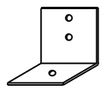
DHT 159489

Part "A" Angle Bracket Connector



DHT 159490

Part "B" Angle Bracket Connector



DHT 2917

Angle Bracket For Temporary Mailbox

See Table of Applicable DHT Numbers on sheet 4 of 4 for DHT description and unit of measure.

SHEET 2 OF 4

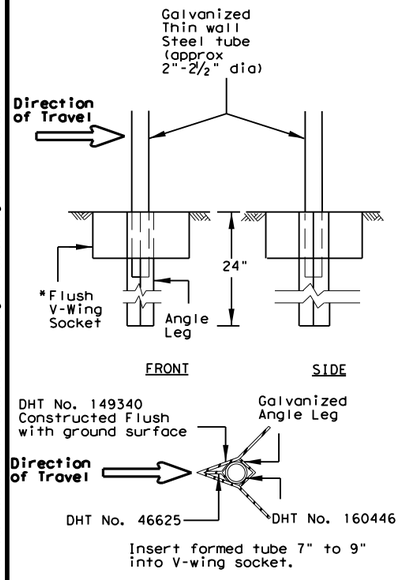
Texas Department of Transportation

Maintenance Division Standard

MAILBOX BRACKET CONNECTING DETAILS

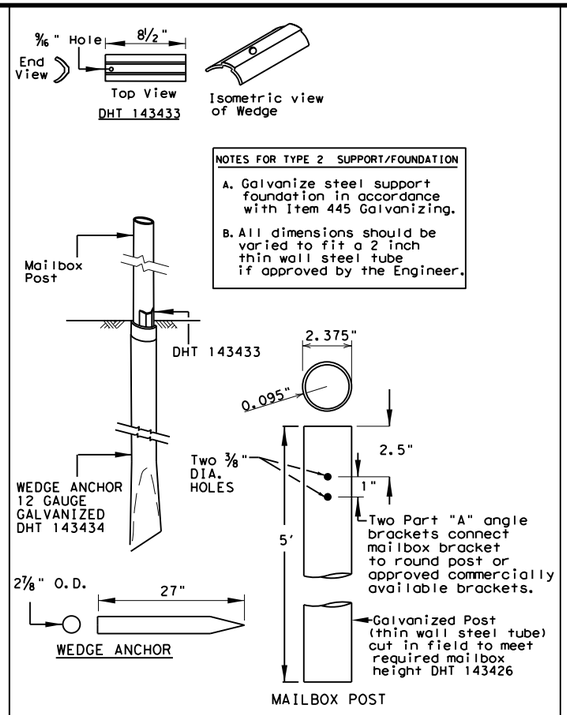
MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS ADDED DHT 163730	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		51



TYPE 1 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ V-LOC ANCHORAGE



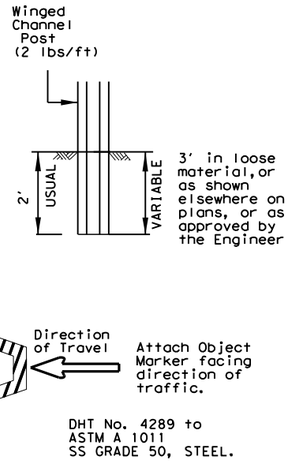
NOTES FOR TYPE 2 SUPPORT/FOUNDATION

A. Galvanize steel support foundation in accordance with Item 445 Galvanizing.

B. All dimensions should be varied to fit a 2 inch thin wall steel tube if approved by the Engineer.

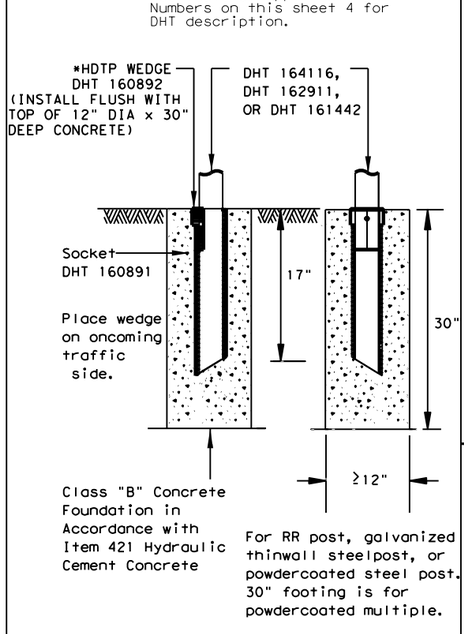
TYPE 2 SUPPORT/FOUNDATION

THIN WALL STEEL TUBE w/ WEDGE ANCHOR SYSTEM



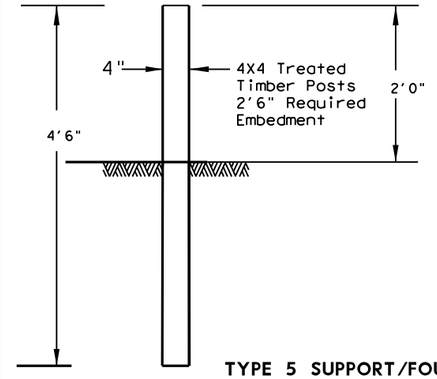
TYPE 3 SUPPORT/FOUNDATION

WINGED CHANNEL POST



TYPE 4 SUPPORT/FOUNDATION

FOR WHITECOATED STEEL POST, MULTIPLE POST, AND RECYCLED RUBBER.

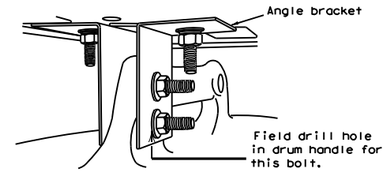


TYPE 5 SUPPORT/FOUNDATION

FOR ONE PIECE MOLDED PLASTIC MAILBOX

ONE PIECE MOLDED PLASTIC MAILBOXES

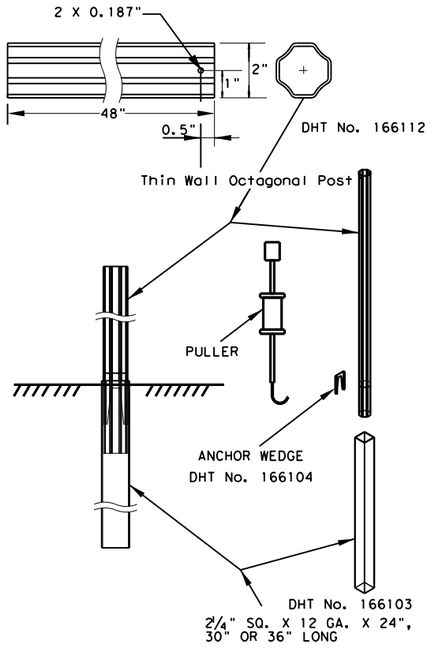
Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.



Placed on approved plastic drum as shown in the Compliant Work Zone Traffic Control Devices (CWZTCD).
Existing attachment hardware shall be used unless damaged. Damaged hardware shall be replaced.

TYPE 6 TEMPORARY MAILBOX SUPPORT

CONNECTION DETAIL



TYPE 7 MAILBOX SUPPORT/FOUNDATION

CONNECTION DETAIL

GENERAL NOTES

1. Erect post plumb or vertical.
2. When galvanized part is required galvanize in accordance with Item 445.
3. type 1, 2, 3, 4 or 7 supports or foundation can be used for single or double mailbox installations. The RCR post should be used only for a single installation with a small mailbox. The Type 5 support/foundation is used for the single molded plastic mailbox. The Type 4 support/foundation is used for the 2.375" O.D. RR post, thin wall steel post, and white multiple mailbox post.
4. The Type 1 or type 7 support/foundation can be used for a multiple mailbox mount.
5. The Type 4 support should be used with thin wall steel pipe for the medium, large and double mailbox installations.
6. Use a concrete footing as shown or when directed. Concrete footing will be required when soils do not hold the support/foundations in a stable condition.

MB-(X) ASSM TY (XXX) (X) (XX) (OPTIONAL)

Type of Mailbox
- S = Single
- D = Double
- M = Multiple
- SP = Single Plastic

Type of Post
- WC = Winged Channel Post
- RR = Recycled Rubber
- TWW = Thin Walled White Tubing
- TWG = Thin Walled Galvanized Tubing
- TIM = Timber

Type of Foundation
- Ty 1 = V-Loc
- Ty 2 = Wedge Anchor Steel System
- Ty 3 = Winged Channel post
- Ty 4 = Wedge Anchor Plastic System
- Ty 5 = 4 X 4 Post
- Ty 7 = Wedge Anchor

Type of Bracket
- AB = Angle Bracket.
- TB = 2.375" Tube Bracket

DOUBLE AND LARGE MAILBOXES MUST BE ON STEEL POST.

*HDTP: High density thermoplastic polyesters

SHEET 3 OF 4

Texas Department of Transportation

Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB-15(1)

FILE: MB14(1).DGN	DN: JEO	CK:	DW: JEO	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		52

LOCKABLE ARCHITECTURAL MAILBOX

SINGLE-MOUNT INSTALLATION PARTS			
#	PART NAME	PART/DHT #	QTY
1	SOCKET, TYPE 4 FOUNDATION	160891	1
2	WEDGE FOR TYPE 4 FOUNDATION	160892	1
3	THIN-WALL WHITE STEEL TUBE 2.375 OD	162911	1
4	BRACKET FOR ATTACHING MAILBOX	161443	1
5	ARCHITECTURAL MAILBOX	SEE NOTE	1
6	NUT, 5/16" HEX	NUT, 5/16" HEX	1
7	BOLT, 5/16 X 3 HEX	GRADE 5	1
8	PLATE WASHER FOR ARCHITECTURAL MAILBOX	SEE SEE SHEET 2	2
9	WASHER, 3/8 FLAT		8
10	WASHER, 3/8 LOCK		4
11	NUT, 3/8 HEX		4
12	BOLT, 3/8 X 1-1/4 HEX	GRADE 5	4
13	CONCRETE, CLASS B (2000 PSI)		1

LOCKABLE ARCHITECTURAL MAILBOX DETAILS

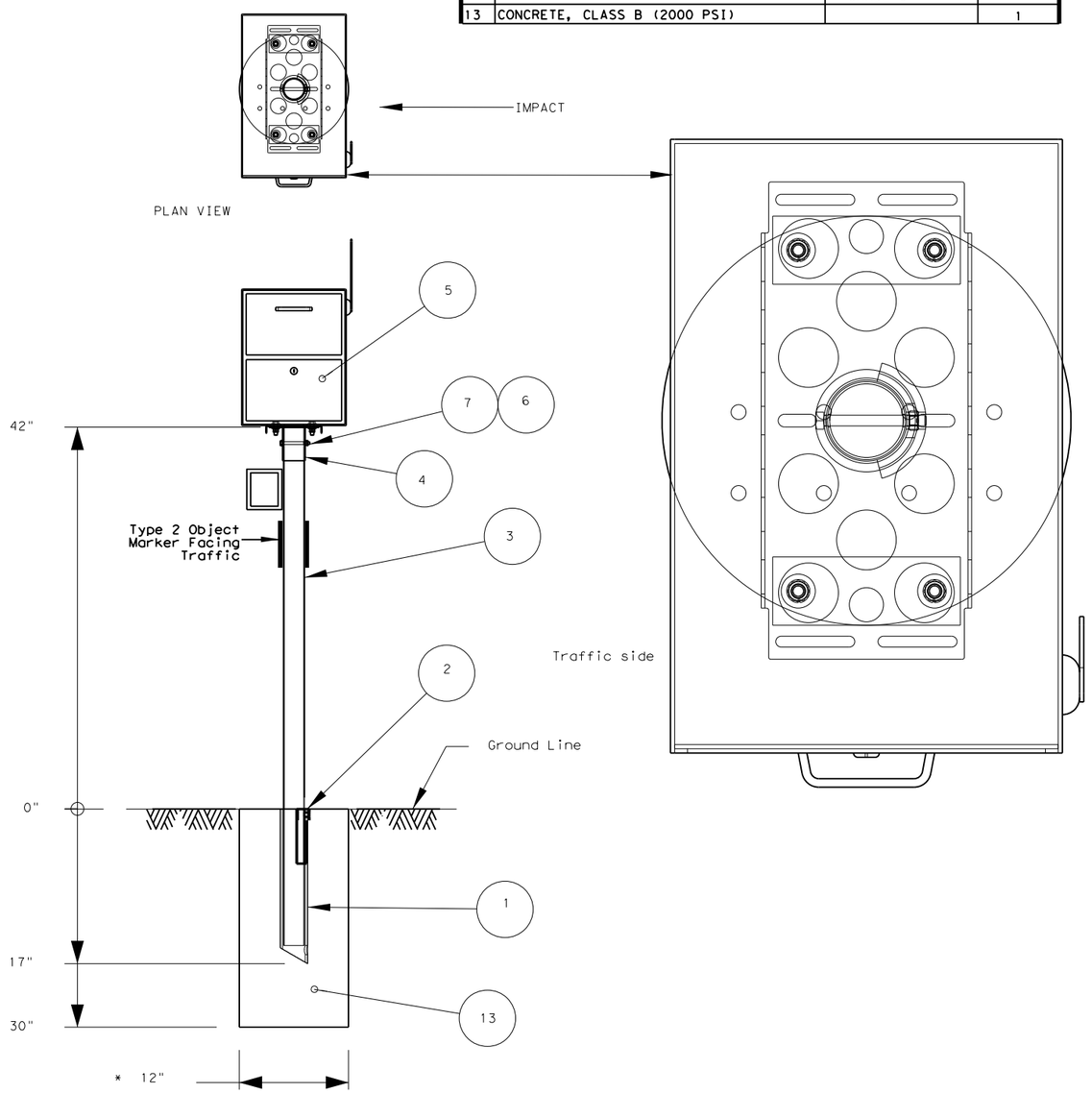


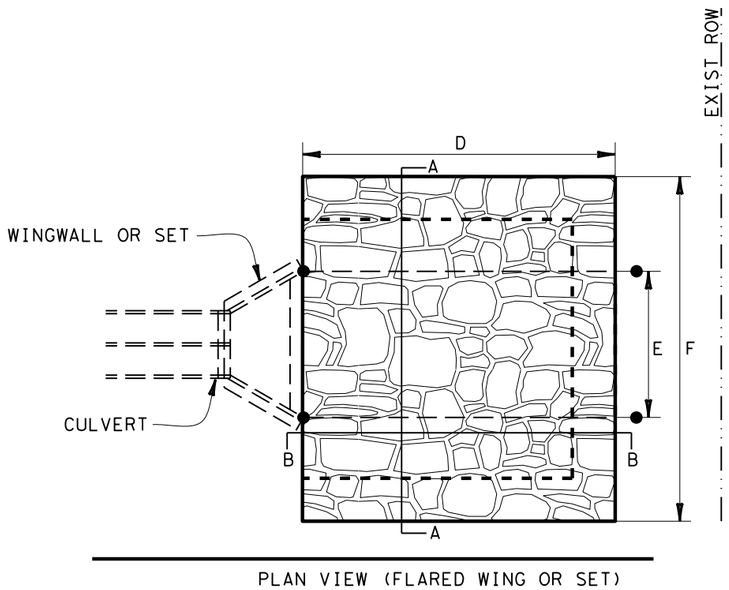
TABLE OF APPLICABLE DHT NUMBERS	
DHT NUMBER	DESCRIPTION
	FOUNDATIONS
46625	WEDGE FOR V-WING SOCKET FOR TYPE 1 FOUNDATION
149340	V-WING SOCKET FOR TYPE 1 FOUNDATION
143433	WEDGE FOR TYPE 2 FOUNDATION
143434	ANCHOR FOR TYPE 2 FOUNDATION
166103	ANCHOR FOR TYPE 7 FOUNDATION
160891	SOCKET FOR TYPE 4 FOUNDATION
160892	WEDGE FOR TYPE 4 FOUNDATION
166104	WEDGE FOR TYPE 7 FOUNDATION
	POSTS
4289	WINGED CHANNEL MAILBOX POST
149339	MULTIPLE MAILBOX POST (GALVANIZED TUBING)
164116	MULTIPLE MAILBOX POST (WHITE COATED)
166114	MULTIPLE MAILBOX POST (WHITE COATED OCTAGONAL)
166153	MULTIPLE MAILBOX POST (GALVANIZED OCTAGONAL)
161442	RECYCLED RUBBER POST. FOR SMALL MAILBOX ONLY
143426	THIN-WALL GALVANIZED STEEL TUBE 2.375" OUTER DIAMETER
162911	THINWALL WHITE STEEL TUBE 2.375" OUTER DIAMETER
166152	SINGLE OR DOUBLE THIN-WALL MAILBOX POST GALVANIZED 2" OCTAGONAL
166112	SINGLE OR DOUBLE THIN-WALL MAILBOX POST WHITECOATED 2" OCTAGONAL
	REFLECTIVE SHEETING
161812	REFLECTIVE SHEETING FOR EMERGENCY LOCATION NUMBER PANEL
	CONNECTING HARDWARE
2917	ANGLE BRACKET USED FOR TEMPORARY MAILBOX SUPPORT
166105	BRACKET FOR SINGLE MOUNTING OF MAILBOXES (MOUNTING KIT)
3789	PLATE FOR DOUBLE MOUNTING OF MAILBOXES
166108	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES (MOUNTING KIT)
166111	BRACKET FOR MULTIPLE MOUNTING OF MAILBOXES (MOUNTING KIT)
148939	BRACKET FOR ATTACHING SMALL OR MEDIUM SIZE MAIL BOX
148938	EXTENDER TO BRACKET FOR ATTACHING LARGE MAILBOX
159489	ANGLE BRACKET PART A
159490	ANGLE BRACKET PART B
162323	BRACKET FOR DOUBLE MOUNTING OF MAILBOXES ON THINWALL STEEL POST, GALVANIZED OR POWDERCOATED.
161443	BRACKET FOR ATTACHING MAILBOX TO RECYCLED RUBBER POST AND TO MULTIPLE WHITE MAILBOX POST
158358	CASTING (NEWSPAPER RECEPTACLE BRACKET)
163731	U-BOLT (NEWSPAPER RECEPTACLE BRACKET)
160698	BOLT;HEX HEAD, GALV;3/8"DIA X 3/4"L HD, W/2-FLAT WASHERS
163750	BOLT;HEX HEAD, GALV;3/8" X 1-1/2, 16 NC, W/WASHERS
160701	BOLT;HEX HEAD, GALV;3/8"DIA X 2-1/2"L, HD, W/2-FLAT WASHERS
163730	BOLT;HEX HEAD, GALV;3/8" X 3-1/2", NC, W/NUT, 2 FLAT WASHERS
160699	BOLT;HEX HEAD, GALV;3/8"DIA X 3-3/4"L HD, W/2-FLAT WASHERS
160700	BOLT;HEX HEAD, GALV;3/8"DIA X 4"L HD, W/2-FLAT WASHERS

Texas Department of Transportation | Maintenance Division Standard

DHT NUMBERS TABLE

MB-15(1)

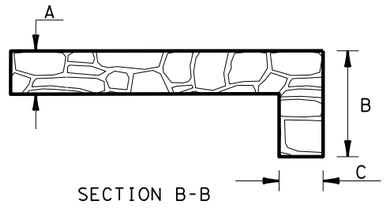
FILE:MB14(1).DGN	DN:	CK:	DW:	CK:
©TxDOT APRIL 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		53



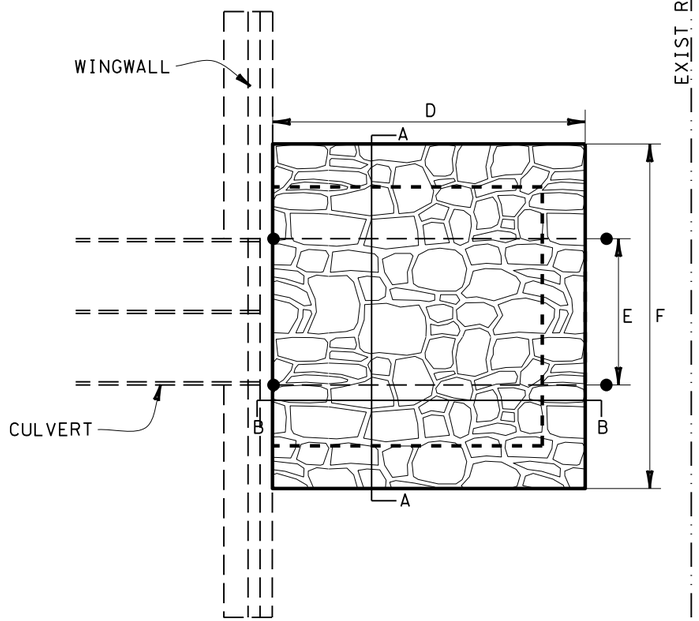
PLAN VIEW (FLARED WING OR SET)

RIPRAP DETAIL

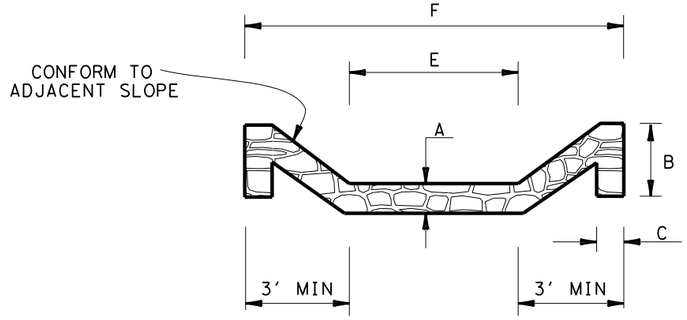
NOT TO SCALE



SECTION B-B



PLAN VIEW (PARALLEL WING)



SECTION A-A

ELEVATION VIEWS

NOTE: CEMENT STABILIZE BACKFILL AS DIRECTED

① ESTIMATED USING CULVERT LAYOUTS

② WIDTH OF CHANNEL TO BE VERIFIED IN THE FIELD

RIPRAP DIMENSIONS

USUAL DIMENSIONS	A	B	C	Riprap Size
	1.0'	2.0'	1.5'	12"
LOCATION	① D	E	② F	CY
FM 2022 (CSJ:1875-02-027)				
STA 393+52 (RT)	14'	16'	9'	2.5
STA 451+08 (LT)	9'	20'	26'	1.5
STA 511+74 (LT)	14'	20'	26'	37
STA 511+74 (RT)	12'	20'	26'	31
STA 540+75 (LT)	10'	15'	21'	8
STA 540+75 (RT)	7'	2'	8'	6
STA 552+00 (RT)	2'	4'	10'	1
STA 560+00 (LT)	2'	4'	10'	1
STA 577+60 (LT)	4'	4'	10'	2
STA 577+60 (RT)	4'	4'	10'	2
STA 627+48 (RT)	4'	4'	10'	2
PROJECT TOTAL				94

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

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Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

MISCELLANEOUS DRAINAGE DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		54

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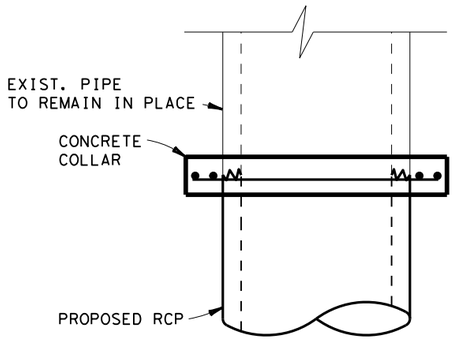
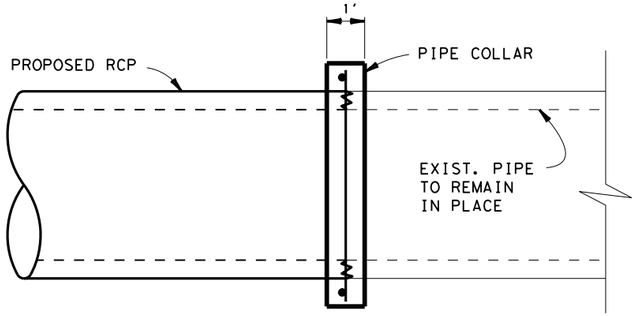
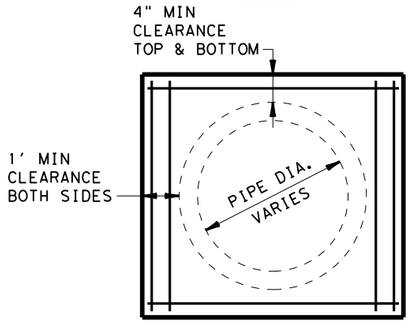


PLAN



ELEVATION



SECTION

CONCRETE COLLAR NOTES:

1. A CLASS "C" CONCRETE COLLAR SHALL BE USED WHERE CONNECTING RCP TO EXISTING CMP & RCP, WHEN INSTALLING VERTICAL RCP BENDS AND AS DIRECTED BY THE ENGINEER.
2. REINFORCEMENT SHALL BE #4 BARS FIELD CUT TO FIT INSTALLATION.
3. REINFORCING BARS SHALL HAVE A MINIMUM OF 1 ½" OF CLEAR COVER.
4. CONCRETE COLLAR SHALL CONFORM TO THE OUTSIDE DIAMETER OF THE RCP.

CONCRETE COLLAR

N. T. S.

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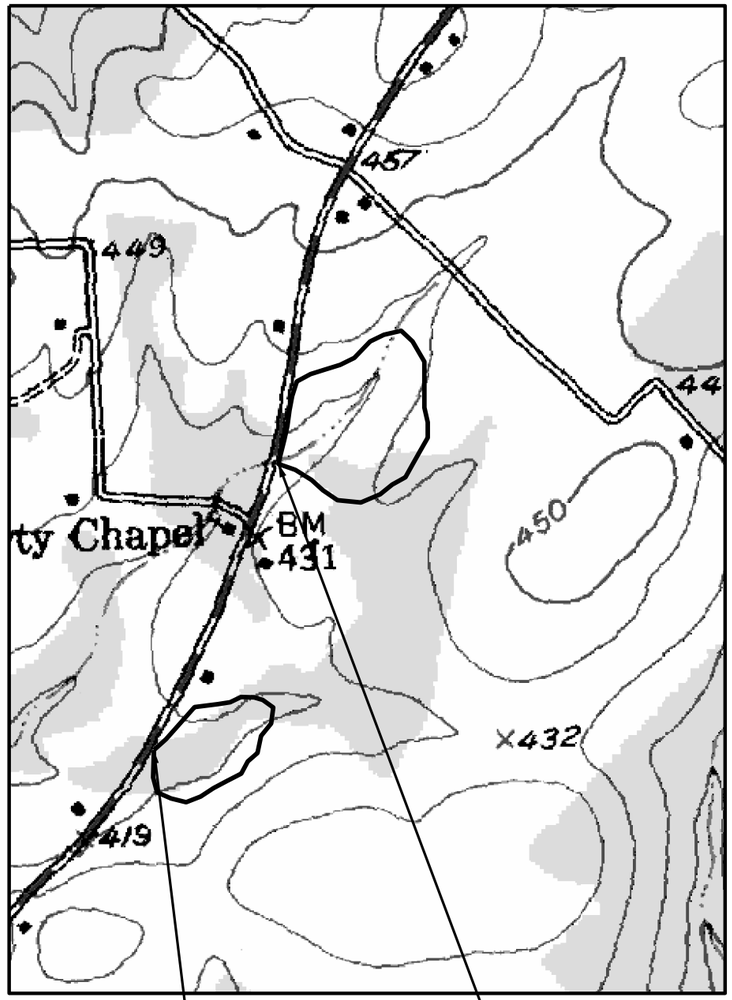
1B27AAE71511446...
5/13/2021

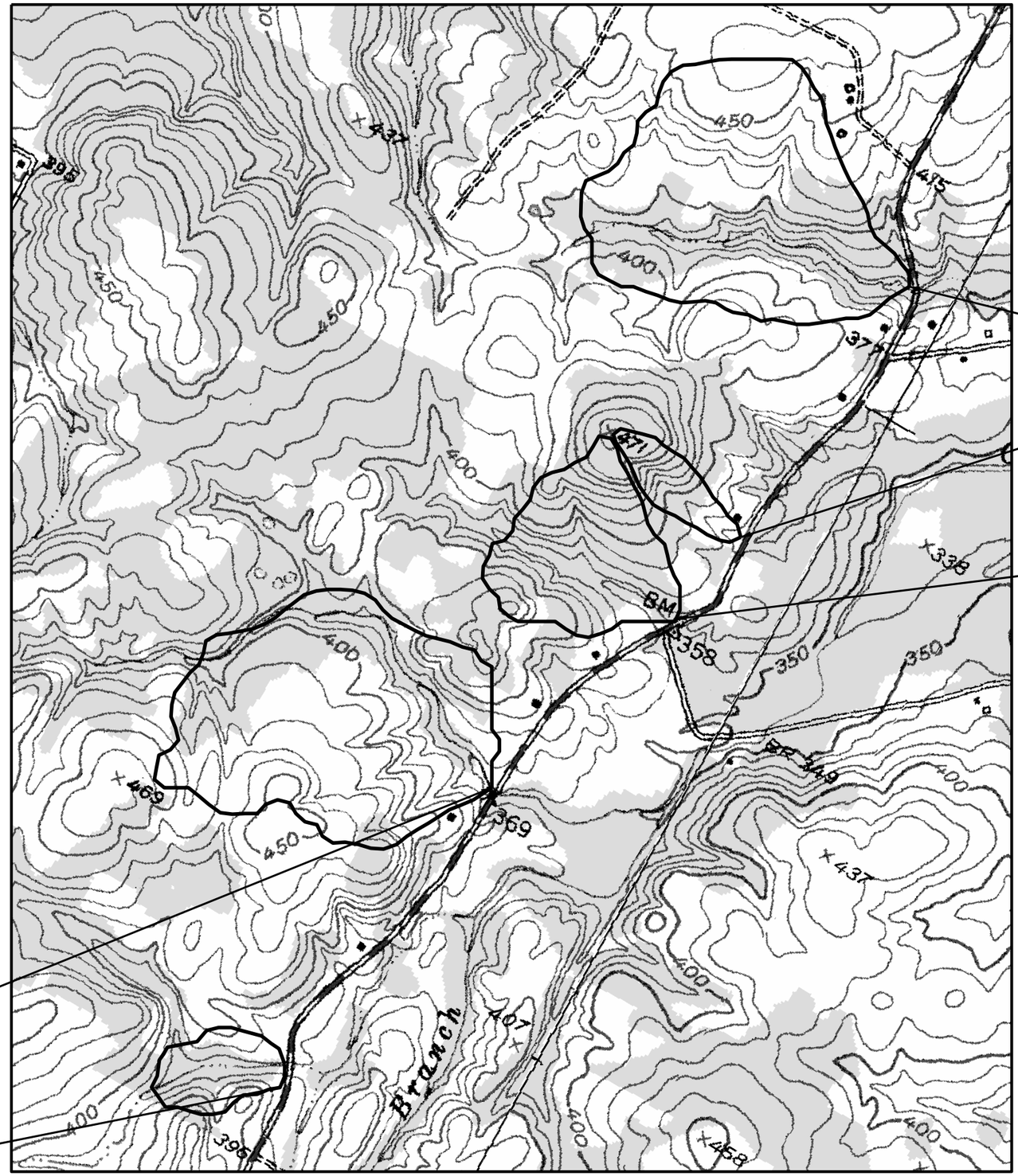
MISCELLANEOUS DRAINAGE DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		55





STA 377+40
2.86 ACRES
6'X 3'X 58' RCP
W/ PW-2 LT&RT

STA 393+52
8.74 ACRES
6'X 4'X 53' BOX
W/ PW-2 LT &
FW-0 RT

STA 540+75
55.76 ACRES
6'X 6'X 57' BOX
W/ PW-2 LT&RT

STA 511+74
8.69 ACRES
3-6'X 4'X 56' BOX
W/ PW-2 LT&RT

STA 594+50
52.46 ACRES
6'X 6'X 66'
W/PW-2 LT&RT

STA 570+00
9.98 ACRES
36"X 50'RCP
W/ CH-PW-0 LT
& SET RT

STA 560+00
34.18 ACRES
5'X 4'X 57' BOX
W/ FW-2 LT&RT

N. T. S.

STATE OF TEXAS
ELIZABETH A. ORTEGO
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DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
5/13/2021

DRAINAGE AREA MAP

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		56

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RUN-OFF COMPUTATIONS

STATION		DESCRIPTION	RATIONAL METHOD							COMMENTS
			DRAINAGE AREA	Tc	RUNOFF COEFFICIENT	I 10-YEAR	I 100-YEAR	Q 10-YEAR	Q 100-YEAR	
			ACRES	(min)	C	(in/hr)	(in/hr)	CFS	CFS	
377+40	EXISTING	6" X 3' X 40' BOX CULVERT	2.86	6.214	0.26	8.59	13.59	6.441	10.19	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) LT; REMOVE EXIST WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) RT								
393+52	EXISTING	6' X 4' X 35' BOX CULVERT	8.74	8.448	0.26	7.84	12.49	17.964	28.169	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 10' W/CONC BOX CULV (6 FT X 4 FT), ADD WINGWALL (PW - 2) (HW=5 FT 6 IN) LT; REMOVE EXIST WINGS, EXTEND 8' W/CONC BOX CULV(6 FT X 4 FT), ADD WINGWALL (FW - 0) (HW=5 FT 6 IN) RT								
511+74	EXISTING	3-6' X 4' X 40' MC6-1 MCWF-1 BOX CULVERT	8.69	7.158	0.26	8.25	13.1	18.795	29.845	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) LT REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) RT								
540+75	EXISTING	6' X 6' X 40' SC15°A, FW15°RT FWD SKW BOX CULVERT	55.76	14.188	0.26	6.45	10.39	94.289	151.88	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) LT; REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 8' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) RT								
560+00	EXISTING	5' X 4' X 41' FC-3 BOX CULVERT	34.18	9.265	0.26	7.6	12.13	68.103	108.696	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") LT; REMOVE EXIST HDWL & WINGS, EXTEND 7' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") RT								
570+00	EXISTING	36" X 40' RCP W/SET	9.98	5.995	0.26	8.67	13.71	22.684	35.871	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST PW, EXTEND W/36"X10' RC PIPE (CL III)(36 IN) & CH-PW-0(DIA=36 IN)(2:1) LT; REMOVE EXIST SET, ADD SET (TY II)(36 IN)(RCP)(4:1) RT								
594+50	EXISTING	6' X 6' X 55' SCNA & FWN	52.48	13.702	0.26	6.54	10.54	89.98	145.015	Tc VALUES WERE ESTIMATED USING THE KIRBY-KIRPICH METHOD
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 6' W/CONC BOX CULV (6 FT X 6FT), ADD WINGWALL (PW - 2) (HW=8 FT 6 IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (PW - 2) (HW=10 FT) RT								

STATE OF TEXAS
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91106
LICENSED PROFESSIONAL ENGINEER

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HYDRAULIC DATA SHEET

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		57

6/2/2021 8:36:23 AM
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HYDRAULIC COMPUTATIONS

STATION		DESCRIPTION	PROP RDWY ELEV	FREQUENCY	HYDRAULIC DATA (HY-8) EXISTING CULVERT HW	EXISTING CULVERT TW	EXISTING CULVERT V (OUT)	PROPOSED CULVERT HW	PROPOSED CULVERT TW	PROPOSED CULVERT V (OUT)
			FT		FT	FT	FPS	FT	FT	FPS
377+40	EXISTING	6" X 3' X 40' BOX CULVERT	419.11	10-YR	414.58	413.68	0.896	414.61	413.69	0.896
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) LT; REMOVE EXIST WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 3 FT), ADD WINGWALL (PW - 2) (HW=5 FT) RT		100-YR	414.78	414.12	1.039	414.97	414.49	1.033
393+52	EXISTING	6' X 4' X 35' BOX CULVERT	429.1	10-YR	423.69	423.64	1.084	423.7	423.64	1.084
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 10' W/CONC BOX CULV (6 FT X 4 FT), ADD WINGWALL (PW - 2) (HW=5 FT 6 IN) LT; REMOVE EXIST WINGS, EXTEND 8' W/CONC BOX CULV(6 FT X 4 FT), ADD WINGWALL (FW - 0) (HW=5 FT 6 IN) RT		100-YR	424.84	424.79	1.199	424.84	424.8	1.199
511+74	EXISTING	3-6' X 4' X 40' MC6-1 MCWF-1 BOX CULVERT	391.1	10-YR	385.16	385.1	1.361	385.16	385.1	1.369
	PROPOSED	REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) LT REMOVE EXIST FW-N, EXTEND 8' W/CONC BOX CULV (3-6' X 4') & ADD PW-2(HW=5'6" FT)(2:1) RT		100-YR	385.43	385.35	1.621	385.44	385.35	1.621
540+75	EXISTING	6' X 6' X 40' SC15°A, FW15°RT FWD SKW BOX CULVERT	386.64	10-YR	380.29	380.02	3.301	380.29	380.02	3.301
	PROPOSED	REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 9' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) LT; REMOVE EXIST HDWL & PW-2 WINGS, EXTEND 8' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (FW - S) (HW=7 FT 6 IN) RT		100-YR	382.67	382.22	4.219	382.68	382.22	4.219
560+00	EXISTING	5' X 4' X 41' FC-3 BOX CULVERT	366.27	10-YR	360.79	360.33	4.218	360.8	360.33	4.218
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 9' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") LT; REMOVE EXIST HDWL & WINGS, EXTEND 7' W/CONC BOX CULV (5 FT X 4 FT), ADD FW-0 (HW= 5' 6") RT		100-YR	362.53	361.78	5.435	362.56	361.78	5.435
570+00	EXISTING	36" X 40' RCP W/SET	363.8	10-YR	361.19	360.52	8.473	361.2	360.55	4.149
	PROPOSED	REMOVE EXIST PW, EXTEND W/36"X10' RC PIPE (CL III)(36 IN) & CH-PW-0(DIA=36 IN)(2:1) LT; REMOVE EXIST SET, ADD SET (TY II)(36 IN)(RCP)(4:1) RT		100-YR	362.17	361.41	5.075	362.19	361.4	5.075
594+50	EXISTING	6' X 6' X 55' SCNA & FWN	376.83	10-YR	367.36	365.84	3.344	367.58	365.7	3.344
	PROPOSED	REMOVE EXIST HDWL & WINGS, EXTEND 6' W/CONC BOX CULV (6 FT X 6FT), ADD WINGWALL (PW - 2) (HW=8 FT 6 IN) LT; REMOVE EXIST HDWL & WINGS, EXTEND 5' W/CONC BOX CULV (6 FT X 6 FT), ADD WINGWALL (PW - 2) (HW=10 FT) RT		100-YR	368.78	367.9	4.028	368.78	367.95	4.028

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6/2/2021

HYDRAULIC DATA SHEET

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		58

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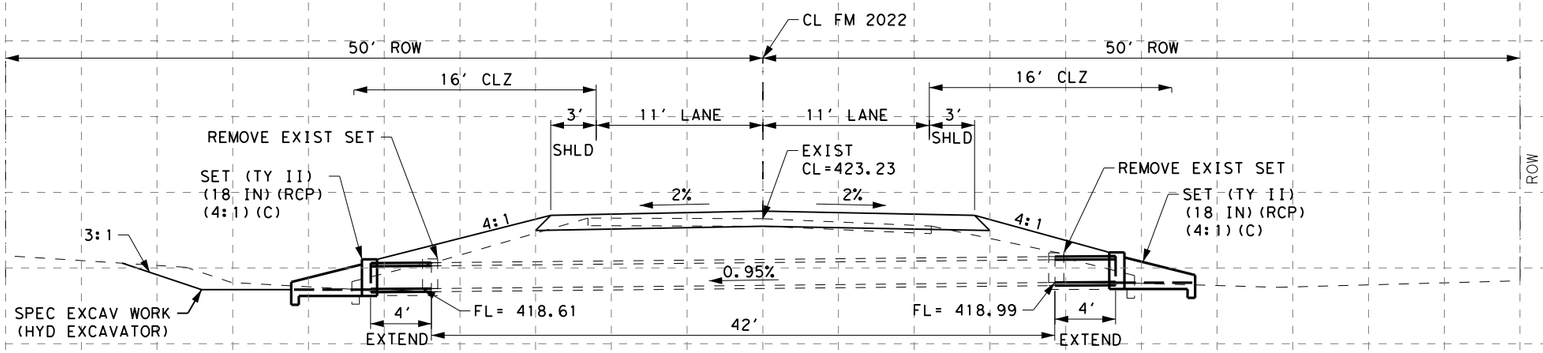
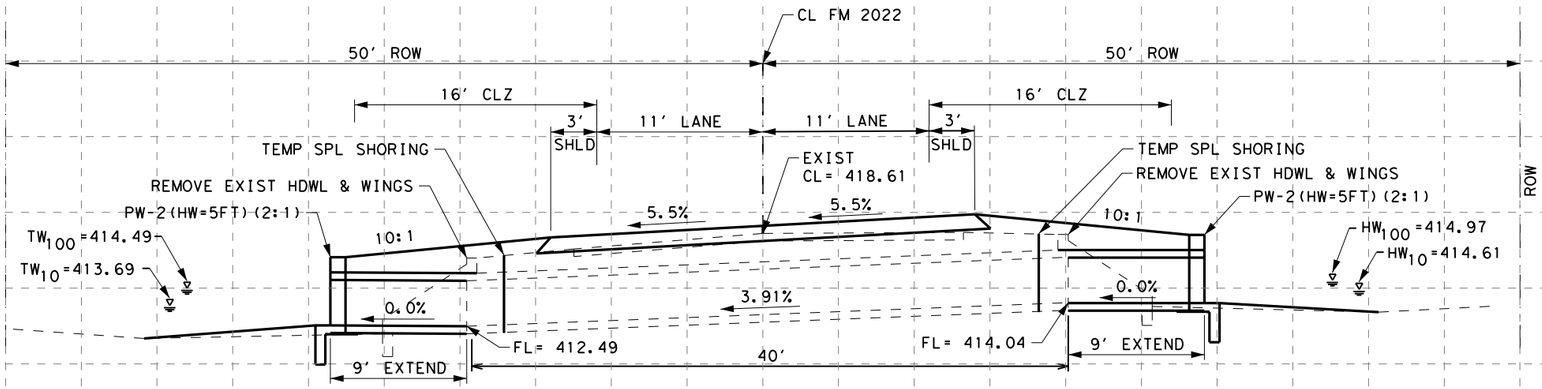


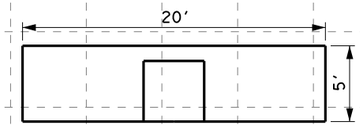
STA 348+00

EXIST 18"X 42'RCP W/SET
LT: REMOVE EXIST SET, EXTEND W/18" X 4' RCP & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)
RT: REMOVE EXIST SET, EXTEND W/18" X 4' RCP & ADD SET (TY II)(18 IN)(RCP)(4:1)(C)



STA 377+40

EXIST 6'X 3'X 40'FC-2 W/SW
LT:REMOVE EXIST HDWL & WINGS, EXTEND 9' W/ CONC BOX CULV (6'X 3')& ADD PW-2(HW-5 FT)2:1)
RT:REMOVE EXIST HDWL & WINGS, EXTEND 9' W/ CONC BOX CULV (6'X 3')& ADD PW-2(HW-5 FT)2:1)



TEMP SPL SHORING DETAIL
TYP. BOTH SIDES

SCALE 1" = 10'

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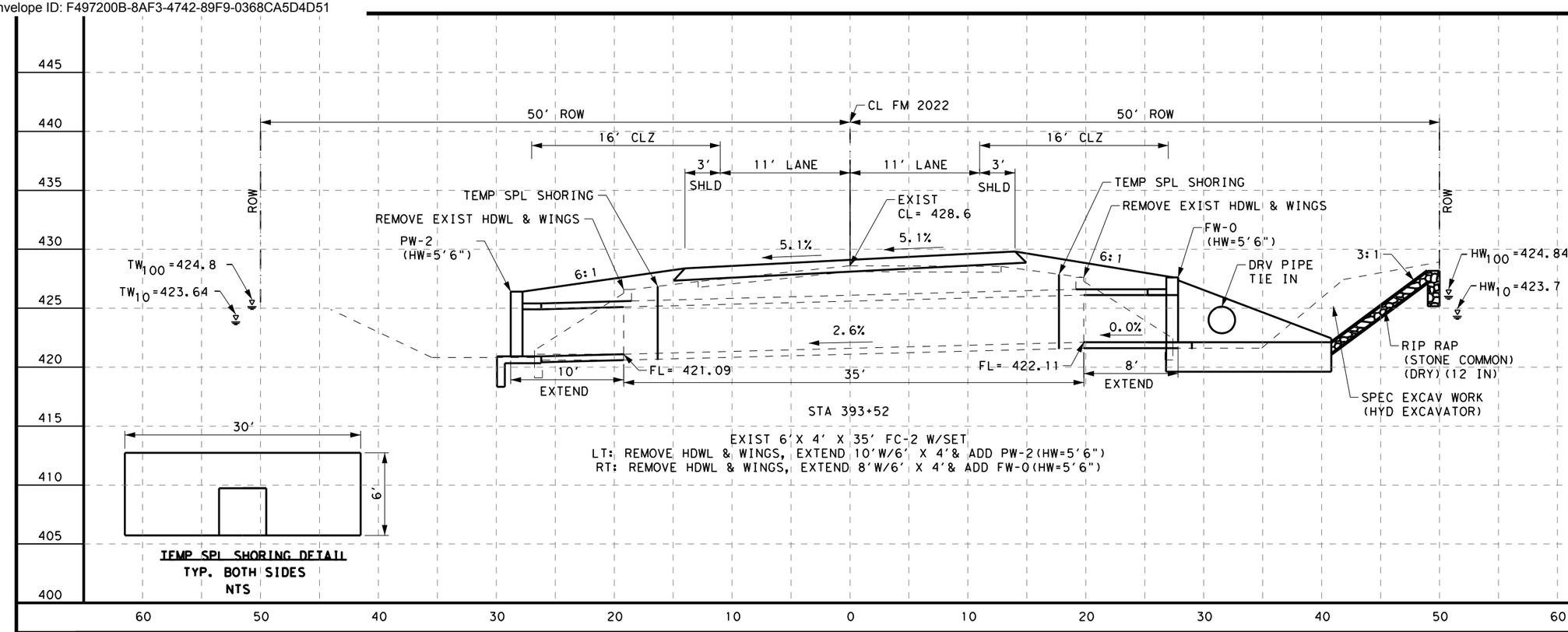
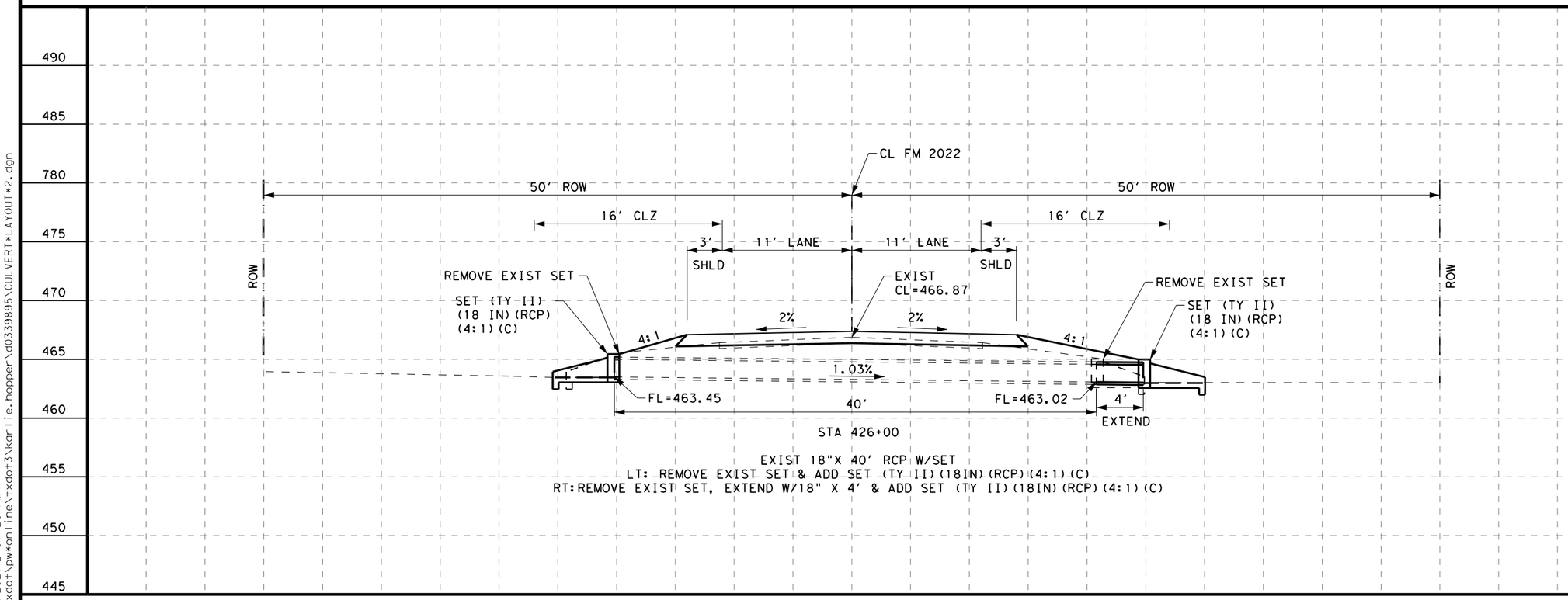
CULVERT LAYOUT

SHEET 1 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		59





SCALE 1" = 10'

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SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		60

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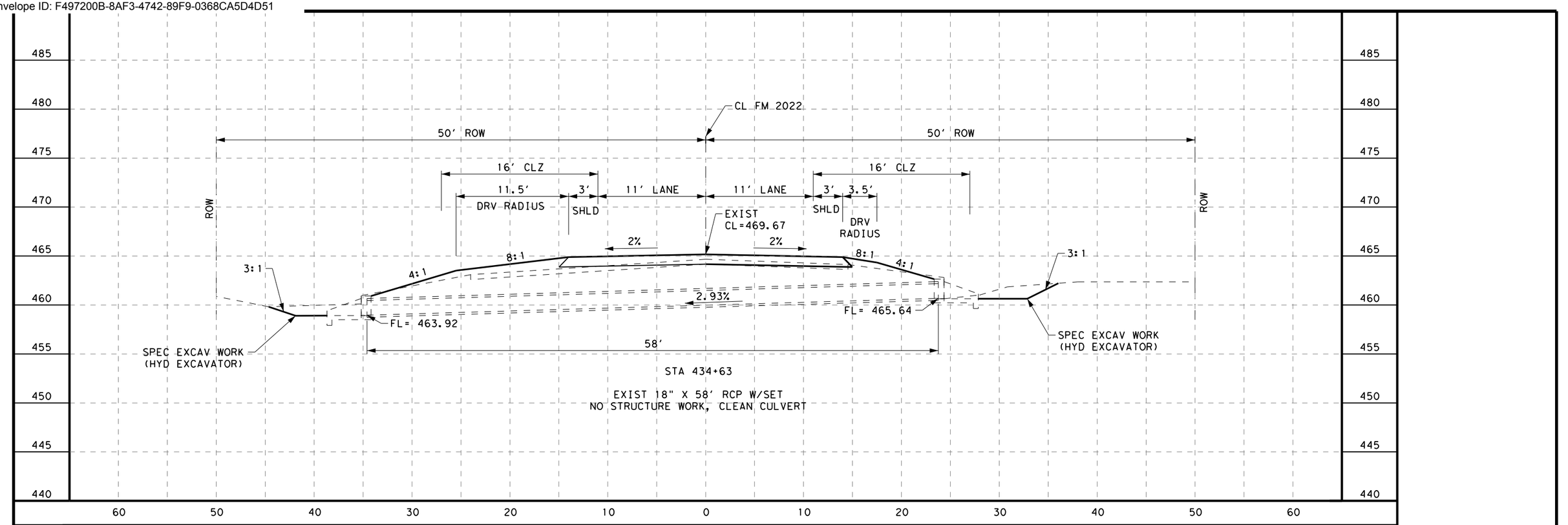

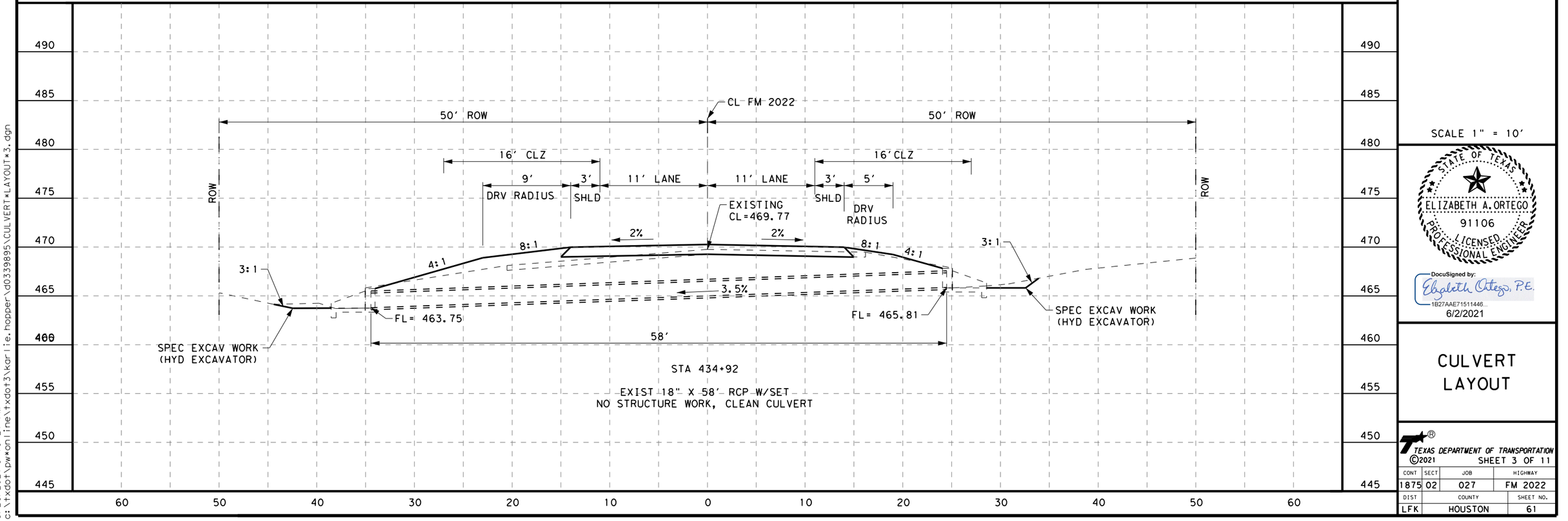

SCALE 1" = 10'

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SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		61

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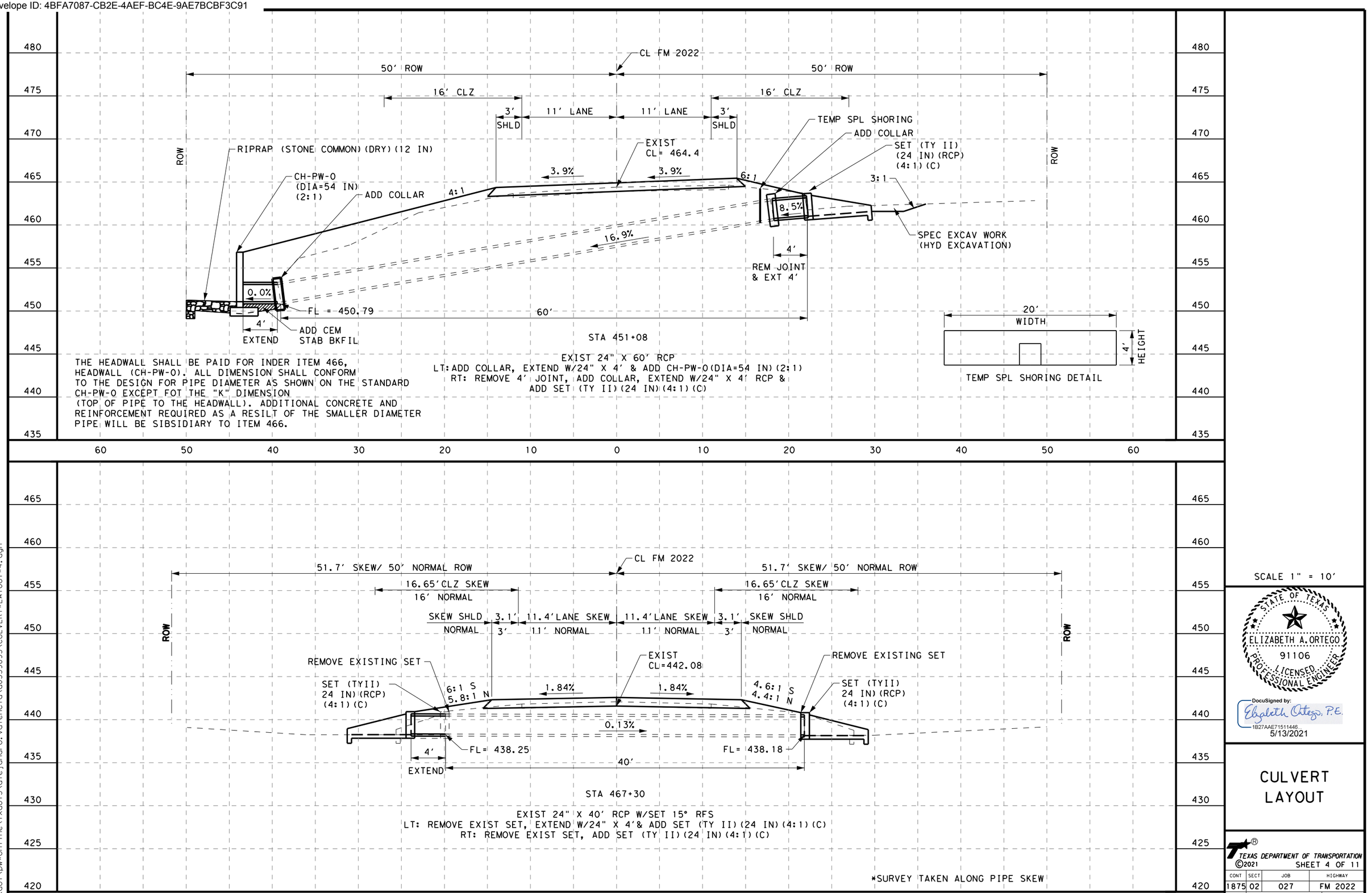

SCALE 1" = 10'

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SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		62

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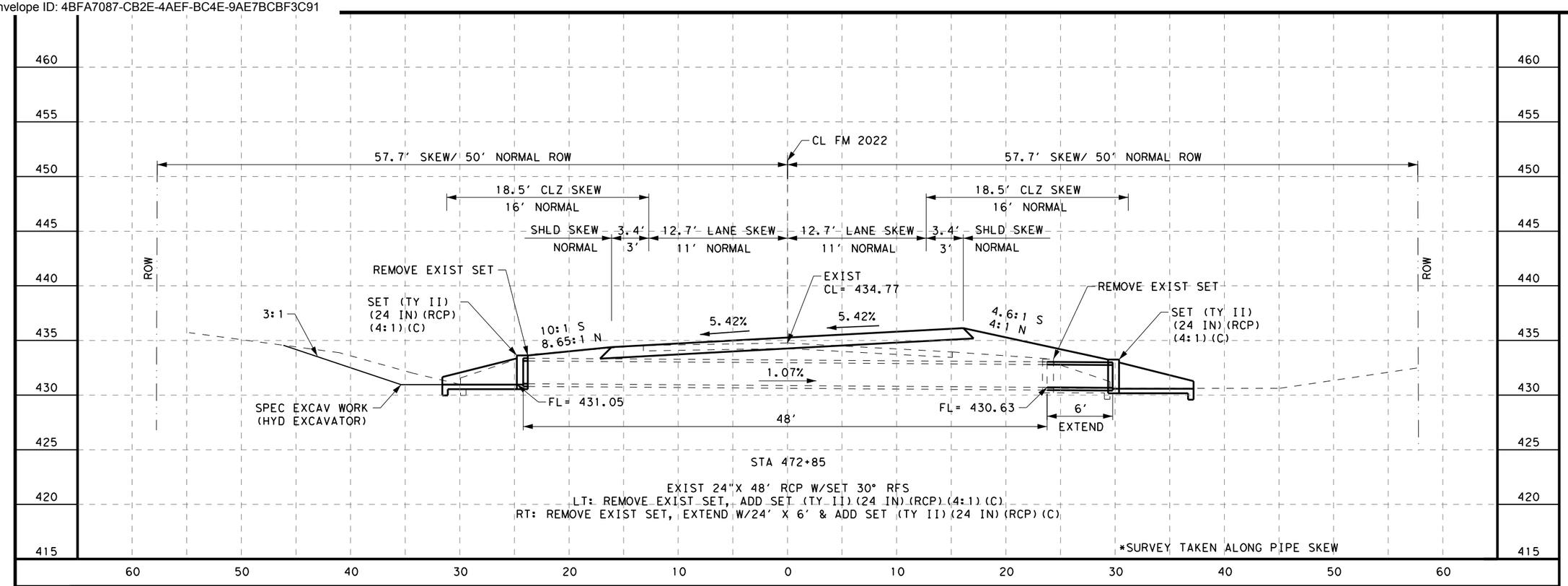
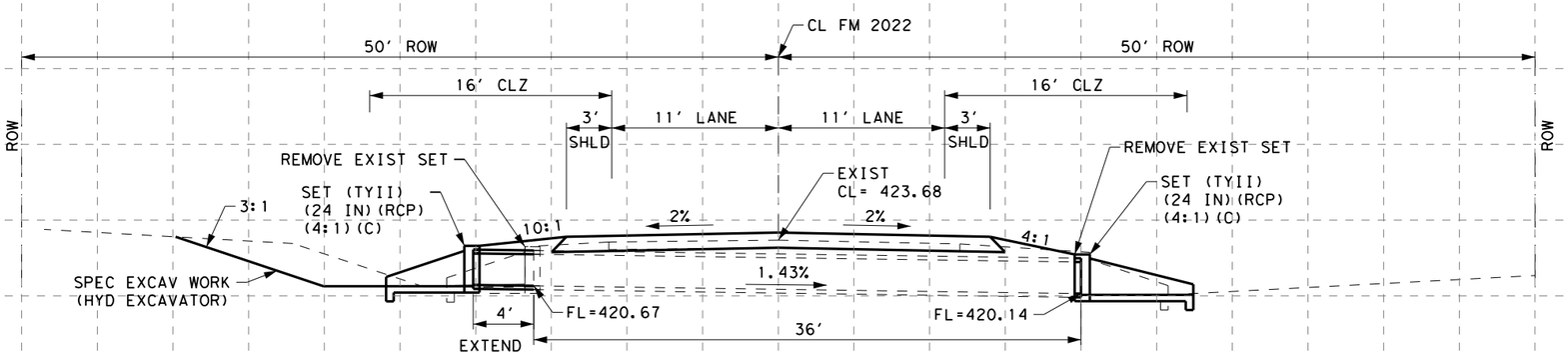


STA 472+85

EXIST 24"X 48' RCP W/SET 30° RFS
LT: REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C)
RT: REMOVE EXIST SET, EXTEND W/24' X 6' & ADD SET (TY II)(24 IN)(RCP)(C)

*SURVEY TAKEN ALONG PIPE SKEW



STA 480+90

EXIST 24"X 36' RCP
LT: REMOVE EXIST SET, EXTEND W/24" X 4' & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)
RT: REMOVE EXIST SET & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)

SCALE 1" = 10'

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SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
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DIST	COUNTY		SHEET NO.
LFK	HOUSTON		63

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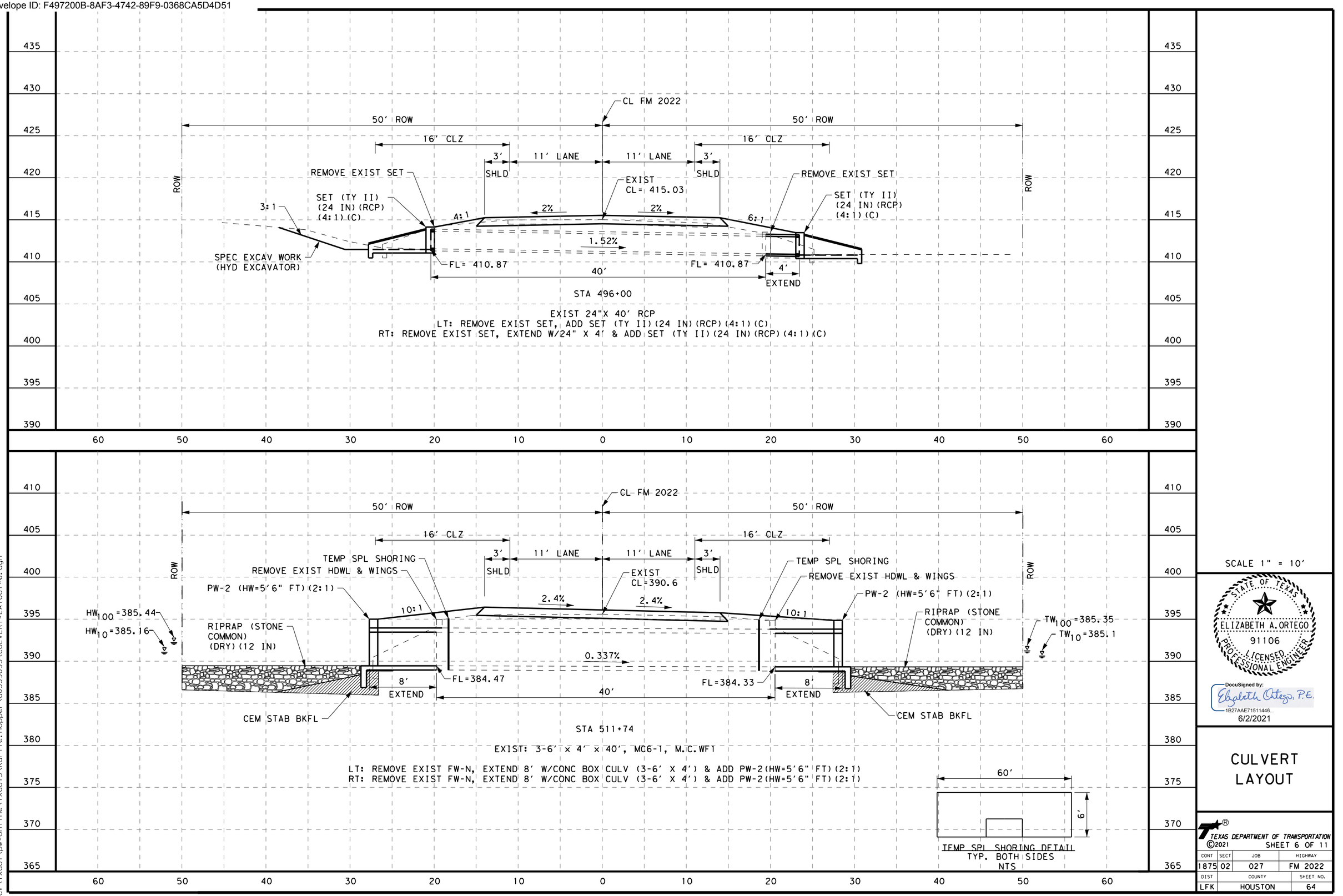

SCALE 1" = 10'

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CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		64

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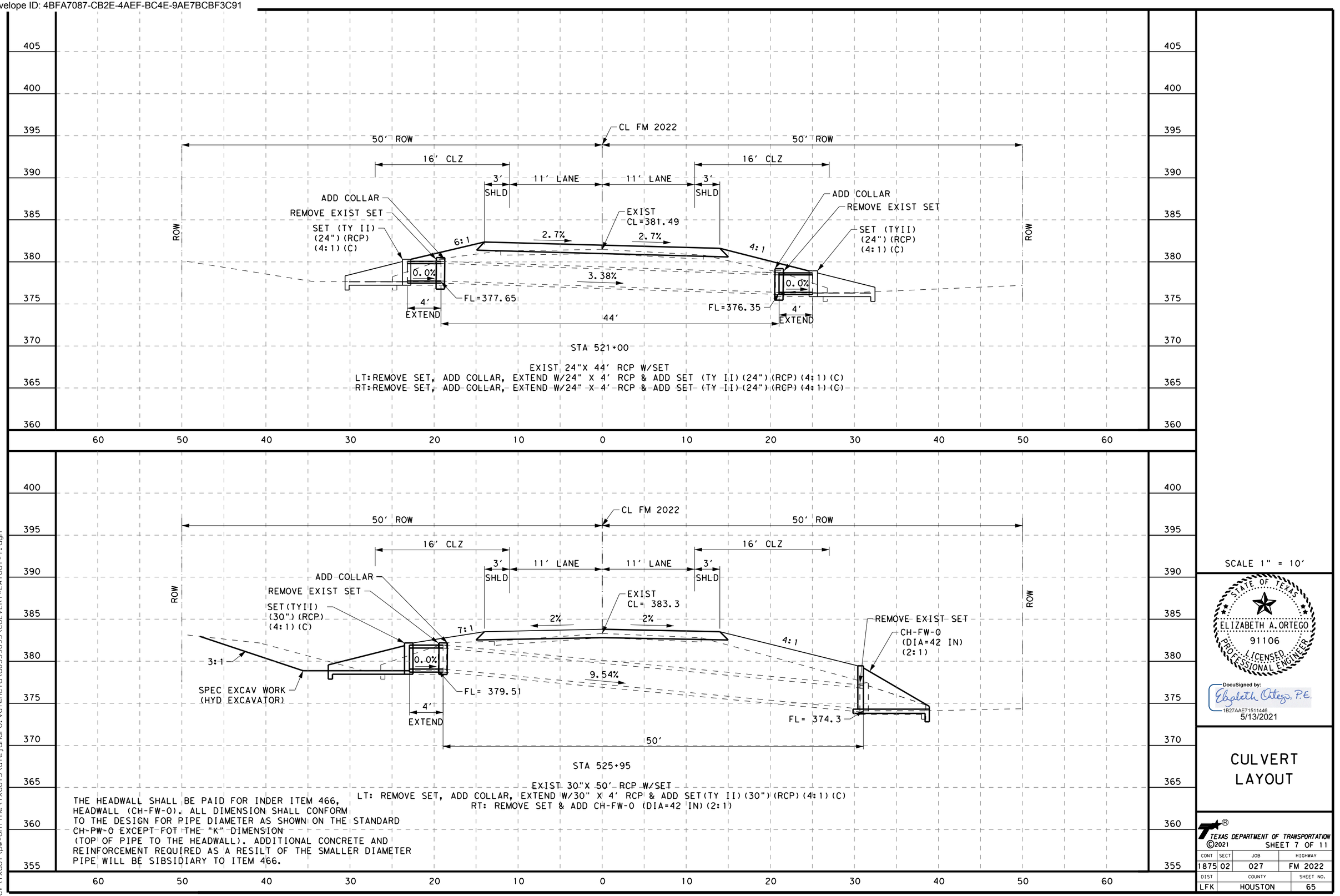

SCALE 1" = 10'

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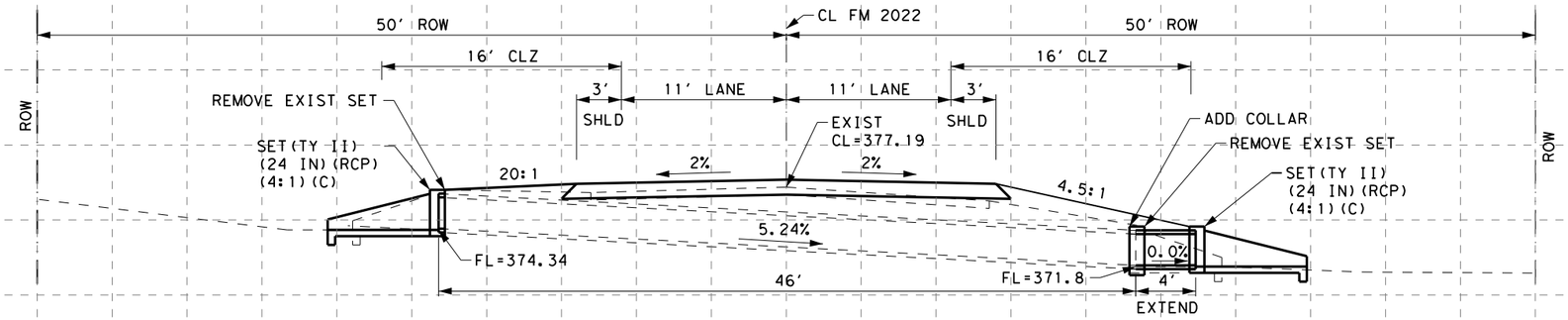
CULVERT LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

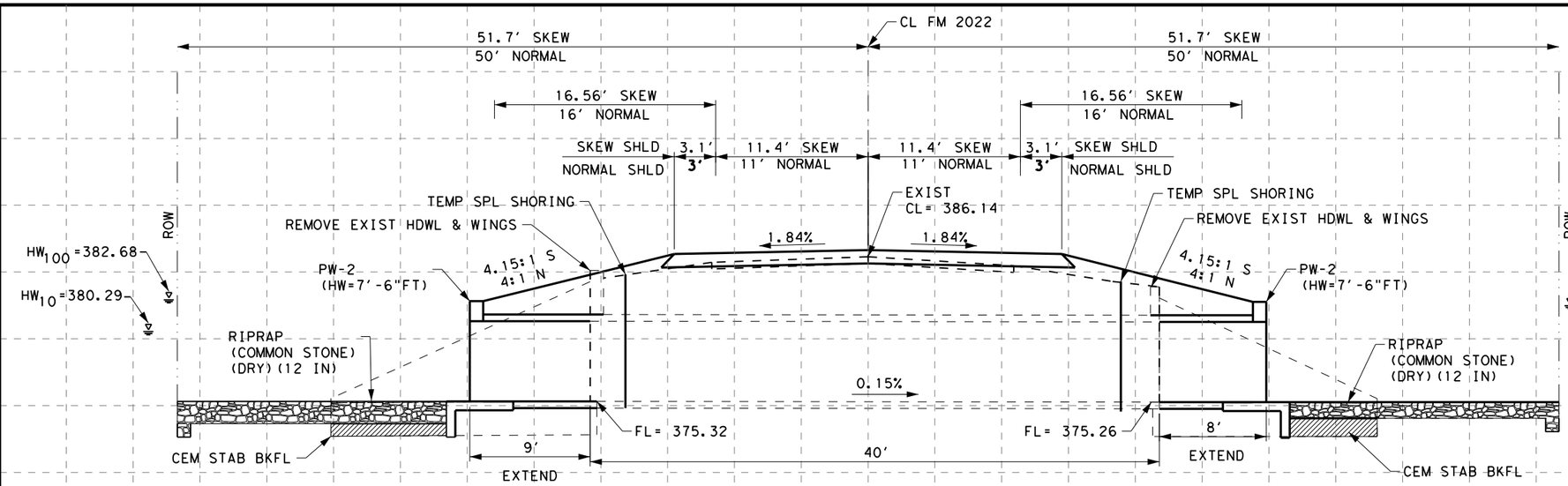
SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		65



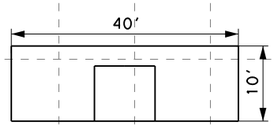
STA 532+16

EXISTING: 24"X 46' RCP W/SET
LT: REMOVE EXIST SET, ADD SET (TY II)(24 IN)(RCP)(4:1)(C)
RT: REMOVE EXIST SET, ADD COLLAR, EXTEND W/24" X 4' & ADD SET (TY II)(24 IN)(RCP)(4:1)(C)



STA 540+75

EXIST: 6' X 6' X 40' SC15°A, 15° RFS
LT:REMOVE EXIST HDWL & WINGS,EXTEND 9'W/6'X 6'& ADD PW-2 (HDW= 7'-6")
RT:REMOVE EXIST HDWL & WINGS,EXTEND 8'W/6'X 6'& ADD PW-2 (HDW= 7'-6")



TEMP SPL SHORING DETAIL
TYP. BOTH SIDES
NTS

*SUVERY TAKEN ALONG BOX SKEW

SCALE 1" = 10'

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CULVERT LAYOUT

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CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		66

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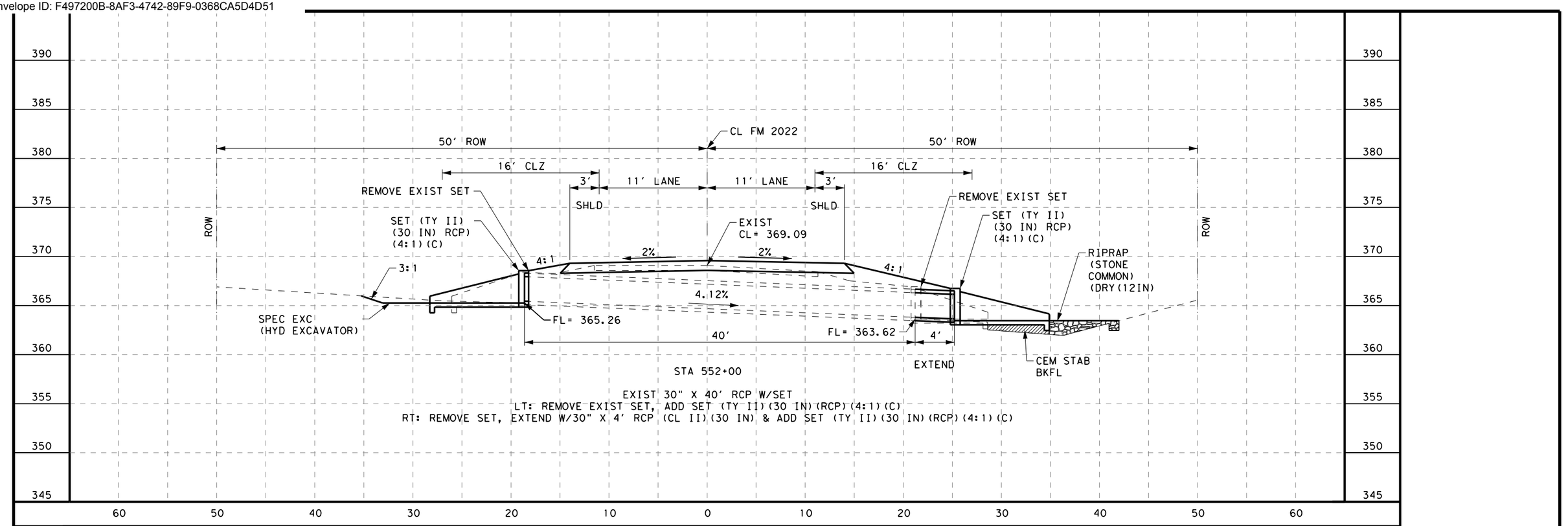

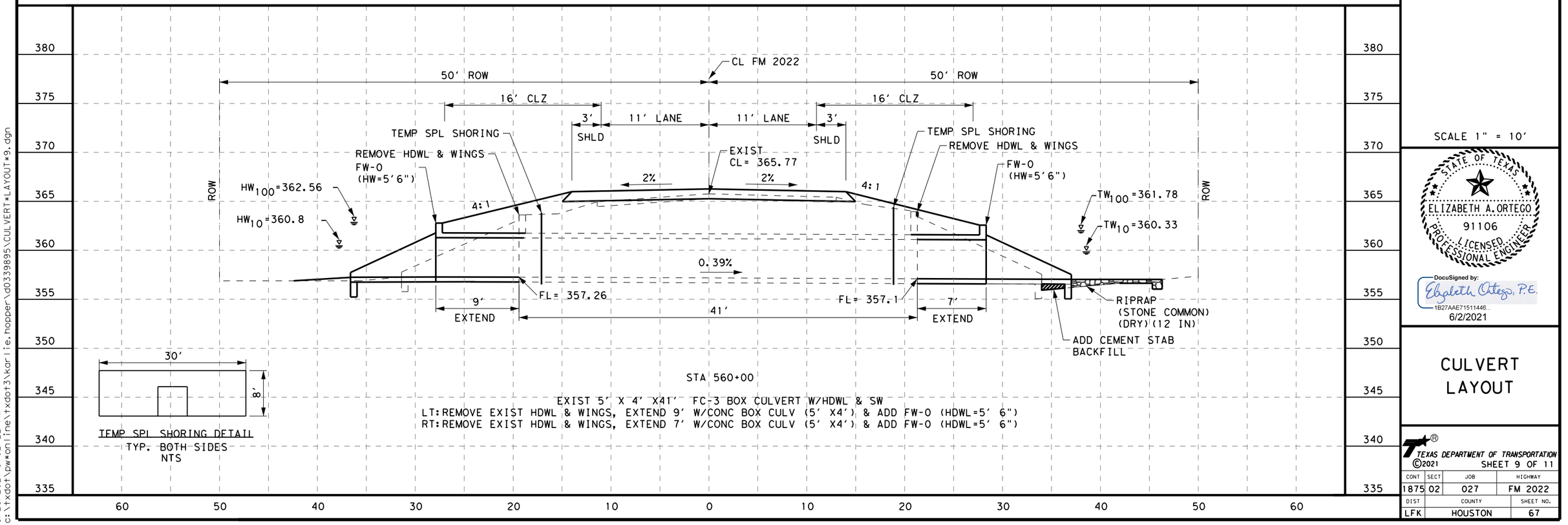

SCALE 1" = 10'

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CULVERT LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION
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CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		67

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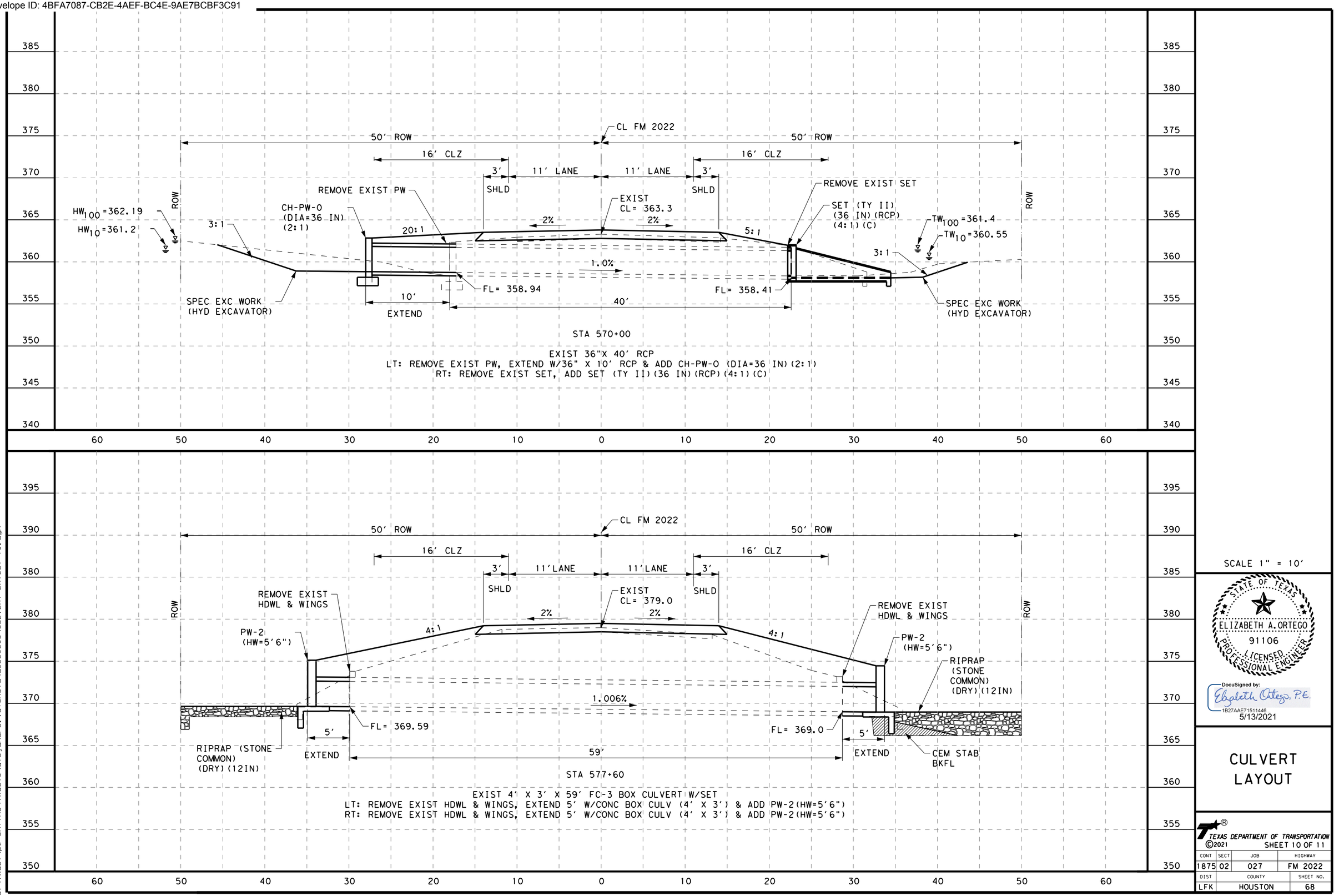

SCALE 1" = 10'

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CULVERT LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		68

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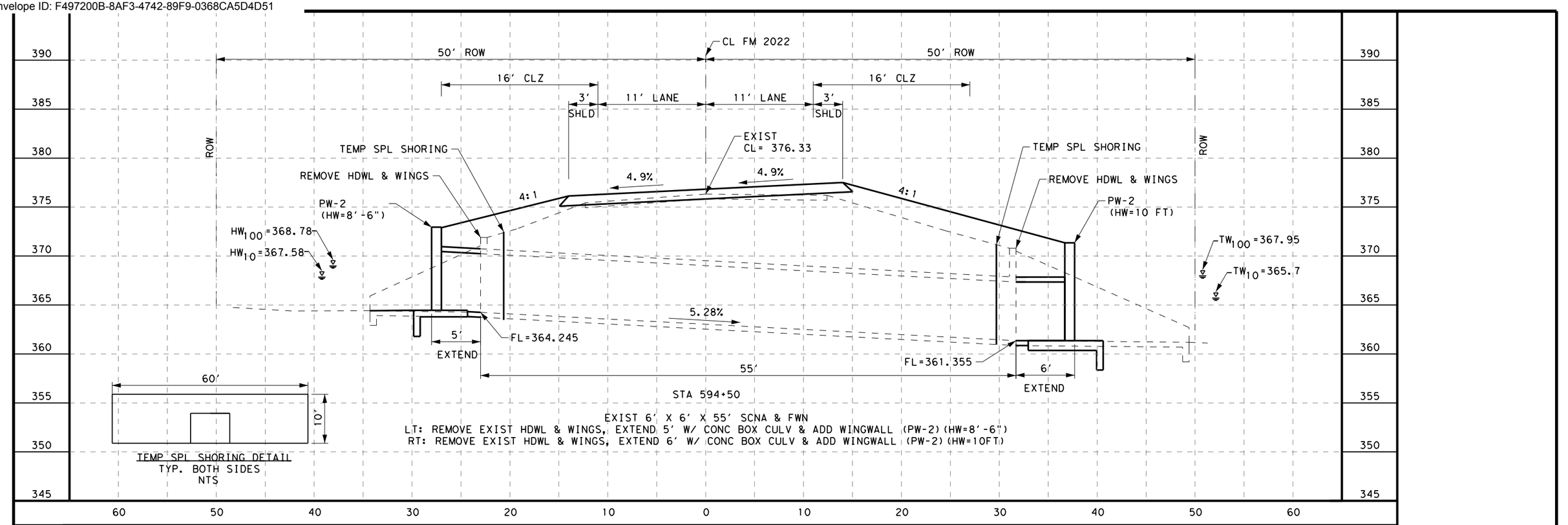

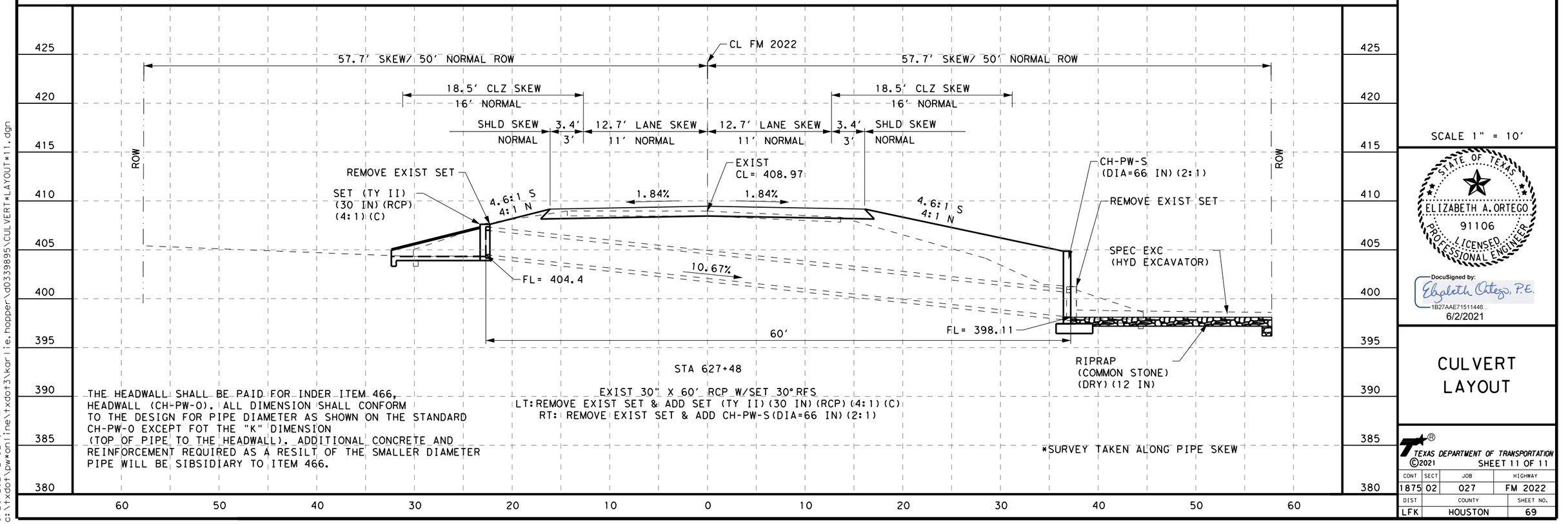

SCALE 1" = 10'

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CULVERT LAYOUT

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SHEET 11 OF 11

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		69

5/26/2021 2:52:01 PM
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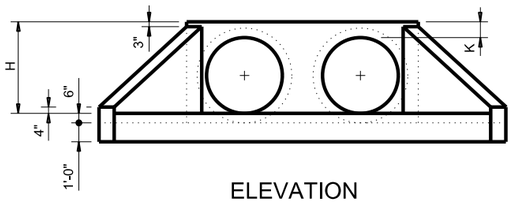
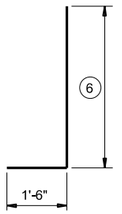
DATE:
FILE:

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

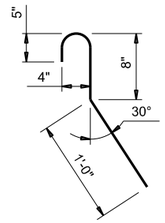
Slope	Dia of Pipe (D)	Values for One Pipe W	X	Y	L	Reinf (Lbs)	Conc (CY) (1)	Values to be Added for Each Addt'l Pipe X and W	Reinf (Lbs)	Conc (CY) (1)
2:1	12"	4' - 7 ½"	2' - 6"	2' - 10"	3' - 3 ¼"	88	0.6	1' - 9"	20	0.2
	15"	5' - 5 ¾"	2' - 9 ½"	3' - 4"	3' - 10 ¼"	103	0.7	2' - 2"	24	0.3
	18"	6' - 4 ¼"	3' - 1"	3' - 10"	4' - 5"	124	0.9	2' - 8"	32	0.3
	21"	7' - 2 ¾"	3' - 4 ½"	4' - 4"	5' - 0"	143	1.1	3' - 1"	43	0.4
	24"	8' - 2 ½"	3' - 9 ½"	4' - 10"	5' - 7"	164	1.3	3' - 7"	50	0.5
	27"	9' - 1"	4' - 1"	5' - 4"	6' - 2"	179	1.5	3' - 11"	56	0.6
	30"	9' - 11 ½"	4' - 4 ½"	5' - 10"	6' - 8 ¾"	203	1.7	4' - 4"	65	0.8
	33"	10' - 10"	4' - 8"	6' - 4"	7' - 3 ¾"	224	2.0	4' - 8"	71	0.9
	36"	11' - 8 ¼"	4' - 11 ½"	6' - 10"	7' - 10 ¾"	249	2.2	5' - 1"	81	1.0
	42"	13' - 5 ¼"	5' - 6 ½"	7' - 10"	9' - 0 ½"	298	2.8	5' - 10"	97	1.3
	48"	15' - 9"	6' - 1 ½"	9' - 4"	10' - 9 ¼"	360	3.8	6' - 7"	117	1.7
	54"	17' - 5 ¾"	6' - 8 ½"	10' - 4"	11' - 11 ¼"	427	4.5	7' - 6"	151	2.1
	60"	19' - 2 ¾"	7' - 3 ½"	11' - 4"	13' - 1"	481	5.3	8' - 3"	174	2.5
	66"	20' - 11 ½"	7' - 10 ½"	12' - 4"	14' - 3"	544	6.2	8' - 9"	194	2.9
	72"	22' - 8 ½"	8' - 5 ½"	13' - 4"	15' - 4 ¾"	601	7.1	9' - 4"	213	3.3
3:1	12"	6' - 3"	2' - 6"	4' - 3"	4' - 11"	118	0.8	1' - 9"	22	0.2
	15"	7' - 5"	2' - 9 ½"	5' - 0"	5' - 9 ¼"	137	1.1	2' - 2"	28	0.3
	18"	8' - 6 ¾"	3' - 1"	5' - 9"	6' - 7 ¾"	170	1.3	2' - 8"	37	0.5
	21"	9' - 8 ¾"	3' - 4 ½"	6' - 6"	7' - 6"	195	1.6	3' - 1"	48	0.6
	24"	11' - 0"	3' - 9 ½"	7' - 3"	8' - 4 ½"	227	2.0	3' - 7"	58	0.7
	27"	12' - 2"	4' - 1"	8' - 0"	9' - 2 ¾"	251	2.3	3' - 11"	67	0.8
	30"	13' - 4"	4' - 4 ½"	8' - 9"	10' - 1 ¼"	293	2.7	4' - 4"	77	1.0
	33"	14' - 5 ¾"	4' - 8"	9' - 6"	10' - 11 ¾"	318	3.1	4' - 8"	84	1.2
	36"	15' - 7 ¾"	4' - 11 ½"	10' - 3"	11' - 10"	351	3.5	5' - 1"	96	1.4
	42"	17' - 11 ½"	5' - 6 ½"	11' - 9"	13' - 6 ¾"	432	4.5	5' - 10"	119	1.7
	48"	21' - 1 ¾"	6' - 1 ½"	14' - 0"	16' - 2"	537	6.1	6' - 7"	146	2.3
	54"	23' - 5 ½"	6' - 8 ½"	15' - 6"	17' - 10 ¾"	630	7.3	7' - 6"	186	2.9
	60"	25' - 9 ¼"	7' - 3 ½"	17' - 0"	19' - 7 ½"	719	8.7	8' - 3"	219	3.4
	66"	28' - 1"	7' - 10 ½"	18' - 6"	21' - 4 ¼"	811	10.1	8' - 9"	242	3.9
	72"	30' - 4 ¾"	8' - 5 ½"	20' - 0"	23' - 1 ¼"	924	11.7	9' - 4"	272	4.4
4:1	12"	7' - 10 ¾"	2' - 6"	5' - 8"	6' - 6 ½"	148	1.1	1' - 9"	24	0.3
	15"	9' - 4"	2' - 9 ½"	6' - 8"	7' - 8 ½"	181	1.5	2' - 2"	32	0.4
	18"	10' - 9 ½"	3' - 1"	7' - 8"	8' - 10 ¼"	221	1.9	2' - 8"	42	0.5
	21"	12' - 2 ¾"	3' - 4 ½"	8' - 8"	10' - 0"	260	2.3	3' - 1"	57	0.7
	24"	13' - 9 ½"	3' - 9 ½"	9' - 8"	11' - 2"	301	2.8	3' - 7"	67	0.9
	27"	15' - 3"	4' - 1"	10' - 8"	12' - 3 ¾"	334	3.3	3' - 11"	77	1.0
	30"	16' - 8 ¼"	4' - 4 ½"	11' - 8"	13' - 5 ¾"	385	3.8	4' - 4"	89	1.3
	33"	18' - 1 ¾"	4' - 8"	12' - 8"	14' - 7 ½"	425	4.5	4' - 8"	101	1.4
	36"	19' - 7"	4' - 11 ½"	13' - 8"	15' - 9 ¼"	472	5.1	5' - 1"	115	1.7
	42"	22' - 5 ¾"	5' - 6 ½"	15' - 8"	18' - 1"	583	6.5	5' - 10"	141	2.1
	48"	26' - 6 ¼"	6' - 1 ½"	18' - 8"	21' - 6 ¾"	730	8.9	6' - 7"	175	2.8
	54"	29' - 5"	6' - 8 ½"	20' - 8"	23' - 10 ¼"	875	10.7	7' - 6"	226	3.6
	60"	32' - 3 ¾"	7' - 3 ½"	22' - 8"	26' - 2"	996	12.7	8' - 3"	264	4.3
	66"	35' - 2 ½"	7' - 10 ½"	24' - 8"	28' - 5 ¾"	1,140	14.9	8' - 9"	300	4.9
	72"	38' - 1 ¼"	8' - 5 ½"	26' - 8"	30' - 9 ½"	1,297	17.3	9' - 4"	334	5.6
6:1	12"	11' - 2"	2' - 6"	8' - 6"	9' - 9 ¾"	224	1.9	1' - 9"	28	0.4
	15"	13' - 2 ¼"	2' - 9 ½"	10' - 0"	11' - 6 ½"	268	2.5	2' - 2"	37	0.5
	18"	15' - 2 ½"	3' - 1"	11' - 6"	13' - 3 ¼"	330	3.2	2' - 8"	50	0.7
	21"	17' - 2 ¾"	3' - 4 ½"	13' - 0"	15' - 0 ¼"	387	3.9	3' - 1"	69	0.9
	24"	19' - 4 ½"	3' - 9 ½"	14' - 6"	16' - 9"	453	4.8	3' - 7"	80	1.2
	27"	21' - 4 ¾"	4' - 1"	16' - 0"	18' - 5 ¾"	512	5.7	3' - 11"	96	1.4
	30"	23' - 5 ¼"	4' - 4 ½"	17' - 6"	20' - 2 ½"	593	6.7	4' - 4"	110	1.7
	33"	25' - 5 ½"	4' - 8"	19' - 0"	21' - 11 ¼"	675	7.8	4' - 8"	127	2.0
	36"	27' - 5 ¾"	4' - 11 ½"	20' - 6"	23' - 8"	735	9.0	5' - 1"	144	2.3
	42"	31' - 6 ¼"	5' - 6 ½"	23' - 6"	27' - 1 ½"	922	11.5	5' - 10"	179	3.0
	48"	37' - 3 ½"	6' - 1 ½"	28' - 0"	32' - 4"	1,191	15.9	6' - 7"	231	4.0
	54"	41' - 4 ¼"	6' - 8 ½"	31' - 0"	35' - 9 ½"	1,424	19.2	7' - 6"	300	5.0
	60"	45' - 4 ¾"	7' - 3 ½"	34' - 0"	39' - 3"	1,631	22.9	8' - 3"	353	6.0



ELEVATION
(Showing dimensions.)



BARS V



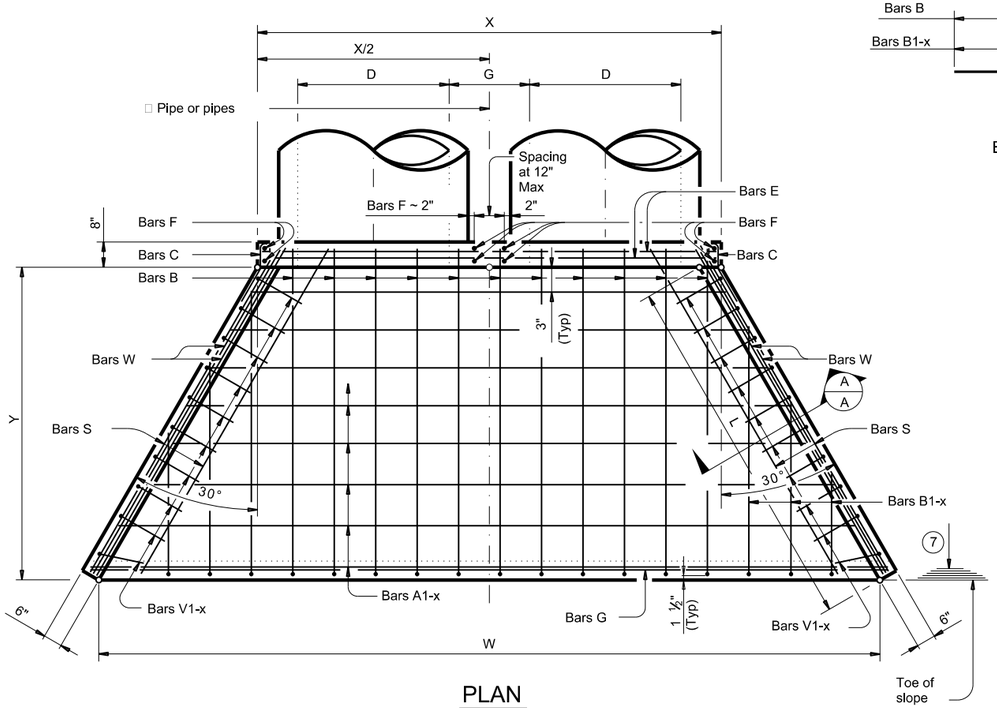
BARS CL
(Length = 2'-5")

TABLE OF REINFORCING STEEL (5)

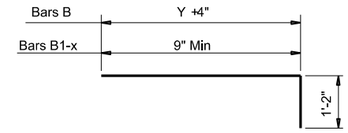
Bar	Size	Spa	No.
A	#4	1' - 0"	~
B	#3	1' - 6"	~
C	#4	1' - 0"	~
D	#3	1' - 0"	~
E	#5	~	4
F	#5	~	~
G	#3	~	2
S	#4	~	6
V	#4	1' - 0"	~
W	#5	~	4

TABLE OF CONSTANT DIMENSIONS

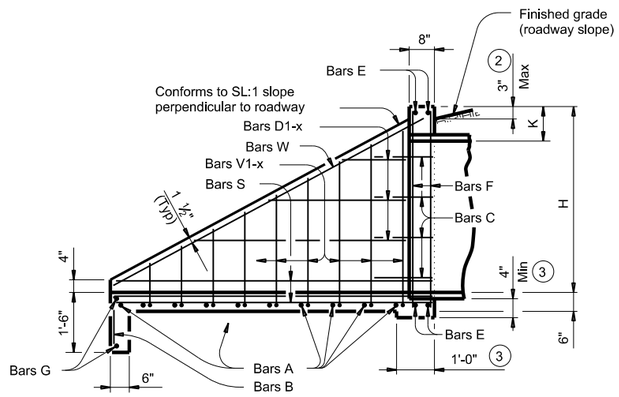
Dia of Pipe (D)	G	K (4)	H
12"	0' - 9"	1' - 0"	2' - 0"
15"	0' - 11"	1' - 0"	2' - 3"
18"	1' - 2"	1' - 0"	2' - 6"
21"	1' - 4"	1' - 0"	2' - 9"
24"	1' - 7"	1' - 0"	3' - 0"
27"	1' - 8"	1' - 0"	3' - 3"
30"	1' - 10"	1' - 0"	3' - 6"
33"	1' - 11"	1' - 0"	3' - 9"
36"	2' - 1"	1' - 0"	4' - 0"
42"	2' - 4"	1' - 0"	4' - 6"
48"	2' - 7"	1' - 3"	5' - 3"
54"	3' - 0"	1' - 3"	5' - 9"
60"	3' - 3"	1' - 3"	6' - 3"
66"	3' - 3"	1' - 3"	6' - 9"
72"	3' - 4"	1' - 3"	7' - 3"



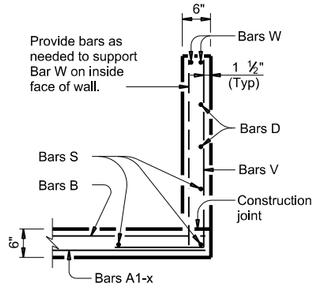
PLAN



BARS B and B1-x



TYPICAL WING ELEVATION



SECTION A-A

(1) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(2) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(3) Provide a 1'-0" footing as shown where required to maintain 4" minimum cover for pipes.

(4) Dimensions shown are usual and maximum.

(5) Quantities shown are for one structure end only (one headwall).

(6) Min Length = 6" + 3" x $\left(\frac{12 \times H}{12 \times L} - 7\right)$

Max Length = 12 x H + 3" x $\left(\frac{12 \times H}{12 \times L} - 7\right)$ -

(7) Lengths of wings based on SL:1 slope along this line.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

Texas Department of Transportation

Bridge Division Standard

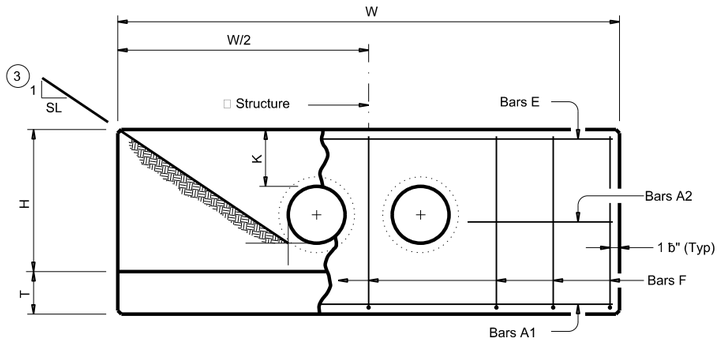
CONCRETE HEADWALLS
WITH FLARED WINGS FOR 0° SKEW PIPE CULVERTS

CH-FW-0

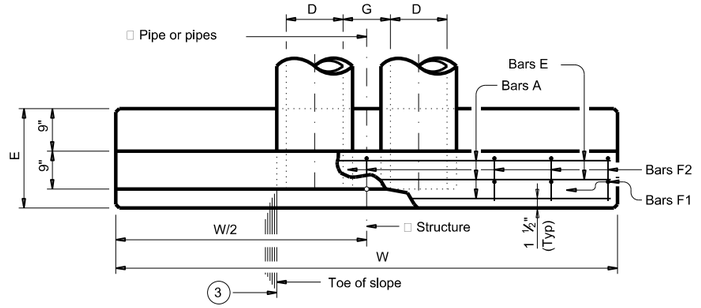
FILE: chfw00se-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	187502	027		FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		70

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

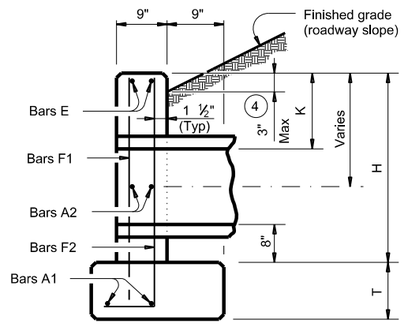
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 0"	122	1.1	1' - 9"	15	0.2
	15"	10' - 3"	136	1.3	2' - 2"	16	0.2
	18"	11' - 6"	163	1.5	2' - 8"	19	0.3
	21"	12' - 9"	200	1.8	3' - 1"	31	0.4
	24"	14' - 0"	217	2.1	3' - 7"	34	0.4
	27"	15' - 3"	254	2.4	3' - 11"	37	0.5
	30"	16' - 6"	272	2.7	4' - 4"	40	0.6
	33"	17' - 9"	314	3.1	4' - 8"	43	0.6
	36"	19' - 0"	371	3.9	5' - 1"	46	0.8
	42"	21' - 6"	442	4.9	5' - 10"	52	1.0
	48"	25' - 0"	569	6.4	6' - 7"	59	1.3
	54"	27' - 6"	701	7.5	7' - 6"	82	1.6
	60"	30' - 0"	794	8.8	8' - 3"	90	1.8
	66"	32' - 6"	894	10.2	8' - 9"	96	2.0
	72"	35' - 0"	1,055	11.7	9' - 4"	103	2.3
3:1	12"	13' - 0"	175	1.6	1' - 9"	14	0.2
	15"	14' - 9"	193	1.9	2' - 2"	17	0.2
	18"	16' - 6"	228	2.2	2' - 8"	19	0.3
	21"	18' - 3"	299	2.6	3' - 1"	31	0.4
	24"	20' - 0"	323	3.0	3' - 7"	33	0.4
	27"	21' - 9"	371	3.5	3' - 11"	37	0.5
	30"	23' - 6"	415	4.0	4' - 4"	40	0.5
	33"	25' - 3"	469	4.6	4' - 8"	43	0.6
	36"	27' - 0"	556	5.7	5' - 1"	46	0.8
	42"	30' - 6"	675	7.1	5' - 10"	52	1.0
	48"	35' - 6"	837	9.2	6' - 7"	59	1.3
	54"	39' - 0"	1,015	11.0	7' - 6"	84	1.6
	60"	42' - 6"	1,171	12.9	8' - 3"	91	1.8
	66"	46' - 0"	1,298	14.9	8' - 9"	98	2.0
	72"	49' - 6"	1,561	17.1	9' - 4"	103	2.3
4:1	12"	17' - 0"	229	2.0	1' - 9"	15	0.2
	15"	19' - 3"	266	2.4	2' - 2"	17	0.2
	18"	21' - 6"	308	2.9	2' - 8"	19	0.3
	21"	23' - 9"	382	3.5	3' - 1"	31	0.3
	24"	26' - 0"	430	3.9	3' - 7"	34	0.4
	27"	28' - 3"	486	4.7	3' - 11"	37	0.5
	30"	30' - 6"	539	5.2	4' - 4"	40	0.6
	33"	32' - 9"	603	6.0	4' - 8"	42	0.6
	36"	35' - 0"	738	7.5	5' - 1"	47	0.8
	42"	39' - 6"	881	9.3	5' - 10"	52	1.0
	48"	46' - 0"	1,102	12.1	6' - 7"	61	1.3
	54"	50' - 6"	1,364	14.4	7' - 6"	84	1.6
	60"	55' - 0"	1,547	16.9	8' - 3"	91	1.8
	66"	59' - 6"	1,741	19.5	8' - 9"	98	2.0
	72"	64' - 0"	2,077	22.4	9' - 4"	102	2.3
6:1	12"	25' - 0"	336	3.0	1' - 9"	14	0.2
	15"	28' - 3"	384	3.6	2' - 2"	17	0.2
	18"	31' - 6"	452	4.2	2' - 8"	19	0.3
	21"	34' - 9"	581	5.1	3' - 1"	31	0.4
	24"	38' - 0"	644	5.8	3' - 7"	34	0.4
	27"	41' - 3"	737	6.9	3' - 11"	37	0.5
	30"	44' - 6"	807	7.7	4' - 4"	39	0.6
	33"	47' - 9"	912	8.9	4' - 8"	44	0.6
	36"	51' - 0"	1,108	11.0	5' - 1"	48	0.8
	42"	57' - 6"	1,318	13.7	5' - 10"	54	1.0
	48"	67' - 0"	1,682	17.9	6' - 7"	59	1.3
	54"	73' - 6"	2,072	21.3	7' - 6"	83	1.6
	60"	80' - 0"	2,351	24.9	8' - 3"	89	1.8
	66"	86' - 6"	2,643	28.9	8' - 9"	96	2.0
	72"	93' - 0"	3,121	33.1	9' - 4"	101	2.3



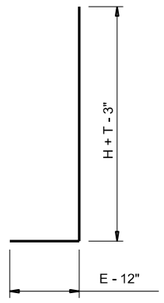
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

1. Total quantities include one 3'-1" lap for bars over 60' in length.
2. Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.
3. Indicated slope is perpendicular to centerline pipe or pipes.
4. For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
5. Dimensions shown are usual and maximum.
6. Quantities shown are for one structure end only (one headwall).

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

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Texas Department of Transportation — Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		71

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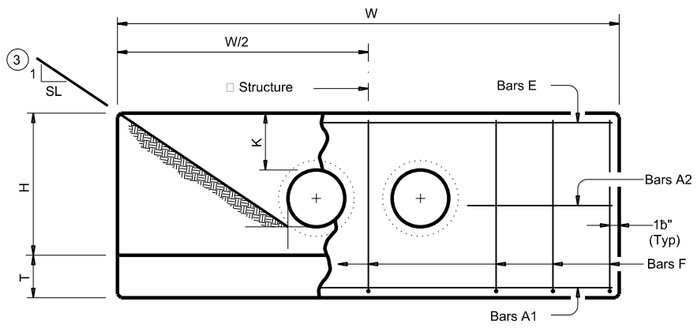
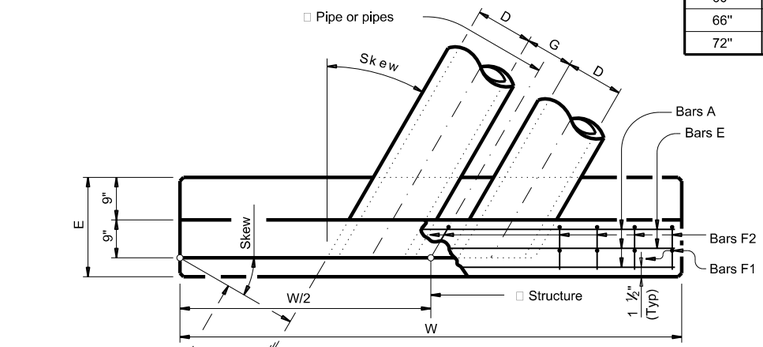
TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 4"	124	1.1	1' - 9 ¾"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 ¾"	17	0.3
	15"	10' - 7"	136	1.3	2' - 3"	17	0.2	11' - 10"	159	1.5	2' - 6"	18	0.2	14' - 6"	191	1.8	3' - 0 ¾"	20	0.3
	18"	11' - 11"	165	1.5	2' - 9"	19	0.3	13' - 3"	174	1.7	3' - 1"	29	0.3	16' - 3"	207	2.1	3' - 9 ¼"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 ¼"	31	0.4	14' - 9"	233	2.1	3' - 6 ¾"	33	0.4	18' - 0"	276	2.6	4' - 4 ¼"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 ¼"	34	0.4	16' - 2"	251	2.4	4' - 1 ¾"	36	0.5	19' - 10"	318	2.9	5' - 0 ¾"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 ¾"	38	0.5	17' - 7"	292	2.8	4' - 6 ¼"	39	0.6	21' - 7"	342	3.4	5' - 6 ¼"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 ¾"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 ¾"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 ¾"	43	0.6	20' - 6"	358	3.6	5' - 4 ¾"	46	0.7	25' - 1"	439	4.4	6' - 7 ¼"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 ¾"	50	0.9	26' - 10"	517	5.5	7' - 2 ¼"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 ¾"	53	1.1	24' - 10"	528	5.6	6' - 8 ¾"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 ¾"	60	1.3	28' - 10"	637	7.3	7' - 7 ¼"	79	1.5	35' - 4"	791	9.0	9' - 3 ¾"	88	1.8
	54"	28' - 6"	711	7.8	7' - 9"	83	1.6	31' - 9"	781	8.7	8' - 8"	81	1.8	38' - 11"	958	10.7	10' - 7 ¼"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 ¼"	91	1.9	34' - 8"	881	10.2	9' - 6 ¼"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 ¾"	98	2.1	37' - 6"	1,028	11.8	10' - 1 ¼"	102	2.4	46' - 0"	1,235	14.5	12' - 4 ¼"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 ¼"	110	2.6	49' - 6"	1,446	16.6	13' - 2 ¼"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 ¾"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 ¾"	17	0.2
	15"	15' - 3"	212	1.9	2' - 3"	17	0.2	17' - 0"	223	2.1	2' - 6"	17	0.3	20' - 10"	276	2.6	3' - 0 ¾"	20	0.3
	18"	17' - 1"	231	2.3	2' - 9"	19	0.3	19' - 1"	259	2.5	3' - 1"	29	0.3	23' - 4"	318	3.1	3' - 9 ¼"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 ¼"	31	0.4	21' - 1"	339	3.0	3' - 6 ¾"	33	0.4	25' - 10"	413	3.7	4' - 4 ¼"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 ¾"	35	0.4	23' - 1"	384	3.5	4' - 1 ¾"	36	0.5	28' - 3"	462	4.2	5' - 0 ¾"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 ¾"	38	0.5	25' - 1"	438	4.1	4' - 6 ¼"	39	0.6	30' - 9"	522	5.0	5' - 6 ¼"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 ¾"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 ¾"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 ¾"	46	0.7	35' - 9"	644	6.5	6' - 7 ¼"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 ¾"	50	0.9	38' - 2"	787	8.0	7' - 2 ¼"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 ¼"	53	1.1	35' - 3"	776	8.2	6' - 8 ¾"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 ¾"	61	1.3	41' - 0"	953	10.7	7' - 7 ¼"	81	1.5	50' - 2"	1,166	13.1	9' - 3 ¾"	88	1.8
	54"	40' - 5"	1,065	11.4	7' - 9"	85	1.6	45' - 0"	1,185	12.7	8' - 8"	89	1.8	55' - 2"	1,435	15.5	10' - 7 ¼"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 ¼"	93	1.9	49' - 1"	1,356	14.8	9' - 6 ¼"	96	2.1	60' - 1"	1,635	18.2	11' - 8"	124	2.6
	66"	47' - 7"	1,357	15.4	9' - 1"	98	2.1	53' - 1"	1,497	17.2	10' - 1 ¼"	103	2.3	65' - 1"	1,892	21.1	12' - 4 ¼"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 ¼"	109	2.6	70' - 0"	2,218	24.1	13' - 2 ¼"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 ¾"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 ¾"	18	0.2
	15"	19' - 11"	272	2.5	2' - 3"	17	0.2	22' - 3"	301	2.8	2' - 6"	18	0.3	27' - 3"	361	3.5	3' - 0 ¾"	21	0.3
	18"	22' - 3"	313	3.0	2' - 9"	19	0.3	24' - 10"	344	3.3	3' - 1"	29	0.3	30' - 5"	427	4.0	3' - 9 ¼"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 ¼"	31	0.4	27' - 5"	446	4.0	3' - 6 ¾"	33	0.4	33' - 7"	549	4.9	4' - 4 ¼"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 ¾"	35	0.4	30' - 0"	499	4.5	4' - 1 ¾"	36	0.5	36' - 9"	609	5.6	5' - 0 ¾"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 ¾"	38	0.5	32' - 7"	562	5.4	4' - 6 ¼"	40	0.6	39' - 11"	703	6.6	5' - 6 ¼"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 ¾"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 ¾"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 ¾"	46	0.7	46' - 4"	848	8.5	6' - 7 ¼"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 ¾"	49	0.9	49' - 6"	1,058	10.6	7' - 2 ¼"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 ¼"	53	1.0	45' - 7"	1,022	10.7	6' - 8 ¾"	57	1.2	55' - 10"	1,262	13.1	8' - 3"	78	1.4
	48"	47' - 7"	1,152	12.6	6' - 10"	61	1.3	53' - 1"	1,268	14.0	7' - 7 ¼"	80	1.5	65' - 1"	1,587	17.2	9' - 3 ¾"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 ¼"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 ¼"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 ¾"	92	1.9	63' - 6"	1,806	19.5	9' - 6 ¼"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 ¾"	97	2.1	68' - 8"	2,019	22.5	10' - 1 ¼"	101	2.4	84' - 2"	2,472	27.6	12' - 4 ¼"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 ¼"	108	2.6	90' - 6"	2,937	31.7	13' - 2 ¼"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 ¾"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 ¾"	17	0.2
	15"	29' - 3"	390	3.7	2' - 3"	17	0.2	32' - 7"	442	4.2	2' - 6"	18	0.2	39' - 11"	549	5.1	3' - 0 ¾"	20	0.3
	18"	32' - 7"	459	4.4	2' - 9"	20	0.3	36' - 4"	515	4.9	3' - 1"	29	0.3	44' - 7"	629	6.0	3' - 9 ¼"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 ¼"	31	0.4	40' - 2"	660	5.9	3' - 6 ¾"	33	0.4	49' - 2"	823	7.2	4' - 4 ¼"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 ¾"	35	0.4	43' - 11"	748	6.7	4' - 1 ¾"	36	0.5	53' - 9"	920	8.2	5' - 0 ¾"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 ¾"	38	0.5	47' - 8"	852	8.0	4' - 6 ¼"	41	0.5	58' - 4"	1,039	9.7	5' - 6 ¼"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 ¾"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 ¾"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 ¾"	48	0.7	67' - 6"	1,292	12.6	6' - 7 ¼"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 ¾"	51	1.0	72' - 1"	1,583	15.6	7' - 2 ¼"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 ¼"	55	1.0	66' - 5"	1,530	15.8	6' - 8 ¾"	57	1.2	81' - 4"	1,875	19.4	8' - 3"	76	1.4
	48"	69' - 4"	1,737	18.5	6' - 10"	59	1.3	77' - 4"	1,942	20.7	7' - 7 ¼"	79	1.5	94' - 9"	2,368	25.3	9' - 3 ¾"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 ¼"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 ¼"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 ¾"	90	1.9	92' - 5"	2,681	28.8	9' - 6 ¼"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 ¾"	96	2.1	99' - 11"	3,038	33.3	10' - 1 ¼"	101	2.4	122' - 4"	3,697	40.8	12' - 4 ¼"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 ¼"	108	2.6	131' - 6"	4,372	46.8	13' - 2 ¼"	139	3.2



ELEVATION



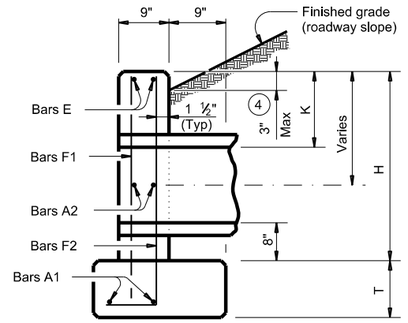
Lengths of wings based on SL:1 slope along this line.

3

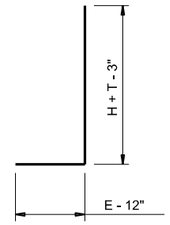
Toe of slope

PLAN OF SKEWED PIPES

Showing 30° skew.



SECTION AT CENTER OF PIPE



BARS F2

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

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

(1) Total quantites include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

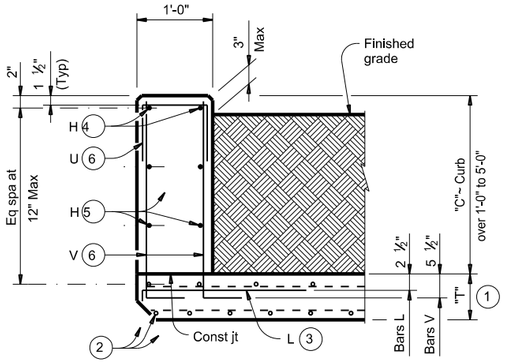
Texas Department of Transportation

Bridge Division Standard

CONCRETE HEADWALLS
WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

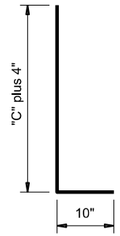
CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		72



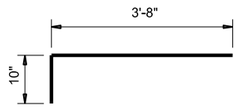
TYPICAL SECTION

Used for curbs over 1'-0" to 5'-0"



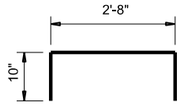
BARS V (#5) 6

Spaced at 12" Max



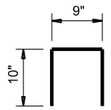
BARS L (#5) 3

Spaced at 12" Max



OPTIONAL BARS L (#5) 3 7

Spaced at 12" Max



BARS U (#4) 6

Spaced at 12" Max

1. "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.
2. Adjust normal culvert slab bars as necessary to clear obstructions.
3. Place bars L as shown. Tilt hook as necessary to maintain cover.
4. Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.
5. Additional bars H(#4) as required to maintain 12" Max spacing.
6. Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.
7. Optional bars L are to be used only for precast box culverts with 3'-0" closure pour.
8. Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'-0"	0.037	10.4
1'-6"	0.056	14.5
2'-0"	0.074	15.6
2'-6"	0.093	18.0
3'-0"	0.111	19.0
3'-6"	0.130	21.3
4'-0"	0.148	22.4
4'-6"	0.167	24.8
5'-0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class "C" concrete (f'_c = 3,600 psi) minimum for curbs.

Provide bar laps, where required, as follows:

· Uncoated or galvanized ~ #4 = 1'-8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		73

DATE: 5/24/2021 1:46:10 PM
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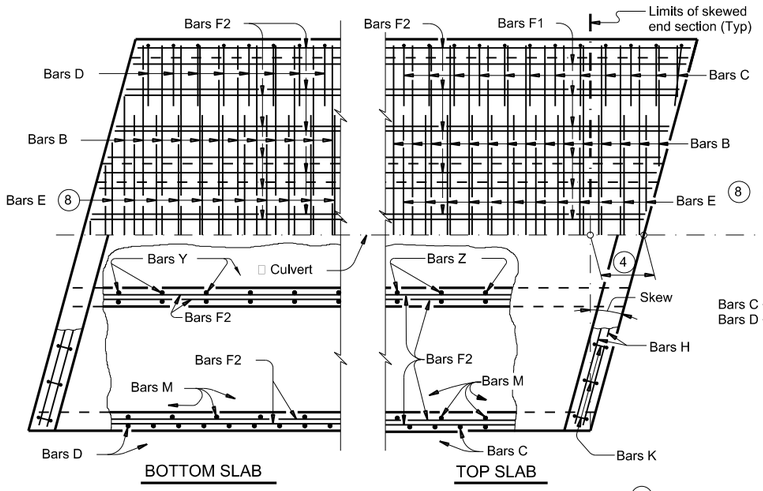
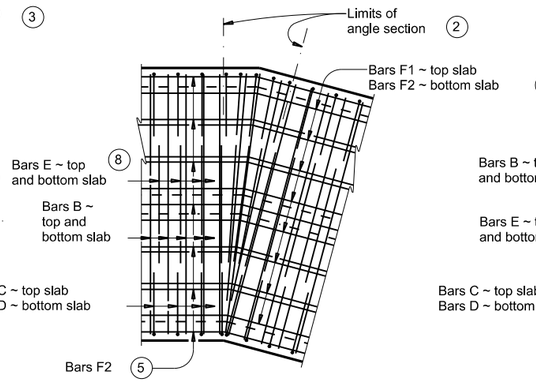
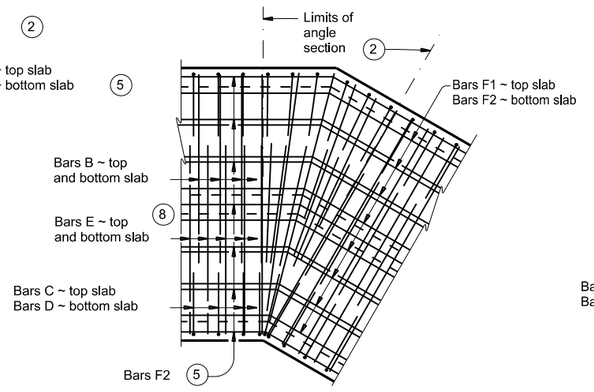


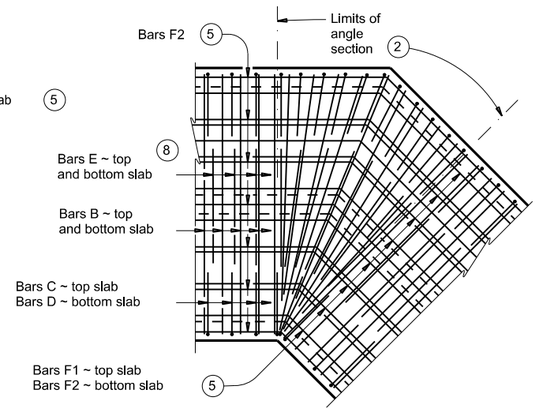
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



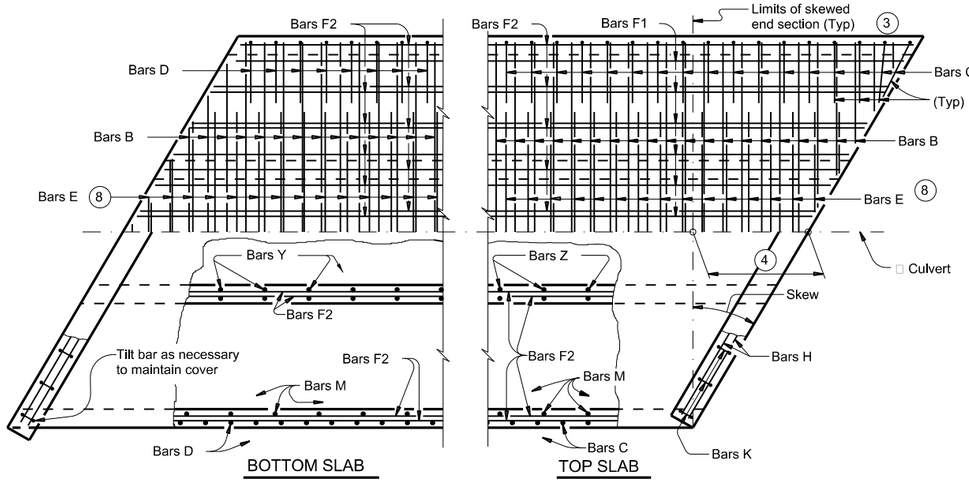
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



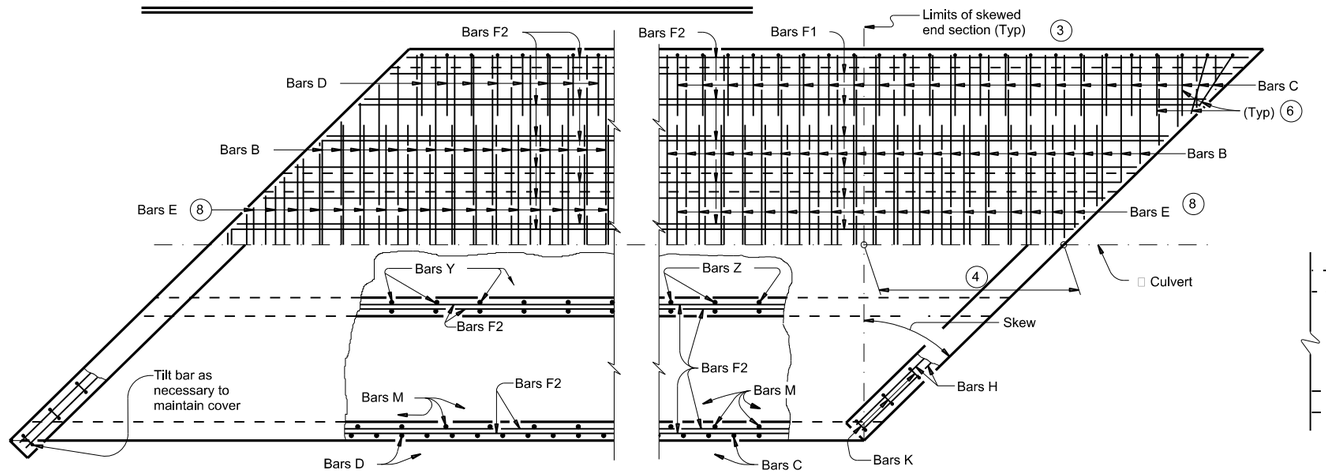
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 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. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B and Bars E will vary in the skewed end sections.

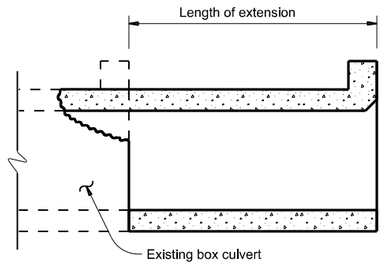
(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

(8) Extend Bars E as shown on the MC standard sheet for direct traffic culverts.



LENGTHENING DETAIL (1)

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		74

DATE: 5/24/2021 1:56:49 PM
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DATE: 06/01/2021 01:27 PM
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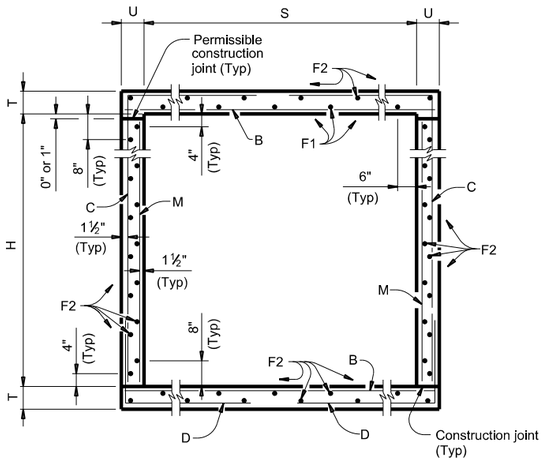
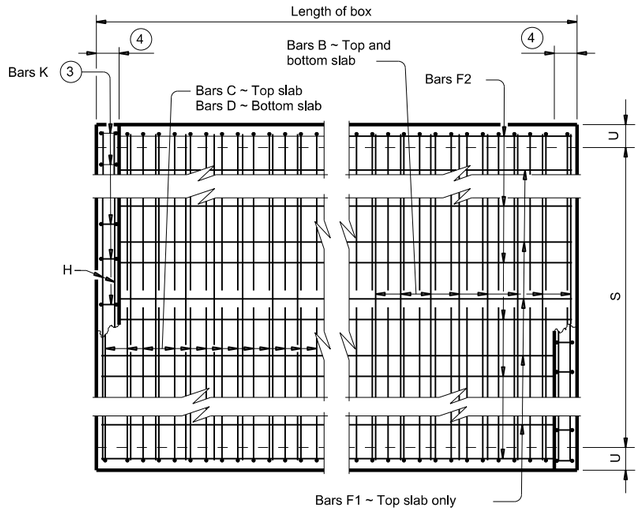


TYPICAL SECTION



PLAN OF REINF STEEL

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

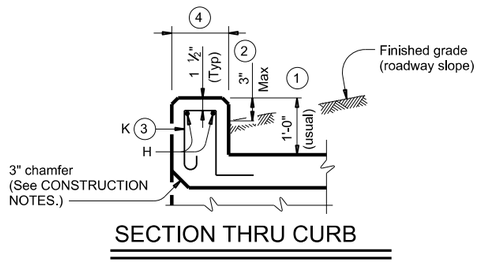
2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).



SECTION THRU CURB

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

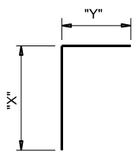
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

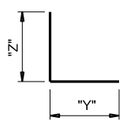
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

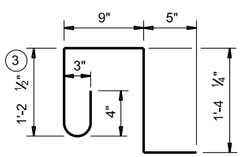
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		74A

SECTION DIMENSIONS				⑤ FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
5' - 0"	2' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 3"	704	2' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.391	80.5	0.5	55	16.1	3,276
5' - 0"	2' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	6' - 4"	713	2' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	2' - 0"	144	4	39' - 9"	106	22	39' - 9"	584	5' - 11"	16	14	39	0.429	81.0	0.5	55	17.6	3,294
5' - 0"	3' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 3"	817	3' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.434	87.8	0.5	55	17.8	3,567
5' - 0"	3' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	7' - 4"	826	3' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	3' - 0"	216	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.472	88.3	0.5	55	19.3	3,585
5' - 0"	4' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 3"	929	4' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.477	92.4	0.5	55	19.5	3,752
5' - 0"	4' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	8' - 4"	939	4' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	4' - 0"	289	4	39' - 9"	106	26	39' - 9"	690	5' - 11"	16	14	39	0.515	92.9	0.5	55	21.1	3,771
5' - 0"	5' - 0"	8"	7"	26'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 3"	1,042	5' - 6"	3' - 9"	108	#5	9"	6' - 5"	723	3' - 9"	2' - 8"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.521	99.7	0.5	55	21.3	4,044
5' - 0"	5' - 0"	9"	7"	30'	108	#6	9"	5' - 11"	960	108	#5	9"	9' - 4"	1,051	5' - 7"	3' - 9"	108	#5	9"	6' - 6"	732	3' - 9"	2' - 9"	108	9"	5' - 0"	361	4	39' - 9"	106	30	39' - 9"	797	5' - 11"	16	14	39	0.559	100.2	0.5	55	22.8	4,062
6' - 0"	2' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	6' - 7"	742	2' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.440	89.1	0.5	63	18.1	3,628
6' - 0"	2' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	6' - 8"	1,126	2' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	2' - 0"	144	5	39' - 9"	133	25	39' - 9"	664	6' - 11"	18	16	45	0.485	108.6	0.5	63	19.9	4,407
6' - 0"	2' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	6' - 10"	1,155	2' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	2' - 0"	110	5	39' - 9"	133	25	39' - 9"	664	7' - 1"	19	18	50	0.551	109.9	0.5	69	22.6	4,463
6' - 0"	3' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	7' - 7"	854	3' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.484	96.4	0.5	63	19.9	3,918
6' - 0"	3' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	7' - 8"	1,295	3' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	3' - 0"	216	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.528	117.3	0.5	63	21.6	4,754
6' - 0"	3' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	7' - 10"	1,324	3' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	3' - 0"	164	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.601	118.1	0.5	69	24.6	4,792
6' - 0"	4' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	8' - 7"	967	4' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.527	101.0	0.5	63	21.6	4,104
6' - 0"	4' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	8' - 8"	1,464	4' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	4' - 0"	289	5	39' - 9"	133	29	39' - 9"	770	6' - 11"	18	16	45	0.571	123.3	0.5	63	23.4	4,996
6' - 0"	4' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	8' - 10"	1,493	4' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	4' - 0"	219	5	39' - 9"	133	29	39' - 9"	770	7' - 1"	19	18	50	0.650	123.7	0.5	69	26.5	5,016
6' - 0"	5' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	9' - 7"	1,080	5' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.570	108.3	0.5	63	23.3	4,395
6' - 0"	5' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	9' - 8"	1,633	5' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	5' - 0"	361	5	39' - 9"	133	33	39' - 9"	876	6' - 11"	18	16	45	0.614	132.0	0.5	63	25.1	5,343
6' - 0"	5' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	9' - 10"	1,661	5' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	5' - 0"	274	5	39' - 9"	133	33	39' - 9"	876	7' - 1"	19	18	50	0.700	131.9	0.5	69	28.5	5,345
6' - 0"	6' - 0"	8"	7"	20'	108	#6	9"	6' - 11"	1,122	108	#5	9"	10' - 7"	1,192	6' - 6"	4' - 1"	108	#5	9"	6' - 9"	760	4' - 1"	2' - 8"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.613	115.6	0.5	63	25.0	4,685
6' - 0"	6' - 0"	9"	7"	26'	108	#6	9"	6' - 11"	1,122	162	#5	6"	10' - 8"	1,802	6' - 7"	4' - 1"	162	#5	6"	6' - 10"	1,155	4' - 1"	2' - 9"	108	9"	6' - 0"	433	5	39' - 9"	133	37	39' - 9"	982	6' - 11"	18	16	45	0.657	140.7	0.5	63	26.8	5,690
6' - 0"	6' - 0"	10"	8"	30'	108	#6	9"	7' - 1"	1,149	162	#5	6"	10' - 10"	1,830	6' - 8"	4' - 2"	162	#5	6"	7' - 0"	1,183	4' - 2"	2' - 10"	82	12"	6' - 0"	329	5	39' - 9"	133	37	39' - 9"	982	7' - 1"	19	18	50	0.749	140.2	0.5	69	30.5	5,675

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE: 06/01/2021 01:27 PM
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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

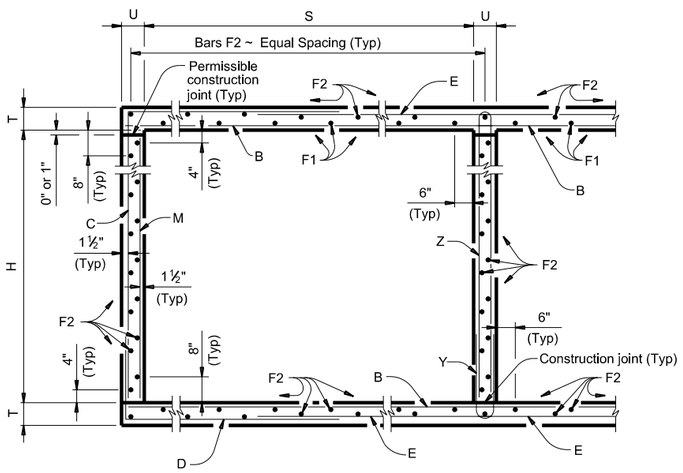
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

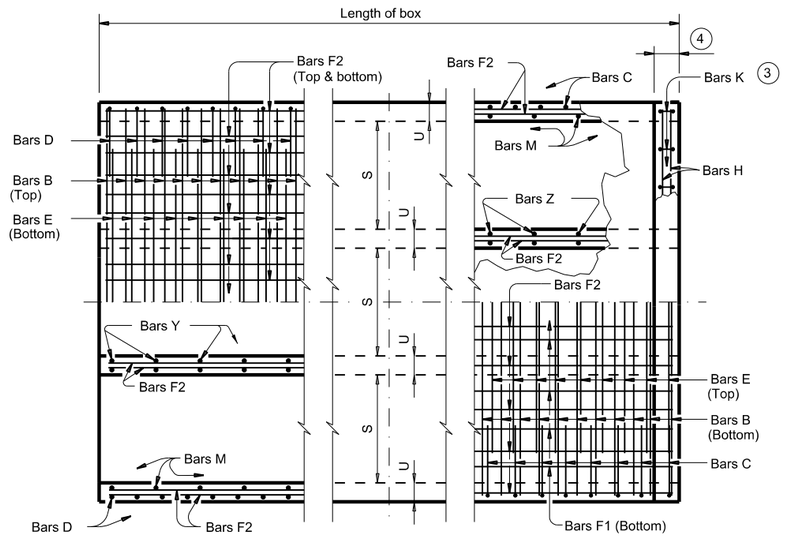
SCC-5 & 6

FILE: scc56ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT	
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1875	02	027	FM 2022	
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.	
	LFK	HOUSTON		74B	

DATE: 06/01/2021 01:40 PM
FILE: DOCUMENT NAME



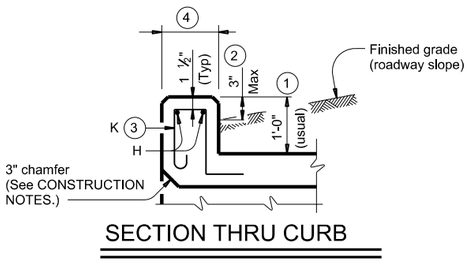
TYPICAL SECTION



BOTTOM SLAB

TOP SLAB

PART PLANS



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
2'-0"	2'-7 ½"	4'-1"
3'-0"	3'-7 ½"	4'-1"
4'-0"	4'-7 ½"	4'-1"
5'-0"	5'-7 ½"	4'-1"
6'-0"	6'-7 ½"	4'-1"

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   · For structures without bridge rail, construct curbs no more than 3" above finished grade.
   · For structures with bridge rail, construct curbs flush with finished grade.
   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

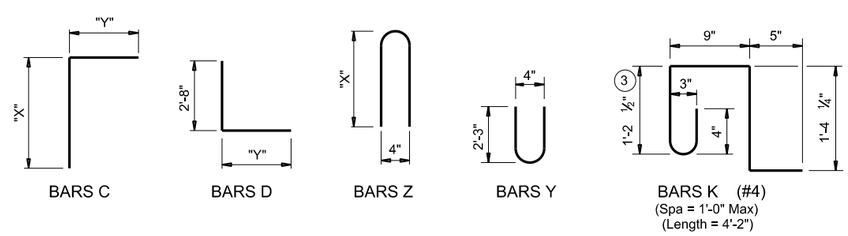
MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
· culverts with overlay,
· culverts with 1-to-2 course surface treatment, or
· culverts with the top slab as the final riding surface.
Provide bar laps, where required, as follows:
· Uncoated or galvanized ~ #4 = 1'-8" Min
· Uncoated or galvanized ~ #5 = 2'-1" Min
· Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

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



BARS C | BARS D | BARS Z | BARS Y | BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
6'-0" SPAN
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		74C

NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4							Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Bars C		Bars D		No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Bars Y		Bars Z		Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
													Length	Wt	Length	Wt																					Length	Wt	Length	Wt										
2	6' - 0"	2' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	44	18"	39' - 9"	1,168	108	9"	2' - 0"	144	54	9"	4' - 9"	171	5' - 5"	195	13' - 6"	36	30	84	0.894	182.4	1.0	120	36.8	7,414
3	6' - 0"	2' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	63	18"	39' - 9"	1,673	108	9"	2' - 0"	144	108	9"	4' - 9"	343	5' - 5"	391	20' - 1"	54	44	122	1.302	260.9	1.5	176	53.6	10,611
4	6' - 0"	2' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	82	18"	39' - 9"	2,177	108	9"	2' - 0"	144	162	9"	4' - 9"	514	5' - 5"	586	26' - 8"	71	56	156	1.711	339.4	2.0	227	70.4	13,801
5	6' - 0"	2' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	101	18"	39' - 9"	2,682	108	9"	2' - 0"	144	216	9"	4' - 9"	685	5' - 5"	782	33' - 3"	89	70	195	2.120	417.9	2.5	284	87.3	16,999
6	6' - 0"	2' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	6' - 8"	751	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	120	18"	39' - 9"	3,186	108	9"	2' - 0"	144	270	9"	4' - 9"	857	5' - 5"	977	39' - 10"	106	82	228	2.529	496.4	3.0	334	104.1	20,189
2	6' - 0"	3' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	50	18"	39' - 9"	1,328	108	9"	3' - 0"	216	54	9"	4' - 9"	171	7' - 5"	268	13' - 6"	36	30	84	0.958	192.8	1.0	120	39.3	7,832
3	6' - 0"	3' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	71	18"	39' - 9"	1,885	108	9"	3' - 0"	216	108	9"	4' - 9"	343	7' - 5"	535	20' - 1"	54	44	122	1.389	274.4	1.5	176	57.1	11,152
4	6' - 0"	3' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	92	18"	39' - 9"	2,443	108	9"	3' - 0"	216	162	9"	4' - 9"	514	7' - 5"	803	26' - 8"	71	56	156	1.819	356.1	2.0	227	74.7	14,469
5	6' - 0"	3' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	113	18"	39' - 9"	3,000	108	9"	3' - 0"	216	216	9"	4' - 9"	685	7' - 5"	1,070	33' - 3"	89	70	195	2.250	437.7	2.5	284	92.5	17,790
6	6' - 0"	3' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	7' - 8"	864	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	134	18"	39' - 9"	3,558	108	9"	3' - 0"	216	270	9"	4' - 9"	857	7' - 5"	1,338	39' - 10"	106	82	228	2.681	519.3	3.0	334	110.2	21,107
2	6' - 0"	4' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	50	18"	39' - 9"	1,328	108	9"	4' - 0"	289	54	9"	4' - 9"	171	9' - 5"	340	13' - 6"	36	30	84	1.023	199.2	1.0	120	41.9	8,089
3	6' - 0"	4' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	71	18"	39' - 9"	1,885	108	9"	4' - 0"	289	108	9"	4' - 9"	343	9' - 5"	679	20' - 1"	54	44	122	1.475	282.6	1.5	176	60.5	11,481
4	6' - 0"	4' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	92	18"	39' - 9"	2,443	108	9"	4' - 0"	289	162	9"	4' - 9"	514	9' - 5"	1,019	26' - 8"	71	56	156	1.927	366.1	2.0	227	79.1	14,870
5	6' - 0"	4' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	113	18"	39' - 9"	3,000	108	9"	4' - 0"	289	216	9"	4' - 9"	685	9' - 5"	1,359	33' - 3"	89	70	195	2.380	449.5	2.5	284	97.7	18,264
6	6' - 0"	4' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	8' - 8"	976	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	134	18"	39' - 9"	3,558	108	9"	4' - 0"	289	270	9"	4' - 9"	857	9' - 5"	1,698	39' - 10"	106	82	228	2.832	533.0	3.0	334	116.2	21,652
2	6' - 0"	5' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	56	18"	39' - 9"	1,487	108	9"	5' - 0"	361	54	9"	4' - 9"	171	11' - 5"	412	13' - 6"	36	30	84	1.088	209.6	1.0	120	44.5	8,505
3	6' - 0"	5' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	79	18"	39' - 9"	2,098	108	9"	5' - 0"	361	108	9"	4' - 9"	343	11' - 5"	824	20' - 1"	54	44	122	1.562	296.2	1.5	176	64.0	12,024
4	6' - 0"	5' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	102	18"	39' - 9"	2,708	108	9"	5' - 0"	361	162	9"	4' - 9"	514	11' - 5"	1,235	26' - 8"	71	56	156	2.035	382.7	2.0	227	83.4	15,536
5	6' - 0"	5' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	125	18"	39' - 9"	3,319	108	9"	5' - 0"	361	216	9"	4' - 9"	685	11' - 5"	1,647	33' - 3"	89	70	195	2.509	469.3	2.5	284	102.8	19,056
6	6' - 0"	5' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	9' - 8"	1,089	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	148	18"	39' - 9"	3,930	108	9"	5' - 0"	361	270	9"	4' - 9"	857	11' - 5"	2,059	39' - 10"	106	82	228	2.983	555.9	3.0	334	122.3	22,570
2	6' - 0"	6' - 0"	9"	7"	108	#6	9"	13' - 6"	2,190	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	10' - 2"	1,649	10	18"	39' - 9"	266	62	18"	39' - 9"	1,646	108	9"	6' - 0"	433	54	9"	4' - 9"	171	13' - 5"	484	13' - 6"	36	30	84	1.153	220.0	1.0	120	47.1	8,921
3	6' - 0"	6' - 0"	9"	7"	108	#6	9"	20' - 1"	3,258	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	16' - 9"	2,717	15	18"	39' - 9"	398	87	18"	39' - 9"	2,310	108	9"	6' - 0"	433	108	9"	4' - 9"	343	13' - 5"	968	20' - 1"	54	44	122	1.648	309.7	1.5	176	67.4	12,565
4	6' - 0"	6' - 0"	9"	7"	108	#6	9"	26' - 8"	4,326	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	23' - 4"	3,785	20	18"	39' - 9"	531	112	18"	39' - 9"	2,974	108	9"	6' - 0"	433	162	9"	4' - 9"	514	13' - 5"	1,452	26' - 8"	71	56	156	2.144	399.4	2.0	227	87.7	16,204
5	6' - 0"	6' - 0"	9"	7"	108	#6	9"	33' - 3"	5,394	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	29' - 11"	4,853	25	18"	39' - 9"	664	137	18"	39' - 9"	3,638	108	9"	6' - 0"	433	216	9"	4' - 9"	685	13' - 5"	1,936	33' - 3"	89	70	195	2.639	489.1	2.5	284	108.0	19,849
6	6' - 0"	6' - 0"	9"	7"	108	#6	9"	39' - 10"	6,462	108	#5	9"	10' - 8"	1,202	6' - 9"	760	108	#6	9"	36' - 6"	5,921	30	18"	39' - 9"	797	162	18"	39' - 9"	4,302	108	9"	6' - 0"	433	270	9"	4' - 9"	857	13' - 5"	2,420	39' - 10"	106	82	228	3.134	578.9	3.0	334	128.3	23,488

DATE: 06/01/2021 01:40 PM
FILE: DOCUMENT NAME

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

6'-0" SPAN

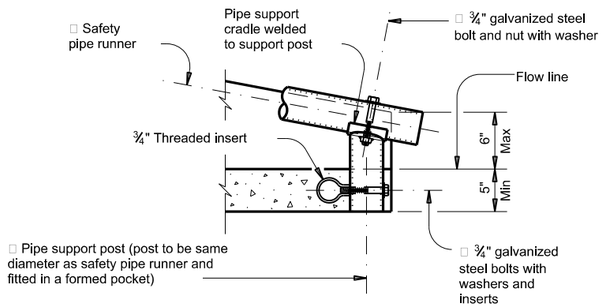
0' TO 16' FILL

MC-6-16

FILE: mc616ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		74D

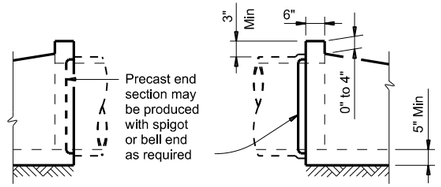
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"				
				6:1	17' - 11"	> 0°	Yes		
42"	4 ½"	N/A	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



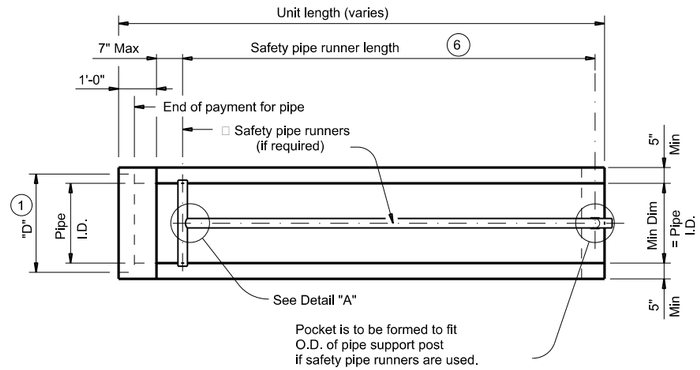
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



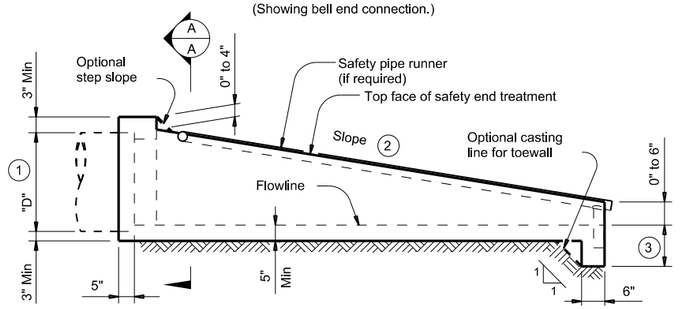
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



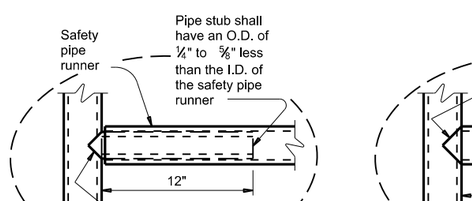
PLAN

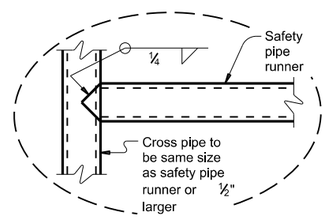
(Showing bell end connection.)



LONGITUDINAL ELEVATION

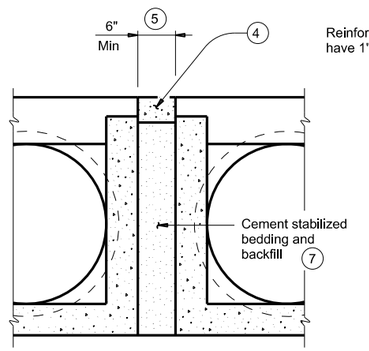
(Showing bell end connection.)



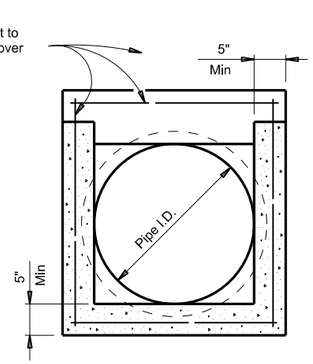


DETAIL A

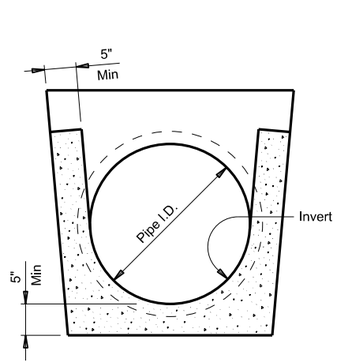
(If required)



MULTIPLE PIPE INSTALLATION

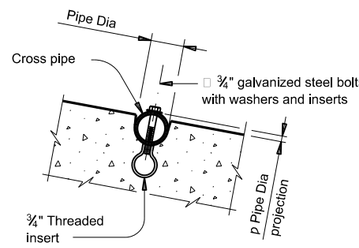


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on 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.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		75

DATE: 5/24/2021 2:03:10 PM
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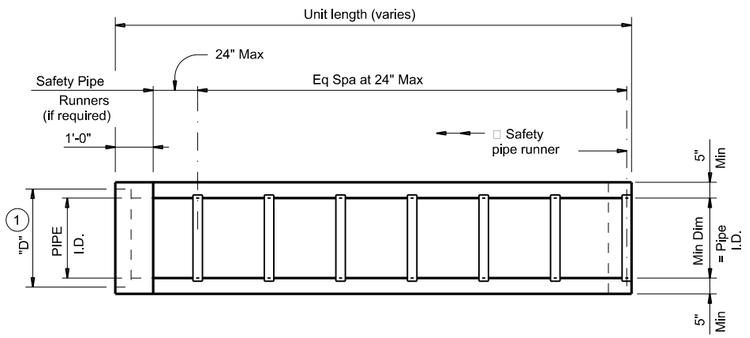
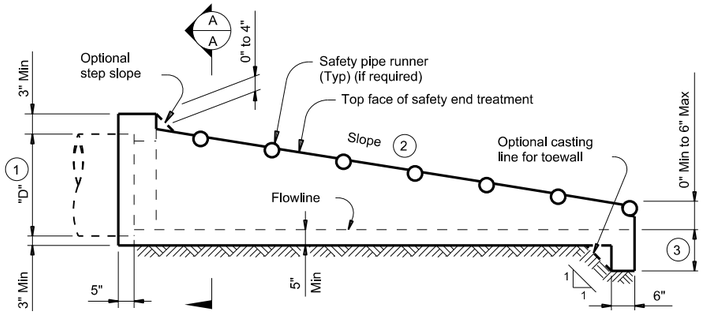


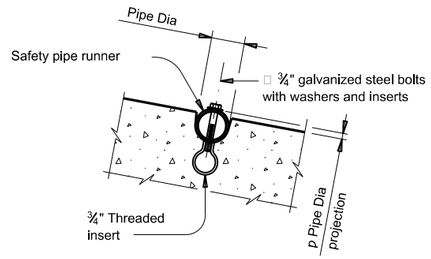
PLAN

(Showing bell end connection.)



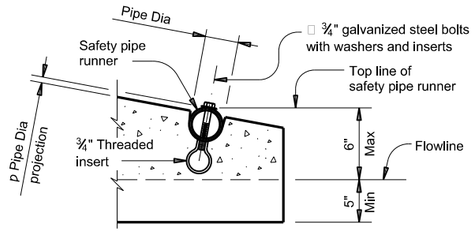
LONGITUDINAL ELEVATION

(Showing bell end connection.)

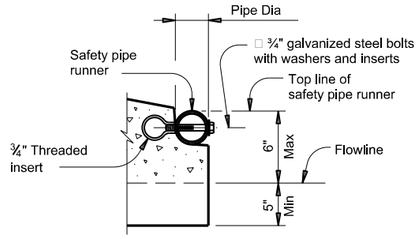


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



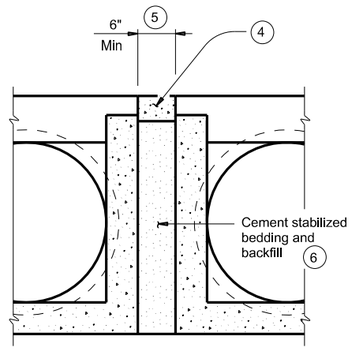
OPTION A



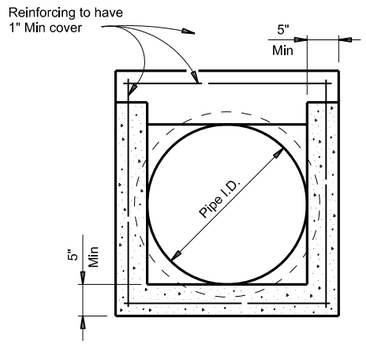
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

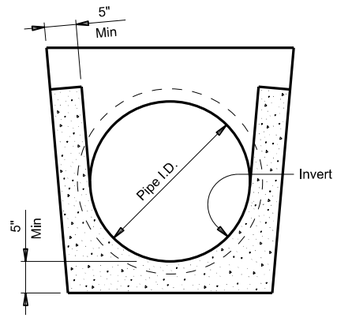
(If required)



MULTIPLE PIPE INSTALLATION

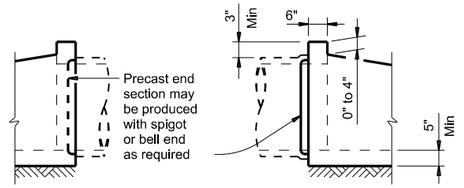


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' - 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' - 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' - 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' - 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' - 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' - 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	N/A	52.50"	6:1	21' - 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on 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.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See PBGC standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	LFK	HOUSTON		76

DATE: 5/24/2021 2:29:36 PM
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TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

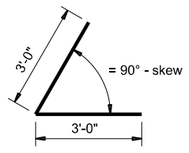
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

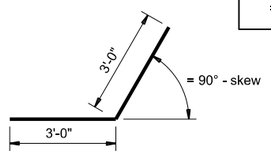
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

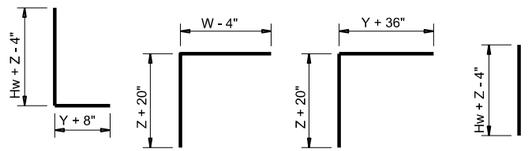
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:

(All values are in feet.)

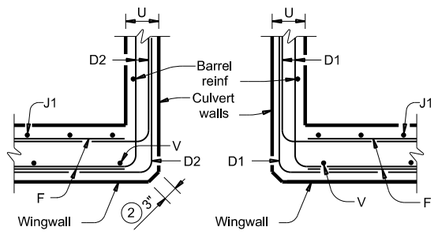
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' ≥
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw 4' <

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

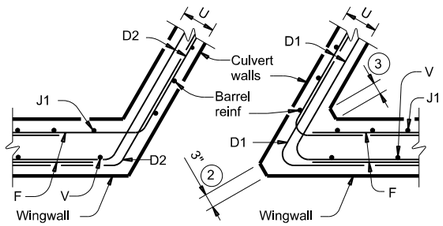
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw 4' ≥
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw 4' <

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

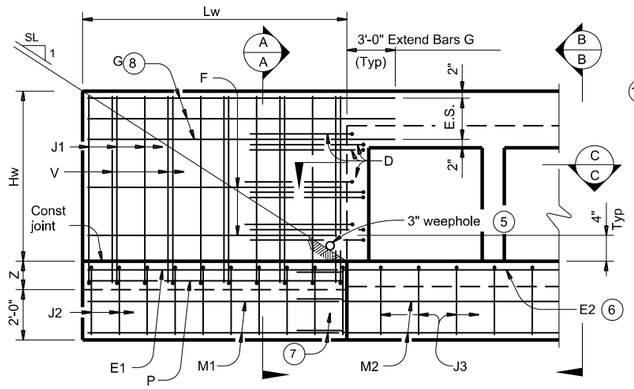
See applicable box culvert standard sheet for S, H, T, and U values.



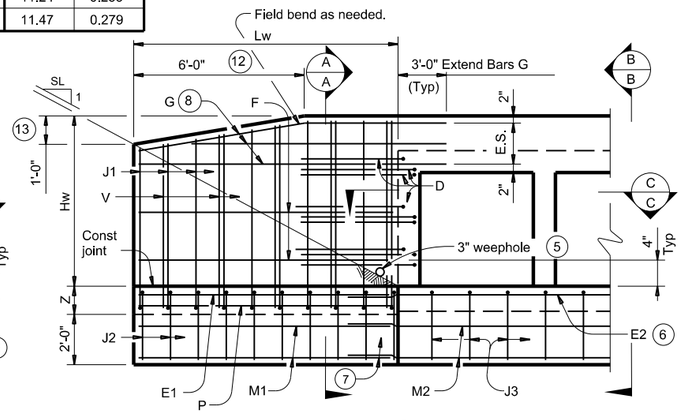
SECTION C-C - PW-1



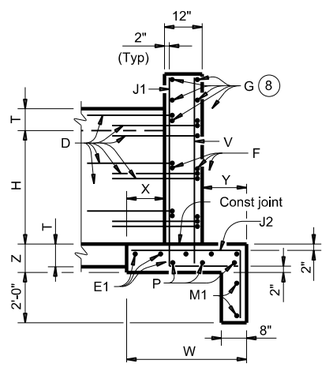
SECTION C-C - PW-2



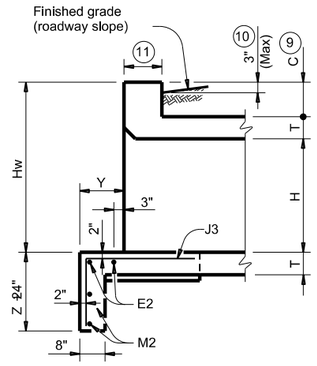
PARTIAL ELEVATION - PW-1



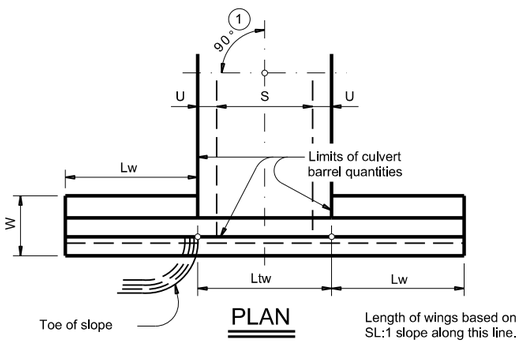
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)



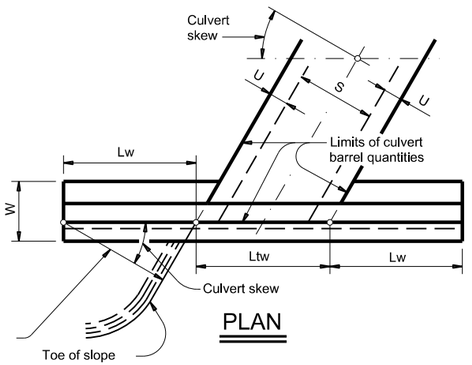
SECTION B-B
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		77

DATE:
FILE:

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (2~wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height 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
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~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

WING DIMENSION FORMULAS:
(All values are in feet.)

Hw = H + T + C - 0.250'
A = (Hw - 0.333') (SL)
B = (A) tangent (30°)
Lw = (A) ÷ cosine (30°)

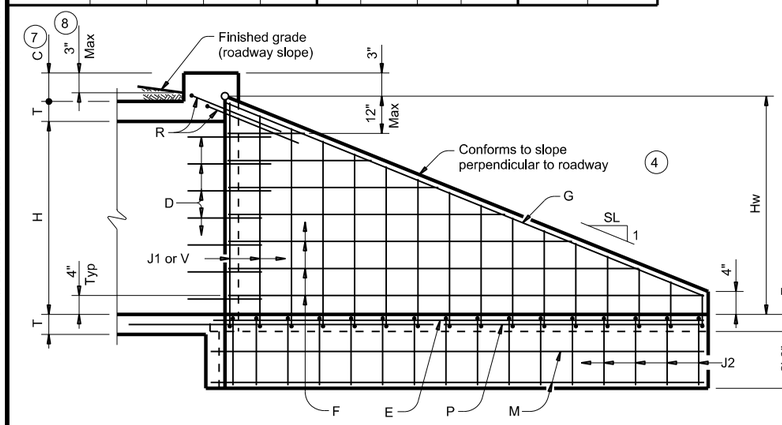
For cast-in-place culverts:
Ltw = (N) (S) + (N + 1) (U)

For precast culverts:
Ltw = (N) (2U + S) + (N - 1) (0.5')

Total wingwall area (two wings ~ SF) = (Hw + 0.333') (Lw)

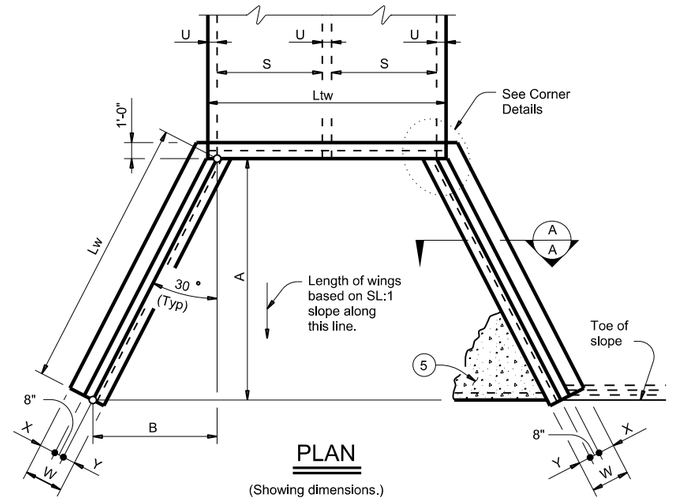
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans

See applicable box culvert standard sheet for H, S, T, and U values.



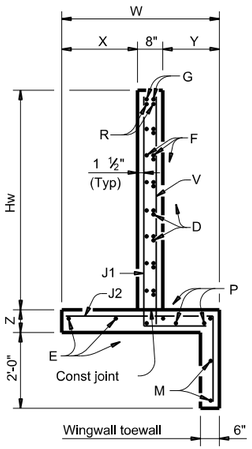
INSIDE ELEVATION

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

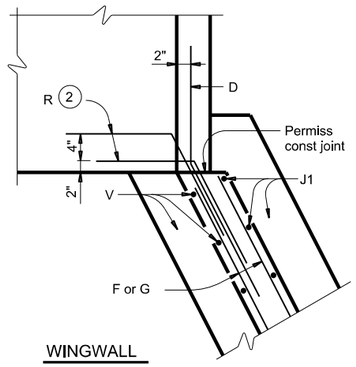


PLAN

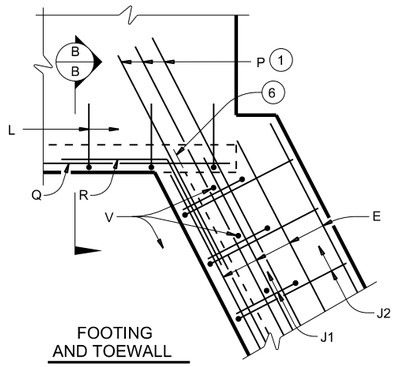
(Showing dimensions.)



SECTION A-A



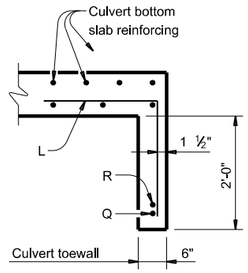
WINGWALL



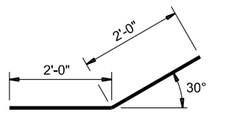
FOOTING AND TOEWALL

CORNER DETAILS

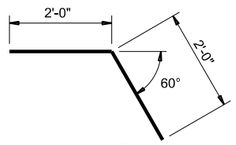
(Culvert and culvert toewall reinforcing not shown for clarity.)



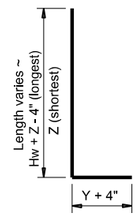
SECTION B-B (5)



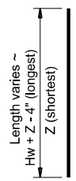
BARS D



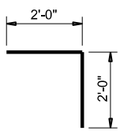
BARS R



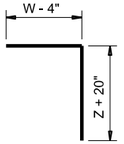
BARS J1



BARS V



BARS L



BARS J2

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

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum 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 side slope are: 2:1, 3:1, 4:1, and 6:1.

(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, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and 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 will not be required.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(8) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing unless noted otherwise.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for Contractor's information only.

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

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS
WITH FLARED WINGS FOR 0° SKEW BOX CULVERTS

FW-0

FILE: fw-0stde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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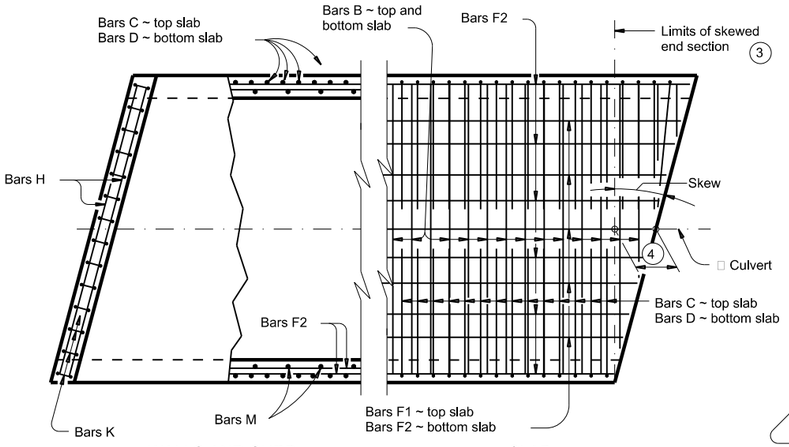
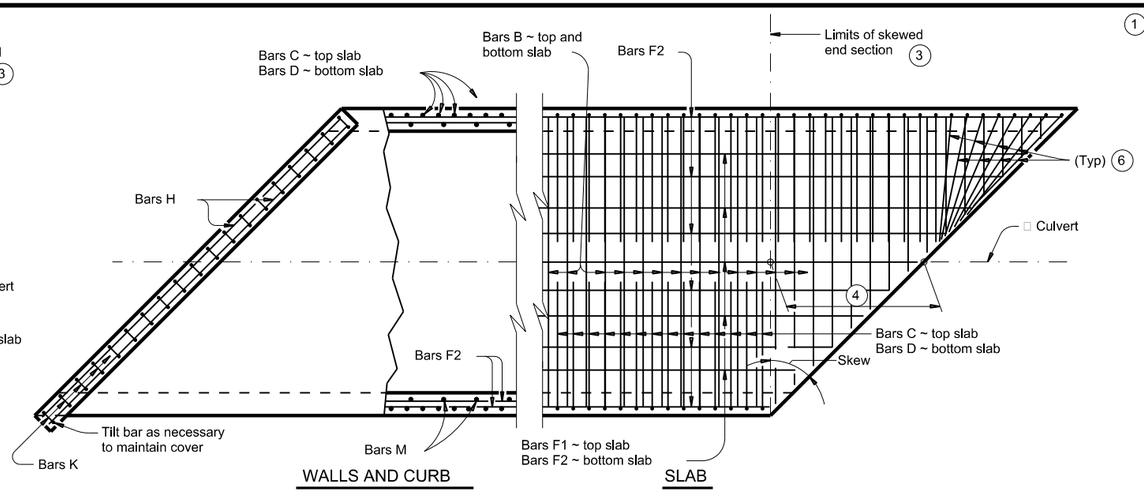
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		78

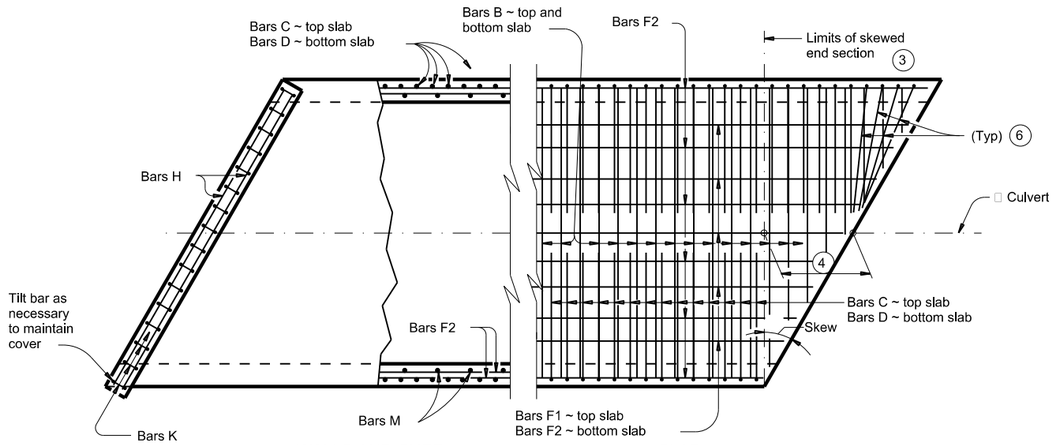
DATE:
FILE:



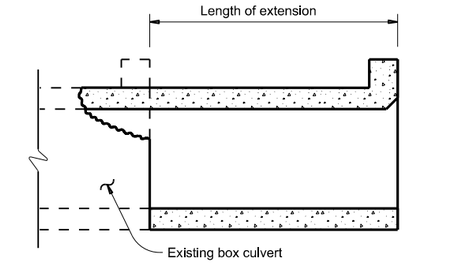
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



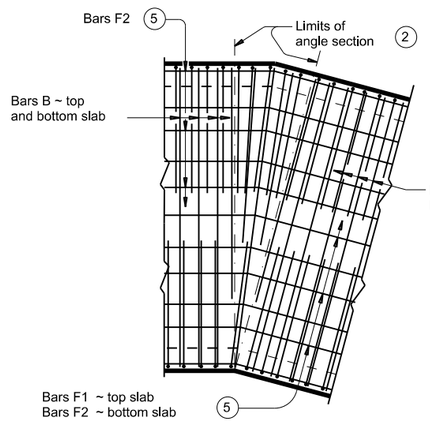
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



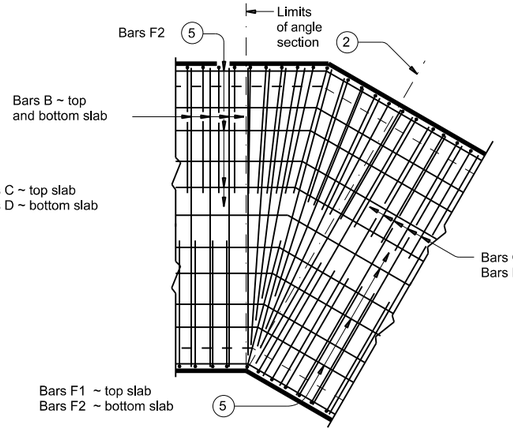
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



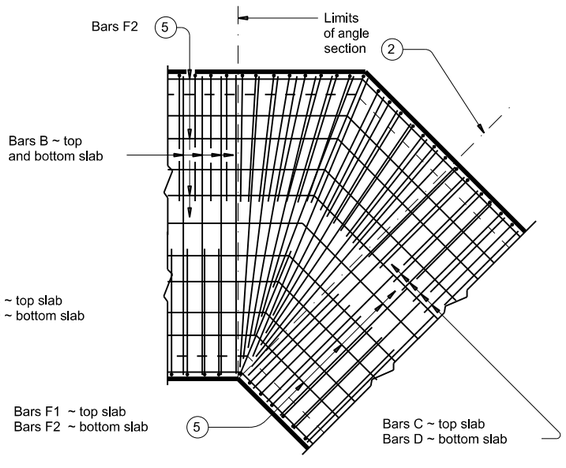
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 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. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	187502		027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		79

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 Height of Wingwall (1) (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 (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
377+40 (Both)	1 ~ 6' x 3'	2'	SCC-5&6	PW-2	0°	2:1	8"	7"	1.000 '	4.667 '	N/A	N/A	7.333 '	7.167 '	N/A	0.0	0.6	10.0	124
393+52 (Lt)	1 ~ 6' x 4'	3'	SCC-5&6	PW-2	0°	2:1	8"	7"	1.000 '	5.667 '	N/A	N/A	9.333 '	7.167 '	N/A	0.0	0.3	7.2	100
393+52 (Rt)	1 ~ 6' x 4'	3'	SCC-5&6	FW-0	0°	3:1	8"	7"	1.000 '	5.417 '	15.250 '	8.805 '	17.609 '	N/A	N/A	3.4	0.3	6.3	101
511+74 (Both)	3 ~ 6' x 4'	2'	MC-6-16	PW-2	0°	2:1	9"	7"	1.000 '	5.750 '	N/A	N/A	9.500 '	20.333 '	N/A	0.0	1.6	16.6	206
540+75 (Both)	1 ~ 6' x 6'	5'	SCC-5&6	PW-2	15°	2:1	8"	7"	1.000 '	7.667 '	N/A	N/A	13.804 '	7.419 '	N/A	0.0	0.6	27.6	412
560+00 (Both)	1 ~ 5' x 4'	5'	SCC-5&6	FW-0	0°	3:1	8"	7"	1.000 '	5.417 '	15.250 '	8.805 '	17.609 '	N/A	N/A	6.2	0.4	12.6	202
577+60 (Both)	1 ~ 4' x 3'	8'	SCC-3&4	PW-2	0°	2:1	8"	7"	1.000 '	4.667 '	N/A	N/A	7.333 '	5.167 '	N/A	0.0	0.4	9.6	124
594+50 (Both)	1 ~ 6' x 6'	8'	SCC-5&6	PW-2	0°	2:1	8"	7"	1.000 '	7.667 '	N/A	N/A	13.333 '	7.167 '	N/A	0.0	0.6	26.6	396

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NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
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 must 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 sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets 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 sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has 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 is 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 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.

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/16/2021

Texas Department of Transportation

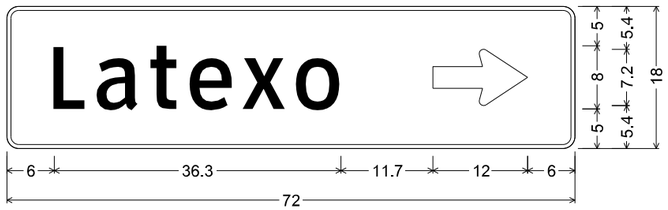
Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE:	bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		1875	02	027	FM 2022
		DIST	COUNTY		SHEET NO.
		LFK	HOUSTON		79A

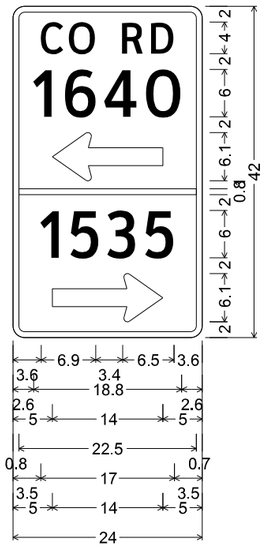
S7



D1-1 8in RT;
1.5" Radius, 0.5" Border, White on, Green;
"Latexo", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';
Table of letter and object lefts

L	a	t	e	x	o	⇨
6.0	11.5	18.2	23.3	29.9	36.7	54.0

S17



D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"1640", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"1535", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';
Table of letter and object lefts

C	O	R	D
3.6	7.1	13.9	17.6

1	6	4	0
2.6	6.6	11.6	16.9

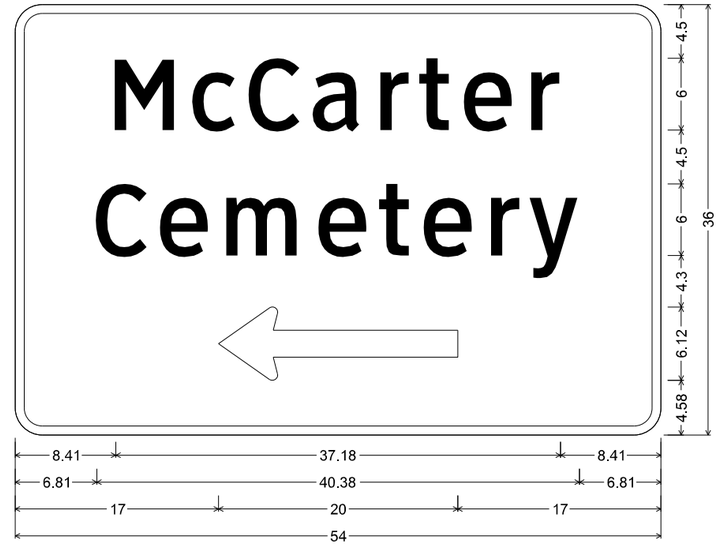
⇦ 5.0

0.8

1	5	3	5
3.5	7.4	12.0	16.8

⇨ 5.0

S20



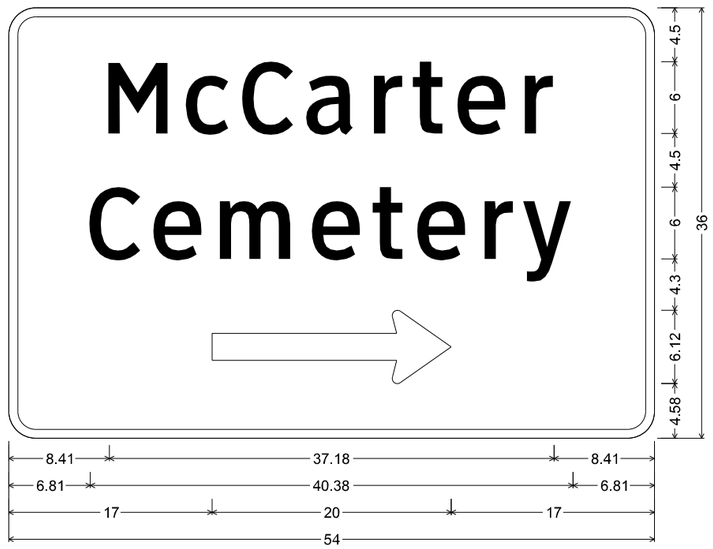
D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"McCarter", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 180';
Table of letter and object lefts

M	c	C	a	r	t	e	r
8.41	14.88	19.59	24.95	30.51	33.80	37.59	43.12

C	e	m	e	t	e	r	y
6.81	12.17	17.73	25.42	30.44	34.24	39.76	43.02

⇦ 17.00

S20



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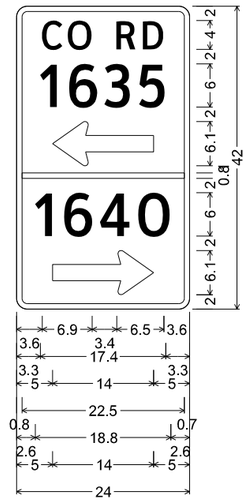
"McCarter", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 0';
Table of letter and object lefts

M	c	C	a	r	t	e	r
8.41	14.88	19.59	24.95	30.51	33.80	37.59	43.12

C	e	m	e	t	e	r	y
6.81	12.17	17.73	25.42	30.44	34.24	39.76	43.02

⇨ 17.00

S21



D20-5T_24x42;
1.5" Radius, 0.8" Border, White on, Green;
"CO RD", ClearviewHwy-3-W;
"1635", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 180';
"1640", ClearviewHwy-3-W;
Standard Arrow Custom 14.0" X 6.1" 0';
Table of letter and object lefts

C	O	R	D
3.6	7.1	13.9	17.6

1	6	3	5
3.3	7.3	12.2	17.1

⇦ 5.0

0.8

1	6	4	0
2.6	6.6	11.6	16.9

⇨ 5.0

N. T. S.

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

SIGN DETAILS

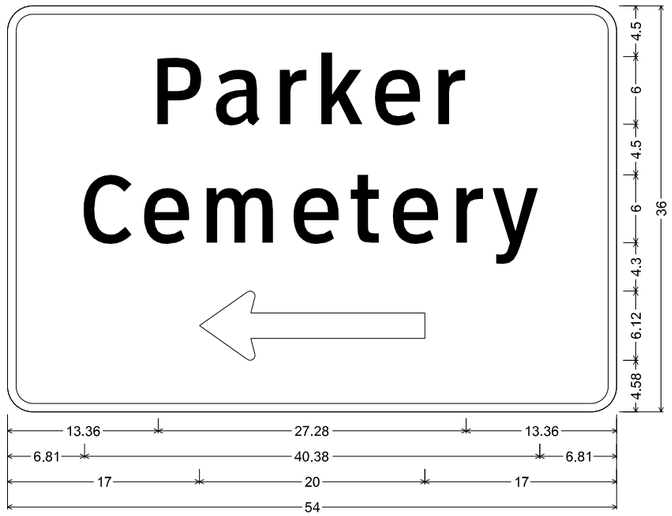
TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		80

5/24/2021 3:42:46 PM
c:\txdot\pw*online*xdot3\karlie.hopper\d0339898\SignDetails.dgn

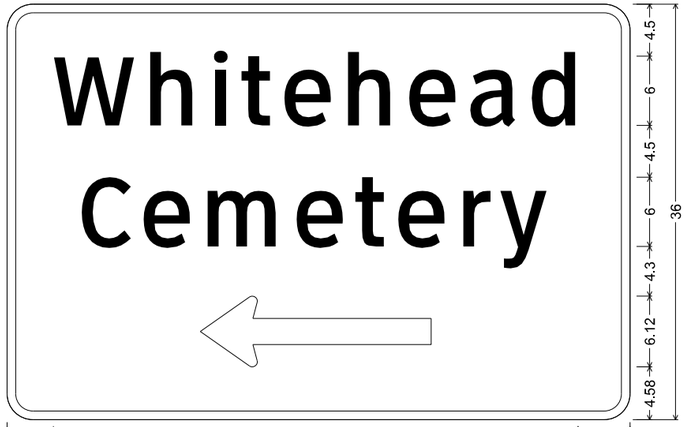
S23



D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Parker", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 180';
Table of letter and object lefts

P 13.36	a 18.54	r 24.10	k 27.90	e 32.64	r 38.17
C 6.81	e 12.17	m 17.73	e 25.42	t 30.44	e 34.24	r 39.76	y 43.02
⇦ 17.00					

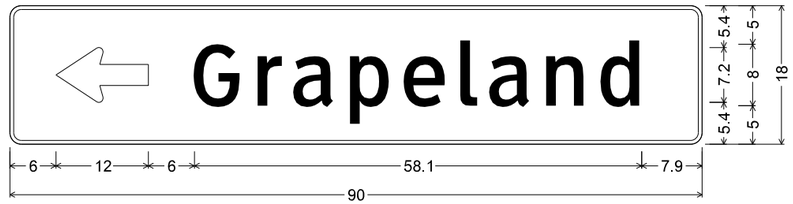
S34



D3-3bTL_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Whitehead", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 180';
Table of letter and object lefts

W 4.02	h 12.50	i 17.92	t 20.33	e 24.12	h 29.65	e 34.94	a 40.22	d 45.55	
C 6.56	e 11.92	m 17.48	e 25.17	t 30.19	e 33.99	r 39.51	y 42.77		
⇦ 16.75									

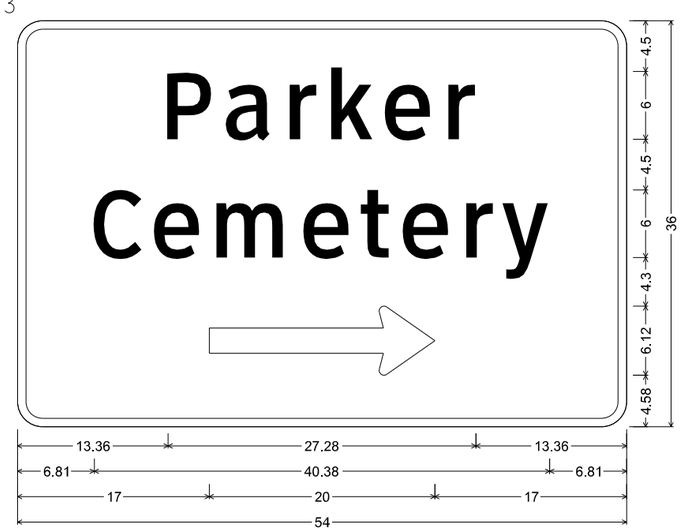
S48



D1-1 8in LT;
1.5" Radius, 0.5" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Grapeland", ClearviewHwy-3-W;
Table of letter and object lefts

⇦ 6.0	G 24.0	r 32.2	a 36.9	p 44.3	e 51.3	l 58.7	a 62.4	n 69.8	d 76.9

S23



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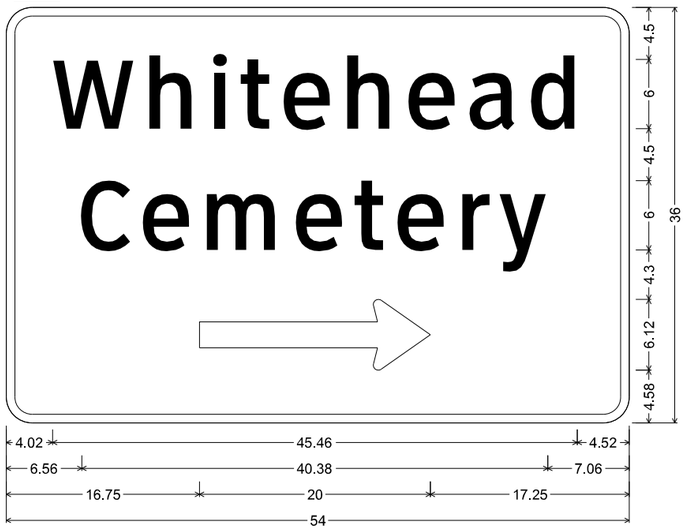
"Parker", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 0';
Table of letter and object lefts

P 13.36	a 18.54	r 24.10	k 27.90	e 32.64	r 38.17
C 6.81	e 12.17	m 17.73	e 25.42	t 30.44	e 34.24	r 39.76	y 43.02
⇨ 17.00					

S34



D3-3bTR_VARx36;
2.25" Radius, 0.75" Border, White on, Green;
"Whitehead", ClearviewHwy-3-W; "Cemetery", ClearviewHwy-3-W;
Standard Arrow Custom 20.00" X 6.13" 0';
Table of letter and object lefts

W 4.02	h 12.50	i 17.92	t 20.33	e 24.12	h 29.65	e 34.94	a 40.22	d 45.55	
C 6.56	e 11.92	m 17.48	e 25.17	t 30.19	e 33.99	r 39.51	y 42.77		
⇨ 16.75									

N. T. S.

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

SIGN DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		81

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

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

Number of Posts (1 or 2)

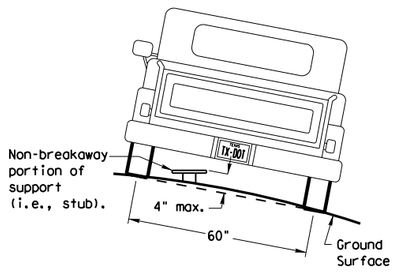
Anchor Type

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

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
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))

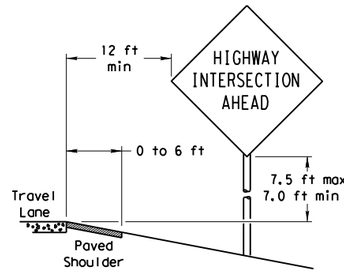
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

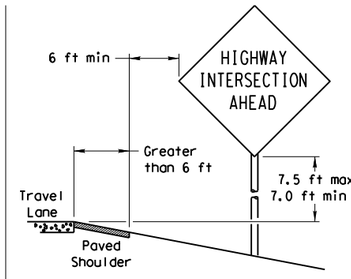
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

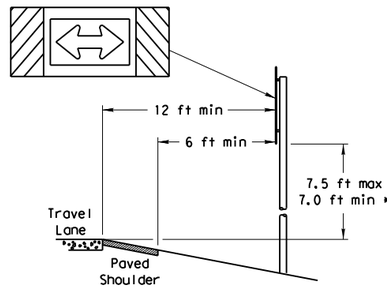
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



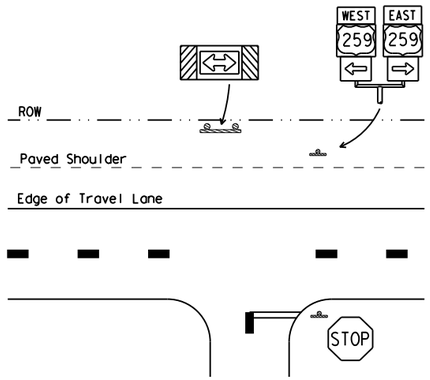
GREATER THAN 6 FT. WIDE

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.

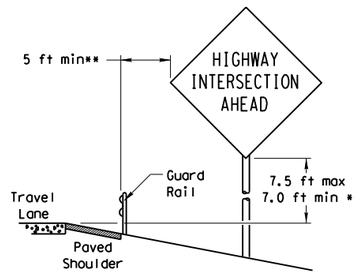
T-INTERSECTION



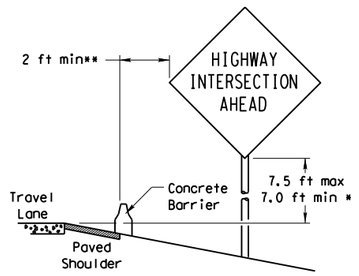
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

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

* 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

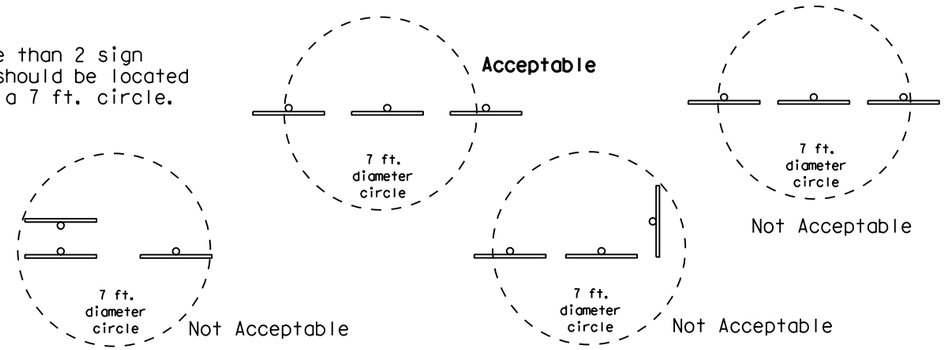
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

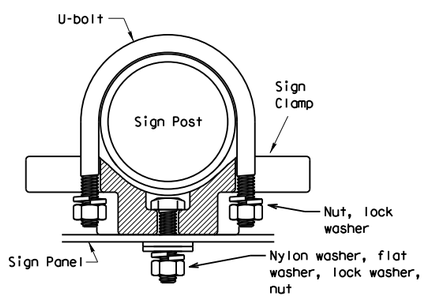
The website address is:
http://www.txdot.gov/publications/traffic.htm

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



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

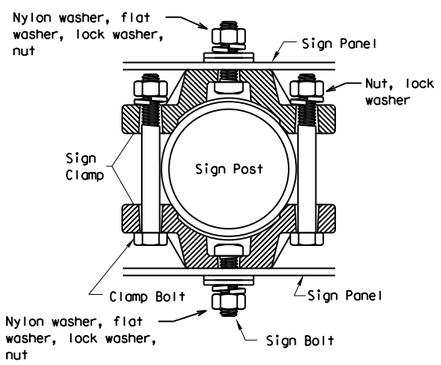


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

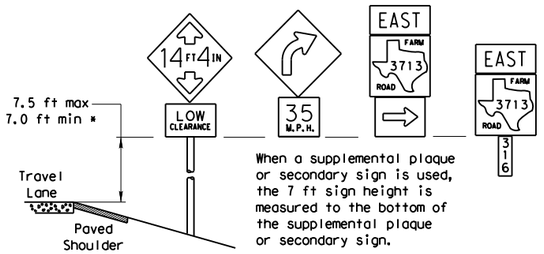
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



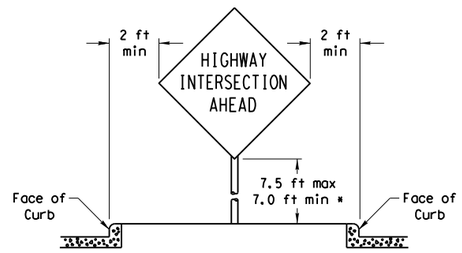
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



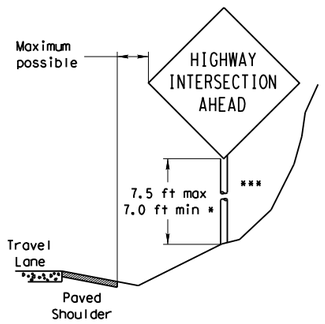
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		82

DATE: 5/10/2021 9:47:19 AM
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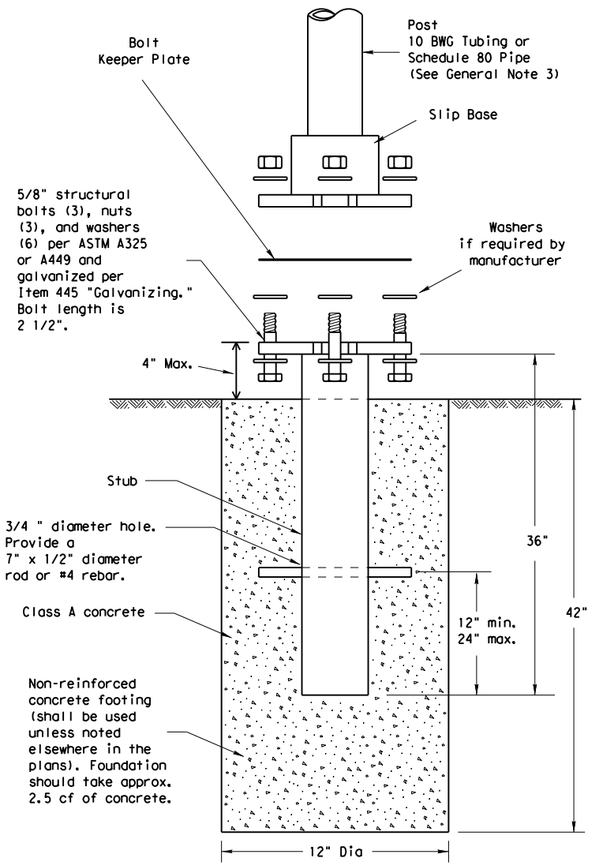
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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.

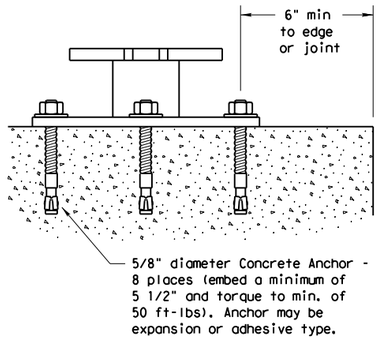
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum 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
1875	02	027	FM 2022

DIST	COUNTY	SHEET NO.
LFK	HOUSTON	83

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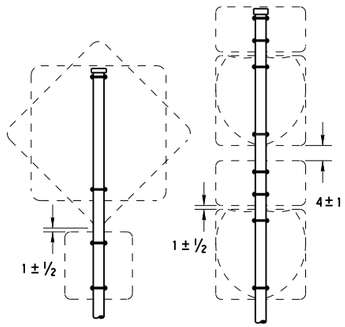
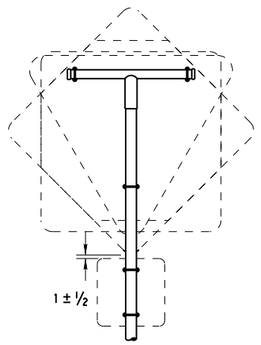


SM RD SGN ASSM TY XXXXX(1)XX(P)



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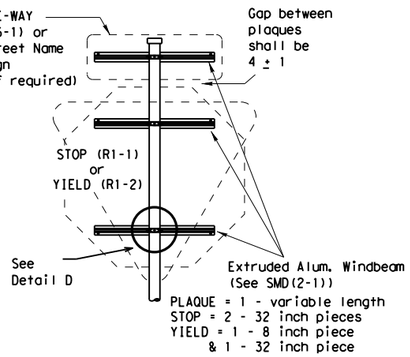
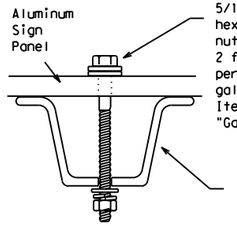
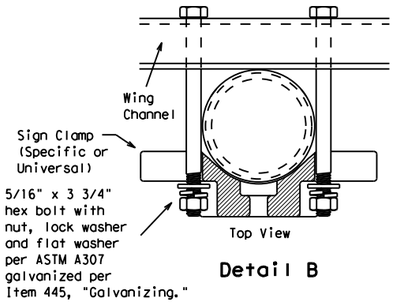


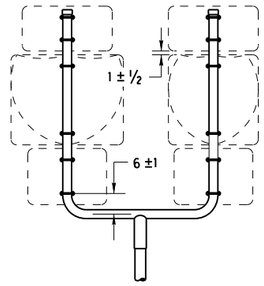
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



Detail B



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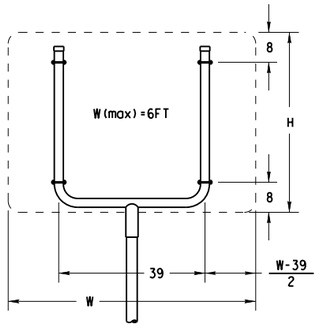
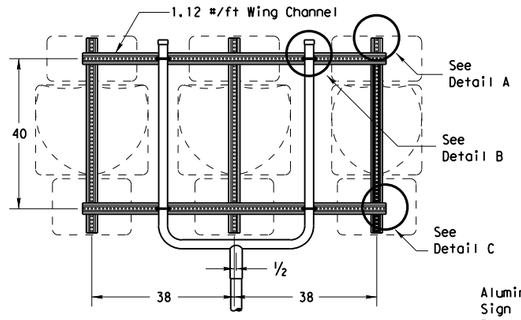
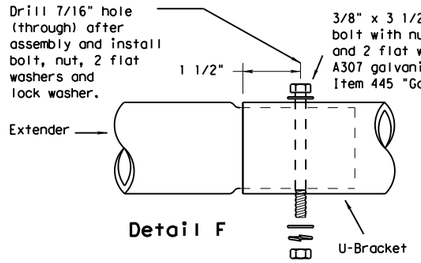


SM RD SGN ASSM TY XXXXX(1)XX(U)

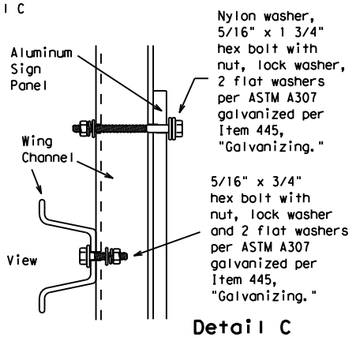


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

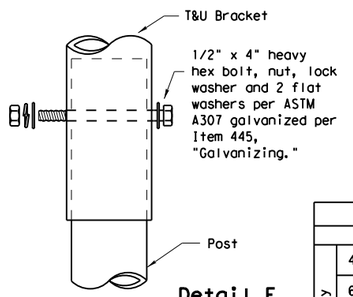


Detail F

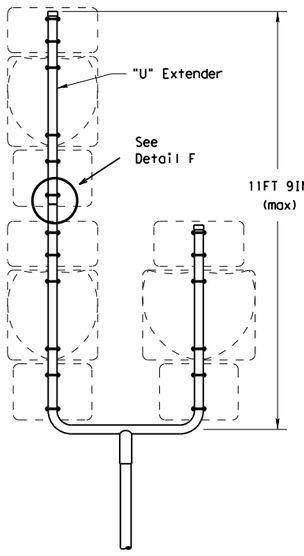
Splices shall only be allowed behind the sign substrate.



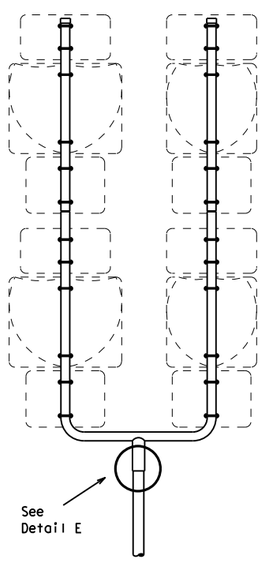
Detail C



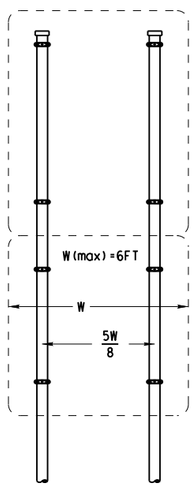
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

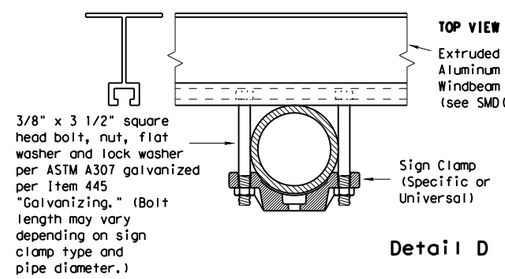


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

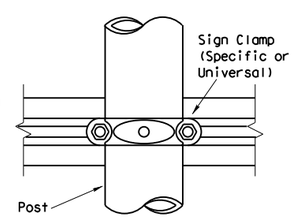


SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D



GENERAL NOTES:

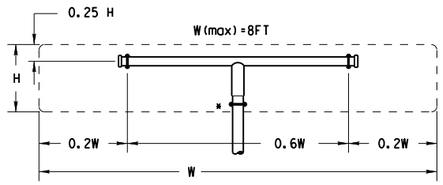
1.

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

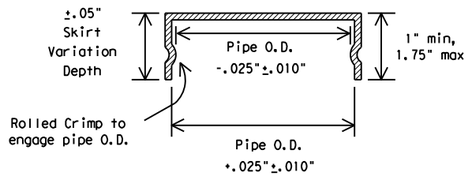
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	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)



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.

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		84

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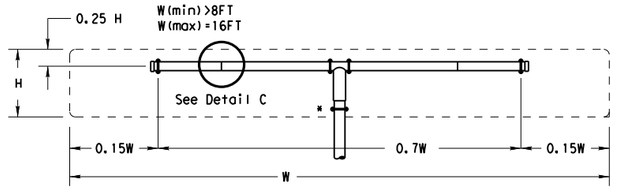
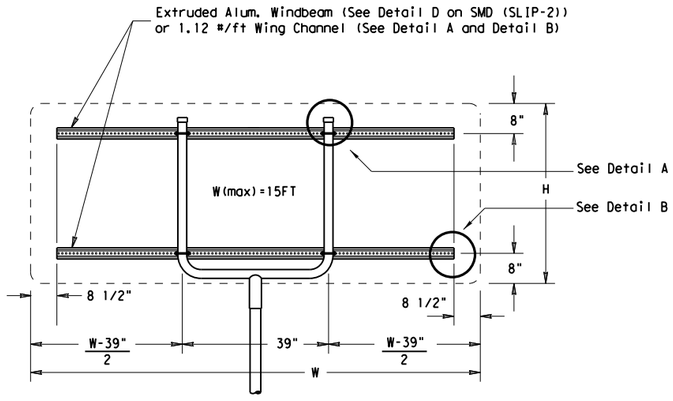
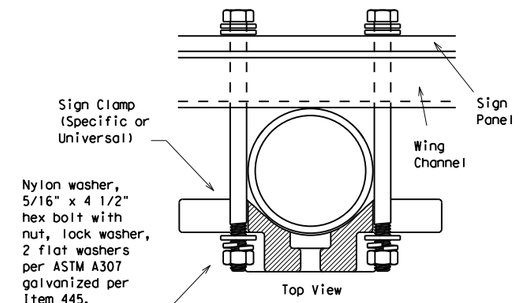


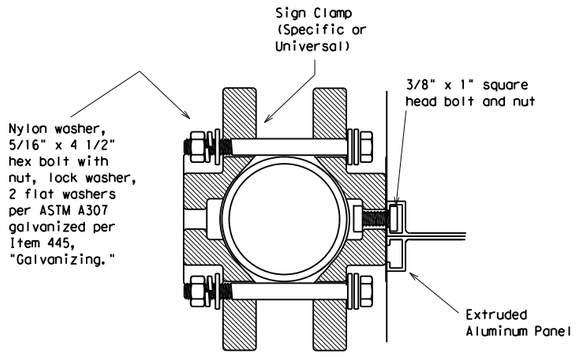
SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)



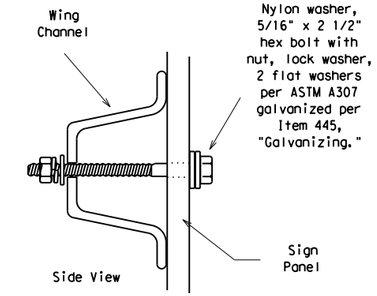
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



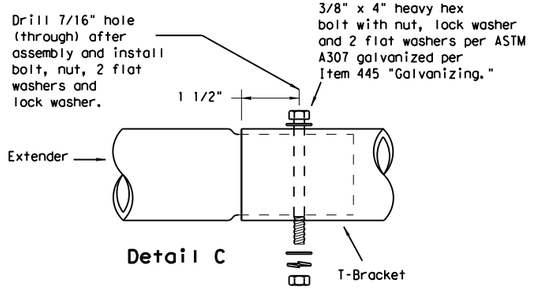
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

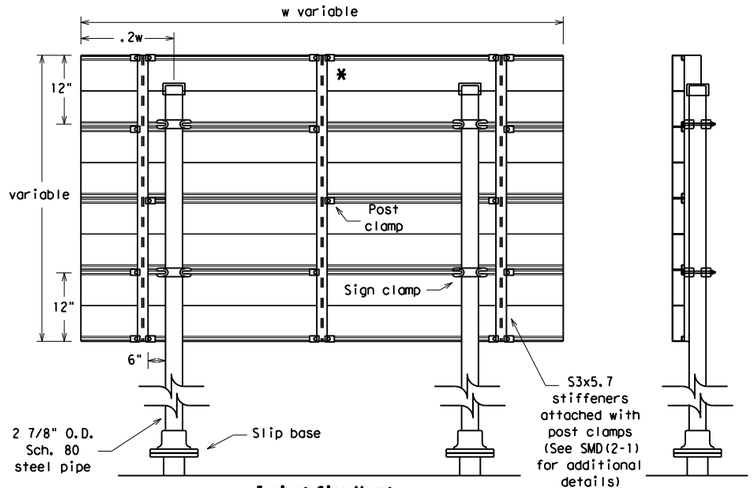


Detail B



Detail C

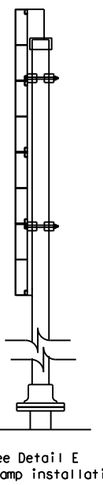
Splices shall only be allowed behind the sign substrate.



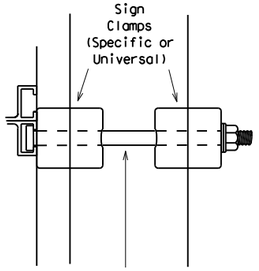
Typical Sign Mount

SM RD SGN ASSM TY S80(2)XX(P-EXAL)

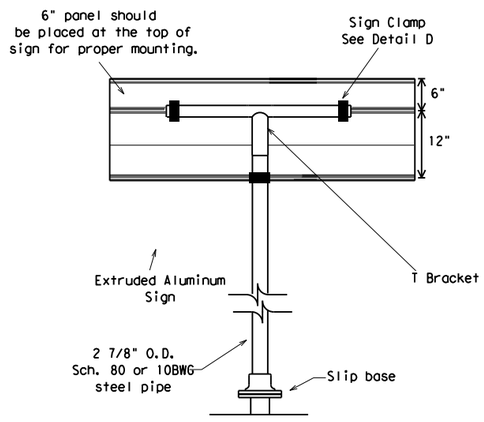
* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.



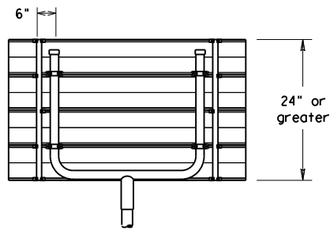
See Detail E
for clamp installation



Detail E



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

GENERAL NOTES:

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

1. 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.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. 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.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. 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.
6. 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.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. 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."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. 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.
11. Post open ends shall be fitted with Friction Caps.

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)

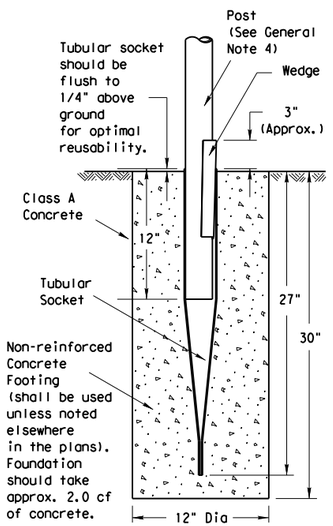
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

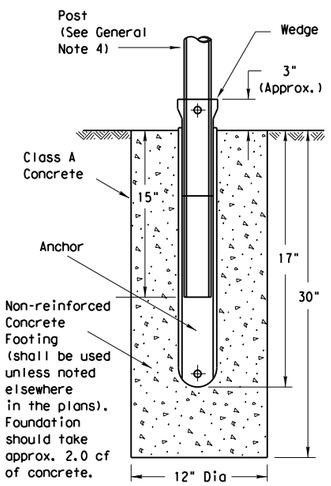
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		85

Wedge Anchor Steel System



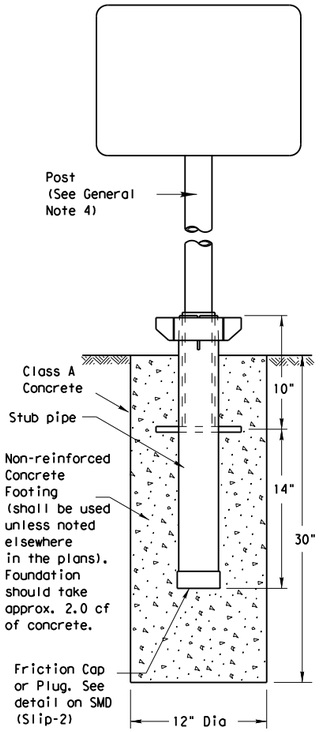
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

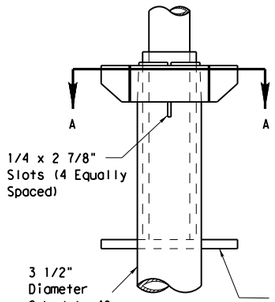


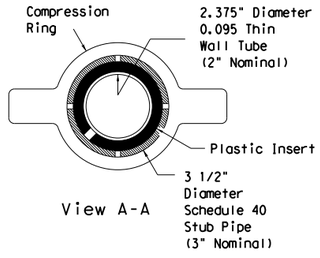
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



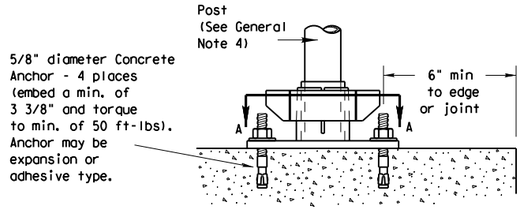
SM RD SGN ASSM TY TWT(X)UA(P)



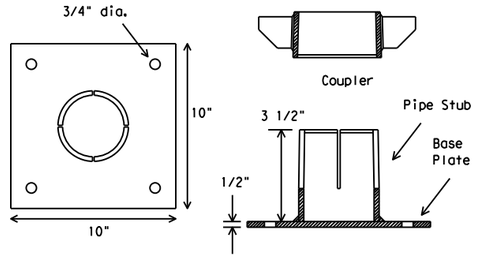


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

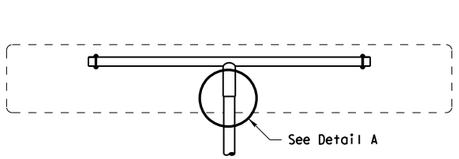


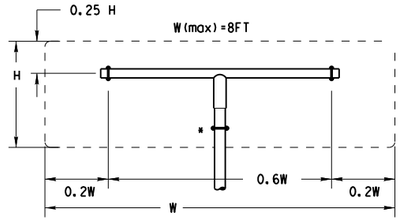
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. 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.



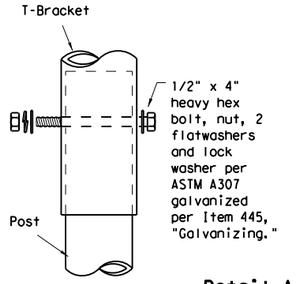
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   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
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
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. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1875	02	027	FM 2022

DIST	COUNTY	SHEET NO.
LFK	HOUSTON	86

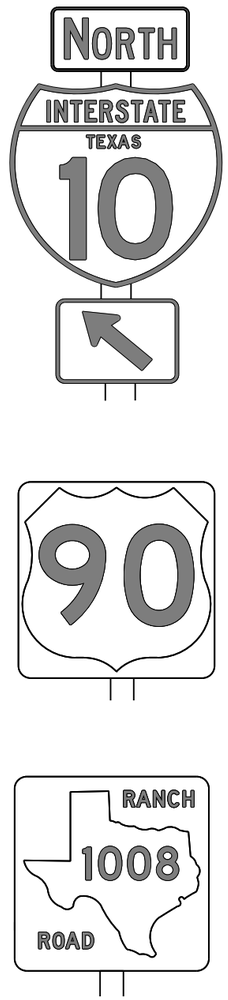
26E

DATE: 5/10/2021 9:47:55 AM
FILE: c:\txdot\pw\online\txdot3\alejandro.valencia\d0339898\smdtwt.dgn

DATE: 5/10/2021 9:48:04 AM
FILE: c:\txdot\pw_online\txdot3\alejandro.valencia\d0339898\tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

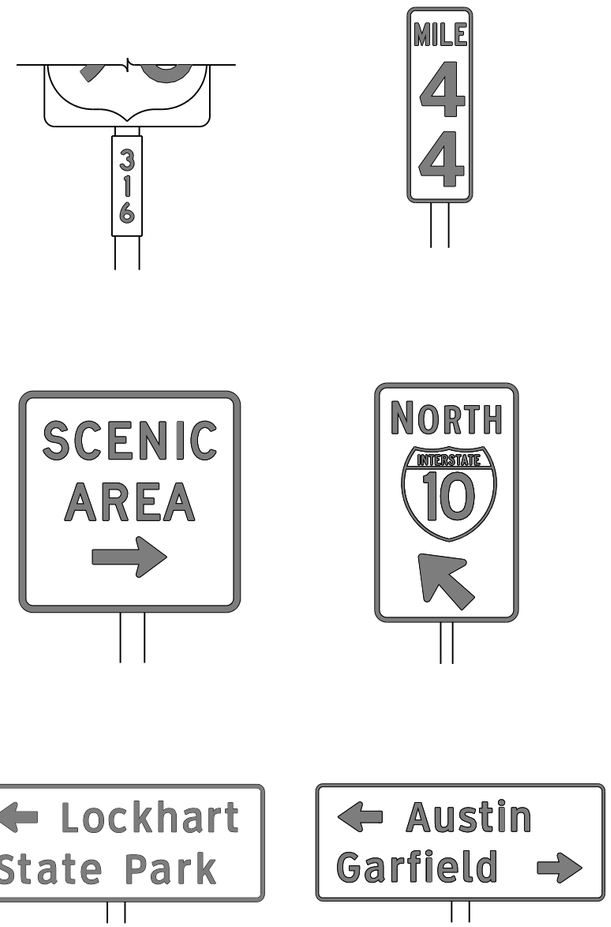
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

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. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. 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.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

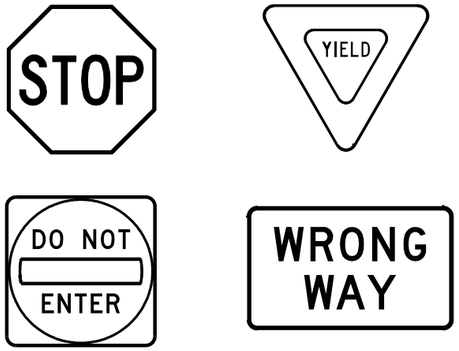
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	LFK	HOUSTON		87

DATE: 5/10/2021 9:48:13 AM
FILE: c:\txdot\pw_online\txdot3\valejandro.valencia\d0339898\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

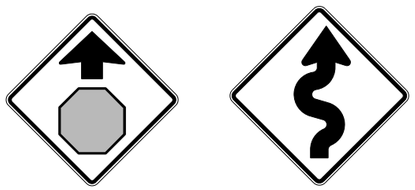
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

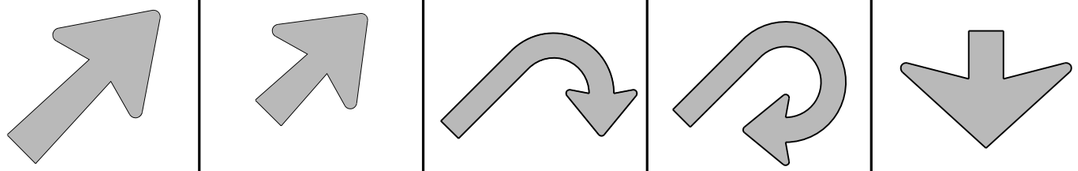
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		88

DATE: 5/10/2021 9:48:22 AM
FILE: c:\txdot\pw_online\txdot3\alejandro.valencia\d0339898\tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

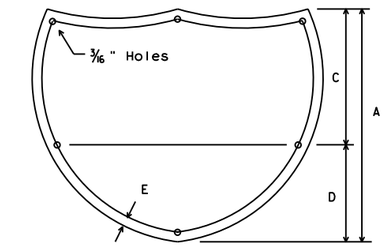
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

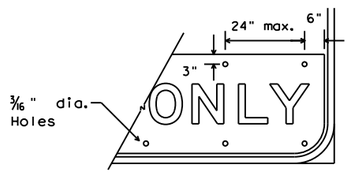
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

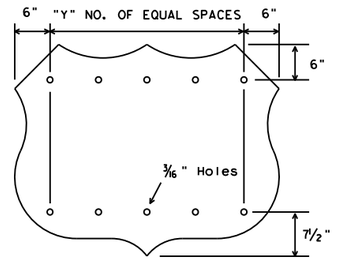


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

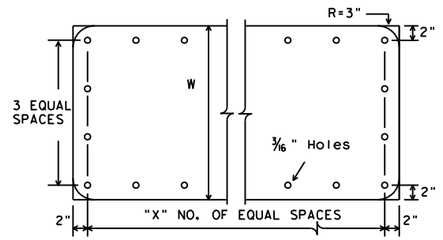


EXIT ONLY PANEL



U.S. ROUTE MARKERS

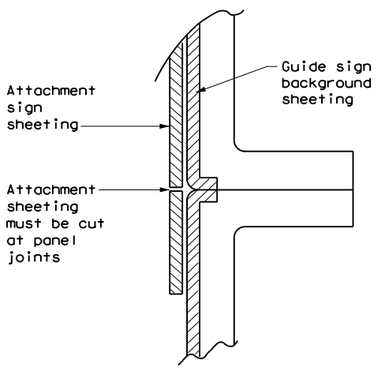
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

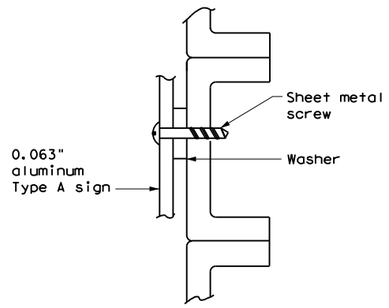
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



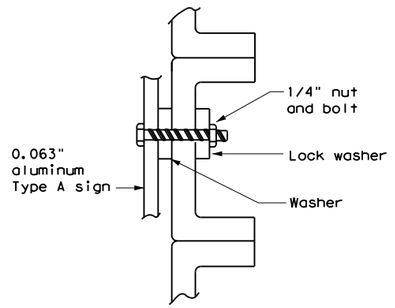
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



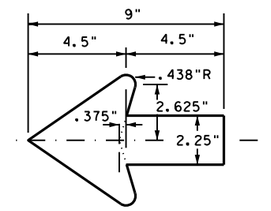
NUT/BOLT ATTACHMENT

NOTE:

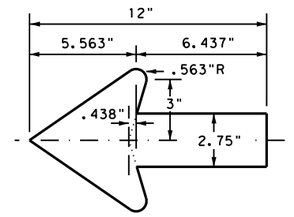
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

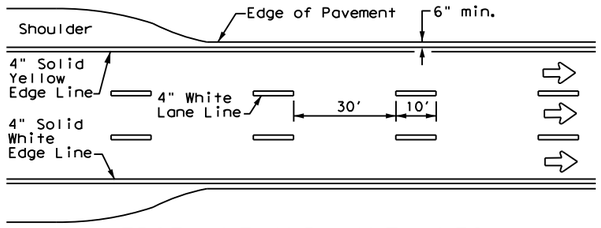
Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

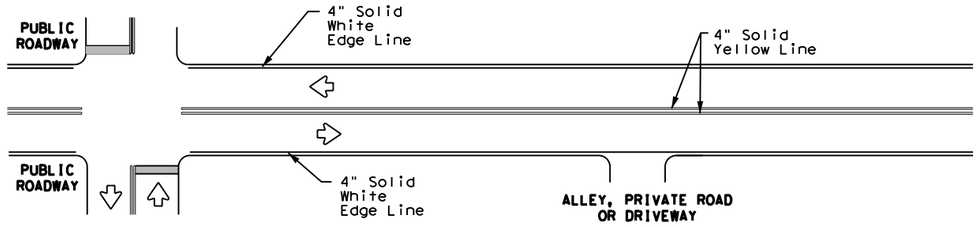
TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	LFK	HOUSTON		89

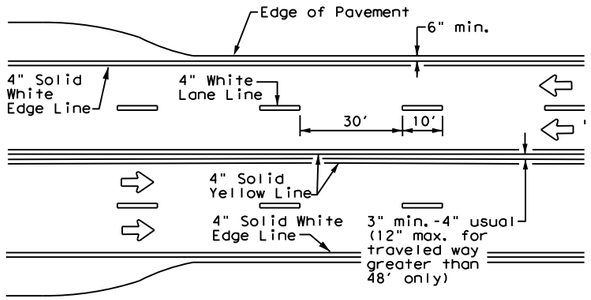
5



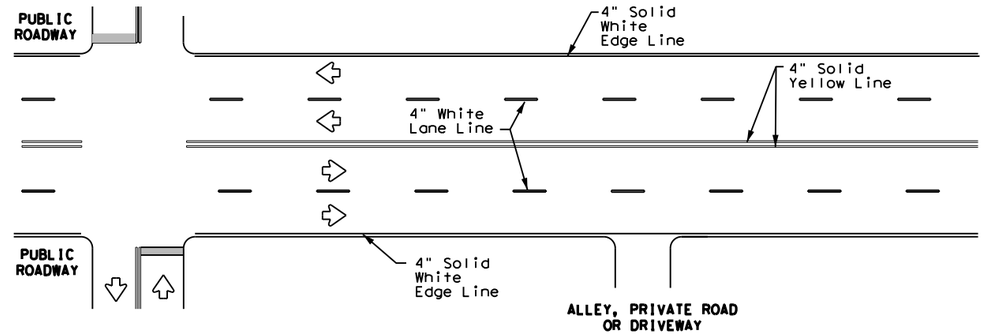
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



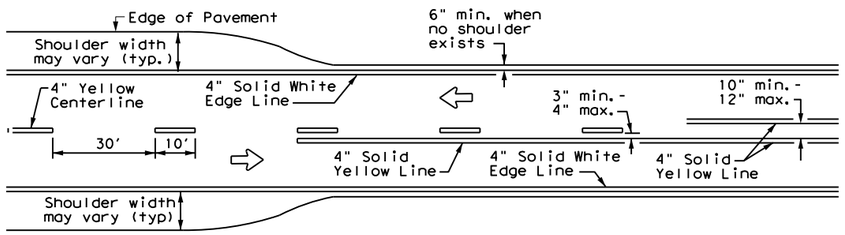
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



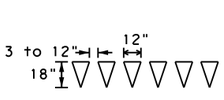
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



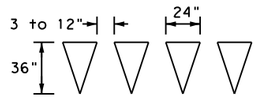
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

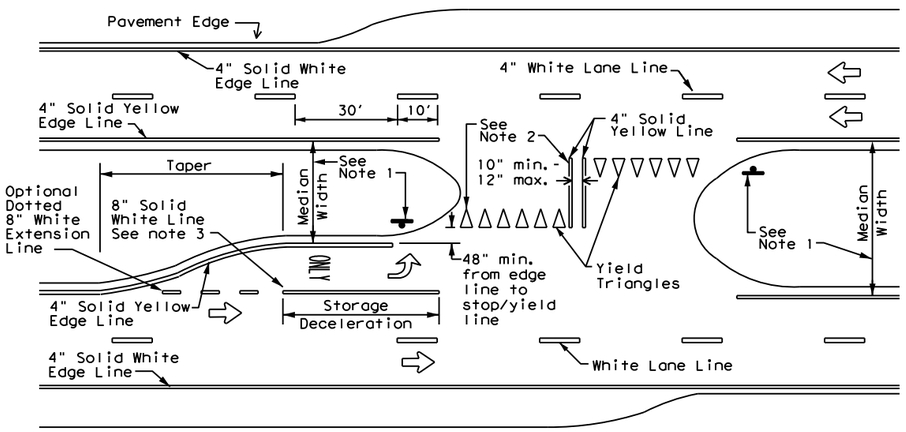


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

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.

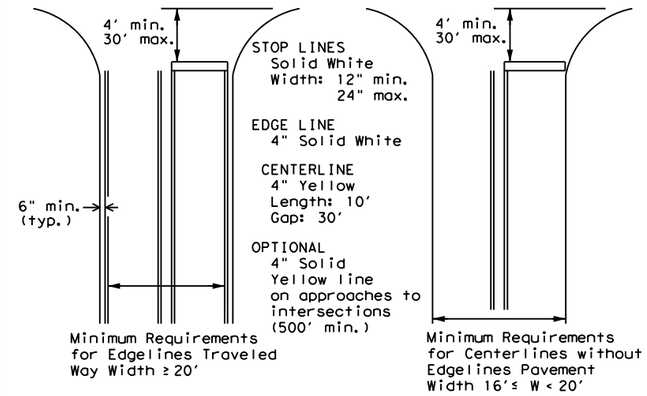
GENERAL NOTES

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

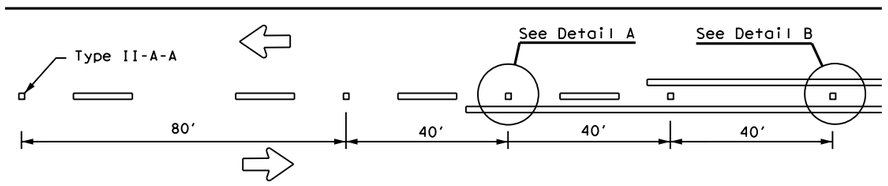
PM(1)-20

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	1875	02	027	FM 2022
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	LFK	HOUSTON		90

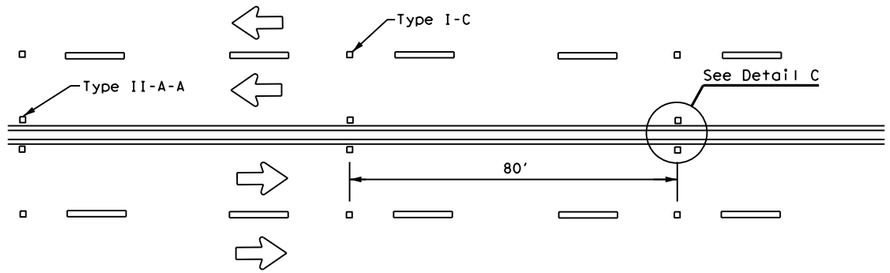
22A

DATE: 5/10/2021 9:48:31 AM
FILE: c:\txdot\pw_online\txdot3\valejandro.valencia\d0339898\pm1-20.dgn

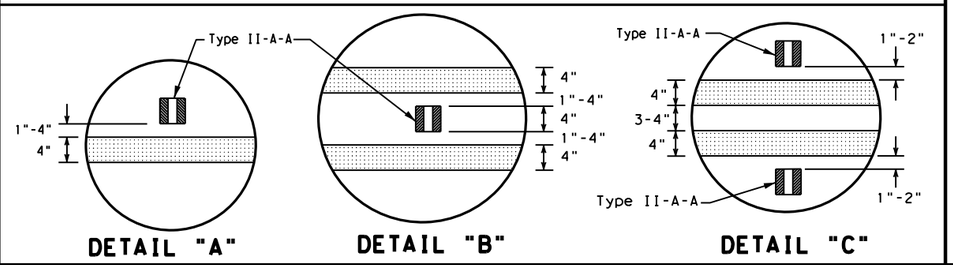
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



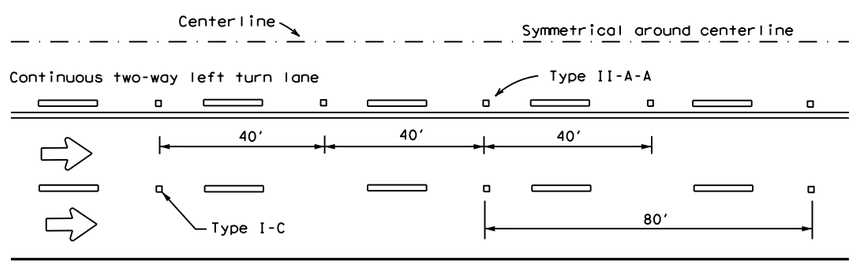
CENTERLINE FOR ALL TWO LANE ROADWAYS



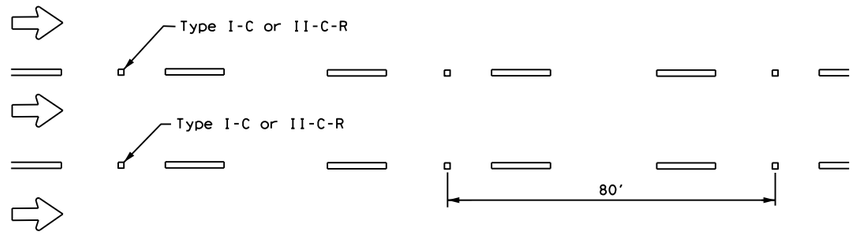
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**

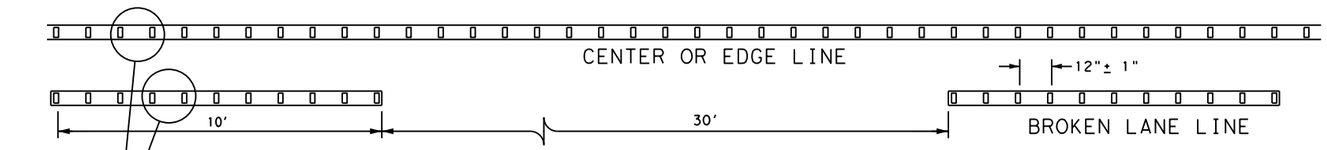


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

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

NOTE

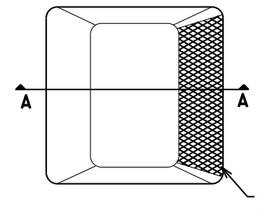
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

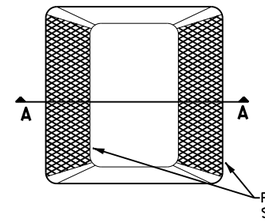
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

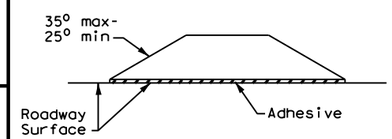
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

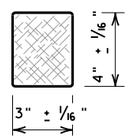
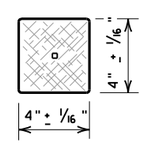
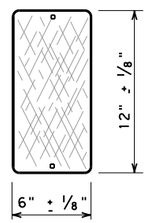
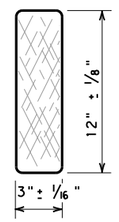
POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-20

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	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		91

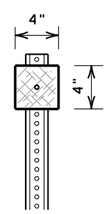
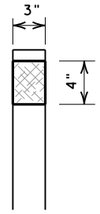
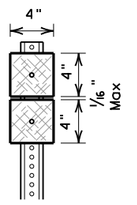
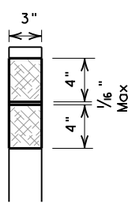
22B

DATE: 5/10/2021 9:48:39 AM
FILE: c:\txdot\pw_online\txdot3\alejandro.valencia\d0339898\pm2-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE				
	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

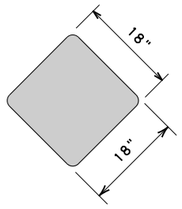
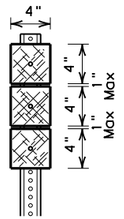
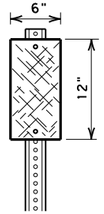
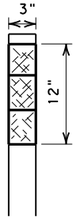
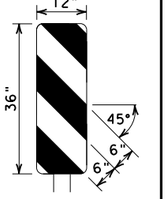
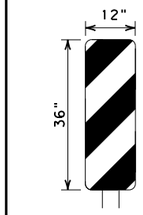
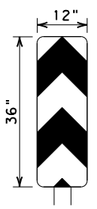
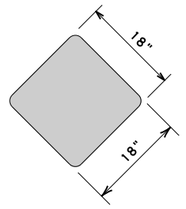
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

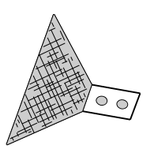
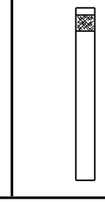
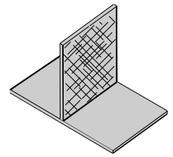
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

DEPARTMENTAL MATERIAL SPECIFICATIONS

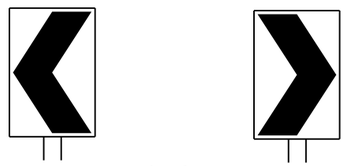
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE



SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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20A

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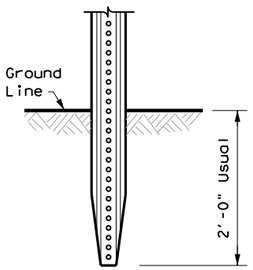
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

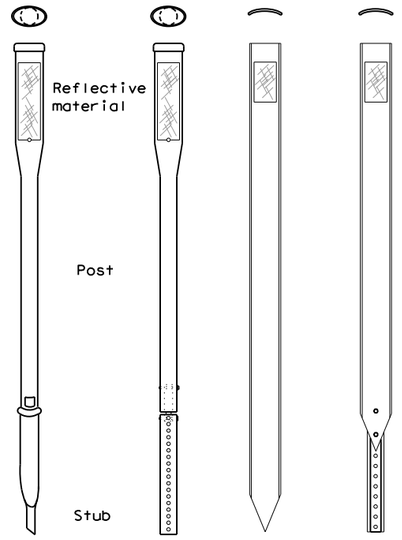


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

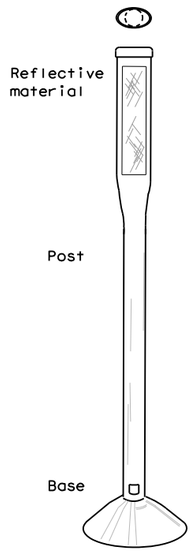
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



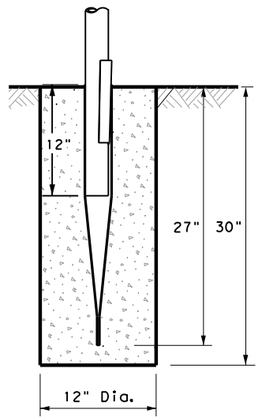
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

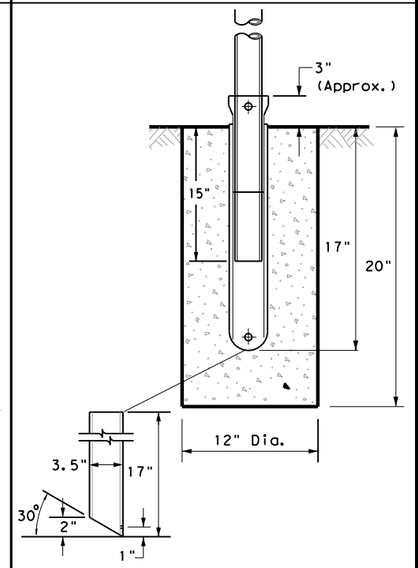
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

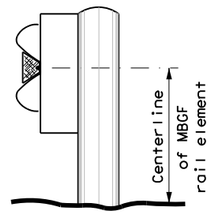
NOTE

1. Install per manufacturer's recommendations.

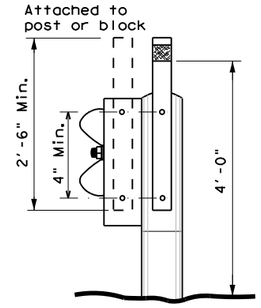
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

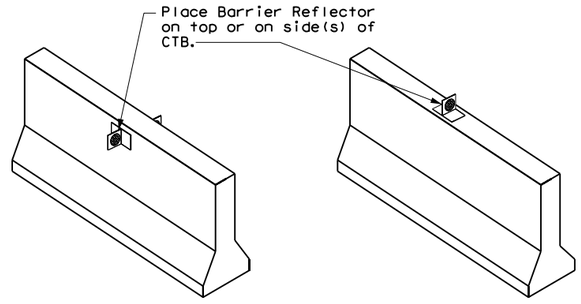
GF1



GF2



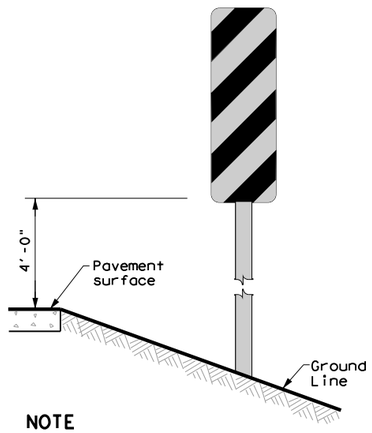
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

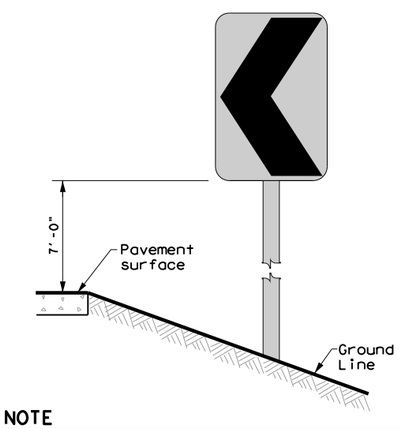
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

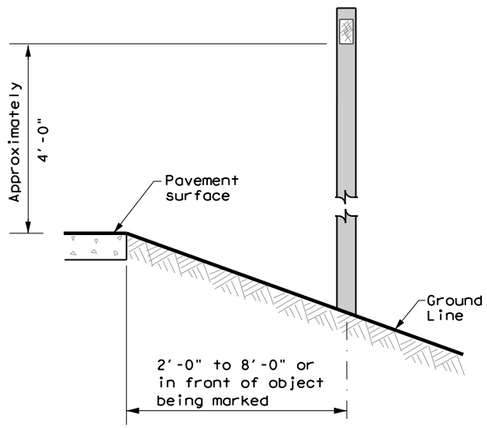
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

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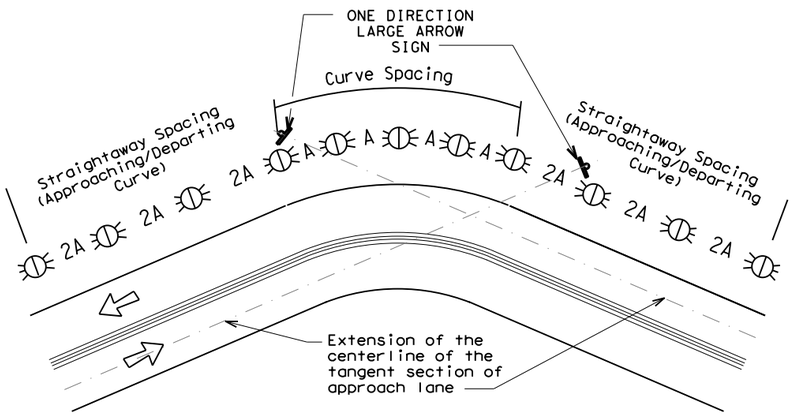
20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

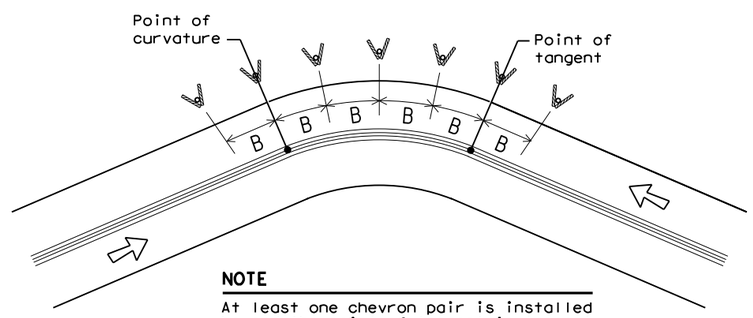
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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8-15 7-20	LFK	HOUSTON		94

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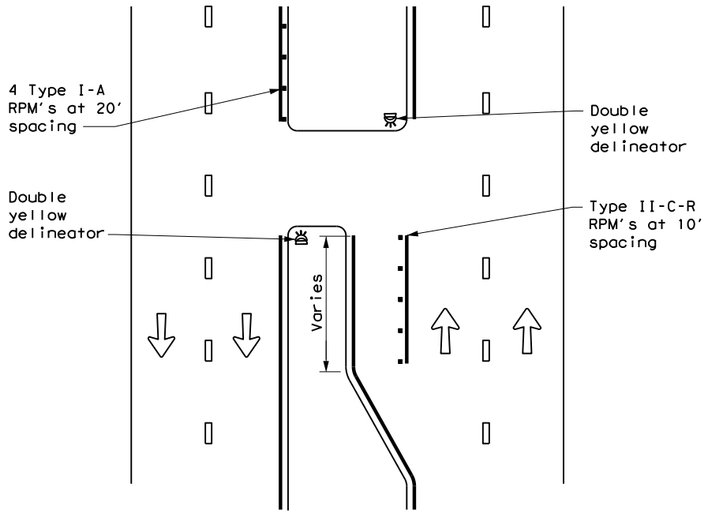
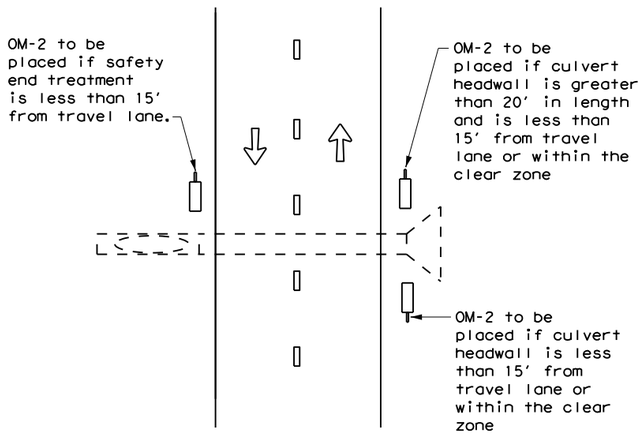
CROSSOVERS



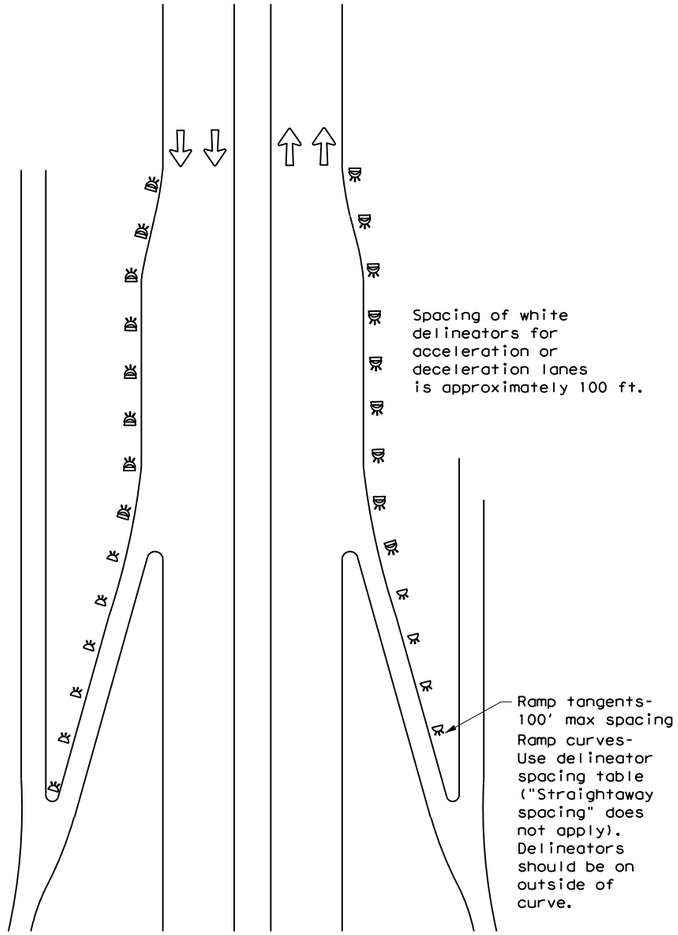
DETAIL 1

FOR CULVERTS WITHOUT MBGF



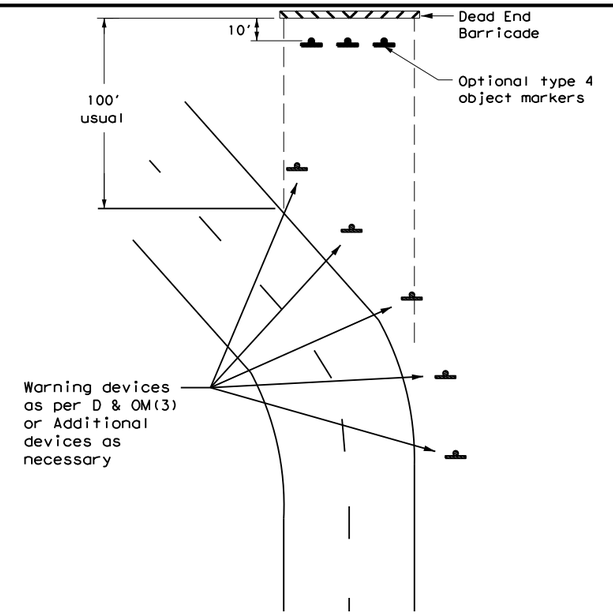
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



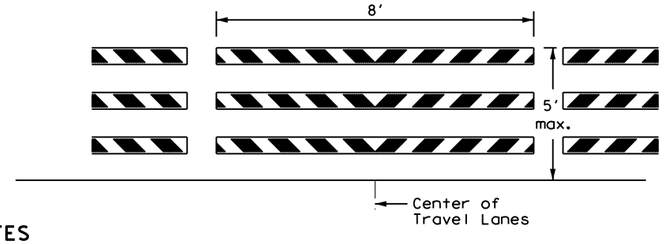
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

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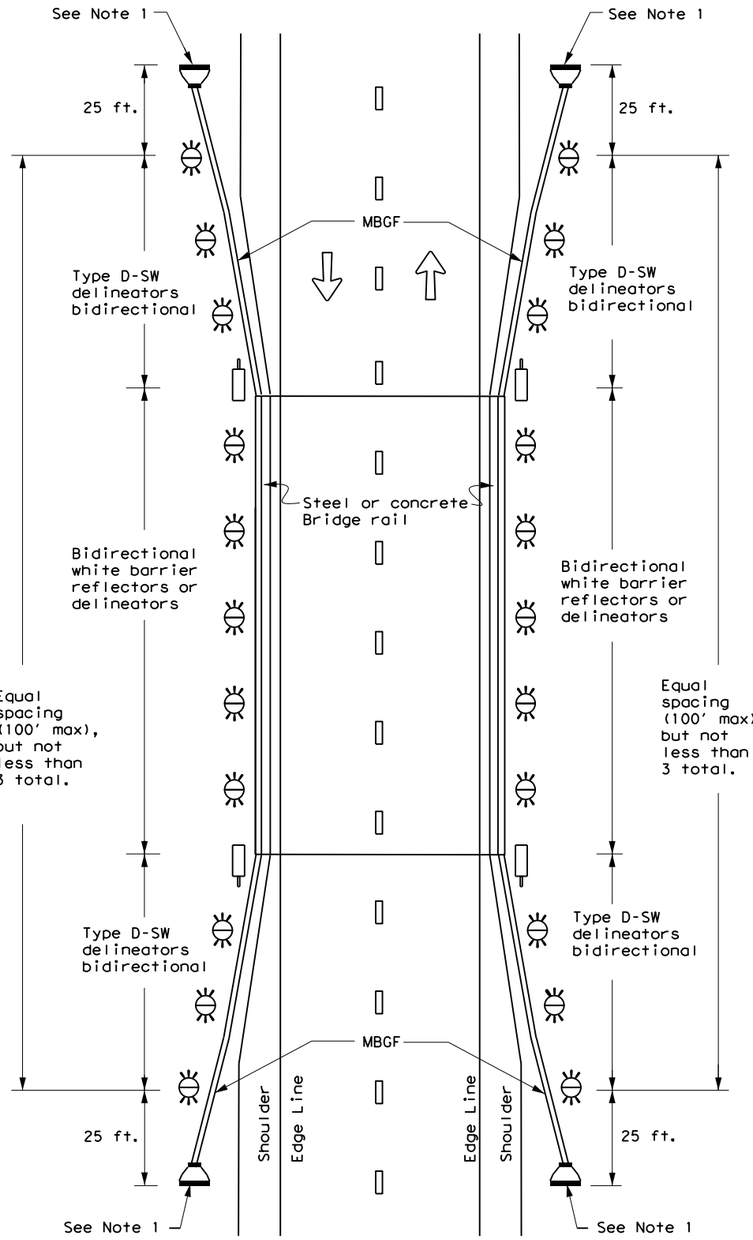
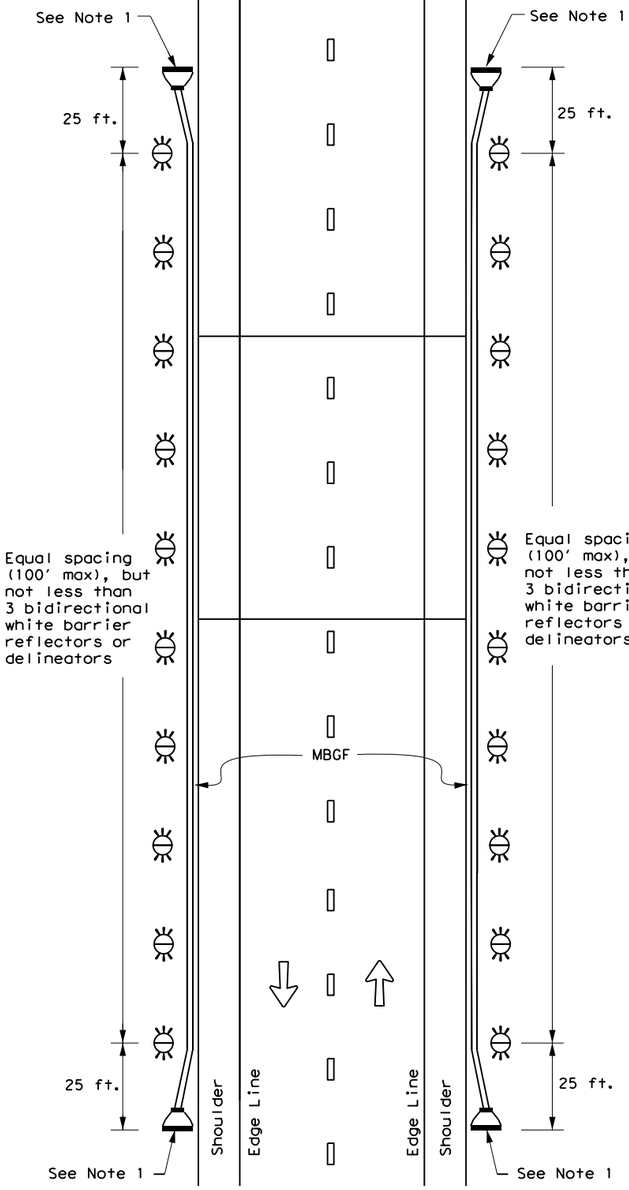
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

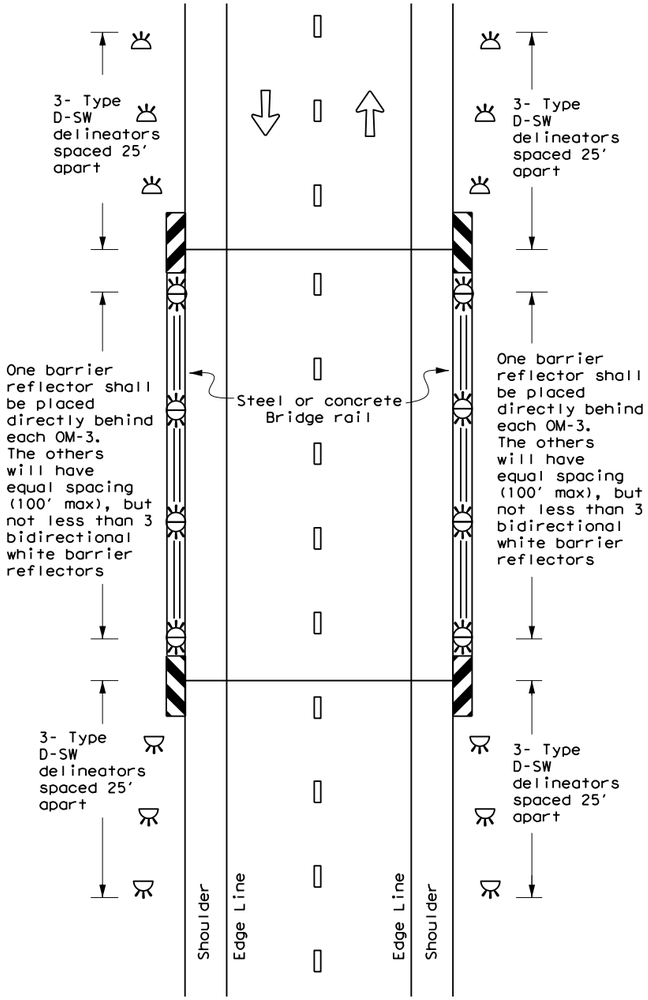
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	LFK	HOUSTON		96

20E

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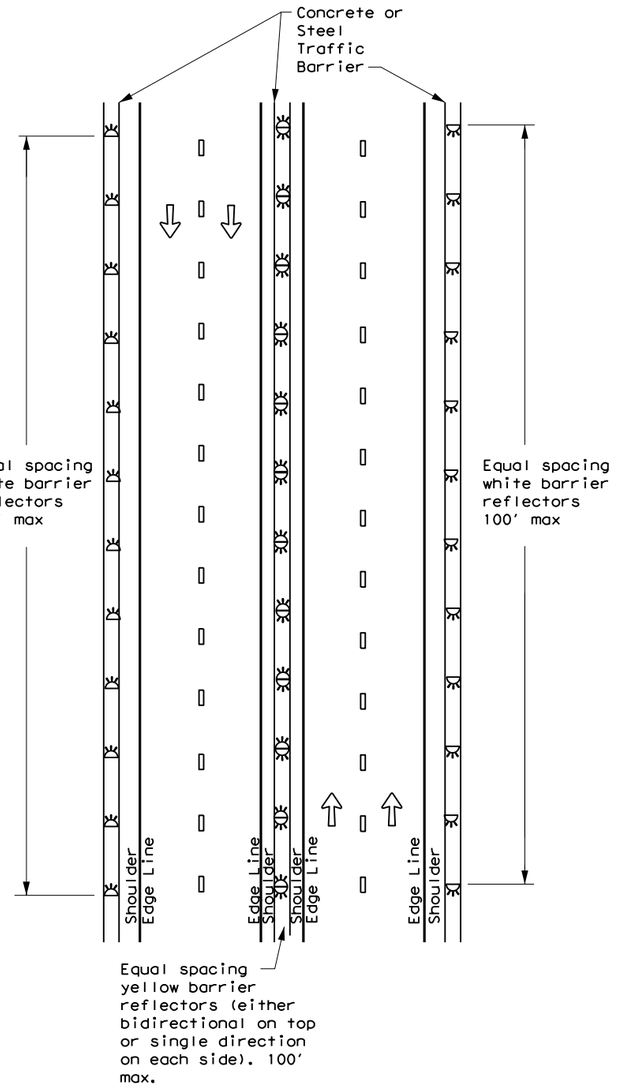
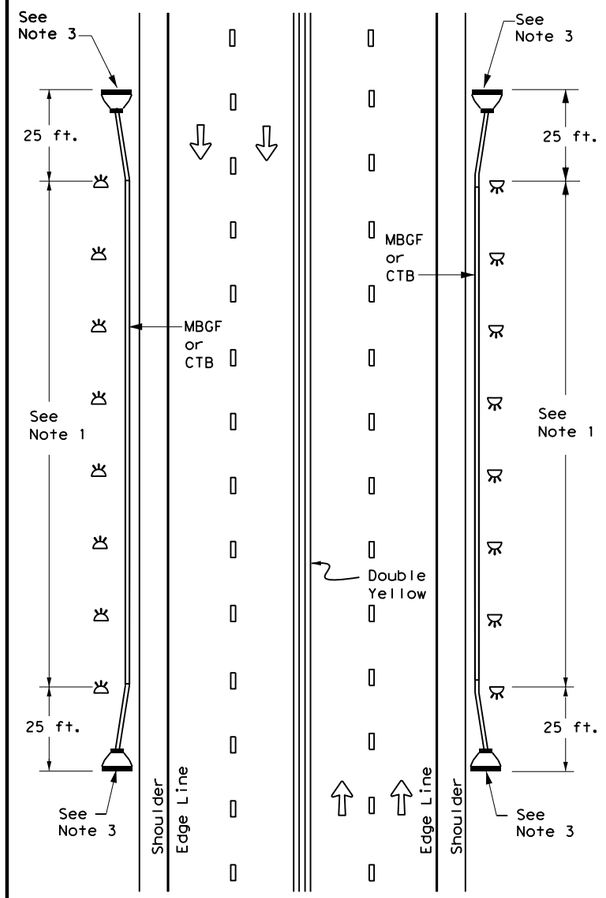
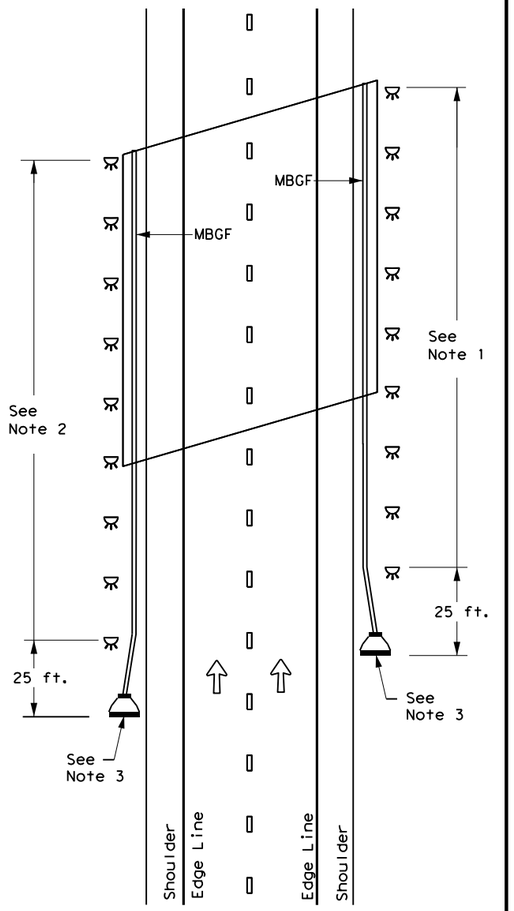
CONTINUOUS CONCRETE OR STEEL BARRIER



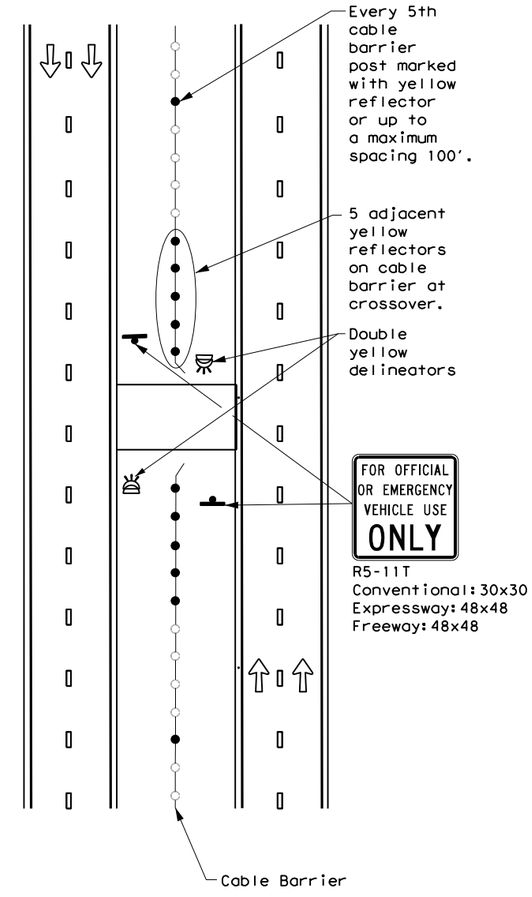
MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



DIVIDED ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



EMERGENCY CROSSOVER



NOTES

1. Equal spacing (100′ max), but not less than 3 single directional white barrier reflectors or delineators. On Continuos Barrier, equal spacing (100′ max.)
2. Equal spacing (100′ max), but not less than 3 single directional yellow barrier reflectors or delineators.
3. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3)in front of the terminal end.

LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(6)-20

FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	LFK	HOUSTON		97

DATE: 5/10/2021 9:49:33 AM
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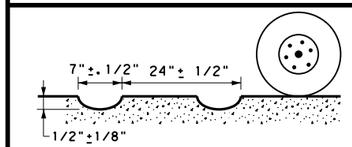
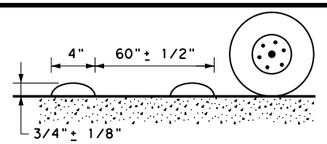
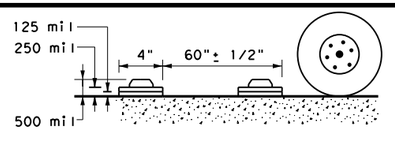
CENTERLINE RUMBLE STRIPS



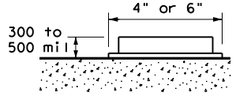
MILLED RUMBLE STRIPS



RAISED TRAFFIC BUTTONS

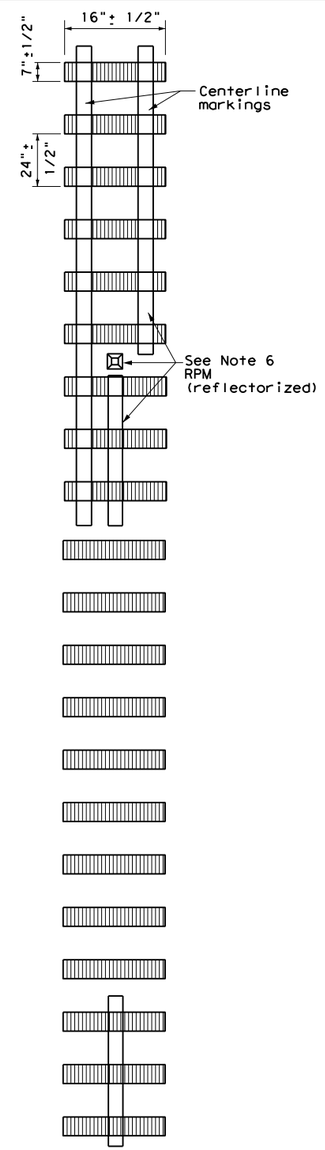


PREFORMED THERMOPLASTIC STRIPS



PROFILE MARKINGS

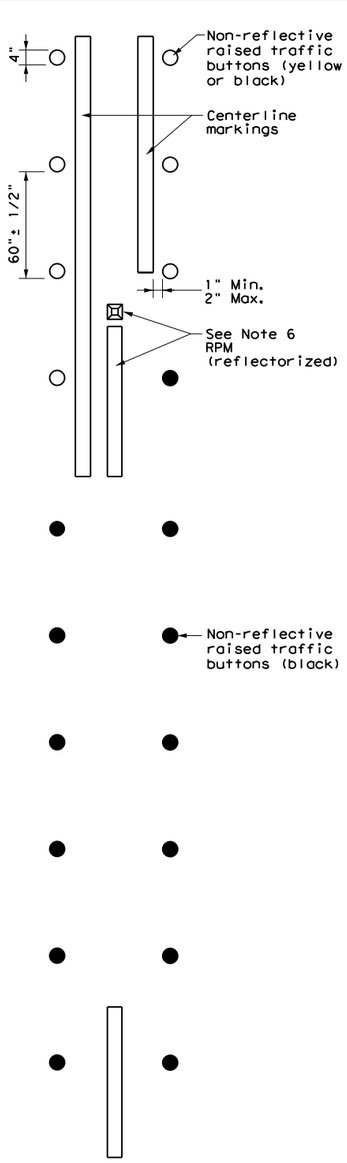
PROFILE VIEW



PLAN VIEW
OPTION 1

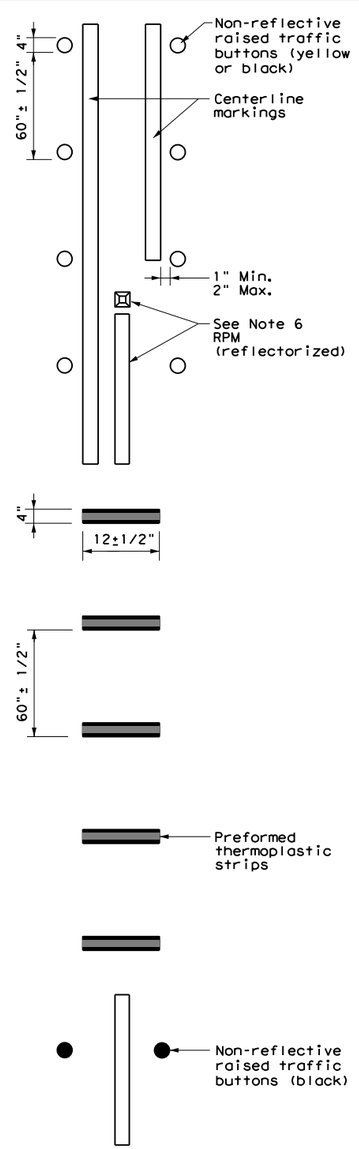
TWO LANE TWO-WAY ROADWAYS

MILLED CENTERLINE RUMBLE STRIPS



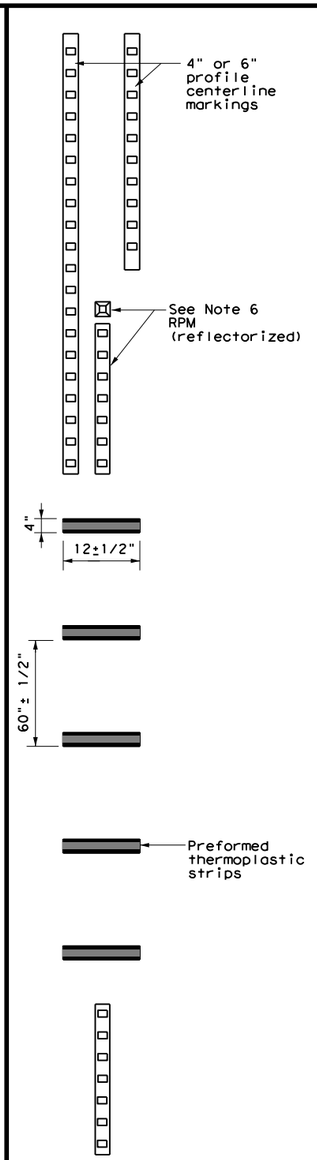
PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS



PLAN VIEW
OPTION 3

RAISED CENTERLINE RUMBLE STRIPS AND PREFORMED THERMOPLASTIC STRIPS



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edgeline rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. 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.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.
5. Breaks in milled centerline 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.
6. Use Standard Sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, and dimensions pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A minimum of 3/8 inch depth of milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. 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 manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.

WHEN INSTALLING EDGELINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

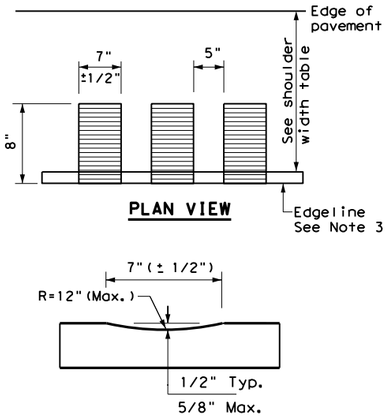
12. See standard sheet RS(4).

Texas Department of Transportation®
Traffic Operations Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS

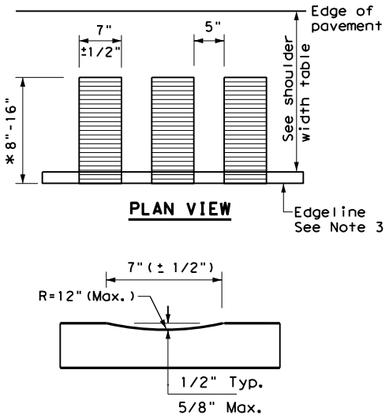
RS(3)-13

FILE: rs(3)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		98



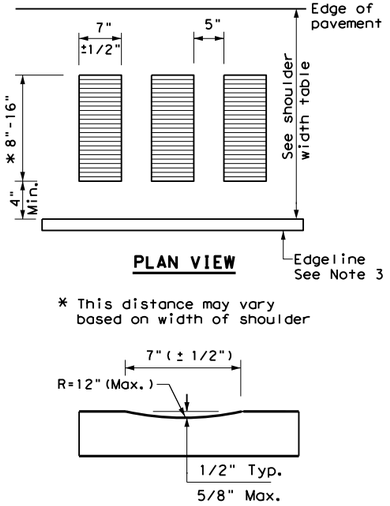
OPTION 1

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



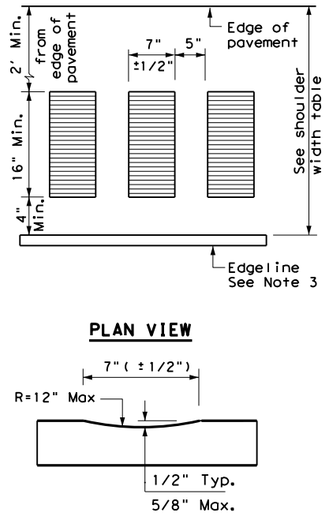
OPTION 2

CONTINUOUS MILLED DEPRESSIONS
(Rumble Stripes)



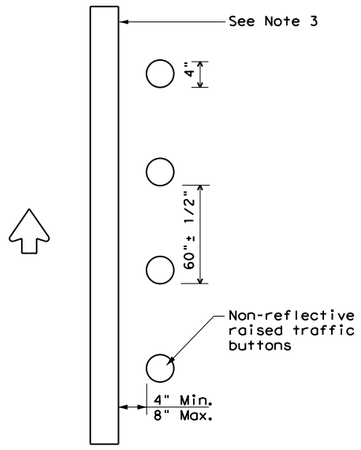
OPTION 3

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



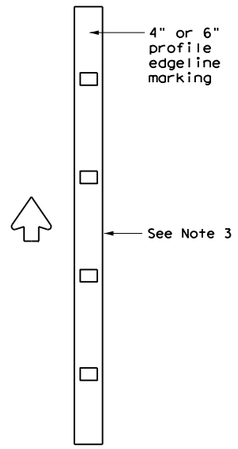
OPTION 4

CONTINUOUS MILLED DEPRESSIONS
(Rumble Strips)



OPTION 5

RAISED EDGELINE RUMBLE STRIPS



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

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.

Texas Department of Transportation

Traffic Operations Division Standard

EDGELINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS
RS(4)-13

FILE: rs(4)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2013	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		99

DATE: 5/10/2021 9:49:41 AM
FILE: c:\txdot\pw_online\txdot3\alejandro.valencia\d0339898\rs(4)-13.dgn

NOTES:
(1) THE PURPOSE OF THIS SHEET IS TO POINT THE USER TO THE APPROPRIATE LOCATIONS TO FIND THE REQUIRED CONTENT OF THE SWP3.
(2) THE PROJECT LIMITS SHOWN ON THE TITLE SHEET AND LIMITS OF TXDOT RIGHT OF WAY SHALL ALSO BE THE LIMITS OF COVERAGE OF THE SWP3.

PROJECT DESCRIPTION

A. NATURE OF ACTIVITY: RECONSTRUCT EXISTING PAVEMENT AND WIDEN TO 26FT

B. POTENTIAL POLLUTANTS AND THEIR SOURCES: POLLUTANT: SEDIMENT, POLLUTANT: SEDIMENT, SOURCE: DISTURBED SOIL; POLLUTANT: GARBAGE AND SOLID WASTE, SOURCE: CONSTRUCTION ACTIVITES; POLLUTANT: OIL AND GREASE, SOURCE: VEHICLE AND EQUIPMENT

C. INTENDED SEQUENCE OF ACTIVITIES: SEE CONSTRUCTION SCHEDULE FOR ESTIMATED START DATES AND DURATION OF SOIL-DISTURBING ACTIVITIES

D. TOTAL AREA OF SITE: 77.11 ACRE AREA TO BE DISTURBED: 44.34 ACRE

E. DATA DESCRIBING THE SOIL OR QUALITY OF ANY DISCHARGE FROM THE SITE:
12.5% GRAVELLY CLAY LOAM, 11.7% CLAY LOAM, 16.7% LOAMY FINE SAND, 20.8% FINE SANDY LOAM

F. GENERAL LOCATION MAP: SEE TITLE SHEET OF THE PROJECT PLANS

G. DETAILED SITE MAP/MAPS INDICATING THE FOLLOWING:
- i. DRAINAGE PATTERNS: SEE PLAN LAYOUT
- ii. ANTICIPATED SLOPES AFTER MAJOR GRADING ACTIVITIES: SEE TYPICAL SECTIONS
- iii. AREAS WHERE SOIL DISTURBANCE WILL OCCUR: SEE TYPICAL SECTIONS
- iv. LOCATIONS OF ALL CONTROLS OR BUFFERS (PLANNED/IN PLACE): SEE PLAN LAYOUT
- v. LOCATIONS WHERE TEMPORARY OR PERMANENT STABILIZATION PRACTICES ARE EXPECTED TO BE USED: SEE PLAN LAYOUT
- vi. LOCATION OF CONSTRUCTION SUPPORT ACTIVITIES: SEE PLAN LAYOUT
- vii. SURFACE WATERS, INCLUDING WETLANDS, AT, ADJACENT, OR IN CLOSE PROXIMITY TO THE SITE (* INDICATES IMPAIRED WATERS): SEE PLAN LAYOUT
- viii. LOCATIONS WHERE STORMWATER DISCHARGES DIRECTLY TO A SURFACE WATER BODY OR MS4: SEE PLAN LAYOUT
- ix. VEHICLE WASH AREAS: N/A
- x. DESIGNATED POINTS ON THE SITE WHERE VEHICLES WILL EXIT FROM UNSTABLE DIRT TO PAVED ROAD: SEE SWP3 LAYOUTS

H. LOCATION AND DESCRIPTION OF CONSTRUCTION SUPPORT ACTIVITIES AUTHORIZED UNDER THE PERMITTEE'S NOI: CONSTRUCTION SUPPORT ACTIVITIES ARE NOT COVERED UNDER THIS SWP3 AS IT IS NOT AUTHORIZED UNDER THIS PERMITTEE'S CGP. THE PERMITTEE WILL MAKE REFERENCE TO CONSTRUCTION SUPPORT ACTIVITIES THAT ARE COVERED UNDER THE CONTRACTOR'S SWP3 AND CGP ON SWP3 LAYOUTS

I. NAME OF RECEIVING WATER(S) AT OR NEAR SITE:
PERKINS CREEK AND UNNAMED TRIBUTARIES TO PERKINS.
VENADO CREEK AND UNNAMED TRIBUTARIES TO VENADO,
MATTHEWS CREEK AND UNNAMED TRIBUTARIES TO MATTHEWS,
CANEY CREEK AND UNNAMED TRIBUTARIES TO CANEY

NEAREST CLASSIFIED SEGMENT NUMBER: 0610

CLASSIFIED SEGMENT NAME: SAM RAYBURN RESERVOIR

J. COPY OF TPDES GENERAL PERMIT: SEE SWP3 FILE

K. NOI AND ACKNOWLEDGEMENT CERTIFICATE OR SITE NOTICE: SEE SWP3 FILE

L. STORMWATER AND ALLOWABLE NON-STORMWATER DISCHARGE LOCATIONS: SEE SWP3 LAYOUTS

M. LOCATIONS OF POLLUTANT GENERATING ACTIVITIES: ACTIVITIES AUTHORIZED UNDER THIS PERMITTEE'S CGP CAN BE FOUND ON SWP3 LAYOUTS. THIS SHEET WILL ALSO REFERENCE THE LOCATION OF POLLUTANT GENERATING ACTIVITIES THAT ARE COVERED BY THE CONTRACTOR'S CGP AND SWP3.

DESCRIPTION OF BMPS

A. GENERAL REQUIREMENTS: EROSION AND SEDIMENT CONTROLS SHOWN ON SWP3 LAYOUTS WERE DESIGNED TO RETAIN SEDIMENT ON-SITE TO THE EXTENT PRACTICABLE WITH CONSIDERATION OF LOCAL TOPOGRAPHY, SOIL TYPE, AND RAINFALL. THE EROSION AND SEDIMENT CONTROLS WILL BE INSTALLED AND MAINTAINED ACCORDING TO MANUFACTURER AND TXDOT STORM WATER MANAGEMENT GUIDELINES. CONTROLS TO MINIMIZE THE OFF-SITE TRANSPORT OF LITTER, CONSTRUCTION DEBRIS, AND CONSTRUCTION MATERIALS INCLUDE: CONSTRUCTION MATERIALS TO BE STORED IN LOCATIONS THAT MINIMIZE THEIR EXPOSURE TO PRECIPITATION & STORM WATER RUNOFF; COLLECTION OF CONSTRUCTION DEBRIS IN RECEPTACLES WITH A SECURE COVER MEETING STATE AND LOCAL SOLID WASTE MANAGEMENT REGULATIONS; HAULING AND EMPTYING RECEPTACLES AT APPROVED LANDFILL SITES; PROHIBITING THE BURIAL OF CONSTRUCTION DEBRIS; COLLECTION OF SANITARY WASTE FROM PORTABLE UNITS AS NECESSARY OR AS REQUIRED BY LOCAL REGULATIONS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

B. EROSION CONTROL AND STABILIZATION PRACTICES

T/P	TEMP/PERM SEEDING		PROTECTION OF TREES AND VEGETATION
P	MULCHING (HAY OR STRAW)		GEOTEXTILES
	VEGETATIVE BUFFER STRIPS		SLOPE TEXTURING
	SOD STABILIZATION		TEMP VELOCITY DISSIPATION DEVICES
P	BLOCK SOD		FLOW DIVERSION MECHANISMS
T	OTHER		

T = TEMPORARY; P = PERMANENT

DATES:
1. MAJOR GRADING ACTIVITIES: SEE CONSTRUCTION SCHEDULE
2. WHEN CONSTRUCTION ACTIVITIES TEMPORARILY OR PERMANENTLY CEASE ON A PORTION OF THE SITE:
3. WHEN STABILIZATION MEASURES ARE INITIATED: SEE SWP3 FILE

INITIATE EROSION CONTROL AND STABILIZATION MEASURES IMMEDIATELY IN THAT PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED AND WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS. INITIATE STABILIZATION MEASURES THAT PROVIDE A PROTECTIVE COVER IMMEDIATELY IN THAT PORTION OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED. "IMMEDIATELY" MEANS NO LATER THAN THE NEXT WORK DAY FOLLOWING THE DAY WHEN THE SOIL-DISTURBING ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED. STABILIZATION MEASURES MUST BE COMPLETED NO MORE THAN 14 CALENDAR DAYS AFTER INITIATION BEGINS.

THE SCHEDULE OF IMPLEMENTATION OF THESE PRACTICES WILL BE BASED ON THE INTENDED SEQUENCE OF MAJOR SOIL-DISTURBING ACTIVITIES. SEE CONSTRUCTION SCHEDULE

C. SEDIMENT CONTROL PRACTICES

T	SILT FENCE		VEGETATIVE BUFFER STRIPS
T	OTHER		

IF SITE WILL DISTURB 10 OR MORE ACRES WITHIN A COMMON DRAINAGE LOCATION AND A SEDIMENTATION BASIN IS NOT FEASIBLE, PROVIDE REASON: NO ROOM IN EXIST ROW.

THE SCHEDULE OF IMPLEMENTATION OF THESE PRACTICES WILL BE BASED ON THE INTENDED SEQUENCE OF MAJOR SOIL-DISTURBING ACTIVITIES. SEE CONSTRUCTION SCHEDULE

DESCRIPTION OF PERMANENT STORM WATER CONTROLS

PROVIDE A DESCRIPTION OF ANY MEASURES THAT WILL BE INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL POLLUTANTS IN STORM WATER DISCHARGES THAT MAY OCCUR AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED: N/A

OTHER REQUIRED CONTROLS AND BMPS

TXDOT WILL UTILIZE ROCK AT CONSTRUCTION ENTRANCES AND SPRINKLING, AS NEEDED, TO MINIMIZE OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST.

SEE SECTION A ABOVE FOR DESCRIPTION OF CONSTRUCTION AND WASTE MATERIALS AND CONTROLS USED FOR THOSE THAT MAY BE STORED ON-SITE.

AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, FUELS, MOTOR OIL, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, OR CONCRETE CURING COMPOUNDS AND ADDITIVES. STORE MATERIAL IN ACCORDANCE WITH APPLICABLE REGULATIONS. CONTACT THE SPILL COORDINATOR IMMEDIATELY IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS.

MAINTENANCE REQUIREMENTS

EFFECTIVELY MAINTAIN THE OPERATING CONDITIONS OF ALL EROSION AND SEDIMENT CONTROL AND OTHER PROTECTIVE MEASURES IDENTIFIED IN THE SWP3. IF SITE INSPECTIONS REQUIRED BY THIS PERMIT IDENTIFY BMP'S THAT ARE NOT OPERATING EFFECTIVELY, MAINTENANCE SHALL BE PERFORMED BEFORE THE NEXT ANTICIPATED STORM EVENT, OR AS NECESSARY TO MAINTAIN THE CONTINUED EFFECTIVENESS OF STORM WATER CONTROLS. IF MAINTENANCE PRIOR TO THE NEXT ANTICIPATED STORM EVENT IS UNPRACTICABLE, SCHEDULE AND ACCOMPLISH MAINTENANCE AS SOON AS PRACTICAL. CONTROLS THAT HAVE BEEN INTENTIONALLY DISABLED, RUN-OVER, REMOVED OR OTHERWISE RENDERED INEFFECTIVE MUST BE REPLACED OR CORRECTED IMMEDIATELY UPON DISCOVERY. IF A CONTROL HAS BEEN USED INCORRECTLY, IS PERFORMING INADEQUATELY OR IS DAMAGED, THE OPERATOR SHALL REPLACE OR MODIFY THE CONTROL AS SOON AS PRACTICABLE AFTER THE DISCOVERY.

INSPECTION OF CONTROLS

A) QUALIFIED PERSONNEL SHALL INSPECT DISTURBED AREAS OF THE CONSTRUCTION SITE THAT HAVE NOT BEEN FINALLY STABILIZED, AREAS USED FOR STORAGE OF MATERIALS THAT ARE EXPOSED TO PRECIPITATION, STRUCTURAL CONTROL MEASURES, AND LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE, ONCE EVERY 7 CALENDAR DAYS. DISTURBED AREAS THAT ARE EXPOSED TO PRECIPITATION SHALL BE INSPECTED FOR EVIDENCE OF, OR THE POTENTIAL FOR, POLLUTANTS ENTERING THE DRAINAGE SYSTEM. SEDIMENT AND EROSION CONTROL MEASURES IDENTIFIED ON THE SWP3 SHALL BE OBSERVED TO ENSURE THAT THEY ARE OPERATING CORRECTLY. LOCATIONS WHERE VEHICLES ENTER OR EXIT THE SITE SHALL BE INSPECTED FOR EVIDENCE OF OFF-SITE SEDIMENT TRACKING.

D) THE SWP3 MUST BE MODIFIED BASED ON THE RESULTS OF INSPECTION TO BETTER CONTROL POLLUTANTS IN RUNOFF. REVISIONS TO THE SWP3 MUST BE COMPLETED WITHIN 7 CALENDAR DAYS FOLLOWING THE INSPECTION. IF EXISTING BMPS ARE MODIFIED OR ADDITIONAL BMPS ARE NECESSARY, AN IMPLEMENTATION SCHEDULE MUST BE DESCRIBED IN THE SWP3. IMPLEMENTATION OF CHANGES SHOULD BE DONE PRIOR TO THE NEXT STORM EVENT IF POSSIBLE, OTHERWISE, THEY SHOULD BE DONE AS SOON AS PRACTICABLE.

E) A REPORT SUMMARIZING THE SCOPE, DATE, NAME AND QUALIFICATIONS OF INSPECTOR, AND MAJOR OBSERVATIONS RELATING TO THE IMPLEMENTATION OF THE SWP3 SHALL BE PRODUCED AND RETAINED AS PART OF THE SWP3. MAJOR OBSERVATIONS INCLUDE: LOCATIONS OF DISCHARGES OF SEDIMENT OR OTHER POLLUTANTS FROM THE SITE, LOCATIONS OF BMPS THAT NEED TO BE MAINTAINED, LOCATIONS OF BMPS THAT FAILED TO OPERATE AS DESIGNED OR PROVED INADEQUATE FOR A PARTICULAR LOCATION AND LOCATIONS WHERE BMPS ARE NEEDED. ACTIONS TAKEN AS A RESULT OF INSPECTIONS MUST BE DESCRIBED WITHIN AND RETAINED AS PART OF THE SWP3. REPORTS MUST IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE. WHERE THE REPORT DOES NOT IDENTIFY ANY INCIDENTS OF NON-COMPLIANCE, THE REPORT MUST CONTAIN A CERTIFICATION THAT THE SITE IS IN COMPLIANCE WITH THE SWP3 AND PERMIT.

OTHER SWP3 CONTENT

TXDOT WILL ENSURE THE APPROPRIATE POLLUTION PREVENTION MEASURES (I.E. VEGETATED BUFFER STRIPS, SILT FENCE, ETC.) ARE IDENTIFIED AND IMPLEMENTED FOR ALL ELIGIBLE NON-STORMWATER WATER COMPONENTS OF DISCHARGE SUCH AS WASHING OF VEHICLES, STRUCTURES, AND PAVEMENT WHERE SOAPS AND DETERGENTS ARE NOT USED AND THE PURPOSE IS TO REMOVE DIRT, MUD OR DUST; UNCONTAMINATED WATER USED FOR DUST CONTROL; AND LAWN WATERING AND SIMILAR IRRIGATION DRAINAGE.

CHECKLIST FOR CONTENTS OF AREA OFFICE SWP3 FILE:

- ☐ CONTACT FORM *
- ☐ NOI AND ACKNOWLEDGEMENT CERTIFICATE (IF EQUAL OR GREATER THAN 5 ACRES)
- ☐ APPLICABLE CONSTRUCTION SITE NOTICE *
- ☐ SWP3 CERTIFICATION STATEMENT (SIGNED BY AE)
- ☐ TPDES GENERAL PERMIT
- ☐ SWP3 PLAN
- ☐ INSPECTION AND MAINTENANCE REPORT
- ☐ INSPECTOR QUALIFICATION FORM
- ☐ DELEGATION OF SIGNATURE AUTHORITY (ALL INSPECTORS SIGNING REPORTS)
- ☐ NOTICE OF TERMINATION

* SYMBOL INDICATES THAT THE INFORMATION SHOULD BE DISPLAYED ON THE PROJECT BULLETIN BOARD

ANY REPORTABLE QUANTITY OF HAZARDOUS MATERIAL RELEASE MUST BE REPORTED TO NATIONAL RESPONSE CENTER AT 1-800-424-8802 AND TO STATE OF TEXAS SPILL-REPORTING HOTLINE AT 1-800-832-8224

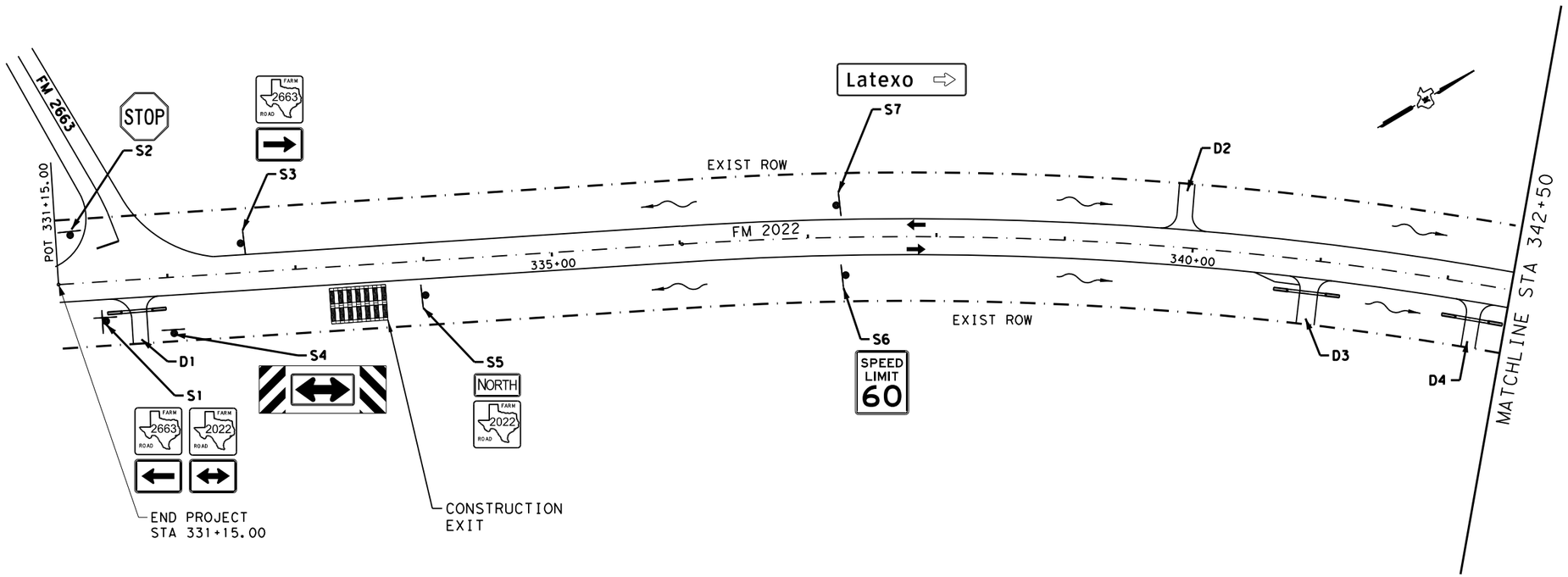
STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
5/13/2021

TXDOT SWP3 INDEX (SWP3I)

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		100

(REVISED OCTOBER 30, 2013)

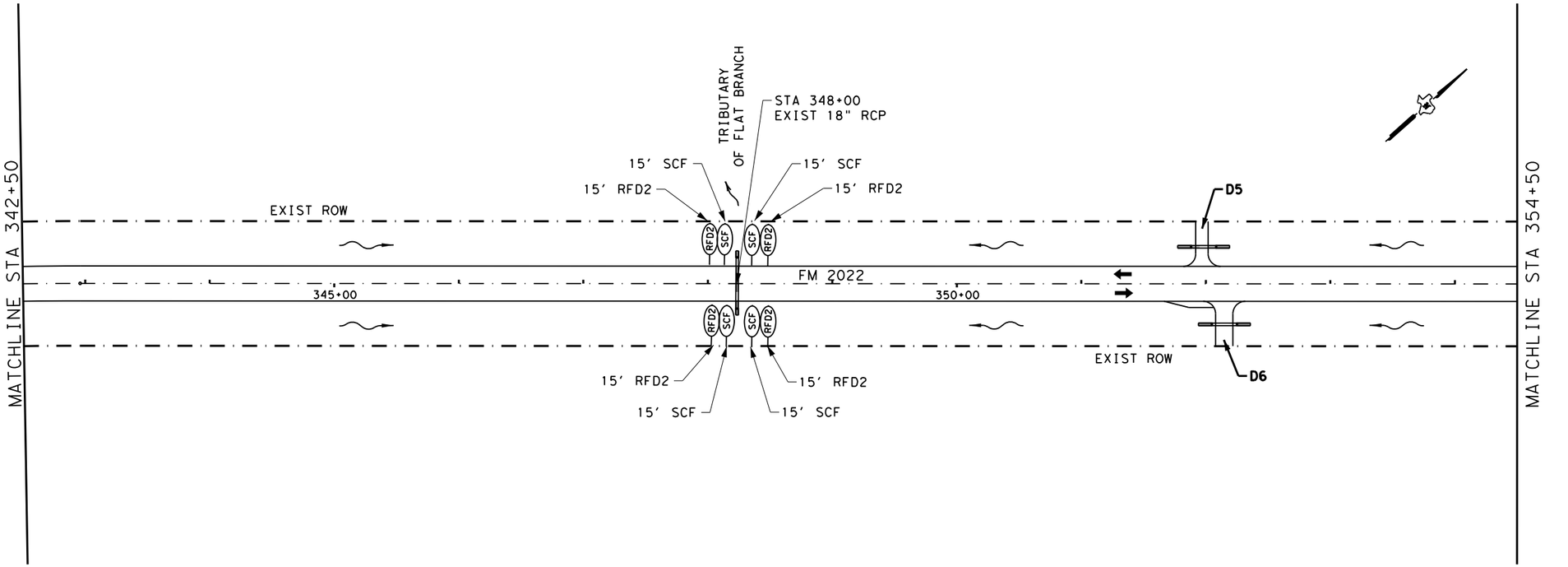


LEGEND

- (RFD2) ROCK FILTER DAM (TY 2)
- (SCF) SEDIMENT CONT FENCE
- TRAFFIC DIRECTION
- CONSTRUCTION EXIT
- FLOW DIRECTION
- D# DRIVEWAY ID
- S# SIGN TO BE REPLACED

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

REFER TO TYPICAL SECTIONS FOR AREA OF DISTURBANCE AND SEEDING LIMITS.



SCALE 1" = 100'

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 1 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		101

5/25/2021 3:49:57 PM
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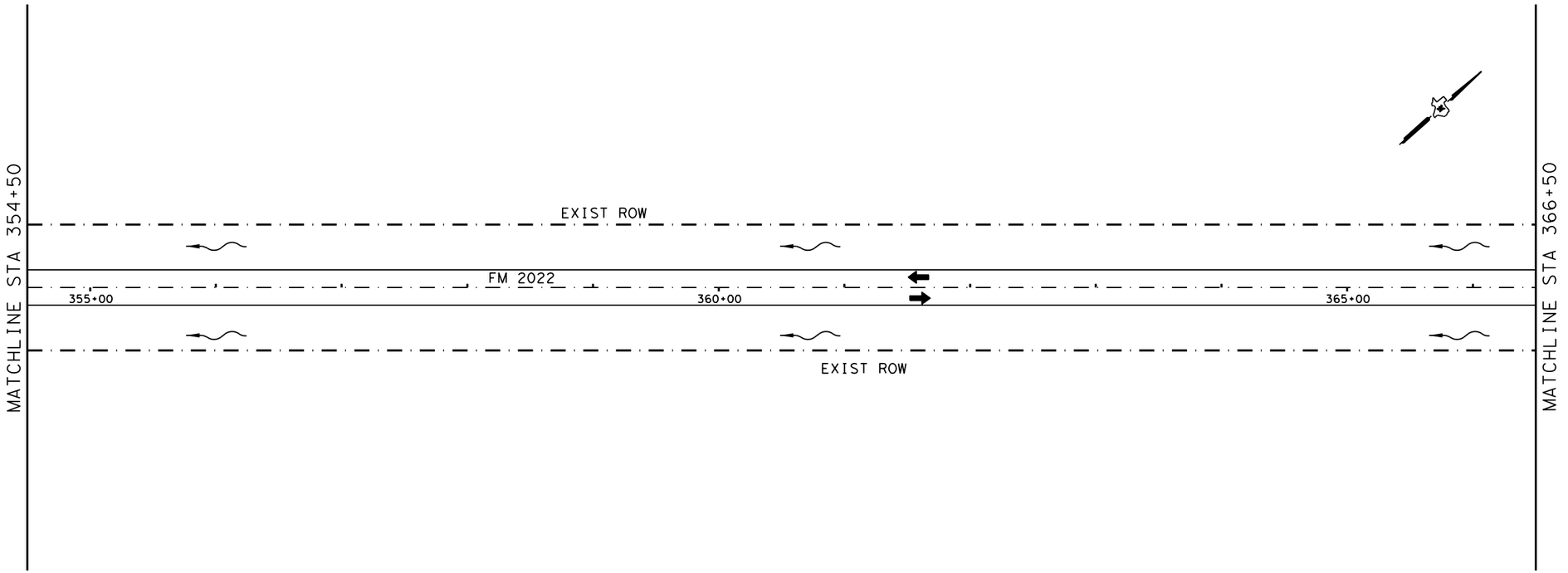
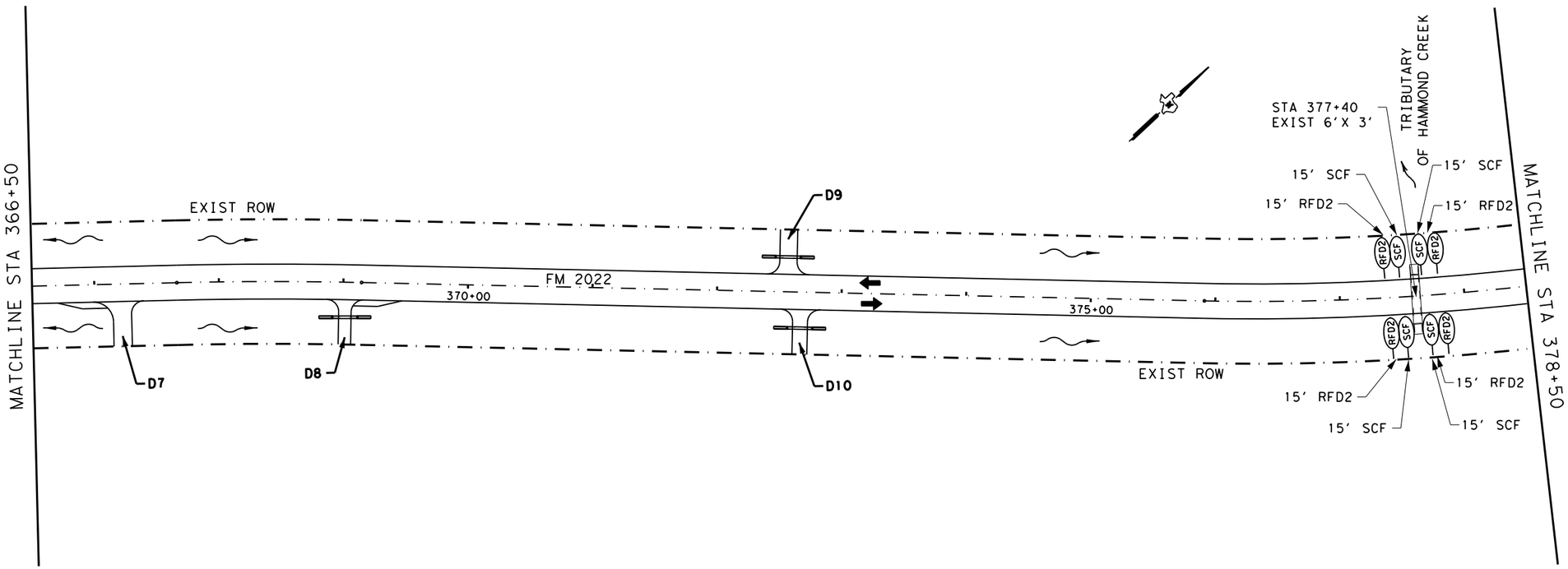


LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- TRAFFIC DIRECTION
- CONSTRUCTION EXIT
- FLOW DIRECTION
- D# — DRIVEWAY ID
- S# — SIGN TO BE REPLACED

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

REFER TO TYPICAL SECTIONS FOR AREA OF DISTURBANCE AND SEEDING LIMITS.



SCALE 1" = 100'

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 2 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		102

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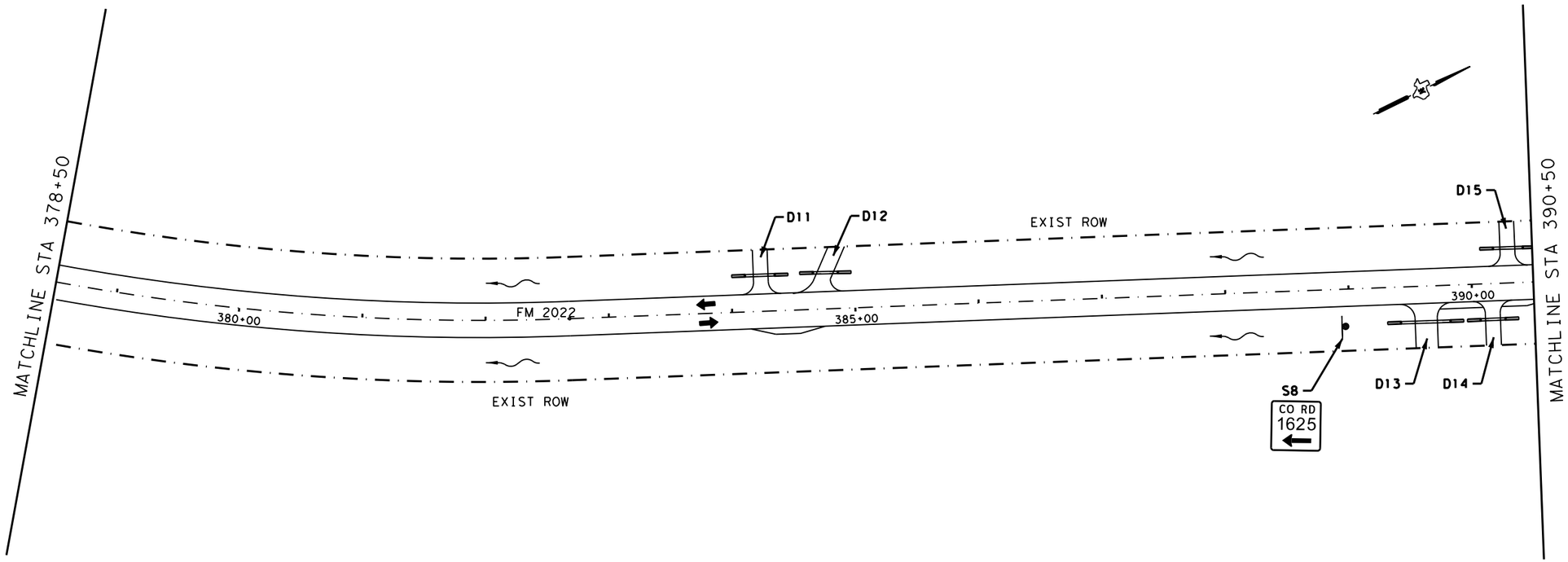

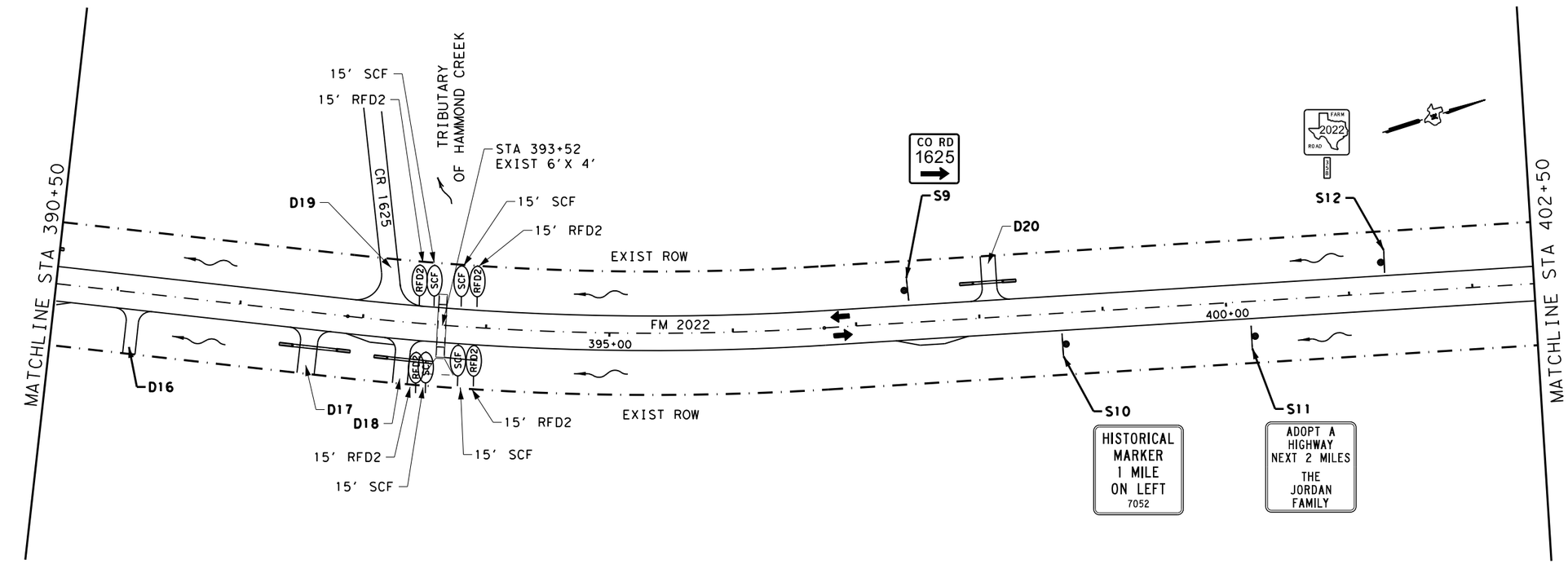

LEGEND

- RFD2 — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONT FENCE
- TRAFFIC DIRECTION
- CONSTRUCTION EXIT
- FLOW DIRECTION
- D# — DRIVEWAY ID
- S# — SIGN TO BE REPLACED

NOTE: LOCATIONS OF CONSTRUCTION EXITS MAY BE ADJUSTED IN THE FIELD AS DIRECTED BY THE ENGINEER.

REFER TO TYPICAL SECTIONS FOR AREA OF DISTURBANCE AND SEEDING LIMITS.

SCALE 1" = 100'

STATE OF TEXAS
ELIZABETH A. ORTEGO
91106
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 3 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		103

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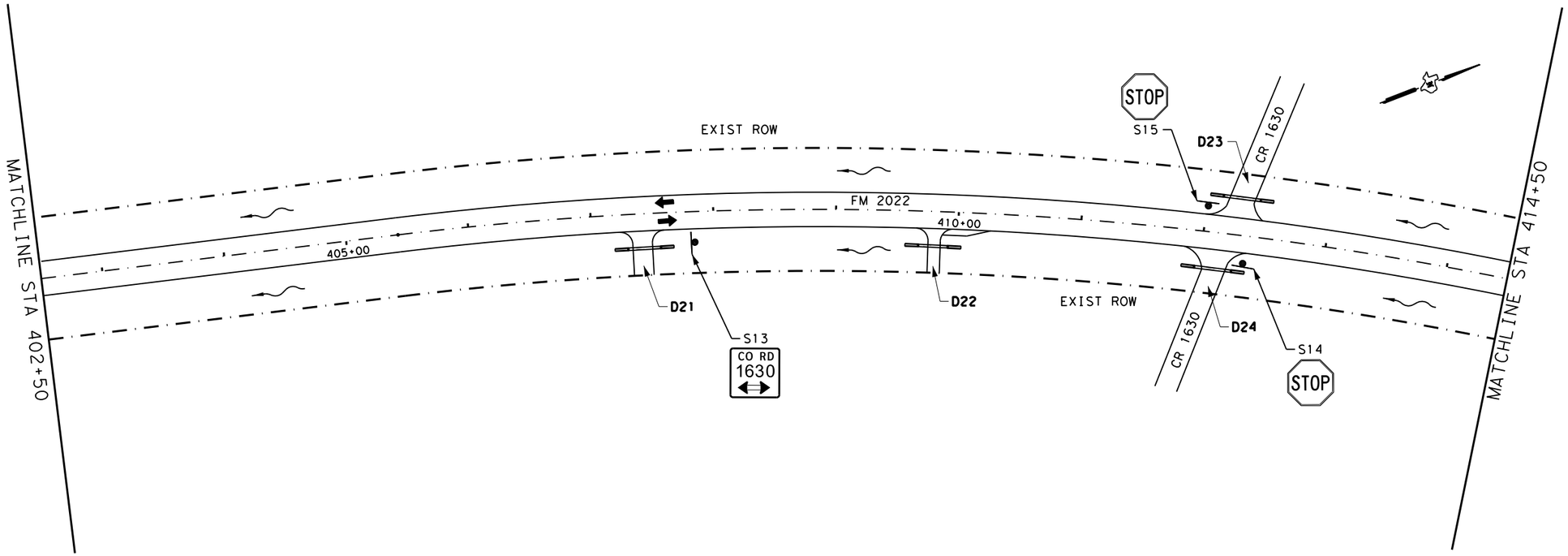

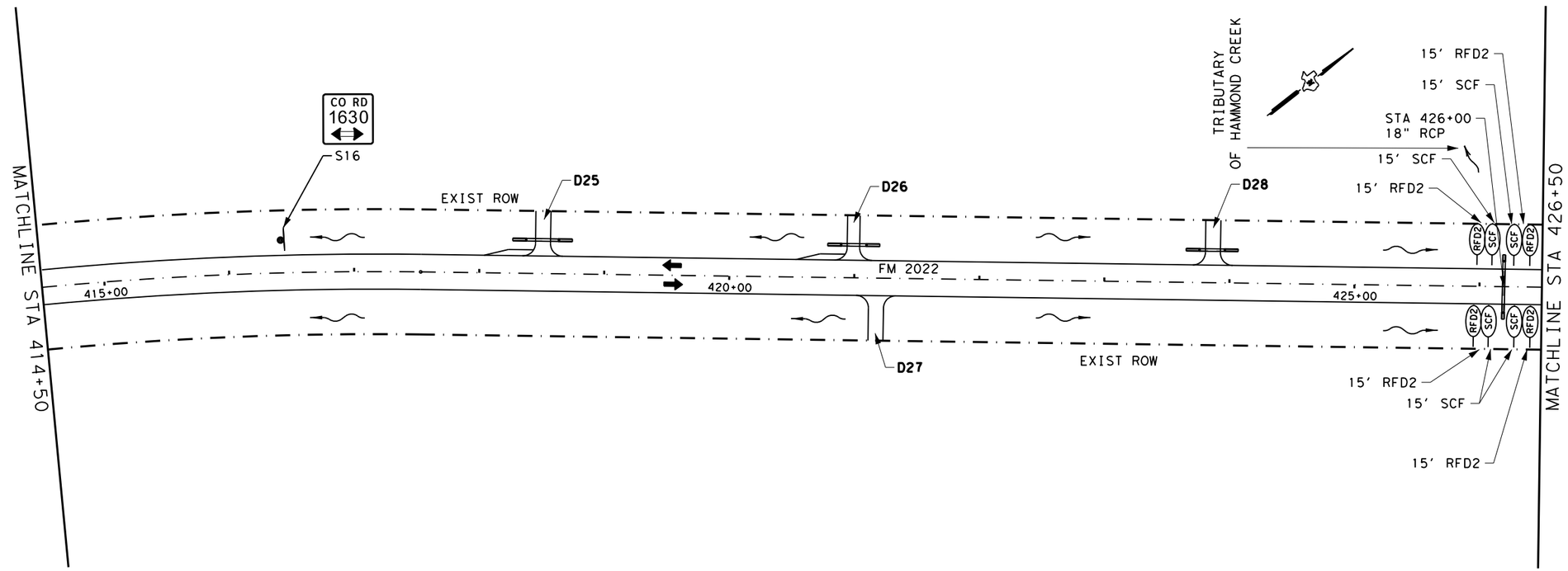

LEGEND

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 4 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		104

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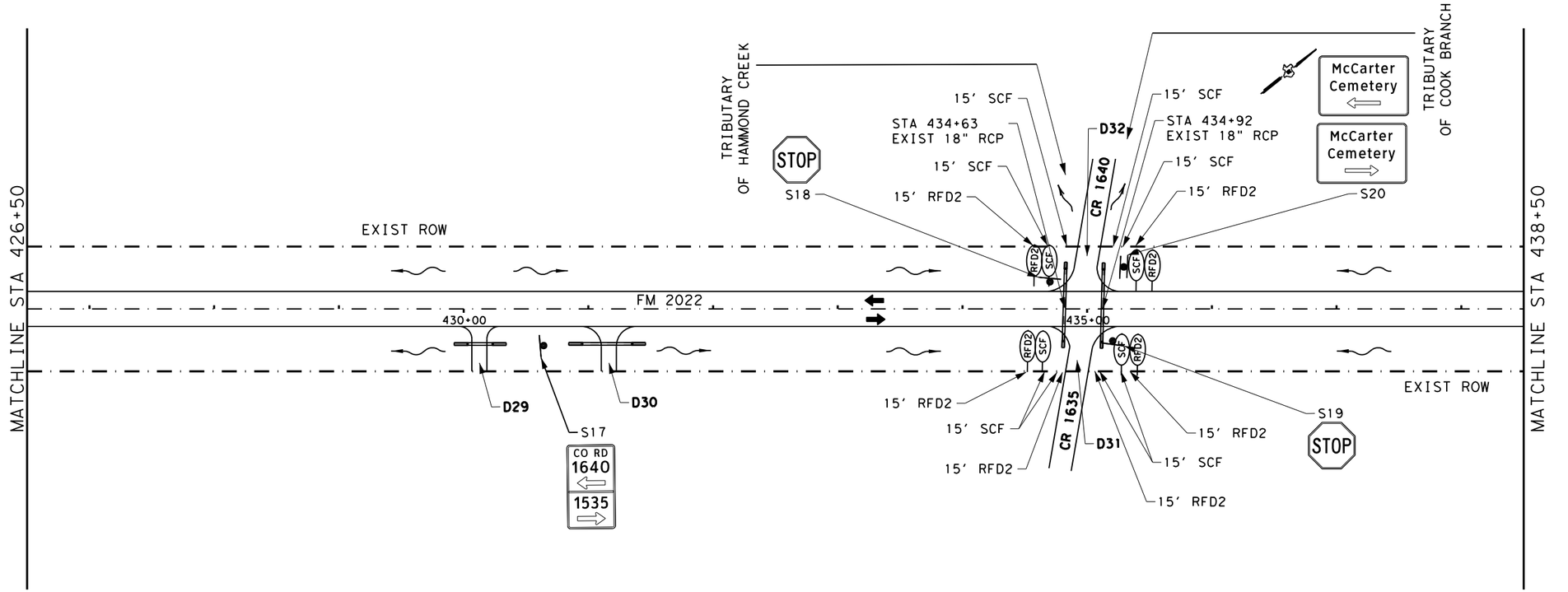

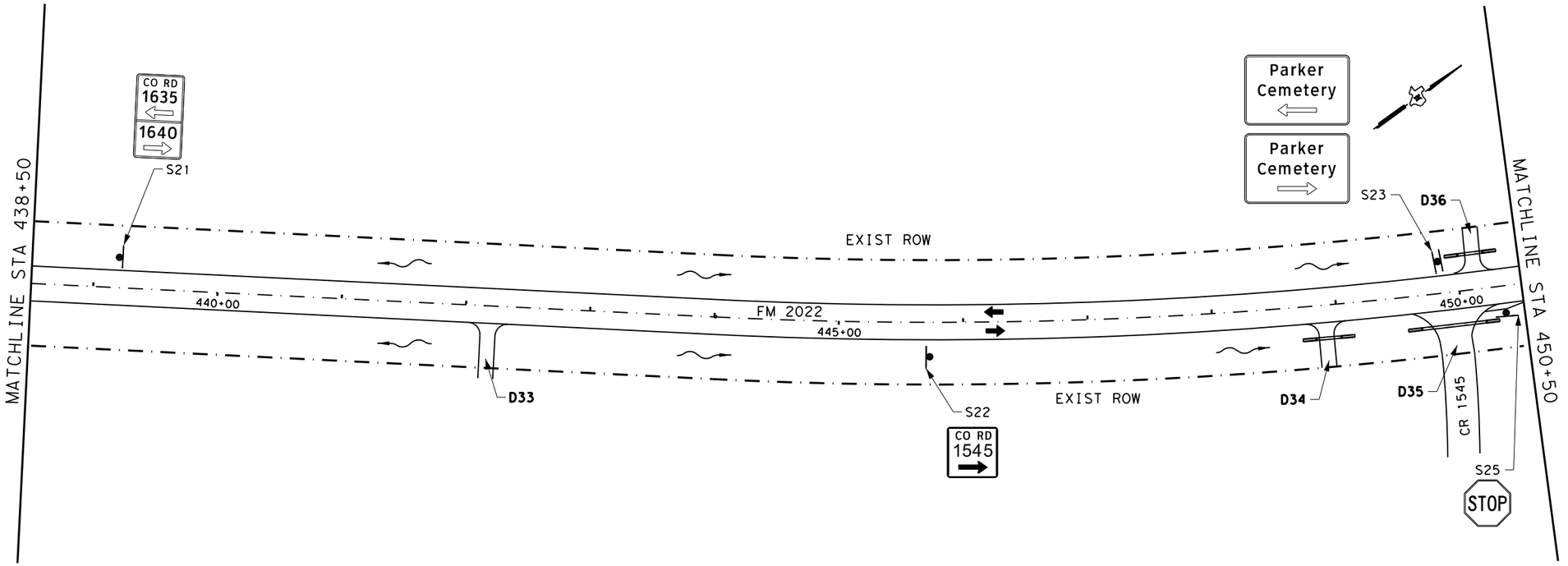

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 5 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		105

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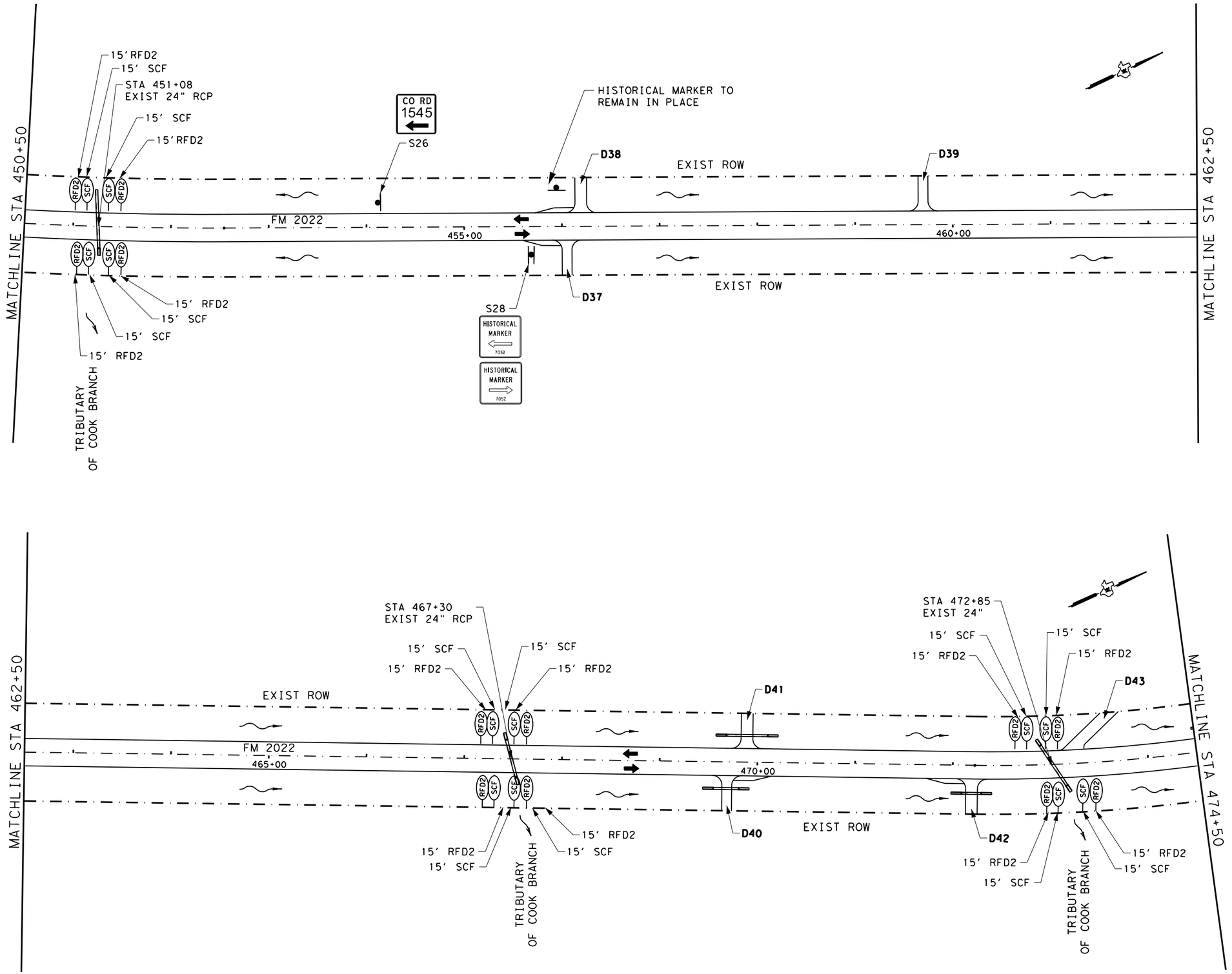

LEGEND

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6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 6 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		106

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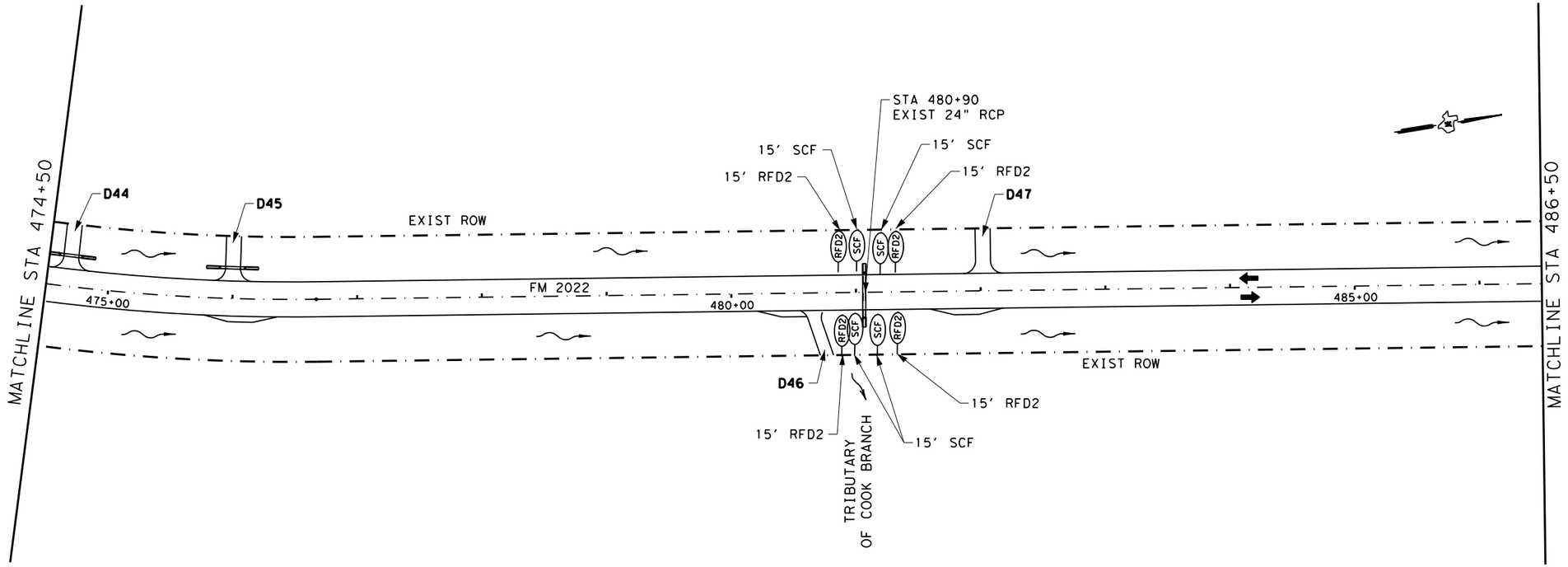

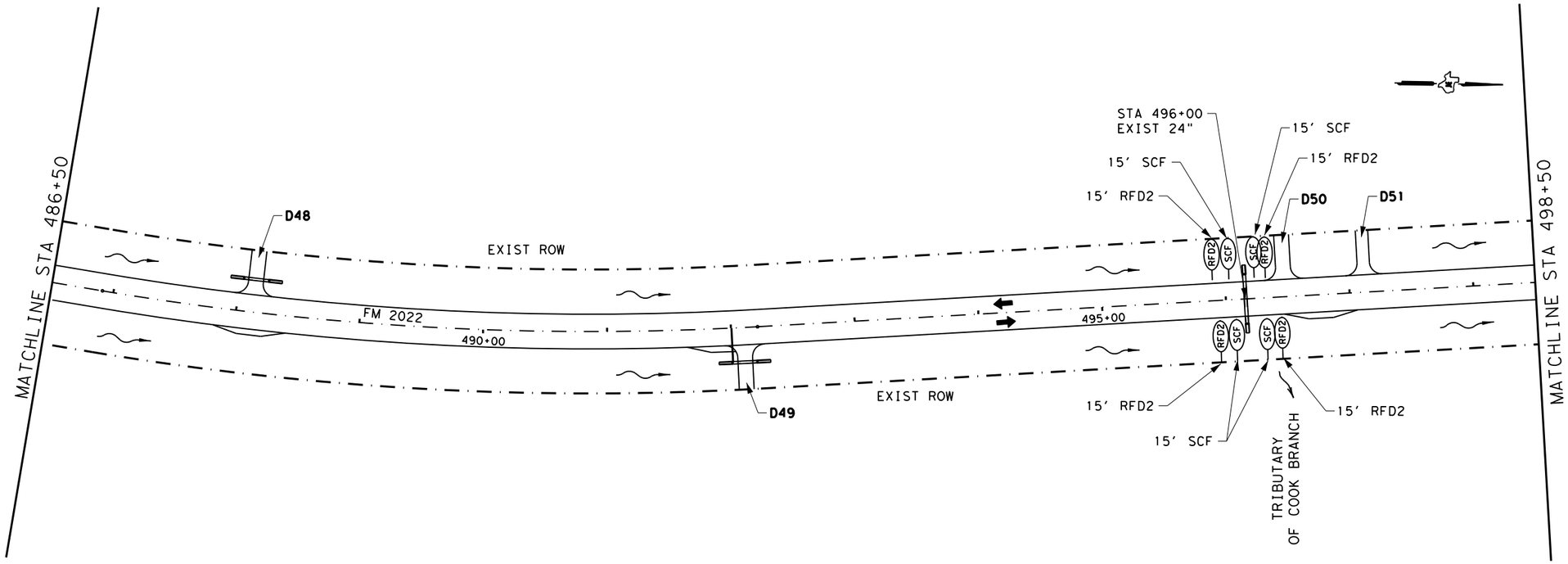

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6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 7 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		107

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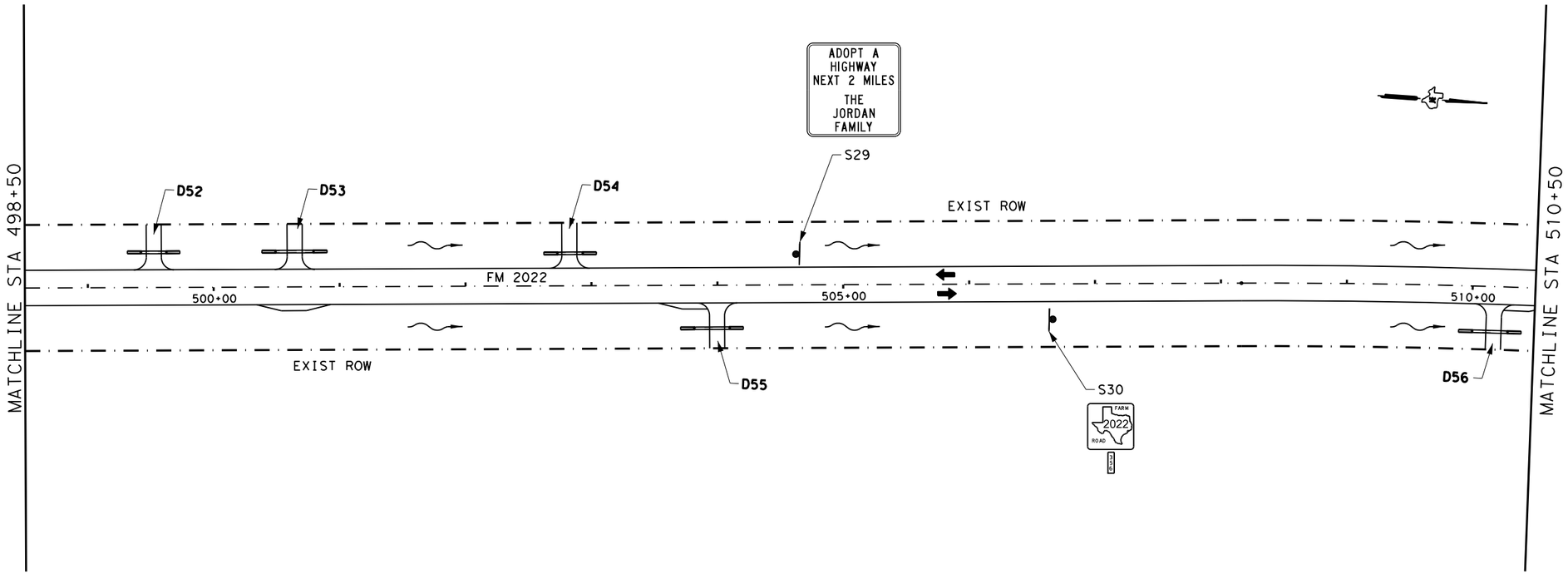

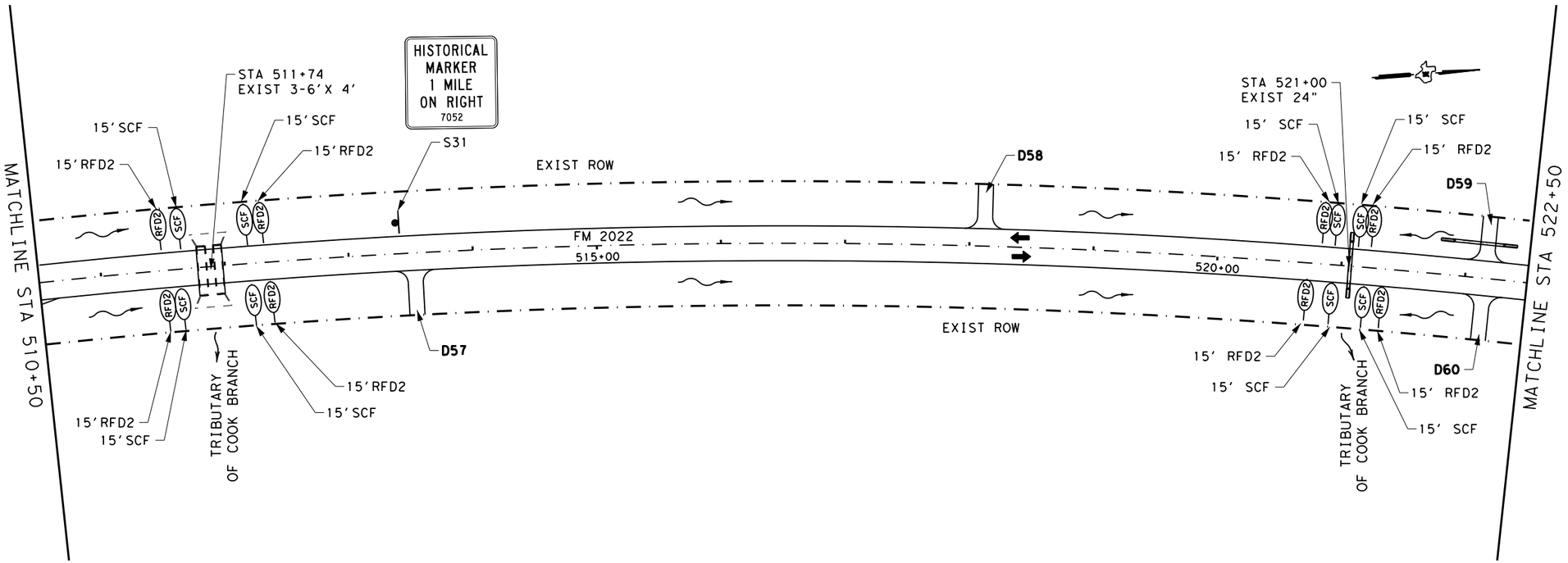

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6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 8 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		108

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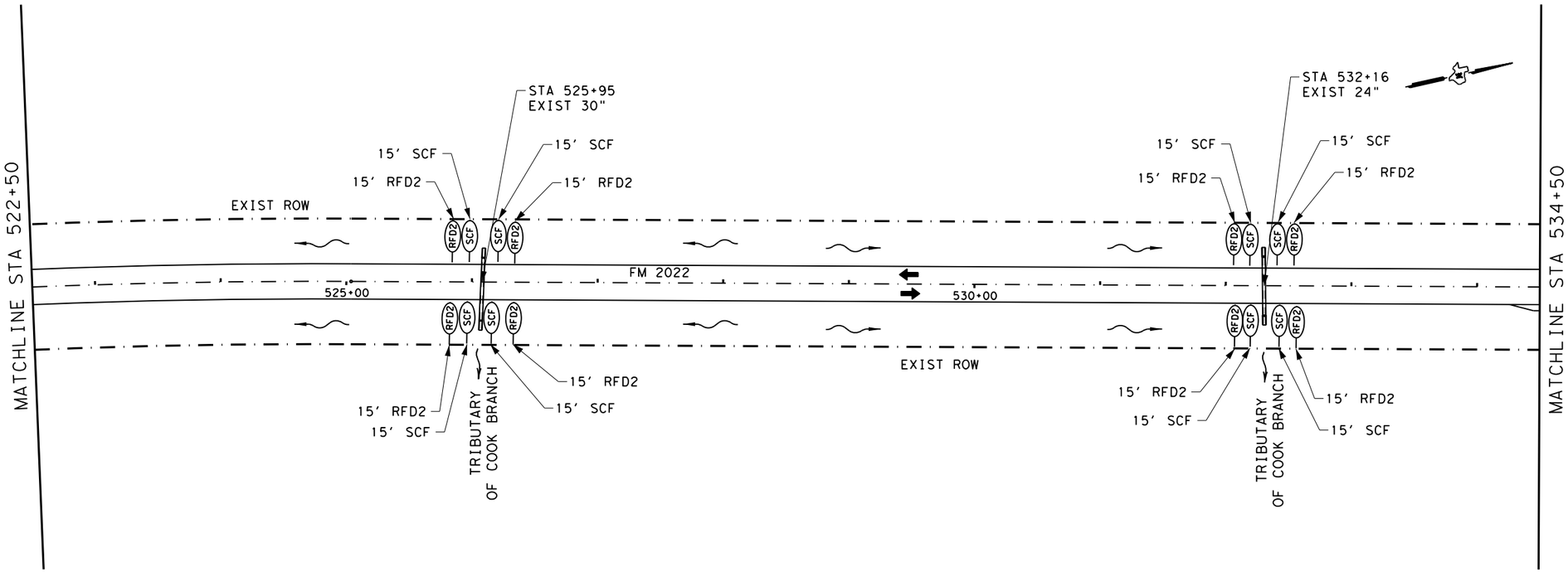

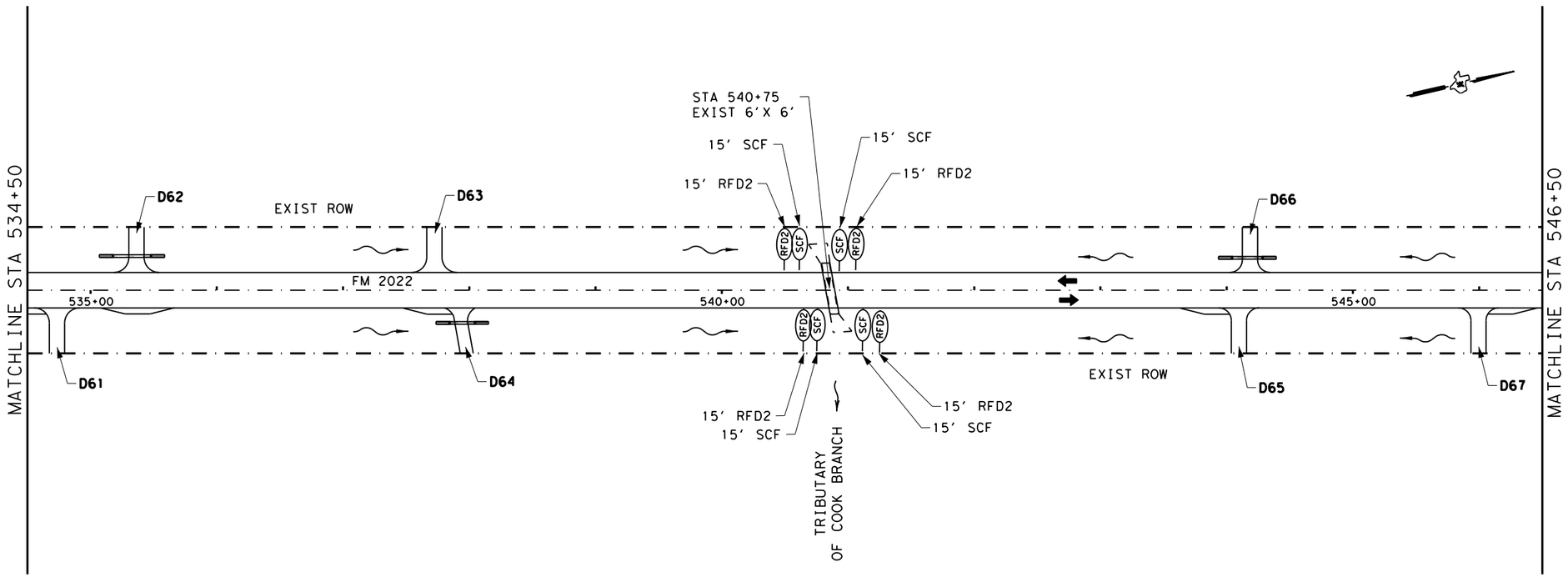

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 9 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		109

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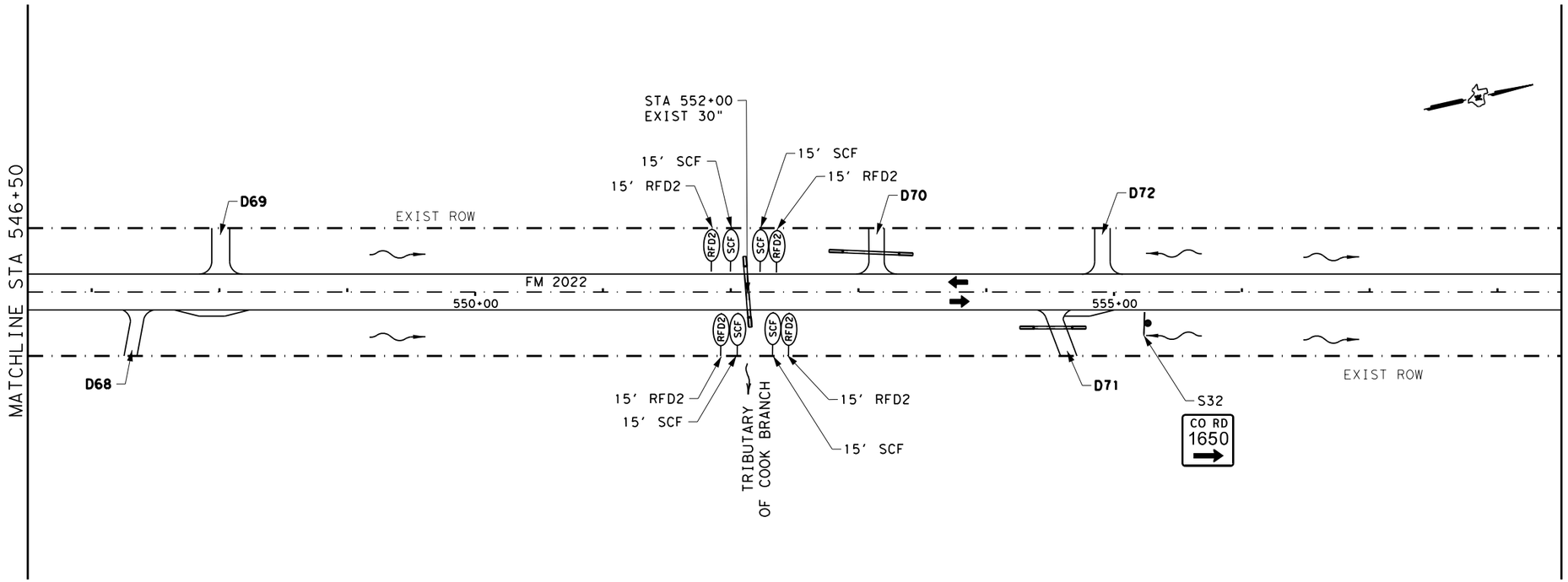

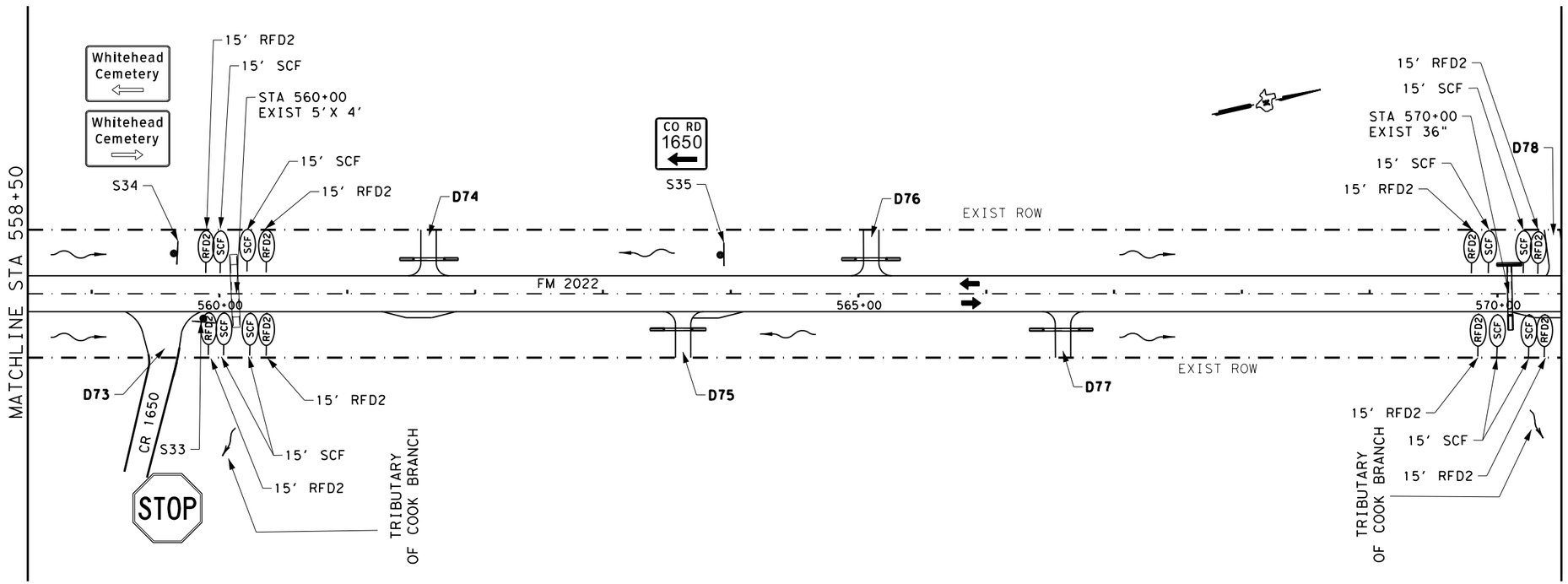

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 10 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		110

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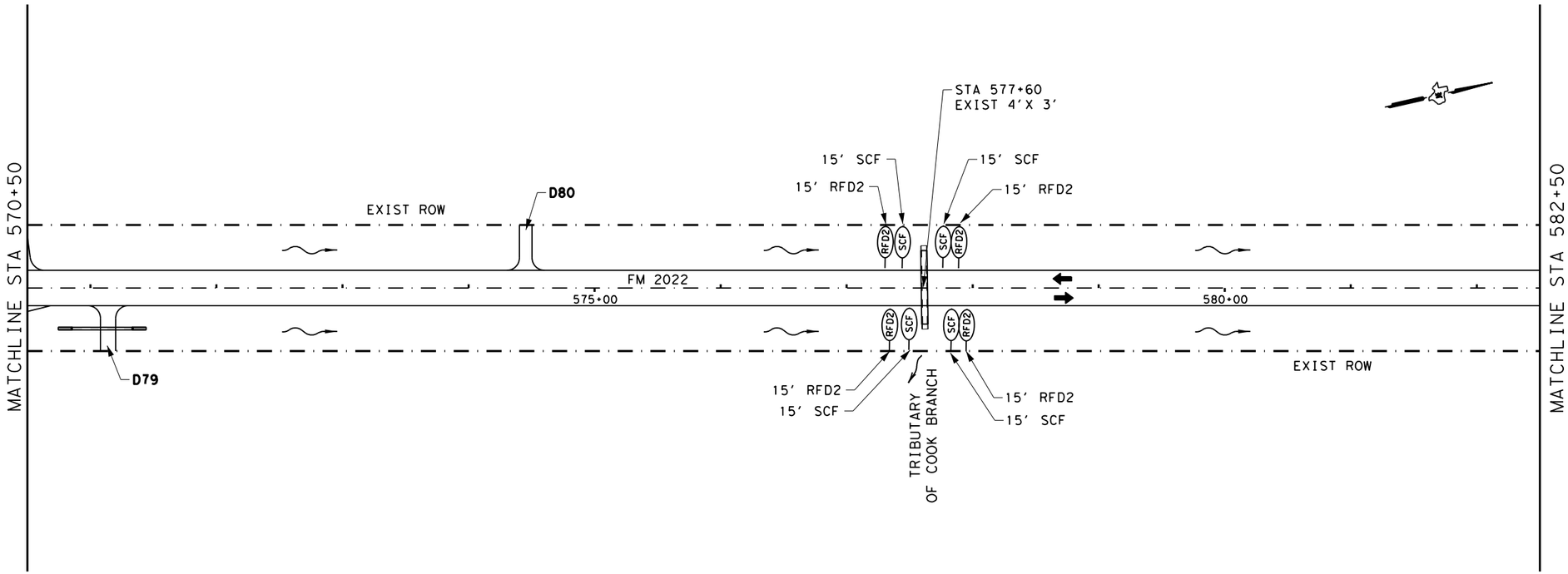

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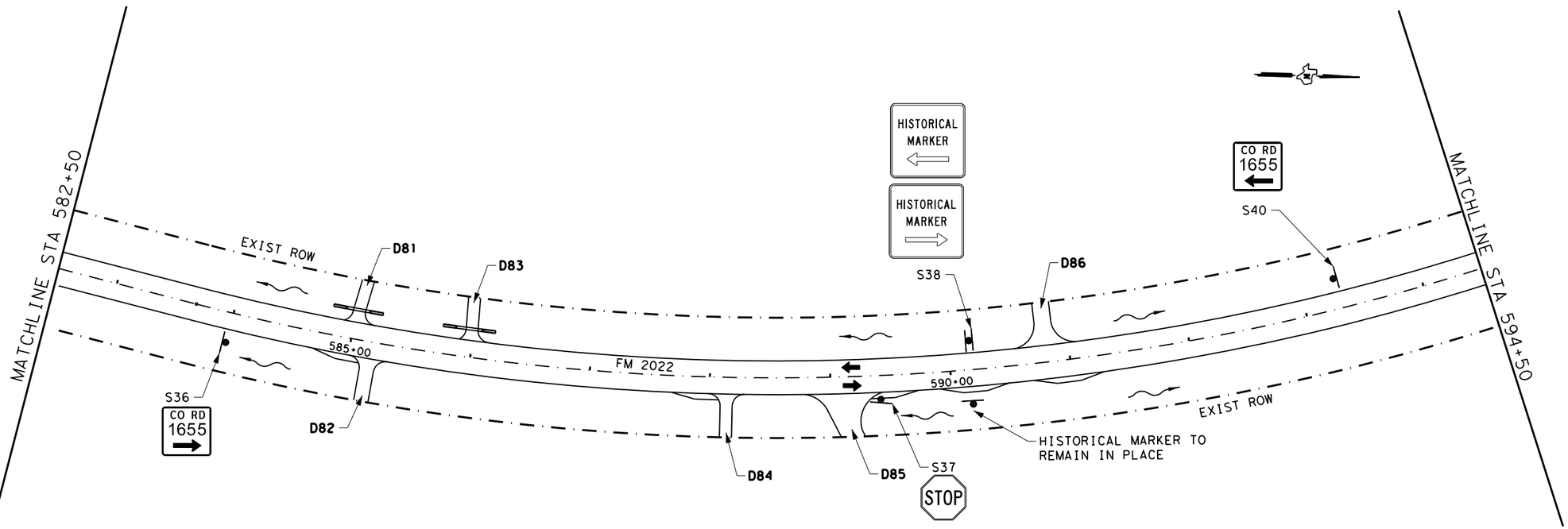

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1B27AAE71511446...
6/2/2021

SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 11 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		111

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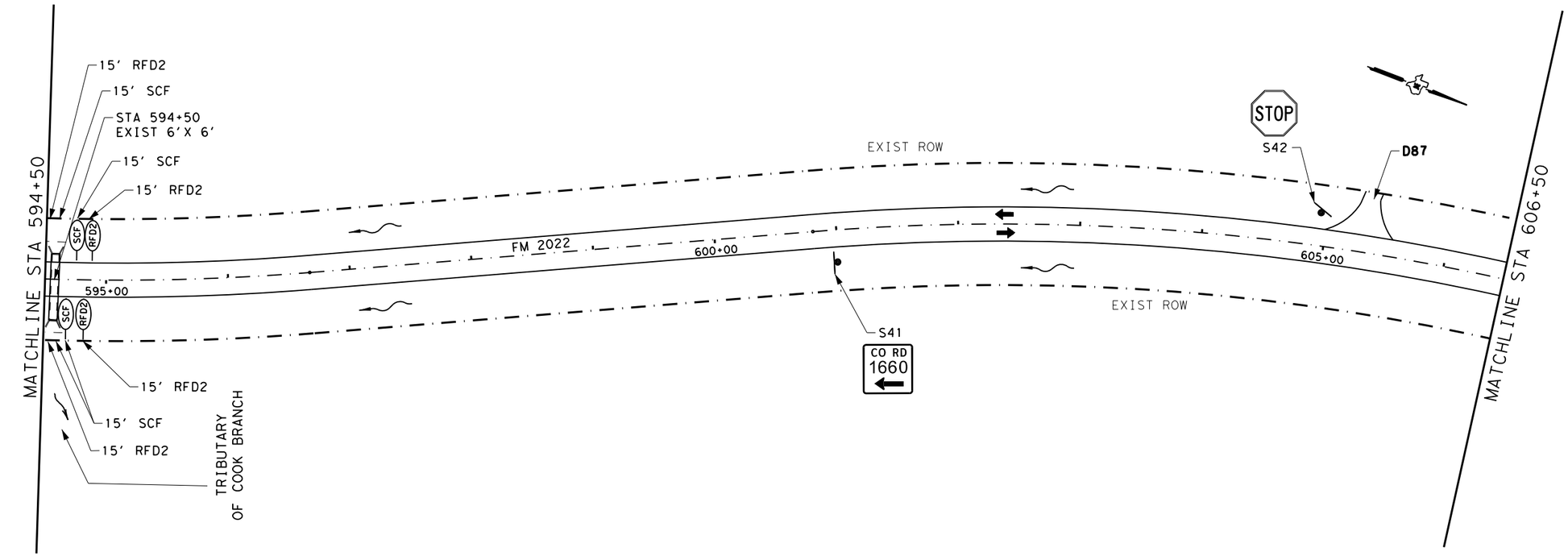

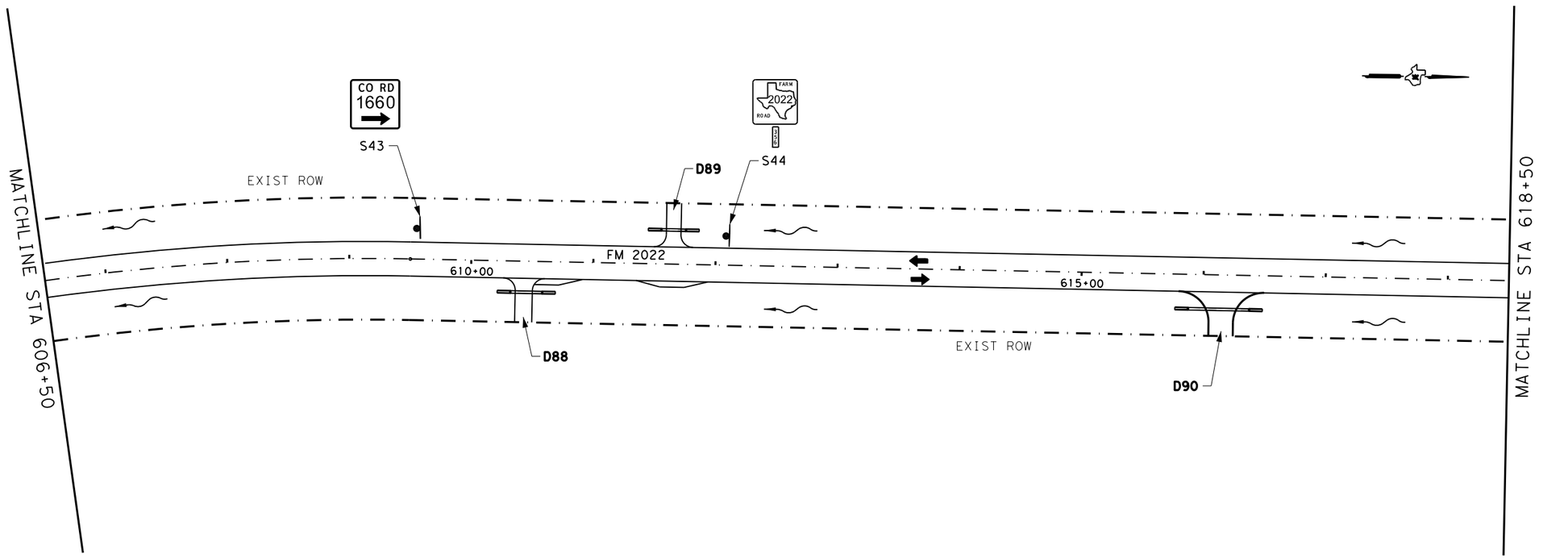

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 12 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		112

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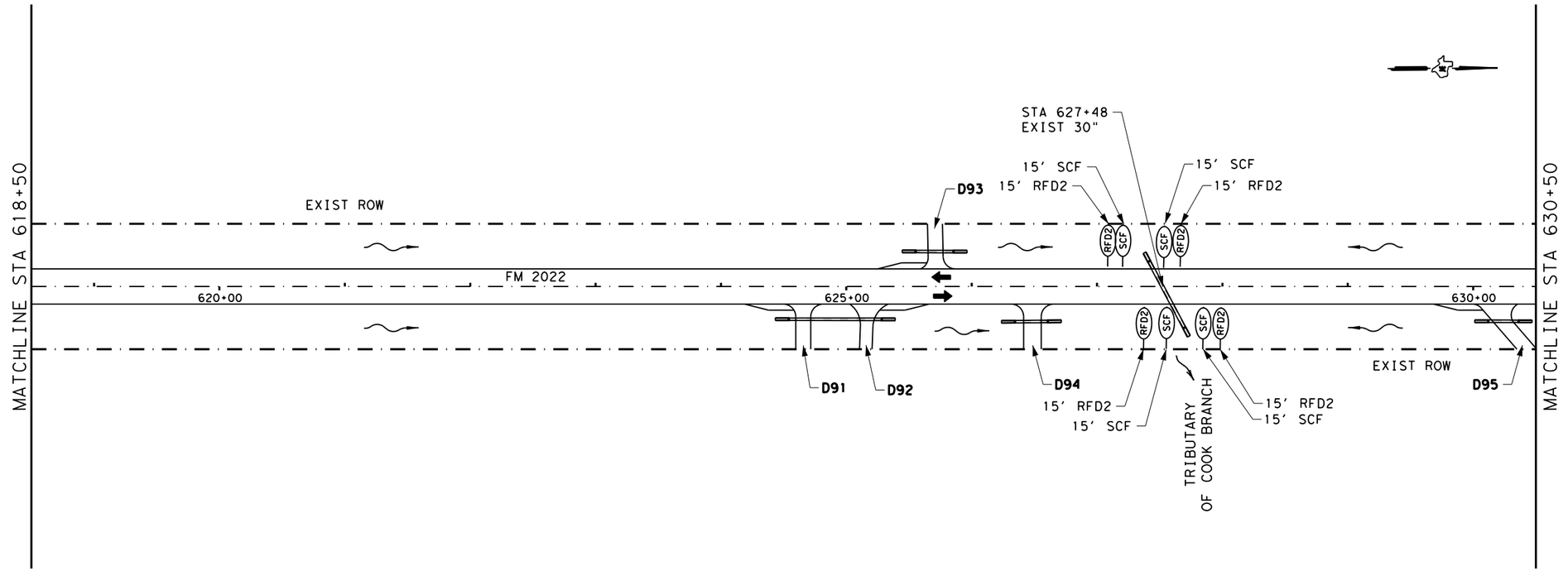

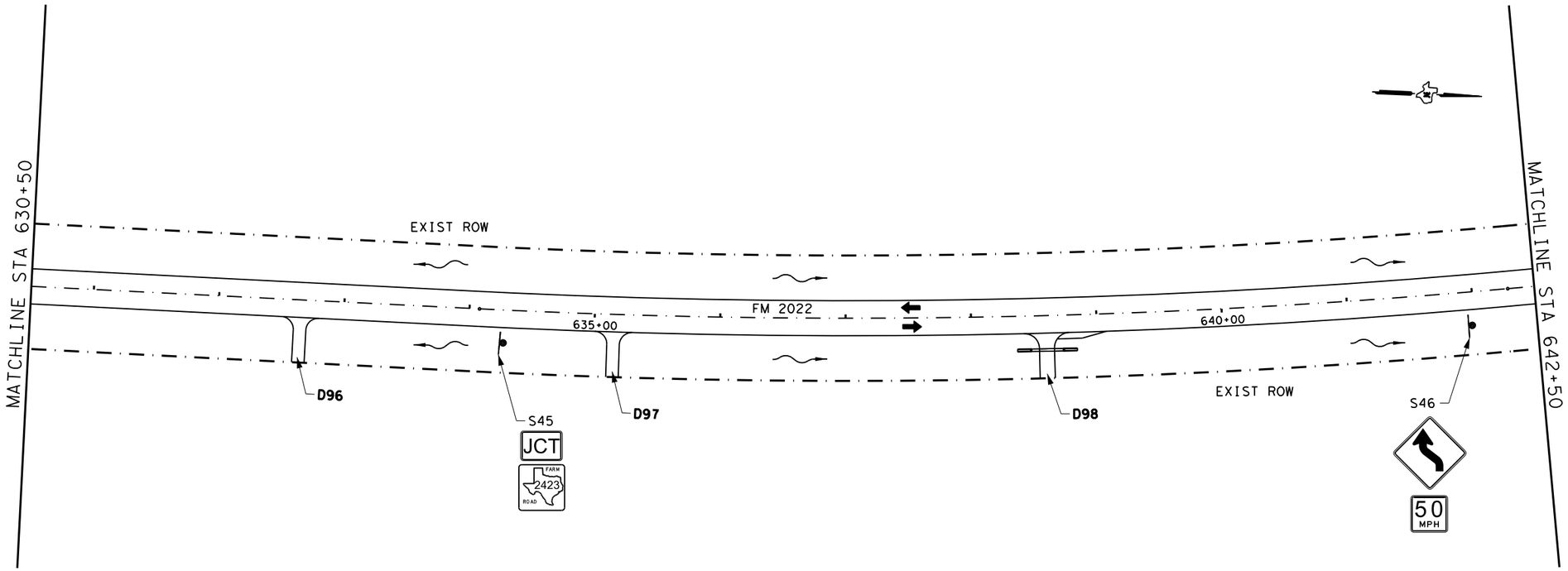

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SWP3 LAYOUT

TEXAS DEPARTMENT OF TRANSPORTATION

SHEET 13 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		113

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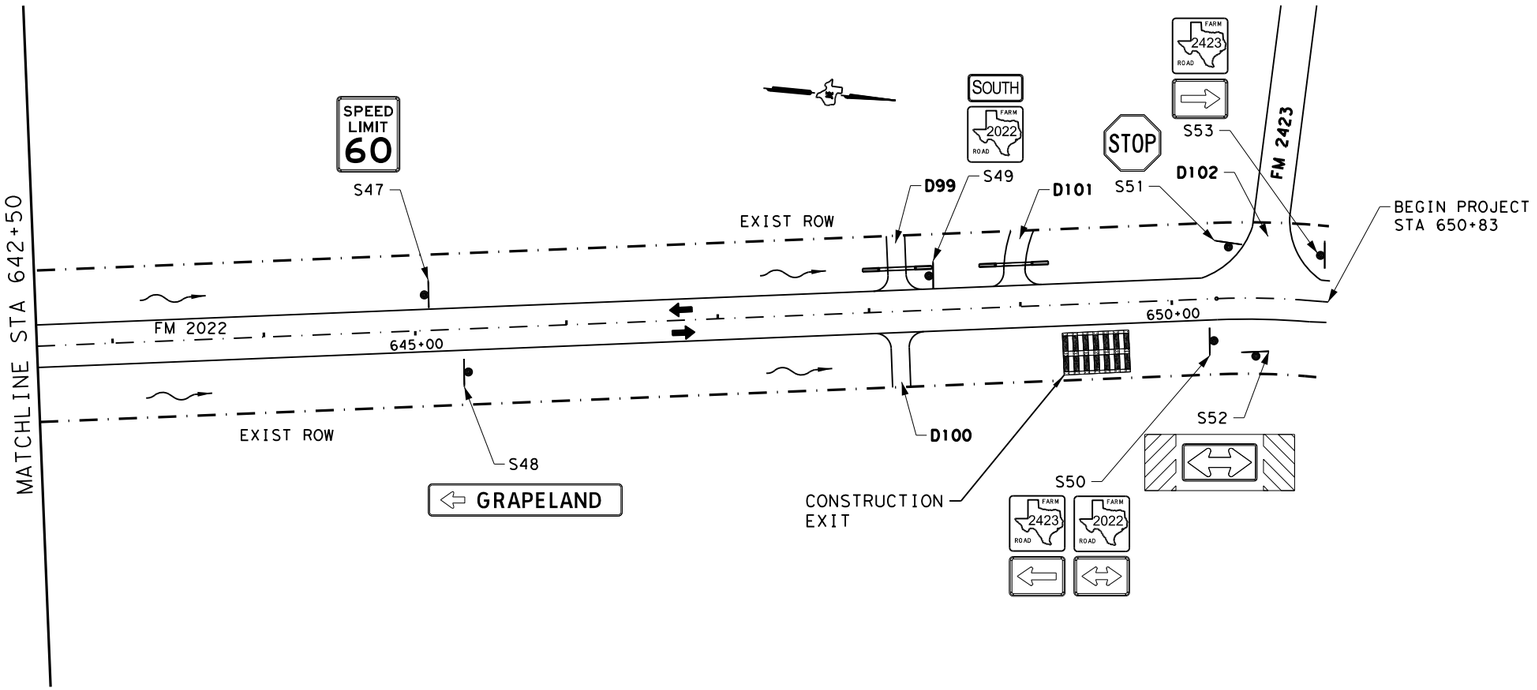

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SHEET 14 OF 14

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		114

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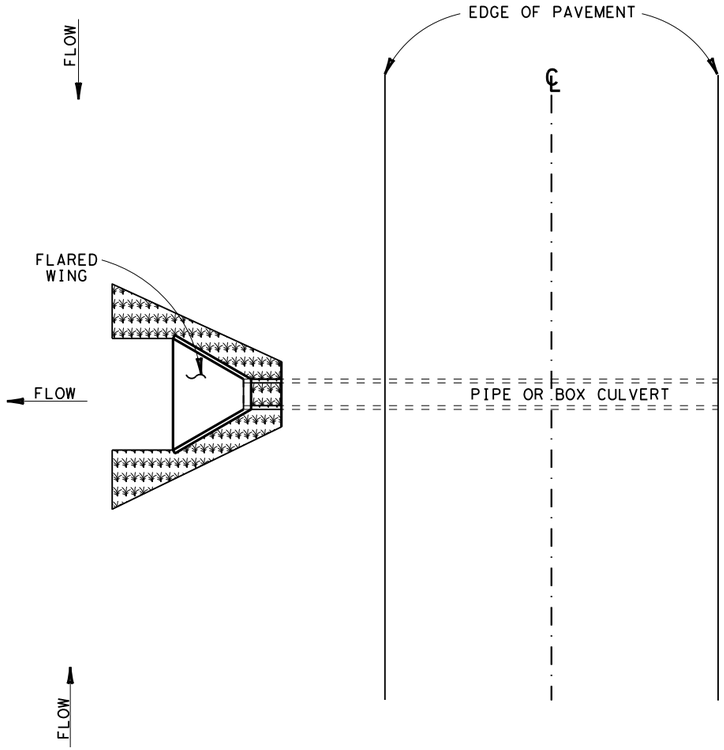
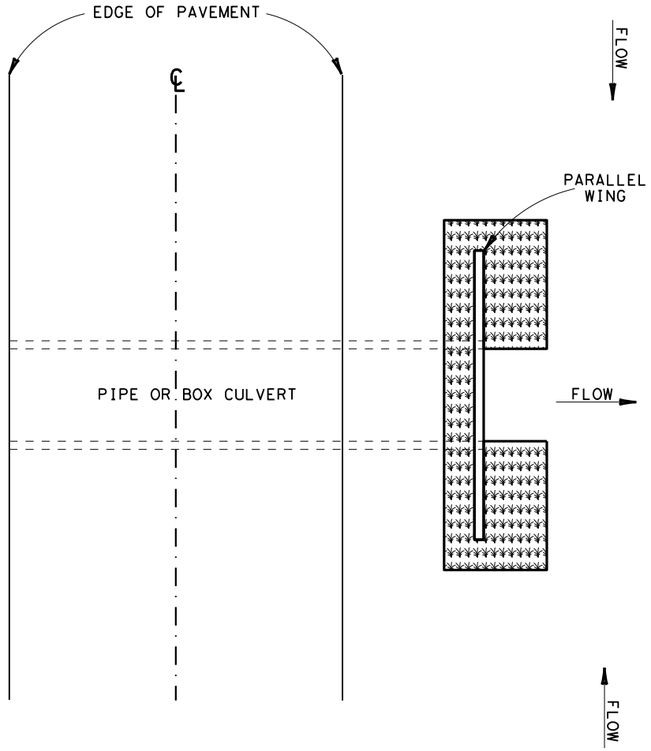
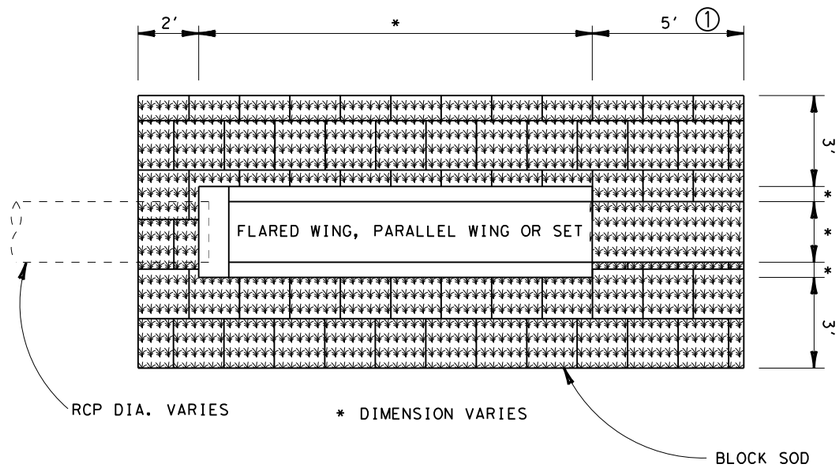




SYMBOL	DESCRIPTION
	BONDED FIBER MATRIX SEED

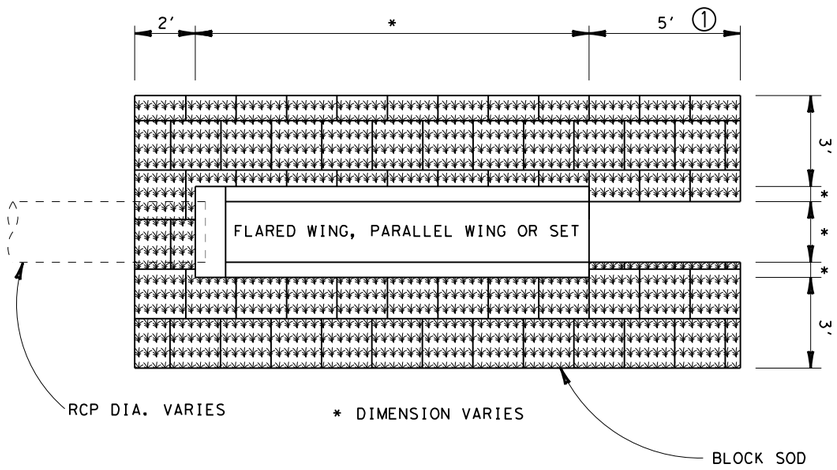
FLARED WING CROSS DRAINAGE DETAIL ①



BONDED FIBER MATRIX SEED DETAIL

PLACE AT ALL PARALLEL CULVERTS
WHERE WORK IS PROPOSED.

PARALLEL WING CROSS DRAINAGE DETAIL ①



BONDED FIBER MATRIX SEED DETAIL

PLACE AT ALL CROSSROAD CULVERTS
WHERE WORK IS PROPOSED.
DO NOT PLACE DIRECTLY IN
THE CHANNEL.

① DO NOT PLACE BONDED FIBER MATRIX SEED WHERE RIPRAP (STONE COMMON) IS INSTALLED.

N. T. S.

STATE OF TEXAS
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91106
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DocuSigned by:
Elizabeth Ortego, P.E.
1B27AAE71511446...
5/13/2021

EROSION CONTROL DETAILS

TEXAS DEPARTMENT OF TRANSPORTATION

CONT	SECT	JOB	HIGHWAY
1875	02	027	FM 2022
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		115

DATE: 5/27/2021 7:40:38 AM
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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. This project disturbs more than 5 cares of surface area

☐ No Action Required ☒ Required Action

Action No.

As this project will result in greater that 5 acres of disturbance, the following actions are required:

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SWP3 and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SWP3 information on or near the site , accessible to mthe public and TCEQ, EPA or other inspectors
4. 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. Various un-named streams

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. An Official State Historical Marker and paved turnout is located within the project limits on FM 2022. No storage of materials or equipment is allowed near the marker location. Contractor is responsible for preventing damage to the marker during the entire construction project. Contractor to repair or replace in kind, at his own expense, any historic marker damaged in the course of executing the work. Contractor is responsible for locating replacement sources for historic materials damaged in the course of work. If the marker is damaged, contact the Lufkin District Environmental Section at 1-800-687-8087. TxDOT - Environmental Affairs Division would be informed of proposed repairs to consult with Texas Historical Commission prior to execution of repair work.

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.

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

☐ No Action Required ☒ Required Action

Action No.

If any state/federally species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately.

In order to maintain compliance with Chapter 64 of the Texas Parks and Wildlife Code and Migratory Bird Treaty Act (MBTA), construction activities that may affect nests (i.e. tree removal, tree limbing, bridge work) shall be conducted outside of the nesting season (March 15 to September 15). In the event birds or active nests (eggs and/or nestlings present) are encountered, contact the engineer prior to conducting work.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SWP3:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

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

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

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

Contact the Engineer if any of the following are detected:

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

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

☐ Yes ☒ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

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

☐ Yes ☐ No

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

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

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

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

☒ No Action Required ☐ Required Action

Action No.

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

Action No.

Texas Department of Transportation

Design Standard

EPIC

(ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS)

SHEET 1 OF 2

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: May 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-12-2011 (DS)	1875	02	027	FM 2022
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY		SHEET NO.
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	LFK	HOUSTON		116

NWP GENERAL CONDITIONS

AS APPLICABLE TO
THIS PROJECT

2. AQUATIC LIFE MOVEMENTS. NO ACTIVITY MAY SUBSTANTIALLY DISRUPT THE NECESSARY LIFE CYCLE MOVEMENTS OF THOSE SPECIES OF AQUATIC LIFE INDIGENOUS TO THE WATERBODY, INCLUDING THOSE SPECIES THAT NORMALLY MIGRATE THROUGH THE AREA, UNLESS THE ACTIVITY'S PRIMARY PURPOSE IS TO IMPOUND WATER.

3. SPAWNING AREAS. ACTIVITIES IN SPAWNING AREAS DURING SPAWNING SEASONS MUST BE AVOIDED TO THE MAXIMUM EXTENT PRACTICABLE. ACTIVITIES THAT RESULT IN THE PHYSICAL DESTRUCTION (E.G., THROUGH EXCAVATION, FILL, OR DOWNSTREAM SMOTHERING BY SUBSTANTIAL TURBIDITY) OF AN IMPORTANT SPAWNING AREA ARE NOT AUTHORIZED.

6. SUITABLE MATERIAL. NO ACTIVITY MAY USE UNSUITABLE MATERIAL (E.G., TRASH, DEBRIS, CAR BODIES, ASPHALT, ETC.). MATERIAL USED FOR CONSTRUCTION OR DISCHARGED MUST BE FREE FROM TOXIC POLLUTANTS IN TOXIC AMOUNTS (SEE SECTION 307 OF THE CLEAN WATER ACT).

8. ADVERSE EFFECTS FROM IMPOUNDMENTS. IF THE ACTIVITY CREATES AN IMPOUNDMENT OF WATER, ADVERSE EFFECTS TO THE AQUATIC SYSTEM DUE TO ACCELERATING THE PASSAGE OF WATER, AND/OR RESTRICTING ITS FLOW MUST BE MINIMIZED TO THE MAXIMUM EXTENT PRACTICABLE.

9. MANAGEMENT OF WATER FLOWS. TO THE MAXIMUM EXTENT PRACTICABLE, THE PRE-CONSTRUCTION COURSE, CONDITION, CAPACITY, AND LOCATION OF OPEN WATERS MUST BE MAINTAINED FOR EACH ACTIVITY, INCLUDING STREAM CHANNELIZATION AND STORM WATER MANAGEMENT ACTIVITIES, EXCEPT AS PROVIDED BELOW. THE ACTIVITY MUST BE CONSTRUCTED TO WITHSTAND EXPECTED HIGH FLOWS. THE ACTIVITY MUST NOT RESTRICT OR IMPEDE THE PASSAGE OF NORMAL OR HIGH FLOWS, UNLESS THE PRIMARY PURPOSE OF THE ACTIVITY IS TO IMPOUND WATER OR MANAGE HIGH FLOWS. THE ACTIVITY MAY ALTER THE PRE-CONSTRUCTION COURSE, CONDITION, CAPACITY, AND LOCATION OF OPEN WATERS IF IT BENEFITS THE AQUATIC ENVIRONMENT (E.G., STREAM RESTORATION OR RELOCATION ACTIVITIES).

11. EQUIPMENT. HEAVY EQUIPMENT WORKING IN WETLANDS OR MUD FLATS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE.

12. SOIL EROSION AND SEDIMENT CONTROLS. APPROPRIATE SOIL EROSION AND SEDIMENT CONTROLS MUST BE USED AND MAINTAINED IN EFFECTIVE OPERATING CONDITION DURING CONSTRUCTION, AND ALL EXPOSED SOIL AND OTHER FILLS, AS WELL AS ANY WORK BELOW THE ORDINARY HIGH WATER MARK OR HIGH TIDE LINE, MUST BE PERMANENTLY STABILIZED AT THE EARLIEST PRACTICABLE DATE. PERMITTEES ARE ENCOURAGED TO PERFORM WORK WITHIN WATERS OF THE UNITED STATES DURING PERIODS OF LOW-FLOW OR NO-FLOW.

13. REMOVAL OF TEMPORARY FILLS. TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO PRE-CONSTRUCTION ELEVATIONS. THE AFFECTED AREAS MUST BE REVEGETATED, AS APPROPRIATE.

14. PROPER MAINTENANCE. ANY AUTHORIZED STRUCTURE OR FILL SHALL BE PROPERLY MAINTAINED, INCLUDING MAINTENANCE TO ENSURE PUBLIC SAFETY AND COMPLIANCE WITH APPLICABLE NWP GENERAL CONDITIONS, AS WELL AS ANY ACTIVITY-SPECIFIC CONDITIONS ADDED BY THE DISTRICT ENGINEER TO AN NWP AUTHORIZATION.

23. MITIGATION. THE DISTRICT ENGINEER WILL CONSIDER SEVERAL FACTORS WHEN DETERMINING APPROPRIATE AND PRACTICABLE MITIGATION NECESSARY TO ENSURE THAT ADVERSE EFFECTS ON THE AQUATIC ENVIRONMENT ARE MINIMAL.

25. WATER QUALITY. WHERE STATES AND AUTHORIZED TRIBES, OR EPA WHERE APPLICABLE, HAVE NOT PREVIOUSLY CERTIFIED COMPLIANCE OF AN NWP WITH CWA SECTION 401, INDIVIDUAL 401 WATER QUALITY CERTIFICATION MUST BE OBTAINED OR WAIVED (SEE 33 CFR 330.4(C)). THE DISTRICT ENGINEER OR STATE OR TRIBE MAY REQUIRE ADDITIONAL WATER QUALITY MANAGEMENT MEASURES TO ENSURE THAT THE AUTHORIZED ACTIVITY DOES NOT RESULT IN MORE THAN MINIMAL DEGRADATION OR WATER QUALITY.

27. REGIONAL AND CASE-BY-CASE CONDITIONS. THE ACTIVITY MUST COMPLY WITH ANY REGIONAL CONDITIONS THAT MAY HAVE BEEN ADDED BY THE DIVISION ENGINEER (SEE 33 CFR 330.4(E)) AND WITH ANY CASE SPECIFIC CONDITIONS ADDED BY THE CORPS OR BY THE STATE, INDIAN TRIBE, OR U.S. EPA IN ITS SECTION 401 WATER QUALITY CERTIFICATION, OR BY THE STATE IN ITS COASTAL ZONE MANAGEMENT ACT CONSISTENCY DETERMINATION.

FOR A COMPLETE LIST OF GENERAL CONDITIONS GO TO:
http://www.swf.usace.army.mil/Missions/Regulatory/Permitting/NationwideGeneralPermits.aspx

USACE - PERMIT #14

AS APPLICABLE TO
THIS PROJECT

ACTIVITIES REQUIRED FOR CROSSINGS OF WATERS OF THE UNITED STATES ASSOCIATED WITH THE CONSTRUCTION, EXPANSION, MODIFICATION, OR IMPROVEMENT OF LINEAR TRANSPORTATION PROJECTS (E.G., ROADS, HIGHWAYS, RAILWAYS, TRAILS, AIRPORT RUNWAYS, AND TAXIWAYS) IN WATERS OF THE U.S. FOR LINEAR TRANSPORTATION PROJECTS IN NON-TIDAL WATERS, THE DISCHARGE CANNOT CAUSE THE LOSS OF GREATER THAN 1/2-ACRE OF WATERS OF THE U.S. ANY STREAM CHANNEL MODIFICATION, INCLUDING BANK STABILIZATION, IS LIMITED TO THE MINIMUM NECESSARY TO CONSTRUCT OR PROTECT THE LINEAR TRANSPORTATION PROJECT; SUCH MODIFICATIONS MUST BE IN THE IMMEDIATE VICINITY OF THE PROJECT.

THIS NWP ALSO AUTHORIZES TEMPORARY STRUCTURES, FILLS, AND WORK NECESSARY TO CONSTRUCT THE LINEAR TRANSPORTATION PROJECT. APPROPRIATE MEASURES MUST BE TAKEN TO MAINTAIN DOWNSTREAM FLOWS AND MINIMIZE FLOODING TO THE MAXIMUM EXTENT PRACTICABLE, WHEN TEMPORARY STRUCTURES, WORK, AND DISCHARGES, INCLUDING COFFERDAMS, ARE NECESSARY FOR CONSTRUCTION ACTIVITIES, ACCESS FILLS, OR DEWATERING OF CONSTRUCTION SITES. TEMPORARY FILLS MUST CONSIST OF MATERIALS, AND BE PLACED IN A MANNER THAT WILL NOT BE ERODED BY EXPECTED HIGH FLOWS. TEMPORARY FILLS MUST BE REMOVED IN THEIR ENTIRETY AND THE AFFECTED AREAS RETURNED TO PRE-CONSTRUCTION ELEVATIONS. THE AREAS AFFECTED BY TEMPORARY FILLS MUST BE REVEGETATED, AS APPROPRIATE.

THIS NWP CANNOT BE USED TO AUTHORIZE NON-LINEAR FEATURES COMMONLY ASSOCIATED WITH TRANSPORTATION PROJECTS, SUCH AS VEHICLE MAINTENANCE OR STORAGE BUILDINGS, PARKING LOTS, TRAIN STATIONS, OR AIRCRAFT HANGARS.

NOTIFICATION: THE PERMITTEE MUST SUBMIT A PRE-CONSTRUCTION NOTIFICATION (PCN) TO THE DISTRICT ENGINEER PRIOR TO COMMENCING THE ACTIVITY IF: (1) THE LOSS OF WATERS OF THE U.S. EXCEEDS 1/10-ACRE; OR (2) THERE IS A DISCHARGE IN A SPECIAL AQUATIC SITE, INCLUDING WETLANDS.

NOTE:

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

USACE

Texas Department of Transportation

EPIC

(ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS)

SHEET 2 OF 2

FILE: epic.dgn	DN: TxDOT		CK: RG	DW: VP		CK: AR	
© TxDOT: February 2015	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1875	02	027		FM 2022		
12-12-2011 (DS)	DIST	COUNTY				SHEET NO.	
05-07-14 ADDED NOTE SECTION IV.	LFK	HOUSTON				117	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.							

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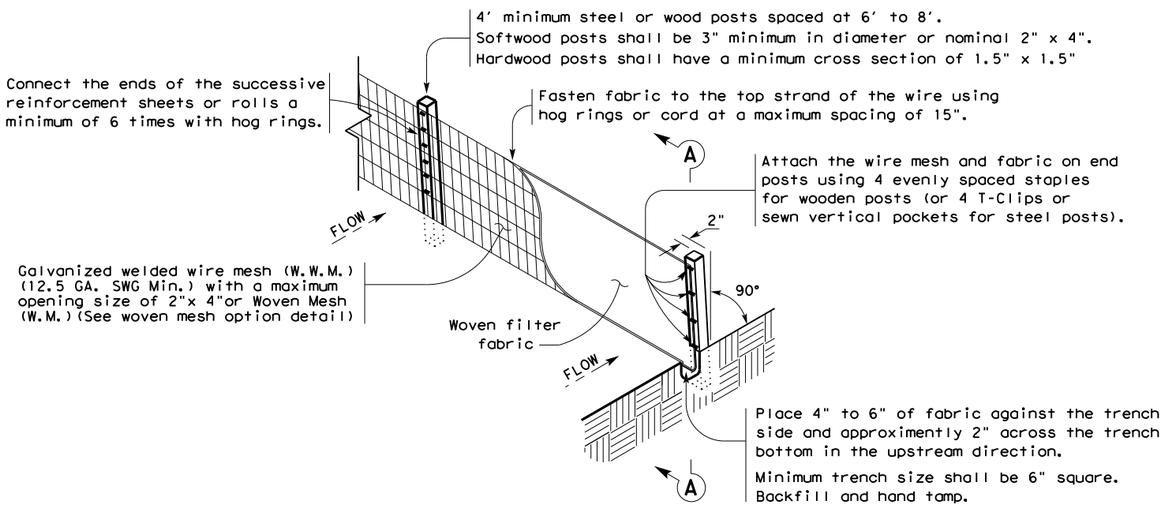
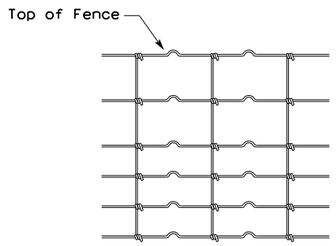
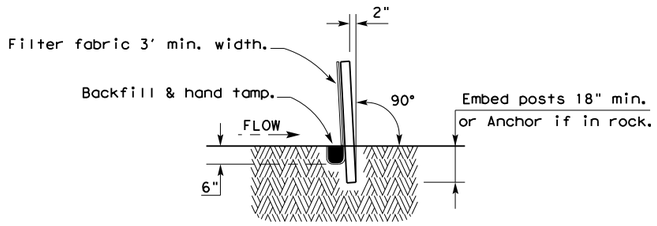


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

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

SEDIMENT CONTROL FENCE USAGE GUIDELINES

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

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

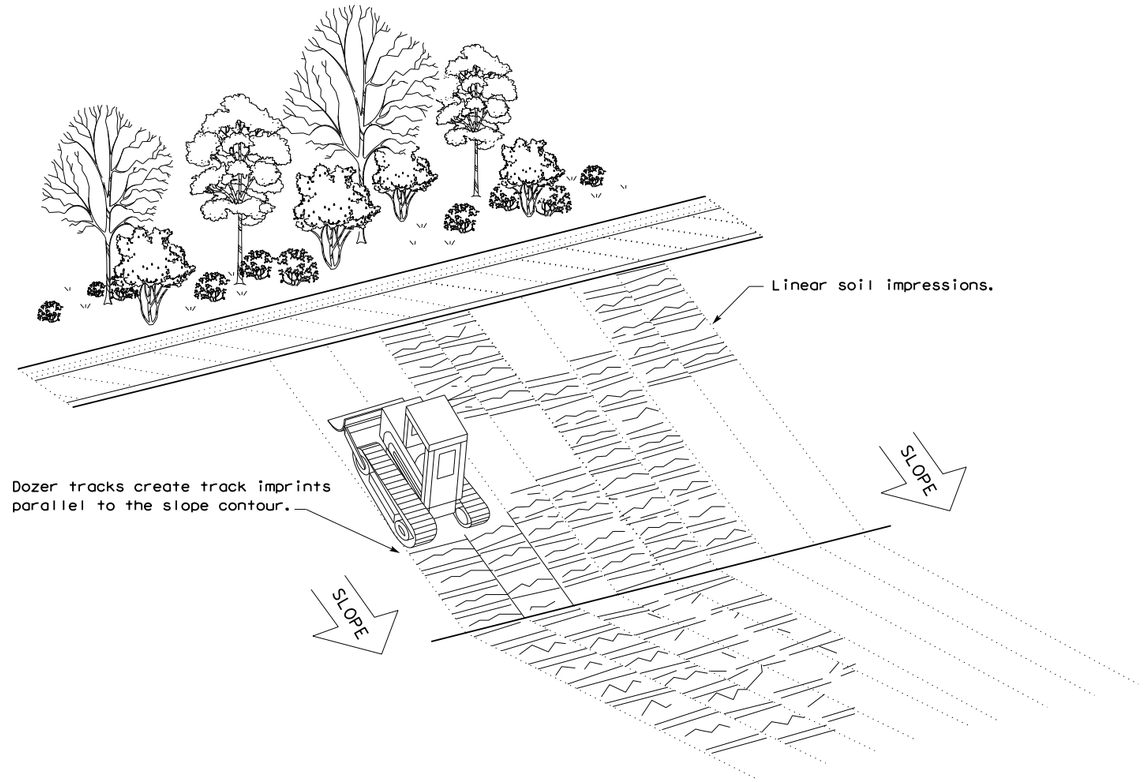
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

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



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1875	02	027		FM 2022	
	DIST	COUNTY			SHEET NO.	
	LFK	HOUSTON			118	

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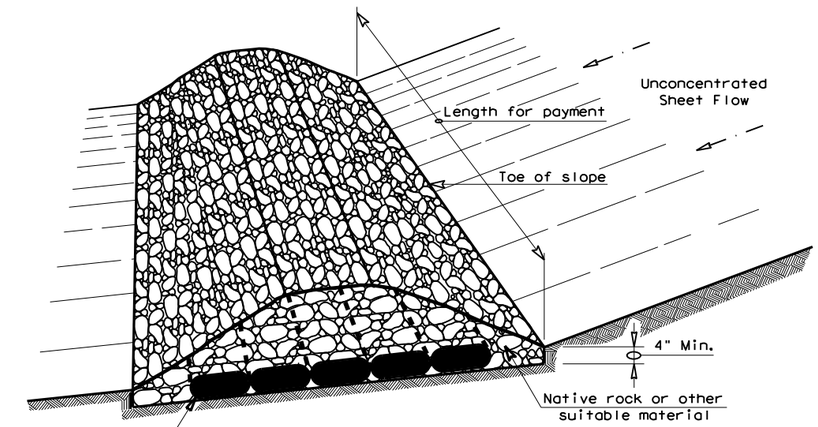
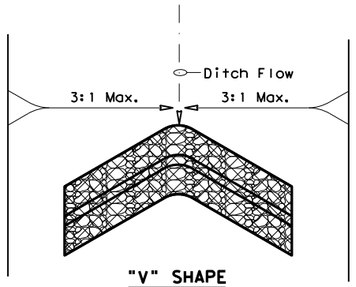
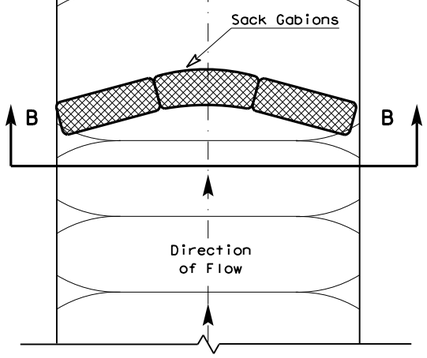


FILTER DAM AT TOE OF SLOPE

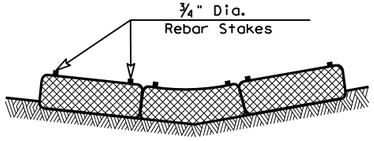
RFD1



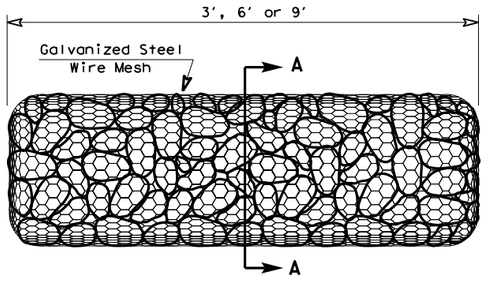
"V" SHAPE PLAN VIEW



PLAN VIEW

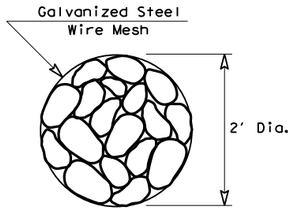


SECTION B-B

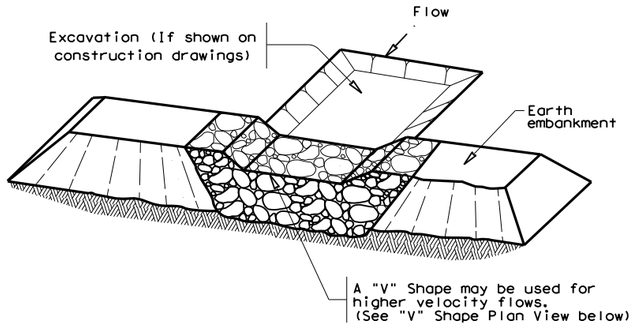


TYPE 4 (SACK GABIONS)

RFD4

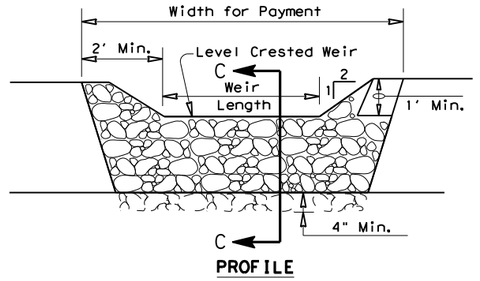


SECTION A-A

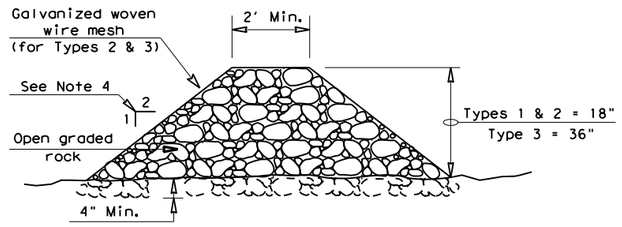


FILTER DAM AT SEDIMENT TRAP

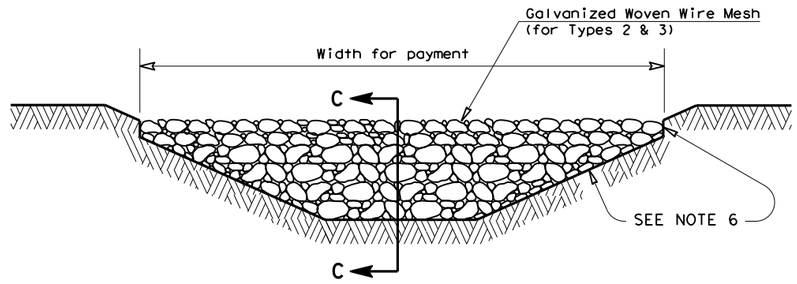
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

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

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

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

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

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

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

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

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

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1875	02	027	FM 2022	
	DIST	COUNTY		SHEET NO.	
	LFK	HOUSTON		119	

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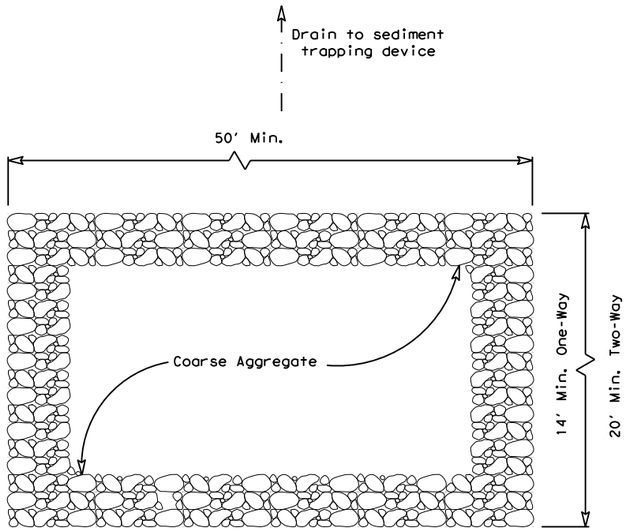
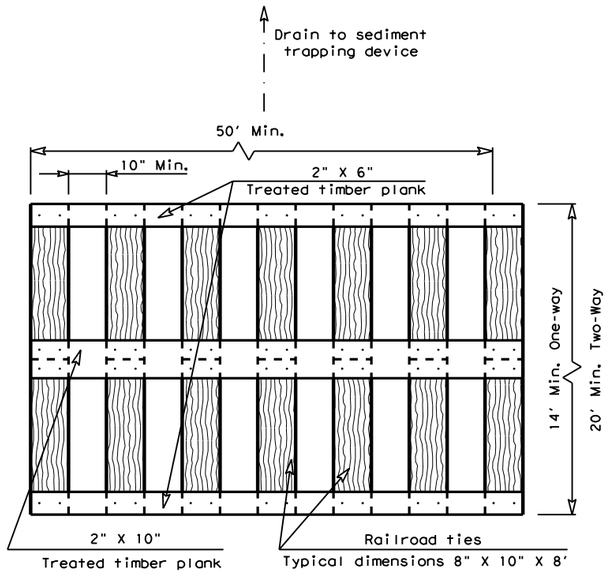
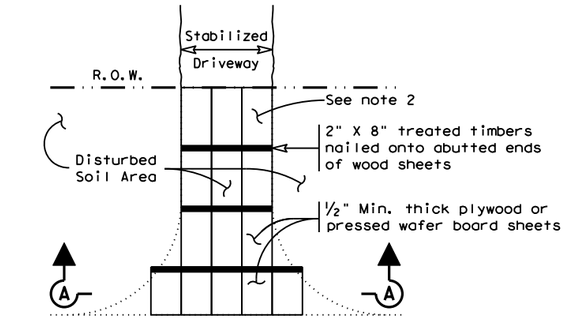


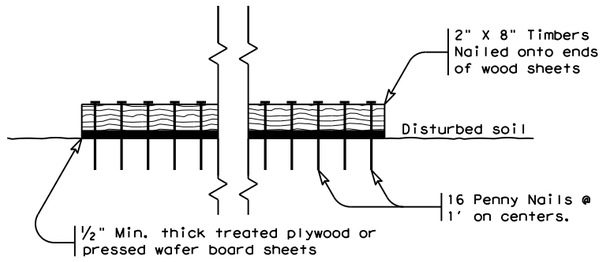
PLAN VIEW



PLAN VIEW



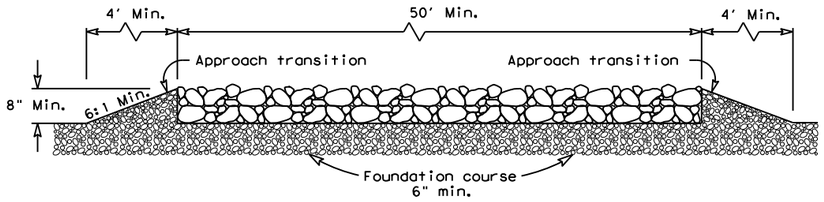
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

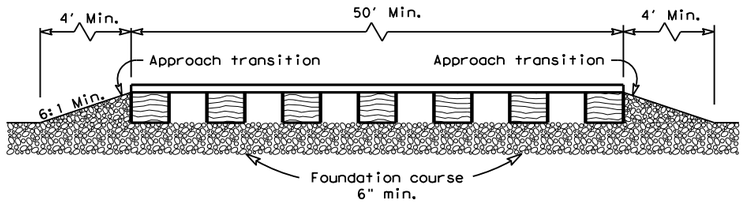
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1875	02	027	FM 2022
	DIST	COUNTY		SHEET NO.
	LFK	HOUSTON		120