

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

STATE HIGHWAY IMPROVEMENT  
STATE OF TEXAS  
DEPARTMENT OF TRANSPORTATION

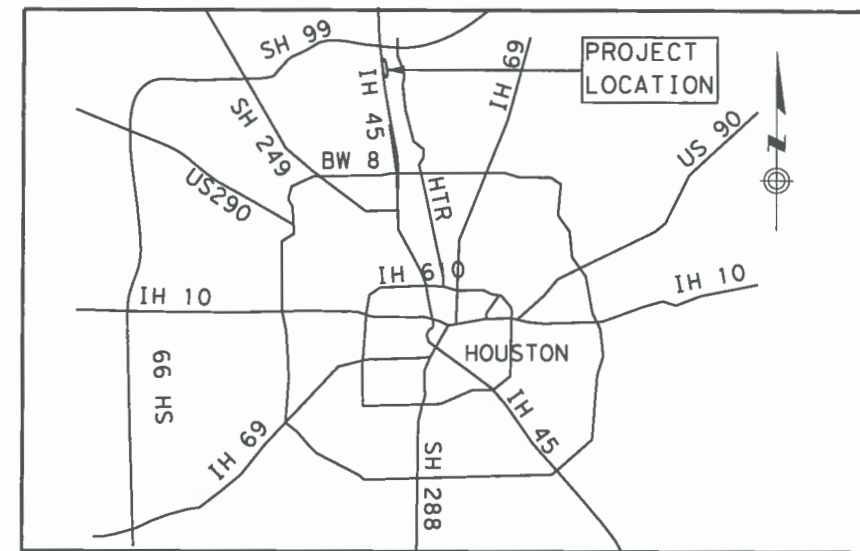
FED. PROJ. NO.	STATE AID PROJECT NO.	SHEET NO.	
	C 110-5-127	1	
STATE	STATE DIST. NO.	COUNTY	
TX	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0110	05	127	I-45

PLANS OF PROPOSED  
STATE HIGHWAY IMPROVEMENT

PROJECT NO. C 110-5-127  
HARRIS COUNTY

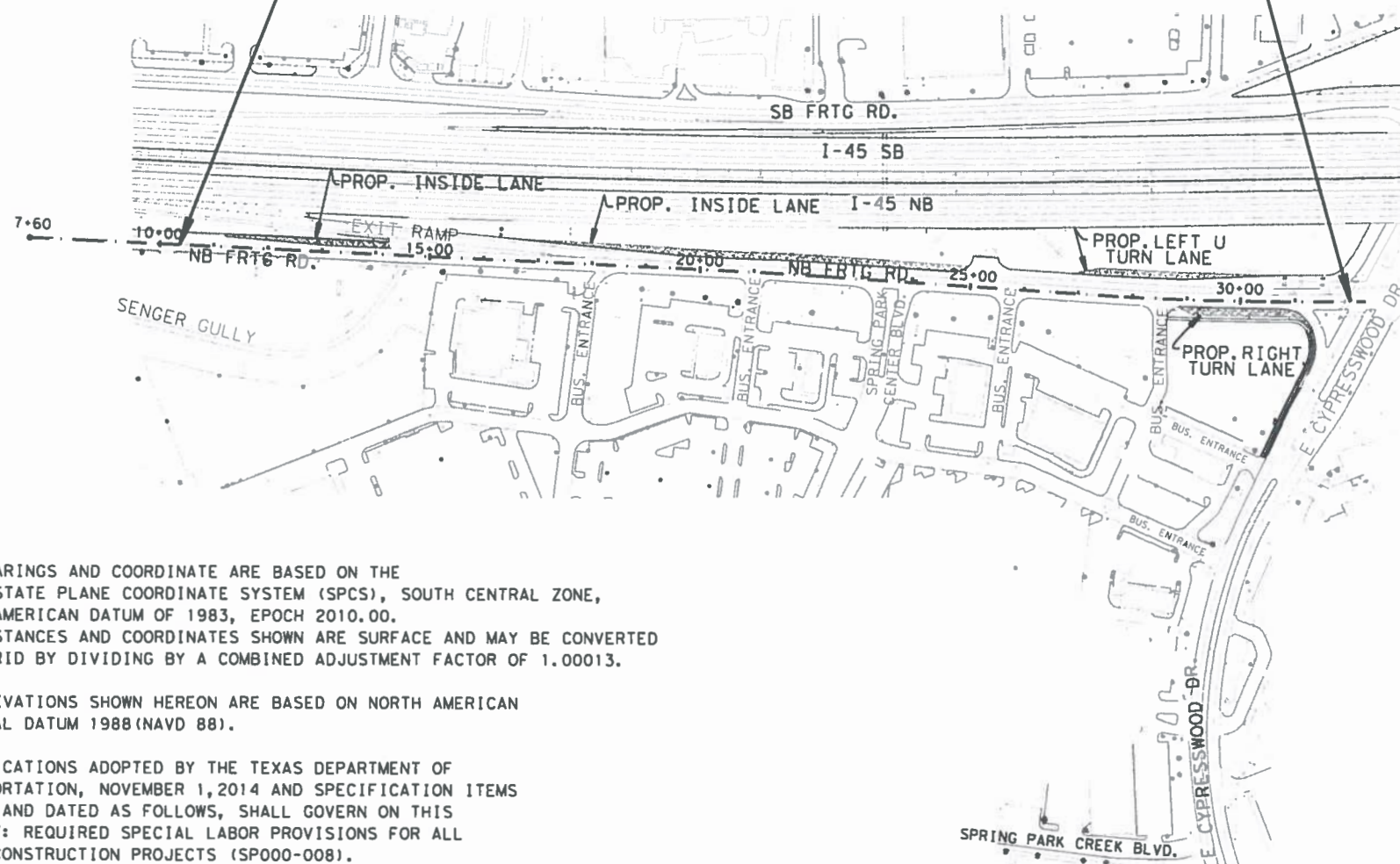
I-45 AT CYPRESSWOOD DR  
LENGTH OF PROJECT 0.409 MI

FOR THE CONSTRUCTION OF LEFT AND RIGHT TURN LANES,  
DRAINAGE, SIDEWALKS, SIGNING, AND PAVEMENT MARKINGS



BEGIN PROJECT  
STA. 10+36.47  
REF. M 68+0.329  
MP 44.916  
X= 3,098,222.26  
Y= 13,947,034.53

END PROJECT  
STA. 32+00.00  
REF. M 68+0.738  
MP 45.325  
X= 3,097,863.49  
Y= 13,949,167.77



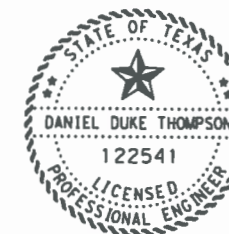
I-45 FRONTAGE RD AT E CYPRESSWOOD DR.  
URBAN FUNCTIONAL CLASSIFICATION: URBAN  
PRINCIPAL ARTERIAL

DESIGN SPEED = 50 MPH  
A.D.T. (2021) = 26,500  
A.D.T. (2041) = 36,100  
TRUCKS 4.6%

E CYPRESSWOOD DR. AT I-45  
URBAN FUNCTIONAL CLASSIFICATION: URBAN  
PRINCIPAL ARTERIAL

DESIGN SPEED = 35 MPH  
A.D.T. (2021) = 35,500  
A.D.T. (2041) = 48,800

A.A.D.T. E CYPRESSWOOD DR. 24,086 (2019)



Daniel Duke Thompson

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RECOMMENDED FOR LETTING: 7/14 20 21

*[Signature]*  
AREA ENGINEER

APPROVED 7/22/2021  
FOR EQUIPMENT BY: Larry W. Blackburn, P.E.  
DISTRICT ENGINEER

ALL BEARINGS AND COORDINATE ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM (SPCS), SOUTH CENTRAL ZONE, NORTH AMERICAN DATUM OF 1983, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE AND MAY BE CONVERTED TO A GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00013.

ALL ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM 1988 (NAVD 88).

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 SPECIAL LABOR PROVISIONS FOR ALL STATE CONSTRUCTION PROJECTS (SP000-008).

EQUATIONS: NONE  
RAILROAD CROSSINGS: NONE  
EXCEPTIONS: NONE

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DATE: 7/14/2021  
SFILLES

COUNTY \_\_\_\_\_ CSJ. \_\_\_\_\_  
HWY. NO. \_\_\_\_\_ LETTING DATE \_\_\_\_\_  
DATE ACCEPTED \_\_\_\_\_

# INDEX OF SHEETS

POL

- GENERAL**
- 1 TITLE SHEET
  - 2 INDEX OF SHEETS
  - 3 PROJECT LAYOUT
  - 4-5 TYPICAL SECTIONS
  - 6-6G GENERAL NOTES
  - 7-7B ESTIMATE & QUANTITY SHEETS
  - 8 ROADWAY QUANTITY SHEET
  - 9 PAVEMENT MARKING AND WORKZONE QUANTITY SHEET
  - 10 SUMMARY OF ILLUMINATION QUANTITIES

- TRAFFIC CONTROL PLAN**
- 11 TRAFFIC CONTROL NARRATIVE
  - 12-13 TRAFFIC CONTROL PLAN - PHASE 1
  - 14-16 TRAFFIC CONTROL PLAN - PHASE 2

- TRAFFIC CONTROL PLAN STANDARDS**
- # 17-28 BC (1)-14 THRU BC (12)-14
  - # 29 TCP(6-1)-12
  - # 30 TCP(1-4)-18
  - 31 OMMITED

- ROADWAY DETAILS**
- 32 SURVEY CONTROL INDEX
  - 33-34 HORIZONTAL & VERTICAL CONTROL
  - 35 ALIGNMENT DATA
  - 36-37 ROADWAY LAYOUT

- ROADWAY DETAILS STANDARDS**
- # 38 CCGG-21
  - # 39-40 CPCD-14
  - # 41-42 CRCP(1)-20
  - # 43 GF(31)-19
  - # 44 GF(31)DAT-19
  - # 45 GF(31)MS-19
  - # 46-49 PED-18 (1 THRU 4)
  - # 50-52 DD (HOU DIST)
  - # 53 SGT(12S)31-18
  - # 54 MS (HOU DIST)
  - # 55 CRCP-FT (HOU DIST)
  - # 56 CC & DID (HOU DIST)

- DRAINAGE DETAILS**
- 57 DRAINAGE MAP
  - 58-59 STORM SEWER PLAN AND PROFILE
  - 60 LATERALS DETAILS HYDRAULIC COMPUTATIONS

- DRAINAGE DETAILS STANDARDS**
- # 61 GD (HOU DIST)
  - # 62-63 E&BD (HOU DIST)
  - # 64 HIL-AD/AAD (HOU DIST)
  - # 65 HIL-C (HOU DIST)
  - # 66 PB
  - # 67 PBGC
  - # 68 PRM
  - # 69 CGT-PCO
  - # 70-71 PSL
  - # 72 MH-A/B (HOU DIST)
  - # 73 MSD (HOU DIST)

- PAVEMENT MARKINGS & DELINEATION**
- 74-75 PAVEMENT MARKING AND SIGNING LAYOUT

- PAVEMENT MARKINGS & DELINEATION STANDARDS**
- # 76 PM-20 (HOU DIST)
  - # 77-79 PM(2)-20 THRU PM(4)-20
  - # 80-85 D&OM (1)-20 THRU D&OM(6)-20
  - # 86 D&OM(VIA)-20
  - # 87 ER-FR(1)-09 (HOU DIST)
  - # 88 FPM(5)-19
  - # 89 EGPM TC6001-04 (HOU DIST)

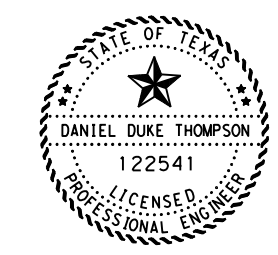
**TRAFFIC DETAILS**

- ILLUMINATION**
- 90-91 LIGHTING LAYOUTS
  - 92 CIRCUIT DIAGRAM

- ENVIRONMENTAL ISSUES**
- 93 STORMWATER POLLUTION PREVENTION PLAN (SW3P) PHASE 1
  - 94-95 STORMWATER POLLUTION PREVENTION PLAN (SW3P) PHASE 2
  - 96 SW3P
  - 97 ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

- ENVIRONMENTAL ISSUES STANDARDS**
- # 98 ECL-12 (HOU DIST)
  - # 99 FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER (HOU DIST)

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



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IH 45  
 AT CYPRESSWOOD DR.  
  
 INDEX OF  
 SHEETS

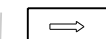
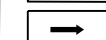
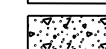
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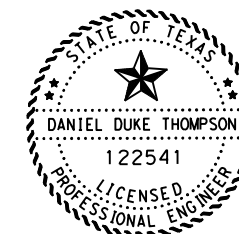
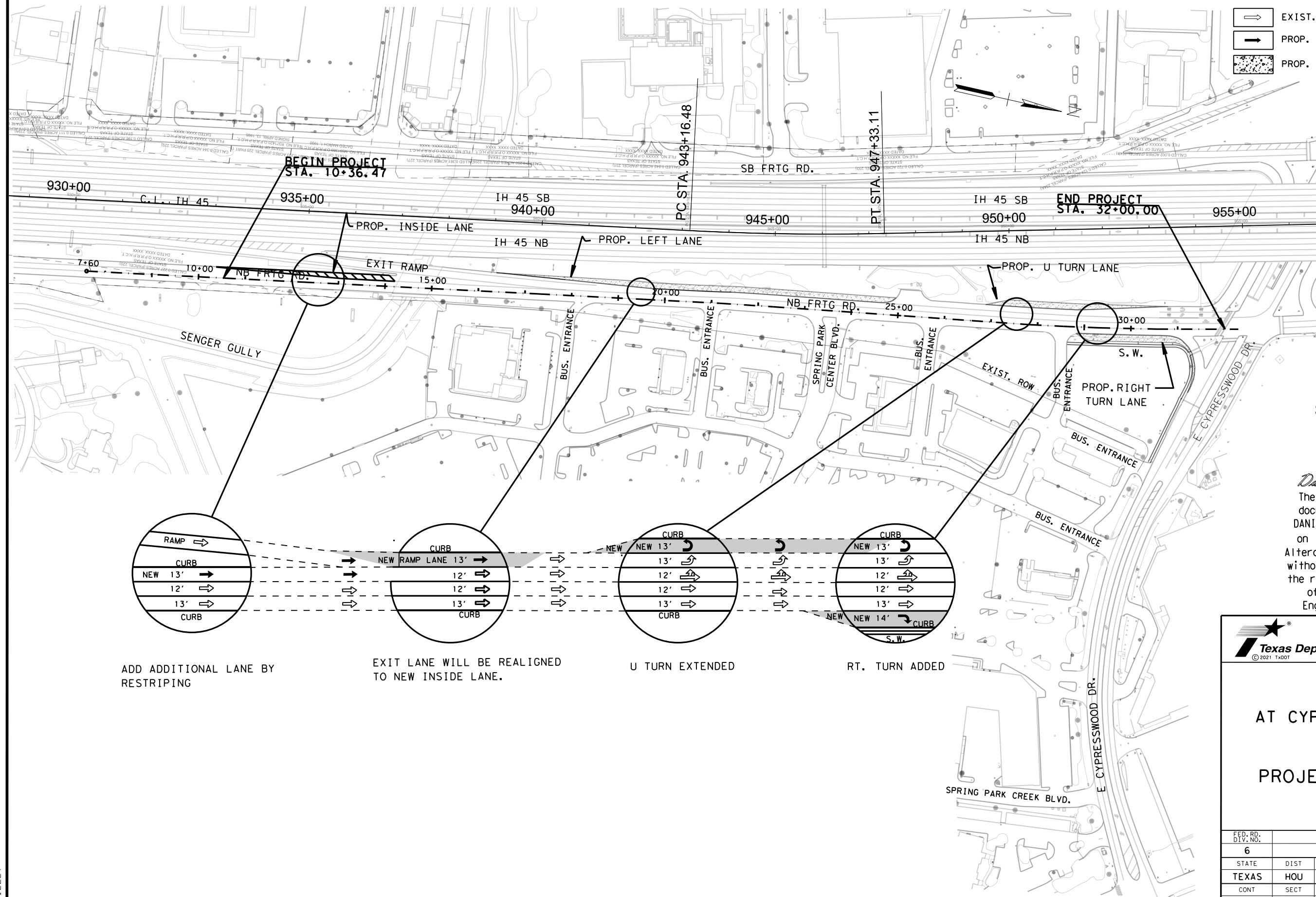
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6			2
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/2/2021 \$FILEL\$

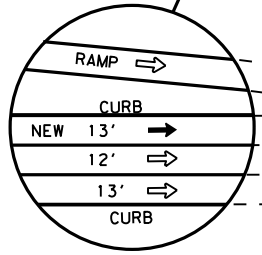
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LEGEND

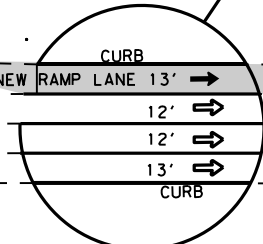
-  EXIST. TRAFFIC LANE
-  PROP. TRAFFIC LANE
-  PROP. ROADWAY



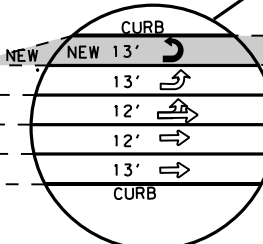
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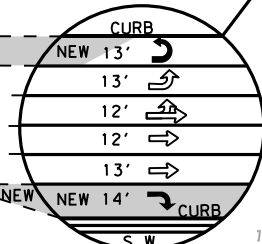
ADD ADDITIONAL LANE BY RESTRIPIING



EXIT LANE WILL BE REALIGNED TO NEW INSIDE LANE.



U TURN EXTENDED



RT. TURN ADDED



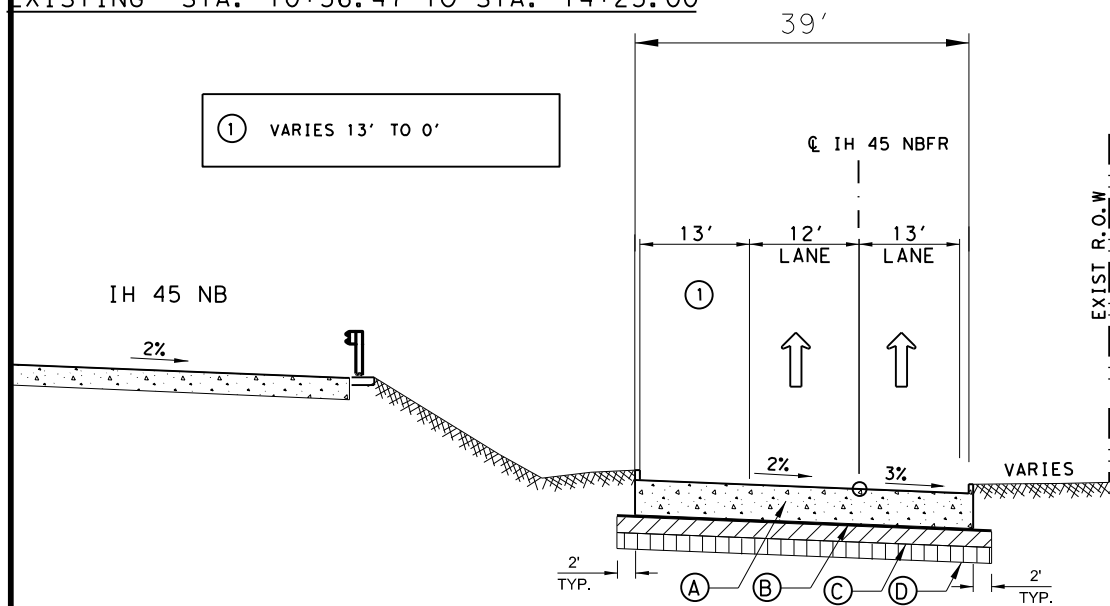
IH 45 AT CYPRESSWOOD DR.

PROJECT LAYOUT

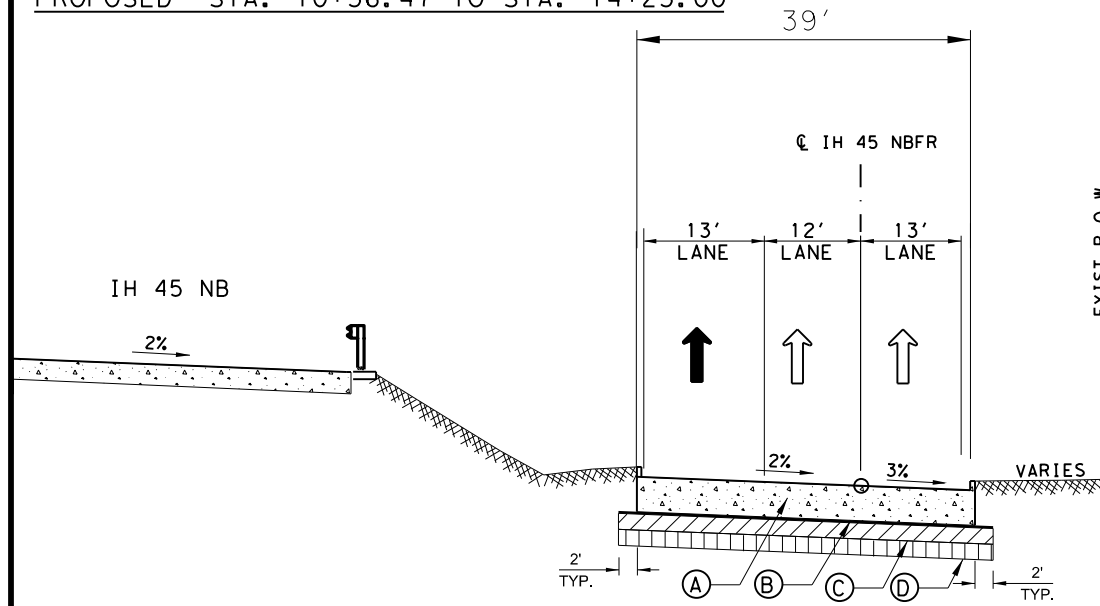
SCALE 240  
 SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			3
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

EXISTING STA. 10+36.47 TO STA. 14+23.00

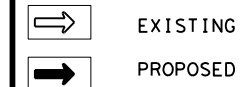


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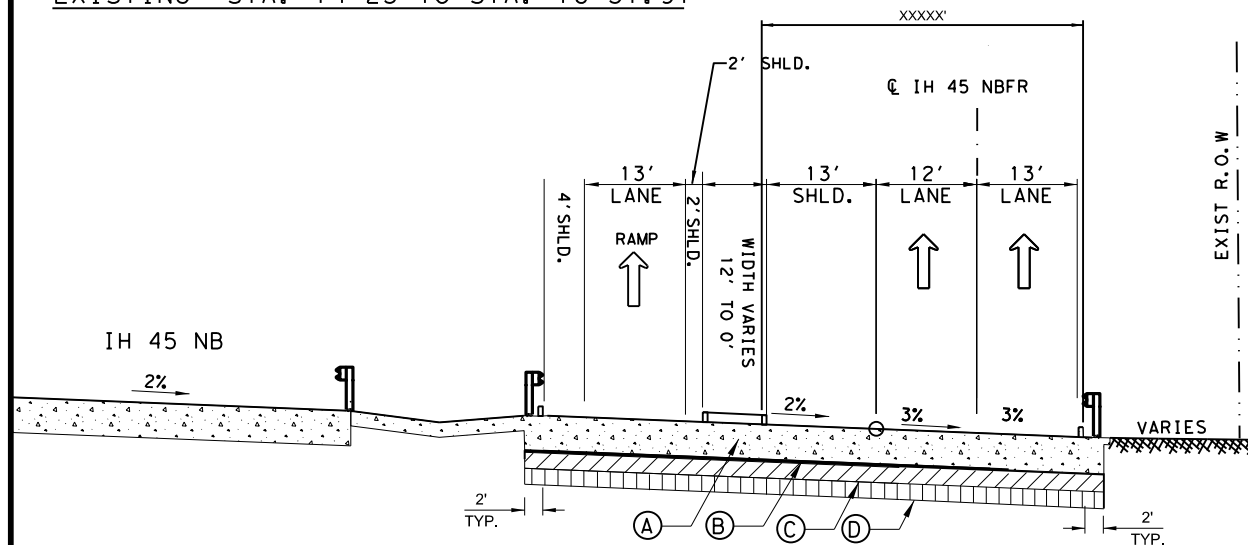


LEGEND AND SYMBOLS

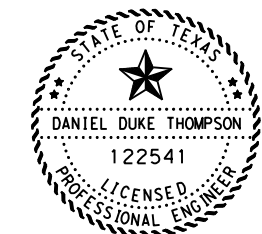
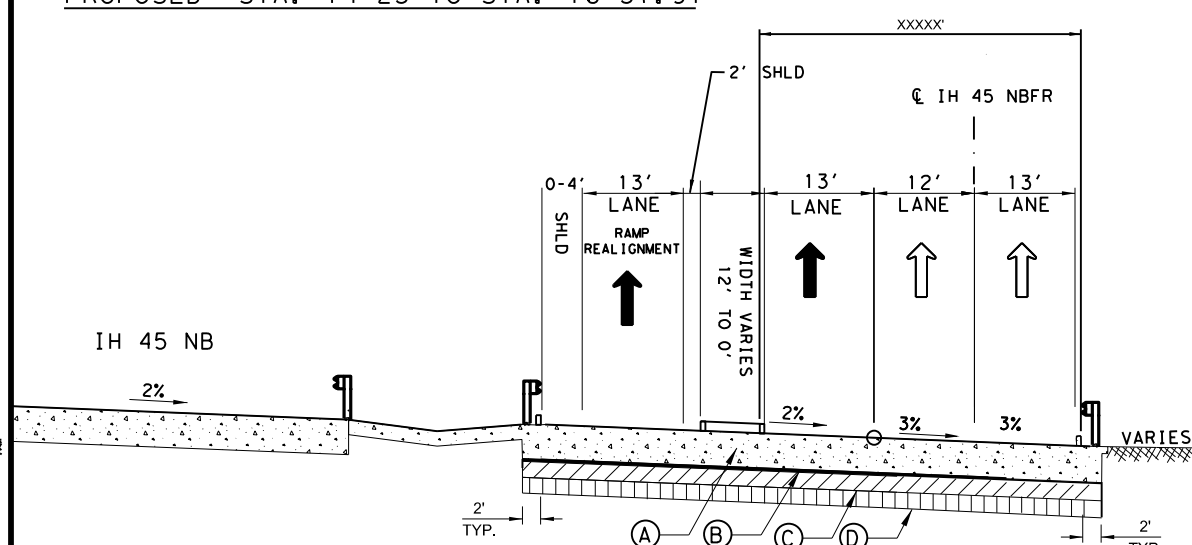
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- (B) EXISTING 1" ACP
- (C) EXISTING 6" PORT CEM. STAB. BASE
- (D) EXISTING 6" LIME TREATED SUB-BASE
- (E) PROPOSED FAST TRACK 13" CRCP



EXISTING STA. 14+23 TO STA. 16+37.91

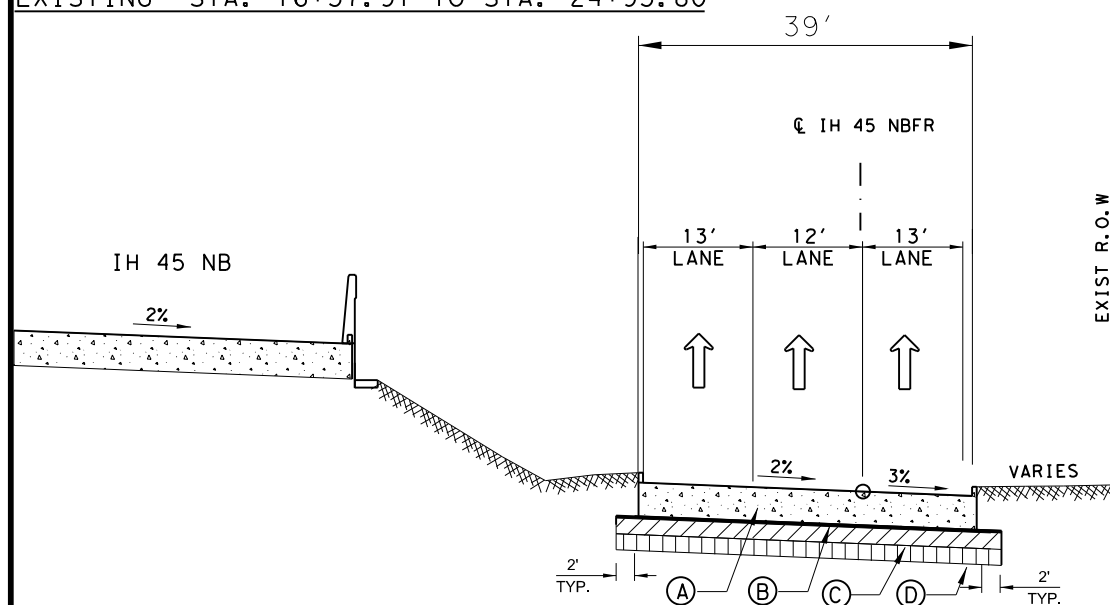


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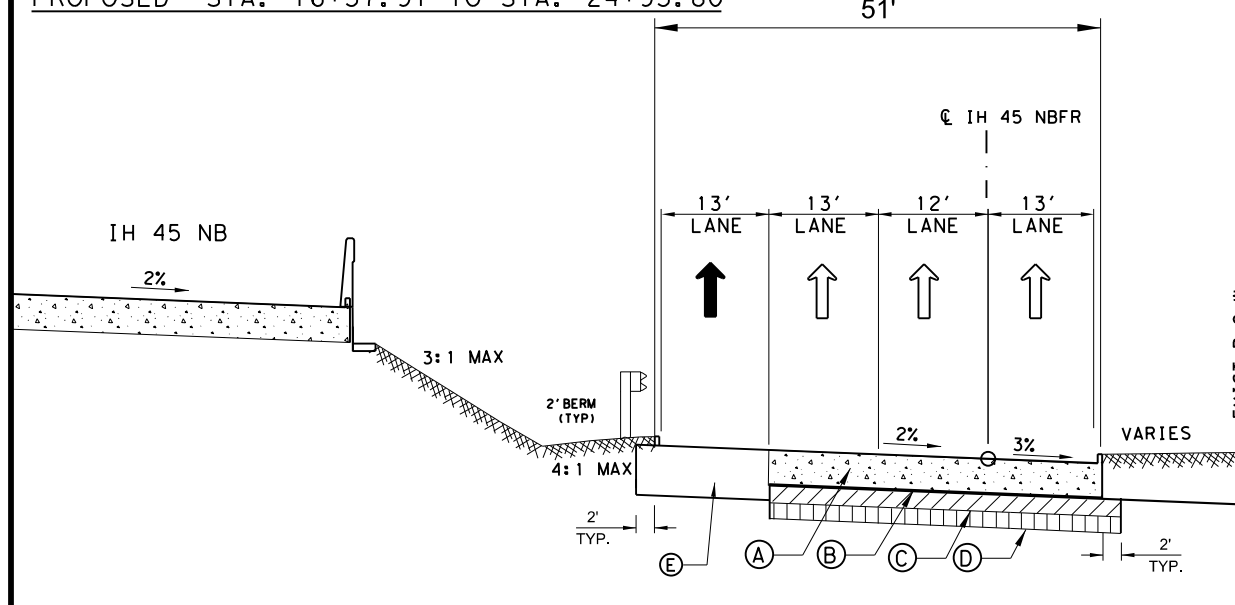


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EXISTING STA. 16+37.91 TO STA. 24+93.80



PROPOSED STA. 16+37.91 TO STA. 24+93.80



IH 45  
 AT CYPRESSWOOD DR.  
 TYPICAL SECTIONS

SCALE: NTS

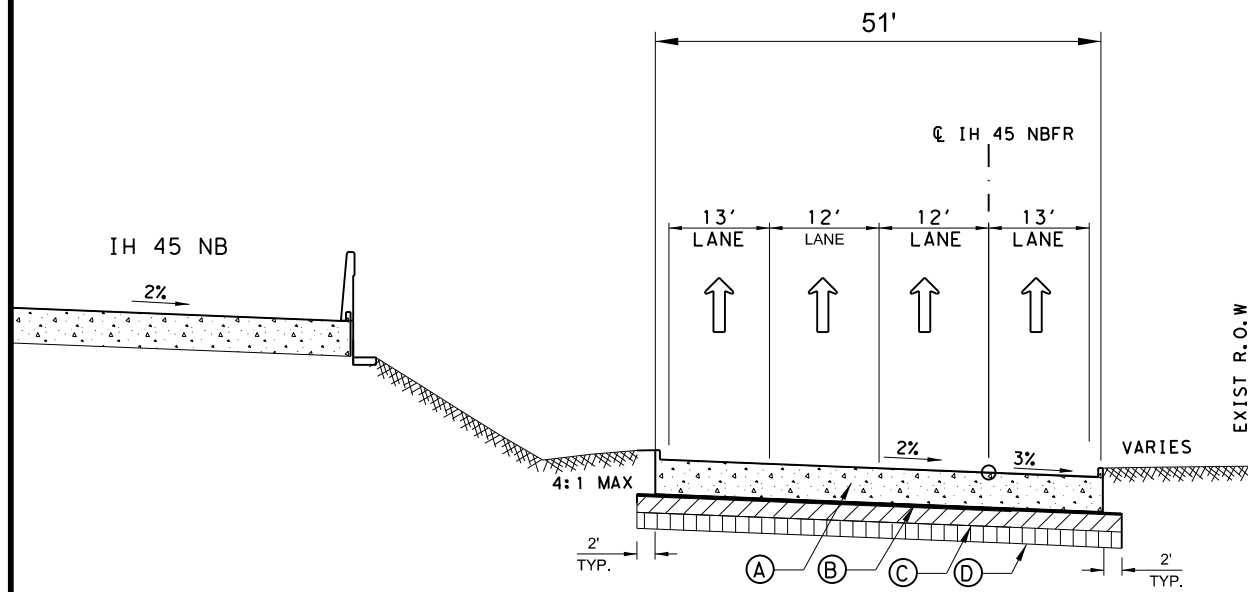
SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			4
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

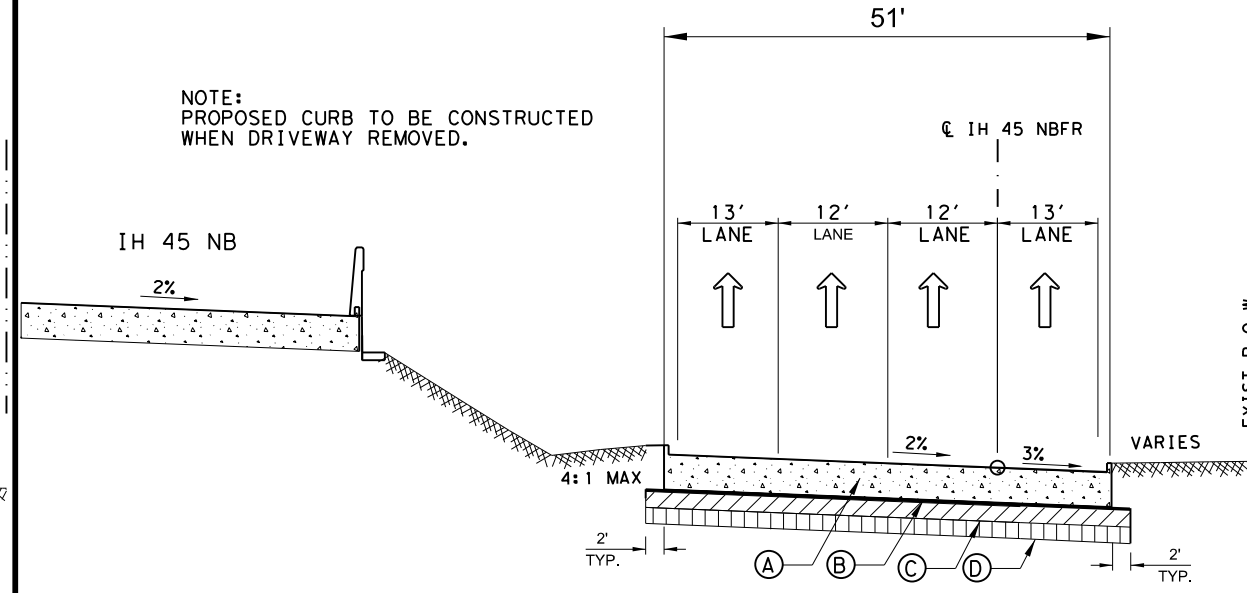
DATE: 8/27/2021  
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DATE: 8/2/2021 \$FILEL\$

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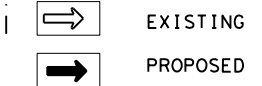


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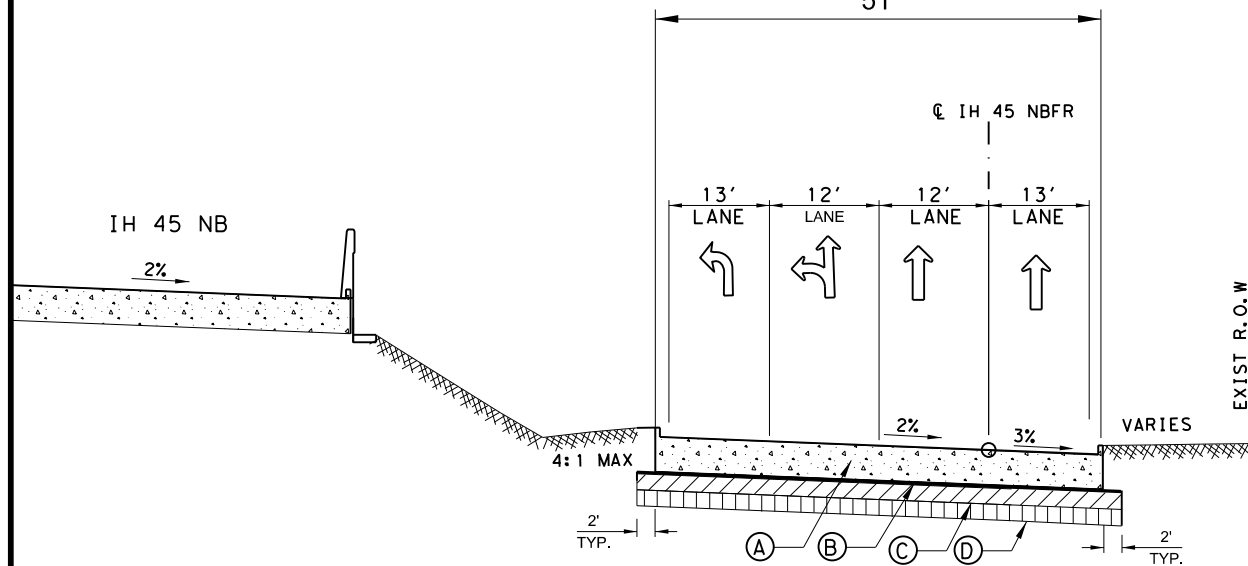


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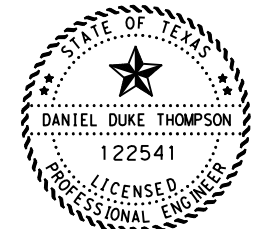
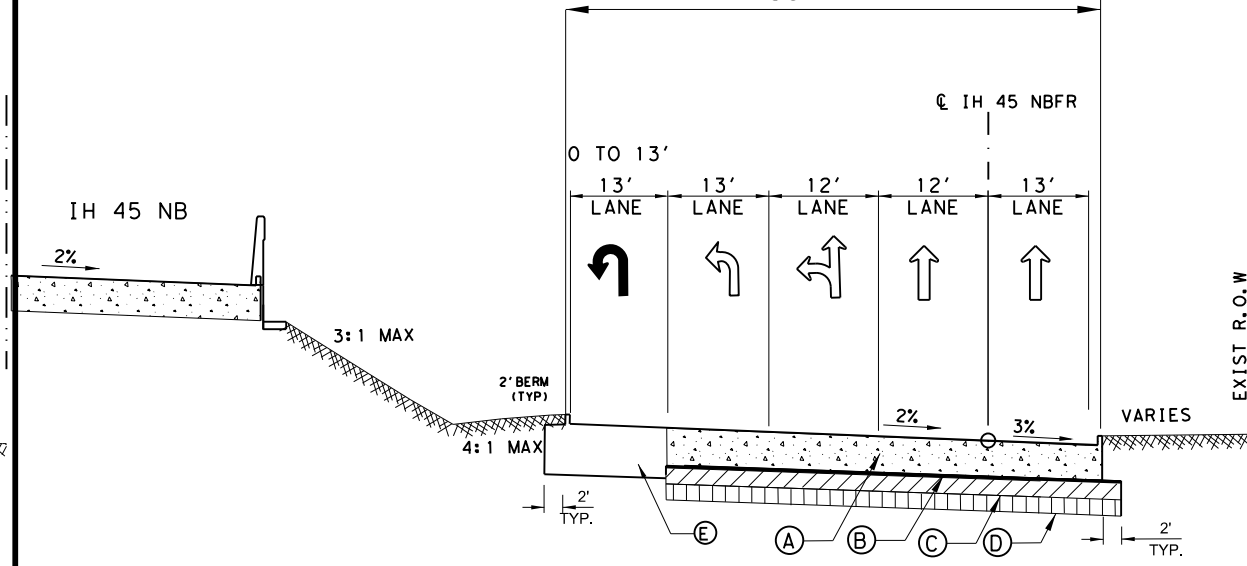
- (A) EXISTING 10" CRCP
- (B) EXISTING 1" ACP
- (C) EXISTING 6" PORT CEM. STAB. BASE
- (D) EXISTING 6" LIME TREATED SUB-BASE
- (E) PROPOSED FAST TRACK 13" CRCP



EXISTING STA. 26+86.00 TO STA. 28+84.16

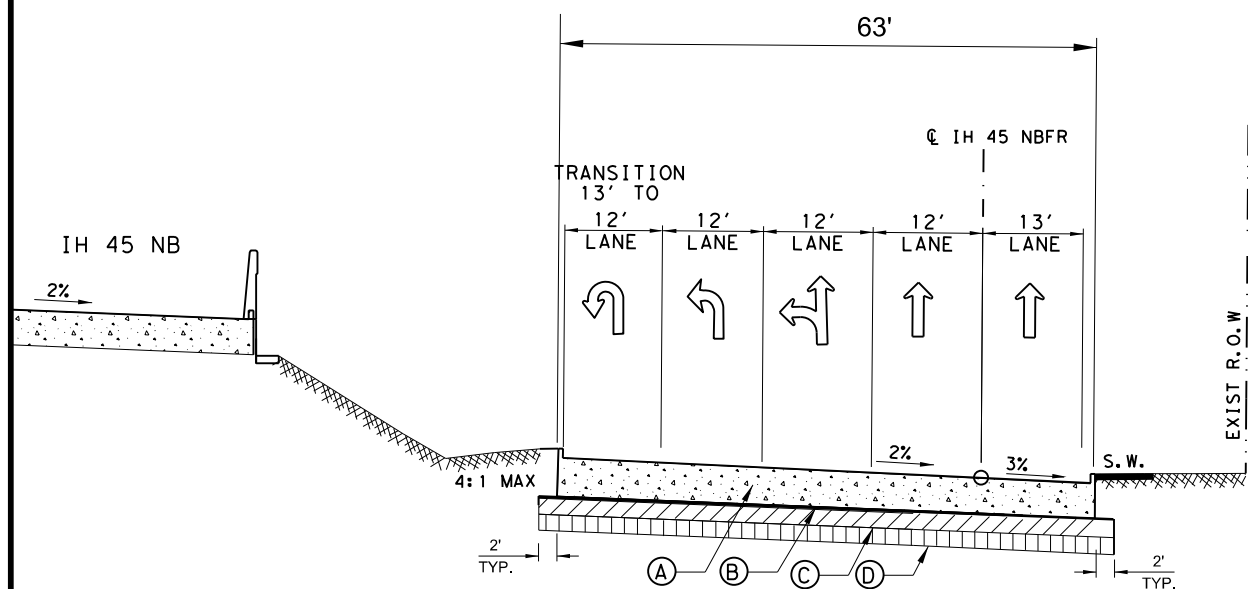


PROPOSED STA. 26+86.00 TO STA. 28+84.16

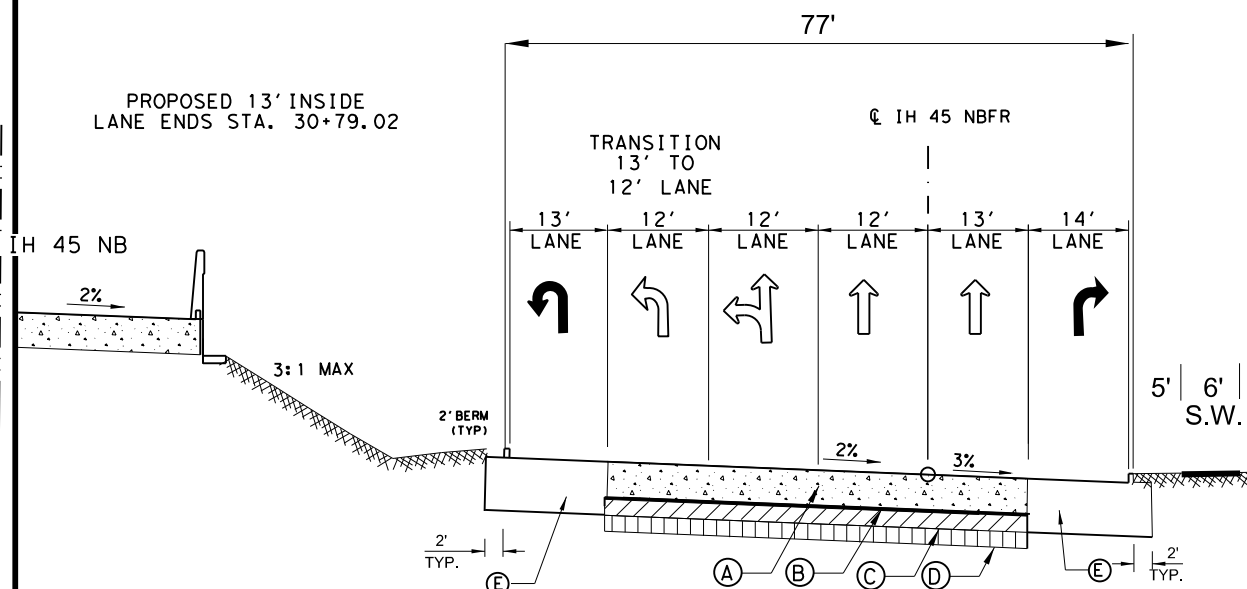


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EXISTING STA. 28+85.16 TO STA. 32+00.00



PROPOSED STA. 28+84.16 TO STA. 32+00.00



IH 45  
 AT CYPRESSWOOD DR.  
 TYPICAL SECTIONS

SCALE: NTS

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			5
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/2/2021 \$FILEL\$

County: HARRIS

Highway: IH 45

Control: 0110-05-127

**General Notes:**

**General:**

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

(Phillip Garlin email: Phillip.Garlin@Txdot.gov)

Contractor questions will be accepted through email, phone, and in person by the above individuals. Contractor questions will be reviewed by the Area Engineer or Assistant Area 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\\_Responses/](https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting_Responses/)

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, and CCSJ/Project Name.

If fixed features require, the governing slopes shown may vary between the limits shown and to the extent determined by the Engineer.

Notify the Engineer immediately if discrepancies are discovered in the horizontal control or the benchmark data.

References to manufacturer's trade name or catalog numbers are for the purpose of identification only. Similar materials from other manufacturers are permitted if they are of equal quality, comply with the specifications for this project, and are approved, except for roadway illumination, electrical, and traffic signal items.

The cost for materials, labor, and incidentals to provide for traffic across the roadway and for ingress and egress to private property in accordance with Section 7.2.4 of the standard specifications is subsidiary to the various bid items. Restore access roadways to their original condition upon completing construction.

If a foundation is to be placed where a riprap surface or an asphalt concrete surface presently exists, use caution in breaking out the existing surface for placement. Break out no greater area than is required to place the foundation. After placing the foundation, wrap the periphery with 0.5 in. pre-molded mastic expansion joint. Then replace the remaining portion of the broken out surface with Class A or Class C concrete or cold mix asphalt concrete to the exact slope, pattern, and thickness of the existing riprap or asphalt. Payment for breaking out the existing surface, wrapping the foundation, and replacing the surface is subsidiary to the various bid items.

Existing drainage flow lines and patterns should be maintained after pavement and/or repair work on roadways and intersections.

County: HARRIS

Highway: IH 45

Sheet 6

Control: 0110-05-127

Tolls incurred by the Contractor are incidental to the various bid items.

Procure permits and licenses, which are to be issued by the City, County, or Municipal Utility District.

**General: Site Management**

Mark stations every 100 ft. and maintain the markings for the project duration. Remove the station markings at the completion of the project. This work is subsidiary to the various bid items.

Do not mix or store materials, or store or repair equipment, on top of concrete pavement or bridge decks unless authorized by the Engineer. Permission will be granted to store materials on surfaces if no damage or discoloration will result.

Personal vehicles of employees are not permitted to park within the right of way, including sections closed to public traffic. Employees may park on the right of way at the Contractor's office, equipment, and materials storage yard sites.

Assume ownership of debris and dispose of at an approved location. Do not dispose of debris on private property unless approved in writing by the District Engineer.

Control the dust caused by construction operations. For sweeping the base material in preparation for laying asphalt and for sweeping the finished concrete pavement, use one of the following types of sweepers or approved equal:

**Tricycle Type**

Wayne Series 900  
Elgin White Wing  
Elgin Pelican

**Truck Type - 4 Wheel**

M-B Cruiser II  
Wayne Model 945  
Mobile TE-3  
Mobile TE-4  
Murphy 4042

**General: Traffic Control and Construction**

Schedule construction operations such that preparing individual items of work follows in close sequence to constructing storm drains in order to provide as little inconvenience as practical to the businesses and residents along the project.

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

In the case of an emergency, the Engineer may allow traffic on the roadway before the asphalt

County: HARRIS

Highway: I-45

Control: 0110-05-127

overlay is in place. The roadway surface will be cleaned by removing all loose matter resulting from the construction operations.

Verify that all conditions under Item 502 are met before beginning work every day that work occurs.

**General: Utilities**

Consider the locations of underground utilities depicted in the plans as approximate and employ responsible care to avoid damaging utility facilities. Depending upon scope and magnitude of planned construction activities, advanced field confirmation by the utility owner or operator may be prudent. Where possible, protect and preserve permanent signs, markers, and designations of underground facilities.

If the Contractor damages or causes damage (breaks, leaks, nicks, dents, gouges, etc.) to the utility, contact the utility facility owner or operator immediately and it is at the contractor's own expense to repair any damages to the utility.

Be aware that an operational Computerized Transportation Management System (CTMS) exists within the limits of this project and that the system must remain operational throughout construction. If the Contractor damages or cause damage to this system, repair such damage within 8 hours of occurrence at no cost to the Department. In the event of system damage, notify the Director of Traffic Management Systems at 713-881-3063 within one hour of occurrence. Failure of the Contractor to repair damage to the main fiber optic cable and CCTV cable trunk lines, which convey all corridor information to TranStar, will result in the Contractor being billed for the full cost of emergency repairs.

At least 72 hours before starting work, make arrangements for locating existing Department-owned above ground and underground fiber optic, communications, power, illumination, and traffic signal cabling and conduit. Do this by calling the Department's Houston District Traffic Signal Operations Office at 713-802-5662, or by e-mailing the Department's Houston District Traffic Signal Operations Office at [locaterquest@txdot.gov](mailto:locaterquest@txdot.gov), to schedule marking of underground lines on the ground. Use caution if working in these areas to avoid damaging or interfering with existing facilities

Notify the Engineer at least 48 hours before constructing junction boxes at storm drain and utility intersections.

If overhead or underground power lines need to be de-energized, contact the electrical service provider to perform this work. Costs associated with de-energizing the power lines or other protective measures required are at no expense to the Department.

If working near power lines, comply with the appropriate sections of Texas State Law and

County: HARRIS

Highway: I-45

Sheet 6A

Control: 0110-05-127

Federal Regulations relating to the type of work involved.

Perform electrical work in conformance with the National Electrical Code (NEC) and Department's standard sheets.

Before beginning any underground work, notify the City of Houston's Chief Inspector, Public Works and Engineering, to establish the locations of any existing electrical systems for lighting facilities within the limits of this project.

**Item 7: Legal Relations and Responsibilities**

This project does not require a U.S. Army Corps of Engineers (USACE) Section 404 Permit before letting, but if a permit is needed during construction, assume responsibility for preparing the permit application. Submit the permit application to the Department's District Environmental Section for approval. Once the permit application is approved, the Department will submit it to the USACE. Assume responsibility for the requested revisions, in coordination with the Department's District Environmental Section.

No significant traffic generator events have been identified.

**Item 8: Prosecution and Progress**

The Department will not adjust the number of days for the project and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule or for errors, omissions, or discrepancies found in the time determination schedule.

Working days will be computed and charged based on a standard workweek in accordance with Section 8.3.3.2.2.

The Lane Closure Assessment Fee is \$ 500.00 for frontage road. This fee applies to the Contractor for closures or obstructions that overlap into restricted hour traffic for each hour or portion thereof, per lane, regardless of the length of lane closure or obstruction. For Restricted Hours subject to Lane Assessment Fee refer to the Item, "Barricades, Signs, and Traffic Handling."

**Item 100: Preparing Right of Way**

Clean existing ditches under fill sections of undesirable materials including grass, muck, and trash. Perform this work in accordance with the Construction section of the Item, "Preparing Right of Way." This work is subsidiary to this bid Item.

The Item, "Preparing Right of Way" will be measured for payment only in those designated areas shown on the plans. Preparing right of way necessary to perform construction that is outside designated areas is subsidiary to this bid Item.

County: HARRIS

Highway: I-45

Control: 0110-05-127

Remove abandoned utilities that are in conflict with the new utilities, at no expense to the Department.

Reestablish and maintain right of way stakes after completing the right of way preparation activities and until the new utilities are in place.

Remove and assume ownership of the existing ground mounted signs within the limits of roadway construction unless otherwise noted or directed. This work is subsidiary to the Item, "Preparing Right of Way."

**Item 104: Removing Concrete**

Removing concrete curb is paid as a separate bid item if the existing pavement on which it rests is not removed at the same time.

**Item 110: Excavation**

If manipulating the excavated material requires moving the same material more than once to accomplish the desired results, the excavation is measured and paid for only once regardless of the manipulation required.

Transition the ditch grades and channel bottom widths at structure locations. Use only approved channel excavation in the embankment.

The total excavation quantity shown on the plans includes the quantity for excavating to 2 ft. behind the back of the proposed curb.

Excess excavated materials becomes the property of the Contractor.

Excavate, strip, and stockpile the top 6 in. of existing topsoil only at locations shown in the plans. The salvaged quantity is shown in the plans. Reuse the topsoil under the Item, "Topsoil" including measurement and payment.

**Item 132: Embankment**

If salvaged base is used for the embankment material, break it into small pieces to achieve the required density and to facilitate placing in the embankment. Obtain approval of the material before placing in the embankment.

Furnish Type C material with a maximum Liquid Limit (LL) of 65, a minimum Plasticity Index (PI) of 5, and composed of suitable earth material such as loam, clay, or other materials that form a suitable embankment.

The embankment material used on the project which has a Liquid Limit exceeding 45 will be tested for Liquid Limits at the rate of one test per 20,000 cu. yd. or per total quantity less than 20,000 cu. yd., unless otherwise directed. Only use material that passes the above tests.

County: HARRIS

Highway: I-45

Sheet 6B

Control: 0110-05-127

Furnish material with a maximum Liquid Limit (LL) of 65.

**Item 162: Sodding for Erosion Control**

**Item 164: Seeding for Erosion Control**

**Item 166: Fertilizer**

**Item 168: Vegetative Watering**

Refer to the "Fertilizer, Seed, Sod, Straw, Compost, and Water" plan sheet for material specifications, application rates, and for watering requirements.

**Item 360: Concrete Pavement**

Where the pavement curb is left off for a later tie, provide the dowels or the tie bars as indicated on the paving detail sheets. The dowel bars and tie bars are subsidiary to the various bid items.

Repair portions of the concrete pavement surfaces that are damaged while in a plastic state before that area receives permanent pavement markings and opens to traffic. Perform repairs that are structurally equivalent to and cosmetically uniform with the adjacent undamaged areas. Do not repair by grouting onto the surface.

On pavement widening, hand finishing in place of the longitudinal float will be permitted.

Where existing pavement is widened with new pavement, place the new pavement a minimum of 2 ft. wide.

Equip the batching plants to proportion by weight, aggregates and bulk cement, using approved proportioning devices and approved automatic scales.

High-early strength cement may be used for frontage road and city street intersection construction.

Do not use limestone dust of fracture as fine aggregate.

Perform saw cutting as shown on the plans in accordance with Section 360.4.10, "Sawing Joints." This saw cutting is subsidiary to this bid Item.

After the concrete has been batched, do not allow additional water into the mix. Use Type F high range water-reducing admixtures for slump control at the jobsite. Submit for approval a work plan for controlling the slump.

Supply on the job site polyethylene fabric sufficient to cover the section of concrete pavement scheduled for placement in one shift.

Complete the entire Fast Track Concrete construction process, from the time the Fast Track Work Area is closed to traffic, to the time the Fast Track Work Area is opened to traffic. The Fast Track operation includes, but is not limited to, traffic control, existing pavement and



subgrade removal, preparation of subgrade, placement of steel, placement of Fast Track concrete pavement, cure time, striping, etc. Perform work in the Fast Track Work Area in an expeditious manner, within the allowable time period for any area shown below:

Fast Track Work Area	Allowable Duration
1. <IH 45 NBFRTG at Cypresswood>: <STA> 24+12.72 to STA. 30+49.91:	15-week days maximum
2. <IH 45 NBFRTG at Cypresswood>: <STA. 12+54.00 to STA. 31+22.00:	30-week days maximum.

Failure to perform any Fast Track Work Area construction within the above time frames will be cause for the Engineer to require the Contractor to shut down all other construction operations to ensure all resources are directed toward the completion of the Fast Track operation. This shutdown will remain in force until the Fast Track operation is complete. Such a shutdown will not warrant additional time, time suspension, or any additional costs to the Department.

Unless otherwise directed in writing, provide Class HES concrete with a minimum average flexural strength of 425 psi or a minimum average compressive strength of 3,000 psi in 16 hours.

When directed in writing, open the pavement to traffic before the minimum requirements have been attained.

When needed, place and remove forms in accordance with Section 360.4.5, except do not remove forms until at least 6 hours after concrete has been placed. The time for the form removal may be extended with the direction of the Engineer if weather or other conditions make it advisable.

Sprinkling and rolling, required for the compaction of the rough subgrade in advance of fine-grading are subsidiary to this Item. Maintenance of a moist condition of the subgrade in advance of fine-grading and concrete is subsidiary work, as provided above.

For the Department's concrete cylinder split samples, transport the test cylinders to the Houston District Laboratory located at 7600 Washington Avenue in Houston, or to the appropriate Area Laboratory, when applicable. Transporting the test cylinders is subsidiary to the various bid items.

#### Item 464: Reinforced Concrete Pipe

Concrete collars are subsidiary to the various bid items except for those specified on the plans for stage construction, which are paid for under the Item, "Concrete Substructures" as "CI C Conc (Collar)."

Rubber gaskets are required for concrete pipe joints except for connections of safety end treatments, driveway culverts, and joints between the existing pipes and extensions.

If performing the work under the Item, "Jacking, Boring, or Tunneling Pipe or Box," use tongue and groove pipe instead of rubber gaskets at these locations.

Open, install, and backfill each section, or a portion of a section, in the same day at locations requiring pipe culverts under existing roadways.

Place the pipe drains across existing roadways half at a time to allow passage of traffic. No trenches may remain open overnight.

Known locations of existing stub-outs are shown on the plans, but these stub-outs may be in a different position or condition. Delays, inconveniences, or additional work required will not be a basis for additional compensation.

Provide leave-outs or holes in the proposed storm drain structures and pipes for drainage during interim construction. This work is subsidiary to the various bid items.

The flowline elevations of side road structures are based on the proposed ditches. Field-verify these elevations and adjust them as necessary to meet the field conditions. Before placing these structures, prepare and submit for approval, the data (revised elevation, alignment, length, etc.) for the adjusted structures.

#### Item 465: Junction Boxes, Manholes, and Inlets

If required on the plans, build manholes and inlets to stage 1 construction, cover with temporary pavement, and complete in a later phase of construction. This temporary covering and pavement are subsidiary to the various bid items.

Construct manholes and inlets in graded areas, first to an elevation at least 4 in. above the top of the highest entering pipe and cover with a wooden cover. Complete the construction of such manholes and inlets to the finished elevation when completing the grading work for such manholes and inlets. Adjust the final elevation, if required, since this elevation is approximate.

Construct manholes and inlets in paved areas to an elevation so their temporary wooden covers are flush with the surface of the base material.

Do not leave excavations or trenches open overnight.

#### Item 502: Barricades, Signs, and Traffic Handling

Use a traffic control plan for handling traffic through the various phases of construction. Follow the phasing sequence unless otherwise agreed upon by the Area Engineer and the Project Manager. Ensure this plan conforms to the latest "Texas Manual on Uniform Traffic Control Devices" and the latest Barricade and Construction (BC) Standard Sheets.

Submit changes to the traffic control plan to the Area Engineer. Provide a layout showing the

construction phasing, signs, striping, and signalizations for changes to the original traffic control plan.

Furnish and maintain the barricades and warning signs, including the necessary temporary and portable traffic control devices, during the various phases of construction. Place and construct these barricades and warning signs in accordance with the latest "Texas Manual on Uniform Traffic Control Devices" for typical construction layouts.

Cover work zone signs when work related to the signs is not in progress, or when any hazard related to the signs no longer exists.

Keep the delineation devices, signs, and pavement markings clean. This work is subsidiary to the Item, "Barricades, Signs, and Traffic Handling."

Erect temporary signs when exit ramps are closed or moved to new locations during construction.

If a section is not complete before the end of the workday, pull back the base material to the existing pavement edge on a 6H: 1V slope. Edge drop-offs during the hours of darkness are not permitted.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Before detouring traffic onto the mainlane shoulders, remove dirt, debris, vegetation, and other deleterious material from the surface of the shoulders. Appropriately sign the detour in an approved manner. This work is subsidiary to the various bid items.

Coordinate and schedule the work with the appropriate Metro representative if requiring access to the High Occupancy Vehicle lanes.

Cover or remove the permanent signs and construction signs that are incorrect or that do not apply to the current situation for a particular phase.

Replace the overhead signs, informational signs, and exit signs to be removed, with temporary signs providing the correct information to the traveling public. Size the replacement signs and include them in the traffic control plan.

Do not mount signs on drums or barricades, except those listed in the latest Barricades and Construction standard sheets.

Use traffic cones for daytime work only. Replace the cones with plastic drums during nighttime hours.

Place positive barriers to protect drop-off conditions greater than 2 ft. within the clear zone that remain overnight

Do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

One Lane Closures IH 45 Frontage

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Mondays	9:00 AM - 3:00 PM	12:00 AM - 5:00 AM 9:00 PM - 11:59 PM	5:00 AM - 9:00 AM 3:00 PM - 9:00 PM
Tuesday	9:00 AM - 3:00 PM	12:00 AM - 5:00 AM 9:00 PM - 11:59 PM	5:00 AM - 9:00 AM 3:00 PM - 9:00 PM
Wednesday	9:00 AM - 3:00 PM	12:00 AM - 5:00 AM 9:00 PM - 11:59 PM	5:00 AM - 9:00 AM 3:00 PM - 9:00 PM
Thursday	9:00 AM - 3:00 PM	12:00 AM - 5:00 AM 9:00 PM - 11:59 PM	5:00 AM - 9:00 AM 3:00 PM - 9:00 PM
Friday	9:00 AM - 3:00 PM	12:00 AM - 5:00 AM 9:00 PM - 11:59 PM	5:00 AM - 9:00 AM 3:00 PM - 9:00 PM
Saturdays *	7:00 AM - 7:00 PM	12:00 AM - 7:00 AM 7:00 PM - 11:59 PM	N/A
Sundays *	7:00 AM - 7:00 PM	12:00 AM - 5:00 AM 7:00 PM - 11:59 PM	N/A

\* Saturdays and Sundays as approved by Engineer

The above times are approved for the traffic control conditions listed. The Area Engineer may approve other closure times if traffic counts warrant. The Area Engineer may reduce the above times for special events

Law enforcement assistance will be required for this project and is expected to be required for major traffic control changes and lane closures. Coordinate with local law enforcement and arrange for law enforcement as directed or agreed by the Engineer. Before payment will be

made, complete the "Daily Report on Law Enforcement Force Account Work" (Form 318), provided by the Department and submit daily invoices that agree with this form for any day during the month in which approved services were provided.

Provide full-time, off-duty, uniformed, certified peace officers, as part of traffic control operations. The peace officers must be able to show proof of certification by the Texas

County: HARRIS

Highway: I-45

Control: 0110-05-127

Commission on Law Enforcement Officers Standards. The cost of the officers is paid for on a force account basis.

A minimum of 7 days in advance of any total closure, notify the Houston District Public Information Office of which roadways, ramps, intersections, or lanes will be closed, the dates they will remain closed, and when they will be opened again to traffic.

A minimum of 7 days in advance of any total closure, place a portable changeable message (PCM) sign at the location of each total closure which informs the traveling public of the details of the closure. Alternately, if the Traffic Control Plan provides a positive barrier at the location, a non-trailer mounted static message board sign behind the positive barrier may be used in place of a PCM.

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

**Item 506: Temporary Erosion, Sedimentation and Environmental Controls**

The use of hay bales is not permitted as Storm Water Pollution Prevention Plan (SWP3) measures.

The Storm Water Pollution Prevention Plan (SWP3) consists of temporary erosion control measures needed and provided for under this Item. The disturbed area is less than one acre and use of erosion control measures is not anticipated. If physical conditions encountered at the job site require necessary controls, BMP installation, maintenance, and removal will be paid as extra work on a force account basis per Articles 4.4 and 9.7. Since the disturbed area is less than 5 acres, a "Notice of Intent" (NOI) is not required.

Use appropriate measures to prevent, minimize, and control the spill of hazardous materials in the construction staging area. Remove and dispose of materials in compliance with State and Federal laws.

Before starting construction, review with the Engineer the SWP3 used for temporary erosion

control as outlined on the plans. Before construction, place the temporary erosion and sedimentation control features as shown on the SWP3.

Implement temporary and permanent erosion control measures to comply with the National

County: HARRIS

Highway: I-45

Sheet 6E

Control: 0110-05-127

Pollution Discharge Elimination System (NPDES) general permit under the Clean Water Act.

Before starting grading operations and during the project duration, place the temporary or permanent erosion control measures to prevent sediment from leaving the right of way.

**Item 512: Portable Traffic Barrier**

Transport Low Profile Concrete Barriers (LPCB) used for traffic handling from the Department's stockpile located on the north side of IH 610 at Long Drive.

Where required by the Engineer, provide anchor pins for Type 2 Low Profile Concrete Barriers (LPCB) as shown on the current LPCB standard. Anchor pins are subsidiary to the Low Profile Concrete Barrier.

After completing the project, return Low Profile Concrete Barriers (LPCB) used for traffic handling, to the Department's stockpile located on the north side of IH 610 at Long Drive. After completing the project, return the associated LPCB connecting hardware to the area office or as directed.

After completing the project, return Standard Height Portable Traffic Barriers (including J-J Hook and Single Slope) used for traffic handling, to the Department's stockpile located on the south side of at IH 610 at Cedar Crest Blvd. (located across IH 610 from Long Drive). After completing the project, return the associated Single Slope barrier connecting hardware to the area office or as directed.

After completing the project, Standard Height Safety Shape Portable Traffic Barriers used for traffic handling and the associated connecting hardware will become the property of the Contractor.

If placing the portable traffic barrier on pre-stressed concrete box beams with exposed reinforcing steel, protect the reinforcing steel by supporting the portable traffic barrier on 4 in. by 4 in. timbers. Place the timbers transversely and space them on 4 ft. centers. The cost of the labor and materials to perform this work are subsidiary to the Item, "Portable Traffic Barrier."

**Item 529: Concrete Curb, Gutter, and Combined Curb and Gutter**

An air-entraining admixture is not required.

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

**Item 531: Sidewalks**

An air-entraining admixture is not required.

County: HARRIS

Highway: IH 45

Control: 0110-05-127

For concrete curbs, use Grade 7 aggregate conforming to Section 421.2.6 of the Item, "Hydraulic Cement Concrete."

For driveways and turnouts, coarse aggregate Grade No. 3 through No. 8 conforming to the gradation requirements specified in the Item, "Hydraulic Cement Concrete" will be permitted.

For reinforcing steel in sidewalks and pedestrian ramps, use No. 4 bars at a maximum 18 in. spacing center-to-center in both directions

**Item 540: Metal Beam Guard Fence**

Painting the timber posts is not required.

Use timber posts for galvanized steel metal beam guard fence, except for anchorage at turned down ends.

Furnish and install wood blocks between the rail elements and the timber posts as detailed on the plans. These block-outs are subsidiary to this bid Item.

The quantity of the metal beam guard fence is subject to change.

Provide a mow strip as shown on the plans, at metal beam guard fence locations, including any guardrail end treatments.

Galvanize the rail elements supplied for this project by using a Type II Zinc Coating.

At locations requiring attachment of Metal Beam Guard Fence (MBGF) to concrete railing or concrete traffic barrier, repair and fill any existing holes in the railing or barrier that are not in the correct location for attaching the new MBGF. Perform this work in accordance with the

Item, "Concrete Structure Repair." Existing anchor bolt holes that cannot be utilized must be filled with an epoxy grout before drilling new holes. Then core-drill new holes in the correct locations and repair any resulting spalls at no expense to the Department. This work is considered subsidiary to the MBGF transition section (Item 540).

Remove and assume ownership of unsalvageable metal beam guard fence rail elements and posts. Transport and store any functional, salvageable rail elements, including steel posts, which are not reused in this project, to the Department's stockpile located at 16803 Eastex Freeway, Humble, TX 77396.

Replace removed wood posts which are unusable because of damage by the Contractor, at no expense to the Department.

**Item 545: Crash Cushion Attenuators**

After completing the project, return remaining unused crash cushion attenuators units to the Area

County: HARRIS

Highway: IH 45

Sheet 6F

Control: 0110-05-127

Office Maintenance yard or as directed, at no cost to the Department.

**Item 644: Small Roadside Sign Assemblies**

Sign locations shown on the plans are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Use the Texas Universal Triangular Slip Base with the concrete foundation for small ground mounted signs, unless otherwise shown in the plans.

Remove existing street name signs from existing stop signs and re-install them above the new stop signs. Removing and re-installing existing street name signs is subsidiary to the Item, "Small Roadside Sign Assemblies."

When design details are not shown on the plans, provide signs and arrows conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Use Type E Super High Specific Intensity (Fluorescent Prismatic) yellow green reflective sheeting background to fabricate school signs (S1-1, S3-1, S4-3, S5-1, W16-2, SW16-9p, and SW16-7pL(R)).

Assume ownership of the removed existing signs.

Locations of the relocated signs are approximate. Before placing them, obtain approval of and then stake the exact locations for these signs.

Replace existing signs that become damaged during relocation at no expense to the Department.

**Item 662: Work Zone Pavement Markings**

At the end of each workday, mark roadways that remain open to traffic during construction operations with standard pavement markings, in accordance with the latest "Texas Manual on Uniform Traffic Control Devices."

Using raised markers for removable work zone pavement markings on final concrete surfaces is optional.

For transition lane lines and detour lane lines, use raised pavement markers as shown for solid lines on the latest Barricade and Construction standard sheet for "Work Zone Pavement Marking Details."

County: HARRIS

Highway: IH 45

Control: 0110-05-127

**Item 662: Work Zone Pavement Markings**

**Item 666: Reflectorized Pavement Markings**

**Item 668: Prefabricated Pavement Markings**

**Item 6038: Multipolymer Pavement Markings (MPM)**

Use Type III glass beads for thermoplastic and multipolymer pavement markings.

Use a 0.100 in. (100 mil) thickness for thermoplastic pavement markings, measured to the top of the thermoplastic, not including the exposed glass beads.

Use a 0.022 in. (22 mil) thickness for multipolymer pavement markings, measured to the top of the multipolymer, not including the exposed glass beads.

For roadways with asphalt surfaces to be striped with work zone or permanent thermoplastic markings, the Contractor has the option to apply paint and beads markings for a maximum 30-day period until placing the thermoplastic markings, or until starting the succeeding phase of work on the striped area. Maintain the paint and beads markings, at no expense to the Department until placing the thermoplastic markings or starting the succeeding phase of work on the striped area. The work zone markings, whether paint and beads or thermoplastic, are paid under the Item, "Work Zone Pavement Markings" and the markings are paid for only once for the given phase of construction.

If using paint and bead markings as described above, purchase the traffic paint from the open market.

If the Type II markings become dirty and require cleaning by washing, brushing, compressed air, or other approved methods before applying the Type I thermoplastic markings, this additional cleaning is subsidiary to the Item, "Reflectorized Pavement Markings."

Establish the alignment and layout for work zone striping and permanent striping.

Stripe all roadways before opening them to traffic.

Place pavement markings under these items in accordance with details shown on the plans, the latest "Texas Manual on Uniform Traffic Control Devices," or as directed.

When design details are not shown on the plans, provide pavement markings for arrows, words, and symbols conforming to the latest "Standard Highway Sign Designs for Texas" manual.

Place the pedestrian crosswalk pavement markings only after the pedestrian signals and push buttons are installed and operating.

**Item 672: Raised Pavement Markers**

If other operations are complete on the project and if the curing time period is not yet elapsed, the contract time will be suspended until the curing is done.

County: HARRIS

Highway: IH 45

Sheet 6G

Control: 0110-05-127

Before placing the raised pavement markers on concrete pavement, blast clean the surface using an abrasive-blasting medium. This work is subsidiary to the Item, "Raised Pavement Markers."

Provide epoxy adhesive that is machine-mixed or nozzle-mixed and dispensed. Equip the machine or nozzle with a mechanism to ensure positive mix measurement control.

**Item 677: Eliminating Existing Pavement Markings and Markers**

Remove existing pavement markings on concrete or asphalt surfaces by flail milling or as directed.

**Item 678: Pavement Surface Preparation for Markings**

Do not blast clean asphalt concrete pavement. Clean asphalt concrete pavement as required under the applicable specifications or as directed.

On new concrete pavement or on existing concrete pavement when placing a new stripe on a new location, remove the curing compounds and contamination from the pavement surface by flail milling or as directed. In addition, air-blast the surface with compressed air just before placing the new stripe.

On existing concrete pavement when placing a new stripe on an existing location, after removing the existing stripe under the Item, "Eliminating Existing Pavement Markings and Markers," air-blast the surface with compressed air just before placing the new stripe.

Do not clean concrete pavement by grinding.

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

A shadow vehicle with Truck Mounted Attenuators (TMAs) or Trailer Attenuators (TAs) is required as shown on the appropriate Traffic Control Plan (TCP) sheets. TMAs/TAs must meet the requirements of the Compliant Work Zone Traffic Control Device List.

Level 3 Compliant TMAs/TAs are required for this project.

A total of three (3) shadow vehicles with a TMA/TA are required for Pavement Marking Operations. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.

In addition to the shadow vehicles with TMAs/TAs that are specified as being required on the TCP layout sheets for this project, provide additional shadow vehicles with TMAs/TAs as shown on the TCP Standard sheets. The Contractor is responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed on the project.



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0110-05-127

DISTRICT Houston  
HIGHWAY IH 45

COUNTY Harris

CONTROL SECTION JOB				0110-05-127		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00123397			
COUNTY				Harris			
HIGHWAY				IH 45			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6001	PREPARING ROW	AC	1.200		1.200	
	100-6003	PREPARING ROW(TREE)(5" TO 12" DIA)	EA	40.000		40.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	120.000		120.000	
	104-6021	REMOVING CONC (CURB)	LF	1,820.000		1,820.000	
	104-6036	REMOVING CONC (SIDEWALK OR RAMP)	SY	166.700		166.700	
	110-6001	EXCAVATION (ROADWAY)	CY	1,625.600		1,625.600	
	132-6007	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CY	250.000		250.000	
	162-6002	BLOCK SODDING	SY	2,000.000		2,000.000	
	162-6003	STRAW OR HAY MULCH	SY	2,000.000		2,000.000	
	164-6052	BROADCAST SEED (PERM)(SPECIAL MIX)	SY	2,000.000		2,000.000	
	166-6001	FERTILIZER	AC	1.200		1.200	
	168-6001	VEGETATIVE WATERING	MG	3.600		3.600	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)	SY	3,000.000		3,000.000	
	360-6043	CONC PVMT (CONT REINF)(FAST TRK)(13")	SY	2,032.000		2,032.000	
	400-6005	CEM STABIL BKFL	CY	94.000		94.000	
	400-6009	CEMENT STAB BACKFILL (INLET OR MH)	CY	27.500		27.500	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	302.000		302.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	5.400		5.400	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	12.300		12.300	
	464-6003	RC PIPE (CL III)(18 IN)	LF	86.000		86.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	124.000		124.000	
	465-6166	INLET (COMPL)(TY AAD)	EA	2.000		2.000	
	465-6174	MANH (COMPL)(TY B)	EA	1.000		1.000	
	465-6259	INLET (COMPL)(EXT TY C)	EA	3.000		3.000	
	465-6269	INLET (COMPL)(TY C)	EA	2.000		2.000	
	479-6003	ADJUSTING MANHOLES & INLETS	EA	2.000		2.000	
	481-6013	PIPE (PVC) (SCH 40) (6 IN)	LF	14.000		14.000	
	496-6007	REMOV STR (PIPE)	LF	100.000		100.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	3.000		3.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	2,779.000		2,779.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	2,779.000		2,779.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	200.000		200.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	200.000		200.000	
	512-6013	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	LF	1,870.000		1,870.000	
	512-6025	PORT CTB (MOVE)(SGL SLP)(TY 1)	LF	850.000		850.000	
	512-6037	PORT CTB (STKPL)(SGL SLP)(TY 1)	LF	1,870.000		1,870.000	

DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0110-05-127	7



CONTROLLING PROJECT ID 0110-05-127

DISTRICT Houston  
HIGHWAY IH 45

COUNTY Harris

# Estimate & Quantity Sheet

CONTROL SECTION JOB				0110-05-127		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00123397			
COUNTY				Harris			
HIGHWAY				IH 45			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	529-6005	CONC CURB (MONO) (TY II)	LF	1,700.000		1,700.000	
	529-6011	CONC CURB (DOWEL)	LF	75.000		75.000	
	530-6025	DRIVEWAYS (CONC) (FAST TRACK)	SY	224.000		224.000	
	531-6001	CONC SIDEWALKS (4")	SY	327.000		327.000	
	531-6005	CURB RAMPS (TY 2)	EA	1.000		1.000	
	531-6010	CURB RAMPS (TY 7)	EA	2.000		2.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	250.000		250.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	1.000		1.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1.000		1.000	
	545-6002	CRASH CUSH ATTEN (DES SOURCE)	EA	2.000		2.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	1.000		1.000	
	545-6004	CRASH CUSH ATTEN (STKPL)	EA	2.000		2.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	1,547.000		1,547.000	
	620-6007	ELEC CONDR (NO.8) BARE	LF	1,547.000		1,547.000	
	620-6008	ELEC CONDR (NO.8) INSULATED	LF	3,094.000		3,094.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	4.000		4.000	
	644-6075	RELOCATE SM RD SN SUP&AM(SIGN ONLY)	EA	6.000		6.000	
	658-6064	INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2	EA	10.000		10.000	
	662-6017	WK ZN PAV MRK NON-REMOV (W)(ARROW)	EA	2.000		2.000	
	662-6018	WK ZN PAV MRK NON-REMOV (W)(DBL ARW)	EA	2.000		2.000	
	662-6060	WK ZN PAV MRK REMOV (W)4"(BRK)	LF	1,700.000		1,700.000	
	662-6063	WK ZN PAV MRK REMOV (W)4"(SLD)	LF	2,250.000		2,250.000	
	662-6095	WK ZN PAV MRK REMOV (Y)4"(SLD)	LF	2,400.000		2,400.000	
	666-6225	PAVEMENT SEALER 6"	LF	1,749.000		1,749.000	
	666-6226	PAVEMENT SEALER 8"	LF	1,416.000		1,416.000	
	666-6228	PAVEMENT SEALER 12"	LF	160.000		160.000	
	666-6230	PAVEMENT SEALER 24"	LF	60.000		60.000	
	666-6231	PAVEMENT SEALER (ARROW)	EA	4.000		4.000	
	666-6232	PAVEMENT SEALER (WORD)	EA	6.000		6.000	
	666-6234	PAVEMENT SEALER (DBL ARROW)	EA	2.000		2.000	
	666-6236	PAVEMENT SEALER (UTURN ARROW)	EA	2.000		2.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	4.000		4.000	
	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	2.000		2.000	
	668-6080	PREFAB PAV MRK TY C (W) (UTURN ARROW)	EA	2.000		2.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	6.000		6.000	
	672-6007	REFL PAV MRKR TY I-C	EA	55.000		55.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	77.000		77.000	



DISTRICT	COUNTY	CCSJ	SHEET
Houston	Harris	0110-05-127	7A



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0110-05-127

DISTRICT Houston  
HIGHWAY IH 45

COUNTY Harris

CONTROL SECTION JOB				0110-05-127		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00123397			
COUNTY				Harris			
HIGHWAY				IH 45			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	677-6002	ELIM EXT PAV MRK & MRKS (6")	LF	1,749.000		1,749.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	1,613.000		1,613.000	
	677-6005	ELIM EXT PAV MRK & MRKS (12")	LF	120.000		120.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	60.000		60.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2.000		2.000	
	677-6009	ELIM EXT PAV MRK & MRKS (DBL ARROW)	EA	2.000		2.000	
	677-6012	ELIM EXT PAV MRK & MRKS (WORD)	EA	4.000		4.000	
	677-6036	ELIM EXT PAV MRK & MRKS (UTURN ARROW)	EA	2.000		2.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	1,749.000		1,749.000	
	678-6004	PAV SURF PREP FOR MRK (8")	LF	1,416.000		1,416.000	
	678-6006	PAV SURF PREP FOR MRK (12")	LF	160.000		160.000	
	678-6008	PAV SURF PREP FOR MRK (24")	LF	60.000		60.000	
	678-6009	PAV SURF PREP FOR MRK (ARROW)	EA	4.000		4.000	
	678-6010	PAV SURF PREP FOR MRK (DBL ARROW)	EA	2.000		2.000	
	678-6012	PAV SURF PREP FOR MRK (UTURN ARR)	EA	2.000		2.000	
	678-6016	PAV SURF PREP FOR MRK (WORD)	EA	6.000		6.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	132.000		132.000	
	690-6006	REMOVAL OF GROUND BOXES	EA	4.000		4.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	28.000		28.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	362.000		362.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	1,387.000		1,387.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	1,416.000		1,416.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	160.000		160.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	60.000		60.000	
	6185-6002	TMA (STATIONARY)	DAY	90.000		90.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	32.000		32.000	
08		EROSION CONTROL MAINTENANCE (NON-PART)	LS	1.000		1.000	
		LAW ENFORCEMENT	LS	1.000		1.000	
		SAFETY CONTINGENCY (NON-PART)	LS	1.000		1.000	



### ROADWAY

LOCATION	0100	0100	0104	0104	0104	0110	0132	0360	0432	0529	0529	0530	0531	0531	0531	0540	0540	0544	0658
	6001	6003	6017	6021	6036	6001	6007	6043	6045	6005	6011	6025	6001	6005	6010	6001	6016	6001	6064
	PREPARING ROW	PREPARING ROW(TREE)(5" TO 12" DIA)	REMOVING CONC (DRIVEWAYS)	REMOVING CONC (CURB)	REMOVING CONC (SIDEWALK OR RAMP)	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(ORD COMP)(TY D)	CONC PVMT (CONT REINF)(FAST TRK)(13")	RIPRAP (MOW STRIP)(4 IN)	CONC CURB (MONO) (TY II)	CONC CURB (DOWEL)	DRIVEWAYS (CONC) (FAST TRACK)	CONC SIDEWALKS (4")	CURB RAMPS (TY 2)	CURB RAMPS (TY 7)	MTL W-BEAM GD FEN (TIM POST)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	INSTL DEL ASSM (D-SY)SZ 1(BRF)GF2
	AC	EA	SY	LF	SY	CY	CY	SY	CY	LF	LF	SY	SY	EA	EA	LF	EA	EA	EA
I 45 NBFRTG RD.	1.2	40	120	1820.0	166.7	1625.6	250	2032.0	12.3	1700	75	224	327	1	2	250	1	1	10
<b>PROJECT TOTALS</b>	<b>1.2</b>	<b>40.0</b>	<b>120.0</b>	<b>1820.0</b>	<b>166.7</b>	<b>1625.6</b>	<b>250.0</b>	<b>2032.0</b>	<b>12.3</b>	<b>1700.0</b>	<b>75.0</b>	<b>224.0</b>	<b>327.0</b>	<b>1.0</b>	<b>2</b>	<b>250</b>	<b>1</b>	<b>1</b>	<b>10</b>

### EROSION CONTROL

### DRAINAGE

LOCATION	0400	0400	0402	0432	0464	0464	0465	0465	0465	0465	0479	0481	0496
	6005	6009	6001	6001	6003	6005	6166	6174	6259	6269	6003	6013	6007
	CEM STABIL BKFL	CEMENT STAB BACKFILL (INLET OR MH)	TRENCH EXCAVATION PROTECTION	RIPRAP (CONC)(4 IN)	RC PIPE (CL III)(18 IN)	RC PIPE (CL III)(24 IN)	INLET (COMPL)(TY AAD)	MANH (COMPL)(TY B)	INLET (COMPL)(EXT TY C)	INLET (COMPL)(TY C)	ADJUSTING MANHOLES & INLETS	PIPE (PVC) (SCH 40) (6 IN)	REMOV STR (PIPE)
	CY	CY	LF	CY	LF	LF	EA	EA	EA	EA	EA	LF	LF
I 45 NBFRTG RD.	94	27.5	302	5.4	86	124	2	1	3	2	2	14	100
<b>PROJECT TOTALS</b>	<b>94</b>	<b>27.5</b>	<b>302</b>	<b>5.4</b>	<b>86</b>	<b>124</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>14</b>	<b>100</b>

LOCATION	0169	0506	0506	0506	0506
	6002	6038	6039	6042	6043
	SOIL RETENTION BLANKETS (CL 1) (TY B)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	LF	LF	LF	LF
I 45 NBFRTG RD.	3000	2779	2779	200	200
<b>PROJECT TOTALS</b>	<b>3000</b>	<b>2779</b>	<b>2779</b>	<b>200</b>	<b>200</b>

①

### LANDSCAPING

LOCATION	0162	0162	0164	0166	0168
	6002	6003	6052	6001	6001
	BLOCK SODDING	STRAW OR HAY MULCH	BROADCAST SEED (PERM)(SPECIAL MIX)	FERTILIZER	VEGETATIVE WATERING
	SY	SY	SY	AC	MG
I 45 NBFRTG RD.	2000	2000	2000	1.2	3.6
<b>PROJECT TOTALS</b>	<b>2000</b>	<b>2000</b>	<b>2000</b>	<b>1.2</b>	<b>3.6</b>

### SIGNALS

LOCATION	0690
	6006
	REMOVAL OF GROUND BOXES
	EA
I 45 NBFRTG	4
<b>PROJECT TOTALS</b>	<b>4</b>

① PLACED AROUND AREA INLETS.



## IH 45 AT CYPRESSWOOD

### ROADWAY QUANTITY SUMMARY

SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			8
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: \$DATE\$ FILE: \$FILE\$


### WORKZONE

LOCATION	0500	0502	0512	0512	0512	0545	0545	0545	0662	0662	0662	0662	0662	6001	6185	6185
	6001	6001	6013	6025	6037	6002	6003	6004	6017	6018	6060	6063	6095	6001	6002	6003
	MOBILIZATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	PORT CTB (DES SOURCE)(SGL SLP)(TY 1)	PORT CTB (MOVE)(SGL SLP)(TY 1)	PORT CTB (STKPL)(SGL SLP)(TY 1)	CRASH CUSH ATTEN (DES SOURCE)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (STKPL)	WK ZN PAV MRK NON-REMOV (W)(ARROW)	WK ZN PAV MRK NON-REMOV (W)(DBL ARW)	WK ZN PAV MRK REMOV (W)4"(BRK)	WK ZN PAV MRK REMOV (W)4"(SLD)	WK ZN PAV MRK REMOV (Y)4"(SLD)	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	LS	MO	LF	LF	LF	EA	EA	EA	EA	EA	LF	LF	LF	DAY	DAY	HR
PHASE 1	1	3		850		2		2				1000	2400		30	
PHASE 2			1870		1870		1		2	2	1700	1250			60	
														28		32
<b>PROJECT TOTALS</b>	<b>1</b>	<b>3</b>	<b>1870</b>	<b>850</b>	<b>1870</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1700</b>	<b>2250</b>	<b>2400</b>	<b>28</b>	<b>90</b>	<b>32</b>

### PAVEMENT MARKINGS

LOCATION	0644	0666	0666	0666	0666	0666	0666	0666	0666	0668	0668	0668	0668	0672	0672	0677	0677	0677	0677	
	6075	6225	6226	6228	6230	6231	6232	6234	6236	6077	6078	6080	6085	6007	6010	6002	6003	6005	6007	6008
	RELOCATE SM RD SN SUP&AM(SIGN ONLY)	PAVEMENT SEALER 6"	PAVEMENT SEALER 8"	PAVEMENT SEALER 12"	PAVEMENT SEALER 24"	PAVEMENT SEALER (ARROW)	PAVEMENT SEALER (WORD)	PAVEMENT SEALER (DBL ARROW)	PAVEMENT SEALER (UTURN ARROW)	PREFAB PAV MRK TY C (W) (ARROW)	PREFAB PAV MRK TY C (W) (DBL ARROW)	PREFAB PAV MRK TY C (W) (UTURN ARROW)	PREFAB PAV MRK TY C (W) (WORD)	REFL PAV MRKR TY I-C	REFL PAV MRKR TY II-C-R	ELIM EXT PAV MRK & MRKS (6")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (12")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)
	EA	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF	LF	LF	LF	EA
SHEET 1	1	975	270												43	974	1333			
SHEET 2	5	774	1146	160	60	4	6	2	2	4	2	2	6	55	34	775	280	120	60	2
<b>PROJECT TOTALS</b>	<b>6</b>	<b>1749</b>	<b>1416</b>	<b>160</b>	<b>60</b>	<b>4</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>55</b>	<b>77</b>	<b>1749</b>	<b>1613</b>	<b>120</b>	<b>60</b>	<b>2</b>

0677	0677	0677	0678	0678	0678	0678	0678	0678	0678	0678	0678	6038	6038	6038	6038	6038
6009	6012	6036	6002	6004	6006	6008	6009	6010	6012	6016	6033	6004	6005	6007	6011	6013
ELIM EXT PAV MRK & MRKS (DBL ARROW)	ELIM EXT PAV MRK & MRKS (WORD)	ELIM EXT PAV MRK & MRKS (UTURN ARROW)	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (8")	PAV SURF PREP FOR MRK (12")	PAV SURF PREP FOR MRK (24")	PAV SURF PREP FOR MRK (ARROW)	PAV SURF PREP FOR MRK (DBL ARROW)	PAV SURF PREP FOR MRK (UTURN ARR)	PAV SURF PREP FOR MRK (WORD)	PAV SURF PREP FOR MRK (RPM)	MULTIPOLYMER PAV MRK (W)(6")(SLD)	MULTIPOLYMER PAV MRK (W)(6")(BRK)	MULTIPOLYMER PAV MRK (W)(8")(SLD)	MULTIPOLYMER PAV MRK (W)(12")(SLD)	MULTIPOLYMER PAV MRK (W)(24")(SLD)
EA	EA	EA	LF	LF	LF	LF	EA	EA	EA	EA	EA	LF	LF	LF	LF	LF
			975	270							43	270	705	270		
2	4	2	774	1146	160	60	4	2	2	6	89	92	682	1146	160	60
<b>2</b>	<b>4</b>	<b>2</b>	<b>1749</b>	<b>1416</b>	<b>160</b>	<b>60</b>	<b>4</b>	<b>2</b>	<b>2</b>	<b>6</b>	<b>132</b>	<b>362</b>	<b>1387</b>	<b>1416</b>	<b>160</b>	<b>60</b>



**IH 45 AT CYPRESSWOOD**

**PAVEMENT MARKING AND WORKZONE QUANTITY SUMMARY**

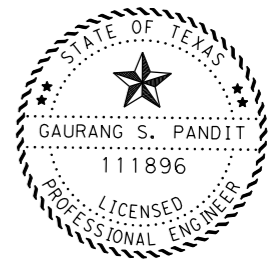
SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			9
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: \$DATE\$ FILE: \$FILE\$

CSJ: 0110-05-127

ITEM NO.	DESC CODE	DESCRIPTION	UNIT	QTY
0618	6046	CONDT (PVC) (SCH 80) (2")	LF	1547
0620	6007	ELEC CONDR (NO.8) BARE	LF	1547
0620	6008	ELEC CONDR (NO.8) INSULATED	LF	3094
0624	6010	GROUND BOX TY D (162922)W/APRON	EA	4



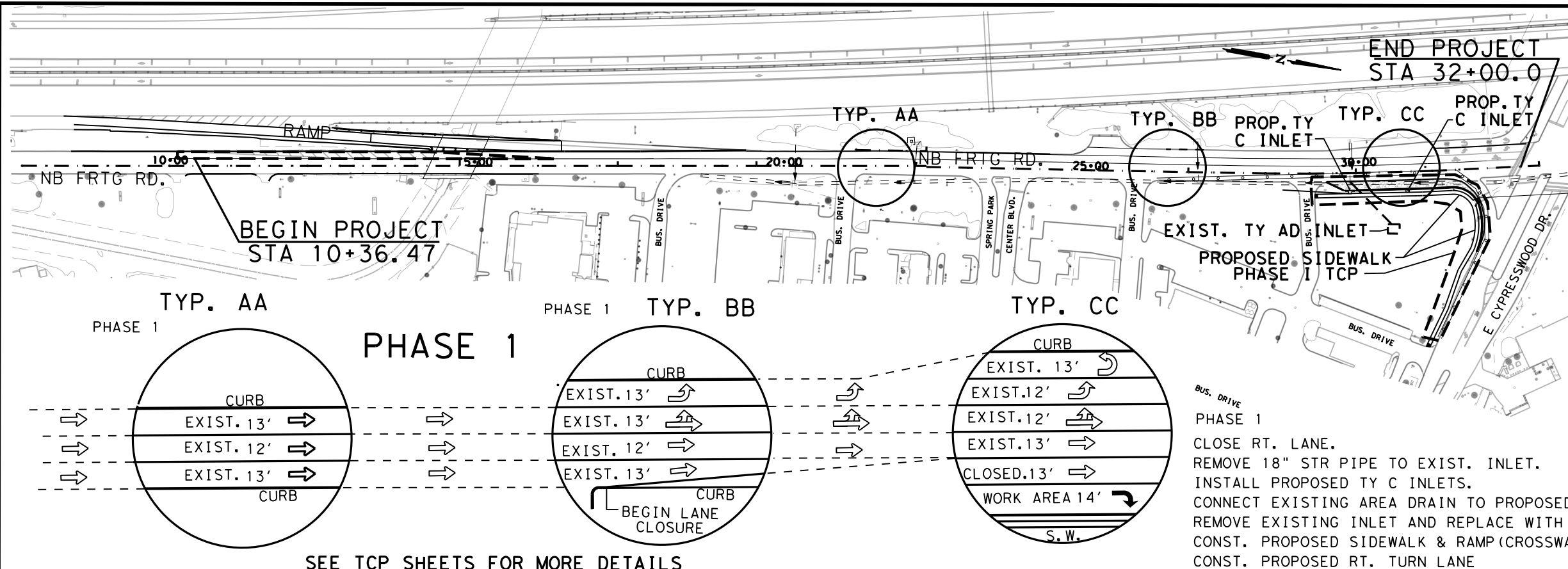
The seal appearing on this document was authorized by Gaurang S. Pandit, P.E. 111896, on

*G. Pandit*  
04/13/2021

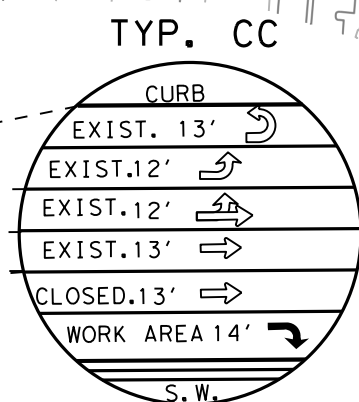
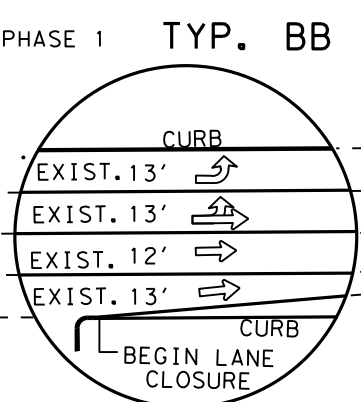
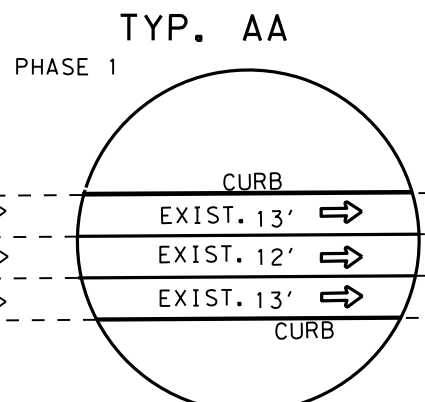
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**TEXAS DEPARTMENT OF TRANSPORTATION**  
 IH 45 AT E. CYPRESSWOOD DR.  
 SUMMARY OF ILLUMINATION  
 QUANTITIES

NOT TO SCALE SHEET 1 OF 1

ORIGINAL DRAWING DATE:	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
DR. I - SAK	12	6		10
DR. I - MM	COUNTY		CONTROL SECTION JOB	HIGHWAY
DR. I - SAK	HARRIS		0110 05 127	IH 45
DR. I - MM				



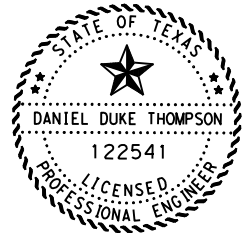
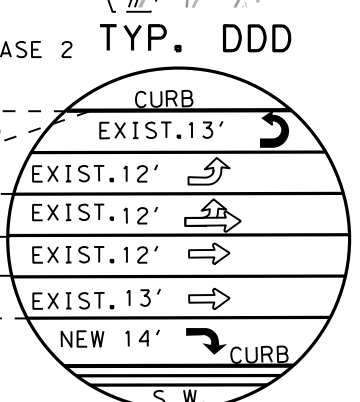
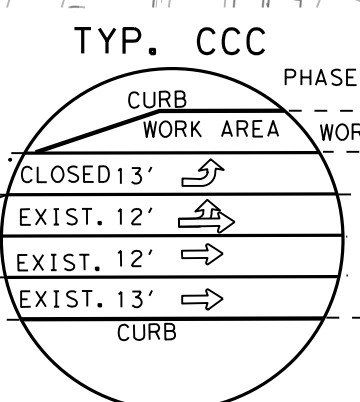
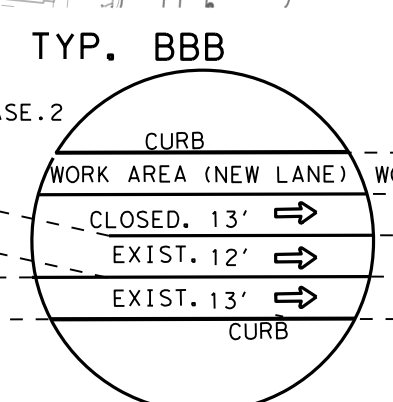
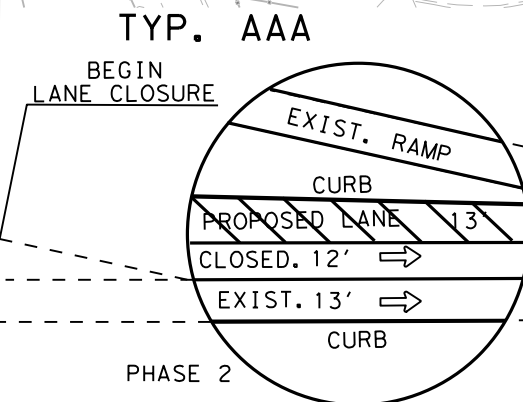
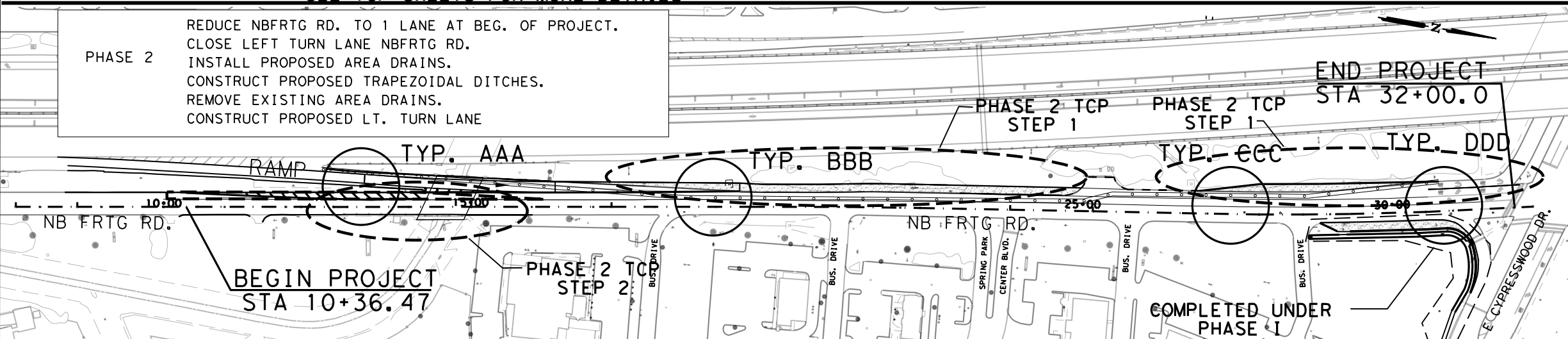
--- PHASE TCP  
 [Hatched Box] PROP. ROADWAY



BUS. DRIVE  
 PHASE 1  
 CLOSE RT. LANE.  
 REMOVE 18" STR PIPE TO EXIST. INLET.  
 INSTALL PROPOSED TY C INLETS.  
 CONNECT EXISTING AREA DRAIN TO PROPOSED INLET.  
 REMOVE EXISTING INLET AND REPLACE WITH MH.  
 CONST. PROPOSED SIDEWALK & RAMP (CROSSWALK TO REMAIN OPEN AT CYPRESSWOOD)  
 CONST. PROPOSED RT. TURN LANE

SEE TCP SHEETS FOR MORE DETAILS

PHASE 2  
 REDUCE NBFRTG RD. TO 1 LANE AT BEG. OF PROJECT.  
 CLOSE LEFT TURN LANE NBFRTG RD.  
 INSTALL PROPOSED AREA DRAINS.  
 CONSTRUCT PROPOSED TRAPEZOIDAL DITCHES.  
 REMOVE EXISTING AREA DRAINS.  
 CONSTRUCT PROPOSED LT. TURN LANE



*Daniel Duke Thompson*  
 The seal appearing on this document was authorized by DANIEL THOMPSON, P.E. 122541 on 07/02, 2021. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.



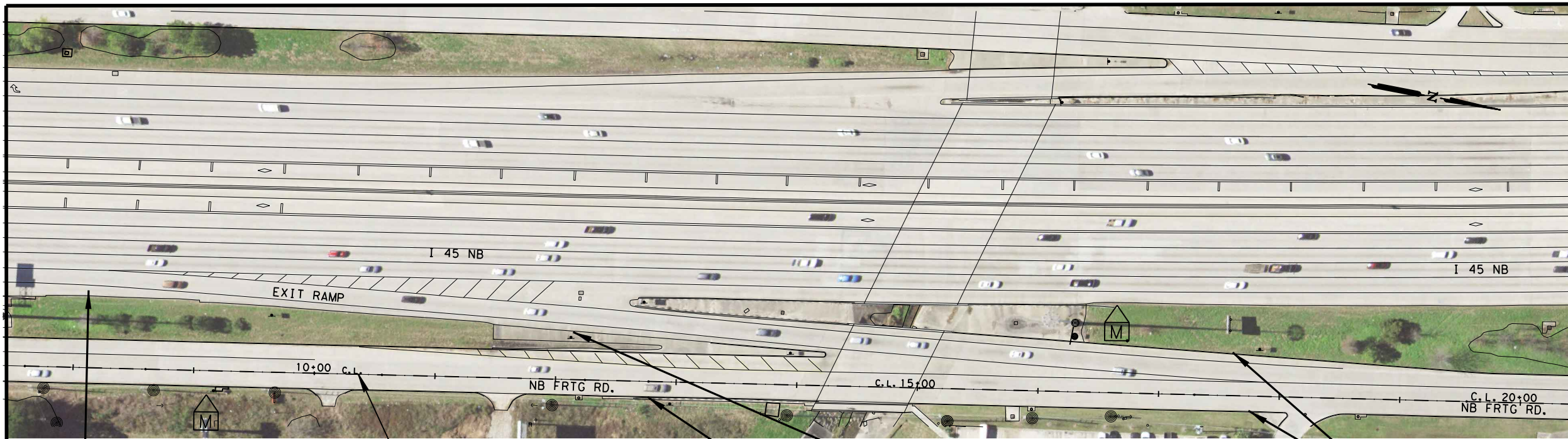
IH45 AT  
 CYPRESSWOOD DR.  
 TRAFFIC CONTROL  
 NARRATIVE












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 SHEET 1 OF 1

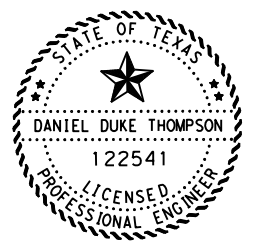
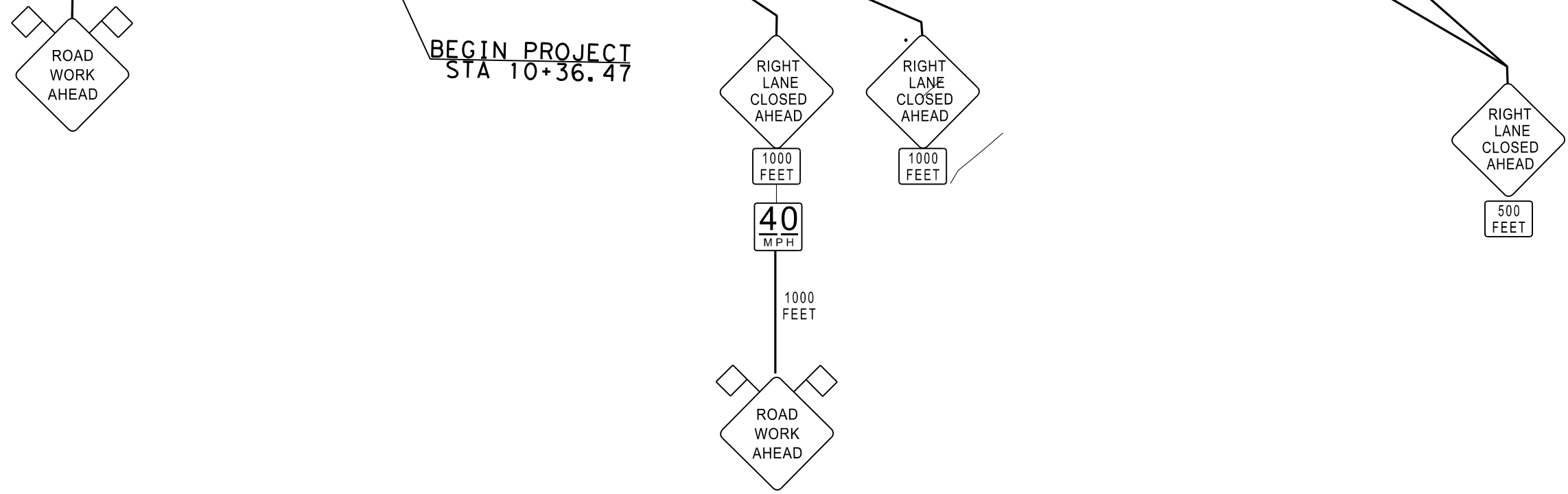
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			11
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

SEE TCP SHEETS FOR MORE DETAILS

DATE: 8/2/2021  
 \$FILEL\$



- LEGEND**
-  PROP WORK ZONE
  -  EXISTING TRAFFIC
  -  PROPOSED TRAFFIC
  -  TMA
  -  CHANNELIZING DEVICES
  -  FLASHING ARROW VIEW
  -  SIGN SUPPORT
  -  TEMP. CONCRETE TRAFFIC BARRIER
  -  TY III BARRICADE
  -  CHANGEABLE MESSAGE SIGN
  -  PROPOSED ROADWAY
- MATCHLINE**
- (A) WK ZN PAV MKR REMPV W 4' SLD
  - (B) WK ZN PAV MKR REMPV Y 4' SLD
  - (C) WK ZN PAV MKR REMPV W 4' BRK



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IH 45  
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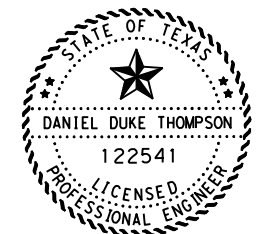
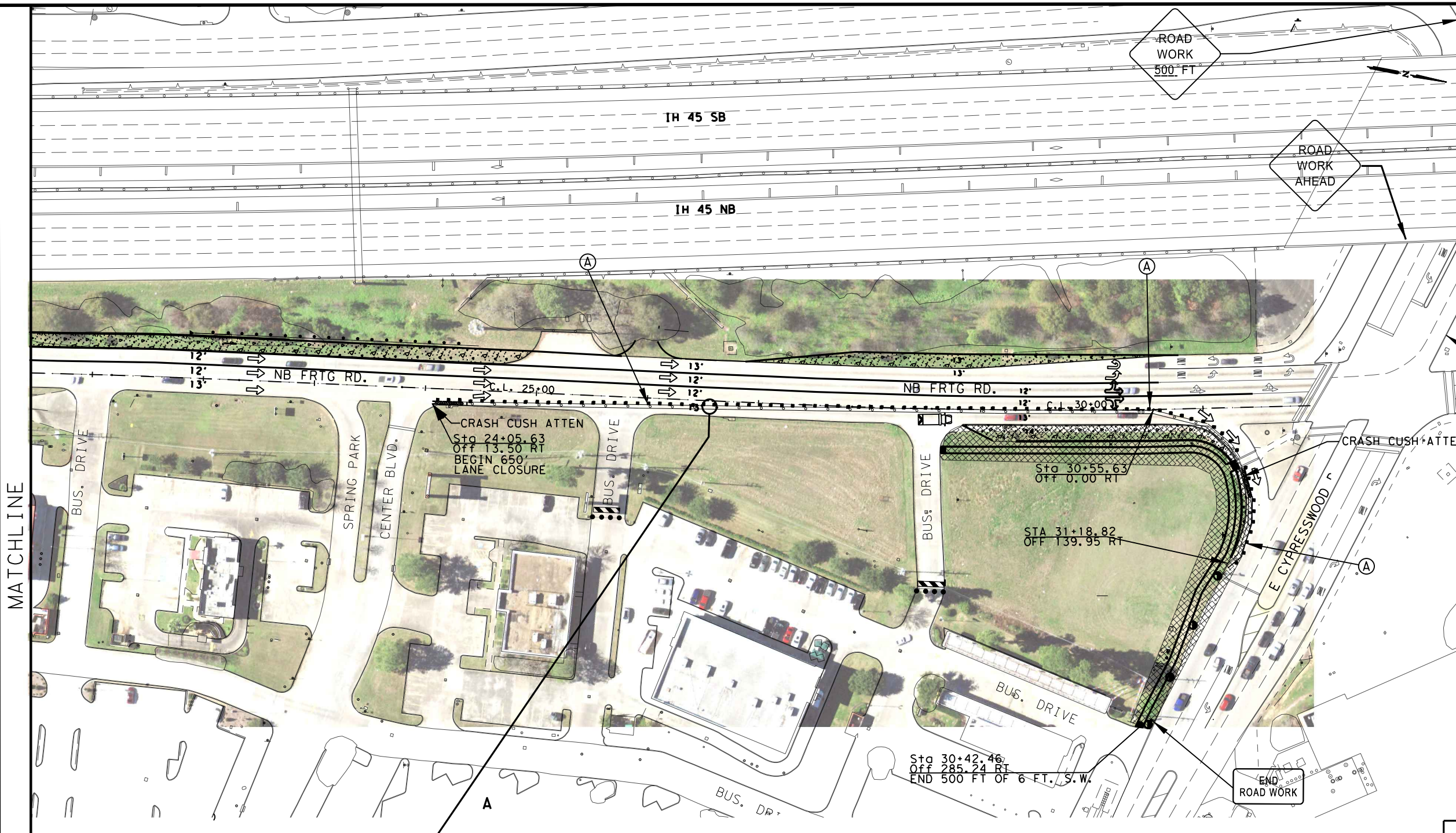
TCP  
 PHASE 1  
 SCALE: 1" = 100' HORZ

SHEET 1 OF 2

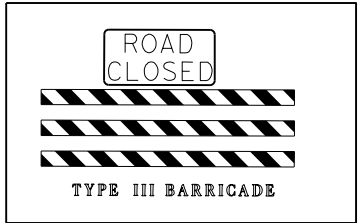
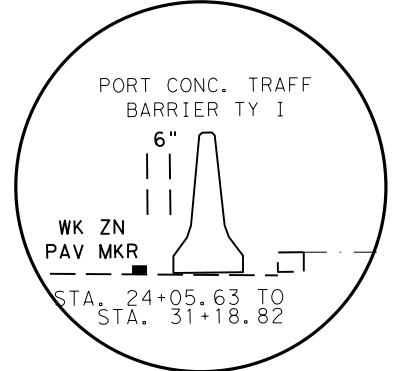
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6			12
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/27/2021  
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- LEGEND**
-  PROP WORK ZONE
  -  EXISTING TRAFFIC
  -  PROPOSED TRAFFIC
  -  TMA
  -  CHANNELIZING DEVICES
  -  FLASHING ARROW VIEW
  -  SIGN SUPPORT
  -  TEMP. CONCRETE TRAFFIC BARRIER
  -  TY III BARRICADE
  -  CHANGEABLE MESSAGE SIGN
  -  PROPOSED ROADWAY
  - (A) WK ZN PAV MKR REMPV W 4' SLD
  - (B) WK ZN PAV MKR REMPV Y 4' SLD
  - (C) WK ZN PAV MKR REMPV W 4' BRK



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CONSTRUCTION OF RT. TURN LANE AND SIDEWALK














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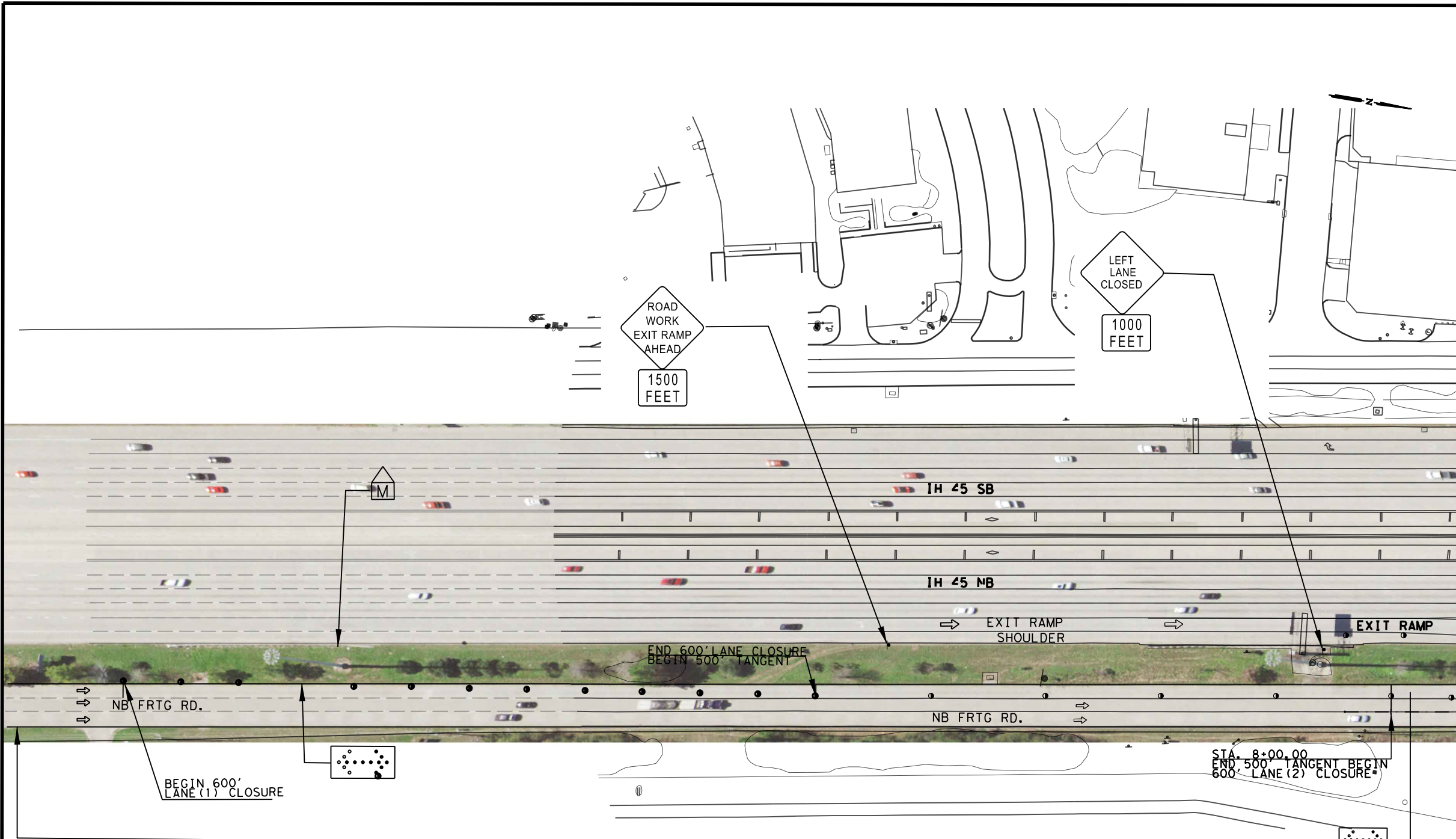
TCP  
 PHASE 1  
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SHEET 2 OF 2

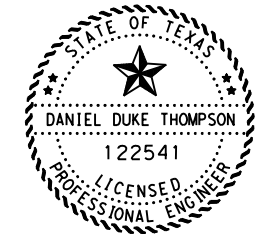
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STATE TEXAS	DIST HOU	COUNTY HARRIS	
CONT 0110	SECT 05	JOB 127	HIGHWAY IH 45

DATE: 8/27/2021  
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- LEGEND**
-  PROP WORK ZONE
  -  EXISTING TRAFFIC
  -  PROPOSED TRAFFIC
  -  TMA
  -  CHANNELIZING DEVICES
  -  FLASHING ARROW VIEW
  -  SIGN SUPPORT
  -  TEMP. CONCRETE TRAFFIC BARRIER
  -  TY III BARRICADE
  -  CHANGEABLE MESSAGE SIGN
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- (A) WK ZN PAV MKR REMPV W 4' SLD  
 (B) WK ZN PAV MKR REMPV Y 4' SLD  
 (C) WK ZN PAV MKR REMPV W 4' BRK



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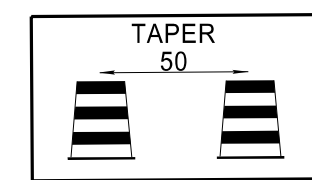
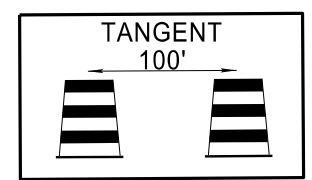
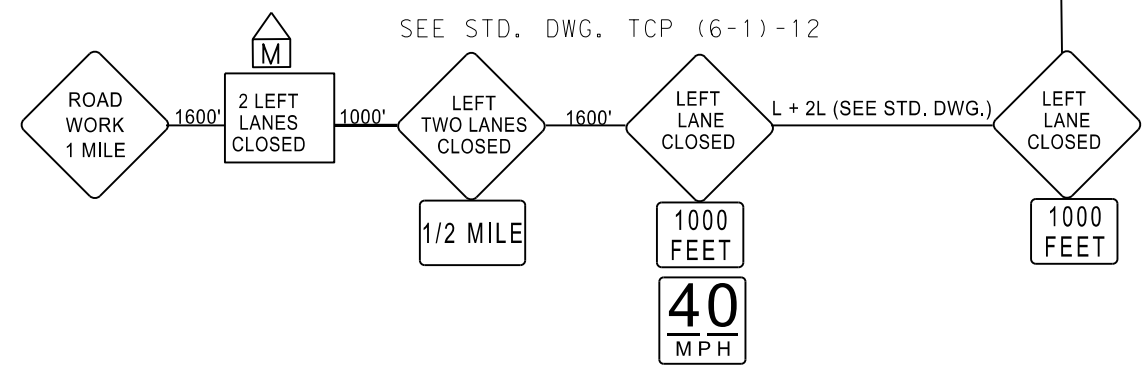


IH 45  
 AT CYPRESSWOOD DR.

TCP  
 PHASE 2












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SHEET 1 OF 3



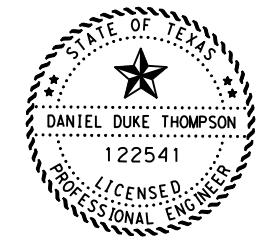
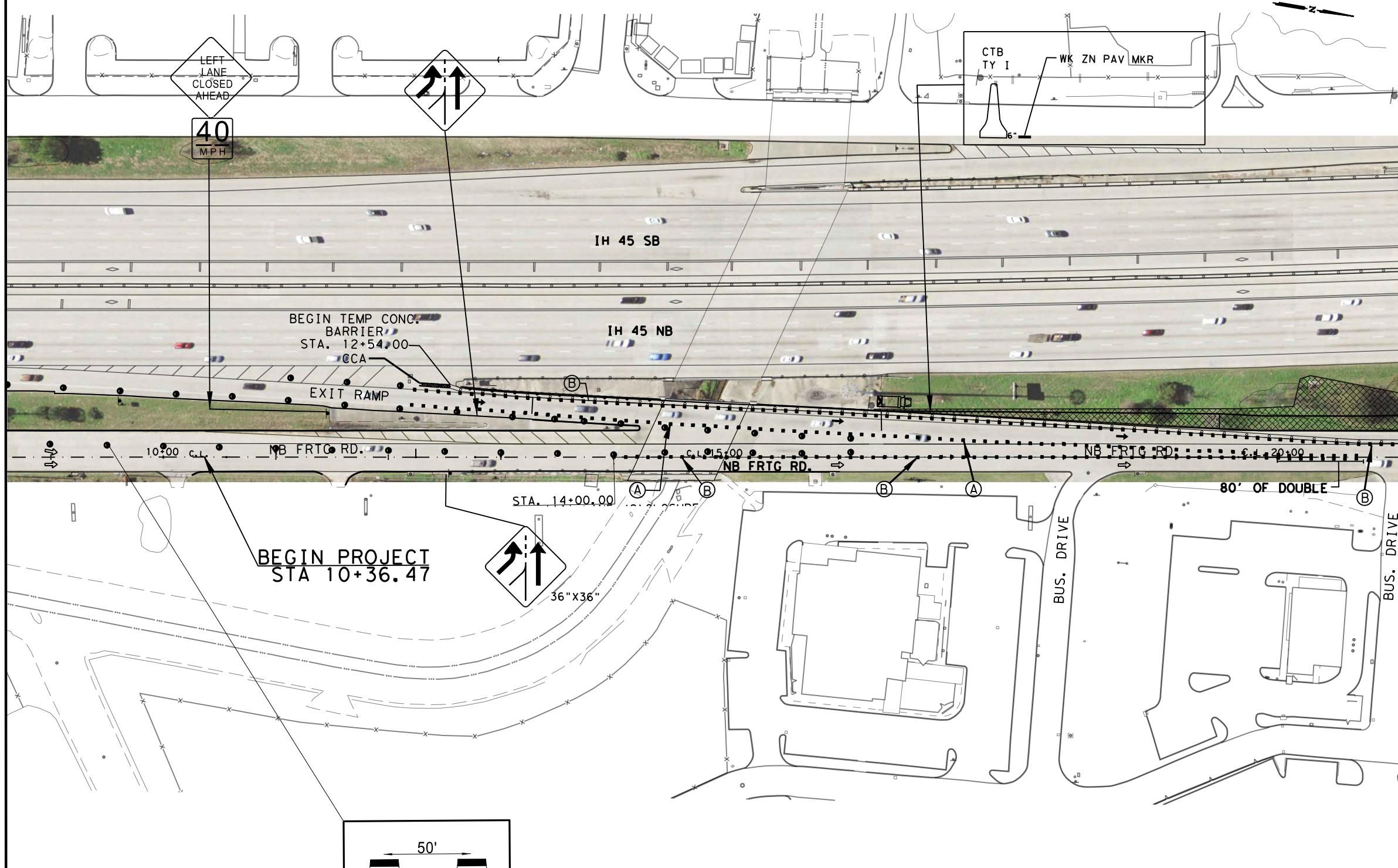
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6			14
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

- LEGEND**
-  PROP WORK ZONE
  -  EXISTING TRAFFIC
  -  PROPOSED TRAFFIC
  -  TMA
  -  CHANNELIZING DEVICES
  -  FLASHING ARROW VIEW
  -  SIGN SUPPORT
  -  TEMP. CONCRETE TRAFFIC BARRIER
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  - (B) WK ZN PAV MKR REMPV Y 4' SLD
  - (C) WK ZN PAV MKR REMPV W 4' BRK

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IH 45  
 AT CYPRESSWOOD DR.

TCP  
 PHASE 2












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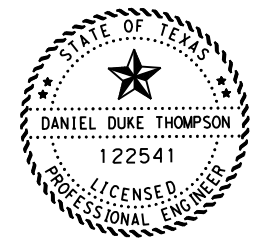
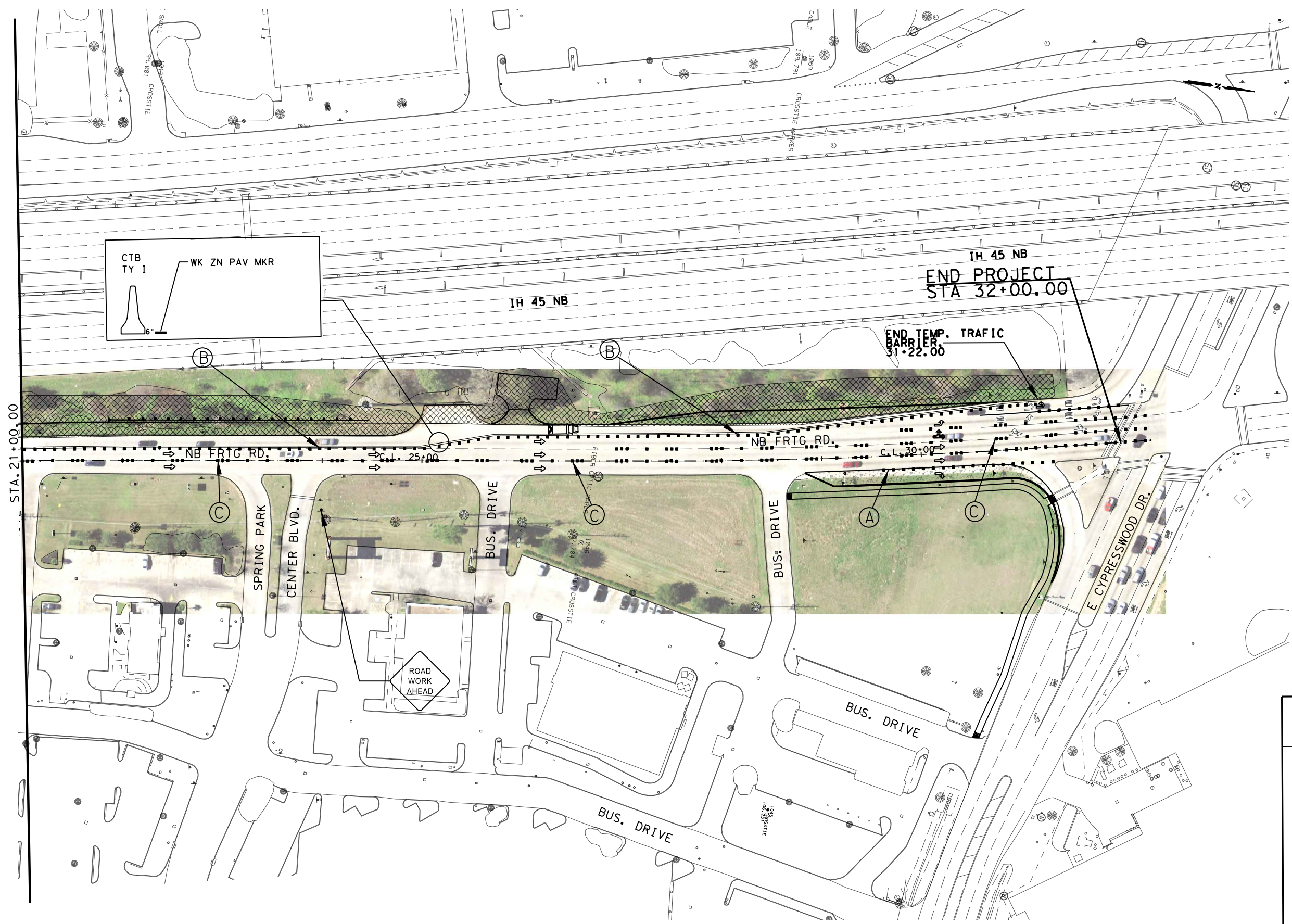
SHEET 2 OF 3

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6			15
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/2/2021  
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- LEGEND**
-  PROP WORK ZONE
  -  EXISTING TRAFFIC
  -  PROPOSED TRAFFIC
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  -  CHANNELIZING DEVICES
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 TCP  
 PHASE 2  
 SCALE: 1" = 100' HORZ  
 SHEET 3 OF 3

FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 16
STATE TEXAS	DIST HOU	COUNTY HARRIS	
CONT 0110	SECT 05	JOB 127	HIGHWAY IH 45

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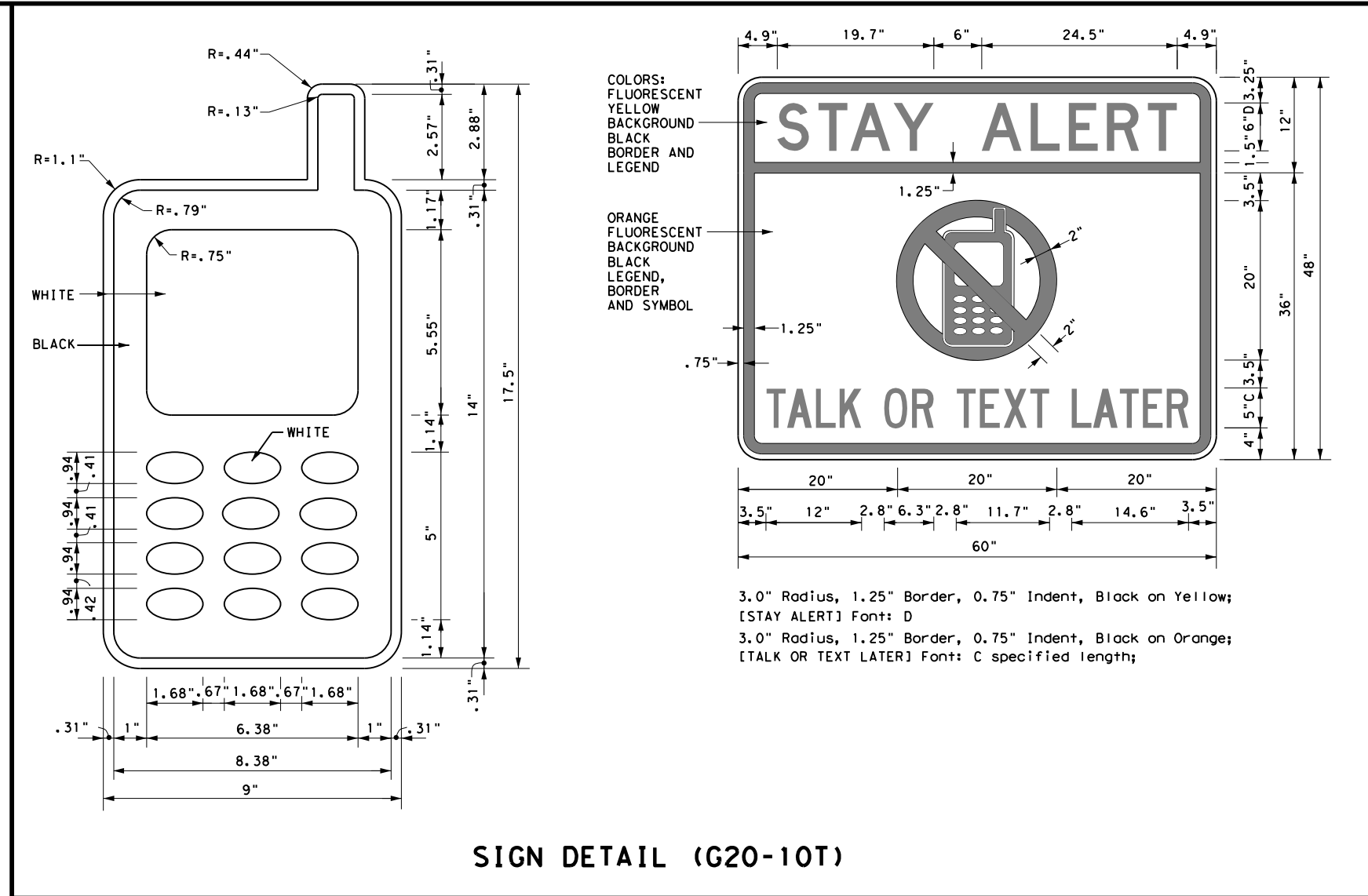
**BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:**

- The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
- The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
- Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
- When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
- The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
- All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
- The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

**WORKER SAFETY APPAREL NOTES:**

- Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.

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

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

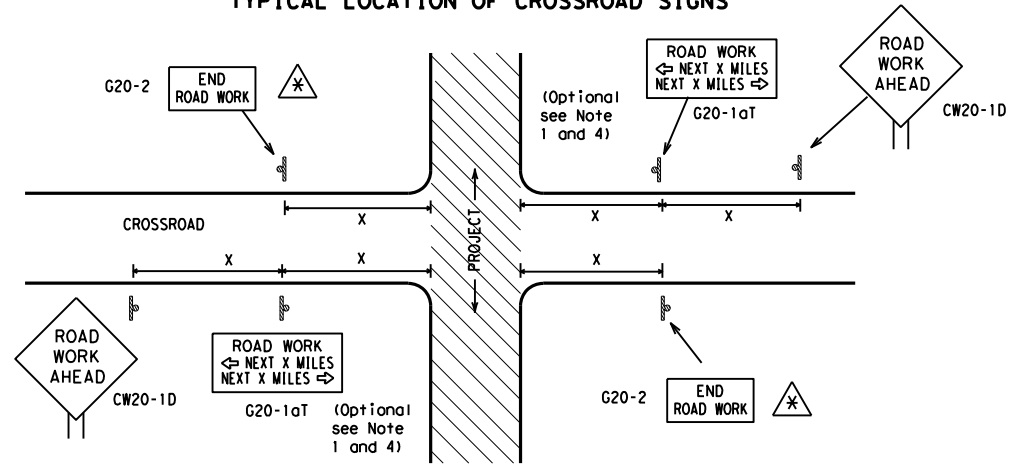
<b>THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT</b> <a href="http://www.txdot.gov">http://www.txdot.gov</a>
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)
MATERIAL PRODUCER LIST (MPL)
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"
STANDARD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

SHEET 1 OF 12

		<i>Traffic Operations Division Standard</i>
<b>BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS</b>		
<b>BC (1) - 14</b>		
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT: 0110	SECT: 05
REVISIONS	0127	JOB: IH45
4-03 5-10 8-14	DIST: HOU	COUNTY: HARRIS
9-07 7-13		SHEET NO.: 17

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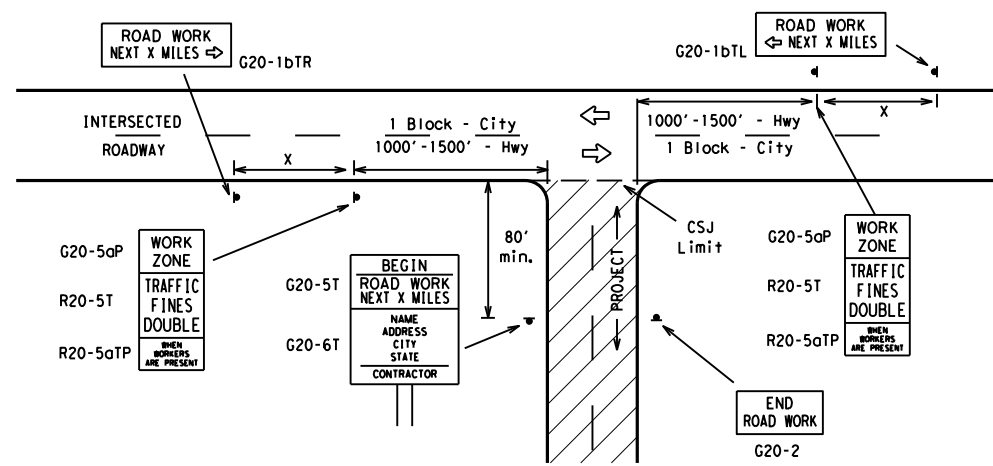
**TYPICAL LOCATION OF CROSSROAD SIGNS**



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

- The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
- The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
- Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
- The "ROAD WORK NEXT X MILES" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
- Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
- When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

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

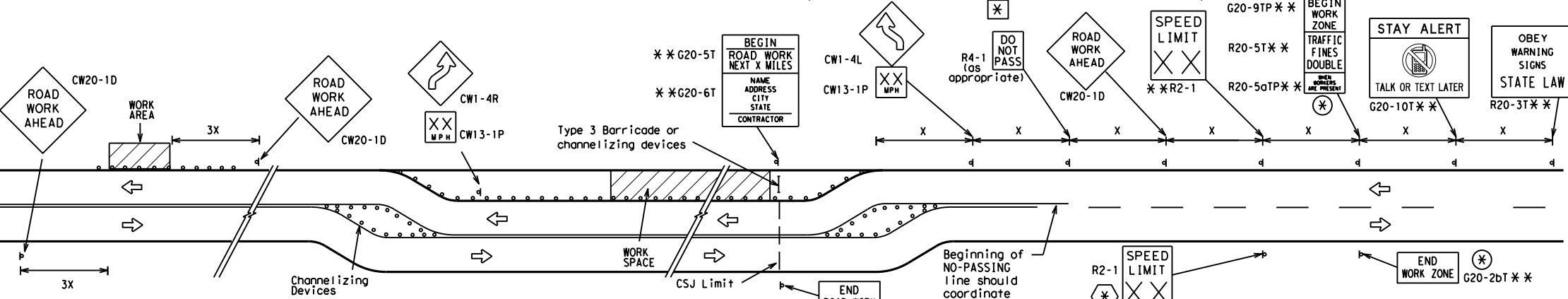
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

**GENERAL NOTES**

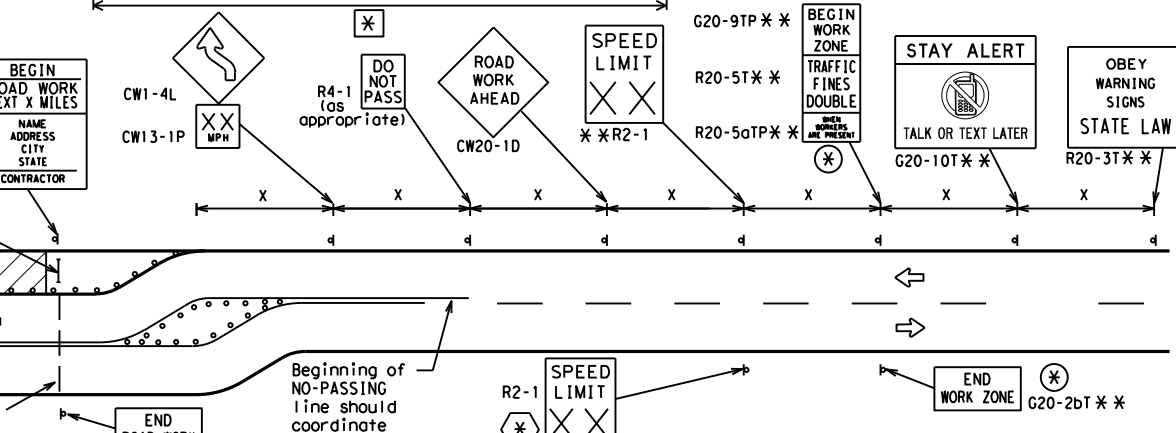
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be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

**WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS**

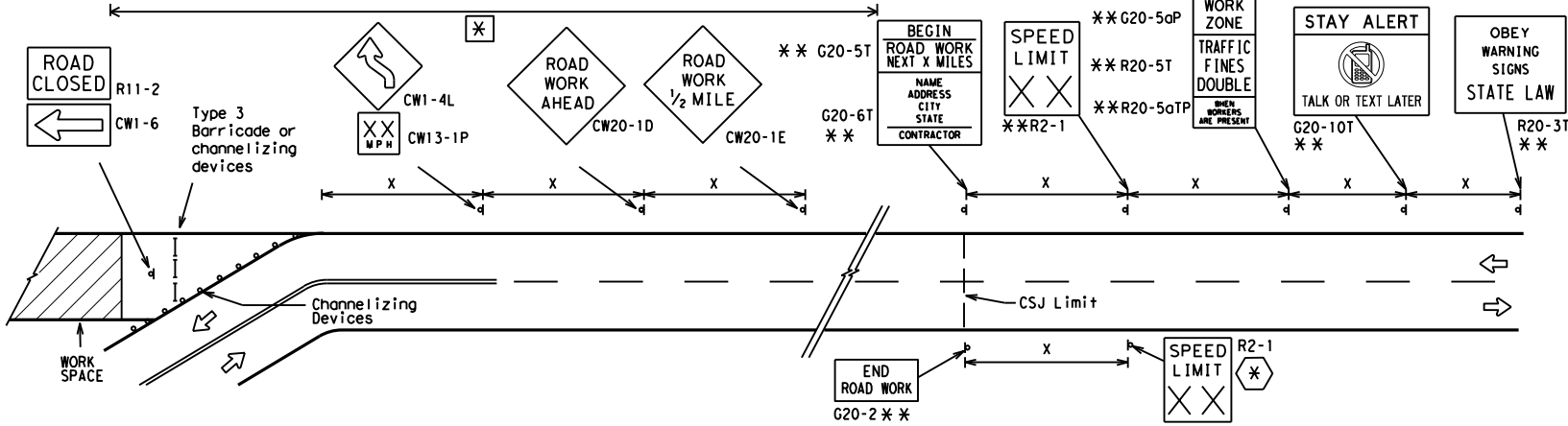


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS**



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



**NOTES**

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- \* The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
- \*\* Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.
- \* Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
- \* Contractor will install a regulatory speed limit sign at the end of the work zone.

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

SHEET 2 OF 12



**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

**BC(2)-14**

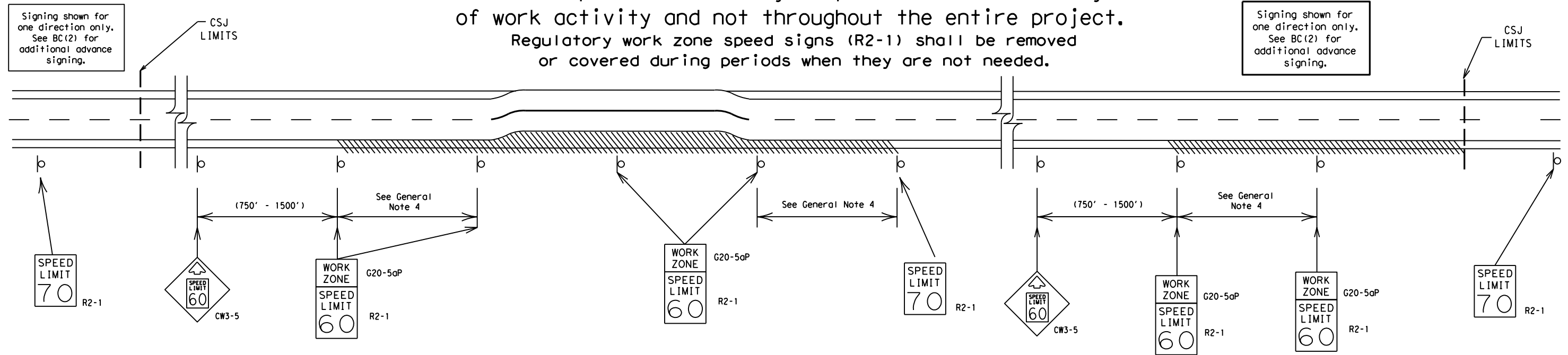
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© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	HOU	HARRIS	18	

DATE: FILE:

# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

### SHORT TERM WORK ZONE SPEED LIMITS

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

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

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:
 

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

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SHEET 3 OF 12



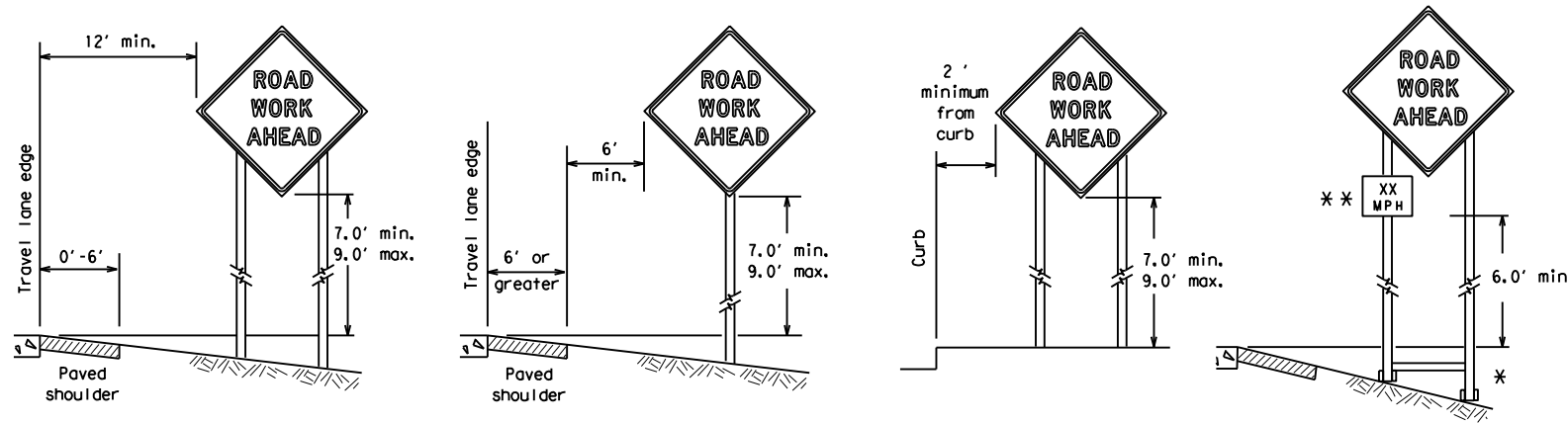
## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3) - 14

FILE:	bc-14.dgn	DW:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
© TxDOT	November 2002	CONT:		SECT:	JOB		HIGHWAY		
REVISIONS		0110	05	127					
9-07	8-14	DIST:		COUNTY:			SHEET NO.		
7-13		HOU:		HARRIS			19		

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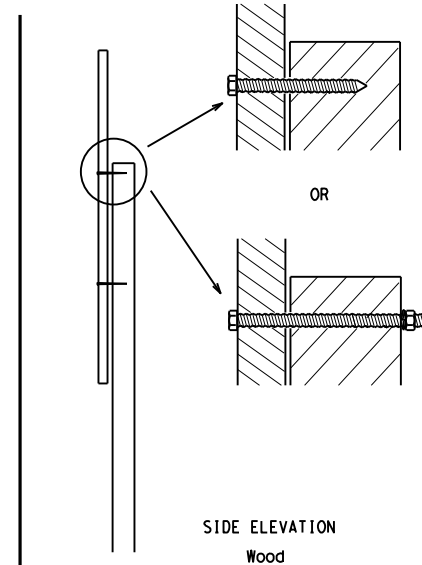
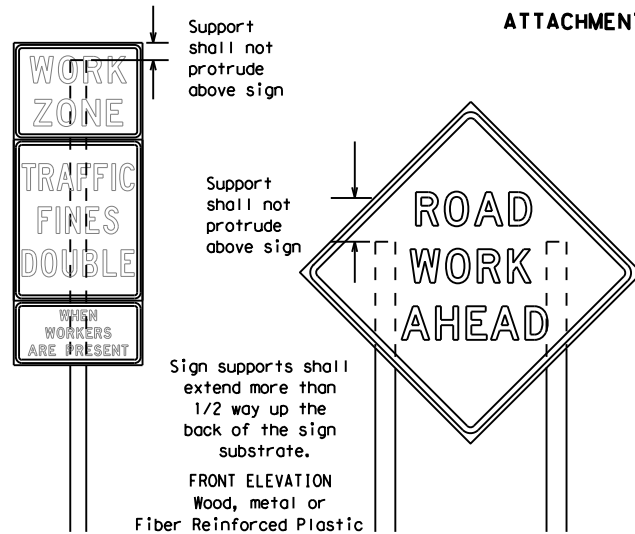
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



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

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

**ATTACHMENT FOR SIGN SUPPORTS**



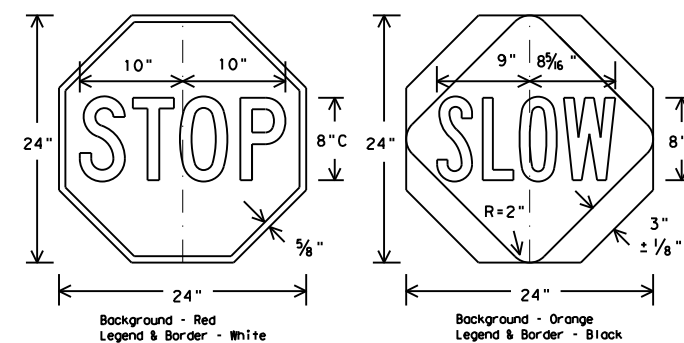
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

**STOP/SLOW PADDLES**

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



**CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS**

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

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
  - Wooden sign posts shall be painted white.
  - Barricades shall NOT be used as sign supports.
  - All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
  - The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
  - The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
  - The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
  - Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
  - The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
    - Long-term stationary - work that occupies a location more than 3 days.
    - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
    - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
    - Short, duration - work that occupies a location up to 1 hour.
    - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

**SIGN MOUNTING HEIGHT**

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

**SIZE OF SIGNS**

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

**SIGN SUBSTRATES**

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

**REFLECTIVE SHEETING**

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

**SIGN LETTERS**

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

**REMOVING OR COVERING**

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

**SIGN SUPPORT WEIGHTS**

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

**FLAGS ON SIGNS**

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

SHEET 4 OF 12



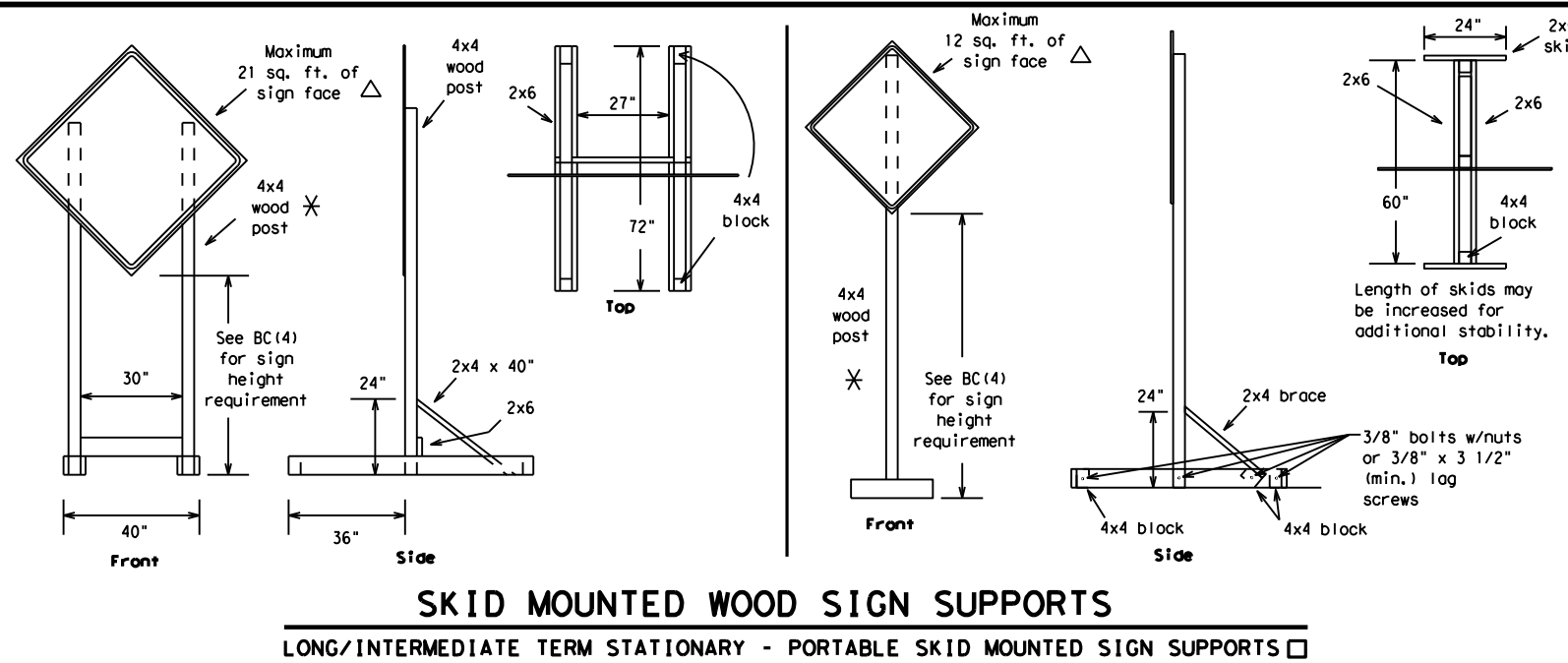
**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC (4) - 14**

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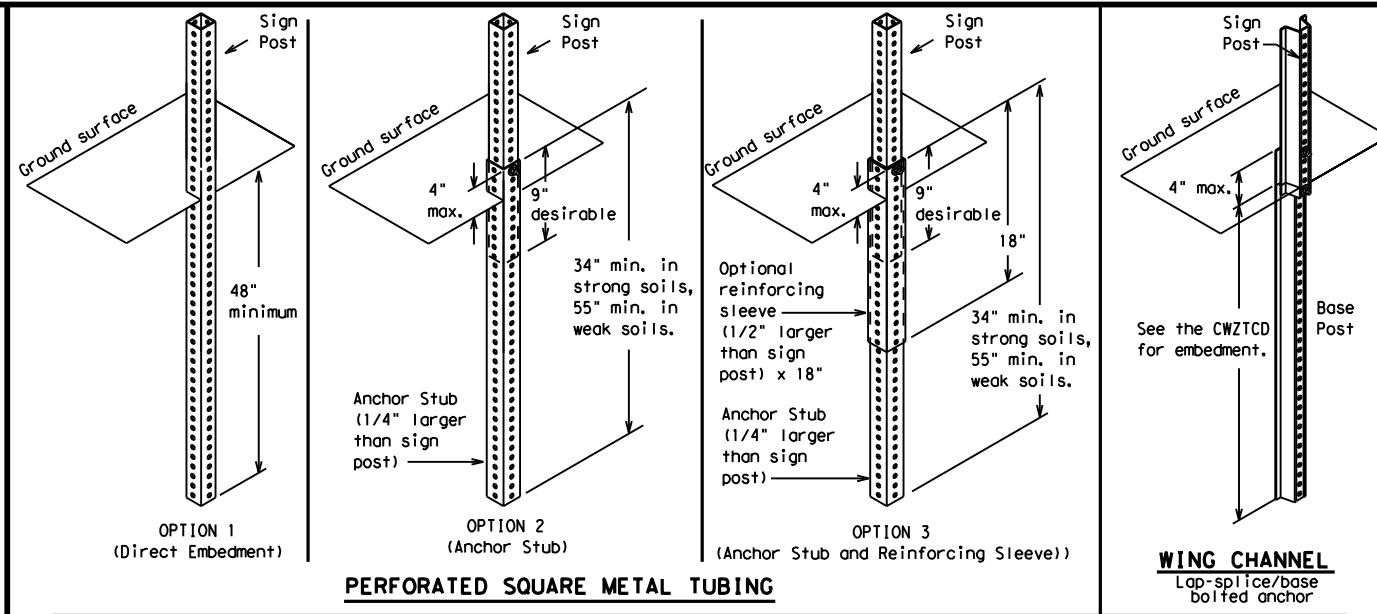
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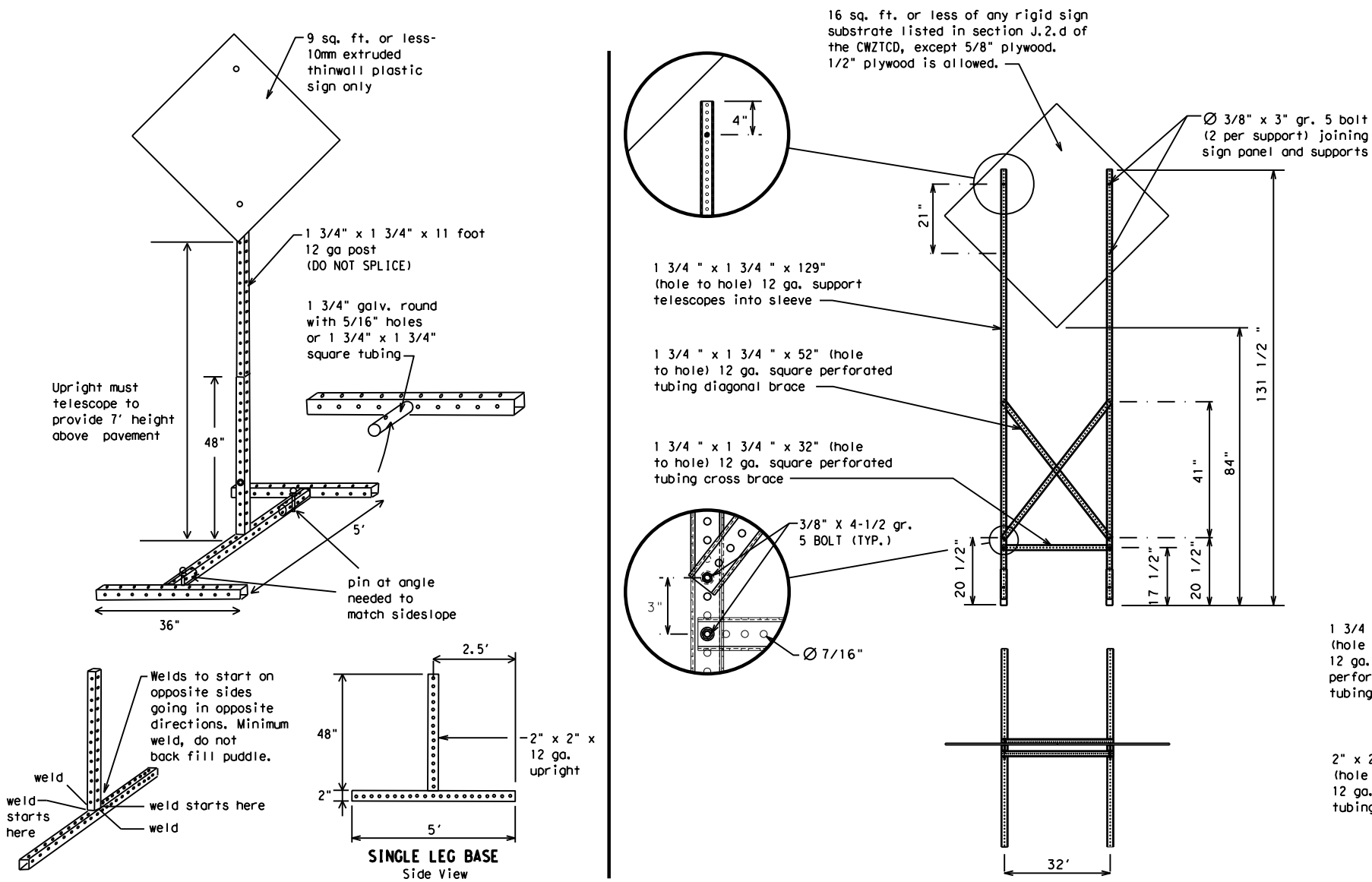
**SKID MOUNTED WOOD SIGN SUPPORTS**

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

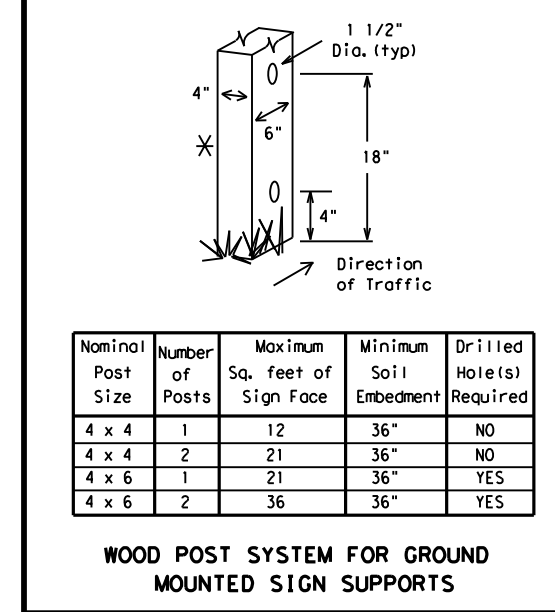


**GROUND MOUNTED SIGN SUPPORTS**

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



**SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS**



**WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS**

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

**WEDGE ANCHORS**

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

**OTHER DESIGNS**

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

**GENERAL NOTES**

- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

- See BC(4) for definition of "Work Duration."
- \* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- △ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

**BC(5) - 14**

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DATE: FILE:

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

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

## PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canal	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

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

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

### Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
LANES SHIFT *

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

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

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

### Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX TO XXXXXX
US XXX TO FM XXXX

### Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

### \*\* Advance Notice List

TUE-FRI XX AM-X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

## WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

## FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the "Flagger Symbol" (CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

SHEET 6 OF 12



Traffic Operations Division Standard

# BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

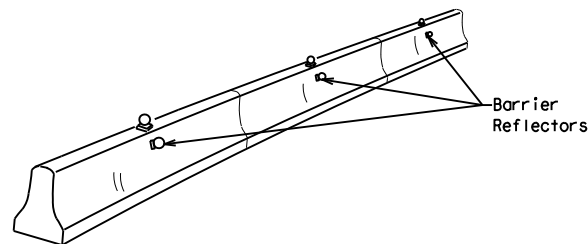
BC (6) - 14

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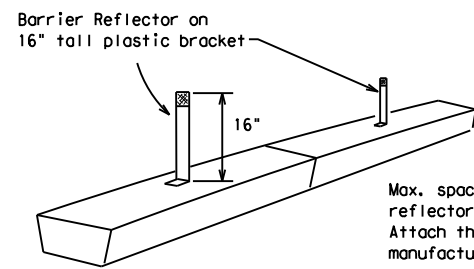
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors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



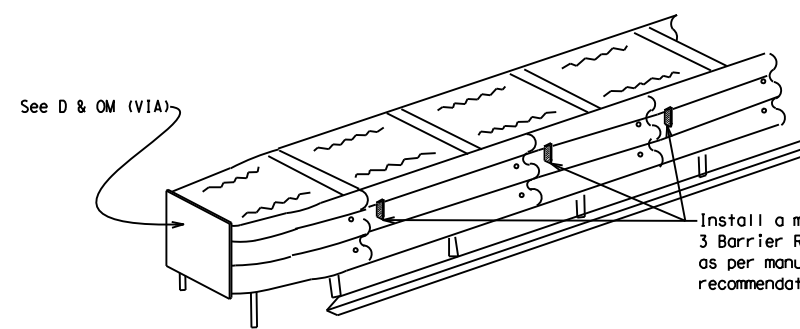
**CONCRETE TRAFFIC BARRIER (CTB)**

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



**LOW PROFILE CONCRETE BARRIER (LPCB)**

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



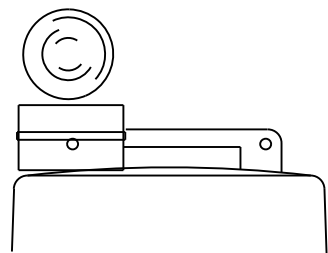
**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

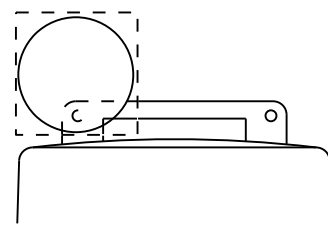
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.



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

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, and on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.



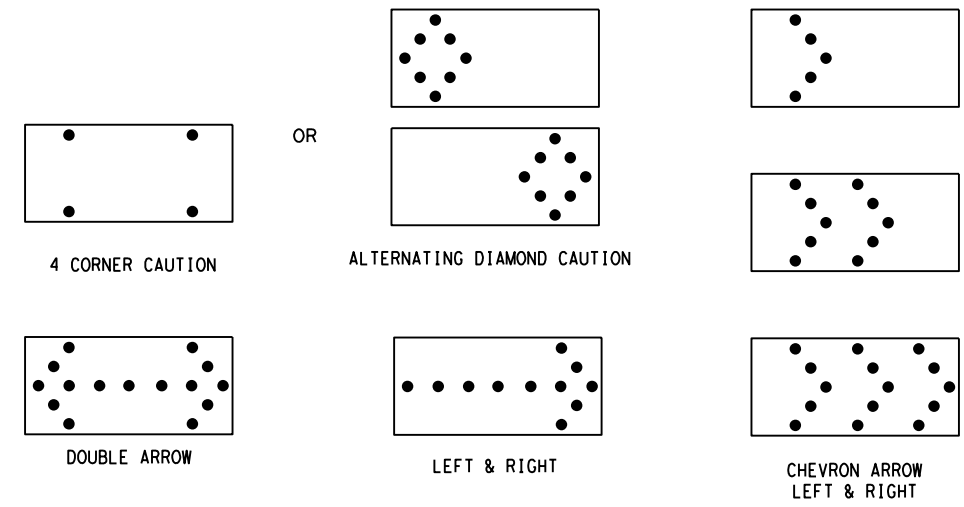
Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

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

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.

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

- The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

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

**ATTENTION**  
 Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



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

**BC(7)-14**

FILE: bc-14.dgn	DN: TxDOT	CR: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	HOU	HARRIS	23	

DATE:  
FILE:



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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

**GENERAL DESIGN REQUIREMENTS**

Pre-qualified plastic drums shall meet the following requirements:

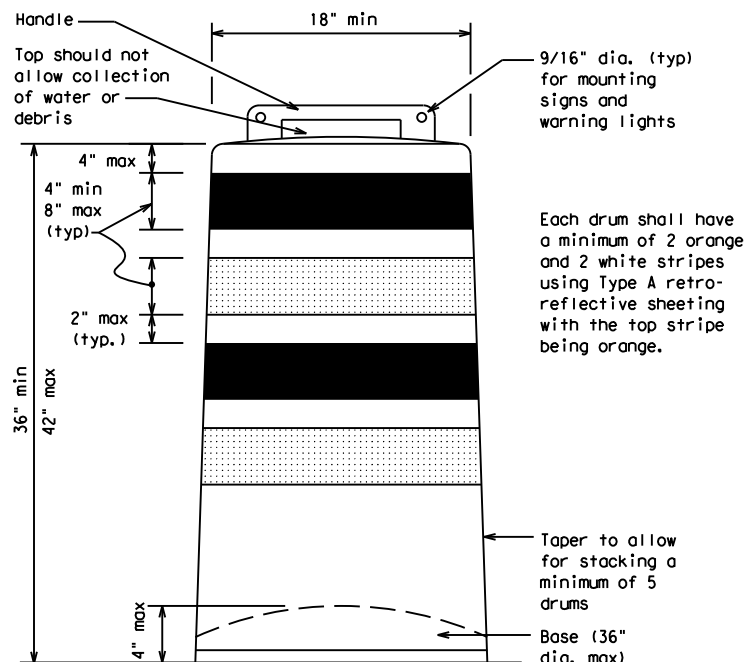
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectORIZED space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

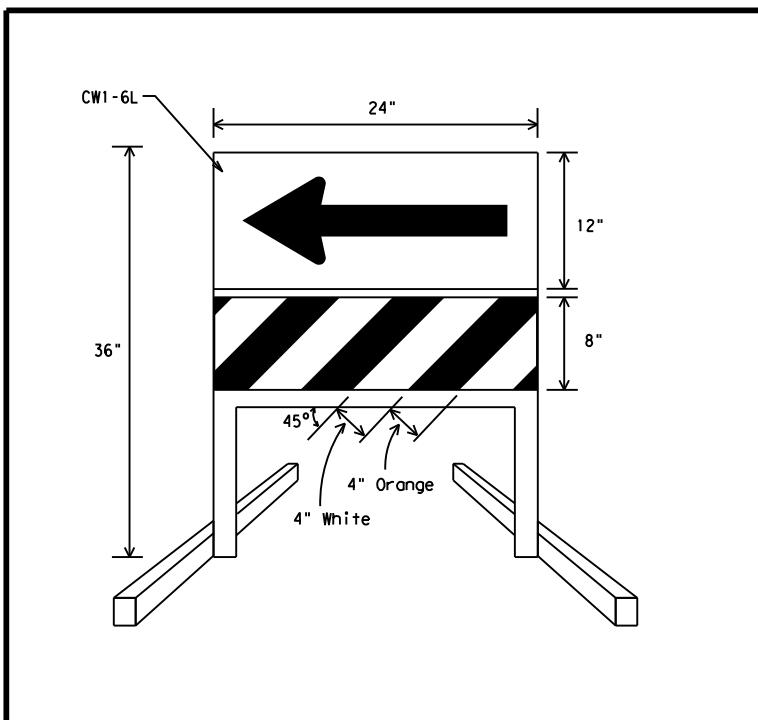
**BALLAST**

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



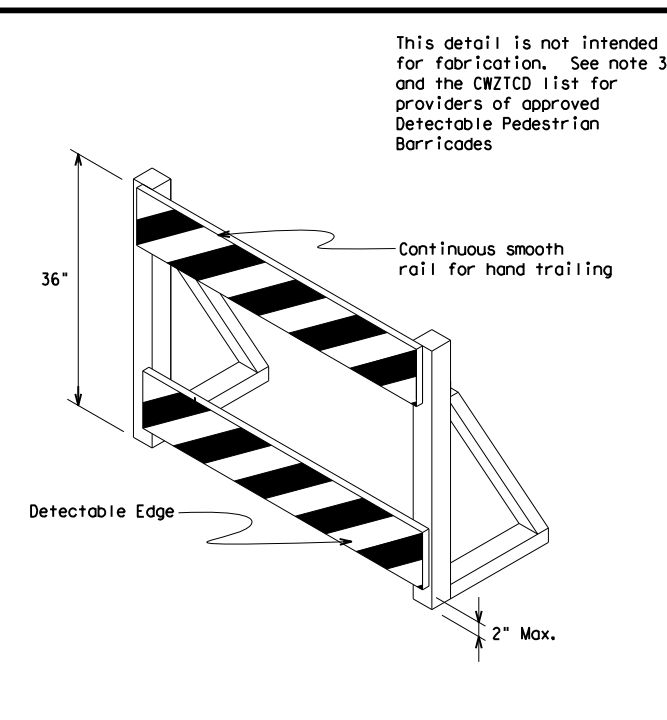
Each drum shall have a minimum of 2 orange and 2 white stripes using Type A retro-reflective sheeting with the top stripe being orange.

Taper to allow for stacking a minimum of 5 drums  
Base (36" dia. max)



**DIRECTION INDICATOR BARRICADE**

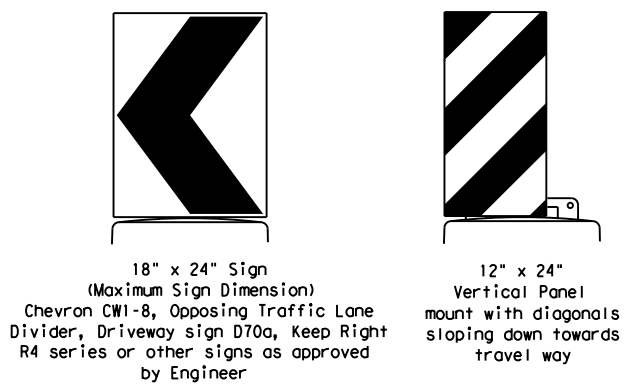
- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The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



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

**DETECTABLE PEDESTRIAN BARRICADES**

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



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

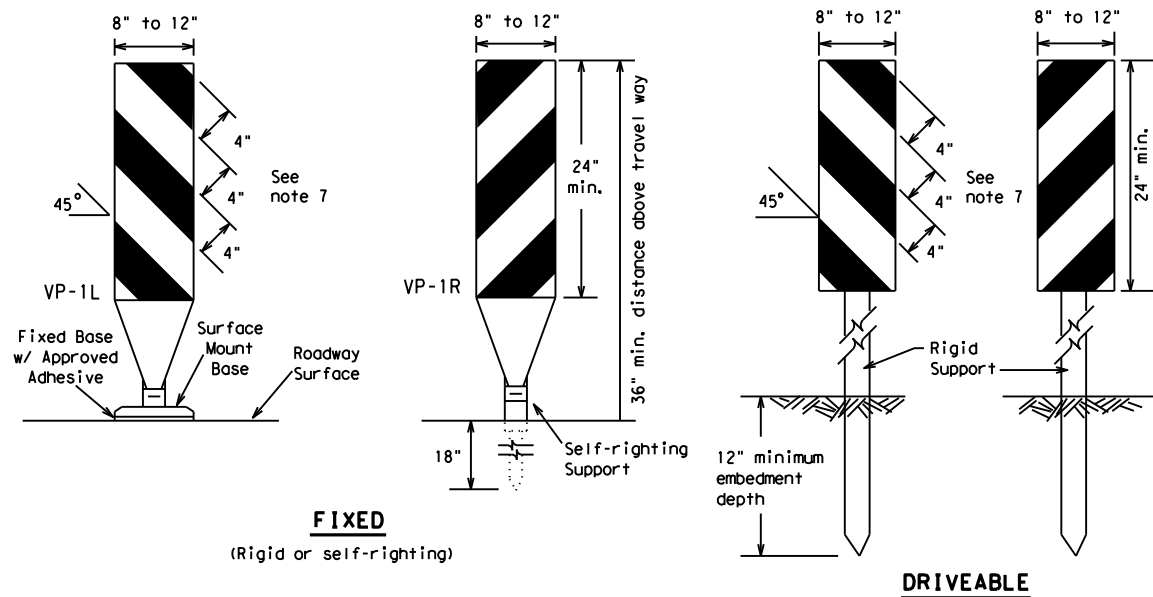
**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

<p><b>BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES</b></p>			
<p><b>BC (8) - 14</b></p>			
FILE:	bc-14.dgn	DWG:	TxDOT
REVISIONS:	0110	05	127
4-03	7-13	DIST:	COUNTY:
9-07	8-14	HOU:	HARRIS
			SHEET NO. 24

DATE: FILE:

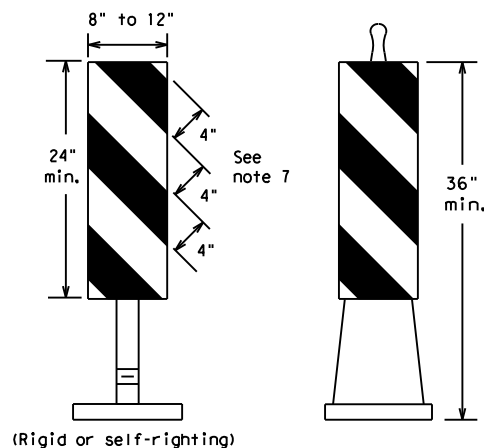
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**FIXED**  
(Rigid or self-righting)

**DRIVEABLE**

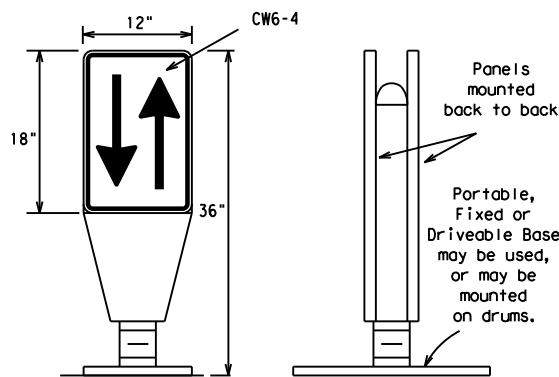
- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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



(Rigid or self-righting)

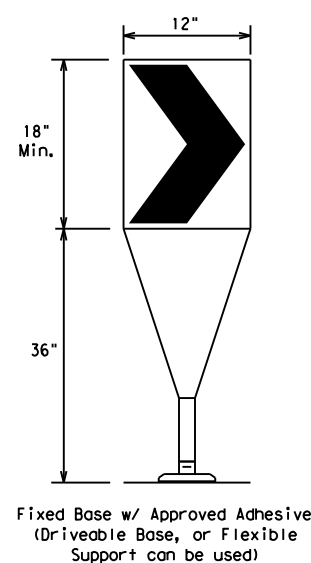
**PORTABLE**

**VERTICAL PANELS (VPs)**



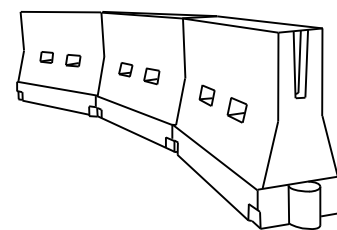
**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

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



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

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

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

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

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

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

**HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS**

**GENERAL NOTES**

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

Posted Speed * S	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

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

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 14**

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	HOU	HARRIS	25	

DATE: FILE:

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**TYPE 3 BARRICADES**

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

Barricades shall NOT be used as a sign support.

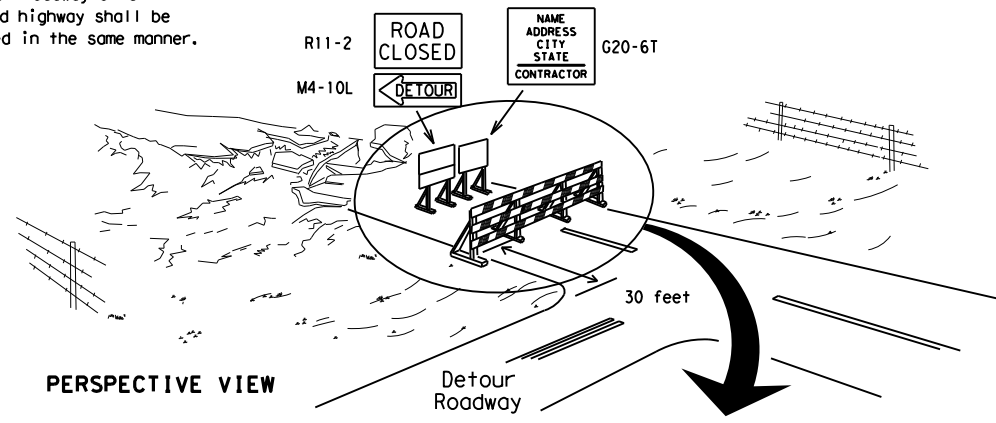


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



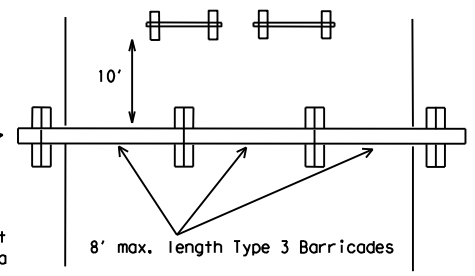
**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**

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



PERSPECTIVE VIEW

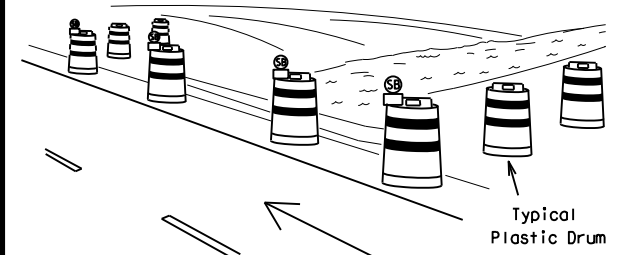
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



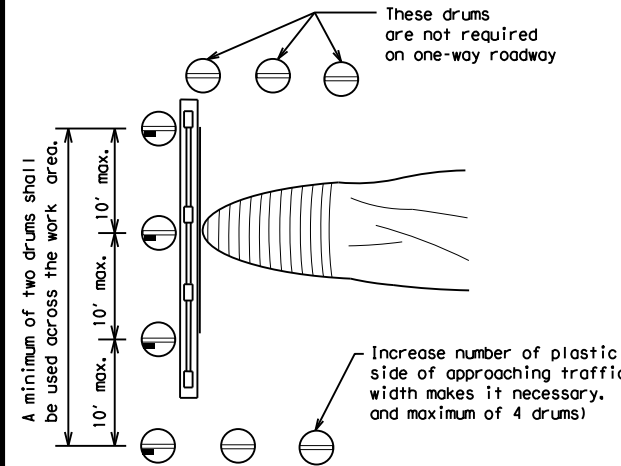
PLAN VIEW

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**



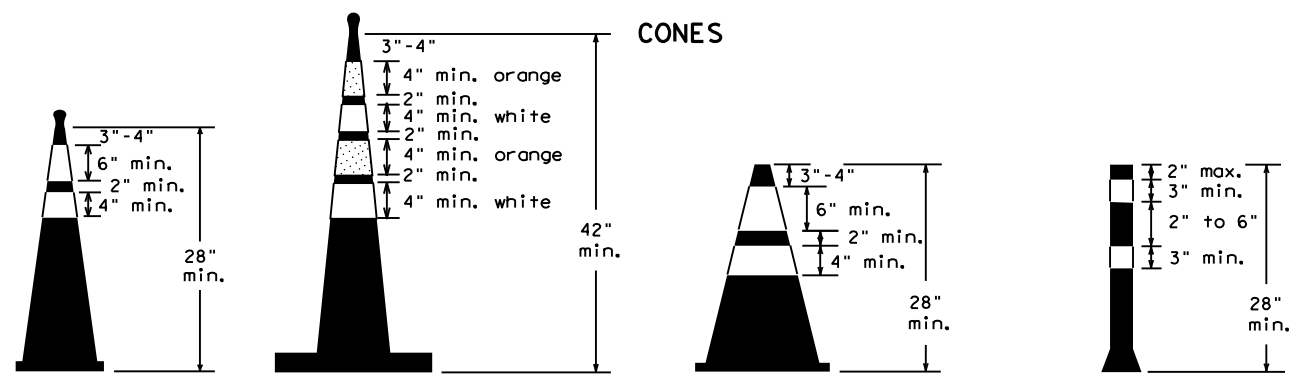
PERSPECTIVE VIEW



PLAN VIEW

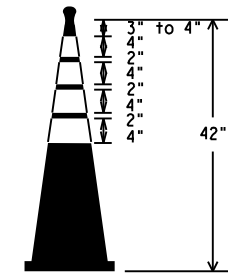
**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

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



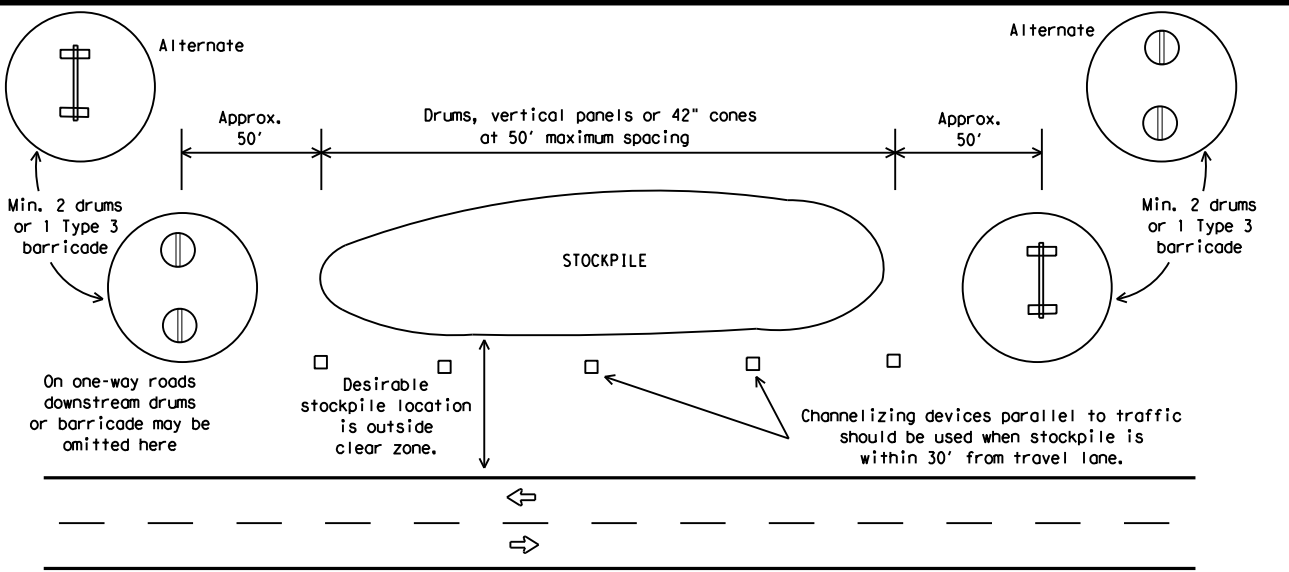
28" Cones shall have a minimum weight of 9 1/2 lbs.  
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



EDGE LINE CHANNELIZER

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



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

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

**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (10) - 14**

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REVISIONS	0110	05	127	IH45
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13	HOU	HARRIS	26	

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

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

### RAISED PAVEMENT MARKERS

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

### PREFABRICATED PAVEMENT MARKINGS

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

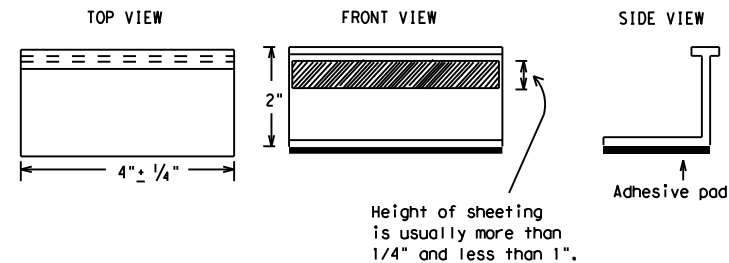
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

### REMOVAL OF PAVEMENT MARKINGS

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

## Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE  
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER  
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
  - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
  - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:  
 YELLOW - (two amber reflective surfaces with yellow body).  
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

**BC(11) - 14**

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REVISIONS				
2-98 9-07	DIST	COUNTY	SHEET NO.	
1-02 7-13	HOU	HARRIS	27	
11-02 8-14				

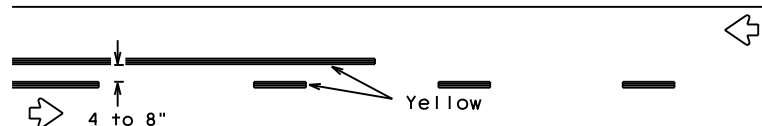
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## PAVEMENT MARKING PATTERNS

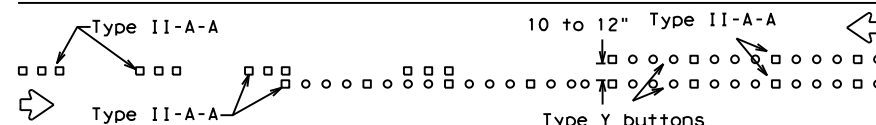


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

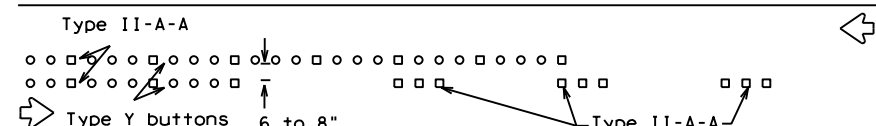


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

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

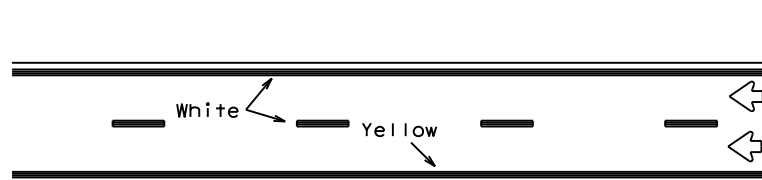


RAISED PAVEMENT MARKERS - PATTERN A



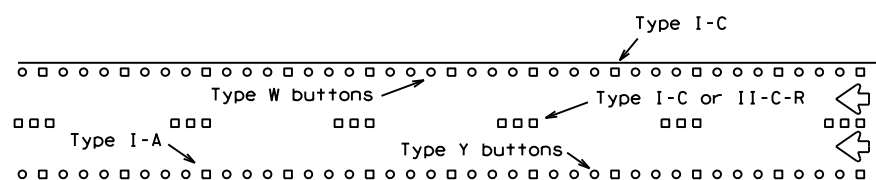
RAISED PAVEMENT MARKERS - PATTERN B

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



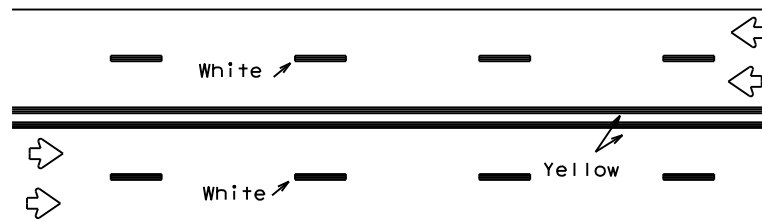
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



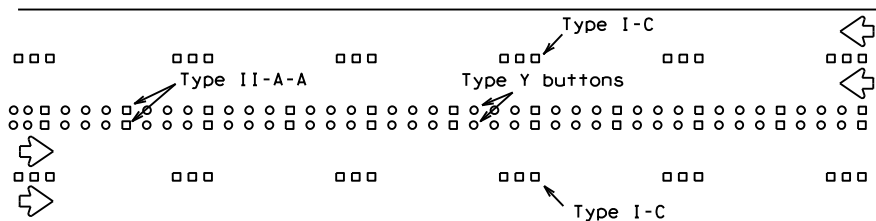
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



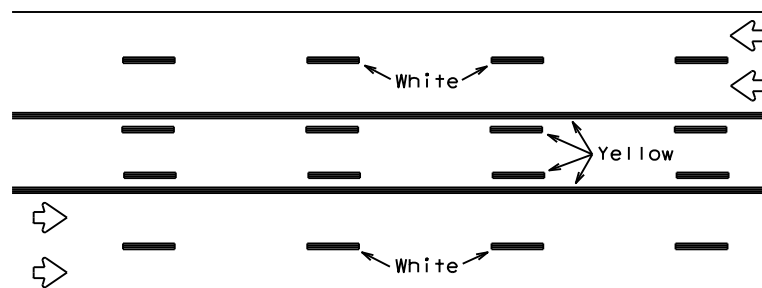
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



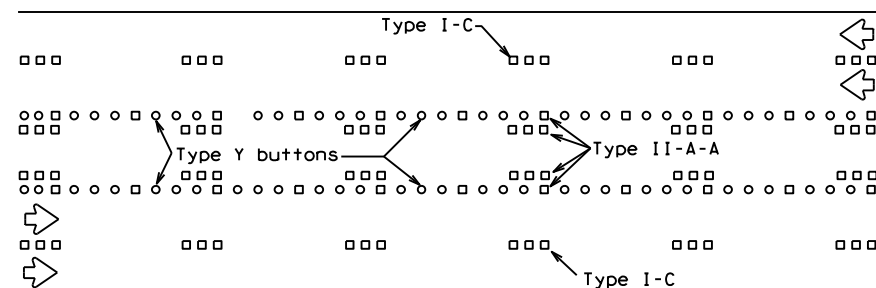
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

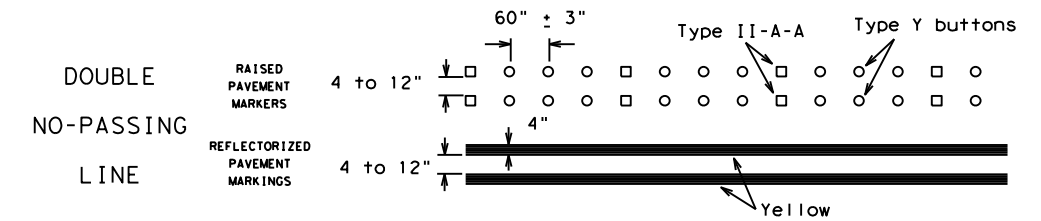
Prefabricated markings may be substituted for reflectorized pavement markings.



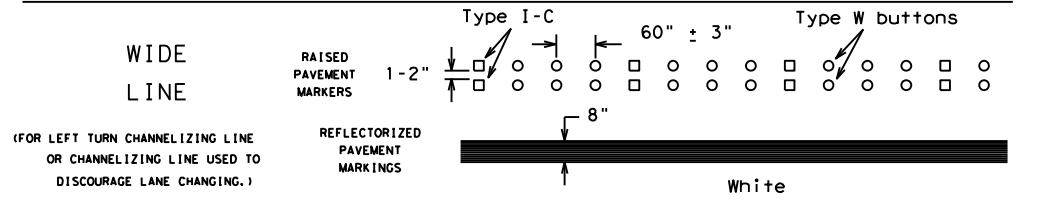
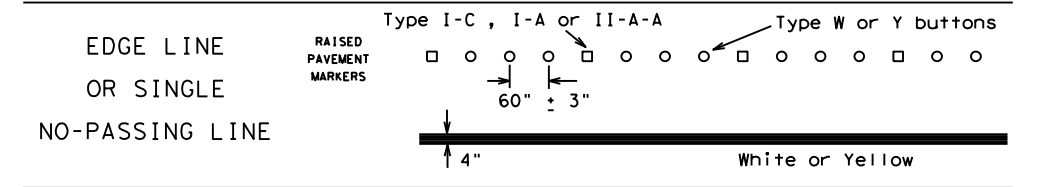
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

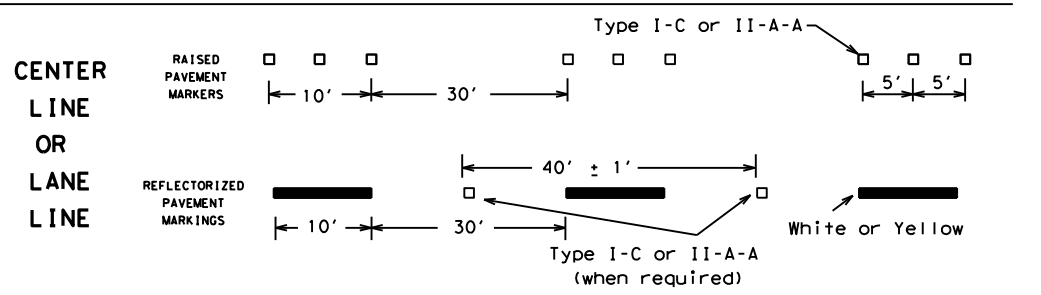
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



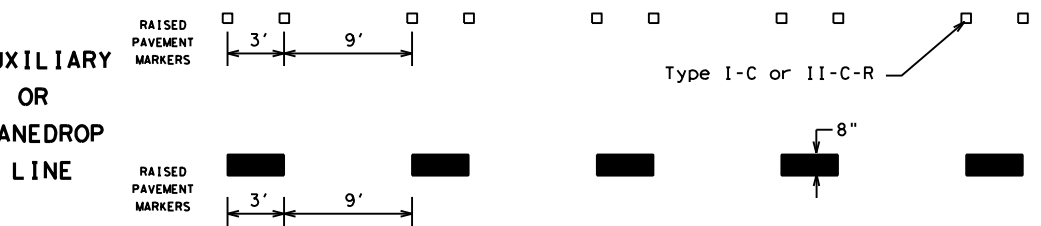
### SOLID LINES



### BROKEN LINES

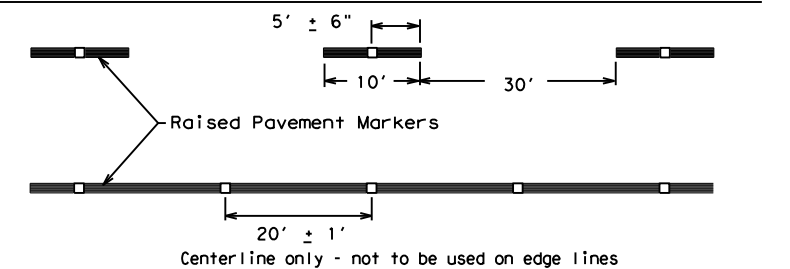


### AUXILIARY OR LANEDROP LINE



### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

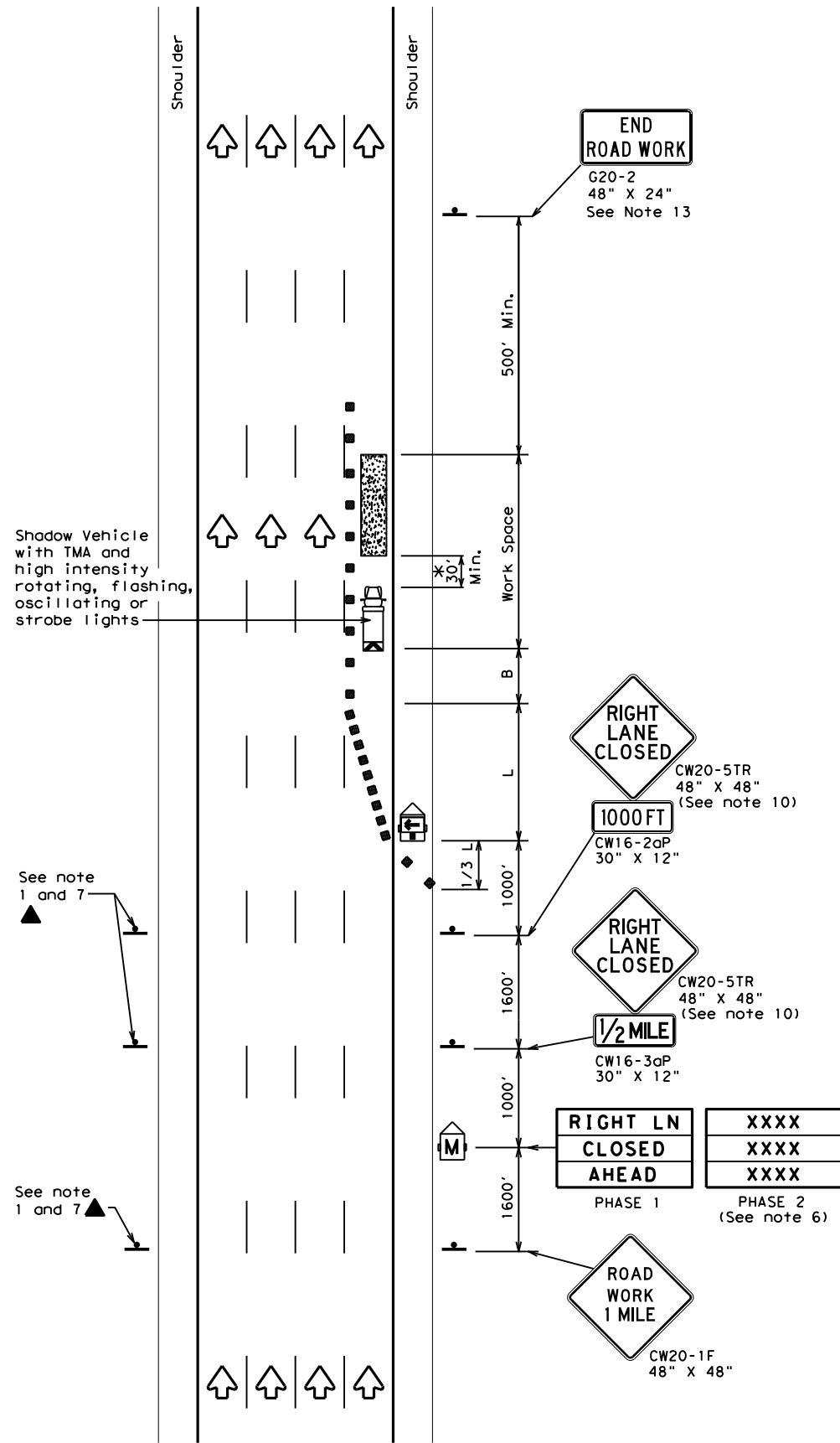
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
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REVISIONS	0110	05	127	IH45
1-97 9-07	DIST	COUNTY	SHEET NO.	
2-98 7-13	HOU	HARRIS	28	
11-02 8-14				

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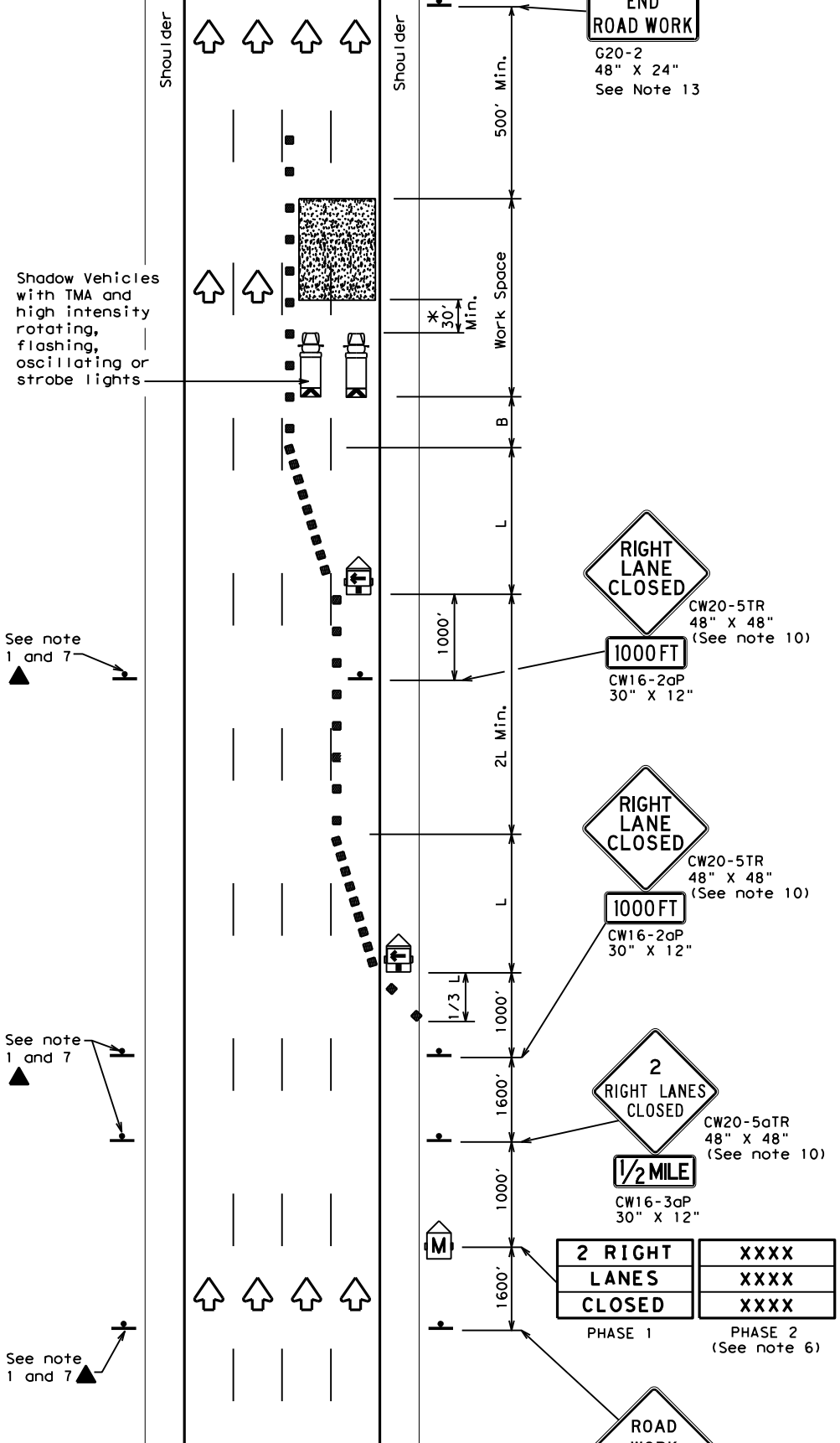
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TCP (6-1a)  
**TYPICAL FREEWAY  
ONE LANE CLOSURE**



TCP (6-1b)  
**TYPICAL FREEWAY  
TWO LANE CLOSURE**

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

Posted Speed	Formula	Minimum Desirable Taper Lengths "L"			Suggested Maximum Spacing of Channelizing Devices		Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent	
45	L = WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80	800'	880'	960'	80'	160'	615'	

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

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

**GENERAL NOTES**

- All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
- Drums or 42" cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
- All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
- The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
- Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
- Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
- Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
- The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
- Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
- Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a plaque below the sign may be used.
- When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
- For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
- The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

\* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Texas Department of Transportation  
Traffic Operations Division Standard

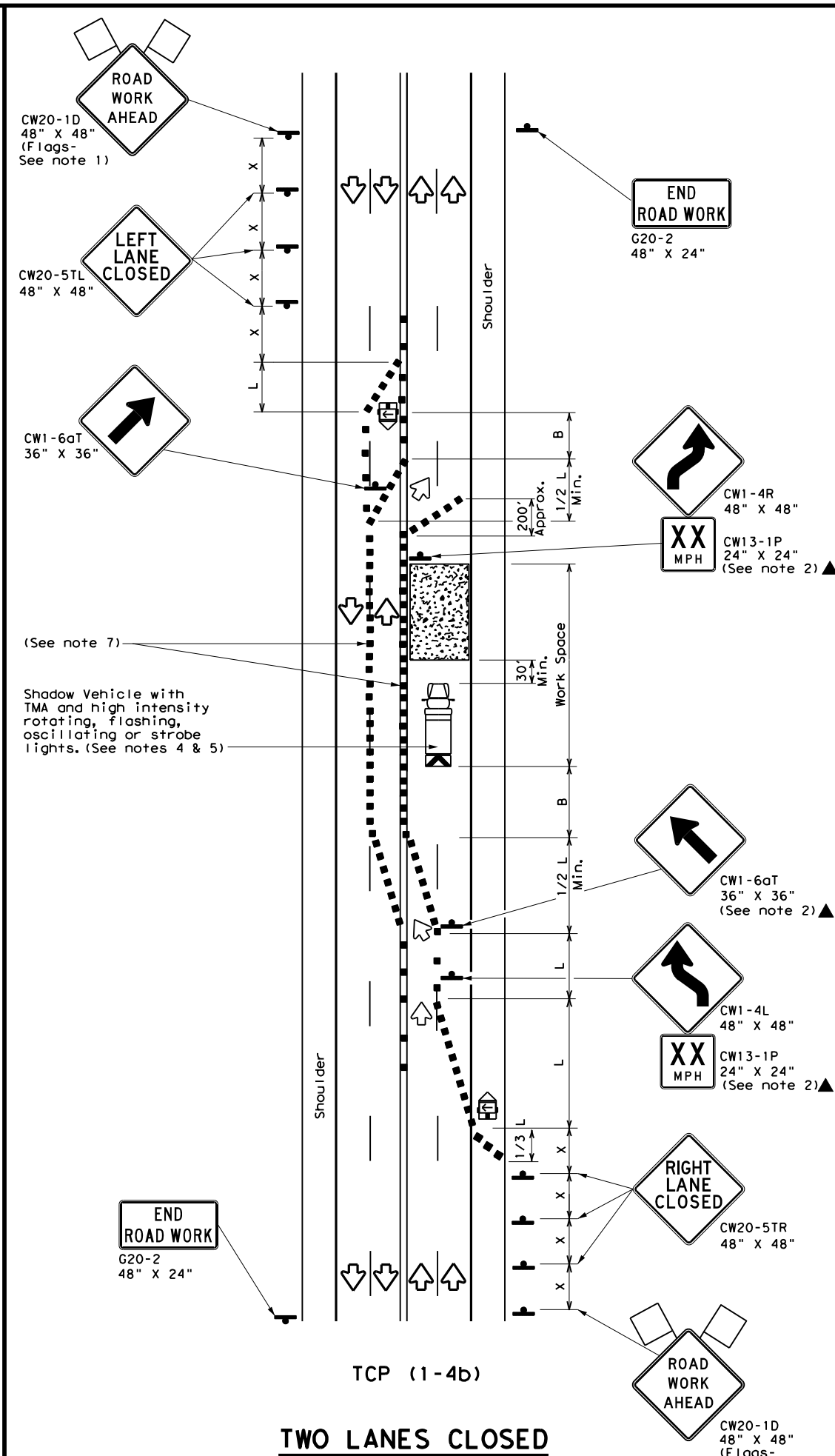
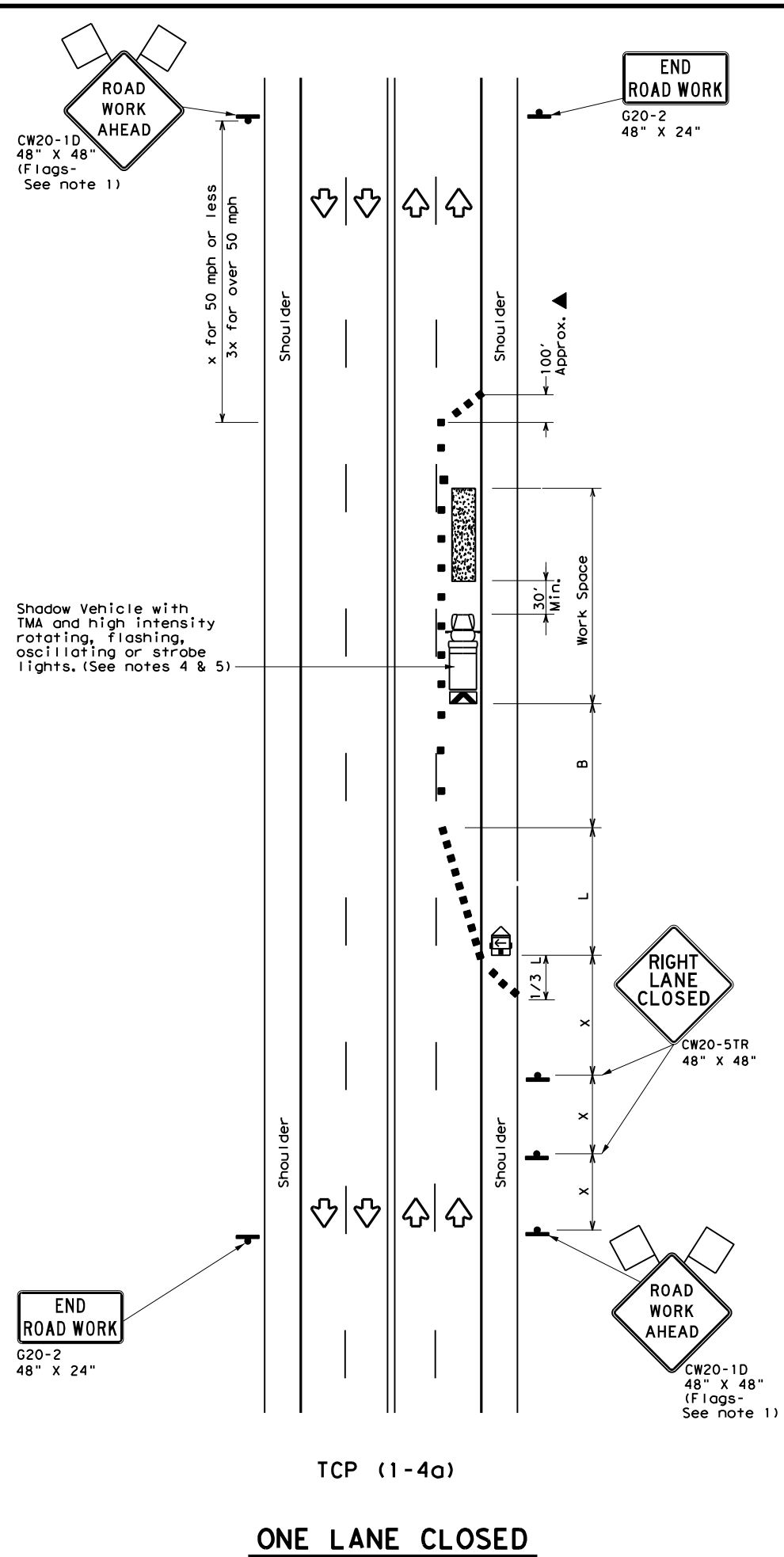
**TRAFFIC CONTROL PLAN  
FREEWAY LANE CLOSURES**

**TCP (6-1) - 12**

FILE:	tcp6-1.dgn	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT
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8-12	REVISIONS	0110	05	127	IH45				
	DIST	COUNTY		SHEET NO.					
	HOU	HARRIS		29					

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		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**
- Flags attached to signs where shown are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

**TCP (1-4a)**

- If this TCP is used for a left lane closure, CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

**TCP (1-4b)**

- Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This tighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation  
Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN**  
**LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS**

**TCP (1-4) - 18**

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	1H45
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	HOU	HARRIS	30	
1-97 2-18				

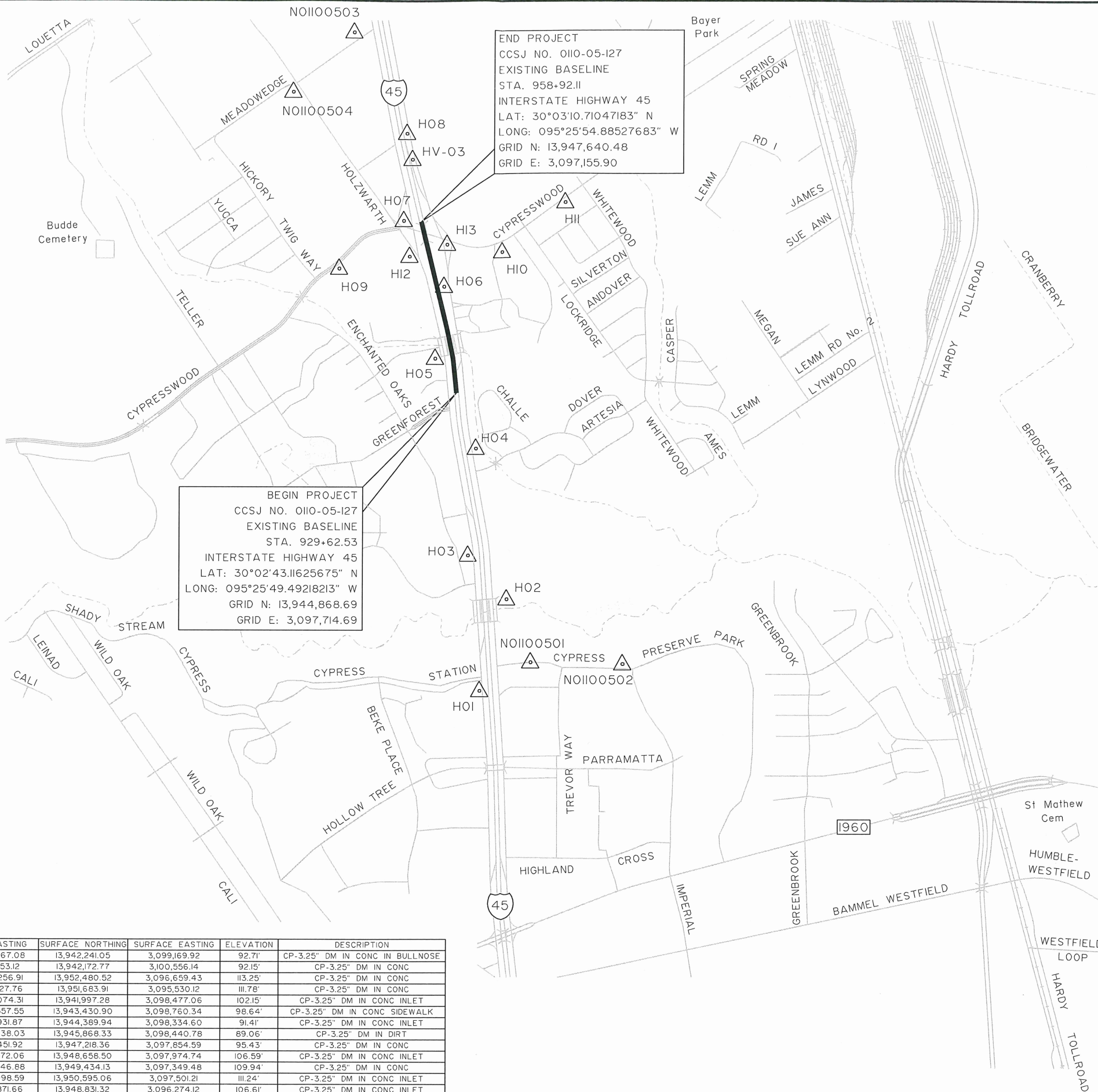
154

NOTES:

1. ALL BEARINGS ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983, SOUTH CENTRAL ZONE (NAD83, 2011 ADJUSTMENT, EPOCH 2010.00).

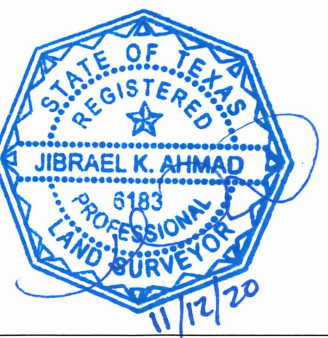
2. ALL DISTANCES AND COORDINATES ARE IN US SURVEY FEET DISPLAYED IN SURFACE VALUES WITH THE TxDOT SURFACE ADJUSTMENT FACTOR OF 1.00013.

3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) USING GEOID12B.



11x17 - SCALE: 1" = NOT TO SCALE  
22x34 - SCALE: 1" = NOT TO SCALE

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS8E



I HEREBY CERTIFY THAT THIS CONTROL MAP WAS PREPARED UNDER MY SUPERVISION IN OCTOBER 2020.

TRAVERSE TABLE

FROM	TO	BEARING	DISTANCE
NO1100502	NO1100501	N 87°10'47" W	1,387.90'
NO1100501	H01	S 70°36'57" W	734.50'
H01	H02	N 11°10'39" E	1,461.34'
H02	H03	N 23°56'15" W	1,049.29'
H03	H04	N 04°06'27" E	1,482.20'
H04	H05	N 23°28'13" W	1,471.80'
H05	H06	N 04°46'09" E	1,445.14'
H06	H12	N 70°01'57" W	473.51'
H12	H13	N 49°12'01" E	497.37'
H13	H07	N 62°34'14" W	627.23'
H07	HV03	N 13°54'28" E	728.99'
HV03	H08	N 02°57'59" W	453.92'
H08	NO1100503	N 24°03'32" W	2,064.84'
NO1100503	NO1100504	S 54°48'04" W	1,382.00'
H07	H09	S 60°43'35" W	1,232.79'
H13	H10	S 80°47'53" E	784.29'
H10	H11	N 56°55'00" E	1,403.02'

POINT No.	LATITUDE (N)	LONGITUDE (W)	GRID NORTHING	GRID EASTING	SURFACE NORTHING	SURFACE EASTING	ELEVATION	DESCRIPTION
NO1100501	30°01'58.8676"	095°25'39.0664"	13,940,428.80	3,098,767.08	13,942,241.05	3,099,169.92	92.71'	CP-3.25" DM IN CONC IN BULLNOSE
NO1100502	30°01'57.7727"	095°25'23.3286"	13,940,360.52	3,100,153.12	13,942,172.77	3,100,556.14	92.15'	CP-3.25" DM IN CONC
NO1100503	30°03'40.9270"	095°26'04.0604"	13,950,666.93	3,096,256.91	13,952,480.52	3,096,659.43	113.25'	CP-3.25" DM IN CONC
NO1100504	30°03'33.3866"	095°26'17.1803"	13,949,870.43	3,095,127.76	13,951,683.91	3,095,530.12	111.78'	CP-3.25" DM IN CONC
H01	30°01'56.6653"	095°25'47.0288"	13,940,185.06	3,098,074.31	13,941,997.28	3,098,477.06	102.15'	CP-3.25" DM IN CONC INLET
H02	30°02'10.7629"	095°25'43.3101"	13,941,618.49	3,098,357.55	13,943,430.90	3,098,760.34	98.64'	CP-3.25" DM IN CONC SIDEWALK
H03	30°02'20.3795"	095°25'47.8179"	13,942,577.40	3,097,931.87	13,944,389.94	3,098,334.60	91.41'	CP-3.25" DM IN CONC INLET
H04	30°02'34.9734"	095°25'46.0973"	13,944,055.60	3,098,038.03	13,945,868.33	3,098,440.78	89.06'	CP-3.25" DM IN DIRT
H05	30°02'48.5067"	095°25'52.2943"	13,945,405.46	3,097,451.92	13,947,218.36	3,097,854.59	95.43'	CP-3.25" DM IN CONC
H06	30°03'02.7180"	095°25'50.4280"	13,946,845.41	3,097,572.06	13,948,658.50	3,097,974.74	106.59'	CP-3.25" DM IN CONC INLET
H07	30°03'10.5802"	095°25'57.2694"	13,947,620.94	3,096,946.88	13,949,434.13	3,097,349.48	109.94'	CP-3.25" DM IN CONC
H08	30°03'22.0197"	095°25'55.1409"	13,948,781.72	3,097,098.59	13,950,595.06	3,097,501.21	111.24'	CP-3.25" DM IN CONC INLET
H09	30°03'04.9410"	095°26'09.7077"	13,947,018.21	3,095,871.66	13,948,831.32	3,096,274.12	106.61'	CP-3.25" DM IN CONC INLET
H10	30°03'06.0789"	095°25'42.2776"	13,947,206.63	3,098,277.63	13,949,019.77	3,098,680.40	108.74'	CP-3.25" DM IN CONC MEDIAN
H11	30°03'13.3001"	095°25'28.6426"	13,947,972.38	3,099,453.04	13,949,785.62	3,099,855.96	108.28'	CP-3.25" DM IN CONC IN BULLNOSE
H12	30°03'04.4521"	095°25'55.4331"	13,947,007.09	3,097,127.06	13,948,820.20	3,097,529.69	109.15'	CP-3.25" DM IN DIRT
H13	30°03'07.5536"	095°25'51.0385"	13,947,332.04	3,097,503.53	13,949,145.19	3,097,906.21	110.46'	CP-3.25" DM IN CONC MEDIAN
HV-03	30°03'17.5280"	095°25'55.0311"	13,948,328.47	3,097,122.08	13,950,141.75	3,097,524.70	109.50'	CP-3.25" DM IN CONC

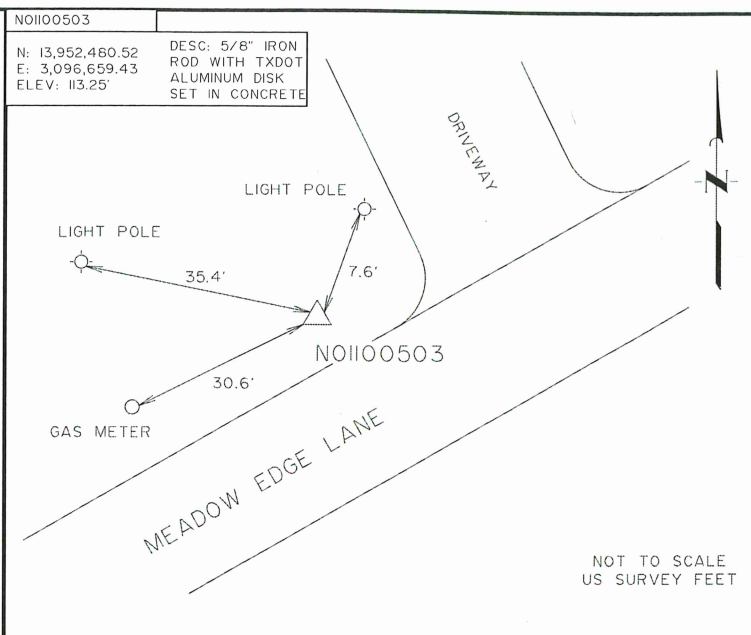
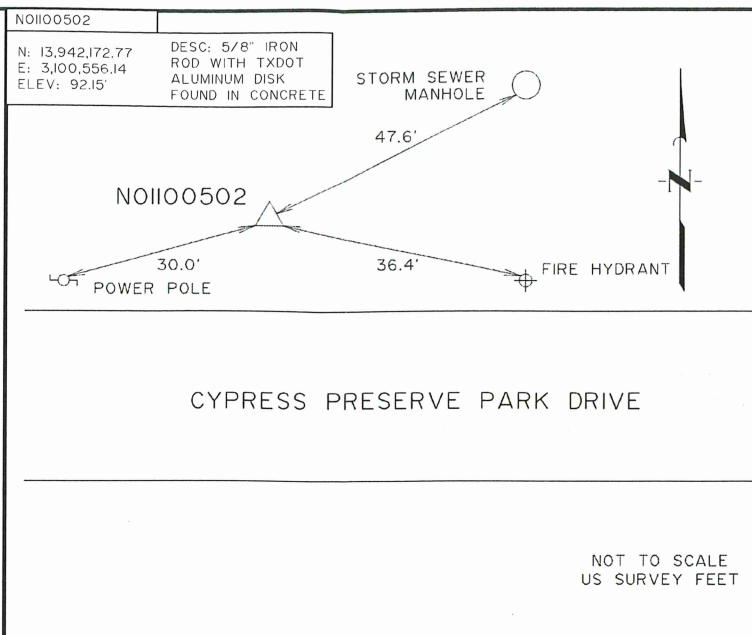
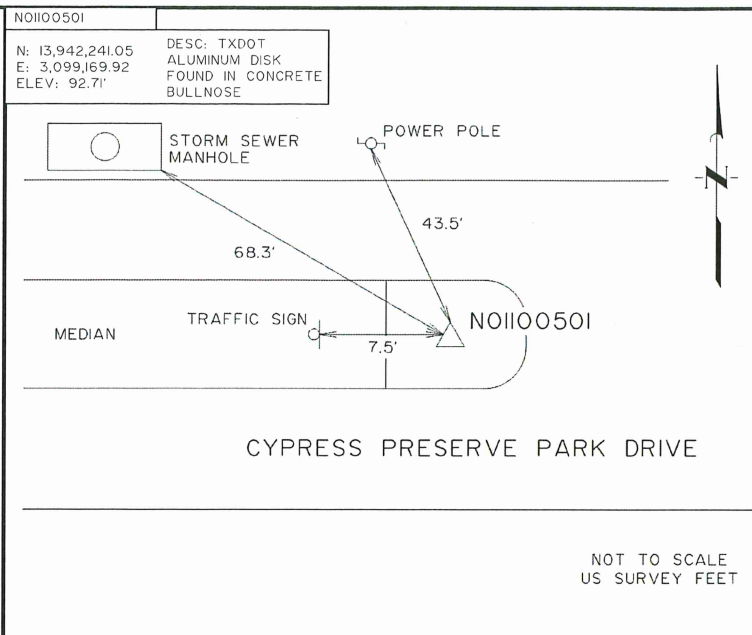
**JONES CARTER**  
2322 West Grand Parkway North, Suite 150  
Katy, Texas 77443 • 832.913.4000  
Texas Board of Professional Land Surveying  
Registration No. 10194039

CONTROL INDEX SHEET  
INTERSTATE HIGHWAY 45

I OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT	SHEET NO.	
06		32	
STATE	DIST.	COUNTIES	
TEXAS	HOU.	HARRIS	
CONT.	SECT.	JOB	HIGHWAY
0110	05	127	11 45





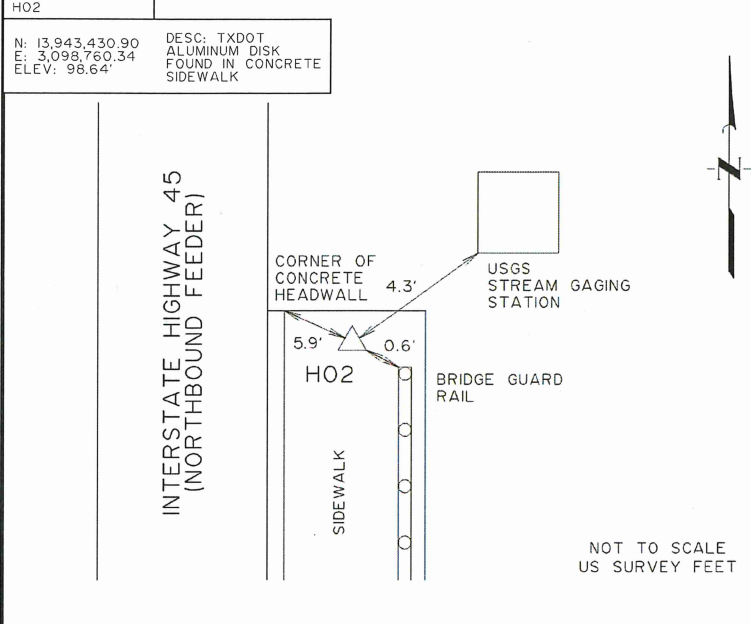
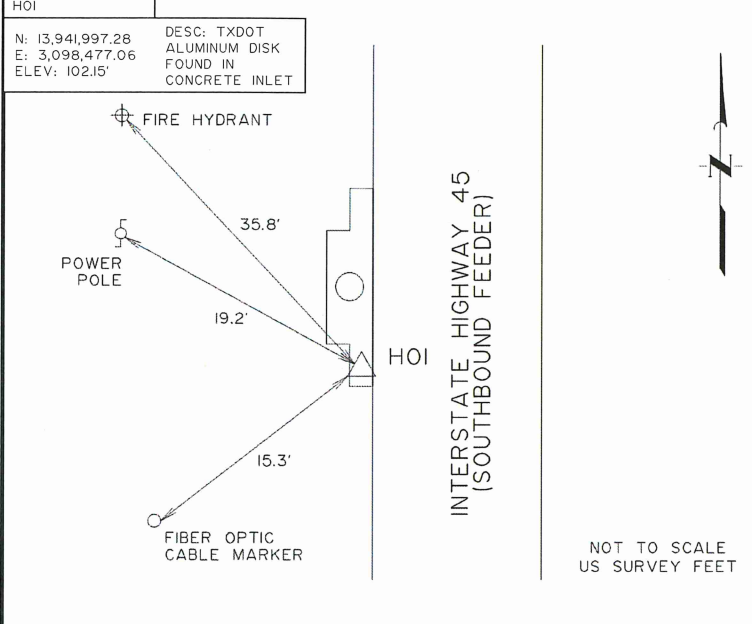
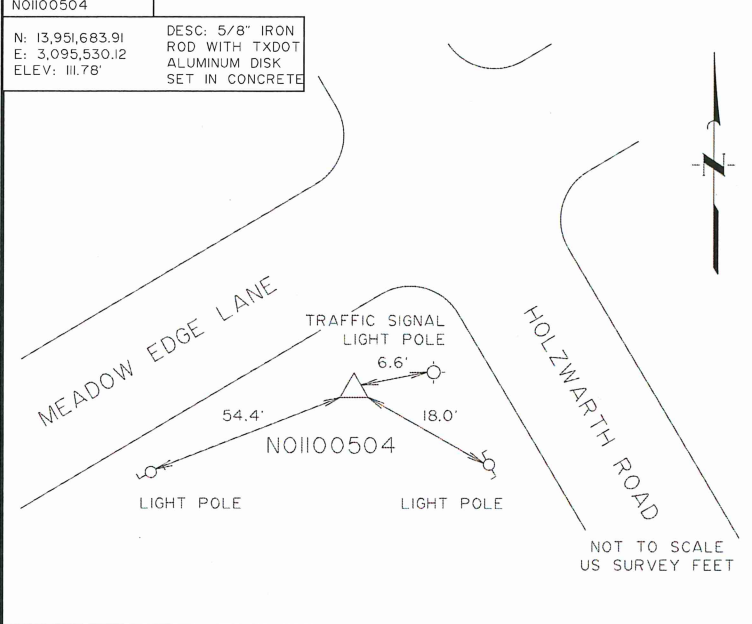
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3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) USING GEOD12B.

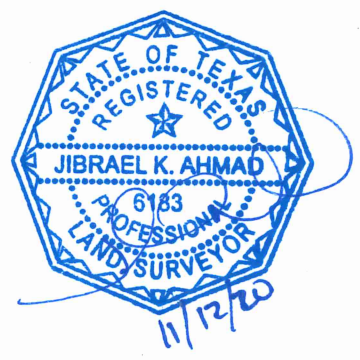
CONTROL POINT NO1100501 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE BULLNOSE, IN THE MEDIAN OF CYPRESS PRESERVE PARK DRIVE, LOCATED APPROXIMATELY 380' EAST OF INTERSTATE HIGHWAY 45.

CONTROL POINT NO1100502 IS A 5/8" IRON ROD WITH TXDOT ALUMINUM DISK FOUND IN CONCRETE, ON THE NORTH SIDE OF CYPRESS PRESERVE PARK DRIVE, LOCATED APPROXIMATELY 100' WEST OF IMPERIAL VALLEY DRIVE.

CONTROL POINT NO1100503 IS A 5/8" IRON ROD WITH TXDOT ALUMINUM DISK SET IN CONCRETE, ON THE NORTH SIDE OF MEADOW EDGE LANE, LOCATED APPROXIMATELY 165' NORTHWEST OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER).



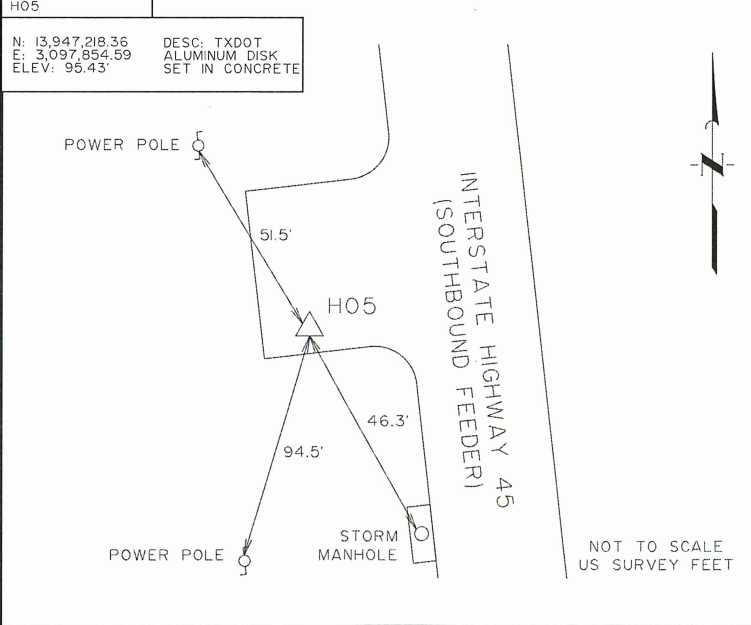
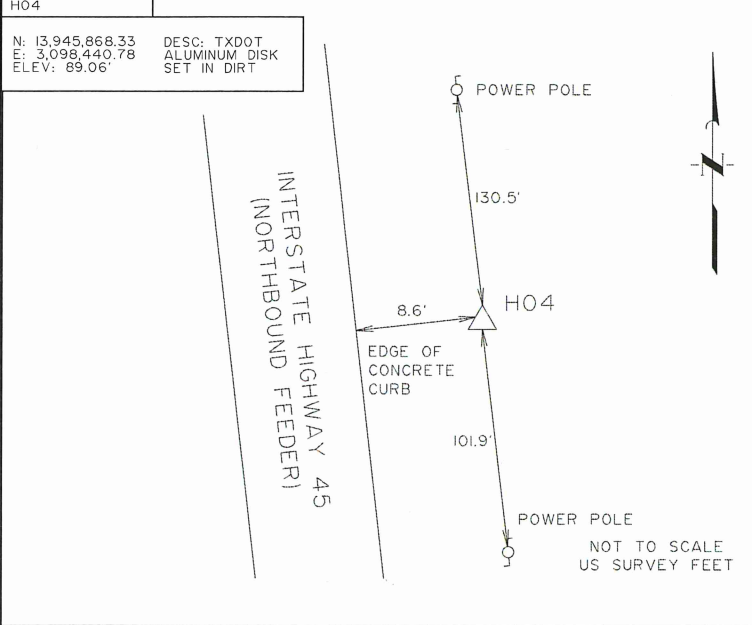
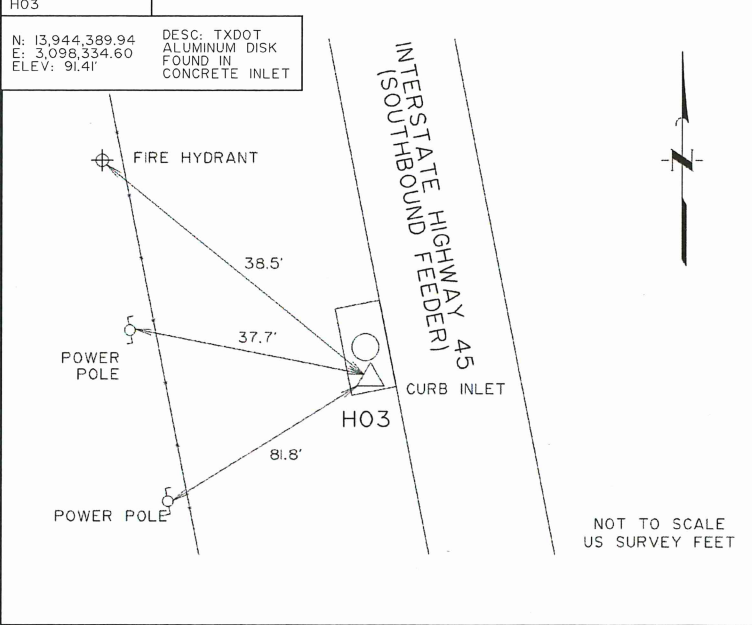
THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.



CONTROL POINT NO1100504 IS A 5/8" IRON ROD WITH TXDOT ALUMINUM DISK SET IN CONCRETE, ON THE SOUTHWEST CORNER OF THE INTERSECTION OF MEADOW EDGE LANE AND HOLZWARTH ROAD.

CONTROL POINT H01 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE INLET, ON THE WEST OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER), LOCATED APPROXIMATELY 100' SOUTH OF CYPRESS STATION DRIVE.

CONTROL POINT H02 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE SIDEWALK, ON THE EAST OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER), LOCATED APPROXIMATELY 1,200' NORTH OF CYPRESS PRESERVE PARK DRIVE.



I HEREBY CERTIFY THAT THIS CONTROL MAP WAS PREPARED UNDER MY SUPERVISION IN OCTOBER 2020.

**J/C JONES CARTER**

2322 West Grand Parkway North, Suite 150  
Katy, Texas 77449 • 832.913.4000  
Texas Board of Professional Land Surveying  
Registration No. 10194039

HORIZONTAL & VERTICAL CONTROL SHEET INTERSTATE HIGHWAY 45

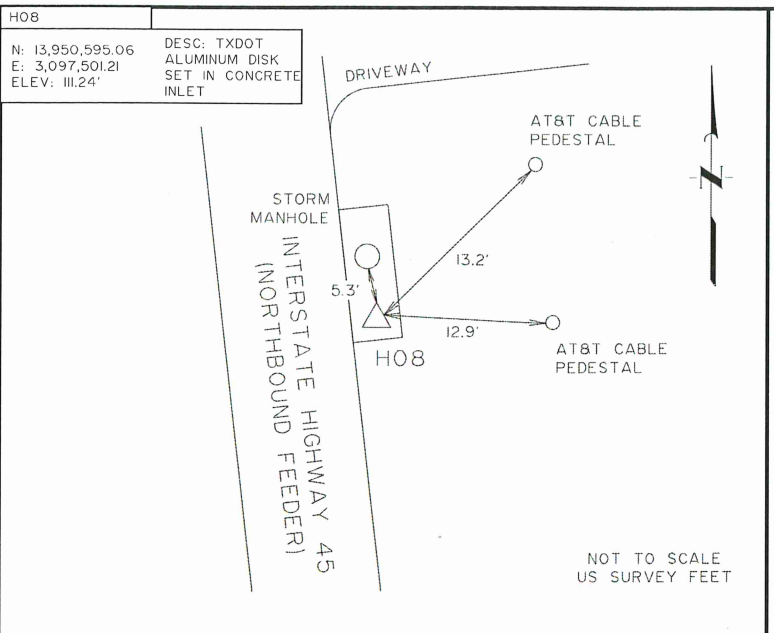
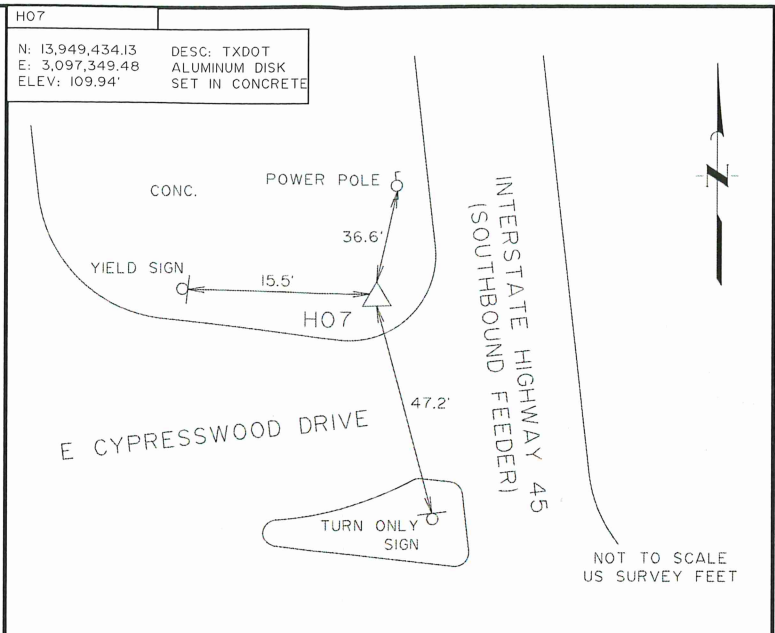
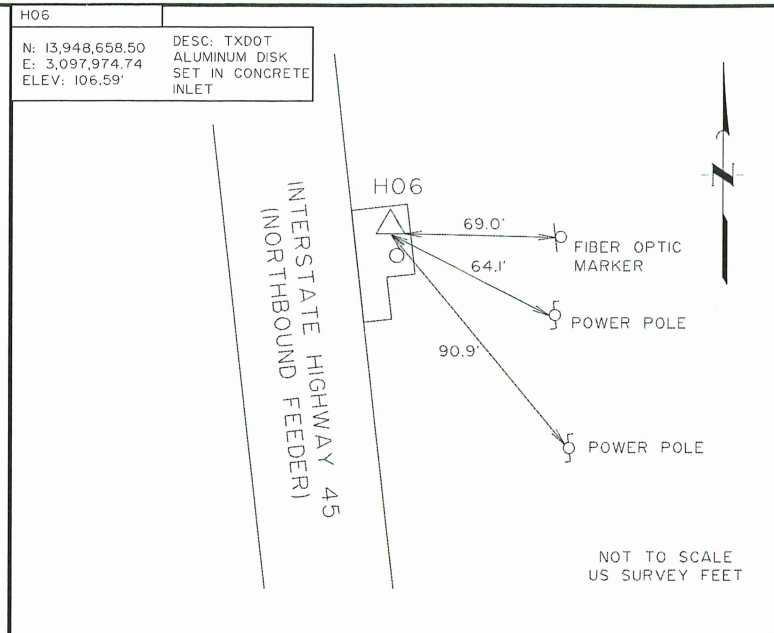
FED. RD. DIV. NO.		FEDERAL AID PROJECT		SHEET NO.	
06				33	
STATE	DIST.	COUNTY			
TEXAS	HOU.	HARRIS			
CONT.	SECT.	JOB	HIGHWAY		
010	05	127	IH 45		

2 OF 3

CONTROL POINT H03 IS A TXDOT ALUMINUM DISK FOUND IN CONCRETE INLET, ON THE WEST OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER), LOCATED APPROXIMATELY 350' NORTH OF CYPRESS OAKS DRIVE.

CONTROL POINT H04 IS A TXDOT ALUMINUM DISK SET IN DIRT, ON THE EAST SIDE OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER), LOCATED APPROXIMATELY 400' NORTH OF NORTH HILL DRIVE.

CONTROL POINT H05 IS A TXDOT ALUMINUM DISK SET IN CONCRETE, ON THE WEST OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER), LOCATED APPROXIMATELY 100' SOUTH OF MAGIC OAKS DRIVE.

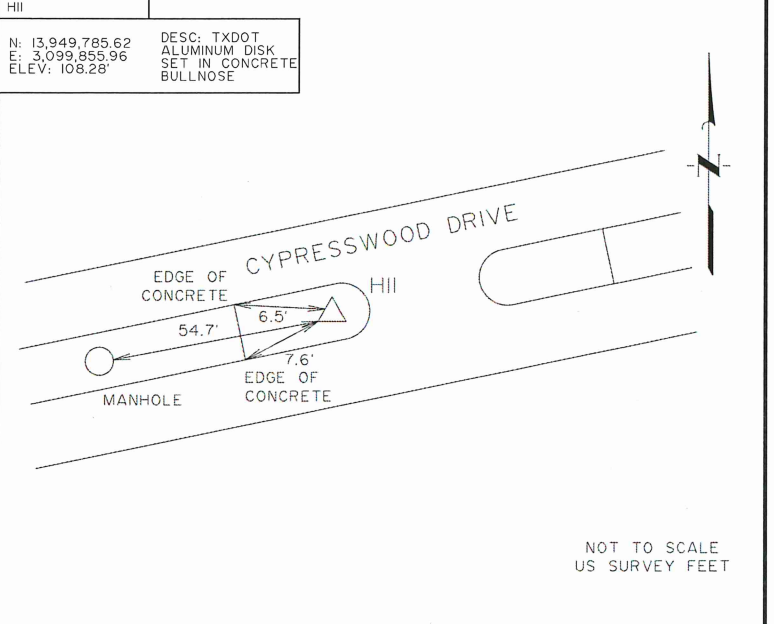
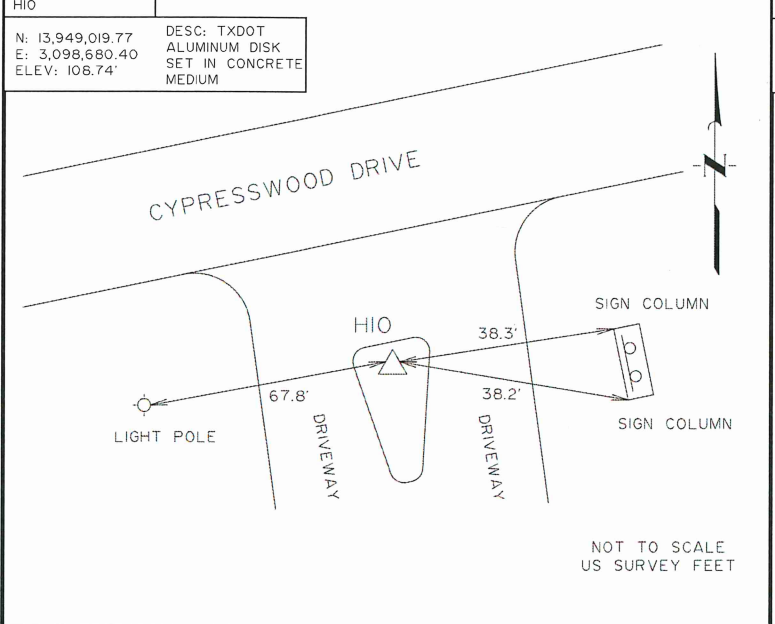
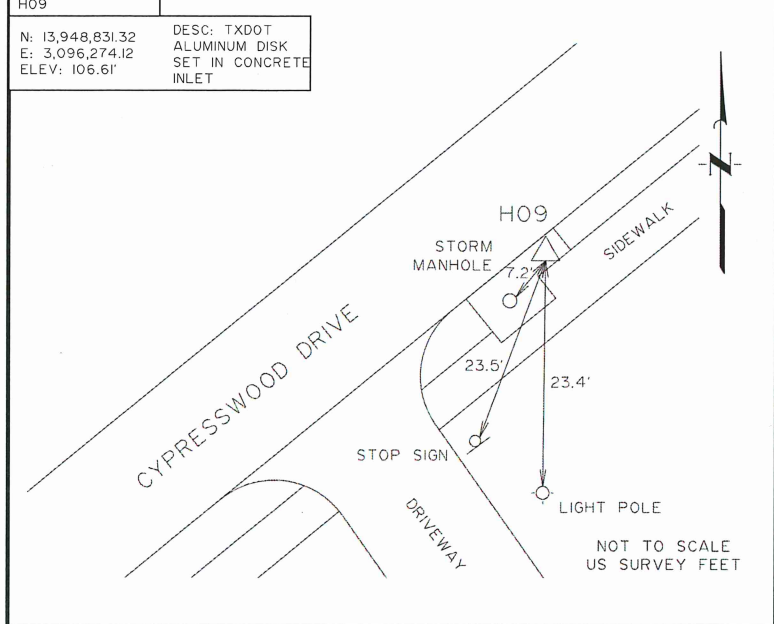


- NOTES:
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  3. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVOD88) USING GEOD12B.

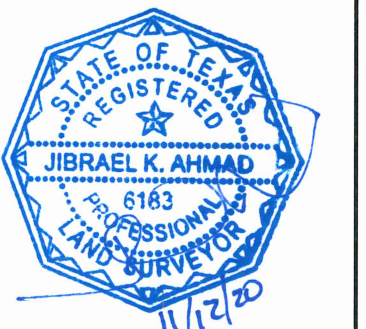
CONTROL POINT H06 IS A TXDOT ALUMINUM DISK SET IN CONCRETE INLET, ON THE EAST OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER), LOCATED APPROXIMATELY 550' SOUTH OF E CYPRESSWOOD DRIVE.

CONTROL POINT H07 IS A TXDOT ALUMINUM DISK SET IN CONCRETE, ON THE NORTH SIDE OF THE INTERSECTION OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER) AND E CYPRESSWOOD DRIVE.

CONTROL POINT H08 IS A TXDOT ALUMINUM DISK SET IN CONCRETE INLET, ON THE EAST OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER), LOCATED APPROXIMATELY 1,500' NORTH OF E CYPRESSWOOD DRIVE.



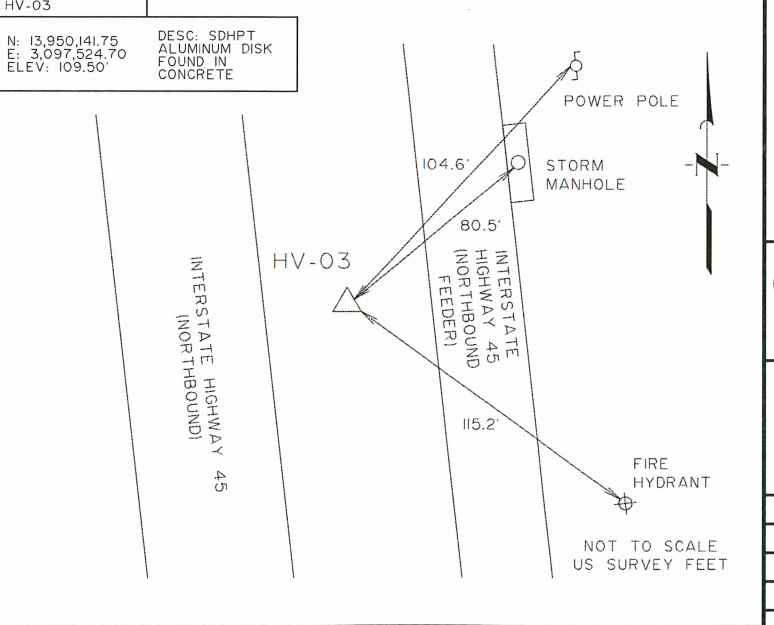
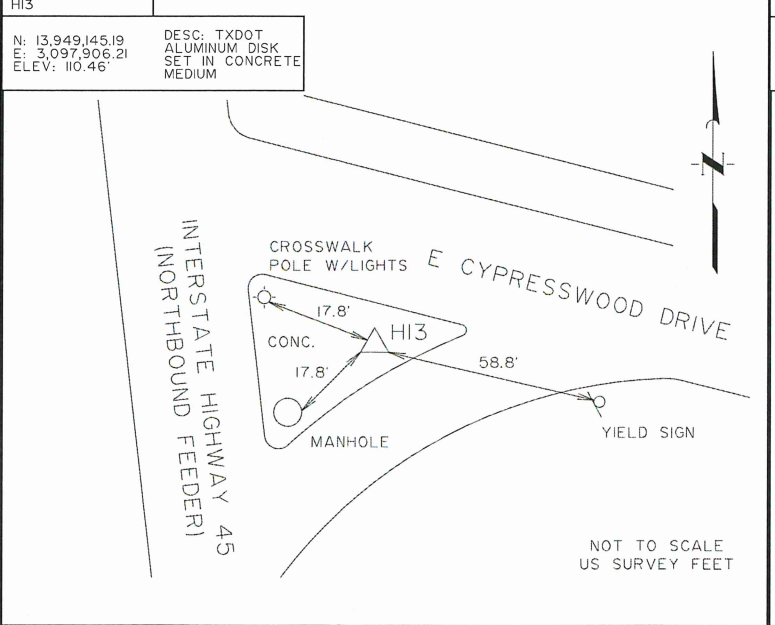
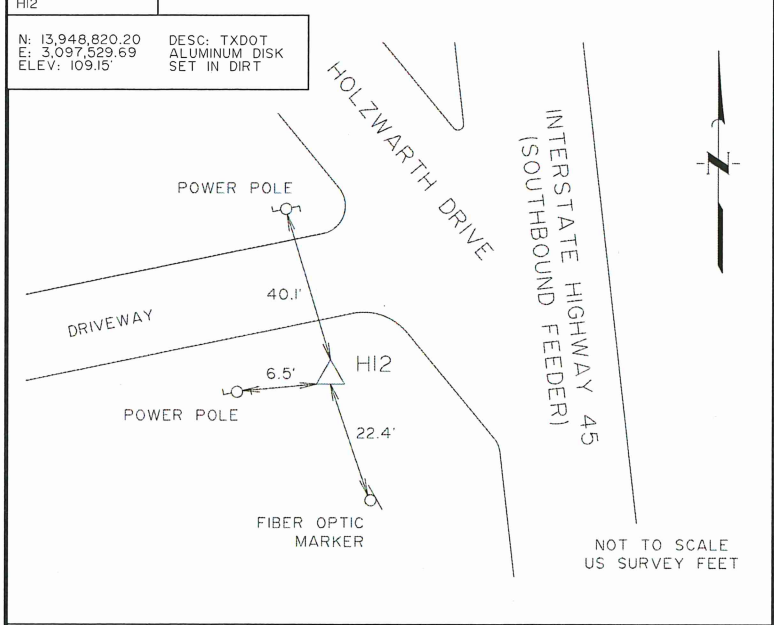
THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.



CONTROL POINT H09 IS A TXDOT ALUMINUM DISK SET IN CONCRETE INLET, ON THE EAST OF CYPRESSWOOD DRIVE, LOCATED APPROXIMATELY 500' NORTHEAST OF HICKORY TWIG WAY.

CONTROL POINT H10 IS A TXDOT ALUMINUM DISK SET IN CONCRETE MEDIUM, AT THE INTERSECTION OF E CYPRESSWOOD DRIVE AND SPRINGS PARK CREEK BOULEVARD.

CONTROL POINT H11 IS A TXDOT ALUMINUM DISK SET IN CONCRETE BULLNOSE, AT THE CENTER OF E CYPRESSWOOD DRIVE, LOCATED APPROXIMATELY 400' SOUTHWEST OF WHITEWOOD DRIVE.



I HEREBY CERTIFY THAT THIS CONTROL MAP WAS PREPARED UNDER MY SUPERVISION IN OCTOBER 2020.

**JC JONES CARTER**

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HORIZONTAL & VERTICAL CONTROL SHEET INTERSTATE HIGHWAY 45

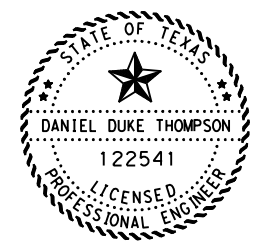
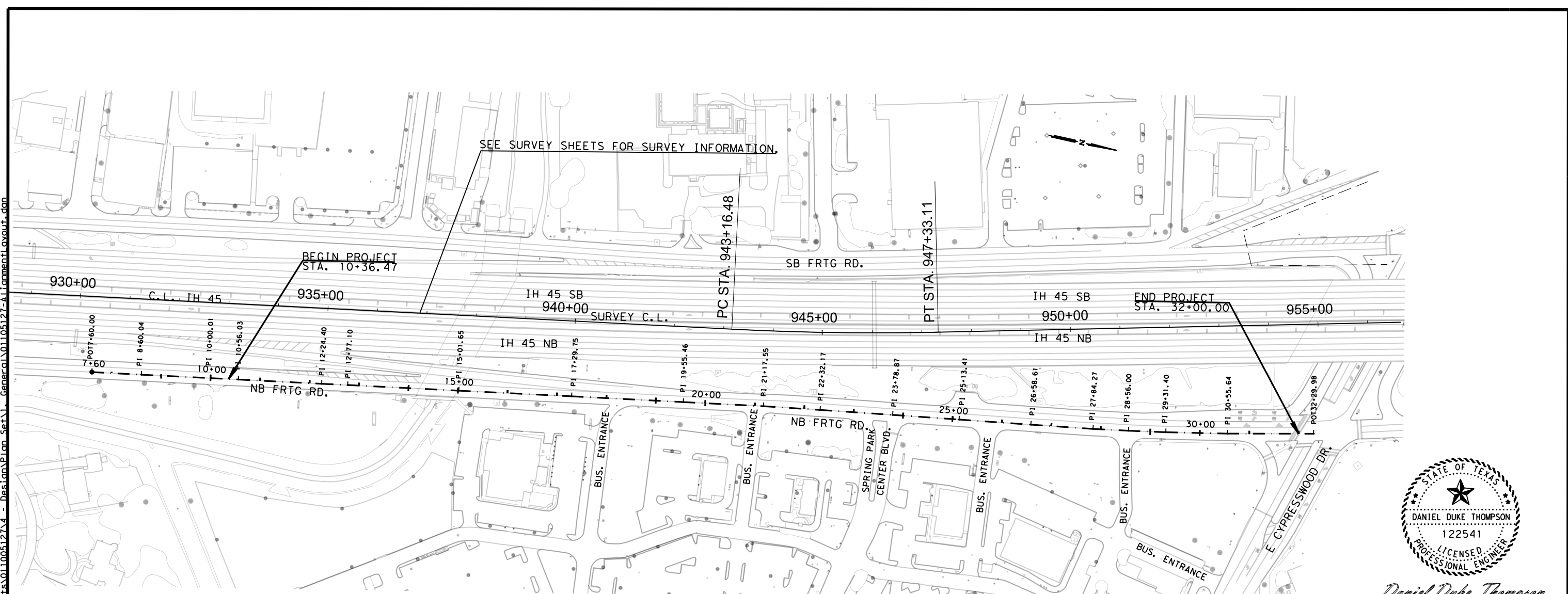
FED. RD. DIV. NO.		FEDERAL AID PROJECT		SHEET NO.	
06				34	
STATE	DIST.	COUNTY			
TEXAS	HOU.	HARRIS			
CONT.	SECT.	JOB	HIGHWAY		
010	05	127	IH 45		

CONTROL POINT H12 IS A TXDOT ALUMINUM DISK SET IN DIRT, ON THE SOUTHWEST CORNER OF THE INTERSECTION OF INTERSTATE HIGHWAY 45 (SOUTHBOUND FEEDER) AND HOLZWARTH DRIVE.

CONTROL POINT H13 IS A TXDOT ALUMINUM DISK SET IN CONCRETE MEDIUM, AT THE INTERSECTION OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER) AND E CYPRESSWOOD DRIVE.

CONTROL POINT HV-03 IS A SDHPT ALUMINUM DISK FOUND IN CONCRETE, ON THE EAST OF INTERSTATE HIGHWAY 45 (NORTHBOUND FEEDER), LOCATED APPROXIMATELY 900' NORTH OF E CYPRESSWOOD DRIVE.

DATE: 8/22/2021  
 SHEET: 6 of 35  
 FILE: \\pvt\project\wisconline.com\XDD13\Documents\12 - HOV\Design\Projects\0110051274 - Design\Plan\_Sett\1 - General\0110051274-Alignment\Layout.dgn



*Daniel Duke Thompson*  
 The seal appearing on this document was authorized by DANIEL THOMPSON, P.E. 122541 on 07/02, 2021. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.

**NB FRTG RD. ALIGNMENT DATA**      **INFORMATION FROM GEOPAK ALG.**

<p>Point CYWOOD1      N 13,946,761.9118 E    3,098,268.1978 Sta    7+60.00            Course from CYWOOD1 to CYWOOD3 N 9° 30' 27.42" W Dist 100.0406</p> <p>Point CYWOOD3      N 13,946,860.5782 E    3,098,251.6732 Sta    8+60.04            Course from CYWOOD3 to CYWOOD5 N 9° 35' 57.07" W Dist 139.9729</p> <p>Point CYWOOD5      N 13,946,998.5912 E    3,098,228.3321 Sta    10+00.01            Course from CYWOOD5 to CYWOOD7 N 9° 34' 52.74" W Dist 56.0156</p> <p>Point CYWOOD7      N 13,947,053.8254 E    3,098,219.0084 Sta    10+56.03            Course from CYWOOD7 to CYWOOD9 N 9° 33' 06.27" W Dist 168.3712</p> <p>Point CYWOOD9      N 13,947,219.8623 E    3,098,191.0692 Sta    12+24.40            Course from CYWOOD9 to CYWOOD11 N 9° 34' 09.29" W Dist 52.6964</p> <p>Point CYWOOD11     N 13,947,271.8255 E    3,098,182.3090 Sta    12+77.10            Course from CYWOOD11 to CYWOOD13 N 9° 35' 47.58" W Dist 224.5512</p> <p>Point CYWOOD13     N 13,947,493.2344 E    3,098,144.8742 Sta    15+01.65            Course from CYWOOD13 to CYWOOD15 N 9° 34' 55.52" W Dist 228.0975</p> <p>Point CYWOOD15     N 13,947,718.1495 E    3,098,106.9050 Sta    17+29.75            Course from CYWOOD15 to CYWOOD17 N 9° 33' 22.84" W Dist 225.7182</p> <p>Point CYWOOD17     N 13,947,940.7354 E    3,098,069.4318 Sta    19+55.46            Course from CYWOOD17 to CYWOOD19 N 9° 32' 30.77" W Dist 162.0903</p> <p>Point CYWOOD19     N 13,948,100.5832 E    3,098,042.5623 Sta    21+17.55            Course from CYWOOD19 to CYWOOD21 N 8° 43' 12.00" W Dist 114.6159</p> <p>Point CYWOOD21     N 13,948,213.8742 E    3,098,025.1859 Sta    22+32.17            Course from CYWOOD21 to CYWOOD23 N 8° 29' 13.35" W Dist 146.6990</p> <p>Point CYWOOD23     N 13,948,358.9667 E    3,098,003.5352 Sta    23+78.87</p>	<p>Course from CYWOOD23 to CYWOOD25 N 8° 27' 43.27" W Dist 134.5381</p> <p>Point CYWOOD25     N 13,948,492.0403 E    3,097,983.7374 Sta    25+13.41            Course from CYWOOD25 to CYWOOD27 N 8° 26' 04.19" W Dist 145.2079</p> <p>Point CYWOOD27     N 13,948,635.6776 E    3,097,962.4385 Sta    26+58.61            Course from CYWOOD27 to CYWOOD29 N 8° 35' 21.58" W Dist 125.6544</p> <p>Point CYWOOD29     N 13,948,759.9227 E    3,097,943.6719 Sta    27+84.27            Course from CYWOOD29 to CYWOOD31 N 9° 28' 24.45" W Dist 71.7318</p> <p>Point CYWOOD31     N 13,948,830.6762 E    3,097,931.8655 Sta    28+56.00            Course from CYWOOD31 to CYWOOD33 N 10° 10' 38.16" W Dist 75.3955</p> <p>Point CYWOOD33     N 13,948,904.8854 E    3,097,918.5435 Sta    29+31.40            Course from CYWOOD33 to CYWOOD35 N 11° 09' 26.95" W Dist 124.2467</p> <p>Point CYWOOD35     N 13,949,026.7837 E    3,097,894.5010 Sta    30+55.64            Course from CYWOOD35 to CYWOOD36 N 12° 24' 08.42" W Dist 174.3348</p> <p>Point CYWOOD36     N 13,949,197.0502 E    3,097,857.0582 Sta    32+29.98</p>
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**IH 45 AT CYPRESSWOOD DR.**

**ALIGNMENT DATA**

SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		35
STATE	DIST	COUNTY
TEXAS	HOU	HARRIS
CONT	SECT	JOB
0110	05	127
		HIGHWAY
		IH 45




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 Radius: 4173.556  
 Delta: 4°16'15.2" Left  
 Degree of Curvature (Arc): 1°22'22.2"  
 Length: 311.101  
 Tangent: 155.622  
 Chord: 311.029  
 Middle Ordinate: 2.898  
 External: 2.900  
 Tangent Direction: N 4°42'22.9" W  
 Radial Direction: N 85°17'37.1" E  
 Chord Direction: N 6°50'30.5" W  
 Radial Direction: N 81°01'22.0" E  
 Tangent Direction: N 8°58'38.0" W

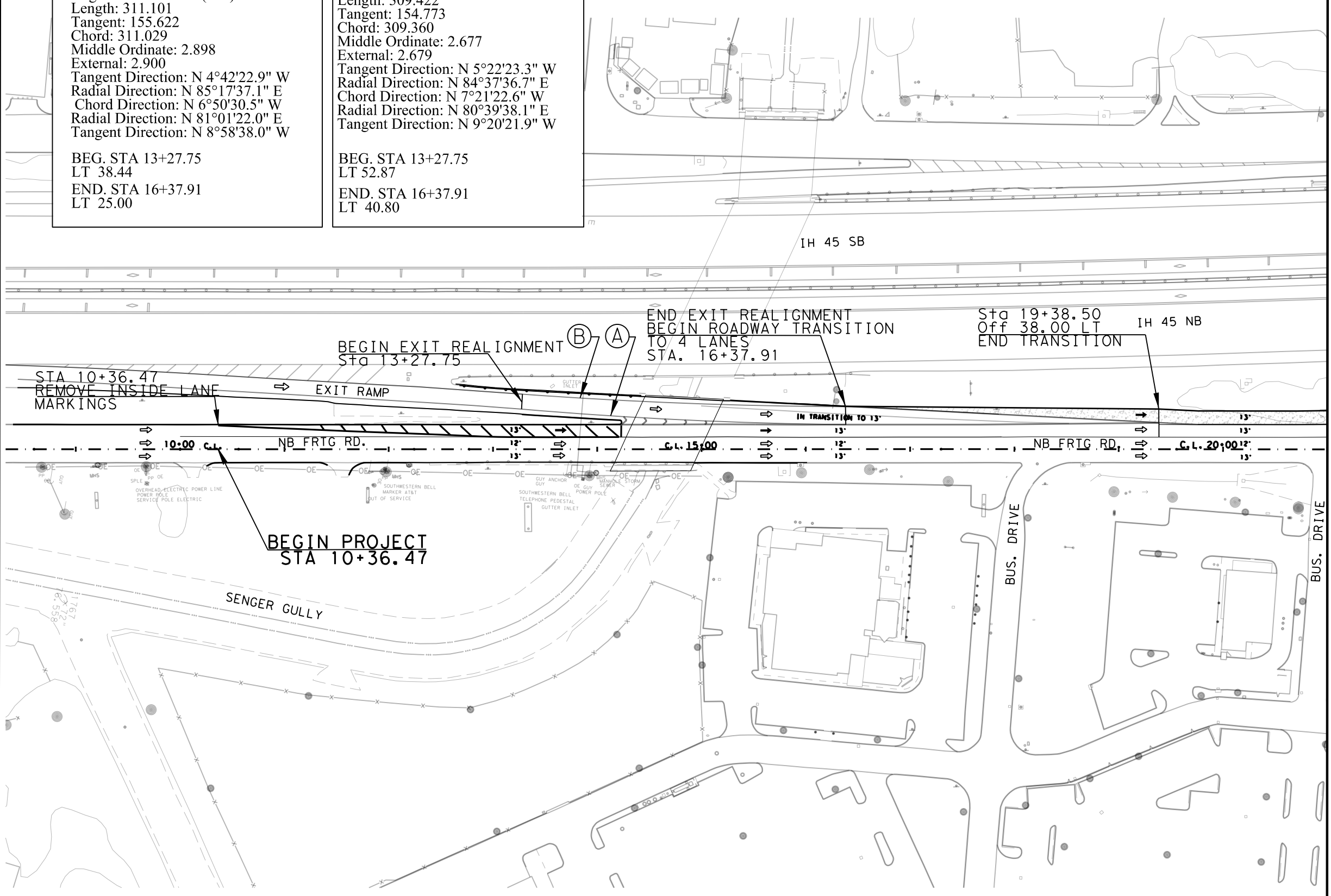
BEG. STA 13+27.75  
 LT 38.44  
 END. STA 16+37.91  
 LT 25.00

Ⓑ  
 Radius: 4469.805  
 Delta: 3°57'58.7" Left  
 Degree of Curvature (Arc): 1°16'54.6"  
 Length: 309.422  
 Tangent: 154.773  
 Chord: 309.360  
 Middle Ordinate: 2.677  
 External: 2.679  
 Tangent Direction: N 5°22'23.3" W  
 Radial Direction: N 84°37'36.7" E  
 Chord Direction: N 7°21'22.6" W  
 Radial Direction: N 80°39'38.1" E  
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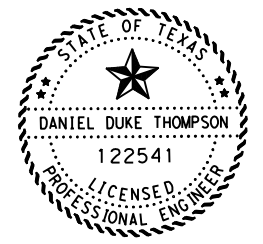
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 LT 52.87  
 END. STA 16+37.91  
 LT 40.80

LEGEND

-  EXIST. TRAFFIC LANE
-  PROP. TRAFFIC LANE
-  PROP. ROADWAY



STA. 21+00.00



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IH 45  
 AT CYPRESSWOOD DR.

ROADWAY LAYOUT




SCALE: 1" = 100' HORZ

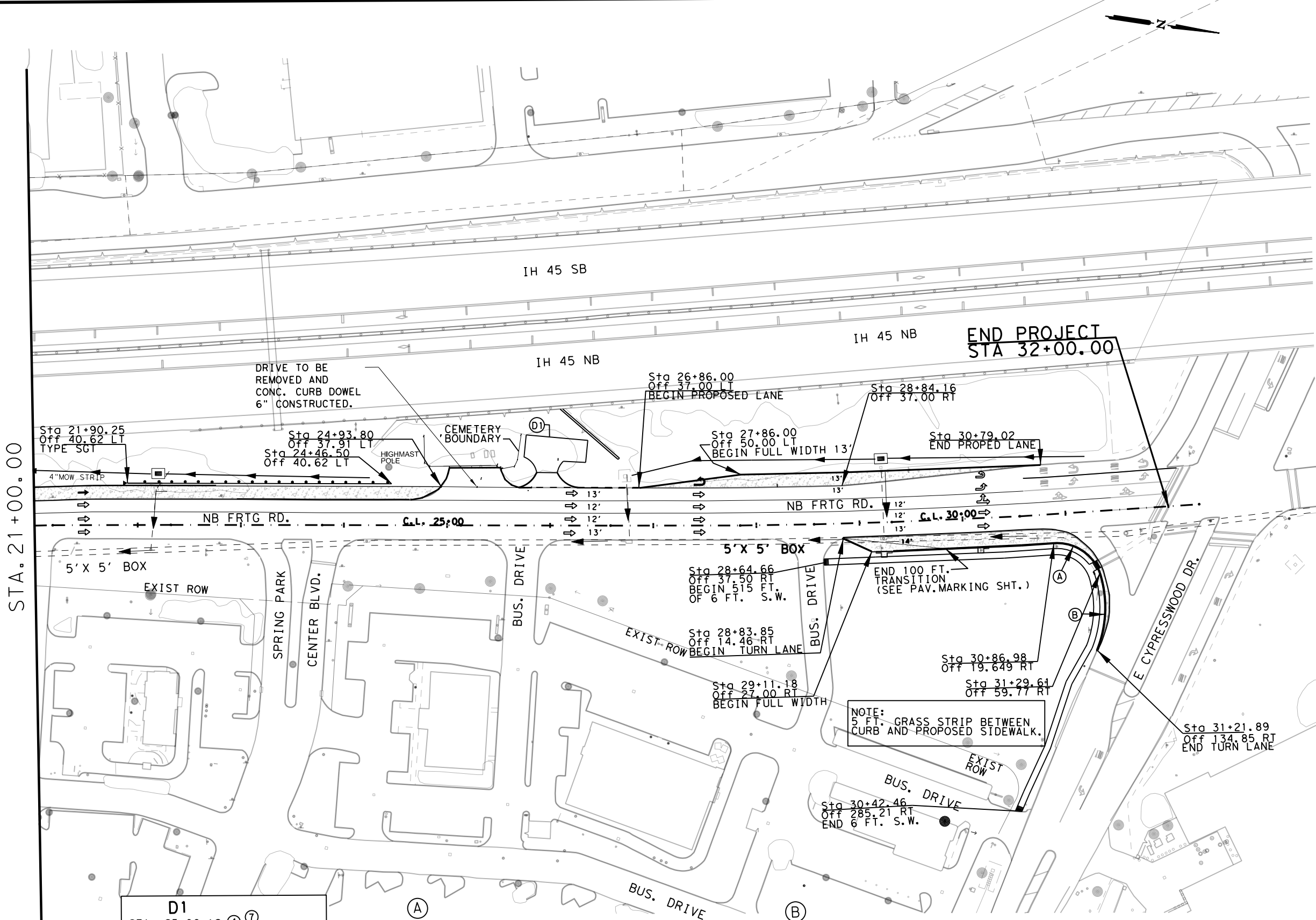
SHEET 1 OF 2

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STATE <b>TEXAS</b>	DIST <b>HOU</b>	COUNTY <b>HARRIS</b>	
CONT <b>0110</b>	SECT <b>05</b>	JOB <b>127</b>	HIGHWAY <b>IH 45</b>

DATE: 8/2/2021  
 \$FILEL\$

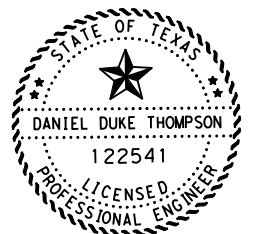
LEGEND

-  EXIST. TRAFFIC LANE
-  PROP. TRAFFIC LANE
-  PROP. ROADWAY



STA. 21+00.00

END PROJECT  
STA 32+00.00



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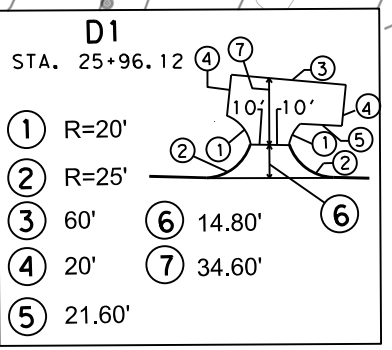
IH 45  
AT CYPRESSWOOD DR.

ROADWAY LAYOUT

SCALE: 1" = 50' HORZ

SHEET 2 OF 2

FED. RD. DIV. NO. 6	PROJECT NO.	SHEET NO. 37
STATE TEXAS	DIST HOU	COUNTY HARRIS
CONT 0110	SECT 05	JOB 127
		HIGHWAY IH 45



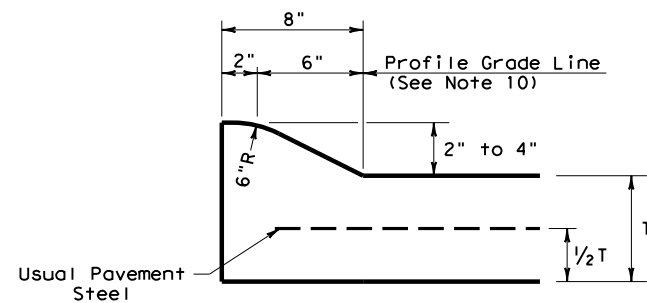
**(A)**  
Radius: 44.323  
Delta: 58°17'06.0"  
Right Degree of Curvature (Arc): 129°16'03.2"  
Length: 45.089  
Tangent: 24.713  
Chord: 43.170  
Middle Ordinate: 5.611  
External: 6.424  
Tangent Direction: N 12°33'09.1" W  
Radial Direction: N 77°26'50.9" E  
Chord Direction: N 16°35'23.9" E  
Radial Direction: S 44°16'03.1" E  
Tangent Direction: N 45°43'56.9" E

**(B)**  
Radius: 111.563  
Delta: 39°32'33.9"  
Right Degree of Curvature (Arc): 51°21'27.1"  
Length: 76.995  
Tangent: 40.102  
Chord: 75.476  
Middle Ordinate: 6.577  
External: 6.989  
Tangent Direction: N 63°43'23.6" E  
Radial Direction: S 26°16'36.4" E  
Chord Direction: N 83°29'40.6" E  
Radial Direction: S 13°15'57.6" W  
Tangent Direction: S 76°44'02.4" E

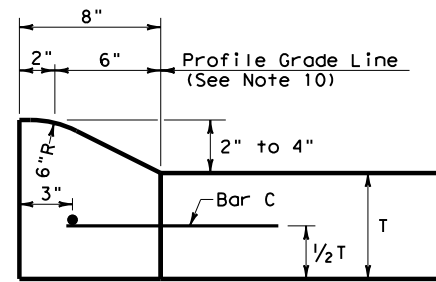
DATE: 8/2/2021  
\$FILEL\$

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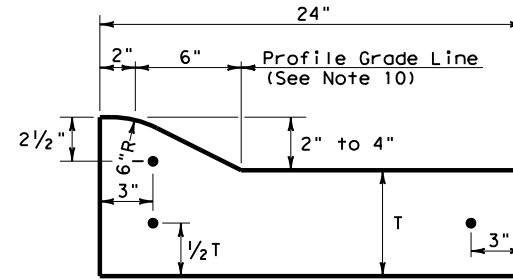
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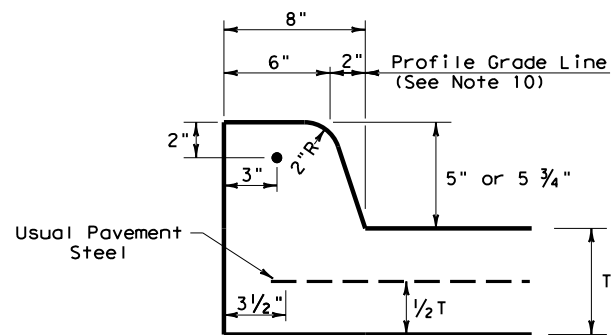
**TYPE I CURB (MONOLITHIC)  
2" - 4" HEIGHT**



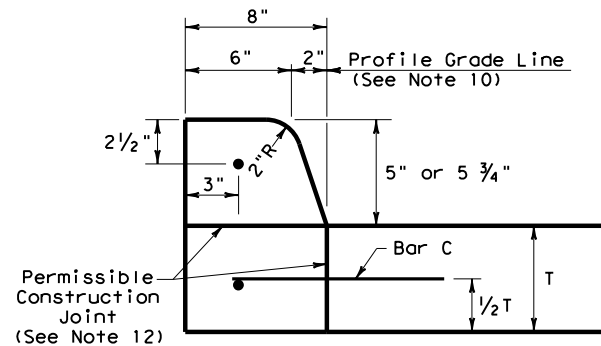
**TYPE I CURB  
2" - 4" HEIGHT**



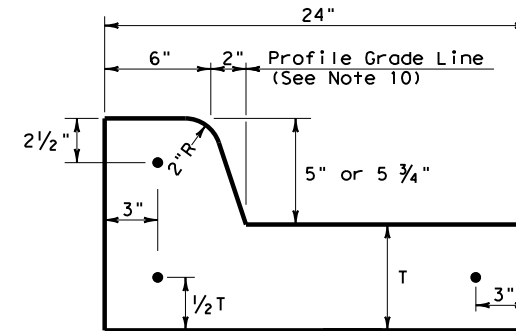
**TYPE I CURB AND GUTTER  
2" - 4" HEIGHT**



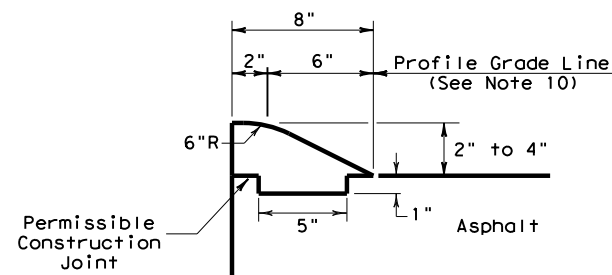
**TYPE II CURB (MONOLITHIC)  
5" - 5 3/4" HEIGHT**



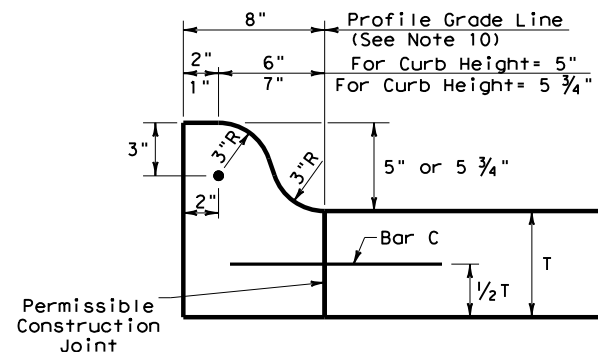
**TYPE II CURB  
5" - 5 3/4" HEIGHT**



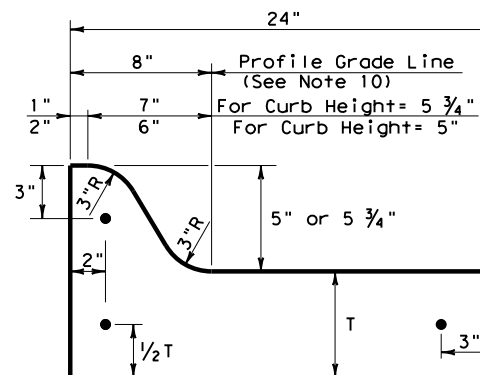
**TYPE II CURB AND GUTTER  
5" - 5 3/4" HEIGHT**



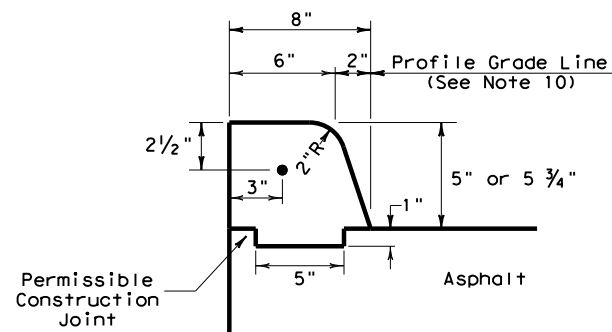
**TYPE III CURB (KEYED)  
2" - 4" HEIGHT**



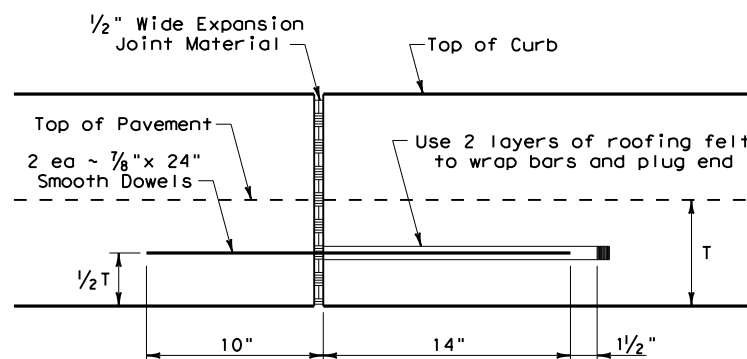
**TYPE IIa CURB  
5" - 5 3/4" HEIGHT**



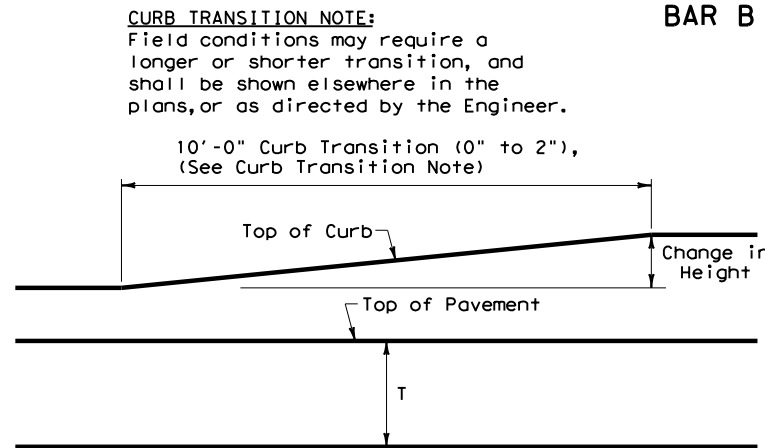
**TYPE IIa CURB AND GUTTER  
5" - 5 3/4" HEIGHT**



**TYPE IV CURB (KEYED)  
5" - 5 3/4" HEIGHT**



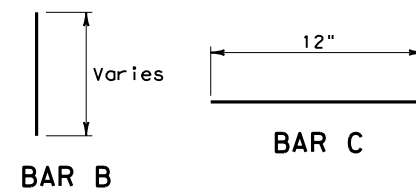
**EXPANSION JOINT DETAIL**



**CURB TRANSITION**  
Note: To be paid for as Highest Curb

**GENERAL NOTES**

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and the grouted in place, or may be inserted into fresh concrete.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B used as needed to support curb reinforcing steel during concrete placement.



**CURB TRANSITION NOTE:**  
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.

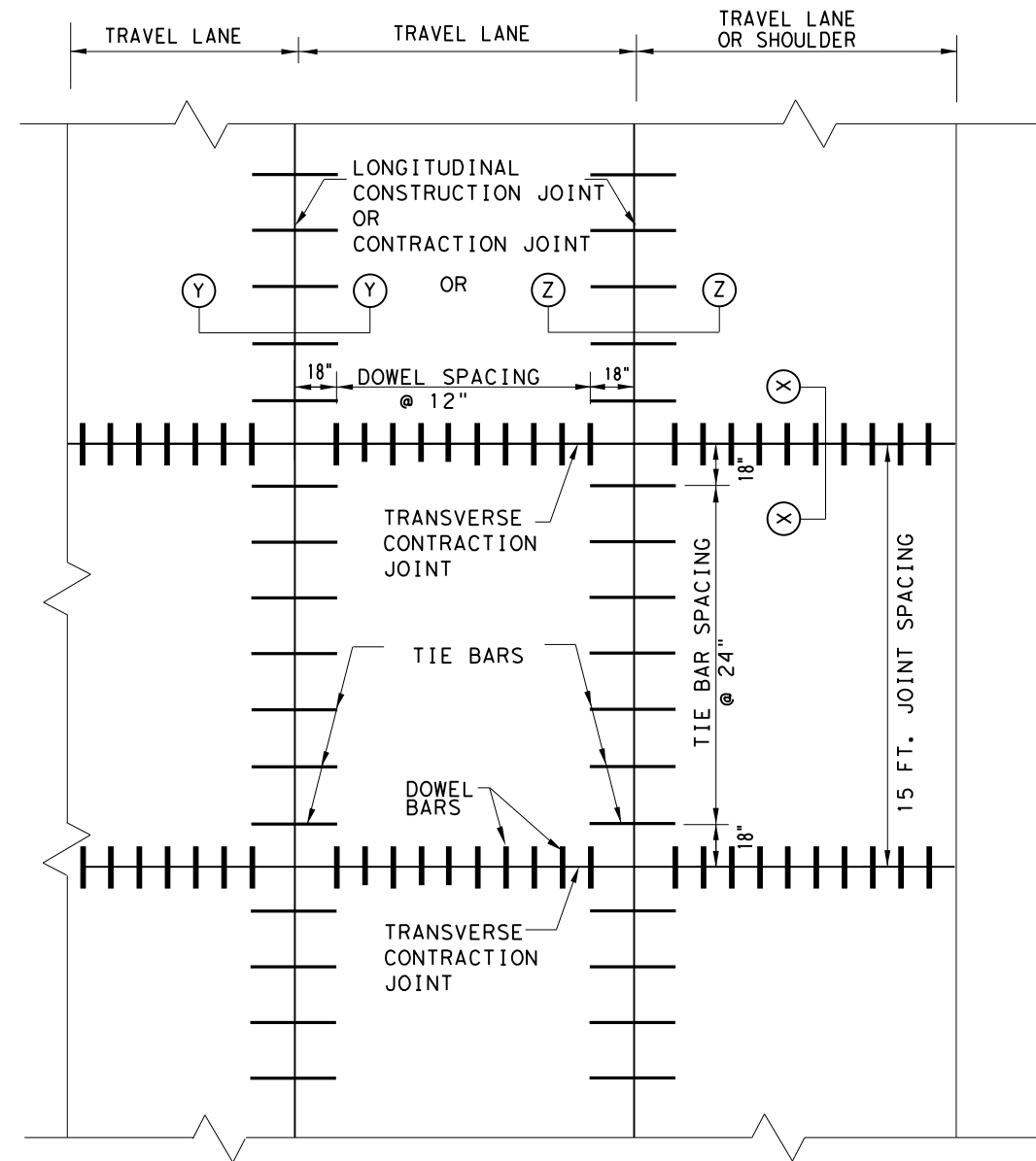
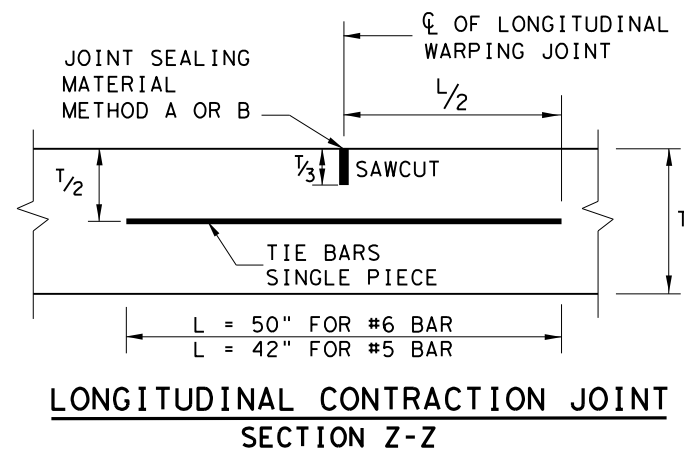
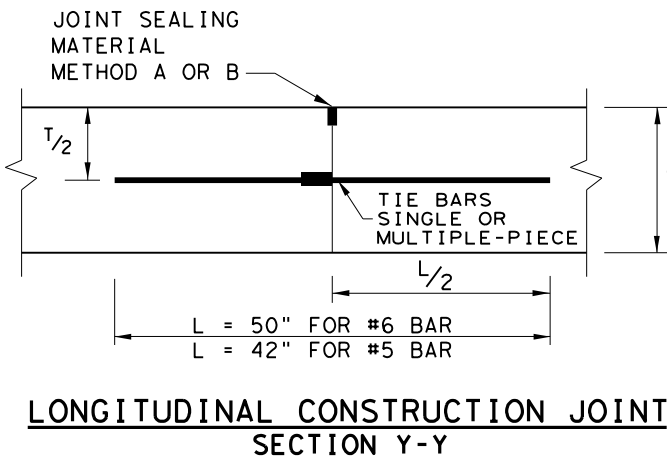
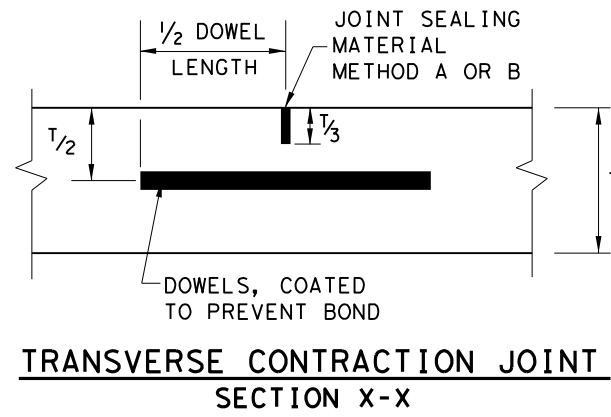
				<b>Design Division Standard</b>	
<b>CONCRETE CURB AND GUTTER</b>					
<b>CCCG-21</b>					
FILE: cccg21.dgn	DN: TxDOT	CK: AN	DW: SS	CK: KM	
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY	
REVISIONS					
0110	05	127	1H45		
DIST	COUNTY		SHEET NO.		
HOU	HARRIS		38		

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DATE:  
FILE:

**GENERAL NOTES**

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND LOAD TRANSFER DEVICES REFER TO THE GOVERNING SPECIFICATION FOR "CONCRETE PAVEMENT".
3. THE SPACING BETWEEN TRANSVERSE CONTRACTION JOINTS SHALL BE 15 FT. UNLESS OTHERWISE SHOWN IN THE PLANS.
4. TRANSVERSE CONSTRUCTION JOINTS MAY BE FORMED BY USE OF METAL OR WOOD FORMS EQUAL IN DEPTH TO THE DEPTH OF PAVEMENT, OR BY METHODS APPROVED BY THE ENGINEER.
5. USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL THE FORMED JOINTS.
6. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
7. THE JOINT BETWEEN OUTSIDE LANE AND SHOULDER SHALL BE A LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) UNLESS OTHERWISE SHOWN IN THE PLANS. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
8. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
9. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
10. WHEN AN MONOLITHIC CURB IS SPECIFIED, THE JOINT IN THE CURB SHALL COINCIDE WITH PAVEMENT JOINTS AND MAY BE FORMED BY ANY MEANS APPROVED BY THE ENGINEER.
11. DOWEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1/4 IN. HORIZONTALLY AND VERTICALLY UNLESS OTHERWISE SPECIFIED. WHERE DOWEL BAR BASKETS ARE USED, REMOVE THE SHIPPING WIRES.
12. THE DETAIL FOR JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



**TYPICAL PAVEMENT LAYOUT**  
PLAN VIEW (NOT TO SCALE)

SLAB THICKNESS T (IN.)	BAR DIA. AND LENGTH	AVERAGE SPACING (IN.)
6 to 7.5	1" X 18"	12
8 to 10	1 1/4" X 18"	12
>= 10.5	1 1/2" X 18"	12

SLAB THICKNESS T (IN.)	BAR SIZE	AVERAGE SPACING (IN.)
6 to 7.5	#5	24
>= 8	#6	24

SHEET 1 OF 2

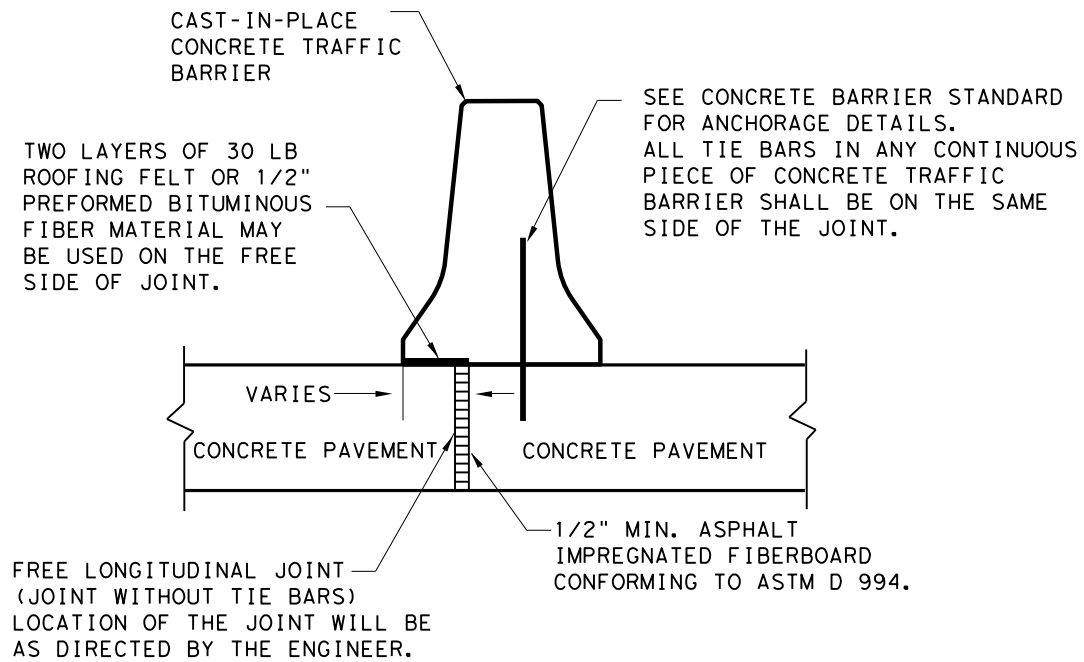


**CONCRETE PAVEMENT DETAILS  
CONTRACTION DESIGN  
T-6 to 12 INCHES**

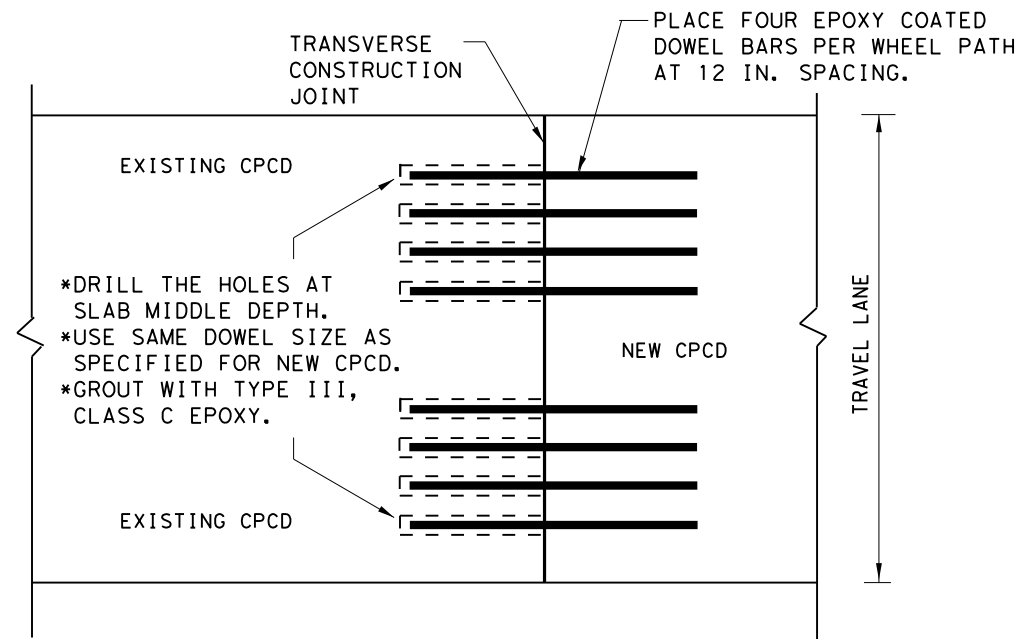
**CPCD-14**

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	TH45
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	39	

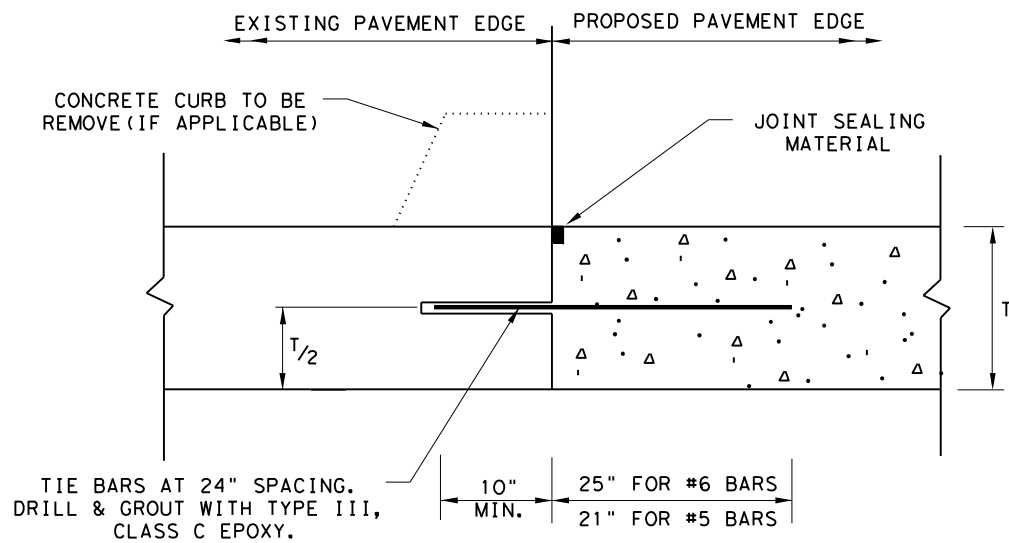
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**FREE LONGITUDINAL JOINT DETAIL**

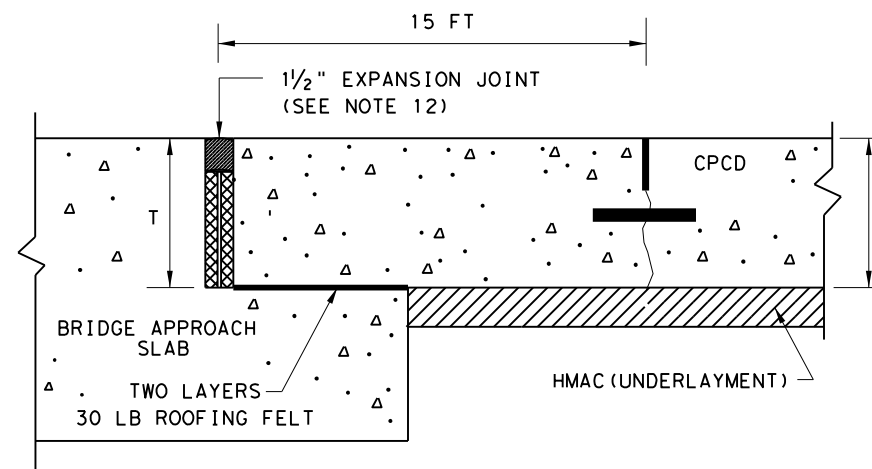


**TRANSVERSE JOINT DETAIL  
EXISTING CPCD TO NEW CPCD  
PLAN VIEW (NOT TO SCALE)**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 BARS FOR 8" AND THICKER SLABS, USE #5 BARS FOR LESS THAN 8" THICK SLABS.
3. THE TRANSVERSE JOINTS OF PROPOSED PAVEMENT SHALL COINCIDE WITH EXISTING PAVEMENT JOINTS UNLESS OTHERWISE SHOWN ON THE PLANS.

**LONGITUDINAL WIDENING JOINT DETAIL**



**TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH**

SHEET 2 OF 2



**CONCRETE PAVEMENT DETAILS  
CONTRACTION DESIGN  
T-6 to 12 INCHES**

**CPCD-14**

FILE: cpcd14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
DIST	COUNTY		SHEET NO.	
HOU	HARRIS		40	

DATE:  
FILE:



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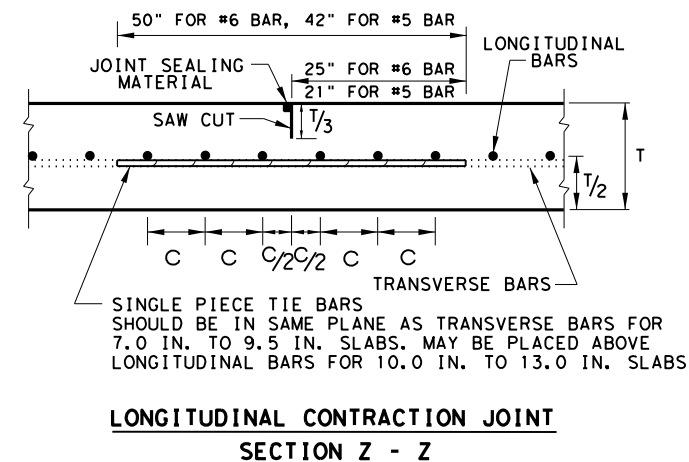
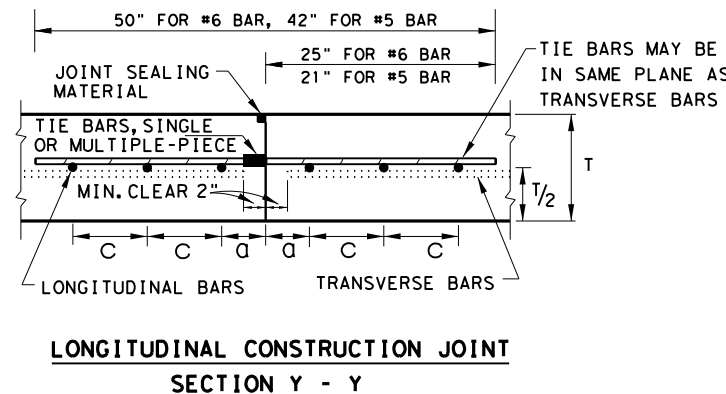
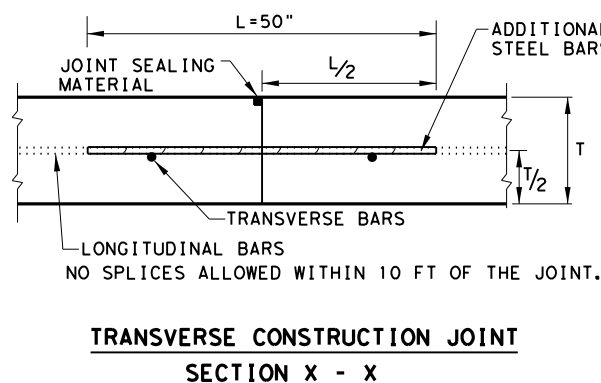
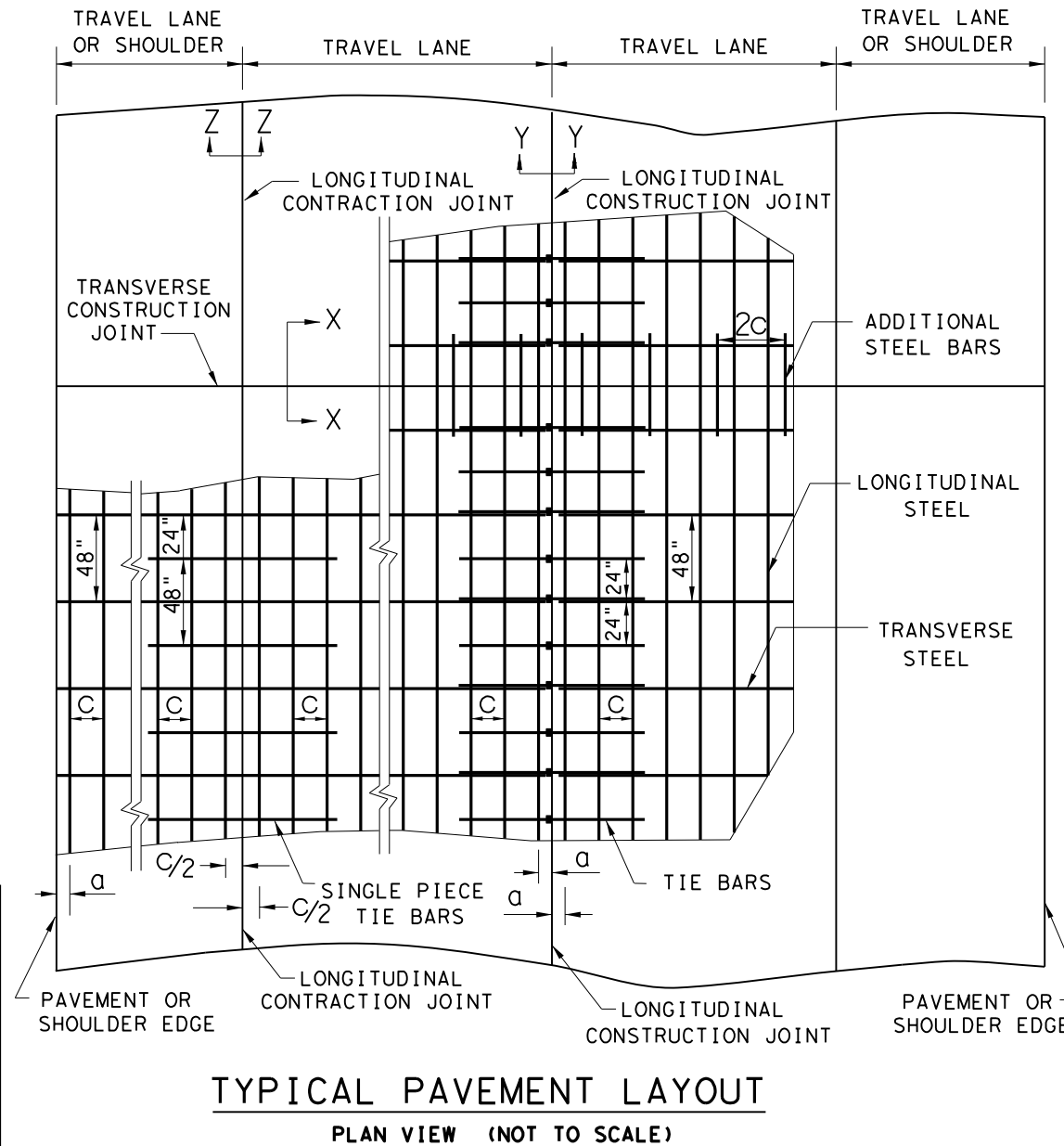
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**GENERAL NOTES**

1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (COTE) OF NOT MORE THAN  $5.5 \times 10^{-6}$  IN/IN/°F AS LISTED IN THE CONCRETE RATED SOURCE QUALITY CATALOG (CRSQC).
3. ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO.1 AND TABLE NO.2.
4. STEEL BAR PLACEMENT TOLERANCE SHALL BE +/- 1 IN. HORIZONTALLY AND +/- 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO.1
5. PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
6. THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
7. WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
8. REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
9. OMIT TIE BARS LOCATED WITHIN 18-IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
10. LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
11. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."

SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING C (IN.)	SPACING a (IN.)	SPACING 2 x C (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24

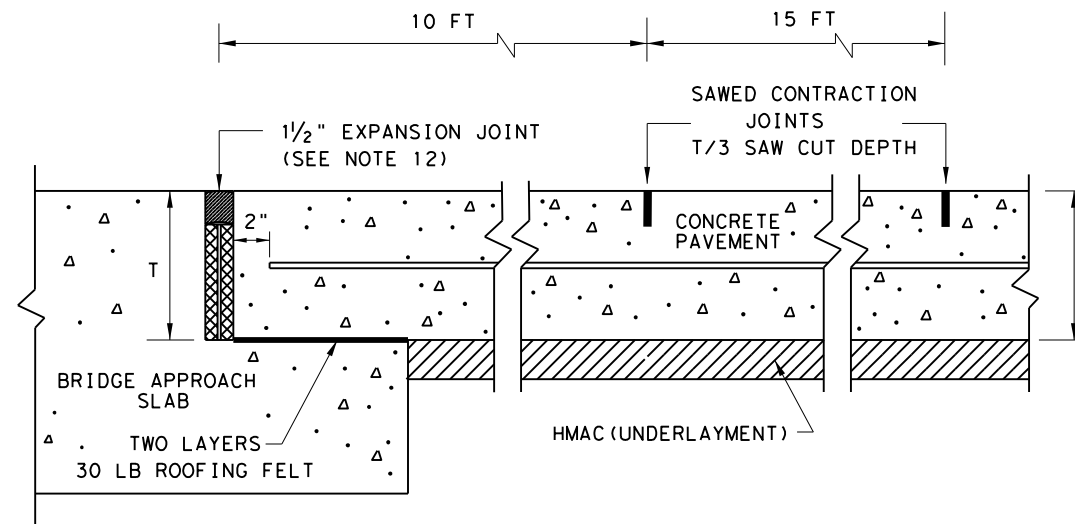


SHEET 1 OF 2

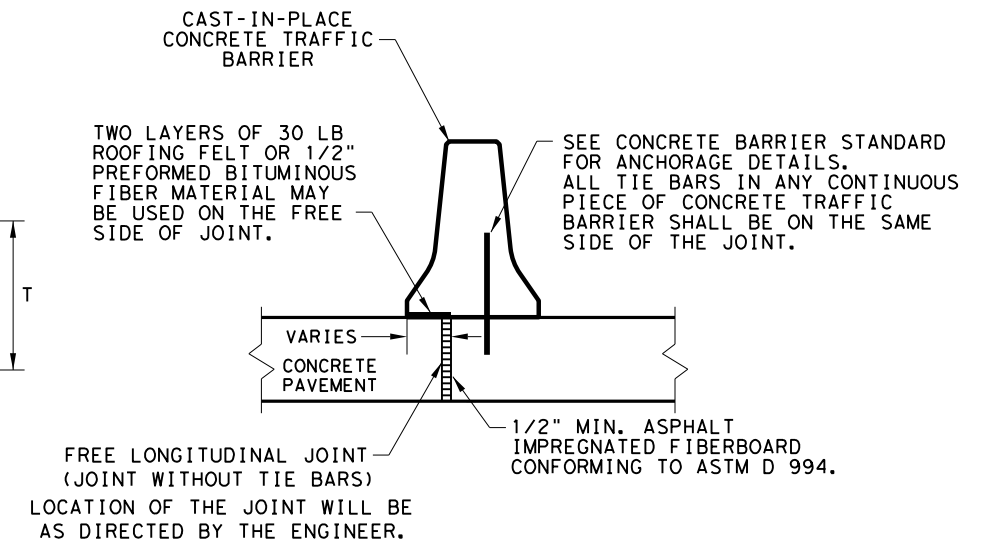
		<b>Design Division Standard</b>	
<b>CONTINUOUSLY REINFORCED CONCRETE PAVEMENT</b>			
<b>ONE LAYER STEEL BAR PLACEMENT</b>			
<b>T - 7 to 13 INCHES</b>			
<b>CRCP (1) - 20</b>			
FILE: crcp120.dgn	DN: TxDOT	CK: KM	DW: AN
© TxDOT: APRIL 2020	CONT	SECT	JOB
10/10/2011 ADD CN #12	0110	05	127
04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS	DIST	COUNTY	SHEET NO.
05/05/2017 COTE AS RATED 4.3	HOU	HARRIS	41

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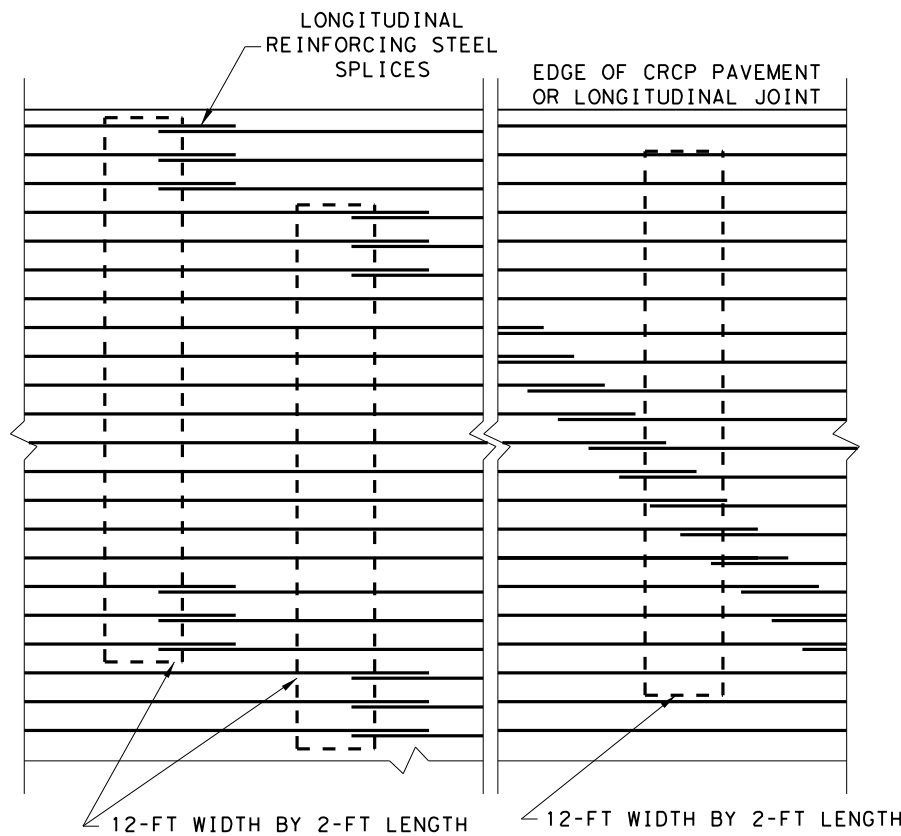
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**TRANSVERSE EXPANSION JOINT DETAIL  
AT BRIDGE APPROACH**

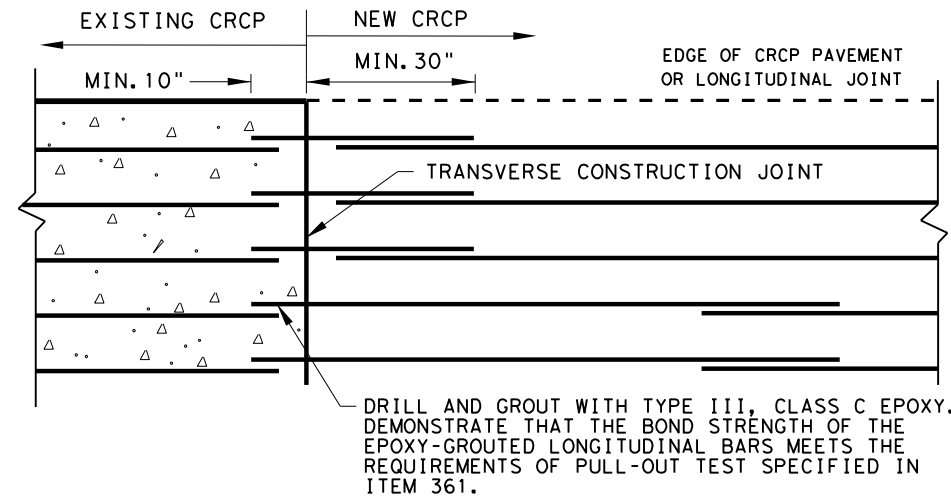


**FREE LONGITUDINAL JOINT DETAIL**

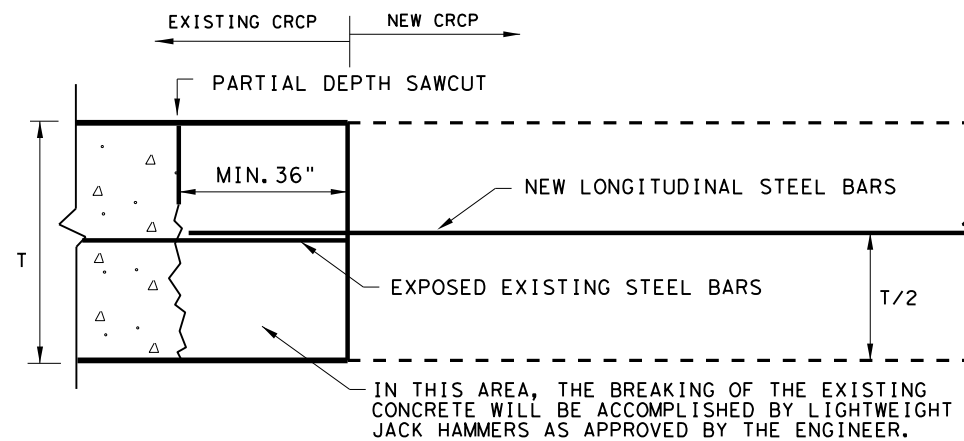


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

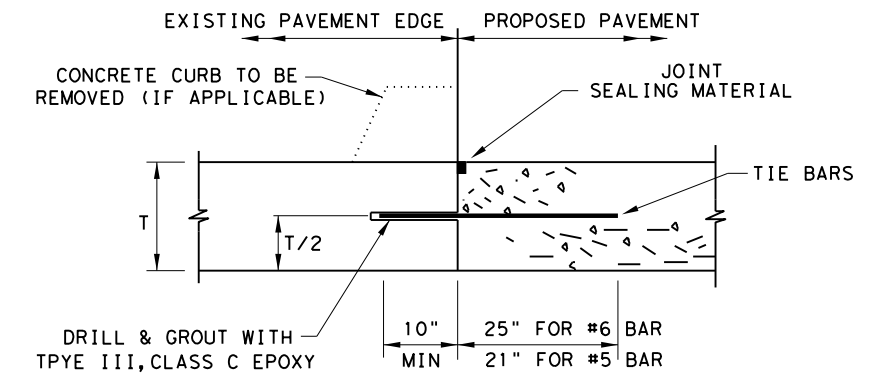
**EXAMPLES OF LAP CONFIGURATION  
PLAN VIEW (NOT TO SCALE)**



**OPTION A: DRILL AND EPOXY  
PLAN VIEW (NOT TO SCALE)**



**OPTION B: BREAKBACK AND LAP  
TRANSVERSE TIE JOINT DETAIL  
EXISTING CRCP TO NEW CRCP**



1. BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
2. SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

**LONGITUDINAL WIDENING JOINT DETAIL**

SHEET 2 OF 2

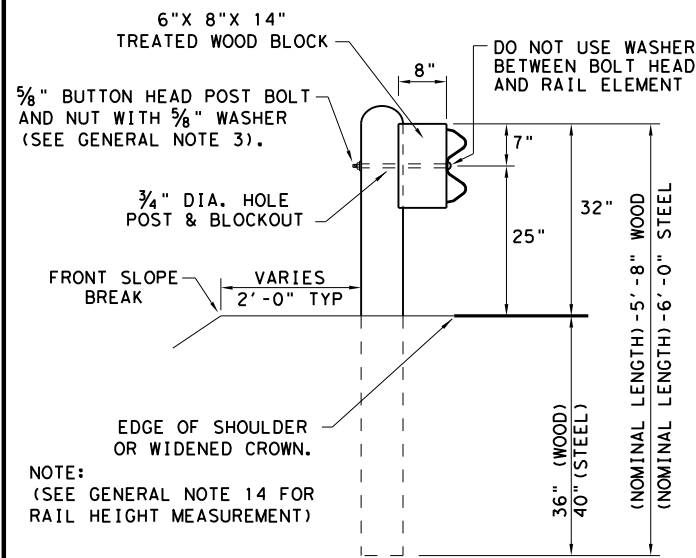


**CONTINUOUSLY REINFORCED  
CONCRETE PAVEMENT  
ONE LAYER STEEL BAR PLACEMENT  
T - 7 to 13 INCHES  
CRCP (1) - 20**

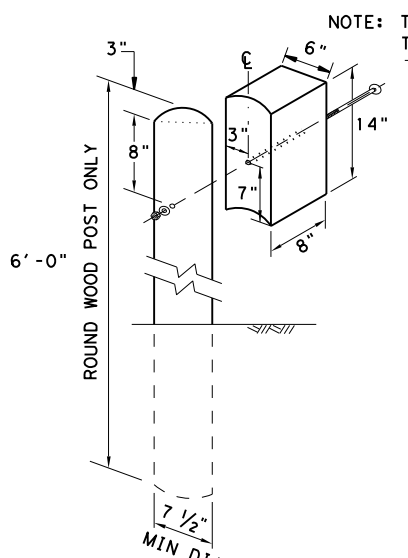
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REVISIONS	0110	05	127	IH45
03/16/2020 REMOVED TABLE 1A	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	42	

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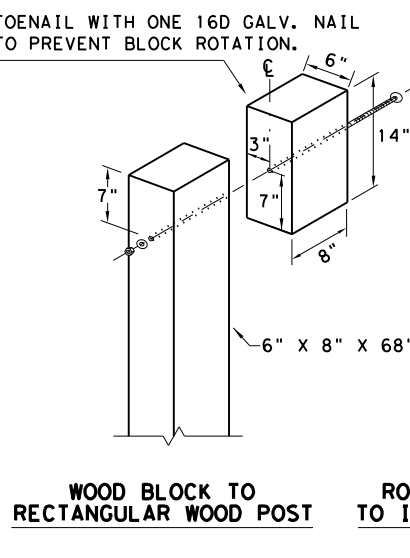
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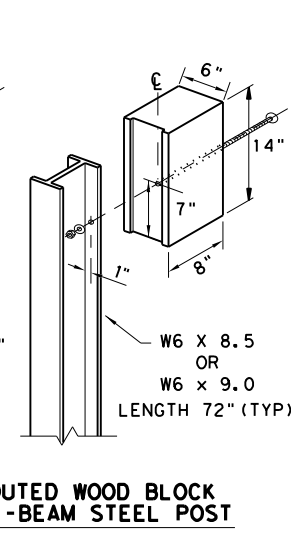
**TYPICAL POST PLACEMENT**



**WOOD BLOCK TO ROUND WOOD POST**

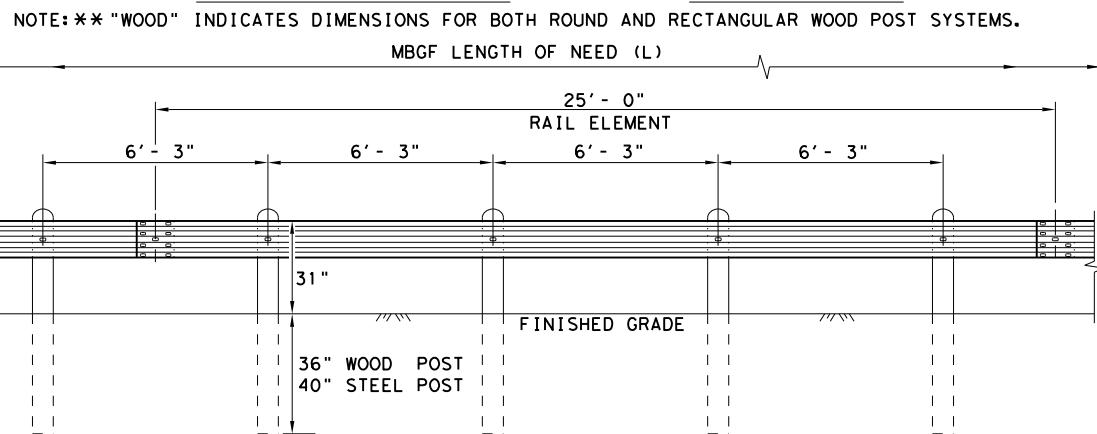


**WOOD BLOCK TO RECTANGULAR WOOD POST**



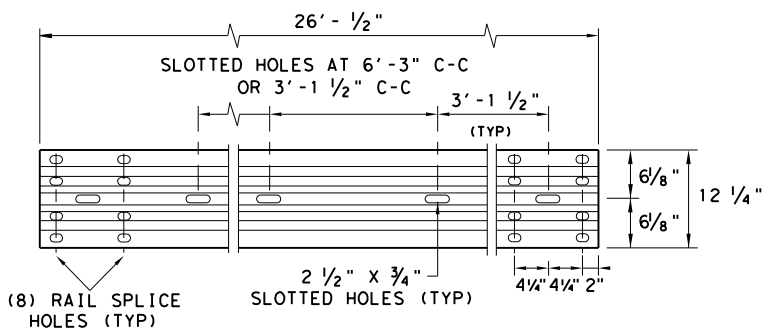
**ROUTED WOOD BLOCK TO I-BEAM STEEL POST**

- GENERAL NOTES**
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
  2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE DOWNSTREAM ANCHOR TERMINAL (DAT) AND THE TRANSITION SECTIONS OF GUARDRAIL.
  3. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND 3/8" WASHER (FWC16G) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
  4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
  6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
  7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
  8. UNLESS OTHERWISE SHOWN IN THE PLANS, GUARD FENCE PLACED IN THE VICINITY OF CURBS SHALL BE POSITIONED SO THAT THE FACE OF CURB IS LOCATED DIRECTLY BELOW OR BEHIND THE FACE OF THE RAIL. RAIL PLACED OVER CURBS SHALL BE INSTALLED SO THAT THE POST BOLT IS LOCATED APPROXIMATELY 25 INCHES ABOVE THE GUTTER PAN OR EDGE OF SHOULDER.
  9. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. IF SOLID ROCK IS ENCOUNTERED WITHIN 0 TO 18" OF THE FINISHED GRADE, DRILL A 24" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
  10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
  11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
  12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
  13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
  14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL, MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.



**ELEVATION MID-SPAN RAIL SPLICE**

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



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

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

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

SPLICE BOLT LENGTH VARIES

FBB01 = 1 1/4"

FBB02 = 2"

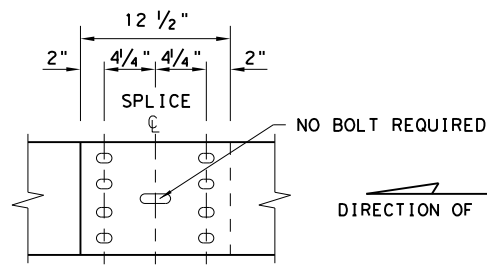
POST & BLOCK LENGTH

FBB03 = 10"

FBB04 = 18"

**BUTTON HEAD BOLT**

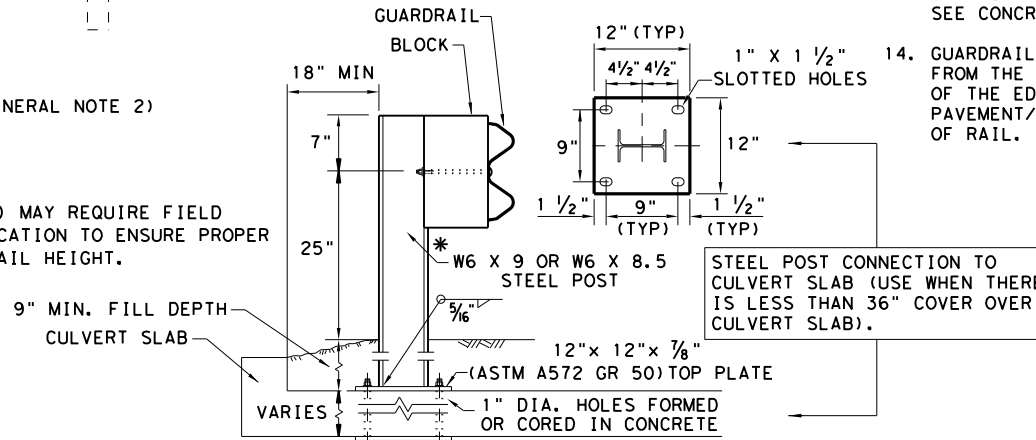
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



**MID-SPAN RAIL SPLICE DETAIL**

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

\* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.



**LOW FILL CULVERT POST**

NOTE: TWO INSTALLATION OPTIONS.

1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS. NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

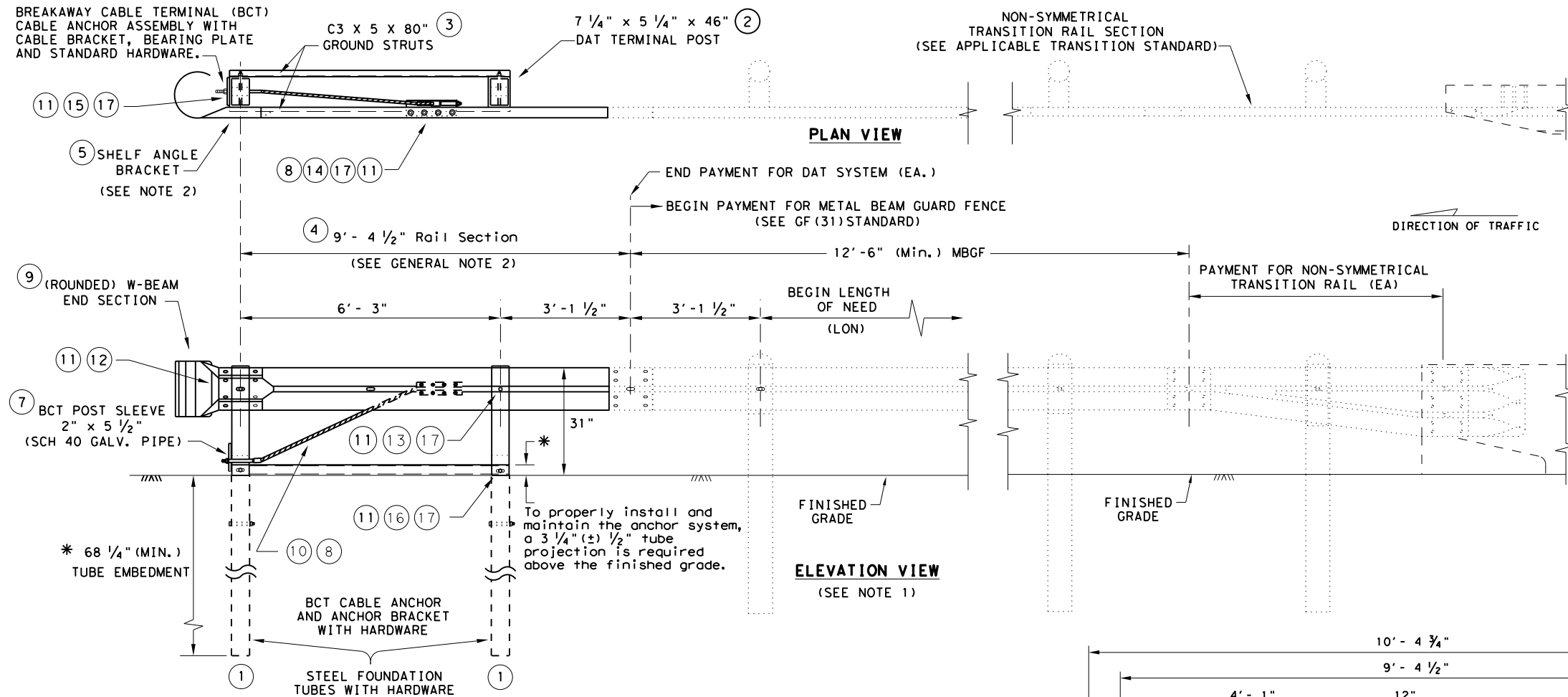
2. **EPOXY ANCHOR OPTION:** THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

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

				Design Division Standard
<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>				
FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
© TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS				
0110	05	127	IH45	
DIST	COUNTY		SHEET NO.	
HOU	HARRIS		43	

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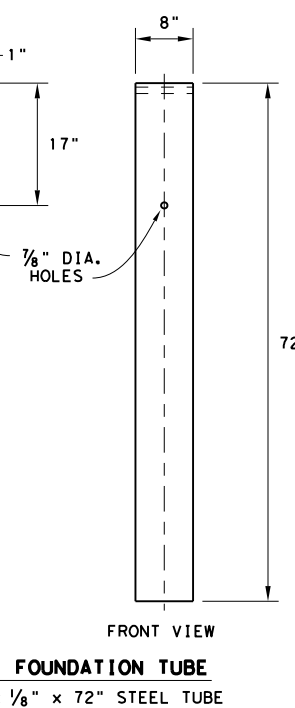
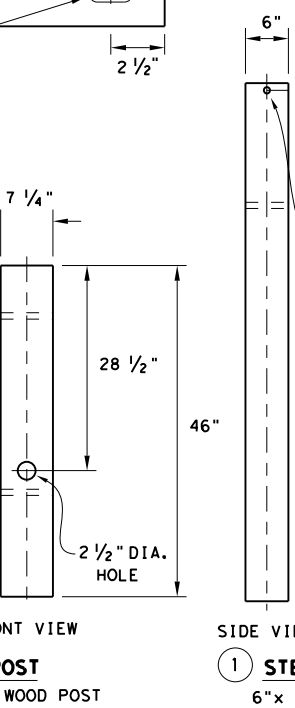
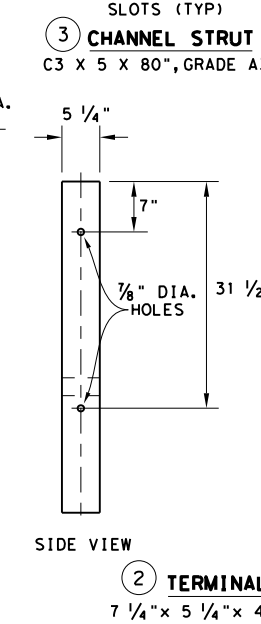
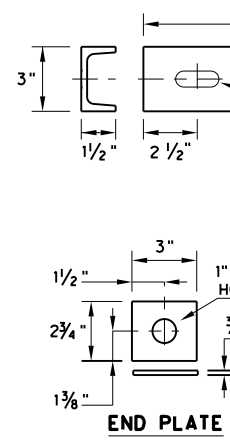
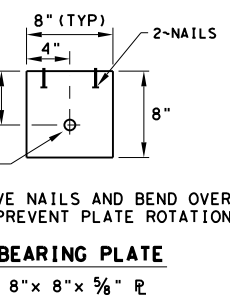
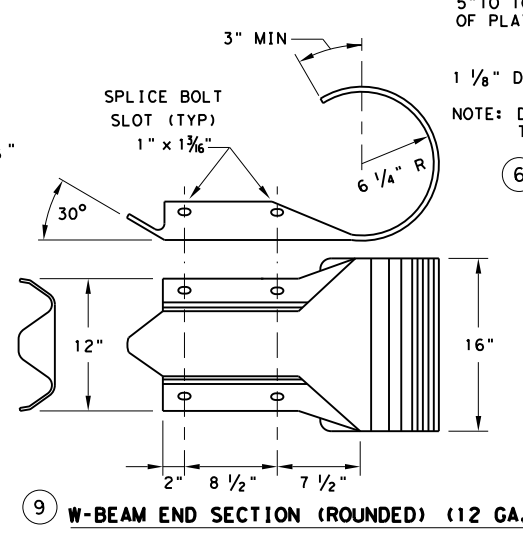
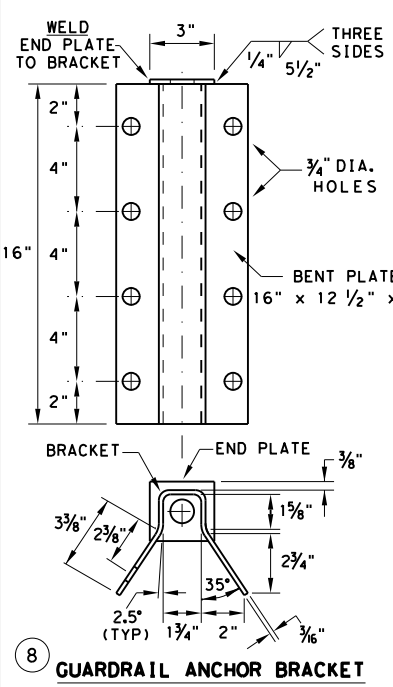
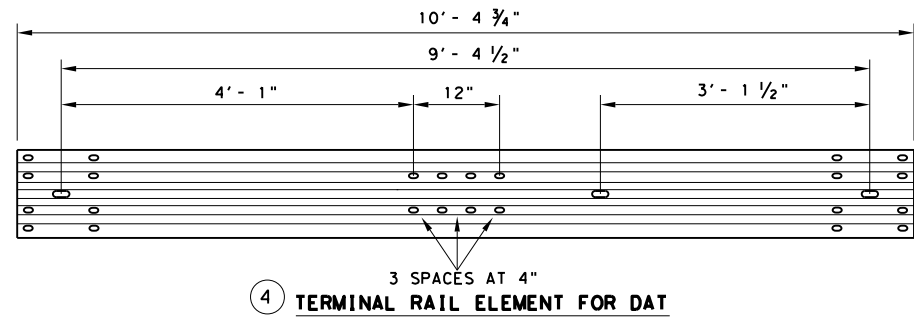


**DOWNSTREAM ANCHOR TERMINAL (DAT)**  
NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

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

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

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

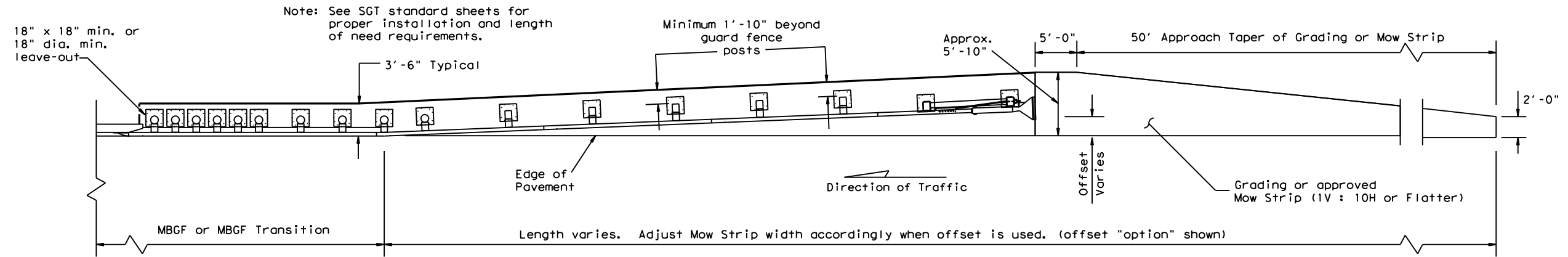


**Texas Department of Transportation**  
Design Division Standard

**METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL) TL-3 MASH COMPLIANT GF(31)DAT-19**

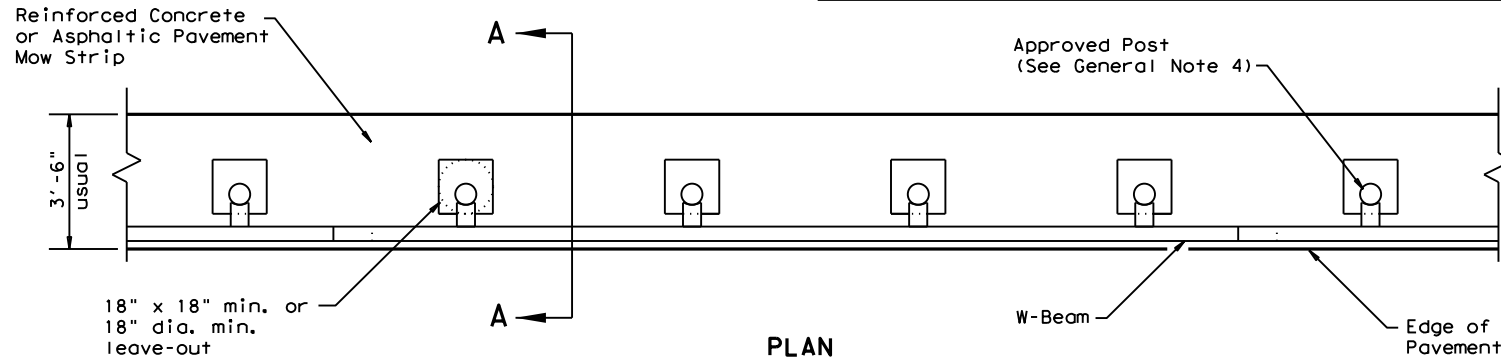
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©TXDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		44

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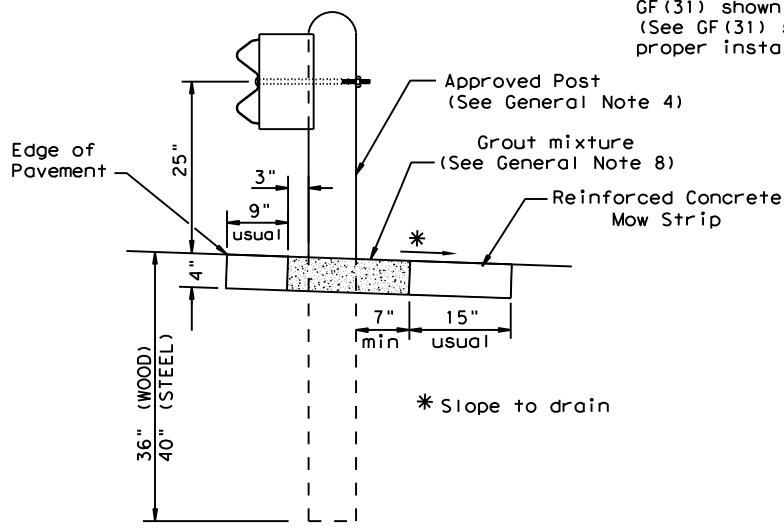
**GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS**

Note: Site Condition(s)  
 Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.  
 Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.



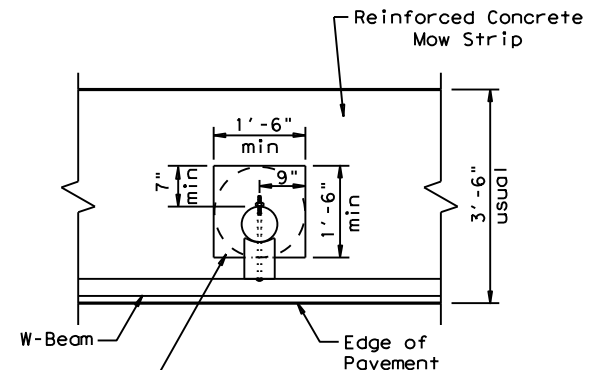
**PLAN**

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



**SECTION A-A**

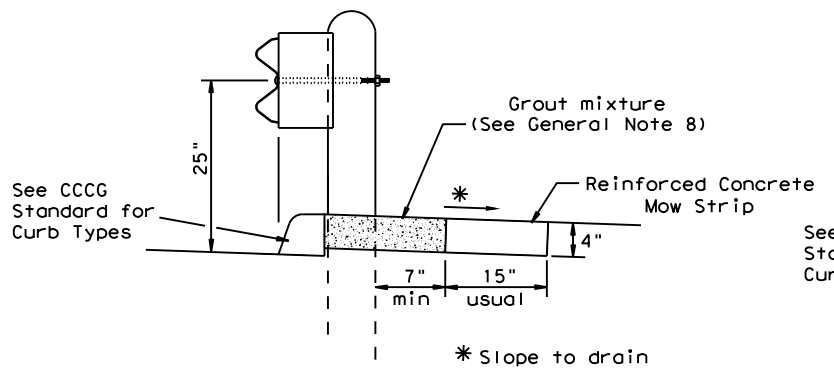
Typical



**MOW STRIP DETAIL**

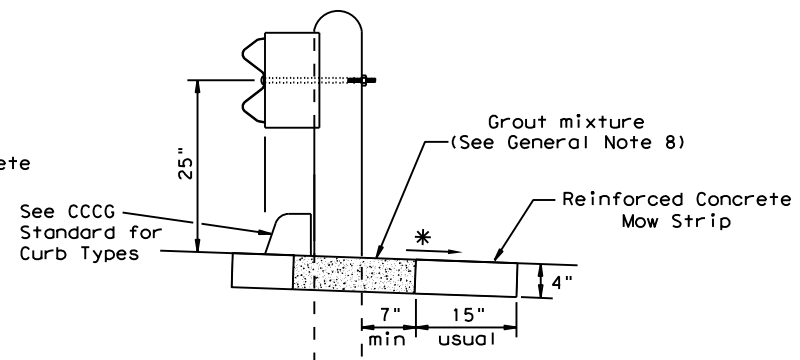
Reinforced Concrete Mow Strip with 18" x 18" Square or 18" Dia. minimum leave-out.

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



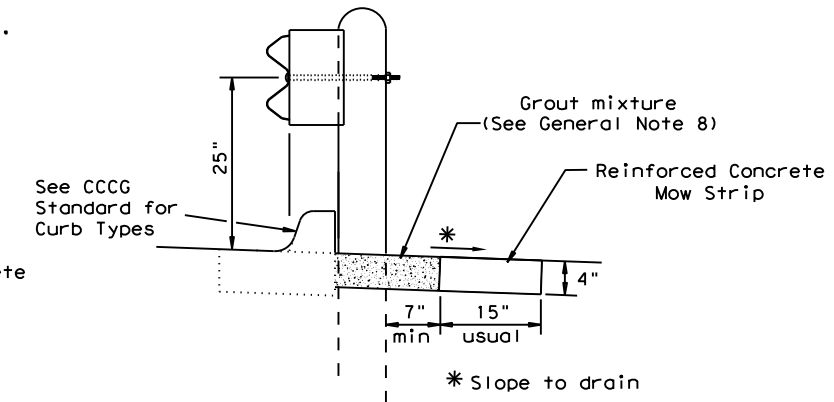
**CURB OPTION (1)**

This option will increase the post embedment throughout the system.



**CURB OPTION (2)**

Curb shown on top of mow strip



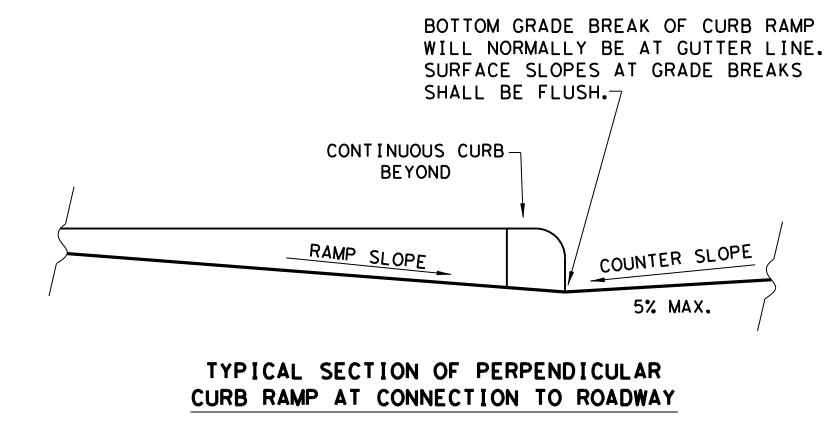
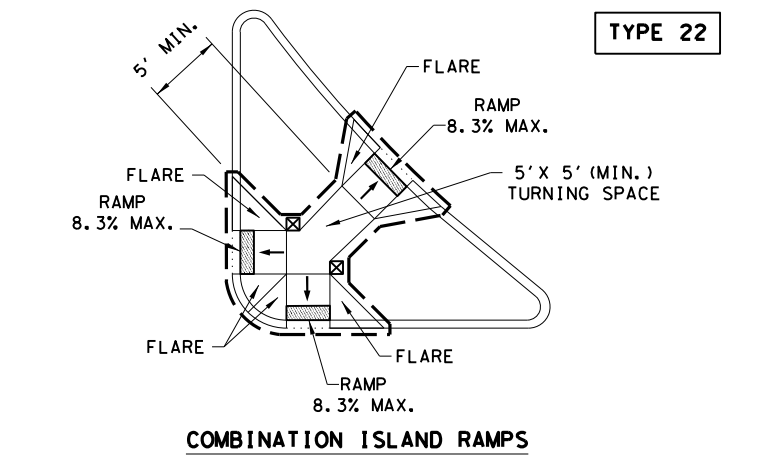
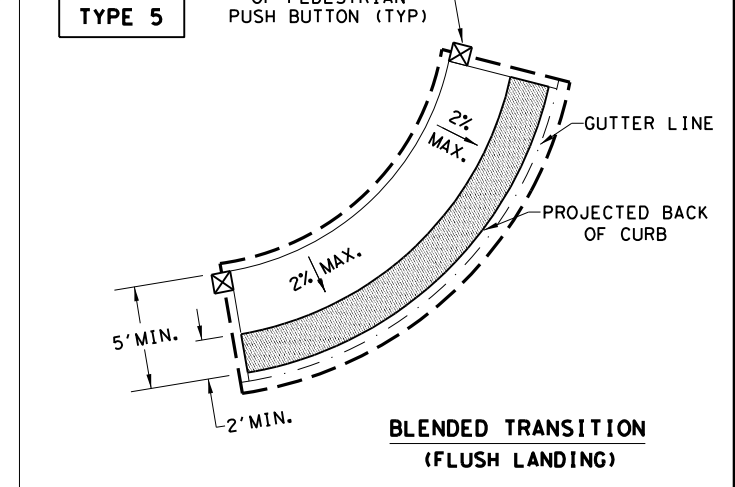
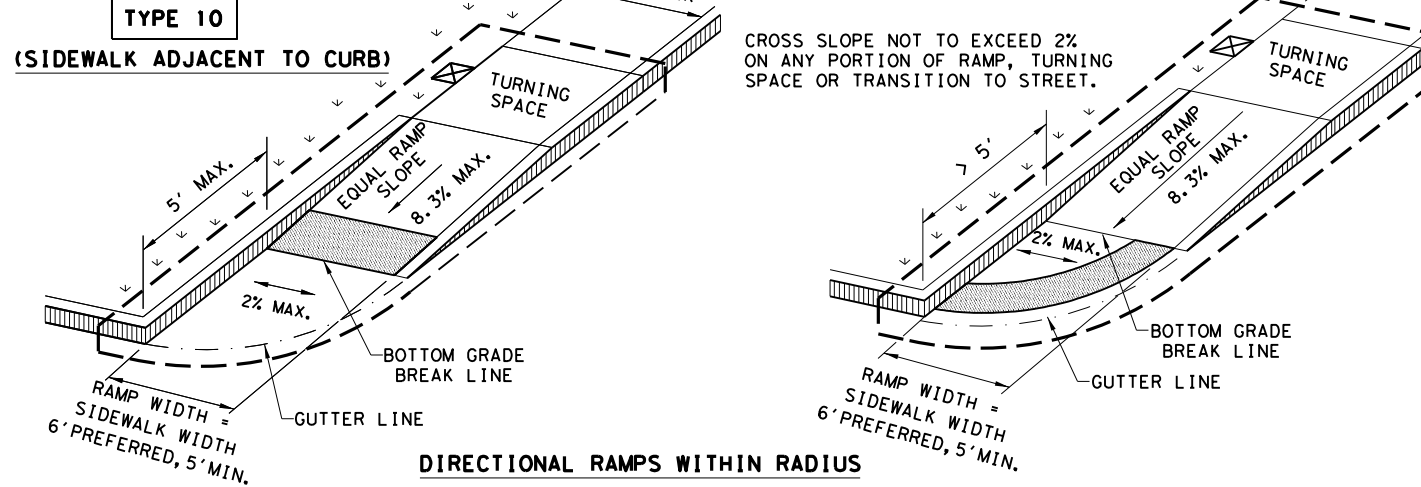
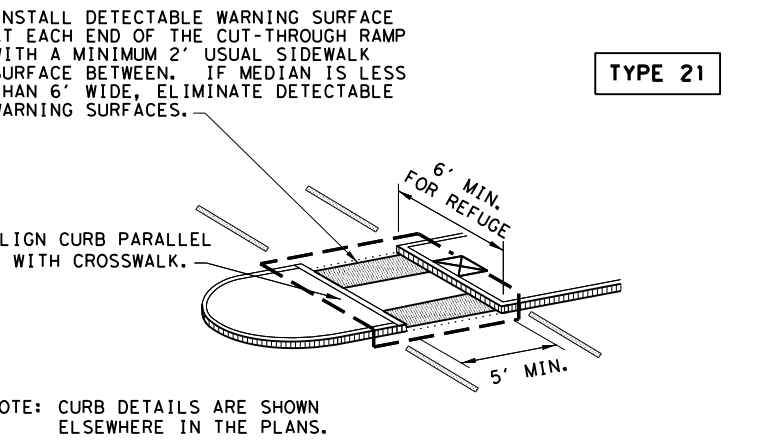
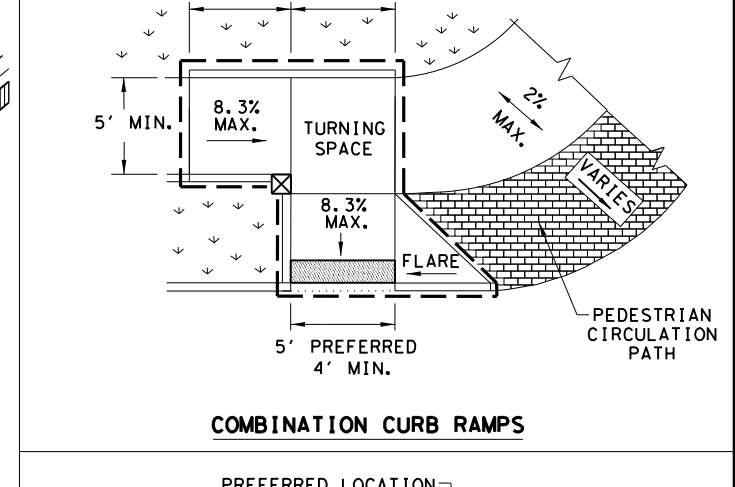
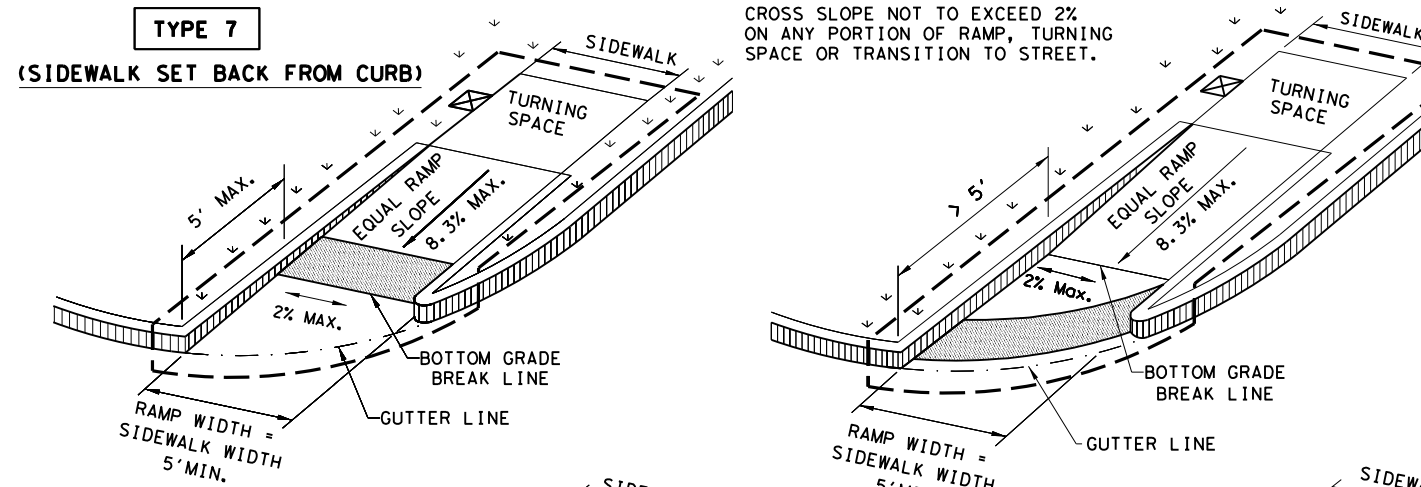
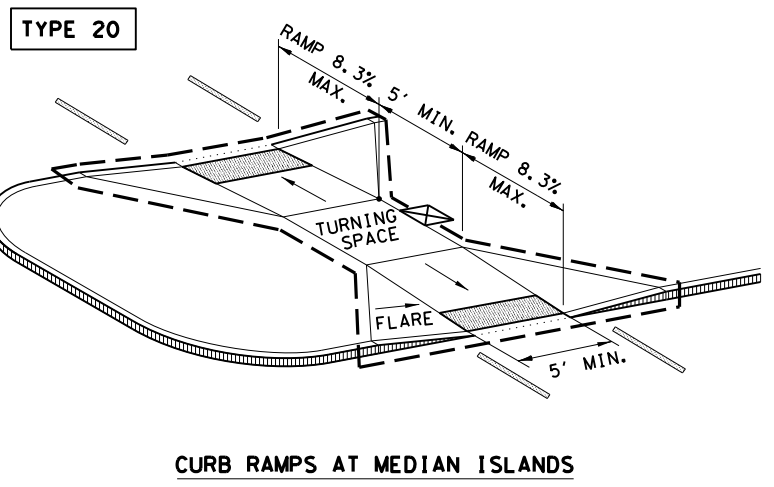
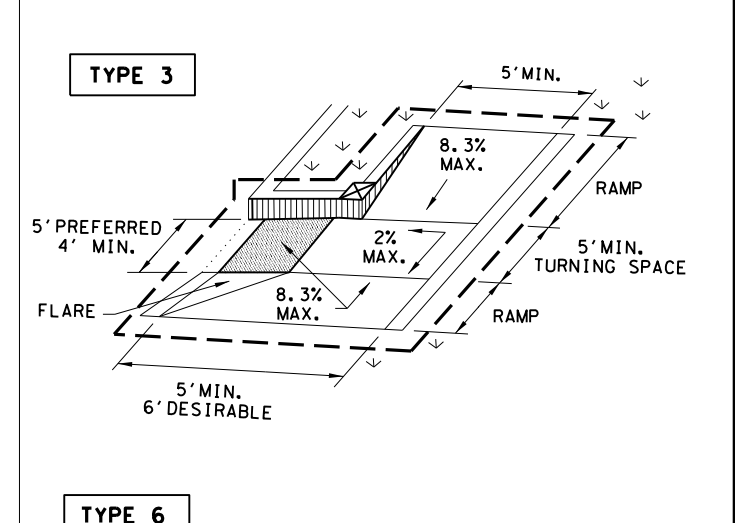
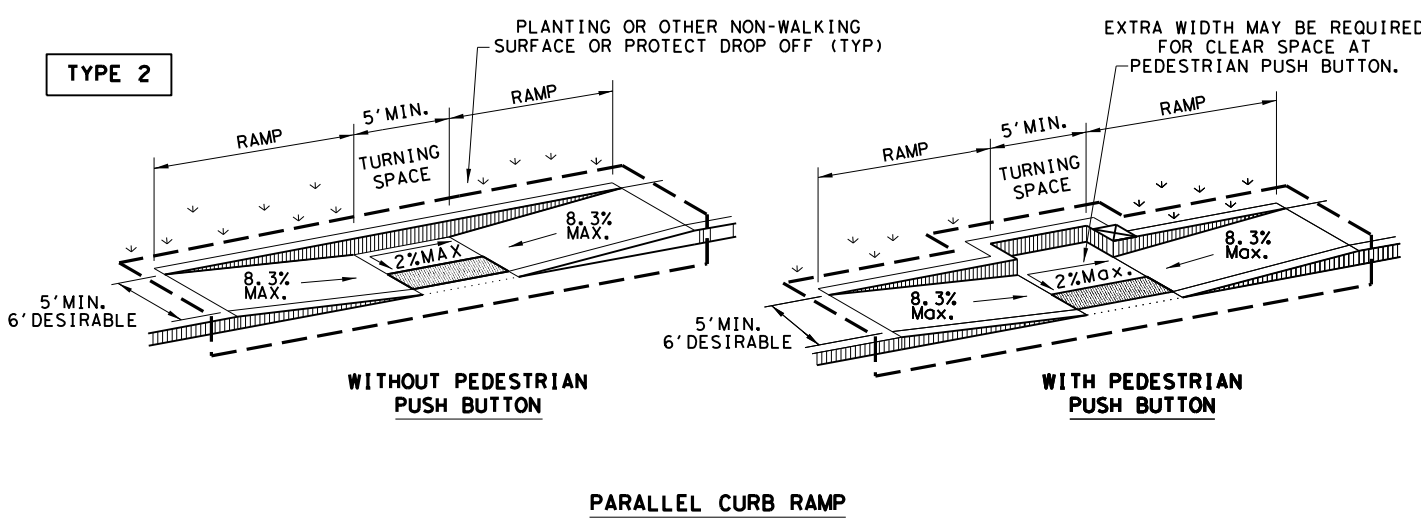
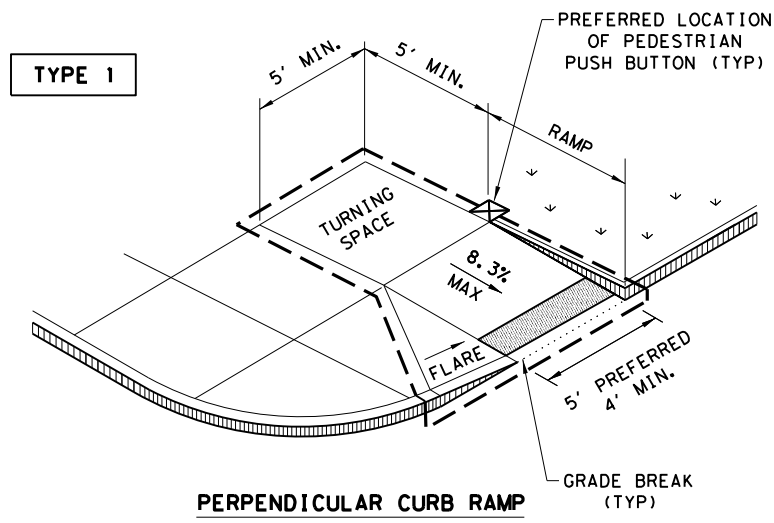
**CURB OPTION (3)**

		<b>Design Division Standard</b>	
<b>METAL BEAM GUARD FENCE (MOW STRIP)</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)MS-19</b>			
FILE: gf31ms19.dgn	DN:TxDOT	CK:KM	DW:VP
©TXDOT: NOVEMBER 2019	CONT	SECT	JOB
REVISIONS	0110	05	127
	DIST	COUNTY	SHEET NO.
	HOU	HARRIS	45

DATE:  
FILE:

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FILE:



**NOTES / LEGEND:**

SEE GENERAL NOTES ON SHEET 2 OF 4 FOR MORE INFORMATION.

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH.

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

DETECTABLE WARNING SURFACE

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

SHEET 1 OF 4

Texas Department of Transportation

Design Division Standard

**PEDESTRIAN FACILITIES CURB RAMPS**

**PED-18**

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	1H45
REVISED 08, 2005	DIST	COUNTY	SHEET NO.	
REVISED 06, 2012	HOU	HARRIS	46	
REVISED 01, 2018				

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DATE: FILE:

## GENERAL NOTES

### CURB RAMP

1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Cross slopes of 1.5% and lesser running should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
4. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5' x 5' passing areas at intervals not to exceed 200' are required.
5. Turning Spaces shall be 5' x 5' minimum. Cross slope shall be maximum 2%.
6. Clear space at the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the latest draft of the Proposed Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) as published by the U.S. Architectural and Transportation Barriers Compliance Board (Access Board).
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5' x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Provide curb ramps to connect the pedestrian access route at each pedestrian street crossing. Handrails are not required on curb ramps.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Furnish and install No. 3 reinforcing steel bars at 18" o.c. both ways, unless otherwise directed.
16. Provide a smooth transition where the curb ramps connect to the street.
17. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
18. Existing features that comply with applicable standards may remain in place unless otherwise shown on the plans.

### DETECTABLE WARNING MATERIAL

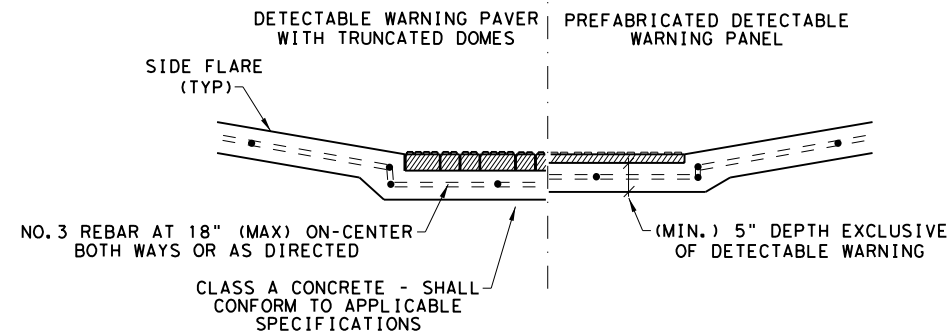
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
20. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
21. Detectable warning surfaces must be firm, stable and slip resistant.
22. Detectable warning surfaces shall be a minimum of 24 inches in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
23. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb and neither end of that edge is greater than 5 feet from the back of curb. Detectable warning surfaces may be curved along the corner radius.
24. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.

### DETECTABLE WARNING PAVERS (IF USED)

25. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
26. Lay full-size units first followed by closure units consisting of at least 25 percent (25%) of a full unit. Cut detectable warning paver units using a power saw.

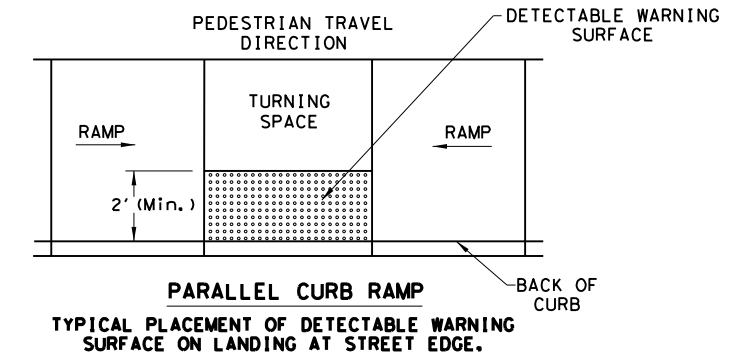
### SIDEWALKS

27. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within unobstructed reach range specified in PROWAG section R406.
28. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
29. Street grades and cross slopes shall be as shown elsewhere in the plans.
30. Changes in level greater than 1/4 inch are not permitted.
31. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than five percent (5%) must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with PROWAG R409.
32. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
33. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
34. Sidewalk details are shown elsewhere in the plans.

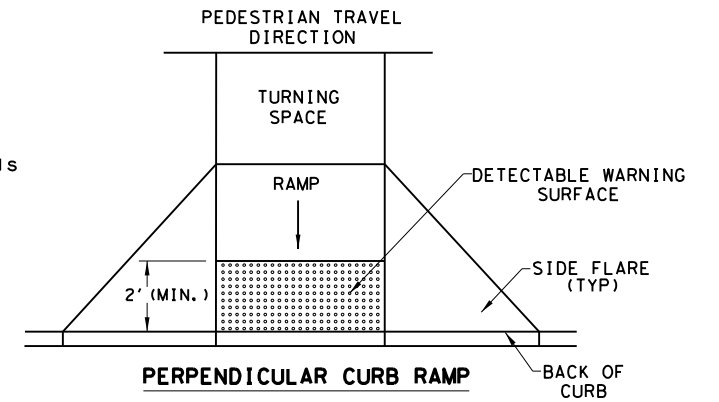


**SECTION VIEW DETAIL**  
**CURB RAMP AT DETECTIBLE WARNINGS**

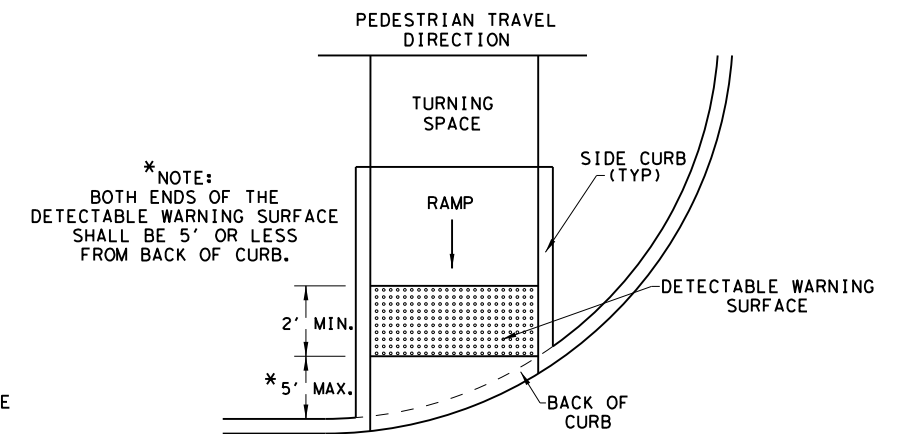
### DETECTABLE WARNING SURFACE DETAILS



**PARALLEL CURB RAMP**  
**TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON LANDING AT STREET EDGE.**



**PERPENDICULAR CURB RAMP**  
**TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.**



\* NOTE:  
 BOTH ENDS OF THE  
 DETECTABLE WARNING SURFACE  
 SHALL BE 5' OR LESS  
 FROM BACK OF CURB.

### DIRECTIONAL CURB RAMP

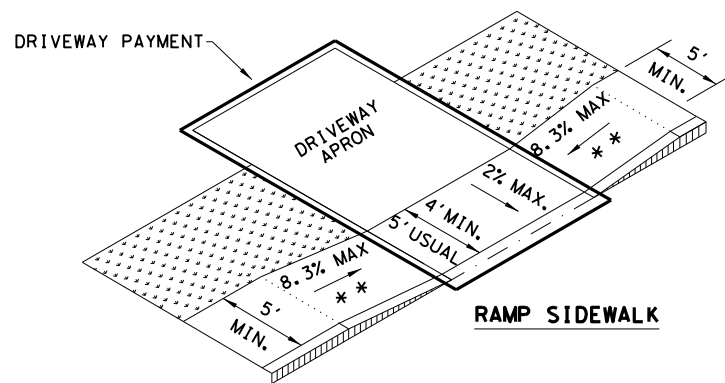
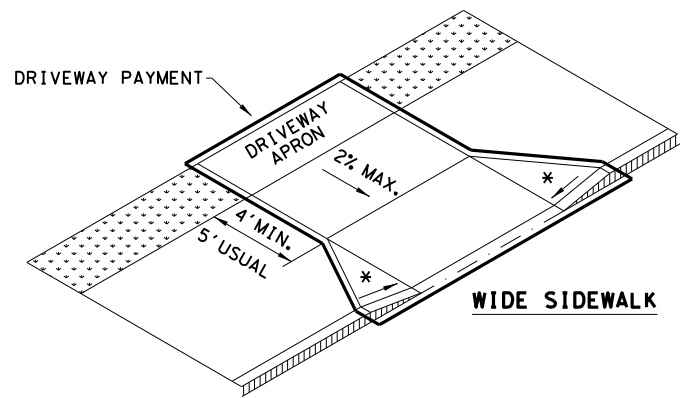
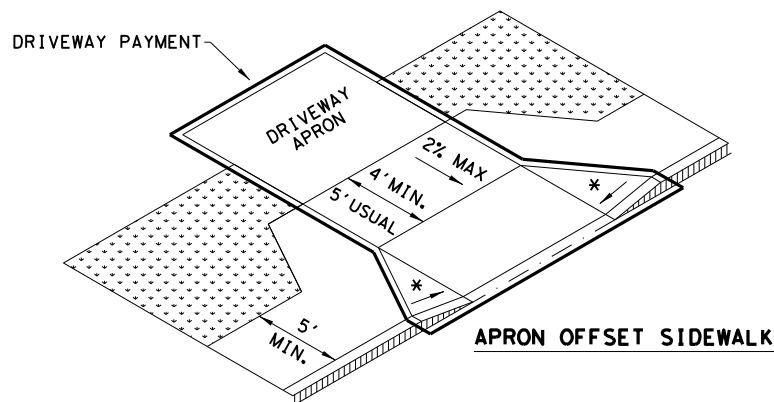
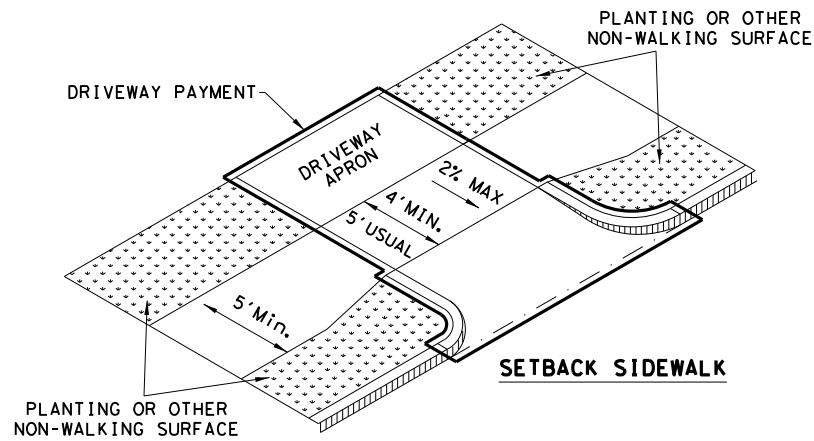
**TYPICAL PLACEMENT OF DETECTABLE WARNING SURFACE ON SLOPING RAMP RUN.**

SHEET 2 OF 4

Texas Department of Transportation		Design Division Standard	
PEDESTRIAN FACILITIES CURB RAMP			
PED-18			
FILE: ped18	DN: TxDOT	DW: VP	CK: KM
© TxDOT: MARCH, 2002	CONT	SECT	JOB
REVISIONS	0110	05	127
REVISED 08, 2005	DIST	COUNTY	SHEET NO.
REVISED 06, 2012	HOU	HARRIS	47
REVISED 01, 2018			

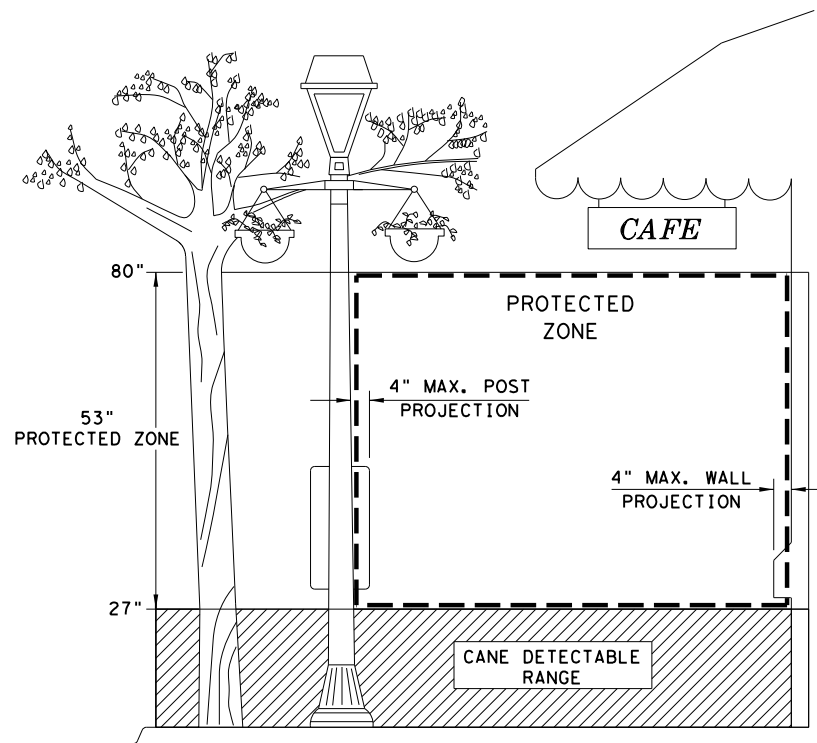
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**SIDEWALK TREATMENT AT DRIVEWAYS**

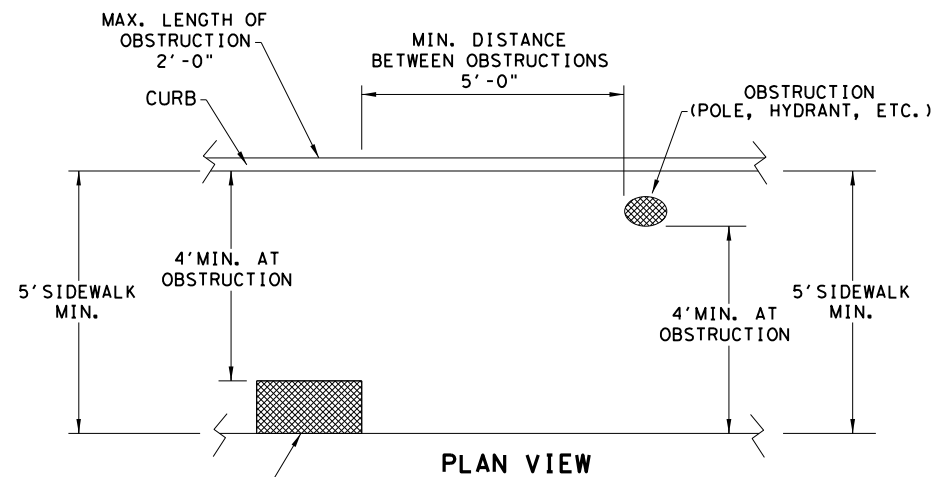
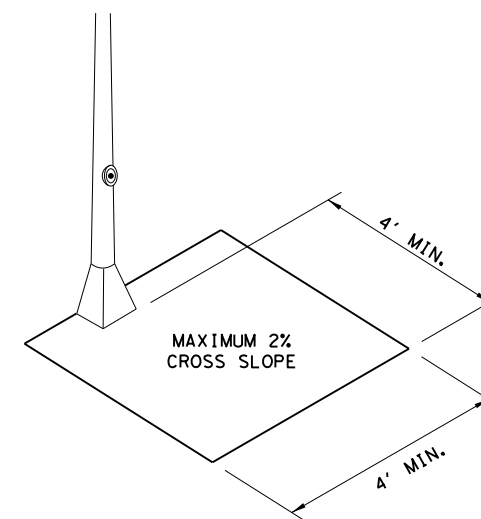


**NOTES:**

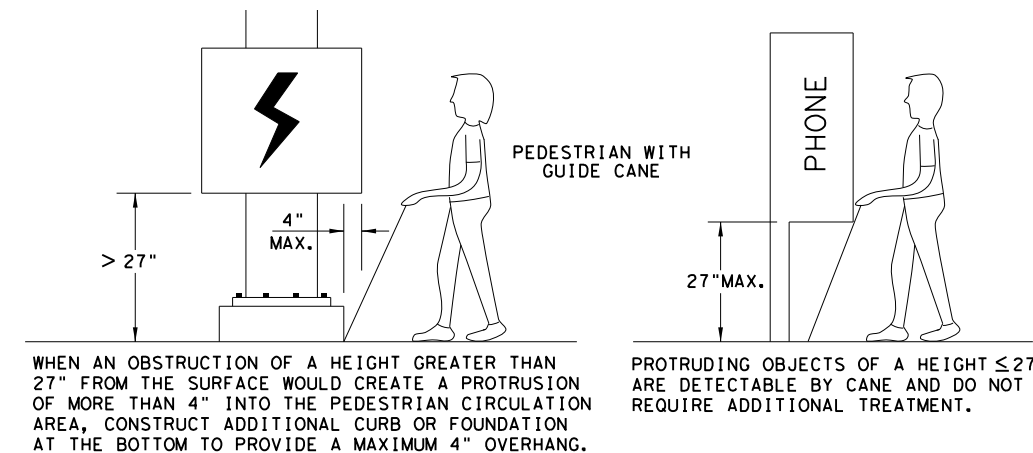
- \* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.
- \*\* IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.



NOTE: IN PEDESTRIAN CIRCULATION AREA, MAXIMUM 4" PROJECTION FOR POST OR WALL MOUNTED OBJECTS BETWEEN 27" AND 80" ABOVE THE SURFACE.



NOTE: ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' X 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.



SHEET 3 OF 4



**PEDESTRIAN FACILITIES CURB RAMPS**

**PED-18**

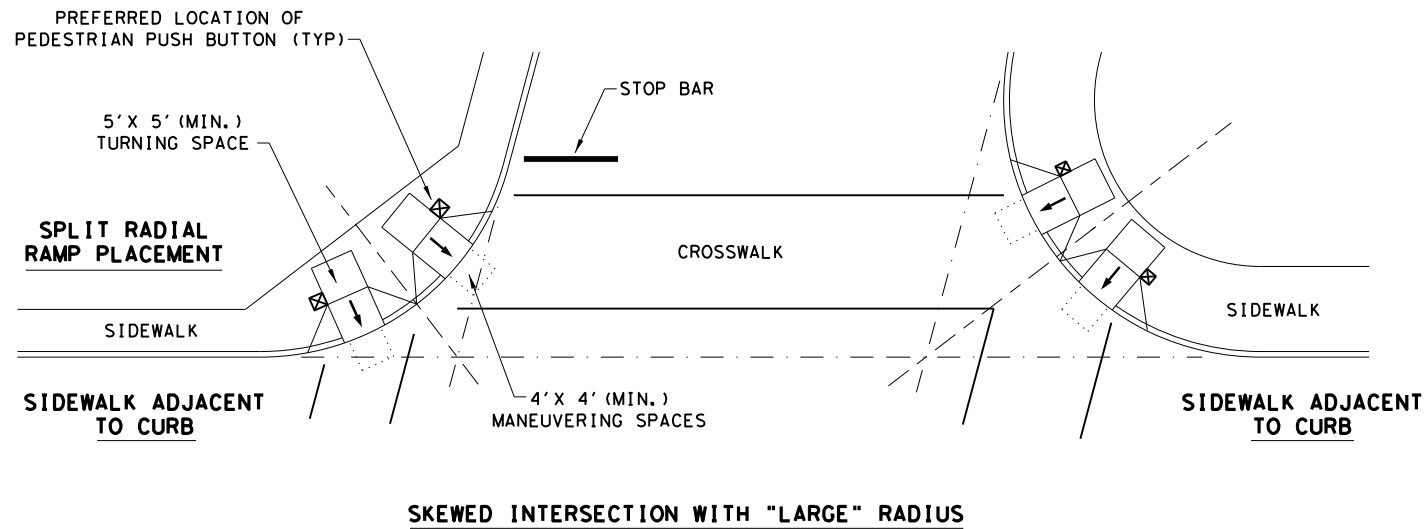
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© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
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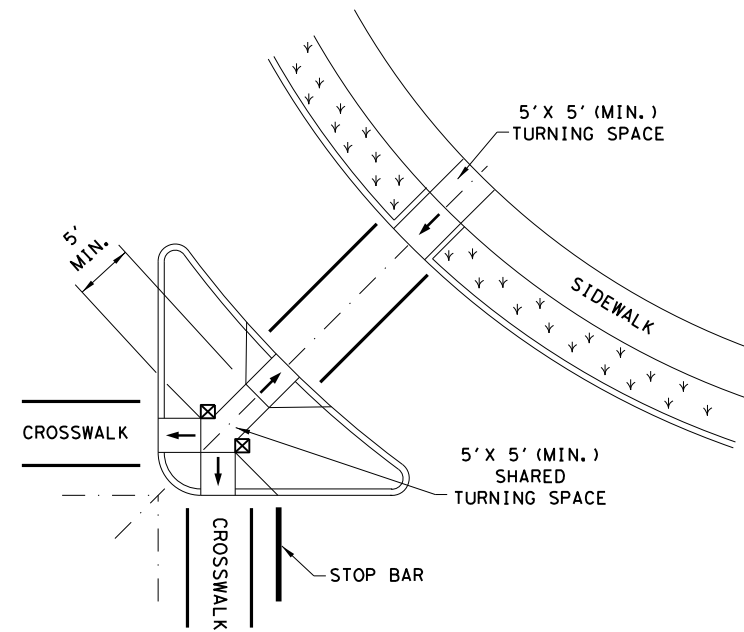


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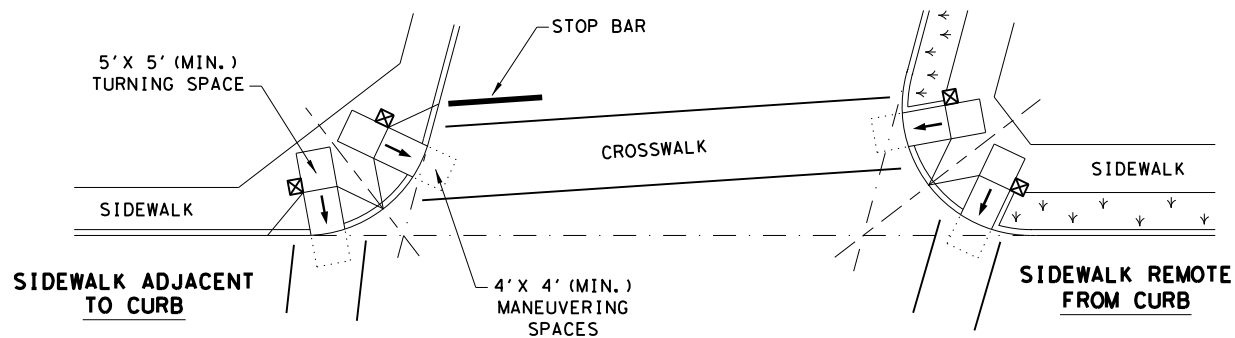
TYPICAL CROSSING LAYOUTS  
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



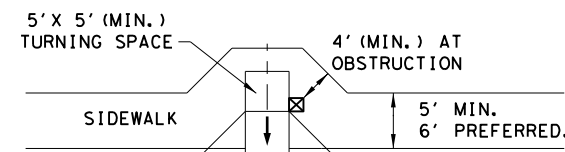
SKewed INTERSECTION WITH "LARGE" RADIUS



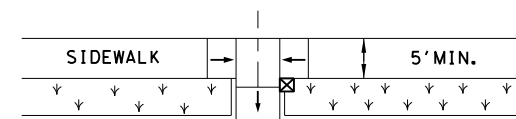
AT INTERSECTION  
W/FREE RIGHT TURN & ISLAND



SKewed INTERSECTION WITH "SMALL" RADIUS

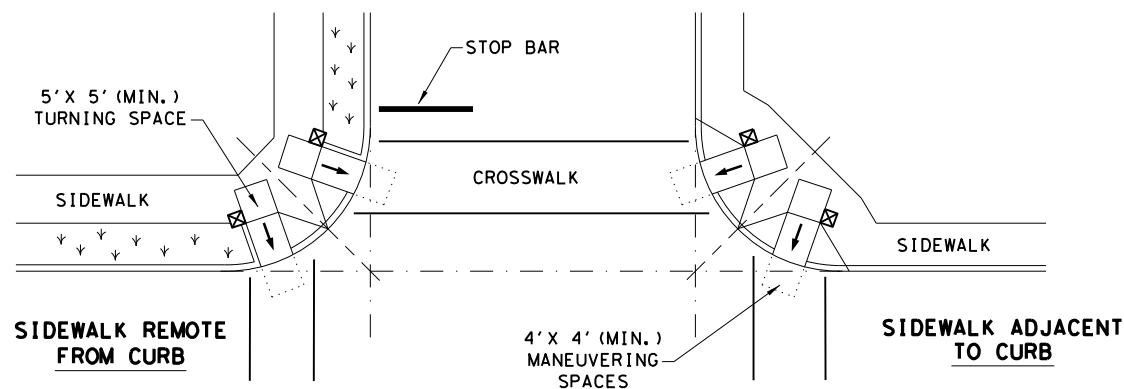


SIDEWALK ADJACENT TO CURB



SIDEWALK REMOTE FROM CURB

MID-BLOCK PLACEMENT PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

LEGEND:

SHOWS DOWNWARD SLOPE. →

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON (IF APPLICABLE). ☒

DENOTES PLANTING OR NON-WALKING SURFACE NOT PART OF PEDESTRIAN CIRCULATION PATH. ↙ ↘ ↙ ↘ ↙ ↘

SHEET 4 OF 4

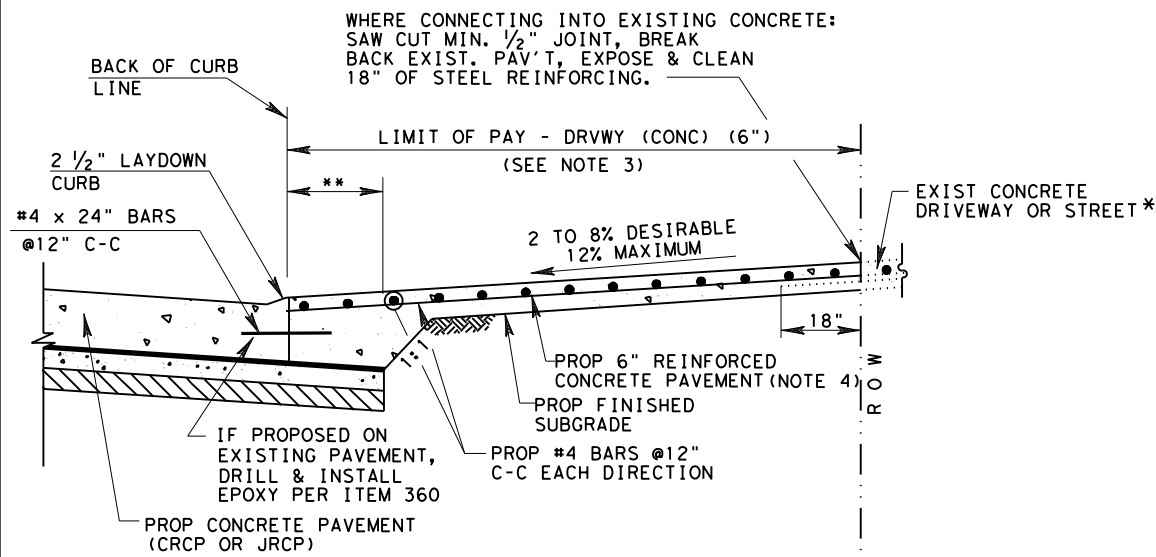


PEDESTRIAN FACILITIES  
CURB RAMPS

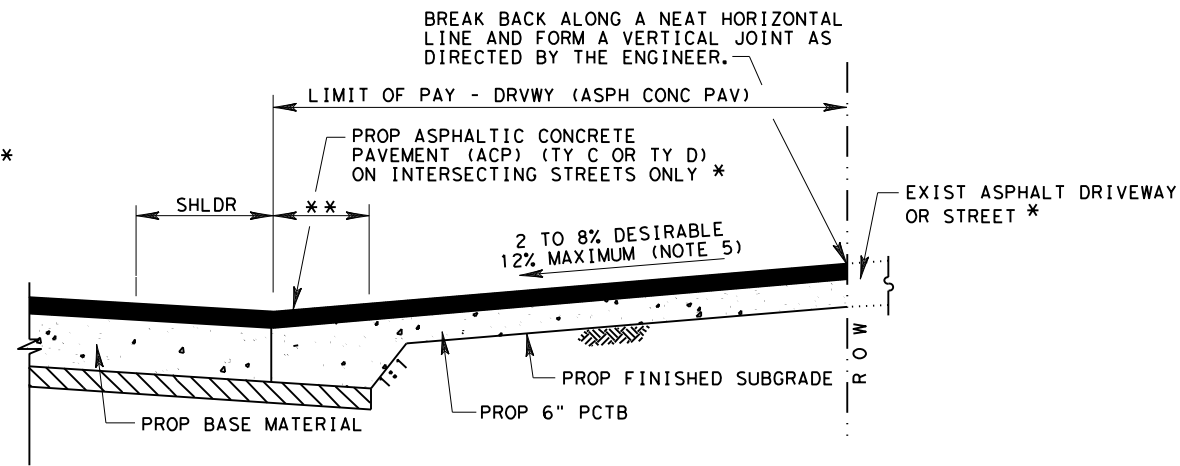
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	PK: JG
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
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REVISED 06, 2012	HOU	HARRIS	49	
REVISED 01, 2018				

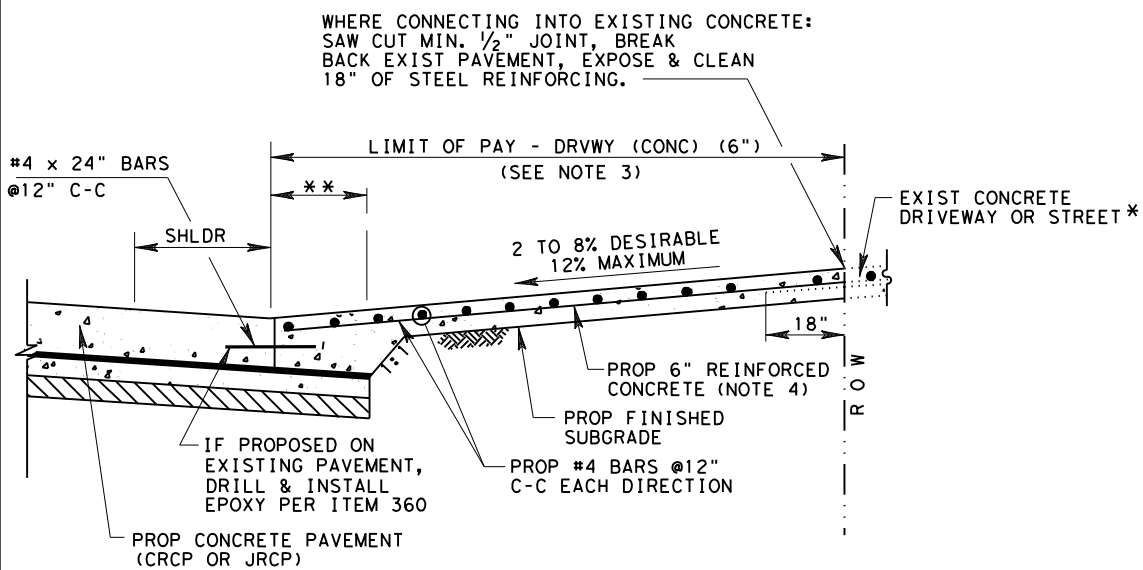
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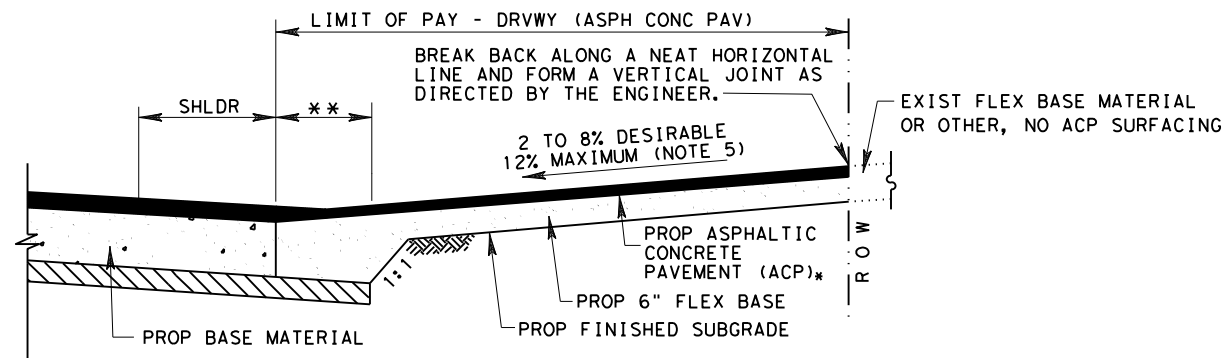
**PROPOSED DRIVEWAY DETAIL  
REINFORCED CONCRETE AT CONCRETE  
CURB AND GUTTER ROADWAY**



**PROPOSED DRIVEWAY DETAIL  
ASPHALT W/ PCTB AT ASPHALT ROADWAY**



**PROPOSED DRIVEWAY DETAIL  
REINFORCED CONCRETE AT CONCRETE ROADWAY**



**PROPOSED DRIVEWAY DETAIL  
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY**

**NOTES:**

1. ALSO SEE SHEET 2 OF 2 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. FAST TRACK CONCRETE IS PAID AS DRVWY (CONC) (FAST TRACK).
4. THICKNESS OF DRIVEWAY IS 6 INCHES FOR REGULAR AND FAST TRACK CONCRETE.
5. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

**LEGEND:**

- PCTB- PORTLAND CEMENT TREATED BASE
- JRCP- JOINTED REINFORCED CONCRETE PAVEMENT
- CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- ACP- ASPHALTIC CONCRETE PAVEMENT

\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

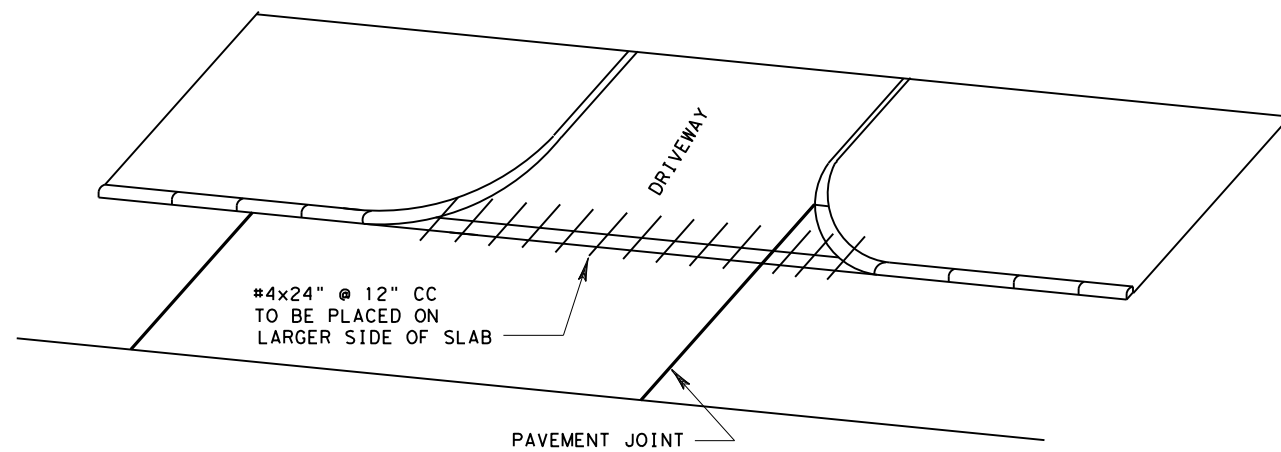
\*\* PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



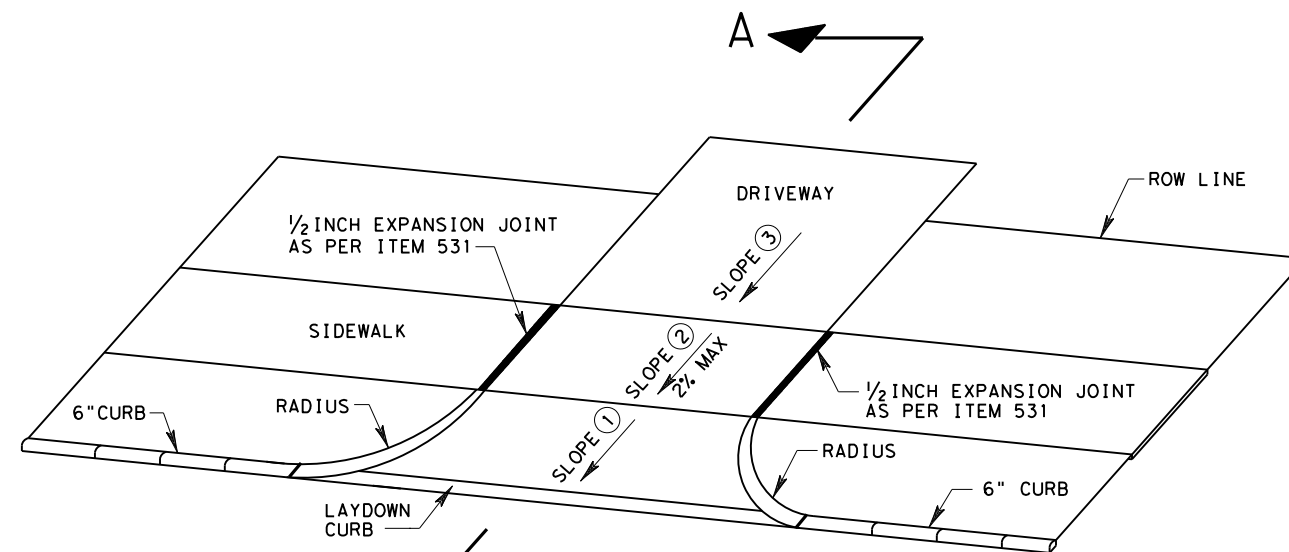
**DRIVEWAY DETAILS**

DD

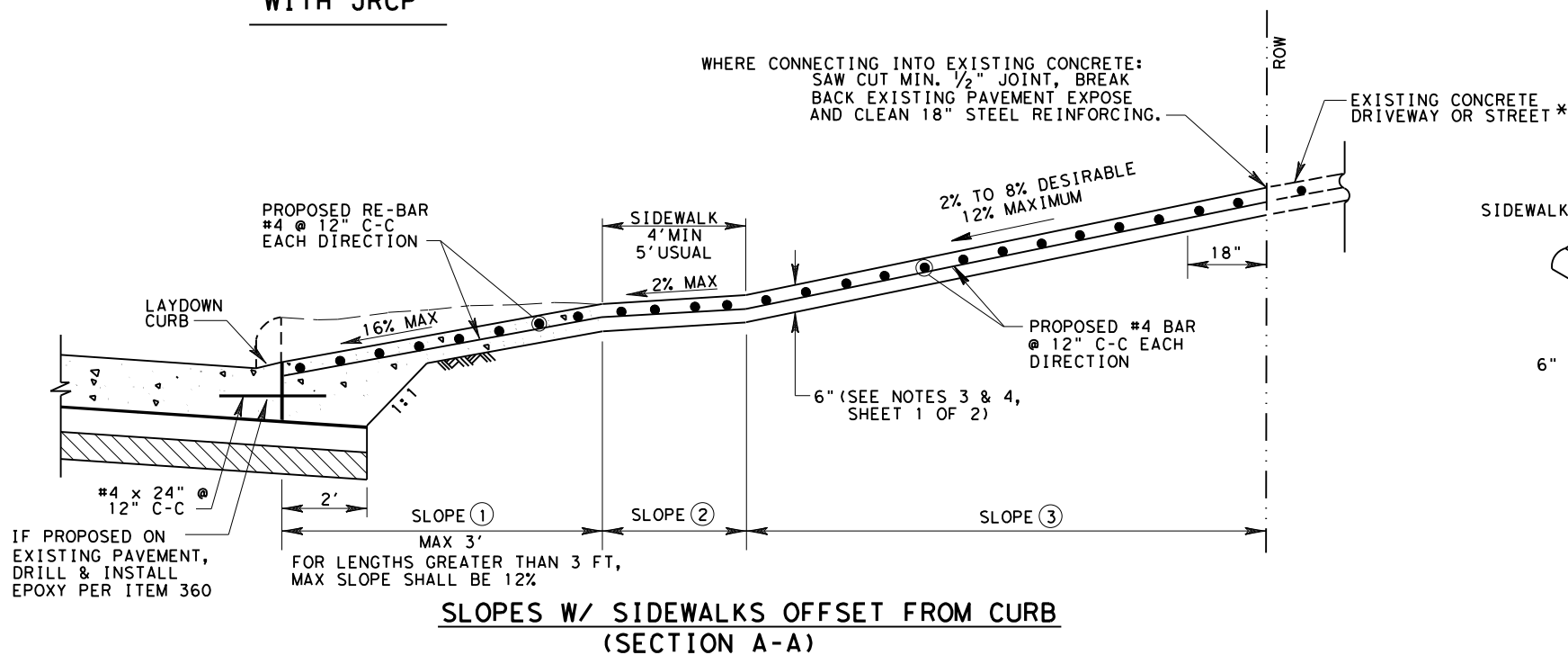
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3/17 MODIFIED PAVEMENT SLOPES	HARRIS	0110	05	127
				HWY
				IH45



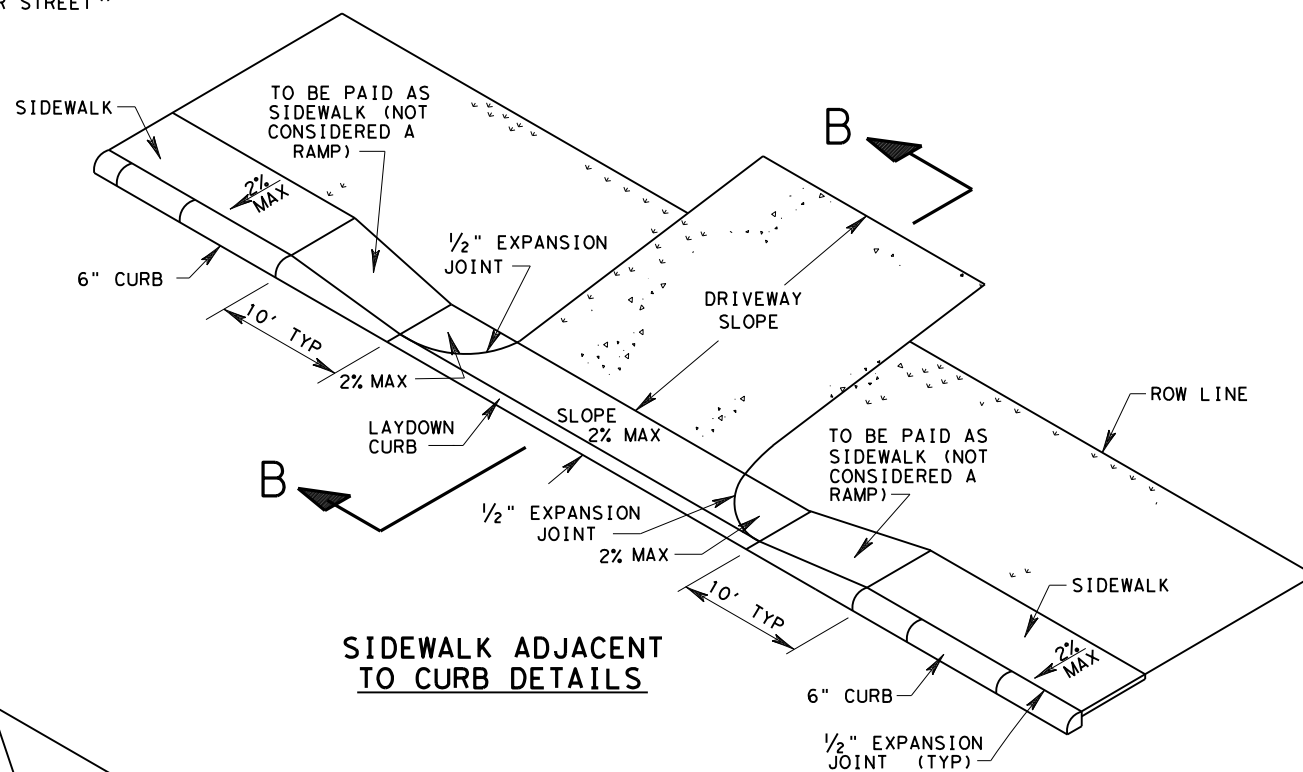
**TIE BAR PLACEMENT WITH JRCP**



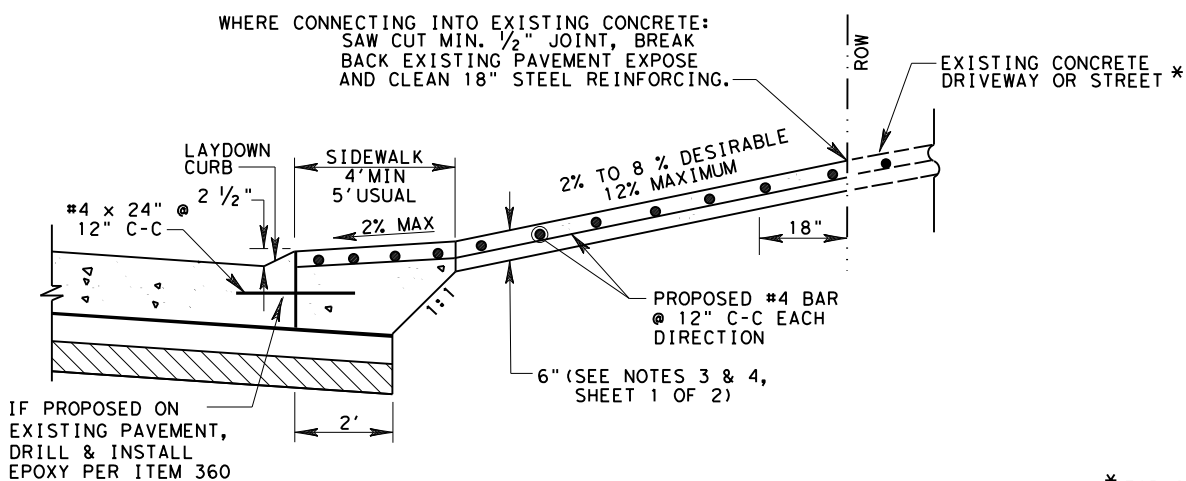
**SIDEWALK OFFSET FROM CURB DETAILS**



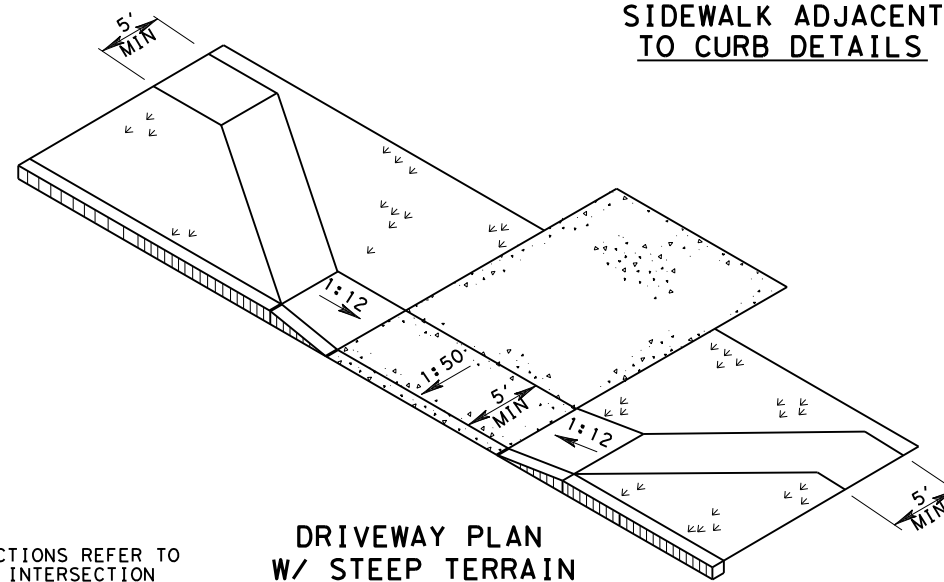
**SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)**



**SIDEWALK ADJACENT TO CURB DETAILS**



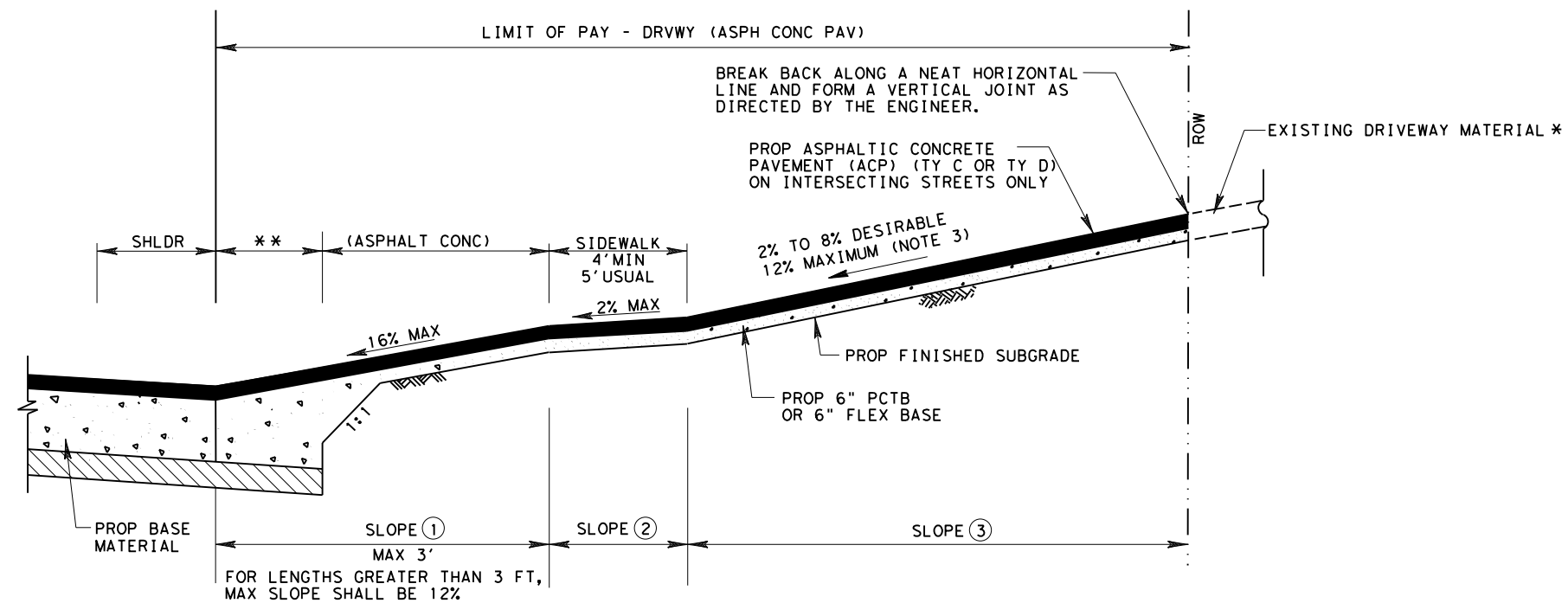
**DRIVEWAY SLOPES W/ SIDEWALKS ADJACENT TO CURB (SECTION B-B)**



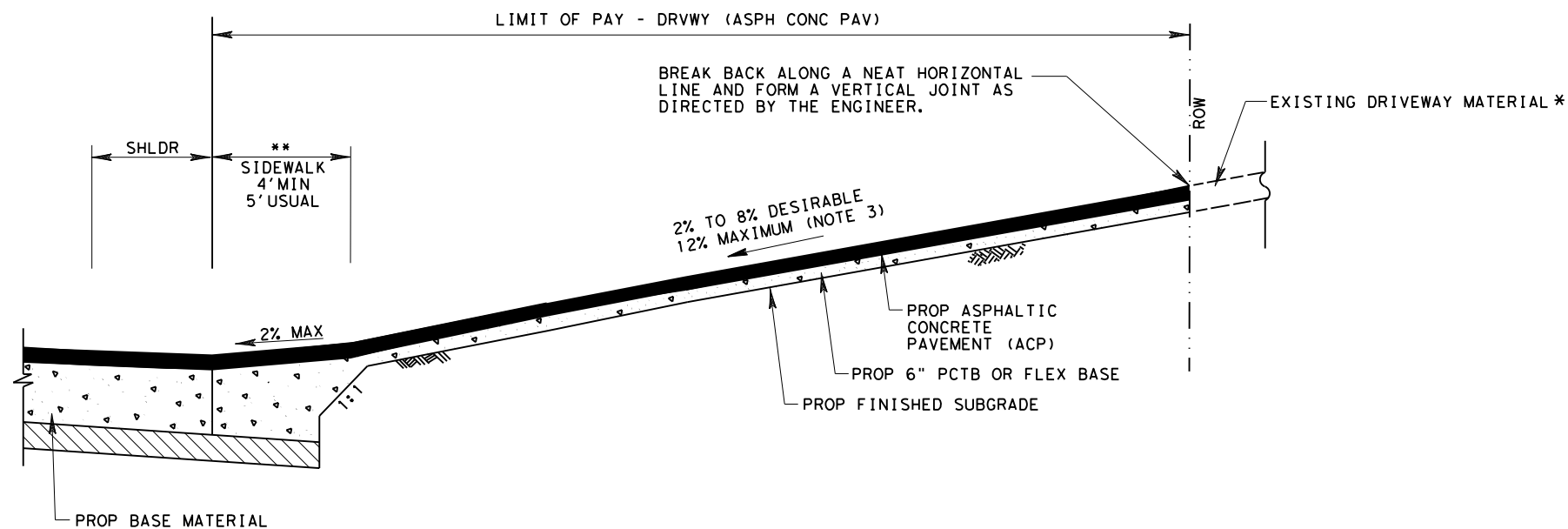
**DRIVEWAY PLAN W/ STEEP TERRAIN**

\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS FOR REINFORCING STEEL AND SECTION REQUIREMENTS.

<b>DRIVEWAY DETAILS</b>									
<b>DD</b>									
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© TXDOT SEPT. 2004	HOU	6						51	
REVISIONS									
9/09 ADDED NOTE FOR ITEM 360.	COUNTY	CONTROL	SECT	JOB	HIGHWAY				
11/15 ADDED NOTE FOR PCTB	HARRIS	0110	05	127	IH45				



PROPOSED DRIVEWAY SLOPES  
WITH SIDEWALKS OFFSET



PROPOSED DRIVEWAY SLOPES  
WITH SIDEWALKS ADJACENT

NOTES:

1. ALSO SEE SHEET 2 OF 3 FOR DRIVEWAY SLOPES WITH PROPOSED SIDEWALKS.
2. FOR INTERSECTIONS BUILT WITH CRCP PAVEMENT SEE CRCP DETAIL.
3. MAXIMUM SLOPE IS: 12% RESIDENTIAL 8% OTHERS

LEGEND:

- PCTB- PORTLAND CEMENT TREATED BASE
- ACP- ASPHALTIC CONCRETE PAVEMENT

\* FOR STREET INTERSECTIONS REFER TO PAVING DETAILS AND INTERSECTION DETAILS.

\*\* PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE

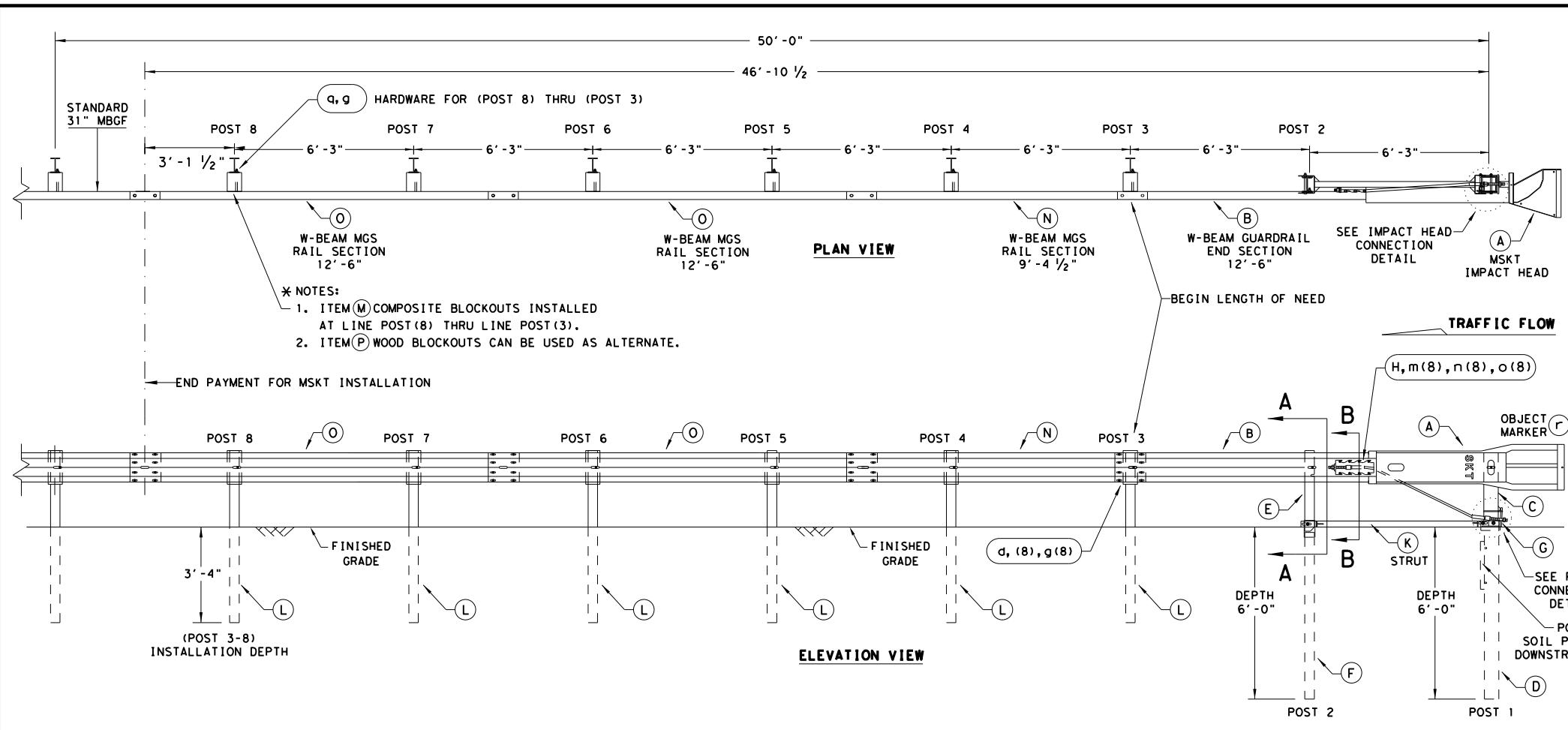


DRIVEWAY DETAILS

DD

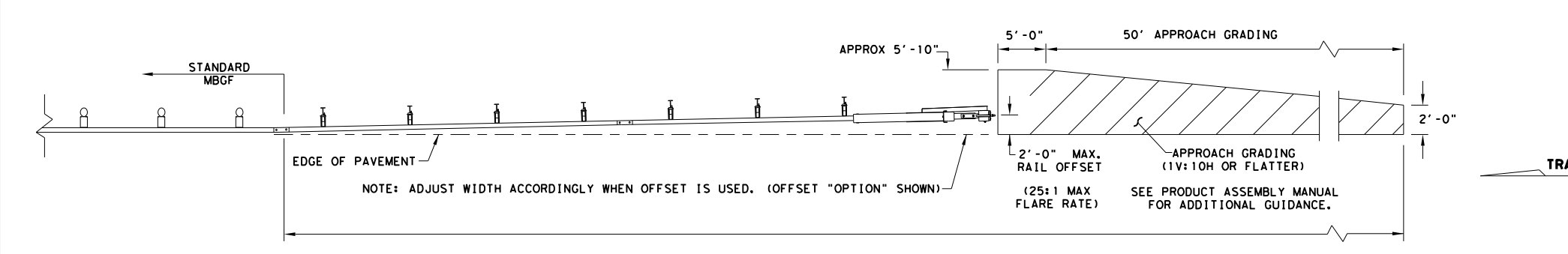
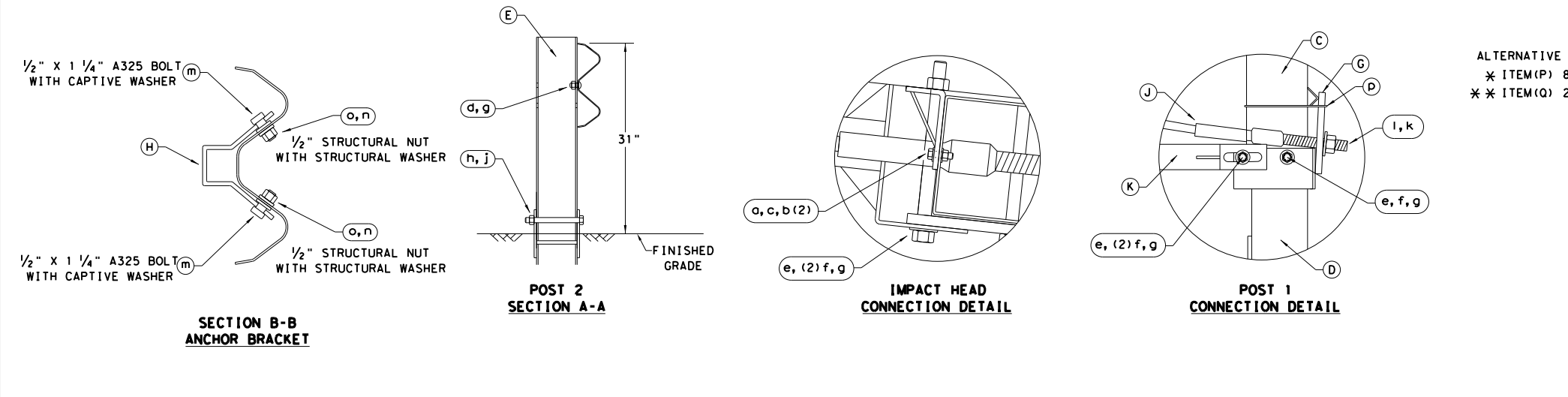
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11/15 ADDED NOTE FOR PCTB	COUNTY	CONTROL	SECT	JOB
3/17 MODIFIED PAVEMENT SLOPES	HARRIS	0110	05	127
				1H45

DISCLAIMER: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TxDOT FOR ANY PURPOSE WHATSOEVER. THE USE OF THIS STANDARD FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE. TxDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.



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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6X9 OR W6X8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
SMALL HARDWARE			
a	2	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/8" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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

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

**Design Division Standard**

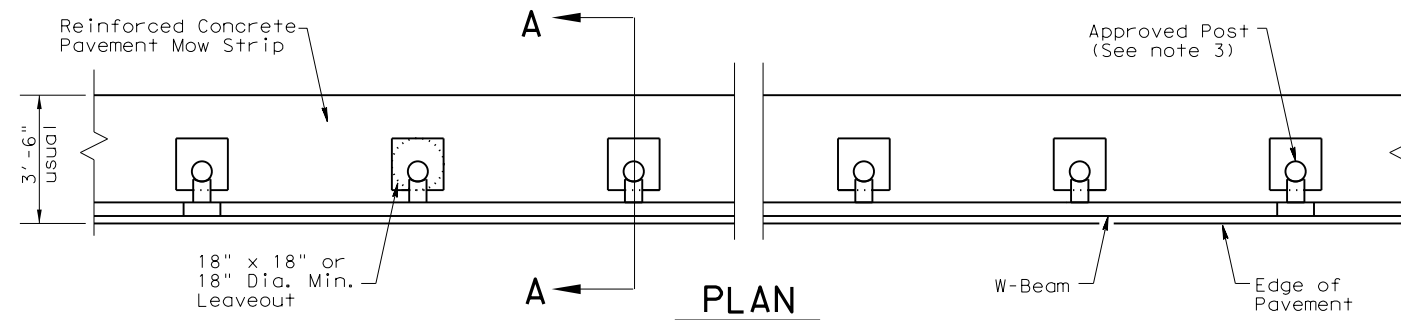
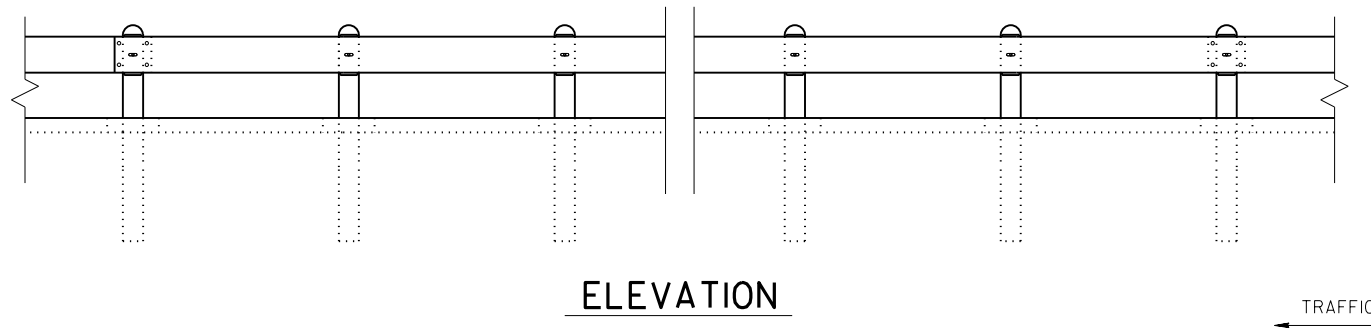
## SINGLE GUARDRAIL TERMINAL

### MSKT-MASH-TL-3

### SGT (12S) 31-18

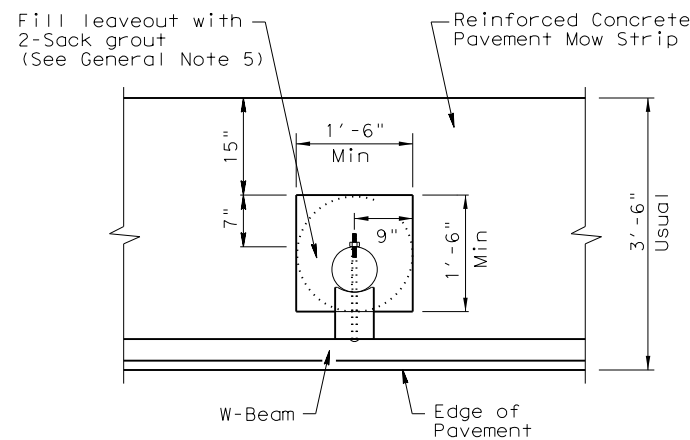
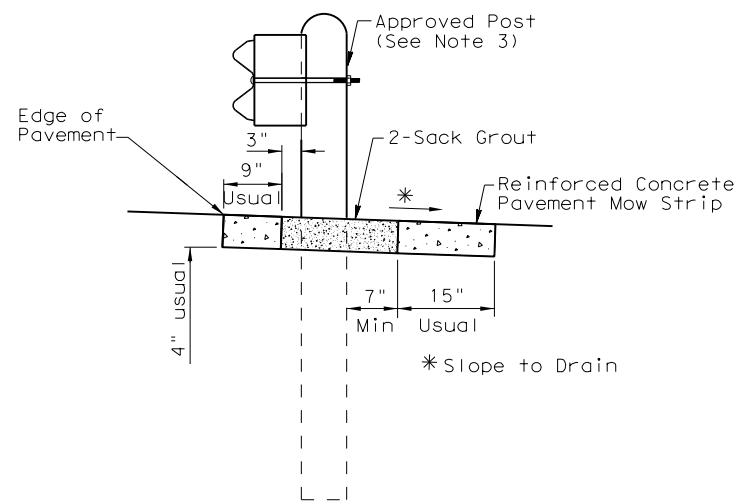
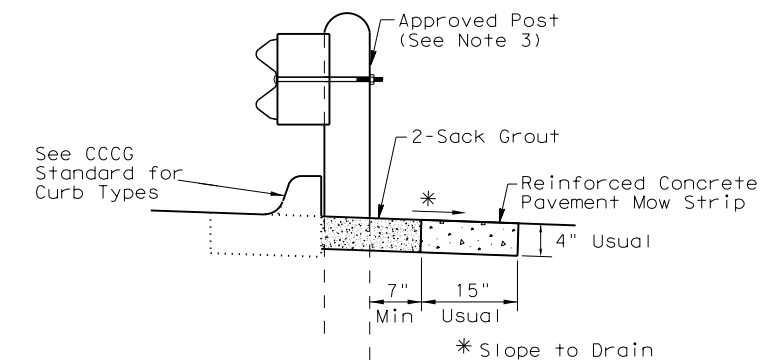
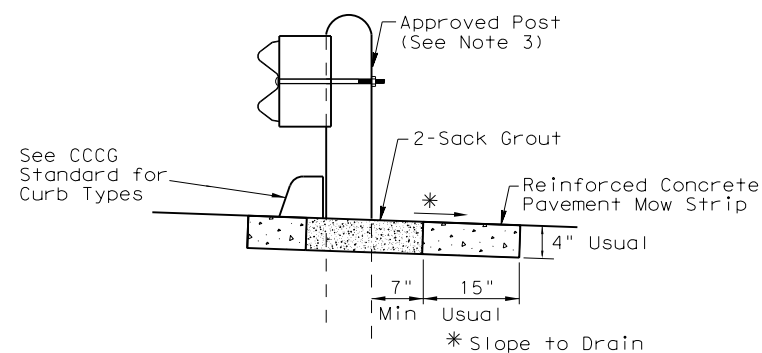
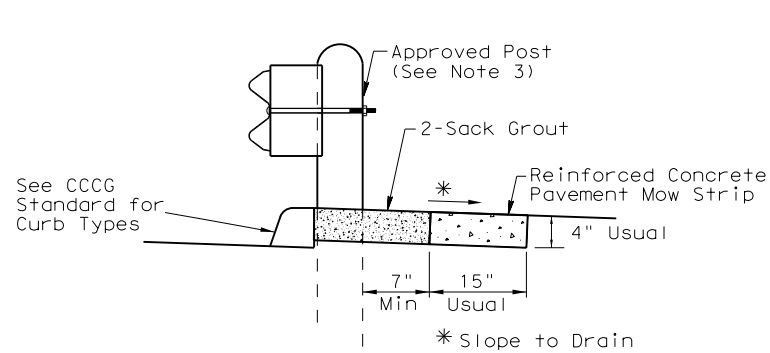
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REVISIONS	0110	05	127	IH45
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		53

DATE:  
FILE:



**GENERAL NOTES**

1. Place concrete riprap mow strips at all Metal Beam Guard Fence locations, and in accordance with Item 432, "Riprap". Use Class B Concrete, reinforced with No. 3 bars spaced at 18 in. centers each direction and 2 in. below the surface.
2. Provide a minimum of 7 in. leave out behind the post. Do not place concrete in the leave out.
3. The type of approved post is shown elsewhere on the plans. See the applicable standard sheets for additional details and information.
4. Other curb placement options may be used. Curbs are not considered part of the mow strip and are paid for under other pertinent bid items.
5. Fill the leave outs with no more than a 2-sack grout mixture and place in accordance with Section 421.2.7, "Mortar and Grout." Payment for furnishing and placing the grout mixture is subsidiary to the Item 432, "RIPRAP."
6. Place the mow strip the entire length of the guard fence plus any Terminal Anchor Section (TAS) or Single Guardrail Terminal (SGT) to 2 ft. beyond the face of the object marker at the end of the SGT. Do not allow concrete to adhere to the ground line strut shown on the SGT standard sheet.



**MOW STRIP DETAIL**

Reinforced Concrete Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

**MOW STRIP**

**MS**

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© TxDOT 2014	DIST	FED REG	PROJECT NO.	
REVISIONS	HOU	6	SHEET	
03/15 2014 SPECS	COUNTY	CONTROL	SECT	JOB
	HARRIS	0110	05	127
				IH45

STDE5.DGN

1. DEFINITION OF TERMS

T<sub>FS</sub> - FAST TRACK CONCRETE PAVING DEPTH AT INTERSECTIONS AND LEAVE OUTS.  
 T - NOMINAL CONCRETE PAVING DEPTH AS SHOWN IN THE PLANS.  
 DETERMINE FAST TRACK CONCRETE PAVING DEPTH USING TABLE 1 AND THE NOMINAL CONCRETE PAVING DEPTH "T" SHOWN IN THE PLANS.

2. AT INTERSECTIONS AND LEAVE-OUT LOCATIONS USE THE SAME LONGITUDINAL AND TRANSVERSE BAR SPACING FOR THE FAST TRACK PAVING AREA AS THAT USED FOR THE ADJACENT CONCRETE PAVING DEPTH "T" (EXCEPT BAR SIZE SHALL BE #7 ON SINGLE MAT). FOR SINGLE MAT FAST TRACK PAVING, PLACE THE LONGITUDINAL AND TRANSVERSE BARS FOR THE FAST TRACK PAVING AREA AT THE HORIZONTAL PLANE ELEVATION THAT IS TWO TIE-BAR DIAMETERS LOWER THAN THAT USED FOR THE ADJACENT CONCRETE PAVING DEPTH "T", AS SHOWN IN FIGURE 1. USE SINGLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH SINGLE MAT REINFORCING. USE DOUBLE MAT STEEL IN FAST TRACK PAVING AREAS ADJACENT TO PAVEMENT SLABS WITH DOUBLE MAT REINFORCING.

3. THE REQUIRED FAST TRACK PAVING AREAS WILL BE SHOWN ON THE PLANS. THE CONTRACTOR HAS THE OPTION TO UTILIZE FAST TRACK CONCRETE PAVING AT U-TURNS, AT INTERSECTIONS, AT MINOR STREETS, AND AT DRIVEWAYS WITH FRONTAGE ROAD LEAVE-OUT AREAS THAT ARE NOT SHOWN ON THE PLANS, WITH PRIOR WRITTEN APPROVAL FROM THE ENGINEER. TYPICAL PAVING PLANS FOR THE INTERSECTION OF A MAJOR STREET WITH THE FRONTAGE ROAD ARE SHOWN AS FIGURE 2, AND FOR THE INTERSECTION OF A MINOR STREET OR DRIVEWAY WITH THE FRONTAGE ROAD AS FIGURE 3. FAST TRACK PAVE THE FRONTAGE ROAD FOR THE FULL FRONTAGE ROAD WIDTH AND PLACE IN STAGES AS REQUIRED.

4. USE ADDITIONAL #6 REINFORCING STEEL BARS (MINIMUM 42 INCHES LONG) AND SPACE THEM MIDWAY BETWEEN ALTERNATE LONGITUDINAL BARS ALONG THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE FAST TRACK PAVING INTERFACE (T<sub>FS</sub>) WITH THE ADJACENT PAVEMENT SLAB (T).

5. SPLICE LENGTH IS A MINIMUM OF 33 TIMES THE NOMINAL STEEL DIAMETER.

6. PLACE THE CONCRETE AT A UNIFORM DEPTH THROUGHOUT THE FAST TRACK CONCRETE PAVING AREA.

7. FOR CONTINUOUS SECTIONS OF ROADWAY WHERE FAST TRACK PAVING IS THE PRIMARY PAVEMENT TYPE, USE THE BAR SIZE AND SPACING FROM THE CRCP STANDARDS THAT CORRESPONDS TO THE FAST TRACK SLAB THICKNESS.

8. USE LONGITUDINAL TIE-BARS OF THE SAME SIZE DIAMETER AND SPACING AS THE LONGITUDINAL BAR. A SINGLE PIECE TIE-BAR MAY BE USED IF THE 33 TIMES DIAMETER TIE-BAR PROJECTION DOES NOT INTERFERE WITH THE SAFE HANDLING OF TRAFFIC.

9. BASE THE DEPTH OF SAW CUTS FOR SAWED JOINTS ON THE FAST TRACK CONCRETE PAVEMENT THICKNESS.

10. THIS STANDARD IS NOT INTENDED TO REPLACE OTHER STANDARDS EXCEPT WHERE SPECIFICALLY STATED HEREIN. FOR PAVING DETAILS NOT SHOWN ON THIS DRAWING, REFER TO THE STANDARD SHEETS FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENT SHOWN ELSEWHERE IN THE PLANS.

TABLE 1

EQUIVALENT PAVEMENT THICKNESS	
T * (IN.)	T <sub>FS</sub> ** (IN.)
<=12"	T+3"
>12"	15"

\* WITH BASE STRUCTURE OF:  
 1" ASPHALT STABILIZED BASE  
 6" PORTLAND CEMENT TREATED BASE  
 6" LIME TREATED SUBGRADE

\*\* ON AS CUT SUBGRADE

\*\*\* SEE JOINT SEALING DETAILS ON CRCP STANDARDS

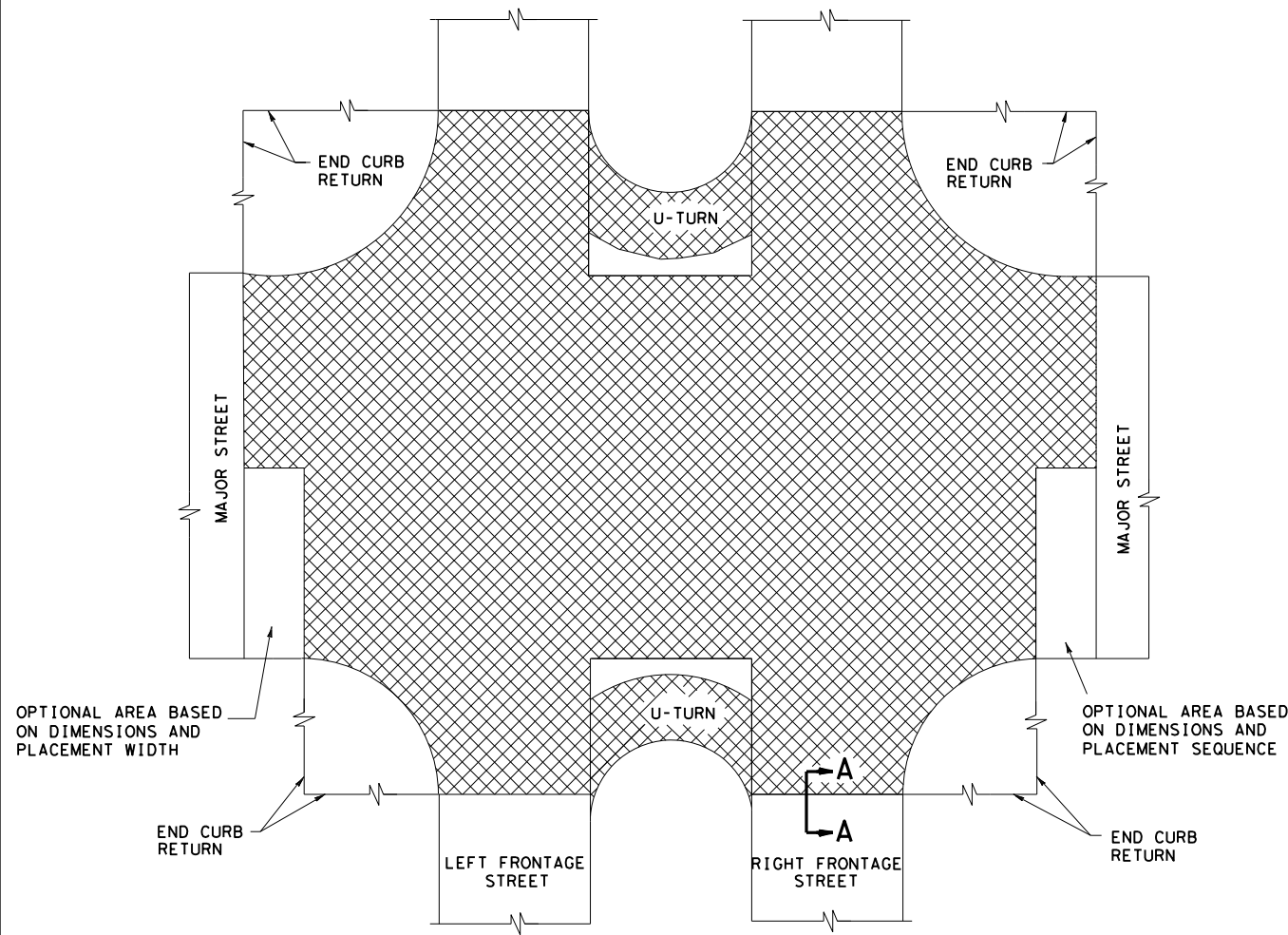


FIGURE 2

INTERSECTION OF MAJOR STREET WITH FRONTAGE STREET

FAST TRACK PAVING AREA

TYPICAL PAVING PLANS

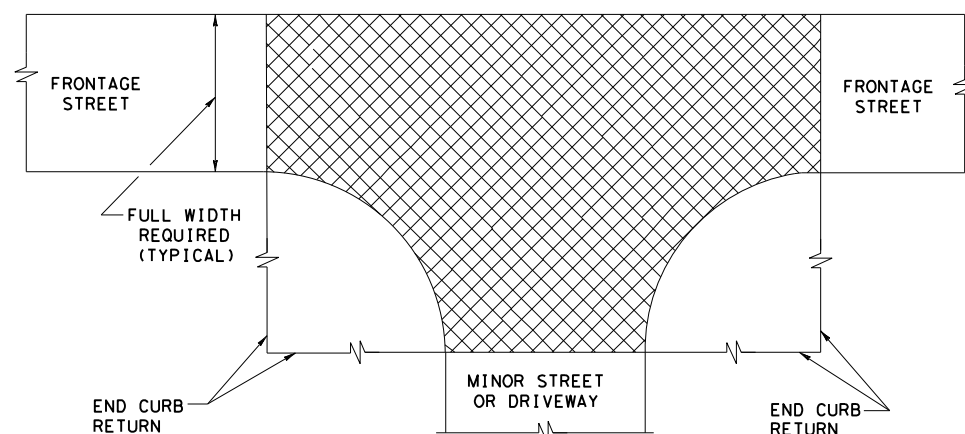
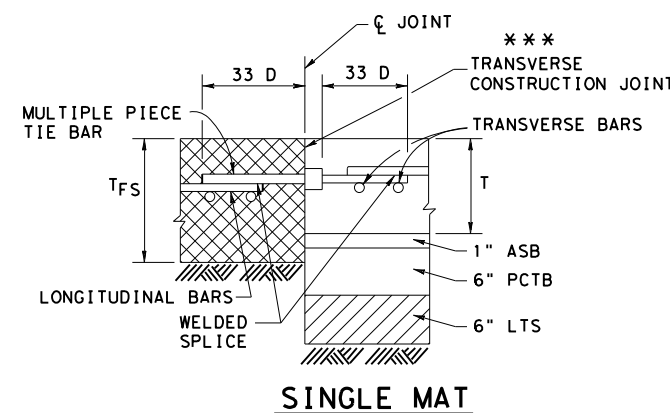


FIGURE 3

INTERSECTION OF MINOR STREET OR DRIVEWAY WITH FRONTAGE STREET



SECTION A - A

TRANSVERSE CONSTRUCTION JOINTS

FIGURE 1

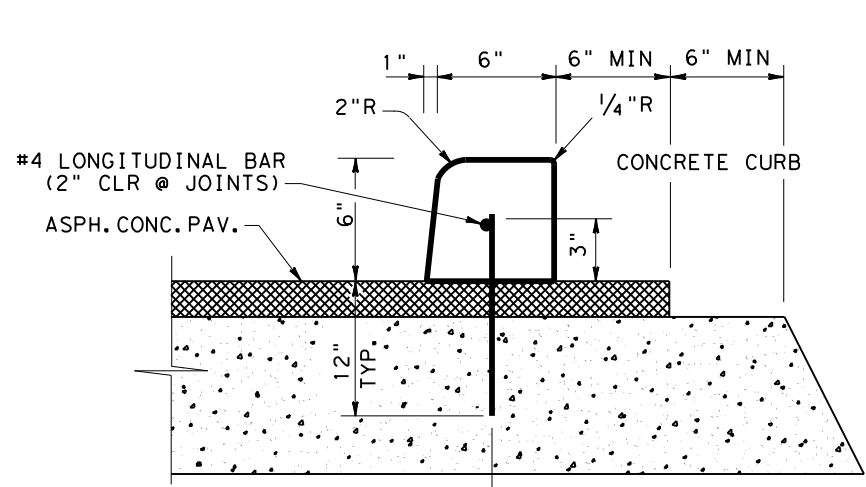
LEGEND

- ASB - ASPHALT STABILIZED BASE
- CRCP - CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
- D - DIAMETER
- LTS - LIME TREATED SUBGRADE
- PCTB - PORTLAND CEMENT TREATED BASE

**Texas Department of Transportation**  
 Houston District

**FAST TRACK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT DETAILS**  
**CRCP-FT**

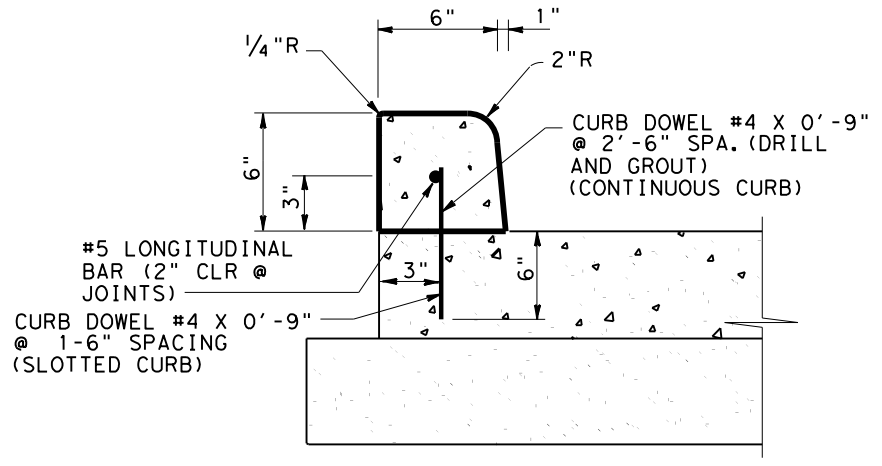
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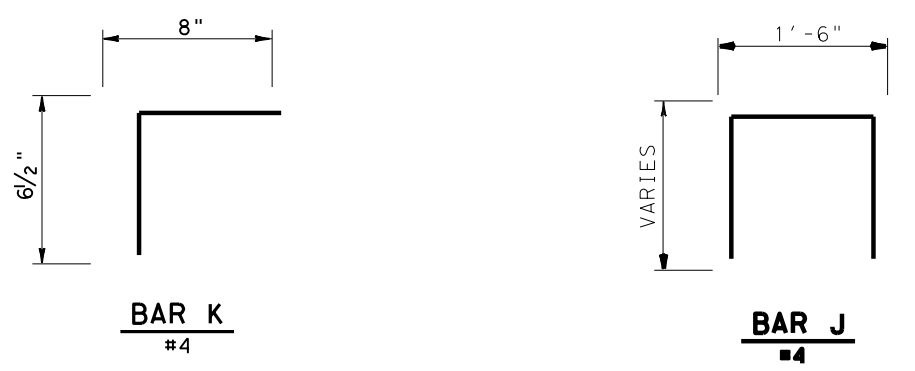
CONTINUOUS CURB; DOWEL #5 X 1'-3"  
@ 2'-6" SPA. (DRILL & GROUT)  
SLOTTED CURB; DOWEL #5 X 1'-3"  
@ 1'-6" SPA. (DRILL & GROUT)

**SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT**  
(PAY ITEM 529-6011) - FOR CONTINUOUS

**CONCRETE CURB (DOWEL) (6 IN.)**

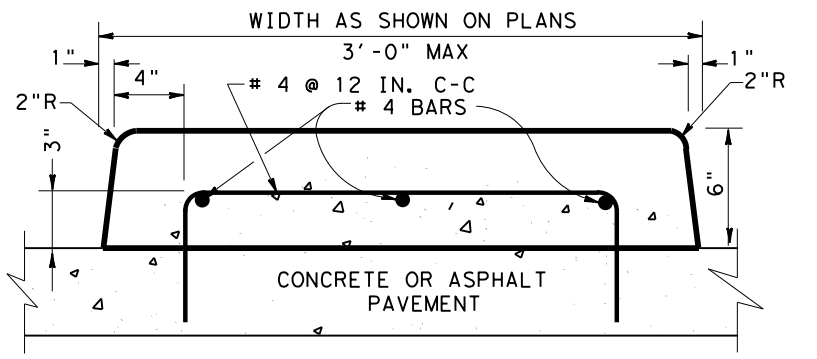


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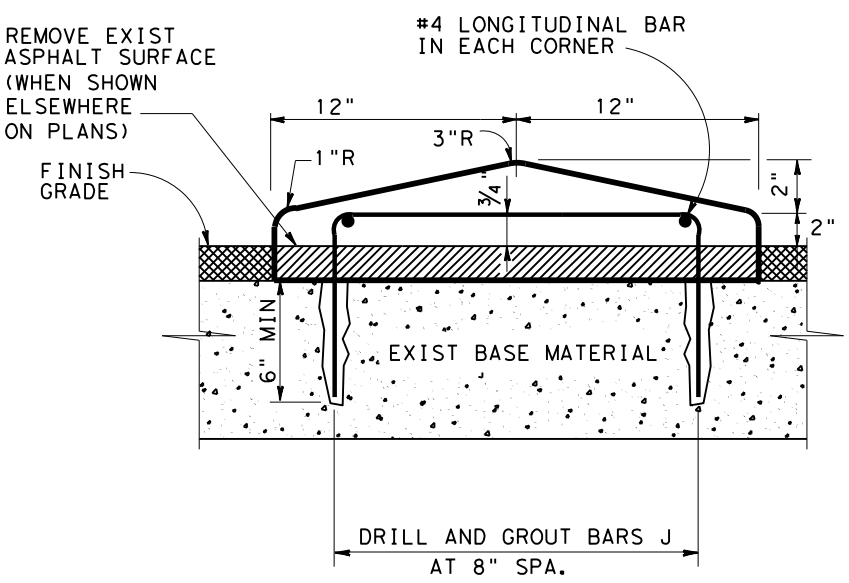


**BAR K**  
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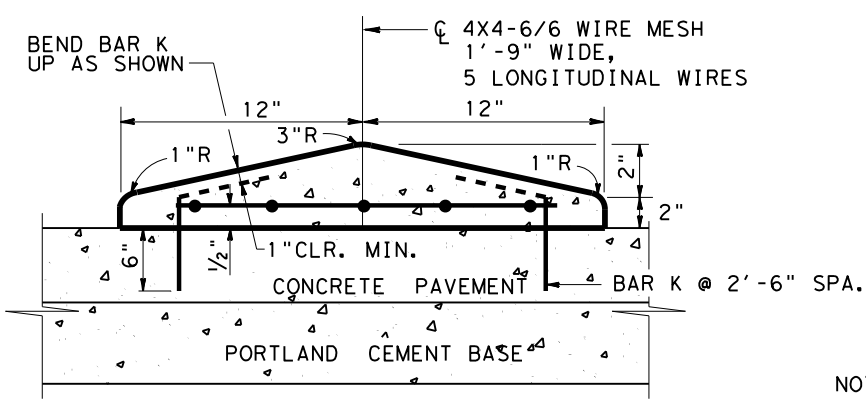
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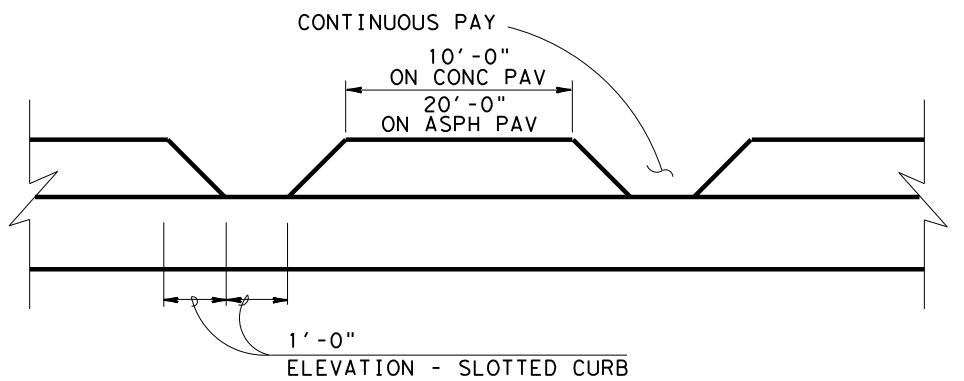
ITEM 536-6001 CONCRETE MEDIAN  
SEE NOTE 2



**SHOWN ON EXISTING ACP PAVEMENT**  
SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



**SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT**  
SEE NOTE 2 - ITEM 536-6003 CONC DIRECTIONAL ISLAND



ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.  
ITEM 529-6009 CONC CURB (DOWEL) (SLOTTED) - ON ASPH.

- NOTES:
1. DRILL AND GROUT BARS SHOWN AS PER ITEM 420.4.7.10, 6" EMBEDMENT, MINIMUM ON CONC.
  2. INSTALL A 2 INCH DRAINAGE OPENING AT 10 FT C-C WHEN CURB/ISLAND IS NOT ON TOP OF CROSS SECTION. (LOCATED ON A 2 OR 3 PERCENT TRANSVERSE GRADE, OR SUPERELEVATION.)

**CONCRETE DIRECTIONAL ISLAND**

**Texas Department of Transportation**  
Houston District

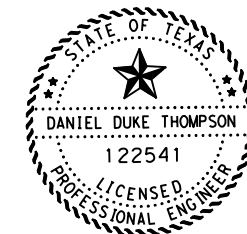
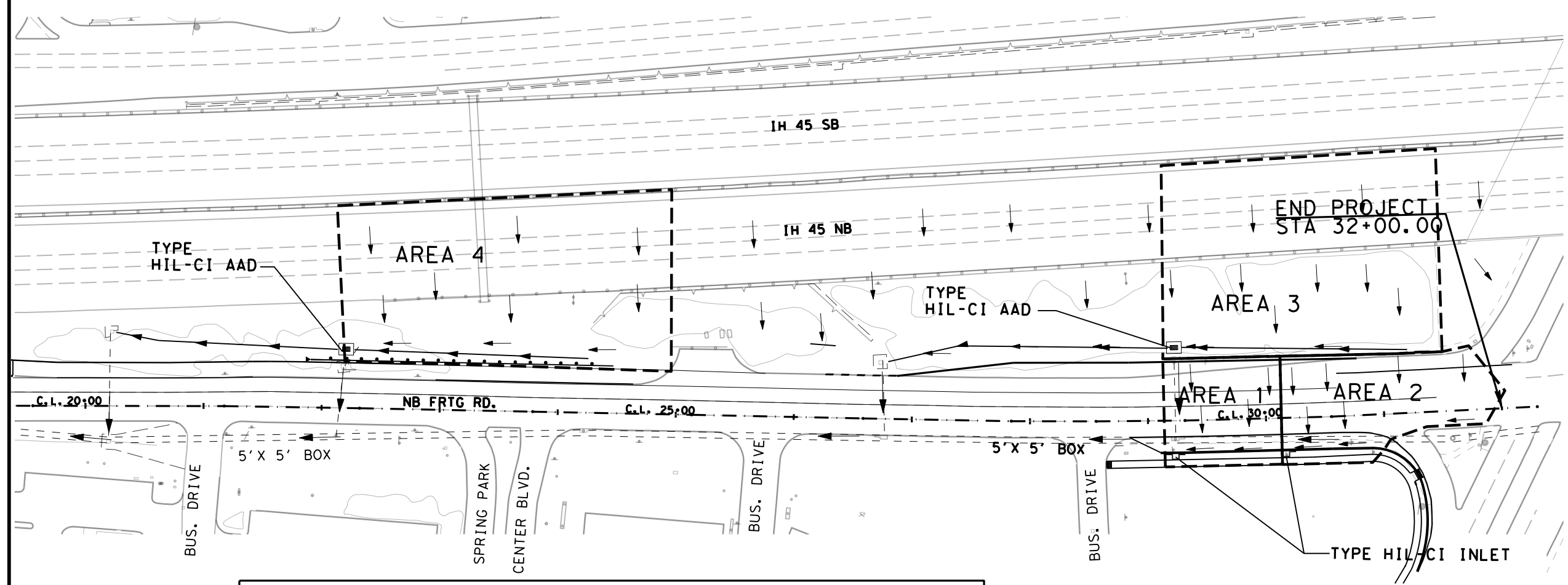
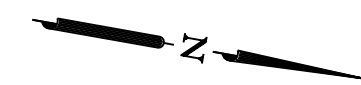
**CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS**  
CC & DID

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REVISIONS	HOU	6		56
	COUNTY	CONTROL	SECT	JOB
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				HIGHWAY
				IH45



LEGEND

 DRAINAGE BOUNDARY



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AREA 1 C=0.9 DA= 0.21 AC TC= 10MIN I= 5.47 IN. Q= 1.03 2 YR	AREA 2 C=0.9 DA= 0.34 AC TC= 10MIN I= 5.47 IN. Q= 1.67 2 YR	AREA 3 C=0.75 DA= 0.88 AC TC= 10MIN I= 7.89 IN. Q= 5.22 10 YR	AREA 4 C=0.75 DA= 0.92 AC TC= 10MIN I= 7.89 IN. Q= 5.43 10 YR
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IH 45  
AT CYPRESSWOOD DR.

DRAINAGE  
MAP

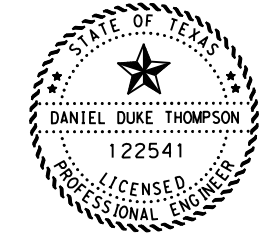
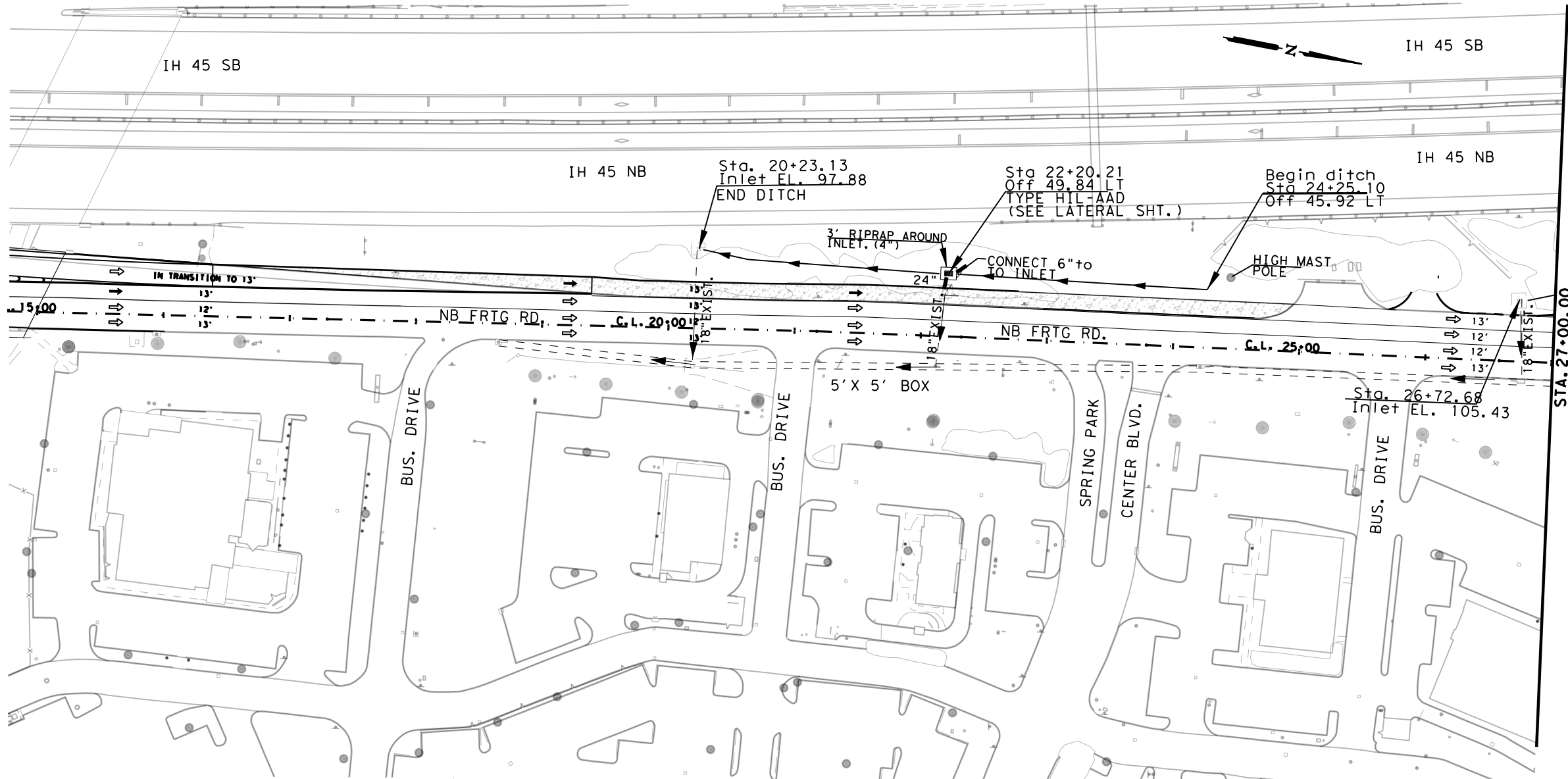
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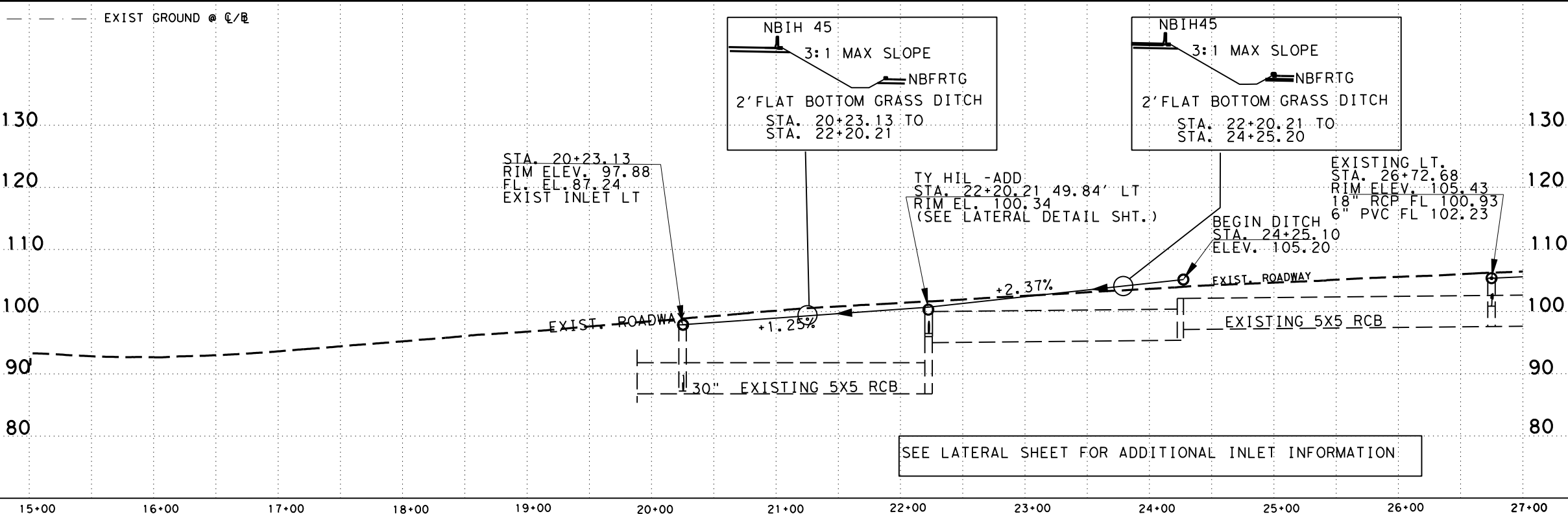
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STATE TEXAS	DIST HOU	COUNTY HARRIS	
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DATE: 8/2/2021 \$FILEL\$

- LEGEND**
- EXIST TRAFFIC LANE
  - PROP TRAFFIC LANE
  - PROPOSED ROADWAY
  - PROP DITCH



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SEE LATERAL SHEET FOR ADDITIONAL INLET INFORMATION

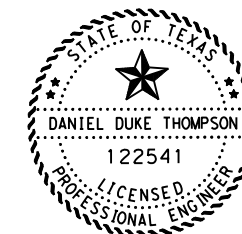
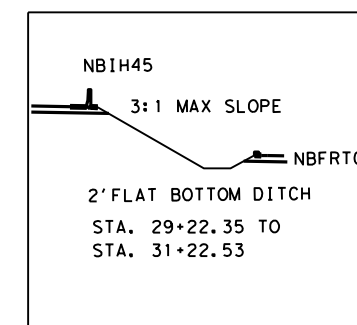
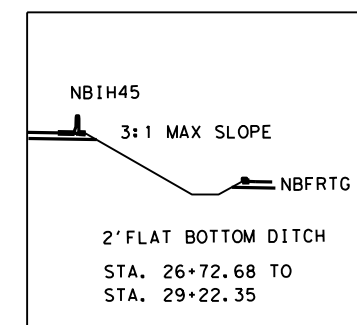
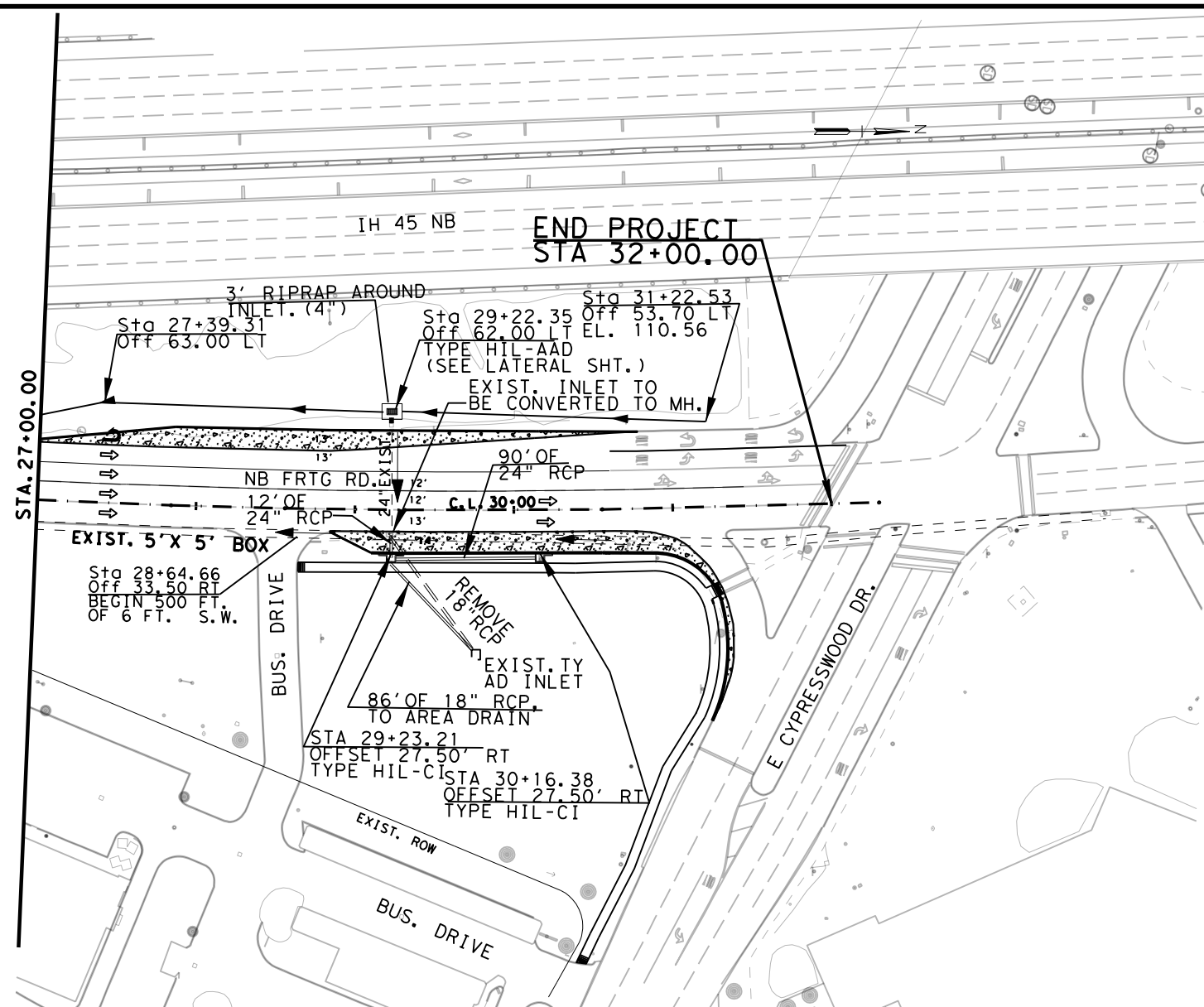


**IH 45  
 AT CYPRESSWOOD DR.  
 STORM SEWER PLAN  
 AND PROFILE**

SCALE: 1" = 100' HORZ  
 1" = 20' VERT  
 SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6				58
STATE	DIST	COUNTY		
TEXAS	HOU	HARRIS		
CONT	SECT	JOB	HIGHWAY	
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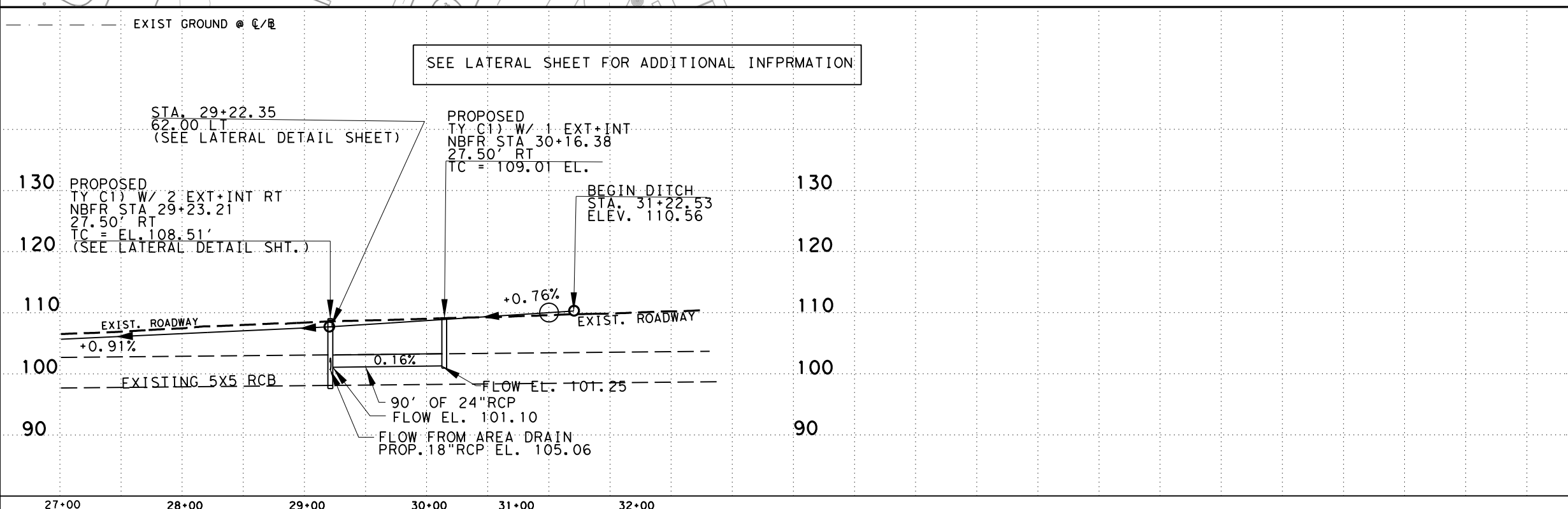
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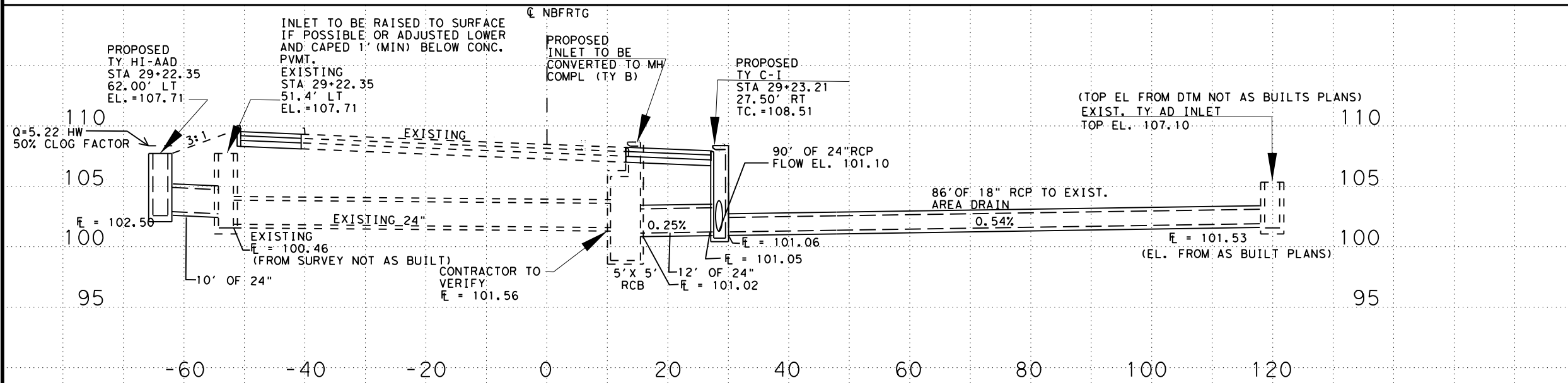
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 AT CYPRESSWOOD DR.  
 STORM SEWER PLAN  
 AND PROFILE

SCALE: 1" = 100' HORZ  
 1" = 20' VERT  
 SHEET 2 OF 2

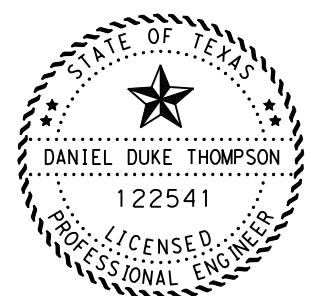
FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6				59
STATE	DIST	COUNTY		
TEXAS	HOU	HARRIS		
CONT	SECT	JOB	HIGHWAY	
0110	05	127	IH 45	



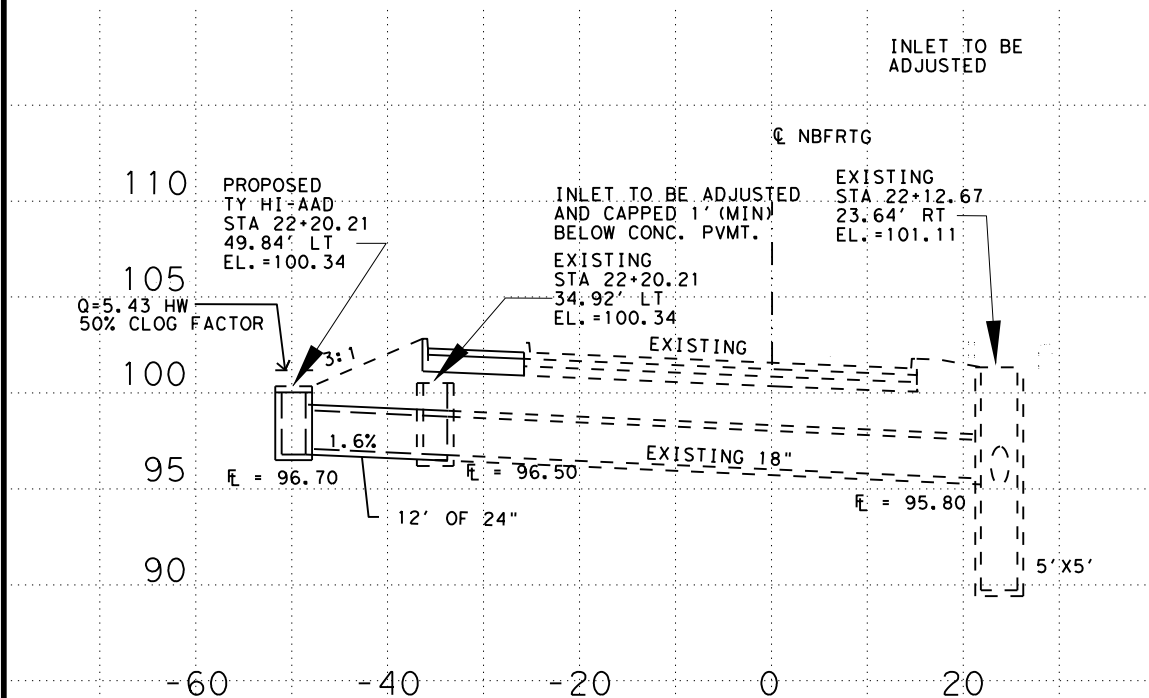
DATE: 8/27/2021  
 \$FILEL\$



Sta. 29+22.35 NBFRTG



*Daniel Duke Thompson*  
 The seal appearing on this document was authorized by DANIEL THOMPSON, P.E. 122541 on 07/02, 2021. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.



Sta. 22+20.21 NBFRTG

HYDRAULIC COMPUTATIONS FOR PROPOSED INLEST ALONG NB FRTG

Sta. 29+23.21 NBFRTG

Discharge = 1.0300 2 YR  
 Total Ponded Width = 3.2573  
 Ponded Width Left = 2.2201  
 Ponded Width Right = 6.6893  
 Ponded Depth Left = 0.0584  
 Ponded Depth Right = 0.1758  
 Inlet Length = 15.0000  
 Depression Depth = 0.2500  
 Depression Width = 1.5000  
 Inlet Capacity = 1.2874  
 Computed Head = 0.0856

Sta. 30+16.38 NBFRTG

Discharge = 1.6000 2 YR  
 Spread Width from Gutter = 6.3430  
 Total Ponded Width = 6.3430  
 Ponded Depth = 0.2049  
 Spread Left Intercept = 0.0000  
 Spread Right Intercept = 6.3430  
 Inlet Length = 10.0000  
 Depression Depth = 0.2500  
 Depression Width = 1.5000  
 Inlet Capacity = 1.6000  
 Length Required = 7.9999  
 ByPass Flow = 0.0000  
 Efficiency = 1.0000



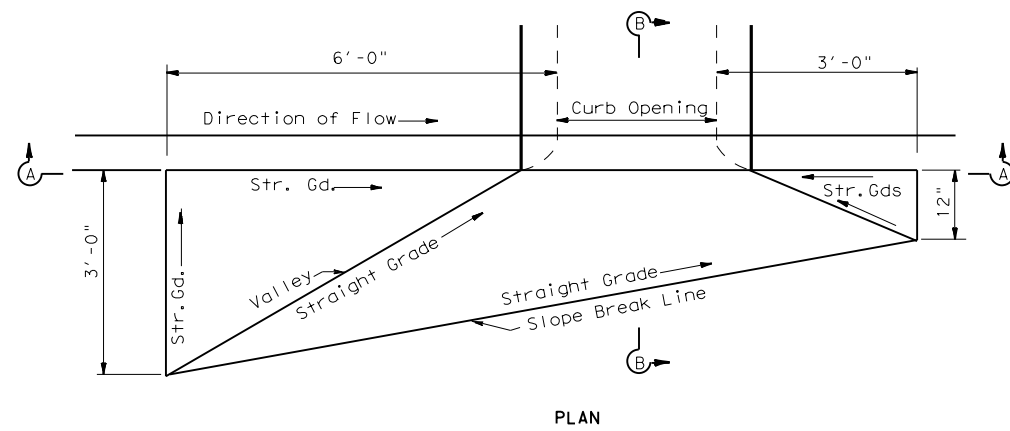
IH 45  
 AT CYPRESSWOOD DR.  
 LATERALS DETAILS  
 HYDRAULIC COMPUTATIONS

SCALE: 1" = 20' HORZ  
 1" = 10' VERT

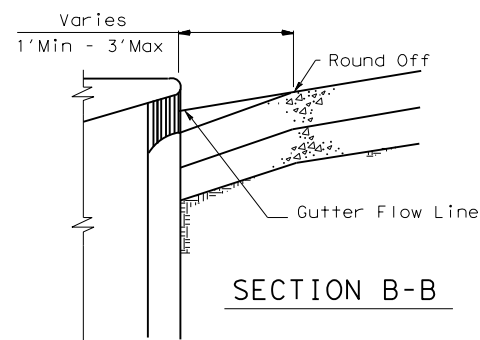
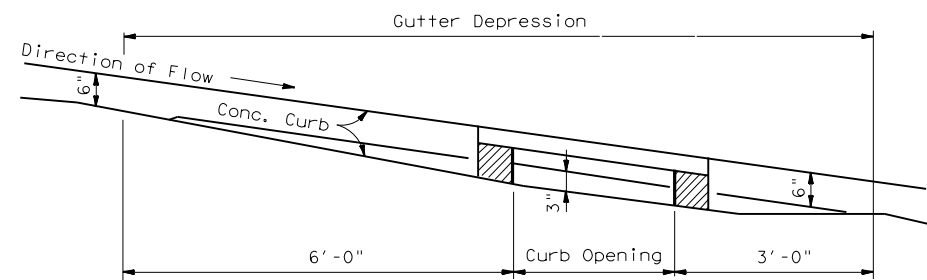
SHEET 1 OF 1

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

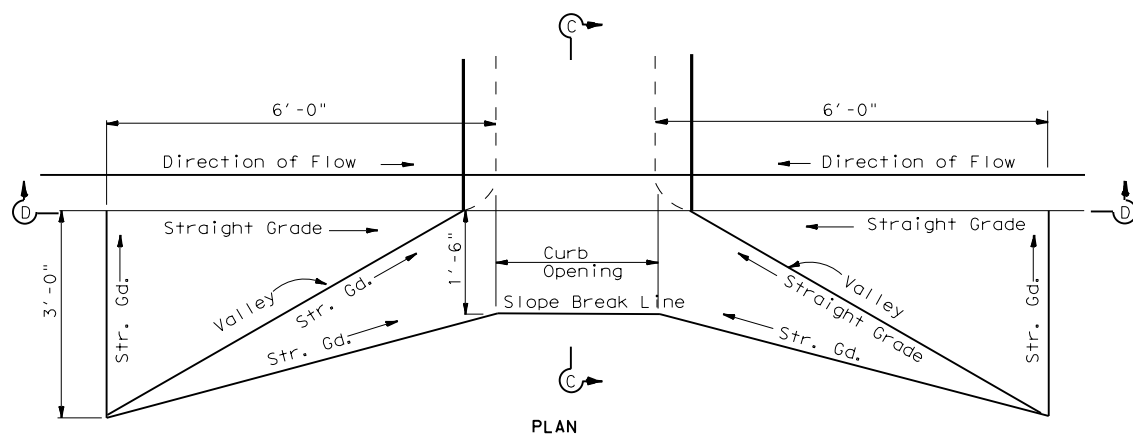
DATE: 8/2/2021 \$FILEL\$



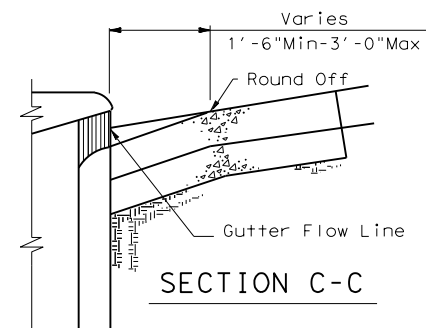
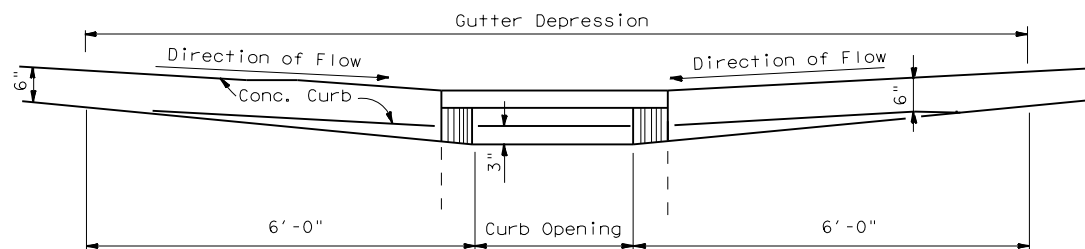
PLAN  
SECTION A-A  
CURB INLET ON GRADE



SECTION B-B



PLAN  
SECTION D-D  
CURB INLET AT SAG



SECTION C-C

GENERAL NOTES:

Base Course under Concrete Pavement shall be full depth and shall conform to surface depression details.

Texas Department of Transportation  
Houston District

GUTTER DEPRESSION DETAILS  
FOR CURB INLETS

GD

FILE:	STDD12.DGN	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT	STD:	
REVISIONS	© TxDOT Mar 2004	DIST	HOUS	FED REG	6	PROJECT NO.		SHEET	61		
		COUNTY	HARRIS	CONTROL	0110	SECT	05	JOB	127	HIGHWAY	IH45

STDD12.DGN

**REINFORCED CONCRETE PIPE**

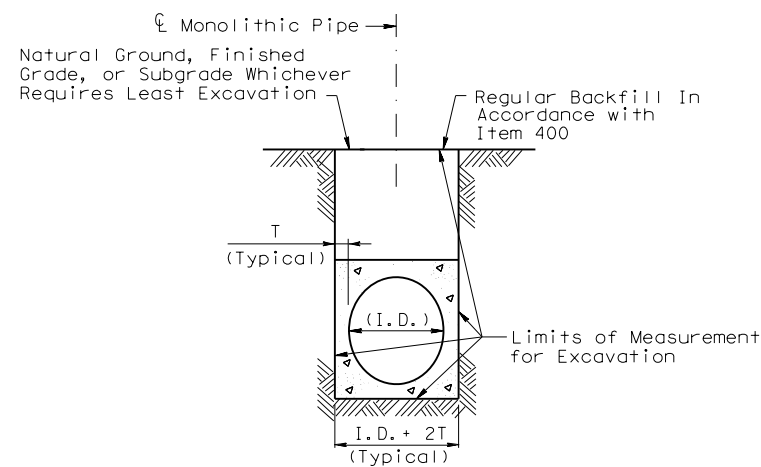
EXCAVATION AND BACKFILL QUANTITIES

PIPE DIA. IN.	T FT.	CULVERT OR SEWER EXCAVATION IN A PAVED OR GRADED AREA	CEMENT STABILIZED BACKFILL IN A PAVED OR GRADED AREA
		C.Y. PER L.F. PER FT. OF DEPTH	C.Y. PER L.F. OF PIPE
18	0.19	0.144	0.383
24	0.23	0.165	0.478
30	0.29	0.188	0.586
36	0.33	0.210	0.692
42	0.38	0.231	0.808
48	0.42	0.327	1.394
54	0.46	0.349	1.560
60	0.50	0.370	1.731
66	0.54	0.392	1.907
72	0.58	0.414	2.088
78	0.62	0.435	2.275
84	0.67	0.457	2.474

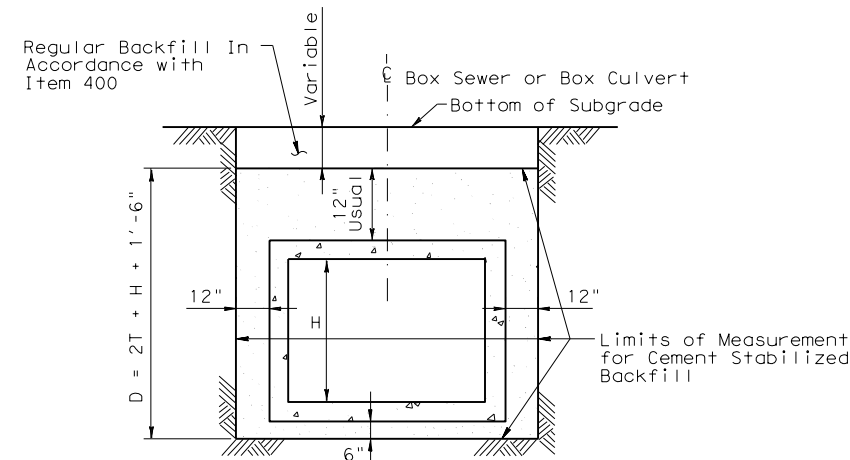
**MONOLITHIC PIPE**

EXCAVATION QUANTITIES

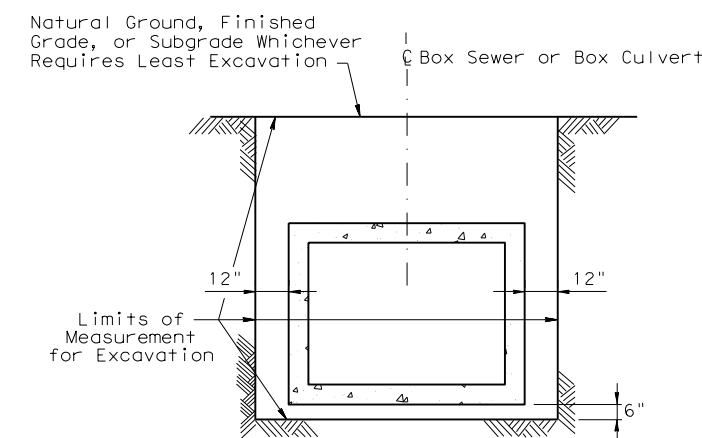
PIPE DIA. IN.	T FT.	EXCAVATION
		C.Y. PER L.F. PER FT. OF DEPTH
36	0.417	0.142
42	0.458	0.164
48	0.458	0.182
54	0.500	0.204
60	0.583	0.228
66	0.583	0.247
72	0.625	0.269
78	0.625	0.287
84	0.625	0.306



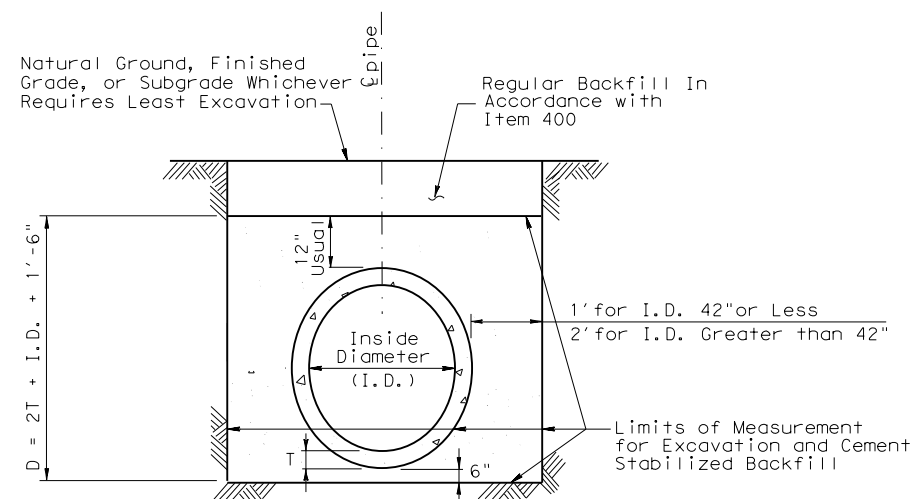
**EXCAVATION DETAIL**  
MONOLITHIC PIPE  
IN A PAVED OR GRADED AREA



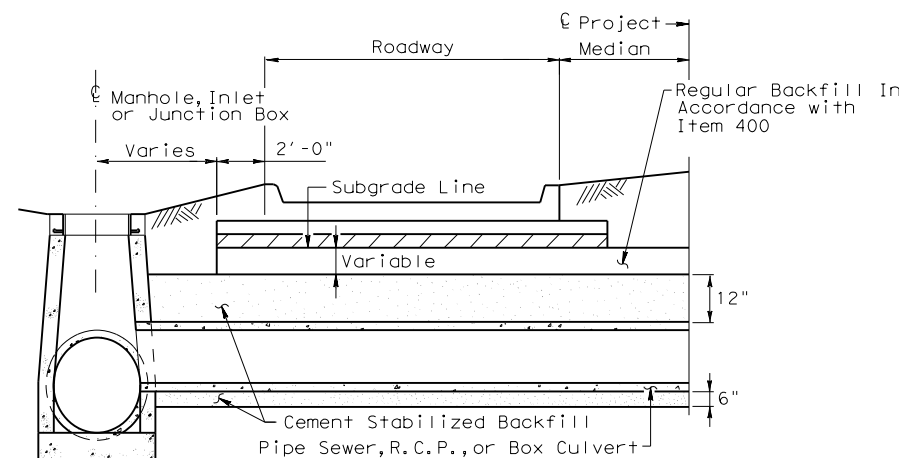
**BACKFILL DETAIL**  
BOX CULVERTS  
IN A GRADED OR PAVED AREA  
INCLUDING DETOURS \*



**EXCAVATION DETAIL**  
BOX CULVERTS  
IN A GRADED AREA



**EXCAVATION & BACKFILL DETAIL**  
REINFORCED CONCRETE PIPE  
IN A GRADED OR PAVED AREA  
INCLUDING DETOURS



**BACKFILL DETAIL**  
AT MANHOLE, INLET OR JUNCTION BOX

**NOTE:**

Cement stabilized backfill may be omitted in private driveways as indicated elsewhere in the plans.

Rubber gaskets shall be required for all joints on proposed cross drainage, pipe culverts and proposed storm sewer systems, unless otherwise shown in the plans.

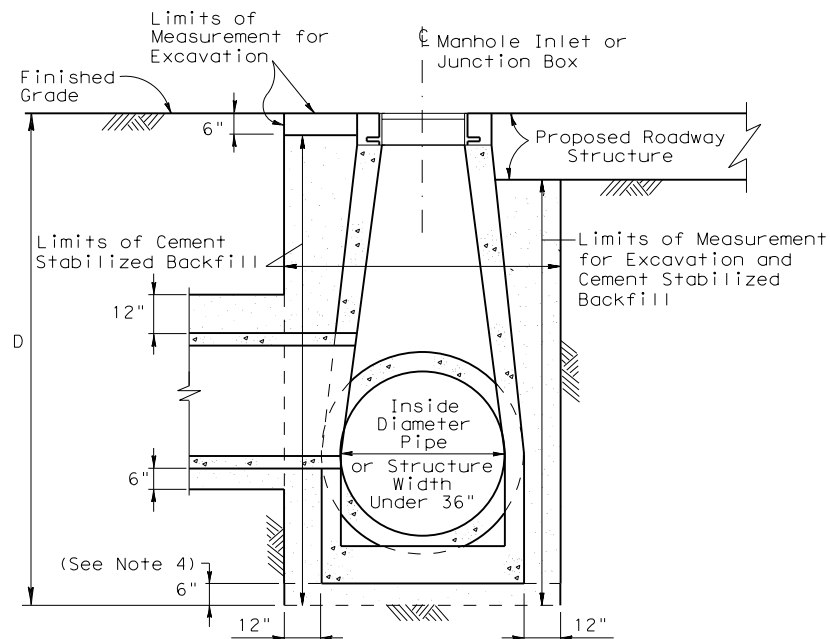
\* Backfill with cement stabilized material will be required for all structures under detours unless noted otherwise in the General Notes.

**EXCAVATION AND BACKFILL DIAGRAMS**

**E&BD**

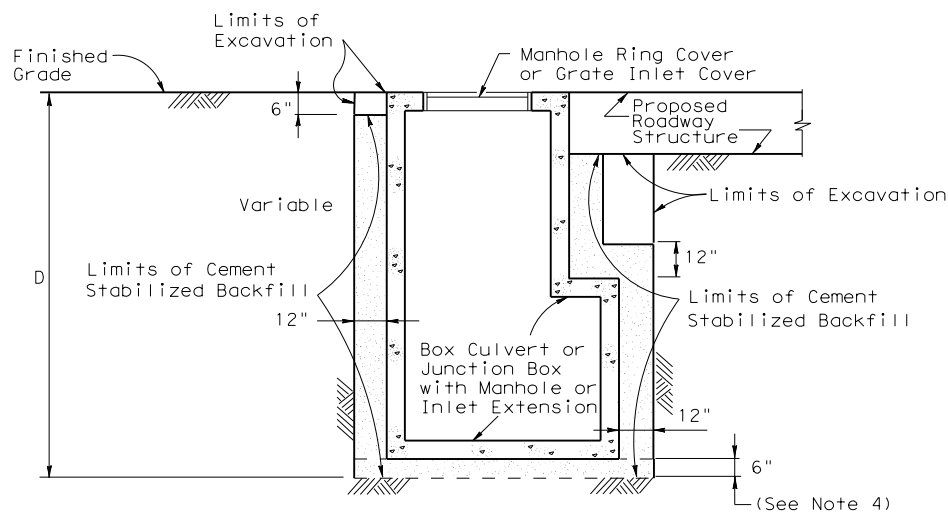
D = Depth  
H = Height  
T = Thickness  
R = Radius  
Dia = Diameter

FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED 11/05	HOUSTON	6		62
REVISED 2/2010 Added note to Table 1, Sht 2 of 2.	COUNTY	CONTROL	SECT	JOB
REVISED 6/12	HARRIS	0110	05	127
REVISED 9/14				1H45



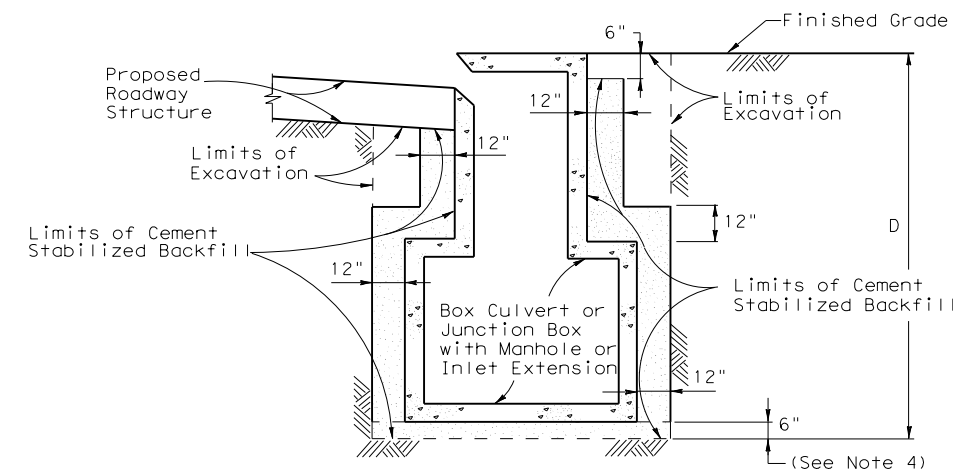
**EXCAVATION AND BACKFILL DETAIL**

MANHOLES SMALLER THAN 36 IN.  
IN A PAVED OR GRADED AREAS  
N. T. S.



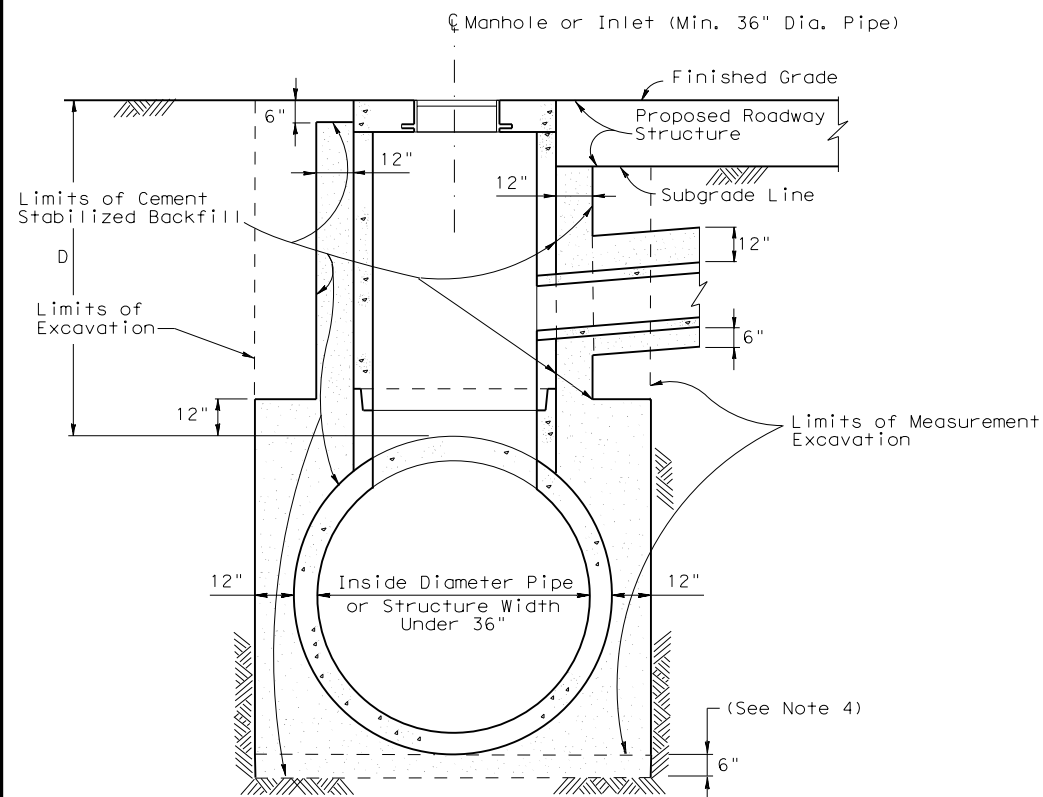
**EXCAVATION AND BACKFILL DETAIL**

JUNCTION BOXES IN A  
PAVED OR GRADED AREA  
N. T. S.



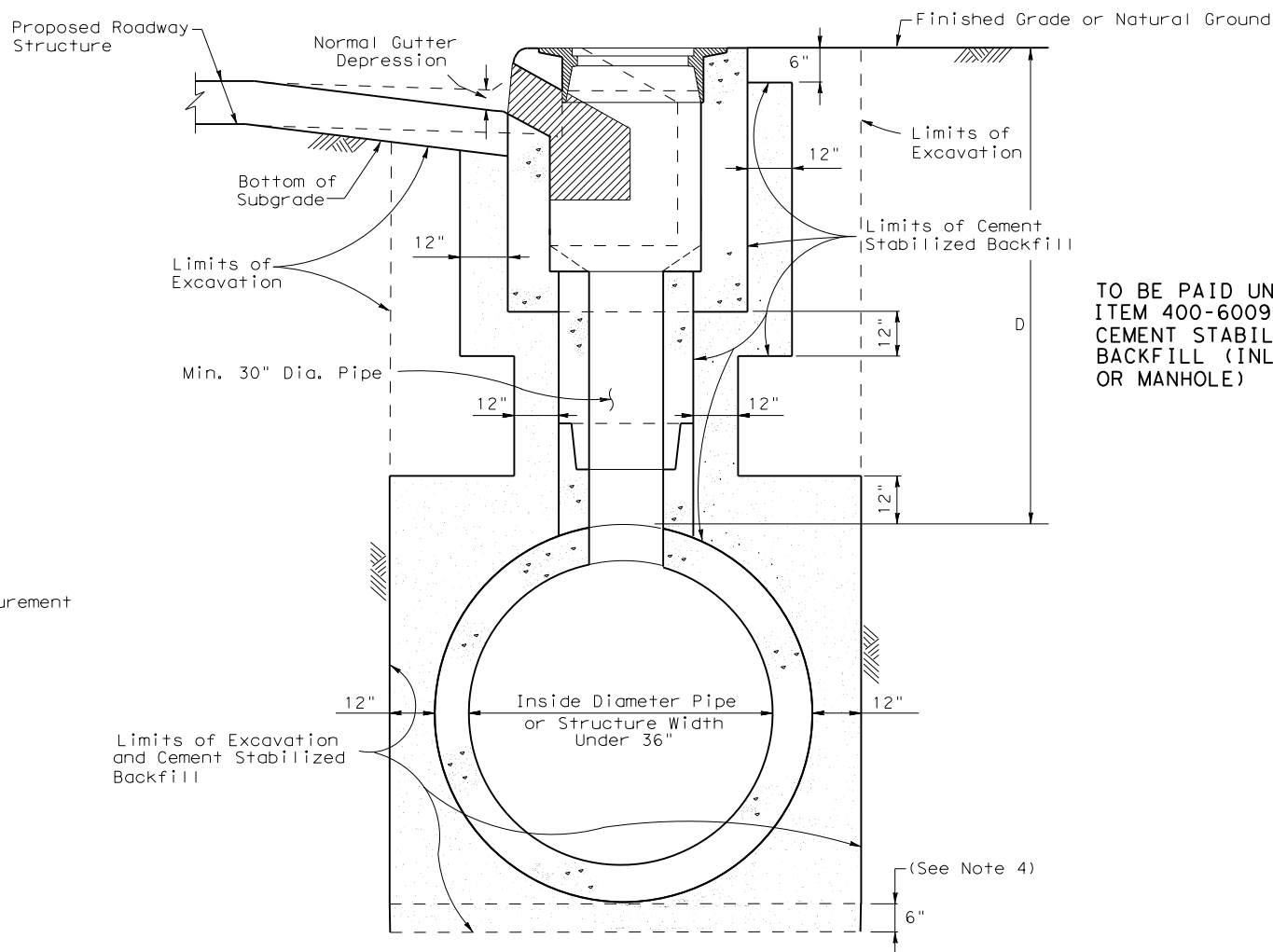
**EXCAVATION AND BACKFILL DETAIL**

INLET EXTENSIONS ON A BOX CULVERT  
IN A PAVED OR GRADED AREA  
N. T. S.



**EXCAVATION AND BACKFILL DETAIL**

MANHOLES 36 IN. AND GREATER  
IN A PAVED OR GRADED AREA  
N. T. S.



**EXCAVATION AND BACKFILL DETAIL**

CURB INLETS IN A PAVED OR GRADED AREA  
N. T. S.

TO BE PAID UNDER  
ITEM 400-6009  
CEMENT STABILIZED  
BACKFILL (INLET  
OR MANHOLE)

TABLE I SCHEDULE FOR PAY QUANTITIES OF CEMENT STABILIZED BACKFILL (SEE NOTE 1)	
MANHOLE OR INLET DEPTH (D) IN FEET	CEMENT STABILIZED BACKFILL IN CUBIC YARDS
0 through 5	5.75
> 5 through 10	8.25
greater than 10	12.75

- NOTES:
- The Contractor is paid a fixed estimated amount for cement stabilized backfill based on depth (D) and Table 1.
  - Proposed roadway structure includes pavement, base and any subgrade.
  - For backfill of intersecting pipes and box culverts, see "Excavation and Backfill Diagram for Pipes and Box Culverts."
  - 6" cement stabilized backfill will be required only for precast units.

SHEET 2 OF 2

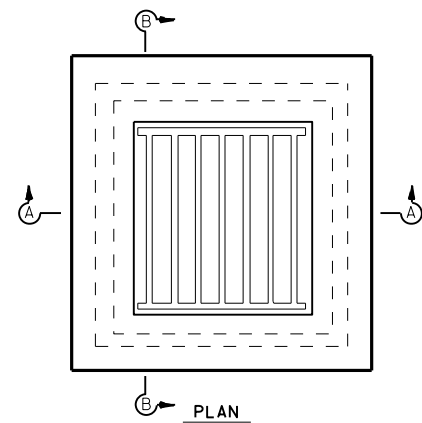
Texas Department of Transportation  
Houston District

**EXCAVATION AND BACKFILL  
DIAGRAMS**

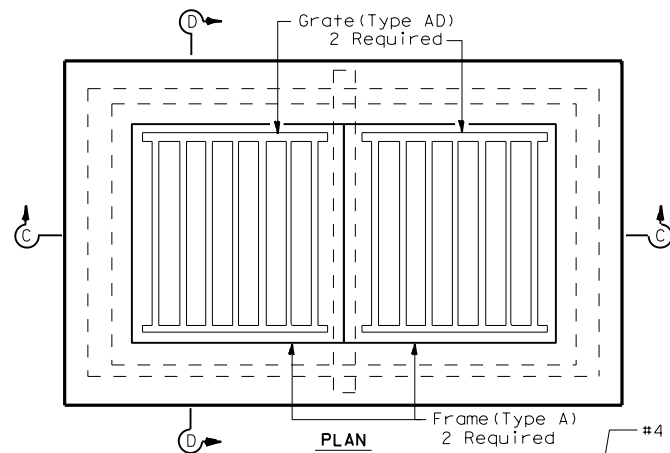
E&BD

D = Depth  
H = Height  
T = Thickness  
R = Radius  
Dia = Diameter

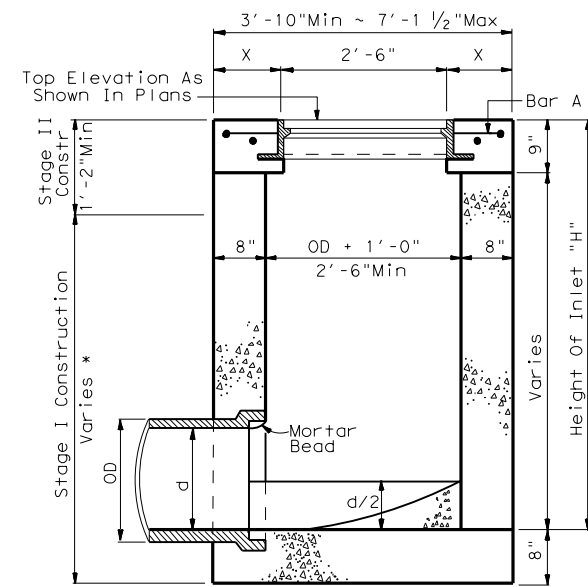
FILE: STDE1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDot FEB 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISED 2/2010 Added note to Table 1.	HOUSTON	6		63
REVISED 8/12	COUNTY	CONTROL SECT	JOB	HIGHWAY
REVISED 3/15	HARRIS	0110	05 127	1H45



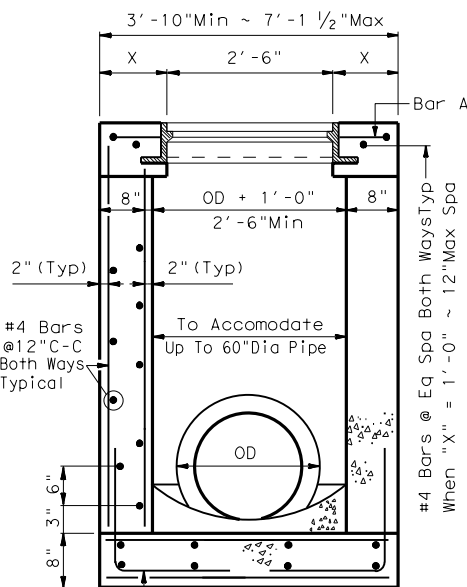
\* But Not Less Than Six Inches Over Highest Entering Pipe.  
X = 8" Min to 3'-9" Max



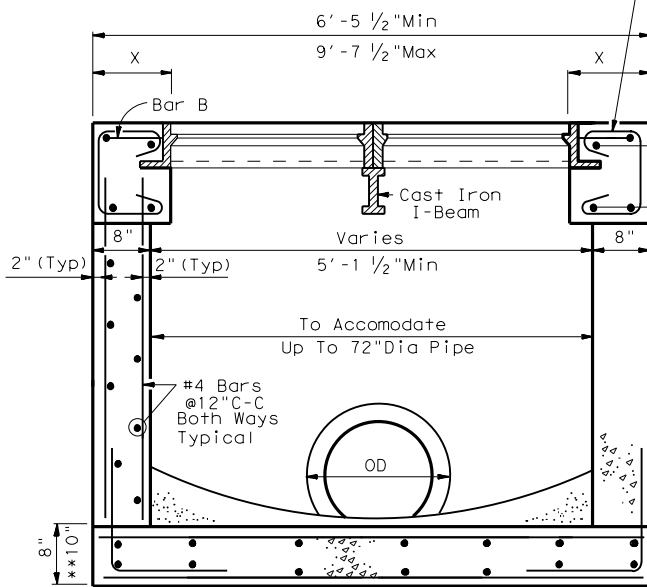
\* But Not Less Than Six Inches Over Highest Entering Pipe.  
\*\* For Pipe Diameters 66" And Greater



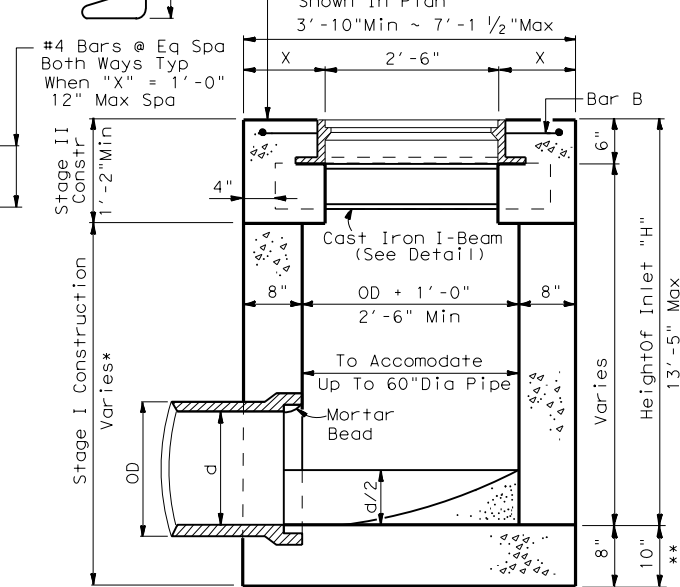
SECTION A-A



SECTION B-B



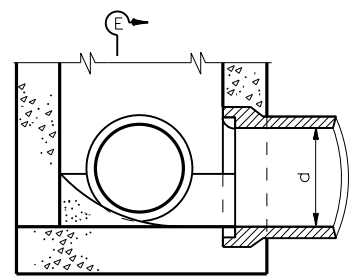
SECTION C-C



SECTION D-D

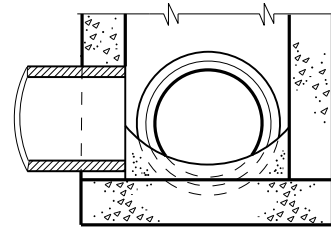
**INLET TYPE AD**

**INLET TYPE AAD**

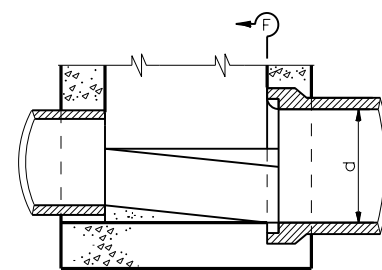


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Adjacent Sides

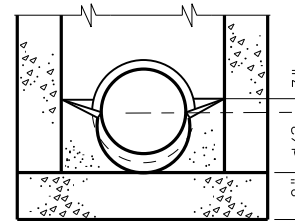


SECTION E-E

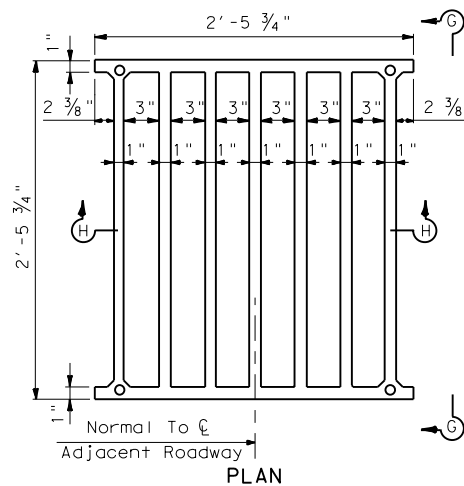


PART SECTION AT INVERT

Showing Shaping Of Invert, Pipe Entering From Opposite Sides



SECTION F-F

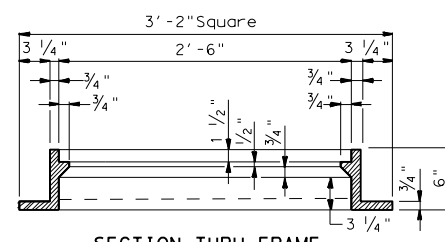


PLAN

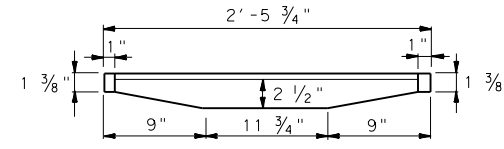
Provide 4 ~ Stainless Steel Hex Head Bolts per Grate

**FRAME AND GRATE**

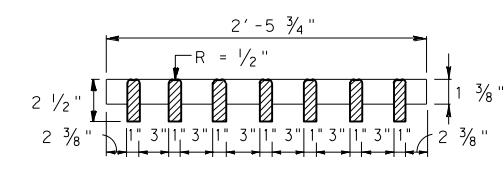
Type AD ~ Neenah No. 3418 or EJIW No. V-4880-2  
Type AAD ~ Neenah No. 3418-2 or EJIW No. V-4881-2



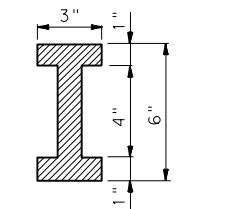
SECTION THRU FRAME



ELEVATION G-G



SECTION H-H



SECTION OF CAST IRON I-BEAM

d = Diameter  
R = Radius

**GENERAL NOTES:**

Type AD Inlet contains a single frame with grate. Type AAD Inlet contains a double frame and double grate with an I-beam.

Frame and Grates may be gray cast iron.

The Furnishing And Installation Of Cast Iron I-Beams Shall Be Considered Incidental To Inlet (Compl) (Ty AAD) Or Inlet (Stage II) (Ty AAD) As The Case May Be.

Where Size Of Pipes Passing Thru Inlet Exceeds 30", Increase Inside Width To Diameter Of Pipe Plus 1'-0" (OD + 1'-0")

Cast Iron Manhole Steps (See Manhole Details) Spaced At 16" Centers And Located On Wall Specified By The Engineer Shall Be Provided And Installed Where "D" Exceeds 5'-0".

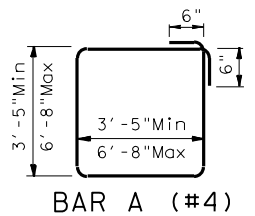
See Standard or Detail Sheet For Excavation and Backfill Diagrams.

Type AD & AAD Inlets Shall Be Built To Stage I And Finished After All Grading Operations Are Substantially Completed.

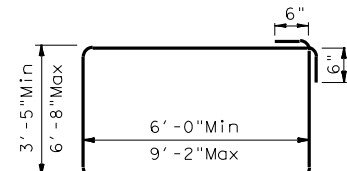
Shop Drawings Will Be Required For Precast Construction Of Inlets.

Upon installation of the grates the threads of the bolts shall be coated with thread lock type adhesive (Lockite or equal). Reapply thread lock adhesive each time grates are removed.

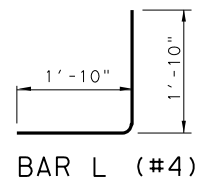
Bolted grates and frames are a matched set, do not unbolt without "Match Marking" so that grates and frames are re-installed as originally built.



BAR A (#4)



BAR B (#4)



BAR L (#4)

**NOT FOR TRAFFIC LOADS**



**INLETS TYPE AD & AAD**

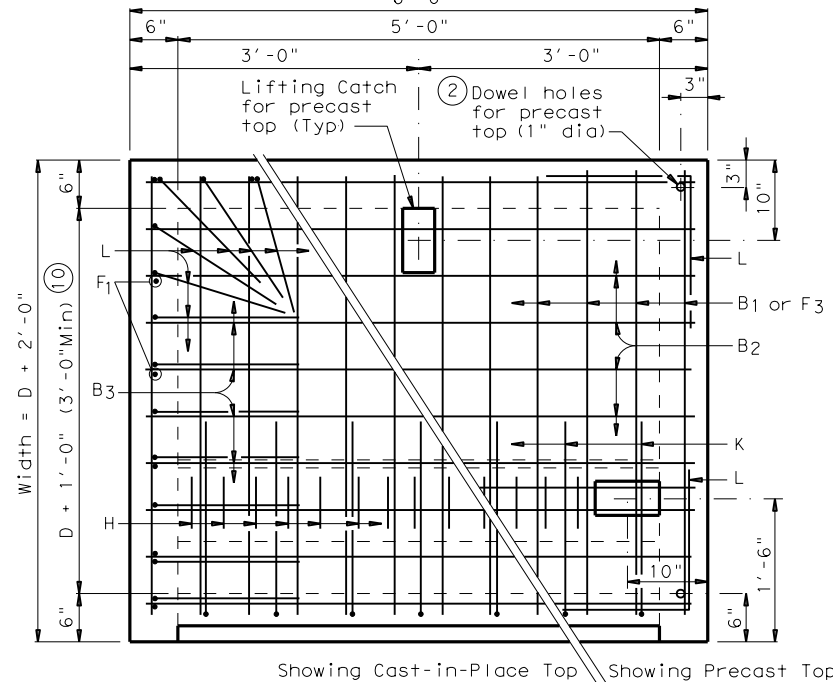
**HIL-AD/AAD**

FILE:	STDD5.DGN	DN:	TxDOT	CK:	TxDOT	DW:	TxDOT	CK:	TxDOT	STD:	
REVISIONS	2014	DIST	HOUS	FED REG	6	PROJECT NO.		SHEET		64	
		COUNTY	HARRIS	CONTROL	0110	SECT	05	JOB	127	HIGHWAY	1H45

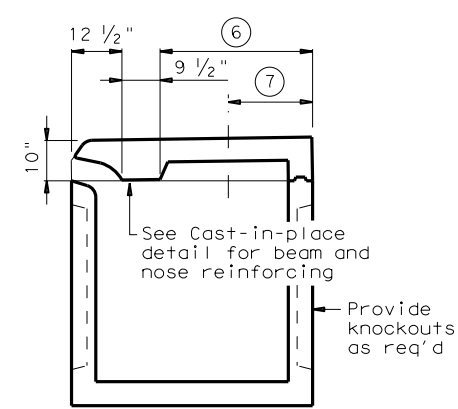


REINF STEEL		
Bar	Size	Spacing
B1	#4	6"
B2	#5	6"
B3	#4	6"
C1-2	#4	12"
C3-4	#4	9"
C5	#6	9"
C6	#4	9"
D	#4	9"
E	#4	12"
F1-3	#4	12"
G	#4	6"
H	#3	4"
K	#4	9"
L	#4	6"

⑨ As shown

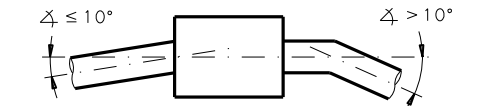


PLAN



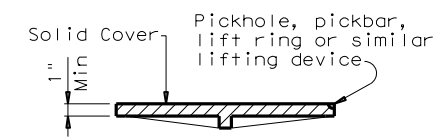
PREFABRICATED INLET

⑥ For reinforcing steel and dimensions not shown, see fabricator's shop drawings. Structure shall be of the size required to accommodate size of pipe shown elsewhere in the plans. Length of inlet = 6'-0"



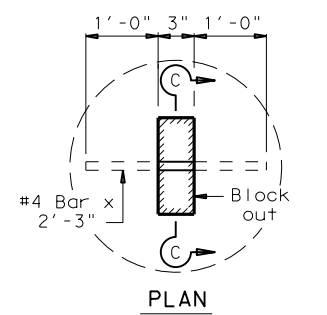
PIPE CONNECTION DETAIL

Connecting pipes should enter within 10° of normal to inlet wall. If necessary, pipe elbow or curved approach alignment should be used to stay within this limit.

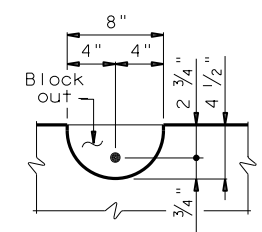


RING AND COVER DETAILS

EJW No V-1814 or Neenah No R5900-FTX

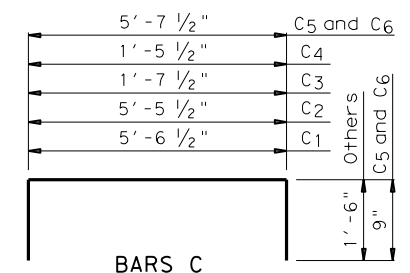


PLAN

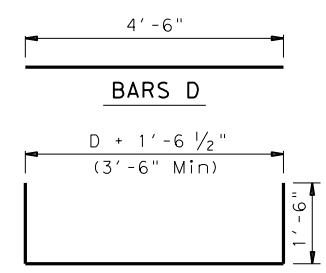


SECTION C-C

LIFTING CATCH

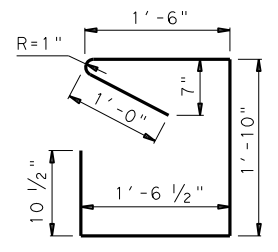


BARS C



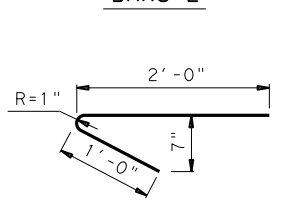
BARS D

BARS E



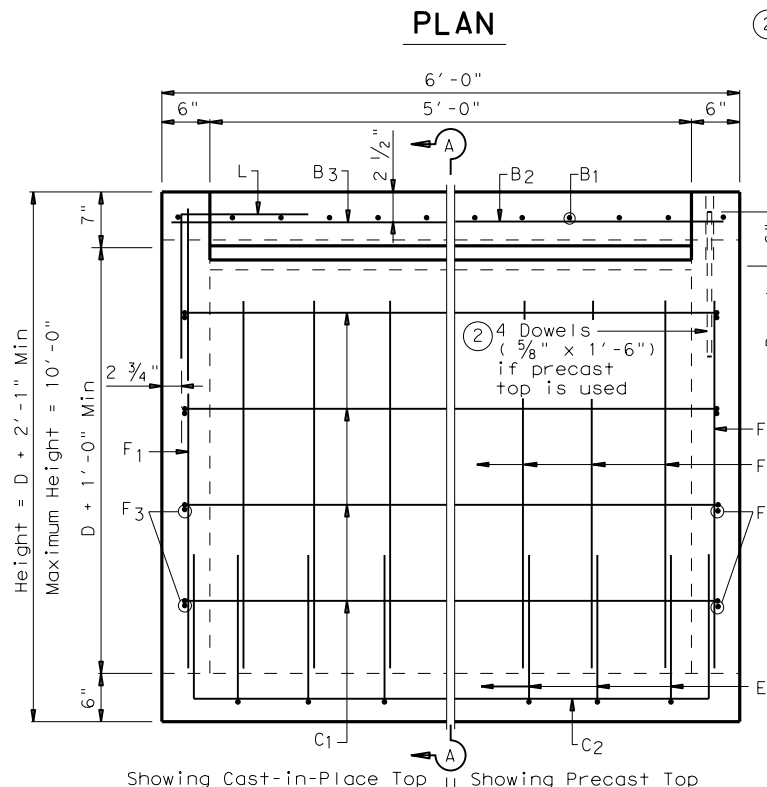
BARS G

BARS H

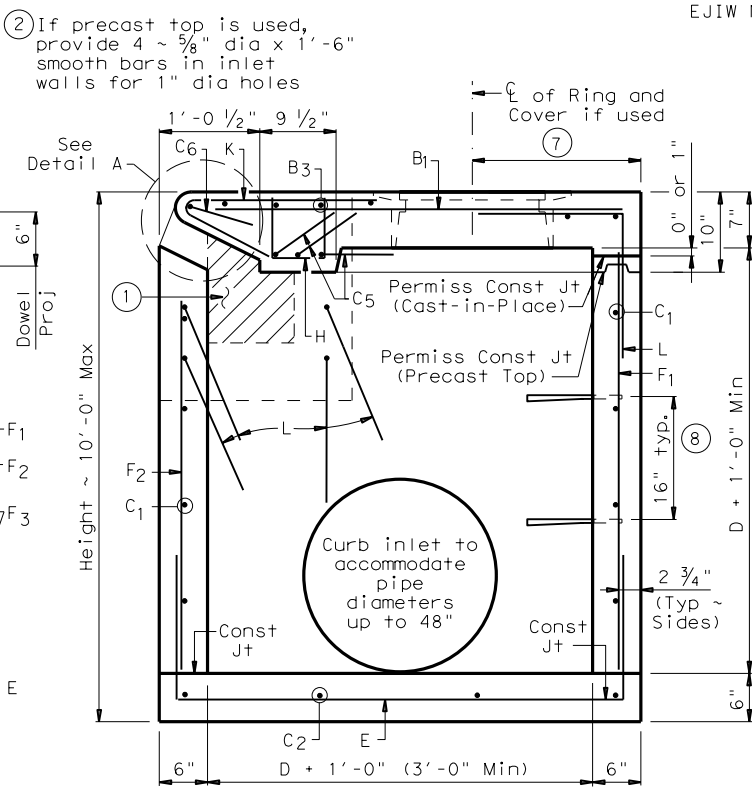


BARS K

BARS L



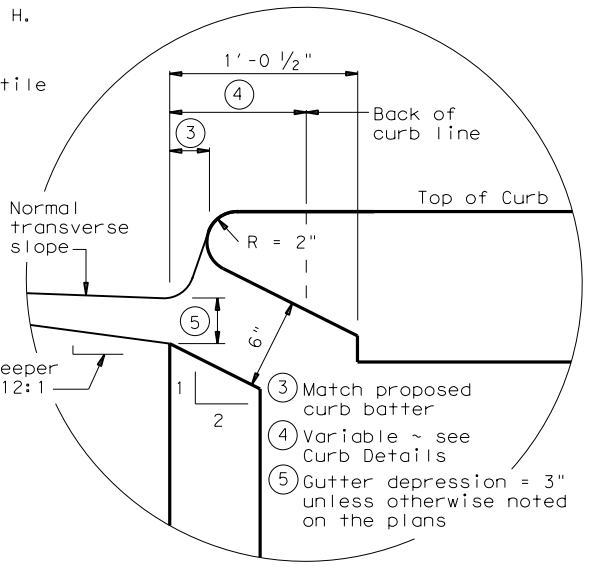
ELEVATION



SECTION A-A

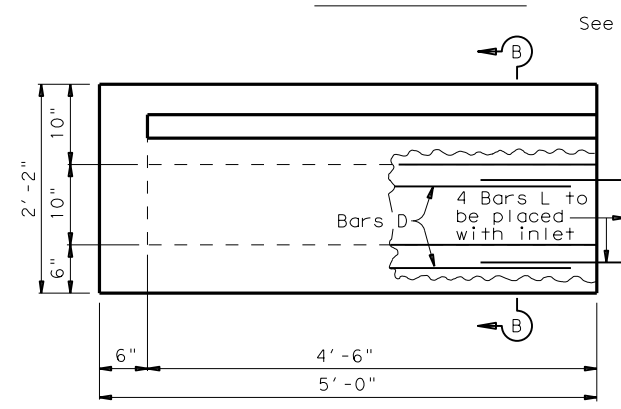
⑦ 1'-6" Min, 1'-9" Max Adjust placement of Ring and Cover as necessary to avoid conflict with Bars H.

⑧ Ladder rung is Ductile Iron, Aluminum or Cast Iron.

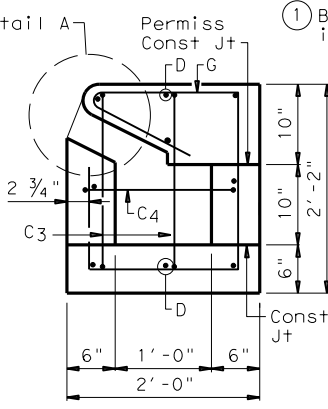


DETAIL A

**GENERAL NOTES:**  
 No alternate designs nor alternate details shall be permitted for precast or cast in place inlets.  
 Quantities shown herein are for Contractor's information only. Unless otherwise shown in the plans, payment will be made for each inlet of the type specified and for each extension. Each five foot curb opening of extension is considered "one extension" regardless of whether placed monolithically or precast. Extension length shall be in multiples of 5 feet.  
 Engineer has the option of specifying cast-in-place top with ring and cover or removable precast top as specified elsewhere in plans. Shop drawings are required for Precast Inlets.  
 In areas of conflict between reinforcing steel, blockouts, pipes, anchor bolts or other reinforcing steel, the reinforcement shall be bent or adjusted to clear as directed by the Engineer.  
 Ring and cover shall conform to the requirements of AASHTO M306, "Standard Specification for Drainage Structure Castings". Materials shall conform to ASTM A48, Class 35B for gray iron castings or ASTM A536, Grade 65-45-12 for ductile iron castings. Aluminum alloy castings shall not be permitted.

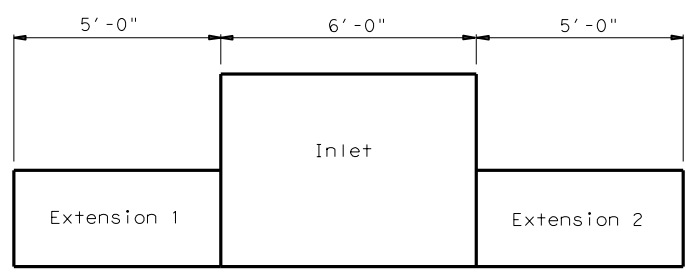


EXTENSION ELEVATION



SECTION B-B

① Block out to accommodate extension if used and to place 4 Bars L



EXTENSION PLACEMENT

Note: If more than one extension is required, they should be located as indicated above. No slope is required in flowline of extension.

**INSTALL A 3 FT. (HORIZ.) x 6 IN. (VERT.) OPENING ON THE BACK OF THE INLET WHEN SPECIFIED ELSEWHERE ON THE PLANS. MOVE STEPS AS NEEDED. NO REINFORCING ON OPENING/ON 2 IN. ADJACENT TO OPENING.**  
**DESIGNERS: CLARIFY FLOWLINE OF OPENING AND INCLUDE OPENING IN HYDRAULIC CALCULATIONS.**

D = Diameter  
 R = Radius

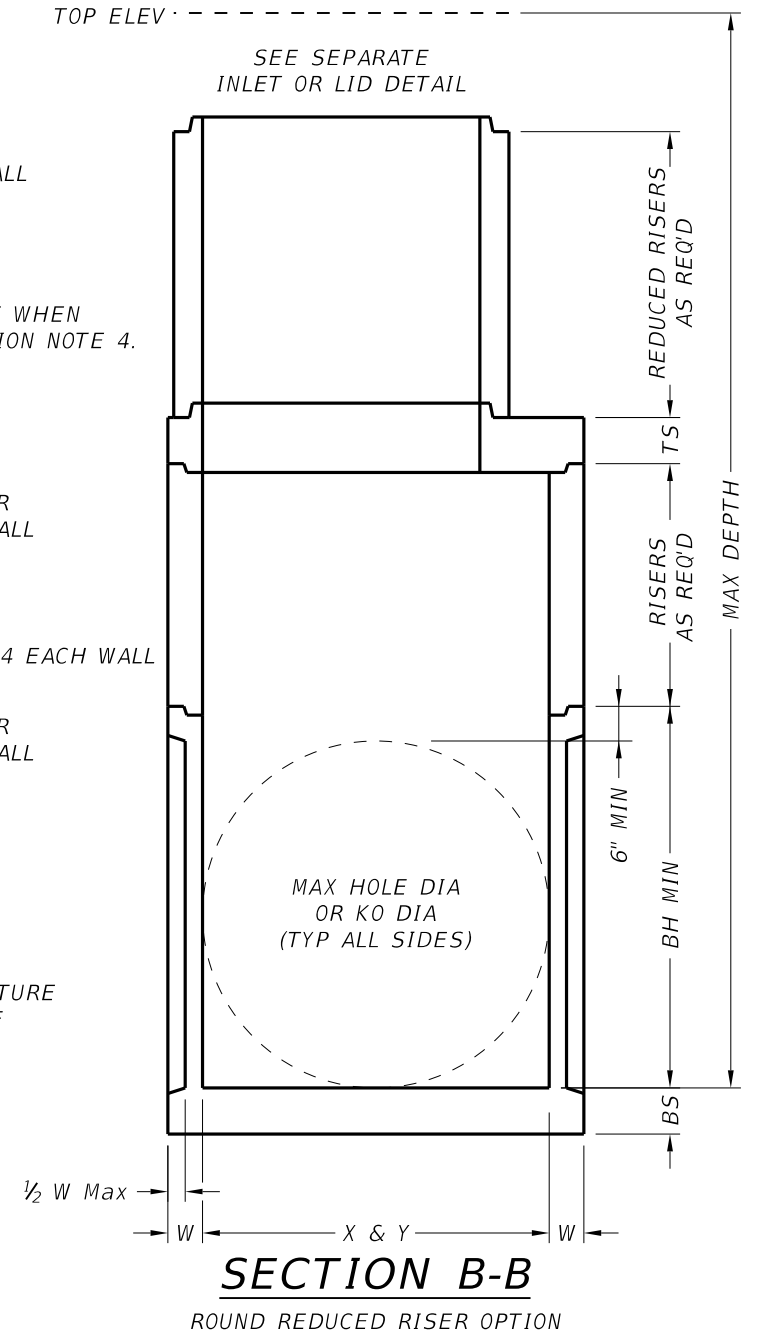
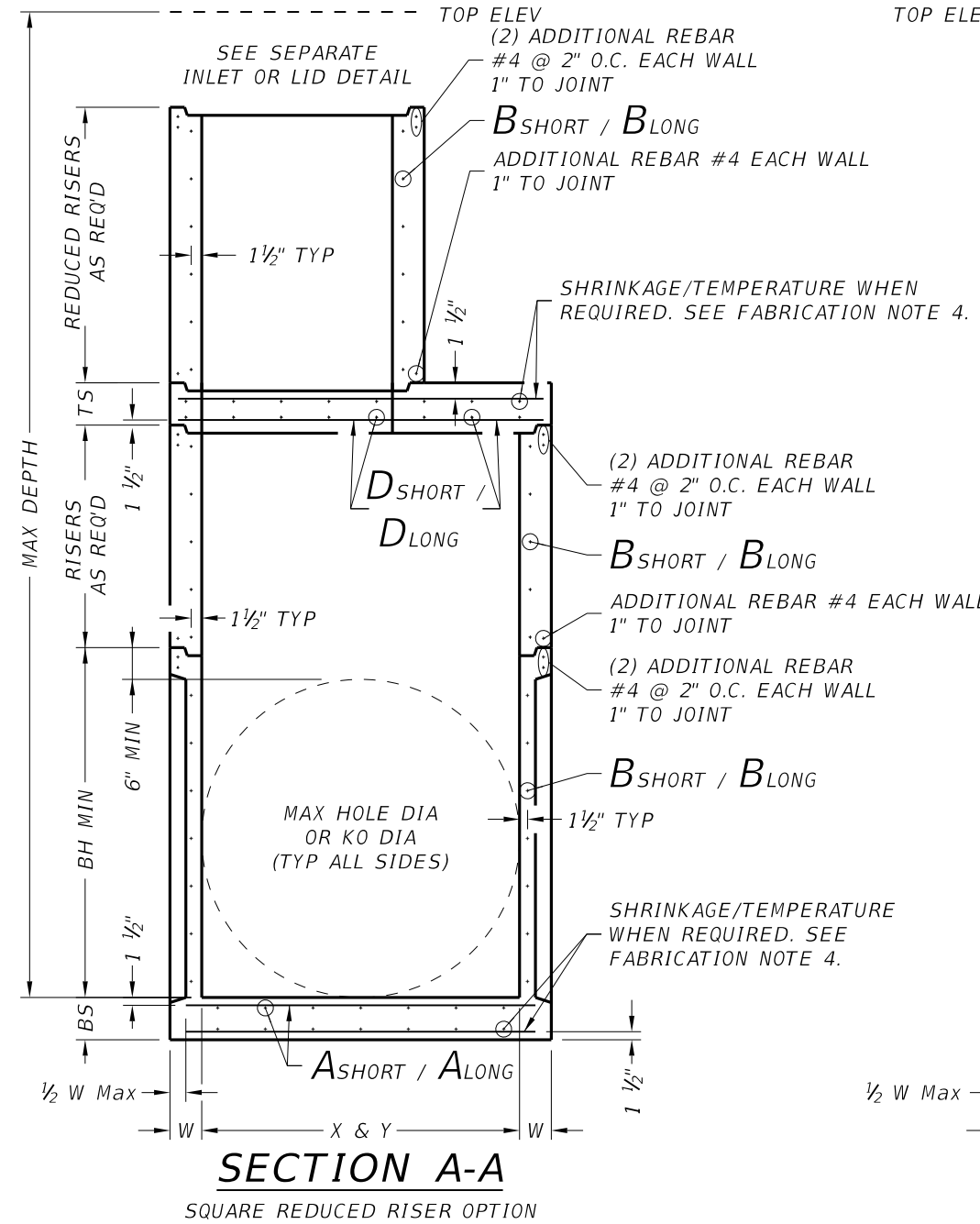
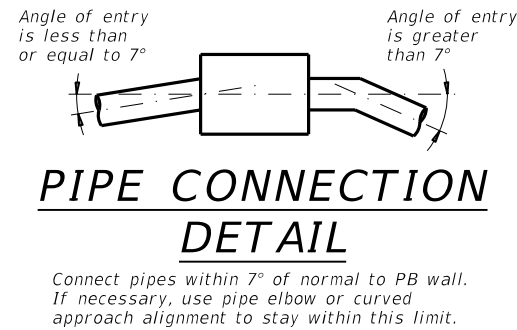
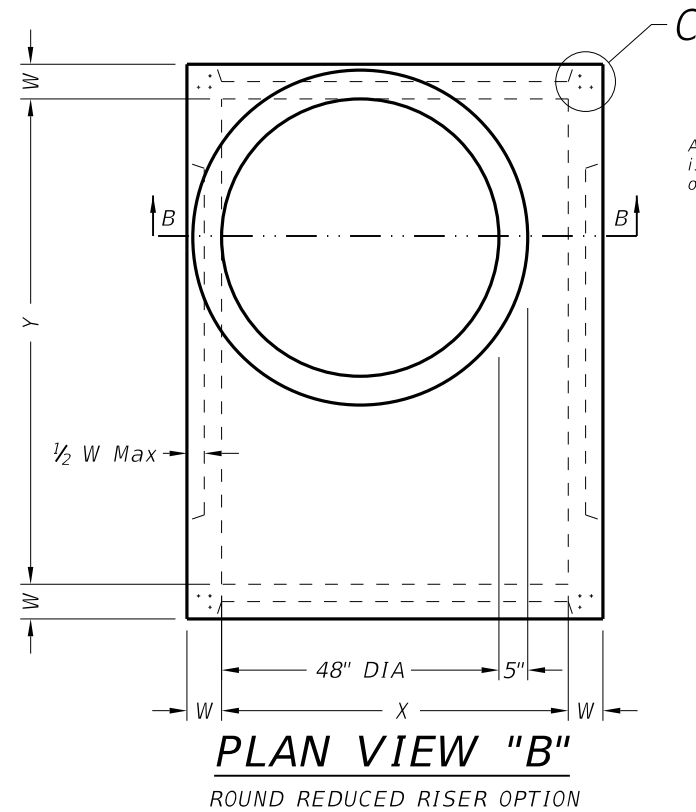
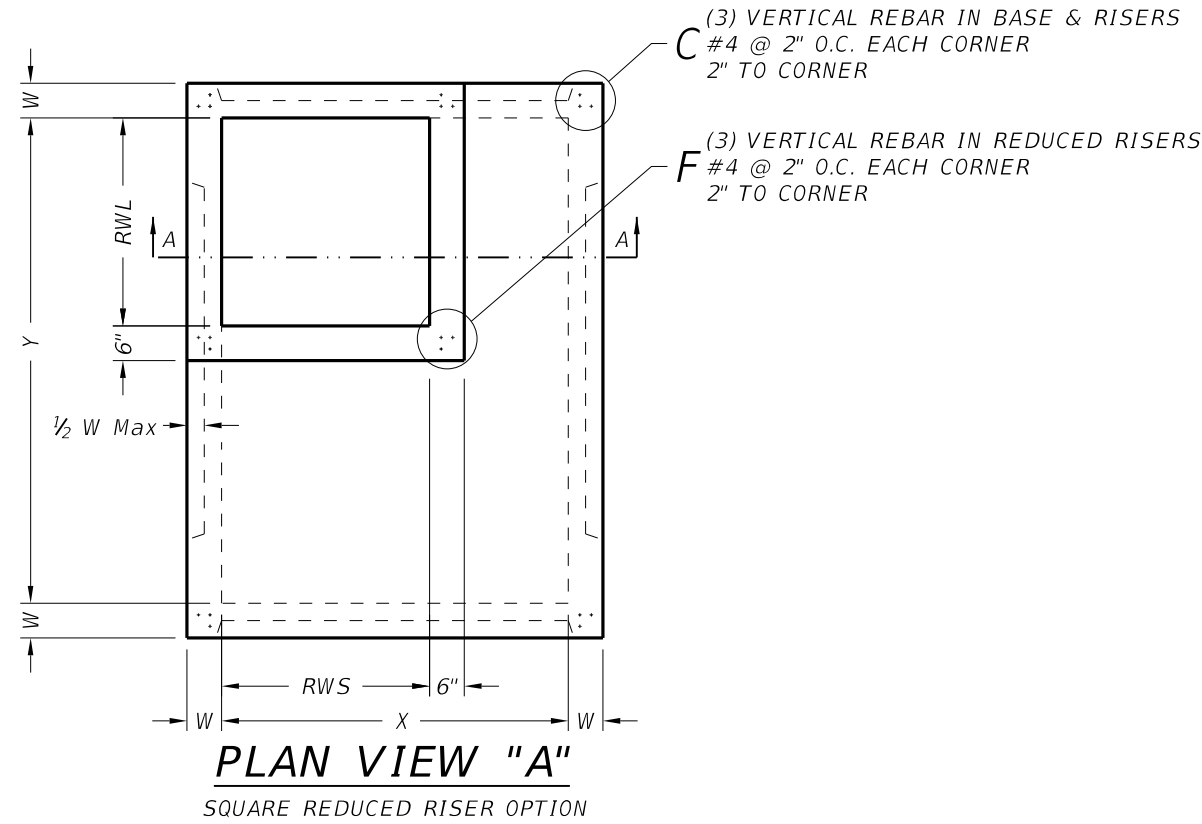
**Texas Department of Transportation**  
 Houston District

**CURB INLET TYPE C**  
 (WITH OR WITHOUT EXTENSION)

**HIL-C**

FILE: STDD1.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	STD:
© TxDOT Feb 2010	DIST	FED REG	PROJECT NO.	SHEET	
REVISIONS	HOUS	6	COUNTY	CONTROL SECT	JOB HIGHWAY
2/2010 Added note concerning opening on the back of inlet.	HARRIS	0110	05	127	IH45
10/2014 Removed Note 10					

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**FABRICATION NOTES:**

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 1/2" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

**INSTALLATION NOTES:**

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

**GENERAL NOTES:**

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING



**PRECAST BASE**

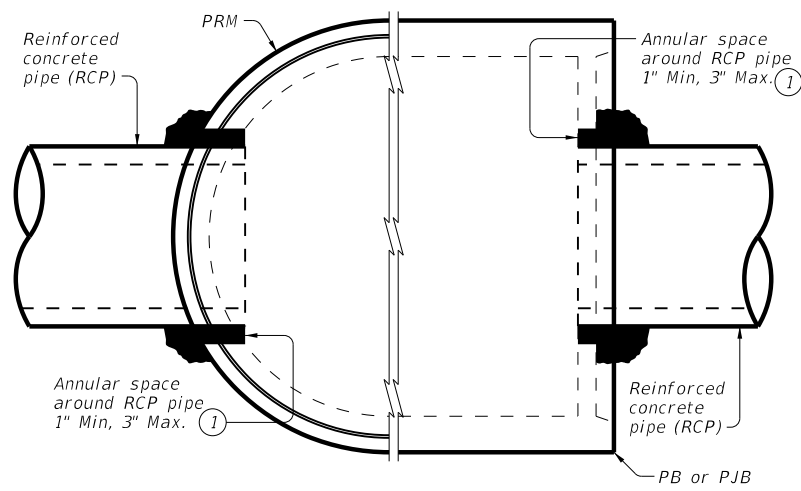
PB

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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
DIST	COUNTY		SHEET NO.	
HOU	HARRIS		66	

DATE:  
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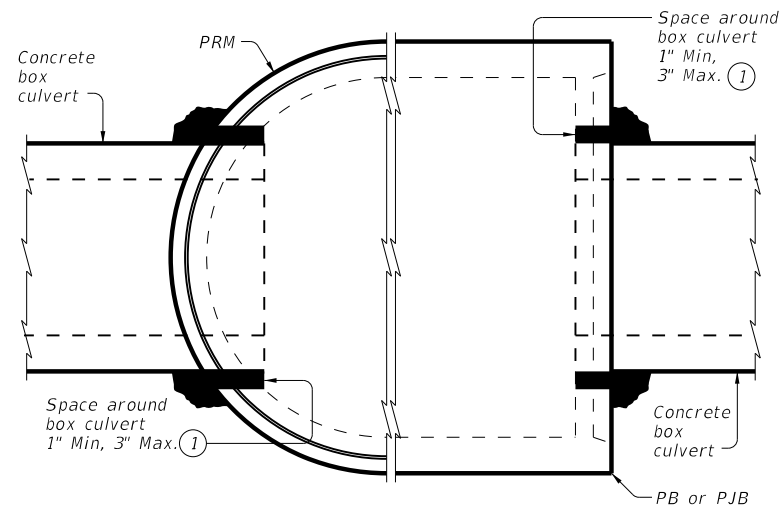
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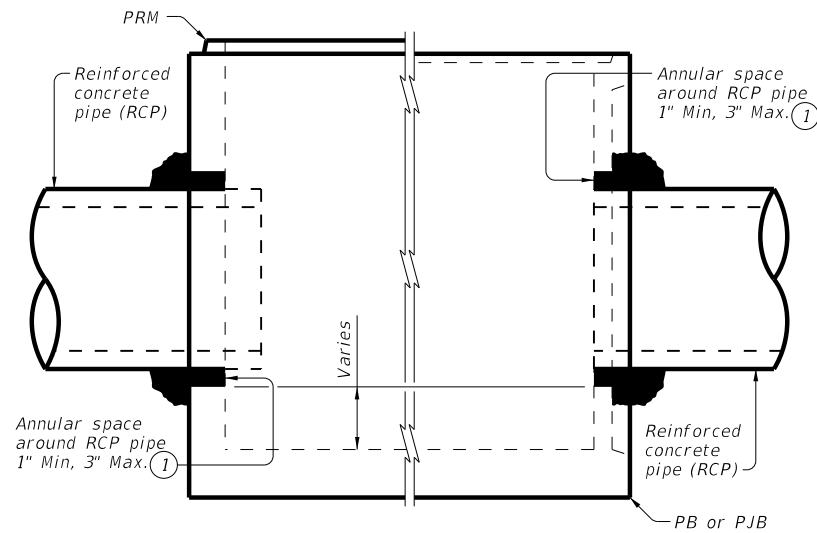
PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE  
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF PLAN



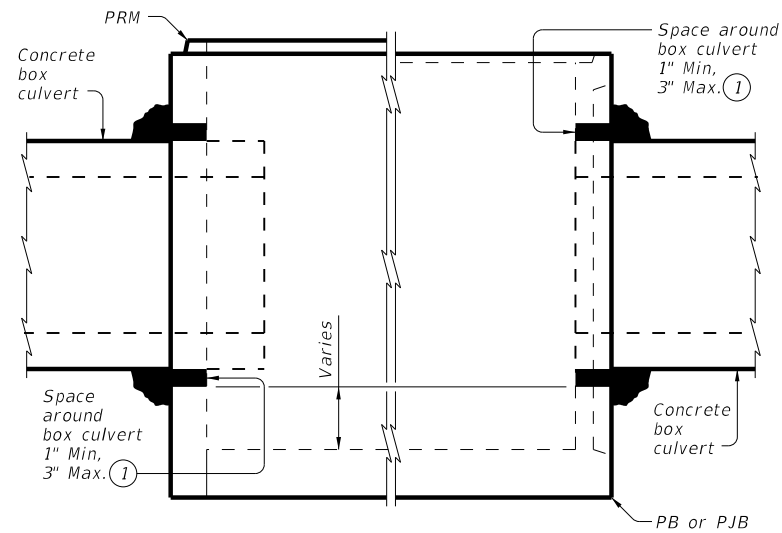
PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE  
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF PLAN



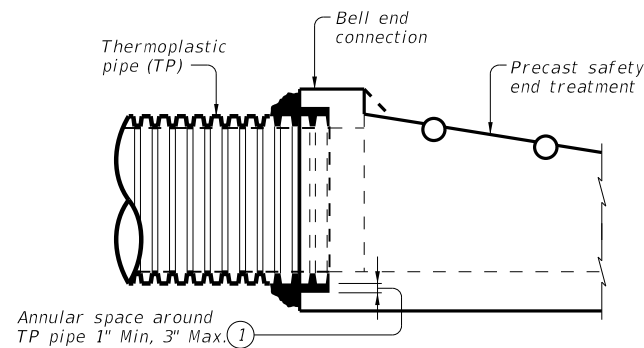
PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE  
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



PRECAST ROUND MANHOLE (PRM) WITH THROUGH-HOLE  
 PRECAST BASE (PB) OR PRECAST JUNCTION BOX (PJB) WITH THIN-WALL KNOCK-OUT

TYPICAL HALF ELEVATION



TYPICAL PARTIAL ELEVATION OF PRECAST SAFETY END TREATMENTS

Showing square PSET for parallel drainage, cross drainage shown similar.

① Completely fill the void between the precast structure and the connecting pipe or box with cementitious grouts and mortars in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

**CONSTRUCTION NOTES:**

Do not grout rubber gasket joints without Manufacturer's recommendations.  
 Do not use bricks, masonry blocks, native stone, or similar materials in conjunction with grouted connections when filling void spaces around pipes or box culverts.

**MATERIAL NOTES:**

Provide grouted connections in accordance with DMS-4675 "Cementitious Grouts and Mortars for Miscellaneous Application".

**GENERAL NOTES:**

See applicable standards for notes and details not shown:  
 Precast Base (PB)  
 Precast Junction Box (PJB)  
 Precast Round Manhole (PRM)  
 Precast Safety End Treatments C/D Square (PSET-SC)  
 Precast Safety End Treatments P/D Square (PSET-SP)  
 Provide Concrete Box Culverts in accordance with Item 462 "Concrete Box Culverts and Drains".  
 Provide Reinforced Concrete Pipe (RCP) in accordance with Item 464 "Reinforced Concrete Pipe".  
 Provide Thermoplastic Pipe (TP) in accordance with Special Specification Thermoplastic Pipe.  
 Payment for grouted connections is considered subsidiary to other bid items.

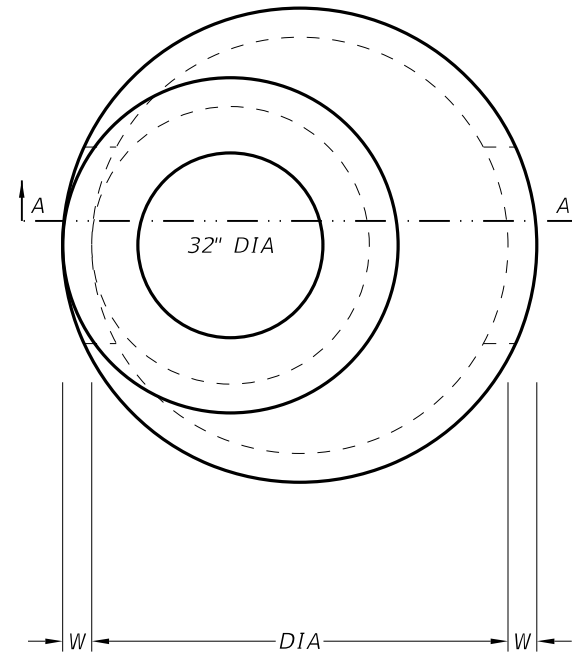
**PIPE AND BOX GROUTED CONNECTIONS FOR PRECAST STRUCTURES**

**PBGC**

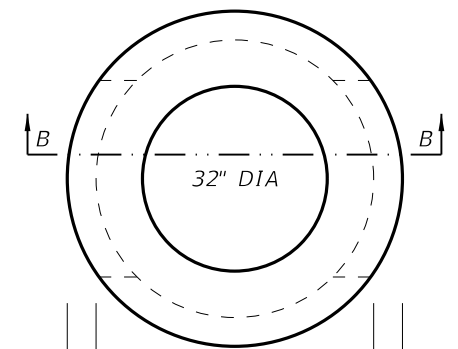
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©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	67	

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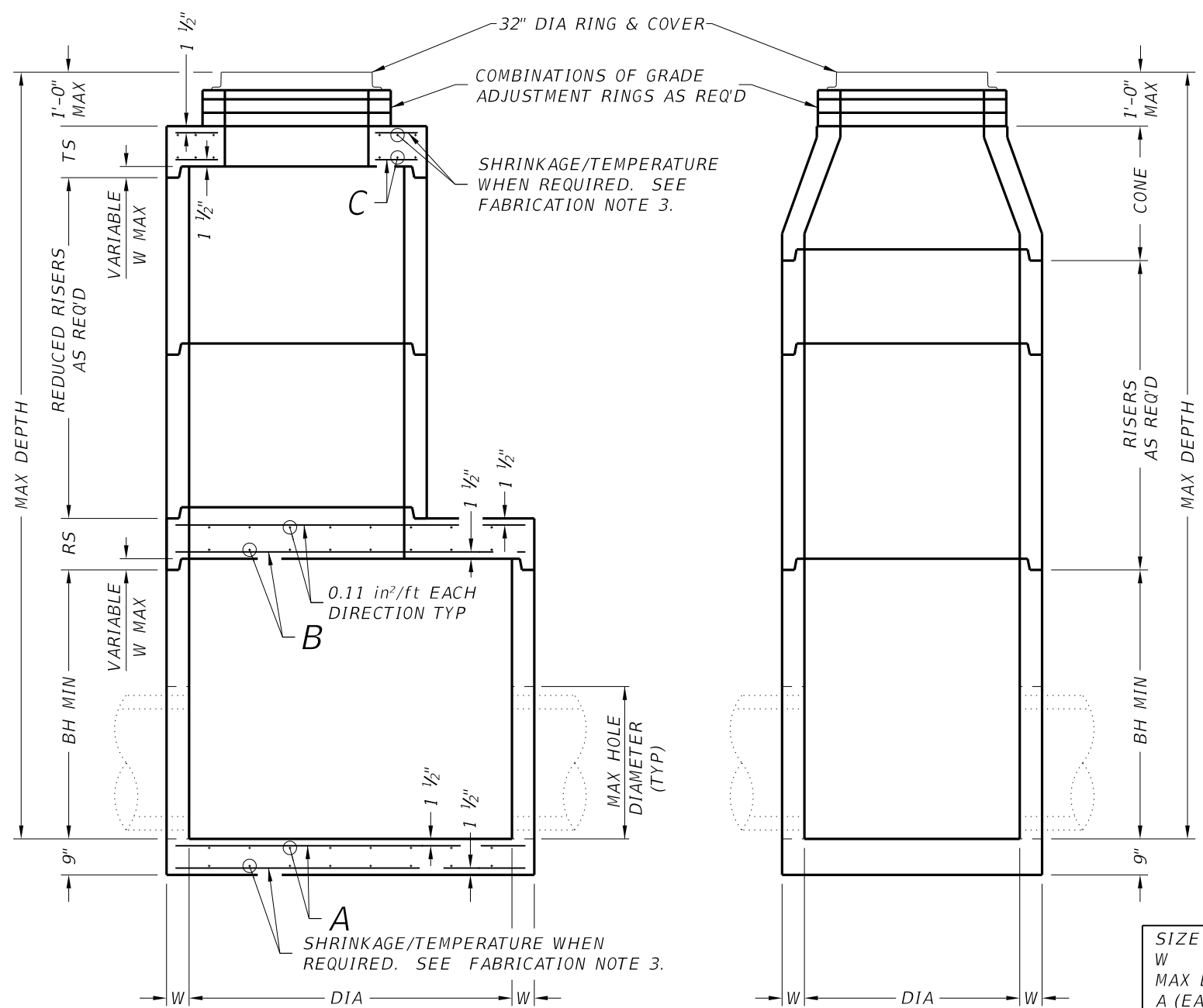
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PLAN VIEW "A"



PLAN VIEW "B"



SECTION A-A  
ROUND REDUCED RISER OPTION  
SHOWING FLAT SLAB TOP

SECTION B-B  
ROUND RISER OPTION  
SHOWING CONE

- FABRICATION NOTES:**
1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
  2. Provide Grade 60 reinforcing steel or equivalent area of WWR. Provide circumferential reinforcing steel in vertical walls of base, riser and cone in accordance with ASTM C478.
  3. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
  4. Manufacture base and risers to nearest 3" increment.
  5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
  6. Provide lifting devices in conformance with Manufacturer's recommendations.
  7. Provide cast iron solid cover, unless noted otherwise elsewhere in the plans.

- INSTALLATION NOTES:**
1. Cones may be concentric or eccentric. Reduction cones are acceptable. See Manufacturer for cone dimensions.
  2. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to this item.
  3. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
  4. Do not grout rubber gasket joints without Manufacturer's recommendation.
  5. Initial installation of grade adjustment rings is limited to 1'-0" Max as shown.
  6. Grade adjustment rings may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments may be made up to the Max depth shown. Structure must be evaluated if Max depth will be exceeded.

- GENERAL NOTES:**
1. Designed according to ASTM C478.
  2. Payment for manhole is per Item 465, "Junction Boxes, Manholes, and Inlets" by type and size.
  3. Pipe OD + placement tolerance must be equal or less than Max hole diameter. For rigid pipe, placement tolerance is 4" Max, 2" Min. For flexible pipe, consult boot/seal manufacturer's specification for placement tolerance.

Cover dimensions are clear dimensions, unless noted otherwise.

SIZE (DIA)	48 in	60 in	72 in
W	5 in	6 in	7 in
MAX DEPTH	25 ft	25 ft	25 ft
A (EACH WAY)	0.22 in <sup>2</sup> /ft	0.30 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
B (EACH WAY)	N/A	0.37 in <sup>2</sup> /ft	0.62 in <sup>2</sup> /ft
C (EACH WAY)	0.24 in <sup>2</sup> /ft	0.46 in <sup>2</sup> /ft	0.46 in <sup>2</sup> /ft
BH MIN	12 in	36 in	36 in
TS	9 in	9 in	9 in
RS	N/A	9 in	12 in
REDUCED RISER DIA	N/A	48 in	48/60 in
MAX HOLE DIA	32 in	40 in	54 in

HL93 LOADING



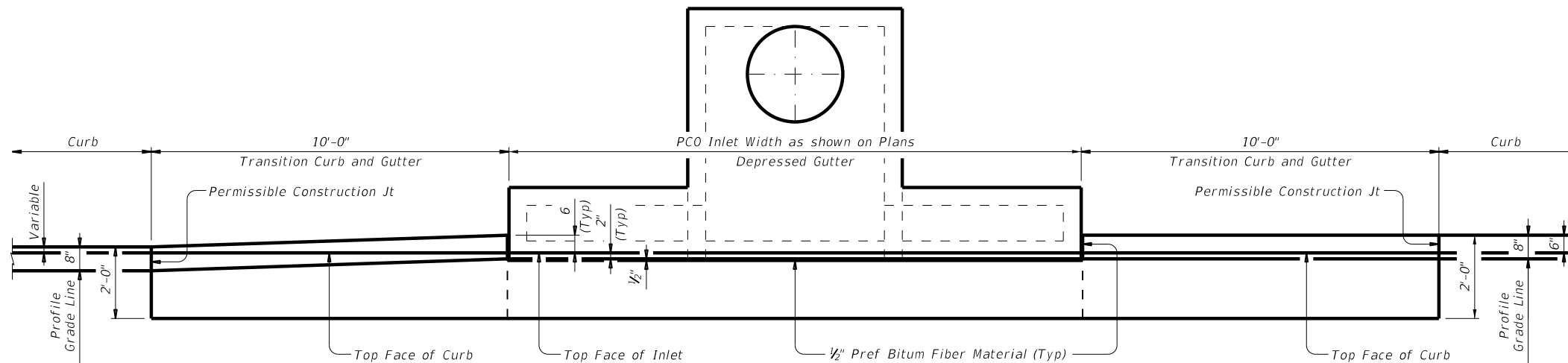
PRECAST ROUND MANHOLE

PRM

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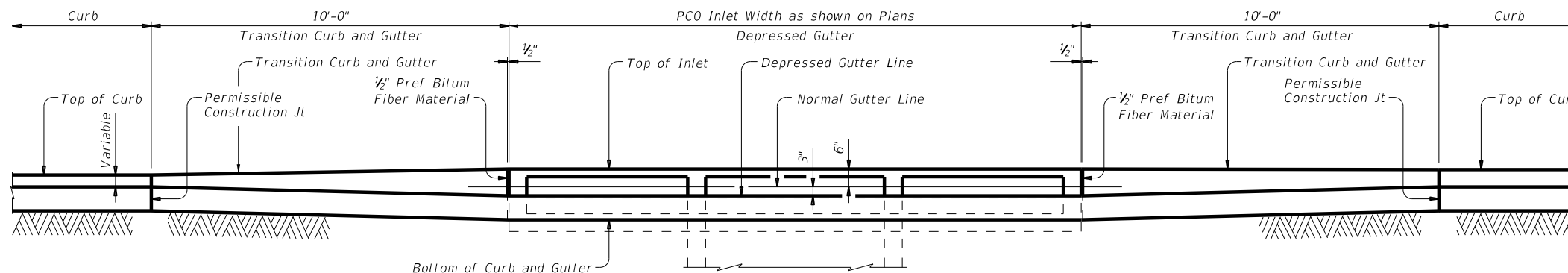
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SHOWING TYPE I, IIa & III Curb and Gutter

SHOWING TYPE II & IV Curb and Gutter

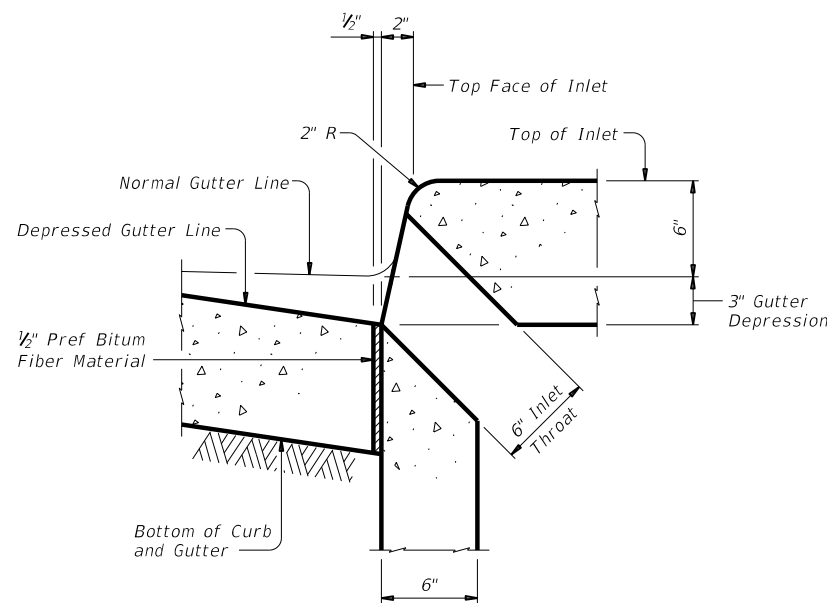
PLAN



SHOWING TYPE I, IIa & III Curb and Gutter

SHOWING TYPE II & IV Curb and Gutter

ELEVATION



SECTION AT GUTTER AND INLET

Reinforcing steel not shown for clarity.

**CONSTRUCTION NOTES:**  
 Align top face of curb with PCO Inlet as shown.

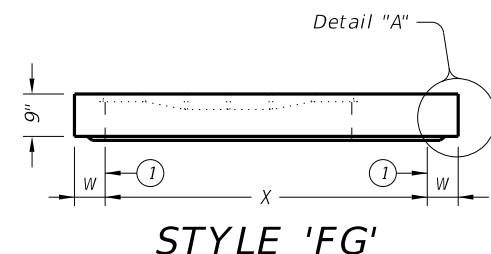
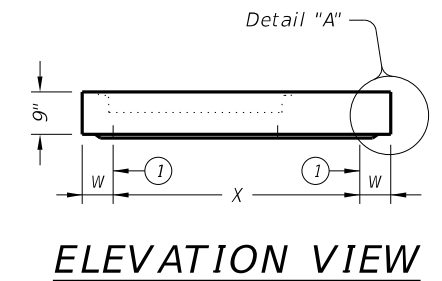
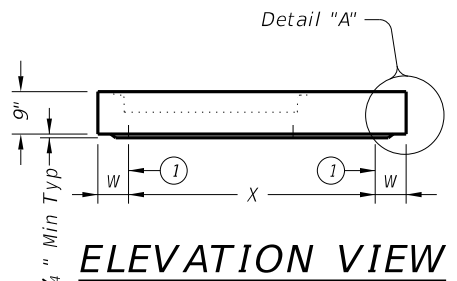
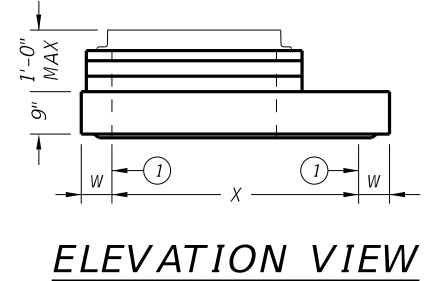
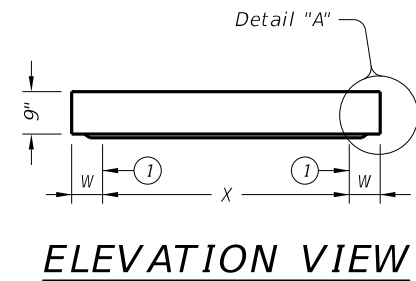
**MATERIAL NOTES:**  
 Provide 1/2" Preformed Bituminous Fiber Material.

**GENERAL NOTES:**  
 See Precast Curb Inlet Outside Roadway (PCO) standard for details and notes not shown.  
 See Concrete Curb and Curb and Gutter (CCCG-12) standard for details and notes not shown.  
 Curb and Gutter Transitions is paid for and in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."  
 Preformed Bituminous Fiber Material is subsidiary to PCO Inlet.

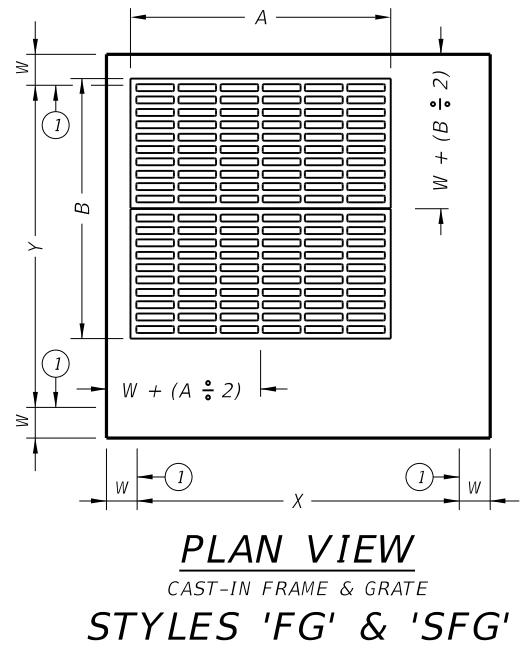
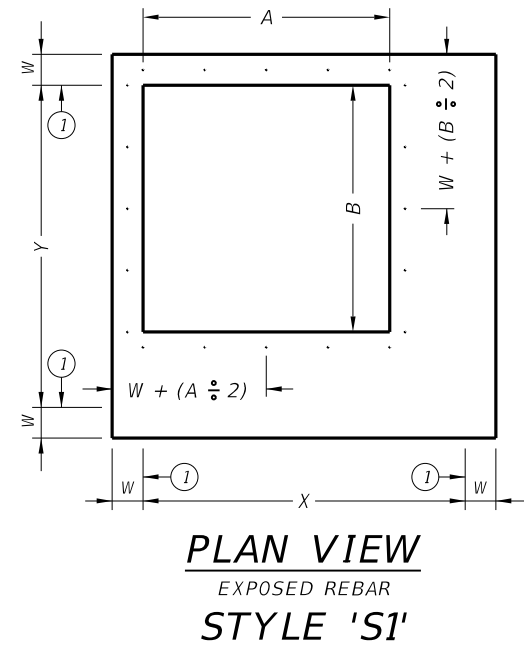
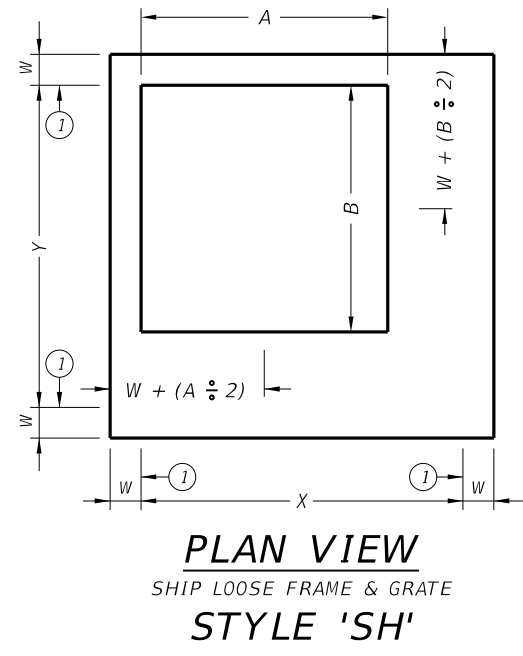
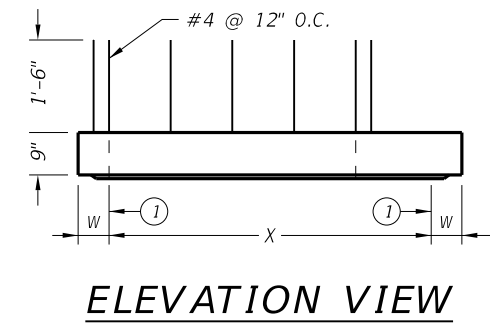
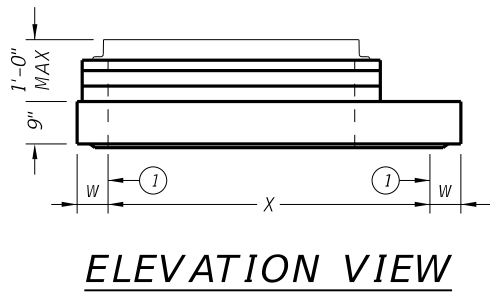
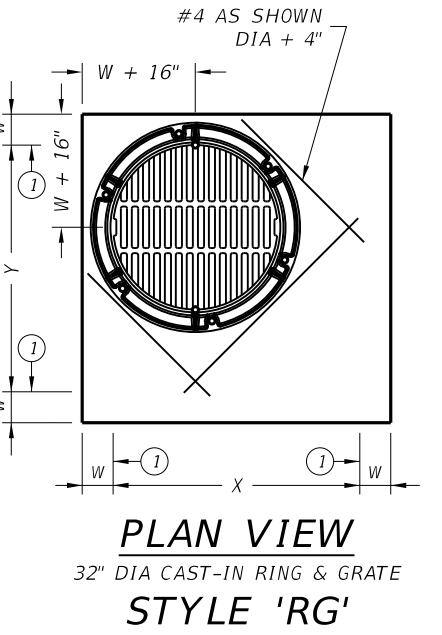
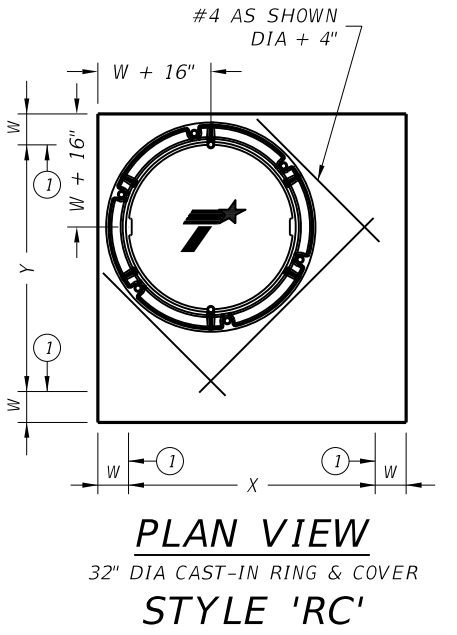
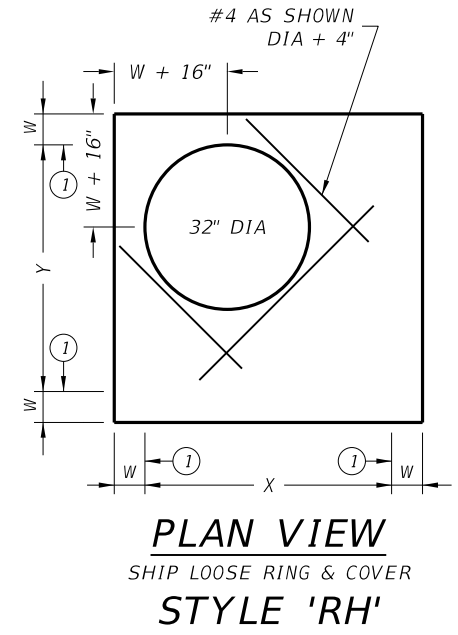
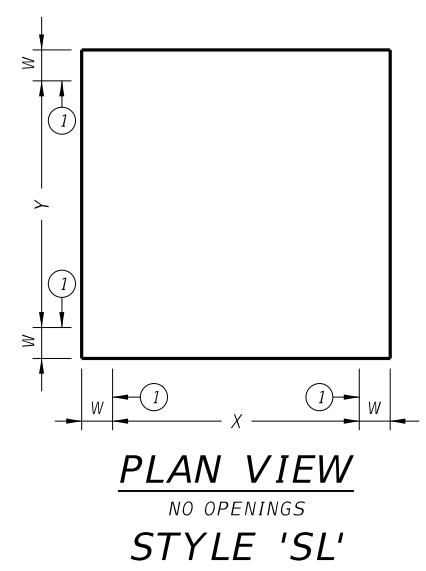
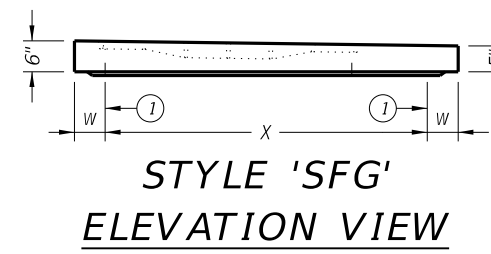
				Bridge Division Standard	
<b>CURB AND GUTTER TRANSITION DETAILS FOR PCO INLET</b>					
<b>CGT-PCO</b>					
FILE: prest13-20.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES	
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REVISIONS	0110	05	127	IH 45	
	DIST	COUNTY	SHEET NO.		
	HOU	HARRIS	69		

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ORIENT TAPER TO CORRESPOND WITH ROADWAY CROSS-SLOPE.



① Matches inside face of wall of precast base or riser below inlet.

HL93 LOADING		SHEET 1 OF 2	
		Bridge Division Standard	
<b>PRECAST SLAB LID</b>			
<b>PSL</b>			
FILE: prest05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT February 2020	CONT	SECT	HIGHWAY
REVISIONS	0110	05	127 IH 45
DIST	COUNTY	SHEET NO.	
HOU	HARRIS	70	

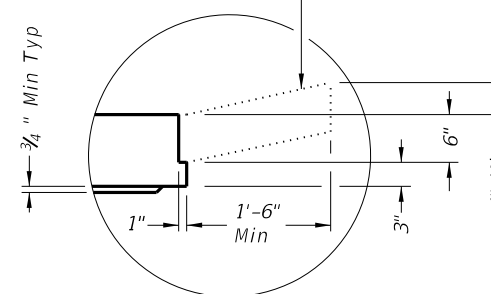
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Style	Size (X x Y)	W <sup>②</sup>	A x B (nominal)	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	6"	n/a	0.37 in <sup>2</sup> /ft	0.37 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	3'x3'	6"	3'x3' or 32" Dia	0.37 in <sup>2</sup> /ft	0.37 in <sup>2</sup> /ft
SFG	3'x3'	6"	3'x3'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	4'x4'	6"	n/a	0.34 in <sup>2</sup> /ft	0.34 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	4'x4'	6"	3'x3' or 32" Dia	0.41 in <sup>2</sup> /ft	0.41 in <sup>2</sup> /ft
SH,S1,FG	4'x4'	6"	4'x4'	0.41 in <sup>2</sup> /ft	0.41 in <sup>2</sup> /ft
SFG	4'x4'	6"	4'x4'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	3'x5'	6"	n/a	0.39 in <sup>2</sup> /ft	0.39 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	3'x5'	6"	3'x3' or 32" Dia	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SH,S1,FG	3'x5'	6"	3'x5'	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SFG	3'x5'	6"	3'x5'	0.32 in <sup>2</sup> /ft	0.32 in <sup>2</sup> /ft
SL	4'x5'	6"	n/a	0.42 in <sup>2</sup> /ft	0.42 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	4'x5'	6"	3'x3' or 32" Dia	0.42 in <sup>2</sup> /ft	0.42 in <sup>2</sup> /ft
SH,S1,FG	4'x5'	6"	4'x4'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SH,S1,FG	4'x5'	6"	3'x5'	0.66 in <sup>2</sup> /ft	0.66 in <sup>2</sup> /ft
SL	5'x5'	6"	n/a	0.36 in <sup>2</sup> /ft	0.36 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	5'x5'	6"	3'x3' or 32" Dia	0.43 in <sup>2</sup> /ft	0.43 in <sup>2</sup> /ft
SH,S1,FG	5'x5'	6"	4'x4'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SH,S1,FG	5'x5'	6"	3'x5'	0.63 in <sup>2</sup> /ft	0.63 in <sup>2</sup> /ft
SL	5'x6'	6"/8"	n/a	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	5'x6'	6"/8"	3'x3' or 32" Dia	0.48 in <sup>2</sup> /ft	0.48 in <sup>2</sup> /ft
SH,S1,FG	5'x6'	6"/8"	4'x4'	0.60 in <sup>2</sup> /ft	0.60 in <sup>2</sup> /ft
SH,S1,FG	5'x6'	6"/8"	3'x5'	0.60 in <sup>2</sup> /ft	0.60 in <sup>2</sup> /ft
SL	6'x6'	6"/8"	n/a	0.43 in <sup>2</sup> /ft	0.43 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	6'x6'	6"/8"	3'x3' or 32" Dia	0.56 in <sup>2</sup> /ft	0.56 in <sup>2</sup> /ft
SH,S1,FG	6'x6'	6"/8"	4'x4'	0.56 in <sup>2</sup> /ft	0.56 in <sup>2</sup> /ft
SH,S1,FG	6'x6'	6"/8"	3'x5'	0.59 in <sup>2</sup> /ft	0.59 in <sup>2</sup> /ft
SL	8'x8'	8"/10"	n/a	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
RH,RC,RG,SH,S1,FG	8'x8'	8"/10"	3'x3' or 32" Dia	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
SH,S1,FG	8'x8'	8"/10"	4'x4'	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft
SH,S1,FG	8'x8'	8"/10"	3'x5'	0.45 in <sup>2</sup> /ft	0.45 in <sup>2</sup> /ft

② See sheet PDD for corresponding wall thickness (W) of base unit or riser.

Construct cast-in-place reinforced concrete apron, when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PSL. Apron is 1'-6" Min width around precast zone drain.



**DETAIL "A"**

(Reinforcing not shown for clarity)  
 When an apron is to be cast around PSL, use detail above to create an apron ledge on all 4 sides.

**FABRICATION NOTES:**

1. Locate penetration (Style 'RH'), ring and cover (Style 'RC'), ring and grate (Style 'RG'), and frame and grate (Style 'FG') in a corner. Only one penetration is allowed per slab lid.
2. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
3. Provide Grade 60 reinforcing steel or equivalent area of WWR.
4. Provide clear cover of 3/4" to reinforcing from lower outside shoulder of slab for structural reinforcement, and 2" from top of slab for shrinkage and temperature reinforcement. Place short span reinforcing closest to surface.
5. Slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing. Provide steel area = 0.11 in<sup>2</sup>/ft each way.
6. No substitution is allowed for diagonal #4 bars around openings.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is 3/4".
8. Provide lifting devices in conformance with Manufacturer's recommendations.

**INSTALLATION NOTES:**

1. Precast slab lids are intended for direct traffic and may be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or 1/2 the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. Initial installation of grade adjustment rings for Styles 'RH' and 'SH' is limited to 1'-0" Max as shown.
5. Grade adjustment rings for Styles 'RH' and 'SH' may be increased to 2'-0" Max when future construction affects final grade of structure. Make adjustments greater than 2'-0" with additional risers. Adjustments can be made up to Max depth shown on sheet PDD. Structure must be evaluated if Max depth will be exceeded.
6. Orient long dimension of grate slots perpendicular to traffic, unless noted otherwise on plans.

**GENERAL NOTES:**

1. Designed according to ASTM C913.
2. Payment for lid is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

SHEET 2 OF 2

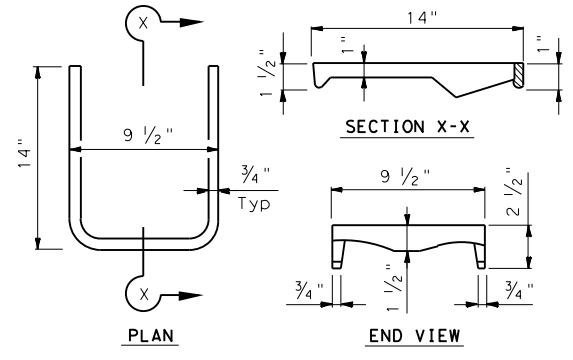
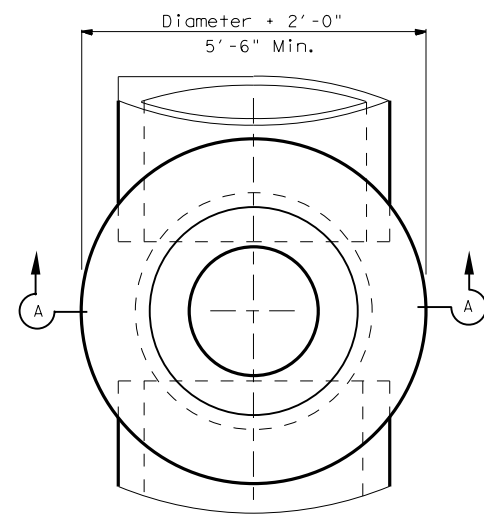


**PRECAST SLAB LID**

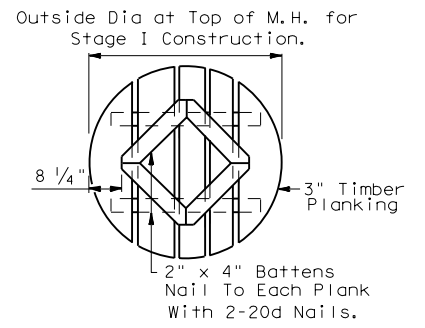
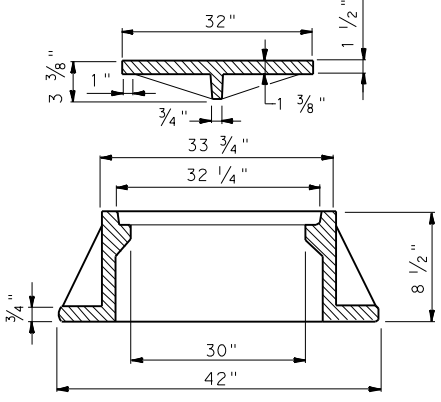
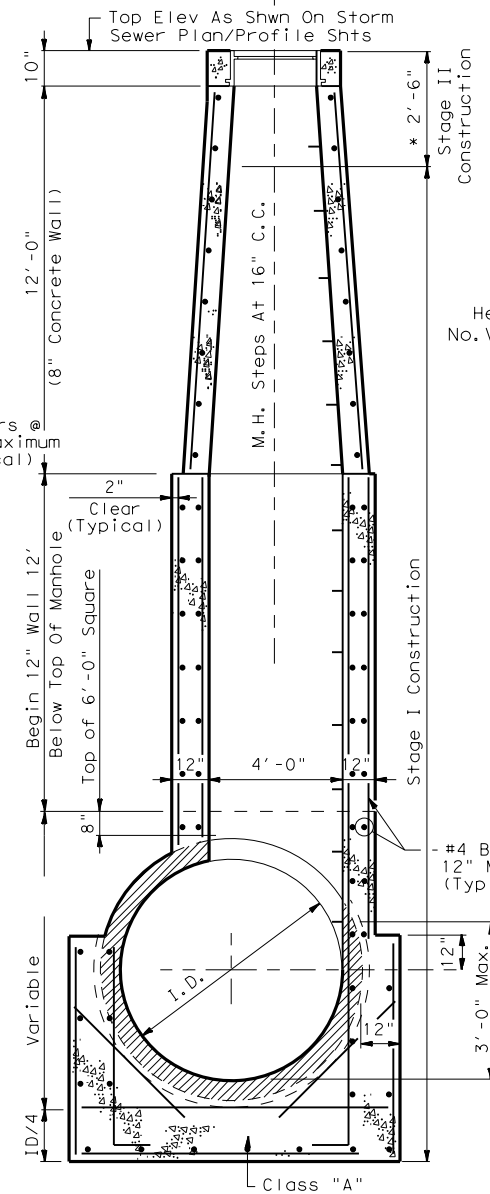
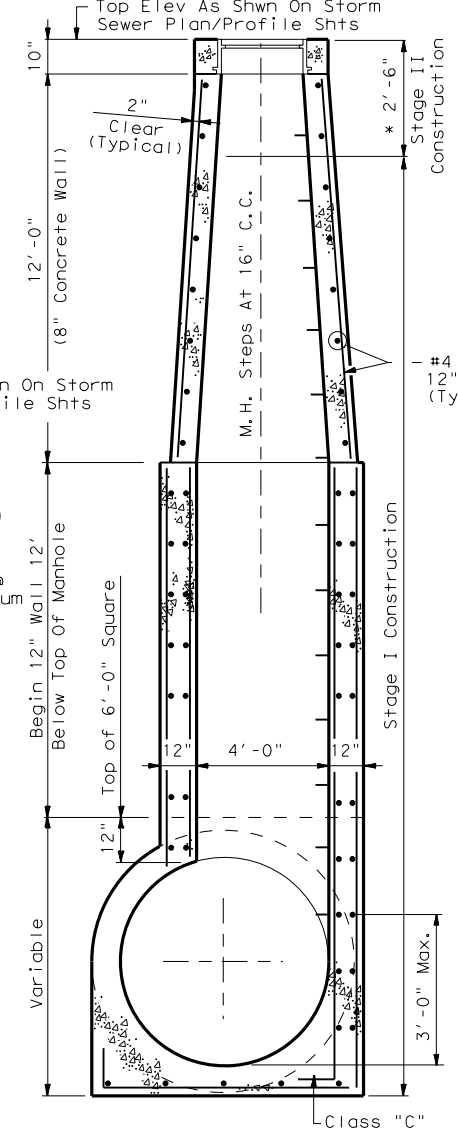
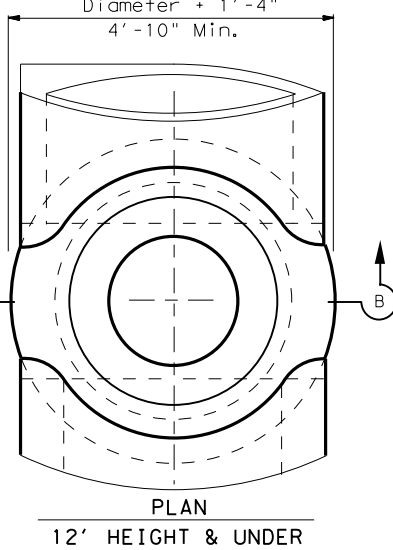
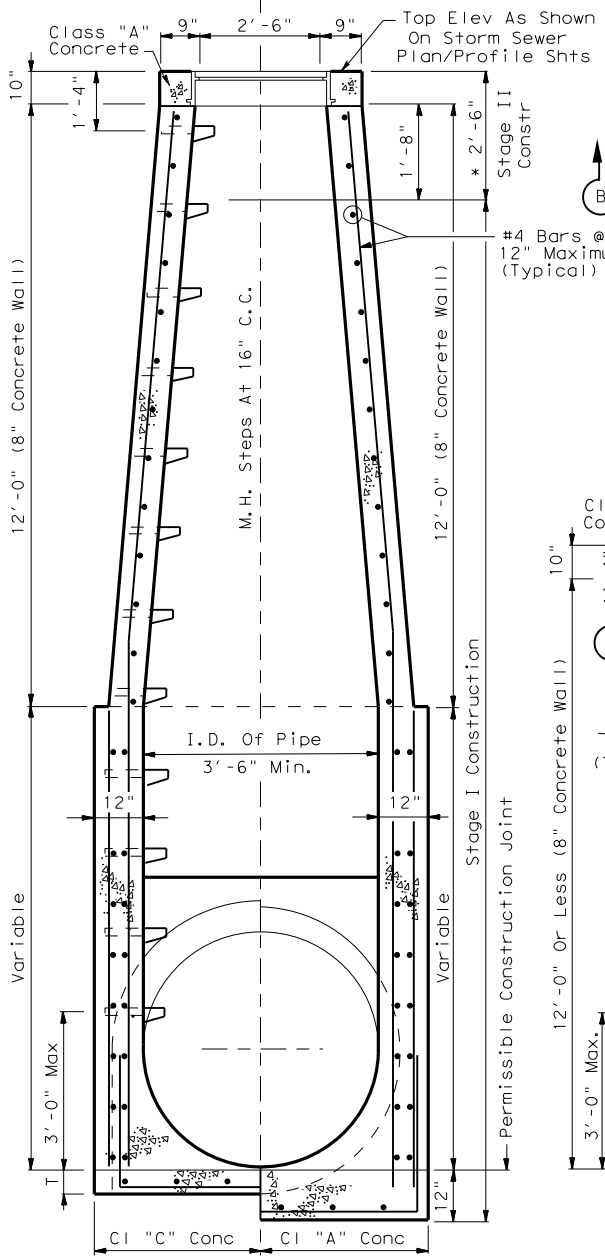
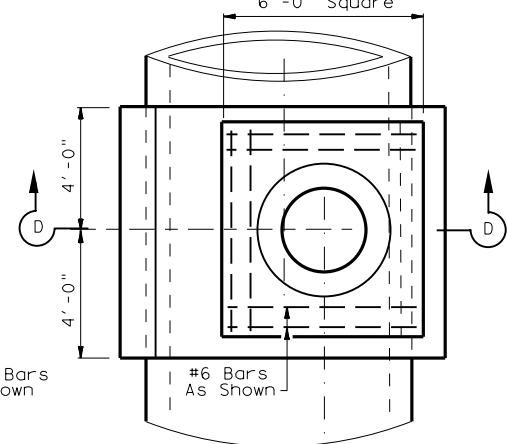
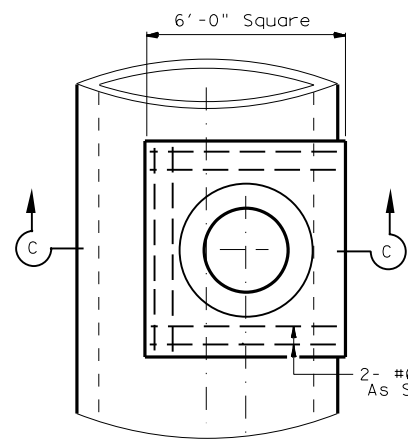
**PSL**

FILE: prest05-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH 45
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	71	

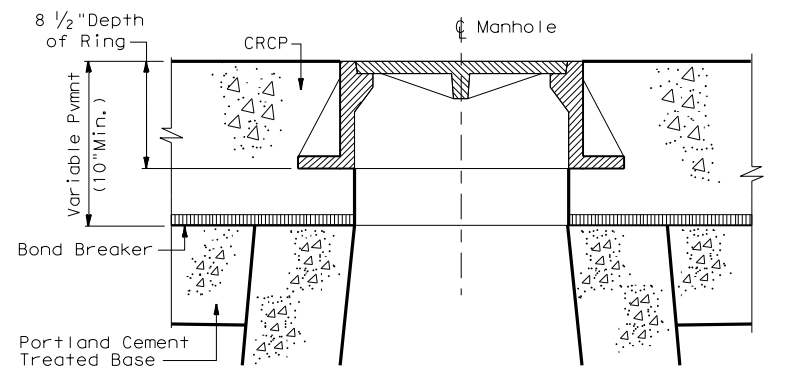
p:\t\projectwiseonline.com:TXDOT3\Documents\12 - HOU\Design Projects\0110051274 - Design\Plan Set\Standards\DRAINAGE STANDARDS\MH-A B HOU DIST.dgn



**CAST IRON MANHOLE STEPS**  
(In Stock Locally)



Heavy Duty 30" ID Ring as Required. Vulcan No. V-1419 w/ribbed cover, Neenah No. R1740-BTX



**RING AND COVER CAST MONOLITHICALLY WITH PAVEMENT**

FOR DIRECT TRAFFIC



**MANHOLES TYPE A & B**  
**MH-A/B**

FILE: STDD10.DGN	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT	STD:
© TXDOT December 2006	DIST: HOU	FED REG: 6	PROJECT NO.:	SHEET 72	
REVISIONS		COUNTY		CONTROL	SECT
3/15 MINOR CORRECTIONS		HARRIS		0110	05
		JOB		127	HIGHWAY
					IH45

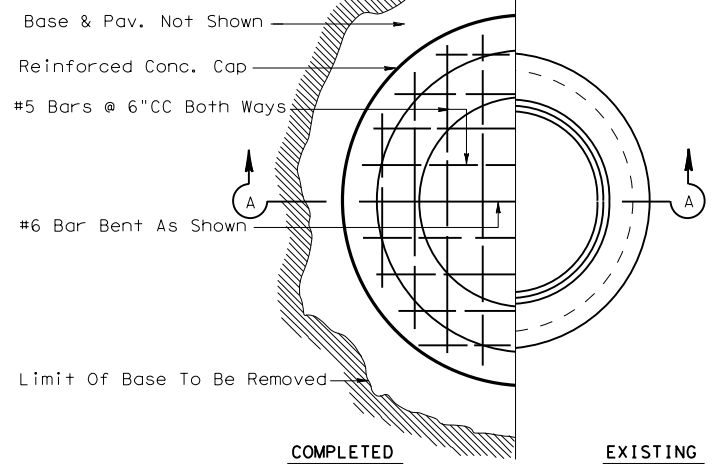
d = Diameter  
R = Radius

**MANHOLE - TYPE A**  
FOR PIPES 54" AND SMALLER

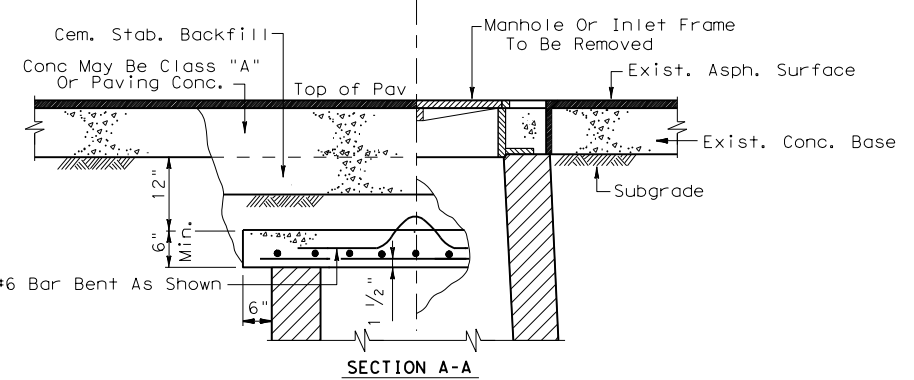
**MANHOLE - TYPE B**  
FOR PIPES 60" AND LARGER



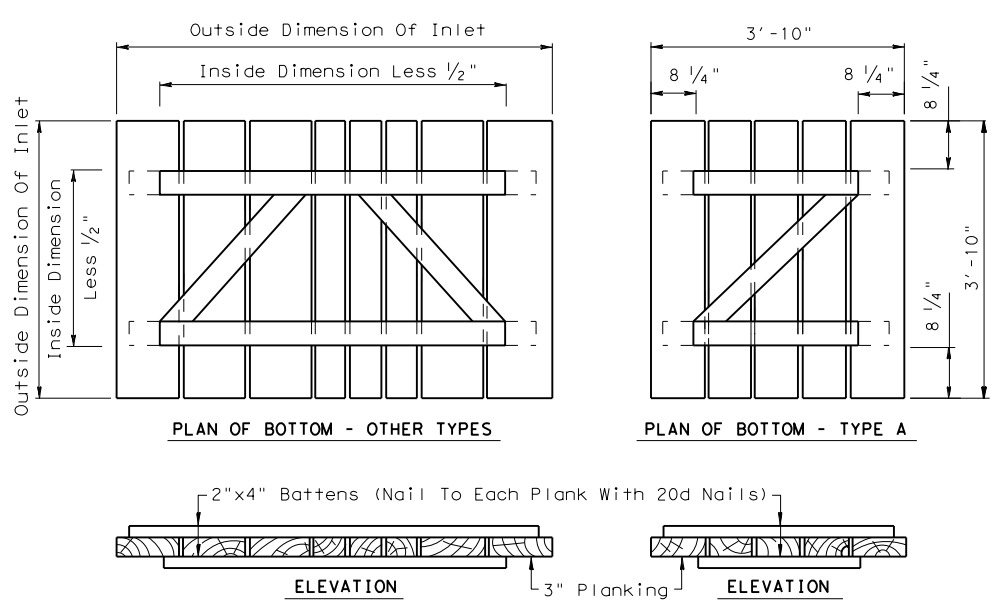
Note: No Conc Or Cem Stab Bkfl Required In Graded Areas.



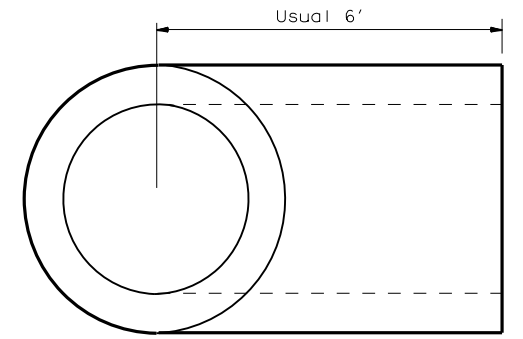
Note: Reinforced Conc. Cap Shall Be Precasted & Properly Cured Before Placing in Position.



**DETAIL SHOWING METHOD OF CAPPING ABANDONED MANHOLES OR INLETS (GRADED OR PAVED AREAS)**

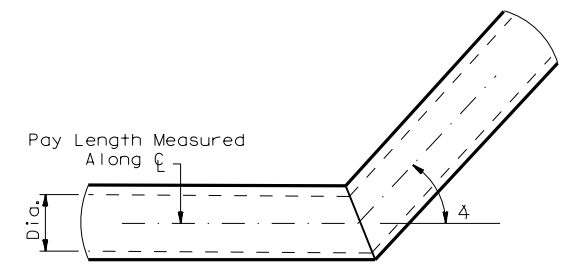


**TEMPORARY COVERS FOR ALL TYPES OF INLETS**



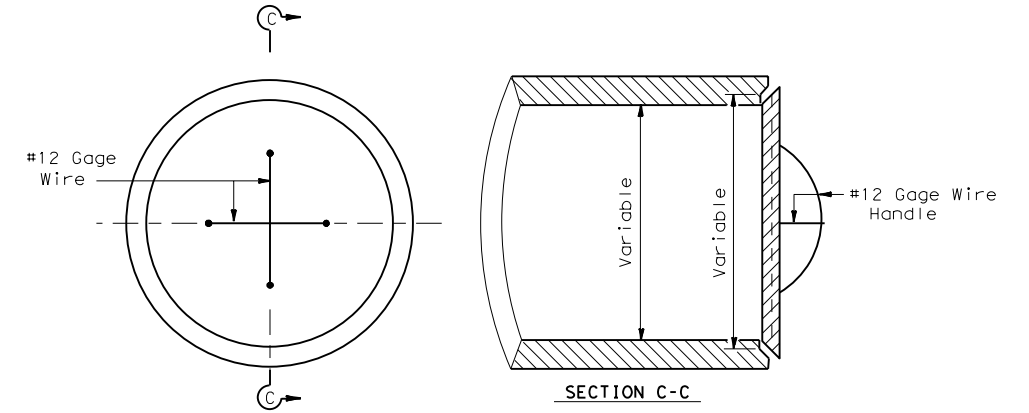
Note: Jointing Material Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Material For Tees Shall Conform To Requirements Of Item "Reinforced Concrete Pipe." Payment For Tee To Be In Accordance With Item "Reinforced Concrete Pipe."

**PRECAST STORM SEWER TEE**



**BENDING DETAIL**

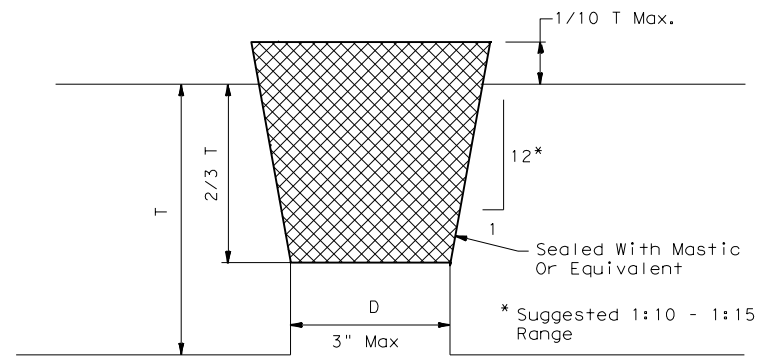
Note: Bending Of Proposed Pipe Sewer Or RCP In A Vertical & /Or Horizontal Plane Shall Be Accomplished By The Use Of A "Pipe Collar" Or A "Precast Elbow", As Approved By The Engineer. Price Of "Pipe Collar" Or, "Precast Elbow" Shall Be Subsidiary To The Unit Prices Bid For Item Reinforced Concrete Pipe. Pay Length Measurement To Be Along Horizontal C & Horizontal Plane Of Pipes.



Note: The Price Of Plug Shall Be Subsidiary To The Unit Bid Price For Pipe Sewer Or RCP. Mortar Joints To Be Used As Directed By The Engineer. Removal Of The Existing Plugs For Storm Sewer Or RCP Conns. Shall Be Considered Incidental To Item "Excavation And Backfill For Structures."

Concrete Plug For End Of Pipe Culvert Or Sewer

**CONCRETE PLUG FOR PIPE**

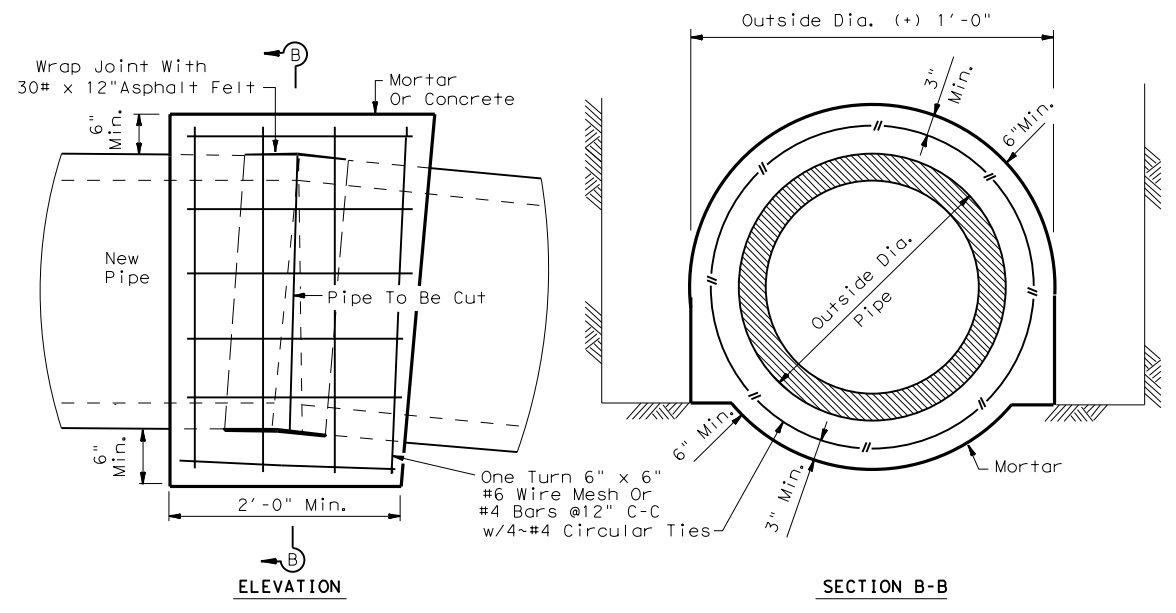


T = Wall Thickness On Top Of Box Or Pipe  
D = Diameter Of Lifting Hole

Minimum Length Of Plug Is 2/3 T +/-  
Minimum Diameter At Bottom Of Plug = D - 1/8"  
Maximum 1/10 T Of Plug Not Seated In Lifting Hole

Note: The Plug Shall Be Cast With The Same Taper As The Lifting Hole.

**DETAIL OF PLUG FOR LIFTING HOLES IN RCB AND RCP**



**PIPE COLLAR DETAIL**

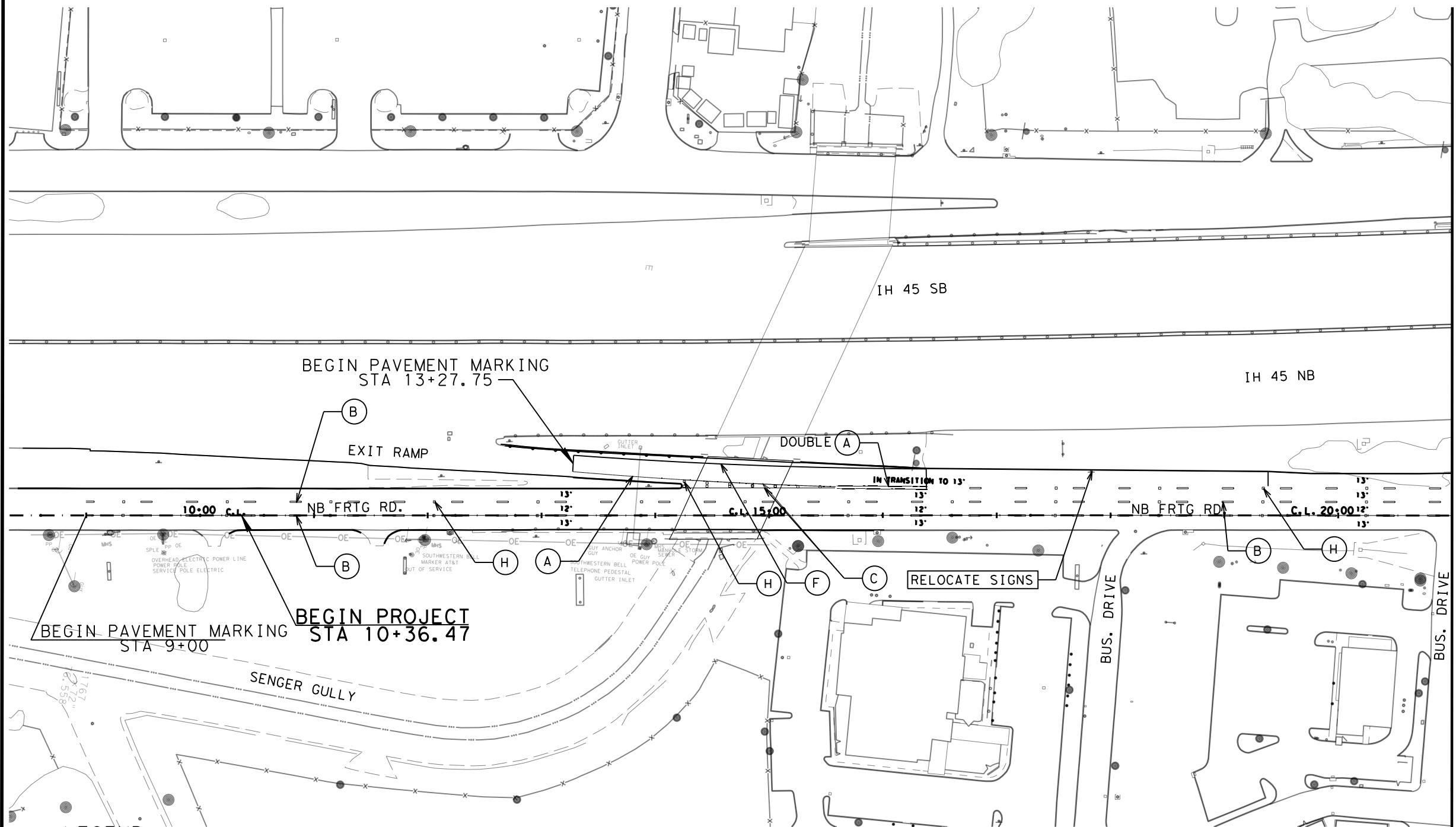
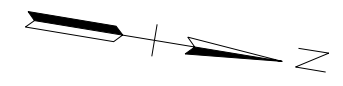
For Horizontal Or Vertical Placement

d = Diameter  
R = Radius

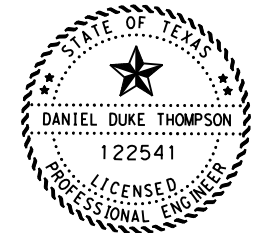
**MISCELLANEOUS SEWER DETAILS**

MSD

FILE: STDD11.DGN	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK:
© TxDOT Mar 2004	DISTRICT: HOU	FED REG: 6	PROJECT NO.:	SHEET: 73
REVISIONS: 3/2015 2014 Specs	COUNTY: HARRIS	CONTROL: 0110	SECT: 05	JOB: 127
				HIGHWAY: IH 45



STA. 21+00.00



*Daniel Duke Thompson*  
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**IH 45  
 AT CYPRESSWOOD DR.  
 PAVEMENT MARKING  
 AND SIGNING LAYOUT**

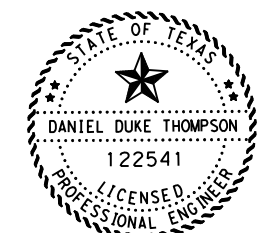
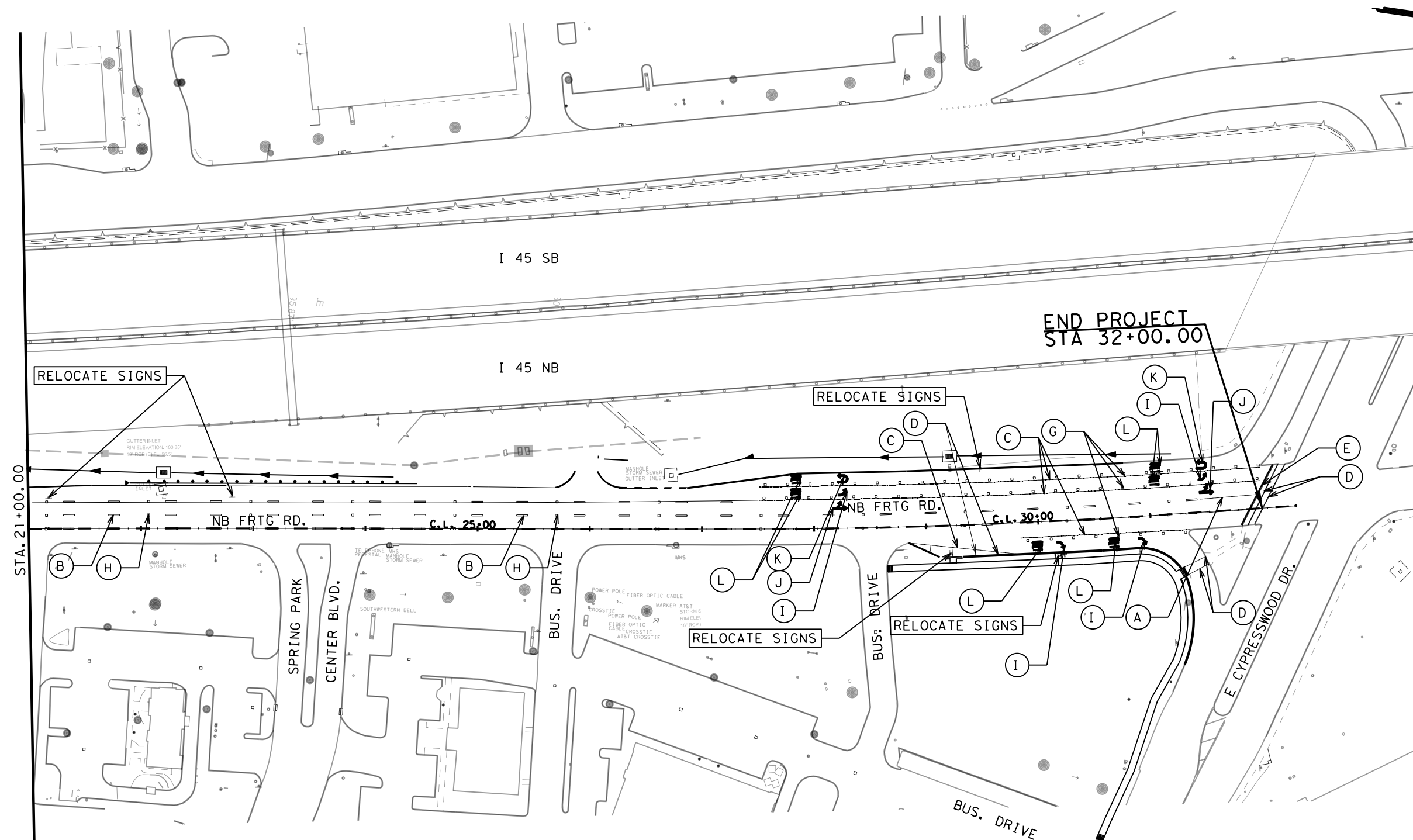
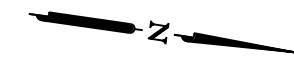
**LEGEND:**

- Ⓐ MULTIPOLYMER PAV MRK (W) (6") (SLD)
- Ⓑ MULTIPOLYMER PAV MRK (W) (6") (BRK)
- Ⓒ MULTIPOLYMER PAV MRK (W) (8") (SLD)
- Ⓓ MULTIPOLYMER PAV MRK (W) (12") (SLD)
- Ⓔ MULTIPOLYMER PAV MRK (W) (24") (SLD)
- Ⓕ MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- Ⓖ REFL PAV MRKR TY I-C
- Ⓗ REFL PAV MRKR TY II-CR

- Ⓘ PREFAB PAV MRK TY C (W) (ARROW)
- ⓵ PREFAB PAV MRK TY C (W) (DBL ARROW)
- Ⓚ PREFAB PAV MRK TY C (W) (U-TURN)
- Ⓛ PREFAB PAV MRK TY C (W) (WORD)

DATE: 8/2/2021  
 \$FILEL\$

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			74
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45



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**IH 45  
 AT CYPRESSWOOD DR.**  
 PAVEMENT MARKING  
 AND SIGNING LAYOUT

SCALE: 1" = 100' HORZ  
 SHEET 2 OF 2

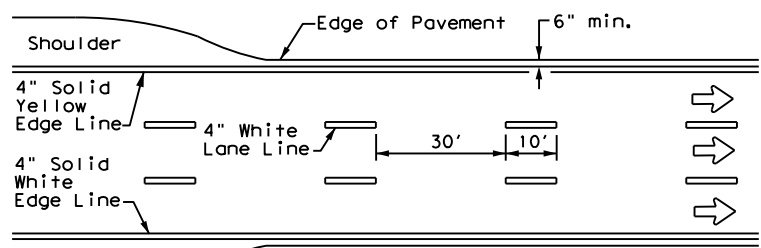
FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 75
STATE TEXAS	DIST HOU	COUNTY HARRIS	
CONT 0110	SECT 05	JOB 127	HIGHWAY IH 45

**LEGEND:**

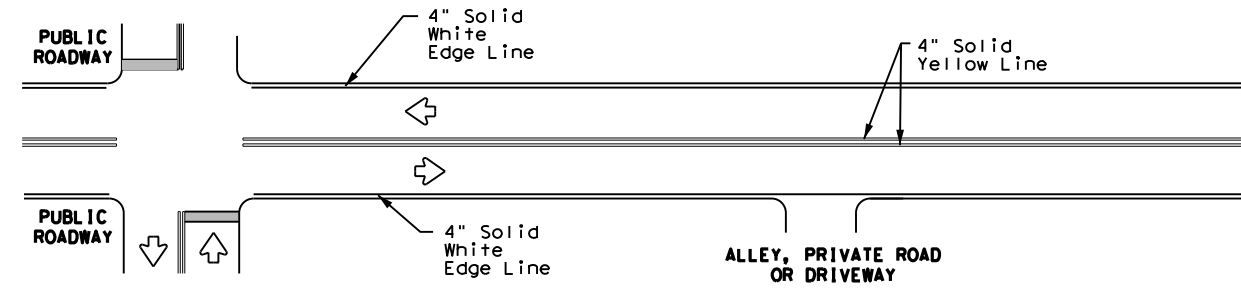
- (A) MULTIPOLYMER PAV MRK (W) (6") (SLD)
- (B) MULTIPOLYMER PAV MRK (W) (6") (BRK)
- (C) MULTIPOLYMER PAV MRK (W) (8") (SLD)
- (D) MULTIPOLYMER PAV MRK (W) (12") (SLD)
- (E) MULTIPOLYMER PAV MRK (W) (24") (SLD)
- (F) MULTIPOLYMER PAV MRK (Y) (6") (SLD)
- (G) REFL PAV MRKR TY I-C
- (H) REFL PAV MRKR TY II-CR
- (I) PREFAB PAV MRK TY C (W) (ARROW)
- (J) PREFAB PAV MRK TY C (W) (DBL ARROW)
- (K) PREFAB PAV MRK TY C (W) (U-TURN)
- (L) PREFAB PAV MRK TY C (W) (WORD)

DATE: 8/2/2021  
 \$FILEL\$

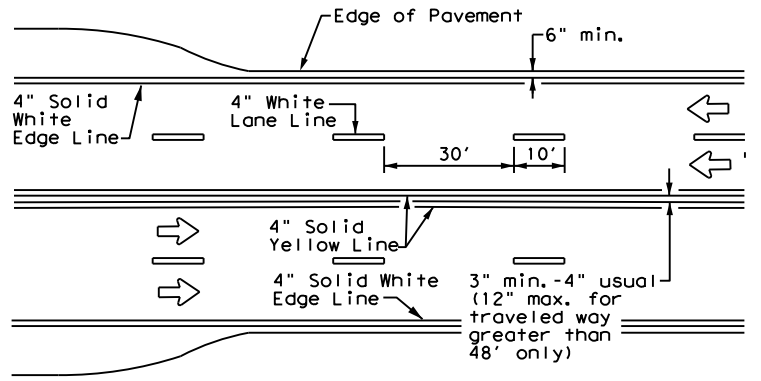
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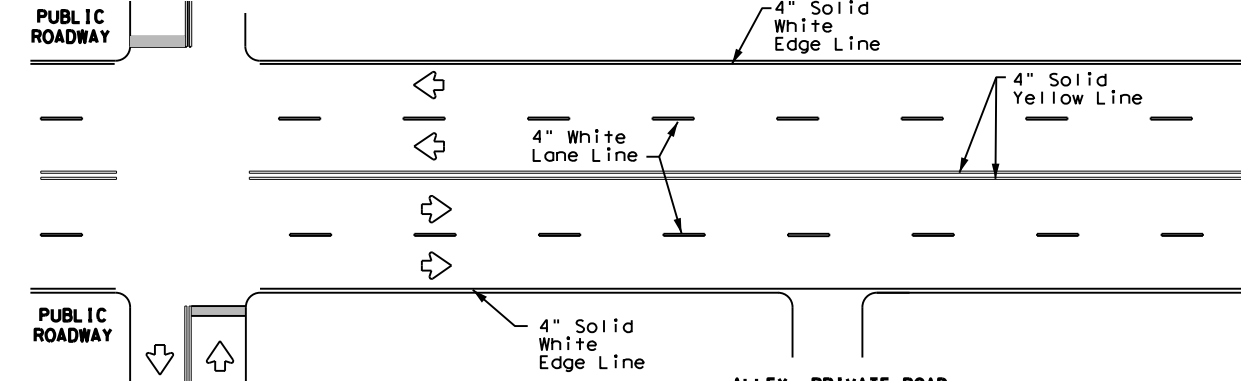
**EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



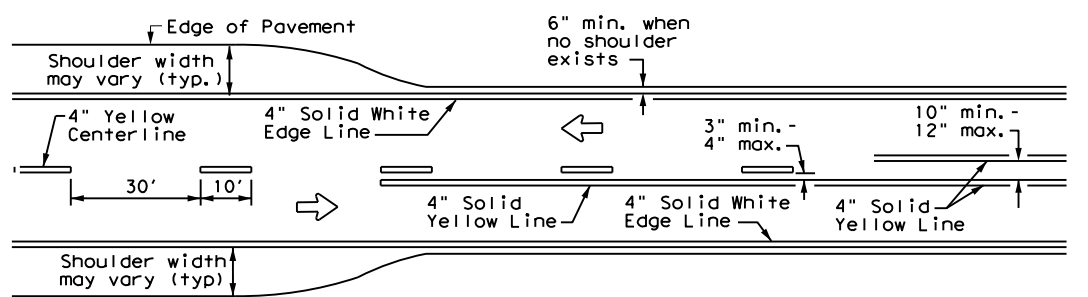
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



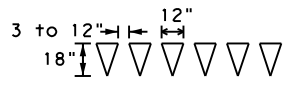
**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



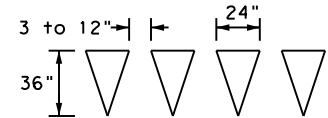
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



**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.

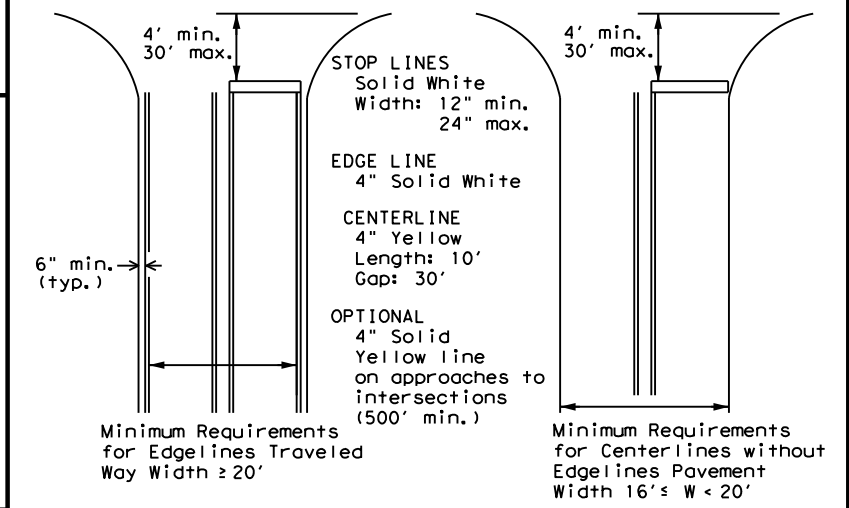
**YIELD LINES**

**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 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.



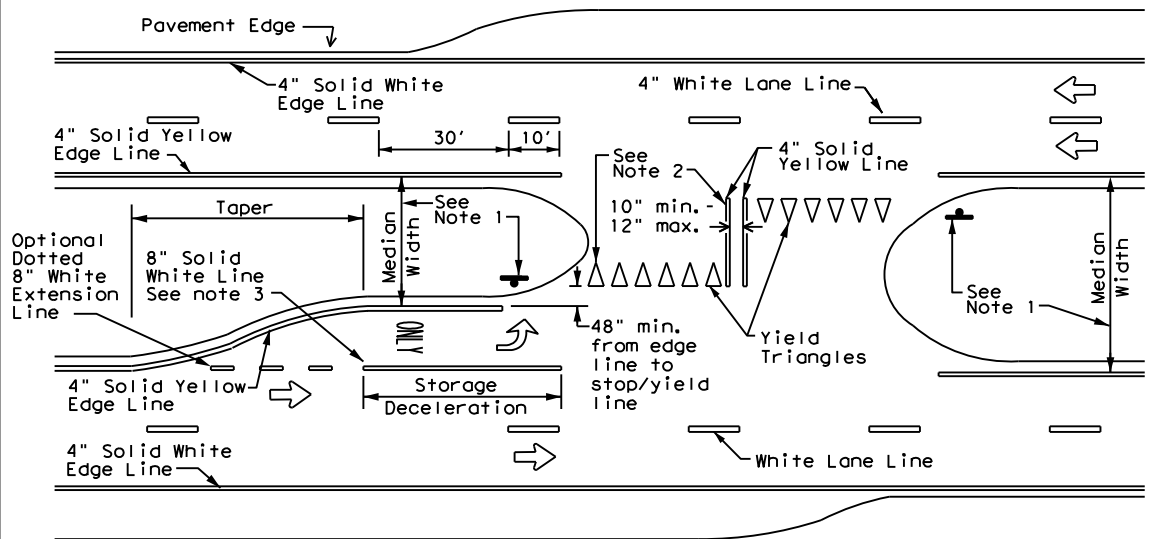
**GUIDE FOR PLACEMENT OF STOP LINES,  
EDGE LINE & CENTERLINE**  
Based on Traveled Way and Pavement Widths  
for Undivided Highways

**NOTE:**

1. Irrespective of shoulder, use 6 in width lines (edge lines).
2. Use 4 in. width lines (edge and lane lines) when lane width is 10 ft. or less; and 6 in. width lines when lane width is greater than 10 ft.

**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 triangles shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**



**TYPICAL STANDARD  
PAVEMENT MARKINGS**

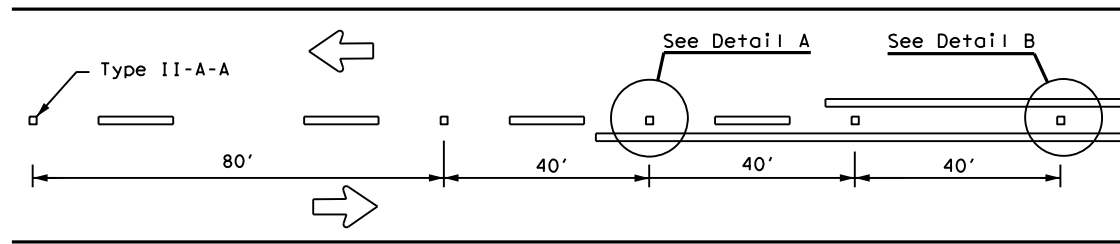
PM-20

© TxDOT NOVEMBER 1978		DNE: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
8-95	2-12	REVISONS	CONT	SECT	JOB
5-00	8-16		0110	05	127
8-00	7-20		DIST	COUNTY	SHEET NO.
3-03			12	HARRIS	76

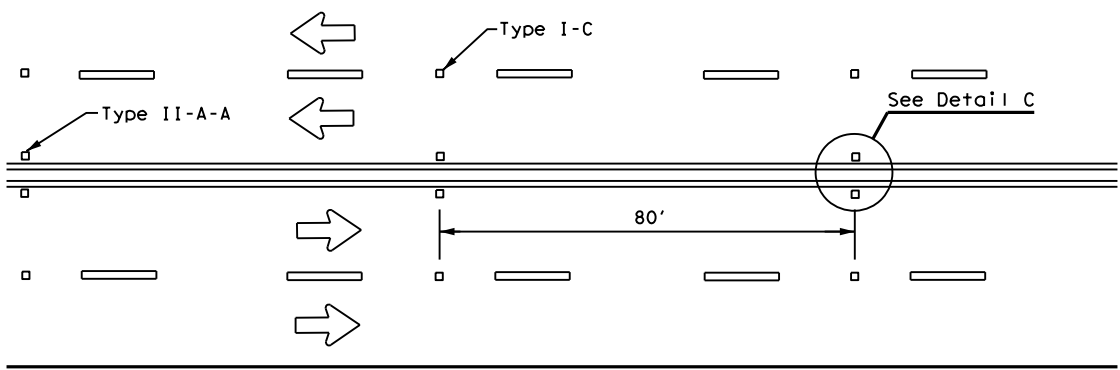
DATE:  
FILE:

# REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

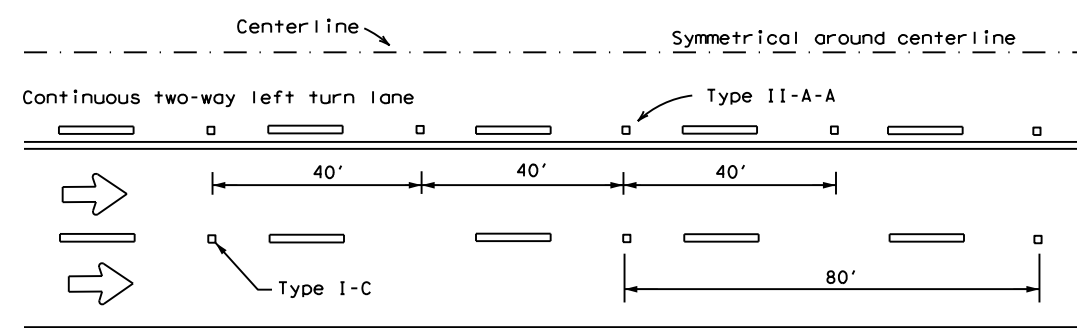
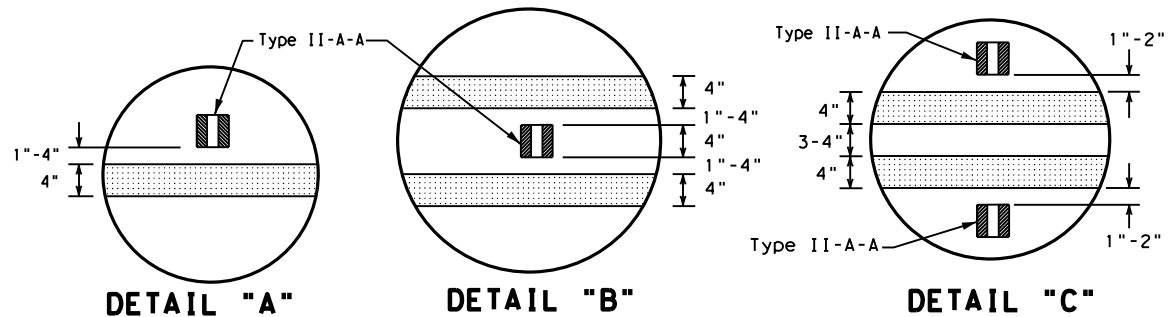
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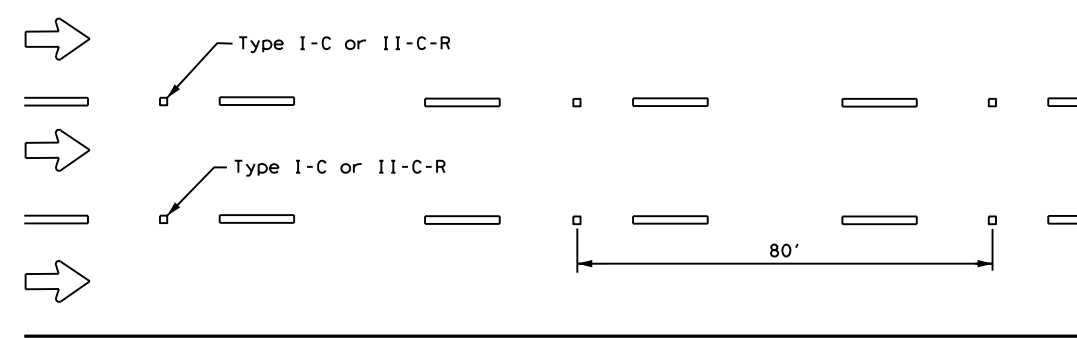
**CENTERLINE FOR ALL TWO LANE ROADWAYS**



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



**CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE**

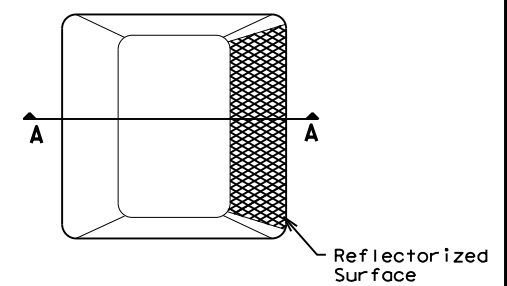


**LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)**

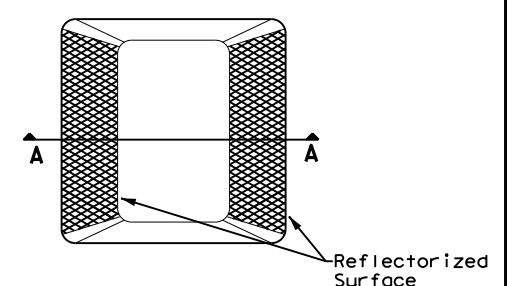
Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

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

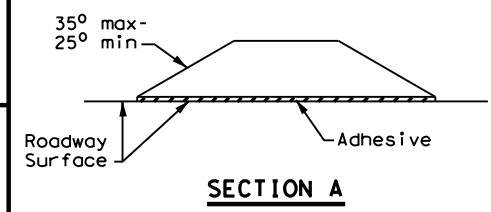
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**Type I (Top View)**



**Type II (Top View)**



**RAISED PAVEMENT MARKERS**

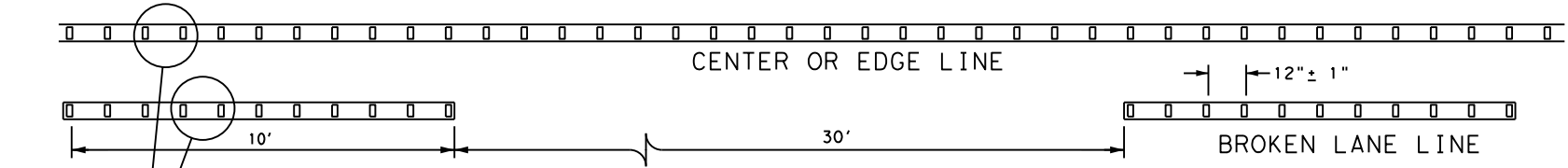
**GENERAL NOTES**

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.



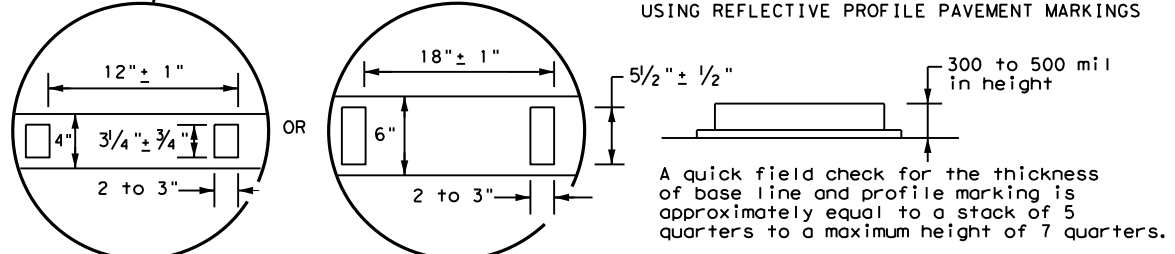
## POSITION GUIDANCE USING RAISED MARKERS REFLECTORIZED PROFILE MARKINGS PM(2) - 20

FILE: pm2-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
4-92 2-10 REVISIONS	0110	05	127	1H45
5-00 2-12	DIST	COUNTY		SHEET NO.
8-00 6-20	HOU	HARRIS		77



**REFLECTORIZED PROFILE  
PATTERN DETAIL**

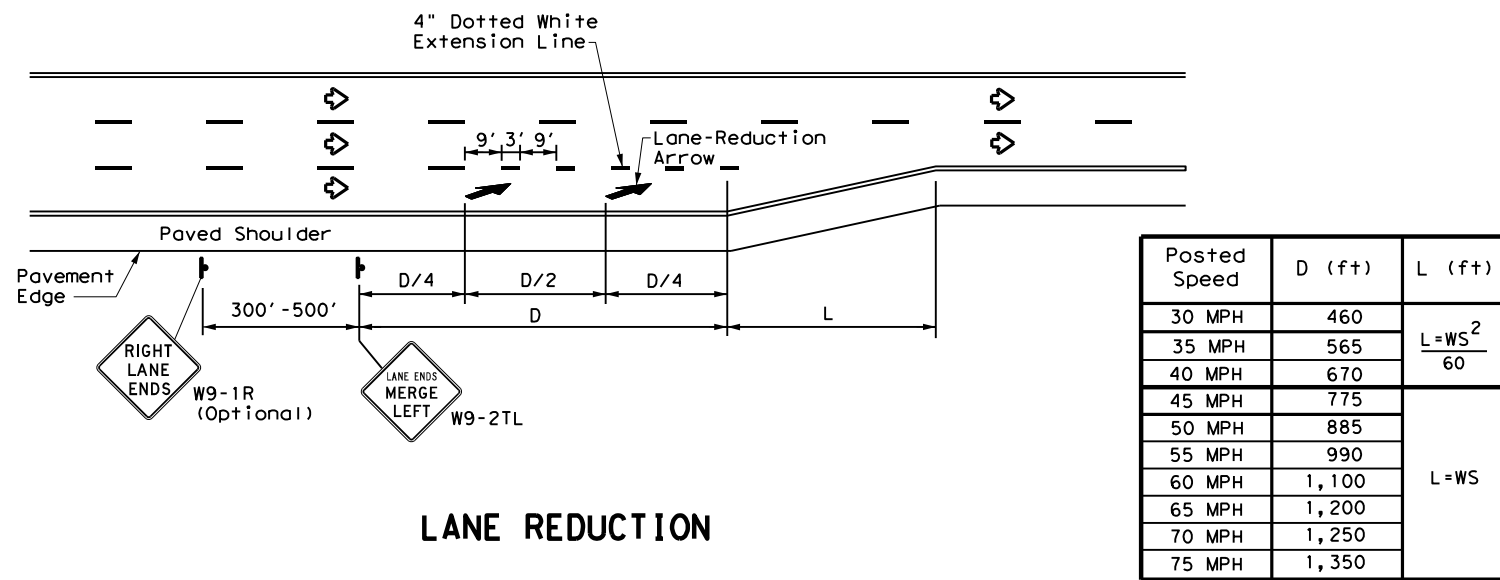
USING REFLECTIVE PROFILE PAVEMENT MARKINGS



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

DATE:  
FILE:

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Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	L = WS
45 MPH	775	
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

**LANE REDUCTION**

**NOTES**

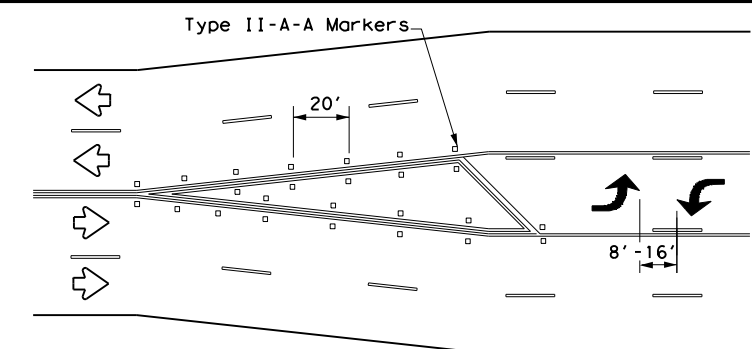
- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
- On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
- Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
- For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

**GENERAL NOTES**

- Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
- When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
- Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

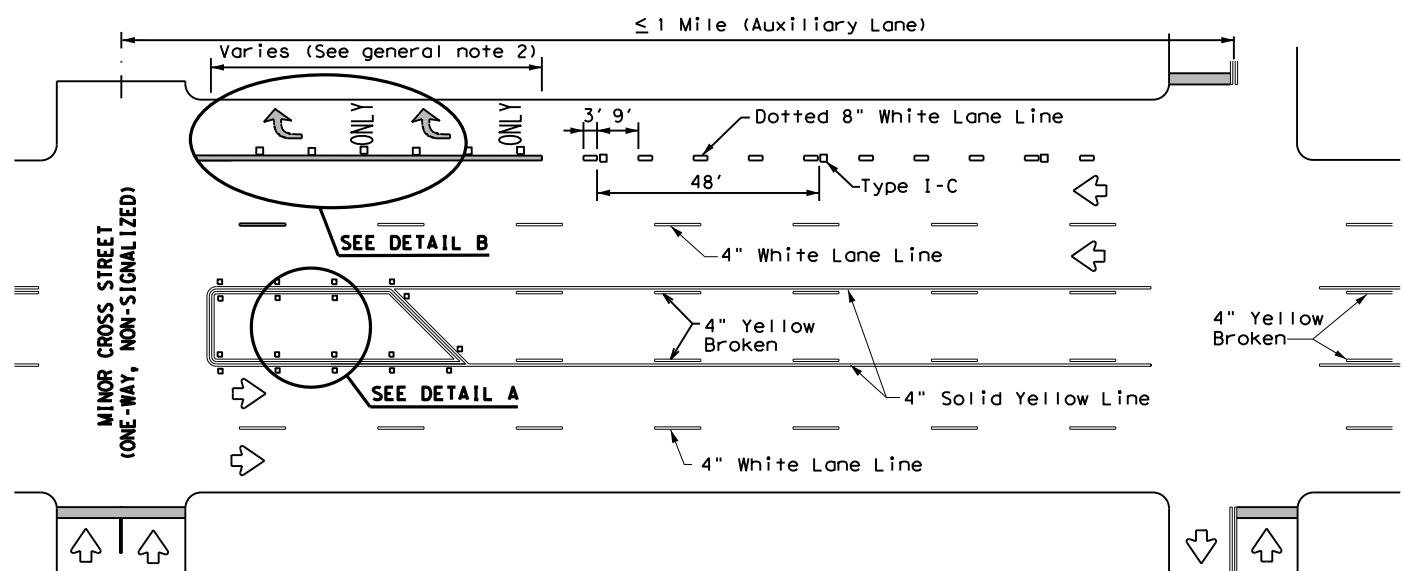
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

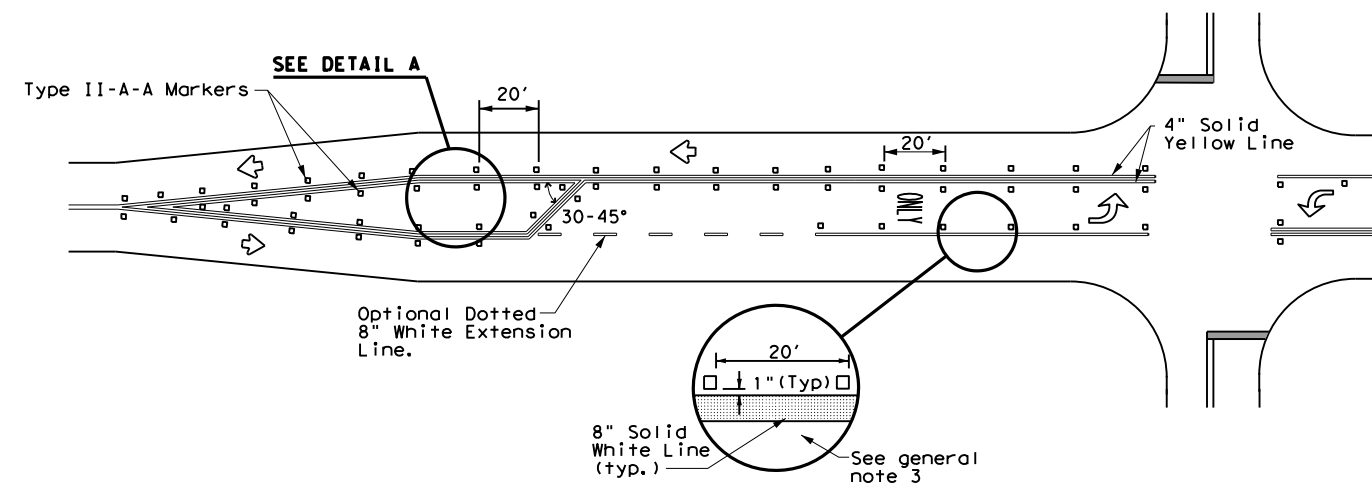


A two-way left-turn (TWLTL) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

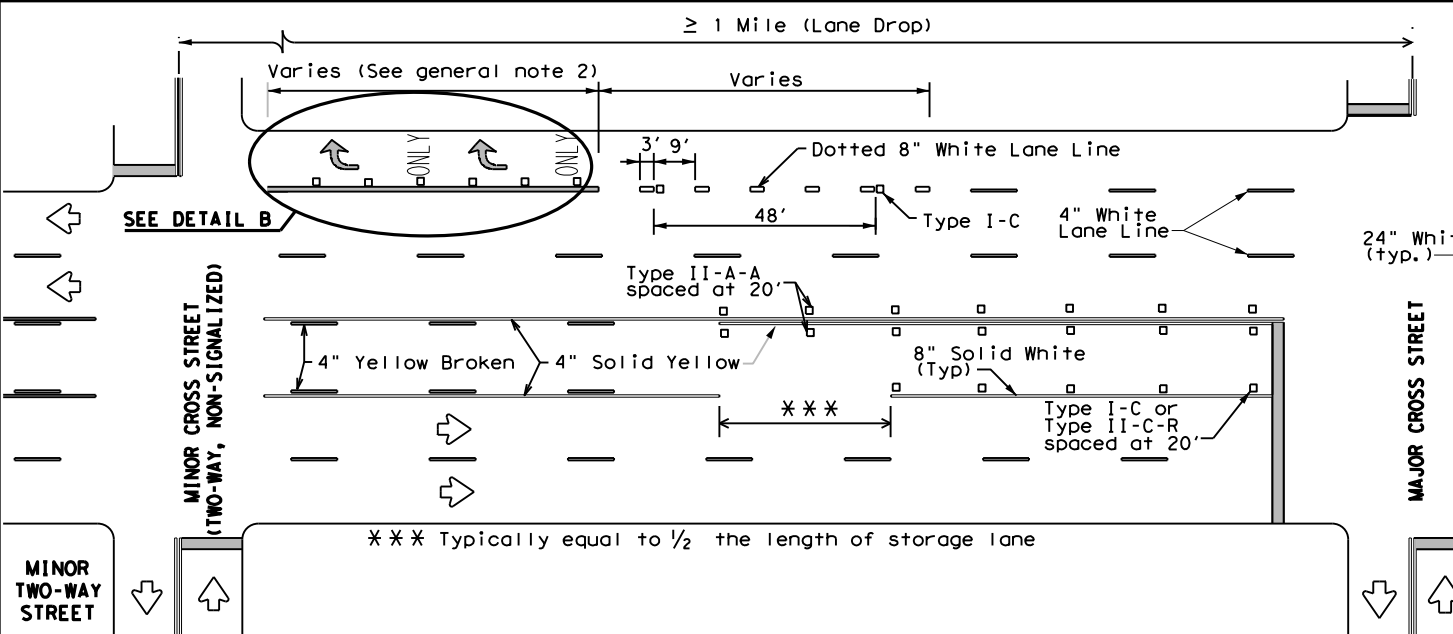
**TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY**



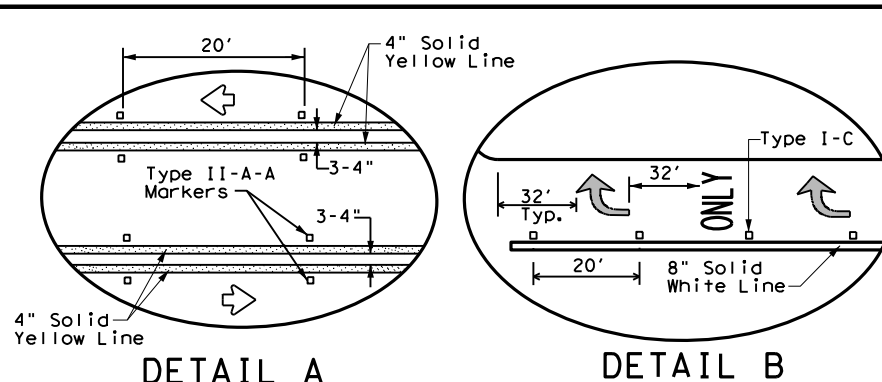
**TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE**



**TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS**



**TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP**



DETAIL A

DETAIL B

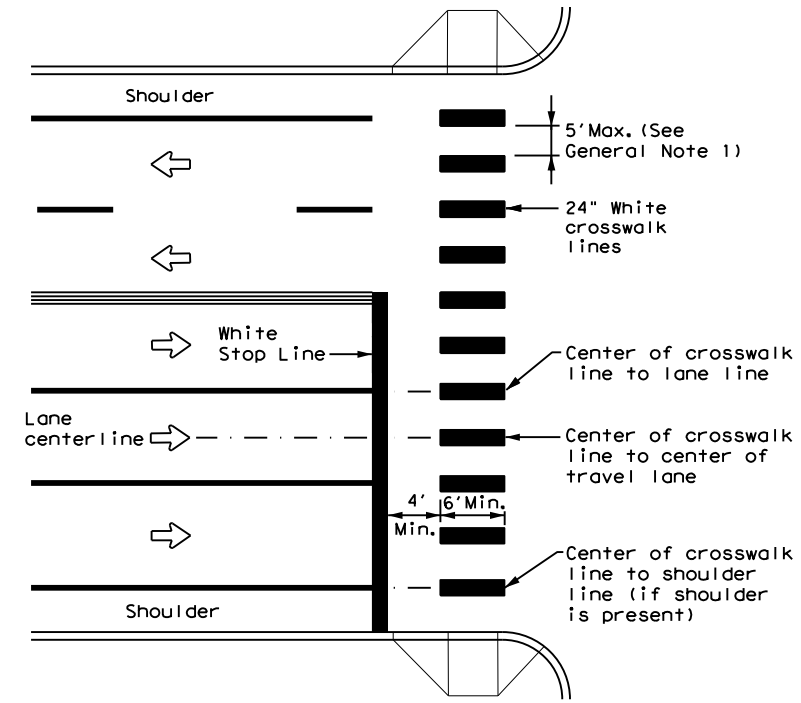
Texas Department of Transportation  
Traffic Safety Division Standard

**TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3) - 20**

FILE: pm3-20.dgn	DN:	CK:	DW:	CK:
© TxDOT April 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
5-00 2-10	DIST	COUNTY	SHEET NO.	
8-00 2-12	HOU	HARRIS	78	
3-03 6-20				

DATE: FILE:

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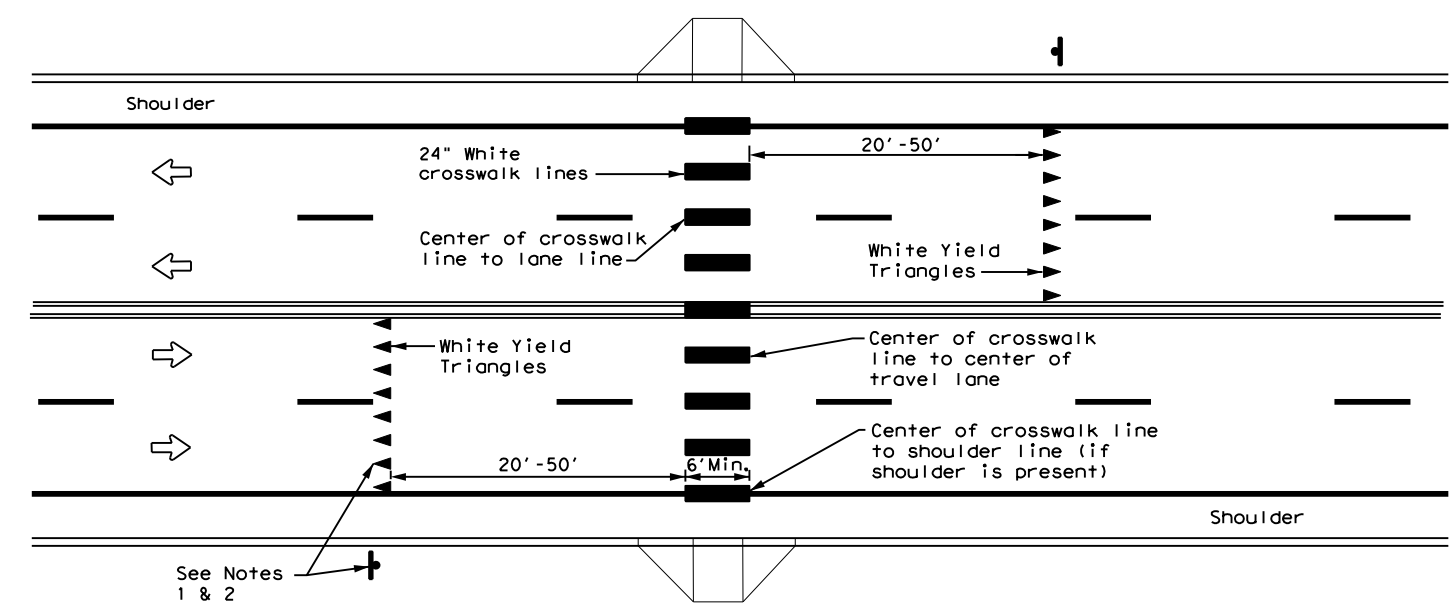
**HIGH-VISIBILITY LONGITUDINAL CROSSWALK AT CONTROLLED APPROACH**

**GENERAL NOTES**

1. Longitudinal crosswalk lines should not be placed in the wheel path of vehicles. Center the crosswalk lines on travel lanes, lane lines, and shoulder lines (if present).
2. A minimum 6" clear distance shall be provided to the curb face. If the last crosswalk line falls into this distance it must be omitted.
3. For divided roadways, adjustments in spacing of the crosswalk lines should be made in the median so that the crosswalk lines are maintained in their proper location across the travel portion of the roadway.
4. At skewed crosswalks, the crosswalk lines are to remain parallel to the lane lines.
5. Each crosswalk shall be a minimum of 6' wide.
6. The High-Visibility Longitudinal Crosswalk is the preferred crosswalk pattern on State Highways. Other crosswalk patterns as shown in the "Texas Manual on Uniform Traffic Control Devices" may be used. All crosswalk designs and dimension shall comply with the "Texas Manual on Uniform Traffic Control Devices."
7. Final placement of Stop Bar/Yield Triangles and Crosswalk shall be approved by the Engineer in the field.

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.



**UNSIGNALIZED MID BLOCK HIGH-VISIBILITY LONGITUDINAL CROSSWALK**

**NOTES**

1. Use yield triangles with "Yield Here to Pedestrians" signs at unsignalized mid block crosswalks.
2. Use stop bars with "Stop Here on Red" signs at mid block crosswalks controlled by traffic signals or pedestrian hybrid beacons.

Texas Department of Transportation

Traffic Safety Division Standard

## CROSSWALK PAVEMENT MARKINGS

### PM(4) - 20

FILE: pm4-20.dgn	DN:	CK:	DW:	CK:
© TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	79	

DATE:  
FILE:

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

OBJECT MARKERS									
DEVICE	Type 1 (OM-1)		Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4	
									NUMBER OF REFLECTORS OR DIRECTION X = 3-Size 2 reflector unit (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
SHEETING	Yellow-Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting		Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting			Red -Type B <sub>FL</sub> or C <sub>FL</sub> Sheeting
POST TYPE	TWT		WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP		GND	GND	GND, SRF	WAS, WAP			WAS, WAP

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

BARRIER REFLECTORS (BRF)			CHEVRONS				ONE DIRECTION LARGE ARROW		NOTE: Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.
DEVICE	GF1	GF2	CTB	W1-8				W1-6	
SHEETING: Yellow, White, Red			SIZE (W x L): 18"x 24" (Conventional), 24"x 30" (Conventional Oversize), 30"x 36" (Expressway), 36" x 48" (Freeway)				SIZE (W x L): 48" x 24" (Conventional), 60" x 30" (Expressway & Freeway)		
NOTE: 1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			MOUNTING HEIGHT: 4'-0" or 7'-0"				MOUNTING HEIGHT: 7'-0"		
NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.			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).						

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 Traffic Safety Division Standard

## DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

### D & OM(1)-20

FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CR: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	HOU	HARRIS		80

DATE: FILE:



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POST TYPE AND SUPPORT FOUNDATION DETAILS				TYPE OF BARRIER MOUNTS	
WING CHANNEL (WC)	FLEXIBLE POSTS (YFLX, WFLX)		WEDGE ANCHOR SYSTEMS		GUARD FENCE ATTACHMENT
GND	GND	SRF	WAS	WAP	GF 1
	EMBEDDED	SURFACE MOUNT	STEEL	PLASTIC	GF 2
<b>NOTES</b> 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.	<b>NOTES</b> 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.		<b>NOTE</b> 1. Install per manufacturer's recommendations.		

TYPE OF BARRIER MOUNTS	
GUARD FENCE ATTACHMENT	
GF 1	GF 2
<b>CONCRETE TRAFFIC BARRIER (CTB)</b>	
<b>GENERAL NOTES</b> 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**

FILE: dom2-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
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REVISIONS	0110	05	127	IH45
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	HOU	HARRIS	81	

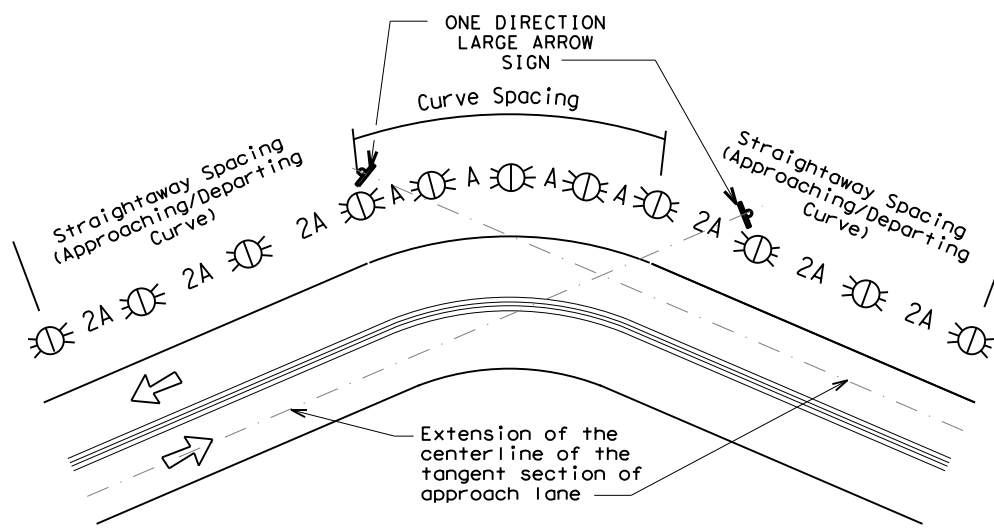
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### MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

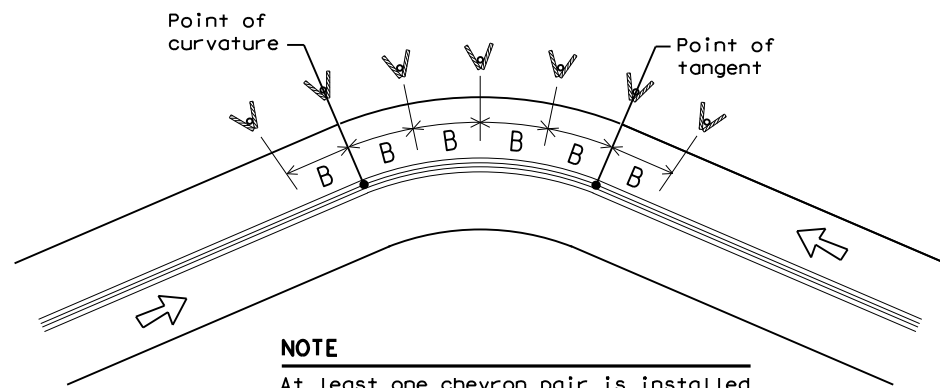
### SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



**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**

- 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.
- Barrier reflectors may be used to replace required delineators.
- Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Traffic Safety Division Standard

## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(3)-20

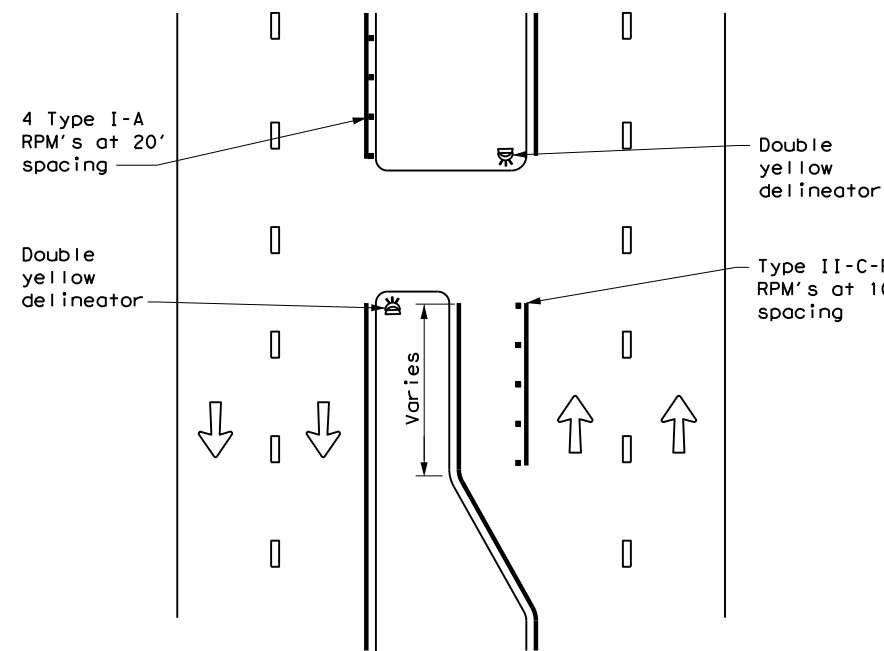
FILE: dom3-20.dgn	DW: TXDOT	CK: TXDOT	OW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS				
0110	05	127	IH45	
3-15	8-15	DIST		SHEET NO.
8-15	7-20	HOU HARRIS		82

DATE: FILE:

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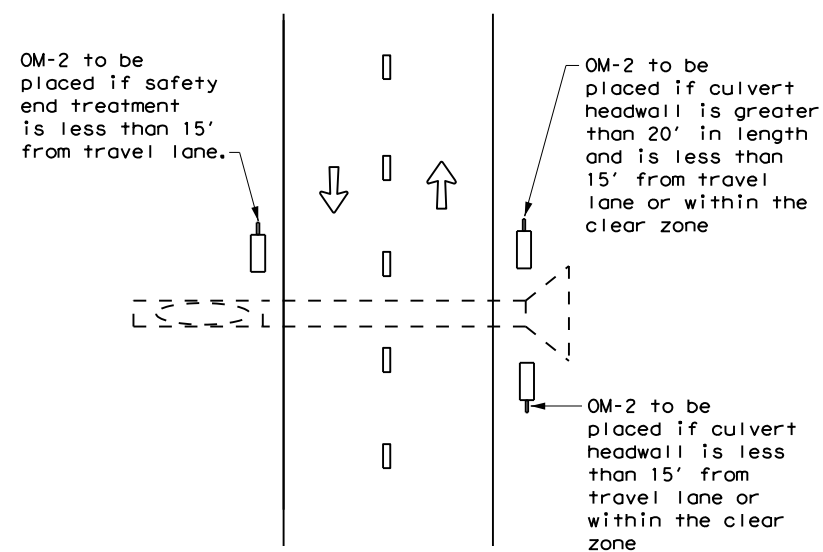
DATE:  
FILE:

**CROSSOVERS**



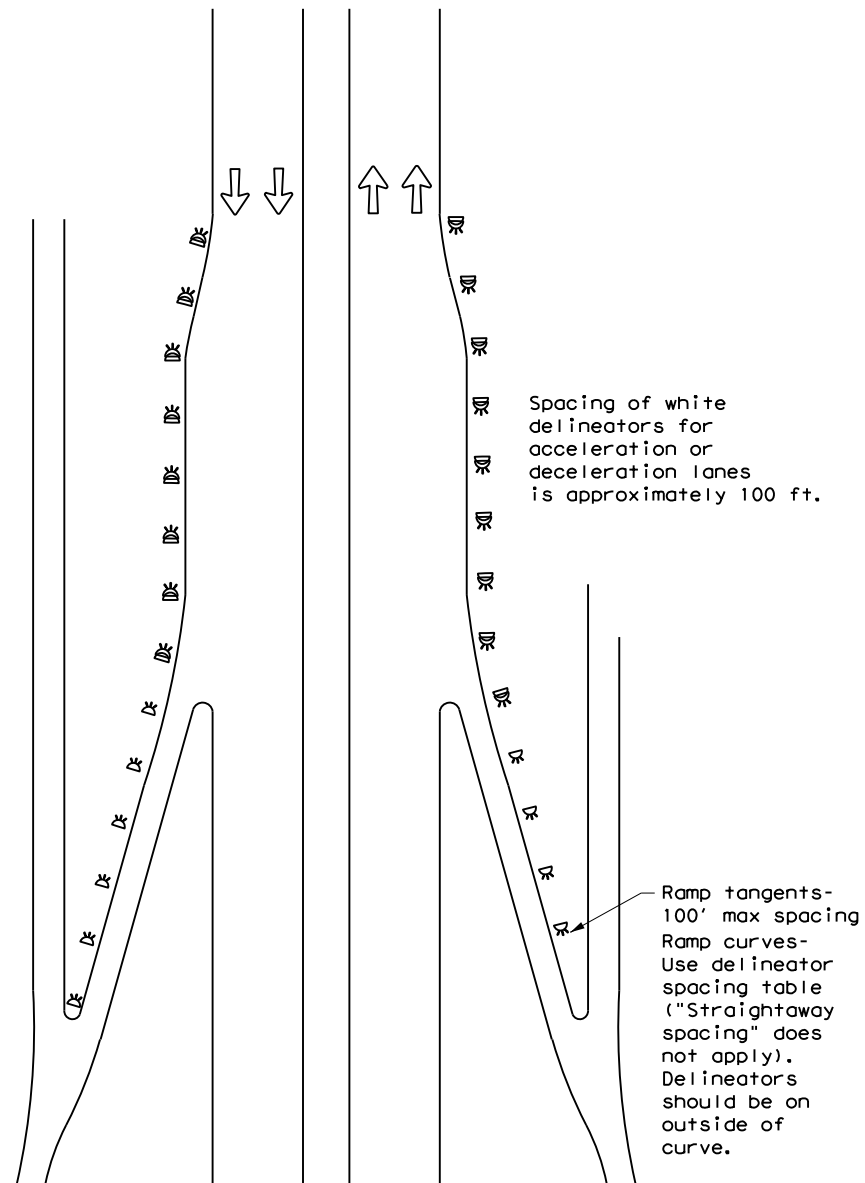
**DETAIL 1**

**FOR CULVERTS WITHOUT MBGF**



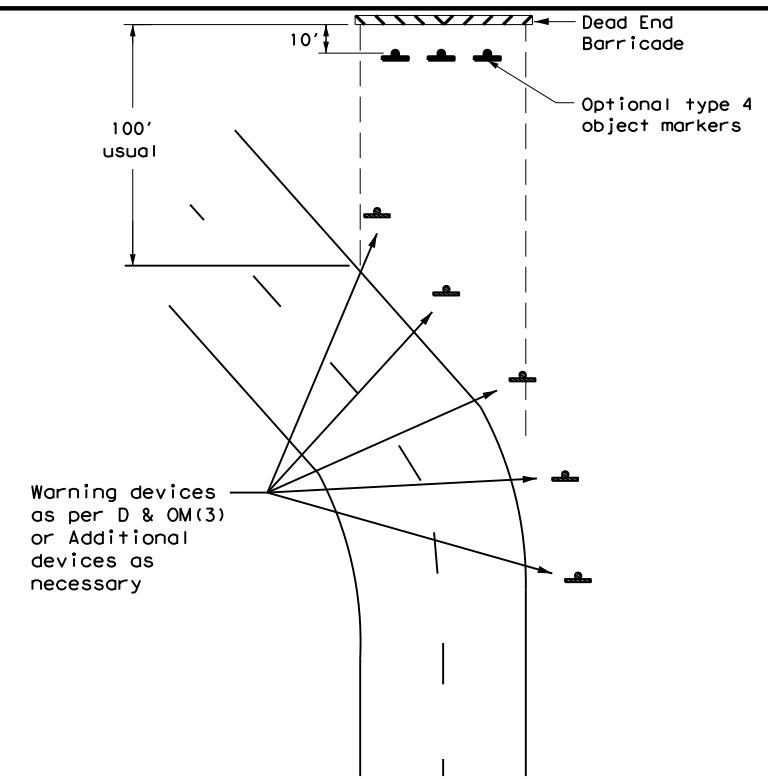
**DETAIL 2**

**FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES**



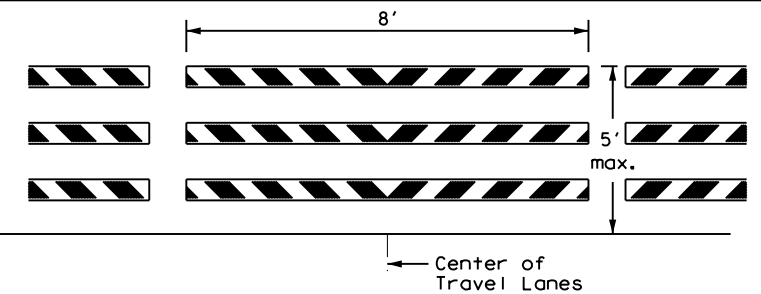
**DETAIL 3**

**TYPICAL APPLICATION OF DEAD END BARRICADE**



**DETAIL 4**

**TYPICAL DEAD END BARRICADE INSTALLATION**



**NOTES**

- Barricade striping shall be red and white reflective sheeting for all permanent road closures.
- Barricade striping is red and white sloping toward the center of the roadway.
- 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

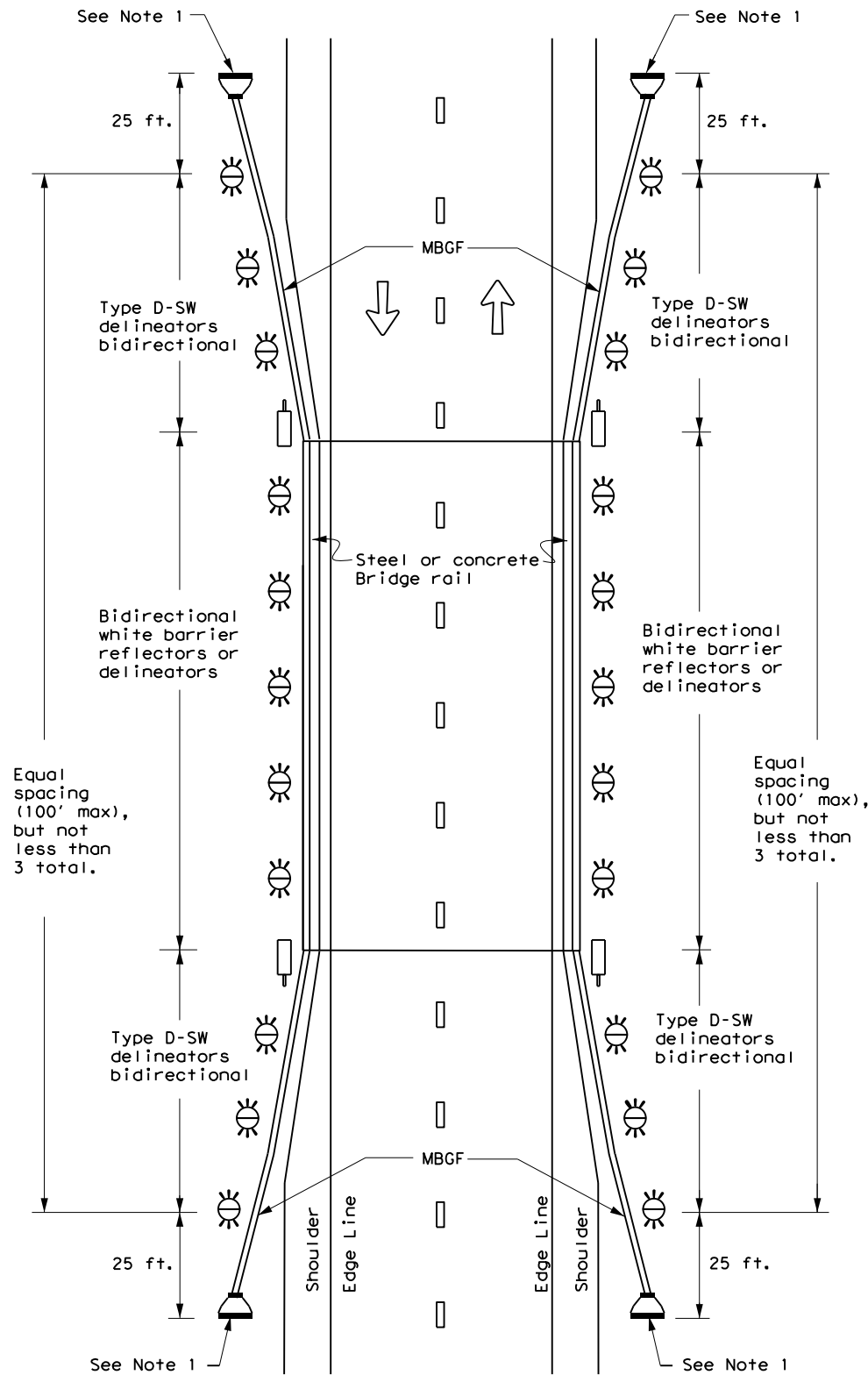


**DELINEATOR & OBJECT MARKER PLACEMENT DETAILS**

**D & OM(4) -20**

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	OW: TXDOT	CR: TXDOT
© TXDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
3-15	DIST	COUNTY	SHEET NO.	
7-20	HOU	HARRIS	83	

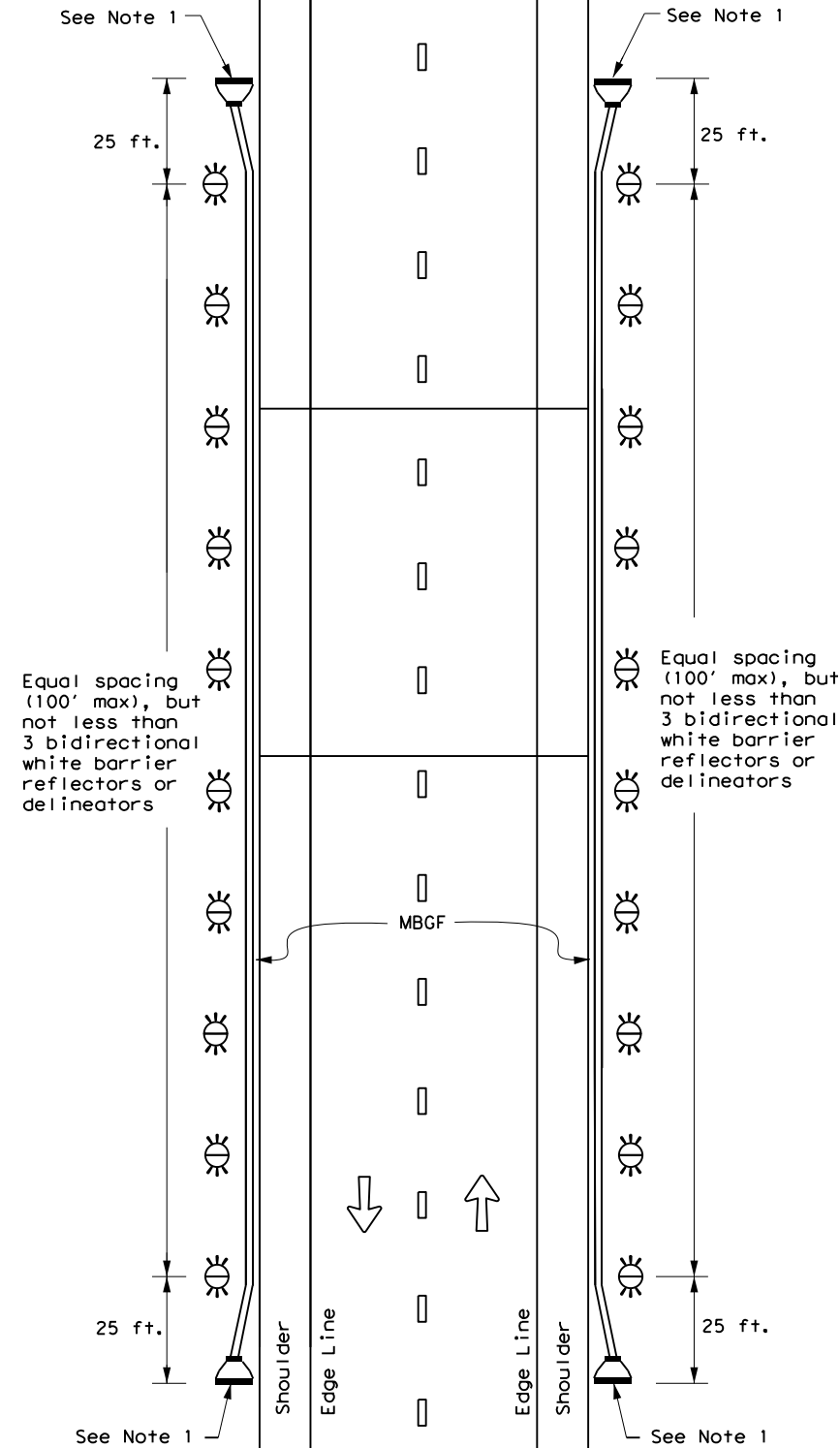
**TWO-WAY, TWO LANE ROADWAY  
WITH REDUCED WIDTH APPROACH RAIL**



**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.

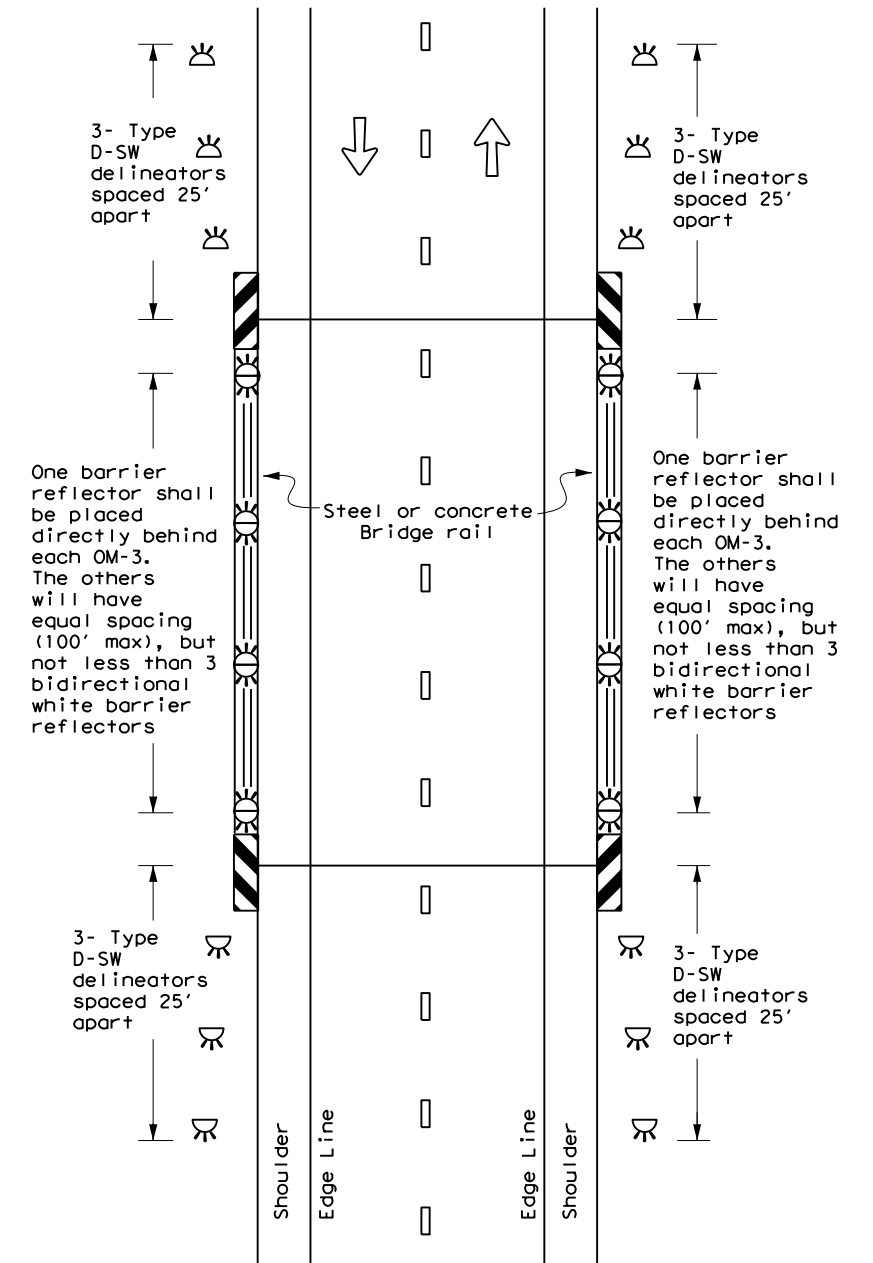
**TWO-WAY, TWO LANE ROADWAY  
WITH METAL BEAM GUARD FENCE (MBGF)**



**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



**DELINEATOR &  
OBJECT MARKER  
PLACEMENT DETAILS**

**D & OM(5)-20**

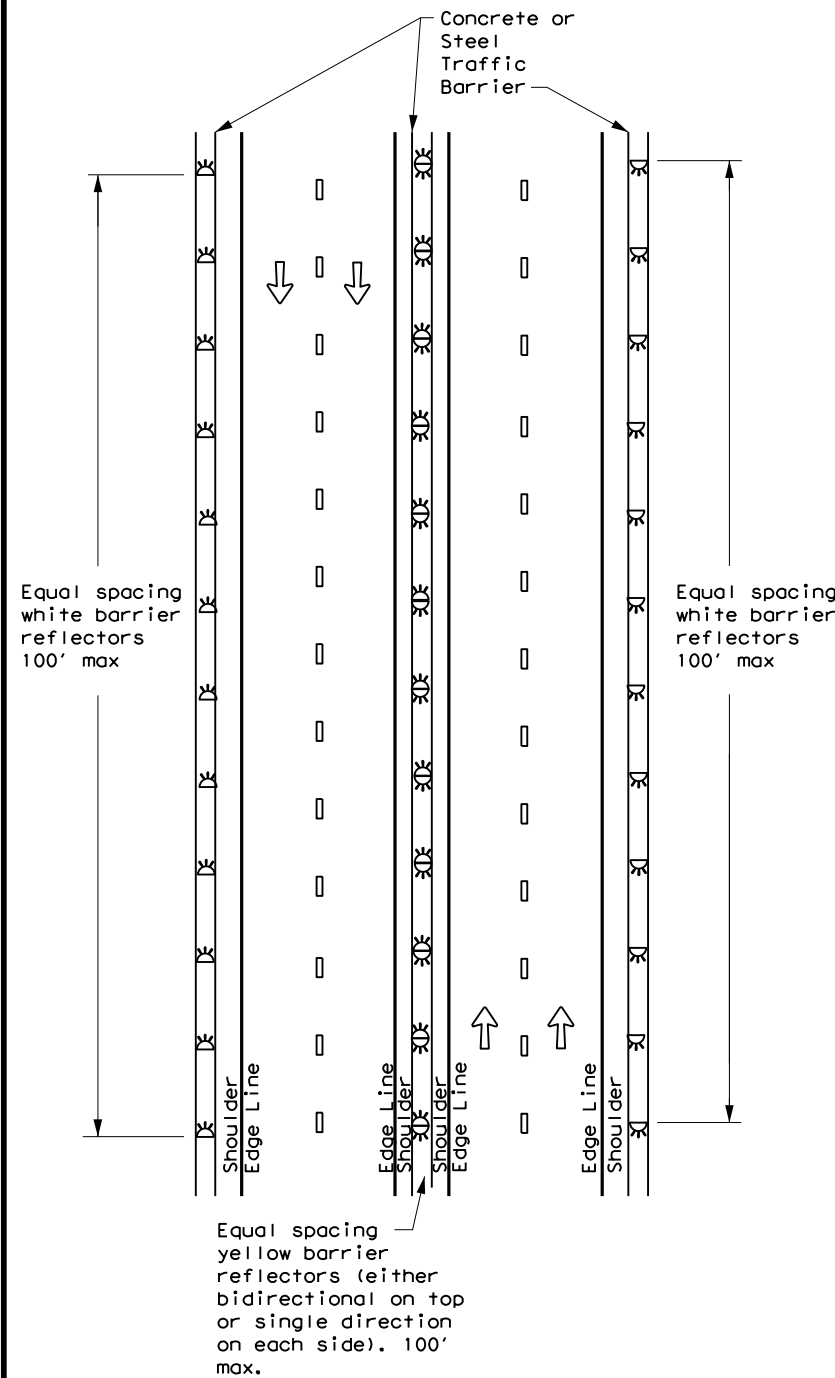
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
7-20	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	84	

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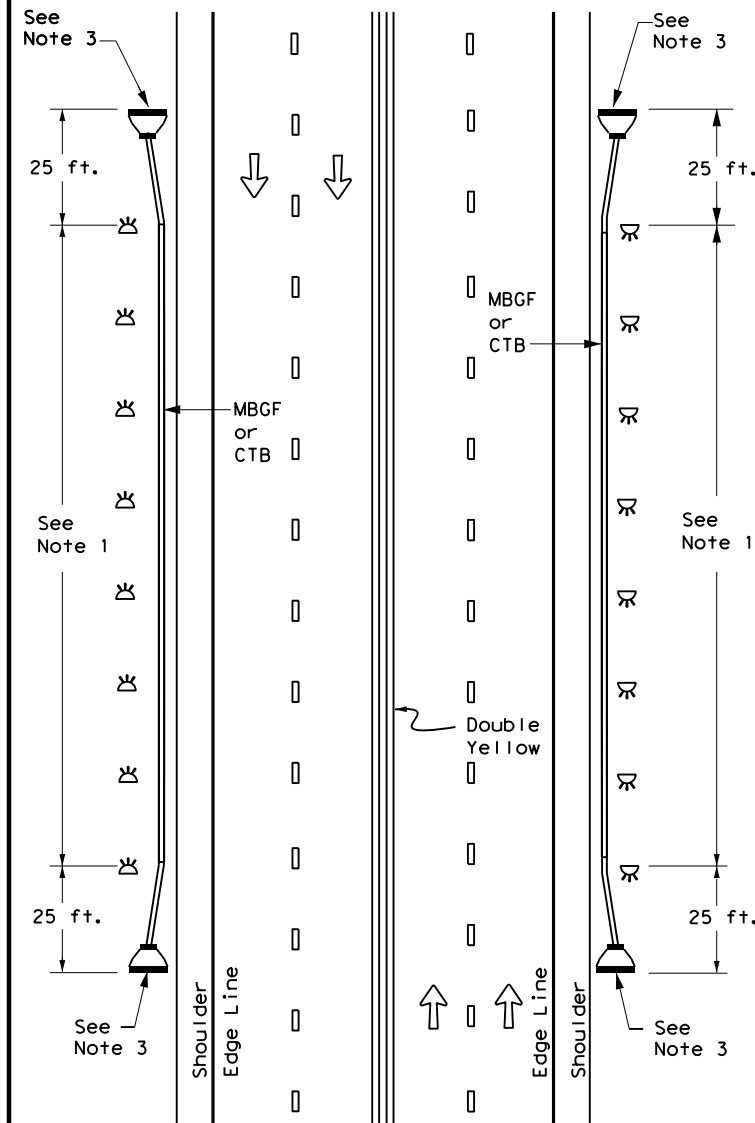
DATE:  
FILE:

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

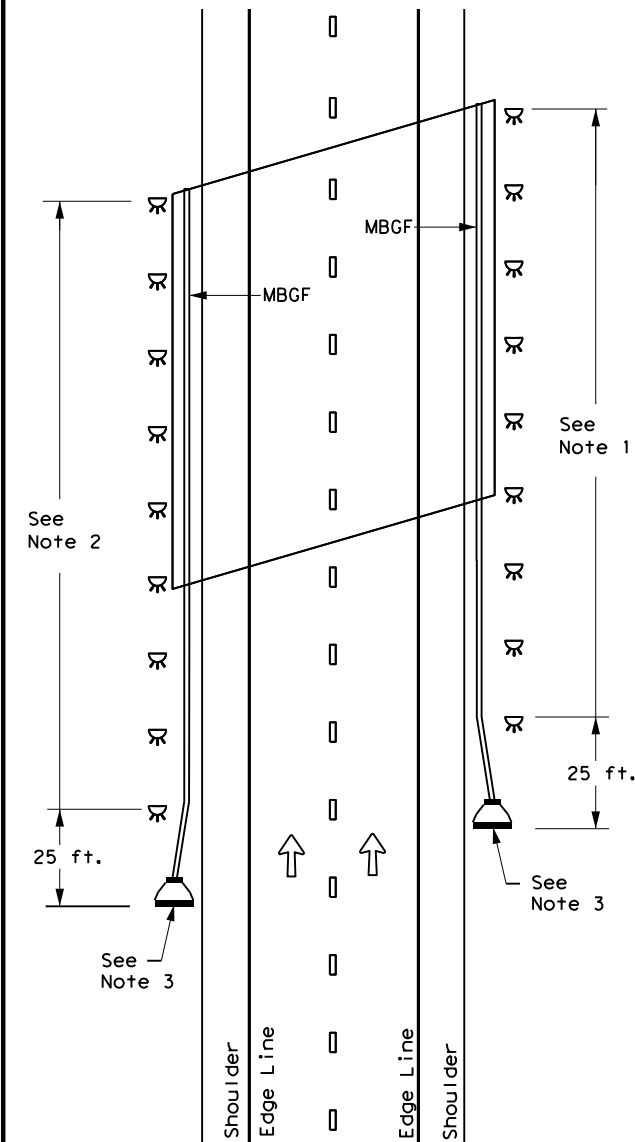
### CONTINUOUS CONCRETE OR STEEL BARRIER



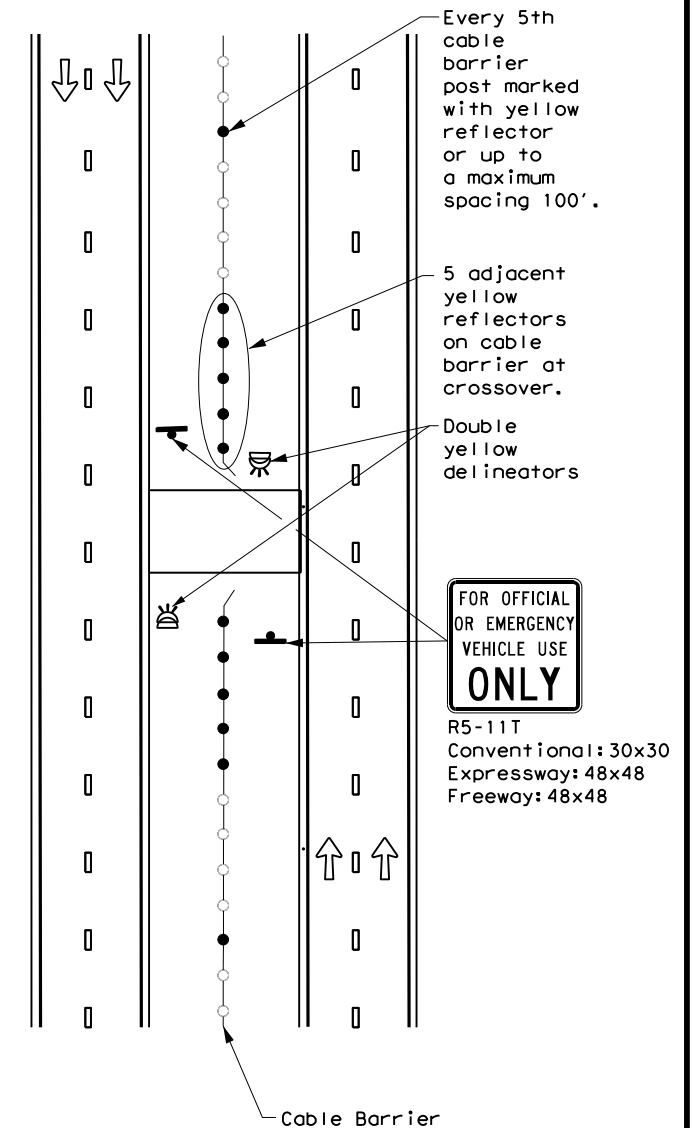
### MULTI-LANE UNDIVIDED, TWO-WAY ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



### 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 Continuous 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



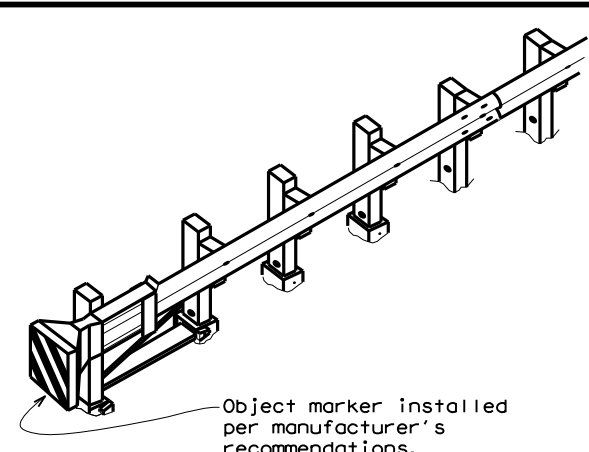
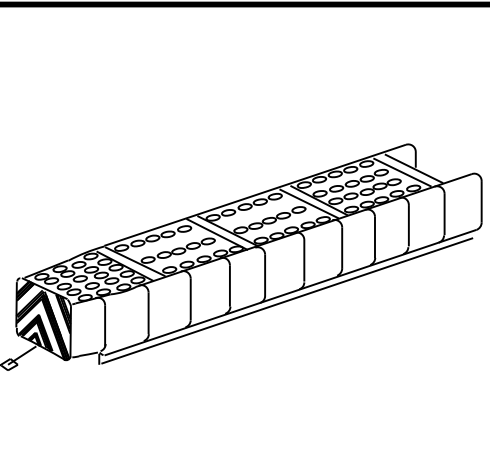
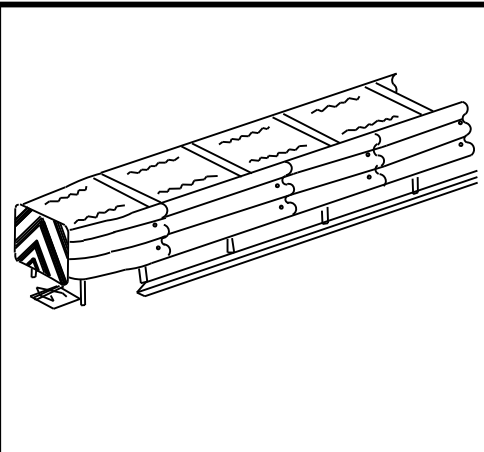
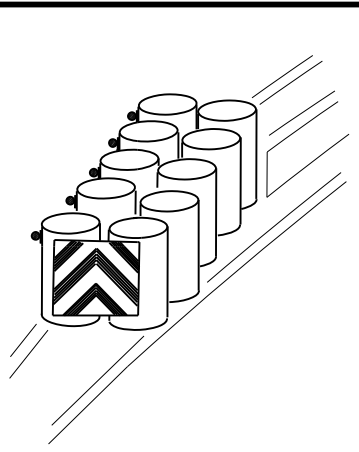
## DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

### D & OM(6)-20

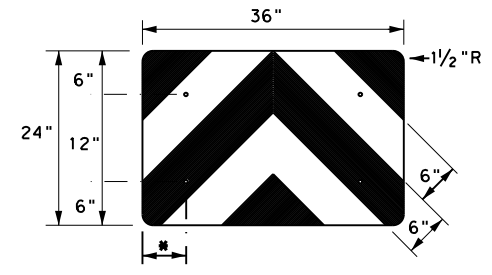
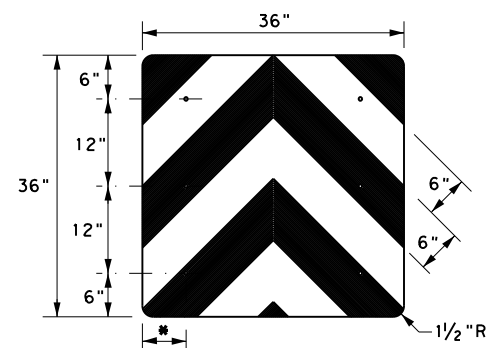
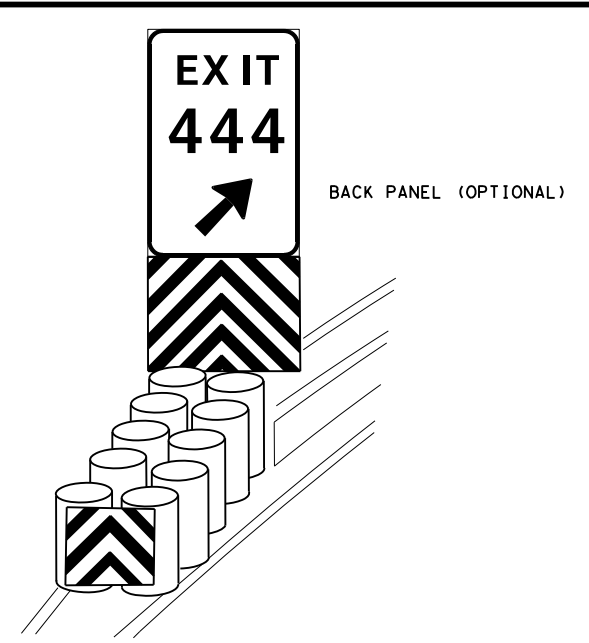
FILE: dom6-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
7-20	DIST	COUNTY	SHEET NO.	
	HOU	HARRIS	85	

DATE:  
FILE:

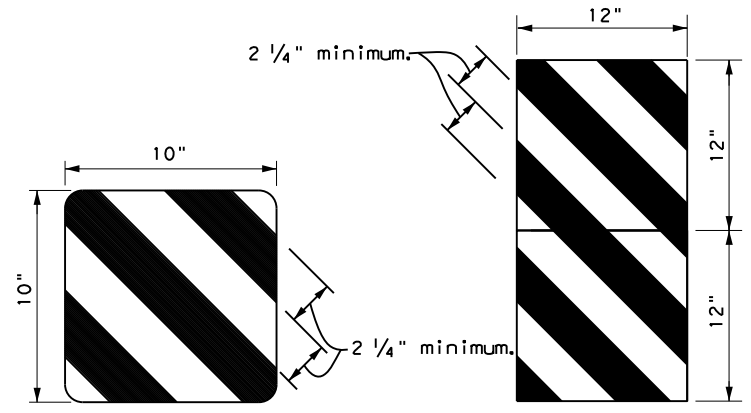
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.



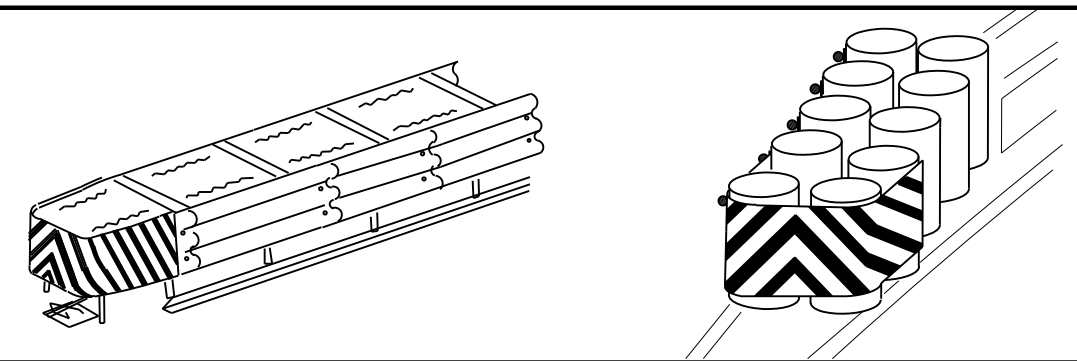
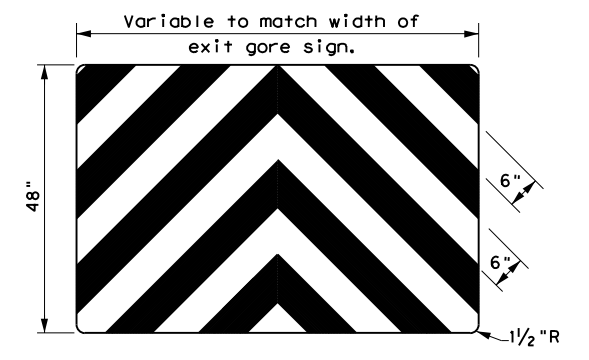
Object marker installed per manufacturer's recommendations.



\* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer



OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>

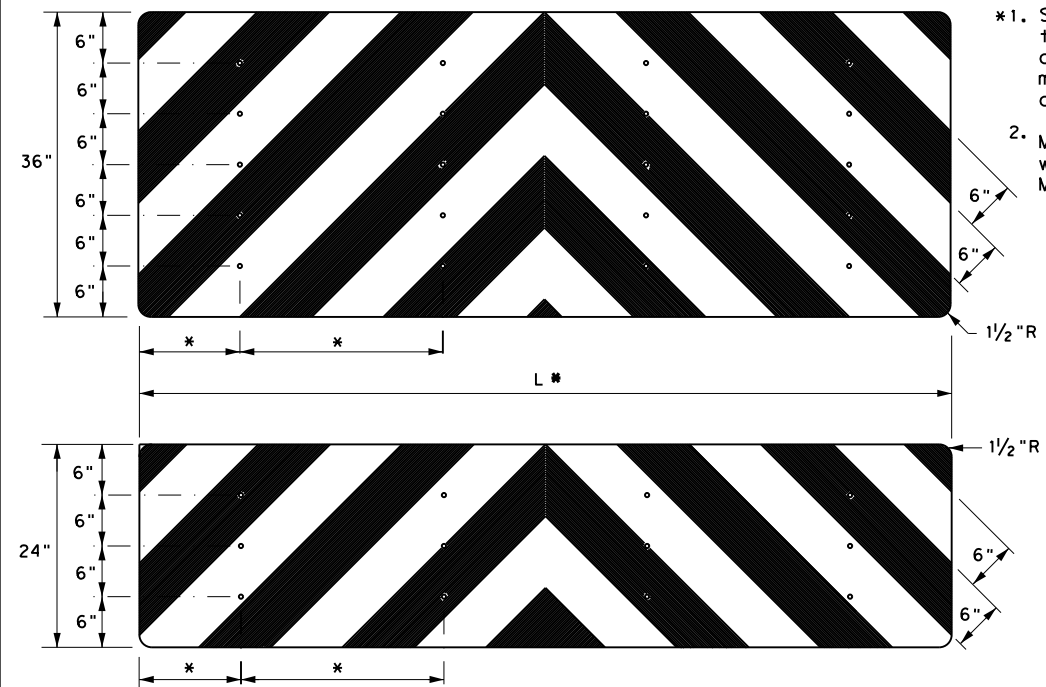


**NOTES**

- Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.
- Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

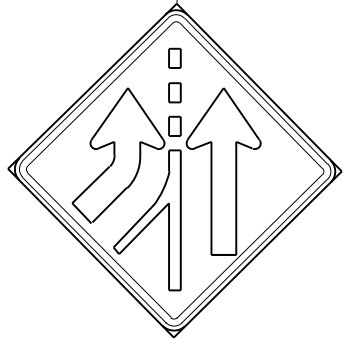
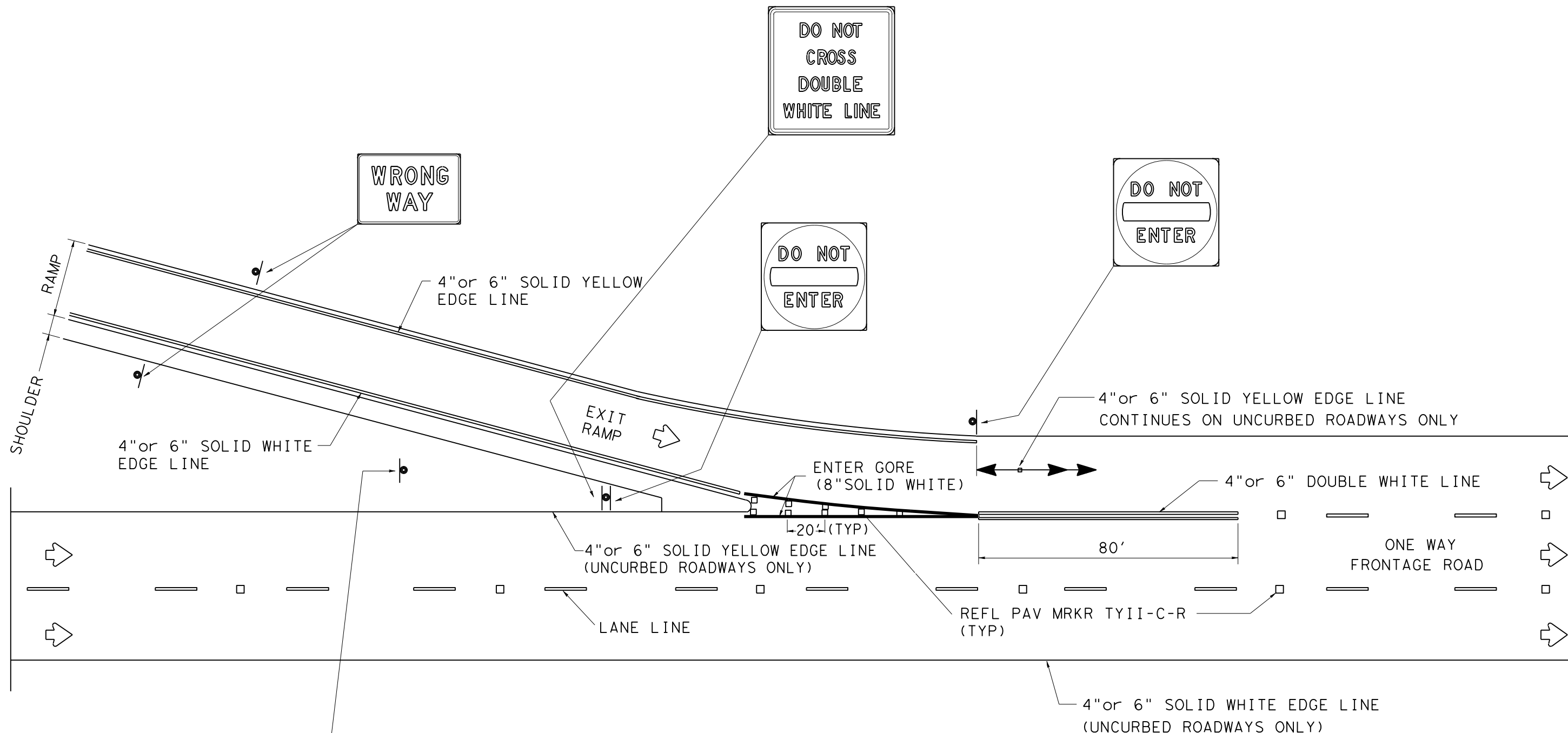
**NOTES**

- Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturer's recommendation, or as directed by the Engineer.
- Mounting should be flush with top of attenuator. Minimum size 96" x 24".



DATE:  
FILE:

		Traffic Safety Division Standard	
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b> <b>D &amp; OM(VIA) -20</b>			
FILE: domvia20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT December 1989	CONT	SECT	JOB
REVISIONS		0110	05 127
4-92 8-04	DIST		COUNTY
8-95 3-15	HOU		HARRIS
4-98 7-20	SHEET NO.		86
20G			



DRAWING SCALE: NONE

**Texas Department of Transportation**  
Houston District

**SIGNING AND PAVEMENT MARKING DETAILS**  
**EXIT RAMPS-FRONTAGE ROAD**

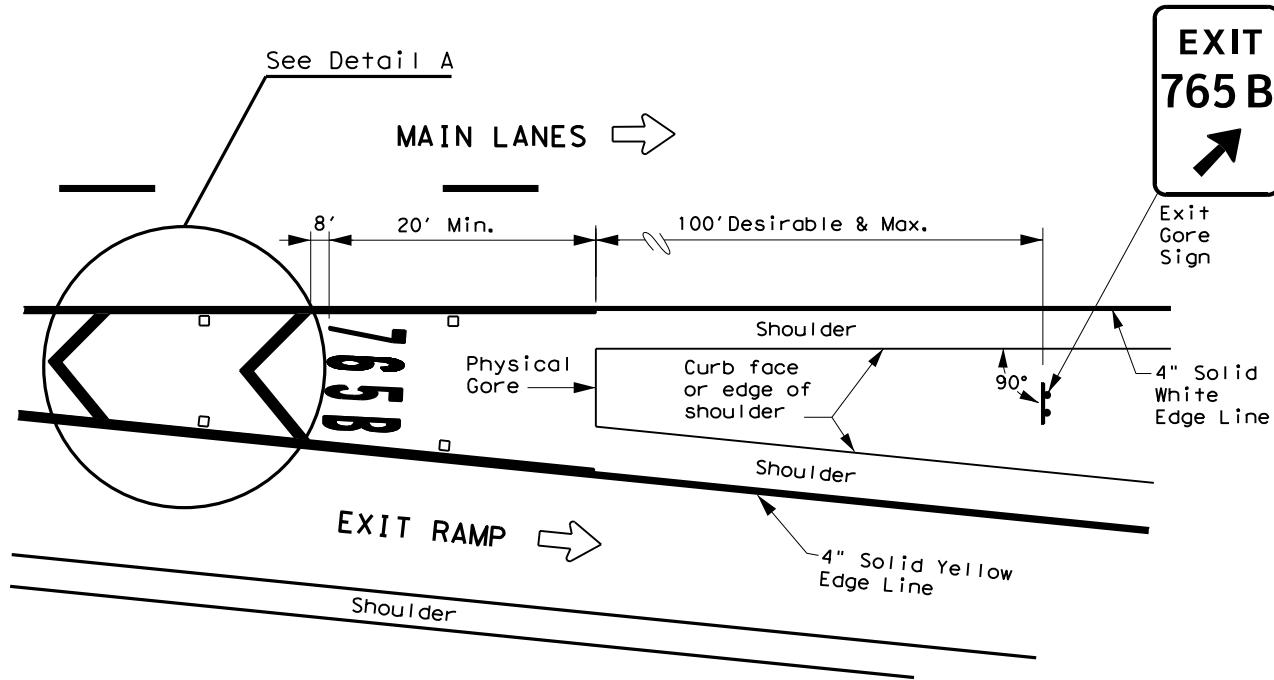
**ER-FR(1)-09**

FILE:	DN:	CK:	DW:	CK:
© TxDOT 1998	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS FEB., 2008 DEC., 2009	HOU	6		87
COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS	0110	05	127	IH45

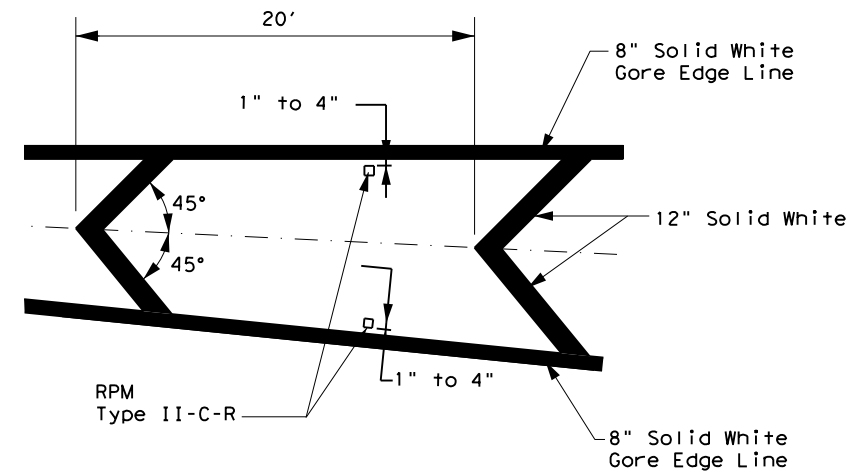
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

### EXIT NUMBER PAVEMENT MARKING NOTES

1. Minimum 8 foot white markings should be used, unless otherwise noted.
2. Spacing between letters and numbers should be approximately 4 inches.
3. Pavement markings are to be located as specified elsewhere in the plans.
4. All pavement marking materials shall meet the required Departmental Material Specifications or as specified in these plans.
5. Numbers and Letters details can be found in the Standard Highway Design for Texas (SHSD) Chapter 12 at <http://www.txdot.gov>



**MARKINGS WITH EXIT NUMBER**



### NOTES

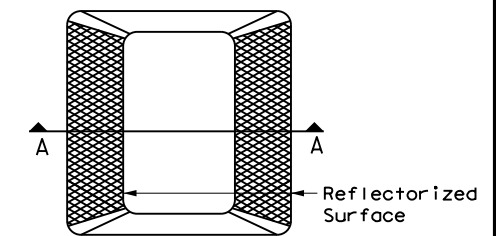
1. Raised pavement markers shall be centered between chevron or gore lines.
2. For more information, see ReflectORIZED Raised Pavement Marker Detail.

**DETAIL A**

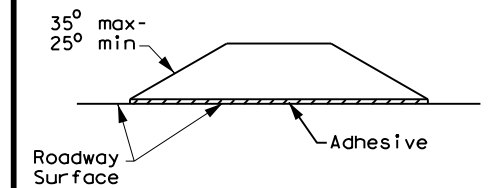
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

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

LEGEND	
←	Traffic flow
□	ReflectORIZED Raised Markers (RPM) Type II-C-R

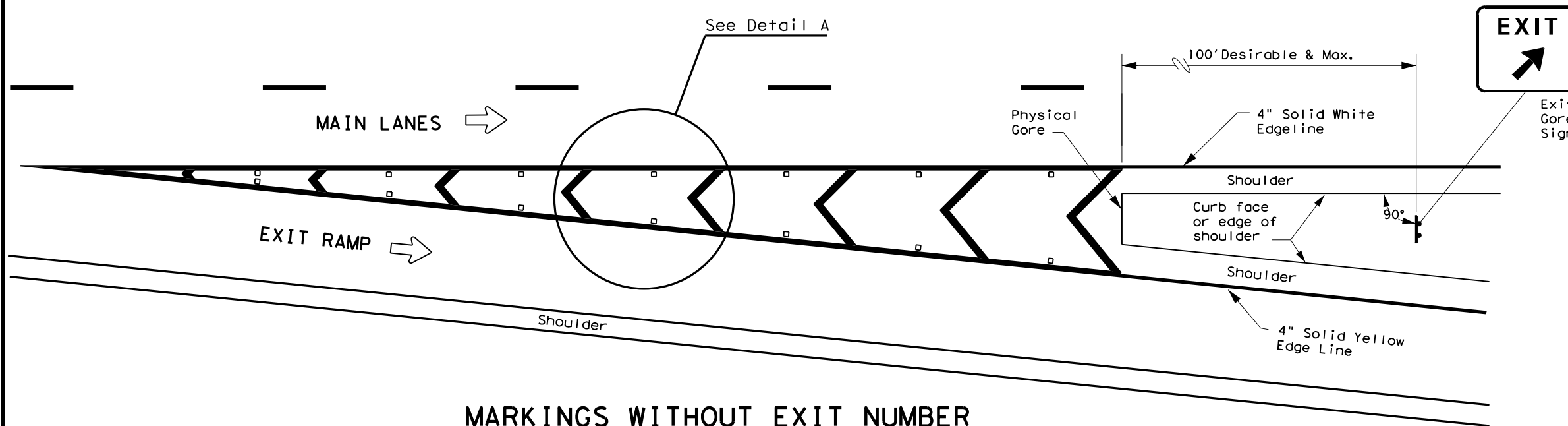


**Type II (Top View)**



**SECTION A**

### REFLECTORIZED RAISED PAVEMENT MARKER (RPM)



**MARKINGS WITHOUT EXIT NUMBER**



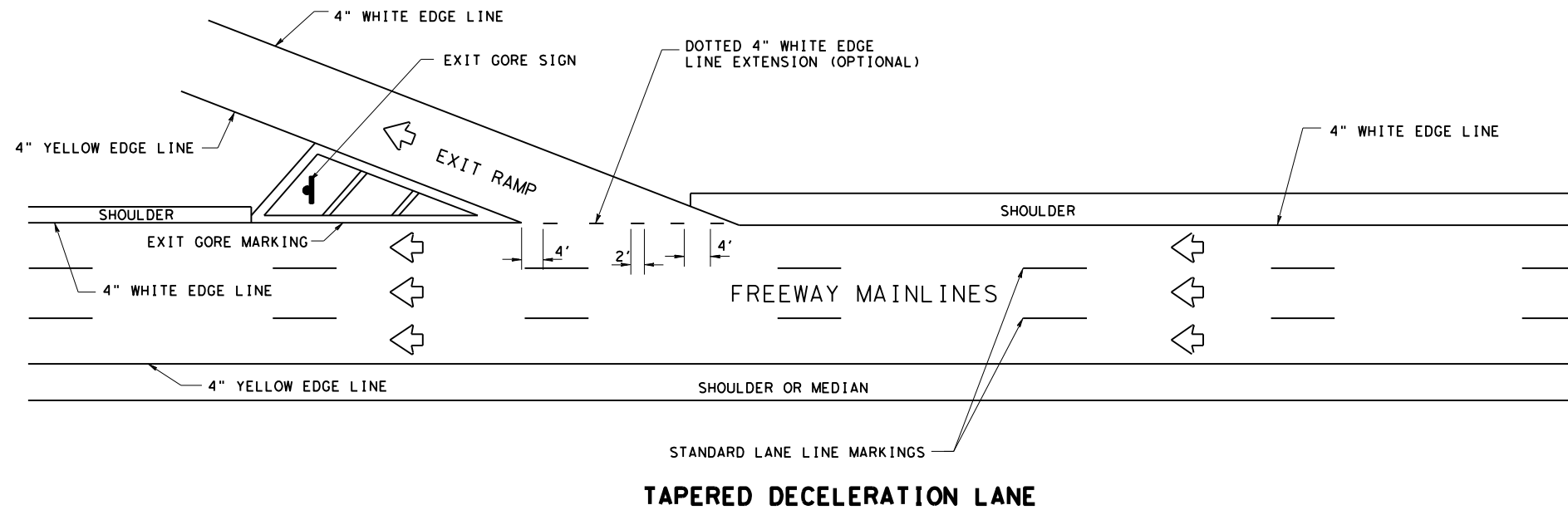
### EXIT GORE PAVEMENT MARKINGS

#### FPM(5) - 19

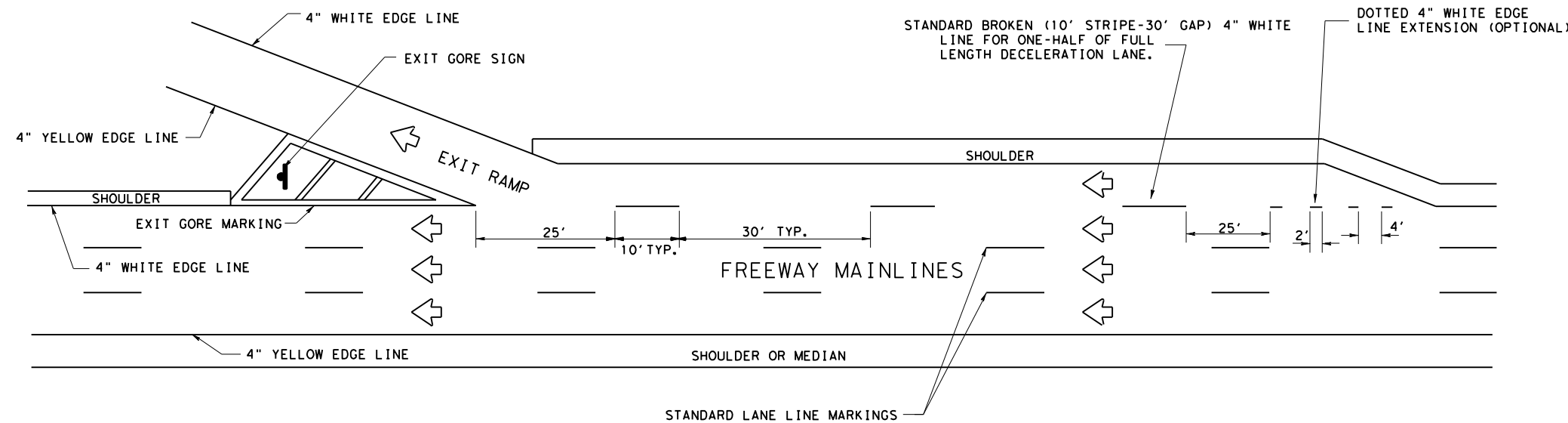
FILE: fpm(5)-19.dgn	DN: [ ]	CK: [ ]	DW: [ ]	CK: [ ]
© TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0110	05	127	IH45
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		88

DATE: FILE:





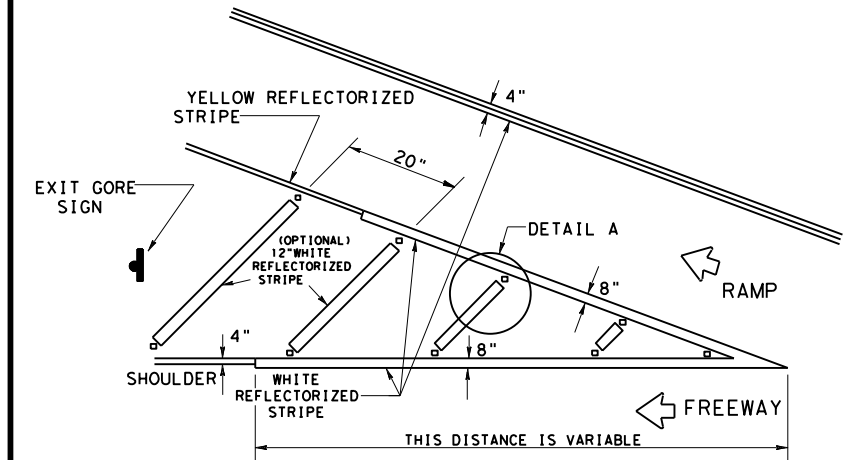
**TAPERED DECELERATION LANE**



**PARALLEL DECELERATION LANE**

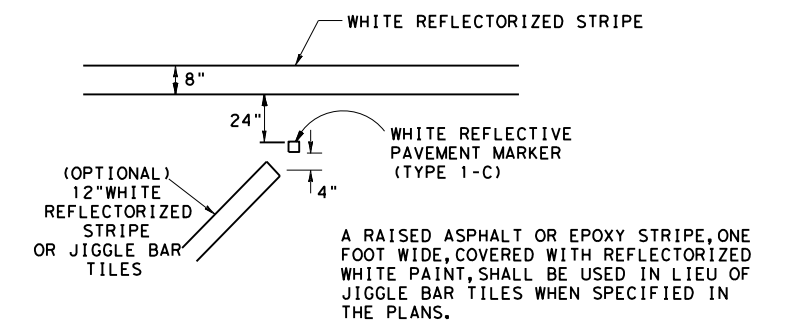
**TYPICAL EXIT RAMP MARKINGS**

THE ABOVE EXIT RAMP MARKINGS SHALL BE APPLIED ONLY ON ONE LANE EXIT RAMPS TO FRONTAGE ROAD OR TO CROSSING ROADS UNLESS OTHERWISE DIRECTED BY THE PLANS OR BY THE ENGINEER.



THE SHAPE OF THE GORE MARKING WILL VARY DEPENDING ON THE RAMP DESIGN AND WILL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

**TYPICAL EXIT RAMP GORE MARKING**



**DETAIL A**



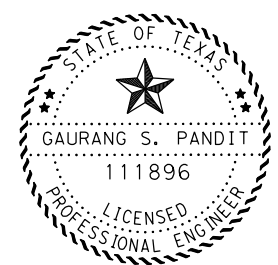
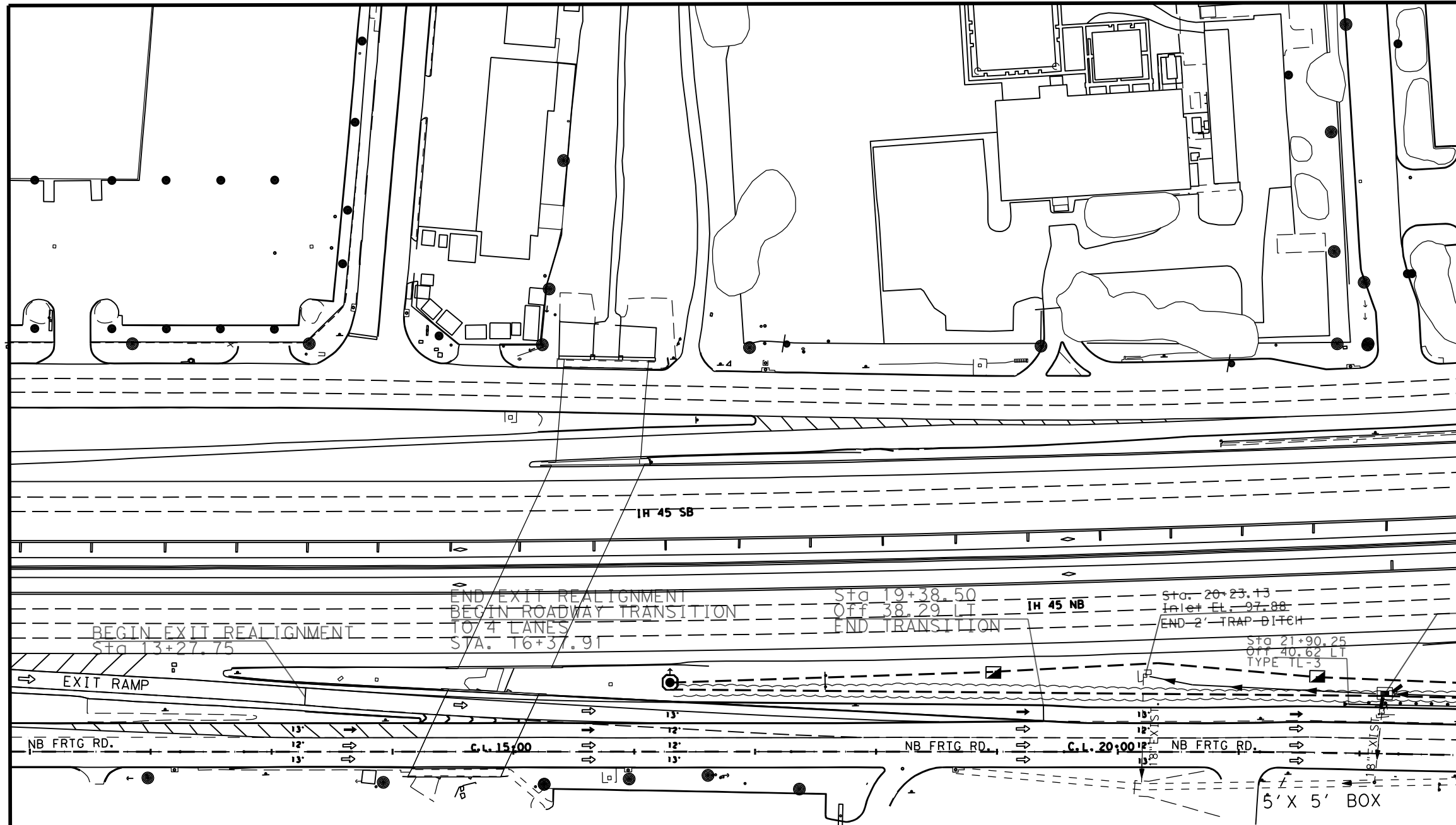
**EXIT GORE PAVEMENT MARKINGS**

**EGPM TC6001-04**

FILE:	DN:	CK:	DW:	CK:
© TxDOT	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS	HOU	6		89
	COUNTY	CONTROL	SECT	JOB
	HARRIS	0110	05	127
				HIGHWAY
				IH45



MATCH LINE: STATION: 22 + 20.21



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*G. Pandit*

06/15/2021

**LEGEND**

- EXISTING HIGH MAST (TO REMAIN)
- NEW GROUND BOX TY D W/APRON
- EXISTING SERVICE (TO BE REUSED)
- NEW UNDERGROUND PVC AND CONDUCTORS
- EXISTING UNDERGROUND CONDUIT AND CONDUCTORS TO BE REMOVED/ABANDONED
- EXISTING GROUND BOX (TO BE REUSED)

ITEM - CODE	0618 - 6046	0620 - 6007	0620 - 6008	0624 - 6010	0628 - 6052
DESCRIPTION	COND (PVC) (SCH 80) (2" TRENCH)	ELECT CONDR (NO. 8) BARE	ELECT CONDR (NO. 8) INSULATED	GROUND BOX TY D (162922) W/APRON	ELC SRV TY A 240/480 60 (SS) SS (E) GC (U)
UNIT	(LF)	(LF)	(LF)	(EA)	(EA)
TOTAL	659	659	1318	2	0



**IH 45 FRONTAGE ROAD AT EAST CYPRESSWOOD DRIVE LIGHTING LAYOUTS**

SCALE: 1" = 100' SHEET 1 OF 2

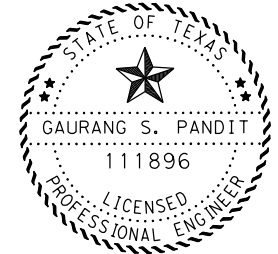
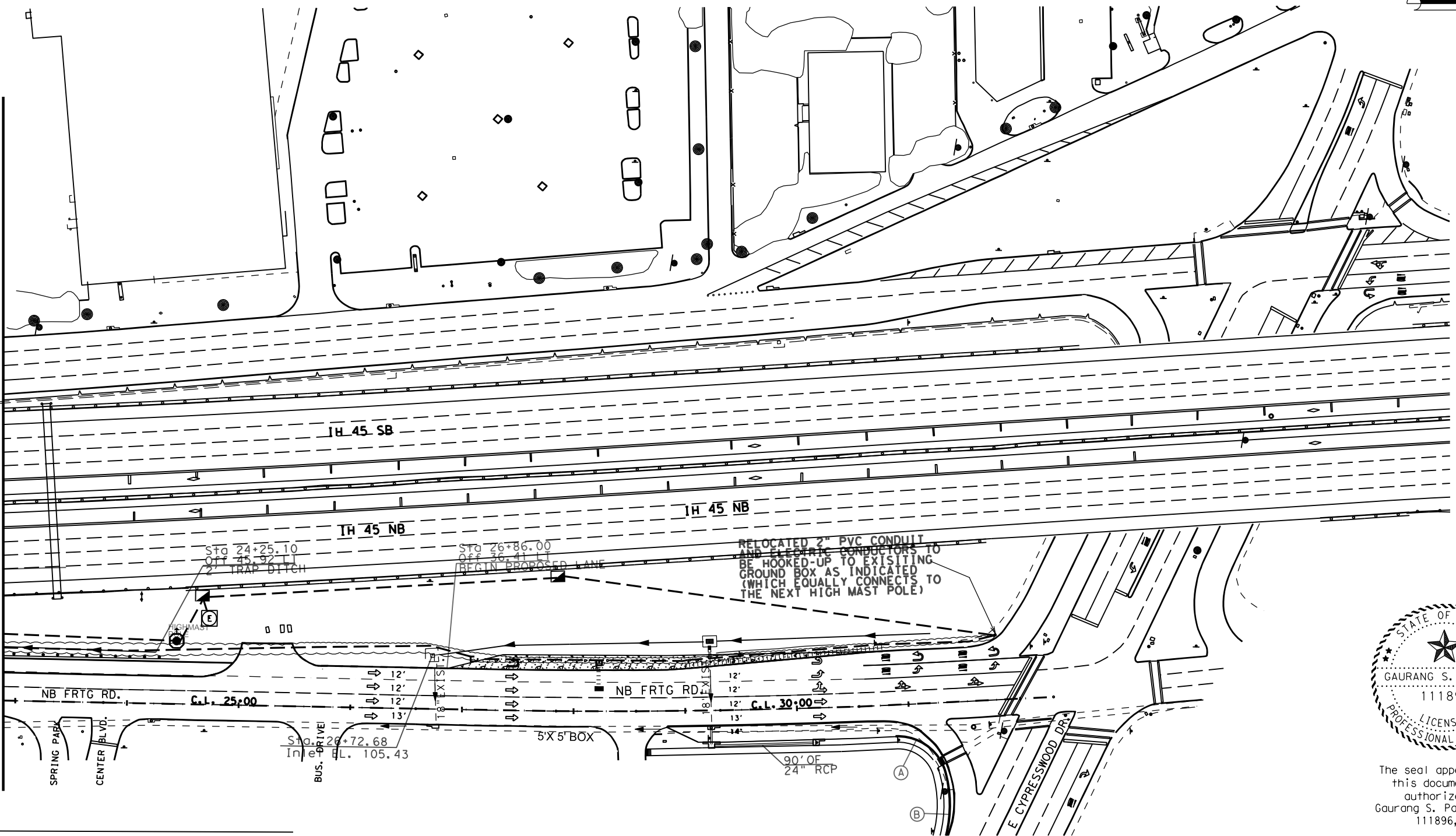
ORIGINAL DRAWING DATE:	REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
		12	6		90
DN. -		COUNTY	CONTROL	SECTION	JOB
CK. -		HARRIS	0110	05	127
					IH 45

TIME: 10:15AM DATE: 05/06/2021

BTM: \$  
DATE: \$  
FILE: \$

FILE: \$

MATCHLINE: STATION: 22 + 20.21



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*G. Pandit* 07/09/2021

LEGEND

- EXISTING HIGH MAST (TO REMAIN):
- NEW GROUND BOX TY D W/APRON
- EXISTING SERVICE (TO BE REUSED)
- NEW UNDERGROUND PVC AND CONDUCTORS
- EXISTING UNDERGROUND CONDUIT AND CONDUCTORS TO BE REMOVED/ABANDONED
- EXISTING GROUND BOX (TO BE REUSED)

ITEM - CODE	0618 - 6046	0620 - 6007	0620 - 6008	0624 - 6010	0628 - 6052
DESCRIPTION	COND (PVC) (SCH 80) (2" TRENCH)	ELECT CONDR (NO. 8) BARE	ELECT CONDR (NO. 8) INSULATED	GROUND BOX TY D (162922) W/APRON	ELC SRV TY A 240/480 60(SS)SS(E)GC(U)
UNIT	(LF)	(LF)	(LF)	(EA)	(EA)
TOTAL	888	888	1776	2	EXISTING

TEXAS DEPARTMENT OF TRANSPORTATION

IH 45 FRONTAGE ROAD AT EAST CYPRESSWOOD DRIVE LIGHTING LAYOUTS

SCALE: 1" = 100' SHEET 2 OF 2

ORIGINAL DRAWING DATE:	REVISIONS	STATE DISTRICT	FEDERAL REGION	FEDERAL AID PROJECT	SHEET
		12	6		91
DR. I - SAK		COUNTY	CONTROL	SECTION	JOB
DR. I - BRR		HARRIS	0110	05	127
DR. I -					IH 45
DR. I -					

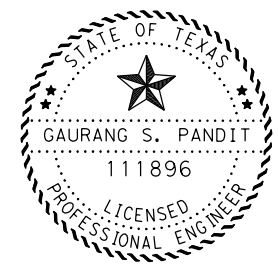
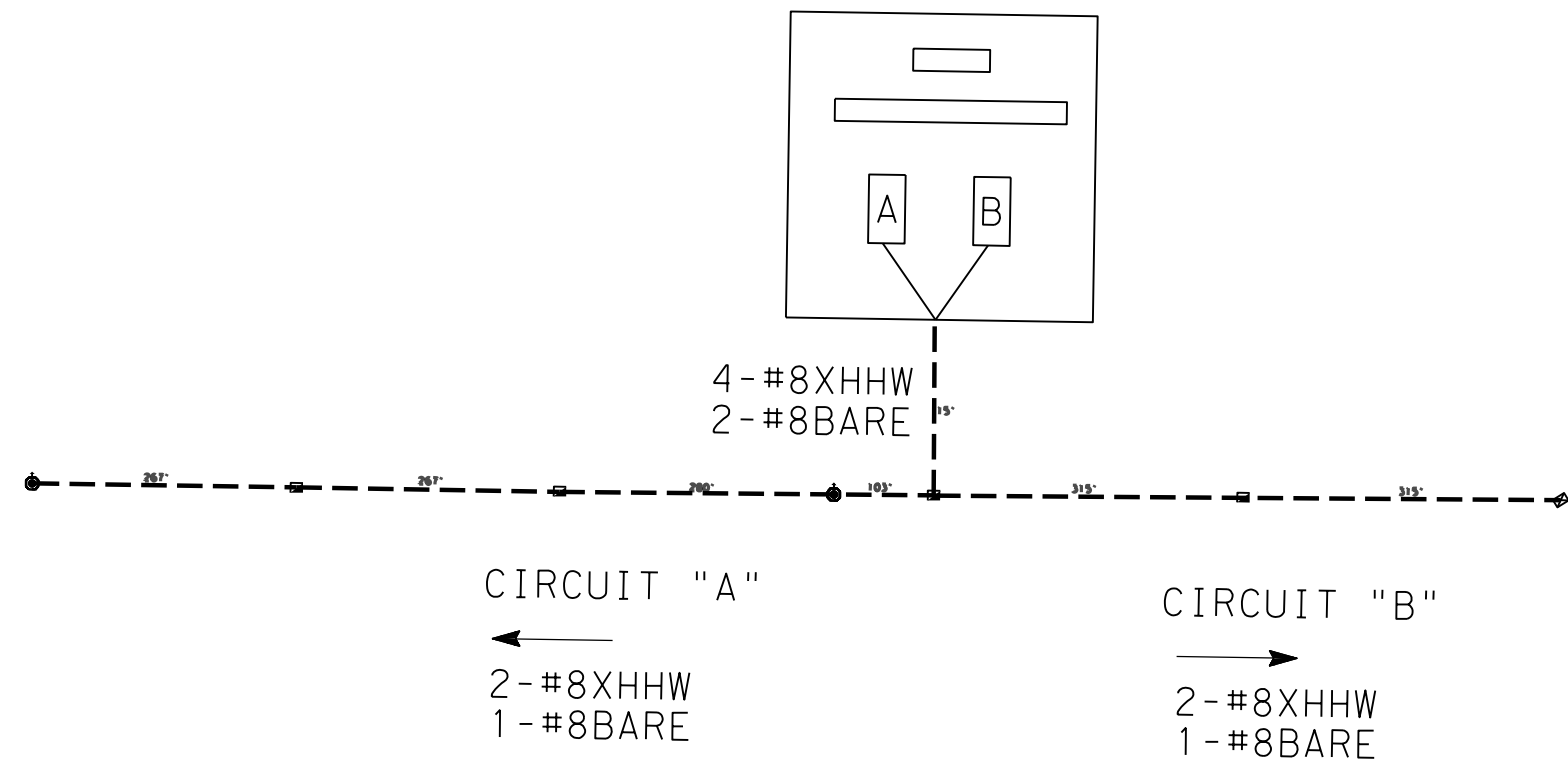
BTIMES\$  
#DATE\$  
#FILEL\$

#FILEL\$

TIME: 10:50AM DATE: 05/06/2021

EXISTING SERVICE  
(TO BE REUSED)

SHEET 2 OF 2




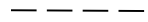
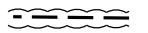



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*G. Pandit*

04/13/2021

LEGEND

-  EXISTING HIGH MAST (TO REMAIN)
-  NEW GROUND BOX TY D W/APRON
-  EXISTING SERVICE (TO BE REUSED)
-  NEW UNDERGROUND PVC AND CONDUCTORS
-  EXISTING UNDERGROUND CONDUIT AND CONDUCTORS TO BE REMOVED/ABANDONED
-  EXISTING GROUND BOX (TO BE REUSED)



IH 45 NORTH BOUND FRONTAGE ROAD  
AT EAST CYPRESSWOOD DRIVE  
CIRCUIT DIGRAM

SCALE: NOT TO SCALE

ORIGINAL DRAWING DATE:	STATE DISTRICT REGION	FEDERAL AID PROJECT	SHEET
REVISED	12 6		92
COUNTY	CONTROL SECTION	JOB	HIGHWAY
HARRIS	0110 05	127	IH 45

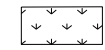



\$TIME\$  
\$DATE\$  
\$FILEL\$

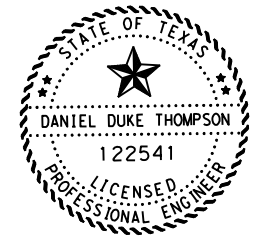
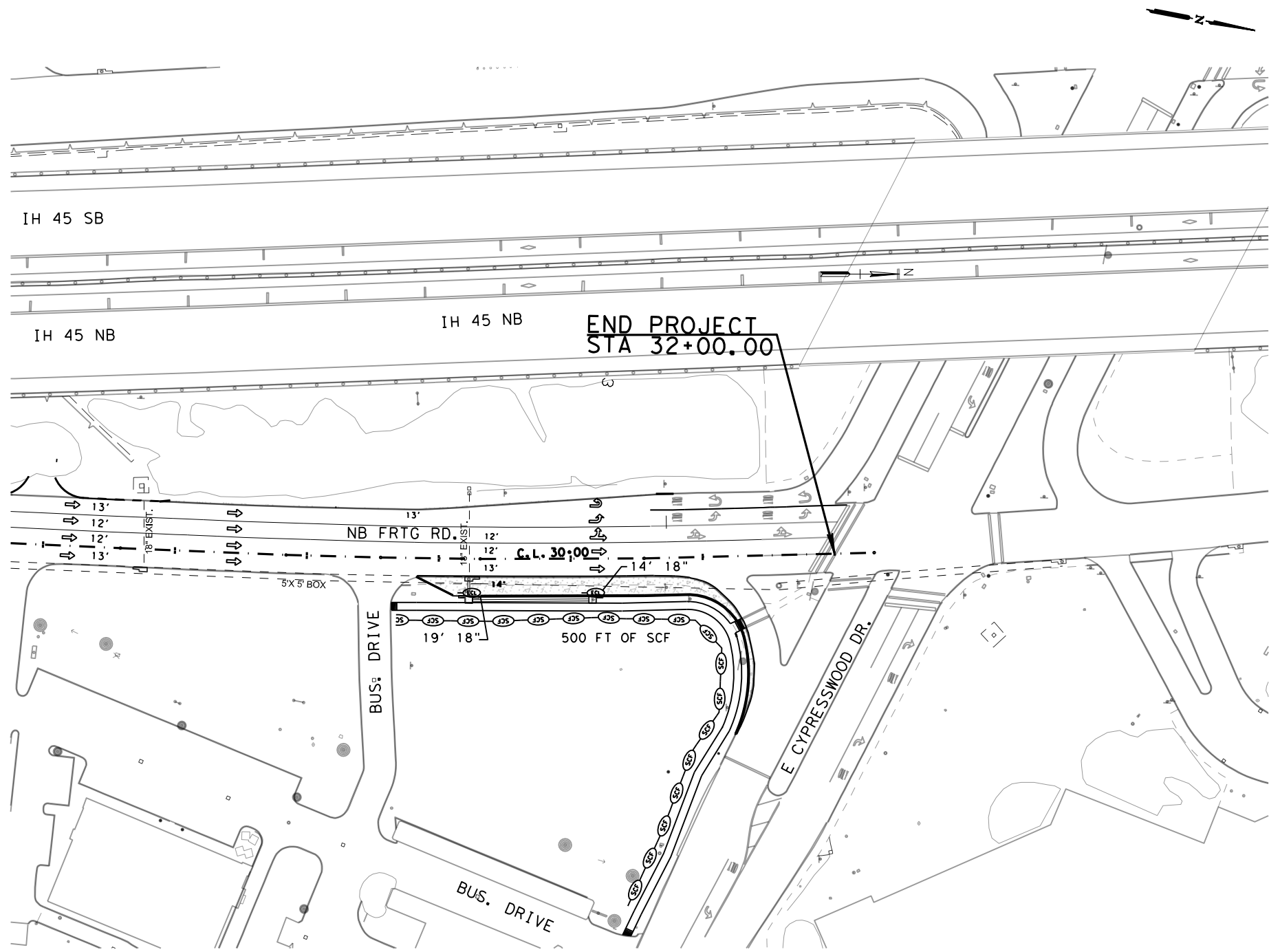
\$FILEL\$

TIME: 7:10PM

DATE: 04/09/2021

LEGEND

-  SOIL RETENTION BLANKET
-  WATER FLOW
-  SEDIMENT CONTROL FENCE
-  18" EROSION CONTROL LOG



*Daniel Duke Thompson*  
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IH 45  
 AT CYPRESSWOOD DR.

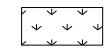



SW3P  
 PHASE I

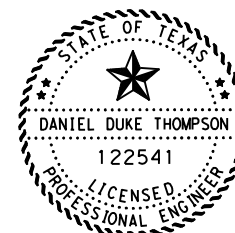
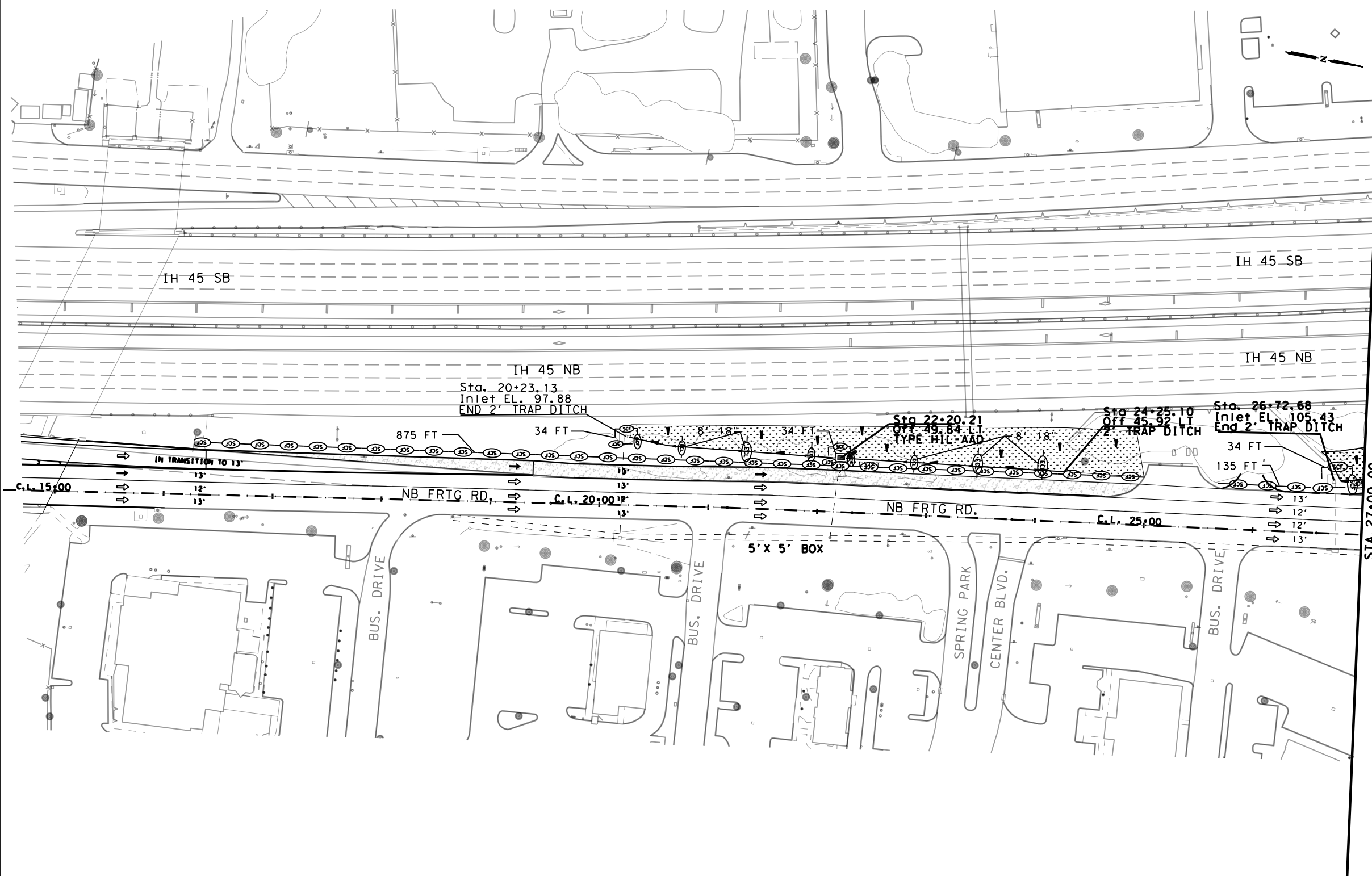
SCALE: 1" = 100' HORZ

SHEET 1 OF 1

FED. RD. DIV. NO. 6	PROJECT NO.		SHEET NO. 93
STATE TEXAS	DIST HOU	COUNTY HARRIS	
CONT 0110	SECT 05	JOB 127	HIGHWAY IH 45

LEGEND

-  SOIL RETENTION BLANKET
-  WATER FLOW
-  SEDIMENT CONTROL FENCE
-  18" EROSION CONTROL LOG



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IH 45  
 AT CYPRESSWOOD DR.

SW3P  
 PHASE 2

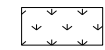



SCALE: 1" = 100' HORZ

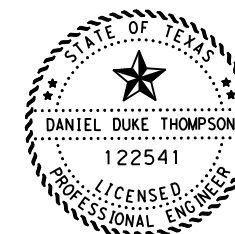
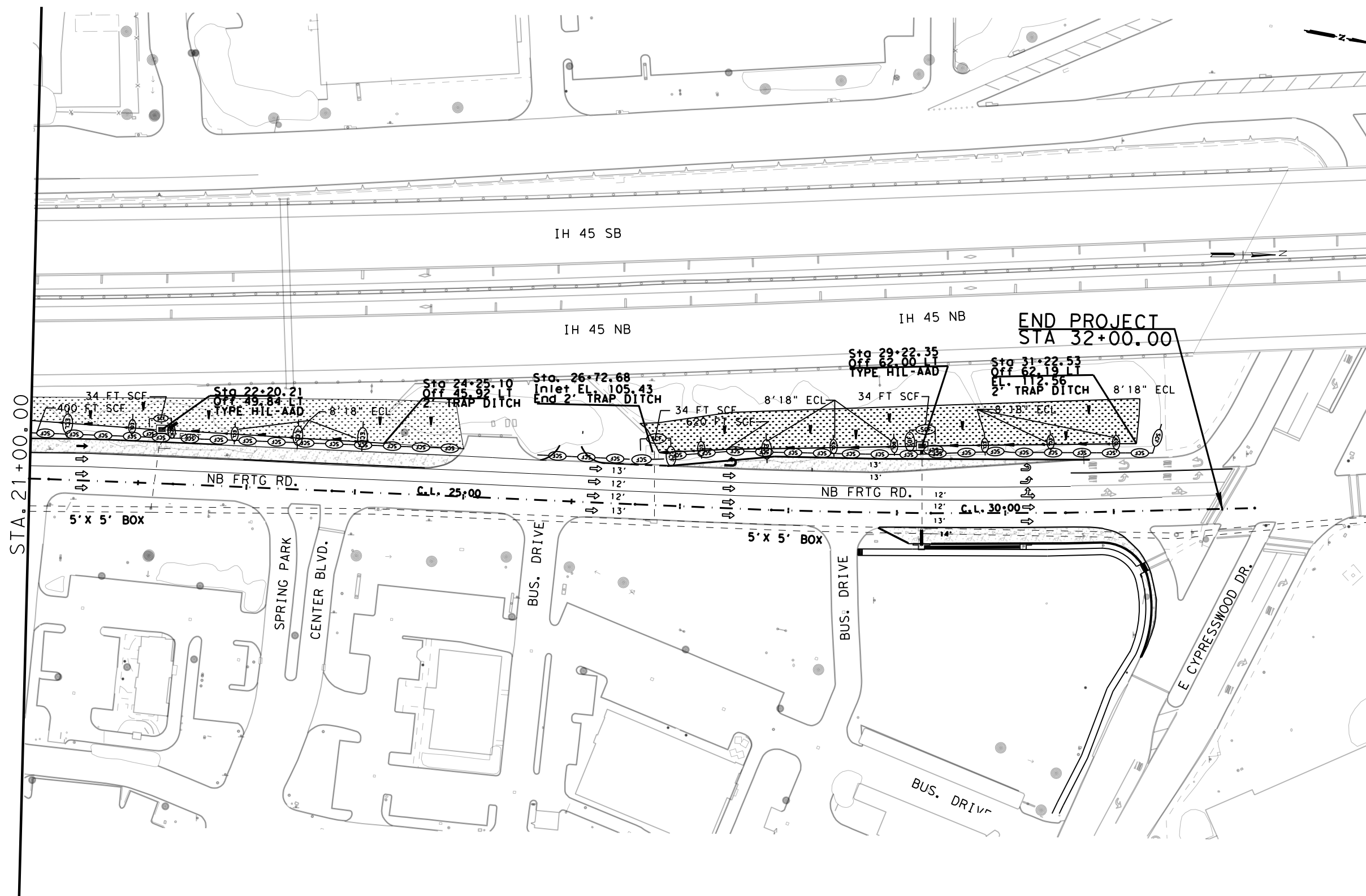
SHEET 1 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			94
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/27/2021  
 \$FILEL\$

LEGEND

-  SOIL RETENTION BLANKET
-  WATER FLOW
-  SEDIMENT CONTROL FENCE
-  18" EROSION CONTROL LOG



*Daniel Duke Thompson*  
 The seal appearing on this document was authorized by DANIEL THOMPSON, P.E. 122541 on 07/02, 2021. Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.

XXXX  
 Texas Department of Transportation  
 SHEET 4 OF 4

IH 45  
 AT CYPRESSWOOD DR.

SW3P  
 PHASE 2

SCALE: 1" = 100' HORZ

SHEET 2 OF 2

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			95
STATE	DIST	COUNTY	
TEXAS	HOU	HARRIS	
CONT	SECT	JOB	HIGHWAY
0110	05	127	IH 45

DATE: 8/27/2021  
 \$FILEL\$

**SITE DESCRIPTION**

PROJECT LIMITS: HARRIS COUNTY

I 45 NB FRONTAGE RD TO CYPRESSWOOD

PROJECT DESCRIPTION:

FOR THE CONSTRUCTION OF RIGHT AND LEFT TURN LANES DRAINAGE, SIDEWALKS, SIGNING AND PAVEMENT MARKINGS.

MAJOR SOIL DISTURBING ACTIVITIES:

CONSTRUCTION OF INSIDE LANE BETWEEN NBFRTG RD AND I 45 AND RIGHT TURN LANE AT CYPRESSWOOD DR.

CONSTRUCTION OF NEW "2" FLAT BOTTOM DITCH BETWEEN NB FRTG RD. AND I 45.

REPLACEMENT OF INLETS ALONG NEW PROPOSED DITCH.

NEW CURB INLETS ALONG RIGTH TURN LANE.

NEW SIDEWALK ALONG NBFRTG RD AND CYPRESSWOOD DR.

TOTAL PROJECT AREA: 2.8 AC.

TOTAL AREA TO BE DISTURBED: 1.2 AC.

WEIGHTED RUNOFF COEFFICIENT: 0.793  
(AFTER CONSTRUCTION):

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: EXISTING PROJECT HAS FAIRLY GOOD VEGTATIVE COVER WITH GRASS AND TREES  
(List existing soil types based on soil mapping and estimated vegetative cover)

MIDLAND-BEAUMONT ASSOCIATION: POORLY DRAINED, LOAMY AND CLAYEY SOILS.

EXISTING VEGTATIVE COVER IS 90%

NAME OF RECEIVING WATERS: SINGER GULLY

**EROSION AND SEDIMENT CONTROLS**

**SOIL STABILIZATION PRACTICES:**

- TEMPORARY SEEDING
- PERMANENT PLANTING, SODDING, OR SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES

OTHER: \_\_\_\_\_

**STRUCTURAL PRACTICES:**

- SILT FENCES
- HAY BALES
- ROCK BERMS
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- PIPE SLOPE DRAINS
- PAVED FLUMES
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- CHANNEL LINERS
- SEDIMENT TRAPS
- SEDIMENT BASINS
- STORM INLET SEDIMENT TRAP
- STONE OUTLET STRUCTURES
- CURBS AND GUTTERS
- STORM SEWERS
- VELOCITY CONTROL DEVICES
- EROSION CONTROL LOGS

OTHER: \_\_\_\_\_

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES: \_\_\_\_\_  
(Provide narrative of construction sequencing)

PHASE 1  
CONSTRUCT RT. TURN LANE. CURB INLETS AND SIDEWALK.

PHASE 2  
CONSTRUCT AREA DRAINS BETWEEN NB FRTG RD AND I 45.  
CONSTRUCT 2' FLAT BOTTOM DITCH.  
CONSTRUCT LEFT TURN LANE.

STORM WATER MANAGEMENT: \_\_\_\_\_

STORMWATER SHOULD NOT BE AN ISSUE DURING CONSTRUCTION BECAUSE OF THE EXISTING AND PROPOSED DITCH.

EROSION CONTROL LOGS WILL BE PLACED IN NEW PROPOSED DITCH.

INLETS ARE PROTECTED BY EROSION CONTROL FENCE.

**OTHER EROSION AND SEDIMENT CONTROLS:**

MAINTENANCE: All erosion and sediment controls will be maintained in good working order. If a repair is necessary it will be done at the earliest date possible, but no later than 7 calender days after the surrounding exposed ground has dried sufficiently to prevent further damage from heavy equipment. The area adjacent to creeks and drainageways shall have priority followed by devices protecting storm sewer inlets.

INSPECTION: All inspections will be performed by a TxDOT inspector per one of the options below as directed by the Area Engineer  
1. At least every 7 calendar days  
2. At least every 14 days or after 0.5 inches or more of rainfall  
An inspection and maintenance report should be made for each inspection. Based on the inspection results, the controls shall be revised according to the inspection report.

WASTE MATERIALS: The dumpster used to store all waste material will meet all state and local city solid waste management regulations. All trash and construction debris will be deposited in the dumpster. The dumpster will be emptied as necessary or as required by local regulation and the trash will be hauled to a local dump. No construction waste material will be buried on site.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING): In the event of a spill which may be considered hazardous, the Houston District Safety Office shall be contacted immediately at 713-802-5962.

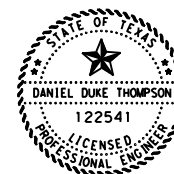
SANITARY WASTE: \_\_\_\_\_

OFFSITE VEHICLE TRACKING:

- HAUL ROADS DAMPENED FOR DUST CONTROL
- LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
- EXCESS DIRT ON ROAD REMOVED DAILY
- STABILIZED CONSTRUCTION ENTRANCE

OTHER: \_\_\_\_\_

REMARKS: Disposal areas, stockpiles, and haul roads shall be constructed in a manner that will minimize and control the sediment that may enter receiving waterways. Disposal areas shall not be located in any waterway, waterbody or streambed. Construction staging areas and vehicle maintenance areas shall be constructed by the contractor in a manner which minimizes the runoff of all pollutants. All waterways shall be cleared as soon as practical of temporary embankments, temporary bridges, matting, falsework, piling, debris, and other obstructions placed during construction operations that are not part of the finished work.



*Daniel Duke Thompson*  
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Alteration of a sealed document without proper notification to the responsible engineer is an offense under the Texas Engineering Practice Act.




**TxDOT STORM WATER POLLUTION PREVENTION PLAN**

**SW3P**

FILE: STDG1.DGN	DW: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
© TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
	HOUSTON	6	NH 2020(369)	96
	COUNTY	CONTROL	SECT	JOB
	HARRIS COUNTY	0110	05	127
				TH 45

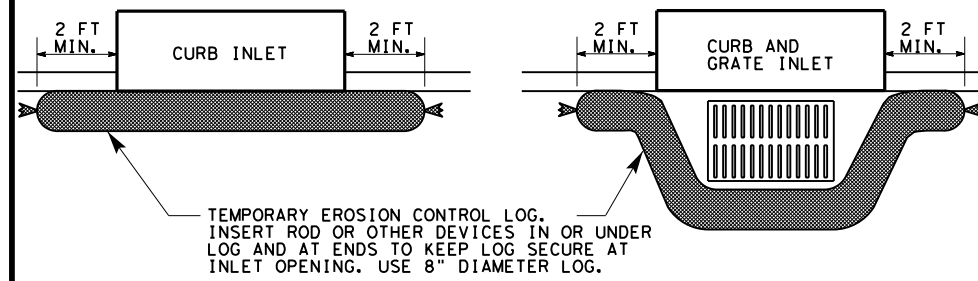


<p><b>I. STORMWATER POLLUTION PREVENTION</b></p> <p>Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit is required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506. Refer to Storm Water Pollution Prevention Plan (SWP3) Houston District standard plan.</p> <p style="text-align: center;">No Additional Comments</p>	<p><b>III. CULTURAL RESOURCES</b></p> <p>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 area and contact the Engineer immediately.</p> <p style="text-align: center;">Additional Comments</p> <p>The Wunsche family cemetery is located in median between main lanes and the frontage road. Care must be taken in this area not to encroach on the cemetery.</p>	<p><b>VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES</b></p> <p>Refer to TxDOT Standard Specifications in the event potentially contaminated materials are observed, such as dead or distressed vegetation, trash disposal areas, drums, canisters, barrels, leaching or seepage of substances, unusual smells or odors, or stained soil, cease work in the area and contact the Engineer immediately.</p> <p style="text-align: center;">No Additional Comments</p>																									
<p><b>II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS</b></p> <p>United States Army Corps of Engineers (USACE) Permit is required for filling, dredging, excavating or other work in water bodies, rivers, creeks, streams, wetlands or wet areas. The Contractor must adhere to all of the terms and general conditions associated with the following permit(s). If additional work not represented in the plans is required, contact the Engineer immediately.</p> <p><input checked="" type="checkbox"/> No United States Army Corps (USACE) Permit Required</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) without a Pre-Construction Notification (PCN). Project specific permit was not issued by USACE, therefore is not in the plan set. The USACE general conditions are in the "General Notes."</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Nationwide Permit (NWP) with a Pre-Construction Notification (PCN). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set. The USACE general conditions are in the "General Notes."</p> <p><input type="checkbox"/> Work is authorized by the United States Army Corps of Engineers (USACE) under a Individual Permit (IP). The project specific permit issued by the United States Army Corps of Engineers (USACE) is included in the plan set.</p> <p><input type="checkbox"/> Work would be authorized by the United States Army Corps of Engineers (USACE) permit. The project specific permit issued by the USACE will be provided to the contractor.</p> <p>United States Coast Guard (USCG) Permit is required for projects that involve the construction or modification (including changes to lighting) of a bridge or causeway across a water body determined to be navigable by the United States Coast Guard (USCG) under Section 9 of the Rivers and Harbors Act. If additional work not represented in the plans is required, contact the Engineer immediately.</p> <p><input checked="" type="checkbox"/> No United States Coast Guard (USCG) Coordination Required</p> <p><input type="checkbox"/> United States Coast Guard (USCG) Permit</p> <p><input type="checkbox"/> United States Coast Guard (USCG) Exemption</p> <p style="text-align: center;">Additional Comments</p>	<p><b>IV. VEGETATION RESOURCES</b></p> <p>Preserve native vegetation to the extent practical. Refer to TxDOT Standard Specifications in order to comply with requirements for invasive species, beneficial landscaping and tree/brush removal.</p> <p style="text-align: center;">No Additional Comments</p>	<p><b>V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS</b></p> <p>If any of the listed species below are observed, cease work in the area, do not disturb species or habitat and contact the Engineer immediately.</p> <p>The work may not remove active nests (from bridges, structures, or vegetation adjacent to the roadway, etc.) during nesting season (February 15 to September 30). If removal of structures or vegetation is necessary during the nesting season, the Contractor shall conduct a bird survey no more than 3 days in advance of the clearing/demolish start date. All bird surveys shall be conducted by a Field Biologist and adhere to the guidance document "Avoiding Migratory Birds and Handling Potential Violations" found in the TxDOT Environmental Compliance Toolkits at the time of the survey. (See below for Field Biologist and Ornithologist qualifications)</p> <p style="text-align: center;">No Additional Comments</p>																									
		<p><b>VII. OTHER ENVIRONMENTAL ISSUES</b></p> <p>Comments:</p>																									
 <span style="float: right;">TxDOT Houston District</span>																											
<p><b>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS</b></p> <p><b>EPIC</b></p>																											
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>FILE: EPIC Sheet.dgn</td> <td>DN:</td> <td>CK:</td> <td>DW:</td> <td>CK:</td> </tr> <tr> <td>© TxDOT: March 2017</td> <td>CONT</td> <td>SECT</td> <td>JOB</td> <td>HIGHWAY</td> </tr> <tr> <td>REVISIONS</td> <td>0110</td> <td>05</td> <td>127</td> <td>IH 45</td> </tr> <tr> <td>UPDATED section V, text and added definition (10/17)</td> <td>DIST</td> <td>COUNTY</td> <td colspan="2">SHEET NO.</td> </tr> <tr> <td>ADDED USCG and USACE notes in Section VII (04/18)</td> <td>HOU</td> <td>Harris</td> <td colspan="2">97</td> </tr> </table>			FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:	© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY	REVISIONS	0110	05	127	IH 45	UPDATED section V, text and added definition (10/17)	DIST	COUNTY	SHEET NO.		ADDED USCG and USACE notes in Section VII (04/18)	HOU	Harris	97	
FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:																							
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY																							
REVISIONS	0110	05	127	IH 45																							
UPDATED section V, text and added definition (10/17)	DIST	COUNTY	SHEET NO.																								
ADDED USCG and USACE notes in Section VII (04/18)	HOU	Harris	97																								
<p><small>Field Biologist, Ornithologist – a field biologist is defined as an individual qualified to perform field investigations, presence/absence surveys and habitat surveys for protected avian species or species of concern. A mandatory bachelor's degree in biology or a related science is required. At a minimum, the Field Biologist, Ornithologist, shall have completed and reported a minimum of three presence/absence and habitat surveys for protected avian species in the past five years. A minimum of three projects must have been conducted in Texas. Surveys shall have been performed for documentation of species in accordance with a protocol approved by USFWS or TPWD, or following generally accepted methodologies.</small></p>																											

DATE: May 25, 2018  
FILE:

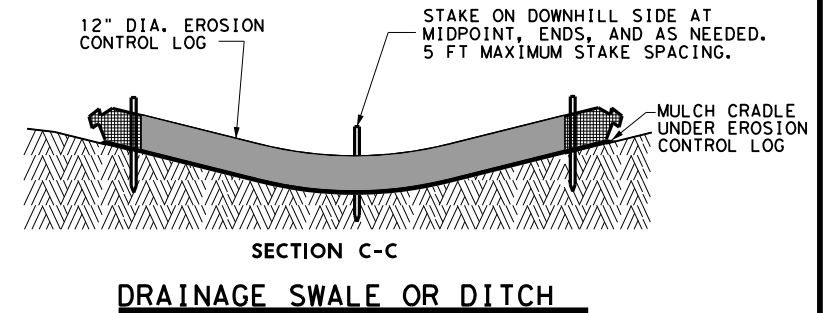
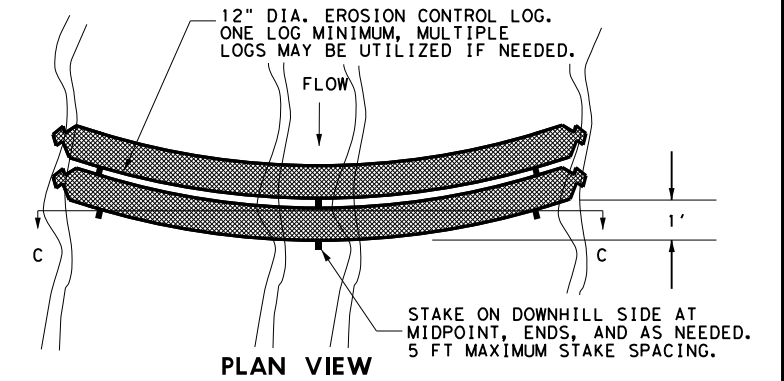
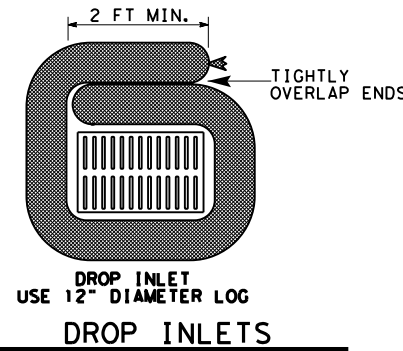
# CURB INLETS 8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



# DROP INLETS AND OTHER LOCATIONS 12" DIAMETER LOGS

ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12")



## MATERIAL REQUIREMENTS

### FILL:

Use 100% shredded mulch or other non-compost biodegradable material as fill for logs. No compost or fines.

DO NOT USE MATERIAL WHICH PROHIBITS WATER INFILTRATION.

### LOG MESH:

Use mesh with 1/4" openings or larger. Mesh must allow water infiltration but also hold fill material in place.

## SEDIMENT BASIN & TRAP USAGE GUIDELINES

A sediment trap (erosion control log) may be used to filter sediment out of runoff draining from an unstabilized area.

**Traps:** The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

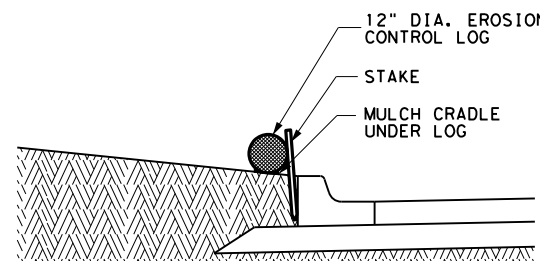
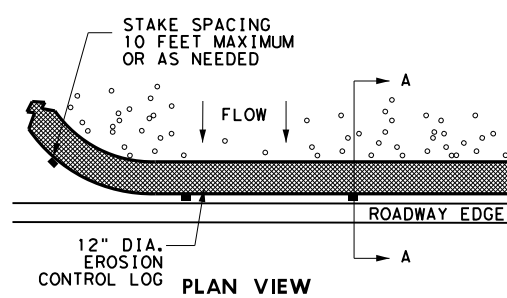
Sediment traps should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way

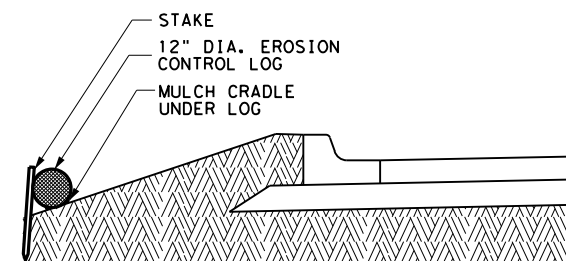
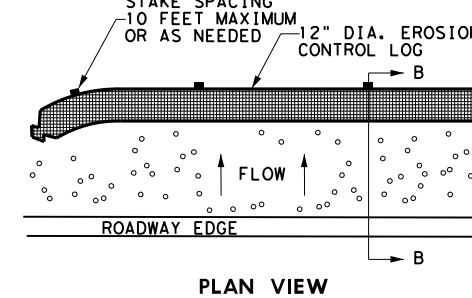
The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

### REQUIRED ITEMS:

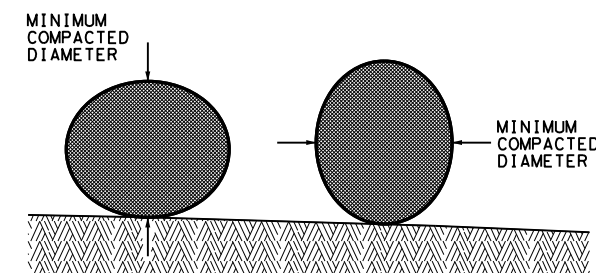
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF



SECTION A-A  
SLOPE TO ROADWAY EDGE



SECTION B-B  
SLOPE AWAY FROM ROADWAY EDGE



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

## EROSION CONTROL LOG

ECL-12

FILE: STDG4G.DGN	DN: TxDot	CK: TxDot	OW: TxDot	CK: TxDot
©TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER	SHEET
REVISIONS	HOU	6		98
3/15 MINOR CORRECTIONS	COUNTY	CONTROL	SECT	JOB
	HARRIS	0110	05	127 IH45

TYPE OF WORK

ITEMS AND REQUIREMENTS FOR EACH TYPE OF WORK

SODDING	PERMANENT SEEDING	TEMPORARY SEEDING	Reference Item 161, 162, 164, 166, 168 of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements that are not shown. Use latest Houston District, Special Provisions for those items indicated.		
	✓		<b>161-6017 COMPOST MANUF TOPSOIL (BIP) (4") SY</b>	APPLICATION RATE Item 161.2.1. Compost Manufactured Topsoil (CMT)	Item 161.2. Materials. Submit quality control (QC) documentation to the Engineer. Compost producer's STA certification must be dated to meet STA requirements (certification must be within 30 or 90 days per STA requirements). Lab analysis performed by an STA-certified lab must be dated within 30 days before delivery of the compost.
✓			<b>162-6002 BLOCK SODDING SY</b>	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. <b>REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.</b> Place sod within 48 hours of delivery to site. No exceptions. Place sod with joints alternating on each row to prevent continuous joint lines. Peg sod as needed with wood pegs to hold sod in place. Pegging sod is subsidiary to Item 162.
	✓		<b>164-6066 DRILL SEEDING (PERM) (WARM OR COOL) SY</b> Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, May, June, July, August, September, October Hulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	PLS (Pure Live Seed) Provide documentation of PLS requirements per Item 164.2.1.  CONSTRUCTION. Cultivate the area to a depth of 4 inches before placing the seed unless otherwise directed. When performing permanent seeding after an established temporary seeding, cultivate the seedbed to a depth of 4 inches or mow the area before placement of the permanent seed. Plant the seed and place the straw or hay mulch after the area has been completed to lines and grades as shown on the plans.
	✓		<b>164-6052 BROADCAST SEED (PERM) (SPECIAL MIX) SY</b> Item 164.1. Description Provide and install seeding as shown on District Standard	November, December, January, February Unhulled - Bermudagrass (Cynodon dactylon) - 40.0 lbs PLS/acre Oats (Avena sativa) - 72.0 lbs PLS/acre Green Sprangletop (Leptochloa dubia) - 4.0 lbs PLS/acre Sideoats Grama (Bouteloua curtipendula) - 3.2 lbs PLS/acre Little Bluestem (Schizachyrium scoparium) - 1.4 lbs PLS/acre	Drill Seeding. Plant seed or seed mixture uniformly over the area shown on the plans at a depth of 1/4 to 1/3 inch using a cultipacker (turfgrass) type seeder. Plant seed along the contour of the slopes.
		✓	<b>164-6051 DRILL SEED (TEMP) (WARM OR COOL) SY</b> Item 164.1. Description Provide and install seeding as shown on District Standard	PLANTING MONTH SEED MIX March, April, May, June, July, August, September, October Foxtail Millet (Setaria italica) - 34.0 lbs PLS/acre	Use broadcast seeding method where site conditions prevent drill seeding method.
		✓	<b>164-6009 BROADCAST SEED (TEMP) (WARM) SY</b> Item 164.1. Description Provide and install seeding as shown on District Standard	November, December, January, February Oats (Avena sativa) - 72.0 lbs PLS/acre	Broadcast Seeding. Distribute the dry seed or dry seed mixture uniformly over the areas shown on the plans using hand or mechanical distribution on top of soil.
	✓	✓	<b>162-6003 STRAW OR HAY MULCH SY</b>	APPLICATION RATE Immediately after planting the seed or seed mixture, apply straw or hay mulch uniformly over the seeded area. Apply straw or hay mulch at 2 tons per acre. Use tacking agent with straw or hay mulch as described on this sheet.	Use straw or hay mulch in conformance with Article 162.2.5, "Mulch." Use biodegradable tacking agents only applied at a rate in accordance with manufacturer's recommendations. Use the following products or an approved equal (see note this sheet): Conweb/Contac Guar Gum, Profile Products Corporation, (307) 655-9565, Ramtec/Procol/Viscol Guar Gum, Ramtec Corporation, (800) 366-1180
✓	✓	✓	<b>166-6001 FERTILIZER AC</b> Item 166.2. Materials Use fertilizer as shown on District Standard	APPLICATION RATE Deliver and evenly distribute fertilizer at a rate of 4000 lbs/acre.	Use a <b>NON-CHEMICAL</b> fertilizer which meets all the following criteria: (1) BRAND NAME must be registered with the Texas State Chemist as a commercial fertilizer. (2) Meets USEPA guidelines for unrestricted use. (3) Derived from biological sources such as, but not limited to: sewage sludge, manures, vegetation, etc. (4) In granular form and essentially dust free. Submit proof of registration and nutrient source to Engineer. Use the following products or an approved equal (see note this sheet): Sigma, SIGMA AgriScience, 281-851-6749 Sustanite-standard grade, Automation Nation, Inc., 713-675-4999 Milorganite, MMSD, 800-287-9645 Agricultural Organic P/L, Ag Org, INC., 713-523-4396
✓	✓	✓	<b>168-6001 VEGETATIVE WATERING MG</b>	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre x 20 consecutive working days = 120,000 gallons total/acre per working day	Begin watering immediately after installation of seed or sod. Replace, fertilize, and water any seed or sod in poor condition due to the failure to apply the specified amount of water within the time allowed at no expense to the Department.

SEQUENCE OF WORK

BLOCK SOD	PERMANENT SEEDING	TEMPORARY SEEDING
1. FERTILIZER 2. CULTIVATE SOIL (ITEM 162.3) 3. SOD 4. VEGETATIVE WATERING	1. FERTILIZER 2. COMPOST MANUFACTURED TOPSOIL 3. CULTIVATE SOIL (ITEMS 164.3 AND 161.3.1) 4. PERMANENT SEEDING 5. STRAW OR HAY MULCH 6. VEGETATIVE WATERING	1. FERTILIZER 2. CULTIVATE SOIL (PER ITEM 164.3) 3. TEMPORARY SEEDING 4. STRAW OR HAY MULCH 5. VEGETATIVE WATERING



FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS		FED DIST	STATE	PROJECT NUMBER			SHEET
10/2014 UPDATED TO 2014 SPECS	FILE: OCT 2014	6	TEXAS				99
3/2015 MINOR CORRECTIONS				DIST	COUNTY	CONTROL SECT	JOB HIGHWAY
		HOU	HARRIS	0110	05	127	IH45