INDEX OF SHEETS

SEE SHEET 2

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STATE	STATE DISTRICT	COUNTY	
TEXAS	12	HARRIS	R
CONTROL	SECTION	JOB	HIGHWAY
0502	01	222	SH 225

DESIGN SPEED 30 MPH
ADT= 21,888 (2021)
ADT= 29,847 (2041)

REGISTERED ACCESSIBILTY SPECIALIST (RAS) INSPECTION REQUIRED
TDLR PROJECT NO. TABS2021007404

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

STATE PROJECT NO. C 502 - 1 - 222

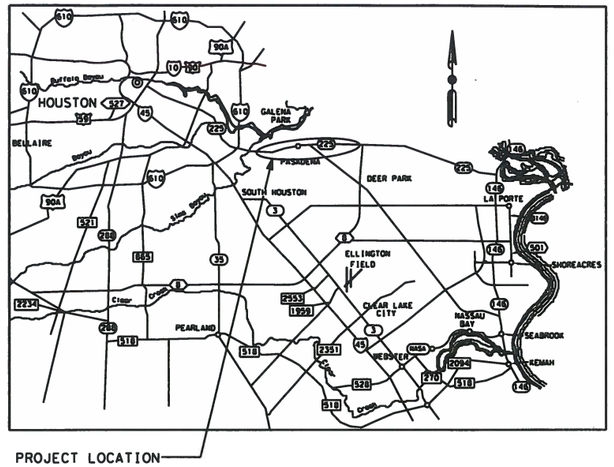
SH 225

HARRIS COUNTY

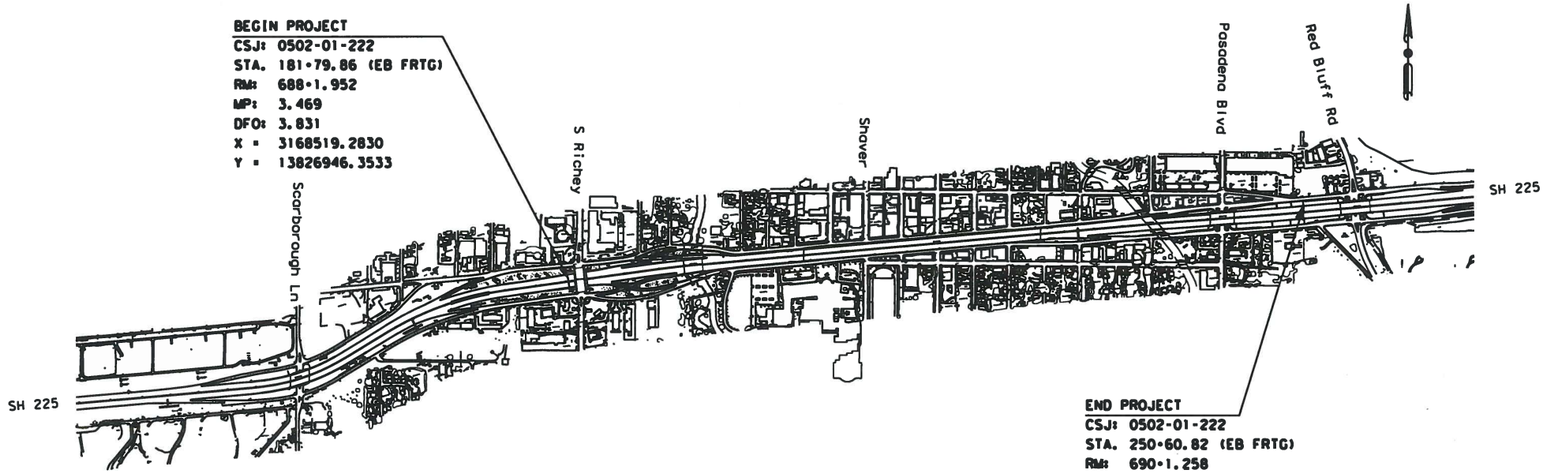
RDWY	=	6,880.96 FT	=	1.303 MI
BRIDGE	=	0.00 FT	=	0.000 MI
TOTAL PROJECT LENGTH	=	6,880.96 FT	=	1.303 MI

LIMITS: FROM S. RICHEY ST TO WEST OF RED BLUFF RD.

FOR THE CONSTRUCTION OF: REHABILITATION OF EXISTING ROAD CONSISTING OF RECONSTRUCT S RICHEY ST AND PASADENA BLVD INTERSECTIONS AND FRONTAGE ROAD FULL DEPTH REPAIRS.



VICINITY MAP
NTS



SH 225

RR CROSSINGS:	NONE
EQUATIONS:	NONE
EXCEPTIONS:	NONE

COUNTY HARRIS PROJ. NO.
HWY. NO. SH 225 LETTING DATE JUNE 2021
DATE ACCEPTED

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND THE SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED LABOR PROVISION FOR STATE PROJECTS: SP000---008.

SUBMITTED FOR LETTING: DATE: 3/26/2021

for: AREA ENGINEER

APPROVED FOR LETTING: DATE: 4/2/2021

DocuSigned by:
James W. Koch . P.E.
8A2ACFA763C24C2...
FOR DISTRICT ENGINEER

H:/DESIGN/0502*01*222*PLAN SET/GENERAL/TITLE01.dgn

GENERAL

TRAFFIC CONTROL PLANS

TRAFFIC CONTROL STANDARDS

ROADWAY PLANS

ROADWAY STANDARDS

UTILITY LAYOUTS

SIGNALS

SIGNALS STANDARDS

(HOU DIST) = HOUSTON DISTRICT STANDARDS

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

*STANDARD SHEETS THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITHIN THE INDEX OF SHEETS , HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO THE PROJECT.

Dedrick D. Knighten , P.E.

DATE: 3/25/2021

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225
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6			2
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CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

H:\WCHAO\Design\Construction Projects\0502-01-222\Plan Set\1. General\Copy of SH225 Index Final.xlsx

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STATE OF TEXAS
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PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ABOVE WITH AN ASTERISK (*) HAVE BEEN SELECTED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Dedrick D. Knighten , P.E.

DATE: 3/25/2021

(HOU DIST) = HOUSTON DISTRICT STANDARDS

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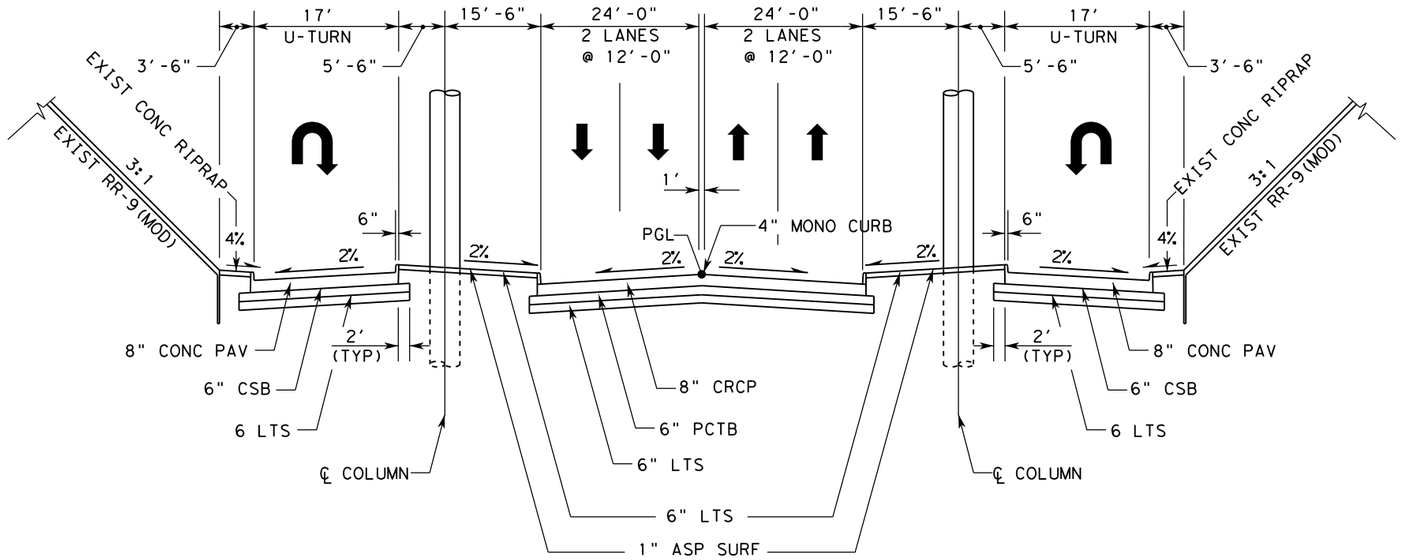
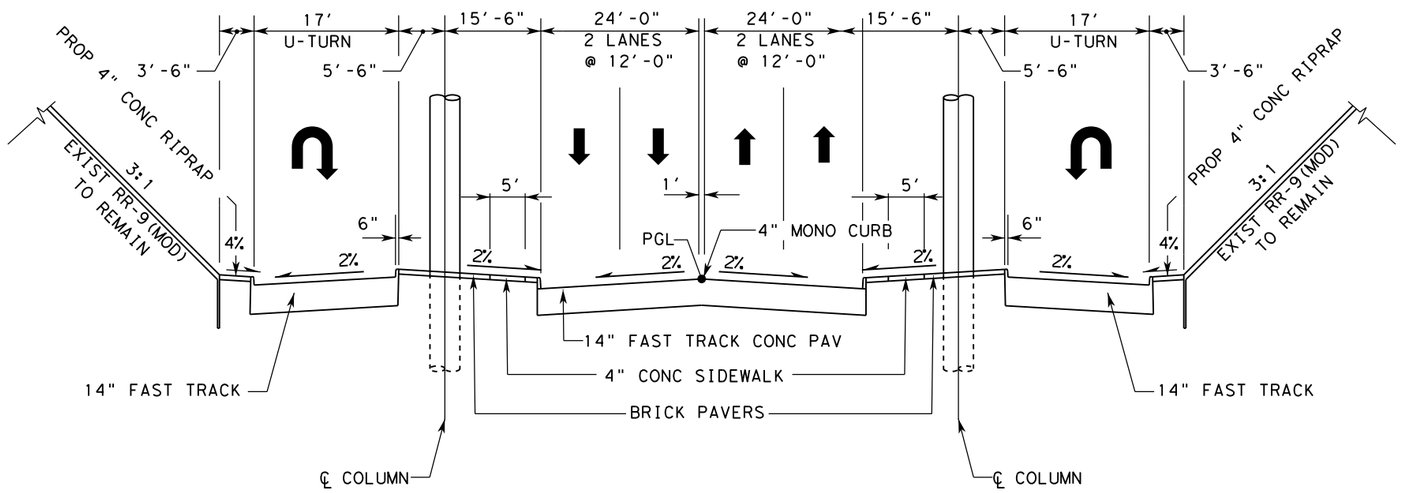
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



STA 19+43.10 TO STA 20+56.59

PASADENA BLVD
EXISTING TYPICAL SECTION



STA 19+43.10 TO STA 20+56.59

PASADENA BLVD
PROPOSED TYPICAL SECTION

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

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3/25/2021

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TEXAS DEPARTMENT OF TRANSPORTATION®

PASADENA BLVD
TYPICAL SECTIONS

N. T. S. SHEET 1 OF 6

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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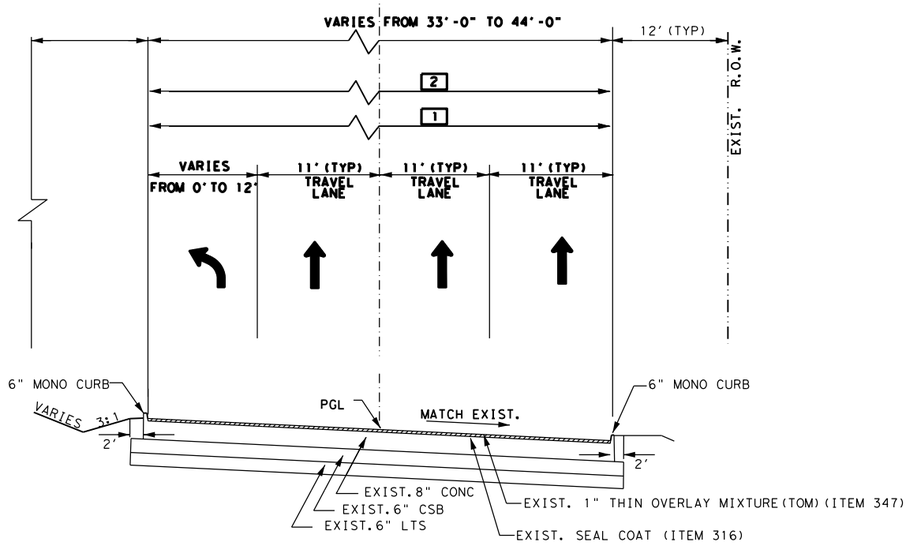
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

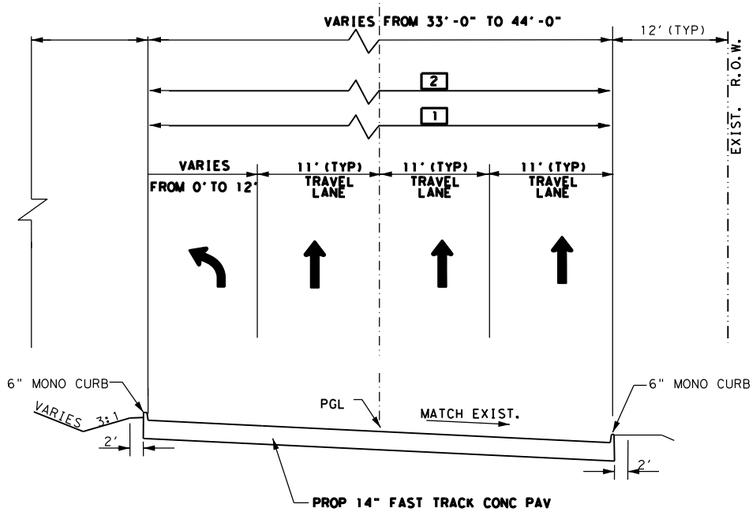
SH 225
℄ EB FRTG



EXISTING TYPICAL SECTION SH 225 EB FRTG RD

STA. 181+79.86 TO STA. 183+42.42
STA. 241+39.26 TO STA. 244+08.18

SH 225
℄ EB FRTG



PROPOSED TYPICAL SECTION SH 225 EB FRTG RD

STA. 181+79.86 TO STA. 183+42.42
STA. 241+39.26 TO STA. 244+08.18

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SH 225 EB FRTG RD TYPICAL SECTIONS

N. T. S. SHEET 2 OF 6

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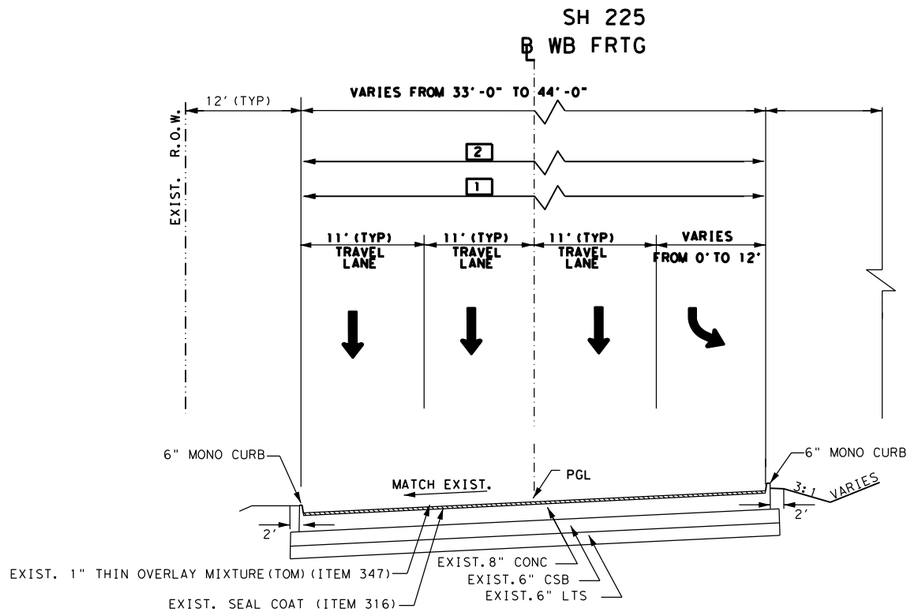
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225 FRTG RD



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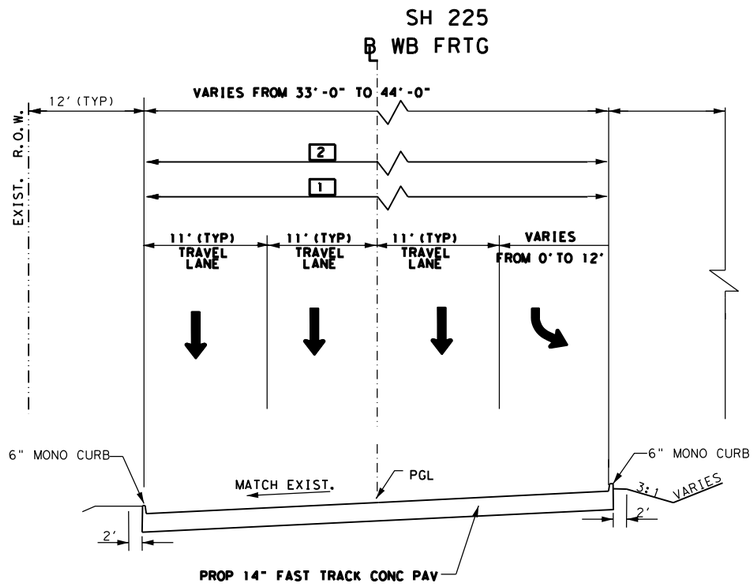
STA. 241+38.89 TO STA. 243+89.23



PROPOSED TYPICAL SECTION SH 225 WB FRTG RD

STA. 181+80.27 TO STA. 183+48.97
STA. 241+38.89 TO STA. 243+89.23

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SH 225 WB FRTG RD TYPICAL SECTIONS

N. T. S. SHEET 3 OF 6

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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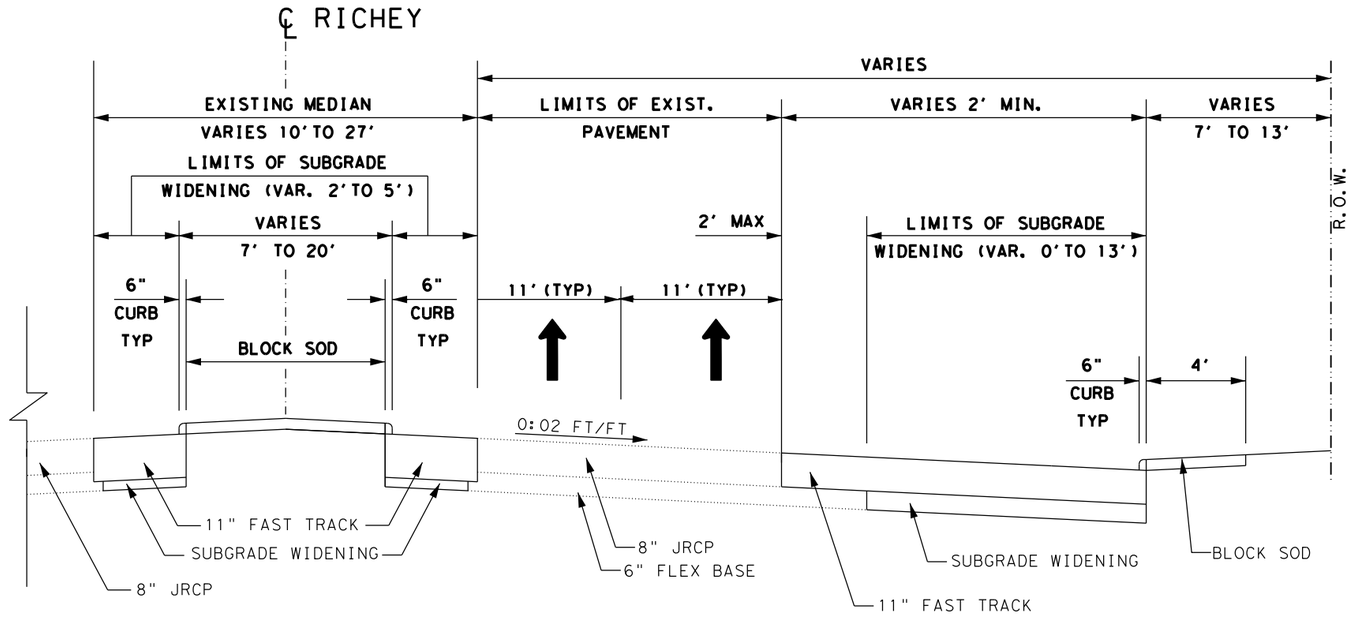
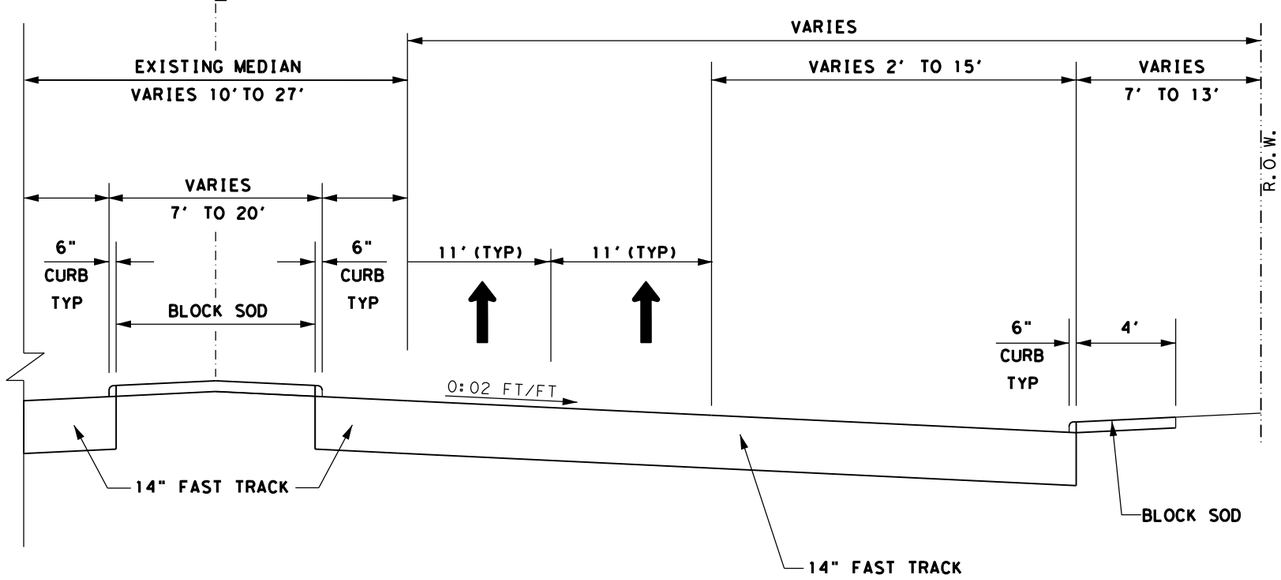
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225 FRTG RD



EXIST. TYPICAL SECTION (RICHEY @ N. OF SH225)

STA. 21+80.29 TO STA. 22+21.53



PROP. TYPICAL SECTION (RICHEY @ N. OF SH225)

STA. 21+80.29 TO STA. 22+21.53

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TEXAS DEPARTMENT OF TRANSPORTATION

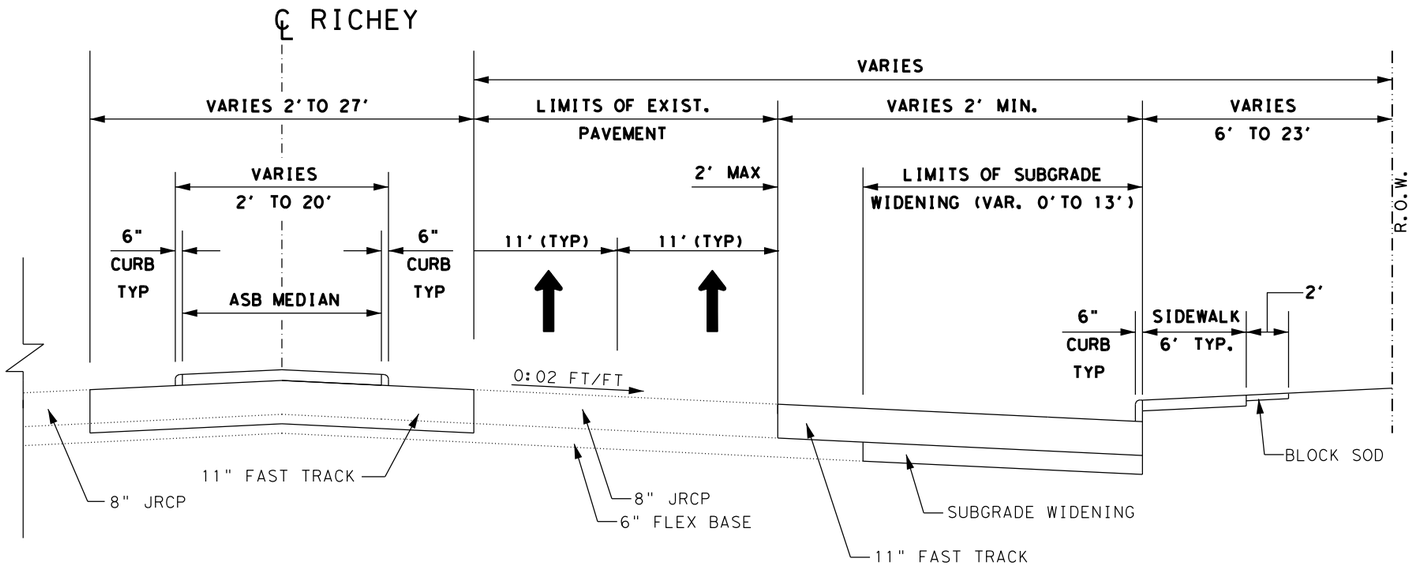
RICHEY ST NORTH TYPICAL SECTIONS

N. T. S.

SHEET 4 OF 6

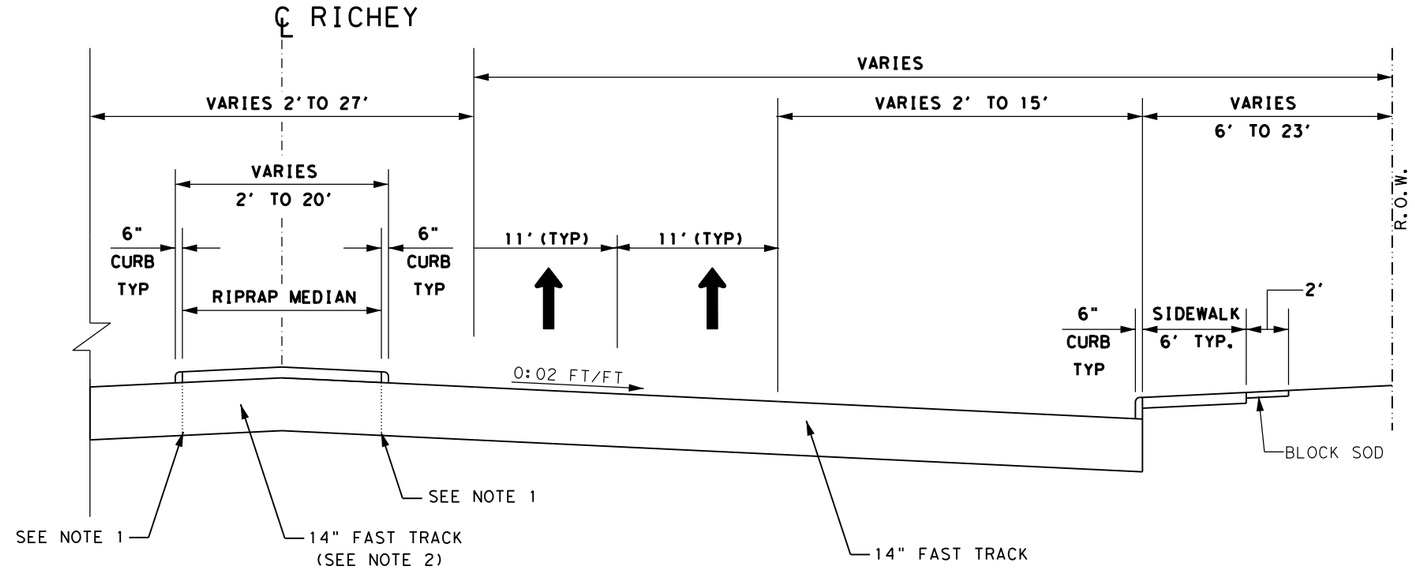
FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		7

STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



EXIST. TYPICAL SECTION (RICHEY @ S. OF SH225)

STA. 17+46.57 TO STA.18+88.70



PROP. TYPICAL SECTION (RICHEY @ S. OF SH225)

STA. 17+46.57 TO STA.18+88.70

NOTES:

1. FROM STA 17+46.57 TO STA 18+23.42 INSIDE LIMITS OF PROPOSED FAST TRACK PAVING WILL BE TO BACK OF RAISED MEDIAN CURB ON EACH SIDE.
2. FROM STA 18+23.42 TO STA 18+88.70, PROPOSED FAST TRACK PAVING WILL BE CONTINUOUS THROUGH MEDIAN AREA.

STATE OF TEXAS
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103612
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on 3/25/2021,

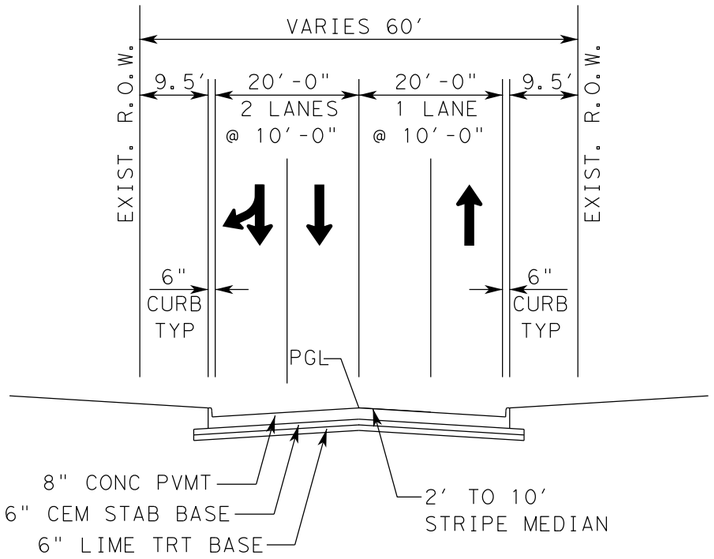
Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

RICHEY ST SOUTH TYPICAL SECTIONS

N. T. S. SHEET 5 OF 6

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			8
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



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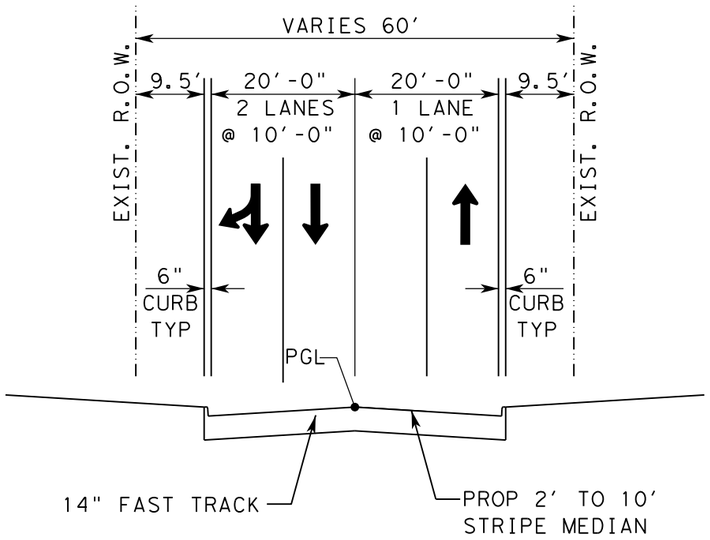
EXISTING PASADENA BLVD (NORTH)



STA 21+31.59 TO STA 21+55.30
PROPOSED PASADENA BLVD (NORTH)

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103612
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PROFESSIONAL ENGINEER

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3/25 2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION®

PASADENA BLVD
NORTH
TYPICAL SECTIONS

N.T.S. SHEET 6 OF 6

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
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STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

General Notes:

General:

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

Melody Galland, P.E. at **Melody.Galland@txdot.gov**
David Lazaro, P.E. at **David.Lazaro@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%20Responses/

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.

Be aware that an adjacent Harris County construction project along Pasadena Blvd from the SH 225 Eastbound Frontage Road going south to Harris Avenue may be ongoing concurrently with this project. TxDOT and its Contractor will be required to coordinate any work on or near Pasadena Blvd with Harris County and its Contractor to avoid work zone and lane closure conflicts between the two projects.

Unless otherwise shown on the plans, RAP generated by this project will become the property of the Contractor for use in the current construction project or in future projects.

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

Superelevate the curves to match the existing surface.

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.

Grade street intersections and median openings for surface drainage.

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.

The lengths of the posts for ground mounted signs and the tower legs for the overhead sign supports are approximate. Verify the lengths before ordering these materials to meet the existing field conditions and to conform to the minimum sign mounting heights shown in the plans.

Clearly mark or highlight on the shop drawings, the items being furnished for this project. Submit required shop drawings in accordance with the shop drawing distribution list shown in the note for Item 5 for review and distribution.

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

General: Roadway Illumination and Electrical

For roadway illumination and electrical items, use materials from pre-qualified producers as shown on the Construction Division (CST) of the Department's material producers list. Check the latest link on the Department's website for this list. The category/item is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list.

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

General: Traffic Signals

For traffic signal items, use materials from the Pre-Qualified Producers List (located at http://www.dot.state.tx.us/GSD/purchasing/supps.htm) and the materials pre-qualified for illumination and electrical items (located at http://ftp.dot.state.tx.us/pub/txdot-info/cmd/mpl/riaes.pdf) as shown on the Department's Material Producers List and the Roadway Illumination and Electrical Supplies List. Check the latest links on the Department's website for these lists. No substitutions will be allowed for materials found on these lists.

General: Site Management

Mow the grass and weeds within the project limits a maximum of 3 times a year as directed. This work is subsidiary to the various bid items.

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	**Truck Type - 4 Wheel**
Wayne Series 900	M-B Cruiser II
Elgin White Wing	Wayne Model 945
Elgin Pelican	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.

Schedule work so that the base placement operations follow the subgrade work as closely as practical to reduce the hazard to the traveling public and to prevent undue delay caused by wet weather.

This project requires extensive grading operations in an environmentally sensitive area.

If relocating mailboxes, place them with the post firmly in the ground at nearby locations. Upon completing the project, the Engineer will locate the final mailbox placement. Perform this work in accordance with the requirements of the Item, "Mailbox Assemblies," except for measurement and payment. This work is subsidiary to the various bid items.

If fences cross construction easements shown on the plans and work is required beyond the fences, remove and replace the fences as directed. This work and the materials are subsidiary to the various bid items.

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

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.

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 causes 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 713-881-3283 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 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.

Install or remove poles and luminaires located near overhead or underground electrical lines using established industry and utility safety practices. Consult the appropriate utility company before beginning such work.

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 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 5: Control of Work

Submit shop drawings electronically for the fabrication of items as documented in Table 1 below. Information and requirements for electronic submittals can be viewed in the "Guide to Electronic Shop Drawing Submittal" which can be accessed through the following web link, ftp://ftp.dot.state.tx.us/pub/txdot-info/library/pubs/bus/bridge/e_submit_guide.pdf. References to 11 in. x 17 in. sheets in individual specifications for structural items imply electronic CAD sheets.

Table 1

2014 Construction Specification Required Shop/Working Drawing Submittals - TxDOT Generated Plans

Spec Item No.'s	Product	Submittal Required	Approval Required (Y/N)	Contractor/ Fabricator P.E. Seal Required	Reviewing Party	Shop or Working Drawing (Note 1)
7.16.1&.2	Construction Load Analyses	Y	Y	Y	B	WD
400	Excavation and Backfill for Structures (cofferdams)	Y	N	Y	A	WD
403	Temporary Special Shoring	Y	N	Y	C	WD
420	Formwork/Falsework	Y	N	Y	A	WD
423	Retaining Walls, (calcs req'd.)	Y	Y	Y	C	SD
425	Optional Design Calculations (Prstrs Bms)	Y	Y	Y	B	SD
425	Prestr Concr Sheet Piling	Y	Y	N	B	SD
425	Prestr Concr Beams	Y	Y	N	B	SD
425	Prestr Concr Bent	Y	Y	N	B	SD
426	Post Tension Details	Y	Y	N	B	SD
434	Elastomeric Bearing Pads (All)	Y	Y	N	B	SD
441	Bridge Protective Assembly	Y	Y	N	B	SD
441	Misc Steel (various steel assemblies)	Y	Y	N	B	SD
441	Steel Pedestals (bridge raising)	Y	Y	N	B	SD
441	Steel Bearings	Y	Y	N	B	SD
441	Steel Bent	Y	Y	N	B	SD
441	Steel Diaphragms	Y	Y	N	B	SD
441	Steel Finger Joint	Y	Y	N	B	SD
441	Steel Plate Girder	Y	Y	N	B	SD
441	Steel Tub-Girders	Y	Y	N	B	SD
441	Erection Plans, including Falsework	Y	N	Y	A	WD
449	Sign Structure Anchor Bolts	Y	Y	N	T	SD
450	Railing	Y	Y	N	A	SD
462	Concrete Box Culvert	Y	Y	N	C	SD
462	Concrete Box Culvert (Alternate Designs Only,calcs reqd.)	Y	Y	Y	B	SD
464	Reinforced Concrete Pipe (Jack and Bore only; ONLY when requested)	Y	Y	Y	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets	Y	Y	N	A	SD
465	Pre-cast Junction Boxes, Grates, and Inlets (Alternate Designs Only, calcs req'd.)	Y	Y	Y	B	SD
466	Pre-cast Headwalls and Wingwalls	Y	Y	N	A	SD
467	Pre-cast Safety End Treatments	Y	Y	N	A	SD
495	Raising Existing Structure (calcs reqd.)	Y	Y	Y	B	SD
610	Roadway Illumination Supports (Non-Standard only, calcs reqd.)	Y	Y	Y	BRG	SD
613	High Mast Illumination Poles (Non-standard only, calcs reqd.)	Y	Y	Y	BRG	SD
627	Treated Timber Poles	Y	Y	N	T	SD
644	Special Non-Standard Supports (Bridge Mounts, Barrier Mounts, Etc.)	Y	Y	Y	T	SD
647	Large Roadside Sign Supports	Y	Y	Y	T	SD
650	Cantilever Sign Structure Supports - Alternate Design Calcs.	Y	Y	Y	T	SD
650	Sign Structures	Y	Y	N	T	SD
680	Installation of Highway Traffic Signals	Y	Y	N	T	SD
682	Vehicle and Pedestrian Signal Heads	Y	Y	N	T	SD
684	Traffic Signal Cables	Y	Y	N	T	SD
685	Roadside Flashing Beacon Assemblies	Y	Y	N	T	SD
686	Traffic Signal Pole Assemblies (Steel) (Non-Standard only)	Y	Y	Y	T	SD
687	Pedestal Pole Assemblies	Y	Y	N	T	SD
688	Detectors	Y	Y	N	A	SD
784	Repairing Steel Bridge Members	Y	Y	Y	B	WD
SS	Prestr Concr Crown Span	Y	Y	N	B	SD
SS	Sound Barrier Walls	Y	Y	Y	A	SD
SS	Camera Poles	Y	Y	Y	TMS	SD
SS	Pedestrian Bridge (Calcs req'd.)	Y	Y	Y	B	SD

County: Harris

Highway: SH 225 **Control: 0502-01-222**

SS	Screw-In Type Anchor Foundations	Y	Y	N	T	SD
SS	Fiber Optic/Communication Cable	Y	Y	N	TMS	SD
SS	Spread Spectrum Radios for Signals	Y	Y	N	T	SD
SS	VIVDS System for Signals	Y	Y	N	T	SD
SS	CTMS Equipment	Y	Y	N	TMS	SD

Notes:

1. Document flow for Working Drawings differs from Shop Drawings in that Working Drawings must be submitted to the Engineer rather than the Engineer of Record and they are for the information of the Engineer only; an approval stamp and distribution to all project offices is not required.

Key to Reviewing Party

A - Area Office

Area Office	Email Address
Brazoria Area Office	HOU-BRZAShpDrwgs@txdot.gov
Fort Bend Area Office	HOU-FBAShpDrwgs@txdot.gov
Galveston Area Office	HOU-GALVAShpDrwgs@txdot.gov
Montgomery Area Office	HOU-MONTAShpDrwgs@txdot.gov
North Harris Area Office	HOU-NHAShpDrwgs@txdot.gov
Southeast Area Office	HOU-SEHAShpDrwgs@txdot.gov
Traffic Systems Construction Office	HOU-TSCShpDrwgs@txdot.gov
West Harris Area Office	HOU-WWCHAOShpDrwgs@txdot.gov

B - Houston Bridge Engineer

Bridge Design (Houston TxDOT)	HOU-BrgShpDrwgs@txdot.gov

BRG - Austin Bridge Division

Bridge Design (Austin TxDOT)	BRG_ShopPlanReview@txdot.gov

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

Item 7: Legal Relations and Responsibilities

Do not initiate activities in a Project Specific Location (PSL), associated with a U.S. Army Corps of Engineers (USACE) permit area, that have not been previously evaluated by the USACE as part of the permit review of this project. Such activities include those pertaining to, but are not limited to, haul roads, equipment staging areas, borrow and disposal sites. Associated defined here means materials are delivered to or from the PSL. The permit area includes the waters of the U.S. or associated wetlands affected by activities associated with this project. Special restrictions may be required for such work. Assume responsibility for consultations with the USACE regarding activities, including PSLs that have not been previously evaluated by the

USACE. Provide the Department with a copy of consultations or approvals from the USACE before initiating activities.

The Contractor may proceed with activities in PSLs that do not affect a USACE permit area if a self-determination has been made that the PSL is non-jurisdictional or if proper USACE clearances have been obtained in jurisdictional areas or have been previously evaluated by the USACE as part of the permit review of this project. The Contractor is solely responsible for documenting any determinations that their activities do not affect a USACE permit area. Maintain copies of their determinations for review by the Department or any regulatory agency.

Document and coordinate with the USACE, if required, before hauling any excavation from or hauling any embankment to a USACE permit area by either 1 or 2 below:

1. **Restricted Use of Materials for the Previously Evaluated Permit Areas.** Document both the Project Specific Locations (PSL) and their authorization. Maintain copies for review by the Department or any regulatory agency. When an area within the project limits has been evaluated by the USACE as part of the permit process for this project:
   a. Suitable excavation of required material in the areas shown on the plans and cross sections as specified in the Item, "Excavation" is used for permanent or temporary fill (under the Item, "Embankment") within a USACE permit area.
   b. Suitable embankment (under the Item, "Embankment") from within the USACE permit area is used as fill within a USACE evaluated area.
   c. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of at a location approved within a USACE evaluated area.

2. **Contractor Materials from Areas Other than Previously Evaluated Areas.** Provide the Department with a copy of USACE coordination or approvals before initiating any activities for an area within the project limits that has not been evaluated by the USACE or for any off right of way locations used for the following, but not limited to, haul roads, equipment staging areas, borrow and disposal sites:
   a. The Item, "Embankment" used for temporary or permanent fill within a USACE permit area.
   b. Unsuitable excavation or excess excavation, "Waste" (under the Item, "Excavation"), that is disposed of outside a USACE evaluated area.

The total area disturbed for this project is 2.187 acres. The disturbed area in this project, the project locations in the Contract, and Contractor project specific locations (PSLs) within 1 mile of the project limits for the Contract, will further establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for

Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer (to the appropriate MS4 operator when on an off-state system route) and to the local government that operates a separate storm drain system.

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.

Maintain the roadway slope stability. Maintaining slope stability is subsidiary to the various bid items.

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.

The maximum number of days the time charges on this contract may be suspended due to contractor mobilization, and material fabrication/accumulation or processing delays is **120** days. The Engineer and the Contractor may mutually agree, in writing, to decrease this maximum number of days.

Working days will be computed and charged based on a 7-day workweek in accordance with Section 8.3.1.3 and 8.3.3.1.

The Lane Closure Assessment Fee is **$500**. 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 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 105: Removing Treated and Untreated Base and Asphalt Pavement

Removing curb on cement-treated and untreated base or on cement treatment being removed at the same time is subsidiary to this bid Item.

Item 104: Removing Concrete
Item 105: Removing Treated and Untreated Base and Asphalt Pavement
Item 354: Planing and Texturing Pavement

Case 1 - ACP over concrete pavement over base

Removing the Asphalt Concrete Pavement (ACP) material is paid under the Item, "Planing and Texturing Pavement."

Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Removing the base material is paid under the Item, "Removing Treated and Untreated Base and Asphalt Pavement."

Remove the ACP separately from the base. The removed depth is as uniform as possible during each removal pass if the pavement depth being removed is composed of different asphalt layers. Stockpile the RAP of differing types of quality separately by its intended use such as for asphalt treatment, cement treatment, lime treatment, or asphalt concrete pavement. Break, crush, or mill the stockpiled materials so that 100 percent pass the 2-in. sieve.

Case 2 - Concrete pavement over base

Removing the concrete pavement material is paid under the Item, "Removing Concrete."

Removing the base material and any asphalt bondbreaker material is paid under the Item, "Removing Treated and Untreated Base and Asphalt Pavement."

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.

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

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.

Item 162: Sodding 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 340: Dense-Graded Hot Mix Asphalt (Small Quantity)

Taper the asphalt concrete pavement at the beginning and ending points.

Use a maximum 6H:1V slope for the asphalt concrete pavement edge.

The stockpile will be the point of sampling of coarse aggregate for test method TEX-217-F (Part II, decantation).

Do not use petroleum-based solvents in the beds of hot mix asphalt delivery vehicles.

Dilution of tack coat is not allowed.

Do not use Surface Aggregate Classification (SAC) C for this project.

For determining the Asphalt Content, only ignition ovens will be allowed.

The tack coat rate shown on the "Basis of Estimate" is an average rate for calculating tack coat quantities. Vary the rate based on the pavement conditions and other factors such as manufacturer's recommendations and weather. Tack coat is subsidiary to bid item 530.

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.

For mono curb, the curb height transitions will be paid at the contract unit price of the larger curb height in the transition. The 2.5-in. laydown curbs for driveways will be paid at the unit price bid for the Item, "Conc Curb (Mono) (Ty II)."

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.

If the concrete design requires greater than 5.5 sacks of cementitious material per cubic yard, obtain written approval. If placing concrete pavement mixes from April 1 to October 31, inclusive, use Mix Design Option 1 as specified in Section 421.4.2.6.1.

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.

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 (Continuous Closures)
1. Richey St Intersection Phase 1*	2 weekend days and 1 weekday
2. Richey St Intersection Phase 2*	2 weekend days and 1 weekday
3. Richey St Intersection Phase 3*	2 weekend days and 1 weekday
4. Richey St Intersection Phase 4	3 days
5. Richey St Intersection Phase 5	3 days
6. Richey St Intersection Phase 6	3 days
7. Richey St Intersection Phase 7	3 days
8. Richey St Intersection Phase 8	2 weekend days and 1 weekday
9. Pasadena Blvd Intersection Phase 1*	2 weekend days and 1 weekday
10. Pasadena Blvd Intersection Phase 2*	2 weekend days and 1 weekday
11. Pasadena Blvd Intersection Phase 3	2 weekend days
12. Pasadena Blvd Intersection Phase 4	2 weekend days
13. Pasadena Blvd Intersection Phase 5	14 days
14. Pasadena Blvd Intersection Phase 6	14 days

* With prior approval from the Engineer, fast track pavement work areas may be subdivided within each phase in order to ensure completion of work within allowable duration for each continuous closure.

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.

Items 360, 420, and 421: All Concrete Items

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 361: Repair of Concrete Pavement

For full depth repairs within existing asphalt overlaid pavement areas, overlay new concrete pavement repair with Type D Hot Mix Asphalt (SAC-A, PG 76-22) in accordance Item 340, "Dense-Graded Hot Mix Asphalt (Small Quantity)" to match surface elevation of surrounding pavement. This work and material will not be paid for directly but will be considered subsidiary to Item 361, "Repair of Concrete Pavement."

For full depth repair, remove only the quantity of pavement replaceable during the daily allowable work schedule.

Remove loose sub-base material and replace it with concrete. Use a bondbreaker, such as a polyethylene sheet, at the interface between the replaced sub-base material and the new concrete pavement.

Supply polyethylene fabric on the job site sufficient to cover the area of repair.

Do not place concrete if impending weather may result in rainfall or low temperatures that may impair the quality of the finished work.

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

Ready mix concrete will be permitted if the equipment and construction methods can produce the desired results. Hand finishing will be permitted.

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.

Item 416: Drilled Shaft Foundations

Include the cost for furnishing and installing anchor bolts mounted in the drilled shafts in the unit bid price for the various diameter drilled shafts.

The Department may test using ultrasonic methods the anchor bolts for overhead sign supports, light standards, and traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 420: Concrete Substructures

For installation of concrete approach slab, install a layer of 40# roofing felt between cement stabilized backfill section and approach slab pavement as a bondbreaker. This will not be paid for directly but will be considered subsidiary to Item 420. See standard BAS-C for limits of proposed cement stabilized backfill.

Unless otherwise noted, use Class C concrete with an ordinary surface finish for signal, lighting, or sign structure foundations.

Item 421: Hydraulic Cement Concrete

Entrained air is required in all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.), but is not required for other structural concrete. Adjust the dosage of air entraining agent for low air content as directed or allowed by the Engineer. If entrained air is provided where not required, do not exceed the manufacturer's recommended dosage.

Item 502: Barricades, Signs, and Traffic Handling

Coordinate any lane closures on or near Pasadena Blvd with Harris County and its Contractor as early as possible to avoid conflicts with the adjacent project on Pasadena Blvd.

Obtain a permit from the City of Pasadena prior to performing any closures and/or detours on city streets.

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. The latest versions of Work Zone Standard Sheets WZ (BTS-1) and WZ (BTS-2) are the traffic control plan for the signal installations.

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."

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.

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.

Closures required by the site-specific Traffic Control Plans included in this contract may be in place continuously for the number of days specified under Item 360 of the General Notes for Fast Track Concrete construction. For all other closures, do not reduce the existing number of lanes open to traffic except as shown on the following time schedule:

One Lane Closure

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	09:00 AM – 03:00 PM	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Tuesday	09:00 AM – 03:00 PM	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Wednesday	09:00 AM – 03:00 PM	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Thursday	09:00 AM – 03:00 PM	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Friday	09:00 AM – 03:00 PM	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Saturday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A
Sunday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A

Two Lane Closures*

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Tuesday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Wednesday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Thursday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Friday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 AM 03:00 PM – 09:00 PM
Saturday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A
Sunday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A

*Two lane closures times shown are only applicable for roadway locations that have at least 3 lanes in one direction during normal operations.

Full Closures (Cross-Streets*, Intersections*, Ramps)**

Day	Daytime Closure Hours	Nighttime Closure Hours	Restricted Hours Subject to Lane Assessment Fee
Monday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 PM
Tuesday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 PM
Wednesday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 PM
Thursday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 PM
Friday	N/A	09:00 PM – 05:00 AM	05:00 AM – 09:00 PM
Saturday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A
Sunday	05:00 AM – 05:00 PM	05:00 PM – 05:00 AM	N/A

*Unless otherwise approved by the Engineer, full closures of cross-streets and intersections are only permitted for one direction at a time.

**Full closure of ramps may only be permitted by the Engineer on a case-by-case basis.

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 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.

Minimize the number of working days for street closures. The following table lists the maximum number of working days allowed for each street closure. The closure period for each

intersection occurs only during the phase when constructing that street, unless otherwise directed. Reopen the street within the number of working days allowed; otherwise the Engineer may cease construction activities not affiliated with reopening the closed street, until it fully reopens to the traveling public. Time charges will not be suspended nor increased to compensate for this occurrence.

Street Name	Number of Working Days Allowed for Closure*
Richey Street	*3 Days Maximum*
Pasadena Street	*3 Days Maximum*

*See also allowable closure duration as outlined under Item 360 of the General Notes for Fast Track Concrete construction for more information.

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 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.

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.

Schedule the seeding or sodding work as soon as possible. The project schedule provides for a vegetation management plan.

After completing earthwork operations, restore and reseed the disturbed areas in accordance with the Department's specifications for permanent or temporary erosion control.

Implement temporary and permanent erosion control measures to comply with the National 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 529: Concrete Curb, Gutter, and Combined Curb and Gutter
Item 530: Intersections, Driveways, and Turnouts
Item 531: Sidewalks

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."

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 585: Ride Quality for Pavement Surfaces

To eliminate the need for corrective action due to excessive deviations in the final surface layers, exercise caution to ensure satisfactory profile results in the intermediate paving layers (mixture).

Milling will not be allowed as a corrective action for excessive deviations in the final surface layer of hot-mix asphalt.

For all roads on this project (frontage roads, cross streets, and intersections), use Surface Test Type A.

Item 618: Conduit
Item 620: Electrical Conductors
Item 628: Electrical Services

If the specifications for electrical items require UL-listed products, this means UL-listed or CSA-listed.

Item 618: Conduit

When backfilling bore pits, ensure that the conduit is not damaged during installation or due to settling backfill material. Compact select backfill in 3 equal lifts to the bottom of the conduit; or if using sand, place it 2 in. above the conduit. Ensure backfill density is equal to that of the existing soil. Prevent material from entering the conduit.

Construct bore pits a minimum of 5 ft. from the edge of the base or pavement. Close the bore pit holes overnight.

Unless otherwise shown on the plans, install underground conduit a minimum of 24 in. deep. Install the conduit in accordance with the latest National Electrical Code (NEC) and applicable Department standard sheets. Place conduit under driveways or roadways a minimum of 24 in. below the pavement surface.

If using casing to place bored conduit, the casing is subsidiary to the conduit.

If placing the conduit under existing pavement to reach the service poles, bore the conduit in place and extend it a minimum distance of 5 ft. beyond the edge of shoulder or the back of curb.

Item 620: Electrical Conductors

Test each wire of each cable or conductor after installation. Incomplete circuits or damage to the wire or the cable are cause for immediate rejection of the entire cable being tested. Remove and replace the entire cable at no expense to the Department. Also test the replacement cable after installation.

When pulling cables or conductors through the conduit, do not exceed the manufacturer's recommended pulling tensions. Lubricate the cables or conductors with a lubricant recommended by the cable manufacturer.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holders as shown on the Department's Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Items 610 and 620. Provide 10 Amp time delay fuses.

Ensure that circuits test clear of faults, grounds, and open circuits.

Split bolt connectors are allowed only for splices on the grounding conductors.

For Roadside Flashing Beacon Assemblies (Item 685) and Pedestal Pole Assemblies (Item 687) within the project, provide single-pole breakaway disconnects as shown on the Construction Division (CST) material producers list. Check the latest link on the Department's website for this list. The category is "Roadway Illumination and Electrical Supplies." The fuse holder is shown on the list under Item 685. For underground (hot) conductors, install a breakaway connector with a dummy fuse (slug). Provide dummy fuse (slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).

For electrical licensing and electrical certification requirements for this project, see Item 7 of the Standard Specifications and any applicable special provisions to Item 7.

Item 624: Ground Boxes

The ground box locations are approximate. Alternate ground box locations may be used as directed, to avoid placing in sidewalks or driveways.

Ground metal ground box covers. Bond the ground box cover and ground conductors to a ground rod located in the ground box and to the system ground.

Ground the existing metal ground box covers as shown on the latest standard sheet ED (4)-14.

During construction and until project completion, provide personnel and equipment necessary to remove ground box lids for inspection. Provide this assistance within 24 hours of notification.

Construct concrete aprons in accordance with the latest standard sheet ED (4)-14. Make the depth of the concrete apron the same as the depth of the ground box, except for Type 1 and Type 2 ground boxes. For Type 1 or Type 2 ground boxes, construct the concrete apron in accordance with details shown on the "Ground Box Details Installations" standard.

Item 628: Electrical Services

Verify and coordinate the electrical service location with the engineering section of the appropriate utility district or company.

Identify the electrical service pole with an address number assigned by the Utility Service Provider. Provide 2-in. numerals visible from the highway. Provide numbers cut out aluminum figures nailed to wood poles or painted figures on steel poles or service cabinets.

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.

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.

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 680: Highway Traffic Signals

Clearly mark or highlight on the shop drawings the items being furnished for this project.

Furnish labor, tools, equipment, and materials as shown on the plans and specifications for a complete and operating signal installation.

Furnish the type of controller cabinet specified on the plans. Refer to the table shown in the Departmental Material Specifications (DMS-11170, Fully Actuated, Solid-State Traffic Signal Controller Assembly), Section 11170.6.A, Type 2 cabinet, page 4 of 39, regarding the size of the cabinet, back panel configuration, and the size of the load bay. Use the following website to view this specification: http://www.txdot.gov/business/resources/dms.html

Complete traffic signal construction work, including correcting discrepancies shown on the Department inspector’s “Traffic Signal Installation Inspection Report” before the beginning of the test period.

Provide a full-time qualified traffic signal technician responsible for installing, maintaining, or replacing traffic signal devices.

Staking in the field is subject to approval.

Make adjustments in project construction, if needed, due to conflicts with underground utilities.

Do not aim the luminaire arms mounted on traffic signal poles into the intersection. Aim each arm perpendicular to the centerline of the roadway it is intended to cover, to develop the proper illumination pattern for the intersection.

Allow the electrical work to be inspected by the City. Complying with the provisions and requirements of the City electrical ordinance is not required. Such inspection does not make the City a party to this contract.

Provide continuous conductors without splices from signal controller to signal heads. Route the conductors for luminaires to the service enclosure. Splices or attachments to the terminal block in the access compartment of the mast arm pole are not permitted except for the luminaire cable.

Abrasions to the conductor insulation caused while pulling cable for the traffic signal system are cause for immediate rejection. Remove and replace the entire damaged cable at no expense to the Department.

When pulling cables or conductors through conduit, do not exceed the manufacturer’s recommended pulling tensions. Lubricate the cables or conductors with a lubricant as recommended by the cable manufacturer.

Bond the controller housing, signal poles, conduit, and spans to a minimum No. 6 AWG stranded copper conductor. An equipment grounding conductor is required in every conduit to form a continuous grounding system. Effectively connect the grounding system to ground rods or concrete encased grounding electrodes as indicated in the plans.

Wrap signal heads with dark plastic or suitable material to conceal the signal faces from the time of installation until placing into operation. Do not use burlap.

Furnish signal heads from the same manufacturer.

Use Type B (high intensity prismatic) or Type D (diamond grade) retroreflective sheeting for signs mounted under or adjacent to the signal heads.

The Contractor may use ready mix concrete.

Apply membrane curing on concrete work in accordance with Section 420.4.10.3, “Membrane Curing.”

The standard 4.5-in. galvanized pipe type poles, except the breakaway type, are subject only to the Engineer’s inspection for their acceptance. Mill test reports or documentation will not be required.

Item 682: Vehicle and Pedestrian Signal Heads

Install two set screws on vehicle signal head mounting hardware fittings.

Furnish black housings for vehicle and pedestrian signals. Furnish black vehicle signal head back plates with 2 in. retroreflective yellow borders.

Item 686: Traffic Signal Pole Assemblies (Steel)

For a steel mast arm or steel strain pole assembly, hold the anchor bolts and conduits rigidly in place with a welded steel template.

Leave a minimum of one full diameter thread exposed on each anchor bolt securing a signal pole.

Set the anchor bolts for the steel strain poles so that two are in compression and two are in tension.

Use a Texas Cone Penetrometer reading of 10. The drilled shaft length is from the surface elevation to the bottom of the drilled shaft. Provide an additional length of the pole foundation from the surface level to the roadway level, if required for unusual locations. Provide the drilled shaft depth regardless of the length of the pole foundation. The pole foundation depth from the surface level to the roadway level is a maximum of 4 ft., or as approved.

Locate traffic signal pole assembly foundations a minimum of 4 ft. from the roadway curb or pavement edge, or as shown on the plans.
Place steel strain poles at a 10 ft. desirable minimum distance from the roadway curb or pavement edge.
.
After the traffic signal pole assembly is plumb and the nuts are tight, tack-weld each anchor bolt nut in two places to its washer. Tack-weld each washer to the base plate in two places. Do not weld components to the bolt. Perform tack-welding in accordance with the Item, "Steel Structures." After tack-welding, repair galvanizing damage on bolts, nuts, and washers in accordance with Section 445.3.5, "Repairs."
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The Department may test the anchor bolts using ultrasonic methods for traffic signal poles after they are installed. Replace faulty anchor bolts as directed. Do not weld the anchor bolts.

Item 688: Pedestrian Detectors and Vehicle Loop Detectors

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

At intersections where a minimum of 10 ft. spacing between adjacent accessible pedestrian signal units is not possible, provide each accessible pedestrian pushbutton with the following features: a pushbutton locator tone, a tactile arrow, a speech walk message for the walking person indication and a speech pushbutton information message.

Provide pedestrian push buttons a minimum of 2 in. diameter in the smallest dimension.

Install a rubber grommet or bushing between the push button assembly and the signal pole to protect the conductors.

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.

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.

Basis of Estimate

Item	Description	Limit and Rate	Unit
340	Dense-Graded Hot Mix Asphalt (Small Quantity)	110 Lb. / Sq. Yd.-In.	TON
	• Asphalt	6 % by weight	
	• Aggregate	94 % by weight	
	Tack Coat		
	• Applied on new HMA	0.06 Gal. / Sq. Yd.	
	• Applied on Existing HMA	0.09 Gal. / Sq. Yd.	
	• Applied on Milled HMA	0.11 Gal. / Sq. Yd.	

ESTIMATE & QUANTITY SHEET

CONTROLLING PROJECT ID 0502-01-222 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY SH 225

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0502-01-222**			
		PROJECT ID		**A00124357**			
		COUNTY		**Harris**			
		HIGHWAY		**SH 225**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	104-6001	REMOVING CONC (PAV)	SY	5,744.000		5,744.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	580.000		580.000	
	104-6015	REMOVING CONC (SIDEWALKS)	SY	121.000		121.000	
	104-6027	REMOVING CONC (APPR SLAB)	SY	273.000		273.000	
	104-6032	REMOVING CONC (WHEELCHAIR RAMP)	SY	178.000		178.000	
	105-6008	REMOVING STAB BASE AND ASPH PAV (6")	SY	6,014.000		6,014.000	
	105-6018	REMOVING STAB BASE AND ASPH PAV (7")	SY	774.000		774.000	
	105-6077	REMOVING STAB BASE & ASPH PAV (8")	SY	42.000		42.000	
	110-6001	EXCAVATION (ROADWAY)	CY	730.000		730.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	268.000		268.000	
	162-6002	BLOCK SODDING	SY	119.000		119.000	
	166-6001	FERTILIZER	AC	0.050		0.050	
	168-6001	VEGETATIVE WATERING	MG	6.000		6.000	
	354-6041	PLANE ASPH CONC PAV (1.5")	SY	1,618.000		1,618.000	
	360-6057	CONC PVMT (CONT REINF)(FAST TRK)(14")	SY	5,914.000		5,914.000	
	361-6002	FULL - DEPTH REPAIR CRCP (8")	SY	63.000		63.000	
	400-6005	CEM STABIL BKFL	CY	106.000		106.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	13.000		13.000	
	416-6033	DRILL SHAFT (TRF SIG POLE) (42 IN)	LF	17.000		17.000	
	420-6122	CL HES CONC (APPROACH SLAB)	CY	91.000		91.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	575.000		575.000	
	500-6001	MOBILIZATION	LS	100.00%		100.00%	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	5.000		5.000	
	506-6040	BIODEG EROSN CONT LOGS (INSTL) (8")	LF	297.000		297.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	297.000		297.000	
	528-6004	LANDSCAPE PAVERS	SY	583.000		583.000	
	529-6004	CONC CURB (MONO) (TY I)	LF	33.000		33.000	
	529-6005	CONC CURB (MONO) (TY II)	LF	1,676.000		1,676.000	
	529-6010	CONC CURB (U-TURN)	LF	1,803.000		1,803.000	
	530-6005	DRIVEWAYS (ACP)	SY	42.000		42.000	
	531-6001	CONC SIDEWALKS (4")	SY	333.000		333.000	
	531-6004	CURB RAMPS (TY 1)	EA	7.000		7.000	
	531-6005	CURB RAMPS (TY 2)	EA	5.000		5.000	
	531-6013	CURB RAMPS (TY 10)	EA	4.000		4.000	
	531-6016	CURB RAMPS (TY 21)	EA	2.000		2.000	
	618-6046	CONDT (PVC) (SCH 80) (2")	LF	260.000		260.000	
	618-6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	100.000		100.000	

ESTIMATE & QUANTITY SHEET

CONTROLLING PROJECT ID 0502-01-222 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY SH 225

						TOTAL EST.	TOTAL FINAL
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		PROJECT ID		**A00124357**			
		COUNTY		**Harris**			
		HIGHWAY		**SH 225**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	618-6053	CONDT (PVC) (SCH 80) (3")	LF	35.000		35.000	
	618-6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	70.000		70.000	
	618-6058	CONDT (PVC) (SCH 80) (4")	LF	65.000		65.000	
	618-6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	70.000		70.000	
	620-6002	ELEC CONDR (NO.14) INSULATED	LF	35.000		35.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	375.000		375.000	
	620-6011	ELEC CONDR (NO.4) BARE	LF	220.000		220.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	435.000		435.000	
	621-6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	780.000		780.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	8.000		8.000	
	624-6028	REMOVE GROUND BOX	EA	5.000		5.000	
	628-6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1.000		1.000	
	666-6212	REFL PAV MRK TY II (Y) 12" (SLD)	LF	47.000		47.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	6.000		6.000	
	668-6078	PREFAB PAV MRK TY C (W) (DBL ARROW)	EA	4.000		4.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	2.000		2.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	32.000		32.000	
	672-6010	REFL PAV MRKR TY II-C-R	EA	30.000		30.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	272.000		272.000	
	677-6002	ELIM EXT PAV MRK & MRKS (6")	LF	93.000		93.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	22.000		22.000	
	677-6008	ELIM EXT PAV MRK & MRKS (ARROW)	EA	2.000		2.000	
	678-6034	PAV SURF PREP FOR MRK (BLAST CLN)(4")	LF	352.000		352.000	
	678-6035	PAV SURF PREP FOR MRK (BLAST CLN)(6")	LF	969.000		969.000	
	678-6036	PAV SURF PREP FOR MRK (BLAST CLN)(8")	LF	367.000		367.000	
	678-6037	PAV SURF PREP FOR MRK (BLAST CLN)(12")	LF	999.000		999.000	
	678-6038	PAV SURF PREP FOR MRK (BLAST CLN)(24")	LF	289.000		289.000	
	678-6039	PV SURF PREP FOR MRK (BLST CLN)(ARRWS)	EA	6.000		6.000	
	678-6040	PV SURF PREP MRKS (BLST CLN)(DBL ARW)	EA	4.000		4.000	
	678-6045	PV SURF PRP FOR MRK (BLST CLN)(WORDS)	EA	2.000		2.000	
	680-6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1.000		1.000	
	680-6004	REMOVING TRAFFIC SIGNALS	EA	1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	5.000		5.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	1.000		1.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	5.000		5.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	1.000		1.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	5.000		5.000	

ESTIMATE & QUANTITY SHEET

CONTROLLING PROJECT ID 0502-01-222 **DISTRICT** Houston **COUNTY** Harris
HIGHWAY SH 225

		CONTROL SECTION JOB		**0502-01-222**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00124357**			
		COUNTY		**Harris**			
		HIGHWAY		**SH 225**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	682-6006	VEH SIG SEC (12")LED(RED ARW)	EA	2.000		2.000	
	682-6018	PED SIG SEC (LED)(COUNTDOWN)	EA	6.000		6.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	5.000		5.000	
	682-6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	1.000		1.000	
	684-6007	TRF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF	1,070.000		1,070.000	
	684-6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	1,100.000		1,100.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	1,075.000		1,075.000	
	686-6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1.000		1.000	
	686-6147	INS TRF SIG PL AM(S)2 ARM(40-36')LUM	EA	1.000		1.000	
	687-6001	PED POLE ASSEMBLY	EA	1.000		1.000	
	688-6001	PED DETECT PUSH BUTTON (APS)	EA	6.000		6.000	
	688-6003	PED DETECTOR CONTROLLER UNIT	EA	1.000		1.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	284.000		284.000	
	6007-6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	35.000		35.000	
	6038-6002	MULTIPOLYMER PAV MRK (W)(4")(BRK)	LF	60.000		60.000	
	6038-6004	MULTIPOLYMER PAV MRK (W)(6")(SLD)	LF	367.000		367.000	
	6038-6005	MULTIPOLYMER PAV MRK (W)(6")(BRK)	LF	130.000		130.000	
	6038-6006	MULTIPOLYMER PAV MRK (W)(6")(DOT)	LF	24.000		24.000	
	6038-6007	MULTIPOLYMER PAV MRK (W)(8")(SLD)	LF	367.000		367.000	
	6038-6011	MULTIPOLYMER PAV MRK (W)(12")(SLD)	LF	952.000		952.000	
	6038-6013	MULTIPOLYMER PAV MRK (W)(24")(SLD)	LF	267.000		267.000	
	6038-6014	MULTIPOLYMER PAV MRK (Y)(4")(SLD)	LF	292.000		292.000	
	6038-6017	MULTIPOLYMER PAV MRK (Y)(6")(SLD)	LF	348.000		348.000	
	6038-6022	MULTIPOLYMER PAV MRK (Y)(24")(SLD)	LF	22.000		22.000	
	6038-6024	MULTIPOLYMER PAV MRK (BLK)(6")(BRK)	LF	100.000		100.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000	
	6185-6002	TMA (STATIONARY)	DAY	143.000		143.000	
	6186-6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	1.000		1.000	
	6292-6004	RVDS(PRESENCE DET ONLY)(INSTALL ONLY)	EA	1.000		1.000	
	6292-6005	RVDS(ADVANCE DET ONLY)(INSTALL ONLY)	EA	1.000		1.000	
	06	MATERIAL FURNISHED BY STATE	LS	1.000		1.000	
	08	SAFETY CONTINGENCY (NON-PART)	LS	5,000.000		5,000.000	
		EROSION CONTROL MAINTENANCE (NON-PART)	LS	2,000.000		2,000.000	
		LAW ENFORCEMENT	LS	92,880.000		92,880.000	

SUMMARY OF MISCELLANEOUS QUANTITIES

SUMMARY OF ROADWAY QUANTITIES

ITEM	110	132	162	166	168	360	361	400	420	432	432	528	529	529	529
DESC. CODE	6001	6006	6002	6001	6001	6057	6002	6005	6122	6001	6003	6004	6004	6005	6010
LOCATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	BLOCK SODDING	FERTILIZER	VEGETATIVE WATERING	CONC PVMT (CONT REINF)(FAST TRK)(14")	FULL - DEPTH REPAIR CRCP (8")	CEM STABIL BKF	CL HES CONC (APPROACH SLAB)	RIPRAP (CONC)(4 IN)	RIPRAP (CONC)(6 IN)	LANDSCAPE PAVERS	CONC CURB (MONO) (TY I)	CONC CURB (MONO) (TY II)	CONC CURB (U-TURN)
	CY	CY	SY	AC	MG	SY	SY	CY	CY	CY	CY	SY	LF	LF	LF
SH 225 EB FRTG RD & RICHEY ST	117	42	50	0.02	2.4	1248		53	41	11	10	0	33	416	
SH 225 WB FRTG RD & RICHEY ST	91	43	50	0.02	2.4	1083		53	50	9	4	0		298	
SH 225 EB FRTG RD & PASADENA BLVD	45	92				1774				53	16	361		533	978
SH 225 WB FRTG RD & PASADENA BLVD	39	91	19	0.01	1.2	1809				35	10	222		429	825
SH 225 FRTG RD PAVEMENT REPAIRS							63								
SH 225 SLOPE PAVING	438									467					
TOTAL	730	268	119	0.05	6.0	5914	63	106	91	575	40	583	33	1676	1803

SUMMARY OF ROADWAY QUANTITIES (CONT.)

ITEM	530	531	531	531	531	531
DESC. CODE	6005	6001	6004	6005	6013	6016
LOCATION	DRIVEWAYS (ACP)	CONC SIDEWALKS (4")	CURB RAMPS (TY 1)	CURB RAMPS (TY 2)	CURB RAMPS (TY 10)	CURB RAMPS (TY21)
	SY	SY	EA	EA	EA	EA
SH 225 EB FRTG RD & RICHEY ST	42	83	1	1	2	1
SH 225 WB FRTG RD & RICHEY ST		6		2	2	1
SH 225 EB FRTG RD & PASADENA BLVD		132	2			
SH 225 WB FRTG RD & PASADENA BLVD		112	4	2		
SH 225 FRTG RD PAVEMENT REPAIRS						
SH 225 SLOPE PAVING						
TOTAL	42	333	7	5	4	2

SUMMARY OF SWP3 QUANTITIES

ITEM	506	506
DESC. CODE	6040	6043
LOCATION	BIODEG EROSN CONT LOGS (INSTL) (8")	BIODEG EROSN CONT LOGS (REMOVE)
	LF	LF
SH 225 EB FRTG RD & RICHEY ST	88	88
SH 225 WB FRTG RD & RICHEY ST	22	22
SH 225 FRTG RD & PASADENA BLVD	99	99
SH 225 FRTG RD SLOPE PAVING	88	88
TOTAL	297	297

SUMMARY OF DEMOLITION QUANTITIES

ITEM	104	104	104	104	104	105	105	105	354
DESC. CODE	6001	6009	6015	6027	6032	6008	6018	6077	6041
LOCATION	REMOV CONC (PAV)	REMOVING CONC (RIPRAP)	REMOVING CONC (SIDEWALK)	REMOVING CONC (APPR SLAB)	REMOVING CONC (WHEELCHAIR RAMP)	REMOVING STAB BASE & ASPH PAV (6")	REMOVING STAB BASE & ASPH PAV (7")	REMOVING STAB BASE & ASPH PAV (8")	PLANE ASPH CONC PAV (1.5")
	SY	SY	SY	SY	SY	SY	SY	SY	SY
SH 225 EB FRTG RD & RICHEY ST	1248	31	81	123	37	1242	0	42	340
SH 225 WB FRTG RD & RICHEY ST	1083	26	6	150	46	987	0	0	397
SH 225 FRTG RD & PASADENA BLVD	3413	523	34	0	95	3785	774	0	881
TOTAL	5744	580	121	273	178	6014	774	42	1618

SH 225
SUMMARY OF MISCELLANEOUS QUANTITIES

SHEET 1 OF 1

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			14
STATE	STATE DIST. NO.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

SUMMARY OF QUANTITIES

ITEM	0666	0668			0672		0677					0678			
DESC. CODE	6212	6077	6078	6085	6009	6010	6001	6002	6003	6007	6008	6034	6035	6036	6037
LOCATION	REFL PAV MRK TY II (Y) 12" (SLD)	PREFAB PAV MRK TY C (W) (ARROW)	PREFAB PAV MRK TY C (W) (DBL ARROW)	PREFAB PAV MRK TY C (W) (WORD)	REFL PV MRK TY II-A-A	REFL PV MRK TY II-C-R	ELIM EXT PAV MRK & MRKS (4")	ELIM EXT PAV MRK & MRKS (6")	ELIM EXT PAV MRK & MRKS (8")	ELIM EXT PAV MRK & MRKS (24")	ELIM EXT PAV MRK & MRKS (ARROW)	PAV SURF PREP FOR MRK (BLAST CLN) (4")	PAV SURF PREP FOR MRK (BLAST CLN) (6")	PAV SURF PREP FOR MRK (BLAST CLN) (8")	PAV SURF PREP FOR MRK (BLAST CLN) (12")
	LF	EA	EA	EA	EA	EA	LF	LF	LF	LF	EA	LF	LF	LF	LF
SH 225 EB FRTG RD & RICHEY ST	17	1	0	0	2	6	0	7	0	0	1	0	110	37	352
SH 225 WB FRTG RD & RICHEY ST	30	0	0	0	0	3	0	26	0	0	0	0	130	38	379
SH 225 FRTG RD & PASADENA BLVD	0	5	4	2	30	26	272	40	76	22	1	272	789	368	312
TOTAL	47	6	4	2	32	35	272	73	76	22	2	272	1029	443	1043

ITEM	0678				6038										
DESC. CODE	6038	6039	6040	6045	6004	6005	6006	6007	6011	6013	6014	6017	6022	6024	
LOCATION	PAV SURF PREP FOR MRK (BLAST CLN) (24")	PAV SURF PREP FOR MRK (BLAST CLN) (ARRWS)	PAV SURF PREP FOR MRK (BLAST CLN) (DBL ARW)	PAV SURF PREP FOR MRK (BLAST CLN) (WORDS)	MULTIPOLYMER PAV MRK (W) (6") (SLD)	MULTIPOLYMER PAV MRK (W) (6") (BRK)	MULTIPOLYMER PAV MRK (W) (6") (DOT)	MULTIPOLYMER PAV MRK (W) (8") (SLD)	MULTIPOLYMER PAV MRK (W) (12") (SLD)	MULTIPOLYMER PAV MRK (W) (24") (SLD)	MULTIPOLYMER PAV MRK (Y) (4") (SLD)	MULTIPOLYMER PAV MRK (Y) (6") (SLD)	MULTIPOLYMER PAV MRK (Y) (24") (SLD)	MULTIPOLYMER PAV MRK (BLK) (6") (BRK)	
	LF	EA	EA	EA	LF	LF	LF	LF	LF	LF	LF	LF	LF	LF	
SH 225 EB FRTG RD & RICHEY ST	72	1	0	0	80	20	0	37	335	72	20	0	0	10	
SH 225 WB FRTG RD & RICHEY ST	80	0	0	0	80	30	0	38	349	80	0	0	0	20	
SH 225 FRTG RD & PASADENA BLVD	148	5	4	2	207	120	24	368	312	126	272	348	22	90	
TOTAL	300	6	4	2	367	170	24	443	996	278	292	348	22	120	

SH 225
SUMMARY OF PAVEMENT MARKING QUANTITIES

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			15
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

ITEM	DESC CODE	DESCRIPTION	UNIT	QUANTITY	FINAL
0416	6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	13	
0416	6033	DRILL SHAFT (TRF SIG POLE) (42 IN)	LF	17	
0618	6046	CONDT (PVC) (SCH 80) (2")	LF	260	
0618	6047	CONDT (PVC) (SCH 80) (2") (BORE)	LF	100	
0618	6053	CONDT (PVC) (SCH 80) (3")	LF	35	
0618	6054	CONDT (PVC) (SCH 80) (3") (BORE)	LF	70	
0618	6058	CONDT (PVC) (SCH 80) (4")	LF	65	
0618	6059	CONDT (PVC) (SCH 80) (4") (BORE)	LF	70	
0620	6002	ELEC CONDR (NO.14) INSULATED	LF	35	
0620	6009	ELEC CONDR (NO.6) BARE	LF	375	
0620	6011	ELEC CONDR (NO.4) BARE	LF	220	
0620	6012	ELEC CONDR (NO.4) INSULATED	LF	435	
0621	6005	TRAY CABLE (4 CONDR) (12 AWG)	LF	780	
0624	6010	GROUND BOX TY D (162922)W/APRON	EA	8	
0624	6028	REMOVE GROUND BOX	EA	5	
0628	6145	ELC SRV TY D 120/240 060(NS)SS(E)SP(O)	EA	1	
0680	6003	INSTALL HWY TRF SIG (SYSTEM)	EA	1	
	*	18-INCH CABINET BASE EXTENSION	EA	1	
	*	GPS COMMUNICATIONS MODULE	EA	1	
	*	CONTROLLER FULL-ACTUATED W/CABINET	EA	1	
	*	DETECTOR CARD RACK (8 SLOT & 4 SLOT)	EA	1	
	*	DETECTOR UNIT (DUAL CHANNEL)	EA	12	
	*	GROUND ROD, 5/8 X 10' COPPER-CLAD (CONTROLLER ONLY)	EA	1	
	*	LED RDWY LUMINAIRE (250W HPS EQ)	EA	2	
	*	MAST ARM DAMPER	EA	3	
	*	TRAFFIC SIGNAL CONTROLLER FOUNDATION	EA	1	
	*	SIGN "Pasadena Blvd" (90" X 18") [11.25 SQFT]	EA	1	
	*	SIGN "Pasadena Frwy" (96" X 18") [12 SQFT]	EA	2	
	*	SIGN R3-8L (30" X 30") [6.25 SQFT]	EA	1	
	*	SIGN R6-1R (36" X 12") [3 SQFT]	EA	1	
	*	SIGN R6-1L (36" X 12") [3 SQFT]	EA	1	
	*	SIGN R10-3ER (9" X15") [.9375 SQFT]	EA	3	
	*	SIGN R10-3EL (9" X15") [.9375 SQFT]	EA	3	
0680	6004	REMOVING TRAFFIC SIGNALS	EA	1	
0682	6001	VEH SIG SEC (12")LED(GRN)	EA	5	
0682	6002	VEH SIG SEC (12")LED(GRN ARW)	EA	1	
0682	6003	VEH SIG SEC (12")LED(YEL)	EA	5	
0682	6004	VEH SIG SEC (12")LED(YEL ARW)	EA	1	
0682	6005	VEH SIG SEC (12")LED(RED)	EA	5	
0682	6006	VEH SIG SEC (12")LED(RED ARW)	EA	2	
0682	6018	PED SIG SEC (LED)(COUNTDOWN)	EA	6	
0682	6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	5	
0682	6055	BACKPLATE W/REF BRDR(4 SEC)(VENT)ALUM	EA	1	

* MATERIALS SUBSIDIARY TO PERTINENT ITEM

ITEM	DESC CODE	DESCRIPTION	UNIT	QUANTITY	FINAL
0684	6007	TRF SIG CBL (TY A)(12 AWG)(2 CONDR)	LF	1070	
0684	6009	TRF SIG CBL (TY A)(12 AWG)(4 CONDR)	LF	1100	
0684	6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	1075	
0686	6035	INS TRF SIG PL AM(S)1 ARM(32')LUM	EA	1	
0686	6147	INS TRF SIG PL AM(S)2 ARM(40-36')LUM	EA	1	
0687	6001	PED POLE ASSEMBLY	EA	4	
	*	SCREW-IN ANCHOR TYPE FOUNDATION	EA	4	
0688	6001	PED DETECT PUSH BUTTON (APS)	EA	6	
0688	6003	PED DETECTOR CONTROLLER UNIT	EA	1	
6007	6011	FIBER OPTIC CBL (SNGLE-MODE)(12 FIBER)	LF	35	
	*	FAN-OUT KIT	EA	2	
6007	6089	FO SPLICE ENCLOSURE (TYPE 2)	EA	1	
6007	6023	FIBER OPTIC PATCH PANEL (12 POSITION)	EA	1	
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1	
6186	6002	ITS GND BOX(PCAST) TY 1 (243636)W/APRN	EA	1	
6292	6004	RVDS(PRESENCE DET ONLY)(INSTALL ONLY)	EA	3	
	*	RADAR PRESENCE DETECTOR COMM/POWER CABLE (22/4C AWG)/(18/2C AWG)		560	
6292	6005	RVDS(ADVANCE DET ONLY)(INSTALL ONLY)	EA	1	
	*	RADAR ADVANCE DETECTOR COMM/POWER CABLE (22/4C AWG)/(18/2C AWG)	LF	130	

* MATERIALS SUBSIDIARY TO PERTINENT ITEM

SH 225 AT PASADENA BLVD TRAFFIC SIGNAL SUMMARY OF QUANTITIES

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

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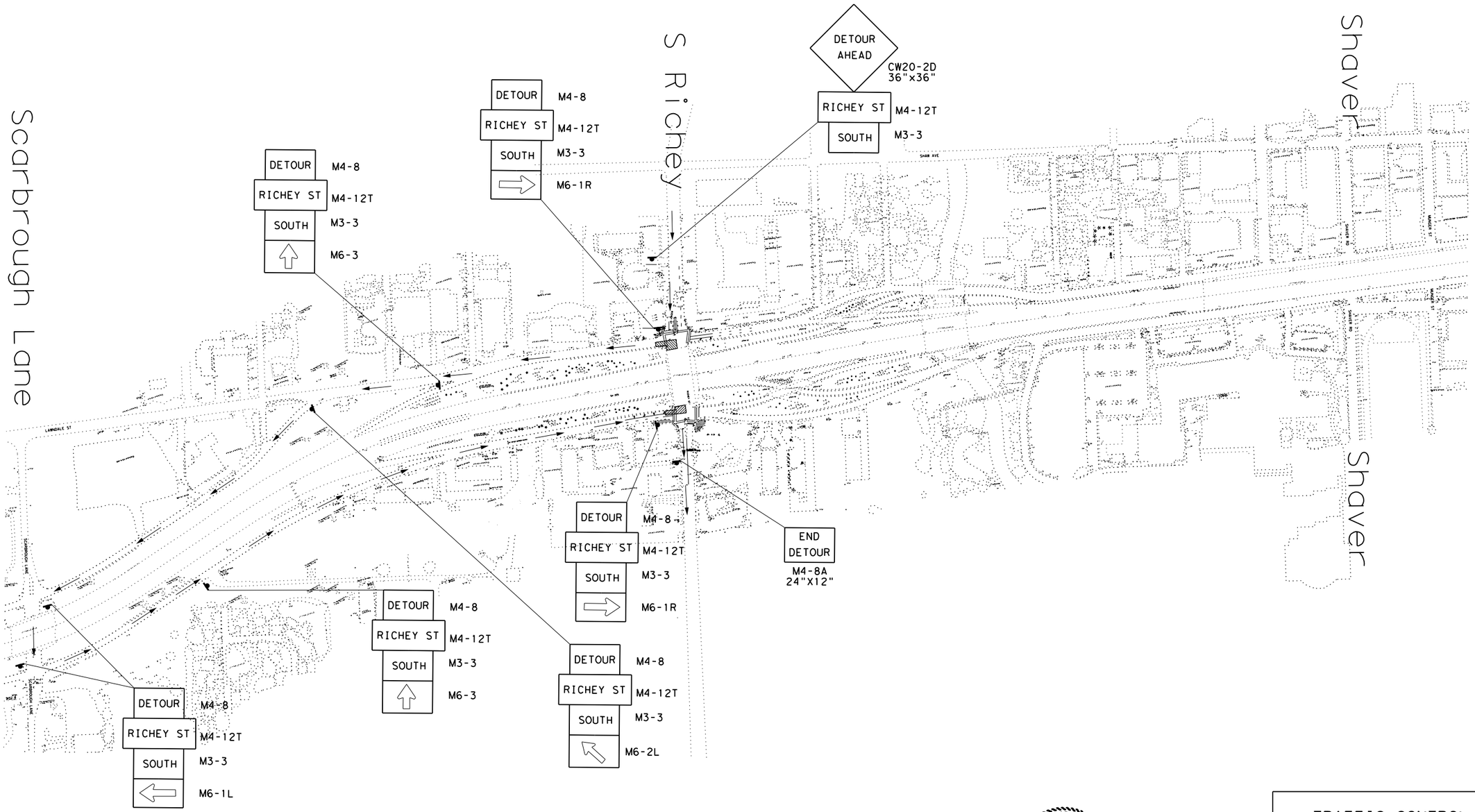

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE RICHEY ST PHASE 1 TCP SHEET FOR ADDITIONAL INFORMATION.

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103612
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TRAFFIC CONTROL PLAN
RICHEY ST.
DETOUR 1

SHEET 1 OF 4

Texas Department of Transportation

SCALE N. T. S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			17
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

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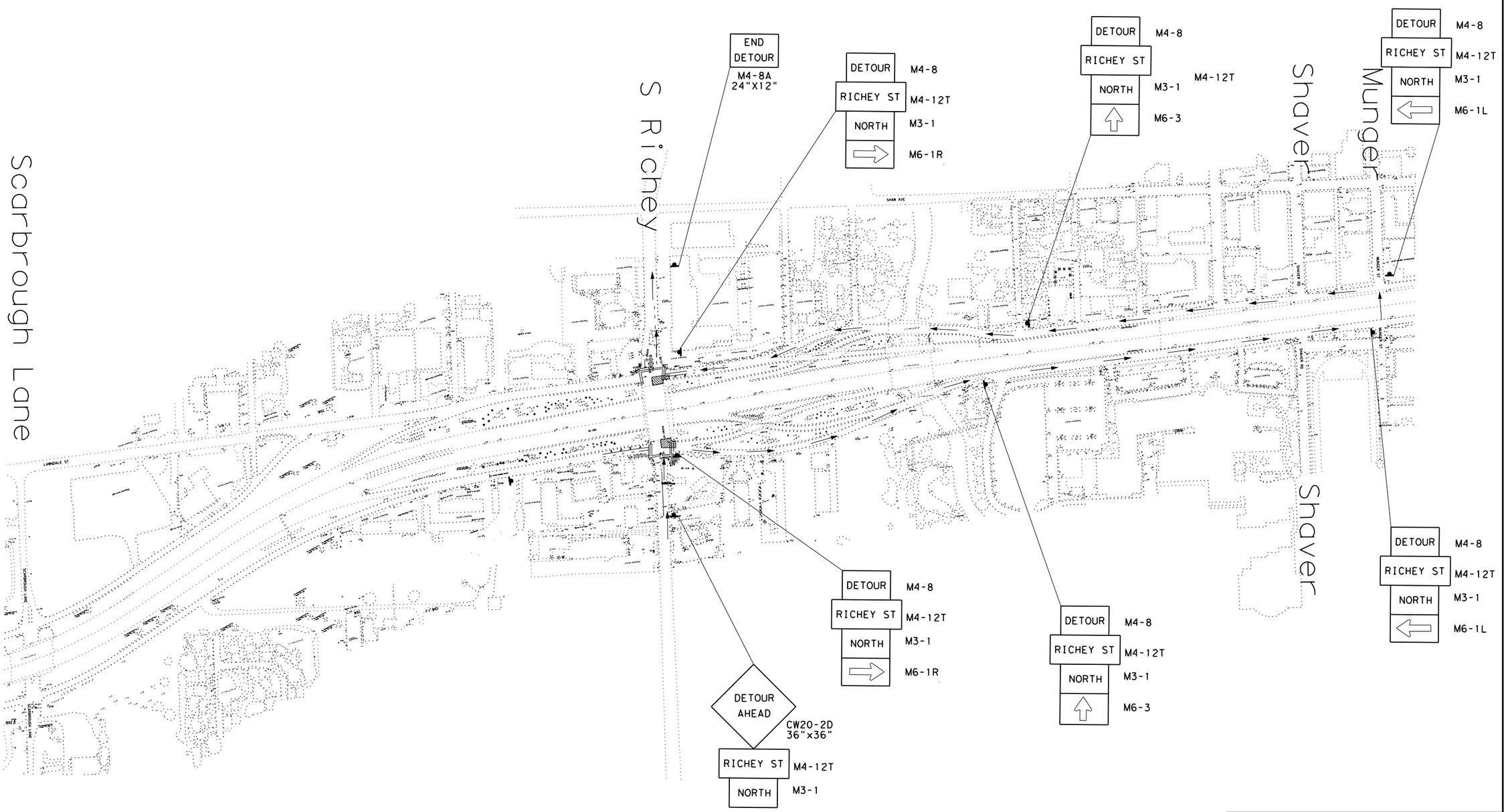

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE RICHEY ST PHASE 2 TCP SHEET FOR ADDITIONAL INFORMATION.

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TRAFFIC CONTROL PLAN
RICHEY ST.
DETOUR 2

SHEET 2 OF 4

Texas Department of Transportation

SCALE N. T. S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			18
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

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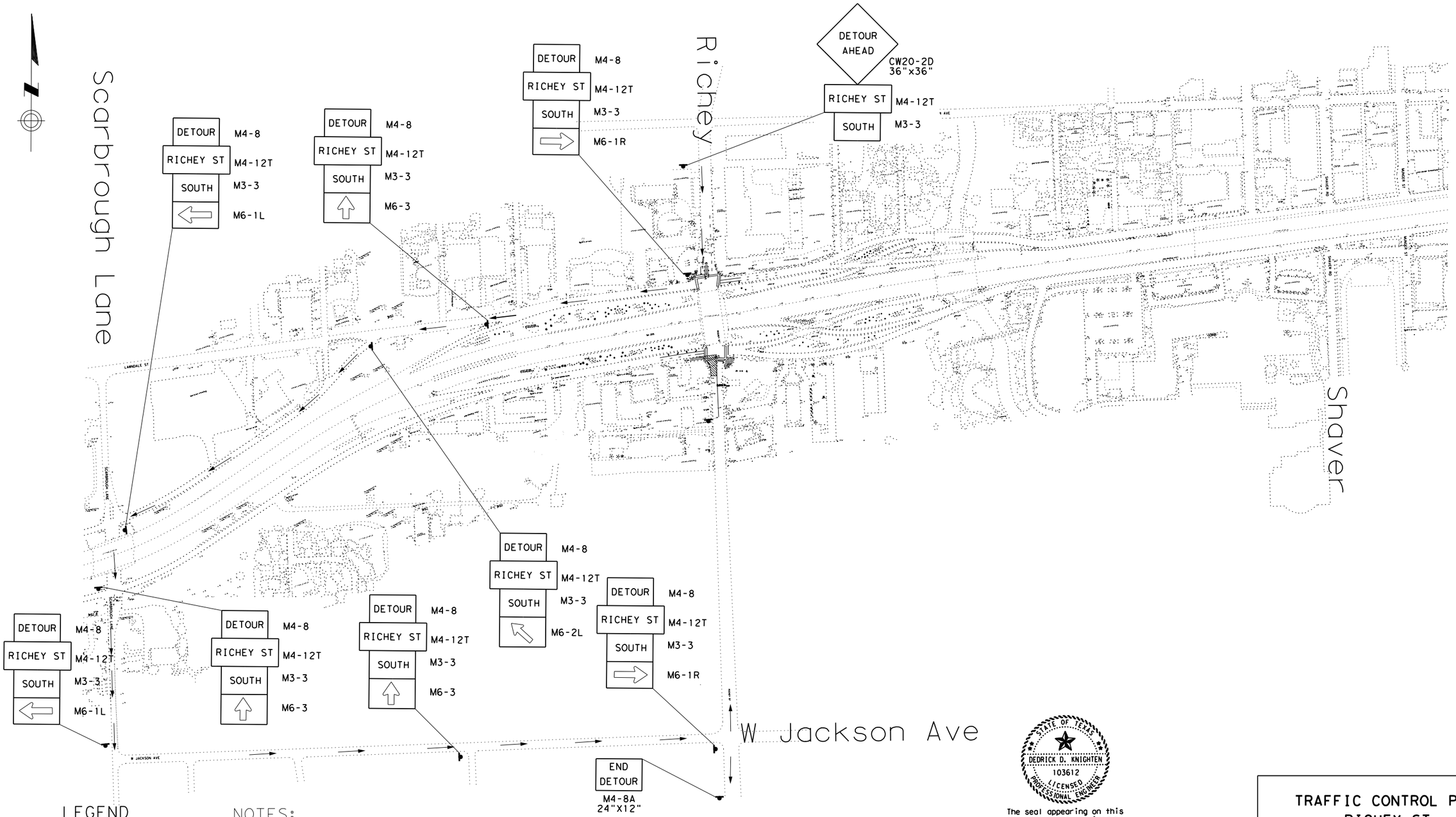

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD

NOTES:

1. SEE RICHEY ST PHASE 3 TCP SHEET FOR ADDITIONAL INFORMATION.

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TRAFFIC CONTROL PLAN
RICHEY ST.
DETOUR 3

SHEET 3 OF 4

Texas Department of Transportation

SCALE N. T. S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			19
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

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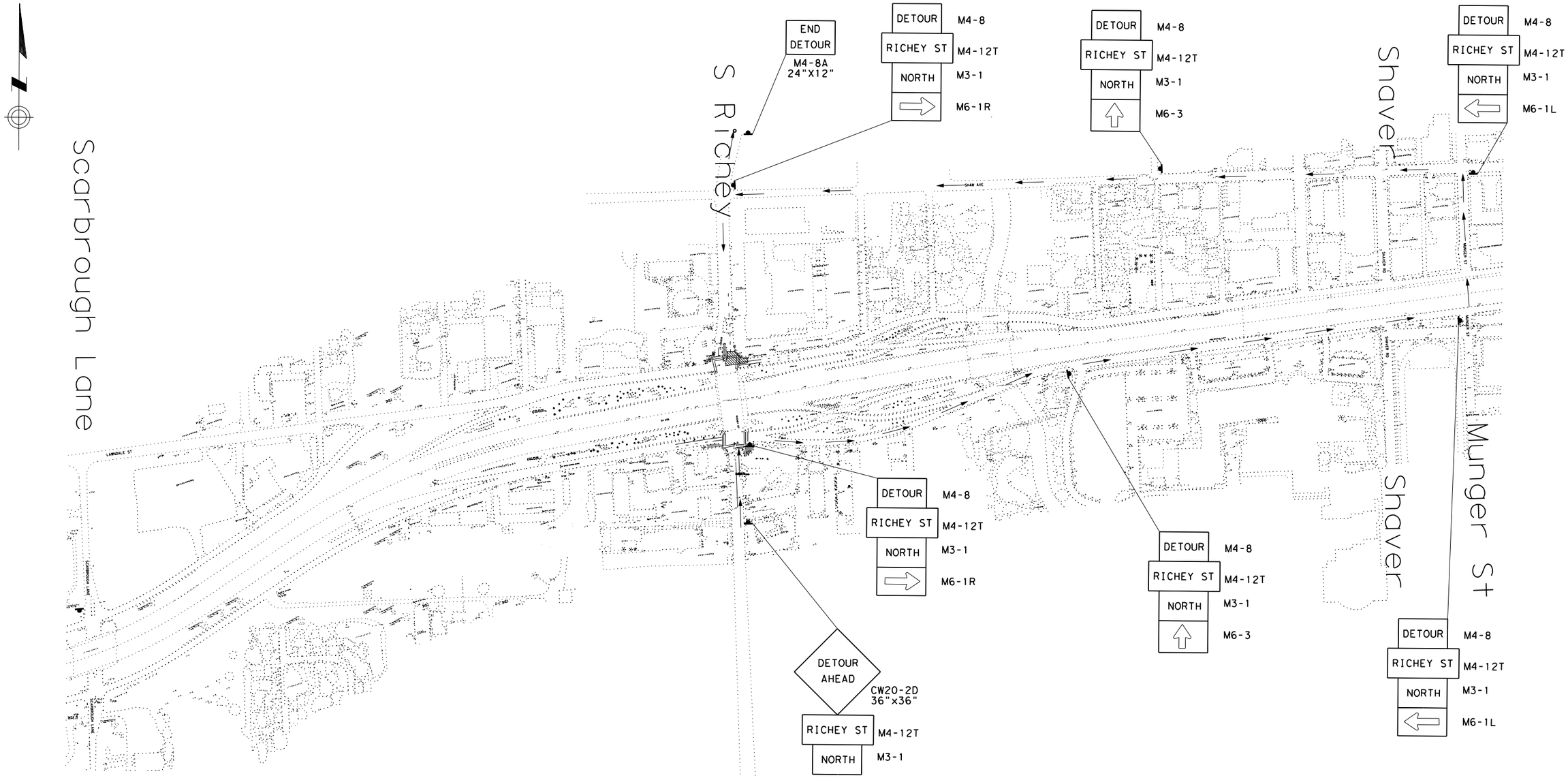

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE RICHEY ST PHASE 8 TCP SHEET FOR ADDITIONAL INFORMATION.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222
FILE: tcp01.DGN

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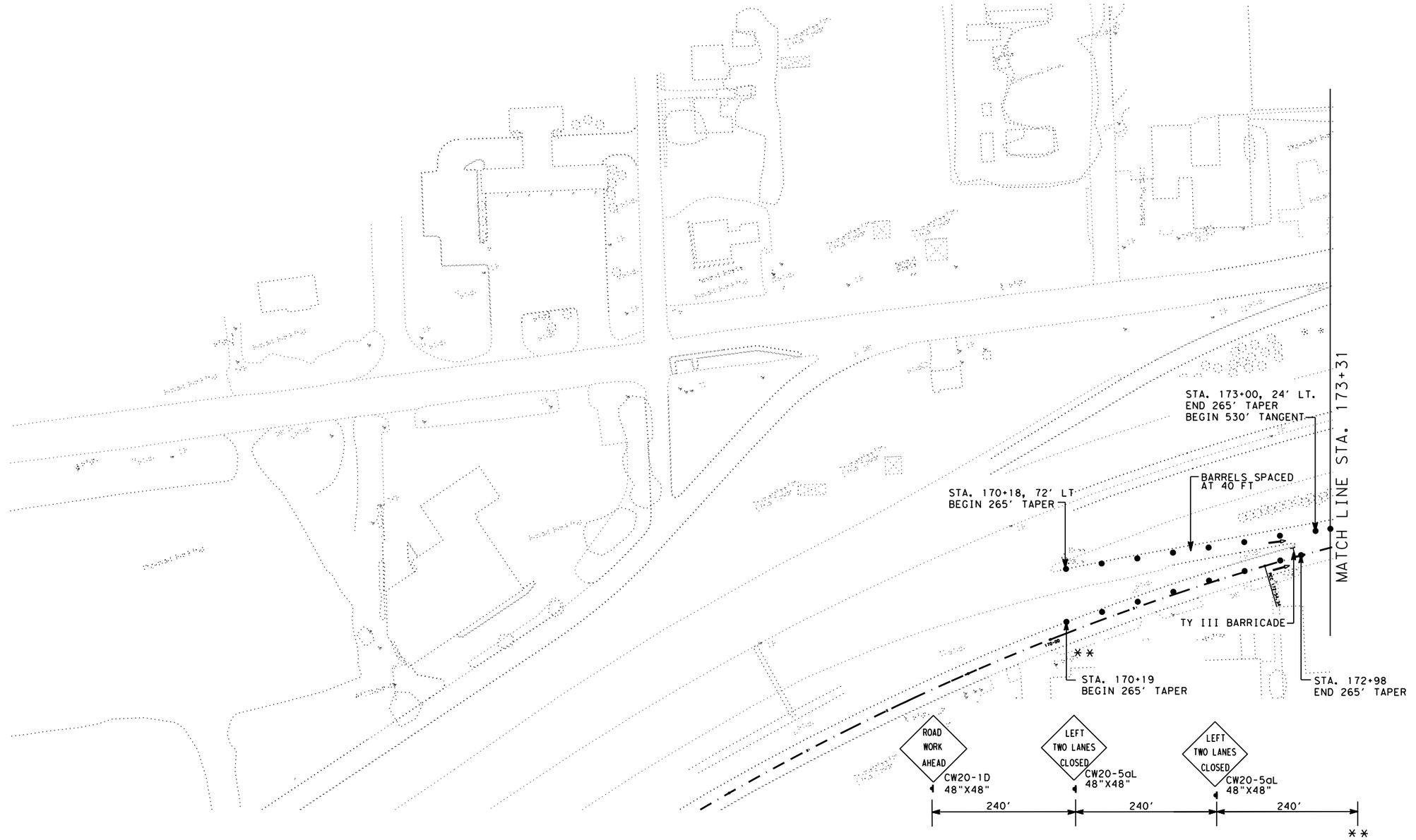
TRAFFIC CONTROL PLAN
RICHEY ST.
DETOUR 4

SHEET 4 OF 4

Texas Department of Transportation

SCALE N. T. S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			20
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



SCALE: 1"=120' HORZ.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 1 FOR SOUTHBOUND RICHEY ROAD DETOUR.

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TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 1

SHEET 1 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			21
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

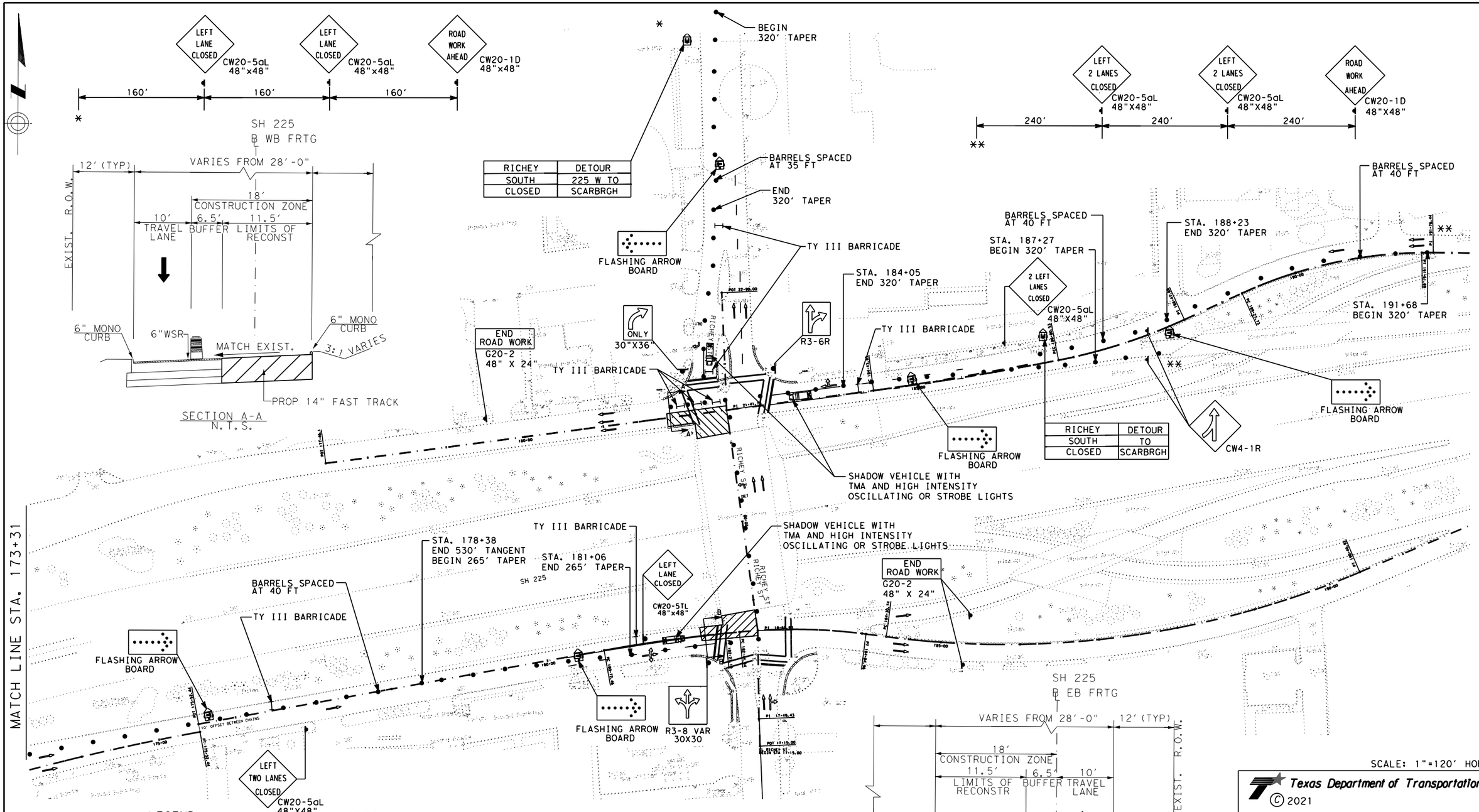
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502011222

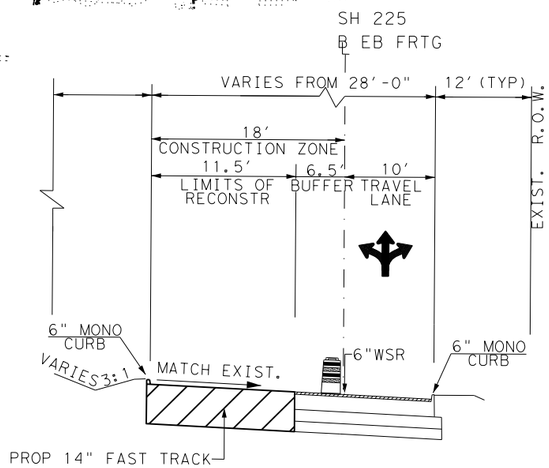
FILE: tcp01.DGN

SECTION A-A
N.T.S.

RICHEY	DETOUR
SOUTH	225 W TO
CLOSED	SCARBRGH



RICHEY	DETOUR
SOUTH	TO
CLOSED	SCARBRGH



SECTION B-B
N.T.S.

SCALE: 1"=120' HORZ.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 1 FOR SOUTHBOUND RICHEY ROAD DETOUR.

STATE OF TEXAS
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TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 1

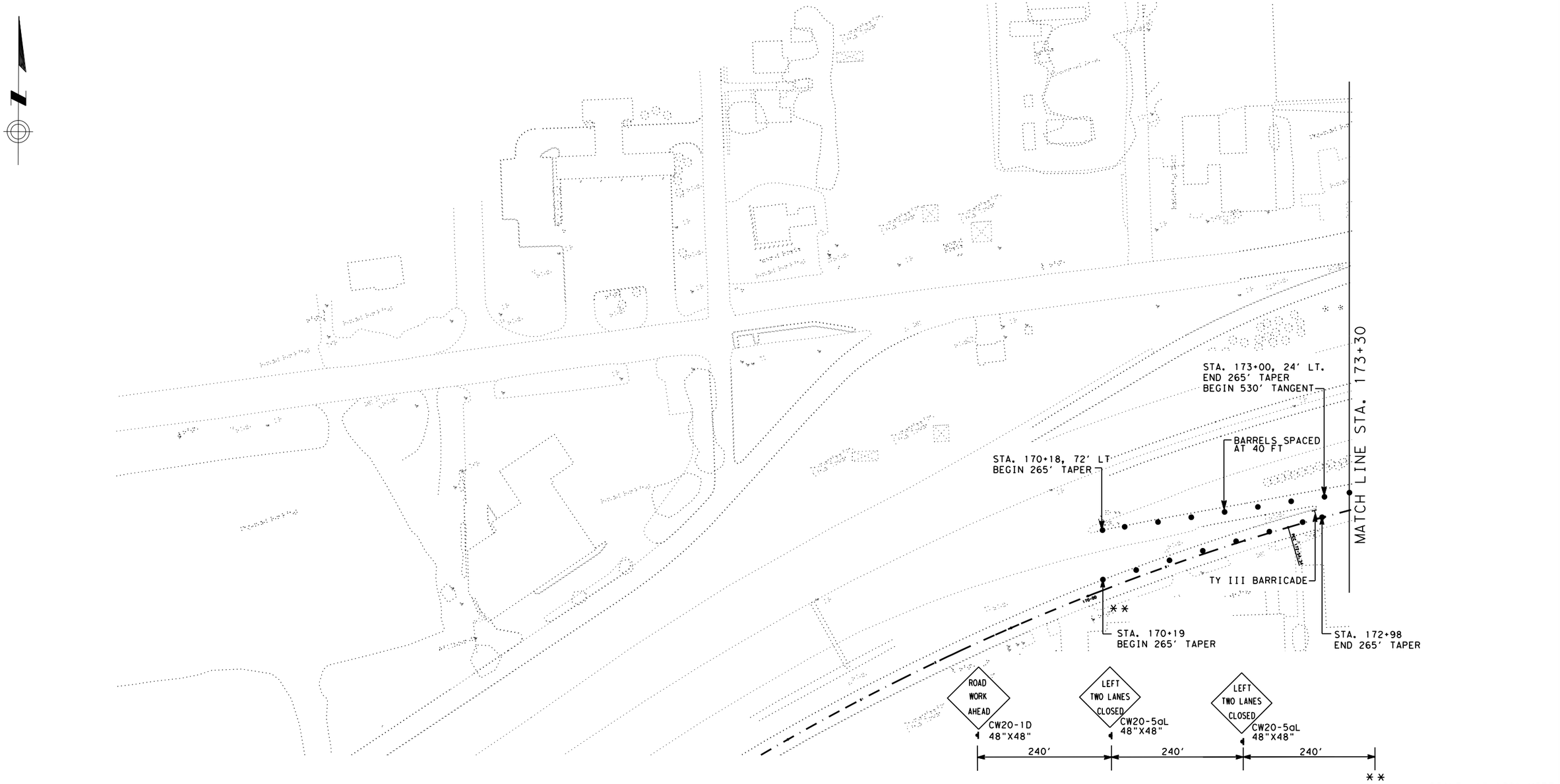
SHEET 2 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			22
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN



SCALE: 1"=120' HORZ.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 2 FOR SOUTHBOUND RICHEY ROAD DETOUR.

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Texas Department of Transportation

TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 2

SHEET 3 OF 13

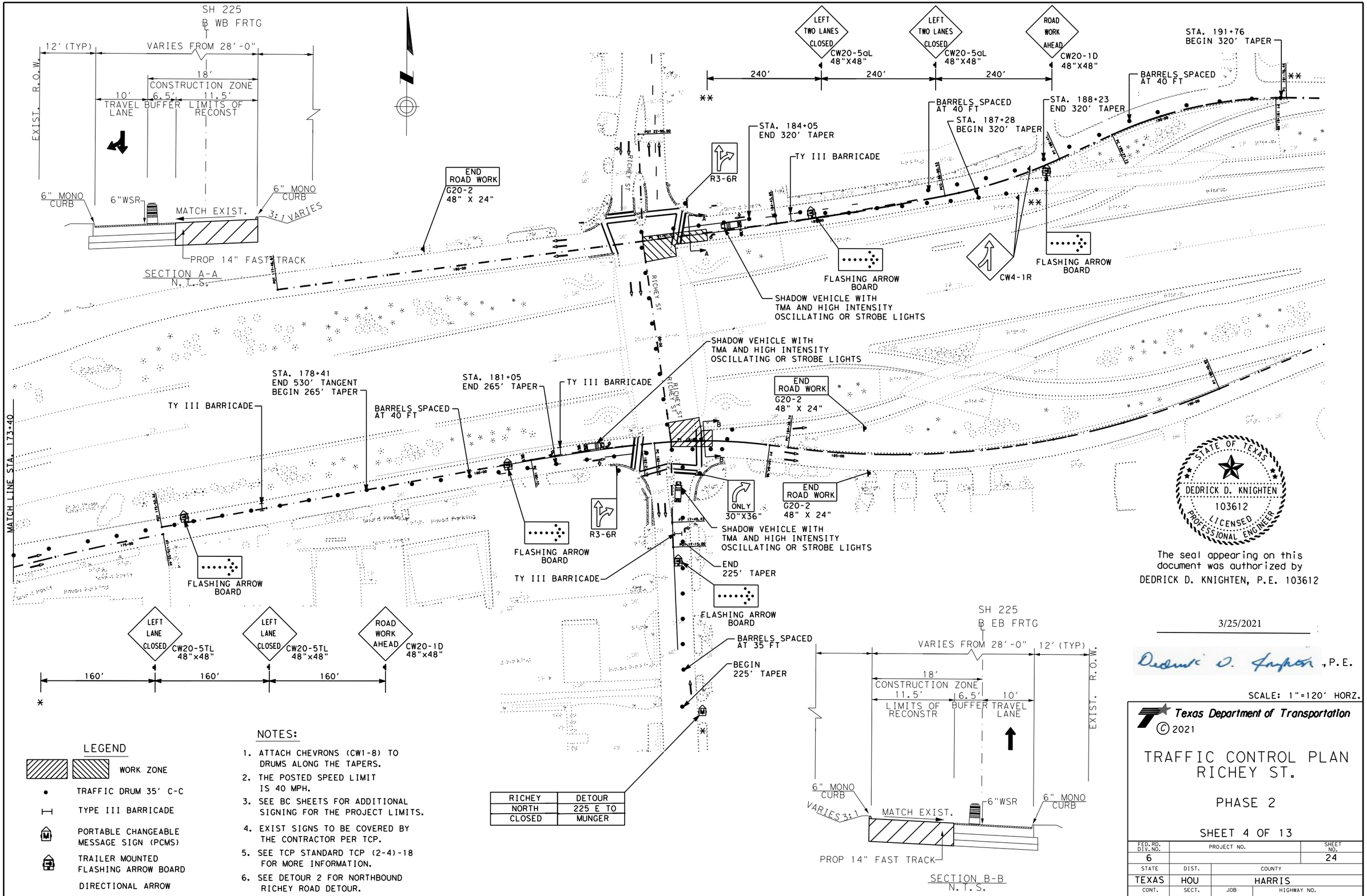
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			23
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

SECTION A-A
N.T.S.



RICHEY	DETOUR
NORTH	225 E TO
CLOSED	MUNGER

SECTION B-B
N.T.S.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 2 FOR NORTHBOUND RICHEY ROAD DETOUR.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222
FILE: tcp01.DGN

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

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SCALE: 1"=120' HORZ.

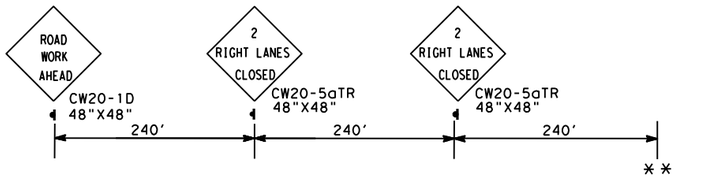
Texas Department of Transportation

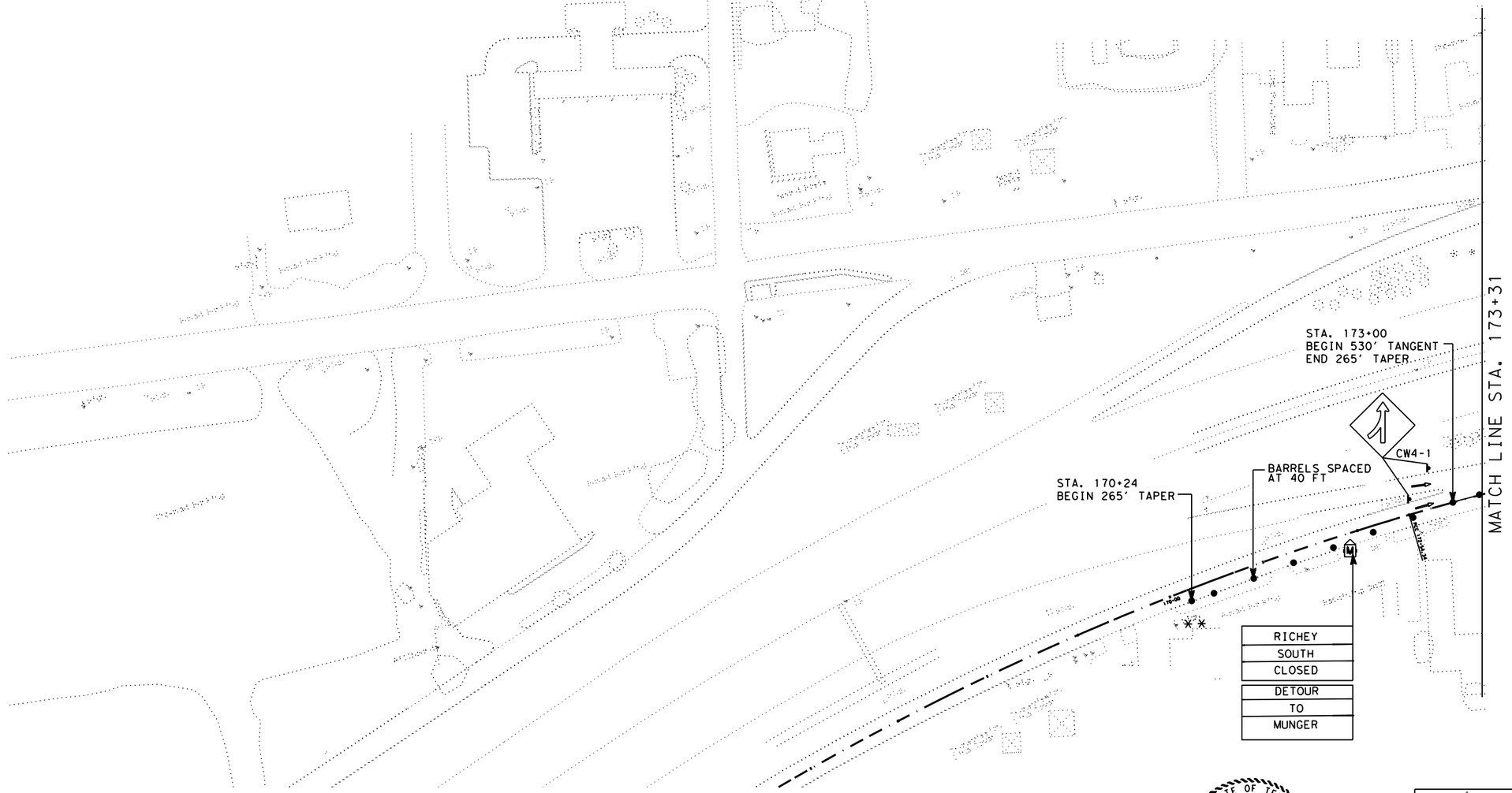
TRAFFIC CONTROL PLAN
RICHEY ST.

PHASE 2

SHEET 4 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			24
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

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6. SEE DETOUR 3 FOR SOUTHBOUND RICHEY ROAD DETOUR.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

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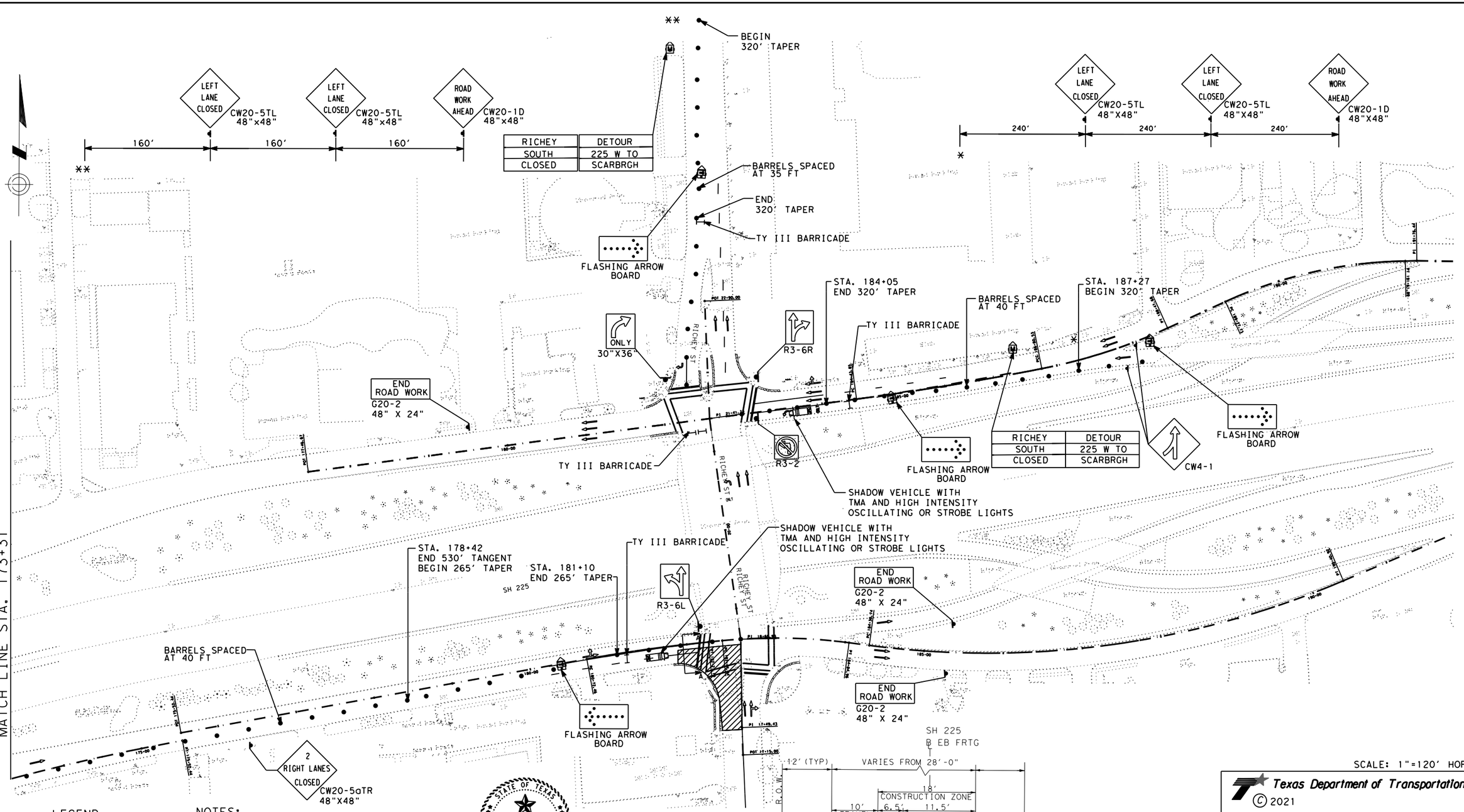
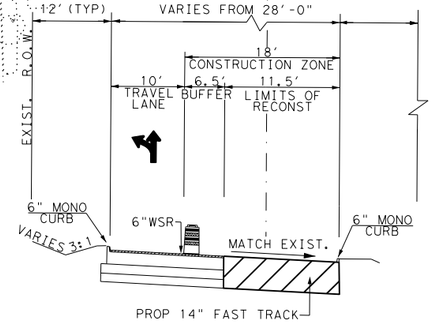
TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 3

SHEET 5 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			25
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



SH 225
@ EB FRTG



SECTION B-B
N.T.S.

SCALE: 1"=120' HORZ.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
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LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502001222

FILE: tcp01.DGN

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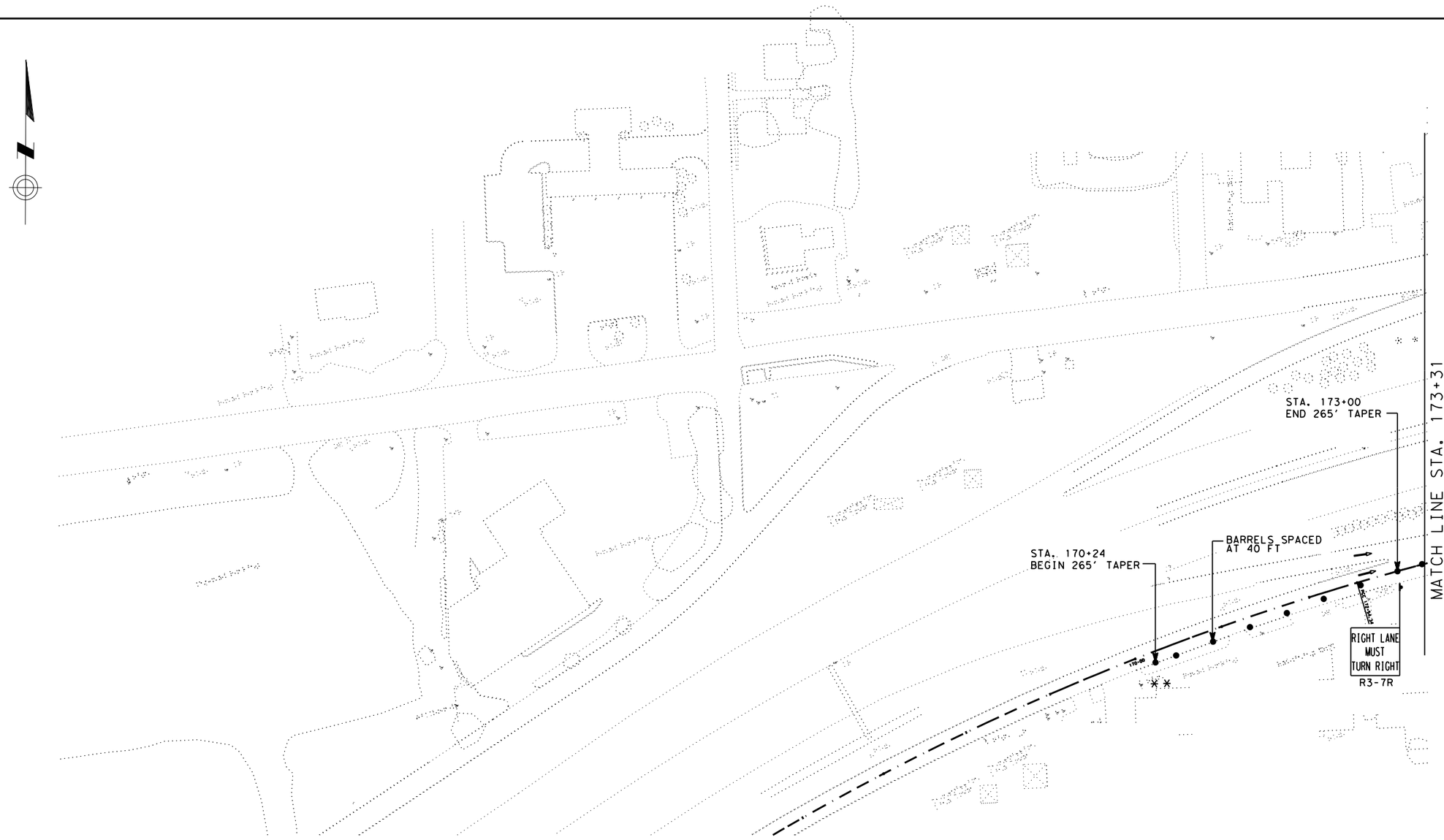
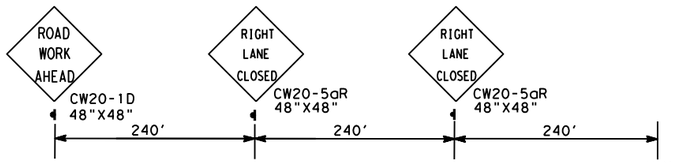
TRAFFIC CONTROL PLAN
RICHEY ST.

PHASE 3

SHEET 6 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			26
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





LEGEND

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- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
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LEVELS DISPLAYED
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17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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TRAFFIC CONTROL PLAN RICHEY ST.

PHASE 4

SHEET 7 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			27
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

MATCH LINE STA. 173+31

SHADOW VEHICLE WITH
TMA AND HIGH INTENSITY
OSCILLATING OR STROBE LIGHTS

TY III BARRICADE

SH 225

BARRELS SPACED
AT 40 FT

TY III BARRICADE

SHADOW VEHICLE WITH
TMA AND HIGH INTENSITY
OSCILLATING OR STROBE LIGHTS

END
ROAD WORK
G20-2
48" X 24"

ONLY
R3-5R

RIGHT LANE
MUST
TURN RIGHT
R3-7R

TY III BARRICADE

END
225' TAPER

BARRELS SPACED
AT 35 FT

FLASHING ARROW
BOARD

LEFT
LANE
CLOSED
CW20-5TL
48"X48"

LEFT
LANE
CLOSED
CW20-5TL
48"X48"

ROAD
WORK
AHEAD
CW20-1D
48"X48"

240'

240'

240'

**

BEGIN
225' TAPER

**

RICHEY ST

RICHEY ST

RICHEY ST

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
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5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.

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℄ RICHEY

VARIES 2' TO 27'

20'
CONSTRUCTION ZONE
18' LIMITS OF RECONSTR
2' BUFFER
10' TRAVEL LANE

VARIES 7' TO 13'

R.O.W.

VARIES 2' TO 20'

6" CURB TYP

ASB MEDIAN

1' SAW CUT

6"WSR

MATCH EXIST.

6" CURB TYP

4'

PROP 14" FAST TRACK

SECTION B-B
N.T.S.

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TRAFFIC CONTROL PLAN
RICHEY ST.

PHASE 4

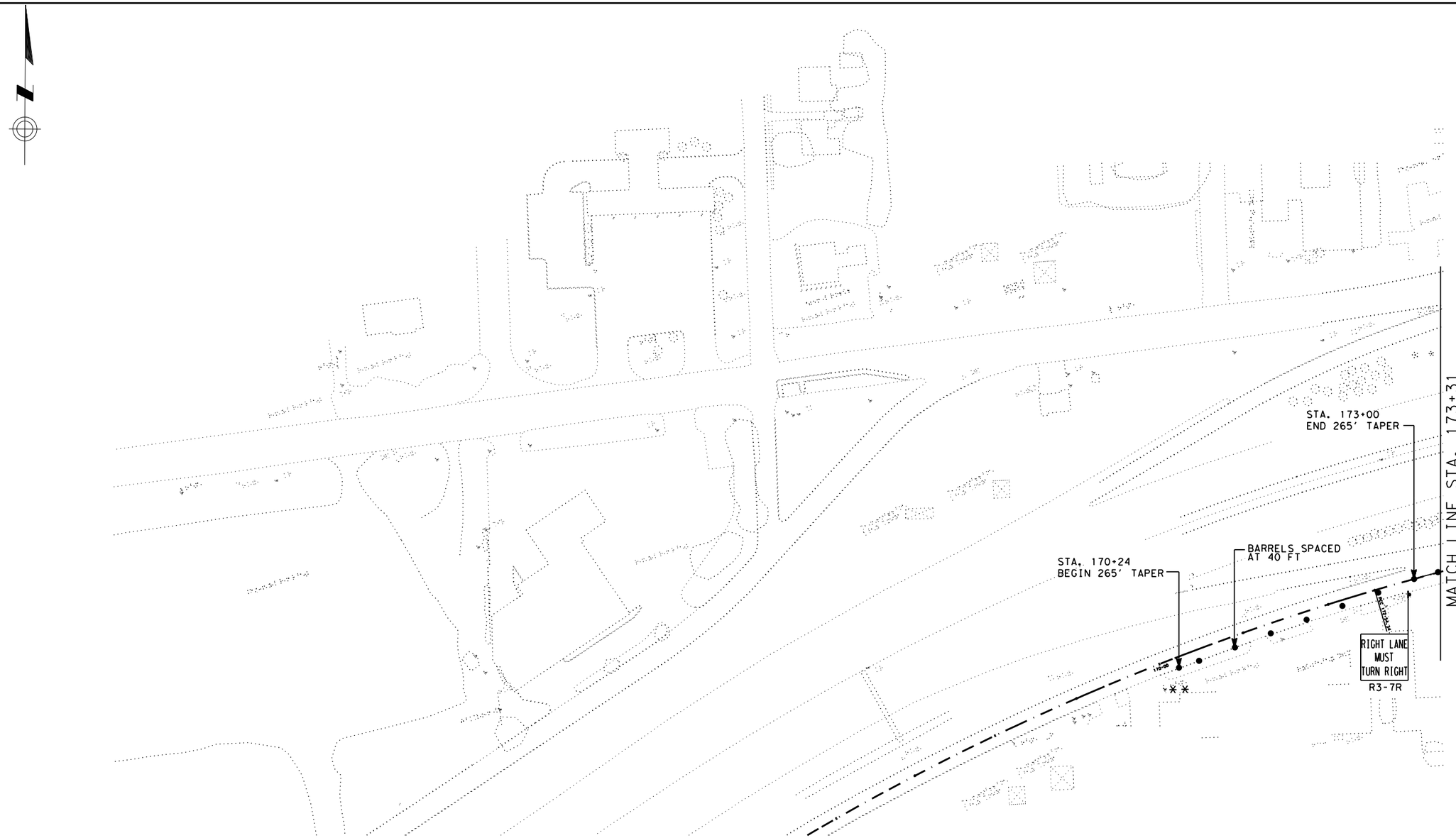
SHEET 8 OF 13

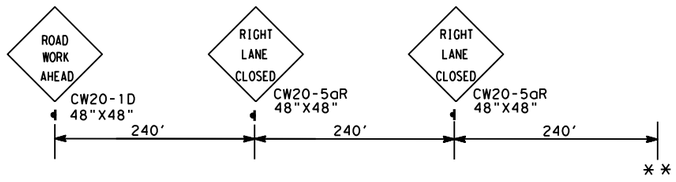
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			28
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502201222

FILE: tcp01.DGN





LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502201222

FILE: tcp01.DGN

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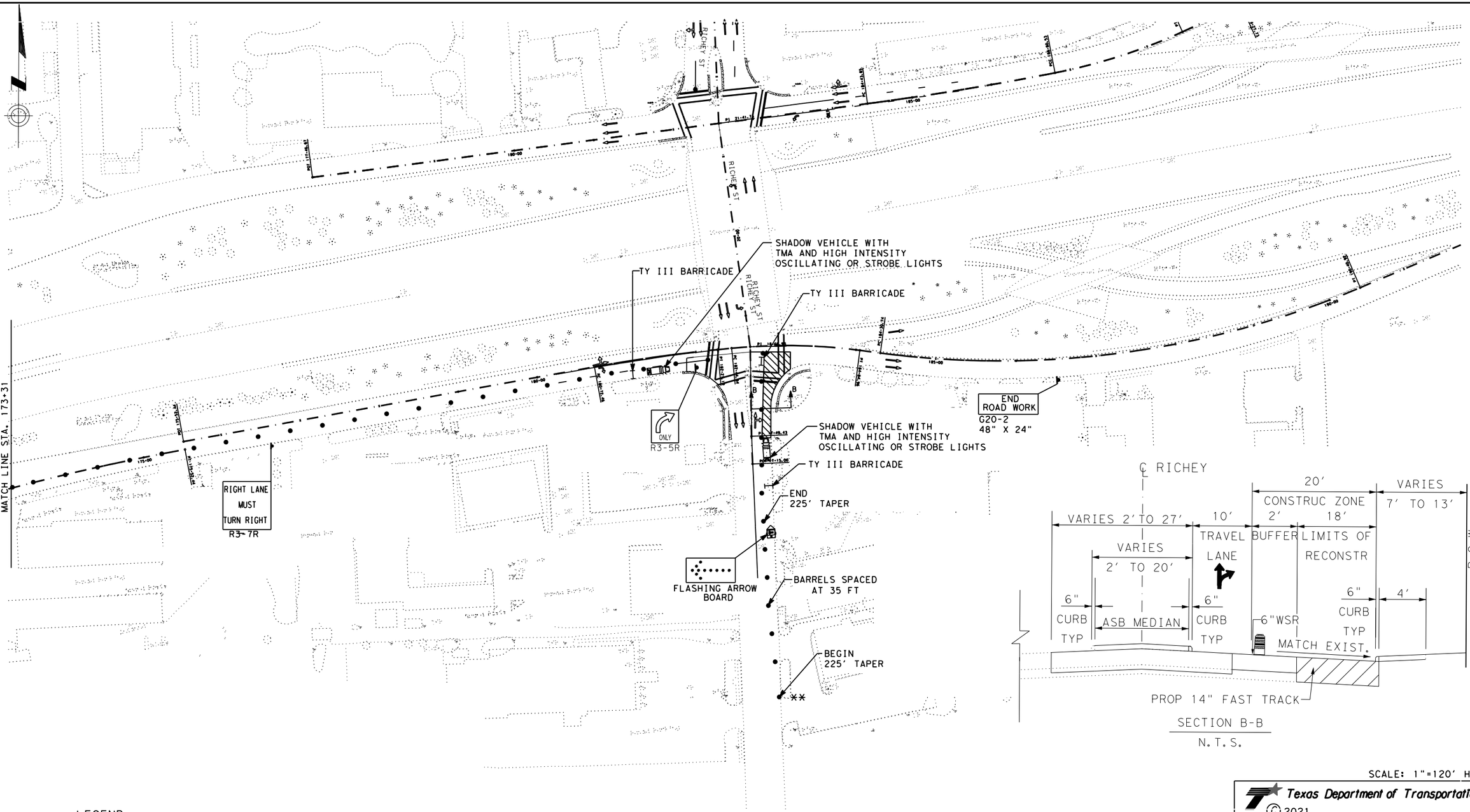
TRAFFIC CONTROL PLAN RICHEY ST.

PHASE 5

SHEET 9 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			29
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



SECTION B-B

N.T.S.

SCALE: 1"=120' HORZ.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

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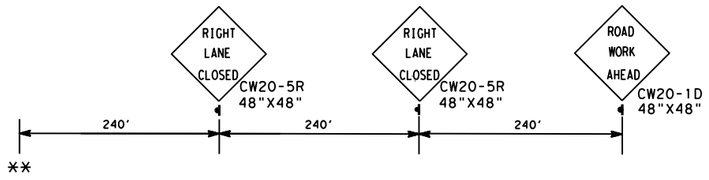
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.



LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502O1222

FILE: tcp01.DGN

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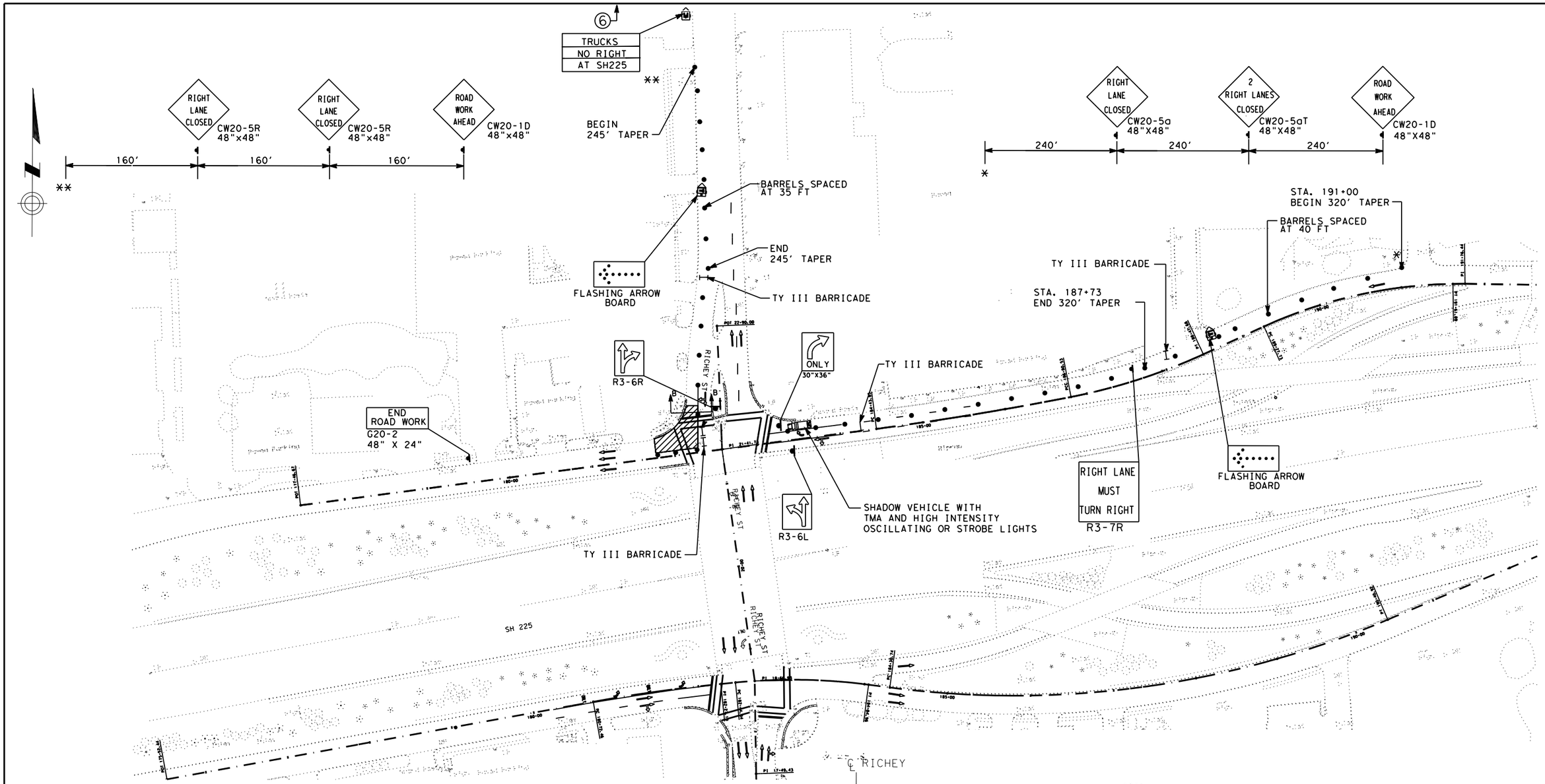
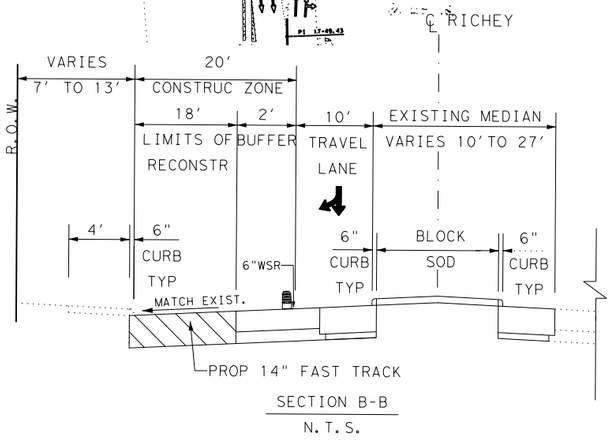
TRAFFIC CONTROL PLAN RICHEY ST.

PHASE 5

SHEET 10 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			30
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





SECTION B-B
N. T. S.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

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2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. PLACE PCMS 1 BLOCK NORTH OF SHAW AVE

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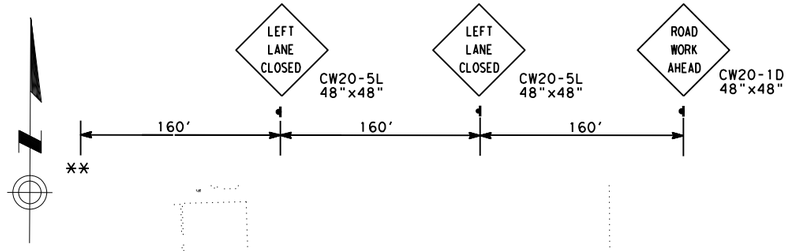
TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 6

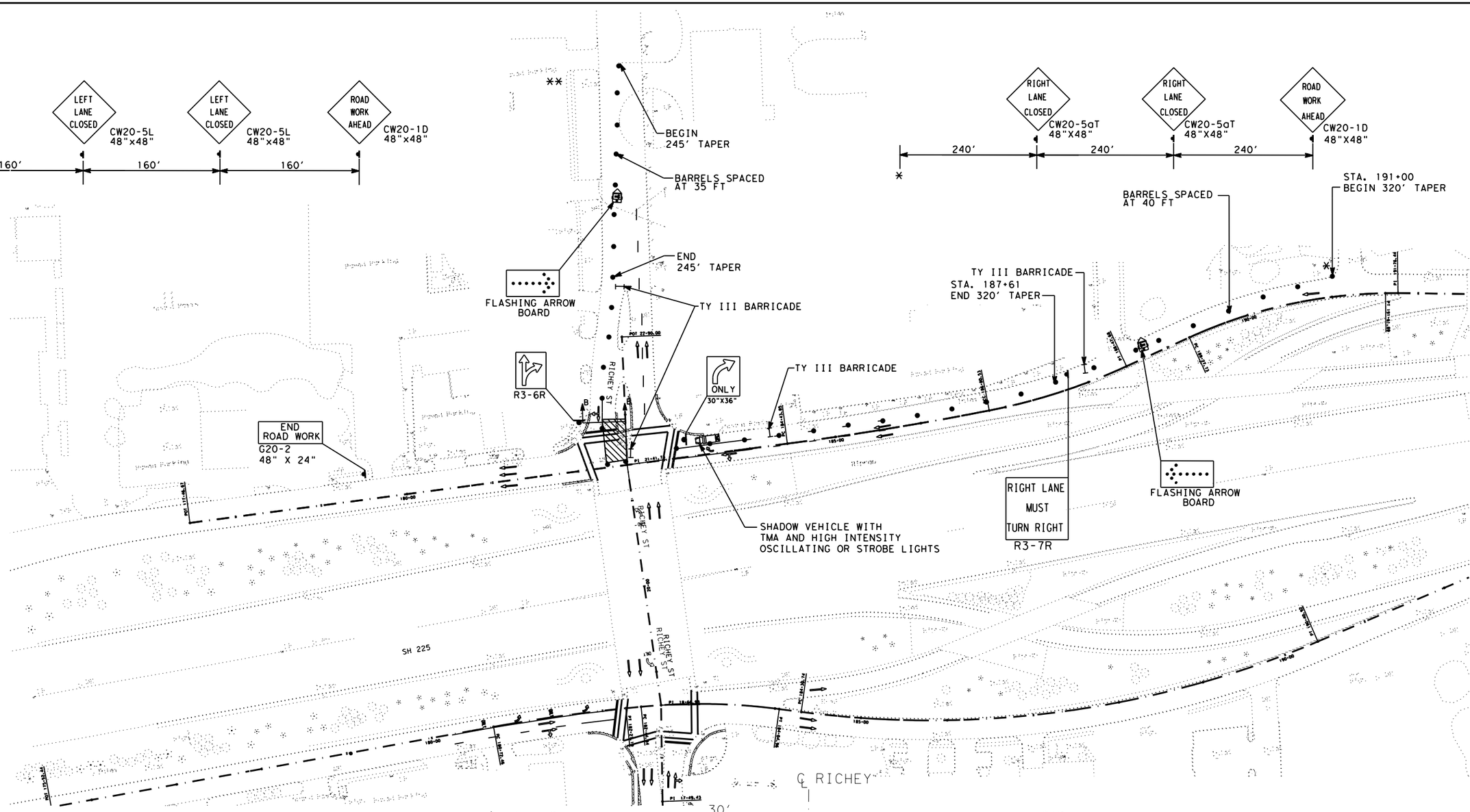
SHEET 11 OF 13

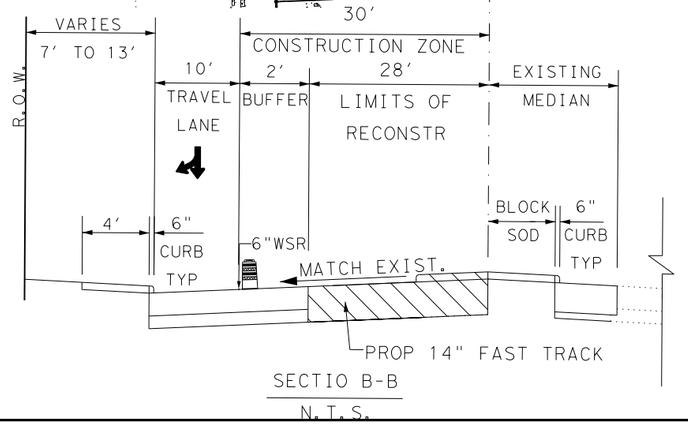
FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			31
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222
FILE: tcp01.DGN







SECTIO B-B

N.T.S.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
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LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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FILE: tcp01.DGN

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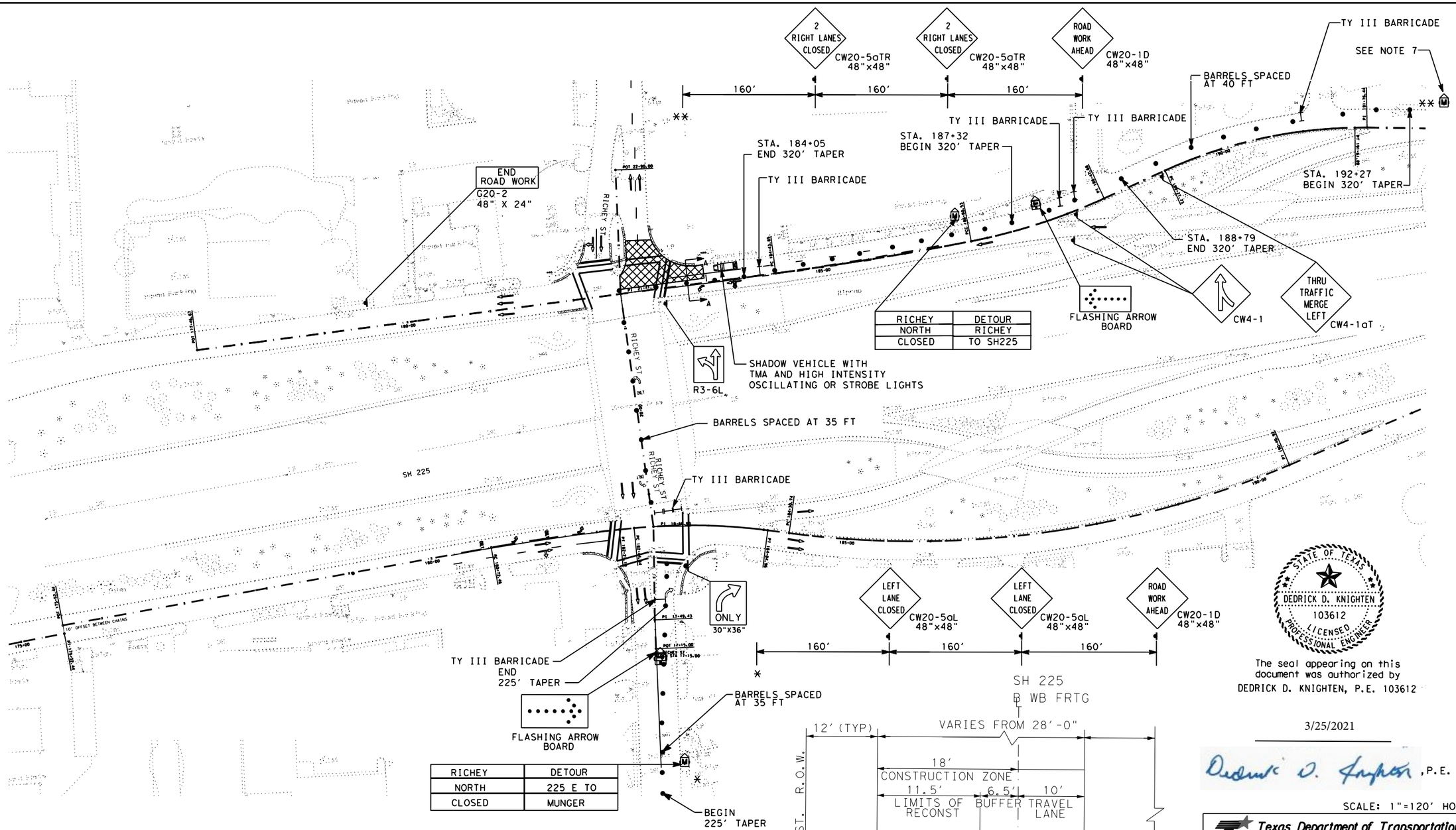
TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 7

SHEET 12 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			32
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
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5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 4 PLAN SHEET FOR NORTHBOUND RICHEY DETOUR.
7. PLACE FOLLOWING PCMS ON WB SH225 FRTG RD AT MAIN ST.

DETOUR
225 W TO
MUNGER
DETOUR
MUNGER
TO SHAW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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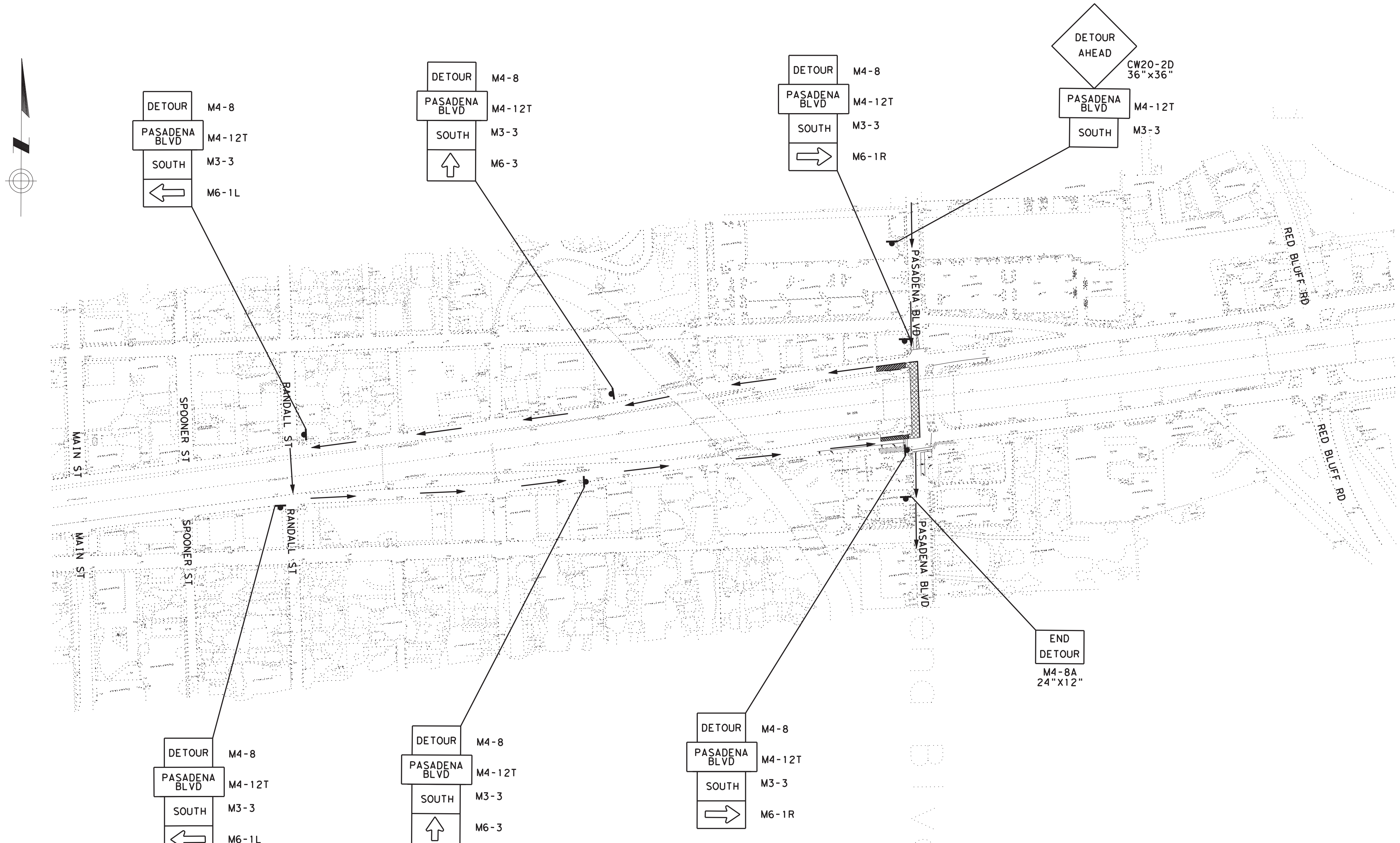
TRAFFIC CONTROL PLAN
RICHEY ST.
PHASE 8

SHEET 13 OF 13

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			33
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

WORK ZONE

• TRAFFIC DRUM 35' C-C

TYPE III BARRICADE

PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

TRAILER MOUNTED FLASHING ARROW BOARD

DIRECTIONAL ARROW

NOTES:

1. SEE PASADENA BLVD PHASE 1 TCP SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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103612
LICENSED PROFESSIONAL ENGINEER

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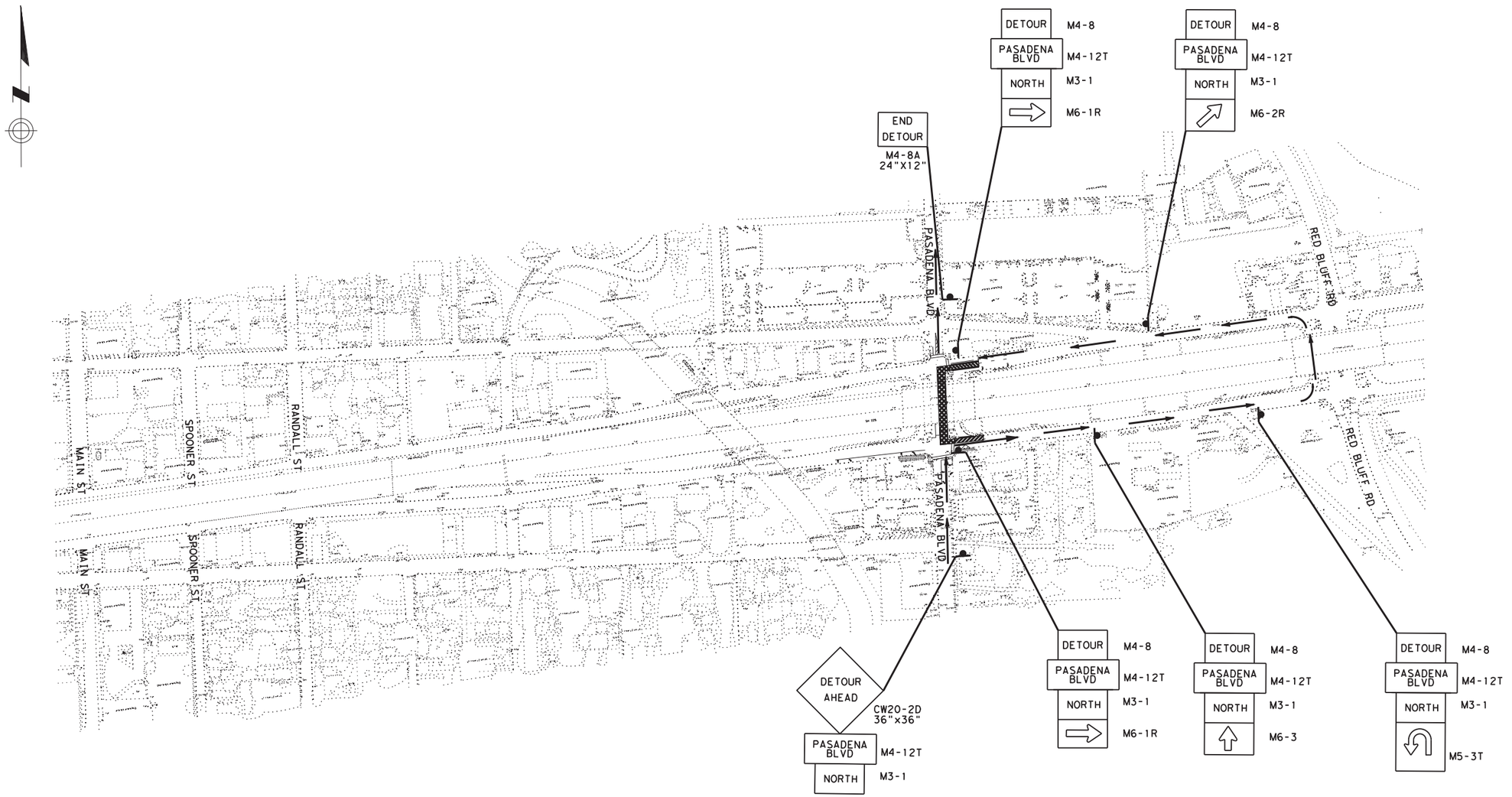
Texas Department of Transportation

DETOUR PLAN
PASADENA BLVD.
DETOUR 1

SHEET 1 OF 4 — *SCALE N.T.S.*

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			34
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

ACC: PROJECT/CSJ0502201222
FILE: tcp01.DGN
LEVELS DISPLAYED



LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE PASADENA BLVD PHASE 2 TCP SHEET FOR ADDITIONAL INFORMATION.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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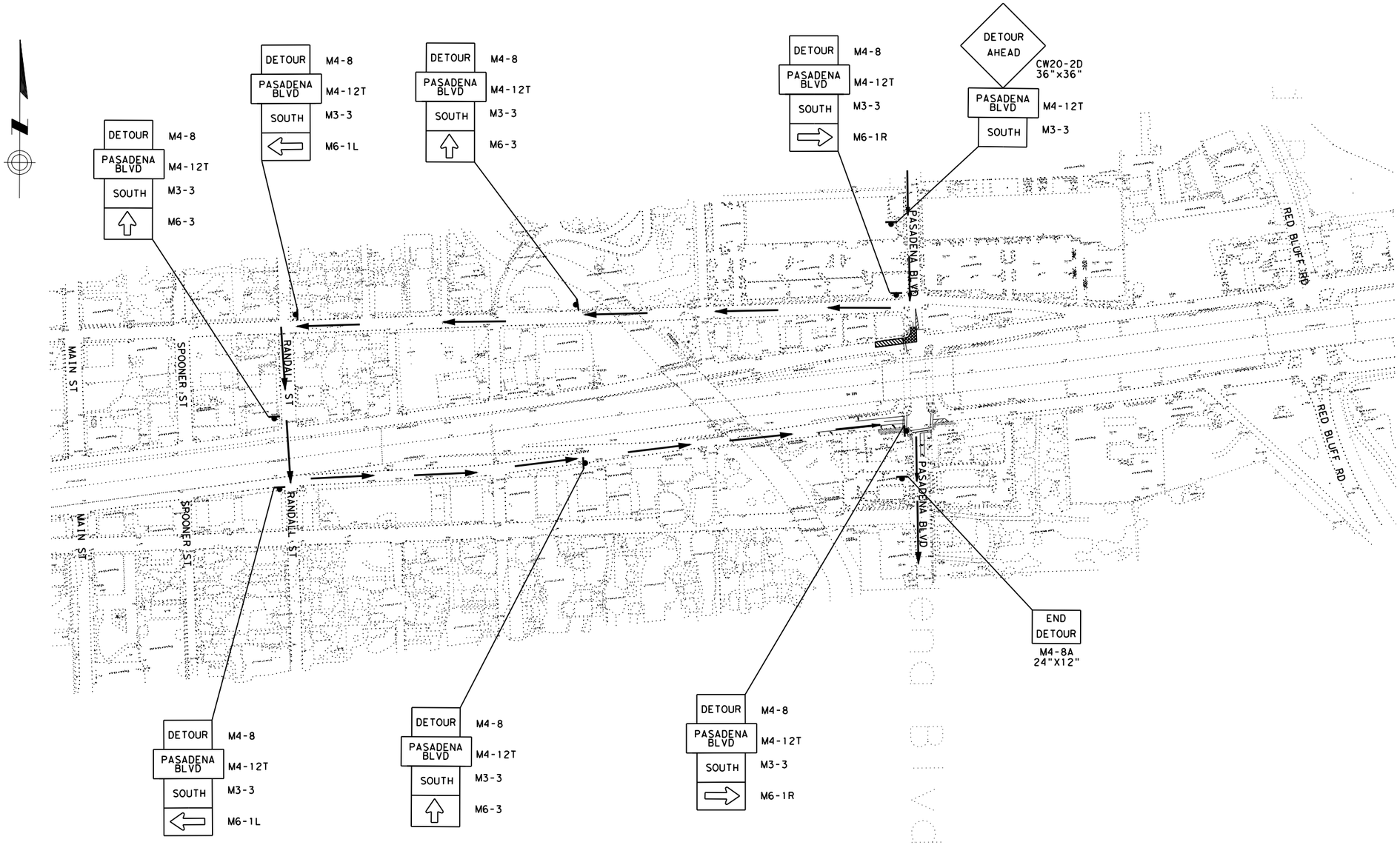
DETOUR PLAN
PASADENA BLVD.
DETOUR 2

SHEET 2 OF 4 SCALE N. T. S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			35
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE PASADENA BLVD PHASE 3 TCP SHEET FOR ADDITIONAL INFORMATION.

LEVELS DISPLAYED

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	45	56	67	38	39	40	41	42	43	44	45	46	47
48	95	05	15	25	35	45	55	65	75	85	96	06	16	26	36

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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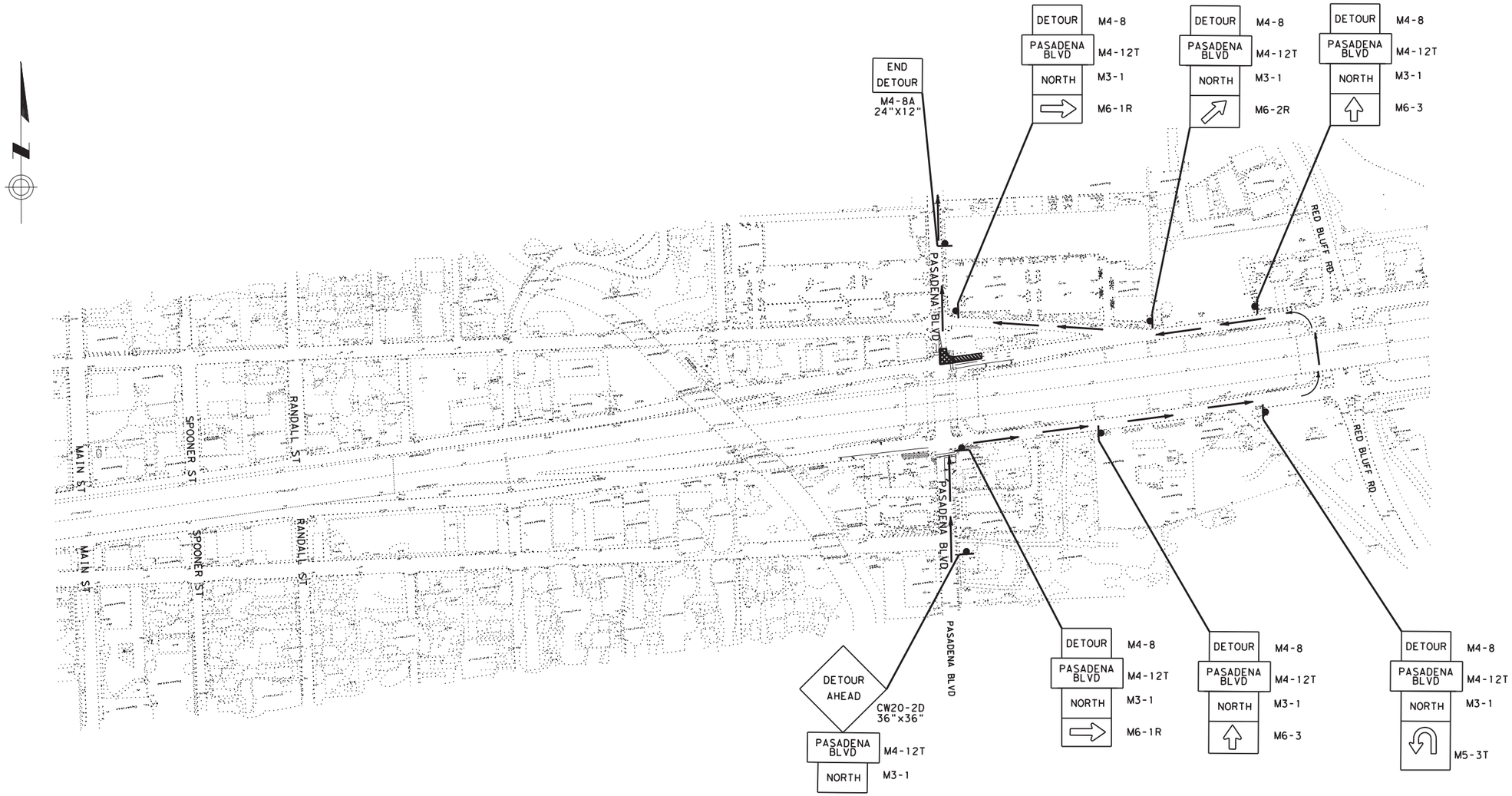
DETOUR PLAN
PASADENA BLVD.
DETOUR 3

SHEET 3 OF 4 SCALE N.T.S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			36
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

NOTES:

1. SEE PASADENA BLVD PHASE 4 TCP SHEET FOR ADDITIONAL INFORMATION.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 31 41 51 61
17 18 19 20 21 22 32 42 52 62 72 82 93 03 13 23
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 55 56 57 58 59 60 61 62 63
ACC: PROJECT/CSJ0502012 22
FILE: tcp01.DGN

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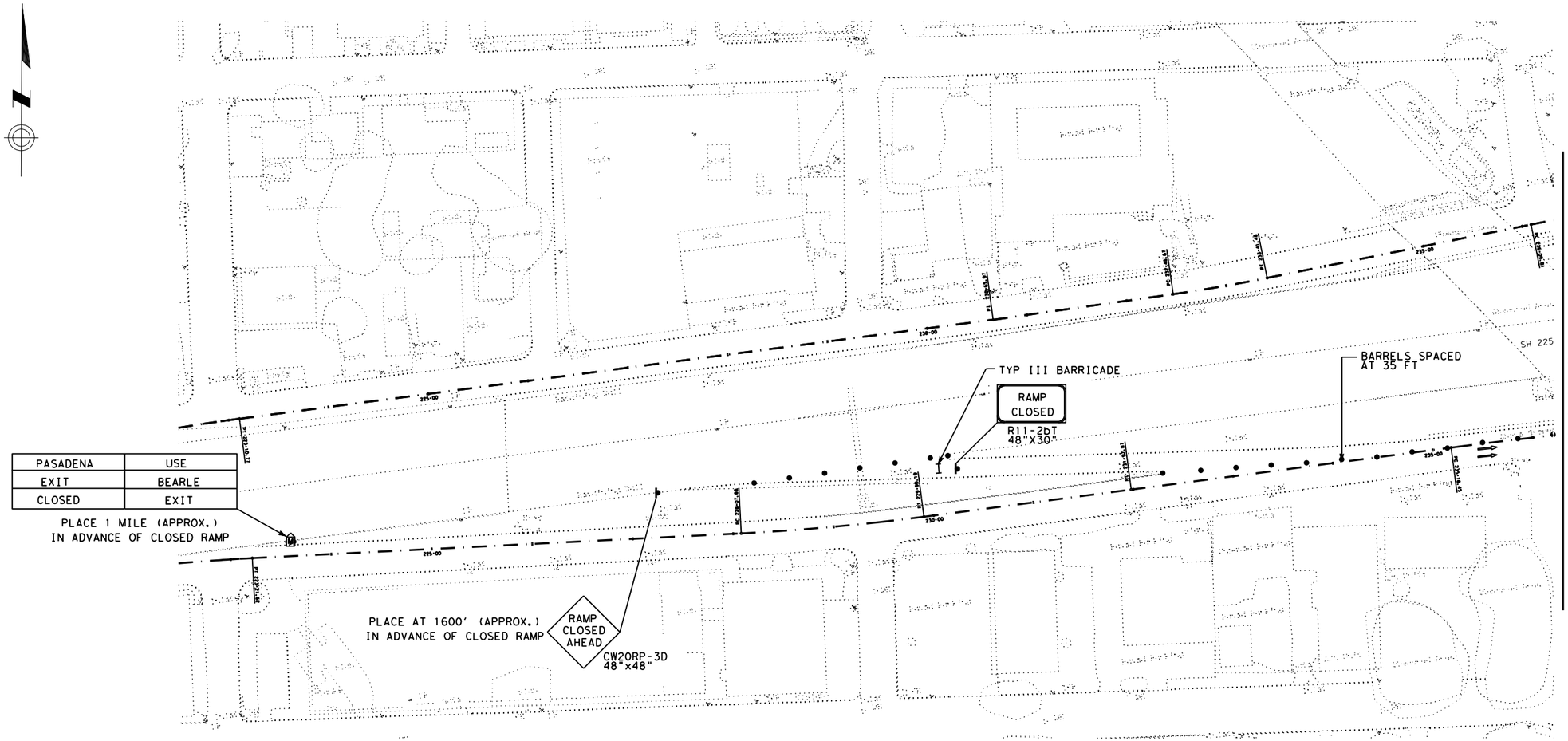
DETOUR PLAN
PASADENA BLVD.
DETOUR 4

SHEET 4 OF 4 SCALE N.T.S.

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			37
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 1 PLAN FOR SOUTHBOUND PASADENA BLVD DETOUR
7. PRIOR TO THIS POINT USE LANE CLOSURE IN ACCORDANCE WITH TCP (2-4)-18

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CS.I0502O1222

FILE: tcp01.DGN

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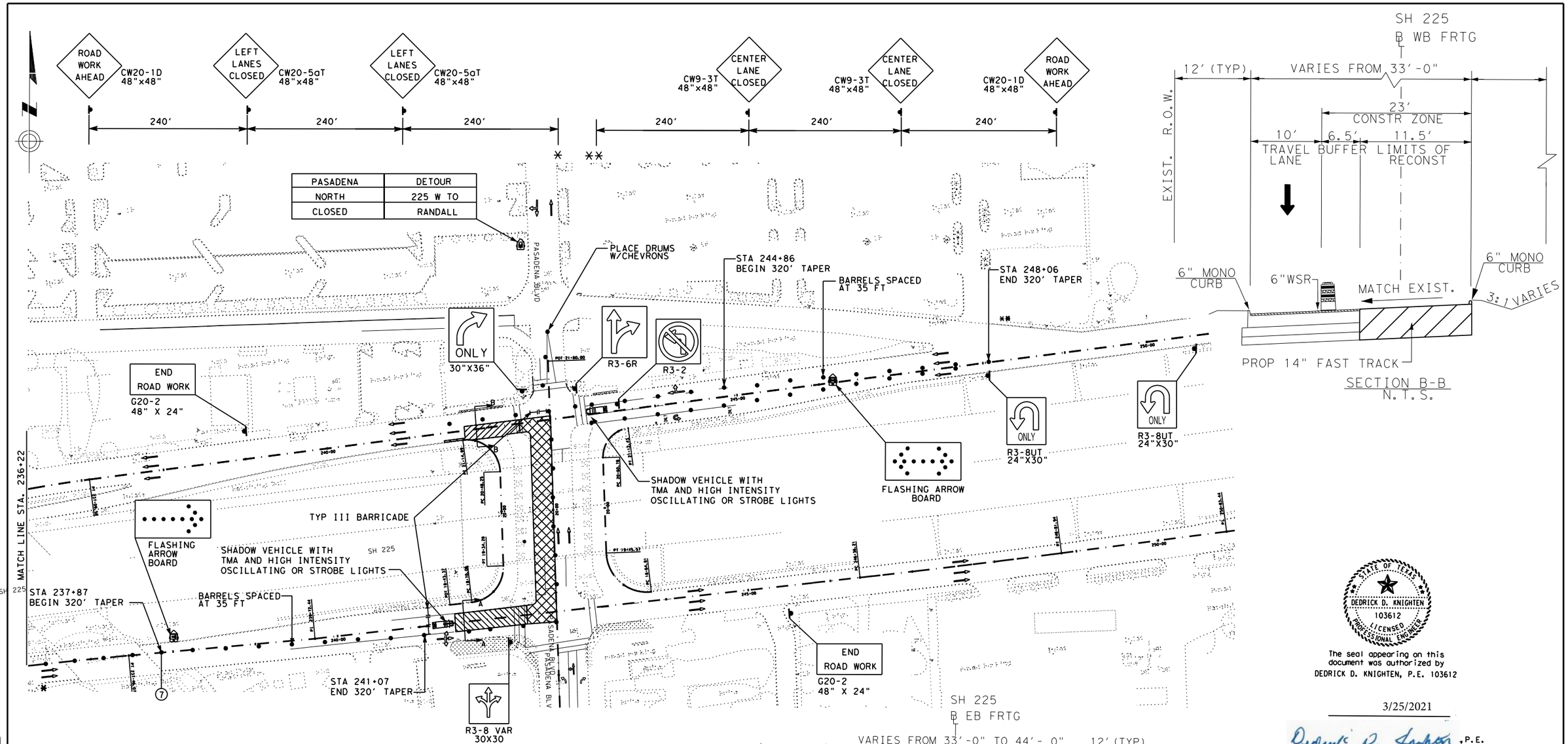
TRAFFIC CONTROL PLAN PASADENA BLVD.

PHASE 1

SHEET 1 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			38
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 1 PLAN FOR SOUTHBOUND PASADENA BLVD DETOUR
7. PRIOR TO THIS POINT USE LANE CLOSURE IN ACCORDANCE WITH TCP (2-4)-18

LEGEND

- WORK ZONE
- • TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222
FILE: tcp01.DGN

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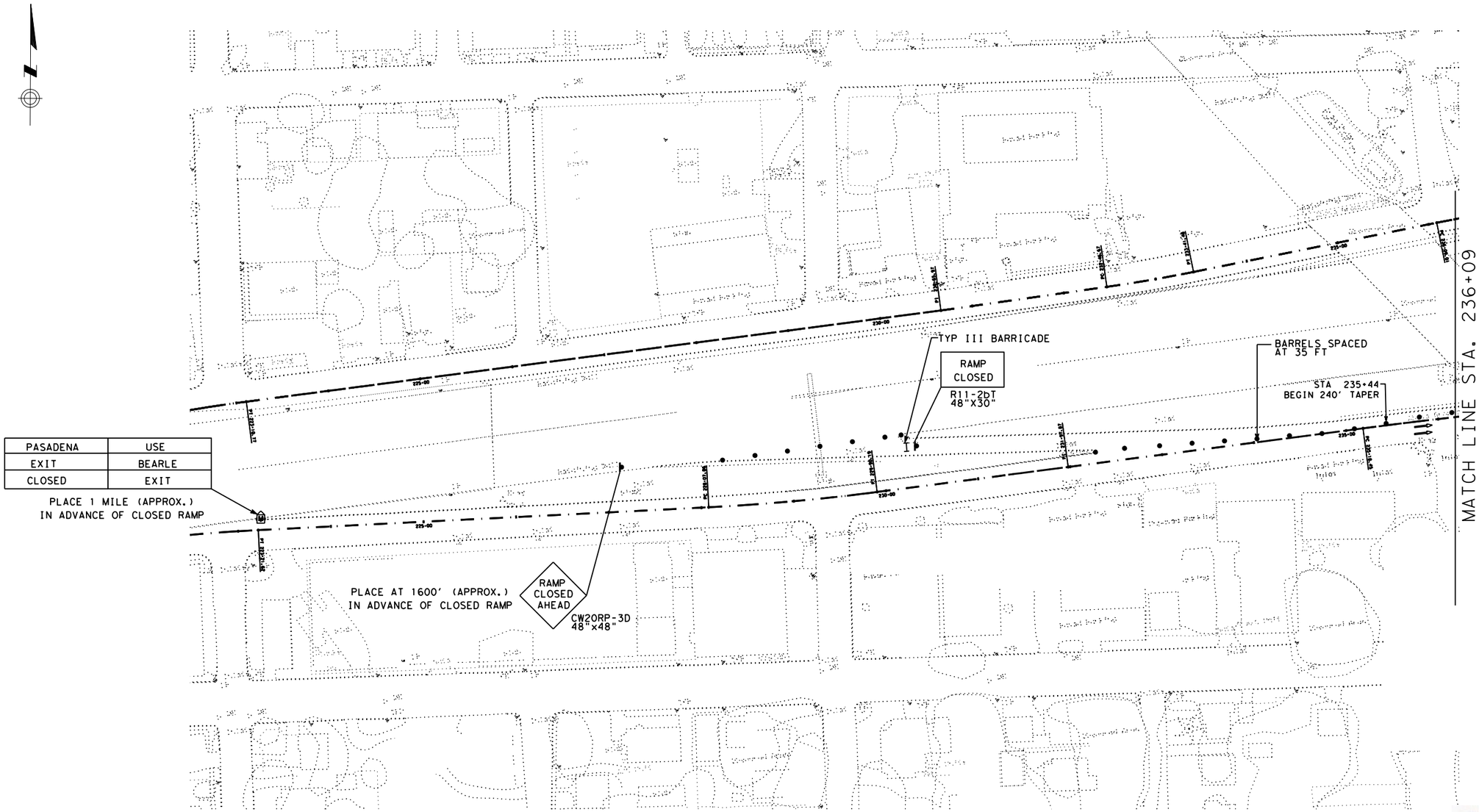
TRAFFIC CONTROL PLAN
PASADENA BLVD.

PHASE 1

SHEET 2 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			38A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 2 PLAN FOR SOUTHBOUND PASADENA BLVD DETOUR
7. PRIOR TO THIS POINT USE LEFT LANE CLOSURE IN ACCORDANCE WITH TCP (2-4)-18.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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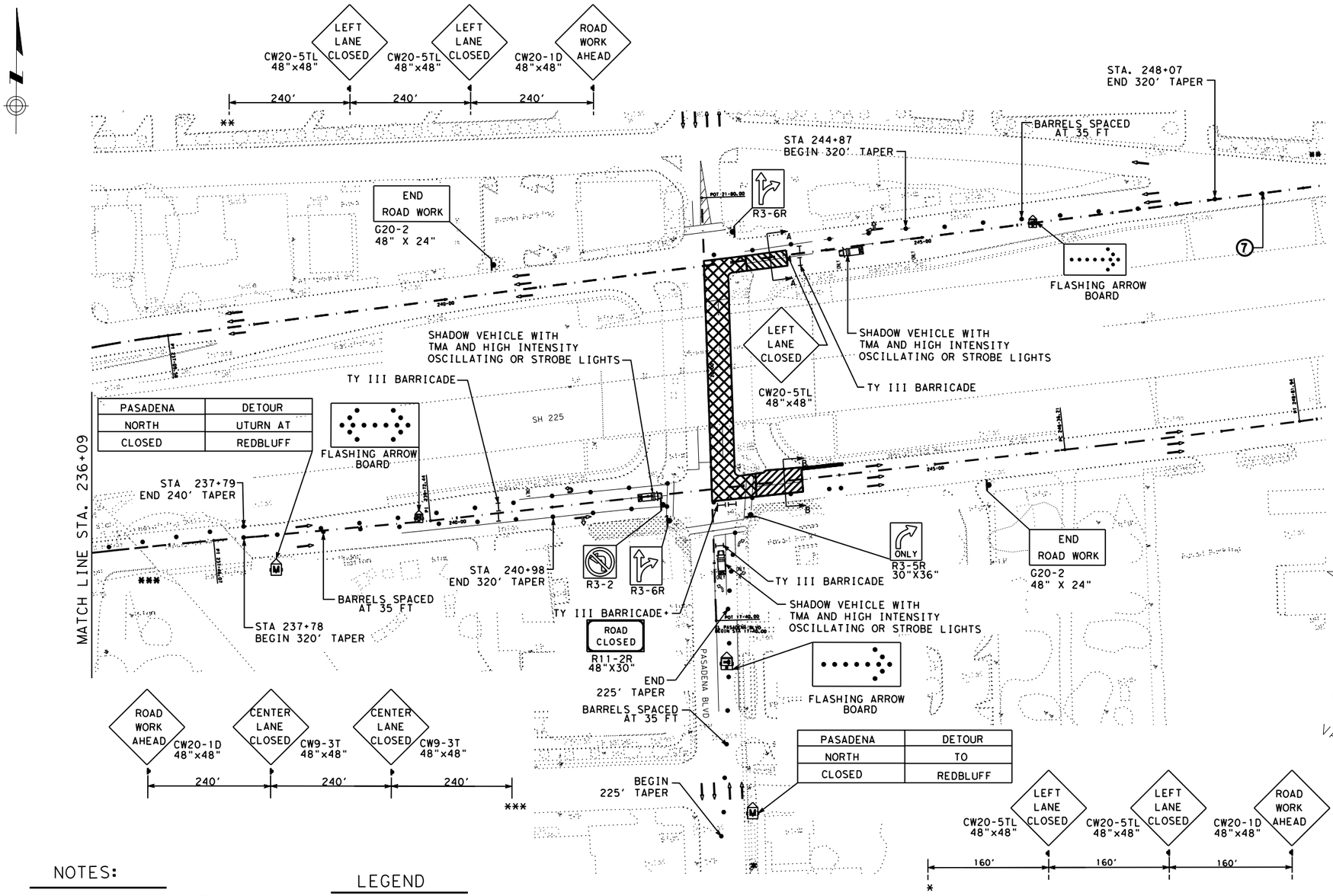
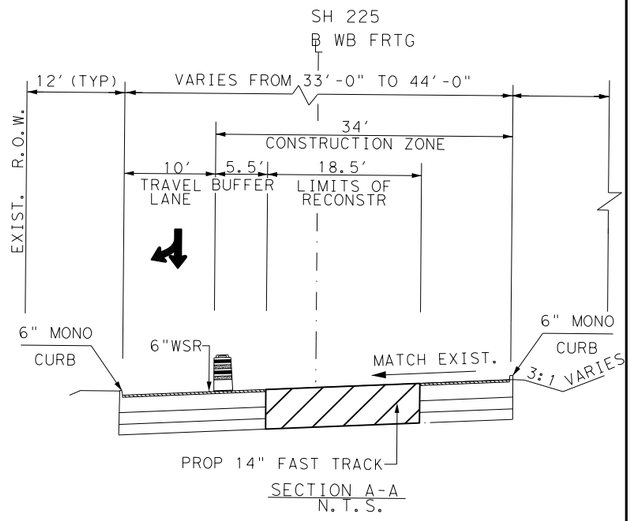
TRAFFIC CONTROL PLAN
PASADENA BLVD.

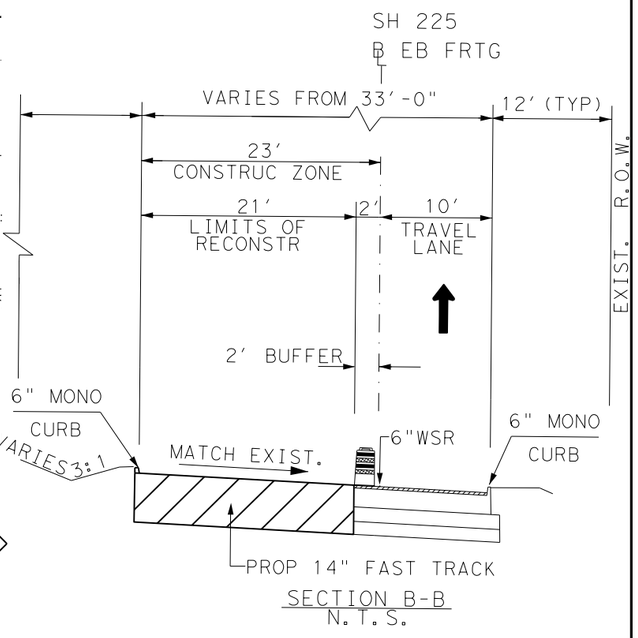
PHASE 2

SHEET 3 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			39
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225







NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 2 PLAN FOR SOUTHBOUND PASADENA BLVD DETOUR
7. PRIOR TO THIS POINT USE LEFT LANE CLOSURE IN ACCORDANCE WITH TCP (2-4)-18.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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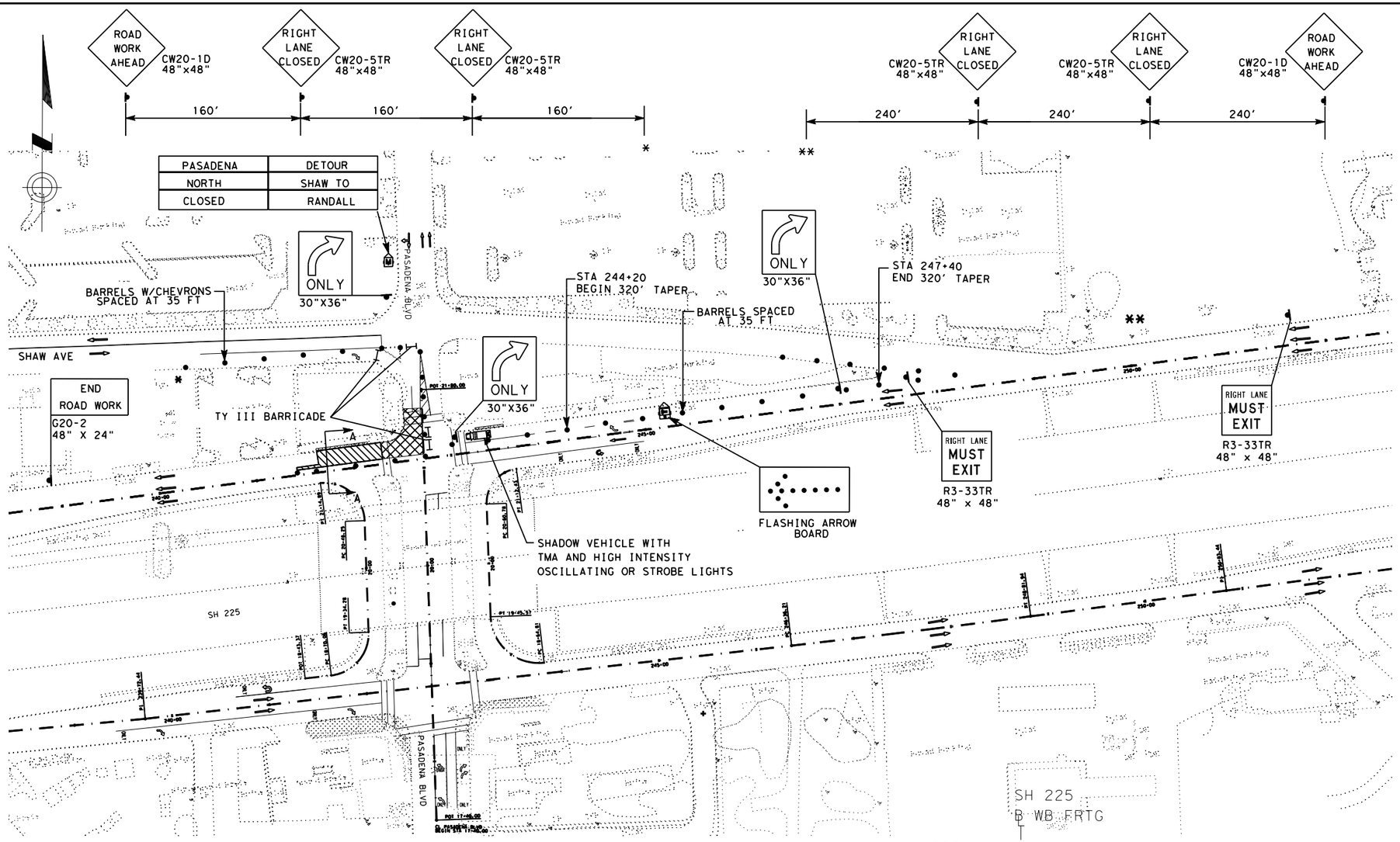
TRAFFIC CONTROL PLAN
PASADENA BLVD.
PHASE 2

SHEET 4 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			39A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

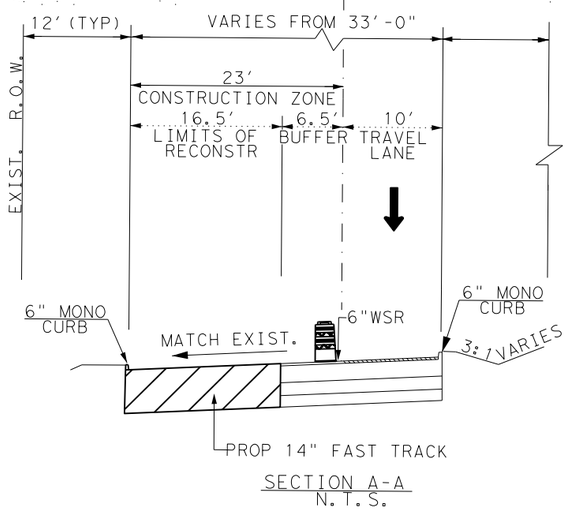


NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 3 PLAN SHEET FOR SOUTHBOUND PASADENA DETOUR.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW



SECTION A-A
N.T.S.

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TRAFFIC CONTROL PLAN PASADENA BLVD.

PHASE 3

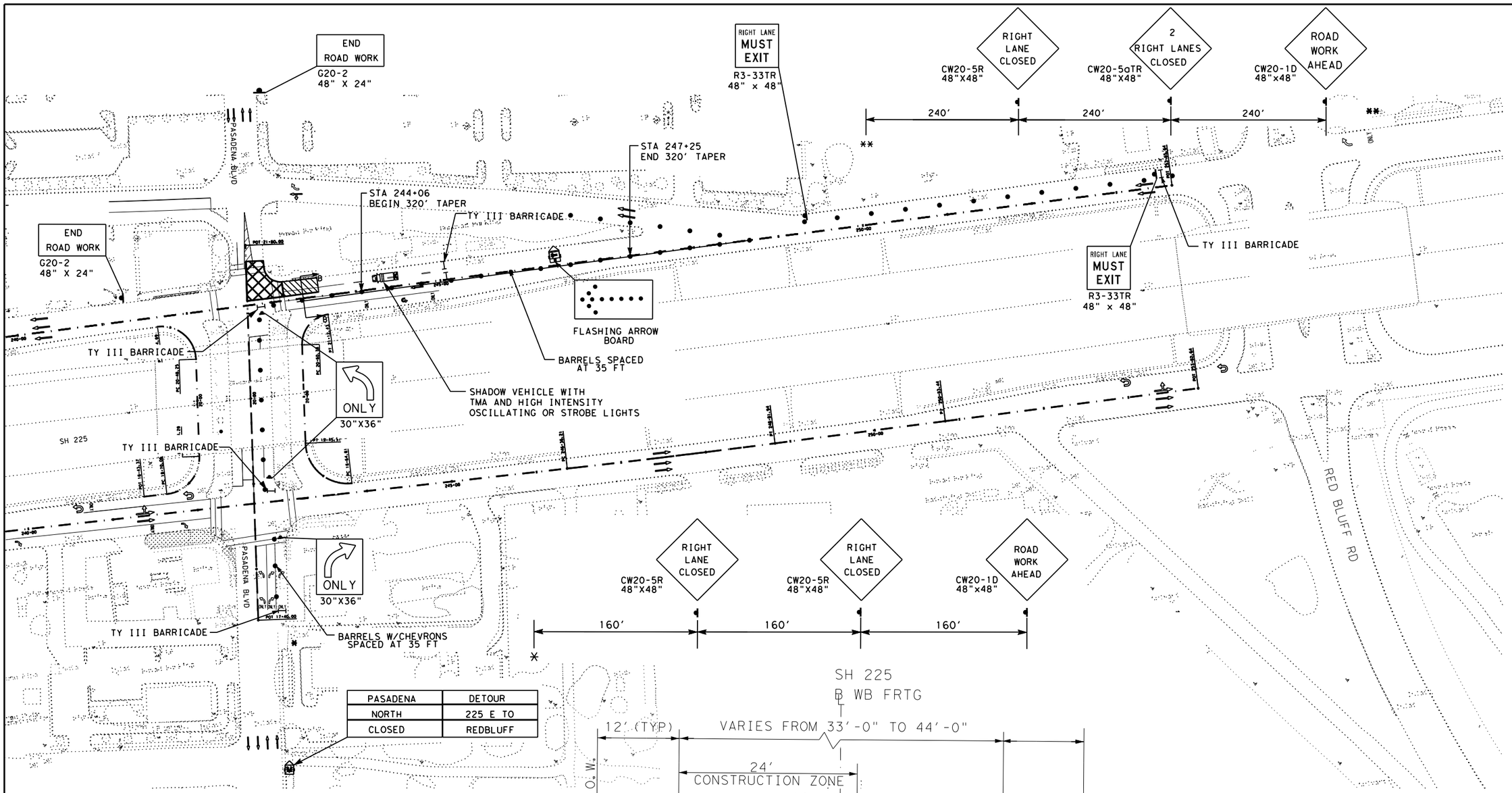
SHEET 5 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			40
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502001222

FILE: tcp01.DGN



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.
6. SEE DETOUR 4 PLAN SHEET FOR SOUTHBOUND PASADENA DETOUR.

LEGEND

- WORK ZONE
- • TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 31 41 51 61
11 18 19 20 21 22 23 24 25 26 27 28 29 30 32
33 34 35 36 37 38 39 40 42 43 44 45 46 47 48
59 60 61 62 63 64 65 66 67 68 69 70 76 263

ACC: PROJECT/CSJ0502012222
FILE: tcp01.DGN

SCALE: 1"=120' HORZ.

Texas Department of Transportation

TRAFFIC CONTROL PLAN
PASADENA BLVD.
PHASE 4

SHEET 6 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			41
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

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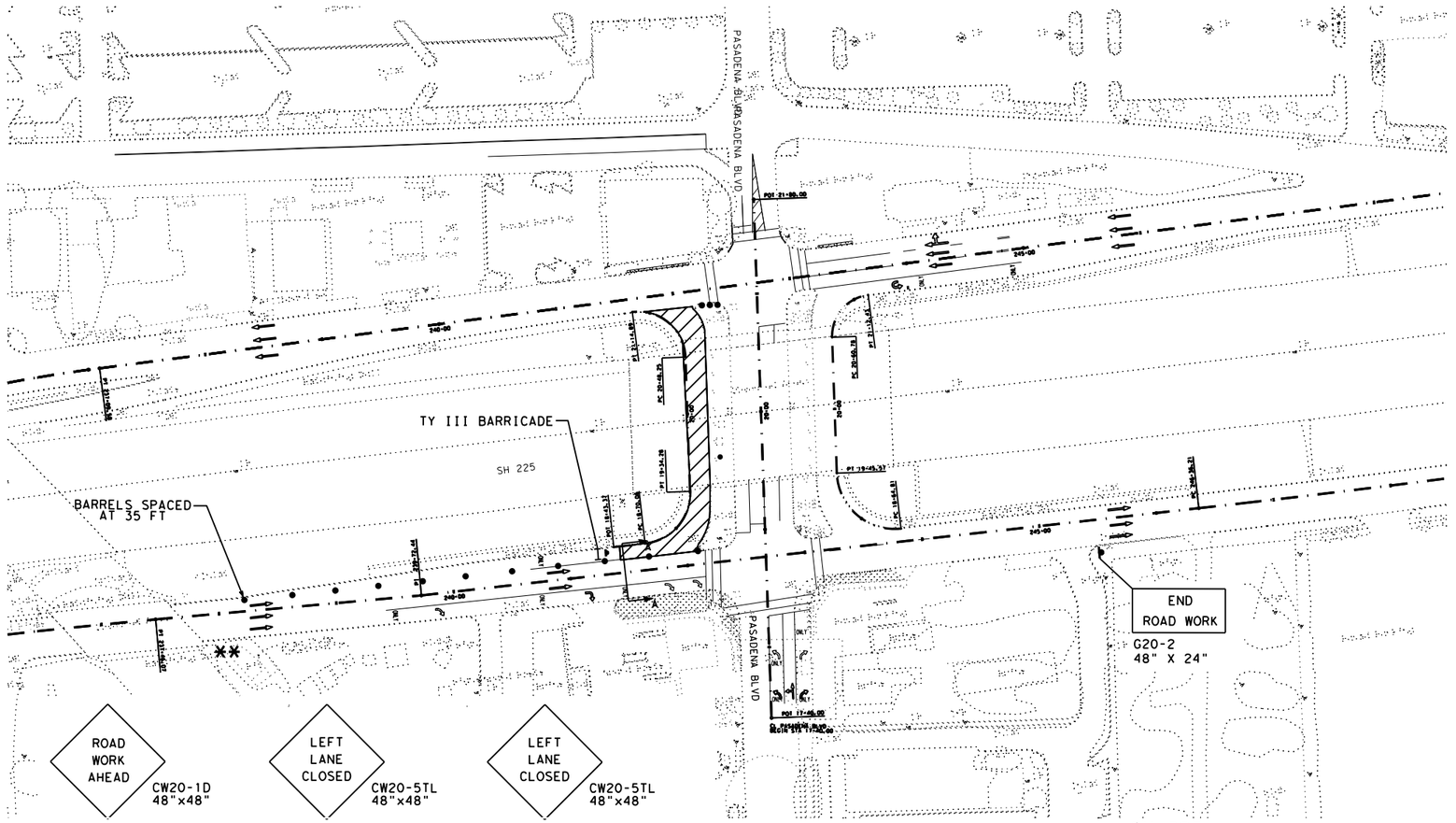
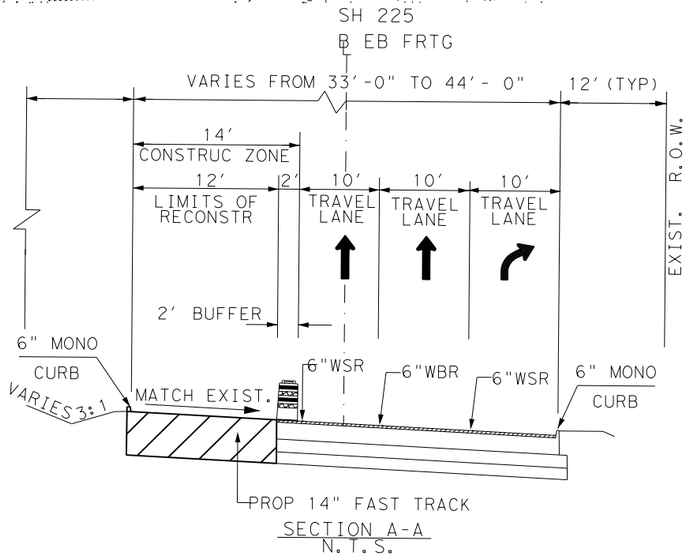


NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW



LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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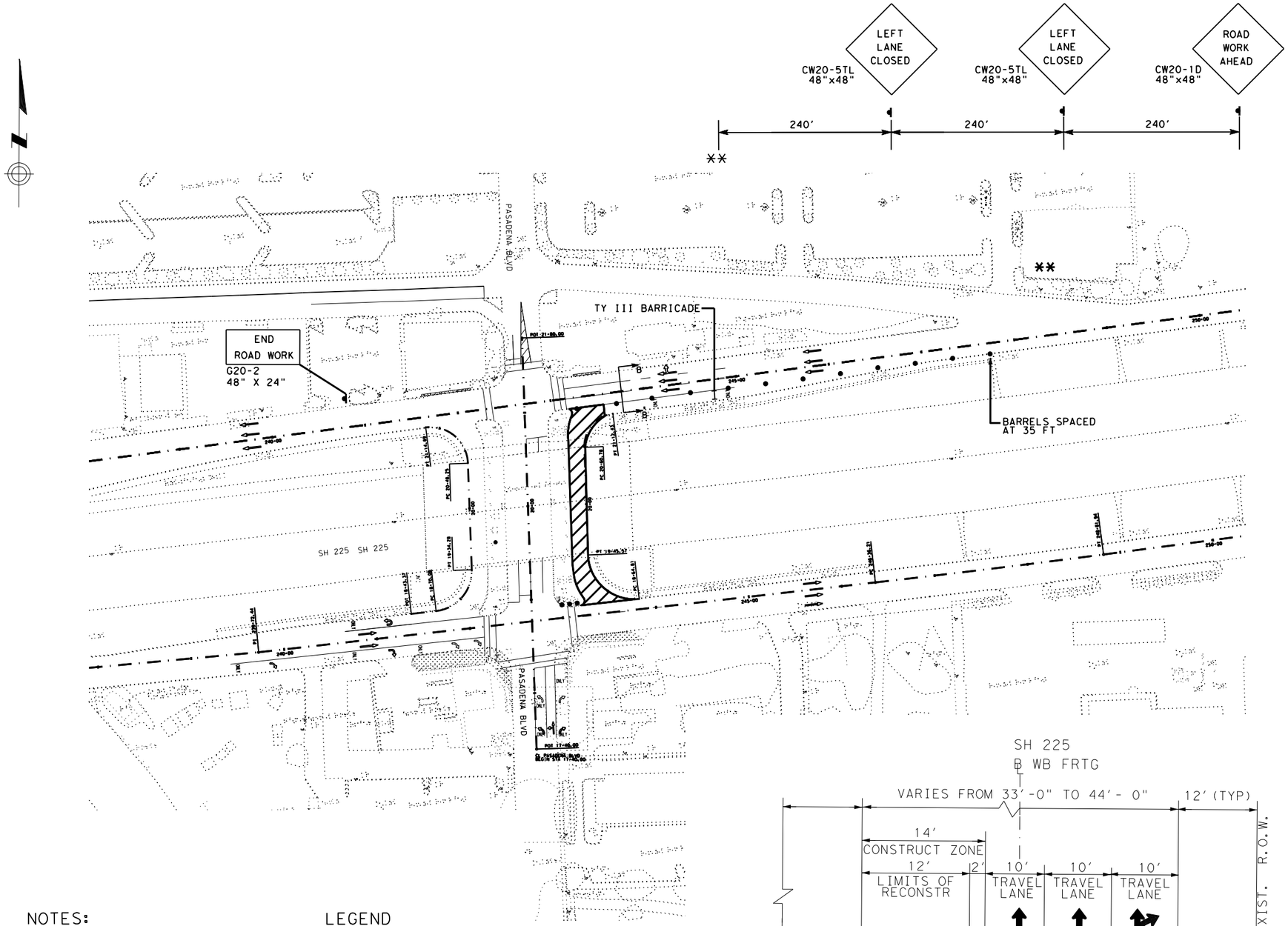
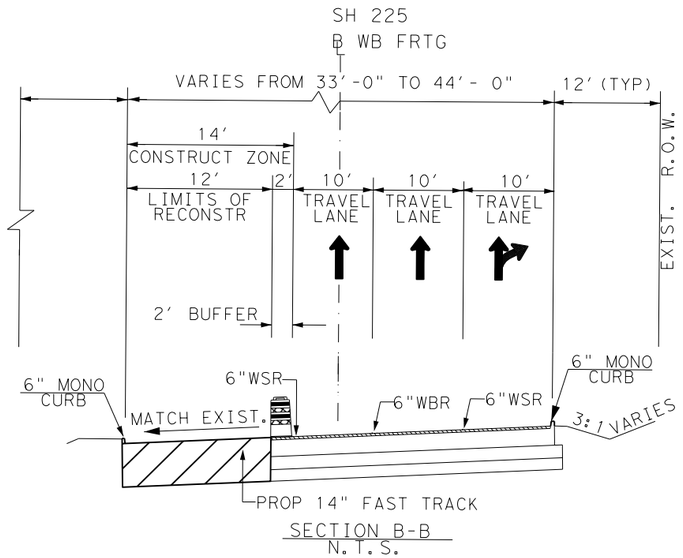
TRAFFIC CONTROL PLAN
PASADENA BLVD.
PHASE 5

SHEET 7 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			42
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





SECTION B-B
N.T.S.

NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.

LEGEND

- WORK ZONE
- • TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

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SCALE: 1"=120' HORZ.

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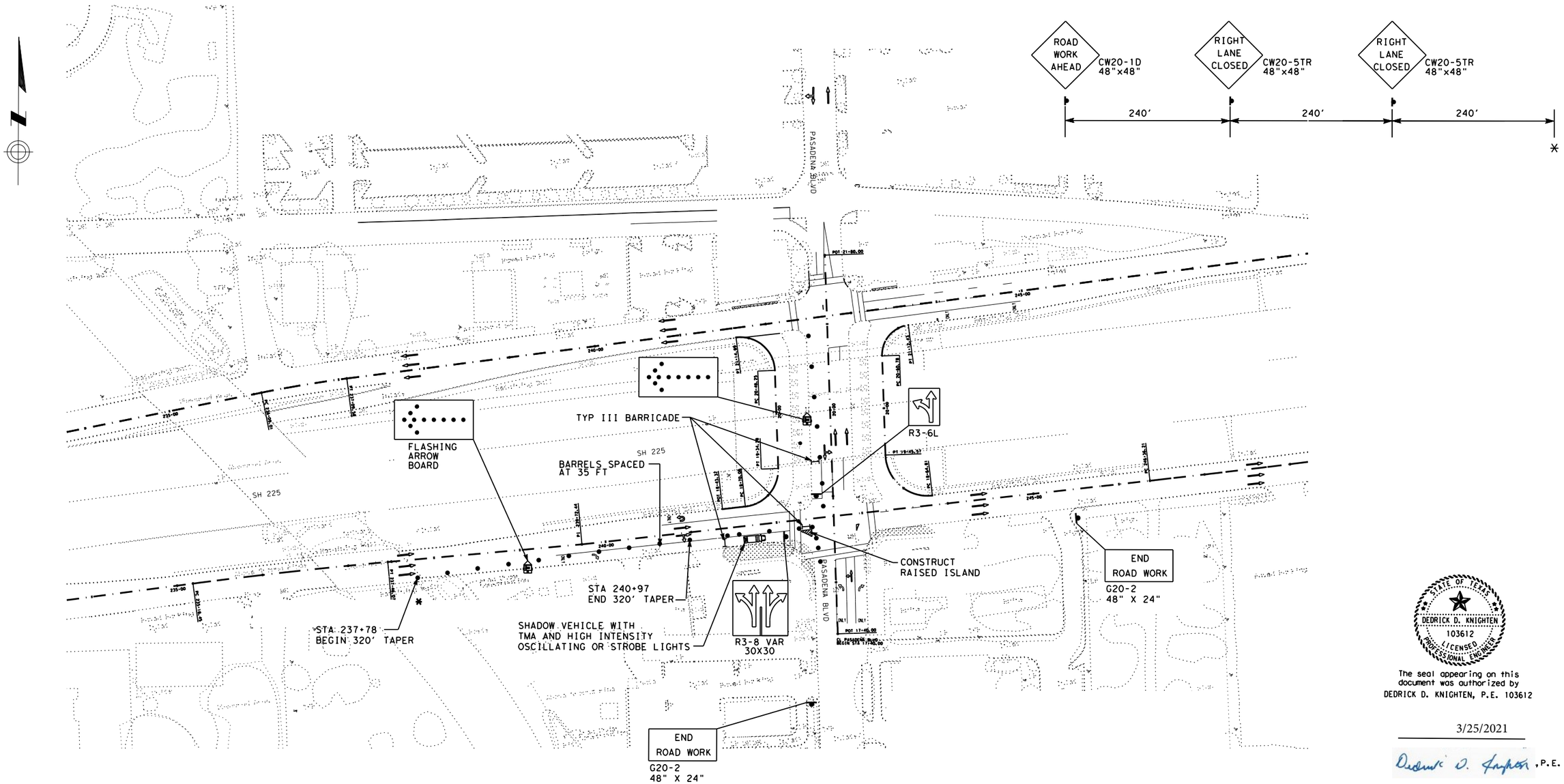
TRAFFIC CONTROL PLAN
PASADENA BLVD.
PHASE 6

SHEET 8 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			43
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.

LEGEND

- WORK ZONE
- TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SCALE: 1"=120' HORZ.

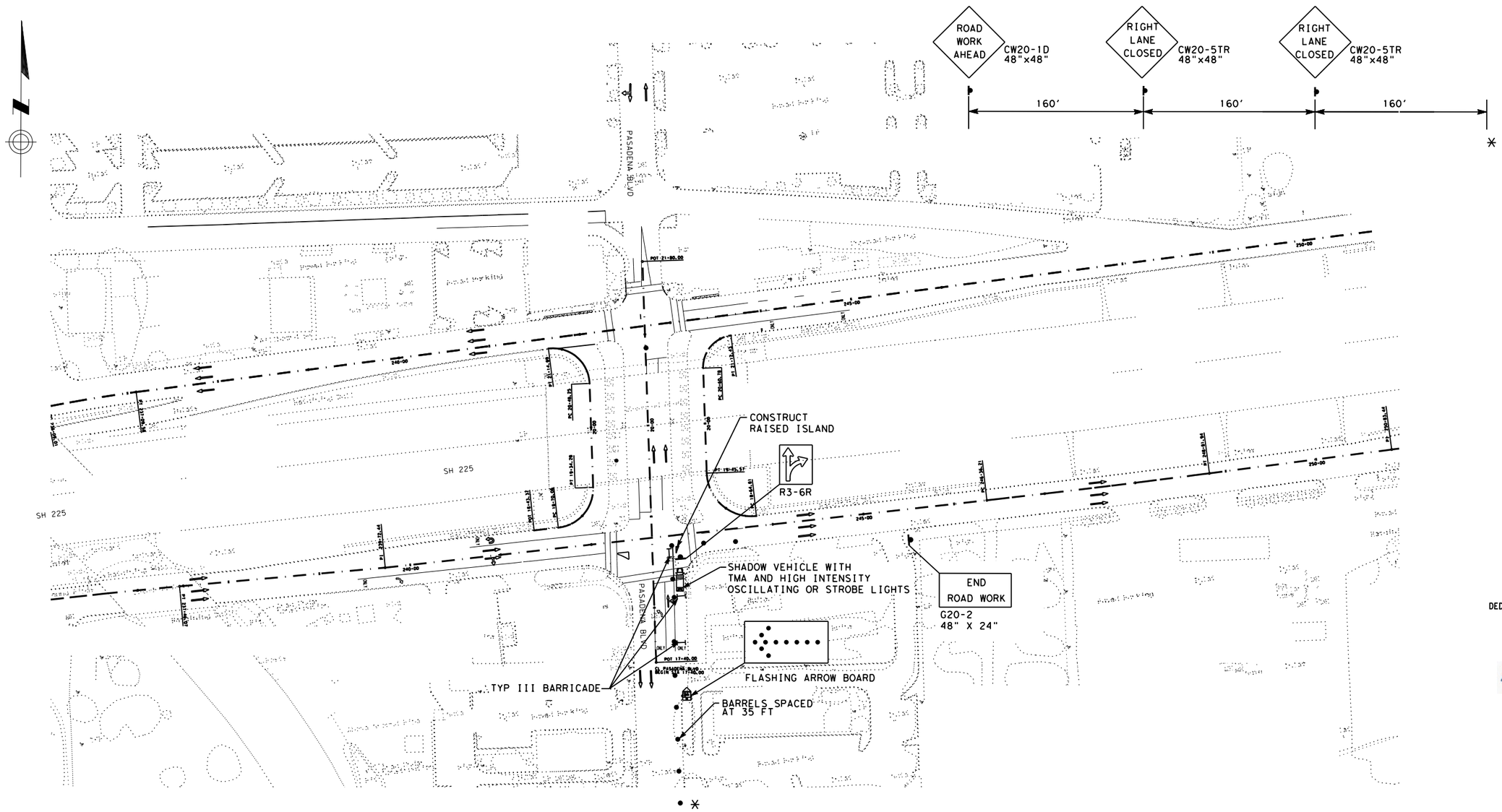
Texas Department of Transportation

TRAFFIC CONTROL PLAN PASADENA BLVD.

PHASE 7

SHEET 9 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			43A
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES:

1. ATTACH CHEVRONS (CW1-8) TO DRUMS ALONG THE TAPERS.
2. THE POSTED SPEED LIMIT IS 40 MPH.
3. SEE BC SHEETS FOR ADDITIONAL SIGNING FOR THE PROJECT LIMITS.
4. EXIST SIGNS TO BE COVERED BY THE CONTRACTOR PER TCP.
5. SEE TCP STANDARD TCP (2-4)-18 FOR MORE INFORMATION.

LEGEND

- WORK ZONE
- • TRAFFIC DRUM 35' C-C
- TYPE III BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- TRAILER MOUNTED FLASHING ARROW BOARD
- DIRECTIONAL ARROW

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SCALE: 1"=120' HORZ.

TRAFFIC CONTROL PLAN
PASADENA BLVD.

PHASE 8

SHEET 10 OF 10

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			43B
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0502012222

FILE: tcp01.DGN

DATE:
FILE:

BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

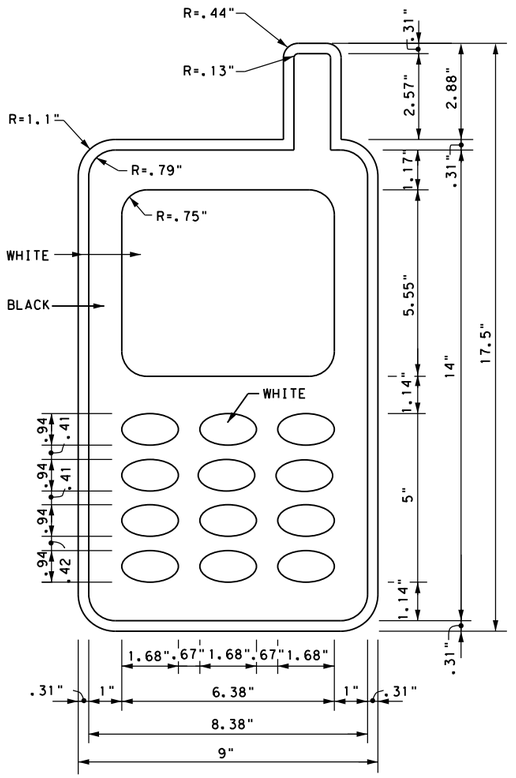
11. Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.

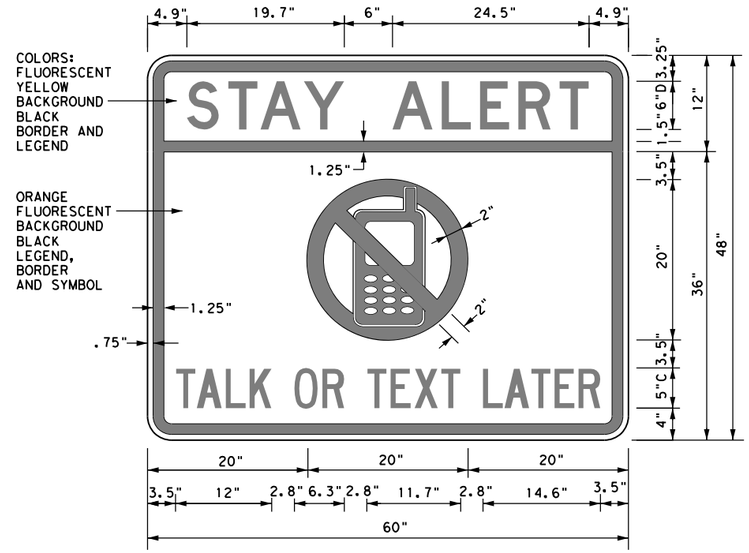
12. The Engineer has the final decision on the location of all traffic control devices.

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

WORKER SAFETY APPAREL NOTES:

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





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

SIGN DETAIL (G20-10T)

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

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

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

Texas Department of Transportation | Traffic Operations Division Standard

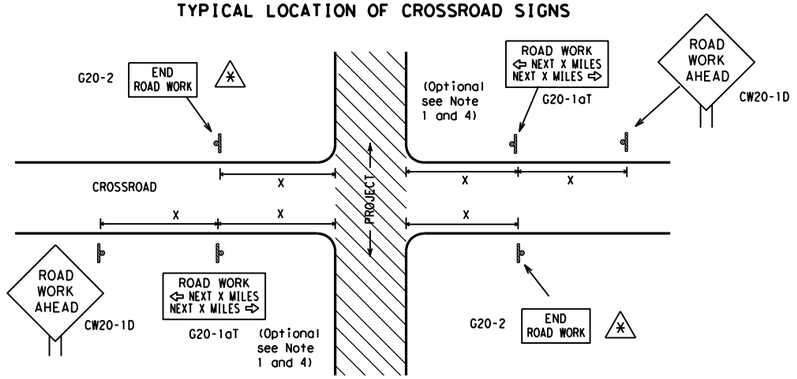
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
4-03 5-10 8-14	DIST	COUNTY		SHEET NO.
9-07 7-13	12	HARRIS		44

DATE:
FILE:

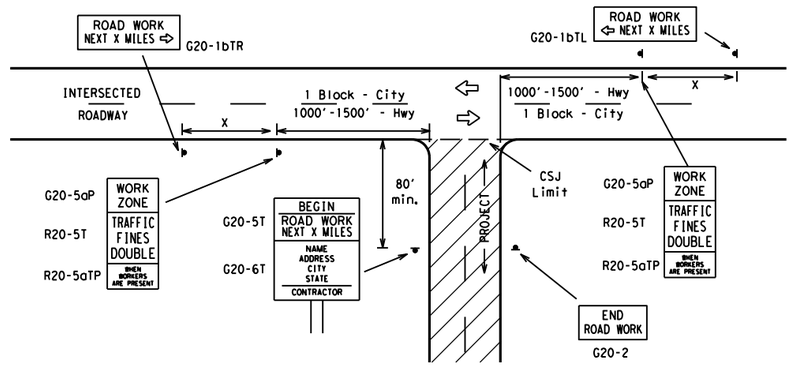
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING[1,5,6]

SIZE

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

SPACING

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

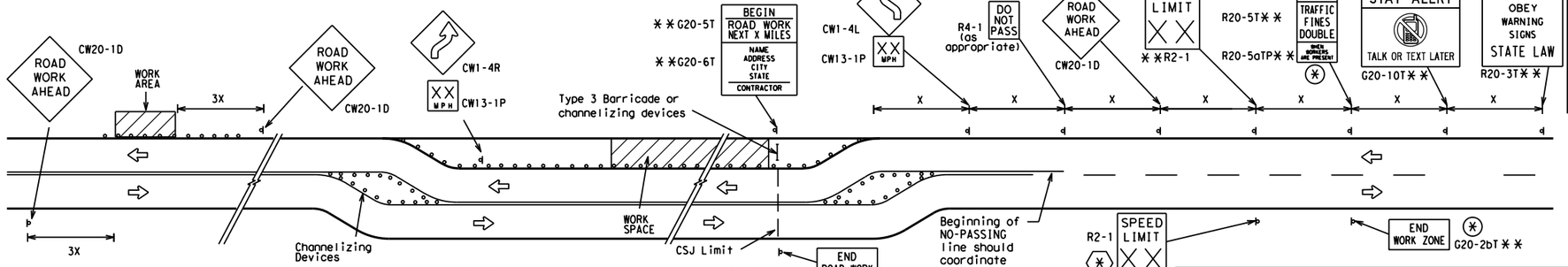
(*) For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

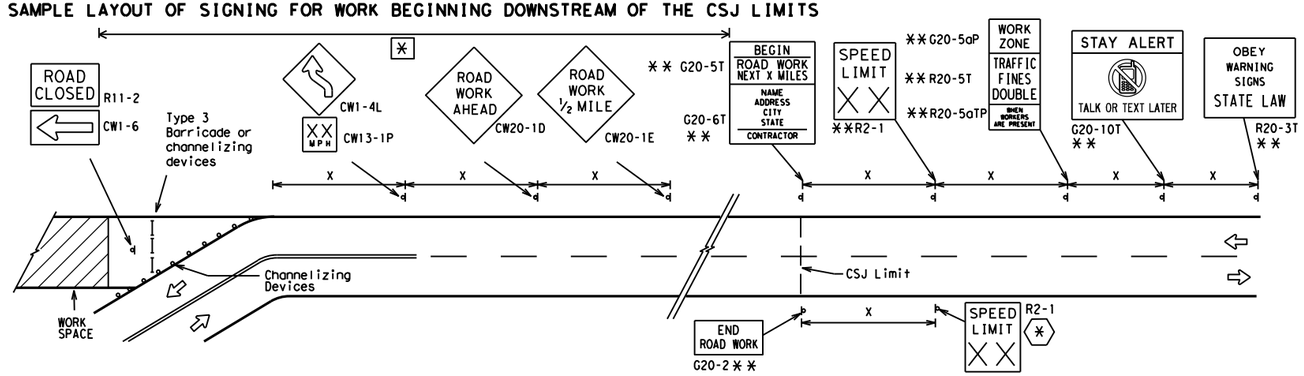
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

(*) Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	12	HARRIS		45

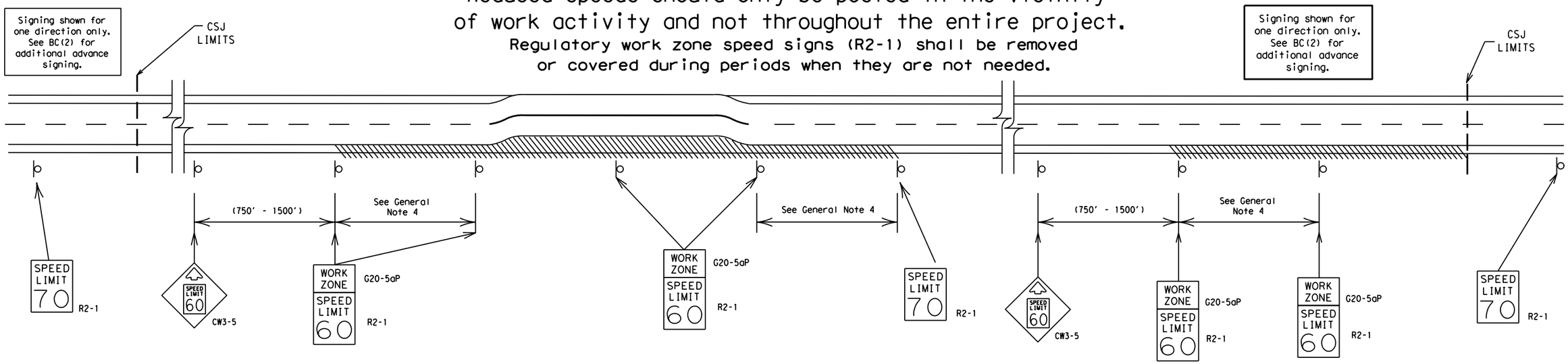
DATE:
FILE:

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:

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

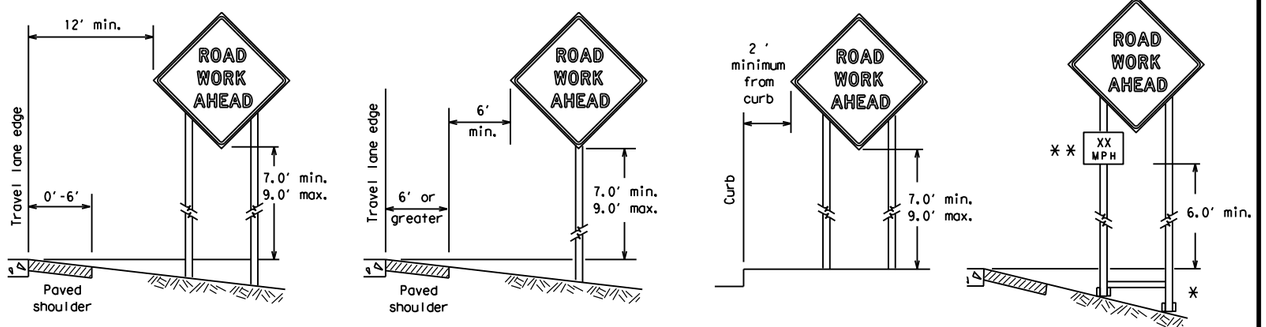
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 9-07 8-14 7-13	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	12	HARRIS		46

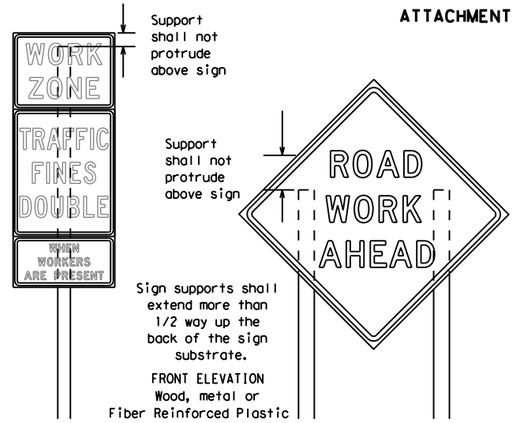
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

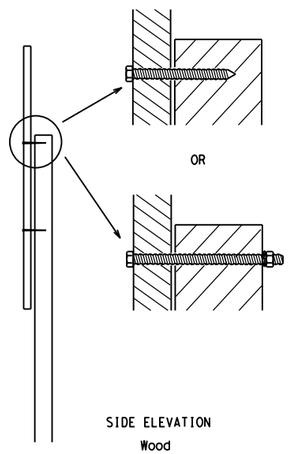


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





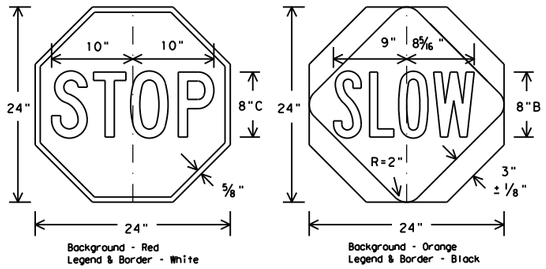
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0502	01	222	SH 225
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	12	HARRIS		47

DATE:
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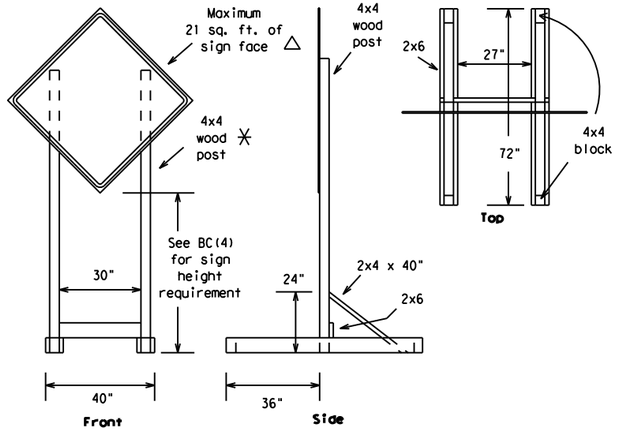
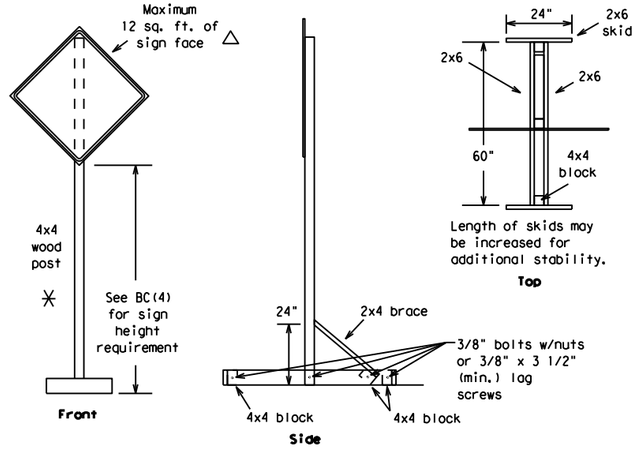
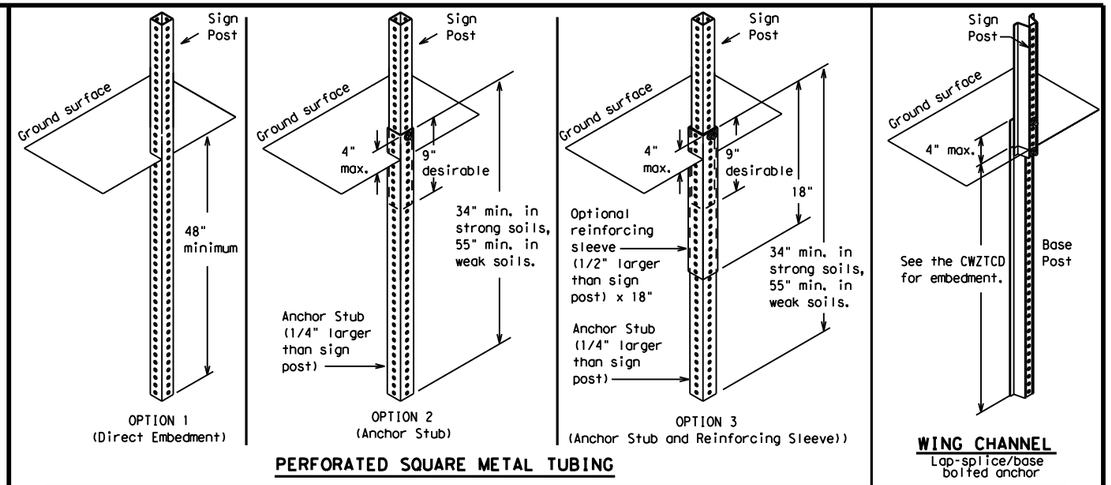




SKID MOUNTED WOOD SIGN SUPPORTS

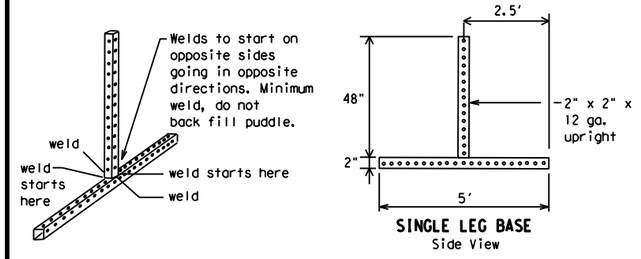
LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS □



PERFORATED SQUARE METAL TUBING

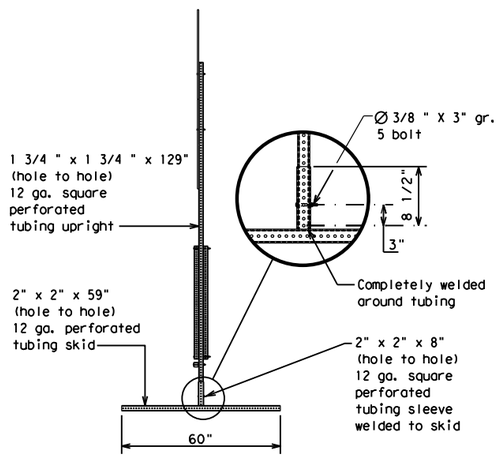
GROUND MOUNTED SIGN SUPPORTS

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.



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

WOOD POST SYSTEM FOR GROUND MOUNTED SIGN SUPPORTS



WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

□ See BC(4) for definition of "Work Duration."

✳ Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.

△ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

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SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

- ROADWORK XXX FT
- ROAD REPAIRS XXXX FT
- FLAGGER XXXX FT
- LANE NARROWS XXXX FT
- RIGHT LN NARROWS XXXX FT
- TWO-WAY TRAFFIC XX MILE
- MERGING TRAFFIC XXXX FT
- CONST TRAFFIC XXX FT
- LOOSE GRAVEL XXXX FT
- UNEVEN LANES XXXX FT
- DETOUR X MILE
- ROUGH ROAD XXXX FT
- ROADWORK PAST SH XXXX
- ROADWORK NEXT FRI-SUN
- BUMP XXXX FT
- US XXX EXIT X MILES
- TRAFFIC SIGNAL XXXX FT
- LANES SHIFT *

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

- MERGE RIGHT
- FORM X LINES RIGHT
- DETOUR NEXT X EXITS
- USE XXXXX RD EXIT
- USE EXIT XXX
- USE EXIT I-XX NORTH
- STAY ON US XXX SOUTH
- USE I-XX E TO I-XX N
- TRUCKS USE US XXX N
- WATCH FOR TRUCKS
- WATCH FOR TRUCKS
- EXPECT DELAYS
- EXPECT DELAYS
- PREPARE TO STOP
- REDUCE SPEED XXX FT
- END SHOULDER USE
- USE OTHER ROUTES
- WATCH FOR WORKERS
- STAY IN LANE *

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0502	01	222	SH 225
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DATE:
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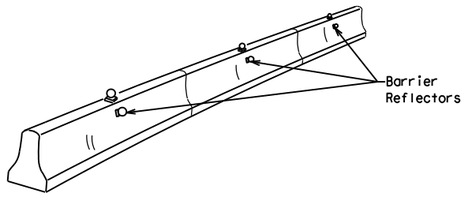
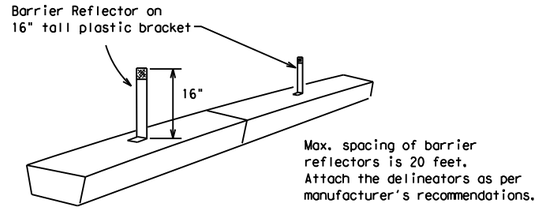
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

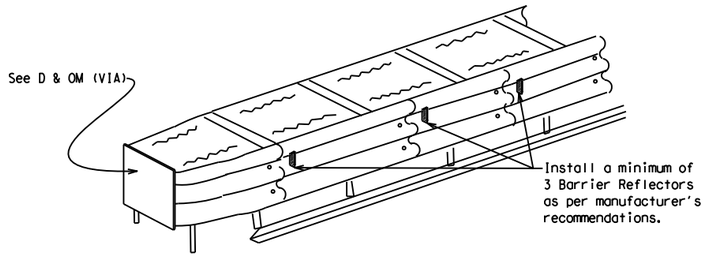


CONCRETE TRAFFIC BARRIER (CTB)

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



LOW PROFILE CONCRETE BARRIER (LPCB)

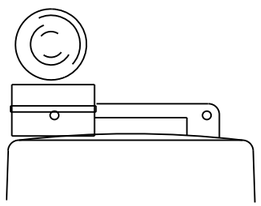


DELINEATION OF END TREATMENTS

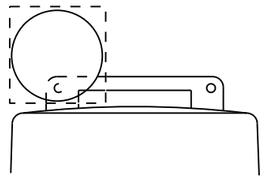
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

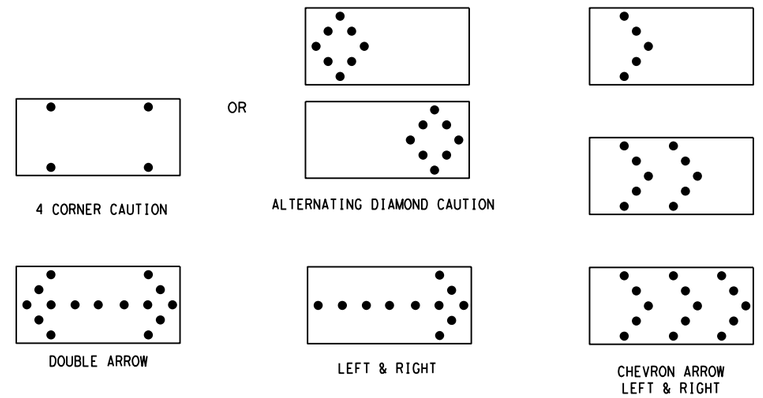
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Operations Division Standard

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

BC(7)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0502	01	222	SH 225
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	12	HARRIS		50

101

DATE:
FILE:

GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

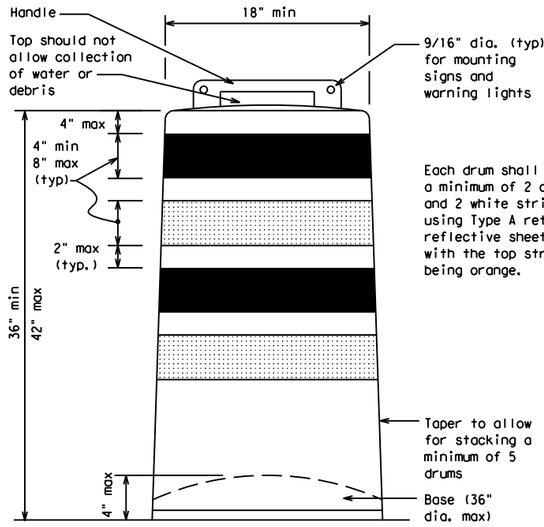
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

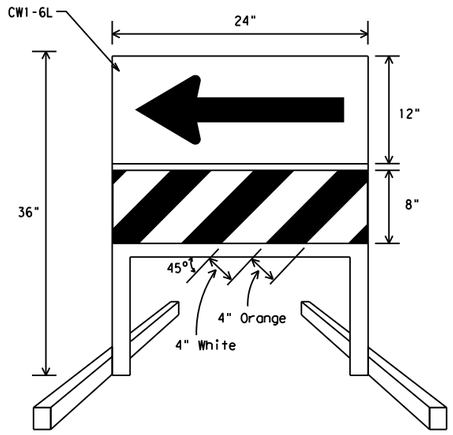
RETROREFLECTIVE SHEETING

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

BALLAST

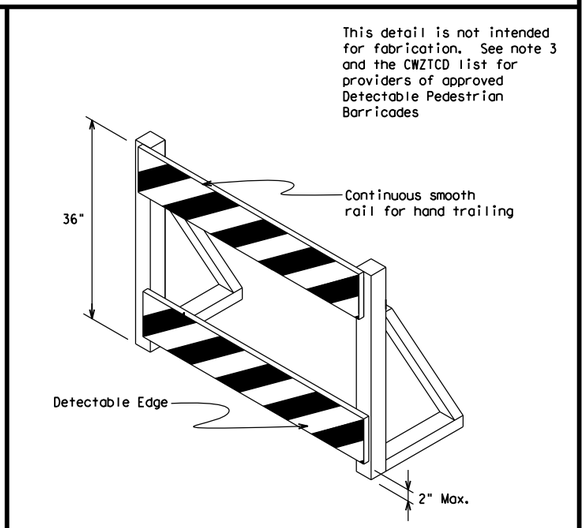
1. Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other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





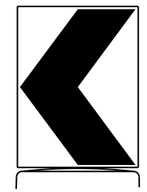
DIRECTION INDICATOR BARRICADE

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

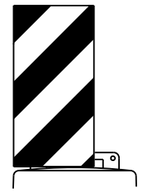


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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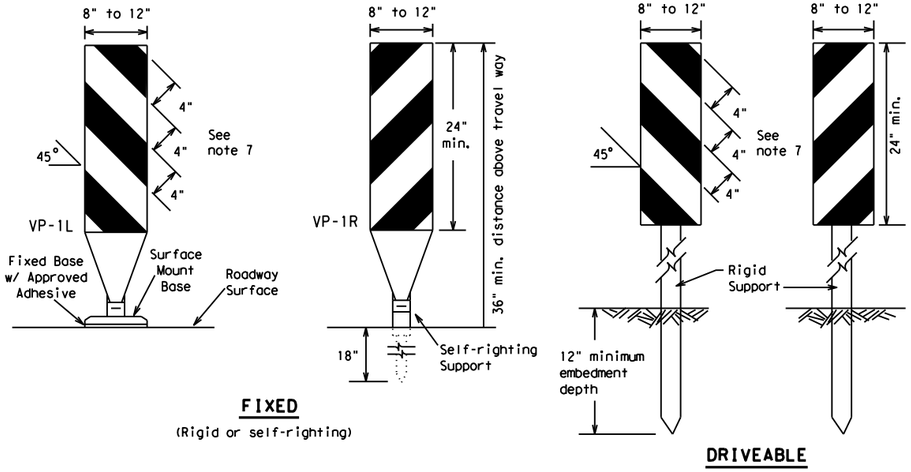
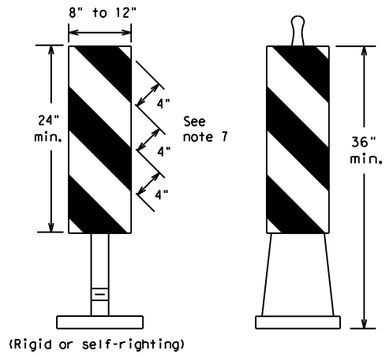
REVISIONS	0502	01	222	SH 225
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	12	HARRIS		51



FIXED
(Rigid or self-righting)

DRIVEABLE

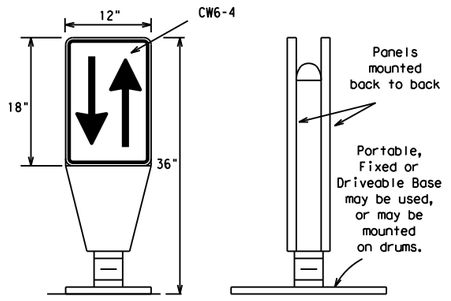


(Rigid or self-righting)

PORTABLE

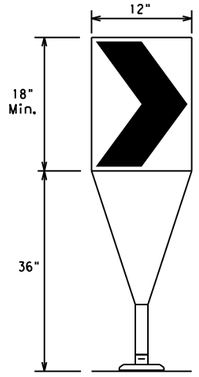
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



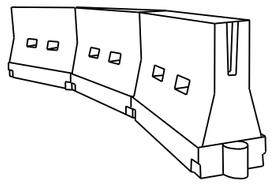
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

Texas Department of Transportation | Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0502	01	222	SH 225
9-07 8-14	DIST	COUNTY		SHEET NO.
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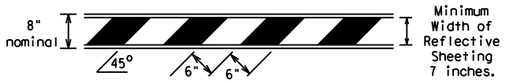
FILE:

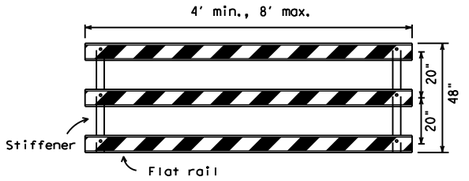
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



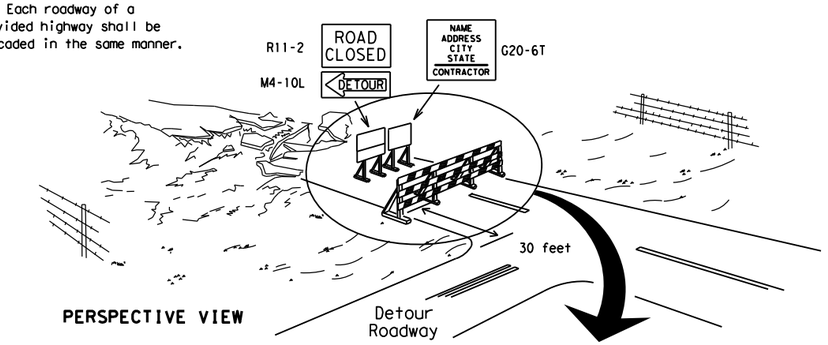
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

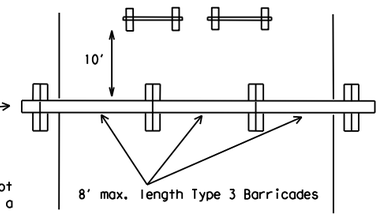
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

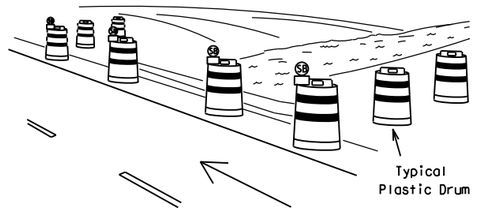
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

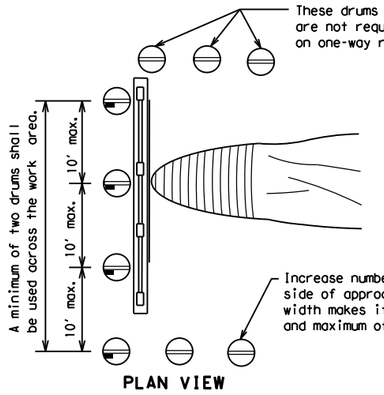
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

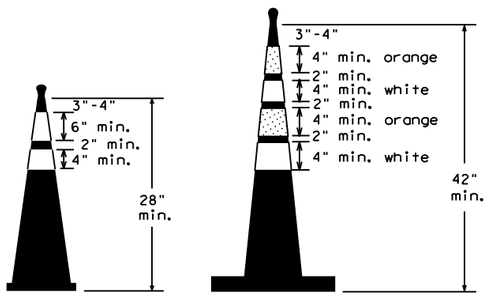
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

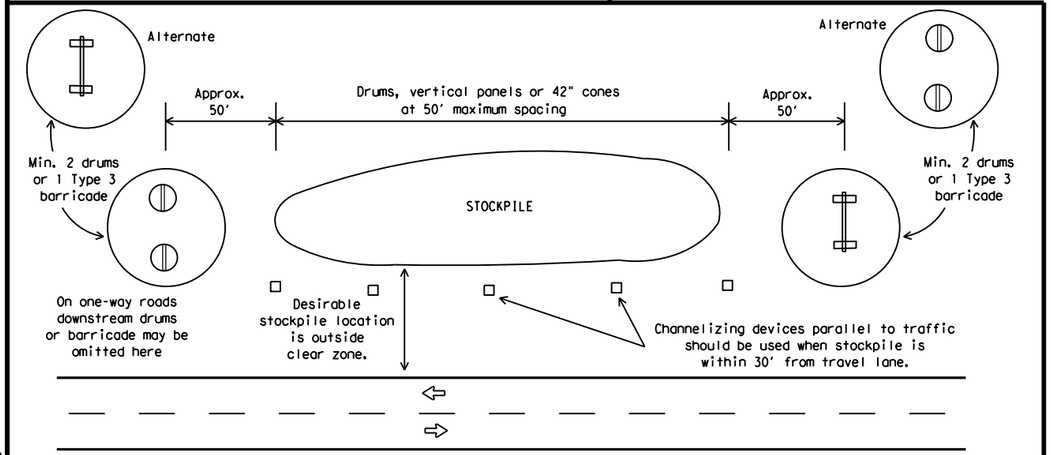
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

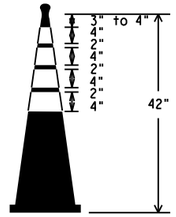
42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

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



EDGELINE CHANNELIZER

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

Texas Department of Transportation — Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13	12	HARRIS		53

DATE:
FILE:

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

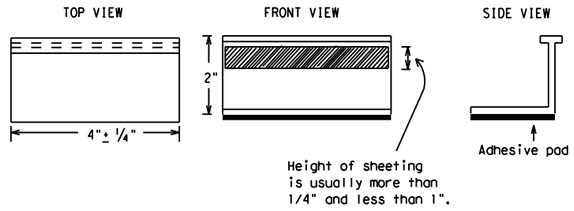
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-14

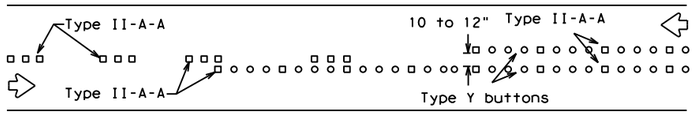
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
2-98 9-07	DIST	COUNTY		SHEET NO.
1-02 7-13	12	HARRIS		54
11-02 8-14				

105

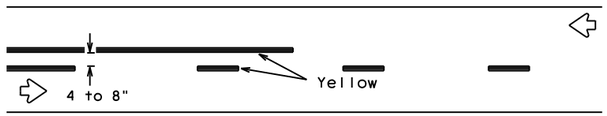
DATE:
FILE:

PAVEMENT MARKING PATTERNS

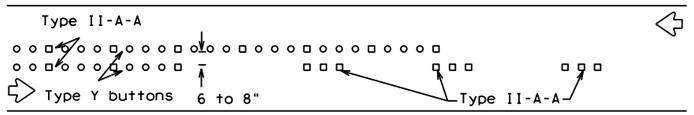
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



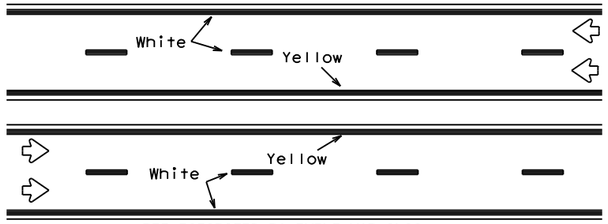
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



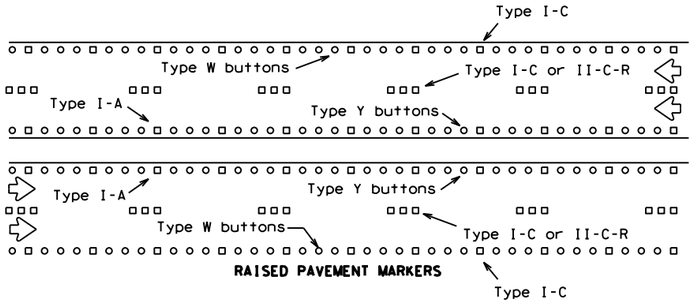
RAISED PAVEMENT MARKERS - PATTERN B

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

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



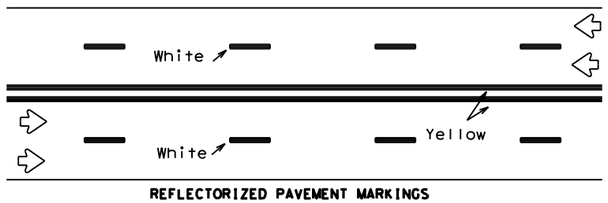
REFLECTORIZED PAVEMENT MARKINGS



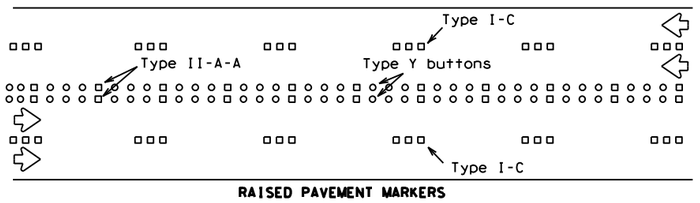
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



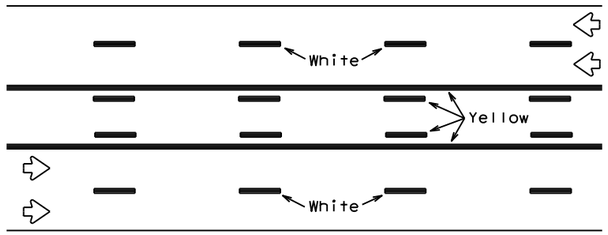
REFLECTORIZED PAVEMENT MARKINGS



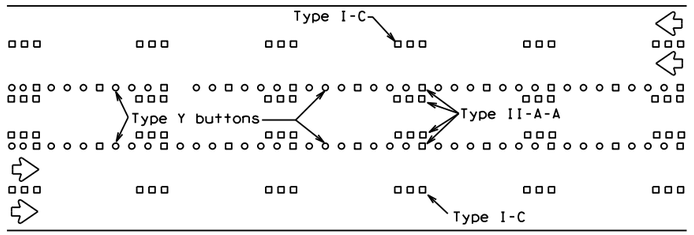
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

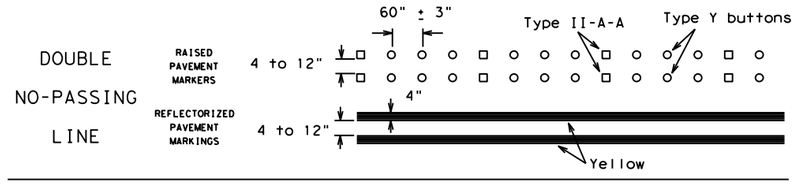
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

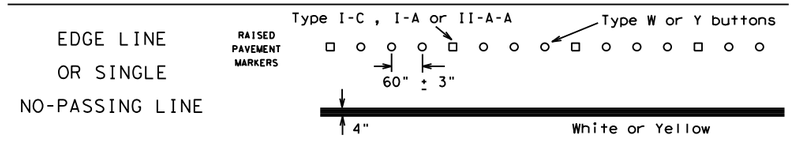
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

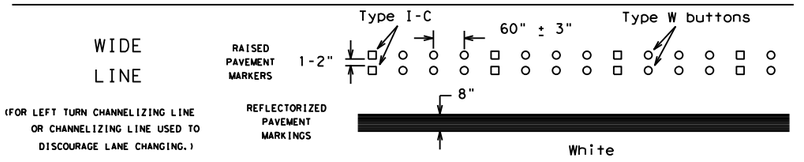


EDGE LINE OR SINGLE NO-PASSING LINE



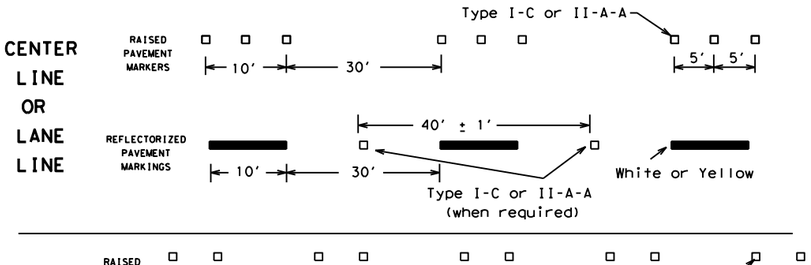
WIDE LINE

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

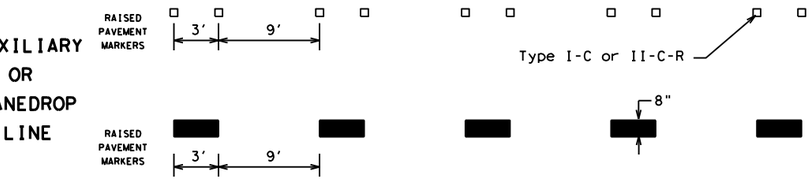


BROKEN LINES

CENTER LINE OR LANE LINE

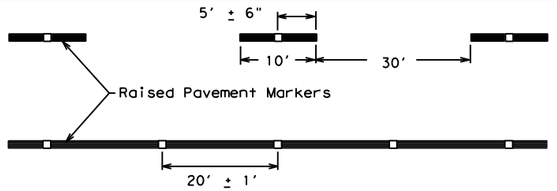


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-14

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11-02 8-14				

DATE:
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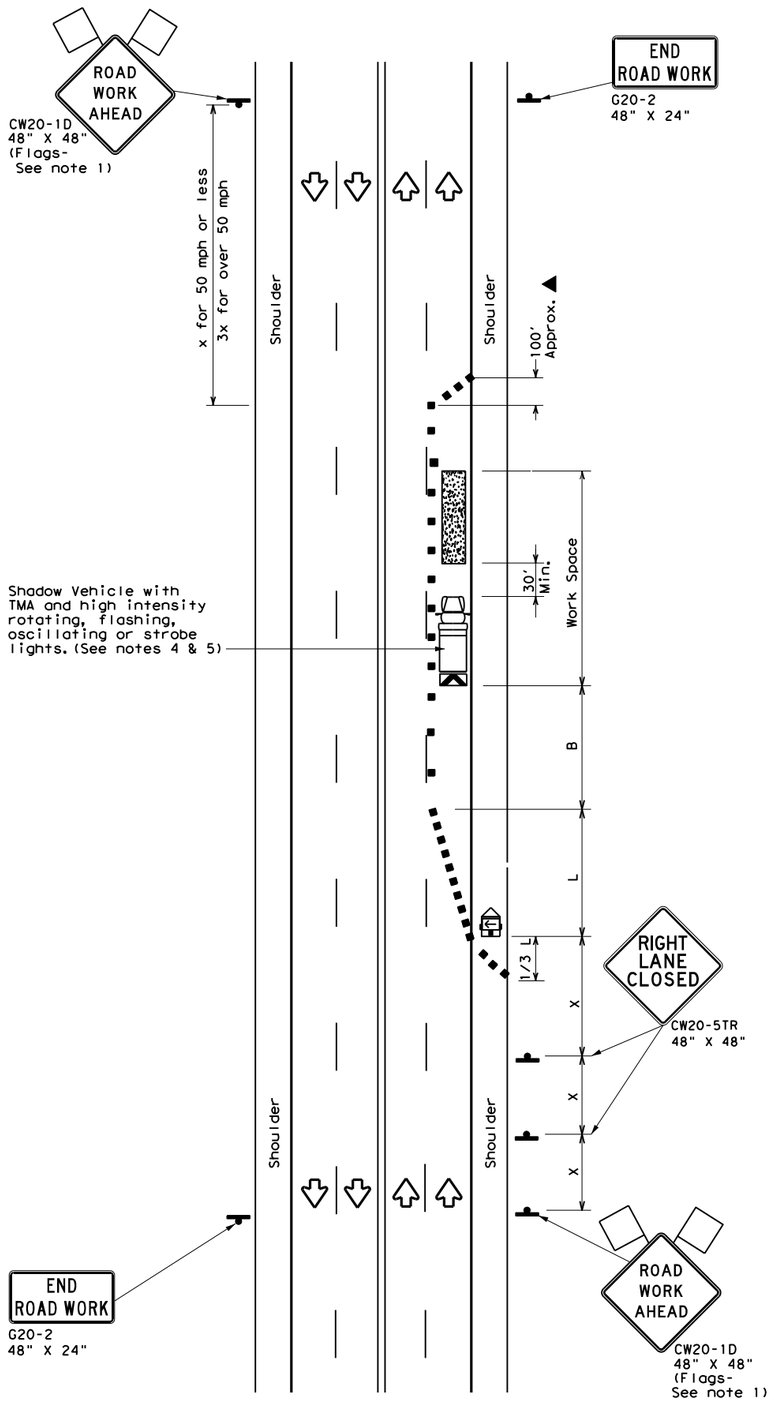
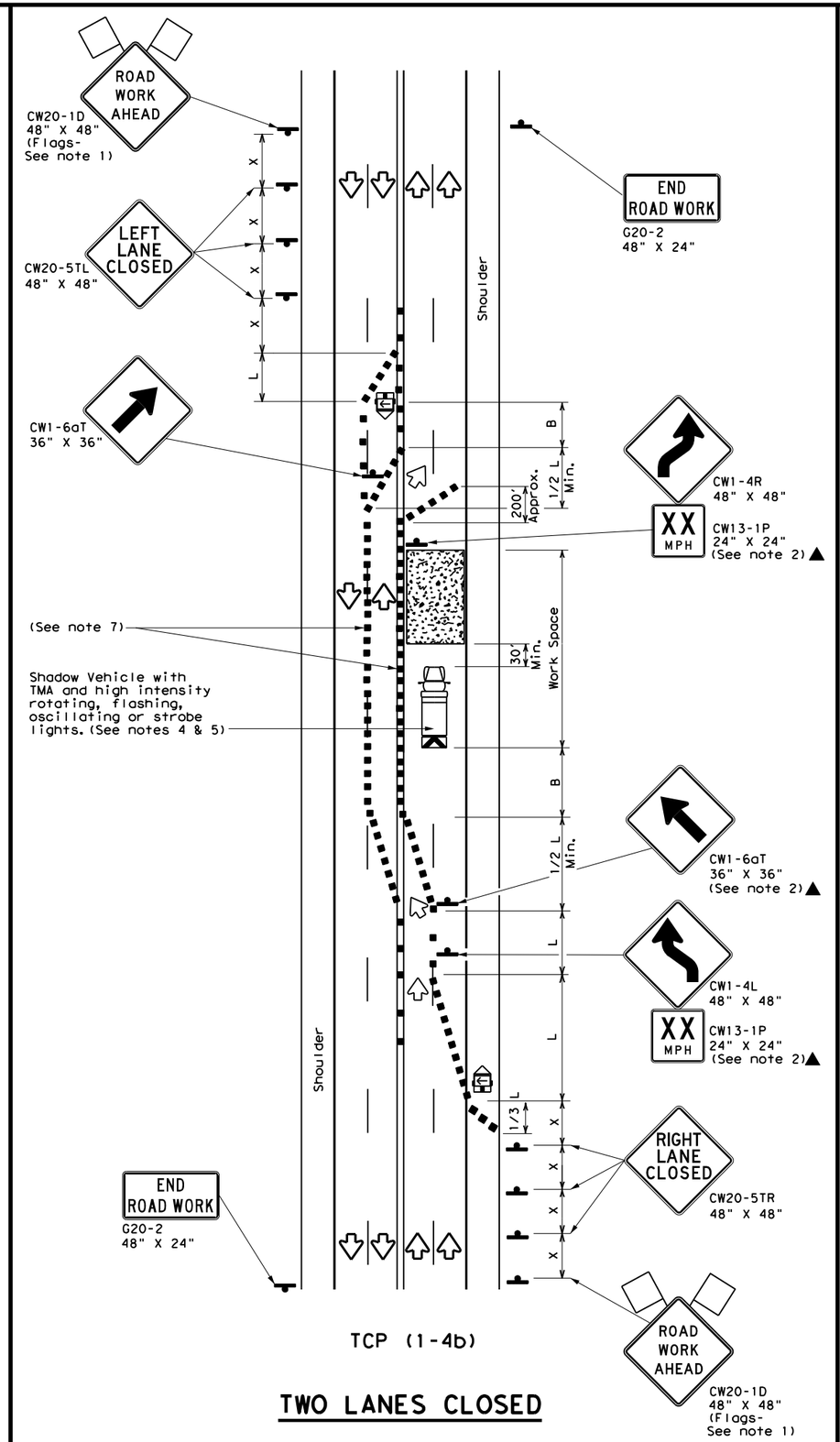


TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The CW20-1D "ROAD WORK AHEAD" sign may be repeated if the visibility of the work zone is less than 1500 feet.
4. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

TCP (1-4a)

6. 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)

7. 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
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	12	HARRIS		56

DATE:
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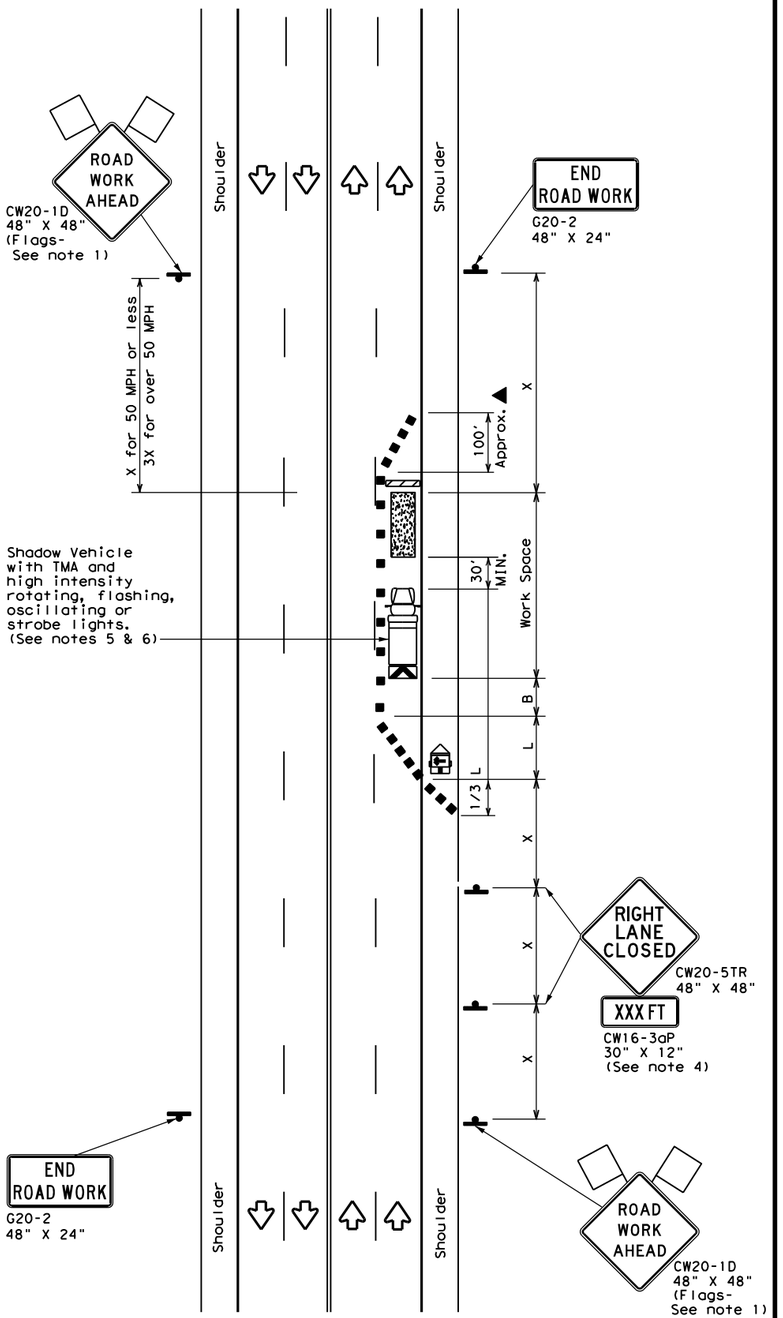
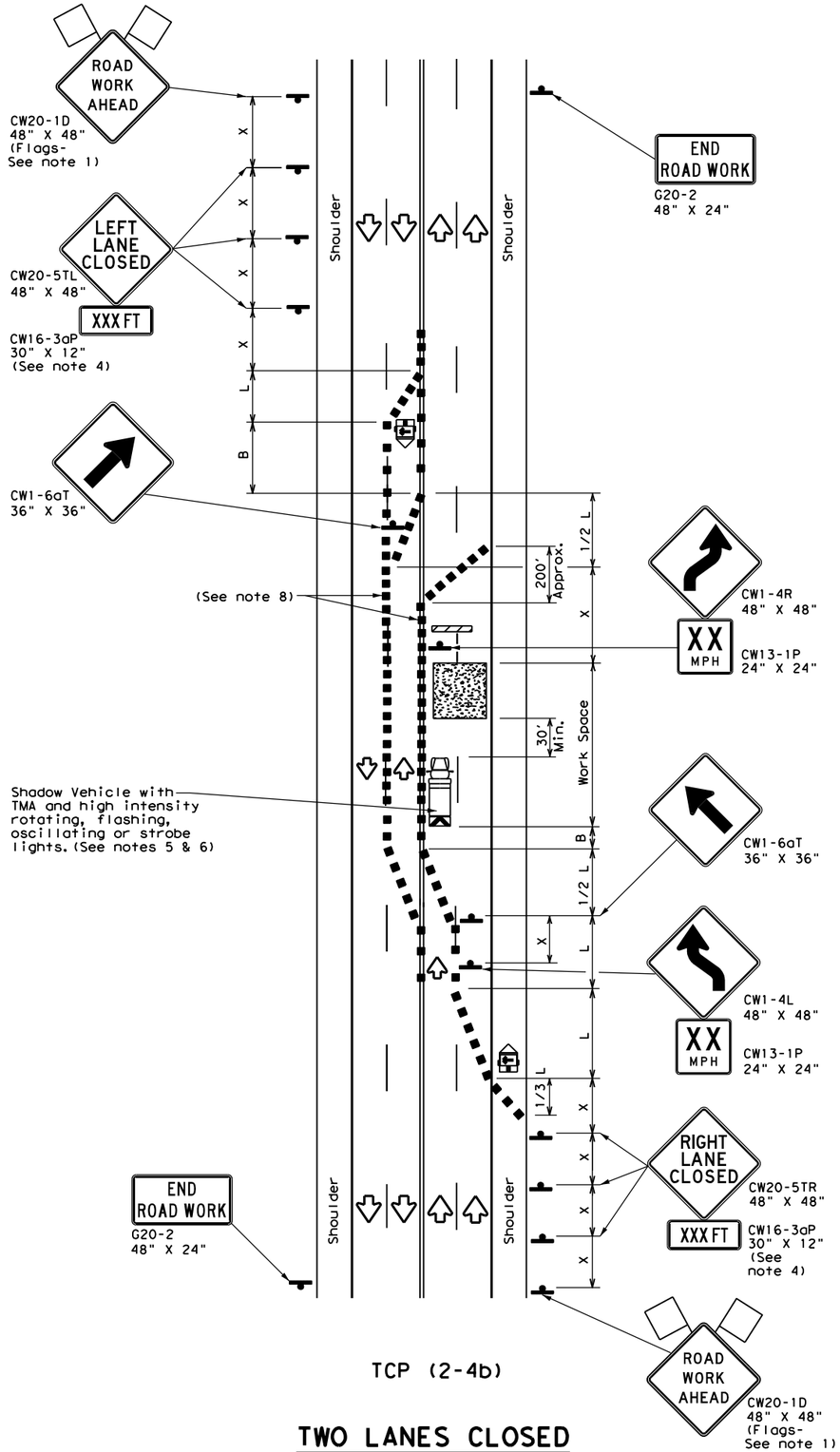


TCP (2-4a)

ONE LANE CLOSED



TCP (2-4b)

TWO LANES CLOSED

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
4. For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3aP supplemental plaque.
5. 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.
6. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

TCP (2-4a)

7. 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 to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.

TCP (2-4b)

8. For shorter durations 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 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Texas Department of Transportation

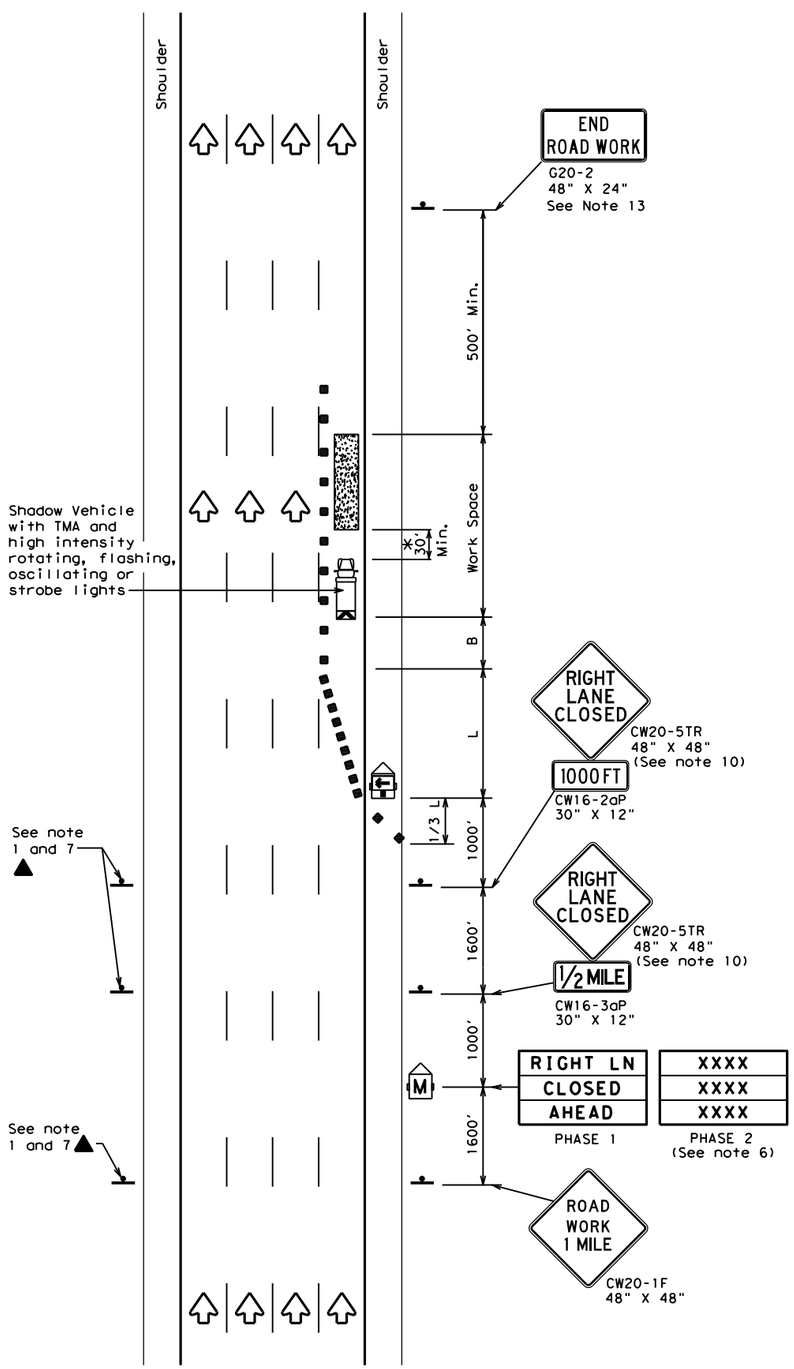
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(2-4)-18

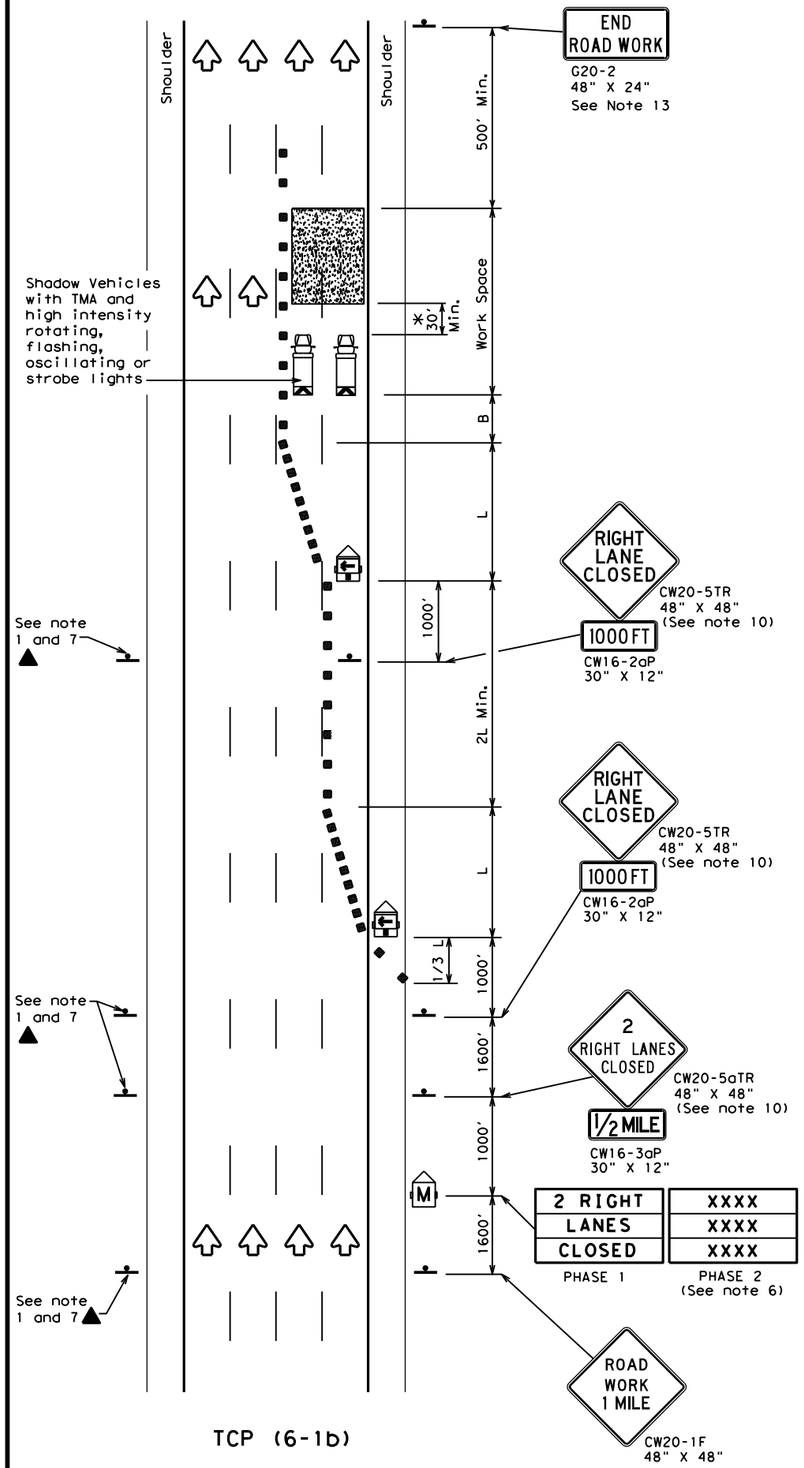
FILE: tcp2-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-95 3-03	0502	01	222	SH 225
1-97 2-12	DIST	COUNTY		SHEET NO.
4-98 2-18	12	HARRIS		57

DATE:
FILE:



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	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

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

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. 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.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. 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.
6. 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.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. 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.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. 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.
11. 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.
12. 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.
13. 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.

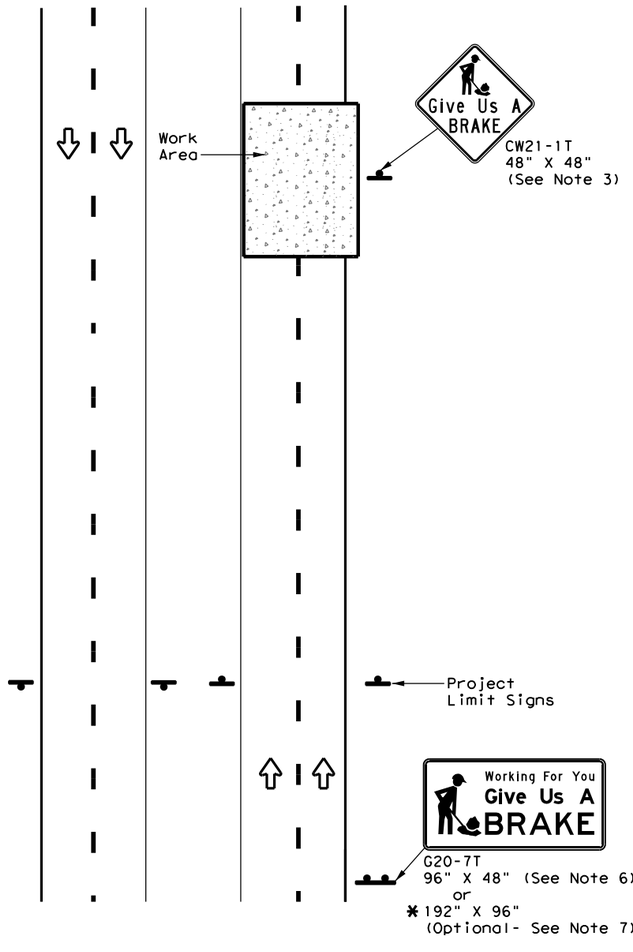
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN FREEWAY LANE CLOSURES

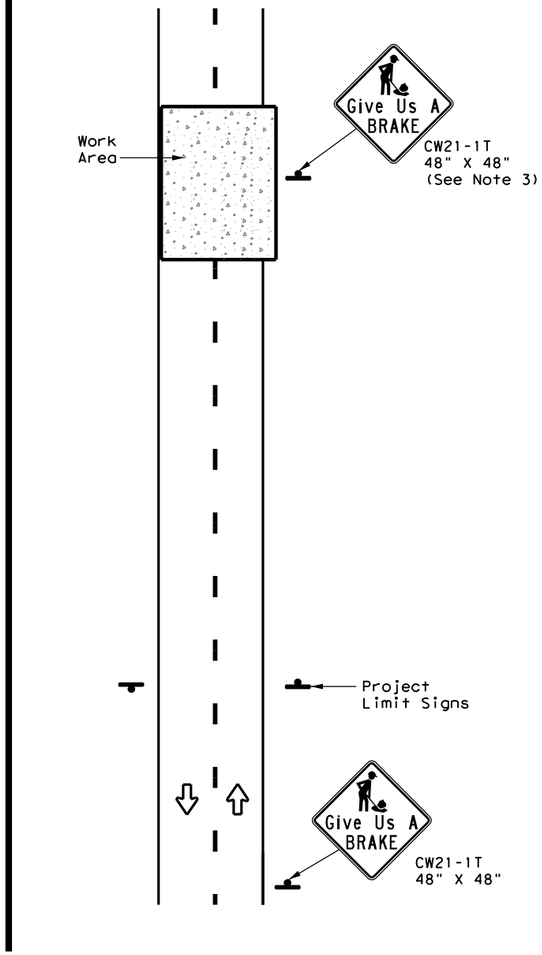
TCP(6-1)-12

FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 8-12	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	12	HARRIS		58

DATE:
FILE:



DIVIDED HIGHWAY



UNDIVIDED HIGHWAY

SIGNS ARE SHOWN FOR ONE DIRECTION OF TRAVEL

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

SUMMARY OF LARGE SIGNS

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

▲ See Note 6 Below

LEGEND	
	Sign
	Large Sign
	Traffic Flow

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

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

GENERAL NOTES

1. See BC and SMD sheets for additional sign support details.
2. Sign locations shall be approved by the Engineer.
3. For projects more than two miles in length, Give Us a BRAKE signs should be repeated halfway through the project. The Give Us a Brake (CW21-1T) may be used for this purpose.
4. Work zone speed limits are sometimes used in conjunction with GIVE US A BRAKE signing. See BC(3) for location and spacing of construction speed zone signing when required.
5. Give Us a Brake (CW21-1T) signs and supports shall be considered subsidiary to Item 502, "Barricades, Signs and Traffic Handling."
6. The 96" X 48" Working For You Give Us A BRAKE (G20-7T) may use a 1/2" or 5/8" plywood substrate or 0.125" aluminum sheeting substrate and may be supported by two 4" x 6" wood posts with drilled holes for breakaway as per BC(5) and will be subsidiary to Item 502.
7. The Working For You Give Us A BRAKE (G20-7T) 192" X 96" sign shall be paid for under the following specification items:
   Item 636 - Aluminum Signs
   Item 647 - Large Roadside Sign Supports and Assemblies.
   Item 416 - Drilled Shaft Foundations
8. All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

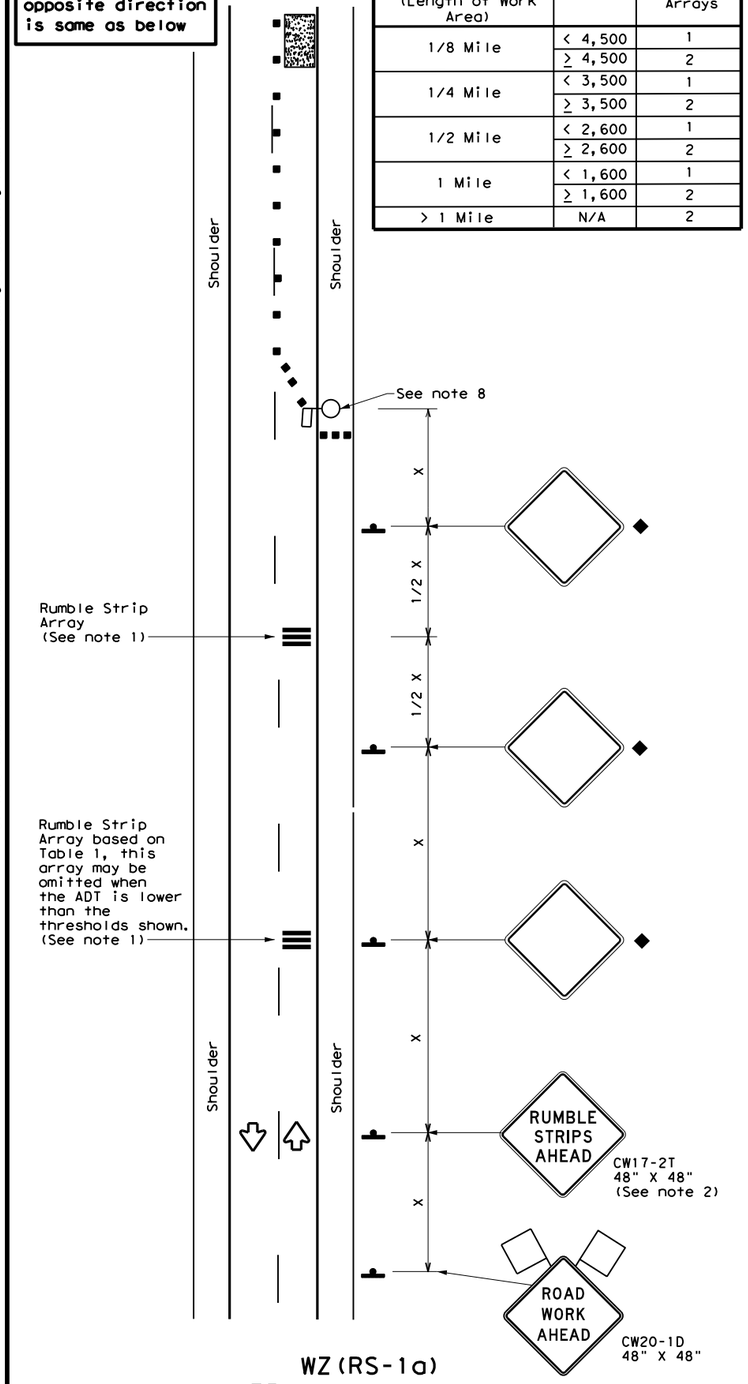
FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	12	HARRIS		59

116

DATE:
FILE:

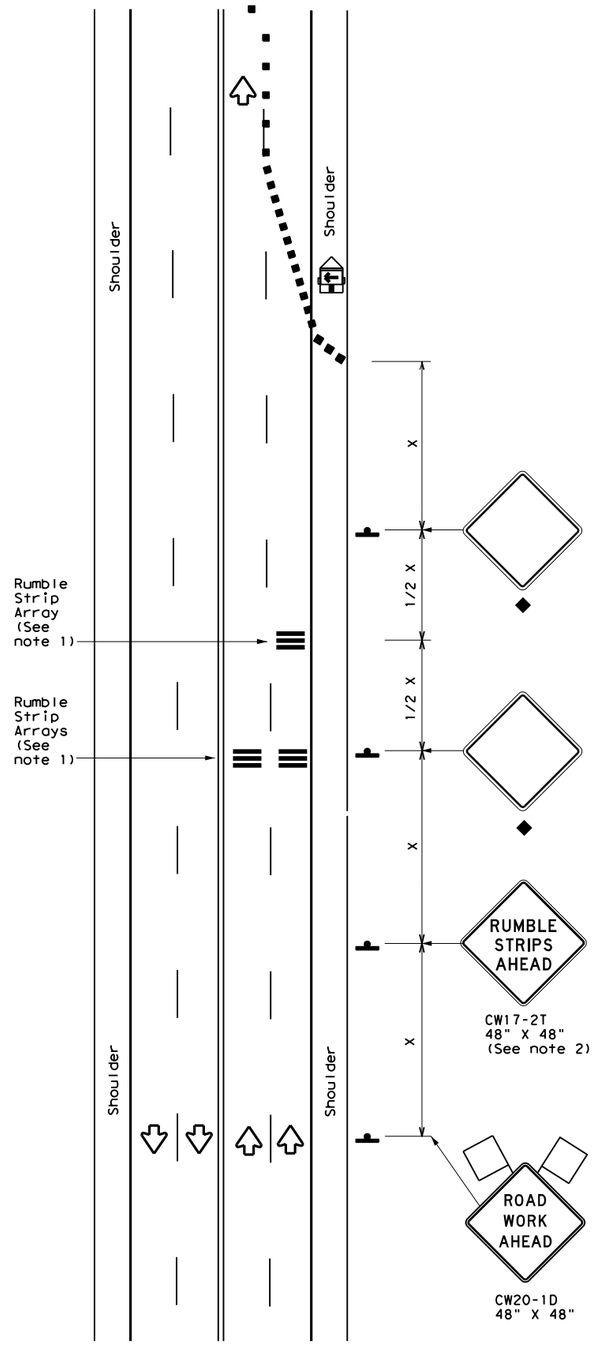
Warning sign and rumble strip sequence in opposite direction is same as below

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



WZ(RS-1a)
75 mph or Less

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)
75 mph or Less

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

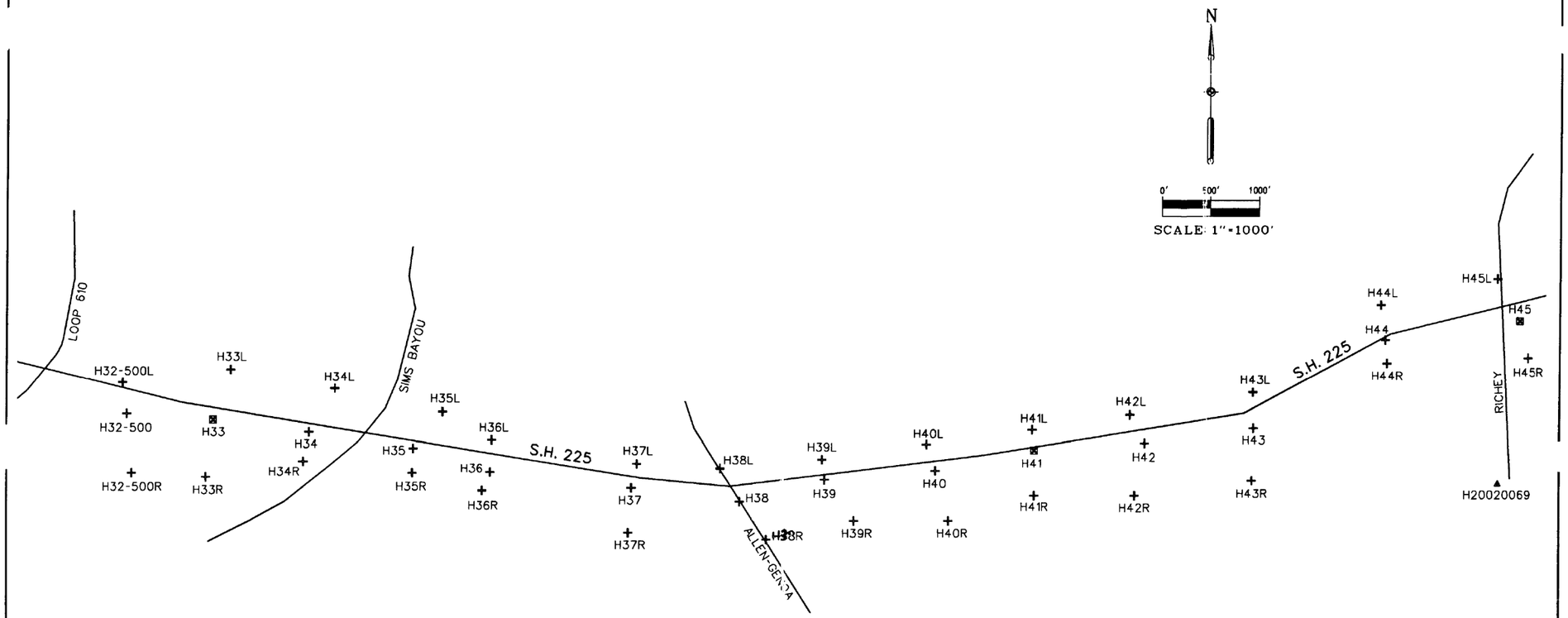
Texas Department of Transportation

Traffic Operations Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-16

FILE: wzrs16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
2-14	DIST	COUNTY		SHEET NO.
4-16	HOU	HARRIS		59A



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

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten ,P.E.

PANEL POINT LOCATIONS
STATE HIGHWAY 225
HARRIS COUNTY, TEXAS

NAD83 (1993 ADJ.)
T.S.P.C.S. - SOUTH CENTRAL ZONE
U.S. SURVEY FEET
PROJECT SCALE FACTOR: 1.00013

SHEET 1 OF 5

FILE: LAYOUT SHEET 1.DGN
DATE: FEB. 1, 2004

PBSJ
1880 S. DAIRY ASHFORD ST., SUITE 300
HOUSTON TEXAS 77077
PHONE (281) 493-5100 FAX (281) 493-1047

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 21 31 41 51 61
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62

ACC: CONSTRUCTION PROJECTS /0502-01-222/

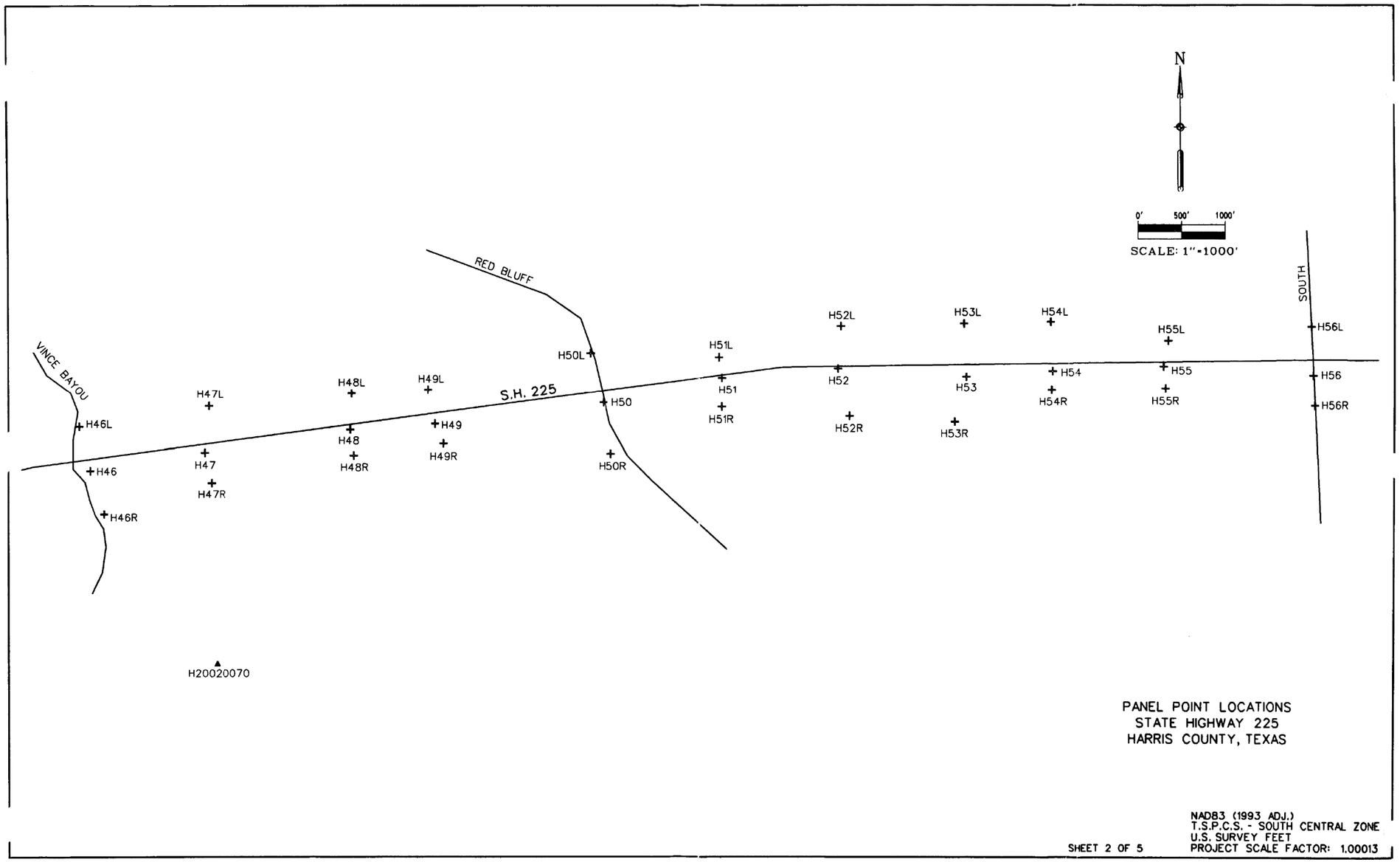
FILE: LAYOUT01.DGN

SH 225
SURVEY CONTROL
POINT LOCATION LAYOUT

SHEET 1 OF 2

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			60
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



PANEL POINT LOCATIONS
STATE HIGHWAY 225
HARRIS COUNTY, TEXAS

NAD83 (1993 ADJ.)
T.S.P.C.S. - SOUTH CENTRAL ZONE
U.S. SURVEY FEET
PROJECT SCALE FACTOR: 1.00013

SHEET 2 OF 5

FILE: LAYOUT SHEET 2.DGN
DATE: FEB. 1, 2004

PBS&J
1880 S. DAIRY ASHFORD ST., SUITE 300
HOUSTON TEXAS 77077
PHONE (281) 493-5100 FAX (281) 493-1047

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

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SH 225
SURVEY CONTROL
POINT LOCATION LAYOUT

SHEET 2 OF 2

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			61
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62

ACC: CONSTRUCTION PROJECTS /0502-01-222/
FILE: LAYOUT02.DGN

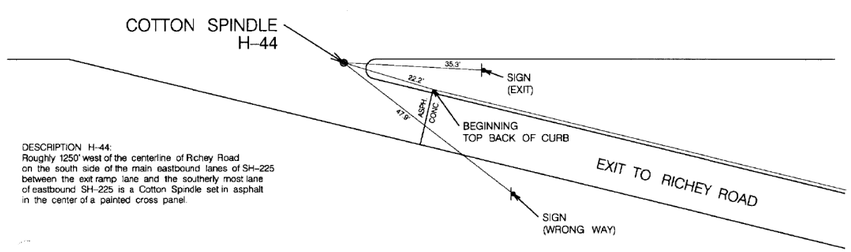
Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

CONTROL DATA SHEET

← SCARBOROUGH STREET

RICHEY ROAD →

SH 225 EAST BOUND



DESCRIPTION H-44:
Roughly 1250' west of the centerline of Richey Road on the south side of the main eastbound lanes of SH–225 between the exit ramp lane and the southerly most lane of eastbound SH–225 is a Cotton Spindle set in asphalt in the center of a painted cross panel.

FRONTAGE ROAD

NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066

2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.

3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

NOT TO SCALE
MARCH 2003

HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 1.00013 (SURFACE)

TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13826632.1306

ELEVATION (NAVD88 /91): 23.43' E = 3167413.0446

STATE OF TEXAS
REGISTERED
JEFFREY J. CURCI
5516
PROFESSIONAL
LAND SURVEYOR
5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL
POINT H–44

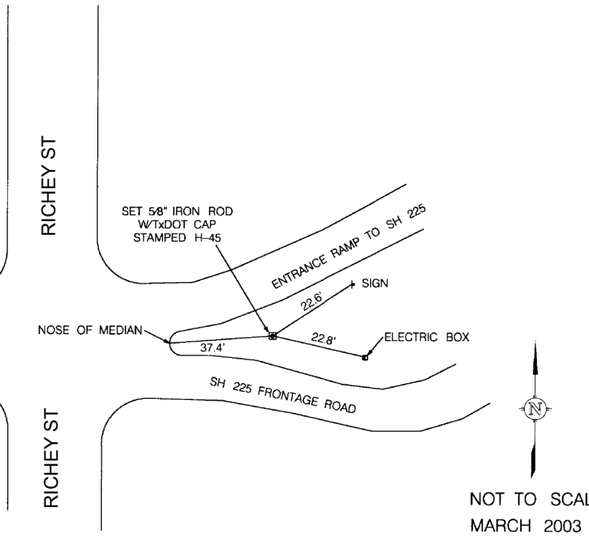
PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-44.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

CONTROL DATA SHEET

DESCRIPTION H-45
East of the Ritchey Road overpass, approximately 38' east of the point of divergence of the eastbound on ramp to and the southerly frontage road of SH–225, lies a 5/8" iron rod with a TxDOT cap stamped "H–45".



NOT TO SCALE
MARCH 2003

HARRIS COUNTY, TEXAS.

NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066

2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.

3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

COMBINED SCALE FACTOR: 100013 (SURFACE)

TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13826823.9082

ELEVATION (NAVD88 /91): 22.20' E = 3168810.6509

STATE OF TEXAS
REGISTERED
JEFFREY J. CURCI
5516
PROFESSIONAL
LAND SURVEYOR
5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL
POINT H–45

PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-45.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

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

STATE OF TEXAS
REGISTERED
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SH 225 SURVEY CONTROL DATA SHEETS

SHEET 1 OF 4

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			62
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

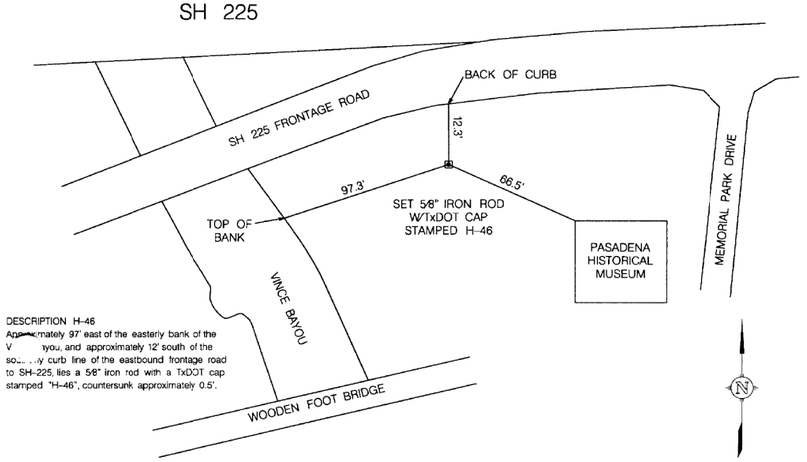
ACC: CONSTRUCTION PROJECTS /0502-01-222/

FILE: DATASHEET01.DGN

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

CONTROL DATA SHEET

SH 225



DESCRIPTION H–46
Approximately 97' east of the easterly bank of the V[illegible]you, and approximately 12' south of the so[illegible]y curb line of the eastbound frontage road to SH–225, lies a 5/8" iron rod with a TxDOT cap stamped "H–46", countersunk approximately 0.5'.

NOT TO SCALE
MARCH 2003

NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 1.00013 (SURFACE)
TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13827065.1200
ELEVATION (NAVD88 /91): 10.74' E = 3169865.4554

STATE OF TEXAS REGISTERED JEFFREY J. CURCI 5516 PROFESSIONAL LAND SURVEYOR 5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL
POINT H–46

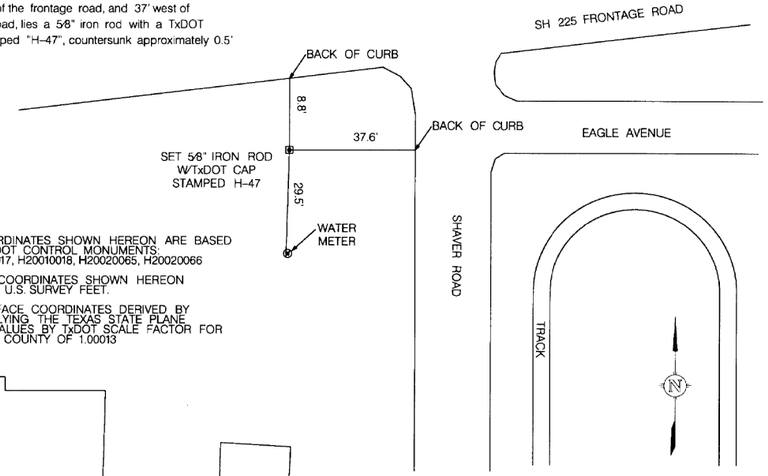
PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT: TxDOT SH 225
JOB NUMBER: 460731.09
DATE: MARCH 2003
SCALE: NOT TO SCALE
SURVEYOR: JJC
TECHNICIAN: JJC
DRAWING: T:\SH225PANELS\DGN\H–46.DGN
FIELDNOTES:
PARTYCHIEF: B. TERRELL
FIELDBOOKS: 1204

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

CONTROL DATA SHEET

DESCRIPTION H 47
Located southwest of the intersection of Shaver Road and the eastbound frontage road of SH–225, approximately 9' south of the frontage road, and 37' west of Shaver Road, lies a 5/8" iron rod with a TxDOT cap stamped "H–47", countersunk approximately 0.5'



NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

NOT TO SCALE
MARCH 2003

HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 1.00013 (SURFACE)
TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13827269.1119
ELEVATION (NAVD88 /91): 20.74' E = 3171188.8976

STATE OF TEXAS REGISTERED JEFFREY J. CURCI 5516 PROFESSIONAL LAND SURVEYOR 5/19/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL
POINT H–47

PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT: TxDOT SH 225
JOB NUMBER: 460731.09
DATE: MARCH 2003
SCALE: NOT TO SCALE
SURVEYOR: JJC
TECHNICIAN: JJC
DRAWING: T:\SH225PANELS\DGN\H–47.DGN
FIELDNOTES:
PARTYCHIEF: B. TERRELL
FIELDBOOKS: 1204

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

STATE OF TEXAS DEDRICK D. KNIGHTEN 103612 LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SH 225 SURVEY CONTROL DATA SHEETS

SHEET 2 OF 4

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			63
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

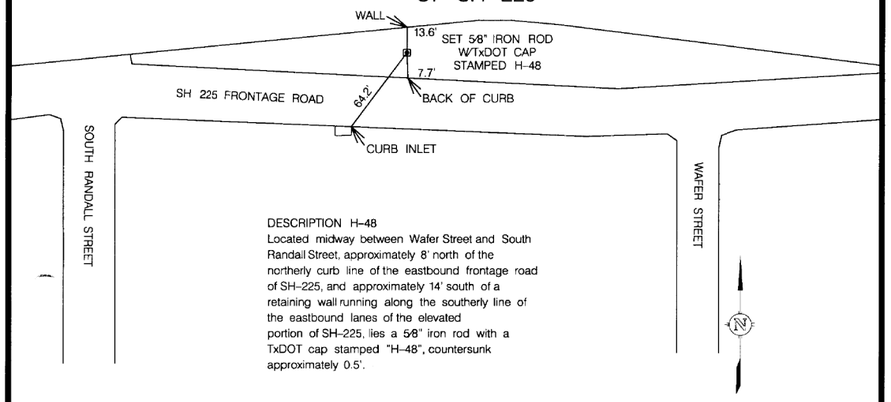
ACC: CONSTRUCTION PROJECTS /0502-01-222/

FILE: DATASHEET02.DGN

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

CONTROL DATA SHEET

ELEVATED PORTION OF SH 225



DESCRIPTION H–48
Located midway between Wafer Street and South Randall Street, approximately 8' north of the northerly curb line of the eastbound frontage road of SH–225, and approximately 14' south of a retaining wall running along the southerly line of the eastbound lanes of the elevated portion of SH–225, lies a 5/8" iron rod with a TxDOT cap stamped "H–48", countersunk approximately 0.5'.

NOT TO SCALE
MARCH 2003
HARRIS COUNTY, TEXAS.

NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

COMBINED SCALE FACTOR: 1.00013 (SURFACE)
TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13827526.6848
ELEVATION (NAVD88 /91): 22.49' E = 3172866.0963

STATE OF TEXAS REGISTERED JEFFREY J. CURCI 5516 PROFESSIONAL LAND SURVEYOR 5/19/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL POINT H–48

PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-48.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

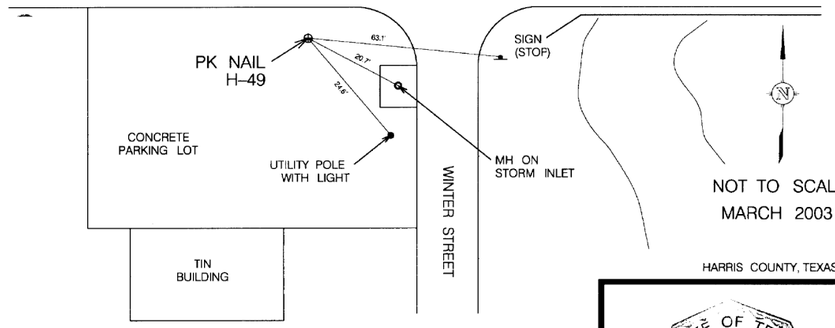
CONTROL DATA SHEET

SH 225 EAST BOUND

NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS: H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

DESCRIPTION H–49
Located southwest of the intersection of the south frontage road of SH–225 and Winter Street, approximately 21' northwest of a manhole embedded in a concrete storm inlet and 63' west of the stop sign on the southeast corner of said intersection, lies a PK Nail set in the concrete parking lot in the middle of a painted aerial panel.

FRONTAGE ROAD



NOT TO SCALE
MARCH 2003
HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 100013 (SURFACE)
TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13827591.7030
ELEVATION (NAVD88 /91): 24.68' E = 3173847.5966

STATE OF TEXAS REGISTERED JEFFREY J. CURCI 5516 PROFESSIONAL LAND SURVEYOR 5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL POINT H–49

PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-49.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

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

STATE OF TEXAS DEDRICK D. KNIGHTEN 103612 LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SH 225 SURVEY CONTROL DATA SHEETS

SHEET 3 OF 4

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			64
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

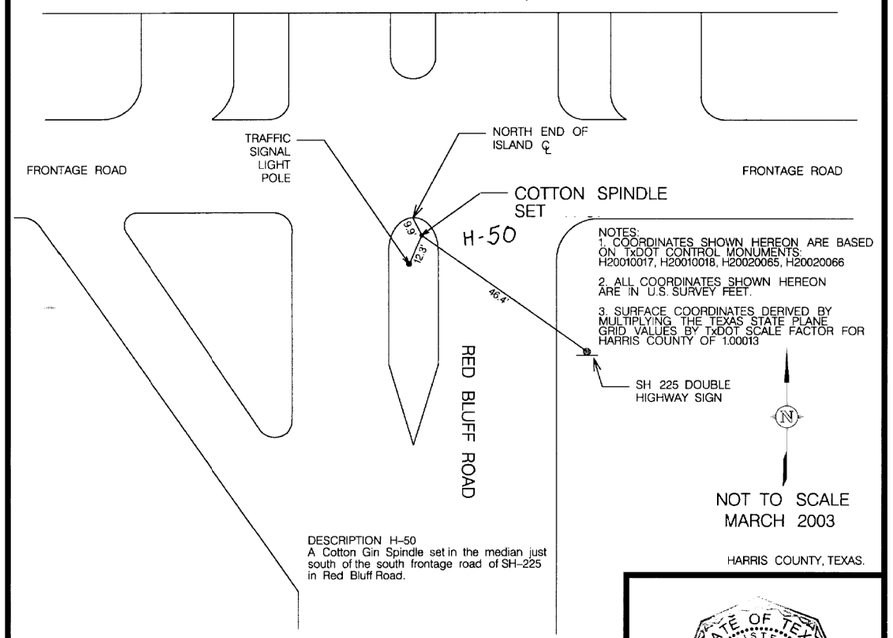
LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: CONSTRUCTION PROJECTS /0502-01-222/
FILE: DATASHEET03.DGN

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

S. TATER STREET — CONTROL DATA SHEET — BEARLE STREET

SH 225 (EAST BOUND)



NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS, H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

NOT TO SCALE
MARCH 2003

HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 1.00013 (SURFACE)

TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13827829.2100

ELEVATION (NAVD88 /91): 24.44' E = 3175787.8416

STATE OF TEXAS — REGISTERED — JEFFREY J. CURCI — 5516 — PROFESSIONAL LAND SURVEYOR — 5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL POINT H–50

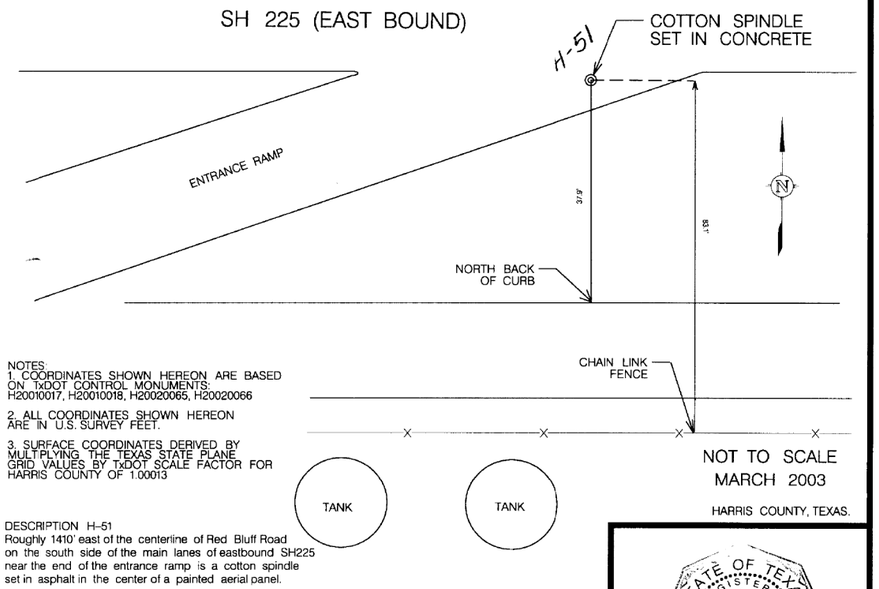
PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-50.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

Texas Department of Transportation Contract No. 12–1XXP1021
WORK AUTHORIZATION # 9
SH 225: IH 610 to SH 146
CSJ: 0912–00–148, & Fnc. 150

RED BLUFF ROAD — CONTROL DATA SHEET — BEARLE STREET

SH 225 (EAST BOUND)



NOTES:
1. COORDINATES SHOWN HEREON ARE BASED ON TxDOT CONTROL MONUMENTS, H20010017, H20010018, H20020065, H20020066
2. ALL COORDINATES SHOWN HEREON ARE IN U.S. SURVEY FEET.
3. SURFACE COORDINATES DERIVED BY MULTIPLYING THE TEXAS STATE PLANE GRID VALUES BY TxDOT SCALE FACTOR FOR HARRIS COUNTY OF 1.00013

DESCRIPTION H–51
Roughly 1410' east of the centerline of Red Bluff Road on the south side of the main lanes of eastbound SH225 near the end of the entrance ramp is a cotton spindle set in asphalt in the center of a painted aerial panel.

NOT TO SCALE
MARCH 2003

HARRIS COUNTY, TEXAS.

COMBINED SCALE FACTOR: 1.00013 (SURFACE)

TEXAS SOUTH CENTRAL ZONE (NAD83 /93): N = 13828106.3714

ELEVATION (NAVD88 /91): 24.37' E = 3177153.4100

STATE OF TEXAS — REGISTERED — JEFFREY J. CURCI — 5516 — PROFESSIONAL LAND SURVEYOR — 5/16/03

Jeffrey J. Curci
Registered Professional Land Surveyor
No. 5516 – State of Texas

CENTERLINE PANEL POINT H–51

PBS&J
1880 S. DAIRY ASHFORD ST.
SUITE #300
HOUSTON, TEXAS
77077–4760
(281) 493–5100

PROJECT:	TxDOT SH 225
JOB NUMBER:	460731.09
DATE:	MARCH 2003
SCALE:	NOT TO SCALE
SURVEYOR:	JJC
TECHNICIAN:	JJC
DRAWING:	T:\SH225PANELS\DGN\H-51.DGN
FIELDNOTES:	
PARTYCHIEF:	B. TERRELL
FIELDBOOKS:	1204

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

STATE OF TEXAS — DEDRICK D. KNIGHTEN — 103612 — LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by
DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

SH 225 SURVEY CONTROL DATA SHEETS

SHEET 4 OF 4

Texas Department of Transportation

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			65
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: CONSTRUCTION PROJECTS /0502-01-222/

FILE: DATASHEET04.DGN

℄ EB FRTG RD ALIGNMENT

Beginning chain SH225FTGS description

Point EBFRTG01 N 13,825,985.5331 E 3,166,465.0413 Sta 159+12.36

Course from EBFRTG01 to EBFRTG02 N 55° 56′ 32.80" E Dist 483.2194

Point EBFRTG02 N 13,826,256.1482 E 3,166,865.3767 Sta 163+95.58

		Curve Data				
Curve EBFRTGCURVE01						
P.I. Station		168+28.26	N	13,826,498.4624	E	3,167,223.8451
Delta	=	17° 19′ 33.06"	(RT)			
Degree	=	2° 01′ 03.12"				
Tangent	=	432.6843				
Length	=	858.7644				
Radius	=	2,839.8937				
External	=	32.7726				
Long Chord	=	855.4962				
Mid. Ord.	=	32.3988				
P.C. Station		163+95.58	N	13,826,256.1482	E	3,166,865.3767
P.T. Station		172+54.34	N	13,826,623.0282	E	3,167,638.2110
C.C.			N	13,823,903.3661	E	3,168,455.7894
Back	= N	55° 56′ 32.80" E				
Ahead	= N	73° 16′ 05.86" E				
Chord Bear	= N	64° 36′ 19.33" E				

		Curve Data				
Curve EBFRTGCURVE02						
P.I. Station		174+03.53	N	13,826,665.9783	E	3,167,781.0841
Delta	=	6° 04′ 22.18"	(RT)			
Degree	=	2° 02′ 13.86"				
Tangent	=	149.1893				
Length	=	298.0993				
Radius	=	2,812.5000				
External	=	3.9541				
Long Chord	=	297.9598				
Mid. Ord.	=	3.9486				
P.C. Station		172+54.34	N	13,826,623.0282	E	3,167,638.2110
P.T. Station		175+52.44	N	13,826,693.5726	E	3,167,927.6993
C.C.			N	13,823,929.6000	E	3,168,447.9030
Back	= N	73° 16′ 05.86" E				
Ahead	= N	79° 20′ 28.04" E				
Chord Bear	= N	76° 18′ 16.95" E				

Ending chain SH225FTGS description

Beginning chain SH225FTRS1 description

Point SH251 N 13,826,703.4001 E 3,167,925.8497 Sta 175+52.44

Course from SH251 to PC SH225FTGS1 N 79° 20′ 28.04" E Dist 520.0242

		Curve Data				
Curve SH225FTGS1						
P.I. Station		181+49.87	N	13,826,813.9013	E	3,168,512.9705
Delta	=	4° 41′ 39.06"	(RT)			
Degree	=	3° 02′ 02.15"				
Tangent	=	77.4047				
Length	=	154.7229				
Radius	=	1,888.5000				
External	=	1.5856				
Long Chord	=	154.6796				
Mid. Ord.	=	1.5843				
P.C. Station		180+72.46	N	13,826,799.5844	E	3,168,436.9013
P.T. Station		182+27.19	N	13,826,821.9449	E	3,168,589.9562
C.C.			N	13,824,943.6690	E	3,168,786.2008
Back	= N	79° 20′ 28.04" E				
Ahead	= N	84° 02′ 07.10" E				
Chord Bear	= N	81° 41′ 17.57" E				

Course from PT SH225FTGS1 to PC SH225FTGS2 N 84° 02′ 07.11" E Dist 17.6559

		Curve Data				
Curve SH225FTGS2						
P.I. Station		183+25.25	N	13,826,832.1356	E	3,168,687.4925
Delta	=	13° 06′ 21.89"	(RT)			
Degree	=	8° 11′ 06.40"				
Tangent	=	80.4114				
Length	=	160.1210				
Radius	=	700.0000				
External	=	4.6034				
Long Chord	=	159.7721				
Mid. Ord.	=	4.5734				
P.C. Station		182+44.84	N	13,826,823.7796	E	3,168,607.5164
P.T. Station		184+04.96	N	13,826,822.1390	E	3,168,767.2801
C.C.			N	13,826,127.5693	E	3,168,680.2574
Back	= N	84° 02′ 07.10" E				
Ahead	= S	82° 51′ 31.01" E				
Chord Bear	= S	89° 24′ 41.95" E				

Course from PT SH225FTGS2 to PC SH225FTGS3 S 82° 51′ 31.01" E Dist 25.7778

℄ EB FRTG RD ALIGNMENT CONTINUED

		Curve Data				
Curve SH225FTGS3						
P.I. Station		187+43.25	N	13,826,780.0841	E	3,169,102.9400
Delta	=	30° 30′ 23.74"	(LT)			
Degree	=	4° 59′ 58.67"				
Tangent	=	312.5063				
Length	=	610.1768				
Radius	=	1,146.0000				
External	=	41.8452				
Long Chord	=	602.9948				
Mid. Ord.	=	40.3711				
P.C. Station		184+30.74	N	13,826,818.9343	E	3,168,792.8580
P.T. Station		190+40.92	N	13,826,904.0211	E	3,169,389.8194
C.C.			N	13,827,956.0441	E	3,168,935.3267
Back	= S	82° 51′ 31.01" E				
Ahead	= N	66° 38′ 05.25" E				
Chord Bear	= N	81° 53′ 17.12" E				

Course from PT SH225FTGS3 to PC SH225FTGS4 N 66° 38′ 05.25" E Dist 418.7370

		Curve Data				
Curve SH225FTGS4						
P.I. Station		195+33.97	N	13,827,099.5623	E	3,169,842.4422
Delta	=	14° 07′ 18.66"	(RT)			
Degree	=	9° 32′ 57.47"				
Tangent	=	74.3184				
Length	=	147.8837				
Radius	=	600.0000				
External	=	4.5852				
Long Chord	=	147.5096				
Mid. Ord.	=	4.5504				
P.C. Station		194+59.66	N	13,827,070.0883	E	3,169,774.2182
P.T. Station		196+07.54	N	13,827,111.4999	E	3,169,915.7956
C.C.			N	13,826,519.2909	E	3,170,012.1725
Back	= N	66° 38′ 05.25" E				
Ahead	= N	80° 45′ 23.91" E				
Chord Bear	= N	73° 41′ 44.58" E				

Course from PT SH225FTGS4 to SH252 N 80° 45′ 23.91" E Dist 213.7606

Point SH252 N 13,827,145.8359 E 3,170,126.7806 Sta 198+21.30

Course from SH252 to PC SH225FTGS5 N 82° 06′ 17.94" E Dist 618.1535

		Curve Data				
Curve SH225FTGS5						
P.I. Station		204+94.17	N	13,827,238.2599	E	3,170,793.2706
Delta	=	1° 05′ 39.02"	(LT)			
Degree	=	0° 59′ 59.73"				
Tangent	=	54.7144				
Length	=	109.4254				
Radius	=	5,730.0000				
External	=	0.2612				
Long Chord	=	109.4237				
Mid. Ord.	=	0.2612				
P.C. Station		204+39.45	N	13,827,230.7444	E	3,170,739.0749
P.T. Station		205+48.88	N	13,827,246.8089	E	3,170,847.3130
C.C.			N	13,832,906.4321	E	3,169,952.0113
Back	= N	82° 06′ 17.94" E				
Ahead	= N	81° 00′ 38.92" E				
Chord Bear	= N	81° 33′ 28.43" E				

Course from PT SH225FTGS5 to PC SH225FTGS6 N 81° 00′ 38.92" E Dist 402.1260

		Curve Data				
Curve SH225FTGS6						
P.I. Station		210+08.22	N	13,827,318.5797	E	3,171,301.0098
Delta	=	1° 08′ 38.86"	(RT)			
Degree	=	0° 59′ 59.73"				
Tangent	=	57.2124				
Length	=	114.4211				
Radius	=	5,730.0000				
External	=	0.2856				
Long Chord	=	114.4192				
Mid. Ord.	=	0.2856				
P.C. Station		209+51.00	N	13,827,309.6404	E	3,171,244.5000
P.T. Station		210+65.43	N	13,827,326.3889	E	3,171,357.6867
C.C.			N	13,821,650.0171	E	3,172,139.8017
Back	= N	81° 00′ 38.92" E				
Ahead	= N	82° 09′ 17.77" E				
Chord Bear	= N	81° 34′ 58.34" E				

Course from PT SH225FTGS6 to PC SH225FTGS7 N 82° 09′ 17.77" E Dist 1,100.1525

STATE OF TEXAS
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98313
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3/24/2021

HORIZONTAL ALIGNMENT DATA

SH 225

SHEET 1 OF 4

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		66

STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

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℄ EB FRTG RD ALIGNMENT CONTINUED

Curve Data

Curve SH225FTGS7
P.I. Station 222+43.64 N 13,827,487.2087 E 3,172,524.8723
Delta = 4° 28′ 12.89" (RT)
Degree = 2° 51′ 53.24"
Tangent = 78.0601
Length = 156.0411
Radius = 2,000.0000
External = 1.5228
Long Chord = 156.0015
Mid. Ord. = 1.5216
P.C. Station 221+65.58 N 13,827,476.5539 E 3,172,447.5427
P.T. Station 223+21.62 N 13,827,491.8040 E 3,172,602.7970
C.C. N 13,825,495.2724 E 3,172,720.5322
Back = N 82° 09′ 17.77" E
Ahead = N 86° 37′ 30.66" E
Chord Bear = N 84° 23′ 24.22" E

Course from PT SH225FTGS7 to PC SH225FTGS8 N 86° 37′ 30.66" E Dist 486.2374

Curve Data

Curve SH225FTGS8
P.I. Station 228+99.07 N 13,827,525.7973 E 3,173,179.2496
Delta = 4° 33′ 29.12" (LT)
Degree = 2° 29′ 59.34"
Tangent = 91.2166
Length = 182.3370
Radius = 2,292.0000
External = 1.8144
Long Chord = 182.2889
Mid. Ord. = 1.8130
P.C. Station 228+07.86 N 13,827,520.4276 E 3,173,088.1912
P.T. Station 229+90.19 N 13,827,538.3864 E 3,173,269.5933
C.C. N 13,829,808.4528 E 3,172,953.2666
Back = N 86° 37′ 30.66" E
Ahead = N 82° 04′ 01.54" E
Chord Bear = N 84° 20′ 46.10" E

Course from PT SH225FTGS8 to SH253 N 82° 04′ 01.54" E Dist 207.6713

Point SH253 N 13,827,567.0478 E 3,173,475.2772 Sta 231+97.87

Course from SH253 to PC SH225FTGS9 N 82° 04′ 12.61" E Dist 320.5860

Curve Data

Curve SH225FTGS9
P.I. Station 236+32.28 N 13,827,626.9791 E 3,173,905.5334
Delta = 2° 16′ 33.66" (RT)
Degree = 0° 59′ 59.73"
Tangent = 113.8242
Length = 227.6184
Radius = 5,730.0000
External = 1.1304
Long Chord = 227.6034
Mid. Ord. = 1.1302
P.C. Station 235+18.45 N 13,827,611.2759 E 3,173,792.7977
P.T. Station 237+46.07 N 13,827,638.1928 E 3,174,018.8039
C.C. N 13,821,936.0675 E 3,174,583.3098
Back = N 82° 04′ 12.61" E
Ahead = N 84° 20′ 46.27" E
Chord Bear = N 83° 12′ 29.44" E

Course from PT SH225FTGS9 to SH254 N 84° 20′ 46.27" E Dist 226.3675

Point SH254 N 13,827,660.4940 E 3,174,244.0701 Sta 239+72.44

Course from SH254 to PC SH225FTGS10 N 83° 08′ 11.74" E Dist 663.7743

Curve Data

Curve SH225FTGS10
P.I. Station 247+59.08 N 13,827,754.4997 E 3,175,025.0731
Delta = 1° 02′ 34.40" (LT)
Degree = 0° 25′ 27.89"
Tangent = 122.8659
Length = 245.7250
Radius = 13,500.0000
External = 0.5591
Long Chord = 245.7216
Mid. Ord. = 0.5591
P.C. Station 246+36.21 N 13,827,739.8169 E 3,174,903.0877
P.T. Station 248+81.94 N 13,827,771.4003 E 3,175,146.7711
C.C. N 13,841,143.0741 E 3,173,289.8004
Back = N 83° 08′ 11.74" E
Ahead = N 82° 05′ 37.33" E
Chord Bear = N 82° 36′ 54.54" E

Course from PT SH225FTGS10 to SH255 N 82° 05′ 37.34" E Dist 201.5017

Point SH255 N 13,827,799.1175 E 3,175,346.3575 Sta 250+83.44

Course from SH255 to SH256 N 82° 08′ 44.86" E Dist 299.2025

Point SH256 N 13,827,840.0044 E 3,175,642.7531 Sta 253+82.64

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Ending chain SH225FTRS1 description

℄ WB FRTG RD ALIGNMENT

Beginning chain SH225FTGN description
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Point SH225 N 13,827,033.4170 E 3,168,084.3292 Sta 177+46.67

Course from SH225 to PC SH225PASA1 N 82° 05′ 34.01" E Dist 697.1823

Curve Data

Curve SH225PASA1
P.I. Station 185+62.23 N 13,827,145.6130 E 3,168,892.1344
Delta = 3° 32′ 51.35" (LT)
Degree = 1° 29′ 56.07"
Tangent = 118.3771
Length = 236.6786
Radius = 3,822.5000
External = 1.8325
Long Chord = 236.6408
Mid. Ord. = 1.8317
P.C. Station 184+43.85 N 13,827,129.3279 E 3,168,774.8827
P.T. Station 186+80.53 N 13,827,169.1221 E 3,169,008.1536
C.C. N 13,830,915.4841 E 3,168,249.0239
Back = N 82° 05′ 34.01" E
Ahead = N 78° 32′ 42.66" E
Chord Bear = N 80° 19′ 08.34" E

Curve Data

Curve SH225PASA2
P.I. Station 187+64.50 N 13,827,185.7970 E 3,169,090.4454
Delta = 13° 30′ 23.47" (LT)
Degree = 8° 04′ 49.70"
Tangent = 83.9643
Length = 167.1501
Radius = 709.0647
External = 4.9540
Long Chord = 166.7634
Mid. Ord. = 4.9197
P.C. Station 186+80.53 N 13,827,169.1221 E 3,169,008.1536
P.T. Station 188+47.68 N 13,827,221.2305 E 3,169,166.5668
C.C. N 13,827,864.0634 E 3,168,867.3368
Back = N 78° 32′ 42.66" E
Ahead = N 65° 02′ 19.19" E
Chord Bear = N 71° 47′ 30.93" E

Course from PT SH225PASA2 to PC SH225PASA3 N 65° 02′ 19.19" E Dist 80.0472

Curve Data

Curve SH225PASA3
P.I. Station 190+46.52 N 13,827,305.1430 E 3,169,346.8354
Delta = 23° 47′ 18.82" (RT)
Degree = 10° 09′ 31.77"
Tangent = 118.7946
Length = 234.1664
Radius = 564.0000
External = 12.3750
Long Chord = 232.4881
Mid. Ord. = 12.1093
P.C. Station 189+27.73 N 13,827,255.0109 E 3,169,239.1371
P.T. Station 191+61.89 N 13,827,307.5745 E 3,169,465.6052
C.C. N 13,826,743.6926 E 3,169,477.1488
Back = N 65° 02′ 19.19" E
Ahead = N 88° 49′ 38.01" E
Chord Bear = N 76° 55′ 58.60" E

Course from PT SH225PASA3 to SH226 N 88° 49′ 38.01" E Dist 14.5501

Point SH226 N 13,827,307.8723 E 3,169,480.1522 Sta 191+76.44

Course from SH226 to PC SH225PASA4 S 89° 29′ 50.64" E Dist 337.9449

Curve Data

Curve SH225PASA4
P.I. Station 195+58.41 N 13,827,304.5217 E 3,169,862.1035
Delta = 9° 01′ 46.49" (RT)
Degree = 10° 16′ 38.17"
Tangent = 44.0210
Length = 87.8597
Radius = 557.5000
External = 1.7353
Long Chord = 87.7688
Mid. Ord. = 1.7299
P.C. Station 195+14.39 N 13,827,304.9078 E 3,169,818.0842
P.T. Station 196+02.25 N 13,827,297.2317 E 3,169,905.5167
C.C. N 13,826,747.4293 E 3,169,813.1938
Back = S 89° 29′ 50.64" E
Ahead = S 80° 28′ 04.15" E
Chord Bear = S 84° 58′ 57.40" E

Course from PT SH225PASA4 to PC SH225PASA5 S 80° 28′ 04.15" E Dist 54.9878

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HORIZONTAL ALIGNMENT DATA

SH 225

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		67

STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

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℄ WB FRTG RD ALIGNMENT CONTINUED

Curve Data

Curve SH225PASA5						
P.I. Station	197+29.18	N	13,827,276.2124	E	3,170,030.6917	
Delta =	17° 27′ 34.38"	(LT)				
Degree =	12° 13′ 46.64"					
Tangent =	71.9398					
Length =	142.7644					
Radius =	468.5000					
External =	5.4911					
Long Chord =	142.2127					
Mid. Ord. =	5.4275					
P.C. Station	196+57.24	N	13,827,288.1257	E	3,169,959.7452	
P.T. Station	198+00.00	N	13,827,286.1341	E	3,170,101.9440	
C.C.		N	13,827,750.1570	E	3,170,037.3295	
Back = S	80° 28′ 04.15" E					
Ahead = N	82° 04′ 21.48" E					
Chord Bear = S	89° 11′ 51.34" E					

Course from PT SH225PASA5 to PC SH225PASA6 N 82° 04′ 21.48" E Dist 955.5347

Curve Data

Curve SH225PASA6						
P.I. Station	208+02.80	N	13,827,424.4379	E	3,171,095.1604	
Delta =	3° 18′ 27.59"	(RT)				
Degree =	3° 30′ 00.17"					
Tangent =	47.2648					
Length =	94.5034					
Radius =	1,637.0000					
External =	0.6822					
Long Chord =	94.4903					
Mid. Ord. =	0.6819					
P.C. Station	207+55.54	N	13,827,417.9192	E	3,171,048.3473	
P.T. Station	208+50.04	N	13,827,428.2447	E	3,171,142.2717	
C.C.		N	13,825,796.5629	E	3,171,274.1185	
Back = N	82° 04′ 21.48" E					
Ahead = N	85° 22′ 49.06" E					
Chord Bear = N	83° 43′ 35.27" E					

Course from PT SH225PASA6 to PC SH225PASA7 N 85° 22′ 49.07" E Dist 31.9369

Curve Data

Curve SH225PASA7						
P.I. Station	209+29.12	N	13,827,434.6138	E	3,171,221.0937	
Delta =	3° 17′ 56.66"	(LT)				
Degree =	3° 30′ 00.17"					
Tangent =	47.1420					
Length =	94.2579					
Radius =	1,637.0000					
External =	0.6787					
Long Chord =	94.2449					
Mid. Ord. =	0.6784					
P.C. Station	208+81.98	N	13,827,430.8169	E	3,171,174.1048	
P.T. Station	209+76.23	N	13,827,441.1085	E	3,171,267.7861	
C.C.		N	13,829,062.4987	E	3,171,042.2581	
Back = N	85° 22′ 49.06" E					
Ahead = N	82° 04′ 52.41" E					
Chord Bear = N	83° 43′ 50.74" E					

Course from PT SH225PASA7 to PC SH225PASA8 N 82° 04′ 52.41" E Dist 1,145.4368

Curve Data

Curve SH225PASA8						
P.I. Station	221+60.18	N	13,827,604.2201	E	3,172,440.4453	
Delta =	2° 41′ 43.38"	(LT)				
Degree =	3° 30′ 00.17"					
Tangent =	38.5121					
Length =	77.0099					
Radius =	1,637.0000					
External =	0.4530					
Long Chord =	77.0028					
Mid. Ord. =	0.4529					
P.C. Station	221+21.67	N	13,827,598.9143	E	3,172,402.3005	
P.T. Station	221+98.68	N	13,827,611.3138	E	3,172,478.2984	
C.C.		N	13,829,220.3045	E	3,172,176.7724	
Back = N	82° 04′ 52.41" E					
Ahead = N	79° 23′ 09.03" E					
Chord Bear = N	80° 44′ 00.72" E					

Course from PT SH225PASA8 to PC SH225PASA9 N 79° 23′ 09.03" E Dist 35.8552

℄ WB FRTG RD ALIGNMENT CONTINUED

Curve Data

Curve SH225PASA9						
P.I. Station	222+72.66	N	13,827,624.9402	E	3,172,551.0112	
Delta =	2° 40′ 05.48"	(RT)				
Degree =	3° 30′ 00.17"					
Tangent =	38.1234					
Length =	76.2329					
Radius =	1,637.0000					
External =	0.4439					
Long Chord =	76.2260					
Mid. Ord. =	0.4437					
P.C. Station	222+34.54	N	13,827,617.9181	E	3,172,513.5401	
P.T. Station	223+10.77	N	13,827,630.2104	E	3,172,588.7685	
C.C.		N	13,826,008.9274	E	3,172,815.0661	
Back = N	79° 23′ 09.03" E					
Ahead = N	82° 03′ 14.51" E					
Chord Bear = N	80° 43′ 11.77" E					

Course from PT SH225PASA9 to SH227 N 82° 03′ 14.51" E Dist 755.2016

Point SH227 N 13,827,734.6089 E 3,173,336.7193 Sta 230+65.97

Course from SH227 to PC SH225PASA10 N 81° 24′ 57.87" E Dist 180.6962

Curve Data

Curve SH225PASA10						
P.I. Station	232+94.09	N	13,827,768.6569	E	3,173,562.2797	
Delta =	3° 19′ 06.55"	(LT)				
Degree =	3° 30′ 00.17"					
Tangent =	47.4196					
Length =	94.8126					
Radius =	1,637.0000					
External =	0.6867					
Long Chord =	94.7994					
Mid. Ord. =	0.6864					
P.C. Station	232+46.67	N	13,827,761.5792	E	3,173,515.3914	
P.T. Station	233+41.48	N	13,827,778.4370	E	3,173,608.6798	
C.C.		N	13,829,380.2420	E	3,173,271.0561	
Back = N	81° 24′ 57.87" E					
Ahead = N	78° 05′ 51.32" E					
Chord Bear = N	79° 45′ 24.59" E					

Course from PT SH225PASA10 to PC SH225PASA11 N 78° 05′ 51.32" E Dist 267.5330

Curve Data

Curve SH225PASA11						
P.I. Station	236+59.32	N	13,827,843.9895	E	3,173,919.6836	
Delta =	4° 01′ 25.63"	(RT)				
Degree =	4° 00′ 03.97"					
Tangent =	50.3042					
Length =	100.5670					
Radius =	1,432.0000					
External =	0.8833					
Long Chord =	100.5463					
Mid. Ord. =	0.8827					
P.C. Station	236+09.01	N	13,827,833.6145	E	3,173,870.4609	
P.T. Station	237+09.58	N	13,827,850.8849	E	3,173,969.5129	
C.C.		N	13,826,432.4020	E	3,174,165.8043	
Back = N	78° 05′ 51.32" E					
Ahead = N	82° 07′ 16.95" E					
Chord Bear = N	80° 06′ 34.14" E					

Course from PT SH225PASA11 to SH228 N 82° 07′ 16.95" E Dist 1,656.0554

Point SH228 N 13,828,077.8887 E 3,175,609.9363 Sta 253+65.64

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Ending chain SH225FTGN description

STATE OF TEXAS
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HORIZONTAL ALIGNMENT DATA

SH 225

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		68

STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

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℄ WEST UTURN ALIGNMENT

Beginning chain WUTURN description

Point WU1 N 13,827,702.7687 E 3,174,407.0096 Sta 18+43.37

Course from WU1 to PC UC1 N 83° 08′ 11.74" E Dist 26.6935

			Curve Data			
Curve UC1						
P.I. Station		19+09.86	N	13,827,710.7146	E	3,174,473.0251
Delta	=	85° 34′ 16.81"	(LT)			
Degree	=	133° 14′ 45.60"				
Tangent	=	39.7985				
Length	=	64.2206				
Radius	=	43.0000				
External	=	15.5911				
Long Chord	=	58.4162				
Mid. Ord.	=	11.4423				
P.C. Station		18+70.06	N	13,827,705.9586	E	3,174,433.5118
P.T. Station		19+34.28	N	13,827,750.4772	E	3,174,471.3344
C.C.			N	13,827,748.6505	E	3,174,428.3732
Back	= N	83° 08′ 11.74" E				
Ahead	= N	2° 26′ 05.08" W				
Chord Bear	= N	40° 21′ 03.33" E				

Course from PT UC1 to PC UC2 N 2° 26′ 05.08" W Dist 113.9709

			Curve Data			
Curve UC2						
P.I. Station		20+92.25	N	13,827,908.2987	E	3,174,464.6238
Delta	=	95° 26′ 37.97"	(LT)			
Degree	=	143° 14′ 22.02"				
Tangent	=	43.9933				
Length	=	66.6324				
Radius	=	40.0000				
External	=	19.4593				
Long Chord	=	59.1911				
Mid. Ord.	=	13.0908				
P.C. Station		20+48.25	N	13,827,864.3451	E	3,174,466.4927
P.T. Station		21+14.89	N	13,827,902.2683	E	3,174,421.0458
C.C.			N	13,827,862.6459	E	3,174,426.5288
Back	= N	2° 26′ 05.08" W				
Ahead	= S	82° 07′ 16.95" W				
Chord Bear	= N	50° 09′ 24.06" W				

Ending chain WUTURN description

℄ EAST UTURN ALIGNMENT

Beginning chain EUTURN description

			Curve Data			
Curve UC3						
P.I. Station		19+17.75	N	13,827,714.1732	E	3,174,597.9910
Delta	=	94° 25′ 43.19"	(RT)			
Degree	=	116° 55′ 48.58"				
Tangent	=	52.9417				
Length	=	80.7565				
Radius	=	49.0000				
External	=	23.1376				
Long Chord	=	71.9222				
Mid. Ord.	=	15.7164				
P.C. Station		18+64.81	N	13,827,720.4999	E	3,174,650.5533
P.T. Station		19+45.57	N	13,827,767.0671	E	3,174,595.7419
C.C.			N	13,827,769.1487	E	3,174,644.6977
Back	= S	83° 08′ 11.74" W				
Ahead	= N	2° 26′ 05.08" W				
Chord Bear	= N	49° 38′ 56.67" W				

Course from PT UC3 to PC UC4 N 2° 26′ 05.08" W Dist 115.2115

			Curve Data			
Curve UC4						
P.I. Station		20+92.60	N	13,827,913.9690	E	3,174,589.4957
Delta	=	84° 33′ 22.03"	(RT)			
Degree	=	163° 42′ 08.02"				
Tangent	=	31.8231				
Length	=	51.6524				
Radius	=	35.0000				
External	=	12.3044				
Long Chord	=	47.0910				
Mid. Ord.	=	9.1039				
P.C. Station		20+60.78	N	13,827,882.1747	E	3,174,590.8475
P.T. Station		21+12.43	N	13,827,918.3312	E	3,174,621.0183
C.C.			N	13,827,883.6615	E	3,174,625.8160
Back	= N	2° 26′ 05.08" W				
Ahead	= N	82° 07′ 16.95" E				
Chord Bear	= N	39° 50′ 35.94" E				

Ending chain EUTURN description

℄ RICHEY ST ALIGNMENT

Beginning chain RICHEYST description

Point SH269 N 13,826,679.9410 E 3,168,634.4861 Sta 17+15.00

Course from SH269 to SH270 N 2° 37′ 28.32" W Dist 34.4323

Point SH270 N 13,826,714.3372 E 3,168,632.9094 Sta 17+49.43

Course from SH270 to SH271 N 1° 09′ 08.88" W Dist 111.4958

Point SH271 N 13,826,825.8105 E 3,168,630.6669 Sta 18+60.93

Course from SH271 to SH272 N 8° 22′ 56.87" W Dist 280.8061

Point SH272 N 13,827,103.6168 E 3,168,589.7309 Sta 21+41.73

Course from SH272 to SH273 N 2° 42′ 50.20" W Dist 148.2658

Point SH273 N 13,827,251.7162 E 3,168,582.7106 Sta 22+90.00

Ending chain RICHEYST description

℄ PASADENA BLVD ALIGNMENT

Beginning chain PASABLVD description

Point PT21 N 13,827,559.0273 E 3,174,542.0311 Sta 17+40.00

Course from PT21 to PT22 N 2° 26′ 05.08" W Dist 440.0000

Point PT22 N 13,827,998.6301 E 3,174,523.3392 Sta 21+80.00

Ending chain PASABLVD description

STATE OF TEXAS
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3/24/2021

HORIZONTAL ALIGNMENT DATA

SH 225

FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
6		69

STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

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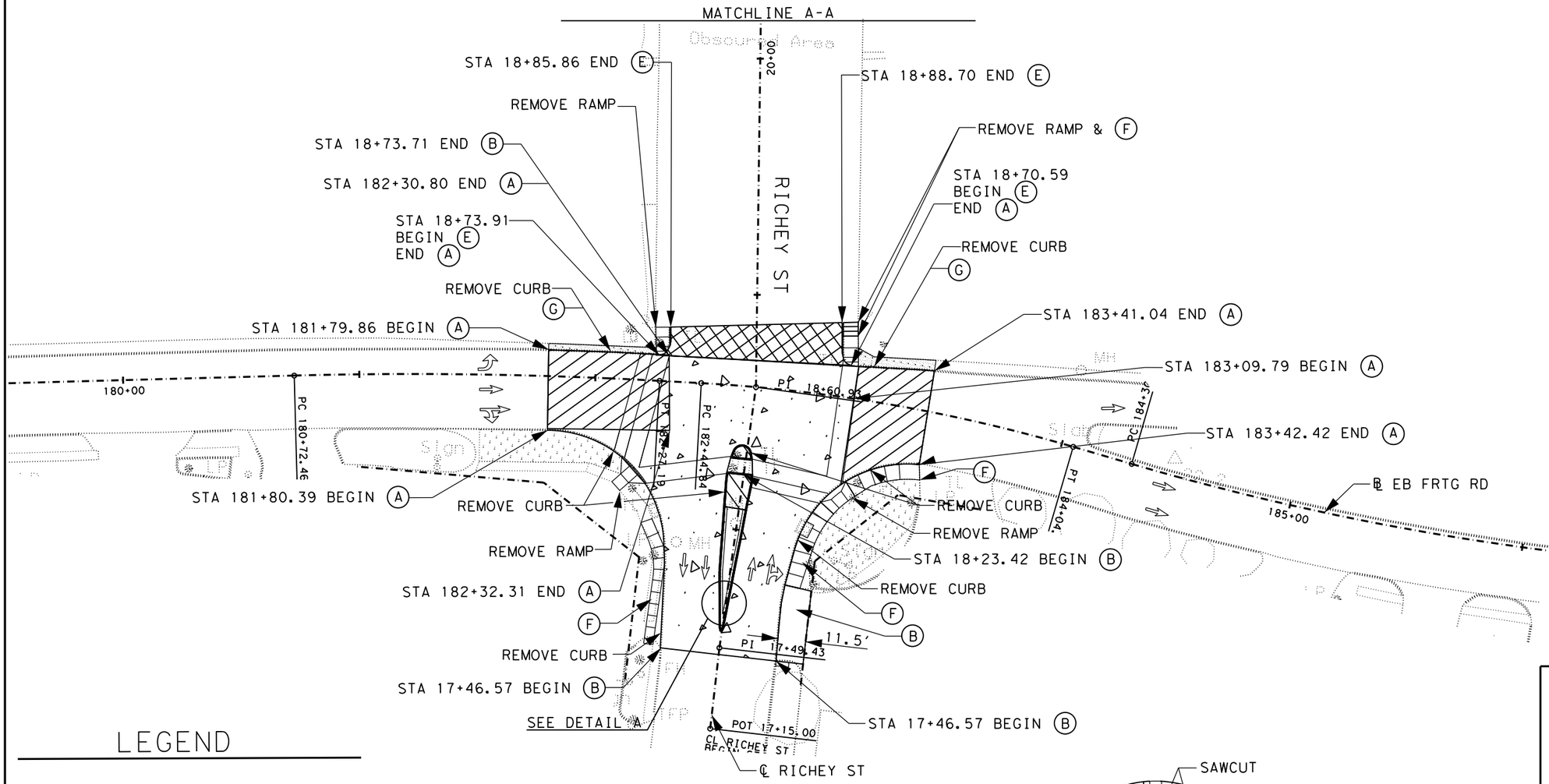
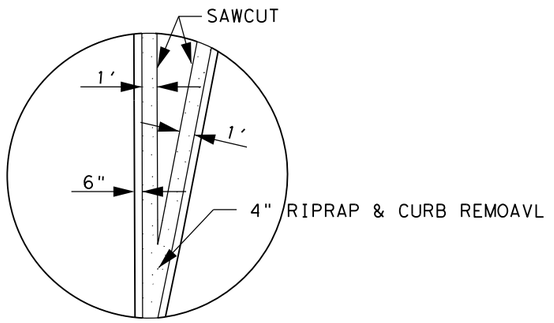


LEGEND

- (A) REMOVE 1.5" ACP & 8" JRCP, 6" CSB
- (B) REMOVE 8" JRCP & CSB OR 11" FAST TRACK
- (C) REMOVE 7" ASPH & STAB BASE
- (D) REMOVE 6" ASPH & STAB BASE
- (E) REMOVE APPROACH SLAB
- (F) REMOVE SIDEWALK
- (G) REMOVE RIPRAP

NOTES:

1. CURB REMOVAL IS INCIDENTAL TO ITEM 104-6001.
2. THE CONTRACTOR SHALL SECURE THE REBAR EXTENSION OF THE APPROACH SLAB AND THE ABUTMENT BACKWALL. SEE STANDARD BAS-C (SHEET 88) FOR ABUTMENT DETAILS.
3. REMOVAL OF BOTH 8" AND 11" CONCRETE WILL BE PAID UNDER ITEM 104 6001



DETAIL A (N.T.S)

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

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3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

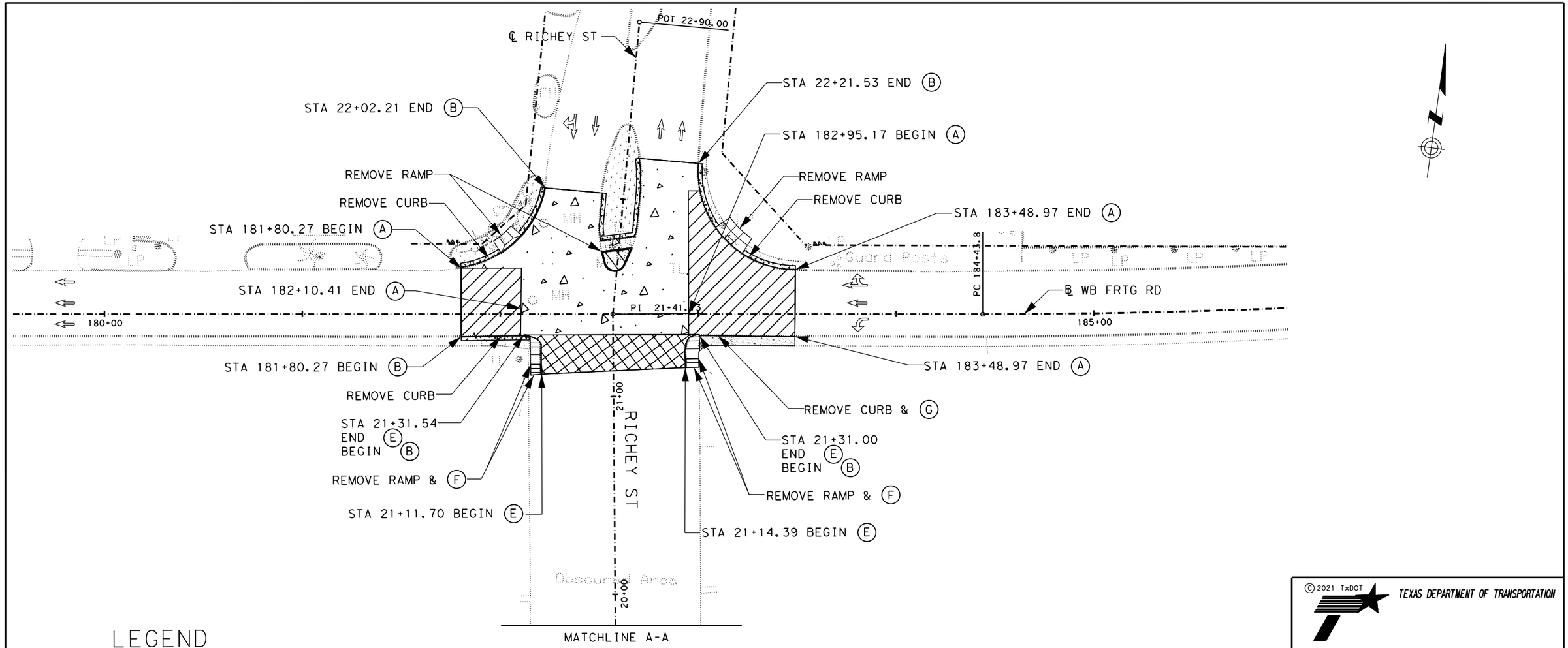
SH 225

EASTBOUND FRONTAGE ROAD & RICHEY ST

DEMO LAYOUT

SHEET NO. 1 OF 2 SCALE: 1" = 50'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			70
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- (A) REMOVE 1.5" ACP & 8" JRCP, 6" CSB
- (B) REMOVE 8" JRCP & CSB OR 11" FAST TRACK
- (C) REMOVE 7" ASPH & STAB BASE
- (D) REMOVE 6" ASPH & STAB BASE
- (E) REMOVE APPROACH SLAB
- (F) REMOVE SIDEWALK
- (G) REMOVE RIPRAP

NOTES:

1. CURB REMOVAL IS INCIDENTAL TO ITEM 104-6001.
2. THE CONTRACTOR SHALL SECURE THE REBAR EXTENSION OF THE APPROACH SLAB AND THE ABUTMENT BACKWALL.
3. REMOVAL OF BOTH 8" AND 11" CONCRETE WILL BE PAID UNDER ITEM 104 6001

STATE OF TEXAS
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3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

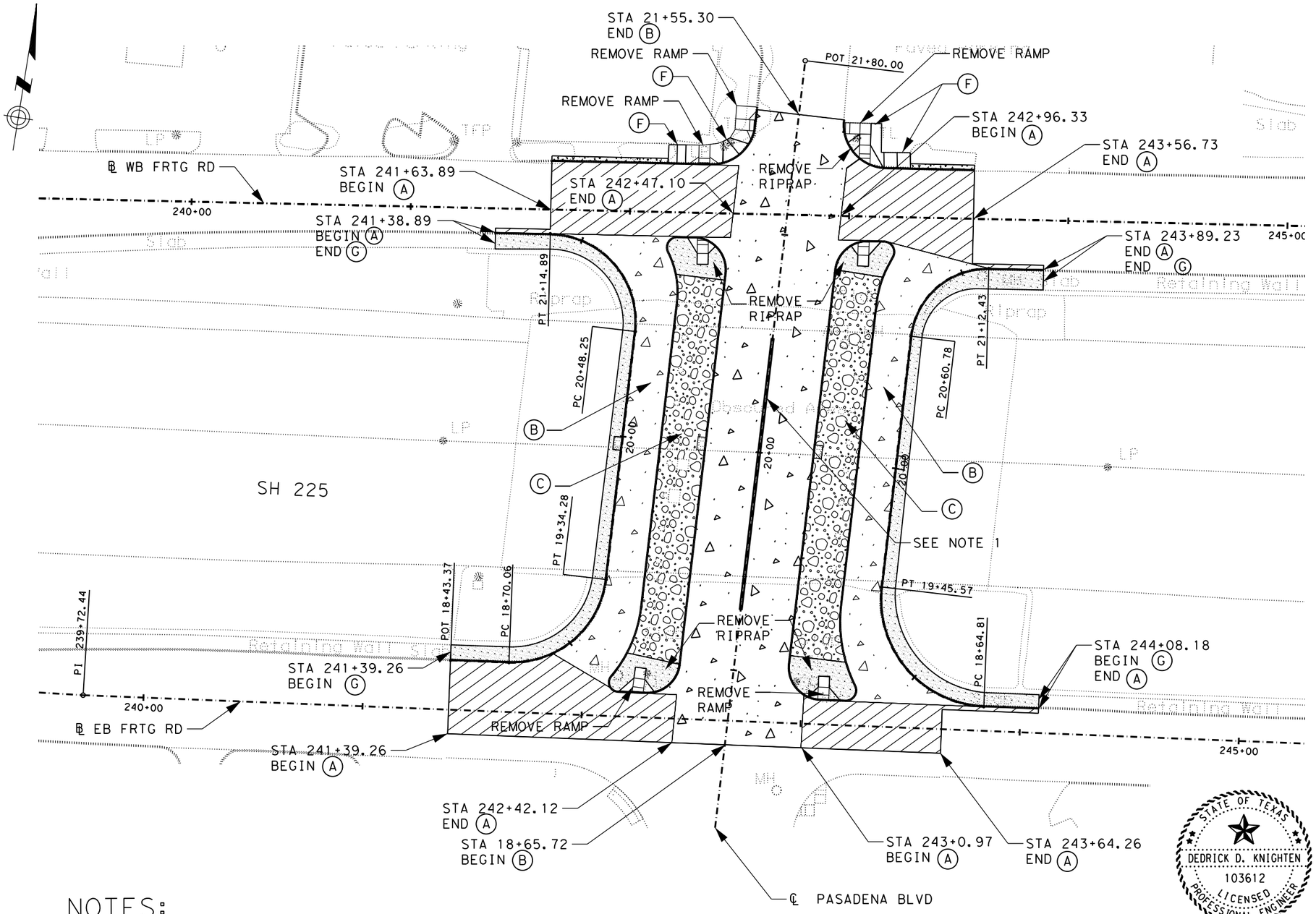
SH 225

WESTBOUND FRONTAGE ROAD & RICHEY ST

DEMO LAYOUT

SHEET NO. 2 OF 2 SCALE: 1" = 50'

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			71
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- (A) REMOVE 1.5" ACP & 8" JRCP, 6" CSB
- (B) REMOVE 8" JRCP & CSB OR 11" FAST TRACK
- (C) REMOVE 7" ASPH & STAB BASE
- (D) REMOVE 6" ASPH & STAB BASE
- (E) REMOVE APPROACH SLAB
- (F) REMOVE SIDEWALK
- (G) REMOVE RIPRAP

NOTES:

1. THE MEDIAN REMOVAL WILL BE CONSIDERED INCIDENTAL TO ITEM 104-6001
2. CURB REMOVAL IS INCIDENTAL TO ITEM 104-6001

STATE OF TEXAS
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Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

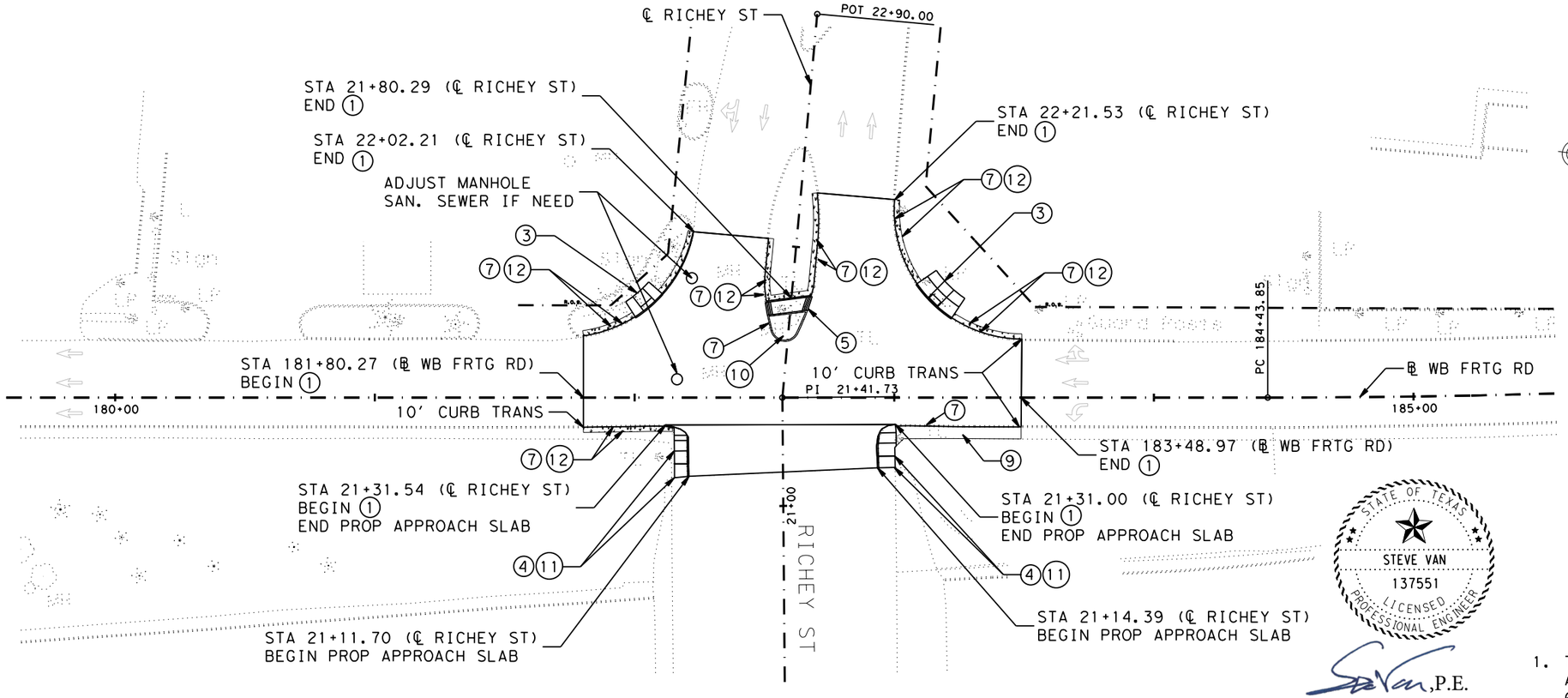
SH 225

FRONTAGE ROAD & PASADENA BLVD

DEMO LAYOUT

SHEET NO. 1 OF 1 SCALE: 1" = 50'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			72
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

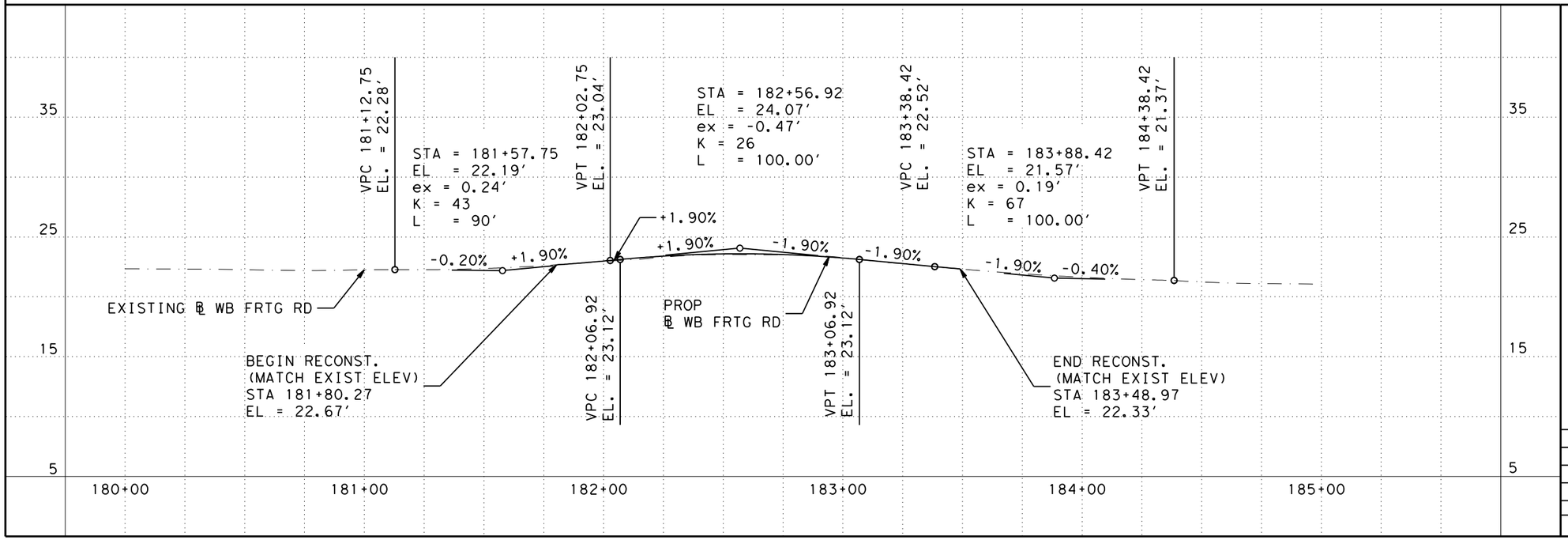
1. PROPOSED 14" FAST TRACK CON PAV
2. PROPOSED CURB RAMP TYP 1
3. PROPOSED CURB RAMP TYP 2
4. PROPOSED CURB RAMP TYP 10
5. PROPOSED CURB RAMP TYP 21
6. PROPOSED 6" MONO CURB TYP I
7. PROPOSED 6" MONO CURB TYP II
8. PROPOSED U-TURN CURB
9. PROPOSED 4" CONC RIPRAP
10. PROPOSED 6" CONC RIPRAP
11. PROPOSED 4" CONC SIDEWALK
12. PROPOSED BLOCK SOD
13. PROPOSED ASPH DRIVEWAY
14. PROPOSED LANDSCAPE PAVER
15. PROPOSED 6" DOWEL CURB

STATE OF TEXAS
STEVE VAN
137551
LICENSED
PROFESSIONAL ENGINEER

SVan, P.E.
03/24/2021

NOTE

1. TRANSITION CURB HEIGHT FROM EXISTING 4.5" AT ASPHALT OVERLAY SECTION TO STANDARD 6". TRANSITION WILL BE PAID FOR UNDER ITEM 529-6005, "CONC CURB (MONO)(TY II)."



TEXAS DEPARTMENT OF TRANSPORTATION

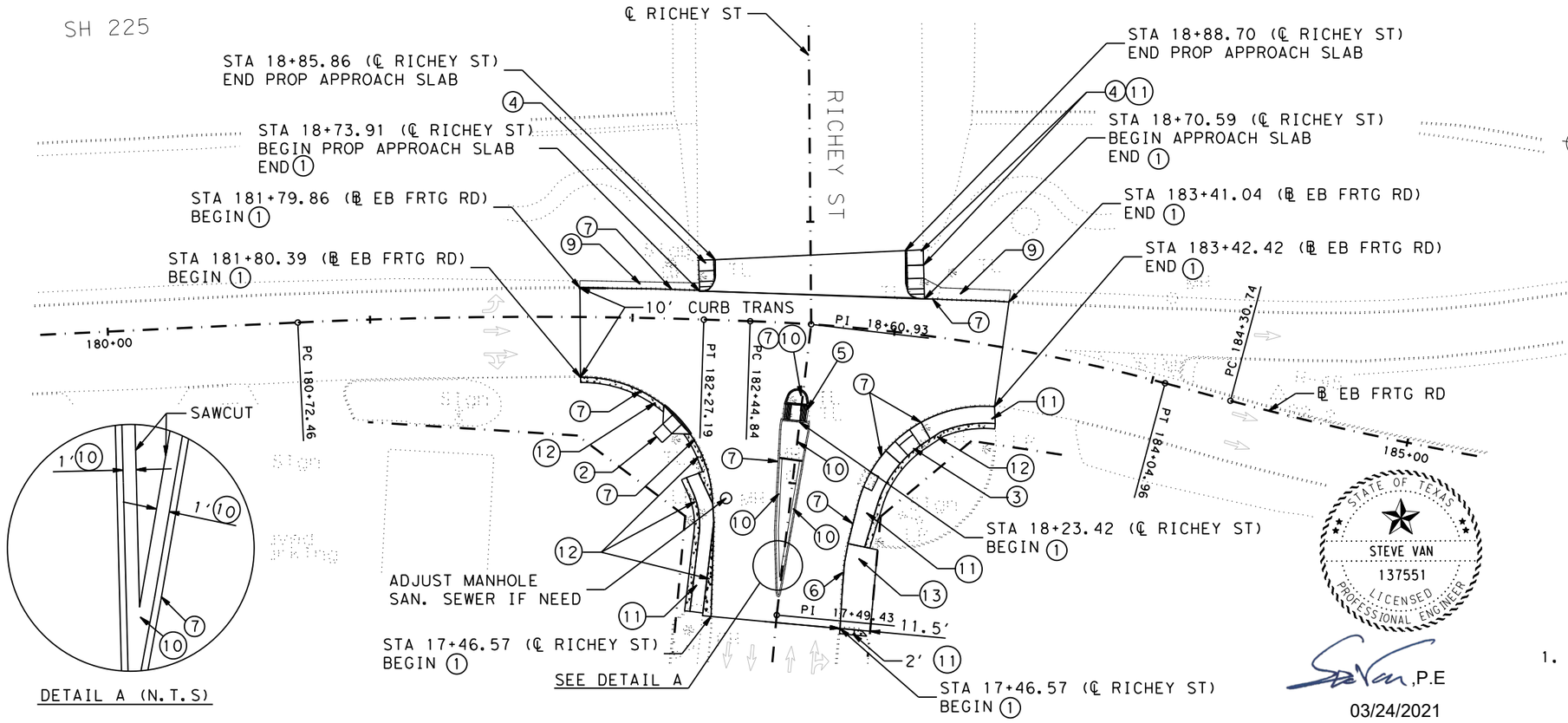
SH 225

WESTBOUND FRONTAGE ROAD & RICHEY ST

PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			73
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

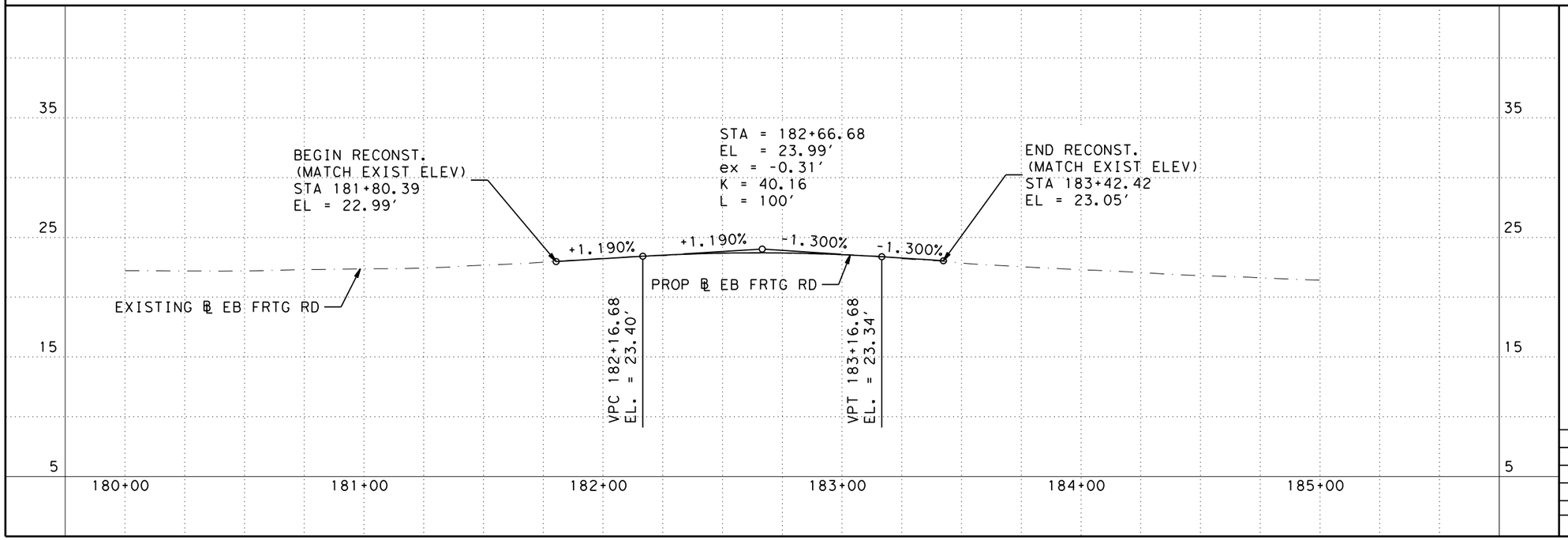
1. PROPOSED 14" FAST TRACK CON PAV
2. PROPOSED CURB RAMP TYP 1
3. PROPOSED CURB RAMP TYP 2
4. PROPOSED CURB RAMP TYP 10
5. PROPOSED CURB RAMP TYP 21
6. PROPOSED 6" MONO CURB TYP I
7. PROPOSED 6" MONO CURB TYP II
8. PROPOSED U-TURN CURB
9. PROPOSED 4" CONC RIPRAP
10. PROPOSED 6" CONC RIPRAP
11. PROPOSED 4" CONC SIDEWALK
12. PROPOSED BLOCK SOD
13. PROPOSED ASPH DRIVEWAY
14. PROPOSED LANDSCAPE PAVER
15. PROPOSED 6" DOWEL CURB

STATE OF TEXAS
STEVE VAN
137551
LICENSED
PROFESSIONAL ENGINEER

Steve Van, P.E
03/24/2021

NOTE

1. TRANSITION CURB HEIGHT FROM EXISTING 4.5" AT ASPHALT OVERLAY SECTION TO STANDARD 6". TRANSITION WILL BE PAID FOR UNDER ITEM 529-6005, "CONC CURB (MONO)(TY II)."



TEXAS DEPARTMENT OF TRANSPORTATION

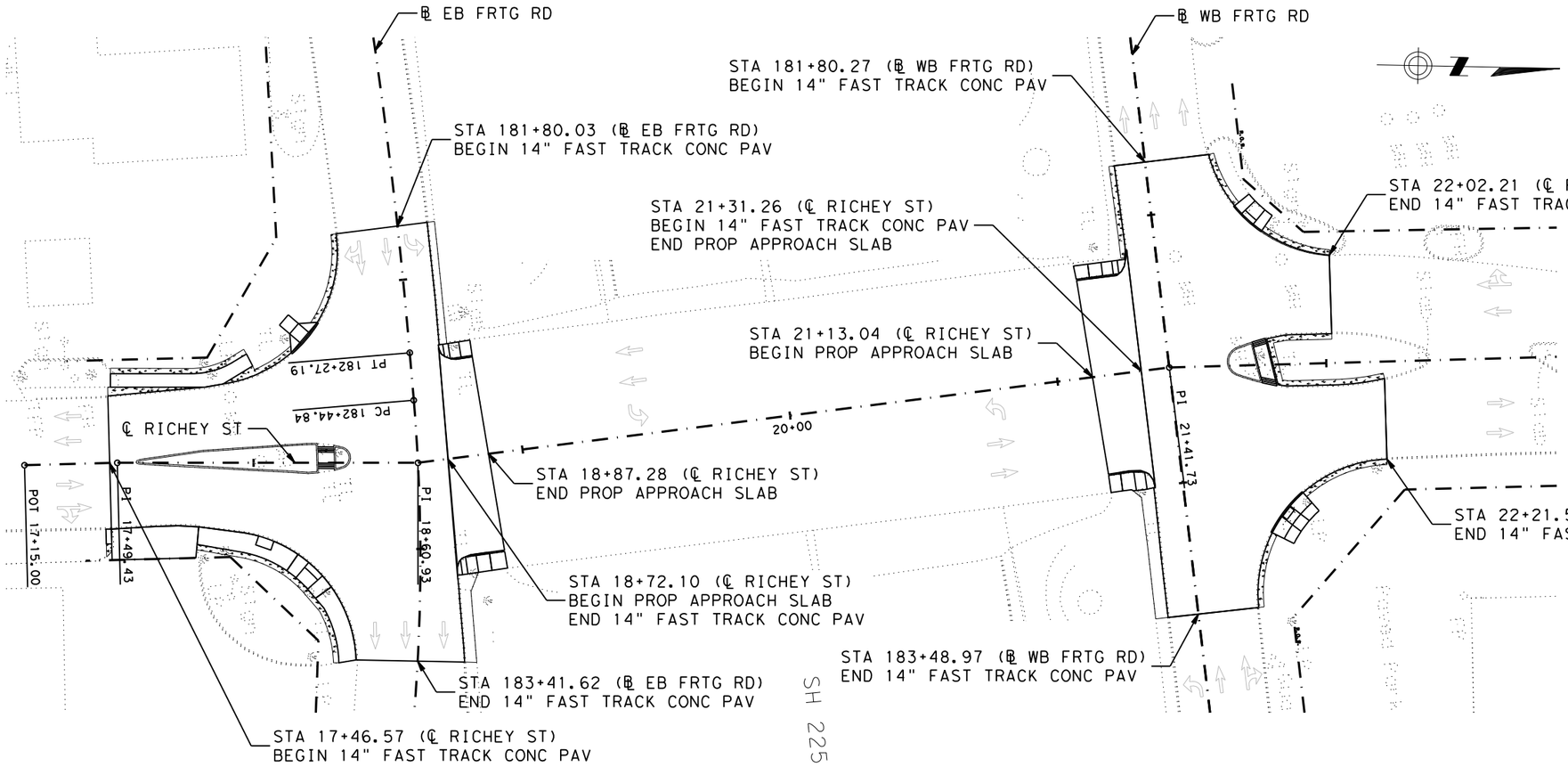
SH 225

EASTBOUND FRONTAGE ROAD & RICHEY ST

PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			74
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTE

1. SEE "WESTBOUND FRONTAGE ROAD & RICHEY ST PLAN & PROFILE" SHEET AND "EASTBOUND FRONTAGE ROAD & RICHEY ST PLAN & PROFILE" SHEET FOR MORE PROPOSED DETAILS

STATE OF TEXAS
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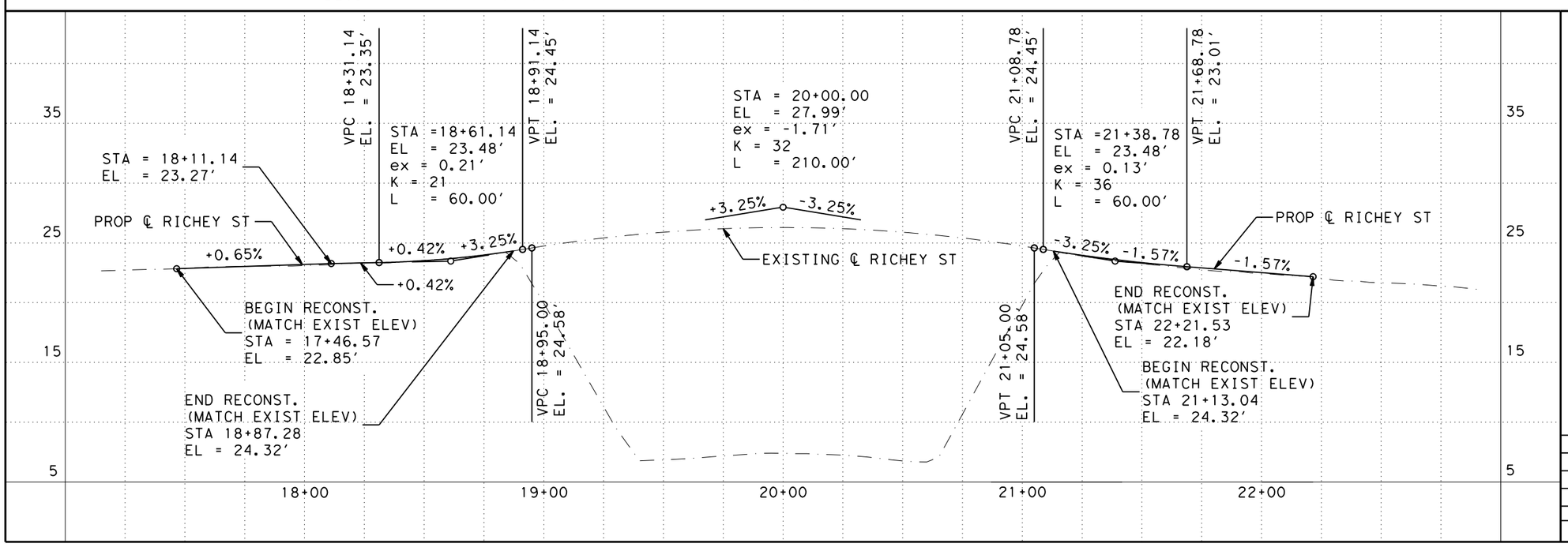
03/24/2021



TEXAS DEPARTMENT OF TRANSPORTATION

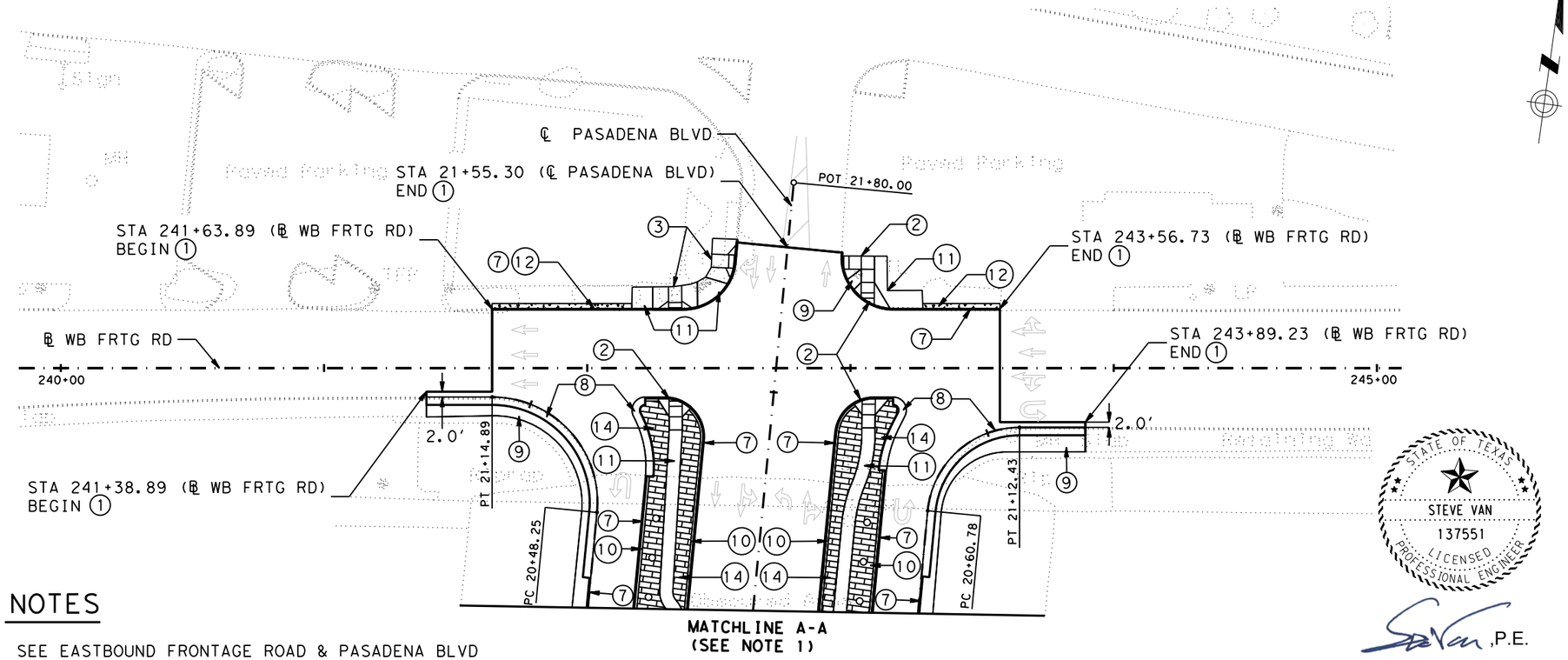
SH 225

RICHEY ST

PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			75
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

1. PROPOSED 14" FAST TRACK CON PAV
2. PROPOSED CURB RAMP TYP 1
3. PROPOSED CURB RAMP TYP 2
4. PROPOSED CURB RAMP TYP 10
5. PROPOSED CURB RAMP TYP 21
6. PROPOSED 6" MONO CURB TYP I
7. PROPOSED 6" MONO CURB TYP II
8. PROPOSED U-TURN CURB
9. PROPOSED 4" CONC RIPRAP
10. PROPOSED 6" CONC RIPRAP
11. PROPOSED 4" CONC SIDEWALK
12. PROPOSED BLOCK SOD
13. PROPOSED ASPH DRIVEWAY
14. PROPOSED LANDSCAPE PAVER
15. PROPOSED 6" DOWEL CURB

NOTES

1. SEE EASTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE SHEET FOR MORE PROPOSED DETAILS

STATE OF TEXAS
STEVE VAN
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,P.E.

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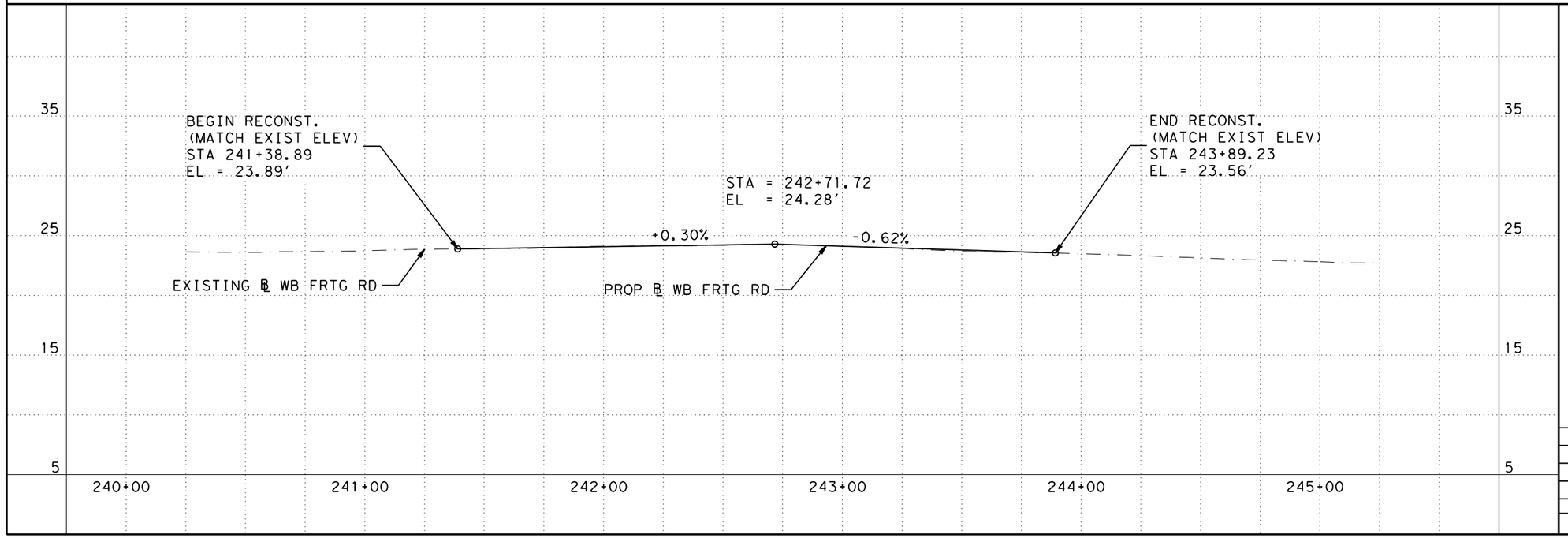


TEXAS DEPARTMENT OF TRANSPORTATION

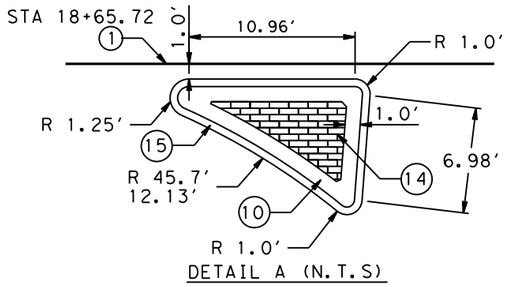
SH 225

WESTBOUND FRONTAGE ROAD & PASADENA BLVD

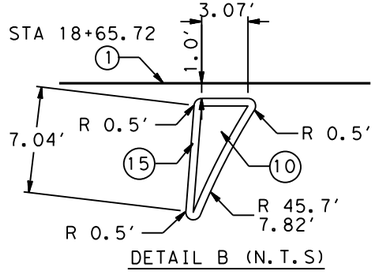
PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

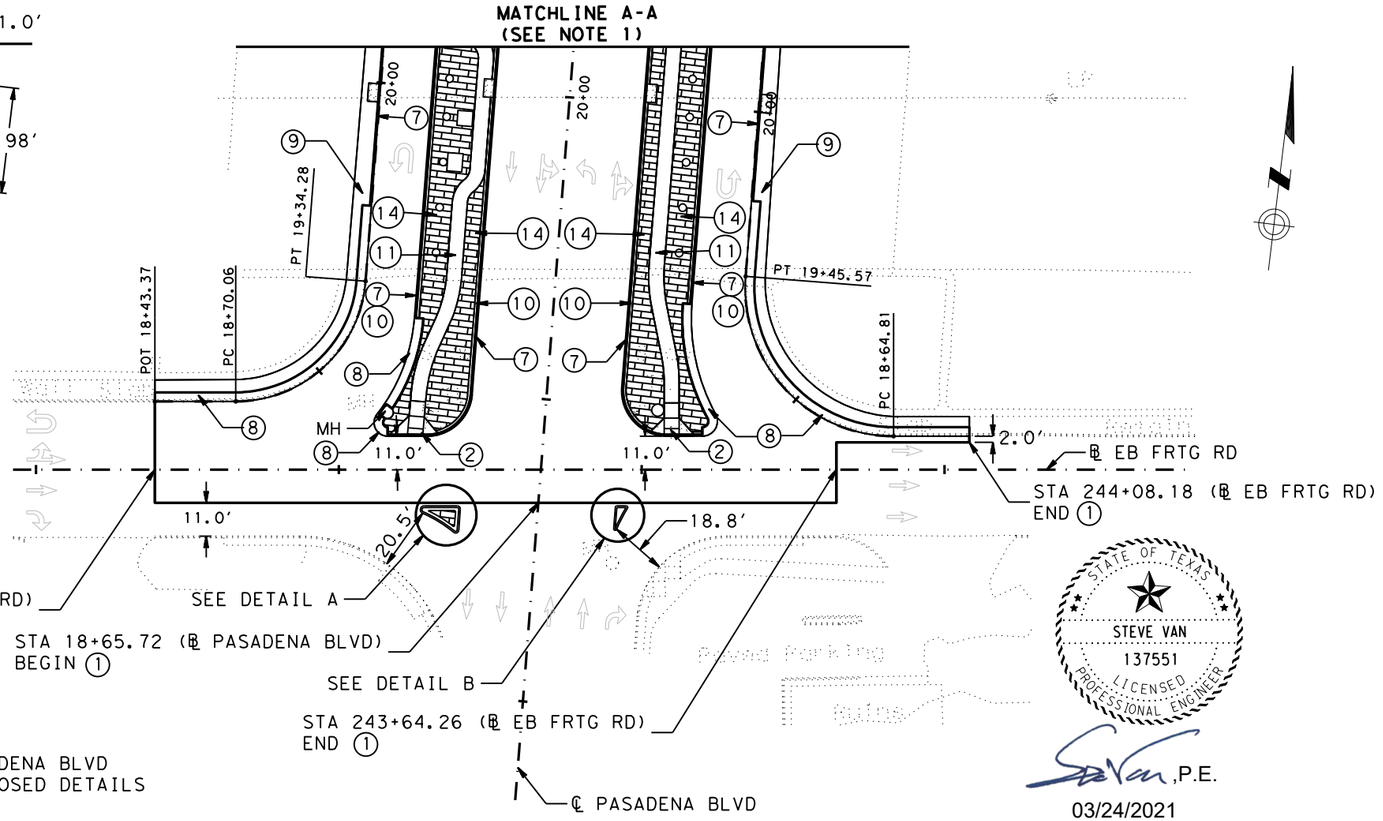
FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			76
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



DETAIL A (N.T.S)



DETAIL B (N.T.S)



LEGEND

1. PROPOSED 14" FAST TRACK CON PAV
2. PROPOSED CURB RAMP TYP 1
3. PROPOSED CURB RAMP TYP 2
4. PROPOSED CURB RAMP TYP 10
5. PROPOSED CURB RAMP TYP 21
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9. PROPOSED 4" CONC RIPRAP
10. PROPOSED 6" CONC RIPRAP
11. PROPOSED 4" CONC SIDEWALK
12. PROPOSED BLOCK SOD
13. PROPOSED ASPH DRIVEWAY
14. PROPOSED LANDSCAPE PAVER
15. PROPOSED 6" DOWEL CURB

NOTES

1. SEE WESTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE SHEET FOR MORE PROPOSED DETAILS

STATE OF TEXAS
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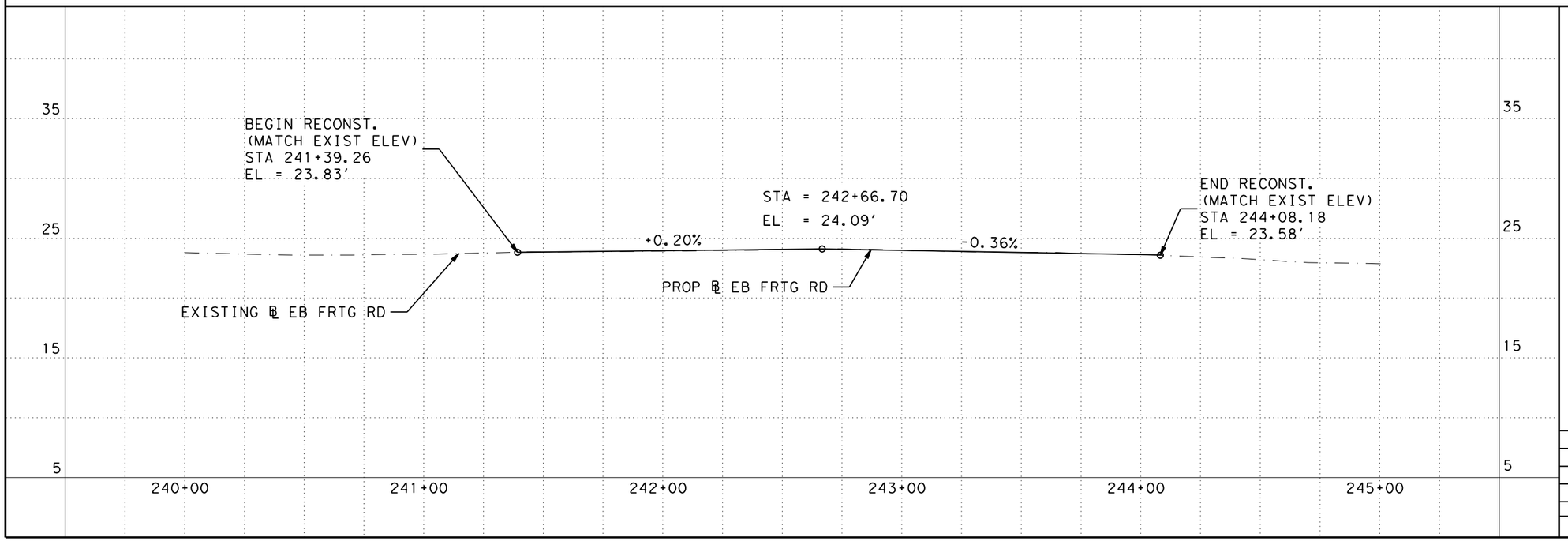
03/24/2021



TEXAS DEPARTMENT OF TRANSPORTATION

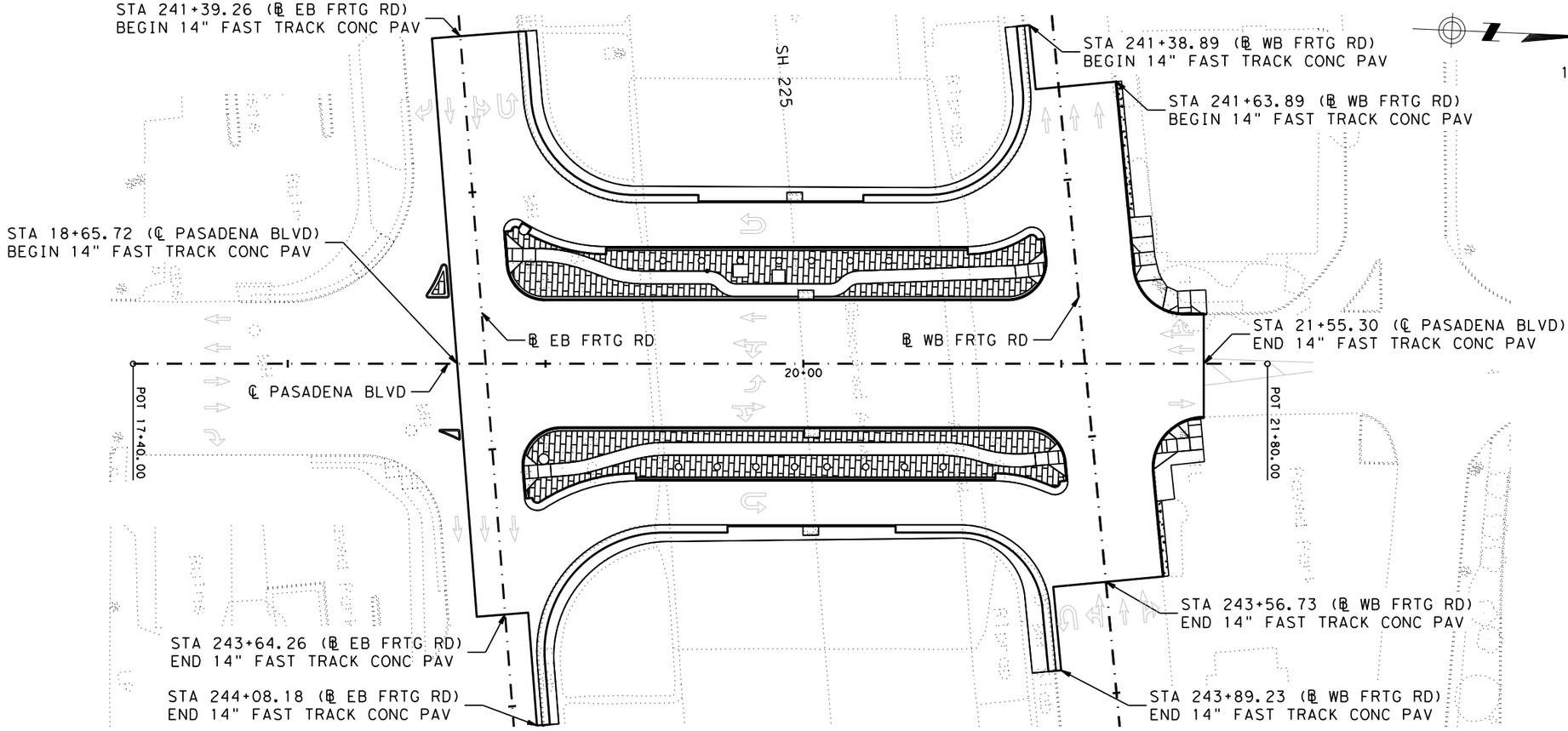
SH 225

EASTBOUND FRONTAGE ROAD & PASADENA BLVD

PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			77
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



NOTES

1. SEE "WESTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE" SHEET AND "EASTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE" SHEET FOR MORE PROPOSED DETAILS

STATE OF TEXAS
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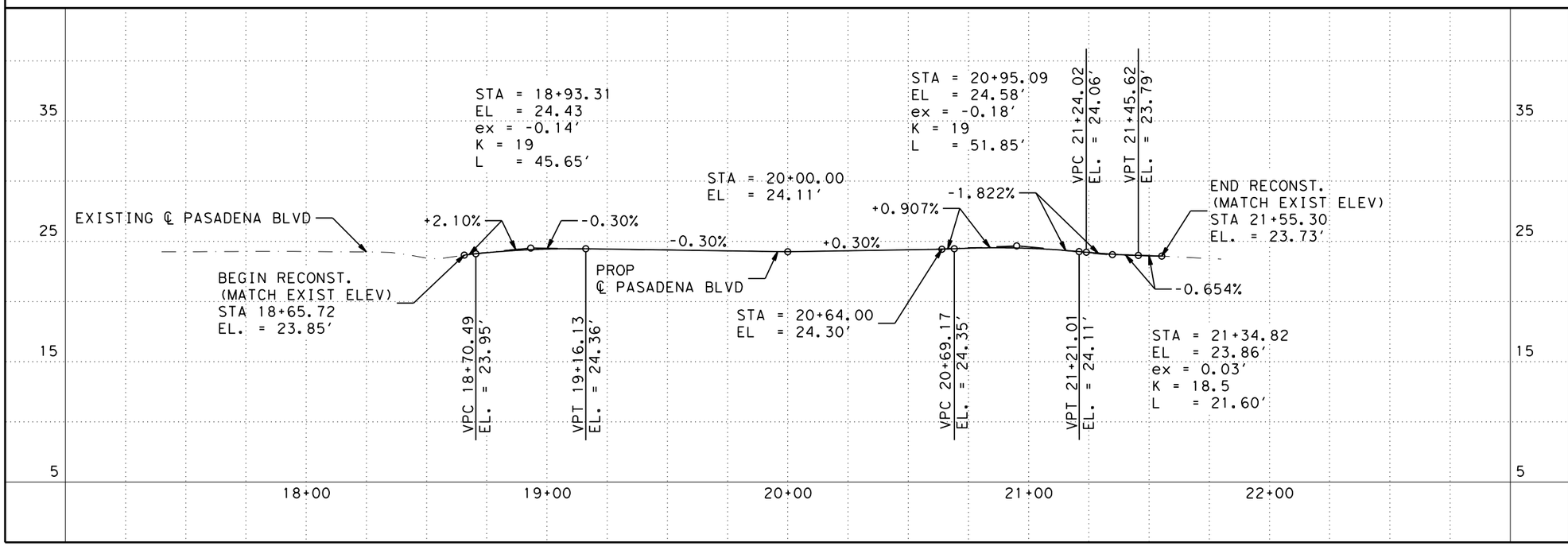


TEXAS DEPARTMENT OF TRANSPORTATION

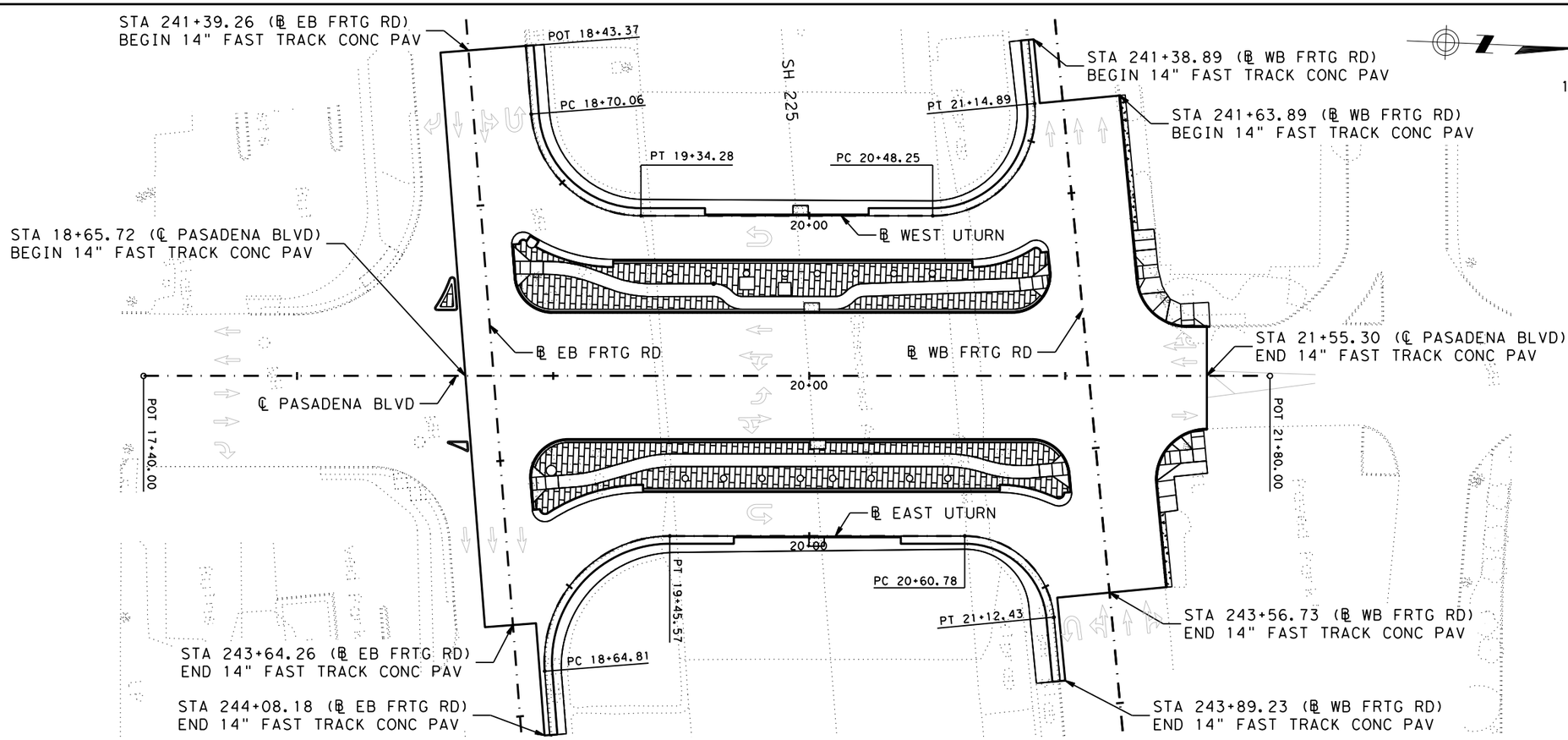
SH 225

PASADENA BLVD

PLAN & PROFILE

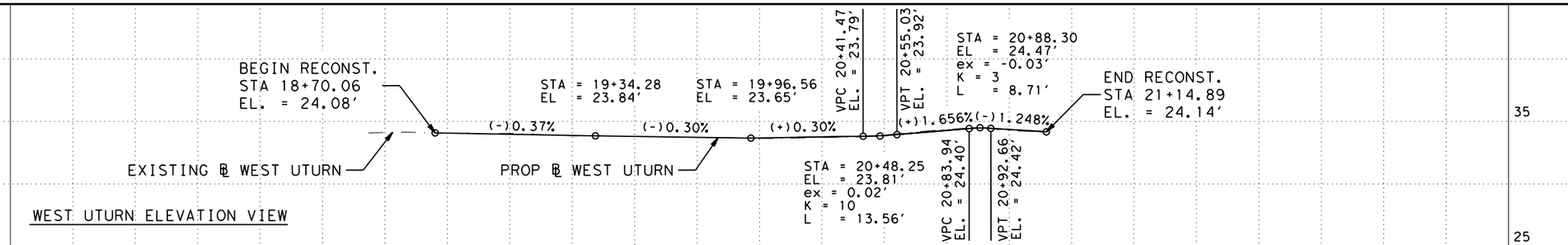
SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			78
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

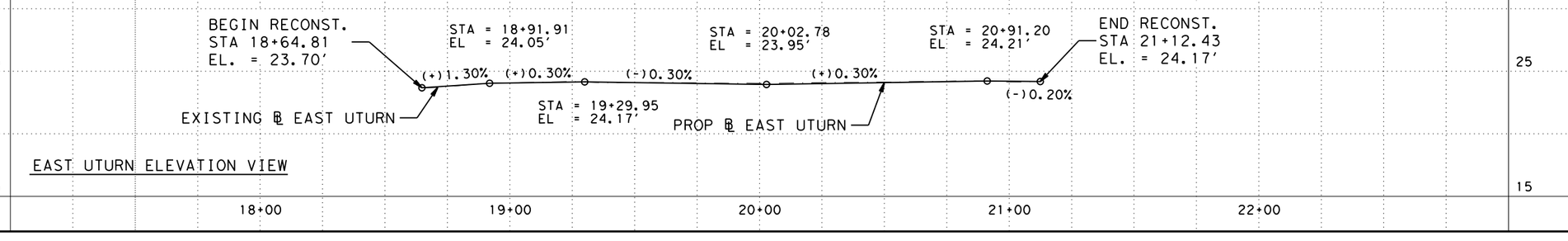


NOTES

1. SEE "WESTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE" SHEET AND "EASTBOUND FRONTAGE ROAD & PASADENA BLVD PLAN & PROFILE" SHEET FOR MORE PROPOSED DETAILS



WEST UTURN ELEVATION VIEW



EAST UTURN ELEVATION VIEW

STATE OF TEXAS
STEVE VAN
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Steve Van ,P.E.

03/24/2021

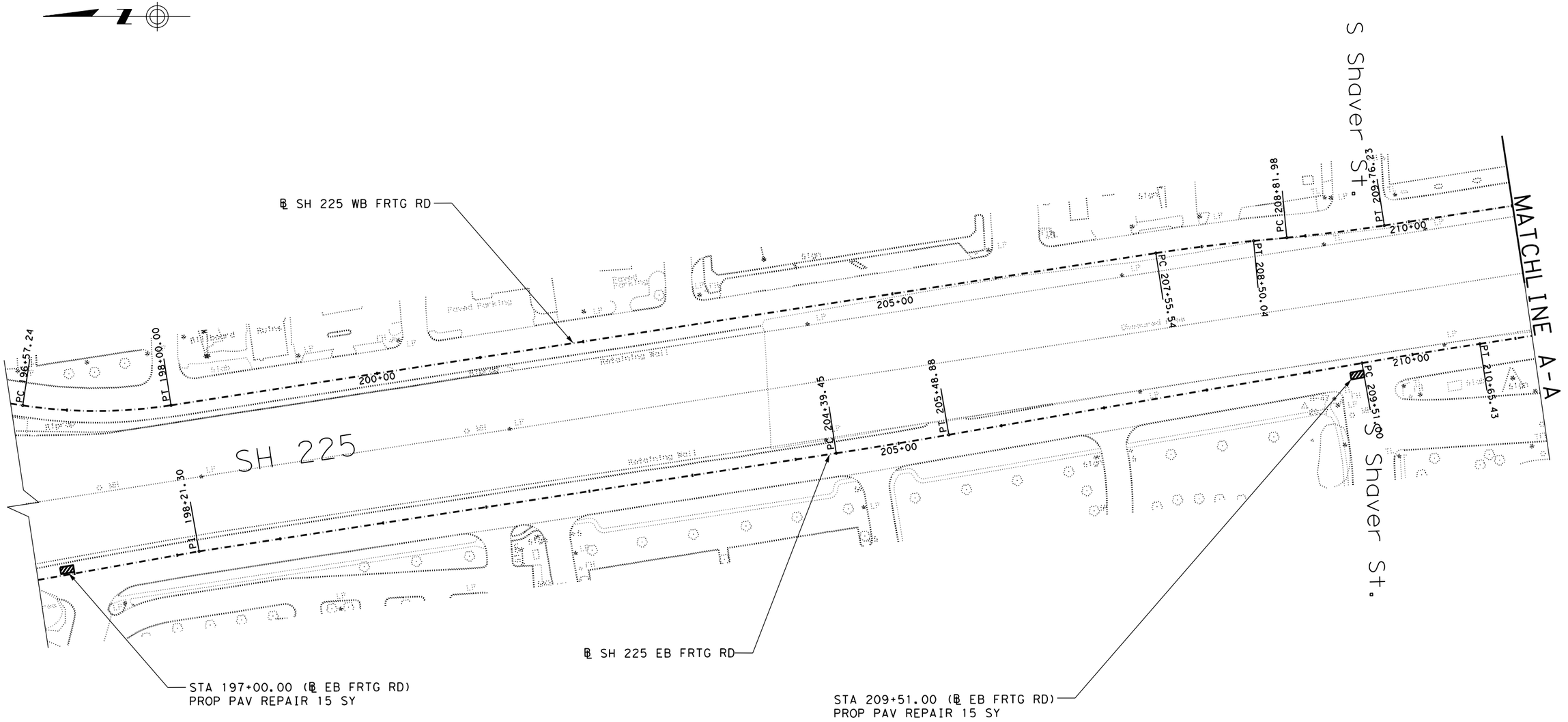
TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

U-TURN LANES AT PASADENA BLVD PLAN & PROFILE

SHEET NO. 1 OF 1
SCALE: H: 1" = 50'
V: 1" = 10'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			79
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0976011040

FILE: tcp01.DGN

LEGEND

PROPOSED PAVEMENT REPAIR (SEE NOTE 2)

NOTES

1. LOCATIONS AND SIZES OF FULL-DEPTH REPAIR SHOWN ARE APPROXIMATE AND MUST BE FIELD VERIFIED BY THE ENGINEER PRIOR TO WORK PERFORMED.
2. IN ORDER TO MATCH SURROUNDING ASPHALT OVERLAY 8" CONCRETE FULL-DEPTH REPAIR WILL ALSO INCLUDE A 1.5" ASPHALT OVERLAY USING TYPE-D SAC-A (PG 76-22) HOT MIX ASPHALT. ASPHALT OVERLAY WILL BE CONSIDERED INCIDENTAL TO ITEM 361-6002 AND WILL BE IN ACCORDANCE WITH ITEM 340 SPECIFICATIONS.
3. PERFORM LANE CLOSURES FOR FULL-DEPTH REPAIRS IN ACCORDANCE WITH TCP (2-4a) ON STANDARD TCP (2-4)-18.

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

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3/25/2021

Dedrick D. Knighten, P.E.

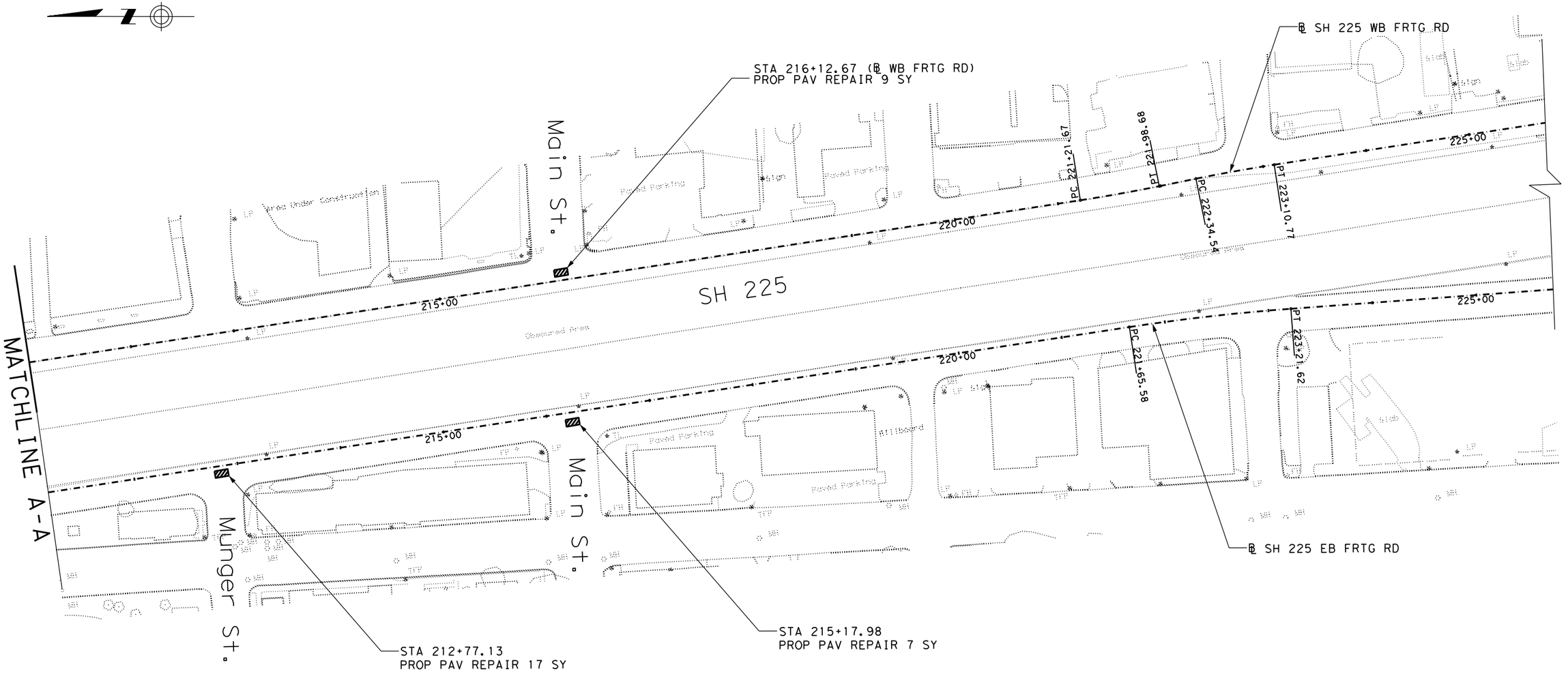
SH 225
FRONTAGE ROADS
PAVEMENT REPAIRS

SHEET 1 OF 2

Texas Department of Transportation

SCALE: 1"=200'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			80
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

PROPOSED PAVEMENT REPAIR (SEE NOTE 2)

NOTES

1. LOCATIONS AND SIZES OF FULL-DEPTH REPAIR SHOWN ARE APPROXIMATE AND MUST BE FIELD VERIFIED BY THE ENGINEER PRIOR TO WORK PERFORMED.

2. IN ORDER TO MATCH SURROUNDING ASPHALT OVERLAY 8" CONCRETE FULL-DEPTH REPAIR WILL ALSO INCLUDE A 1.5" ASPHALT OVERLAY USING TYPE-D SAC-A (PG 76-22) HOT MIX ASPHALT. ASPHALT OVERLAY WILL BE CONSIDERED INCIDENTAL TO ITEM 361-6002 AND WILL BE IN ACCORDANCE WITH ITEM 340 SPECIFICATIONS.

3. PERFORM LANE CLOSURES FOR FULL-DEPTH REPAIRS IN ACCORDANCE WITH TCP (2-4a) ON STANDARD TCP (2-4)-18.

LEVELS DISPLAYED
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

ACC: PROJECT/CSJ0976010 40

FILE: tcp01.DGN

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
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3/25/2021

Dedrick D. Knighten, P.E.

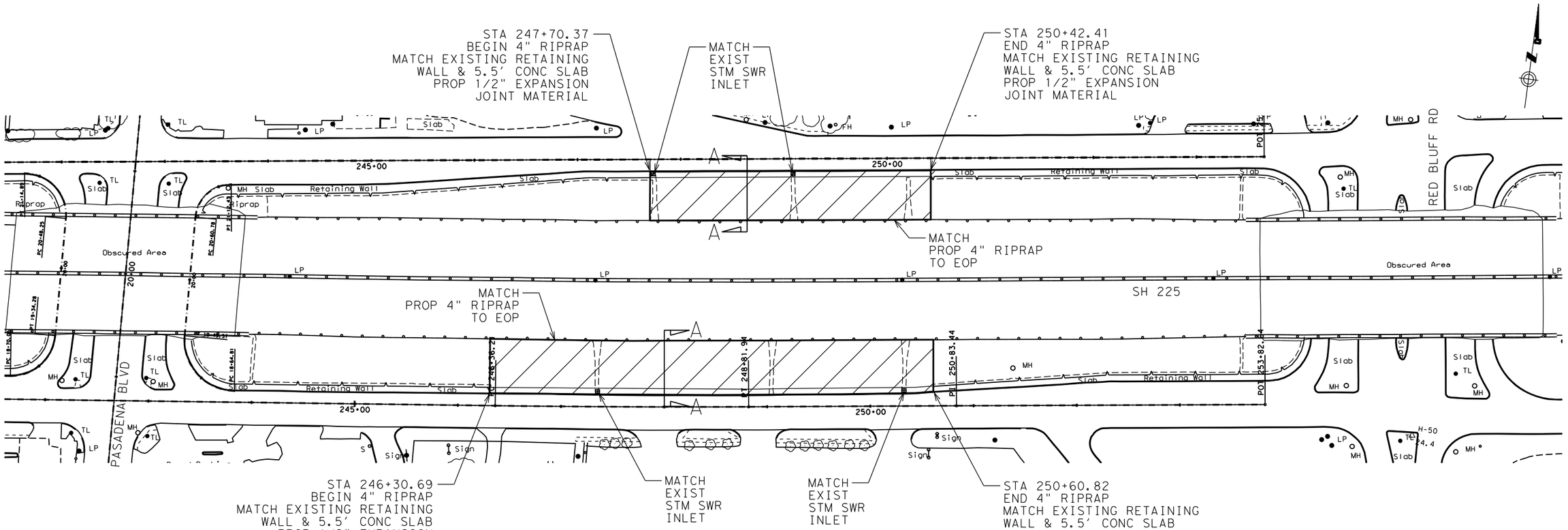
SH 225
FRONTAGE ROADS
PAVEMENT REPAIRS

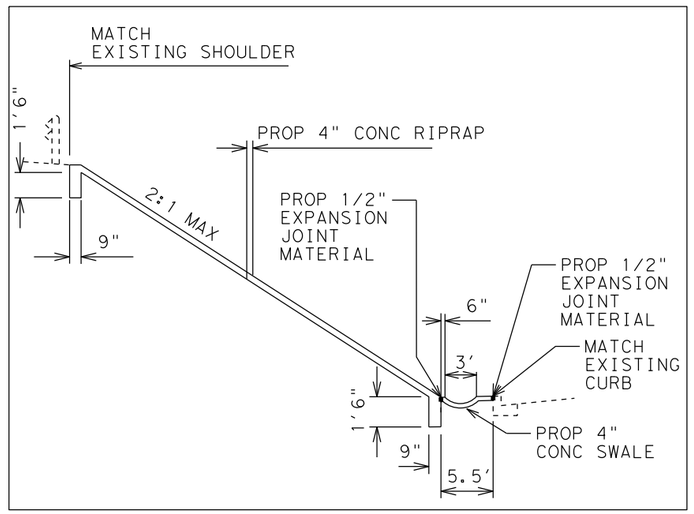
SHEET 2 OF 2

Texas Department of Transportation

SCALE: 1"=200'

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			81
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





SECTION A-A
NTS

NOTES:

① INSTALL BLOCKOUT AROUND EXISTING FOUNDATION WITH 6" CLEARANCE ON EACH SIDE TO BE FILLED WITH ACP. WORK AND MATERIAL SHALL BE SUBSIDIARY TO RIPRAP 432-6004.

② CONTRACTOR SHALL REFER TO CONSTRUCTION STANDARD "CONCRETE RIPRAP AND SHOULDER DRAINS CRR" FOR CONSTRUCTION DETAILS.

③ FOR SINGLE FREEWAY MAINLANE CLOSURE, USE "TCP FREEWAY LANE CLOSURES" TCP(6-1)-12. FOR SINGLE FRONTAGE LANE CLOSURE, USE "TCP LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS" TCP(2-4)-18.

④ MATCH FLOWLINE OF EXISTING SWALE.

STATE OF TEXAS
BRETT H. MCLEOD
98313
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by
BRETT H. MCLEOD, P.E. 98313

March 26, 2021

_____, P.E.

LEGEND

PROP 4" CONCRETE RIPRAP
ITEM 432-2001

SCALE: 1"=100'

SH 225

SLOPE PAVING PLAN LAYOUT

SHEET 1 OF 1

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			82
STATE	DIST.	COUNTY	
TEXAS	HOU	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

DATE:
FILE:

TABLE NO. 1 LONGITUDINAL STEEL

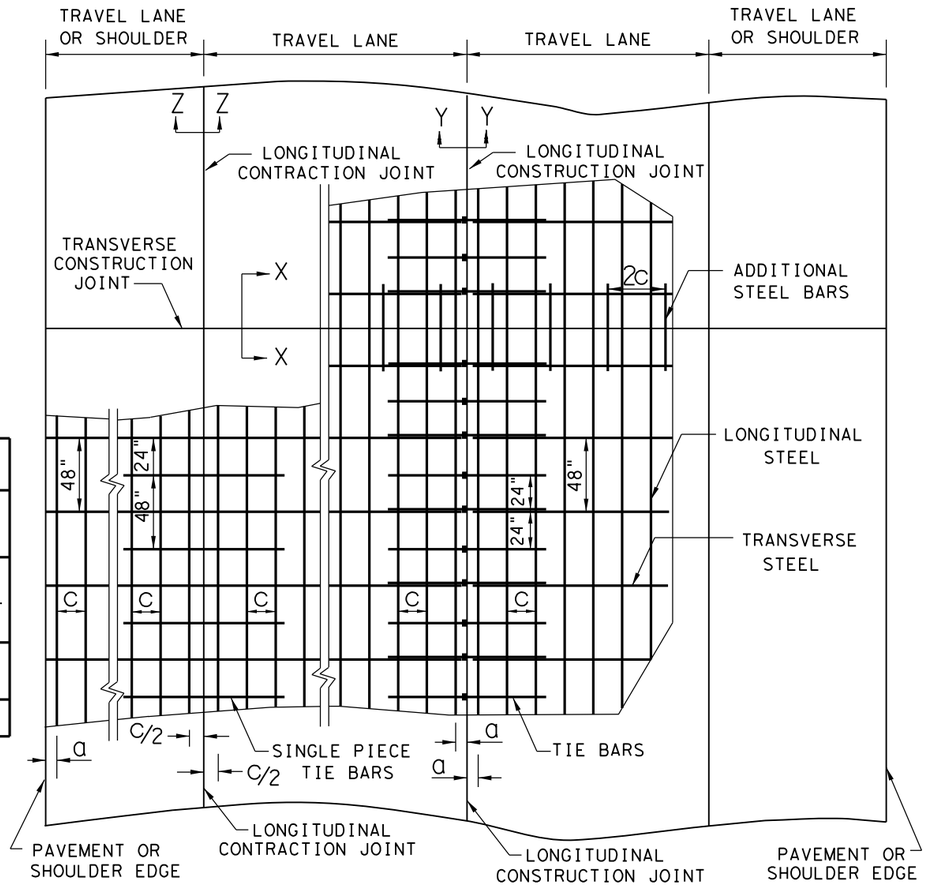
SLAB THICKNESS AND BAR SIZE		FOR BOTH STEEL MATS		FOR TOP STEEL MAT ONLY	
		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING c (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
14	#6	9.5	3 TO 4	19	50
15	#6	8.5	3 TO 4	17	50

TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS

SLAB THICKNESS T (IN.)	FOR BOTH STEEL MATS		FOR LOWER STEEL MAT ONLY		FOR BOTH STEEL MATS	
	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
14 - 15	#5	48	#6	48	#6	24

TABLE NO. 3
TWO LAYER STEEL PLACEMENT
HEIGHT OF STEEL MATS

SLAB THICKNESS T (IN.)	LOWER STEEL MAT HEIGHT T1 (IN.)	TOP STEEL MAT HEIGHT T2 (IN.)
14	4.5	8.0
15	5.0	8.5

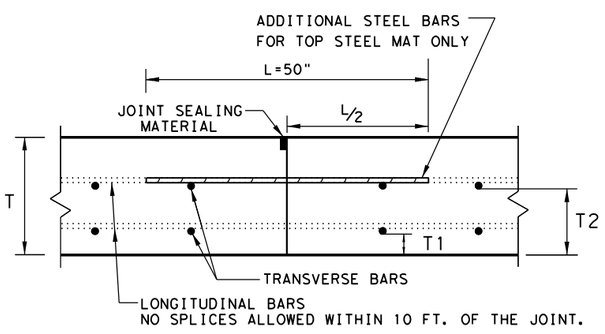


TYPICAL PAVEMENT LAYOUT

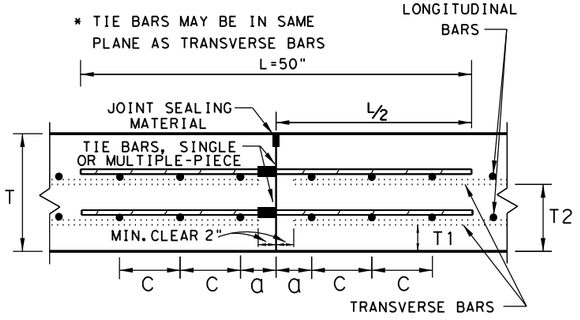
PLAN VIEW (NOT TO SCALE)

GENERAL NOTES

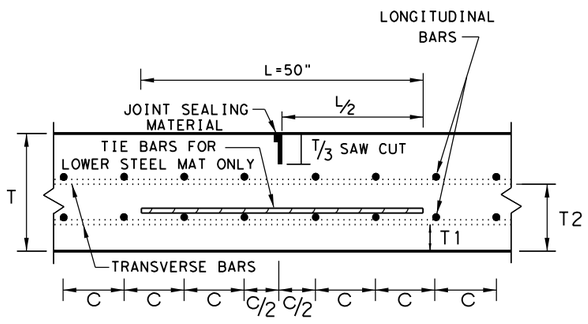
1. DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
2. USE COARSE AGGREGATES WITH A RATED COEFFICIENT OF THERMAL EXPANSION (CoTE) OF NOT MORE THAN 5.5 X 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 ANS SPACINGS SHALL CONFORM TO TABLE NO. 1, TABLE NO. 2 AND TABLE NO. 3.
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."



TRANSVERSE CONSTRUCTION JOINT
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z - Z

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

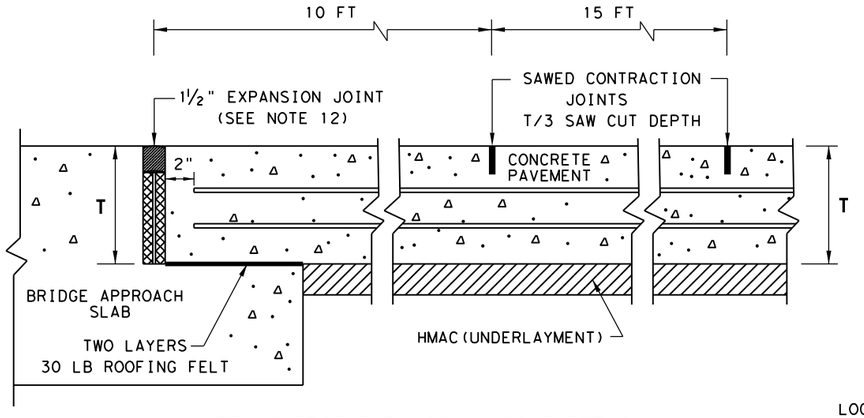
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

TWO LAYER STEEL BAR PLACEMENT T - 14 & 15 INCHES

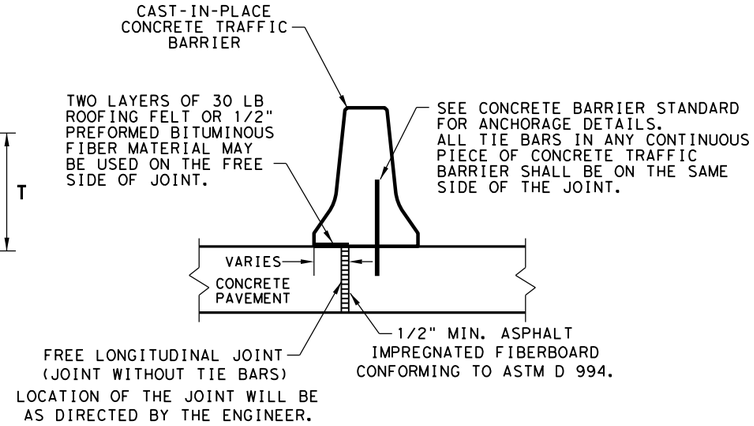
CRCP(2)-20

FILE: crcp220.dgn	DN: TxDOT	CK: KM	DW: AN	CK: VP
© TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 10/10/2011 ADD GN #12 04/09/2013 REMOVE 6" AND 6.5" ADD CTE REQUIREMENTS 04/19/2017 CoTE AS RATED 4.3	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		83

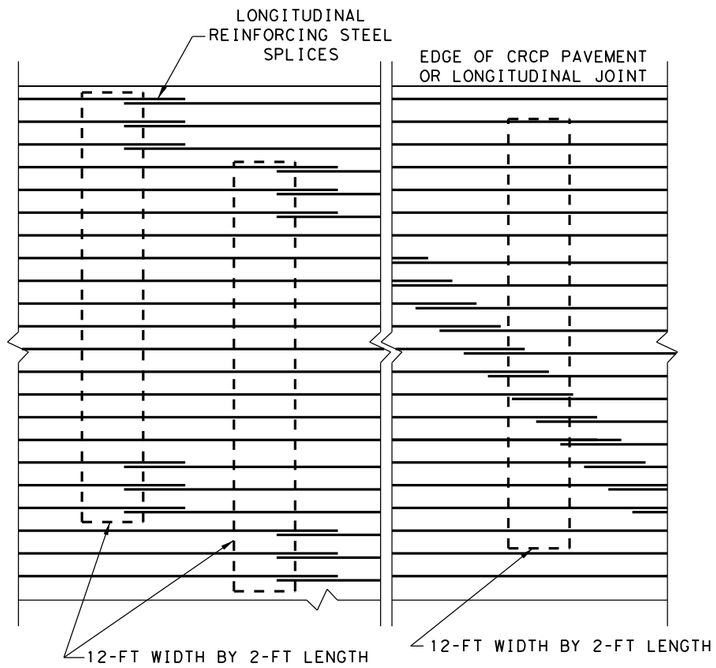
DATE:
FILE:



TRANSVERSE EXPANSION JOINT DETAIL
AT BRIDGE APPROACH

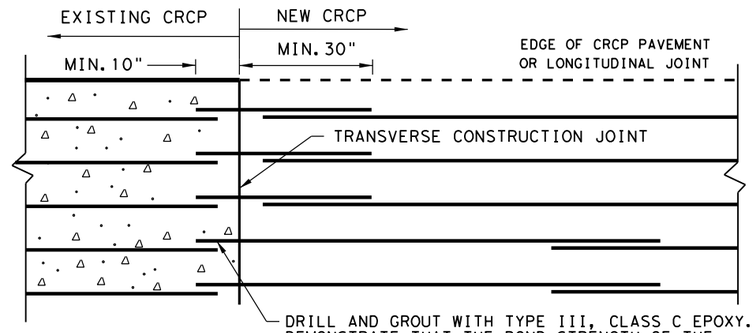


FREE LONGITUDINAL JOINT DETAIL

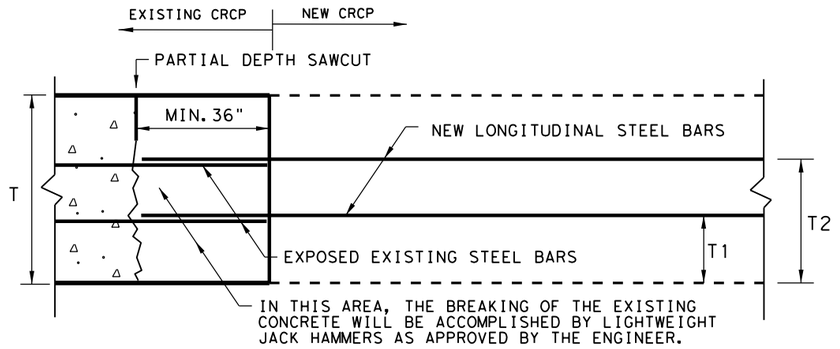


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)

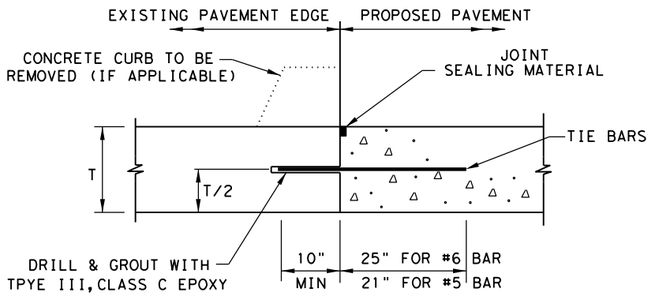


OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)



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 REQURIMENTS 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

Texas Department of Transportation

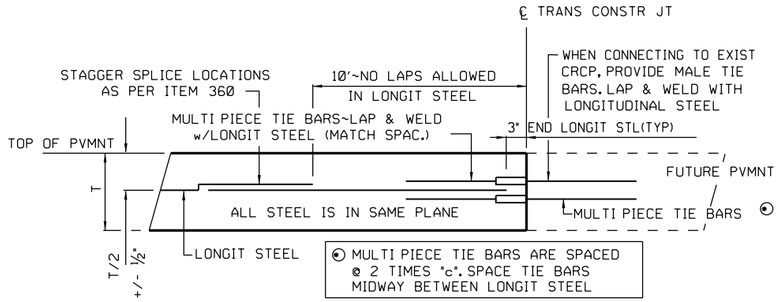
Design Division Standard

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

TWO LAYER STEEL BAR PLACEMENT T - 14 & 15 INCHES

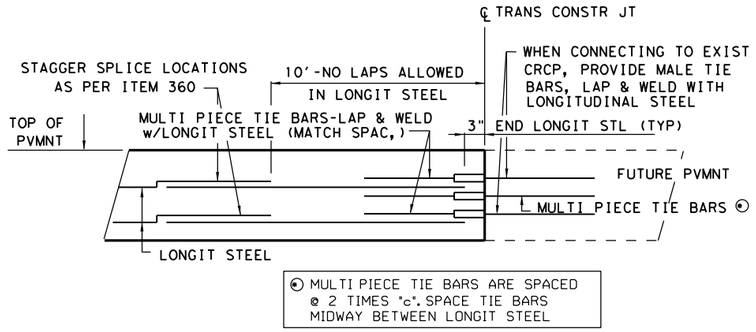
CRCP(2)-20

FILE: crcp220.dgn	DN: TxDOT	CK:KM	DW: AN	CK:VP	
	CONT	SECT	JOB	HIGHWAY	
REVISIONS 03/16/2020 REMOVED TABLE 1A	0502	01	222	SH 225	
	DIST	COUNTY		SHEET NO.	
	HOU	HARRIS		84	



SECTION - SINGLE STEEL MAT

AT END OF PROJECT OR TEMPORARY END OF PAVEMENT



SECTION - DOUBLE STEEL MAT

AT END OF PROJECT OR TEMPORARY END OF PAVEMENT

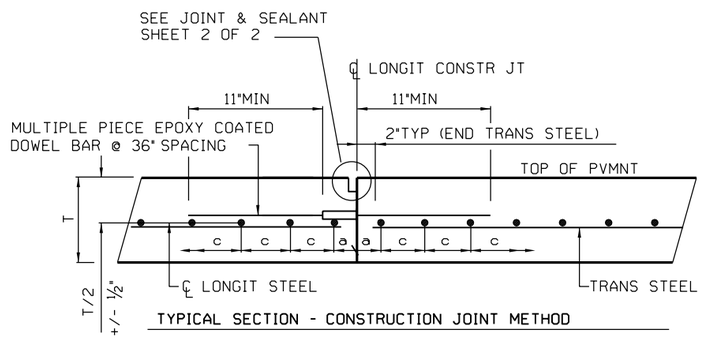
GENERAL NOTES

1. DETAILS FOR 7.0 IN. TO 13.0 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(1)-17. DETAILS FOR 14 IN. TO 15 IN. THICK CONCRETE PAVEMENT ARE SHOWN ON STANDARD CRCP(2)-17.
2. DOWELS AND TIE BARS - DOWELS ARE ONE INCH MINIMUM DIAMETER. ENSURE DOWELS ARE FREE OF GREASE AND ARE EPOXY COATED. DO NOT SHEAR CUT DOWELS DURING FABRICATION. PROVIDE TIE BARS PER ITEM 360. FURNISH MULTI PIECE TIE BARS AND DOWELS WITH STOP COUPLINGS AND WITH THREADS ON THE BARS.
3. USE CHAIRS OF SUFFICIENT STRUCTURAL QUALITY AND NUMBER TO SUPPORT THE MAT TO THE VERTICAL TOLERANCES. CHAIRS WILL BE APPROVED BY THE ENGINEER AND DO NOT REQUIRE GALVANIZING.
4. MECHANICALLY PLACING REINFORCING STEEL IS NOT ALLOWED. NO BARS, DOWELS OR TIE BARS MAY BE VIBRATED INTO POSITION.
5. WHERE DIFFERENT THICKNESS PAVEMENTS MEET, TRANSITION THE THINNER SECTION TO THE THICKER SECTION OVER A DISTANCE OF 20 FT. PLACE REINFORCING STEEL WITHIN THE TRANSITION THE SAME AS IN THE THICKER PAVEMENT.
6. PERFORM WELDING PER ITEM 448. FURNISH WELDABLE REBAR PER ITEM 440.

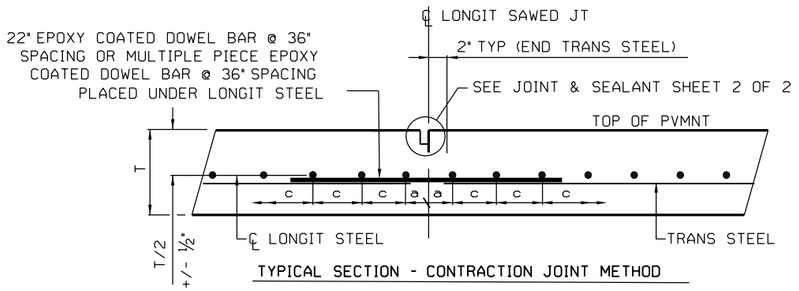
LONGITUDINAL DOWEL JOINT DETAILS

LOCATE WHERE SHOWN IN THE PLANS OR AS APPROVED. CONTRACTOR MAY USE EITHER METHOD

SINGLE STEEL MAT

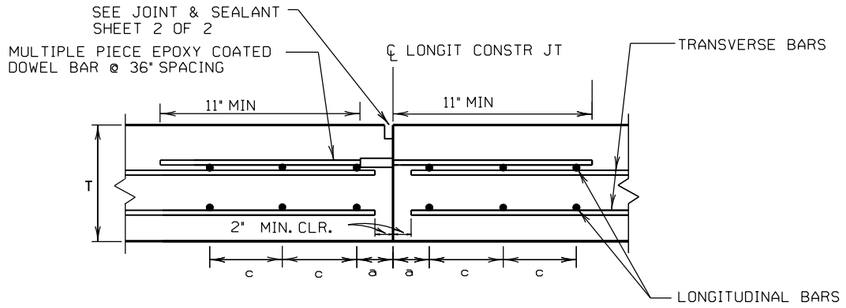


TYPICAL SECTION - CONSTRUCTION JOINT METHOD

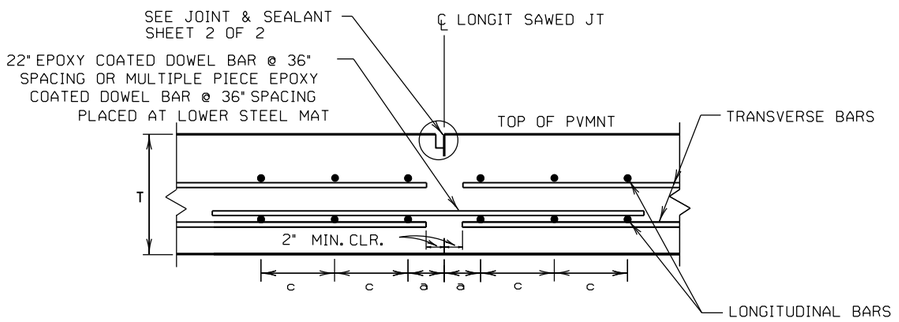


TYPICAL SECTION - CONTRACTION JOINT METHOD

DOUBLE STEEL MAT



TYPICAL SECTION - CONSTRUCTION JOINT METHOD



TYPICAL SECTION - CONTRACTION JOINT METHOD

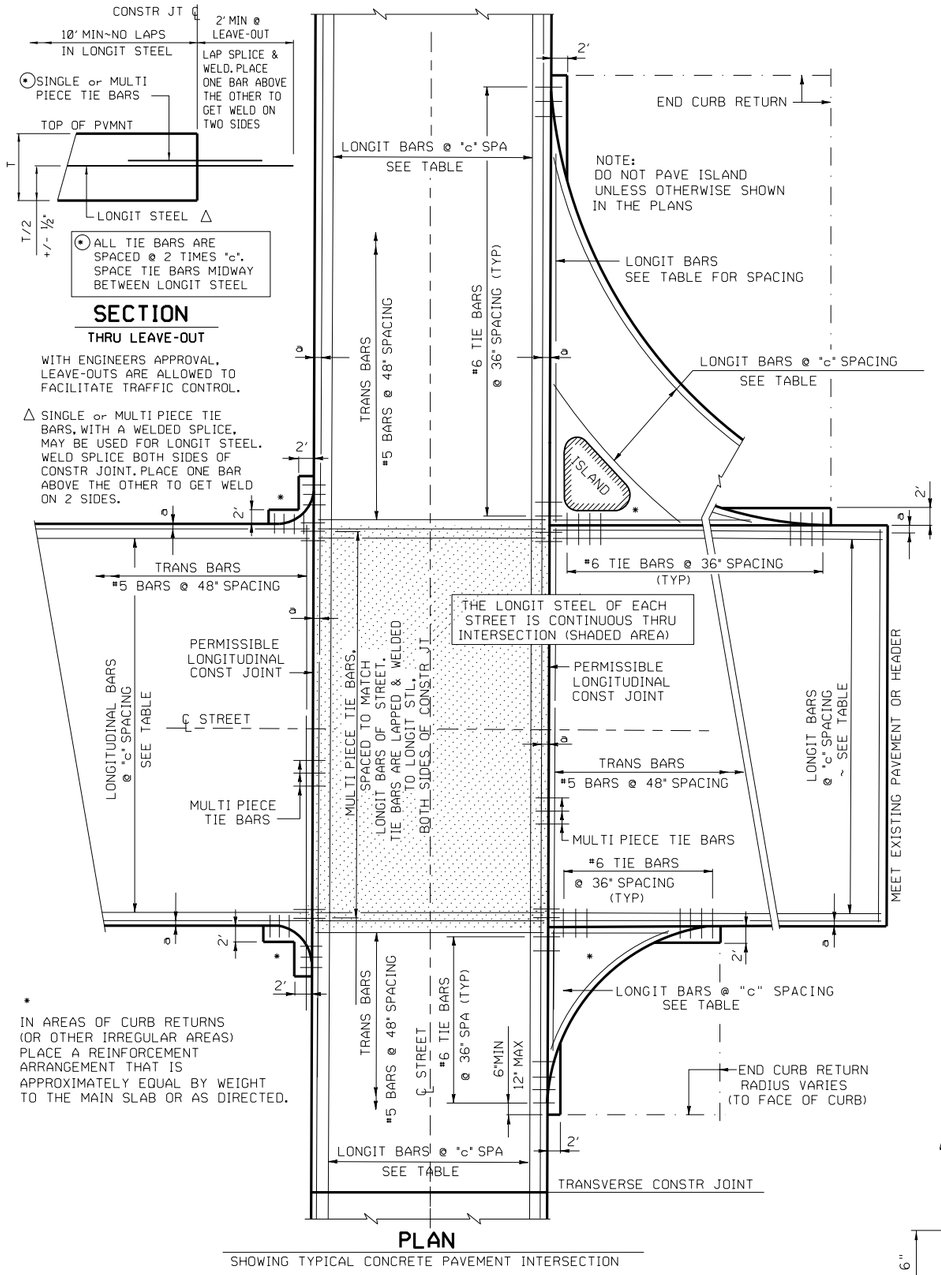
Texas Department of Transportation
Houston District

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT HOUSTON SUPPLEMENT CRCP-HS

REVISIONS
4/12 CHANGED CTE FROM 6.0 TO 5.0
8/14 UPDATE TO REFERENCE CRCP-13 STND.
2/15 REVISED GENERAL NOTES, MINOR CORRECTIONS.
4/17 REVISED NOTE #3 OF GENERAL NOTES, MINOR CORRECTIONS.

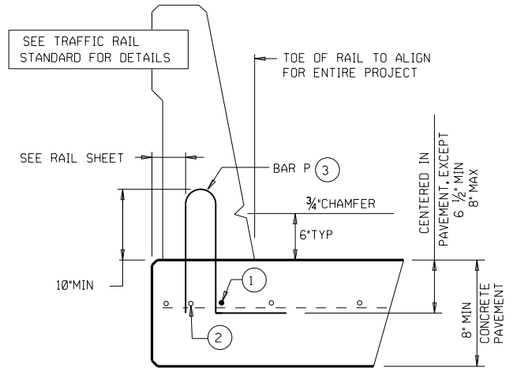
DN: -	CK: -	DW: -	CK: -	
DISTRICT	PROJECT NO.			SHEET
HOU				85
COUNTY	CONTROL	SECTION	JOB	HIGHWAY
HARRIS	0502	01	222	SH 225

STD-B1A



PLAN

SHOWING TYPICAL CONCRETE PAVEMENT INTERSECTION



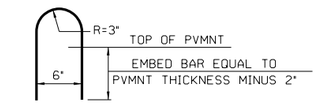
RAIL DETAIL

FOR ADDITIONAL DETAILS, SEE RAIL STANDARD SHEET.
THE MINIMUM LENGTH OF A CONCRETE RAILING PANEL IS FIVE FEET.

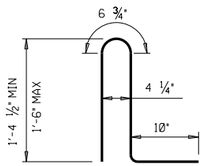
(1) AS AN AID IN SUPPORTING REINFORCEMENT, ADDITIONAL LONGITUDINAL BARS MAY BE USED IN THE SLAB WITH THE APPROVAL OF THE ENGINEER. FURNISH SUCH BARS AT NO EXPENSE TO THE DEPARTMENT.

(2) LONGITUDINAL SLAB BAR MAY BE ADJUSTED LATERALLY 3" +/- TO TIE REINFORCING.

(3) ANCHORAGE BAR SHOWN IS FOR AN SSTR OR T551 RAIL. SEE RAILING DETAIL SHEET FOR SPACING OF BAR P. FOR OTHER RAIL TYPES SEE RAILING DETAIL SHEET.

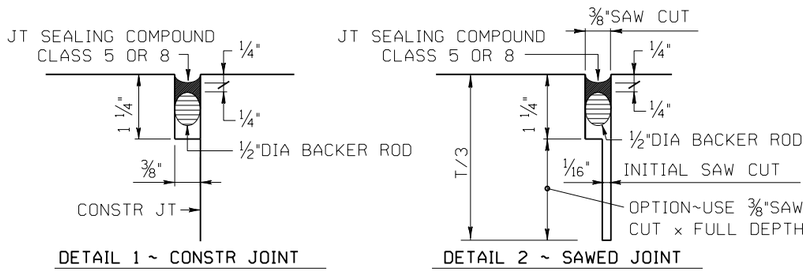


BAR A (#3)

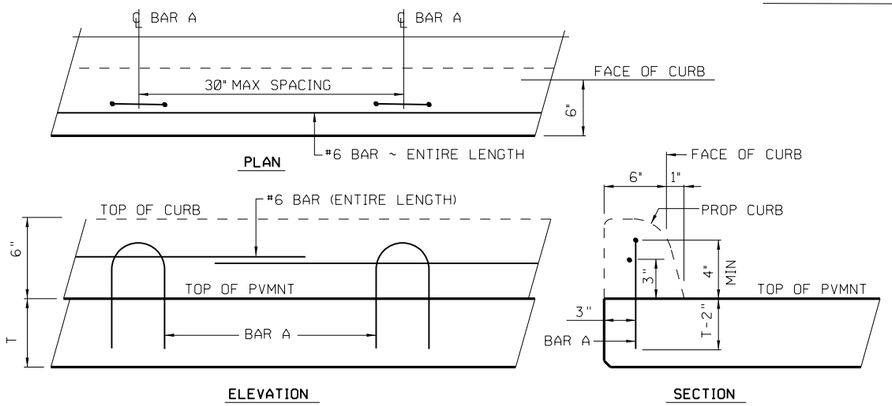


BAR P (#5)

RAIL ANCHOR INSTALLED IN PAVEMENT (3)



JOINT AND SEALANT DETAILS



CURB DETAIL

SEE CC & DID STANDARD

Texas Department of Transportation
Houston District

CONTINUOUSLY REINFORCED CONCRETE PAVEMENT HOUSTON SUPPLEMENT CRCP-HS

DN: -	CK: -	DW: -	CK: -	
DISTRICT	PROJECT NO.			SHEET
HOU				86
COUNTY	CONTROL	SECTION	JOB	HIGHWAY
HARRIS	0502	01	222	SM 225

REVISIONS
4/12 CHANGED CTE FROM 6.0 TO 5.0 (ON SHEET 1).
2/15 MINOR CORRECTIONS.

STD-B1B

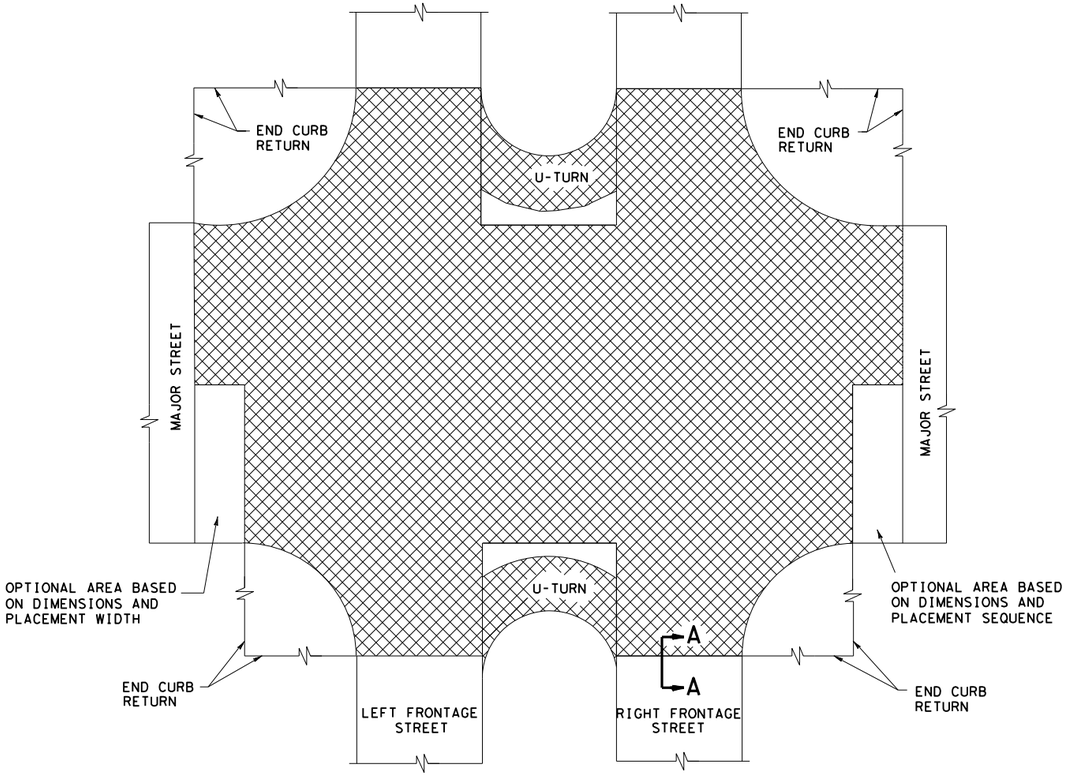


FIGURE 2

INTERSECTION OF MAJOR STREET
WITH FRONTAGE STREET

FAST TRACK PAVING AREA

TYPICAL PAVING PLANS

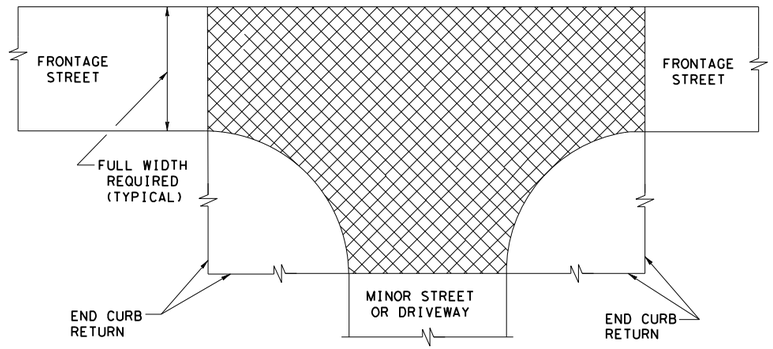


FIGURE 3

INTERSECTION OF MINOR STREET OR
DRIVEWAY WITH FRONTAGE STREET

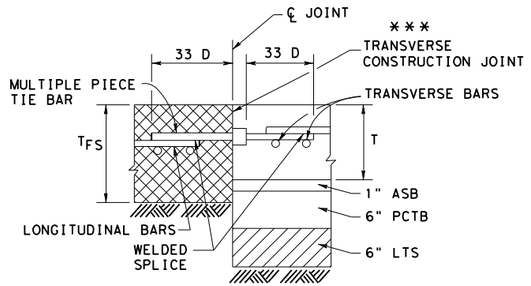
TABLE 1

EQUIVALENT PAVEMENT THICKNESS	
T * (IN.)	T_{FS} ** (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



SINGLE MAT

TRANSVERSE CONSTRUCTION JOINTS

SECTION A - A
FIGURE 1

GENERAL NOTES

1. DEFINITION OF TERMS

   T_{FS} - 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 PAVEMENT 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 THE TRANSVERSE CONSTRUCTION JOINT FORMED AT THE FAST TRACK PAVING INTERFACE (T_{FS}) WITH THE ADJACENT PAVEMENT SLAB (T).

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

6. PLACE THE CONCRETE PLACEMENT 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.

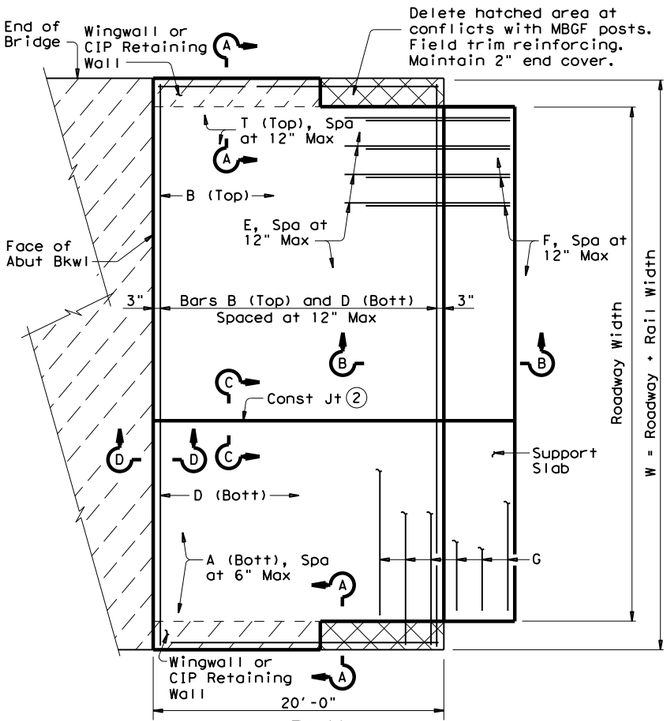
LEGEND

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

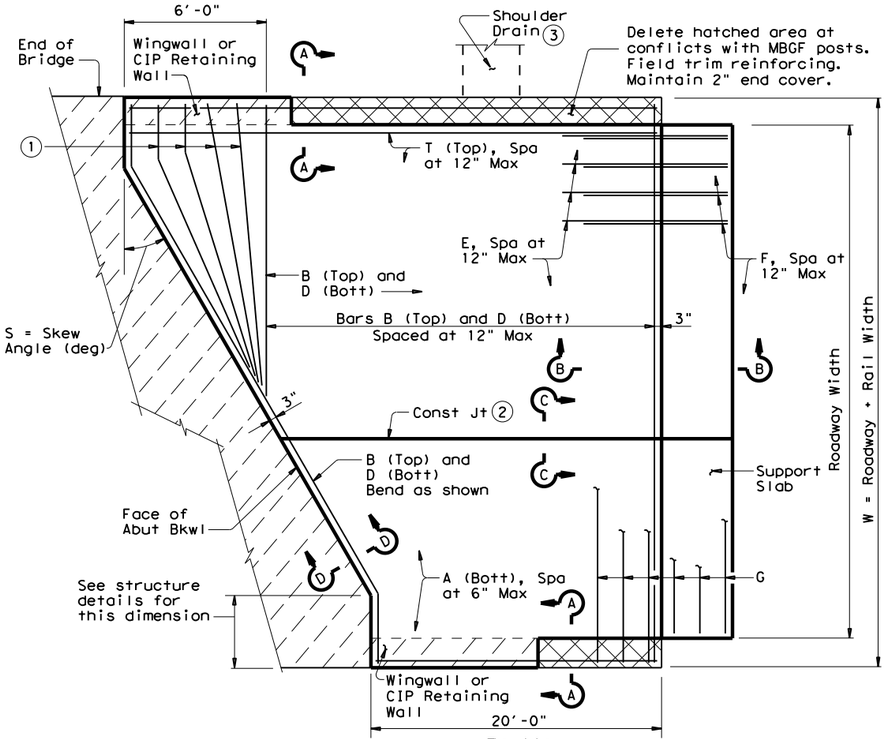
FAST TRACK CONTINUOUSLY REINFORCED CONCRETE PAVEMENT
DETAILS
CRCP-FT

FILE: STDB-4.dgn	DN:	CK:	DW:	CK:	
© TxDOT DEC. 2009	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS 5/05 2004 SPECS 2/15 2014 SPECS	HOU	6			87
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0502	01	222	SH 225



PLAN

(Showing Non-Skewed Approach Slab)



PLAN

(Showing Skewed Approach Slab)

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
E	#5
F	#5
G	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab
= 18.4 Lbs/LF of Support Slab

Area of Appr Slab = $20W + 0.5W^2 \tan S$ (SF)
(Support Slab not included)

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only.

(5) On portion of support slab that supports the concrete pavement, adjust top surface elevation, if required, to accommodate concrete pavement thickness. Smooth trowel finish. Oil top of support slab with 60 grade oil and apply heavy coat of powdered graphite. Press down one layer of 30# roofing felt.

(6) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

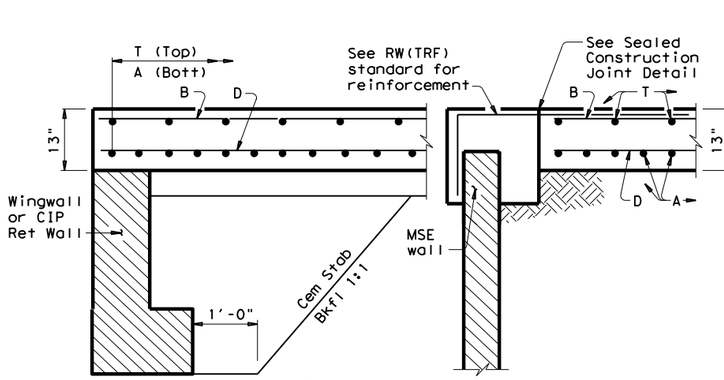
(7) See details elsewhere in plans for required cross-slope.

(8) Place in accordance with Item 438.

(9) Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.

GENERAL NOTES:

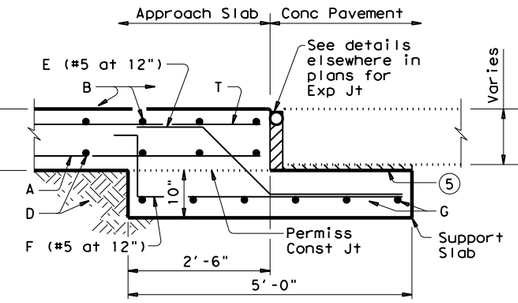
1. Construct approach slab in accordance with Item 422.
2. Concrete shall be Class "S" with a minimum compressive strength of 4,000 psi.
3. All reinforcing steel shall be Grade 60.
4. Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.
5. Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.
6. Cure for 4 days using water or membrane curing per Item 422.
7. Sealant, backer rod and preformed bituminous fiber material is subsidiary to approach slab concrete.



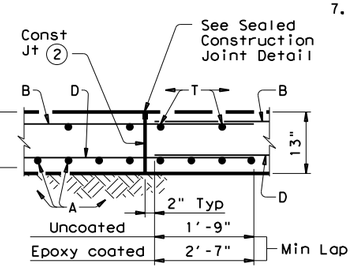
SHOWING WINGWALL OR CIP RETAINING WALL

SHOWING MSE WALL

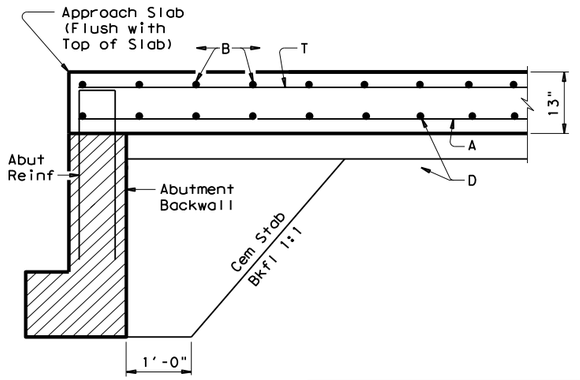
SECTION A-A



SECTION B-B



SECTION C-C (6)



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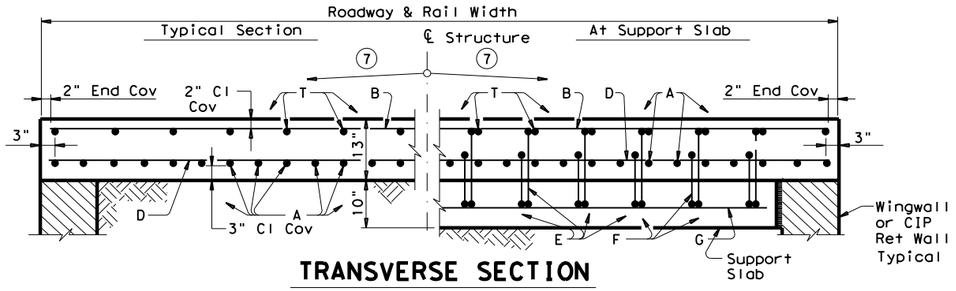
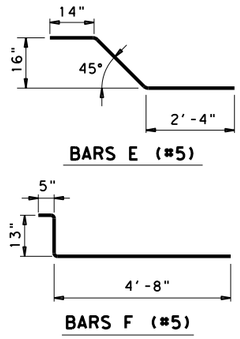
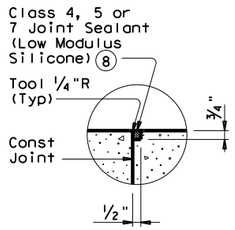


TRANSVERSE SECTION





SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation
Houston District

BRIDGE APPROACH SLAB

CONCRETE PAVEMENT

BAS-C

FILE: STDB10B.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
© TxDOT March 2009	DISTRICT	PROJECT NO.				SHEET
REVISIONS 4/20/2015 updated to 2014 standard						88
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0502	01	222	SH 225

STDB10B

LEVELS DISPLAYED
PATH:
1

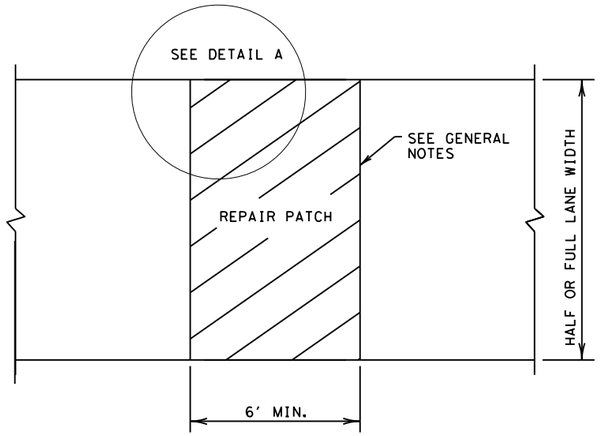
DATE:
FILE:

TABLE NO.1 STEEL BAR SIZE AND SPACING						
TYPE PAVEMENT	SLAB THICKNESS AND BAR SIZE		LONGITUDINAL*		TRANSVERSE*	
			REGULAR BARS	TIEBARS	BARS	TIEBARS
	T (IN.)	BAR SIZE	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)	SPACING (IN.)
CRCP	6.0	#5	7.5	7.5	24	24
	6.5		7.0	7.0		
	7.0		6.5	6.5		
	7.5		6.0	6.0		
	8.0	#6	9.0	9.0	24	24
	8.5		8.5	8.5		
	9.0		8.0	8.0		
	9.5		7.5	7.5		
	10.0		7.0	7.0		
	10.5		6.75	6.75		
	11.0		6.5	6.5		
	11.5		6.25	6.25		
	≥12.0		6.0	6.0		
JRCP	<8.0	#5	24.0	12.0	24	24
	≥8.0	#6	24.0	12.0	24	24
CPCD	<8.0	#5	NONE	12.0	NONE	24
	≥8.0	#6	NONE	12.0	NONE	24

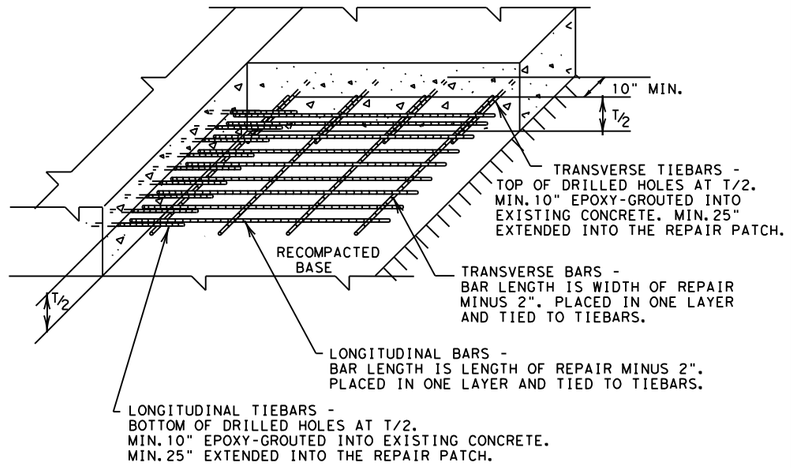
* USE 12" SPACING AS FIRST AND LAST SPACING AT END OR SIDE FOR ALL BARS.

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



PLAN VIEW

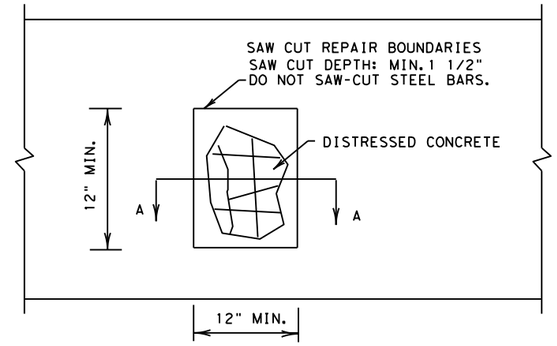


DETAIL A
GROUTED TIEBARS & REINFORCEMENT

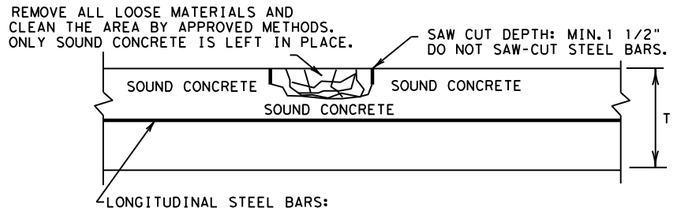
FULL-DEPTH REPAIR OF CRCP, JRCP, AND CPCD

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
3. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



PLAN VIEW



LONGITUDINAL STEEL BARS:

*REPAIR AREAS MAY BE ADJUSTED AFTER REMOVING DISTRESSED CONCRETE. SWITCH THE HALF-DEPTH REPAIR TO FULL-DEPTH REPAIR IF EXPOSED EXISTING LONGITUDINAL BARS ARE DEFICIENT, AS APPROVED. COMPENSATION WILL BE MADE FOR UNEXPECTED VOLUMES OF REPAIR AREAS OR CHANGES IN SCOPE OF WORK.

*INCREASE THE REPAIR AREA AND PERFORM A FULL-DEPTH REPAIR AS DIRECTED IF LONGITUDINAL STEEL BARS WERE DAMAGED BY THE REMOVAL OPERATIONS. NO ADDITIONAL COMPENSATION WILL BE MADE.

SECTION A-A

HALF-DEPTH REPAIR

Texas Department of Transportation

Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		89

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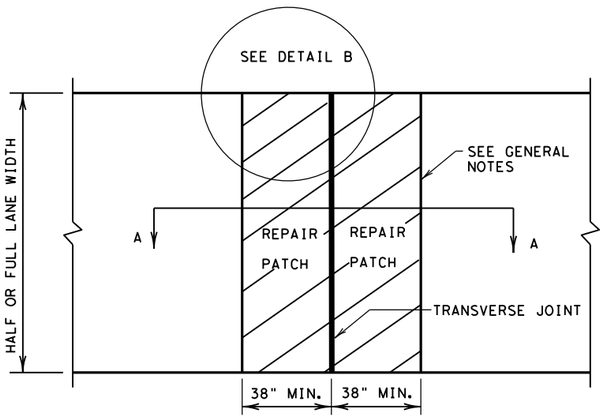
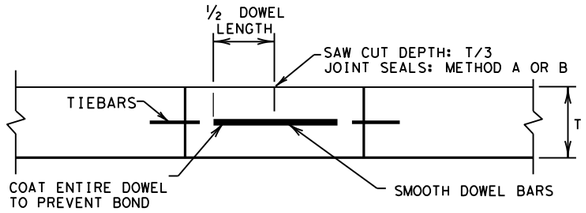
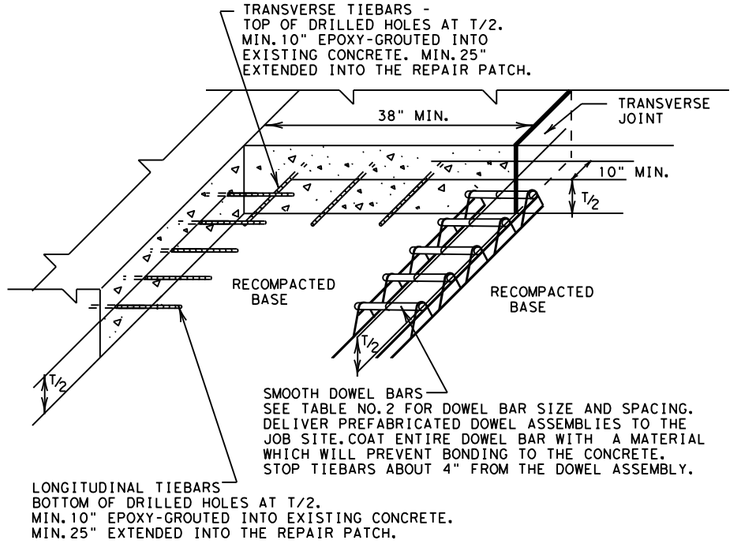


PLAN VIEW



SECTION A-A



DETAIL B
GROUTED TIEBARS & DOWELS

GENERAL NOTES

1. ITEM 361, "REPAIR OF CONCRETE PAVEMENT" SHALL GOVERN FOR THIS WORK.
2. MULTIPLE PIECE TIEBARS SHALL BE USED WHEN THE REPAIR AREA MUST BE PLACED IN TWO STAGES DUE TO SEQUENCE OF CONSTRUCTION.
3. FULL DEPTH SAW CUTS SHALL BE MADE AROUND THE PERIMETER OF THE AREA TO BE REPAIRED. THE CUT SHALL BE MADE AT A RIGHT ANGLE TO THE PAVEMENT EDGE AND TO THE CENTER LINE OF THE PAVEMENT.
4. AT LEAST ONE LONGITUDINAL FULL DEPTH SAW CUT SHALL BE AT AN EXISTING LONGITUDINAL JOINT.
5. ADDITIONAL SAW CUTS MAY BE REQUIRED WITHIN THE AREA OF THE REPAIR TO FACILITATE REMOVAL OF THE CONCRETE OR TO ALLEVIATE BINDING OF THE FULL DEPTH SAW CUT AT THE REPAIR EDGE.
6. THE SAW CUTS WHICH EXTEND OUTSIDE THE AREA OF THE REPAIR WILL BE CLEANED AND FILLED WITH A CEMENTITIOUS GROUT APPROVED BY THE ENGINEER.
7. EXISTING LONGITUDINAL AND TRANSVERSE JOINTS REMOVED DUE TO REPAIR OPERATION SHOULD BE RESTORED IN ACCORDANCE WITH STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."
8. 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.

TABLE NO. 2 DOWELS (SMOOTH BARS)

PAVEMENT THICKNESS (INCHES)	SIZE AND DIA.	LENGTH (IN.)	SPACING (IN.)
<10	#8 (1 IN.)	18.0	12.0
≥10	#10 (1 1/4 IN.)		

REPAIR OF TRANSVERSE JOINT OF CPCD

Texas Department of Transportation

Design Division Standard

REPAIR OF CONCRETE PAVEMENT

REPCP-14

FILE: repcp14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		90

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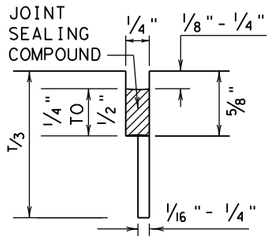
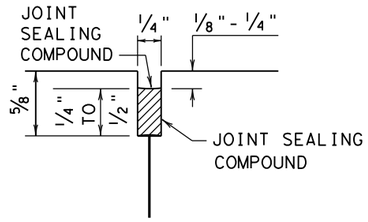
FILE:

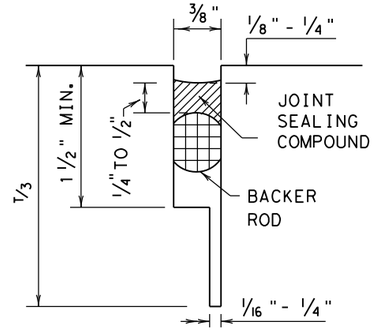
METHOD B: JOINT SEALING COMPOUND



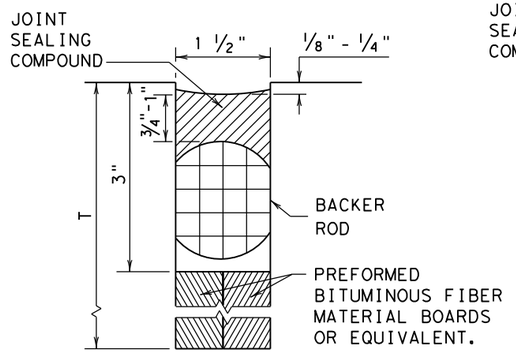
LONGITUDINAL SAWED CONTRACTION JOINT



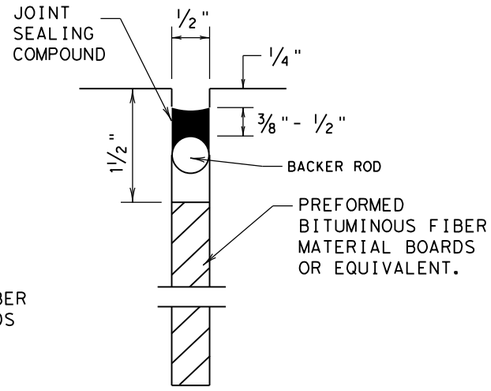
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

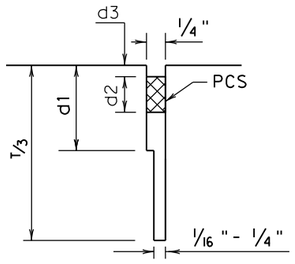


TRANSVERSE FORMED EXPANSION JOINT

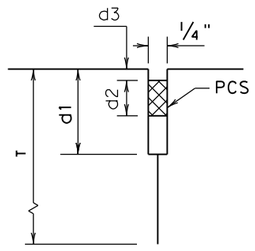


FORMED ISOLATION JOINT

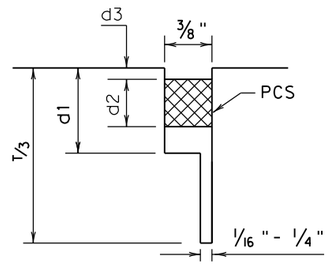
METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



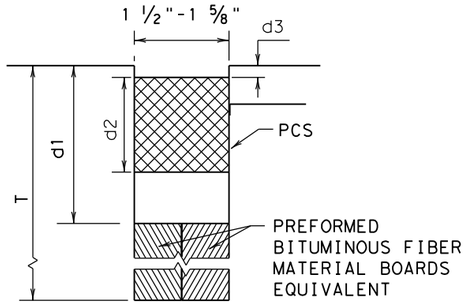
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

1. UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
2. THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
3. THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
4. DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
5. REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
6. FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
7. FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4, 5, 7, OR 8 FOR MAINTAINING EXISTING JOINTS.
8. THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS" OR ITEM 713 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
9. ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A PAVEMENT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, CURB AND GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LIGHTING STRUCTURES.

Texas Department of Transportation | Design Division Standard

CONCRETE PAVING DETAILS

JOINT SEALS

JS-14

FILE: js14.dgn	DN: TxDOT	DN: HC	DW: HC	CK: AN
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REVISIONS	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		91

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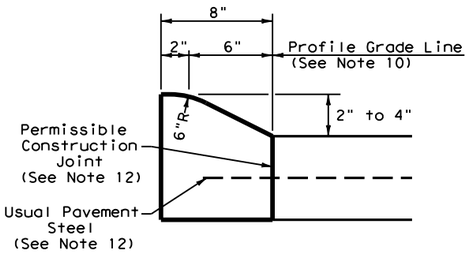
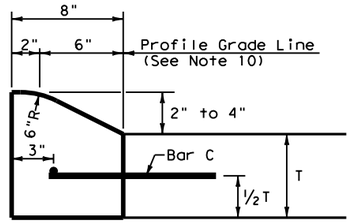
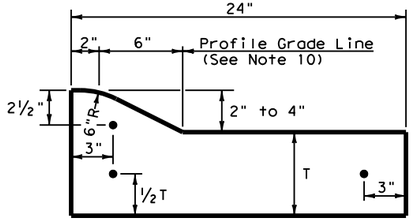


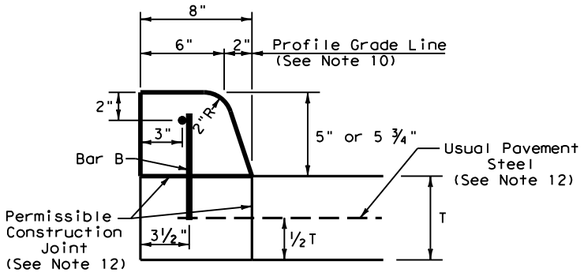
TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT



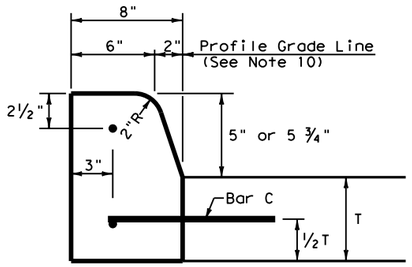
TYPE I CURB
2" - 4" HEIGHT



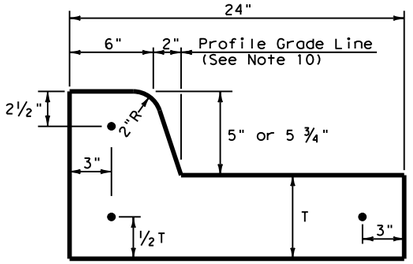
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



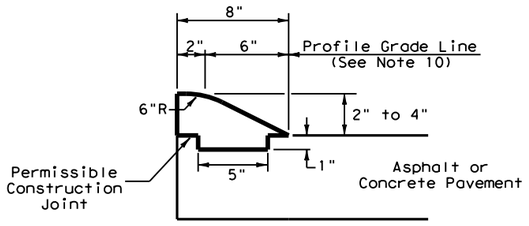
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



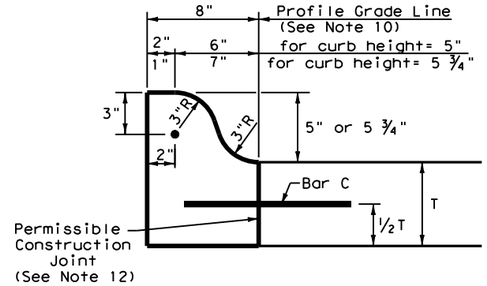
TYPE II CURB
5" - 5 ¾" HEIGHT



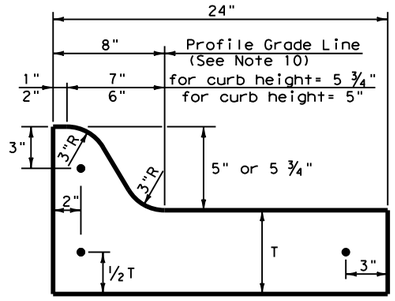
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



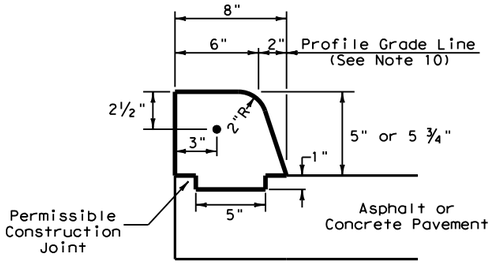
TYPE III CURB (KEYED)
2" - 4" HEIGHT



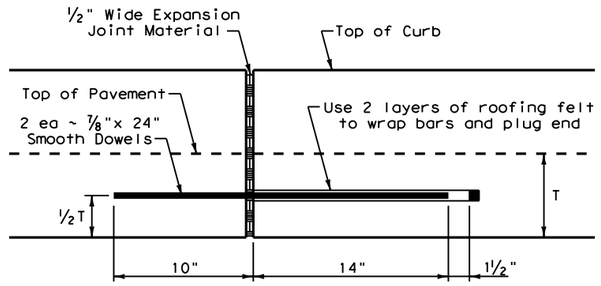
TYPE IIa CURB
5" - 5 ¾" HEIGHT



TYPE IIa CURB AND GUTTER
5" - 5 ¾" HEIGHT

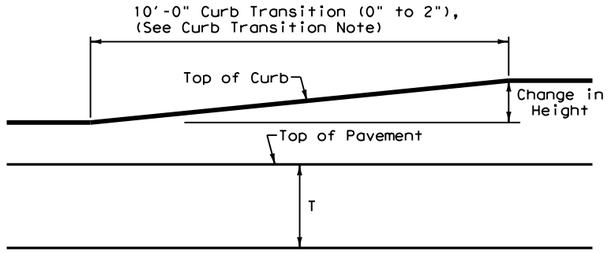


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

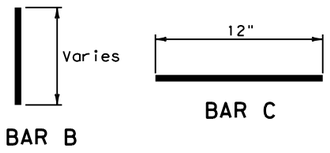
Curb Transition Note:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

General Notes

1. All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
2. Concrete shall be Class A.
3. When reinforcing bars are used, they shall be No. 4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
4. Round exposed sharp edges with a rounding tool, to a minimum radius of ¼ inch.
5. All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
6. Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
7. 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.
8. Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
9. Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
10. Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
11. One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
12. When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.



BAR B

BAR C

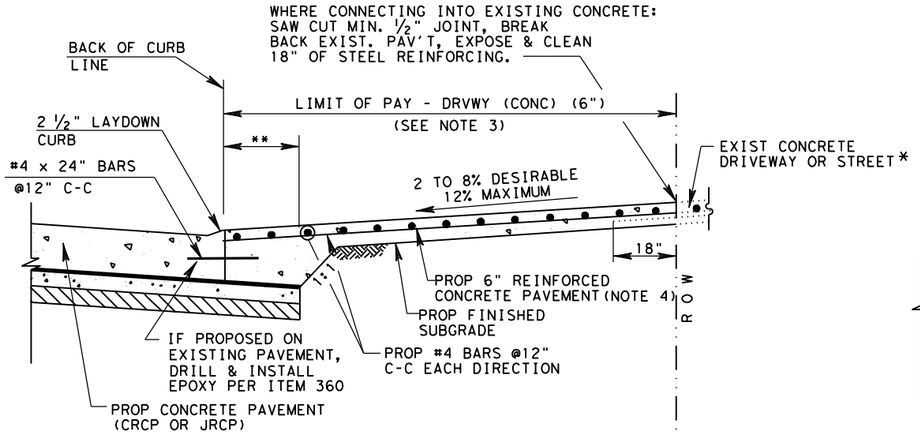
Texas Department of Transportation

Design Division Standard

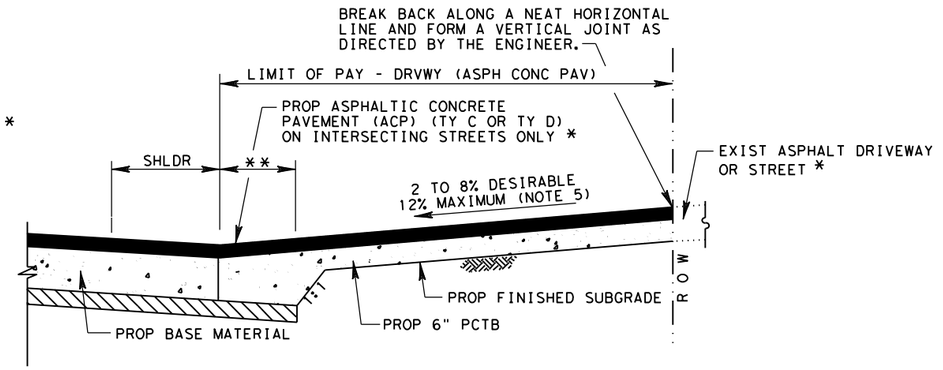
CONCRETE CURB AND CURB AND GUTTER

CCCG-12

FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP	CK: VP
©TxDOT: 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS UPDATED 2012 - VP	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		92



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE
CURB AND GUTTER ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ PCTB 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

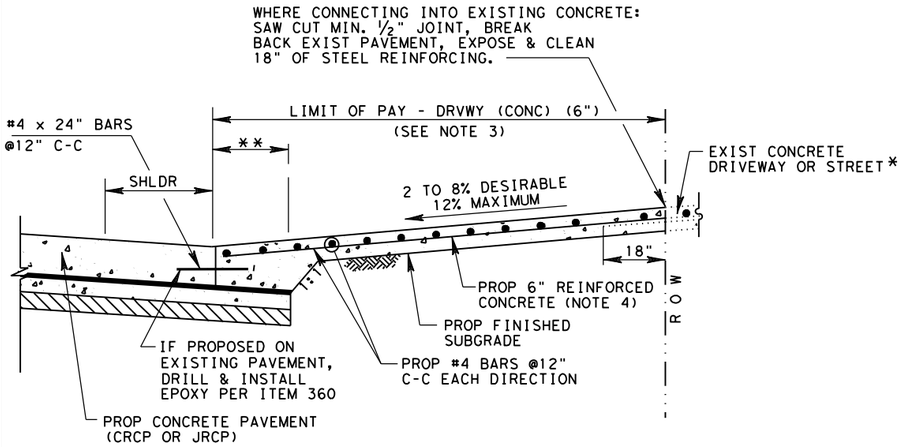
JRCP- JOINTED REINFORCED CONCRETE PAVEMENT

CRCP- CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

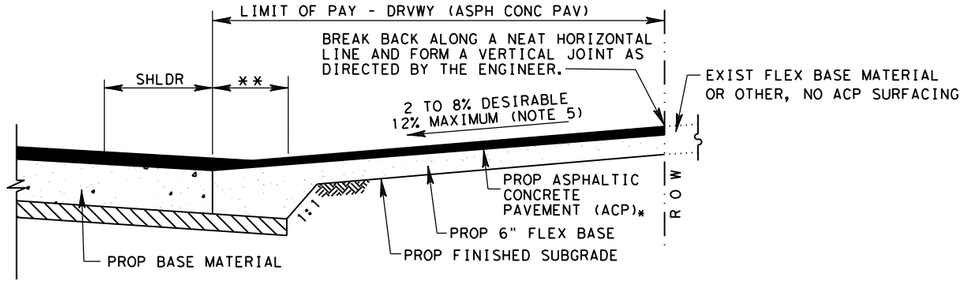
ACP- ASPHALTIC CONCRETE PAVEMENT

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

** PROPOSED LIMIT OF ROADWAY BASE AND/OR SUBGRADE



PROPOSED DRIVEWAY DETAIL
REINFORCED CONCRETE AT CONCRETE ROADWAY



PROPOSED DRIVEWAY DETAIL
ASPHALT W/ FLEX BASE AT ASPHALT ROADWAY

SHEET 1 OF 3

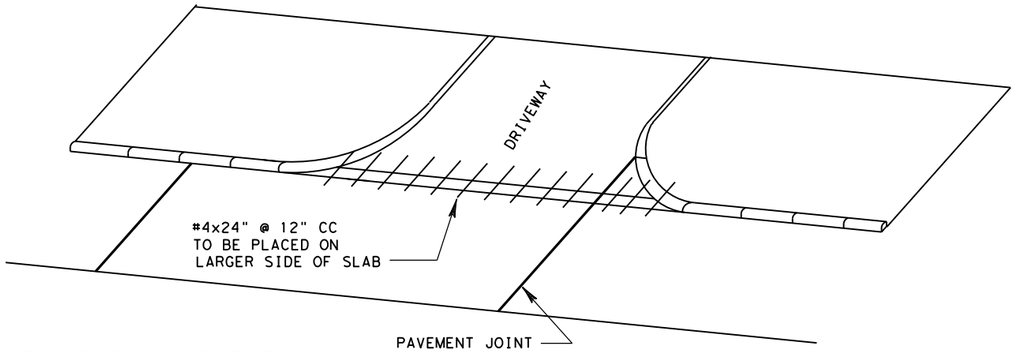
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

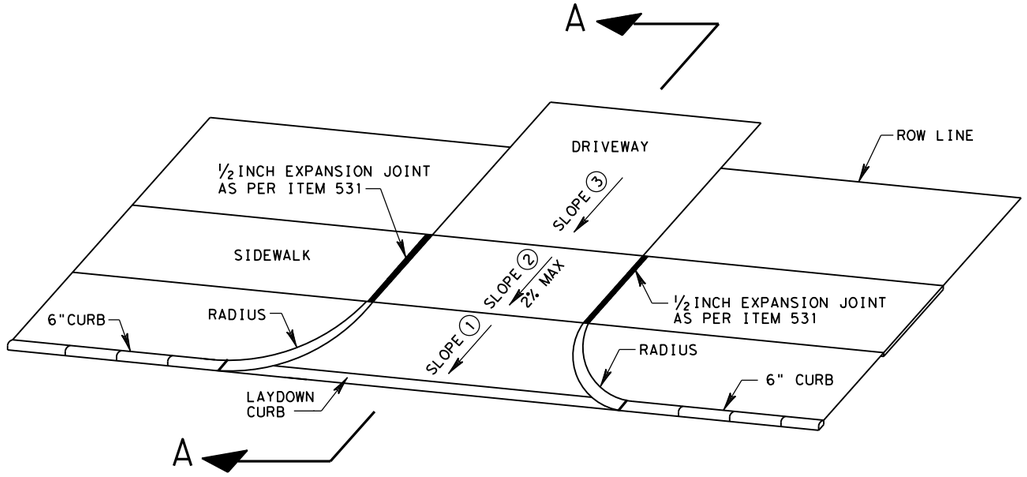
DD

FILE: STDB-8a.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				93
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0502	01	222	SH 225

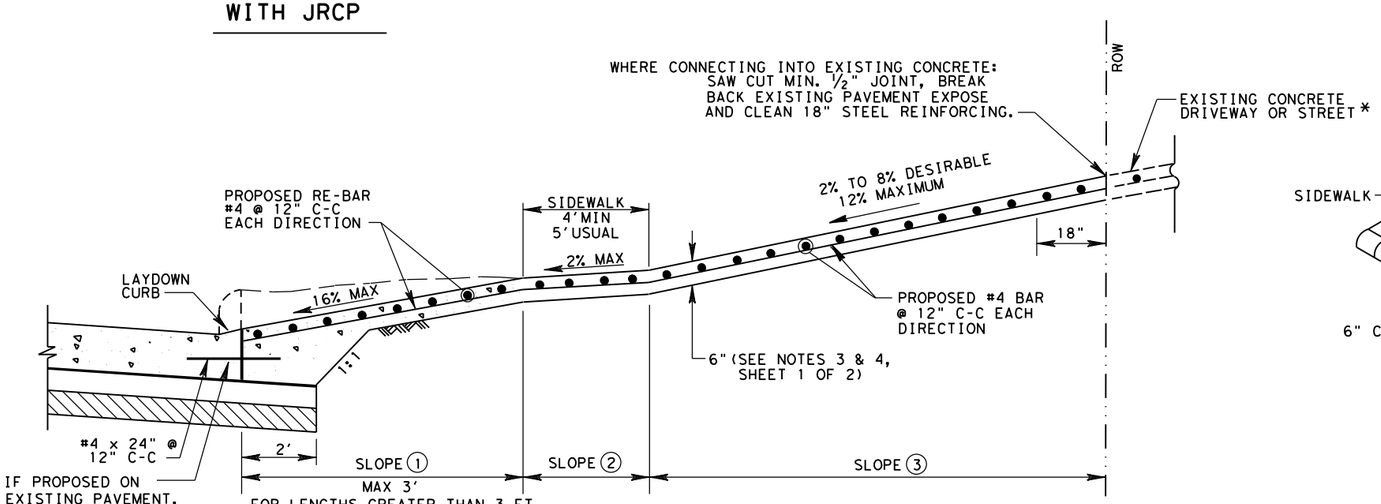
STDB8A



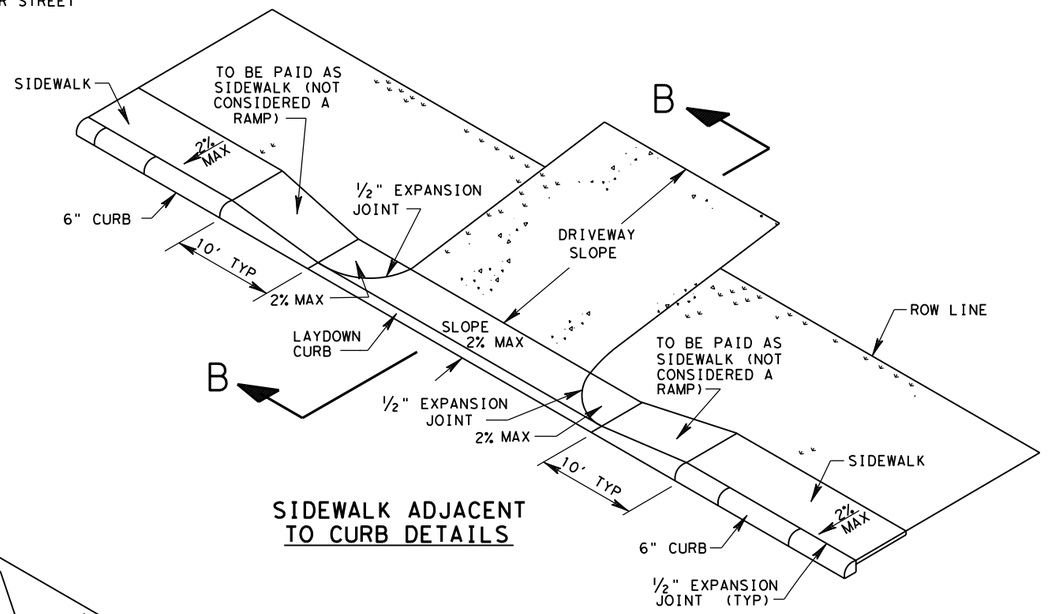
TIE BAR PLACEMENT WITH JRCP



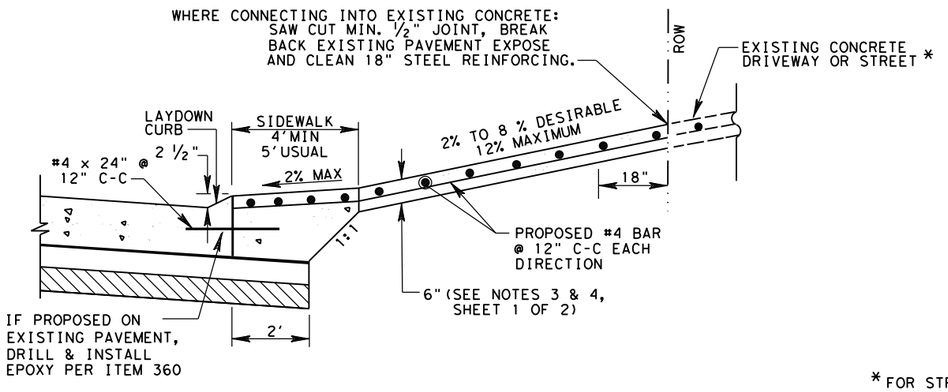
SIDEWALK OFFSET FROM CURB DETAILS



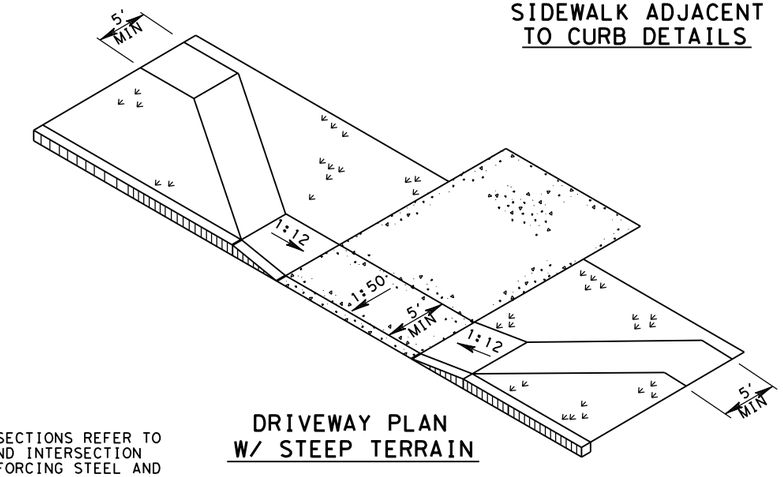
SLOPES W/ SIDEWALKS OFFSET FROM CURB (SECTION A-A)



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.

SHEET 2 OF 3

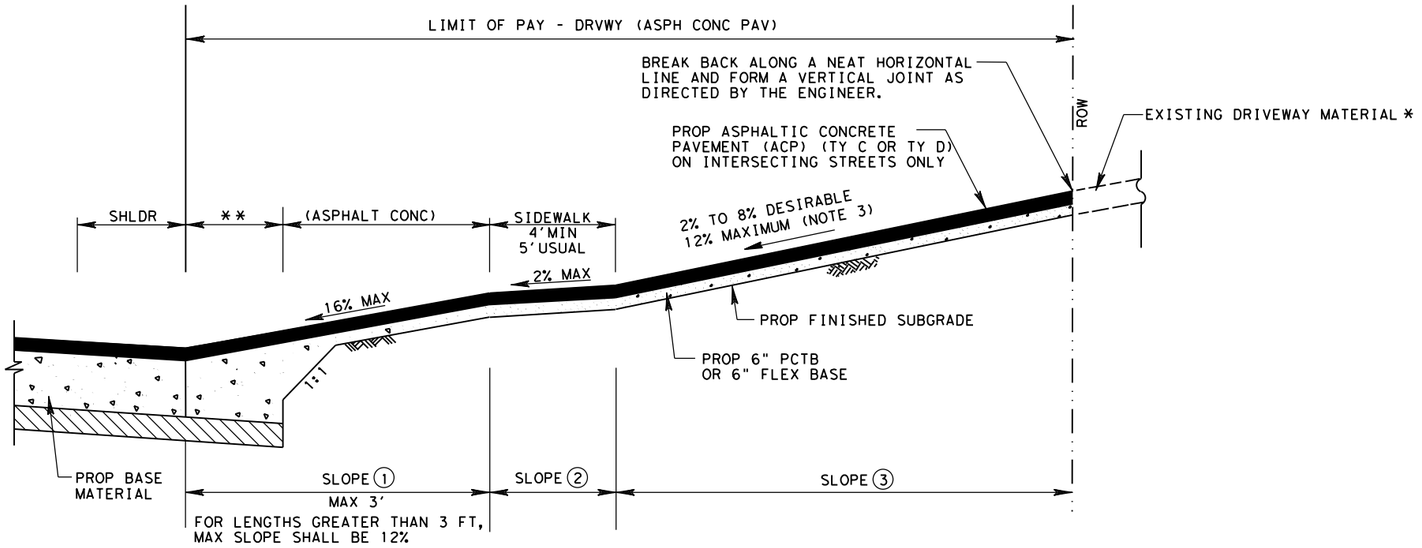
Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

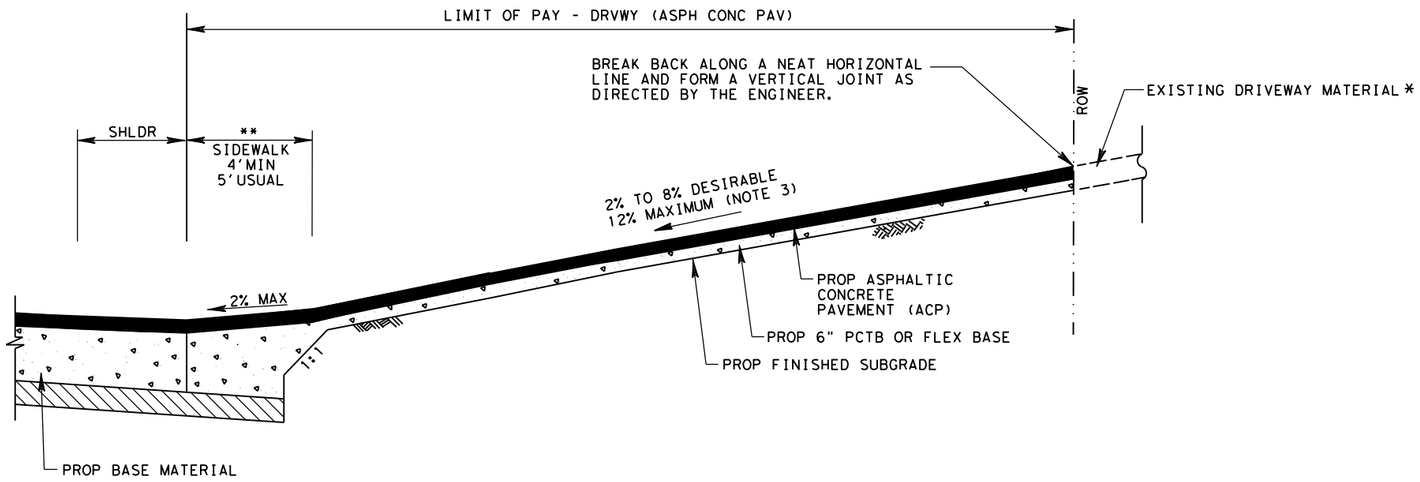
DD

FILE: STDB-8b.dgn	DN:	CK:	DW:	CK:
©TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 9/09 ADDED NOTE FOR ITEM 360. 11/15 ADDED NOTE FOR PCTB	HOU	6		94
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0502	01	222	SH 225

STDB8B



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

Texas Department of Transportation
Houston District

DRIVEWAY DETAILS

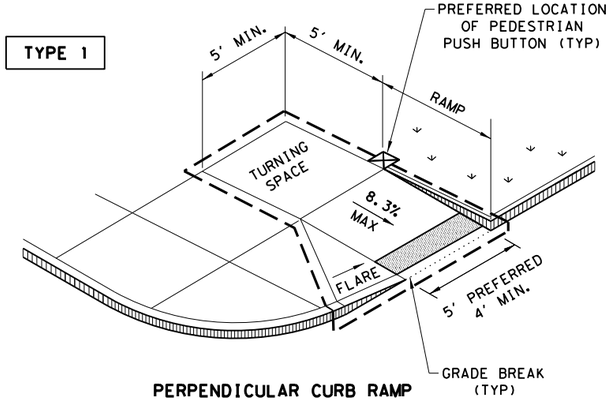
DD

FILE: STDB-8c.dgn	DN:	CK:	DW:	CK:		
© TxDOT SEPT. 2004	DIST	FED REG	PROJECT NO.			SHEET
REVISIONS 11/15 ADDED NOTE FOR PCTB 3/17 MODIFIED PAVEMENT SLOPES	HOU	6				95
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0502	01	222	SH 225

STDB8C

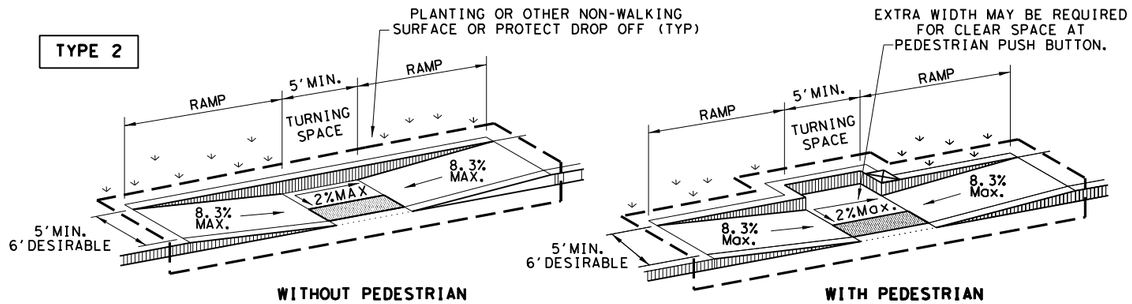
DATE:
FILE:

TYPE 1



PERPENDICULAR CURB RAMP

TYPE 2

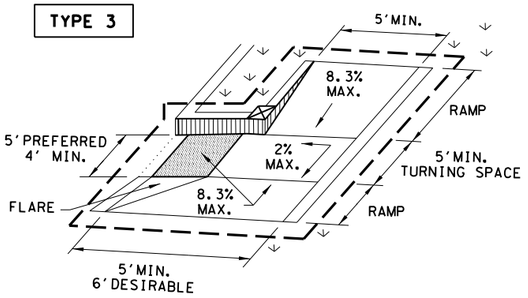


WITHOUT PEDESTRIAN PUSH BUTTON

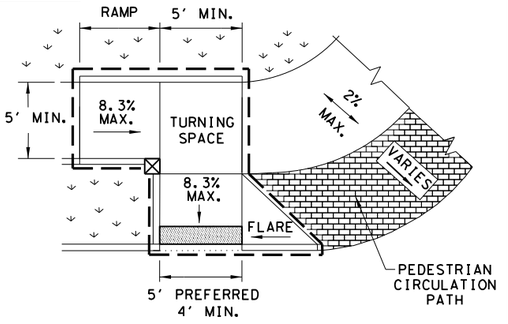
WITH PEDESTRIAN PUSH BUTTON

PARALLEL CURB RAMP

TYPE 3

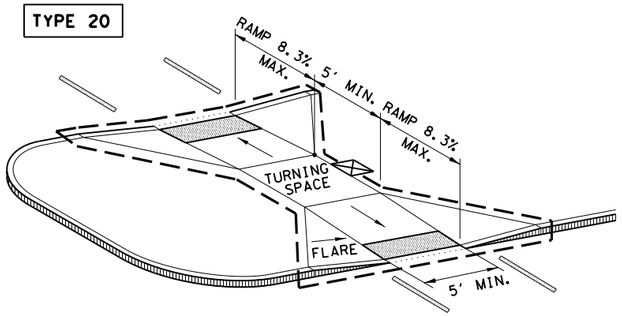


TYPE 6



COMBINATION CURB RAMPS

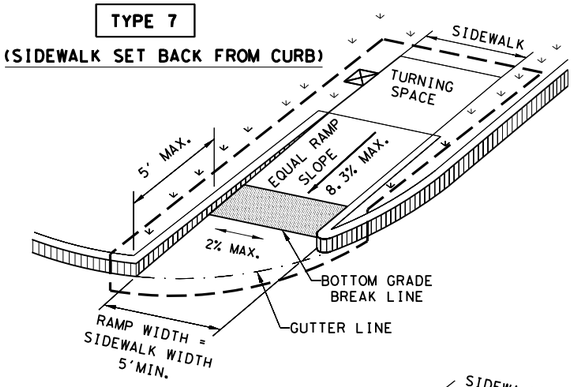
TYPE 20



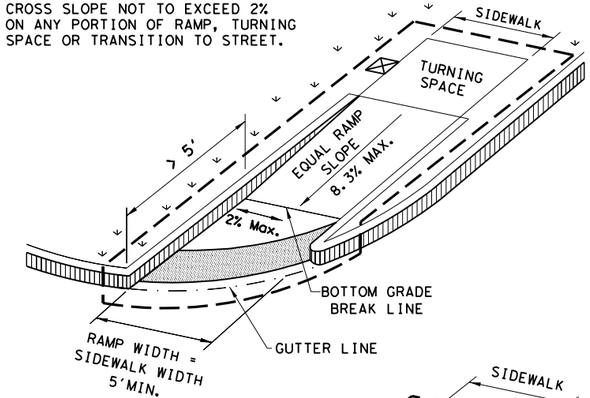
CURB RAMPS AT MEDIAN ISLANDS

TYPE 7

(SIDEWALK SET BACK FROM CURB)

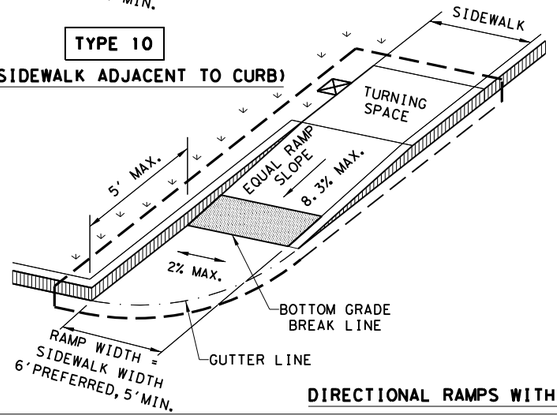


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.

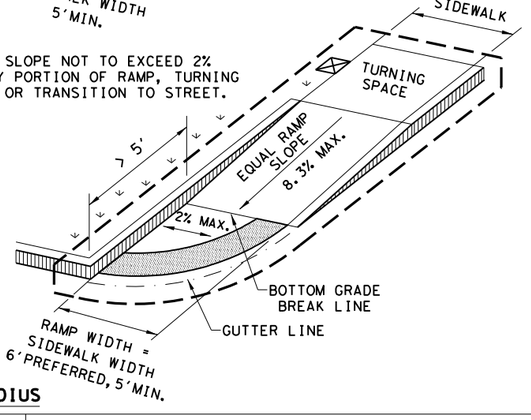


TYPE 10

(SIDEWALK ADJACENT TO CURB)

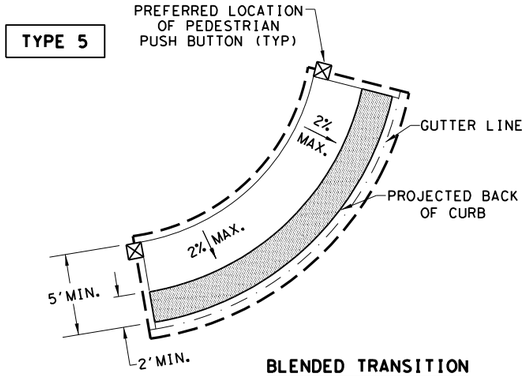


CROSS SLOPE NOT TO EXCEED 2% ON ANY PORTION OF RAMP, TURNING SPACE OR TRANSITION TO STREET.



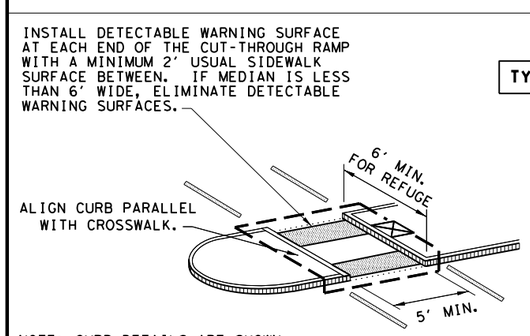
DIRECTIONAL RAMPS WITHIN RADIUS

TYPE 5



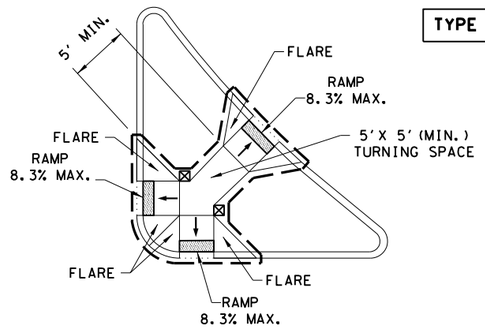
BLENDED TRANSITION
(FLUSH LANDING)

TYPE 21

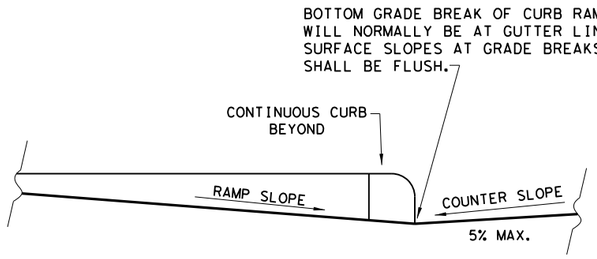


NOTE: CURB DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

TYPE 22



COMBINATION ISLAND RAMPS



TYPICAL SECTION OF PERPENDICULAR CURB RAMP AT CONNECTION TO ROADWAY

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.

DETECTABLE WARNING SURFACE

DENOTES PREFERRED LOCATION OF PEDESTRIAN PUSH BUTTON IF APPLICABLE.

GUTTER LINE

GRADE BREAK

RAMP LIMITS OF PAYMENT

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	0502	01	222	SH 225
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.
	6	HARRIS		96

DATE:
FILE:

GENERAL NOTES

CURB RAMPS

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 applicalble standards may remain in place unless otherwise shown on the plans.

DETECTABLE WARNING MATERIAL

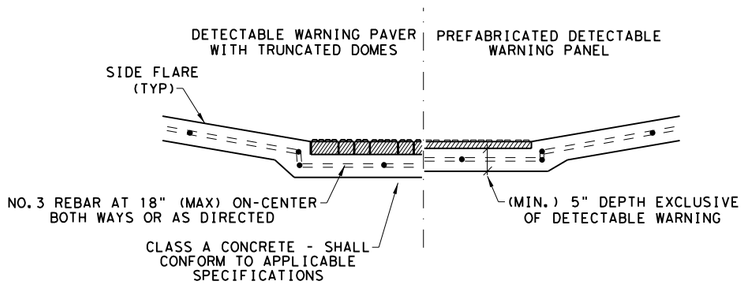
19. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with PROWAG. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material 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.

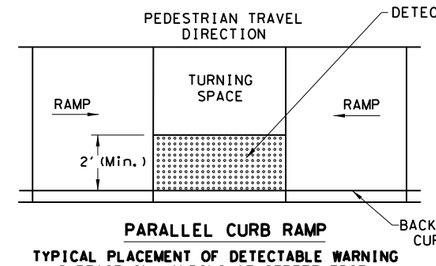
SIDEWALKS

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.

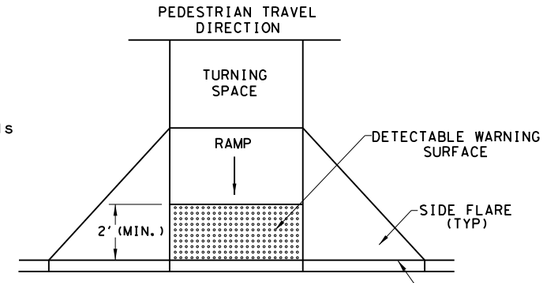


SECTION VIEW DETAIL
CURB RAMP AT DETECTIBLE WARNINGS

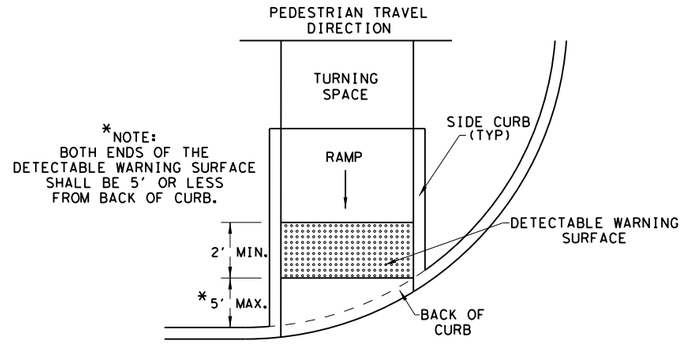
DETECTABLE WARNING SURFACE DETAILS



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.



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

Texas Department of Transportation | Design Division Standard

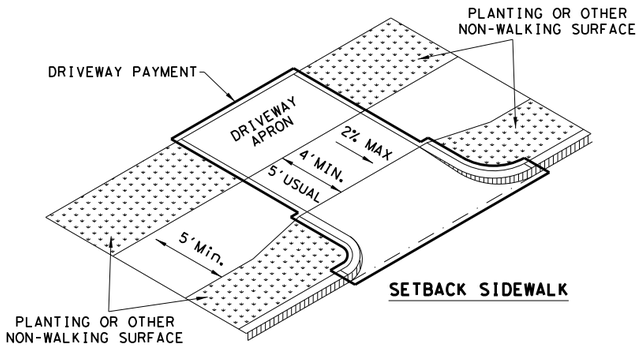
PEDESTRIAN FACILITIES CURB RAMPS

PED-18

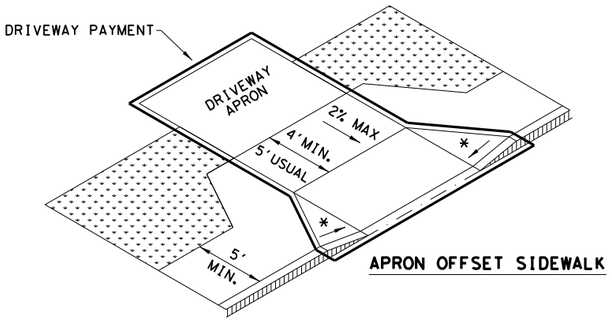
FILE: ped18	DN: TxDOT		DW: VP	CK: KM	CK: PK & JG
	CONT	SECT	JOB		HIGHWAY
REVISIONS REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	0502	01	222		SH 225
	DIST	COUNTY			SHEET NO.
	6	HARRIS			97

DATE:
FILE:

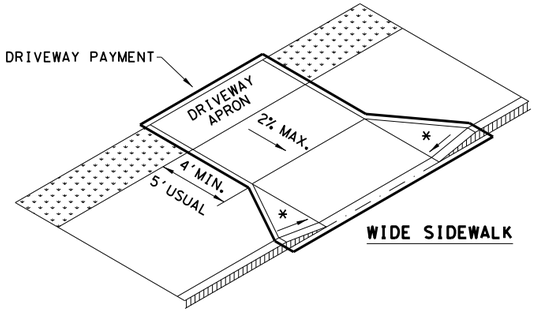
SIDEWALK TREATMENT AT DRIVEWAYS



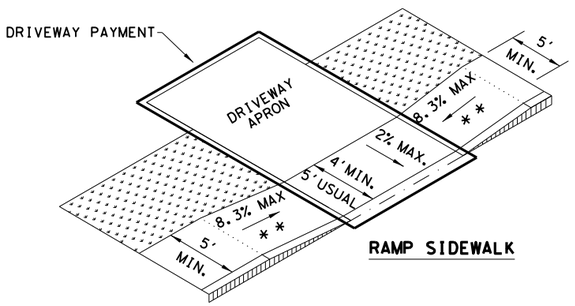
SETBACK SIDEWALK



APRON OFFSET SIDEWALK



WIDE SIDEWALK

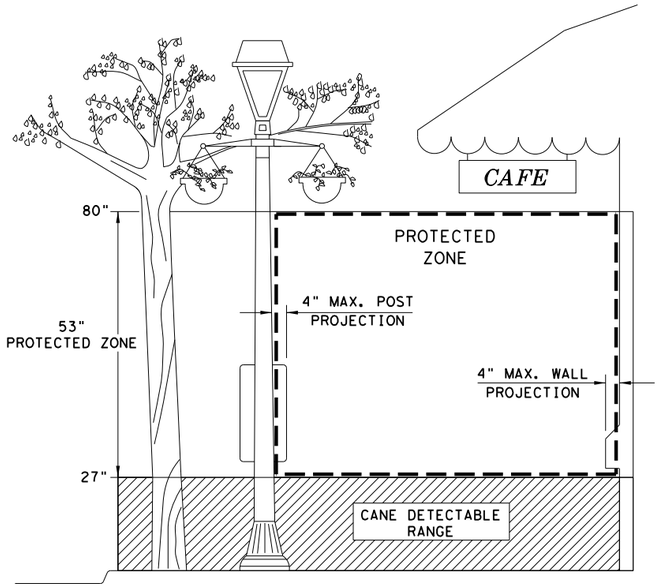


RAMP SIDEWALK

NOTES:

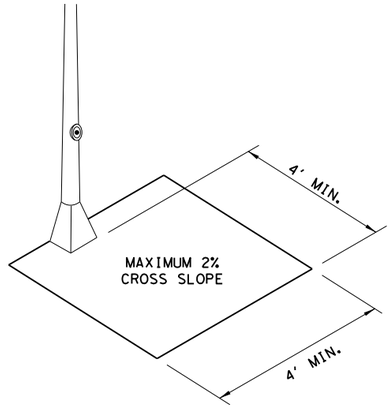
* WHERE DRIVEWAYS CROSS THE PEDESTRIAN ROUTE, SIDES SHALL BE FLARED AT 10% MAX SLOPE.

* * IF CURB HEIGHT IS GREATER THAN 6 INCHES, USE GRADE LESS THAN OR EQUAL TO 5%. HANDRAIL AND DETECTABLE WARNING ARE NOT REQUIRED.

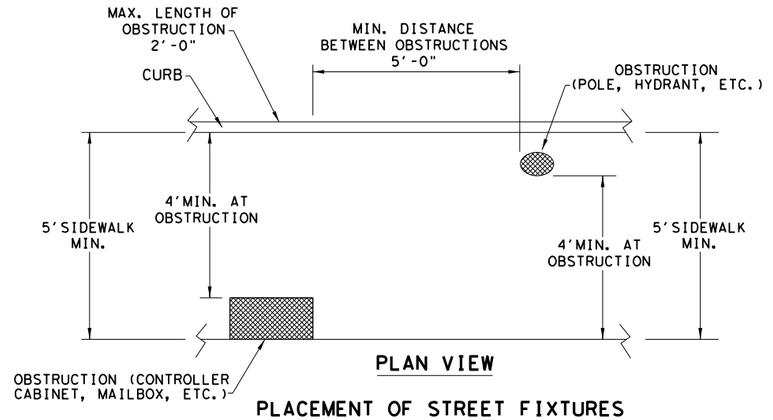


PROTECTED ZONE

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



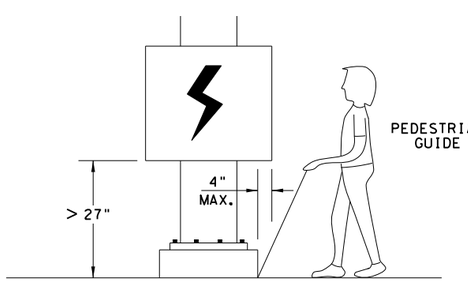
CLEAR SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



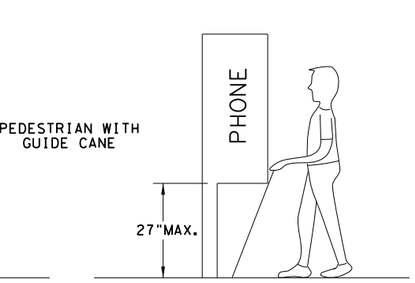
PLAN VIEW

PLACEMENT OF STREET FIXTURES

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



WHEN AN OBSTRUCTION OF A HEIGHT GREATER THAN 27" FROM THE SURFACE WOULD CREATE A PROTRUSION OF MORE THAN 4" INTO THE PEDESTRIAN CIRCULATION AREA, CONSTRUCT ADDITIONAL CURB OR FOUNDATION AT THE BOTTOM TO PROVIDE A MAXIMUM 4" OVERHANG.



PROTRUDING OBJECTS OF A HEIGHT ≤ 27" ARE DETECTABLE BY CANE AND DO NOT REQUIRE ADDITIONAL TREATMENT.

DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

Texas Department of Transportation

Design Division Standard

PEDESTRIAN FACILITIES CURB RAMPS

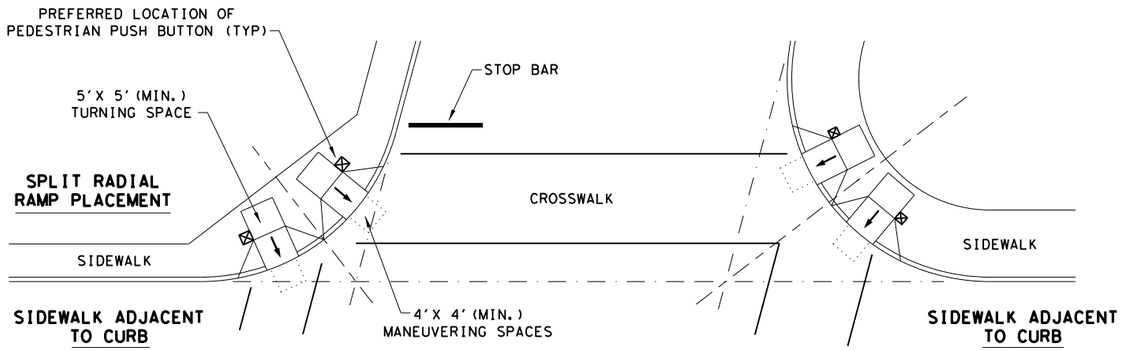
PED-18

FILE: ped18	DN: TxDOT	DW: VP	CK: KM	CK: PK & JG	
© TxDOT: MARCH, 2002	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0502	01	222	SH 225	
REVISED 08,2005 REVISED 06,2012 REVISED 01,2018	DIST	COUNTY		SHEET NO.	
	6	HARRIS		98	

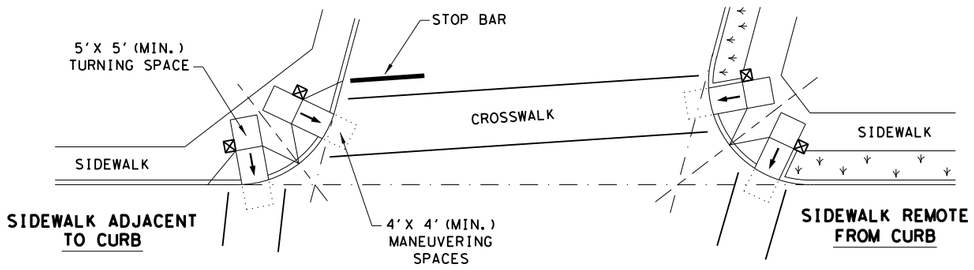
DATE:
FILE:

TYPICAL CROSSING LAYOUTS

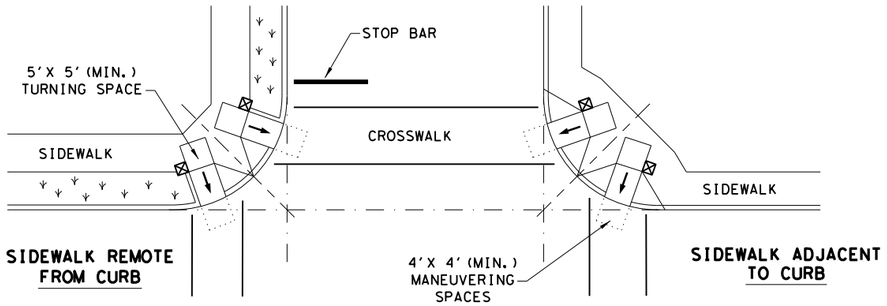
SEE SHEET 1 OF 4 FOR DETAILS AND DIMENSIONS



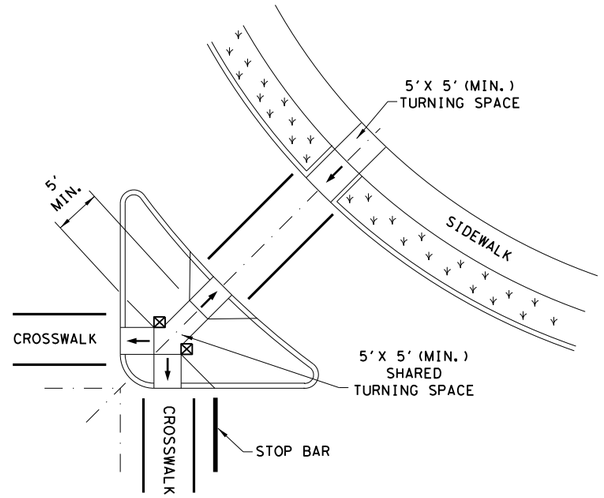
SKEWED INTERSECTION WITH "LARGE" RADIUS



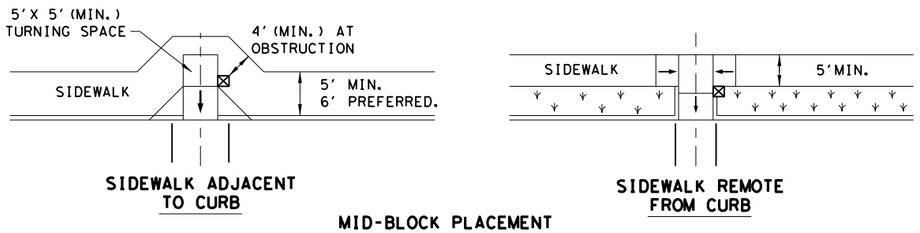
SKEWED INTERSECTION WITH "SMALL" RADIUS



NORMAL INTERSECTION WITH "SMALL" RADIUS



AT INTERSECTION
W/FREE RIGHT TURN & ISLAND



MID-BLOCK PLACEMENT
PERPENDICULAR RAMPS

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

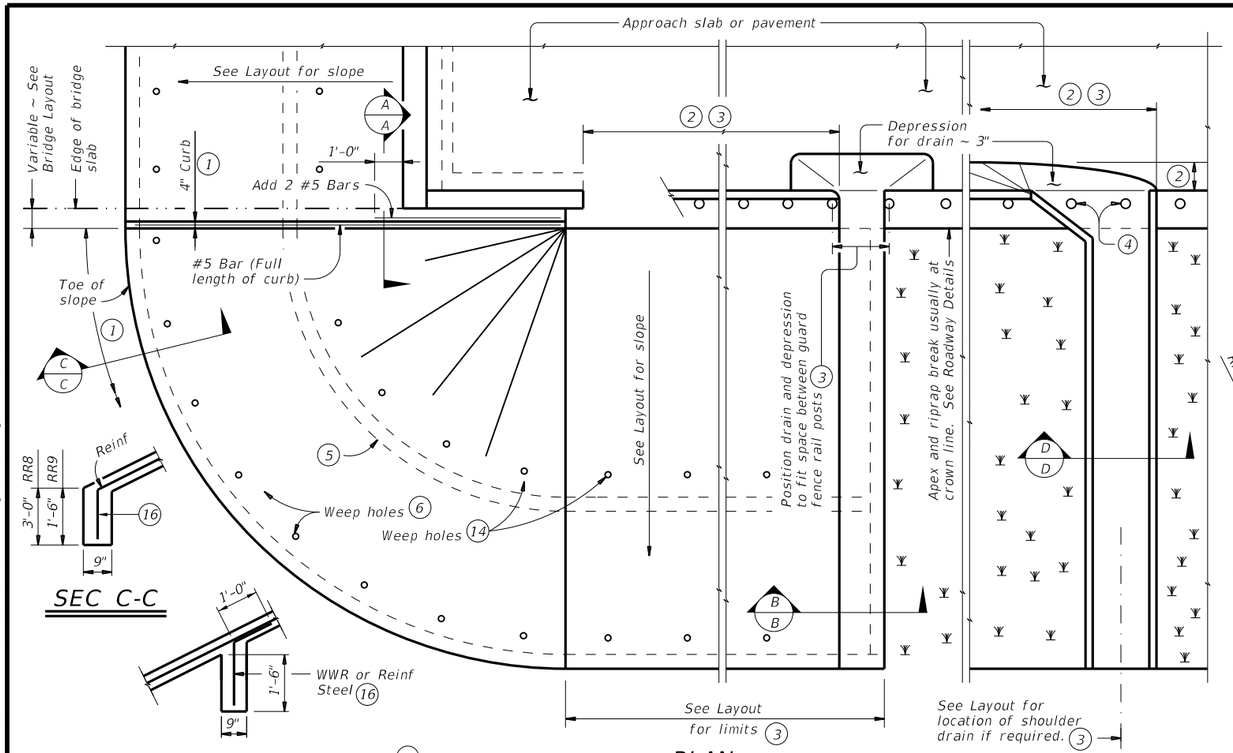
Texas Department of Transportation | Design Division Standard

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	0502	01	222	SH 225
REVISED 08, 2005 REVISED 06, 2012 REVISED 01, 2018	DIST	COUNTY		SHEET NO.
	6	HARRIS		99

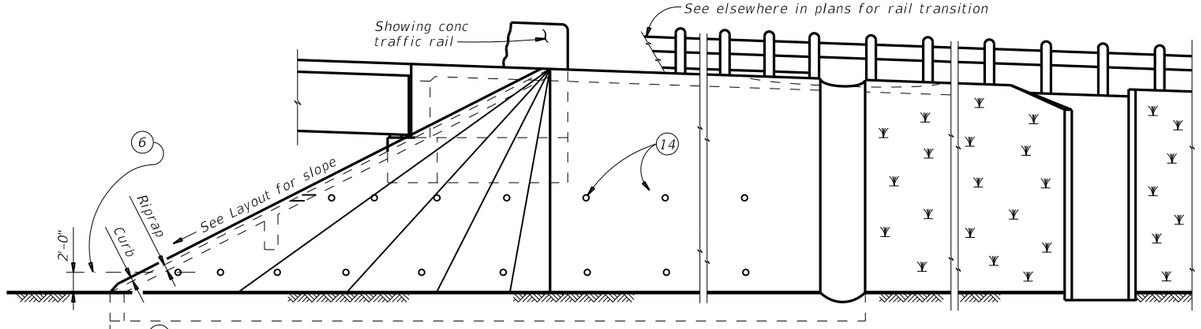
DATE:
FILE:



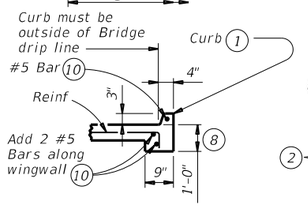
PLAN

SEC C-C

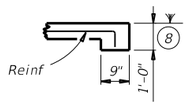
INTERMEDIATE TOEWALL (5)



ELEVATION

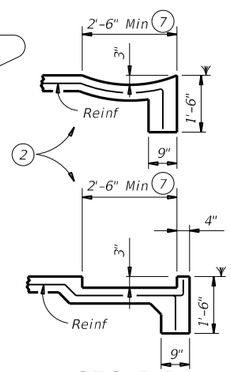


SEC A-A



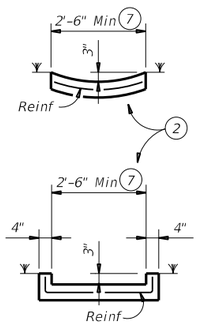
SEC B-B

(No drain)



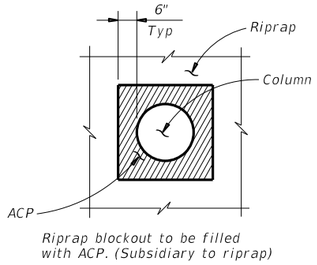
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

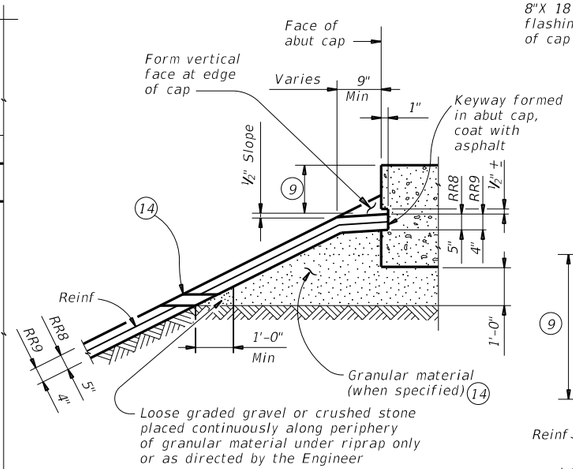
(Shoulder drain)



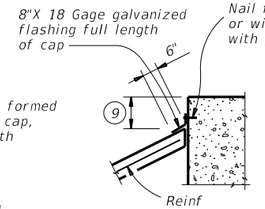
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

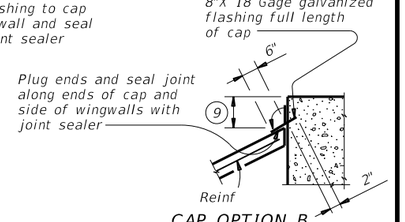
(As directed by the Engineer)



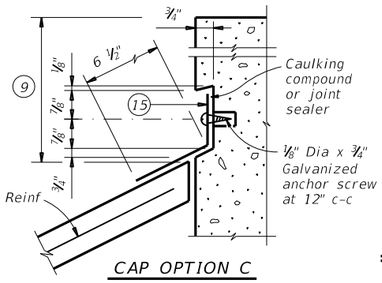
SHOWING KEYWAY OPTION



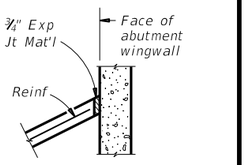
CAP OPTION A



CAP OPTION B

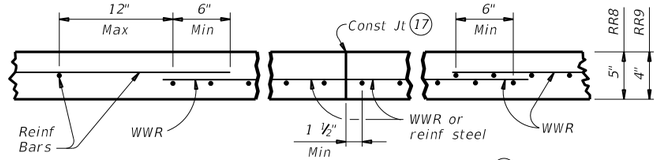


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

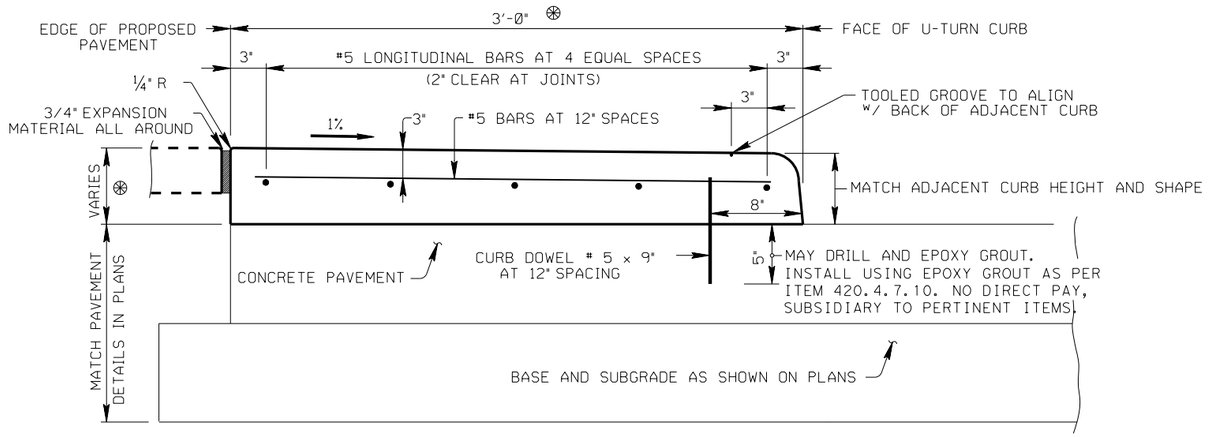
Texas Department of Transportation

Bridge Division Standard

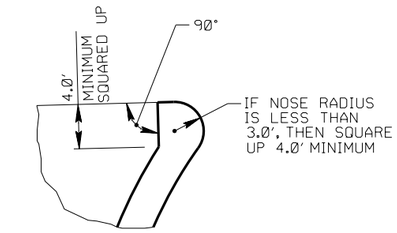
CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

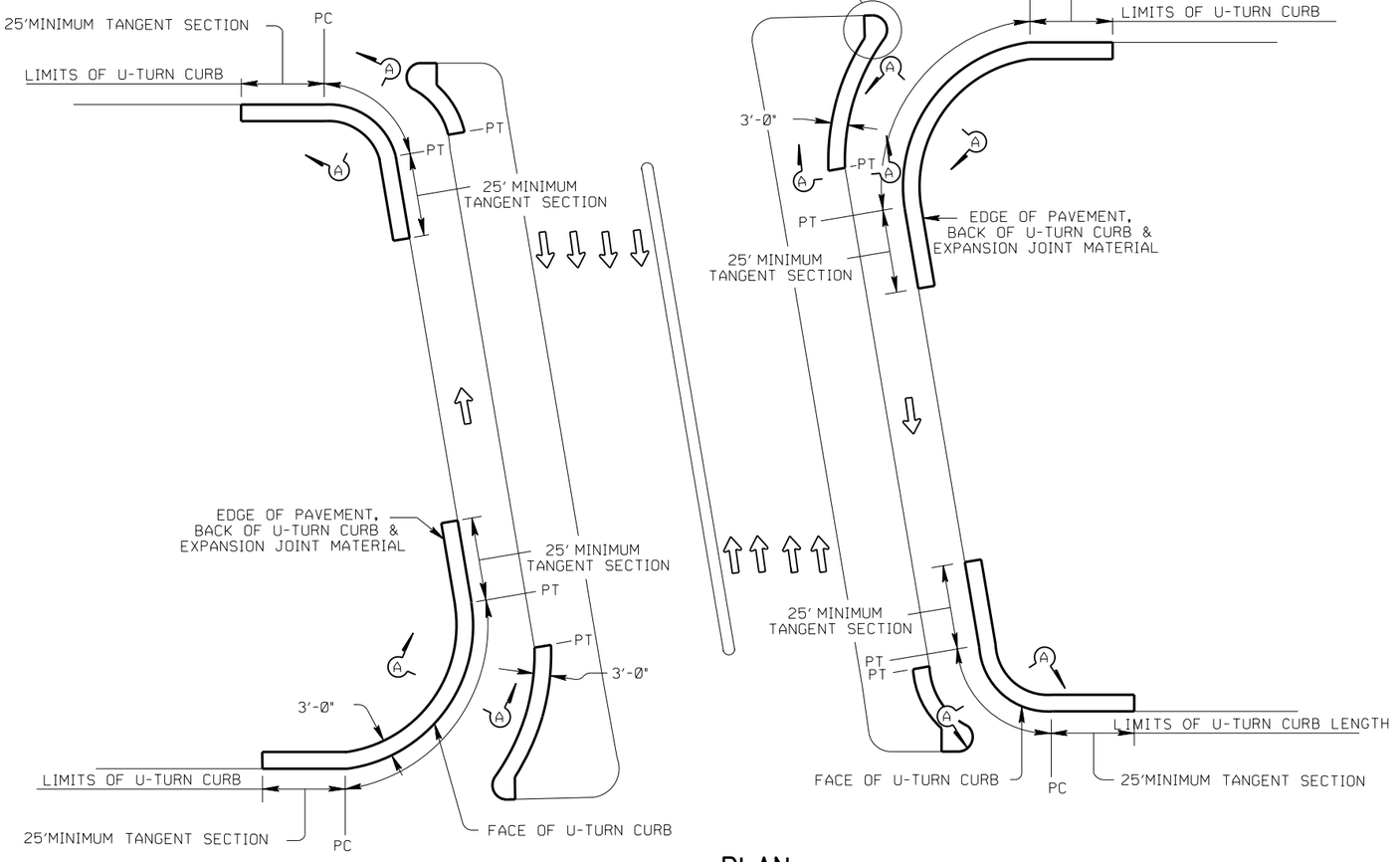
FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	12	HARRIS		100



SECTION A-A
NEW CONSTRUCTION
ITEM 529 - CONC CURB (U-TURN)



DETAIL "A"



PLAN

NOTE:

1. U-TURN CURB MEASURED BY THE FOOT ALONG THE FACE OF THE CURB.

LEGEND:

R = RADIUS
⊛ = LIMITS OF PAY FOR U-TURN CURB WIDTH

Texas Department of Transportation
Houston District

U-TURN CURB DETAIL
NEW CONSTRUCTION
HOU-U-CURB

FILE: UCURBNEW.DGN	DN:TxDOT	CK:TxDOT	DW:TxDOT	CK:TxDOT
©TxDOT 2014 REVISIONS	DIST	FED REG	PROJECT NO.	SHEET
	HOU	6		101
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0502	01	222	SH 225

STD B11

GENERAL PAVER NOTES:

1. Reference Item 528, Colored Textured Concrete and Landscape Pavers, of the Texas Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges 2014 for specifications, dimensions, volumes and measurements not shown. NOTE: Item 528 references several ASTM standard specifications required as part of this Item.
2. Locate and stake all underground conduits and utilities associated with but not limited to: CTMS, CTMS power supply, lighting, signal wires and detectors, gas, electrical, telephone, fiber optics, etc.
3. Locate and stake existing ground boxes, inlets, culverts, manholes, etc. within the project area with a 4' wooden stake, painted orange. Maintain the stakes in place for duration of construction period of the contract. Remove stakes when directed by Engineer.
4. Repair and/or replacement of any damaged underground conduits or utilities, structures, pavement, riprap, equipment, materials, slopes, vegetation, surfaces, etc. at no expense to the Department.

MATERIALS:

1. Use "Class B" concrete for concrete edge for pavers shown in detail. Concrete edge is paid for separately under Item 432-6003 RIPRAP(CONC)(6 IN) CY.
2. Use portland cement treated base which meets the requirements of Item 276, Strength L. Portland cement treated base is subsidiary to Item 528.
3. Use bedding sand described in Item 528.2.2.2. Bedding sand is subsidiary to Item 528.
4. Use paver unit type and color type as shown. Submit sample units for approval by Engineer prior to construction with manufacturer's information certifying that paver units:
   a. Meet the requirements of Item 528.2.2.1. Pavers. including:
      1) Portland cements conform to ASTM C 150
      2) Fly ash conforms to ASTM C 618
      3) Aggregates conform to ASTM C 33 - 07
      4) Color pigments conform to ASTM C 979
   b. Are manufactured so all grey cement products are produced with a concrete mix design that contains a pigment loading that represents, by weight, 3% of the total cementitious weight of the batch. White cement products will contain sufficient pigment to achieve the specified color. Pigment dispensing will be accomplished by automated equipment designed to meter pigment granules accurately to the concrete mixer within +/- 1/2 ounce per 10 pounds of pigment.
   c. Are manufactured using accelerating plasticizer and an efflorescence reducer. Follow manufacturer's application rates, but in no case dose admixture less than 8 ounces per 100 pounds of cementitious material.
   d. Are manufactured by a standard process on equipment capable of creating a four color blend with a full range of colors to occur on each pallet.
5. Use joint sand described in Item 528.2.2.3. Joint sand is subsidiary to ITEM 528.

SUBMITTALS

1. The following submittals are required to ensure conformance with specifications:

	SUBMITTALS RECEIVED FROM CONTRACTOR? YES	NO
a. Certification from the manufacturer stating that the pavers have been tested and meet all the requirements of ASTM C 936.		
b. Mix design, including information indicating percentage of fly ash to be used as cementitious material = less than or equal to 20%.		
c. Current mill certificate from cement supplier for grey cement. Meets all requirements of ASTM C 150.		
d. Current mill certificate from cement supplier for white cement. Meets requirements of ASTM C 150.		
e. Material certification information for fly ash. Meets requirements of ASTM C 618.		
f. Current quality test reports and gradation results of stockpiles from aggregate supplier for sand and gravel products.		
g. Pigment suppliers information.		
h. Complete technical data for admixtures including information relating to percentage of total cementitious material in mix design.		
i. Technical data and specifications for equipment used in dispensing pigment to mixing equipment.		

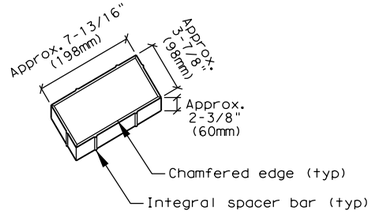
FOR ENGINEER'S USE TO ENSURE ALL SUBMITTALS ARE RECEIVED

CONSTRUCTION METHODS:

1. Provide a minimum 10'X10' (100SF) mock-up adjacent to existing display located at TxDOT District Headquarters, 7600 Washington Ave. Remove mock-up as directed by Engineer.
2. Locate and stake all items and/or limits of landscape pavers and related work in the field. Receive approval from Engineer prior to continuing.
3. Item 528.3.2.2, receive approval from Engineer before covering base material.
4. Maintain a straight joint line orientation both directions in pattern with no deviation more than 1/8 inch in a ten foot horizontal dimension.
5. Maintain vertical elevation of paver units with no surface elevation deviation greater than 3/8 inch under a ten foot straight edge.
6. Item 528.3.2.5, complete a minimum of two sweepings of joint sand, complete additional sweepings to fill the joints to the approval of the Engineer. Leave surplus sand on the surface during construction period. Sweep and clean all excess joint sand, soil, foreign material, and/or stains from pavers as directed by Engineer.
7. Immediately remove and replace paver units damaged during installation.

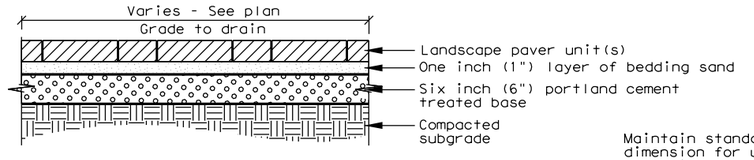
PAVER UNIT

"Holland Stone"
as manufactured by
IPC Building Products, Sugar Land, Tx,
or
approved equal

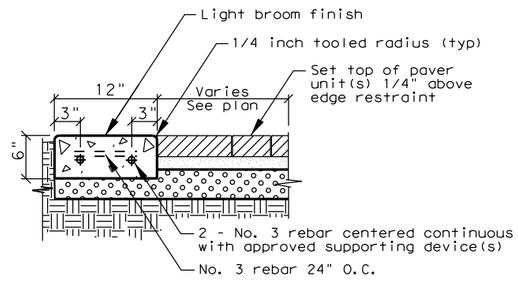


PAVER COLOR

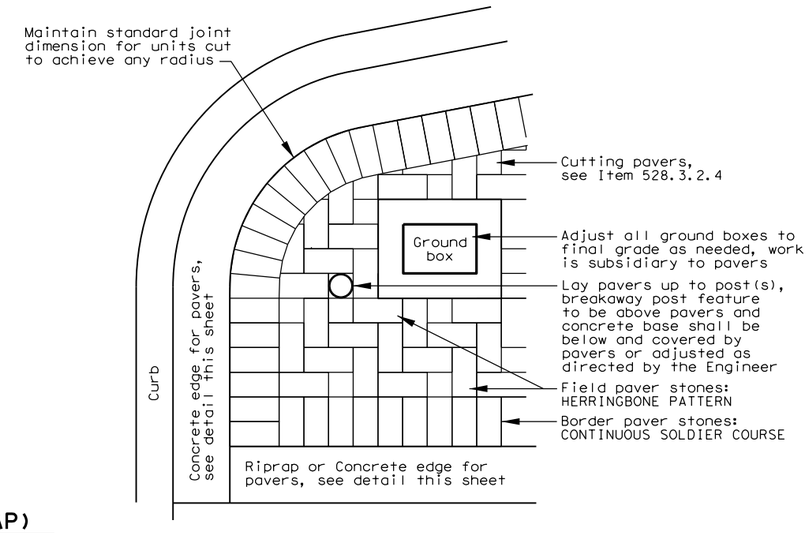
IPC Building Products "TxDOT HOUSTON DISTRICT GRP II BLEND"
or
approved equal
Color mix includes Houston District approved:
Green, charcoal, bronze and tan.
(Border stones and field stones are to be same color blend)



PAVERS ON PORTLAND CEMENT TREATED BASE

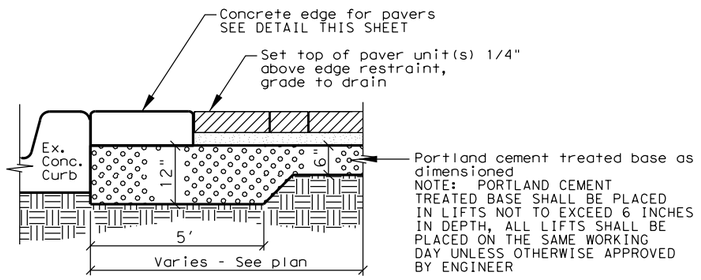


CONCRETE EDGE FOR PAVERS (CL B RIPRAP)



PAVER PATTERN LAYOUT

Install In Herringbone Pattern With
Soldier Course Along Perimeter As Shown



PORTLAND CEMENT TREATED BASE UNDER PAVERS AT EXISTING CONCRETE CURB

REQUIRED ITEMS:

- Item 432-6003 RIPRAP(CONC)(6 IN) CY
- Item 528-6004 LANDSCAPE PAVERS SY

APPROVED EQUAL NOTE:

Reference to manufacturer's trade name or product is for the purpose of identificatin only, Contractor is permitted to furnish like materials of other manufacturers provided they are of equal quality and comply with specifications for this project. All materials for consideration as an "approved equal" must be submitted to the Engineer at the preconstruction meeting. Consideration for late submittals will only be for any materials, shown in plans, which become unavailable as required.

Texas Department of Transportation

HOUSTON DISTRICT

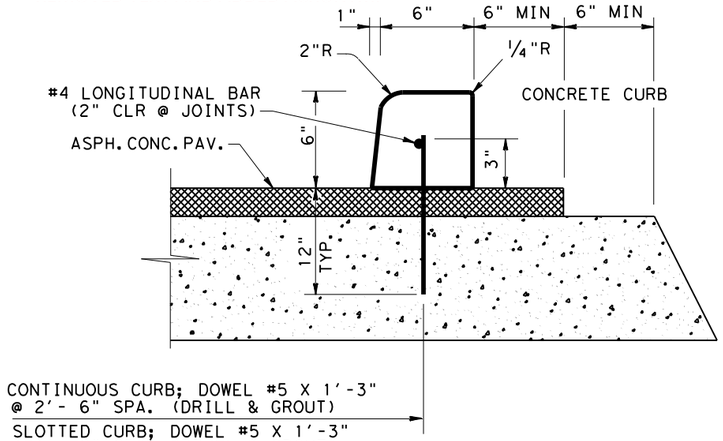
LANDSCAPE PAVERS

SHEET 1 OF 1

Details not to scale

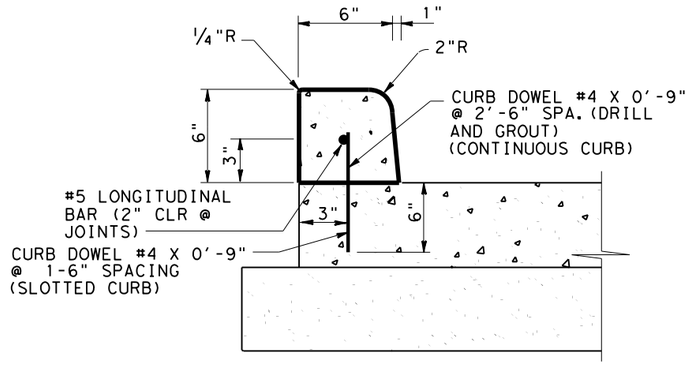
FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
	6	TEXAS				102
REVISED: OCT 2014 for 2014 specs	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	12	HARRIS	0502	01	222	SH 225

#01 - FILENAME CORRECTED.
REMOVED TEXT AND ADDED ACRONYM.



SHOWN ON EXISTING OR PROPOSED ACP PAVEMENT

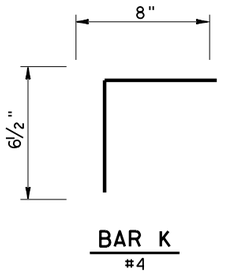
(PAY ITEM 529-6011) - FOR CONTINUOUS



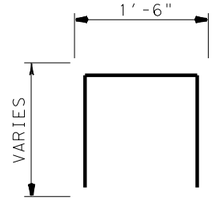
SHOWN ON EXISTING OR PROPOSED CONCRETE PAVEMENT

(PAY ITEM 529-6011) - FOR CONTINUOUS

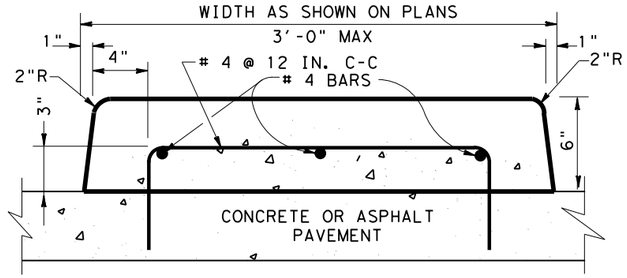
CONCRETE CURB (DOWEL) (6 IN.)



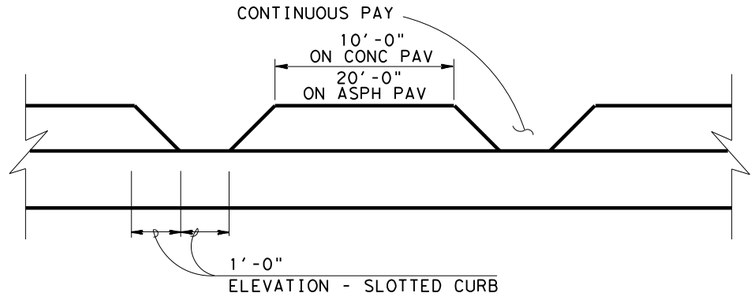
BAR K
#4



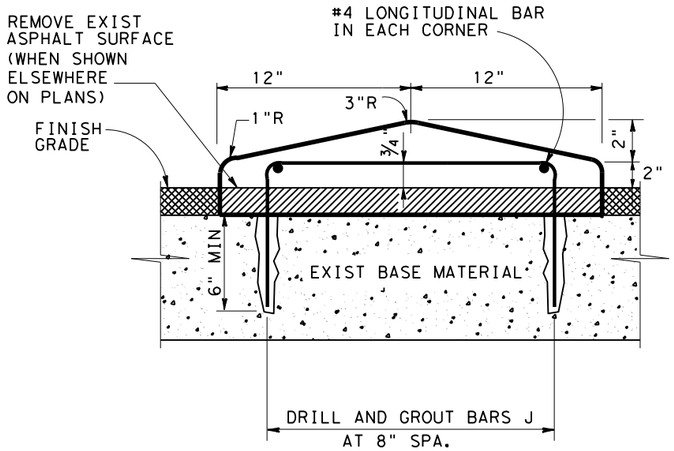
BAR J
#4



ITEM 536-6001 CONCRETE MEDIAN
SEE NOTE 2

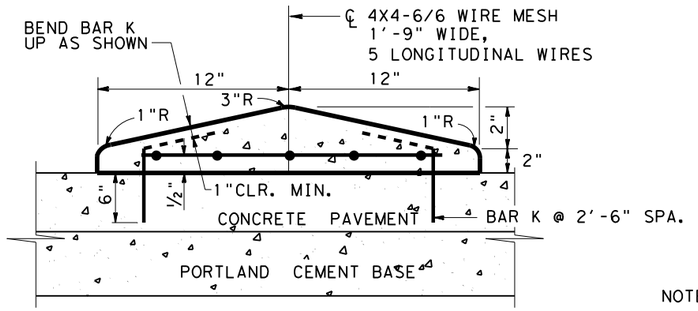


ITEM 529-6012 CONCRETE CURB (SLOTTED) - ON CONC.
ITEM 529-6009 CONC CURB (DOWEL)(SLOTTED) - ON ASPH.



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

CONCRETE DIRECTIONAL ISLAND

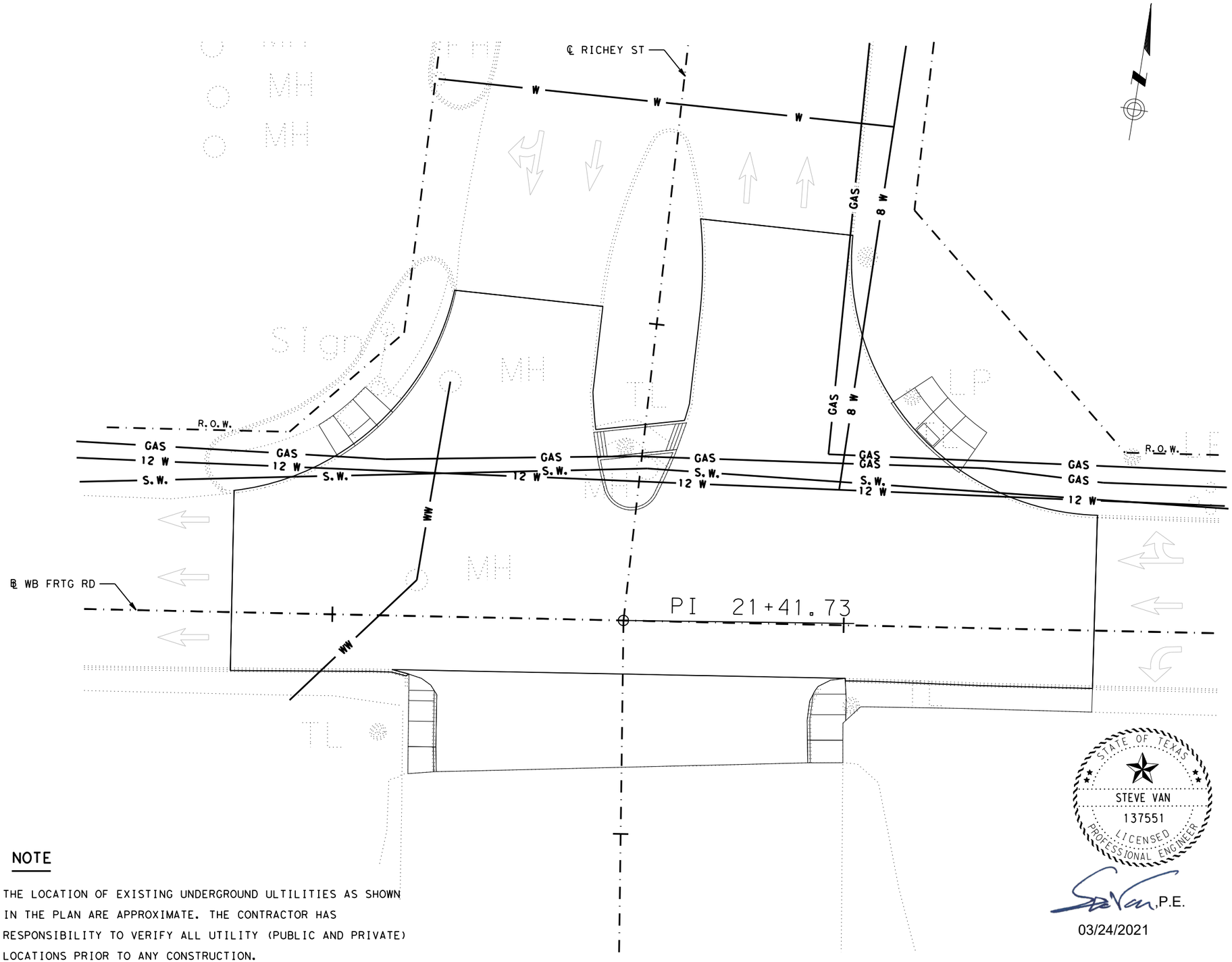
NOTES:

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.)

Texas Department of Transportation
Houston District

CONCRETE CURB AND DIRECTIONAL ISLAND DETAILS
CC & DID

FILE: STDB-9.dgn	DN:	CK:	DW:	CK:	
©TxDOT 2014	DIST	FED REG	PROJECT NO.		SHEET
REVISIONS	HOU	6			102A
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	HARRIS		0502	01	222	SH 225



LEGEND

W	WATER LINE
6 W	6" WATER LINE
8 W	8" WATER LINE
12 W	12" WATER LINE
PL	POWER LINE
GAS	CNP GAS LINE
PH.	SBC/AT&T CABLE
WW	WASTE WATER LINE
S.W.	STORM SEWER LINE
18 S.W.	18" STORM SEWER LINE
66 S.W.	66" STORM SEWER LINE

NOTE

1. THE LOCATION OF EXISTING UNDERGROUND ULTILITIES AS SHOWN IN THE PLAN ARE APPROXIMATE. THE CONTRACTOR HAS RESPONSIBILITY TO VERIFY ALL UTILITY (PUBLIC AND PRIVATE) LOCATIONS PRIOR TO ANY CONSTRUCTION.

STATE OF TEXAS
STEVE VAN
137551
LICENSED
PROFESSIONAL ENGINEER

Steve Van, P.E.

03/24/2021

TEXAS DEPARTMENT OF TRANSPORTATION

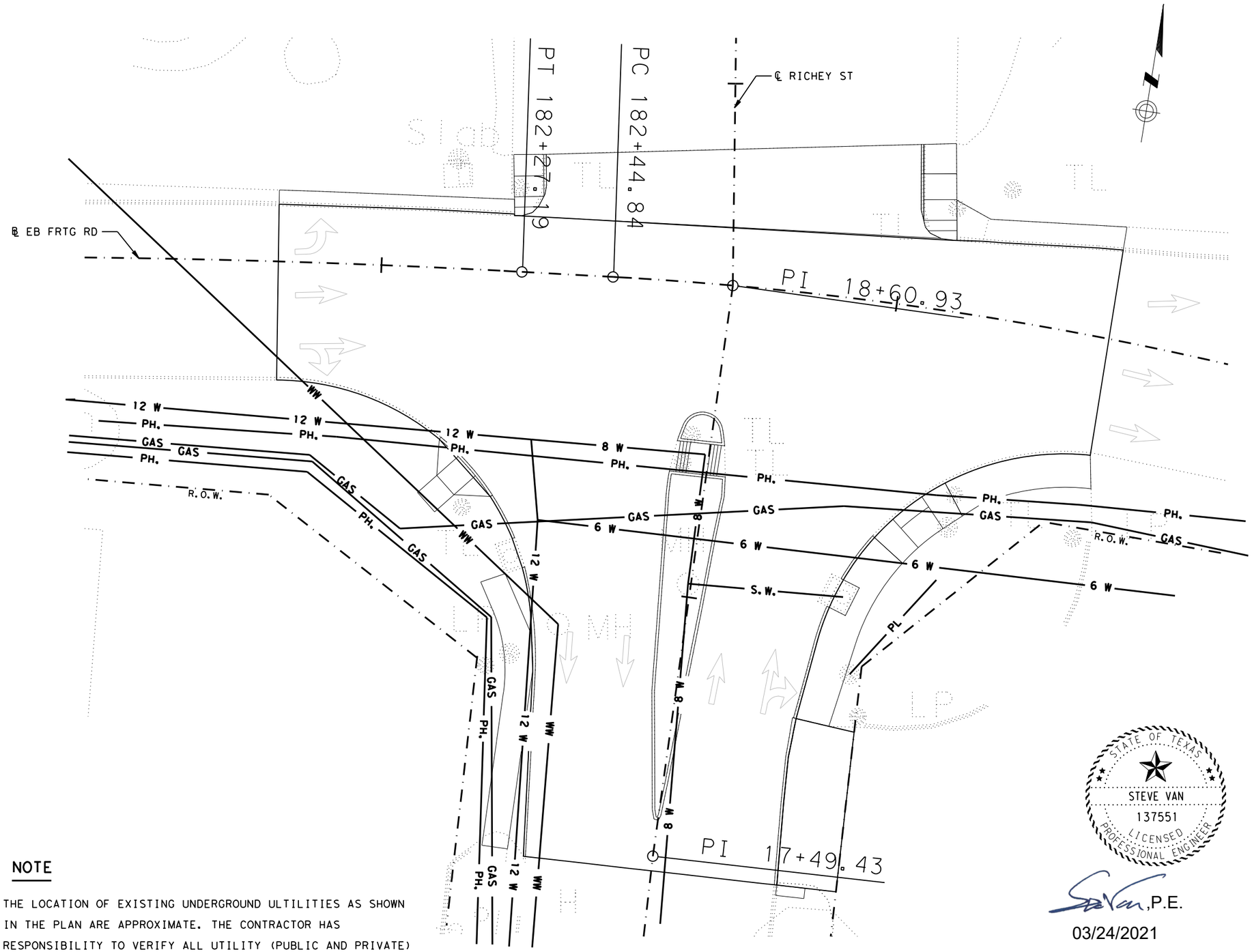
SH 225

WESTBOUND FRONTAGE ROAD & RICHEY ST

UTILITIES LAYOUT

SHEET NO. 1 OF 1 SCALE: 1" = 20'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			103
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

W	WATER LINE
6 W	6" WATER LINE
8 W	8" WATER LINE
12 W	12" WATER LINE
PL	POWER LINE
GAS	CNP GAS LINE
PH.	SBC/AT&T CABLE
WW	WASTE WATER LINE
S.W.	STORM SEWER LINE
18 S.W.	18" STORM SEWER LINE
66 S.W.	66" STORM SEWER LINE

NOTE

1. THE LOCATION OF EXISTING UNDERGROUND ULTILITIES AS SHOWN IN THE PLAN ARE APPROXIMATE. THE CONTRACTOR HAS RESPONSIBILITY TO VERIFY ALL UTILITY (PUBLIC AND PRIVATE) LOCATIONS PRIOR TO ANY CONSTRUCTION.

STATE OF TEXAS
STEVE VAN
137551
LICENSED
PROFESSIONAL ENGINEER

S.Van, P.E.

03/24/2021

TEXAS DEPARTMENT OF TRANSPORTATION

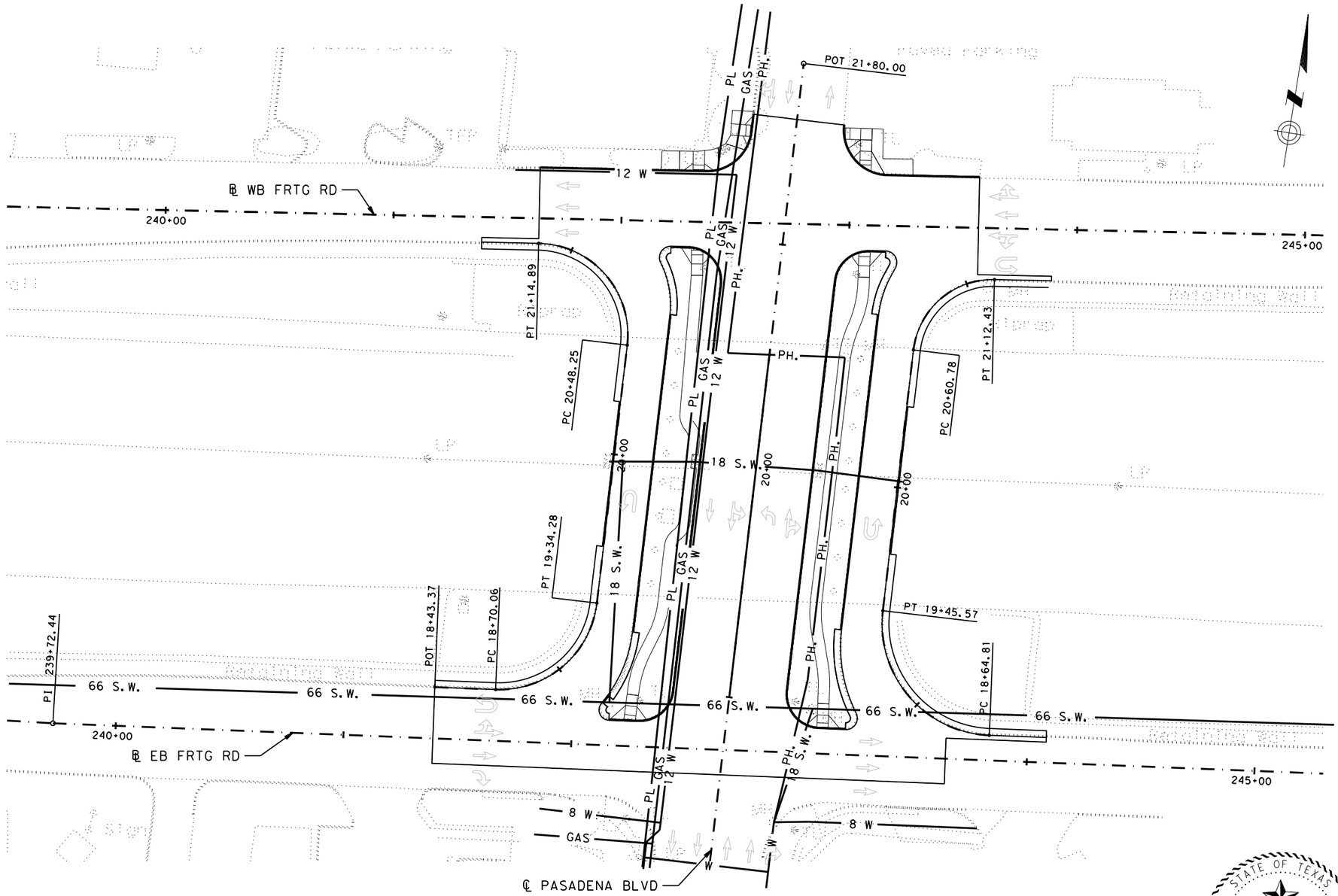
SH 225

EASTBOUND FRONTAGE ROAD & RICHEY ST

UTILITIES LAYOUT

SHEET NO. 1 OF 1 **SCALE: 1" = 20'**

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			104
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

W	WATER LINE
6 W	6" WATER LINE
8 W	8" WATER LINE
12 W	12" WATER LINE
PL	POWER LINE
GAS	CNP GAS LINE
PH.	SBC/AT&T CABLE
WW	WASTE WATER LINE
S.W.	STORM SEWER LINE
18 S.W.	18" STORM SEWER LINE
66 S.W.	66" STORM SEWER LINE

NOTE

1. THE LOCATION OF EXISTING UNDERGROUND ULTILITIES AS SHOWN IN THE PLAN ARE APPROXIMATE. THE CONTRACTOR HAS RESPONSIBILITY TO VERIFY ALL UTILITY (PUBLIC AND PRIVATE) LOCATIONS PRIOR TO ANY CONSTRUCTION.

STATE OF TEXAS
STEVE VAN
137551
LICENSED
PROFESSIONAL ENGINEER

S. Van, P.E.

03/24/2021

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

FRONTAGE ROAD & PASADENA BLVD

UTILITIES LAYOUT

SHEET NO. 1 OF 1 **SCALE: 1" = 50'**

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			105
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

NOTES:

1. INSTALL SIGNALS HORIZONTALLY ON MAST ARM, 17 FT. 6 IN. ABOVE THE ROADWAY.

2. FURNISH BLACK HOUSING FOR VEHICLE AND PEDESTRIAN SIGNALS. FURNISH BLACK VEHICLE SIGNAL HEAD BACK PLATES WITH TWO-INCH RETROREFLECTIVE YELLOW BORDERS.

3. FURNISH VEHICLE AND PEDESTRIAN SIGNALS WITH LIGHT EMITTING DIODE (LED) SIGNAL LAMP UNITS.

4. FURNISH SYMBOL TYPE PEDESTRIAN COUNTDOWN SIGNALS. INSTALL USING MOUNTING HEIGHT IN ACCORDANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

5. FURNISH MATERIALS NECESSARY TO INSTALL ACCESSIBLE PEDESTRIAN SIGNAL UNITS AND SIGNS AS SHOWN IN THE PLANS. INSTALL AT 3 FT. - 6 IN. TO 4 FT. - 0 IN. ABOVE THE SIDEWALK OR CONCRETE WALKWAY.

6. USE TYPE B (HIGH INTENSITY PRISMATIC) OR TYPE D (DIAMOND GRADE) RETROREFLECTIVE SHEETING FOR SIGNS MOUNTED UNDER OR ADJACENT TO THE SIGNAL HEADS.

7. ROUTE CABLE FOR LUMINAIRES (#12/4C TRAY CABLE) TO THE SERVICE ENCLOSURE. SEE ELECTRICAL DETAIL SHEETS. DO NOT PASS LUMINAIRE CONDUCTORS THROUGH THE SIGNAL CONTROLLER CABINET.

8. FURNISH AND INSTALL FULL-ACTUATED CONTROLLER WITH INTERNAL TIME BASE COORDINATION UNIT IN A BASE MOUNTED CABINET.

9. FURNISH ALL MATERIALS. SUPPLY THE CONTROLLER WITH PHASE SEQUENCE, DETECTOR UNITS, DETECTOR CARD RACK, AND POWER SUPPLY, TO THE DEPARTMENT'S SIGNAL SHOP, 6810 KATY ROAD, HOUSTON, TEXAS FORTY FIVE (45) DAYS IN ADVANCE FOR INSPECTION, SET UP, AND TESTING. CONTACT MR. MICHAEL AWA, P. E., IN WRITING, AT LEAST FIFTEEN (15) WORKING DAYS PRIOR TO PICKING UP THE MATERIALS.

   ADDRESS: TEXAS DEPARTMENT OF TRANSPORTATION
   P. O. BOX 1386
   HOUSTON, TEXAS 77251-1386
   TEL. NO. (713) 802-5661

10. THE TRAFFIC SIGNAL CONSTRUCTION AND MAINTENANCE OFFICE WILL PROVIDE PHASING AND TIMING FOR TEMPORARY AND PERMANENT TRAFFIC SIGNALS.

11. LOCATE CONTROLLER(S), MAST ARM POLES, DETECTORS, GROUND BOXES, ETC., AS APPROVED.

12. REPAIR OR REPLACE PAVEMENT AND SIDEWALKS DAMAGED BY THE CONTRACTOR'S FORCES DURING CONSTRUCTION AT NO COST TO THE DEPARTMENT.

13. SEAL ENDS OF ALL CONDUITS WITH DUCT SEAL, EXPANDABLE FOAM, OR BY OTHER METHODS APPROVED BY THE ENGINEER. SEAL CONDUIT IMMEDIATELY AFTER COMPLETION OF CONDUCTOR INSTALLATION AND PULL TESTS. DO NOT USE DUCT TAPE AS A PERMANENT CONDUIT SEALANT. DO NOT USE SILICONE CAULK AS A CONDUIT SEALANT.

14. CAP SPARE CONDUITS INSTALLED IN POLE FOUNDATIONS AND GROUND BOXES USING APPROVED CAPPING DEVICES.

15. DO NOT PLACE SIGNAL HEADS OVER THE ROADWAY UNTIL ALL NECESSARY MATERIALS ARE ON HAND AS APPROVED.

16. INSTALL TWO SET SCREWS ON ALL VEHICLE SIGNAL HEAD MOUNTING HARDWARE FITTINGS.

17. ONCE THE INTEGRITY AND/OR FUNCTION OF THE EXISTING TRAFFIC SIGNAL(S) IS ALTERED BY THE CONTRACTOR, MAINTAIN AND OPERATE THE EXISTING TRAFFIC SIGNAL(S) UNTIL THE TRAFFIC SIGNAL WORK IS ACCEPTED BY THE DEPARTMENT. DURING THE CONSTRUCTION OF THE PROPOSED TRAFFIC SIGNAL, MAINTAIN THE EXISTING TRAFFIC SIGNAL(S) IN CONFORMANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES.

18. DURING CONSTRUCTION OF THE PROPOSED SIGNAL WORK, IF THE EXISTING TRAFFIC SIGNAL EQUIPMENT REQUIRES REPLACEMENT DUE TO WEAR, DETERIORATION, OR ANY CIRCUMSTANCE OVER WHICH THE CONTRACTOR HAS NO CONTROL, THE EQUIPMENT WILL BE FURNISHED BY THE DEPARTMENT AT NO COST TO THE CONTRACTOR. INSTALL THIS EQUIPMENT AT NO COST TO THE DEPARTMENT. SUCH MATERIALS WILL BE PROVIDED AT THE DEPARTMENT'S SIGNAL SHOP LOCATED AT 6810 KATY ROAD, HOUSTON, TEXAS. CONTACT MR. MICHAEL AWA, P.E., AT TELEPHONE NUMBER (713) 802-5661.

19. MAINTAIN THE INTEGRITY AND FUNCTION OF EACH EXISTING SIGNALIZED INTERSECTION. ONCE THE INTEGRITY OR FUNCTION OF THE SIGNAL HAS BEEN ALTERED, PURSUE THE WORK AT THAT LOCATION WITHOUT DELAY OR INTERRUPTION TO RESTORE OPERATION TO ITS ORIGINAL OR FINAL OPERATIONAL DESIGN.

20. INSTALL A 5/8-IN. (MINIMUM) EYE BOLT FOR THE POINT OF ATTACHMENT BELOW THE SERVICE ENTRANCE WEATHERHEAD FOR THE SERVICE DROP TO STEEL OR WOOD POLE.

21. AIM LUMINAIRE ARMS MOUNTED ON TRAFFIC SIGNAL POLES PERPENDICULAR TO THE CENTERLINE OF THE ROADWAY IT IS INTENDED TO COVER, TO DEVELOP THE PROPER ILLUMINATION PATTERN FOR THE INTERSECTION.

22. PROVIDE 250 WATT HPS (HIGH PRESSURE SODIUM) EQUIVALENT LIGHT EMITTING DIODE (LED) LUMINAIRES OPERATING AT 240 VOLTS.

23. WRAP SIGNAL HEADS WITH DARK PLASTIC OR SUITABLE MATERIAL TO CONCEAL THE SIGNAL FACES FROM THE TIME OF INSTALLATION UNTIL PLACING INTO OPERATION.

24. GROUND STEEL MAST ARM POLE ASSEMBLIES IN ACCORDANCE WITH REQUIREMENTS SHOWN ON THE LATEST TRAFFIC SIGNAL POLE FOUNDATION STANDARD. USE THE GROUNDING LUG ON THE POLE TO GROUND THE POLE TO THE GROUND CONDUCTORS FROM THE CONDUITS.

25. VERIFY THE CORRECT MAST ARM POLE LENGTHS FOR EACH SIGNALIZED INTERSECTION PRIOR TO ORDERING THE EQUIPMENT.

26. REFER TO TXDOT'S WEBSITE FOR PREQUALIFIED PRODUCTS LIST REGARDING VIVDS CAMERAS, VEHICLE LED TRAFFIC SIGNAL LAMP UNIT, SYMBOLIC PEDESTRIAN SIGNAL HEAD, SYMBOLIC PEDESTRIAN SIGNAL LAMP, CONDUIT, CONDUCTORS, GROUND BOXES, AND ELECTRIC SERVICE. CHECK WEBSITE PERIODICALLY FOR CURRENT UPDATES.

27. THE CONTRACTOR IS RESPONSIBLE FOR THE SIGNAL CARRYING CAPABILITY AND PERFORMANCE OF THE CABLE. INSTALL EACH WIRE WITH A LIGHTNING PROTECTION DEVICE UNLESS OTHERWISE NOTED.

28. THE LOCATION OF THE RADAR DETECTION ZONE IS APPROXIMATE. THE EXACT LOCATION WILL BE DETERMINED BY THE ENGINEER AND/OR DEPARTMENT'S TRAFFIC OPERATIONS SECTION.

29. ONCE THE CONTRACT HAS BEEN EXECUTED OR DURING THE KICK-OFF MEETING, THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE OR ARRANGE FOR THE RADAR EQUIPMENT TO BE PROVIDED BY THE DEPARTMENT.

30. THE ENGINEER OR HIS/HER REPRESENTATIVE WILL COORDINATE THE ORDERING OF THE RADAR EQUIPMENT BY USING THE FORCE ACCOUNT.

31. ENGINEER OR HIS/HER REPRESENTATIVE WILL CONTACT ARNOLD TREVINO AT 713-866-7101 TO ORDER THE RADAR EQUIPMENT.

32. THE VENDORS' REPRESENTATIVES OF THE RADAR EQUIPMENT SUPPLIED FOR THIS PROJECT MUST SUPERVISE THE INSTALLATION, SETUP AND TESTING OF THIS EQUIPMENT AND BE FACTORY CERTIFIED. THE REPRESENTATIVE MUST BE ON SITE DURING THIS TIME. ANY EQUIPMENT REQUIRED FOR SETUP AND OPERATION OF THE RADAR DEVICES MUST BE PROVIDIED TO TXDOT OR THE CITY UPON COMPLETION. THE VENDORS' REPRESENTATIVE MUST PROVIDE TRAINING TO THE MUNICIPALITIES WHO WILL BE RESPONSIBLES FOR THE MAINTENANCE OF THE RADAR EQUIPMENT AFTER ACCEPTANCE OF THE PROJECT.

33. RADAR PRESENCE DETECTION DEVICE MUST UTILIZE TRUE-PRESENCE DETECTION. SYSTEM USING LOCKING ALGORITHMS TO ATTEMPT PRESENCE DETECTION WILL NOT BE ACCEPTED.

34. RADAR ADVANCE DETECTION DEVICE MUST CONTINUOUSLY TRACK VEHICLE SPEED, DISTANCE, AND ESTIMATED TIME OF ARRIVAL.

35. THE RADAR PRESENCE DETECTION DEVICES AND THE RADAR ADVANCE DETECTION DEVICES MUST BE COMPATIBLE WITH EACH OTHER AND FROM THE SAME MANUFACTURER.

36. COMMUNICATION AND POWER TO THE RADAR DEVICES SHALL BE VIA CONTINUOUS CABLE RUN OF UP TO 1000 FEET WITH THE USE OF REPEATERS.

37. THE FINAL PLACEMENT OF RADAR DEVICES TO BE APPROVED BY ENGINEER.

DATE: 3/25/2021 9:01:53 AM
FILE: H:\TrfSignals\Hai Tran\0502-01-222\SH225atPasadenaBlvd.dgn

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

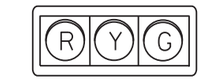
03/30/2021

SH 225
AT PASADENA BLVD
TRAFFIC SIGNAL
NOTES FOR PROPOSED
PLAN LAYOUT

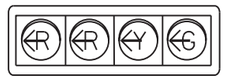
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

EXISTING SIGNAL HEADS (TO BE REMOVED)



B, C, D, F, G



A

W1 - W6

EXISTING OVERHEAD SIGNS (TO BE REMOVED)

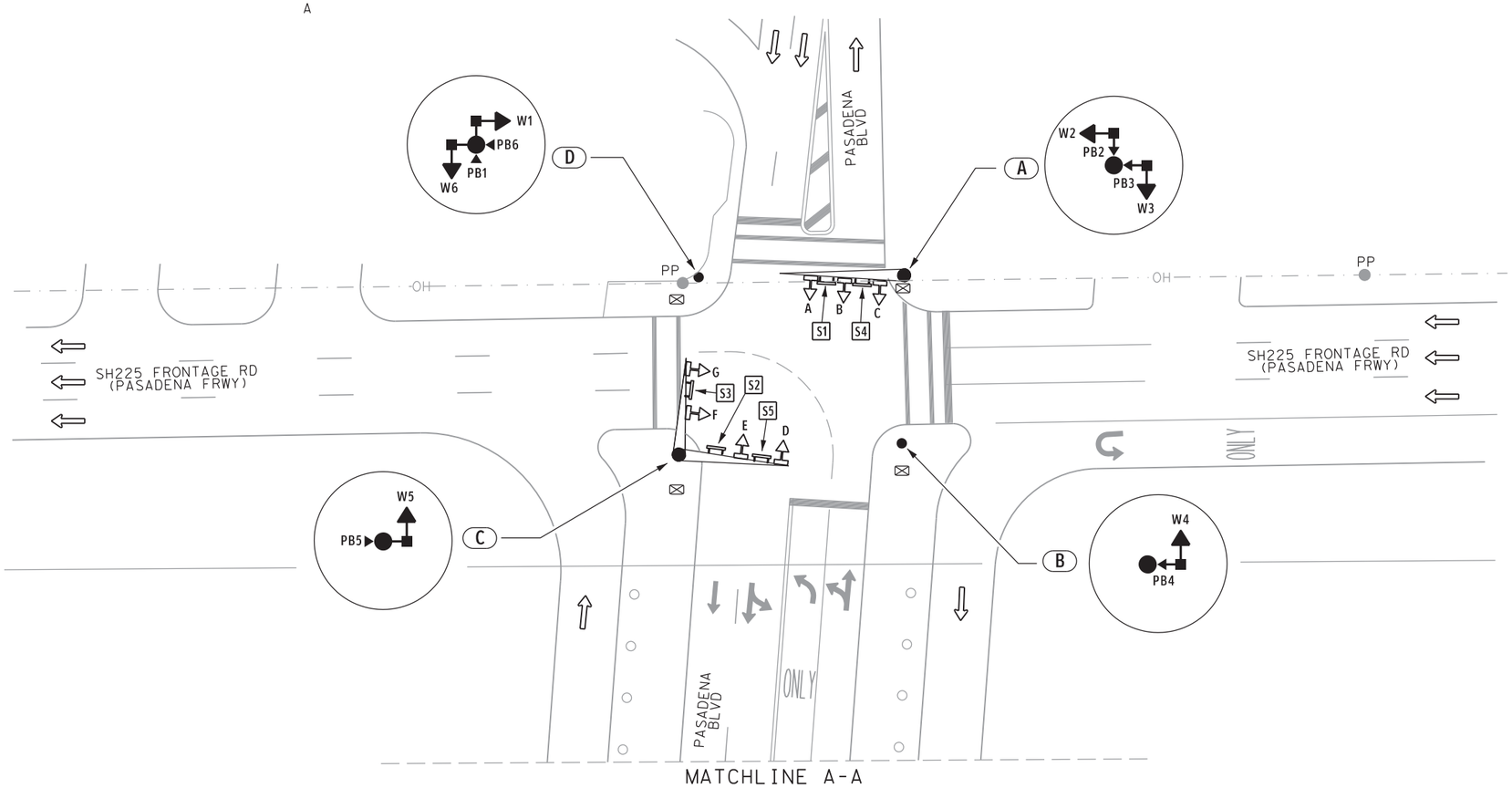
S1

S2

S3

S4

S5



LEGEND

- DIRECTION OF TRAFFIC FLOW
- PP — EXIST. POWER POLE
- OH — EXIST. OVERHEAD LINE
- EXIST. ITS GROUND BOX
- EXIST. TRAFFIC SIGNAL CONTROLLER
- EXIST. GROUND BOX
- EXIST. PEDESTRIAN POLE
- EXIST. PEDESTRIAN PUSH BUTTON
- EXIST. PEDESTRIAN SIGNAL HEAD
- EXIST. TRAFFIC SIGNAL POLE W/MAST ARM
- EXIST. ROADWAY SIGN
- EXIST. TRAFFIC SIGNAL HEAD
- Ω — EXIST. ELECTRICAL SERVICE

CALLOUTS (TO BE REMOVED)

(A) EXIST. TRAFFIC SIGNAL POLE W/MAST ARM, PEDESTRIAN SIGNAL HEADS (2 EA.) AND PUSH BUTTONS (2 EA.). TO BE REMOVED.

(B) EXIST. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON. TO BE REMOVED.

(C) EXIST. TRAFFIC SIGNAL POLE W/DUAL MAST ARMS, PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON. TO BE REMOVED.

(D) EXIST. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEADS (2 EA.) AND PUSH BUTTONS (2 EA.). TO BE REMOVED.

NOTES

-UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATING. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

-REMOVE ALL GROUND BOX, ABANDON CONDUIT AND CABLE THAT WILL NOT REUSED AS PART OF PROPOSED SIGNAL INSTALLATION.

-PROVIDE CONTINUED OPERATION OF THE EXISTING SIGNAL(S) DURING CONSTRUCTION AND UNTIL THE PROPOSED SIGNAL(S) OPERATION IS COMPLETED.

03/30/2021

0 20 40
SCALE IN FEET
1" = 40'

SH 225
AT PASADENA BLVD TRAFFIC SIGNAL EXISTING CONDITION LAYOUT

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

DATE: 3/25/2021 9:02:26 AM
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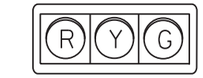
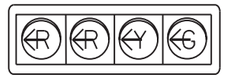
EXISTING SIGNAL HEADS (TO BE REMOVED BY OTHERS)



H, I, J, K, M, N



L

W7-W12

EXISTING OVERHEAD SIGNS (TO BE REMOVED BY OTHERS)

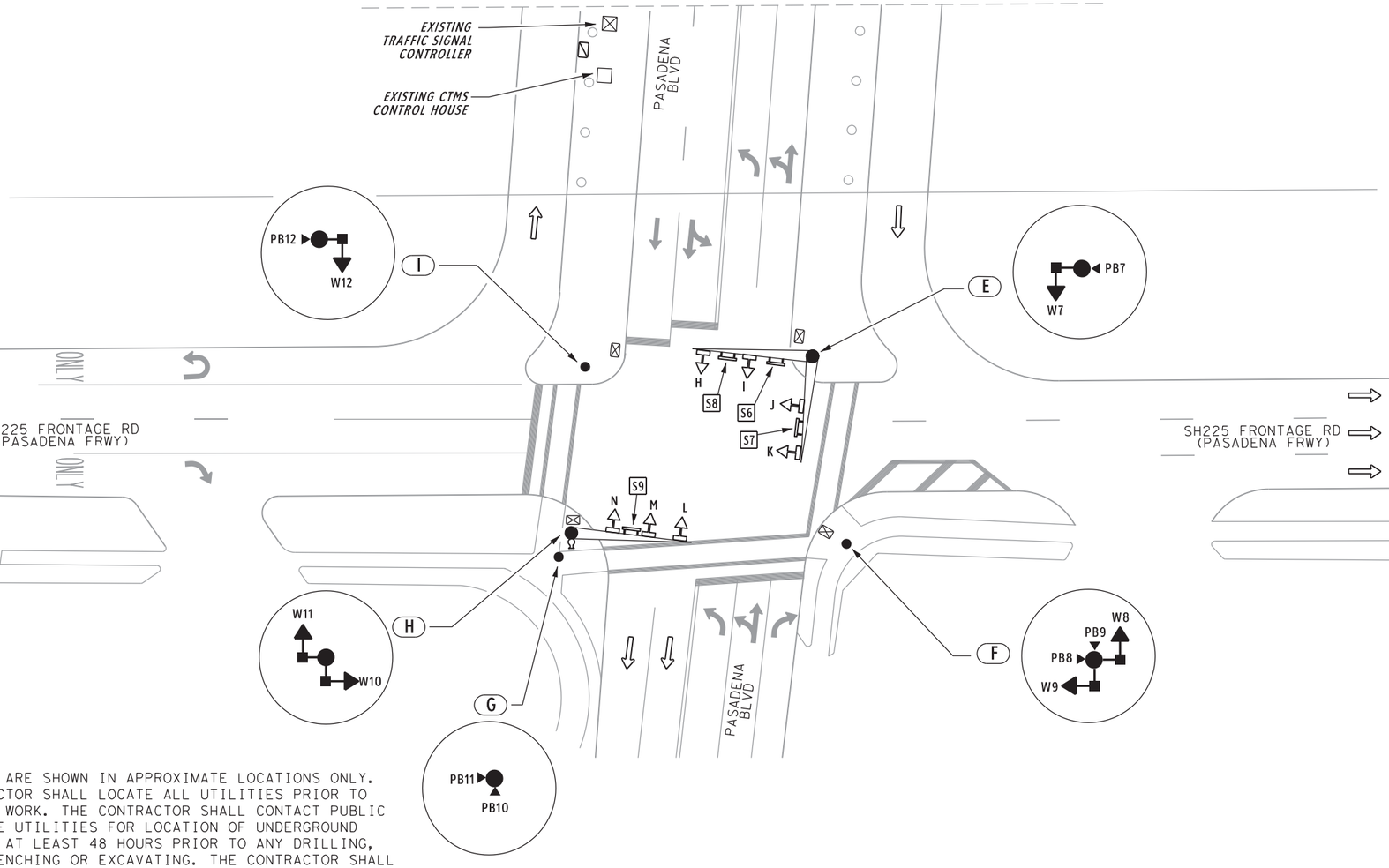
S6

S8

S7

S9

MATCHLINE A-A



LEGEND

⇦	DIRECTION OF TRAFFIC FLOW
●PP	EXIST. POWER POLE
—OH—	EXIST. OVERHEAD LINE
▱	EXIST. ITS GROUND BOX
⊠	EXIST. TRAFFIC SIGNAL CONTROLLER
⊠	EXIST. GROUND BOX
●	EXIST. PEDESTRIAN POLE
◂	EXIST. PEDESTRIAN PUSH BUTTON
■▸	EXIST. PEDESTRIAN SIGNAL HEAD
●—	EXIST. TRAFFIC SIGNAL POLE W/MAST ARM
▭	EXIST. ROADWAY SIGN
⊢▷	EXIST. TRAFFIC SIGNAL HEAD
Ω	EXIST. ELECTRICAL SERVICE

CALLOUTS (TO BE REMOVED BY OTHERS)

E	EXIST. TRAFFIC SIGNAL POLE W/DUAL MAST ARMS, PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.
F	EXIST. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEADS (2 EA.) AND PUSH BUTTONS (2 EA.).
G	EXIST. PEDESTRIAN POLE W/PEDESTRIAN PUSH BUTTONS (2 EA.).
H	EXIST. TRAFFIC SIGNAL POLE W/MAST ARM, PEDESTRIAN SIGNAL HEADS (2 EA.), ELECTRICAL SERVICE METER AND SERVICE DISCONNECT.
I	EXIST. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

NOTES

-UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS ONLY. THE CONTRACTOR SHALL LOCATE ALL UTILITIES PRIOR TO COMMENCING WORK. THE CONTRACTOR SHALL CONTACT PUBLIC AND PRIVATE UTILITIES FOR LOCATION OF UNDERGROUND FACILITIES AT LEAST 48 HOURS PRIOR TO ANY DRILLING, BORING, TRENCHING OR EXCAVATING. THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY DAMAGE CAUSED BY CONTRACTOR'S FAILURE TO LOCATE AND PRESERVE THESE UTILITIES WHETHER UNDERGROUND, ABOVE GROUND OR OVERHEAD.

-REMOVE ALL GROUND BOX, ABANDON CONDUIT AND CABLE THAT WILL NOT REUSED AS PART OF PROPOSED SIGNAL INSTALLATION.

-PROVIDE CONTINUED OPERATION OF THE EXISTING SIGNAL(S) DURING CONSTRUCTION AND UNTIL THE PROPOSED SIGNAL(S) OPERATION IS COMPLETED.

03/30/2021

0 20 40
SCALE IN FEET
1" = 40'

SH 225 AT PASADENA BLVD TRAFFIC SIGNAL EXISTING CONDITION LAYOUT

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

DATE: 3/25/2021 9:02:50 AM
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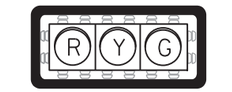
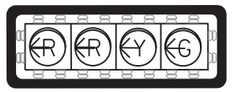
PROPOSED TRAFFIC SIGNAL HEADS



B, C, D, E, F, G, H



A

PROPOSED OVERHEAD SIGNS

R3-8L (30"X30")

S1

R6-1R (36"X12")

S2

Pasadena Blvd (90"X18")

S3

R6-1L (36"X12")

S4

Pasadena Freeway (96"X18")

S5

PROPOSED PEDESTRIAN SIGNAL HEADS AND PUSH BUTTONS (APS UNITS) WITH SIGNS

COUNTDOWN PEDESTRIAN SIGNAL HEADS

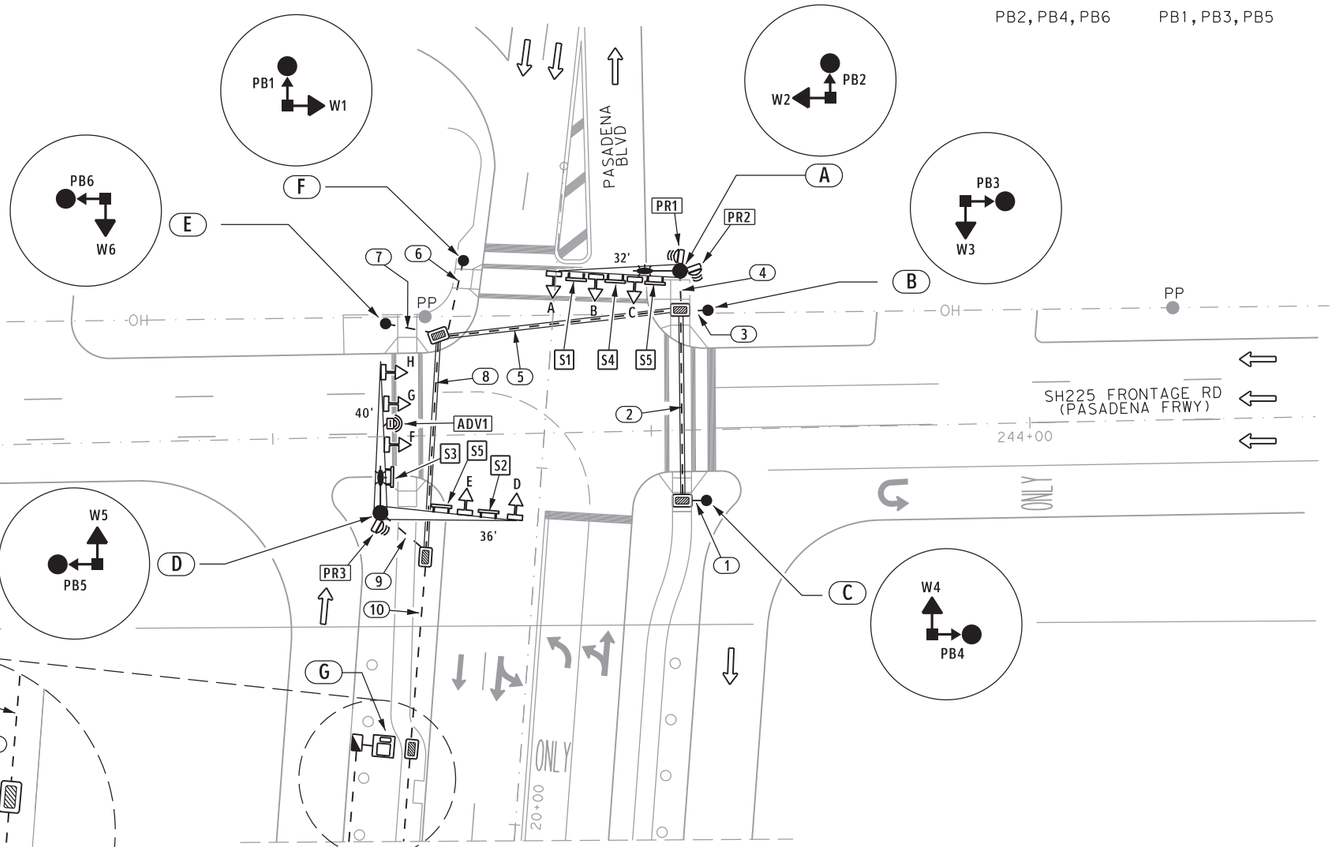
W1 - W6

R10-3EL (9"X15")

PB2, PB4, PB6

R10-3ER (9"X15")

PB1, PB3, PB5



LEGEND

- DIRECTION OF TRAFFIC FLOW
- PP — EXIST. POWER POLE
- OH — EXIST. OVERHEAD LINE
- EXIST. ITS GROUND BOX
- PROP. ITS GROUND BOX
- PROP. FULL-ACTUATED CONTROLLER WITH CABINET, GPS MODULE AND BBU (BATTERY BACKUP)
- PROP. GROUND BOX TY D
- PROP. PEDESTRIAN POLE
- PROP. PEDESTRIAN PUSH BUTTON
- PROP. PEDESTRIAN SIGNAL HEAD
- PROP. TRAFFIC SIGNAL POLE W/MAST ARM
- PROP. ROADWAY SIGN
- PROP. TRAFFIC SIGNAL HEAD
- PROP. ELECTRICAL SERVICE
- PROP. LUMINAIRE
- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)

CALLOUTS

(A) PROP. TRAFFIC SIGNAL POLE W/32' MAST ARM, LUMINAIRE, PRESENCE RADAR DETECTORS (2 EA.), PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(B) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(C) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(D) PROP. TRAFFIC SIGNAL POLE W/36' & 40' DUAL MAST ARMS, LUMINAIRE, PRESENCE RADAR DETECTOR, ADVANCED RADAR DETECTOR, PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(E) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(F) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(G) PROPOSED FULL-ACTUATED CONTROLLER WITH CABINET, GPS MODULE AND BBU (BATTERY BACKUP).

(H) PROPOSED ELECTRICAL SERVICE POLE WITH METER, SERVICE ENCLOSURE (120/240 VOLT SERVICE) AND SERVICE DISCONNECT.

NOTES

-RECONNECT EXISTING CTMS HOUSE TO NEW SIGNAL CONTROLLER USING PROPOSED 2" SCHED 80 PVC CONDUIT AND 12 STRAND SINGLE MODE FIBER OPTIC CABLE.

-COORDINATE WITH THE OTHERS FOR THE INSTALLATIONS OF THE PROPOSED SIGNAL CABLES TO THE NEW SIGNAL CONTROLLER.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

03/30/2021

0 20 40
SCALE IN FEET
1" = 40'

SH 225 AT PASADENA BLVD TRAFFIC SIGNAL PROPOSED PLAN LAYOUT

SHEET 1 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

DATE: 3/25/2021 9:03:18 AM
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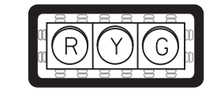
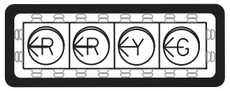
PROPOSED SIGNAL HEADS (TO BE INSTALLED BY OTHERS)



I, J, K, M, N, P, Q



O

PROPOSED OVERHEAD SIGNS (TO BE INSTALLED BY OTHERS)

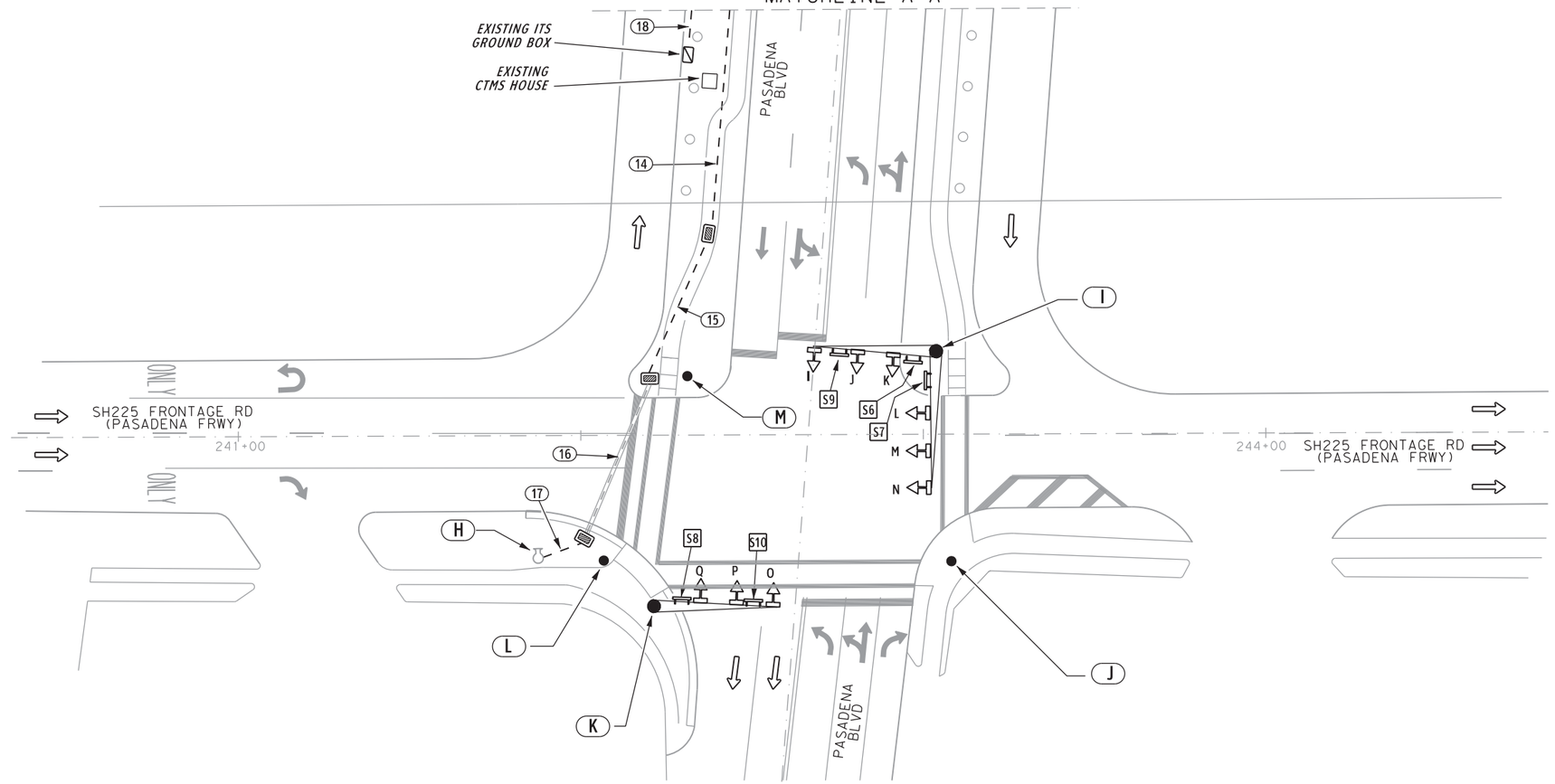
S6, S8

S9

S7

S10

MATCHLINE A-A



LEGEND

- DIRECTION OF TRAFFIC FLOW
- PP — EXIST. POWER POLE
- OH — EXIST. OVERHEAD LINE
- EXIST. ITS GROUND BOX
- PROP. FULL-ACTUATED CONTROLLER WITH CABINET, GPS MODULE AND BBU (BATTERY BACKUP)
- PROP. GROUND BOX TY D
- PROP. PEDESTRIAN POLE
- PROP. PEDESTRIAN PUSH BUTTON
- PROP. PEDESTRIAN SIGNAL HEAD
- PROP. TRAFFIC SIGNAL POLE W/MAST ARM
- PROP. ROADWAY SIGN
- PROP. TRAFFIC SIGNAL HEAD
- PROP. ELECTRICAL SERVICE
- PROP. LUMINAIRE
- PROP. CONDUIT (BORE)
- PROP. CONDUIT (TRENCH)

CALLOUTS (TO BE INSTALLED BY OTHERS)

(I) PROP. TRAFFIC SIGNAL POLE W/36′ & 40′ DUAL MAST ARMS, PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(J) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEADS (2 EA.) AND PUSH BUTTONS (2 EA.).

(K) PROP. TRAFFIC SIGNAL POLE W/32′ MAST ARM, PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(L) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

(M) PROP. PEDESTRIAN POLE W/PEDESTRIAN SIGNAL HEAD AND PUSH BUTTON.

NOTES

-RECONNECT EXISTING CTMS HOUSE TO NEW SIGNAL CONTROLLER USING PROPOSED 2" SCHED 80 PVC CONDUIT AND 12 STRAND SINGLE MODE FIBER OPTIC CABLE.

-COORDINATE WITH THE OTHERS FOR THE INSTALLATIONS OF THE PROPOSED SIGNAL CABLES TO THE NEW SIGNAL CONTROLLER.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

03/30/2021

0 20 40
SCALE IN FEET
1" = 40′

SH 225 AT PASADENA BLVD TRAFFIC SIGNAL PROPOSED PLAN LAYOUT

SHEET 2 OF 2

Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

DATE: 3/25/2021 9:03:43 AM
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ELECTRICAL DATA CHART:

CONDUIT AND CONDUCTOR RUNS																																			
RUN NO.	CONDUIT (618)												CONDUCTORS (620)						TRAY CABLE (621)		CABLES (684)						RADAR (6292)		RADAR (6292)		TRACER (620)		FIBER (6007)	
	PVC												GROUND				POWER		LUMINAIRE		PEDESTRIAN				SIGNAL		PRES. RADAR		ADV. RADAR		WIRE		SINGLE MODE	
	2" (SCHD 80)				3" (SCHD 80)				4" (SCHD 80)				#6 BARE		#4 BARE		#4 INSULATED		#12/4C Tray Cable		#12/2C		#12/4C		#12/7C		# 18/2C & #22/4C		# 18/2C & #22/4C		#14 INSULATED		12 STRAND	
	(6046)		(6047)		(6053)		(6054)		(6058)		(6059)		(6009)		(6011)		(6012)		(6005)		(6007)		(6009)		(6012)		(Subsidiary)		(Subsidiary)		(6002)		(6011)	
	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	BORE	NO.	TRENCH	NO.	BORE	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH	NO.	LENGTH
	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF	EA	LF
1	1	10											1	10							1	10	1	10										
2			1	45									1	45							1	45	1	45										
3	1	10											1	10							1	10	1	10										
4					1	15							1	15					1	15	1	15	1	15	2	15	2	15						
5							1	65					1	65					1	65	3	65	3	65	2	65	2	65						
6	1	25											1	25							1	25	1	25										
7	1	15											1	15							1	15	1	15										
8											1	65	1	65					1	65	5	65	5	65	2	65	2	65						
9					1	15							1	15					1	15	1	15	1	15	4	15	1	15	1	15				
10									1	50			1	50					2	50	6	50	6	50	6	50	3	50	1	50				
11									1	5			1	5							6	5	6	5	6	5	3	5	1	5				
12	1	5													1	5	2	5																
13									1	5			1	5																				
14	1	100													1	100	2	100	2	100														
15	1	40													1	40	2	40	2	40														
16			1	50											1	50	2	50	2	50														
17	1	10													1	10	2	10	2	10														
18	1	20											1	20																	1	20	1	20
19	1	10											1	10																	1	10	1	10
POLE A																			1	40	1	5	1	10	2	20	2	20						
POLE B																					1	5	1	10										
POLE C																					1	5	1	10										
POLE D																			1	40	1	5	1	10	4	20	1	20	1	20				
POLE E																					1	5	1	10										
POLE F																					1	5	1	10										
MAST ARM A (32')																									2	35								
MAST ARM D (36')																									2	35								
MAST ARM D (40')																									2	40			1	30				
TOTAL (LF)		245		95		30		65		60		65		355		205		410		740		1015		1045		1020		530		120		30		30
EST. TOTAL		**260**		**100**		**35**		**70**		**65**		**70**		**375**		**220**		**435**		**780**		**1070**		**1100**		**1075**		**560**		**130**		**35**		**35**

ELECTRICAL SERVICE DATA CHART:

ELECTRICAL SERVICE NAME	CALLOUT	ELECTRICAL SERVICE DESCRIPTION (SEE ED(5), ED(6), ED (7) & ED(8)-14)	SERVICE CONDUIT SIZE (RMC)	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BRK. POLE/AMP	TWO-POLE CONTACTOR AMPS	PANELBD./ LOADCENTER AMP RATING (MIN)	CIRCUIT NO.	BRANCH CKT. BRK. POLE/AMPS	BRANCH CIRCUIT AMPS	kVA LOAD
SH 225 AT PASADENA BLVD	(H)	ELEC SERV TY D (120/240)060(NS)SS(E)SP(O)	1-1/4"	3/#6	N/A	2P/60	30	100	TRF. SIG	1P/50	40	6.2
									LIGHTING	2P/20	6	

VEHICLE RADAR DETECTION CHART:

ADV1	DESIGNATED FOR WESTBOUND APPROACHING VEHICLES (SH225 FRONTAGE RD)
PR1	DESIGNATED FOR PRESENCE OF SOUTHBOUND VEHICLES (PASADENA BLVD)
PR2	DESIGNATED FOR PRESENCE OF WESTBOUND VEHICLES (SH225 FRONTAGE RD)
PR3	DESIGNATED FOR PRESENCE OF NORTHBOUND VEHICLES (PASADENA BLVD)

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

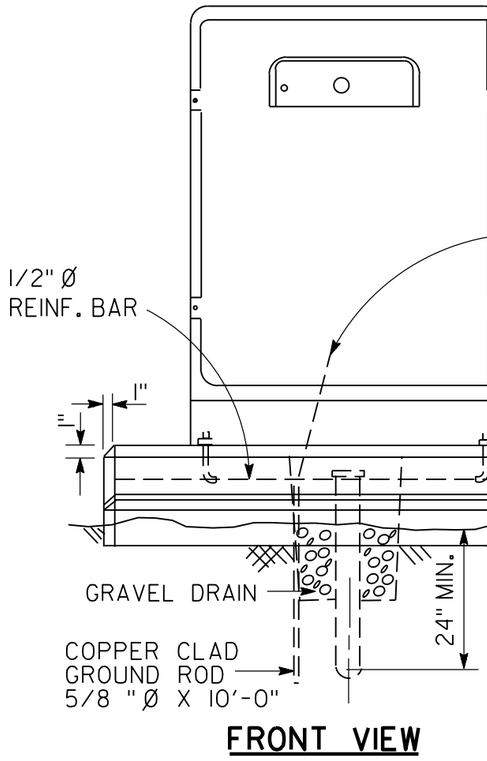
03/30/2021

SH 225 AT PASADENA BLVD TRAFFIC SIGNAL PROPOSED PLAN DETAILS

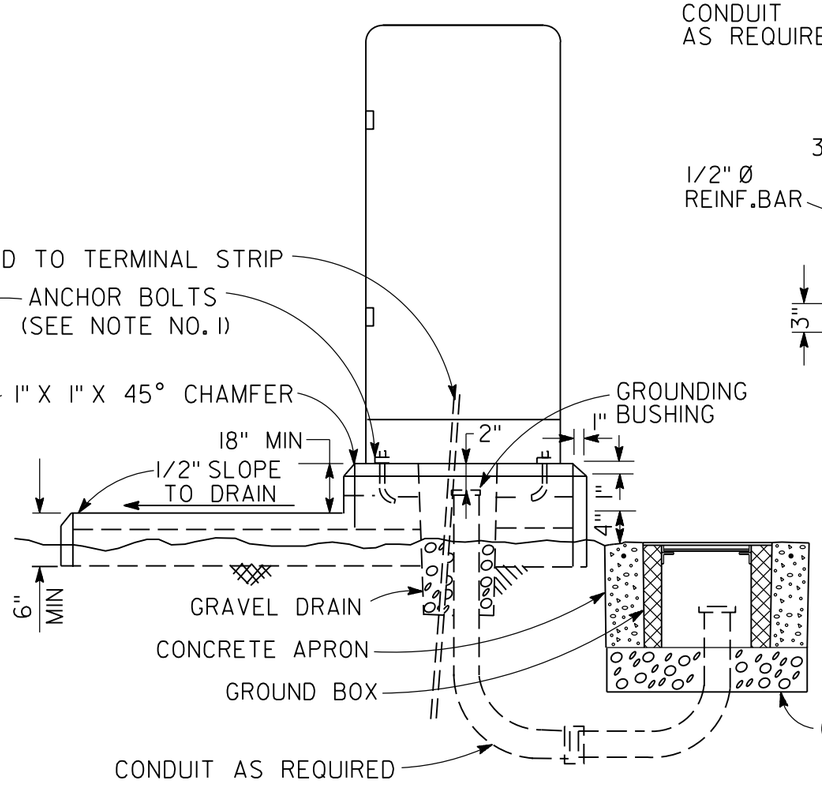
Texas Department of Transportation

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

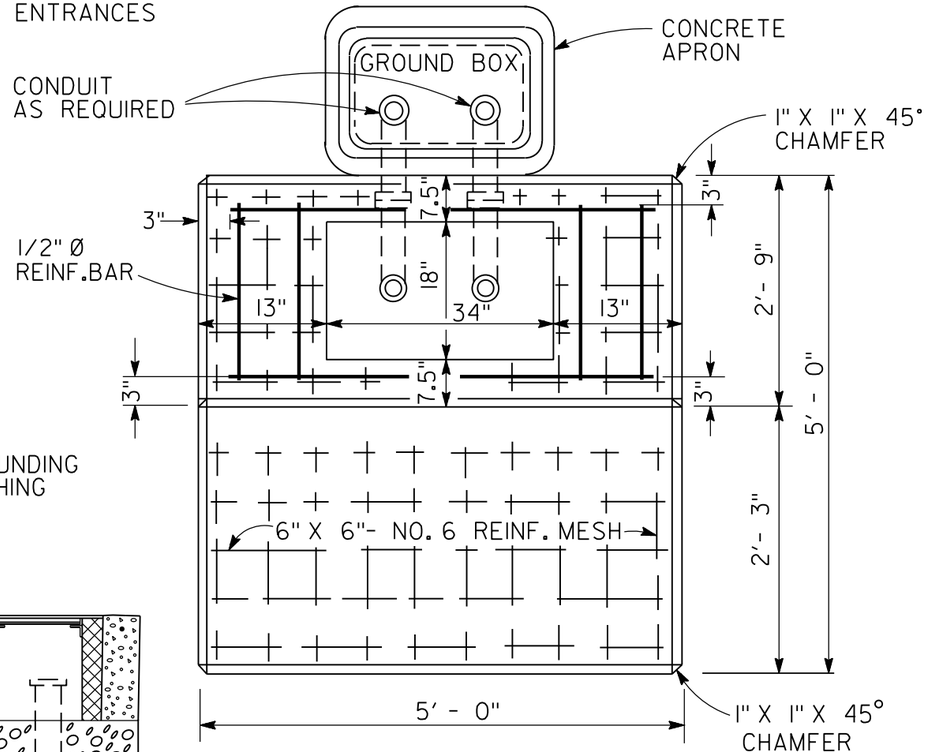
DATE: 3/25/2021 9:01:23 AM
FILE: H:\TrfSignals\Hou Tran\0502-01-222\SH225atPasadenaBlvd.dgn



FRONT VIEW



SIDE VIEW



TOP VIEW
(LESS CABINET)

NOTES:

1. CABINET MANUFACTURER TO PROVIDE DETAILS OF ANCHOR BOLT LOCATION.
2. MODIFY DIMENSIONS FOR CONCRETE BASE TO FIT EQUIPMENT FURNISHED, IF NECESSARY.
3. PROVIDE GRAVEL DRAIN FOR CONTROLLER AND ALL GROUND BOXES.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. SET CONTROLLER FOUNDATION LEVEL WITH THE PAVEMENT SURFACE OR AS APPROVED BY THE ENGINEER.
6. FURNISH AT NO COST TO THE DEPARTMENT ANY ADDITIONAL CONCRETE WHICH MAY BE NECESSARY TO STABILIZE THE FOUNDATION AT UNUSUAL LOCATIONS.
7. PLACE REINFORCING BARS AS DIRECTED.
8. UPON INSTALLING THE CONTROLLER CABINET, APPLY A SILICON-BASED CAULKING COMPOUND AROUND THE BASE OF THE CONTROLLER CABINET.

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONTROLLER FOUNDATION DETAIL

SD/SCFD

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 08-04 03-07	HOU	6		
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0502	01	222	SH 225

STD-M1

DATE: 12/28/2020 4:27:22 PM
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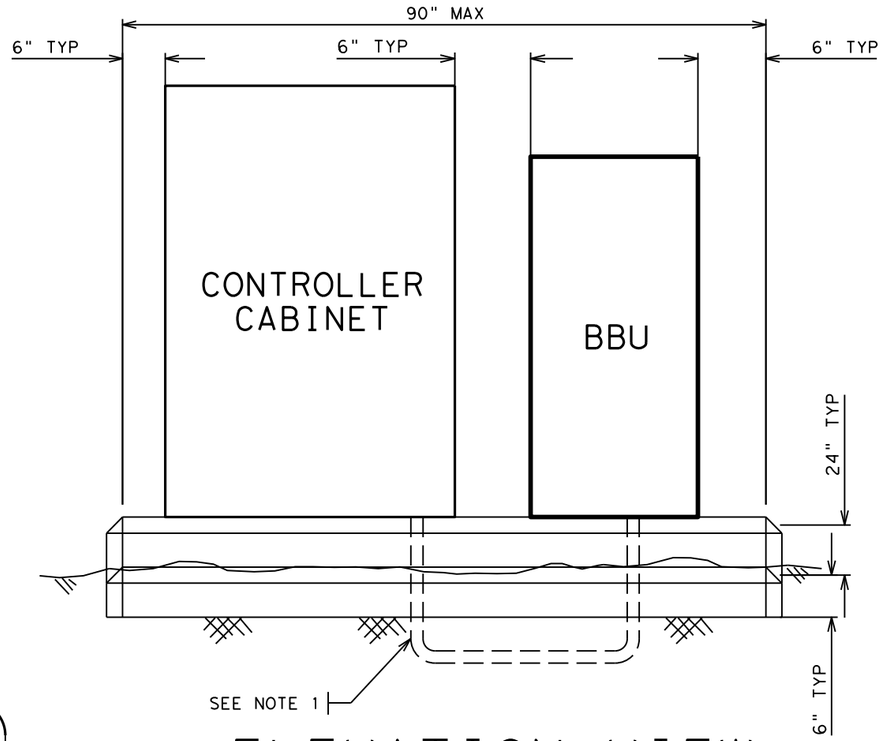
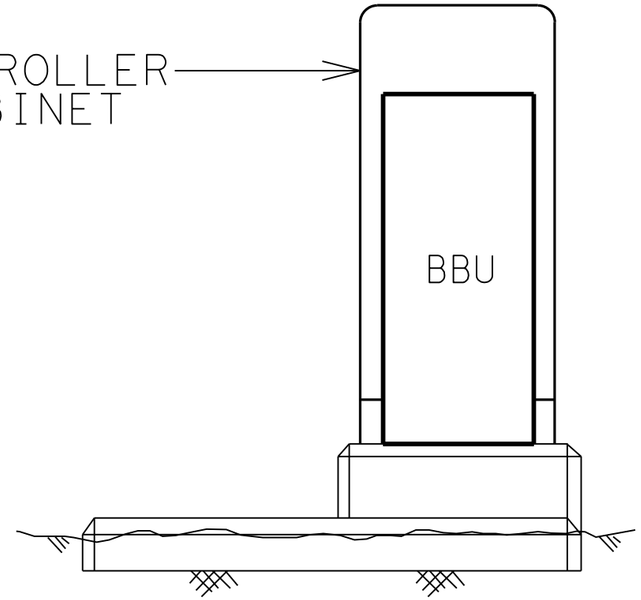
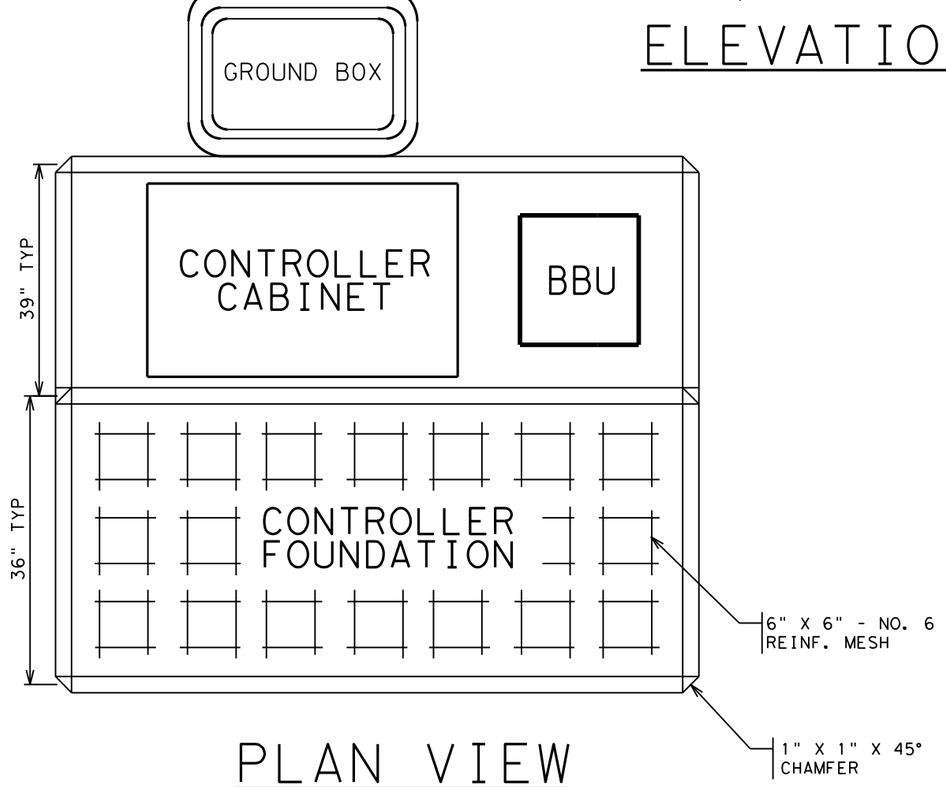


ELEVATION VIEW



SIDE VIEW



PLAN VIEW

NOTES:

1. INSTALL 1-1/2 " PVC CONDUIT WITH FIVE #6 AWG CONDUCTORS, TWO #18 AWG CONDUCTORS AND ONE CAT 5 CABLE WITH CONNECTOR BETWEEN THE TWO CABINETS.
2. EXTEND THE CONCRETE CONTROLLER PAD (REFER TO SD/SCFD) UNDER THE BBU. MODIFY PAD DIMENSIONS TO FIT EQUIPMENT, AS NEEDED.
3. THE WORK PERFORMED AND MATERIALS FURNISHED WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE SUBSIDIARY TO THE BBU ASSEMBLY.
4. FURNISH CLASS "B" OR CLASS "C" CONCRETE.
5. USE 6" X 6" - NO. 6 REINFORCING MESH IN FOUNDATION WITH 1" X 1" X 45° CHAMFER AT ALL CORNERS.

Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
BBU SIDE MOUNT

SD/SBSM

SCALE	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY
N.T.S.	6	TEXAS				SH 225
REVISIONS	STATE DISTRICT	COUNTY	CONTROL	SECTION	JOB	SHEET NO.
09/2019	HOU	HARRIS	0502	01	222	

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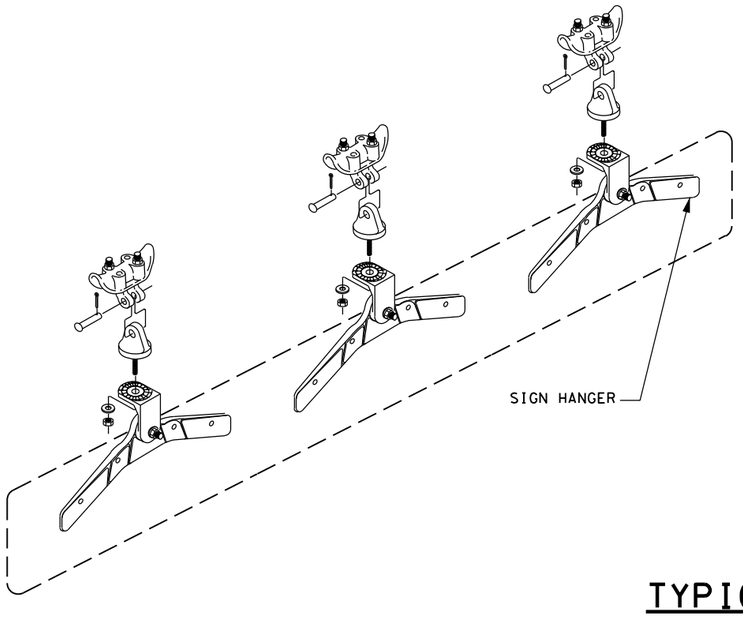
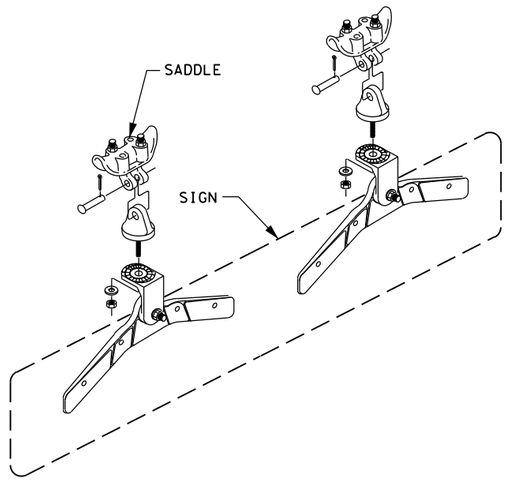
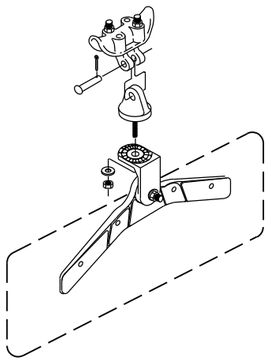
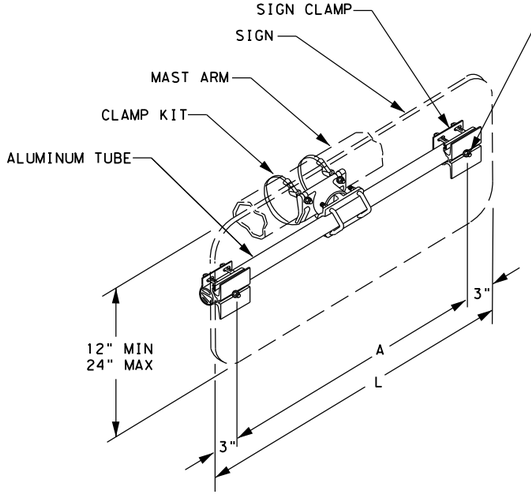


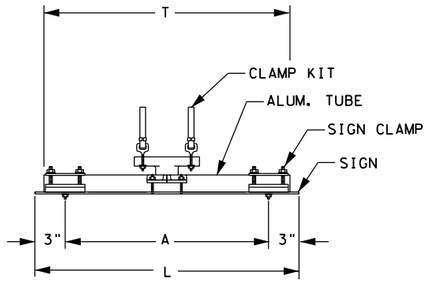


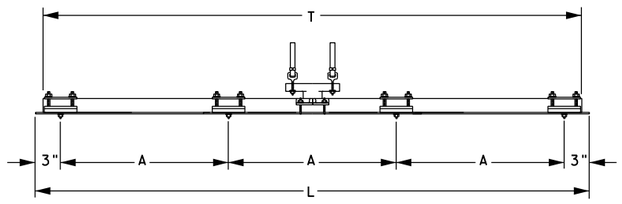


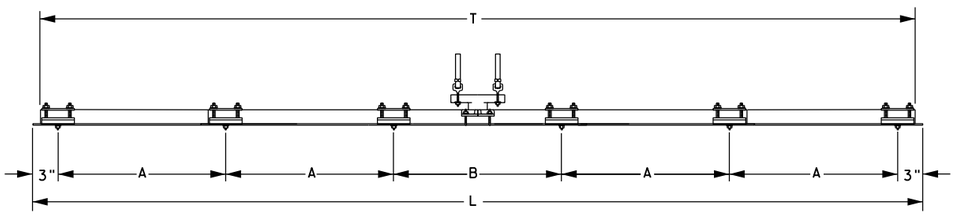
1. USE PELCO PARTS OR APPROVED EQUAL.
2. FURNISH HARDWARE FOR A COMPLETE INSTALLATION.
3. ATTACH THE 90 LB SPAN WIRE CLAMPS (SADDLES) TO TETHERS (SWAY CABLES).
4. FURNISH 1 ADJUSTABLE FREE SWINGING SIGN HANGER PER STREET NAME SIGN SMALLER THAN 3 FT. - 0 IN. SIGNS 3 FT - 0 IN. TO 6 FT.- 0 IN. REQUIRE 2 HANGERS. SIGNS LARGER THAN 6 FT. - 0 IN. REQUIRE 3 HANGERS.

TYPICAL SPAN WIRE SIGN HANGER DETAILS









SIGNS (1'-6" to 3'-0" Long)

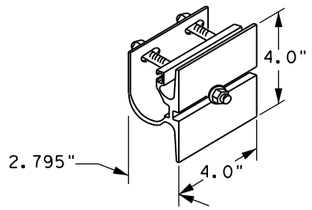
SIGN LENGTH (L)	TUBE LENGTH (T)	A
1'-6"	16"	12"
2'-0"	22"	18"
2'-6"	28"	24"
3'-0"	34"	30"

SIGNS (3'-6" to 8'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A
3'-6"	40"	12"
4'-0"	46"	14"
4'-6"	52"	16"
5'-0"	58"	18"
5'-6"	64"	20"
6'-0"	70"	22"
6'-6"	76"	24"
7'-0"	82"	26"
7'-6"	88"	28"
8'-0"	94"	30"

SIGNS (8'-6" to 10'-0" Long)

SIGN LENGTH (L)	TUBE LENGTH (T)	A	B
8'-6"	100"	19"	20"
9'-0"	106"	20"	22"
9'-6"	112"	21"	24"
10'-0"	118"	22"	26"



SIGN CLAMP DETAIL

GUSSETED TUBE CROSS SECTION

TYPICAL MAST ARM SIGN MOUNT DETAILS

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Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS
OVERHEAD STREET NAME SIGN
MOUNTING DETAILS

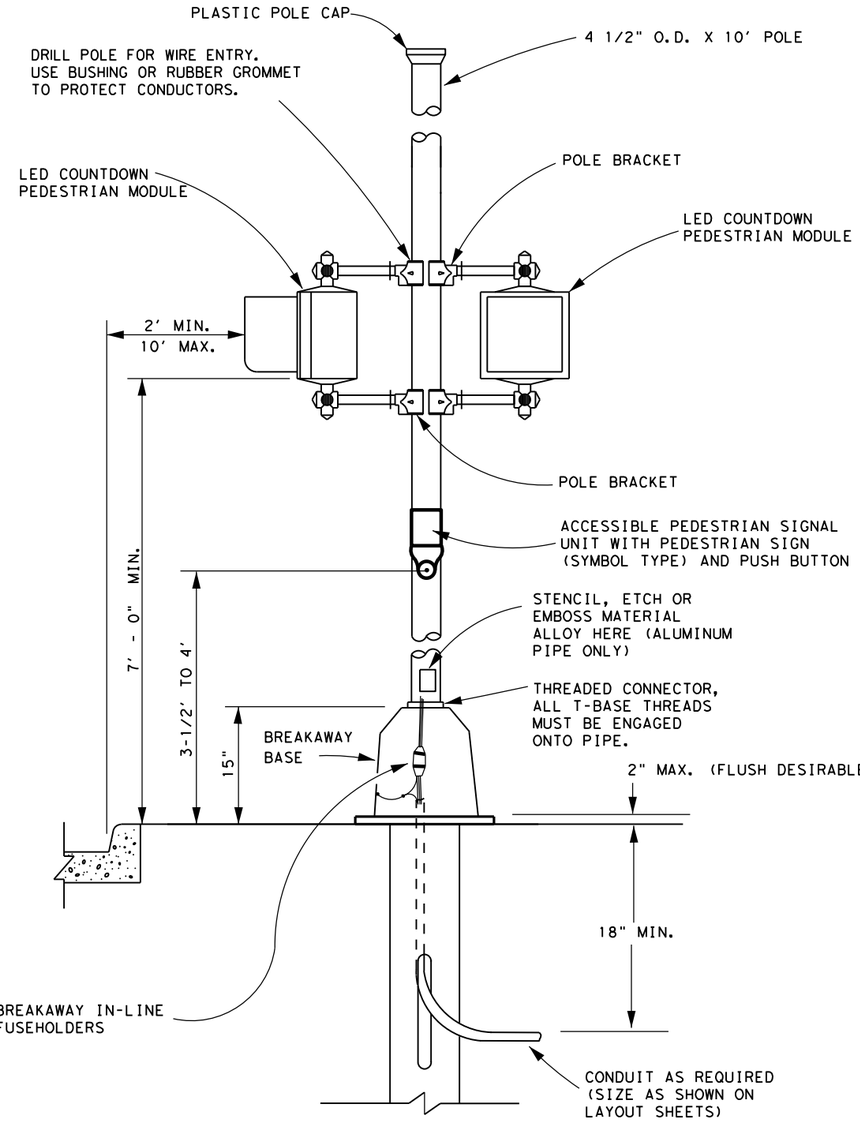
OSNS/MD

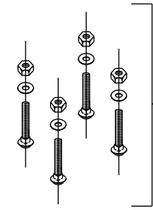
DN:	CK:	DW:	CK:

DIST	FED REG	PROJECT NO.	SHEET
HOU	6		

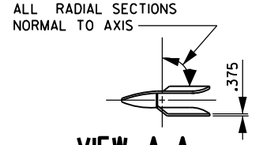
COUNTY	CONTROL	SECT	JOB	HIGHWAY
HARRIS	0502	01	222	SH 225

STD-M12

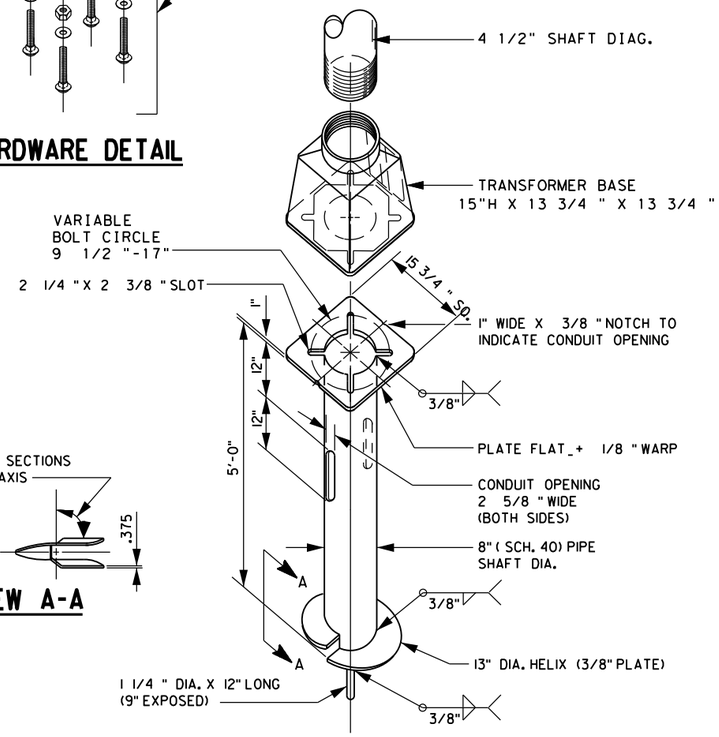




HARDWARE DETAIL



VIEW A-A



SCREW ANCHOR FOUNDATION DETAIL

NOTE:

SEE STANDARD (RFBA - 13) FOR NOTES AND NON - FUSED BREAKAWAY ELECTRICAL CONNECTOR DETAILS

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Texas Department of Transportation
Houston District

SIGNAL DETAILS/STANDARDS CONSTRUCTION DETAILS FOR POLE MOUNTED (APS) PEDESTRIAN SIGNALS

CD/PM(APS)PS

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2012	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 07-14 02-15	HOU	6		
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0502	01	222	SH 225

STD-M19

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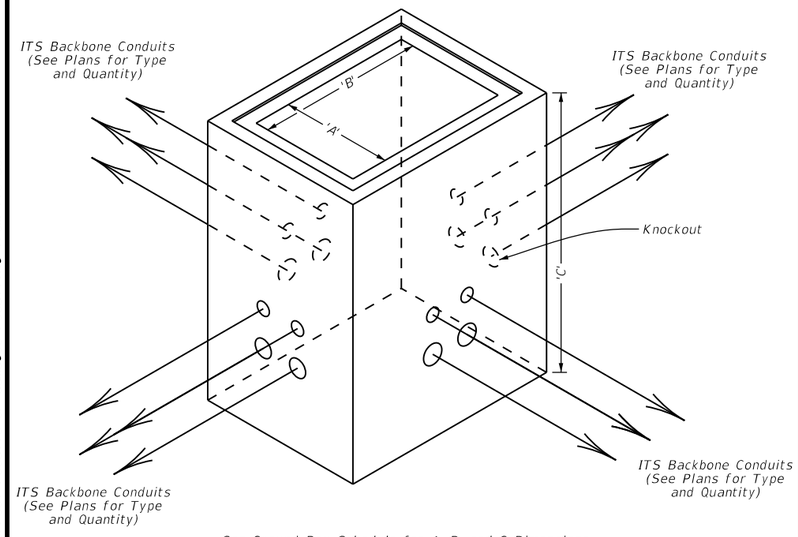
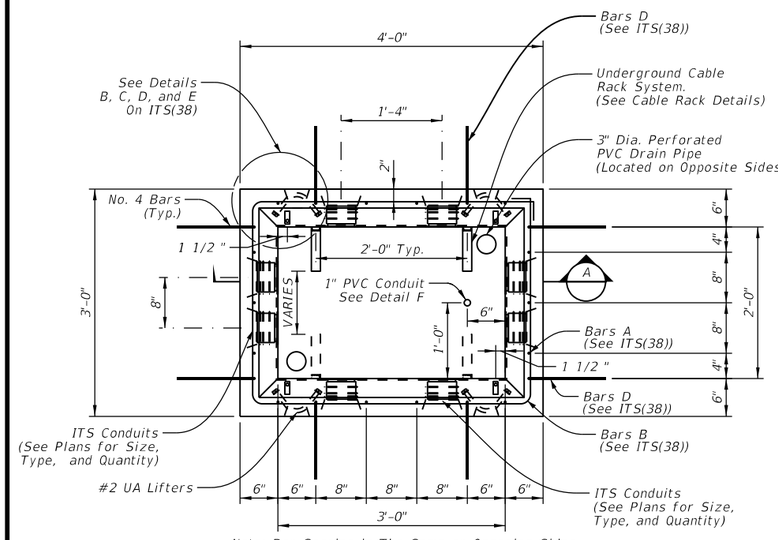


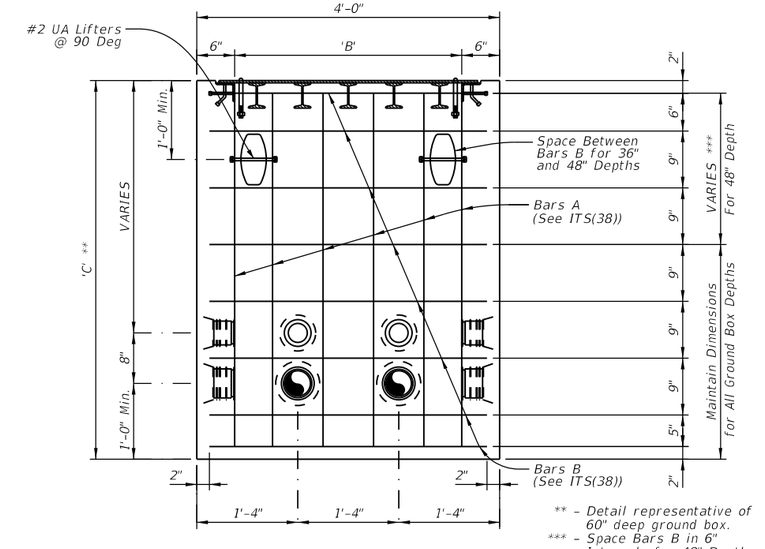
See Ground Box Schedule for A, B, and C Dimensions

Type 1 Ground Box Isometric View



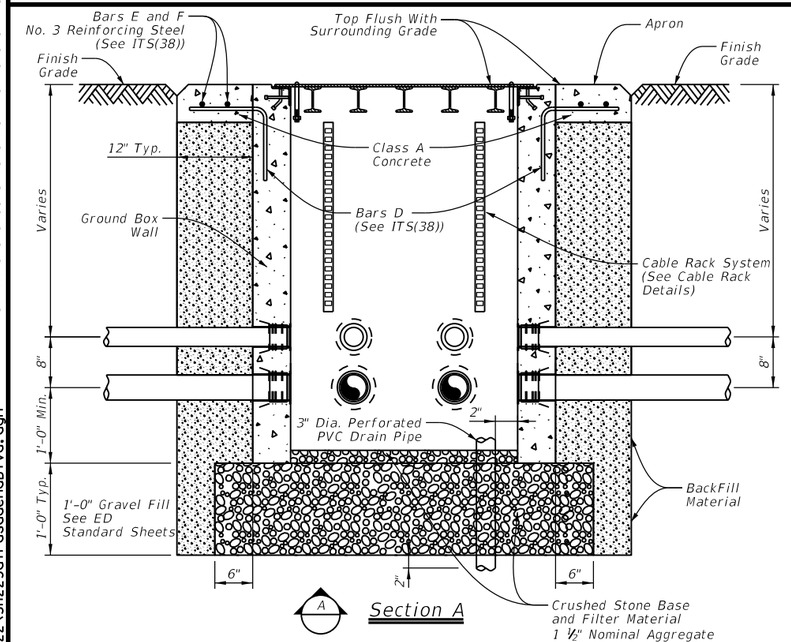
Note: Bar Spacing is The Same on Opposing Sides.

Type 1 Ground Box Plan View

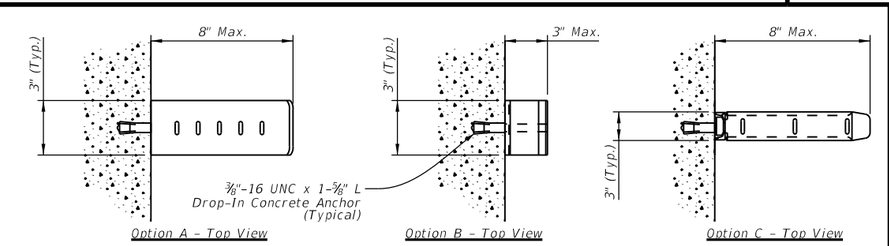


** – Detail representative of 60" deep ground box.
*** – Space Bars B in 6" Intervals for 48" Depth

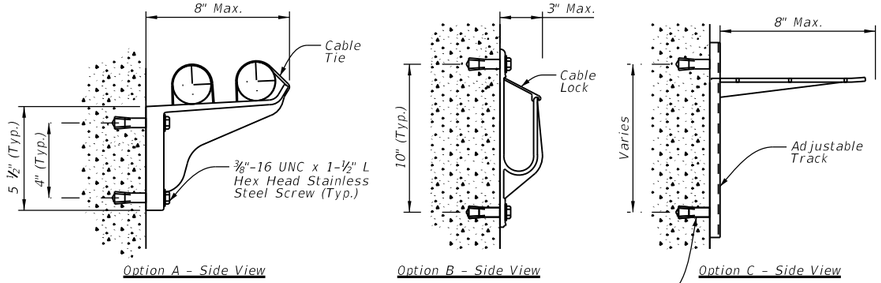
Type 1 Ground Box Elevation View



Section A



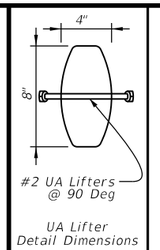
Option A – Top View | Option B – Top View | Option C – Top View



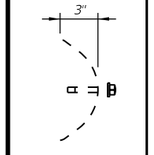
Option A – Side View | Option B – Side View | Option C – Side View

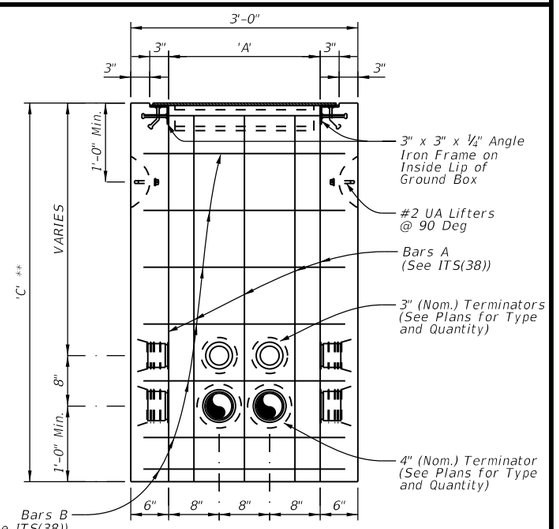
Note: Options Shown for Cable Racks and Attachment Methods. Furnish Shop Drawings of Cable Rack for Engineer Approval Prior to Installation.

Type 1 Cable Rack Details



UA Lifter Detail Dimensions





Type 1 Ground Box Side View

** – Detail representative of 60" deep ground box.

SHEET 1 OF 2

General Notes:

1. Conduit entry points shown represent the standard configuration for backbone conduit as detailed on ITS(27). Additional conduits may be required as shown on the plans.
2. Provide Class A concrete for Type "1" ground boxes.
3. Provide terminators for the PVC conduit cast in the walls and placed symmetrically about the centerline of the box at the depths shown, unless otherwise noted, for the number of conduits identified on the plans to enter the box.
4. Provide terminators appropriately sized for the conduits indicated on the plans. Provide terminators with an air tight and water tight connection.
5. Closed bottom Type "1" ground boxes are acceptable in lieu of open bottom boxes. Provide two 3" Dia. perforated PVC drain pipes on opposite corners to optimize water drainage. Provide 12-inch base of crushed stone which extends 6 inches in all directions from the perimeter of the box for closed bottom boxes. Crushed stone will be subsidiary to Special Specification, "ITS Ground Box."
6. Install all open bottom Type "1" ground boxes on a 12-inch base of crushed stone which extends 6 inches in all directions from the perimeter of the box. Crushed stone will be subsidiary to Special Specification, "ITS Ground Box."
7. Cap and seal terminators that do not have conduits attached.
8. When additional conduit entry points are needed to accommodate existing conduit, core drill conduit knockouts in the field of the appropriate number and size of conduit at each location, as directed by the Engineer.
9. Provide a bell fitting on the end of each conduit to ensure a flush fit inside the ground box.
10. Concrete grout around the knockout (inside and out) and around the conduit and bell fitting to ensure a neat watertight fit after the conduit and bell fitting have been placed in a knockout. Ensure all openings in the ground box are sealed prior to grouting operations.
11. Install a nylon string and plug all unused conduits with tug-plugs sized for the particular conduits. Provide split innerduct plugs in conduits or innerducts with cables to seal the innerduct around the cables to prevent water and dirt from entering.
12. Provide steel (ASTM A-153), glass reinforced nylon, or equivalent cable rack assemblies designed to support the amount of cable storage slack identified in the plans. Locate cable rack system on one side only (longer length side) to allow access to the inside of the ground box. Cable racks may be installed at the factory or in the field. When mounting cable racks in the field, seal all penetrations to the concrete side wall to prevent moisture penetration. Ground metallic cable rack systems to grounding system inside ground box in accordance with the National Electrical Code.

Ground Box Schedule

Ground Box Type	'A' Width Inside (Inches)	'B' Length Inside (Inches)	'C' Depth Inside (Inches)
Type 1	24	36	36, 48, 60

Sheet Details
Not to Scale

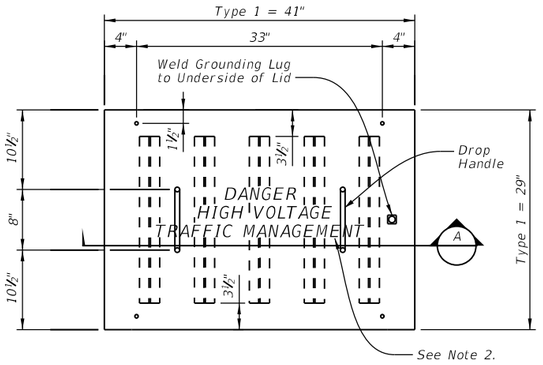
Texas Department of Transportation

Traffic Operations Division Standard

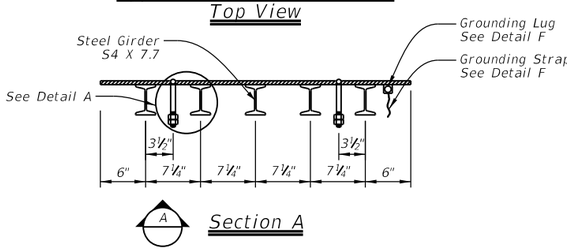
ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(37)-16

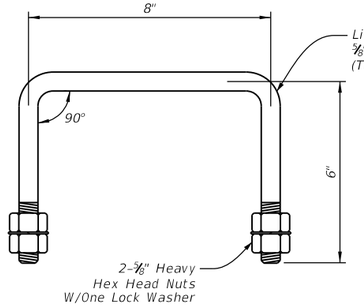
FILE: its(37)-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		



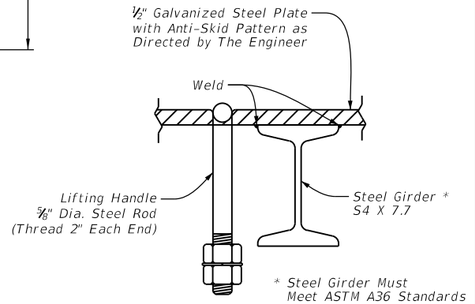
Type 1 Steel Cover Details
Top View



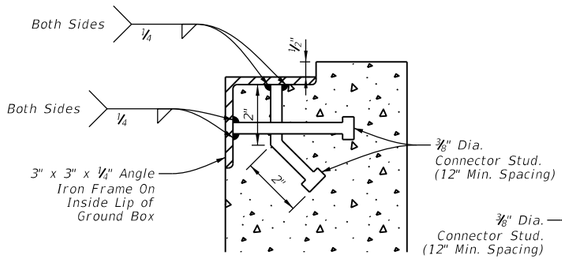
Section A



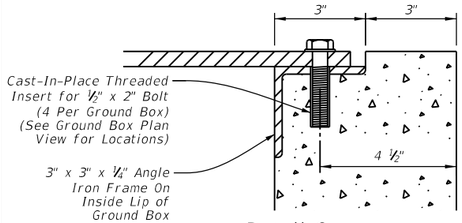
Drop Handle Detail



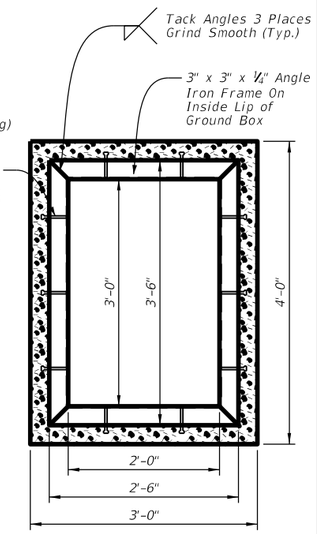
Detail A



Detail B



Detail C
Lid Attachment Detail

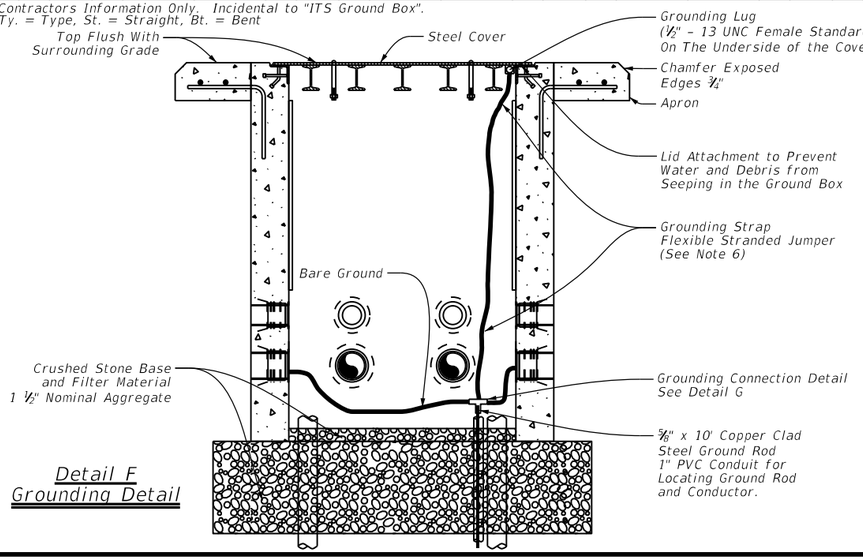


Detail D

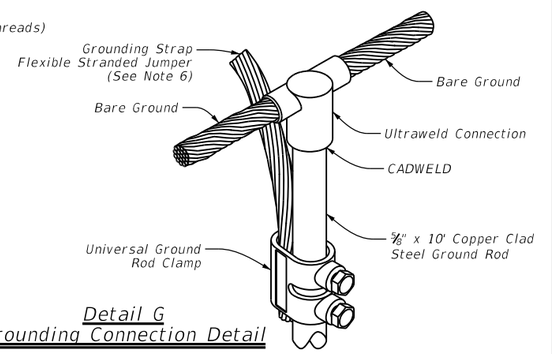
Detail E
Ground Box Apron Detail

Ground Box Type 1	BAR A					BAR B					BAR D					BAR E					BAR F					TOTALS	
	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	No.	Size	Ty.	Length	Weight	Steel * LBS.	Conc. * CY
36" Depth	22	#4	St.	2'-8"	39.3	5	#4	Bt.	13'-2"	44.1	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	108.1	.67
48" Depth	22	#4	St.	3'-8"	54.0	7	#4	Bt.	13'-2"	61.8	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	140.5	.89
60" Depth	22	#4	St.	4'-8"	68.8	8	#4	Bt.	13'-2"	70.6	8	#4	Bt.	2'-0"	10.7	1	#3	Bt.	17'-2"	6.5	1	#3	Bt.	19'-10"	7.5	164.1	1.11

* - For Contractors Information Only. Incidental to "ITS Ground Box".
Legend: Ty. = Type, St. = Straight, Bt. = Bent



Detail F
Grounding Detail



Detail G
Grounding Connection Detail

Note - All grounding connections to be CADWELD or approved equal. This work will not be paid for directly, but is considered incidental to ITS ground box.

General Notes:

1. See ITS(37) for additional Type "1" ground box details.
2. Hot-dip galvanized steel covers after all welds are made.
3. Label top of cover with the words "DANGER HIGH VOLTAGE TRAFFIC MANAGEMENT" using template-guided, hand-welded lettering at a height of 2 inches to ensure neatness.
4. Provide all Type "1" ground boxes with a securable, tamper-proof cover equipped with a bolting system that positively secures the cover in place.
5. Ground steel covers in accordance with the National Electrical Code.
6. Ground covers to the grounding cable using a split-bolt kearney clamp, and a minimum 8-foot long flexible stranded jumper the same size as the grounding conductor. Terminate to metal ground box cover with a tank ground type lug as approved and directed by the Engineer.
7. Provide Type "1" ground box and cover designed for heavy duty loading in accordance with AASHTO H20 loading when located where the box may experience deliberate, continuous vehicular traffic, such as near the shoulder or an auxiliary lane, or immediately adjacent to the unprotected edge of pavement.
8. Provide a Type "1" ground box and cover tested by a laboratory independent of the manufacturer certifying loading requirements are met. Provide certification of such tests to the Engineer for approval.
9. Provide a steel or cast iron cover in accordance with Item 471, Article 471.2, "Frames, Grates, Rings, and Covers." Provide covers with the number of drop handles shown. Provide Class "A" concrete for ground box construction and aprons.
10. Fabricate cover so to fits properly on the ground box, and no undue noise results when traffic contacts the cover.

Sheet Details
Not to Scale

SHEET 2 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

ITS GROUND BOX DETAILS TYPE "1" WITH STEEL COVER

ITS(38)-17

FILE: its(38)-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT FEBRUARY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS 5-17	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		117

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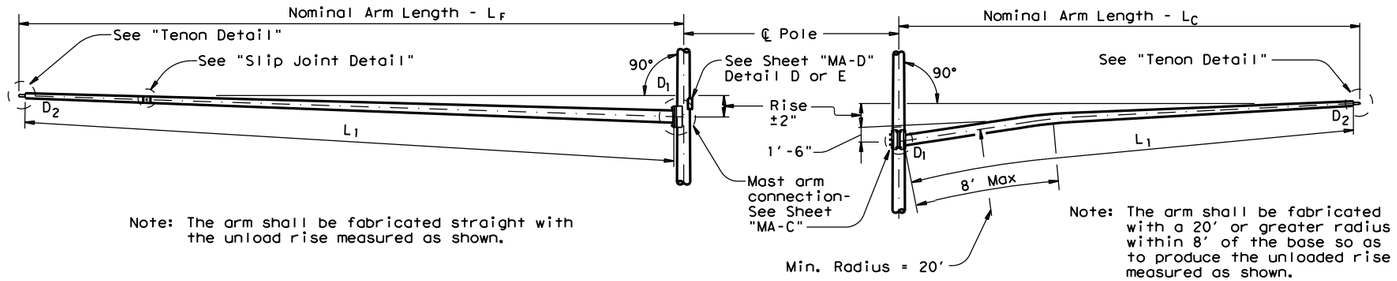
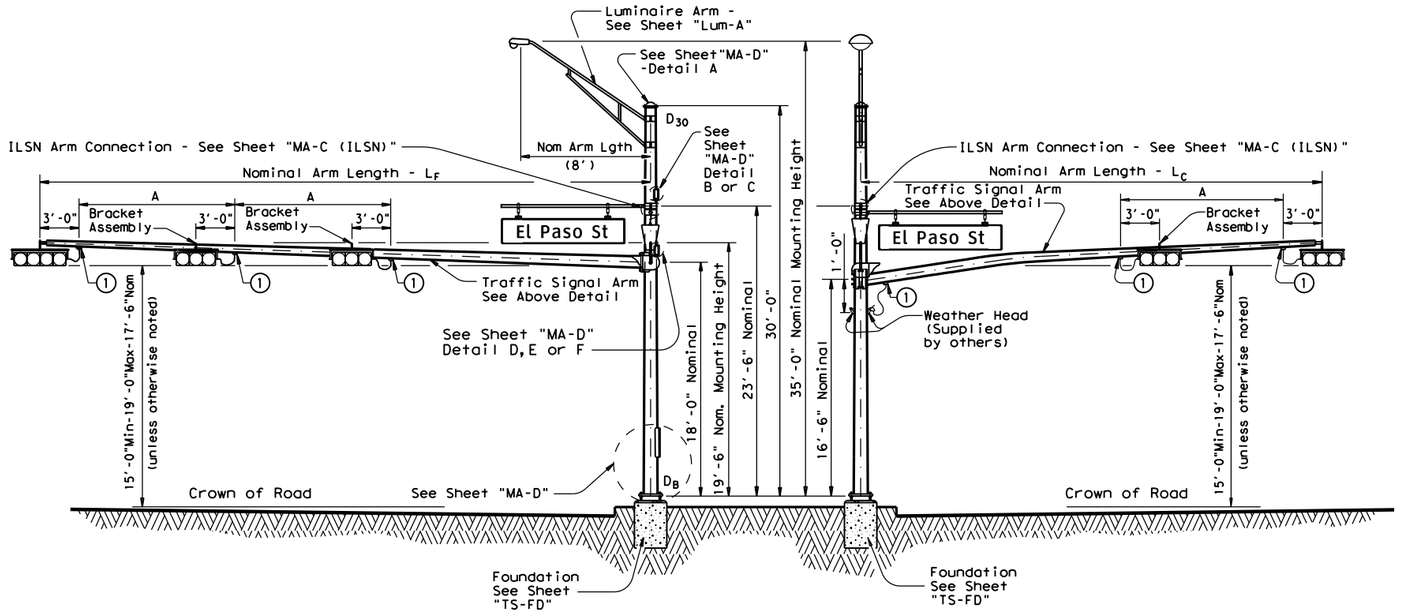


Note: The arm shall be fabricated straight with the unload rise measured as shown.

Note: The arm shall be fabricated with a 20' or greater radius within 8' of the base so as to produce the unloaded rise measured as shown.

FIXED MOUNT TRAFFIC SIGNAL ARM

CLAMP-ON TRAFFIC SIGNAL ARM



ELEVATION

(Showing fixed mount arm)

STRUCTURE ASSEMBLY

① Threaded Coupling for CGB Connector See "ARM COUPLING DETAILS" Sheet 2 of 3

ELEVATION

(Showing clamp mount arm)

TABLE OF DIMENSIONS "A"						
Arm Length	24'	28'	32'	36'	40'	44'
Arm Type II	10'	11'	12'	13'		
Arm Type III			10'	11'	12'	12'

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor. Designs are based on an arm included angle of 90 degrees or more. Angles of less than approximately 75 degrees will require a special design.

Poles are designed to support one 8'-0" luminaire arm, two 9'-0" internally lighted street name signs and two traffic signal arms with length combinations as tabulated. The specified luminaire load applied at the end of luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign applied 4'-6" from the centerline of the pole equals 85 lbs vertical dead load plus the horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

125A

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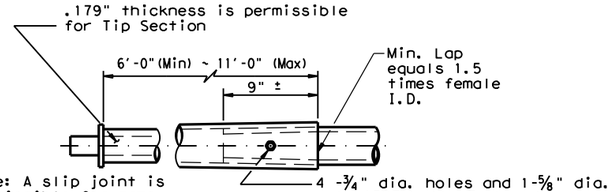
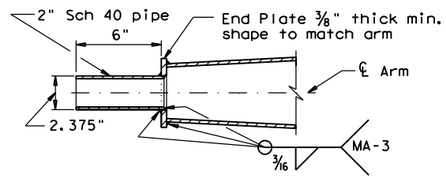


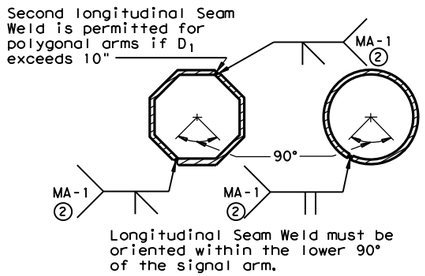
SLIP JOINT DETAIL



TENON DETAIL

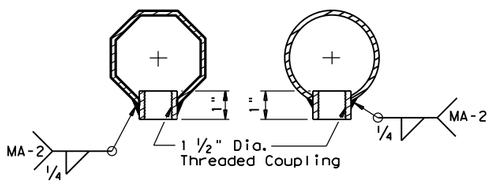
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

②60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (2)-12

DN: MS	CK: JSY	DW: WMF	CK: JSY

REVISIONS
05-96
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

125B

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SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length		30' Poles With Luminaire		24' Poles With ILSN		19' Poles With no Luminaire and no ILSN	
		See note above plus: one (or two if ILSN attached) small hand hole, clamp-on simplex		See note above plus one small hand hole		See note above	
LF ft.	Lc ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20	2020L-100		2020S-100		2020-100	
24	20	2420L-100		2420S-100		2420-100	
	24	2424L-100		2424S-100		2424-100	
28	20	2820L-100		2820S-100		2820-100	
	24	2824L-100		2824S-100		2824-100	
	28	2828L-100		2828S-100		2828-100	
32	20	3220L-100		3220S-100		3220-100	
	24	3224L-100		3224S-100		3224-100	
	28	3228L-100		3228S-100		3228-100	
	32	3232L-100		3232S-100		3232-100	
36	20	3620L-100		3620S-100		3620-100	
	24	3624L-100		3624S-100		3624-100	
	28	3628L-100		3628S-100		3628-100	
	32	3632L-100		3632S-100		3632-100	
	36	3636L-100		3636S-100		3636-100	
40	20	4020L-100		4020S-100		4020-100	
	24	4024L-100		4024S-100		4024-100	
	28	4028L-100		4028S-100		4028-100	
	32	4032L-100		4032S-100		4032-100	
	36	4036L-100	1	4036S-100		4036-100	
44	20	4420L-100		4420S-100		4420-100	
	24	4424L-100		4424S-100		4424-100	
	28	4428L-100		4428S-100		4428-100	
	32	4432L-100		4432S-100		4432-100	
	36	4436L-100		4436S-100		4436-100	

Traffic Signal Arms (Fixed Mount) (1 per pole) Ship each arm w/ the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 1 CGB connector		Type II Arm (2 Signals) 1 Bracket Assembly and 2 CGB Connectors		Type III Arm (3 Signals) 2 Bracket Assemblies and 3 CGB Connectors	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100		36III-100	
40					40III-100	1
44					44III-100	

Traffic Signal Arms (Clamp-On Mount) (1 per pole) Ship each arm w/ the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal) 2 CGB connector and 1 clamp w/bolts and washers		Type II Arm (2 Signals) 1 Bracket Assembly, 3 CGB Connectors, and 1 clamp w/bolts and washers		Type III Arm (3 Signals) 2 Bracket Assembly, 4 CGB Connectors, and 1 clamp w/bolts and washers	
ft.	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	
36			36II-100	1	36III-100	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	1

ILSN Arm (1 or 2 per pole) ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 3/4"	3'-10"	
2"	4'-3"	
2 1/4"	4'-9"	1

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

ARMS LF ft.	ARMS Lc ft.	ROUND POLES D_B in.	D_{19} in.	D_{24} in.	D_{30} in.	③ thk in.	POLYGONAL POLES D_B in.	D_{19} in.	D_{24} in.	D_{30} in.	③ thk in.	Foundation Type
20	20	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
24	20	12.5	9.8	9.1	8.3	.239	13.5	10.5	9.7	8.8	.239	36-A
	24	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
28	20	13.0	10.3	9.6	8.8	.239	14.5	11.5	10.7	9.8	.239	36-A
	24	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A
	28	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
32	20	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
	24	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
	28	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
	32	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
36	20	14.0	11.3	10.6	9.8	.239	15.5	12.5	11.7	10.8	.239	36-B
	24	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
	28	14.5	11.8	11.1	10.3	.239	16.0	13.0	12.2	11.3	.239	36-B
	32	14.5	11.8	11.1	10.3	.239	16.0	13.0	12.2	11.3	.239	36-B
	36	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B
40	20	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B
	24	15.0	12.3	11.6	10.8	.239	16.5	13.5	12.7	11.8	.239	36-B
	28	15.0	12.3	11.6	10.8	.239	17.0	14.0	13.2	12.3	.239	42-A
	32	15.0	12.3	11.6	10.8	.239	17.0	14.0	13.2	12.3	.239	42-A
	36	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
44	20	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
	24	15.5	12.8	12.1	11.3	.239	17.5	14.5	13.7	12.8	.239	42-A
	28	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A
	32	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A
	36	16.0	13.3	12.6	11.8	.239	18.0	15.0	14.2	13.3	.239	42-A

Arm L_F or L_C	ROUND ARMS L_1 ft.	D_1 in.	D_2 in.	③ thk in.	Rise	POLYGONAL ARMS L_1 ft.	D_1 in.	④ D_2 in.	③ thk in.	Rise
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L_F = Fixed Arm Length
L_C = Clamp-on Arm Length (36' Max)

③ Thickness shown are minimums, thicker materials may be used.

④ D_2 may be increased by up to 1.0" for polygonal arms.

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

03/30/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES
DUAL MAST ARM ASSEMBLY
(100 MPH WIND ZONE)
DMA-100 (3)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225

DIST	COUNTY	SHEET NO.
HOU	HARRIS	

125C

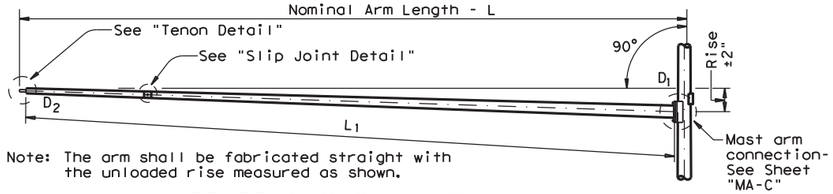
Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D_B	D_{19}	D_{24}	D_{30}	① thk	D_B	D_{19}	D_{24}	D_{30}	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
24	12.0	9.3	8.6	7.8	.239	13.0	10.0	9.2	8.3	.239	36-A
28	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
32	13.0	10.3	9.6	8.8	.239	14.0	11.0	10.2	9.3	.239	36-A
36	13.5	10.8	10.1	9.3	.239	15.0	12.0	11.2	10.3	.239	36-A
40	14.0	11.3	10.6	9.8	.239	16.0	13.0	12.2	11.3	.239	36-B
44	14.5	11.8	11.1	10.3	.239	16.5	13.5	12.7	11.8	.239	36-B

Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L_1	D_1	D_2	① thk	Rise	L_1	D_1	② D_2	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	8.0	5.3	.179	1'-8"	19.1	8.0	3.5	.179	1'-7"
24	23.1	9.0	5.8	.179	1'-9"	23.1	9.0	3.5	.179	1'-8"
28	27.1	9.5	5.7	.179	1'-10"	27.1	10.0	3.5	.179	1'-9"
32	31.0	9.5	5.2	.239	1'-11"	31.0	9.5	3.5	.239	1'-10"
36	35.0	10.0	5.1	.239	2'-0"	35.0	10.0	3.5	.239	1'-11"
40	39.0	10.5	5.1	.239	2'-3"	39.0	11.0	3.5	.239	2'-1"
44	43.0	11.0	5.1	.239	2'-8"	43.0	11.5	4.0	.239	2'-3"

D_B = Pole Base O.D.
D_{19} = Pole Top O.D. with no Luminaire and no ILSN
D_{24} = Pole Top O.D. with ILSN w/out Luminaire
D_{30} = Pole Top O.D. with Luminaire
D_1 = Arm Base O.D.
D_2 = Arm End O.D.
L_1 = Shaft Length
L = Nominal Arm Length

① Thickness shown are minimums, thicker materials may be used.

② D_2 may be increased by up to 1" for polygonal arms.



Note: The arm shall be fabricated straight with the unloaded rise measured as shown.

TRAFFIC SIGNAL ARM

(Fixed Mount)

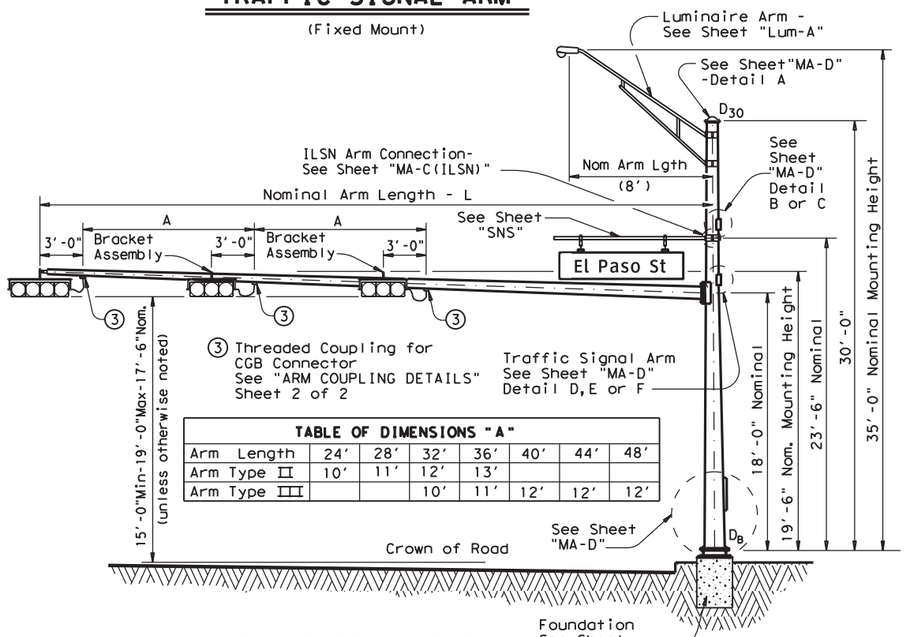


TABLE OF DIMENSIONS "A"

Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

STRUCTURE ASSEMBLY

SHIPPING PARTS LIST

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Above hardware plus: One (or two if ILSN attached) small hand hole, clamp-on simplex		Above hardware plus one small hand hole		See note above	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20L-100		20S-100		20-100	
24	24L-100		24S-100		24-100	
28	28L-100		28S-100		28-100	
32	32L-100	1	32S-100		32-100	
36	36L-100		36S-100		36-100	
40	40L-100		40S-100		40-100	
44	44L-100		44S-100		44-100	

Traffic Signal Arms (1 per pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	1 CGB connector		1 Bracket Assembly and 2 CGB Connectors		2 Bracket Assemblies and 3 CGB Connectors	
ft	Designation	Quantity	Designation	Quantity	Designation	Quantity
20	20I-100					
24	24I-100		24II-100			
28	28I-100		28II-100			
32			32II-100		32III-100	1
36			36II-100		36III-100	
40					40III-100	
44					44III-100	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	1

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 ½"	3'-4"	
1 ¾"	3'-10"	1
2"	4'-3"	

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

SHEET 1 OF 2

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED
PROFESSIONAL ENGINEER
P.E.

03/30/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY (100 MPH WIND ZONE)

SMA-100(1)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
11-99
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225

DIST	COUNTY	SHEET NO.
HOU	HARRIS	

123A

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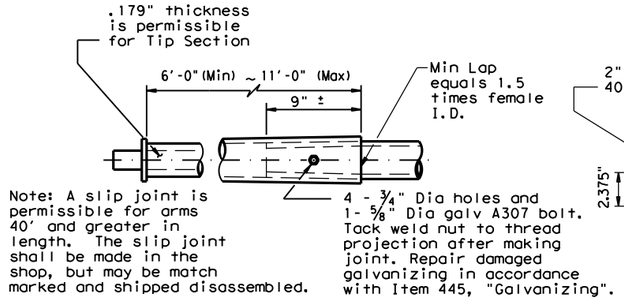
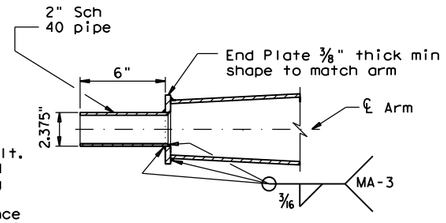


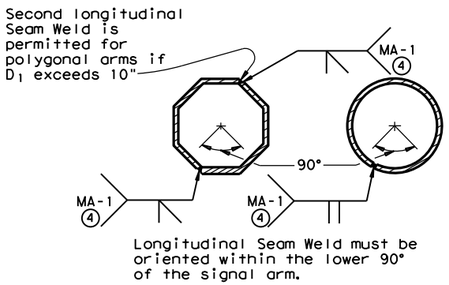
SLIP JOINT DETAIL



TENON DETAIL

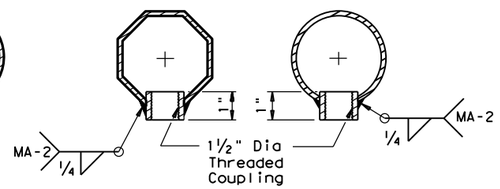
Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 ½" Dia Threaded Coupling.

BRACKET ASSEMBLY



ARM WELD DETAIL

④ 60% Min. penetration
100% pemetration within 6" of circumferential base welds.



ARM COUPLING DETAILS

VIBRATION WARNING

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backpates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 100 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

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

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

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES

SINGLE MAST ARM ASSEMBLY

(100 MPH WIND ZONE)

SMA-100(2)-12

DN: MS	CK: JSY	DW: MMF	CK: JSY

REVISIONS
5-96
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

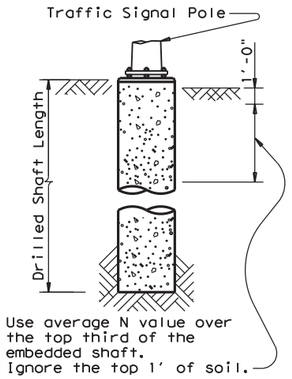
⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
SH225 AT								
PASADENA BLVD								
POLE A	10	36-A	1			13.2		
POLE D	10	42-A	1					17.4
TOTAL DRILLED SHAFT LENGTHS						13.2		17.4

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'



Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.

ANCHOR BOLT & TEMPLATE SIZES

BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

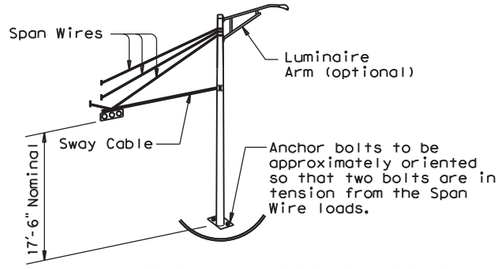
Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

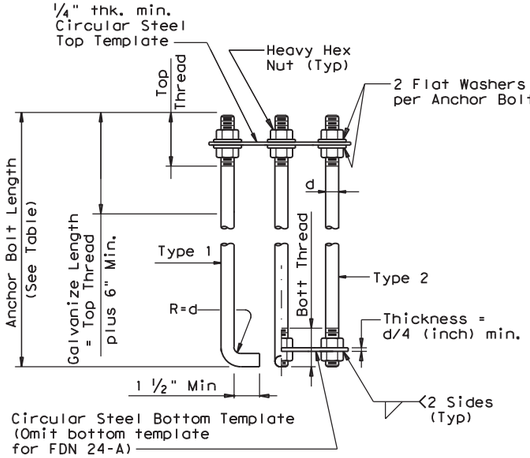
Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



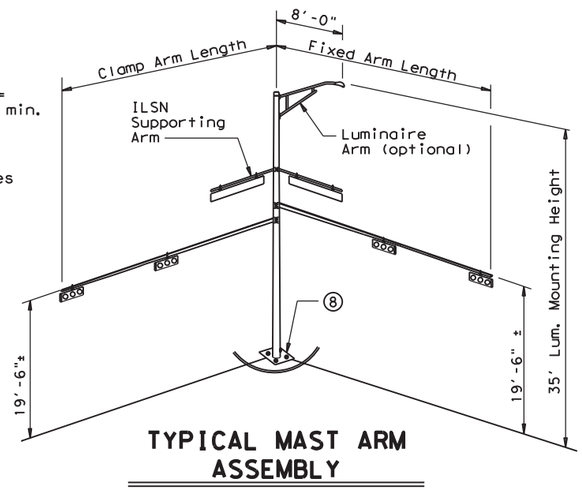
TYPICAL STRAIN POLE ASSEMBLY



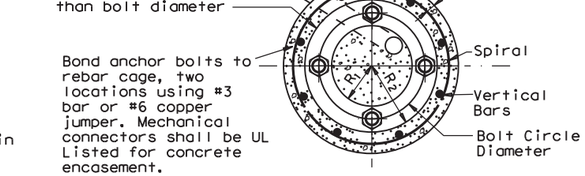
HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

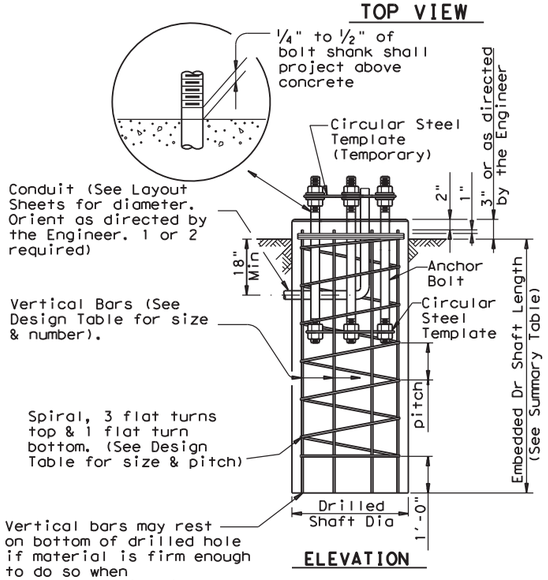
⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



TYPICAL MAST ARM ASSEMBLY



TOP VIEW



ELEVATION

FOUNDATION DETAILS

STATE OF TEXAS
MICHAEL A. OLIVO
108793
LICENSED PROFESSIONAL ENGINEER
P.E.

03/30/2021

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

© TxDOT August 1995	DN: MS	CK: JSY	DW: MAO/MMF	CK: JSY/TEB
REVISIONS	CONT	SECT	JOB	HIGHWAY
5-96 11-98 1-12	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		

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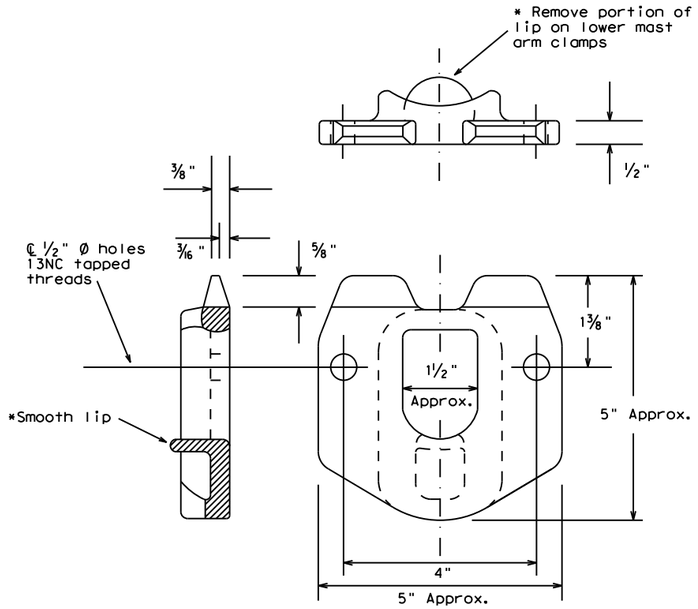


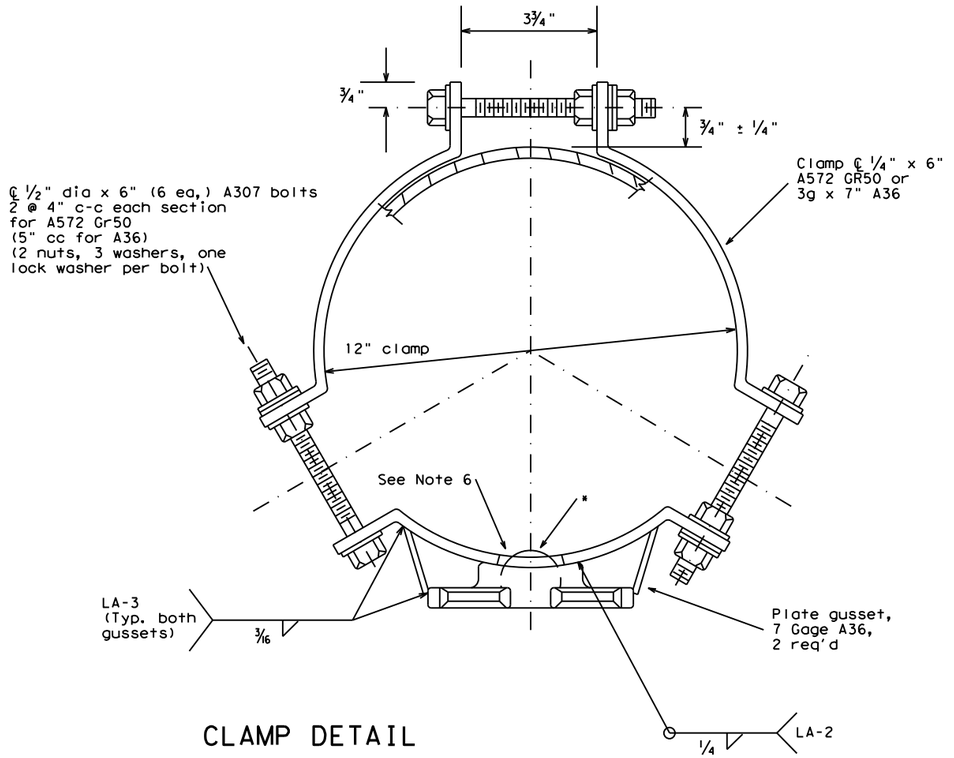
POLE SIMPLEX DETAILS

OTHER MATERIALS:

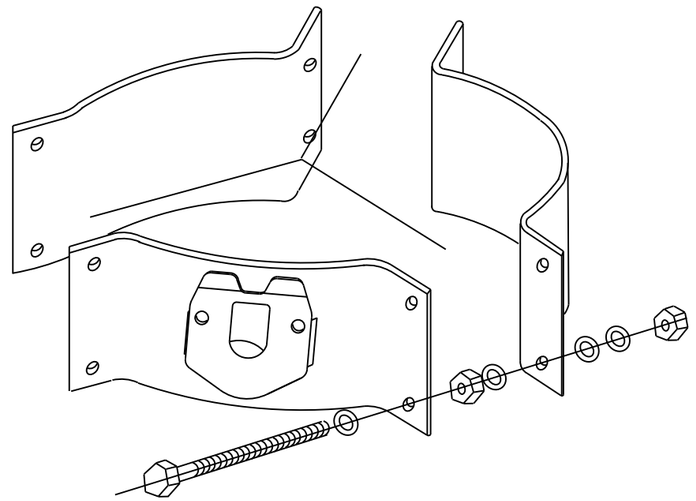
1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, ½in. X 1½in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq.ft.,12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.



CLAMP DETAIL



PROJECTION

For 8.9 - 12 inch diameter Signal Poles
(Two req'd for each mast arm)

Texas Department of Transportation
Traffic Operations Division

CLAMP ON FITTING ASSEMBLY FOR LUMINAIRE MAST ARM

CFA-12

© TxDOT	DN: KAB	CK: RES	DW: FDN	CK: CAL
REVISIONS	CONT	SECT	JOB	HIGHWAY
11-99 1-12	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		

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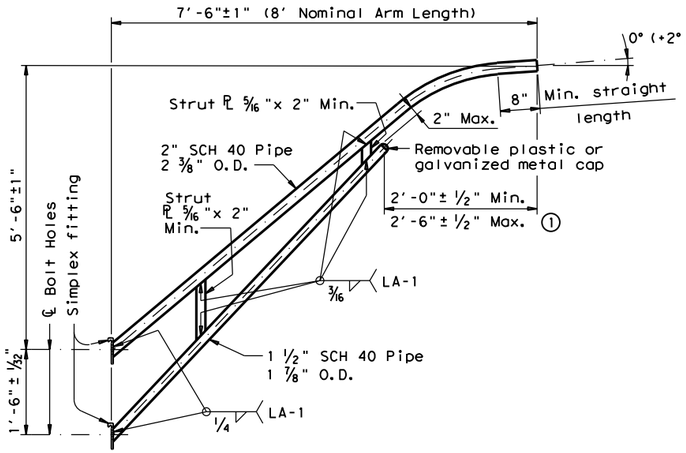
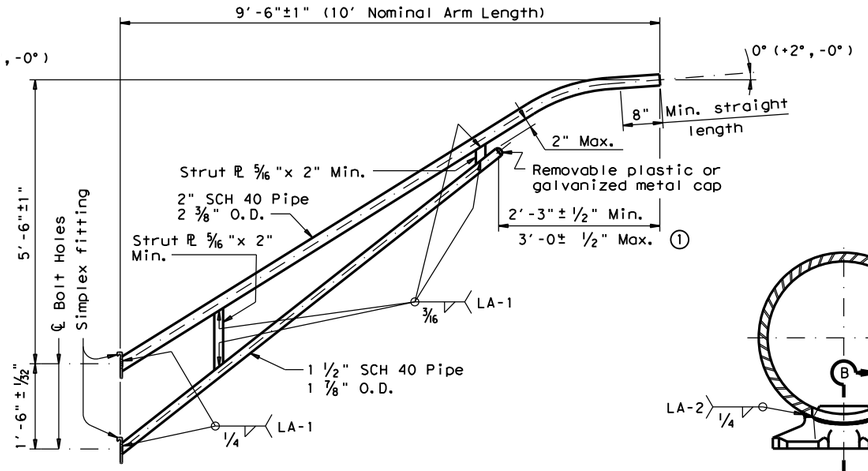
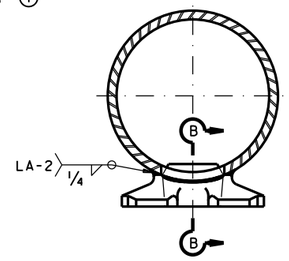


8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

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

(1) Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

(2) Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

(3) A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.

(4) ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

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

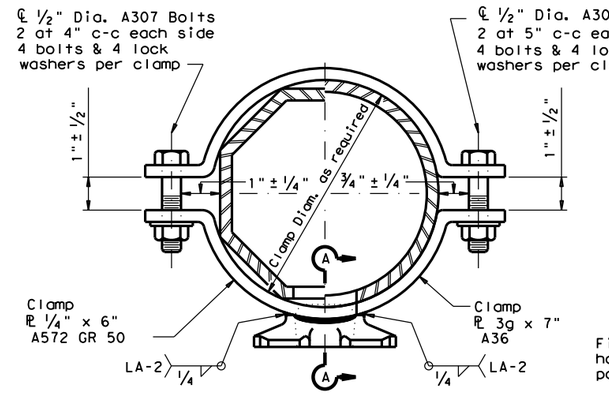
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absense of specified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

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

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

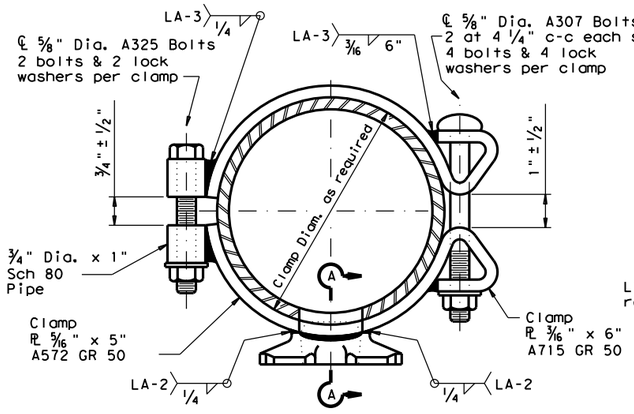
Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly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

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



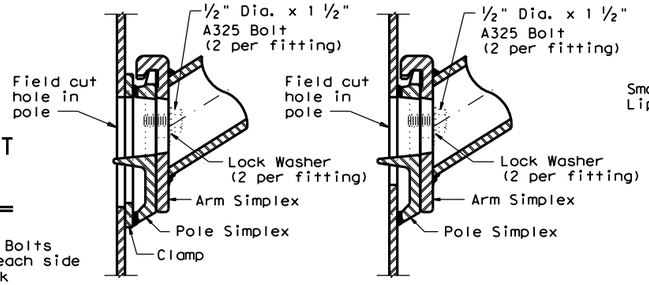
CLAMP ATTACHMENT DETAIL NO. 1 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 2 (HALF SECTION)



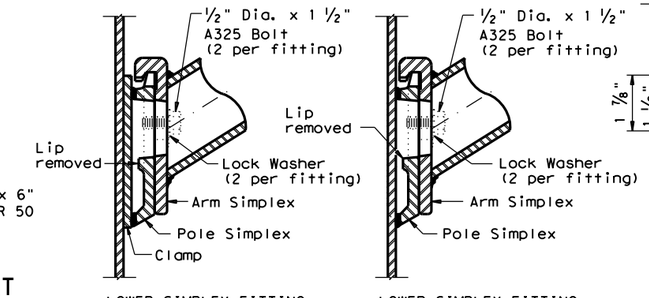
CLAMP ATTACHMENT DETAIL NO. 3 (HALF SECTION)

CLAMP ATTACHMENT DETAIL NO. 4 (HALF SECTION)



UPPER SIMPLEX FITTING

UPPER SIMPLEX FITTING

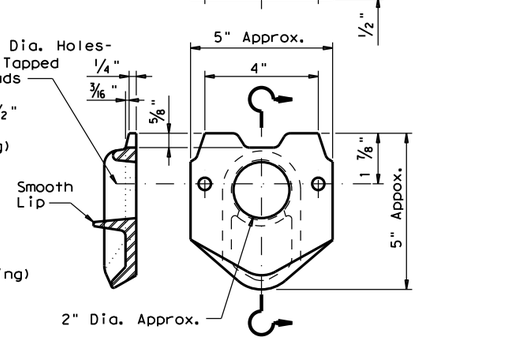


LOWER SIMPLEX FITTING

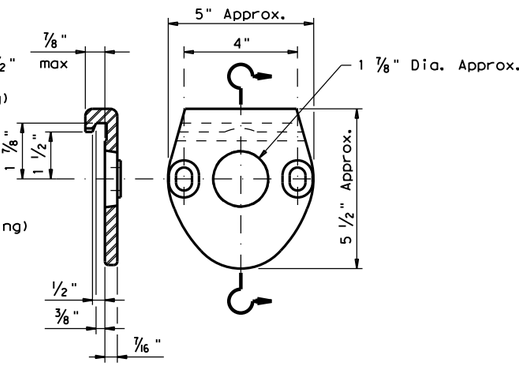
SECTON A-A

LOWER SIMPLEX FITTING

SECTON B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES

ARM DETAILS

LUM-A-12

DN: LEH	CK: JSY	DW: LTT	CK: TEB

REVISIONS
5-96
1-99
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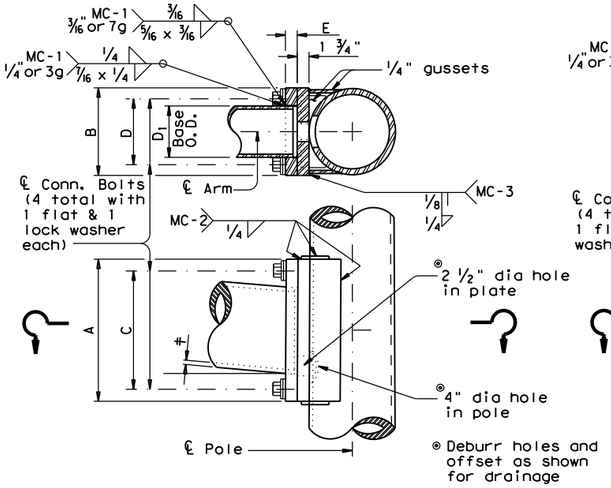
CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225

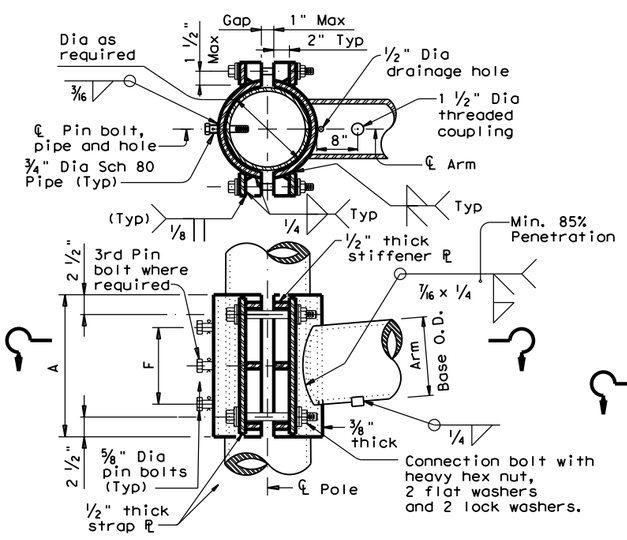
DIST	COUNTY	SHEET NO.
HOU	HARRIS	

ARM SIZE D_1 in.	ARM SIZE ϯ in.	A in.	B in.	C in.	D in.	E in.	CONN BOLT DIA in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2



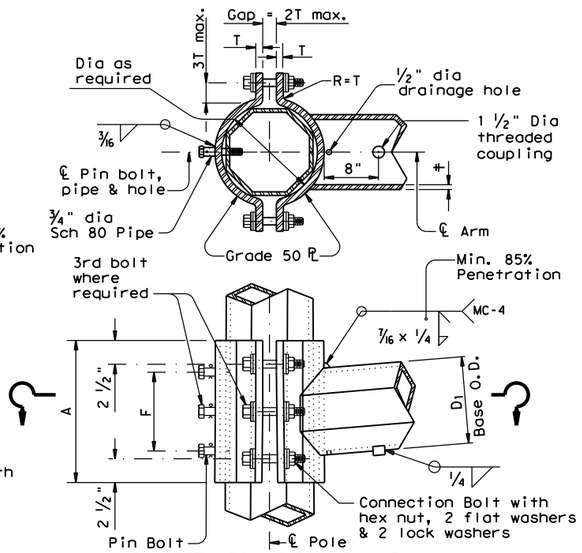
FIXED MOUNT DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ϯ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8



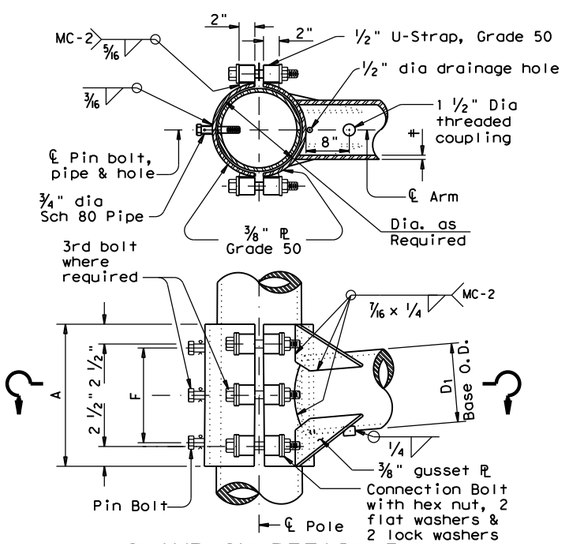
CLAMP-ON DETAIL 1

ARM SIZE D_1 in.	ARM SIZE ϯ in.	A in.	F in.	T in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

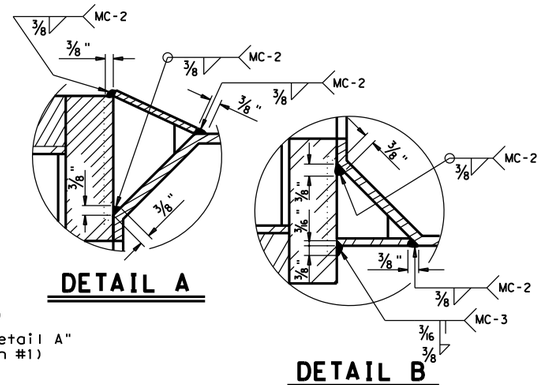


CLAMP-ON DETAIL 2

ARM SIZE D_1 in.	ARM SIZE ϯ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

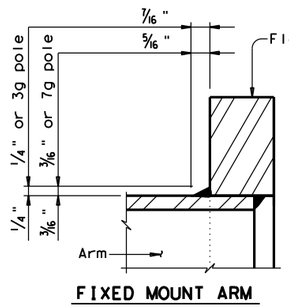


CLAMP-ON DETAIL 3

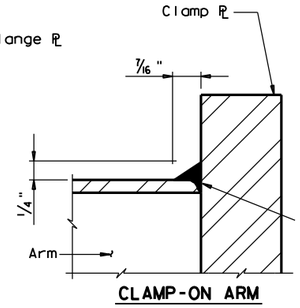


DETAIL A

DETAIL B



FIXED MOUNT ARM



CLAMP-ON ARM

ARM BASE WELD DETAILS

ARM SIZE D_1 in.	ARM SIZE ϯ in.	A in.	F in.	CONN. BOLTS No. ea.	CONN. BOLTS Dia in.	PIN BOLTS No. ea.	PIN BOLTS Dia in.
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.

② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

GENERAL NOTES:

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

NOTE:

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" dia hole for each pin bolt. An 11/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

Texas Department of Transportation
Traffic Operations Division

STANDARD ASSEMBLY FOR TRAFFIC SIGNAL SUPPORT STRUCTURES

MAST ARM CONNECTIONS

MA-C-12

DN: MS	CK: JSY	DW: MMF	CK: JSY
REVISIONS 5-96 5-09 1-12	CONT 0502	SECT 01	JOB 222	HIGHWAY SH 225
	DIST HOU	COUNTY HARRIS	SHEET NO.

126A

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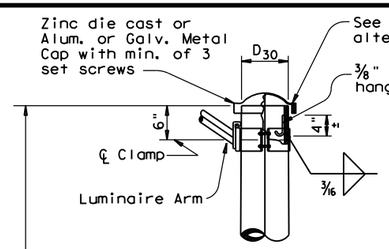
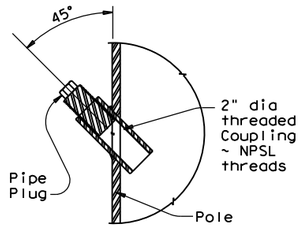
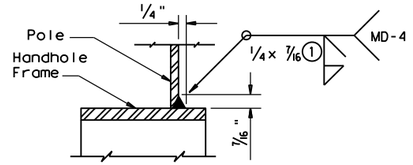


DETAIL A

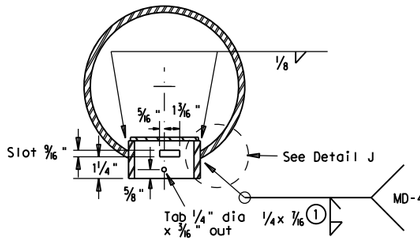
(for pole with luminaire)



POLE COUPLING DETAIL

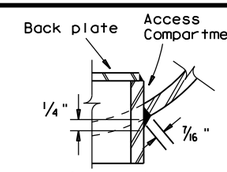


DETAIL G

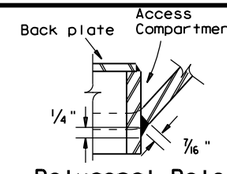


SECTION X-X

Opening for access compartment shall be no more than 1/16 inch wider than the access compartment itself.

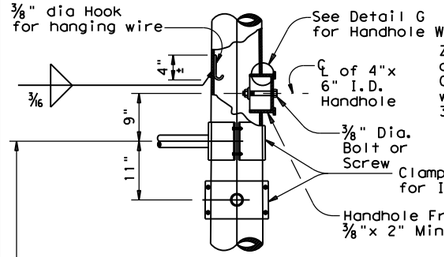


Round Pole

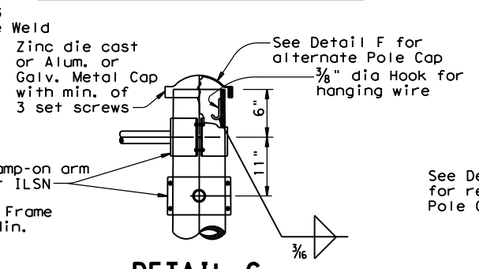


Polygonal Pole

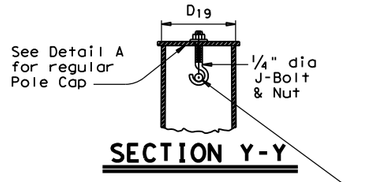
DETAIL J



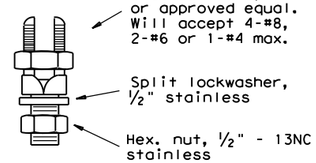
DETAIL B



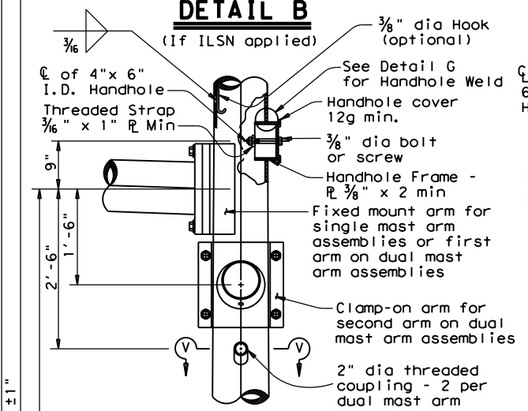
DETAIL C



SECTION Y-Y

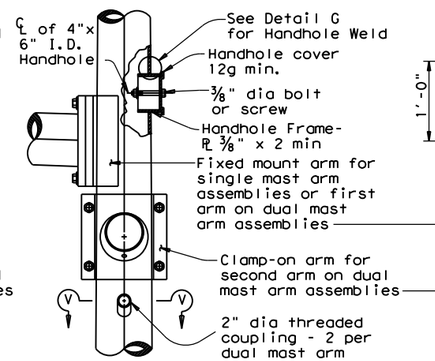


COPPER GROUND CONNECTOR



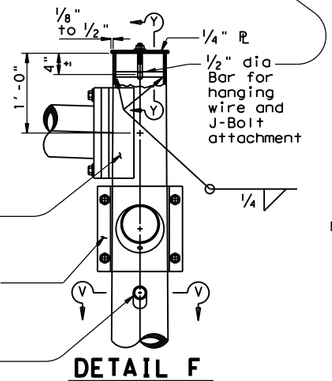
DETAIL D

(for 30' pole with luminaire and ILSN sign)



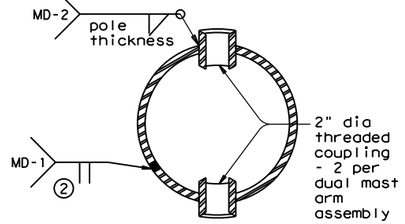
DETAIL E

(for 24' pole with ILSN sign and no luminaire)

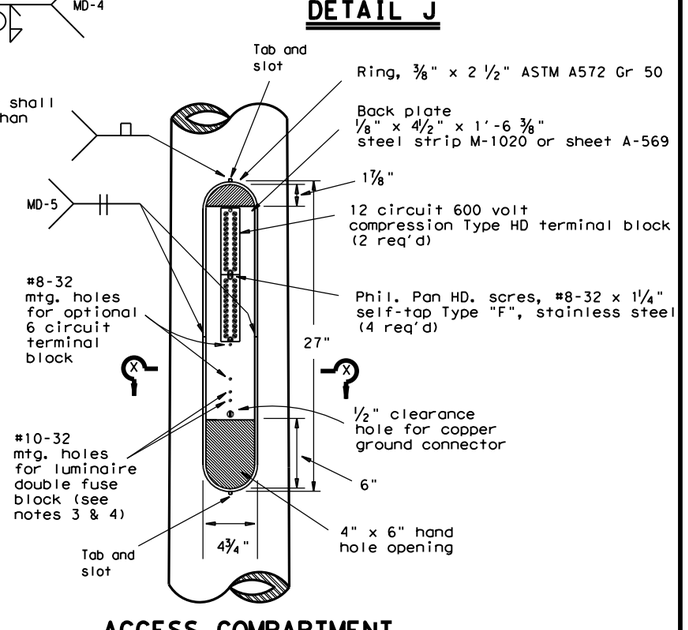


DETAIL F

(for 19' pole with no ILSN sign and no luminaire)



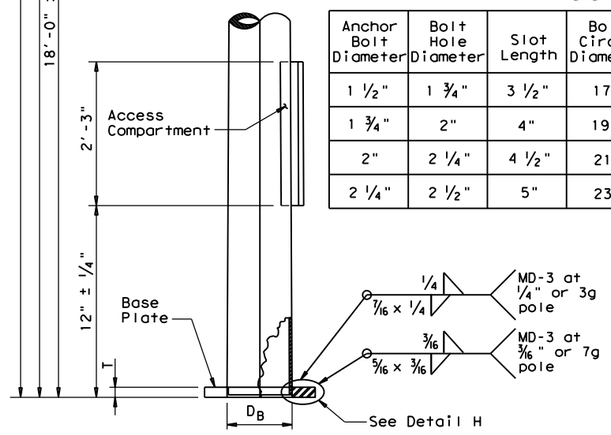
SECTION V-V



ACCESS COMPARTMENT

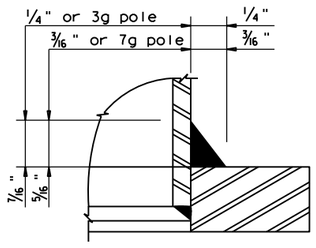
NOTES:

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or Ilsco SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

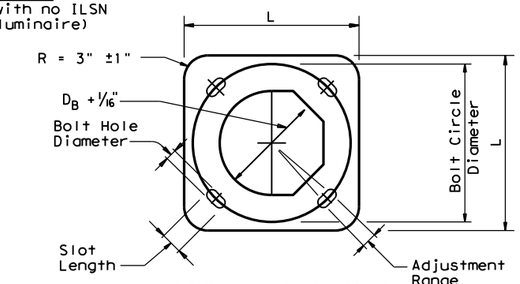


POLE ELEVATION

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base ℞ Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



DETAIL H



BASE PLATE PLAN

(1) 85% Min. penetration

(2) 60% Min. penetration 100% pemetration within 6" of circumferential base welds.

Texas Department of Transportation
Traffic Operations Division

TRAFFIC SIGNAL SUPPORT STRUCTURES MAST ARM POLE DETAILS

MA-D-12

DN: MS	CK: JSY	DW: FDN	CK: CAL

REVISIONS
8-99
1-12

CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225

DIST	COUNTY	SHEET NO.
HOU	HARRIS	

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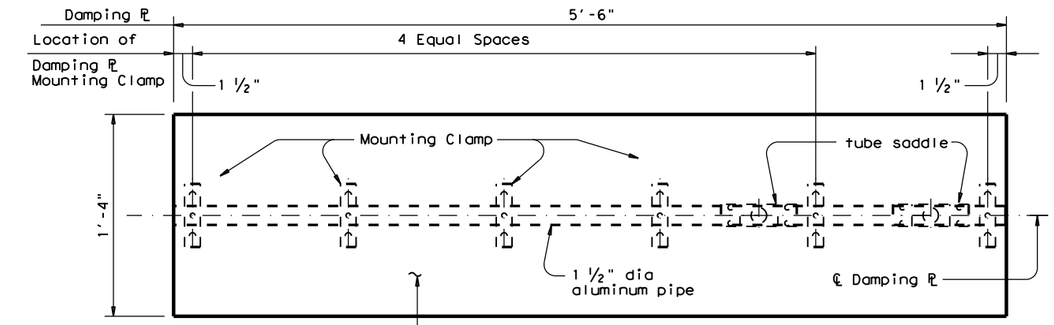
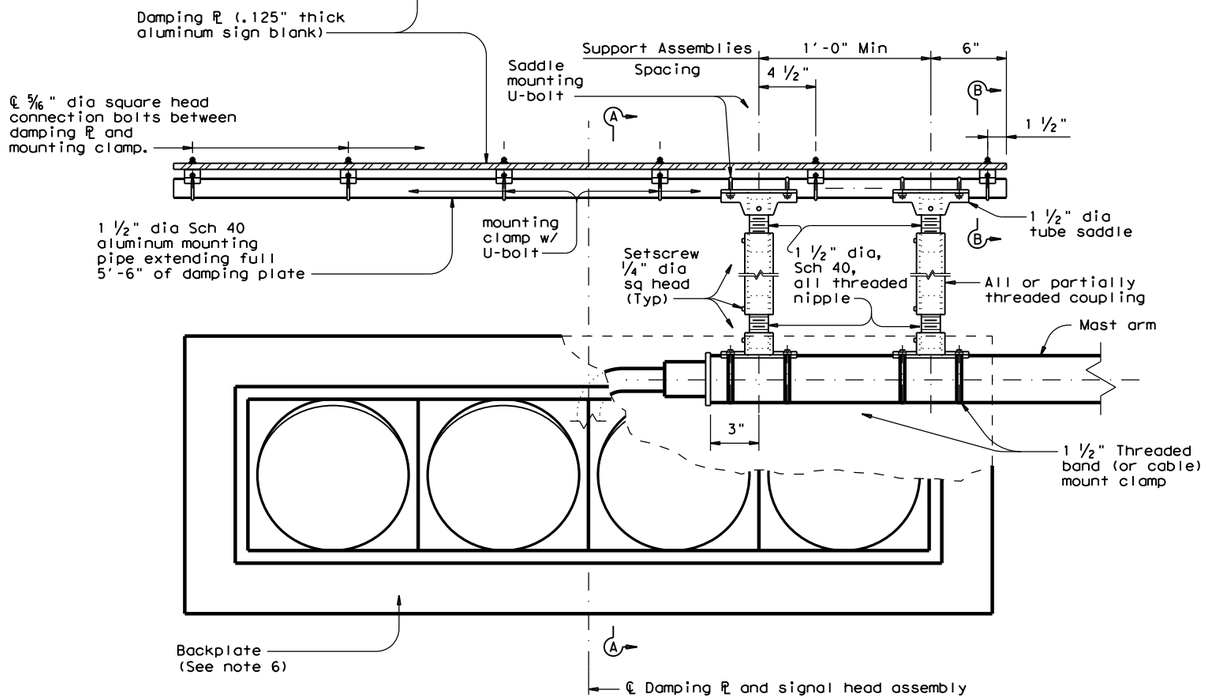


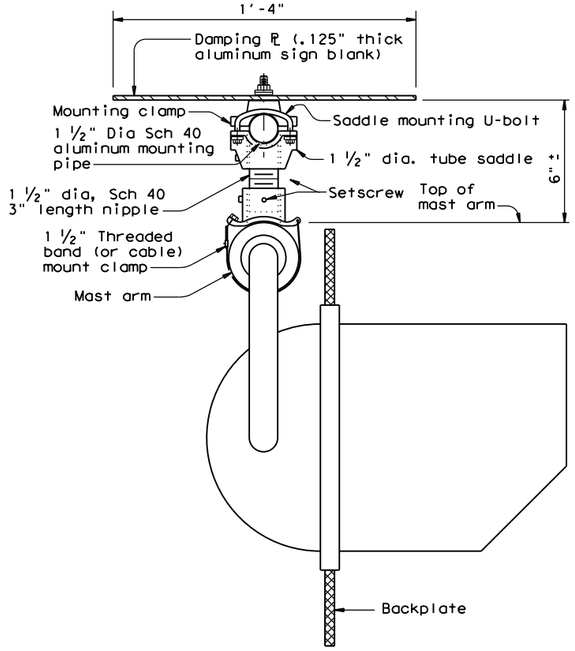
PLAN



ELEVATION

DAMPING PLATE MOUNTING DETAILS

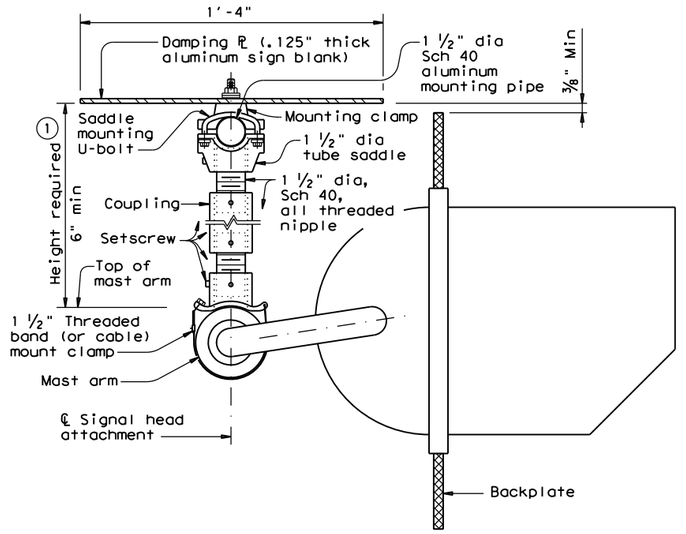
(Showing alternate placement of signal head)



SECTION A-A

(Showing standard placement of signal head)

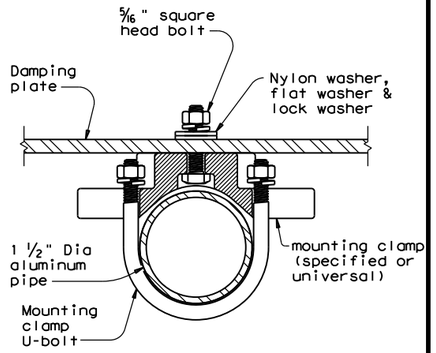
(Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)

(Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

① Recommended supporting assemblies to achieve required height for horizontal section heads			
Height required	One nipple each length	Two nipples each length plus	One coupling each length
6"-6 ¾"	3"	-	-
7"-8 ½"	4"	-	-
9"-10 ½"	6"	-	-
11"-15 ½"	-	4"	5"
16"-24"	-	6"	10"

GENERAL NOTES:

1. In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.

2. Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.

3. Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate)and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.

4. Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".

5. Contractor will verify applicable field dimensions before the installation.

6. Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

Texas Department of Transportation

Traffic Safety Division Standard

MAST ARM DAMPING PLATE DETAILS

MA-DPD-20

FILE: ma-dpd-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT June 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-20 6-20	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		

DATE: 12/28/2020 4:30:07 PM
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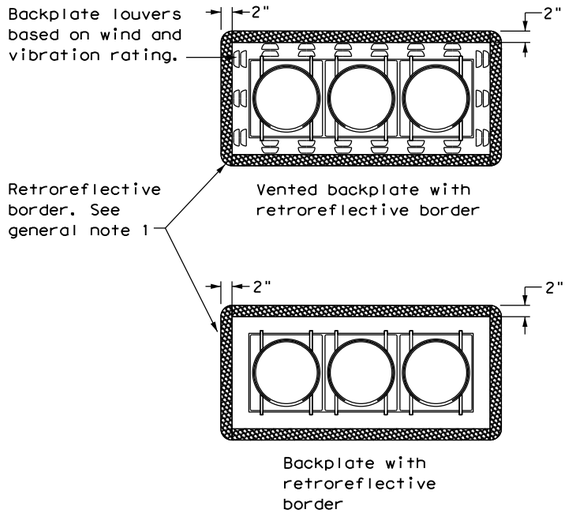
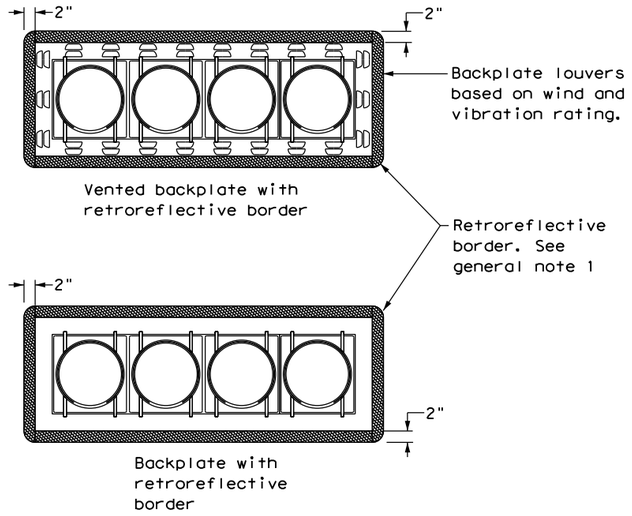
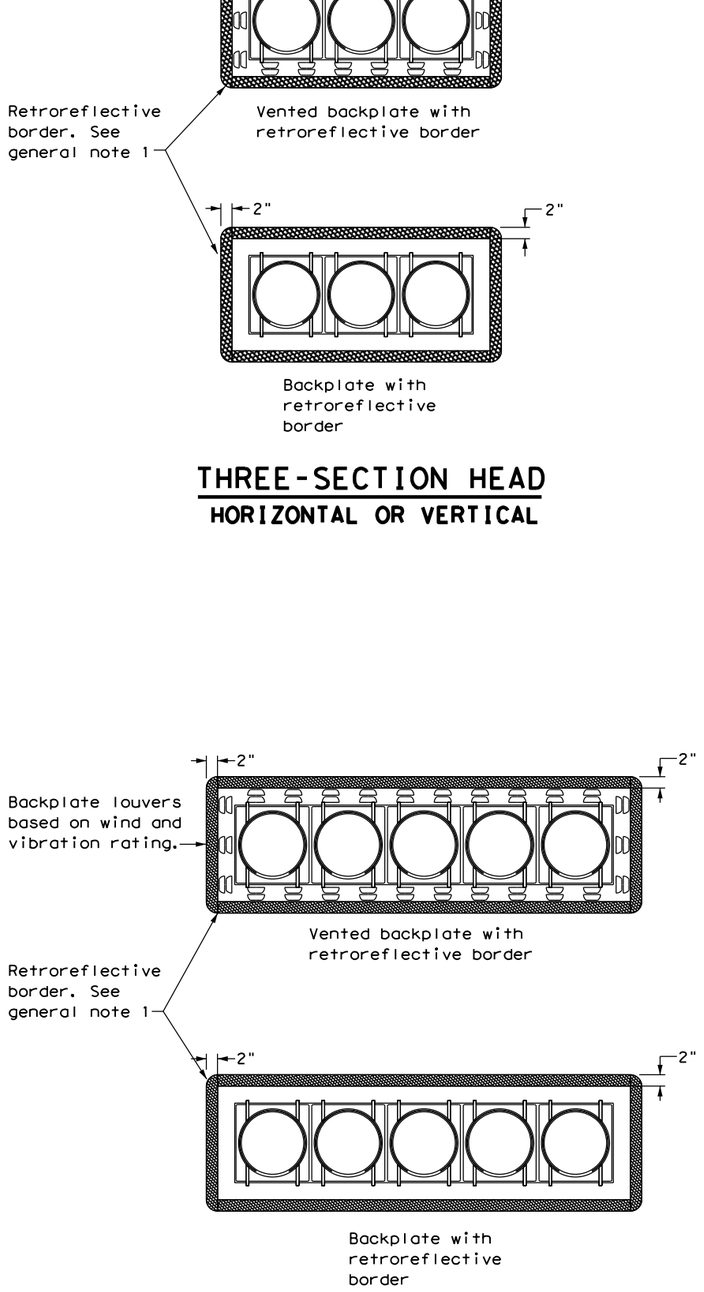


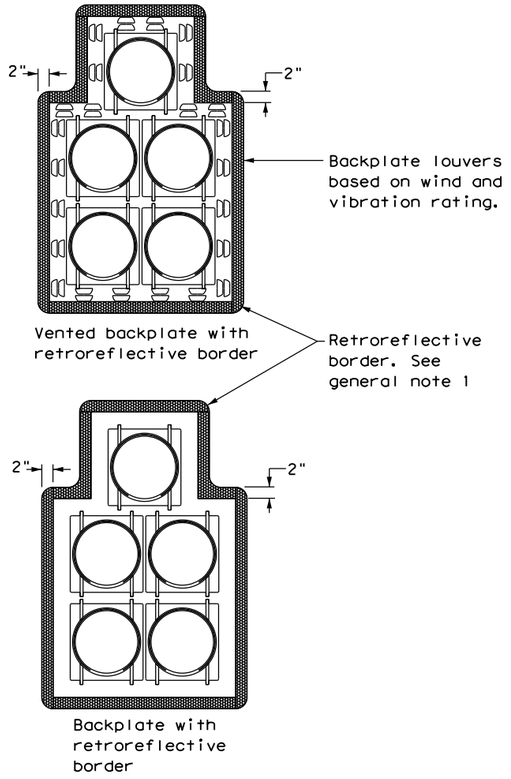
THREE-SECTION HEAD
HORIZONTAL OR VERTICAL



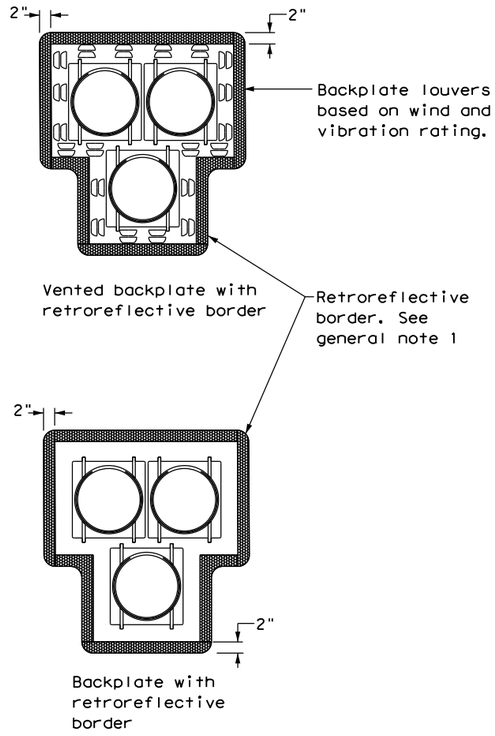
FOUR-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
HORIZONTAL OR VERTICAL



FIVE-SECTION HEAD
CLUSTER



PEDESTRIAN HYBRID
BEACON

GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B_{FL} or C_{FL} retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatability must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
   - Pole mounted
   - Overhead mounted
   - Span wire mounted
   - Mast arm mounted
   - Vertical signal heads
   - Horizontal signal heads
   - Clustered signal heads
   - Pedestrian hybrid beacons

Texas Department of Transportation

Traffic Safety Division Standard

TRAFFIC SIGNAL HEAD WITH BACKPLATE
TS-BP-20

FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		

DATE: 12/28/2020 4:28:16 PM
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GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

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

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

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

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

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

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

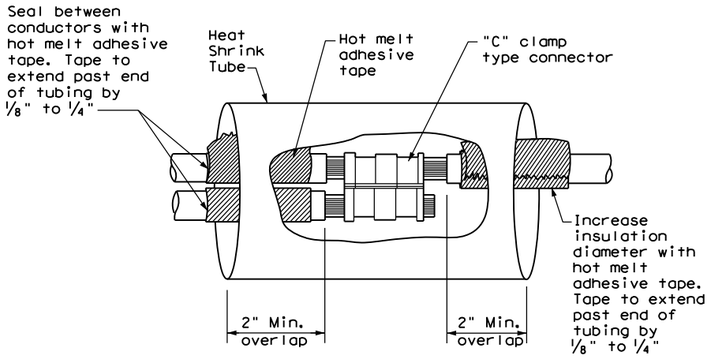
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

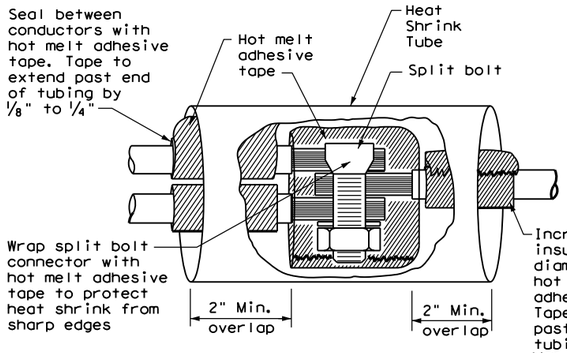
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

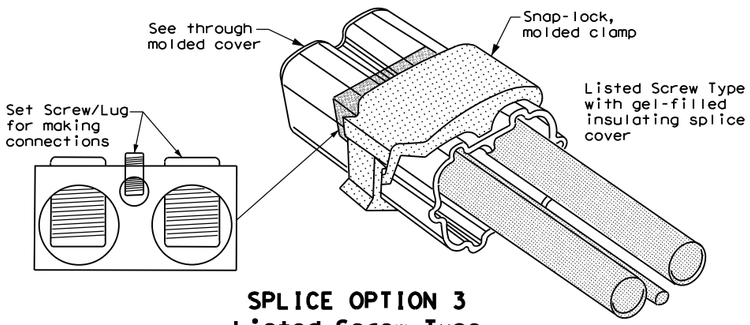
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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ELECTRICAL DETAILS CONDUCTORS

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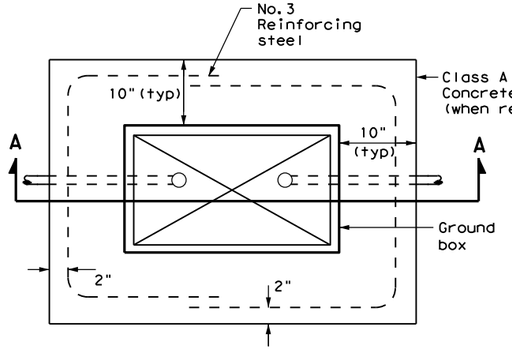
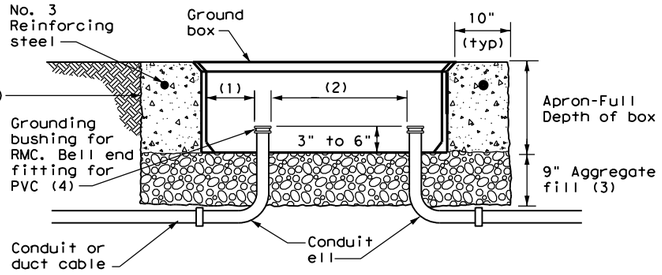


PLAN VIEW



SECTION A - A

APRON FOR GROUND BOX

(1) Uniformly space ends of conduits within the ground box. Position ends of conduits so that ground box walls do not interfere with the installation of grounding bushings or bell end fittings.

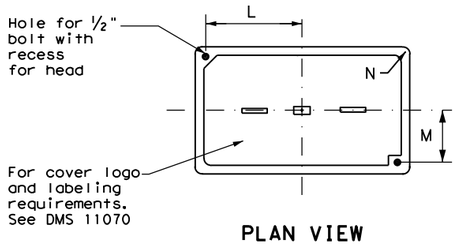
(2) Maintain sufficient space between conduits to allow for proper installation of bushing.

(3) Place aggregate under the box, not in the box. Aggregate should not encroach on the interior volume of the box.

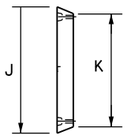
(4) Install a grounding bushing on the upper end of all RMC terminating in a ground box. Ground RMC elbows when any part of the elbow is less than 18 in. below the bottom of the ground box. Install a PVC bushing or bell end fitting on the upper end of all PVC conduits terminating in a ground box.

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

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



PLAN VIEW



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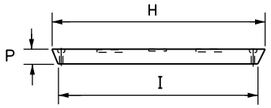

SIDE

GROUND BOX COVER

GROUND BOXES

A. MATERIALS

1. Provide polymer concrete ground boxes measuring 16x30x24 in. (WxLxD) or smaller in accordance with Departmental Material Specification (DMS) 11070 "Ground Boxes" and Item 624 "Ground Boxes."

2. Provide Type A, B, C, D, and E ground boxes as shown in the plans, and as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 624.

3. Ensure ground box cover is correctly labeled in accordance with DMS 11070.

4. Provide larger ground boxes in accordance with Item 624 and as shown in the plans.

B. CONSTRUCTION METHODS

1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the ground box. Install ground box on top of aggregate.

2. Cast ground box aprons in place. Reinforcing steel may be field bent. Ensure the depth of concrete for the apron extends from finished grade to the top of the aggregate bed under the box. Ground box aprons, including concrete and reinforcing steel, are subsidiary to ground boxes when called for by descriptive code.

3. Keep bolt holes in the box clear of dirt. Bolt covers down when not working in ground boxes.

4. Install all conduits and ells in a neat and workmanlike manner. Uniformly space conduits so grounding bushings and bell end fittings can easily be installed.

5. Temporarily seal all conduits in the ground box until conductors are installed.

6. Permanently seal conduits immediately after the completion of conductor installation and pull tests. Permanently seal the ends of all conduits with duct seal, expandable foam, or other method as approved. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a sealant.

7. When a ground rod is present in a ground box, bond all equipment grounding conductors together and to the ground rod with listed connectors.

8. When a type B or D ground box is stacked to meet volume requirements, it is allowable to cut an appropriately sized hole for conduit entry in the side wall at least 18 inches below grade.

9. If an existing ground box in the contract has a metal cover, bond the cover to the equipment grounding conductor with a 3 ft. long stranded bonding jumper the same size as the grounding conductor. The bonding jumper is subsidiary to various bid items. Verify existing ground boxes with metal covers are shown on the plans, with notes fully describing the work required.

10. If other ground boxes with metal covers are within the project limits but are not part of the contract, the Engineer may direct the Contractor to bond the metal covers, identifying the specific boxes in writing. This work will be paid for separately.

11. Bond metal ground box covers to the grounding conductor with a tank ground type lug.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS
GROUND BOXES

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services,"DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

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

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

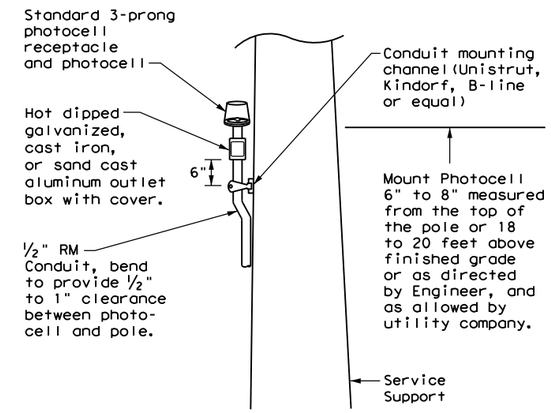
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/
  Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

FILE: ed5-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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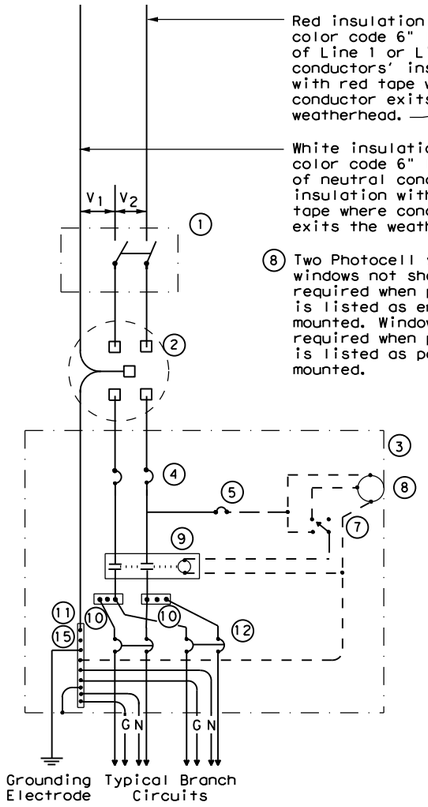
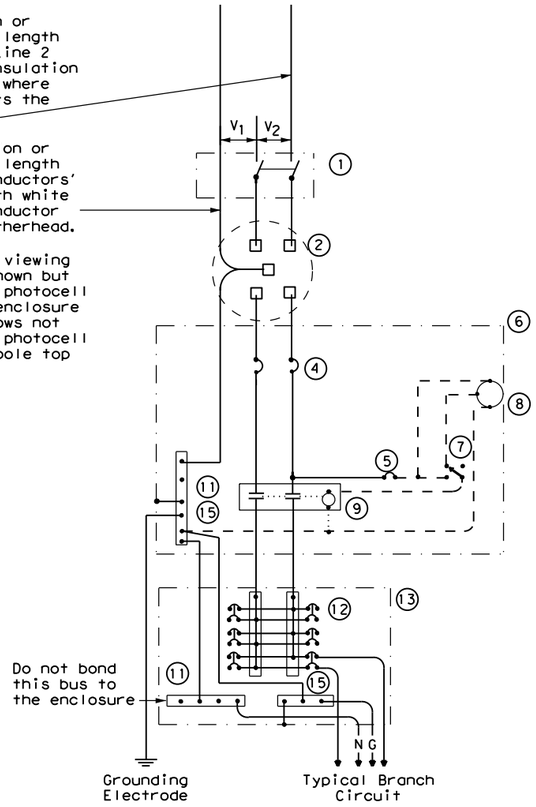
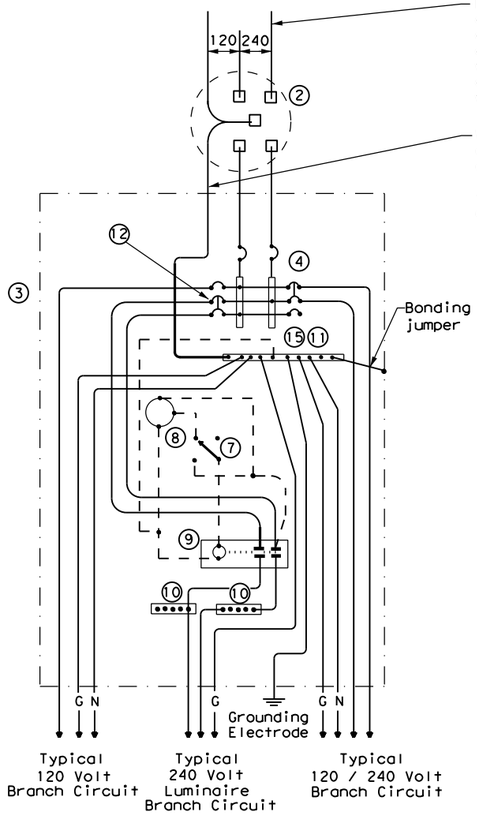
	HOU	HARRIS		



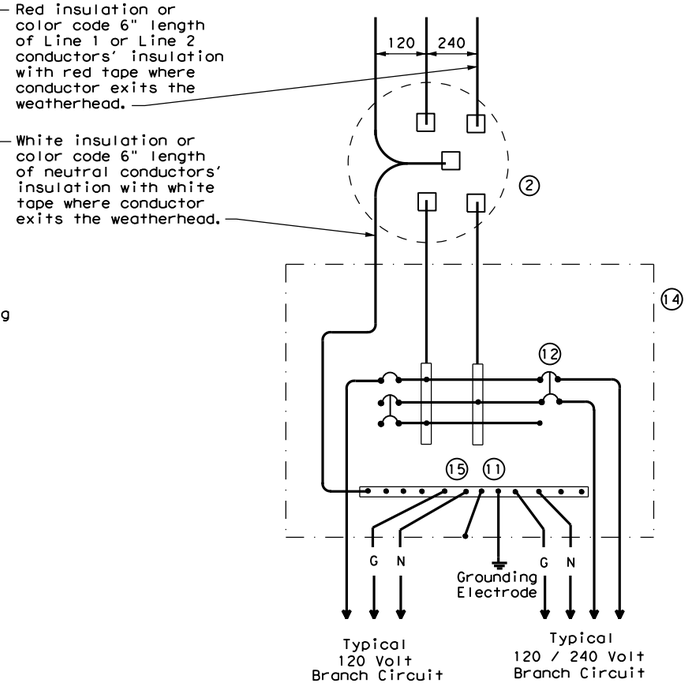
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



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



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

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

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

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 ½ in. or 1 ⅝ in. wide by 1 in. up to 3 ¾ in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.

2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.

3. Provide and install galvanized ¾ in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized ¾ in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 ¼ in. to 3 ½ in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.

4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.

5. Furnish and install rigid metallic ells in all steel pole and steel frame foundations for all conduits entering the service from underground.

6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.

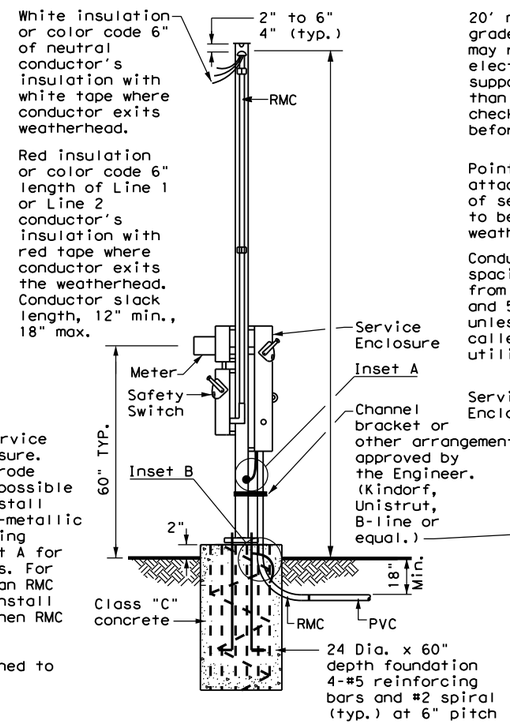
7. Drill and tap steel poles and frames for ½ in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.

8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.

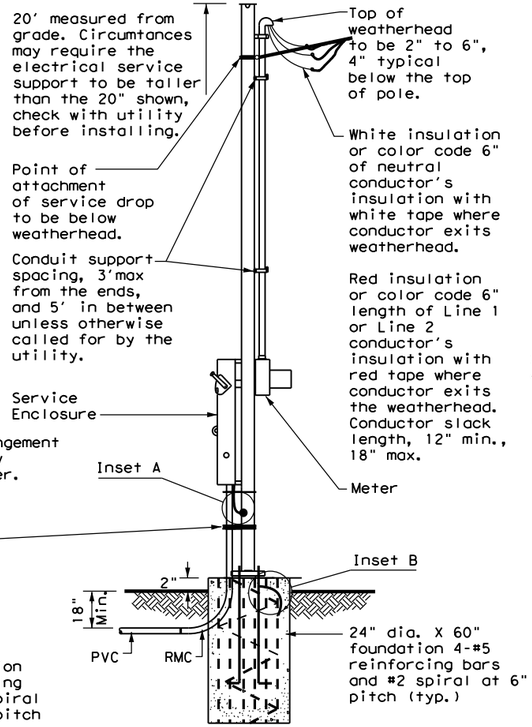
9. Provide ¼" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.

10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.

11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

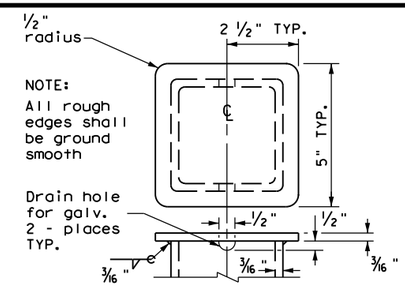


WITH SAFETY SWITCH

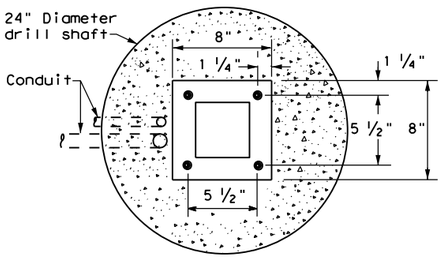


WITHOUT SAFETY SWITCH

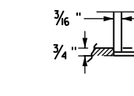
SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE



POLE TOP PLATE

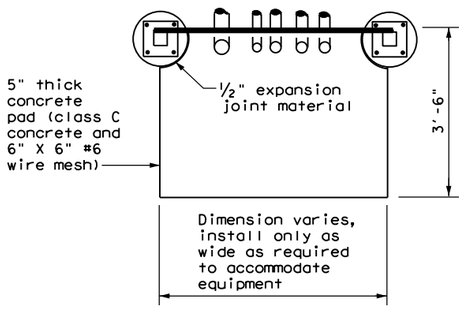


BASE PLATE DETAIL



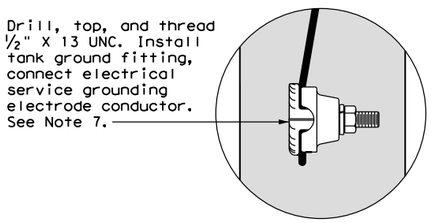
BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



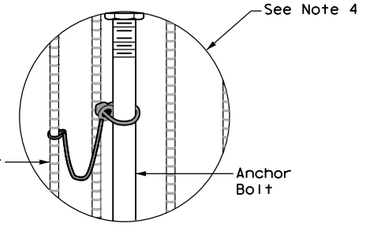
TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

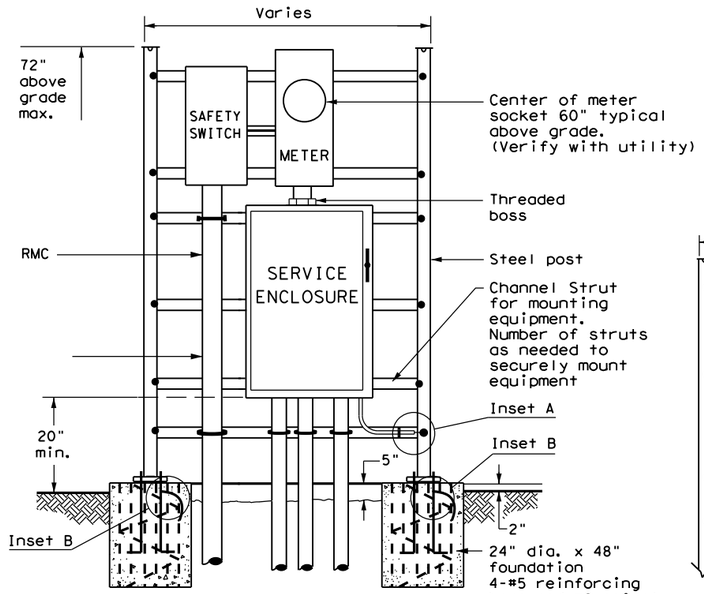


FRONT VIEW

INSET A

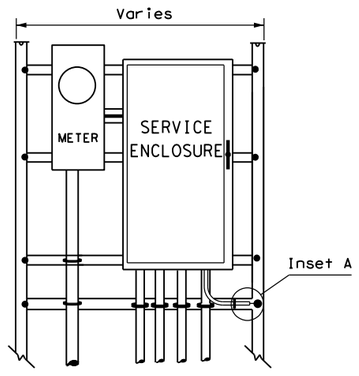


INSET B



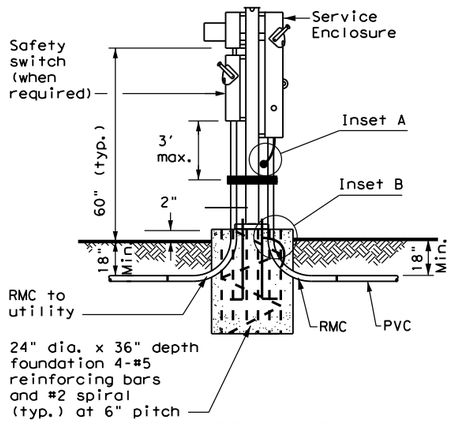
WITH SAFETY SWITCH

FRONT VIEW

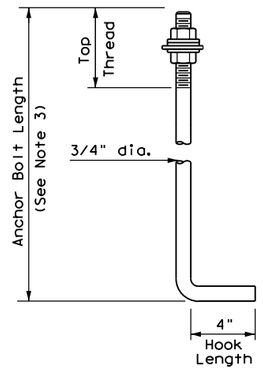


WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE



WITH SAFETY SWITCH



HOOKED ANCHOR DETAIL

SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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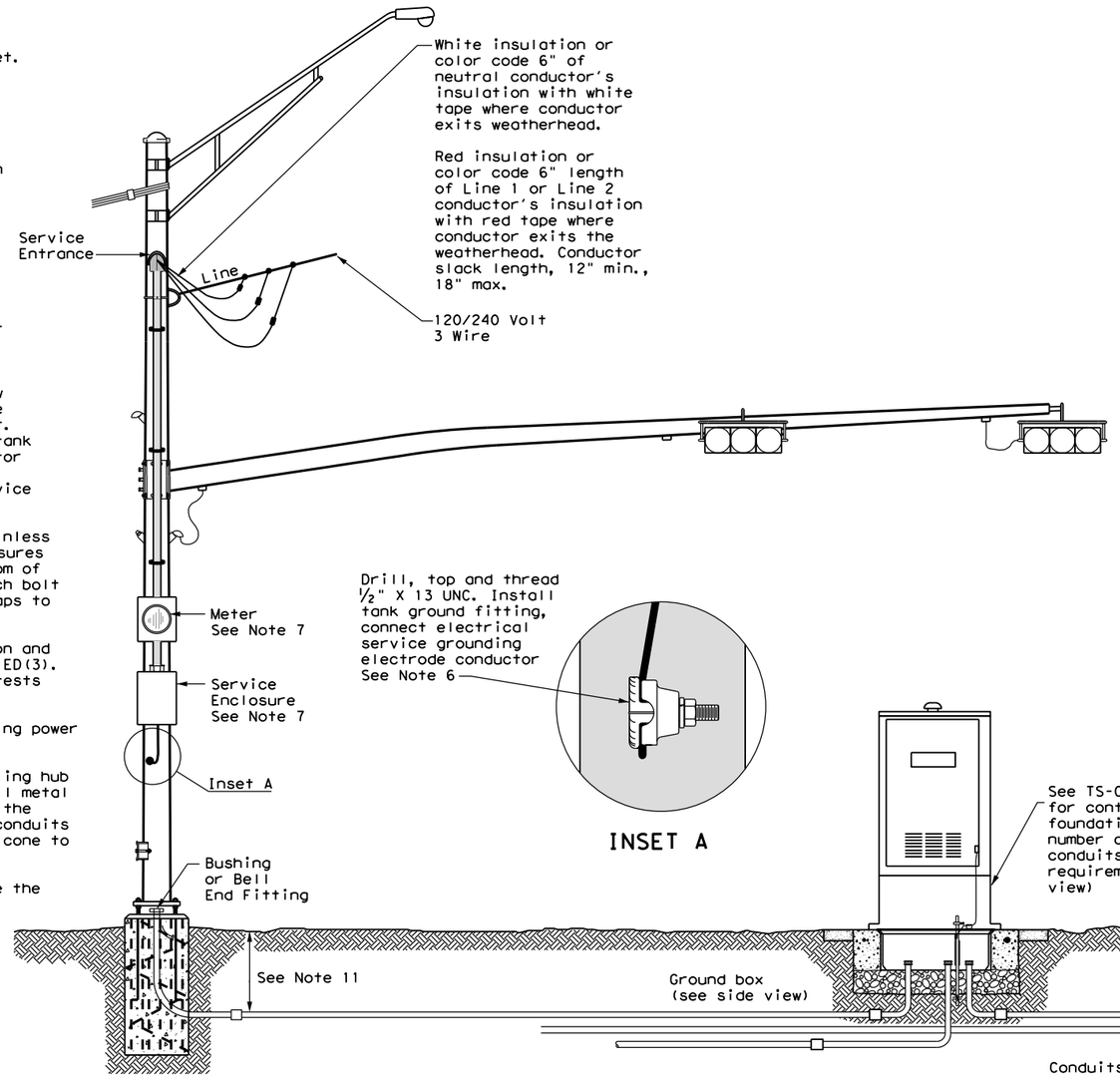
TRAFFIC SIGNAL NOTES

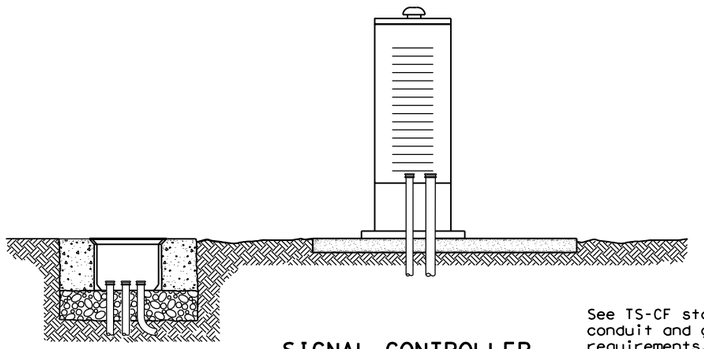
1. Do not pass luminaire conductors through the signal controller cabinet.
2. Include an equipment grounding conductor in all conduits throughout the electrical system. Bond all exposed metal parts to the grounding conductor.
3. Provide roadway luminaires, when required, in accordance with the material and construction sections of Item 610, "Roadway Illumination Assemblies," except for performance testing of luminaires. Test installed roadway luminaires for proper operation as a part of the associated traffic signal system test.
4. If internally illuminated street name signs are approved for use, ground the fixture to the pole with a 12 AWG green XHHW conductor.
5. Bond anchor bolts to rebar cage in two locations using #3 bars or 6 AWG stranded copper conductors. Use listed mechanical connectors rated for embedment in concrete. See TXDOT standard TS-FD for further details.
6. Drill and tap signal poles for ½ in. X 13 UNC tank ground fitting. Provide and install tank ground fitting 4 in. to 6 in. directly below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Connect the electrical service grounding electrode conductor to the tank ground fitting. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. See Inset A detail for further information. Size service entrance conduit and branch circuit conduit as shown in the plans.
7. Mount electrical service enclosure and meter to signal pole with stainless steel bands. Ensure bands are a minimum width of ¾ in. Secure enclosures to bands using two-bolt brackets. Install brackets near top and bottom of each enclosure. Install properly sized stainless steel washers on each bolt in the enclosure. Band or drill and tap properly sized stand-off straps to signal pole for attaching conduit.
8. Conduct pull tests and insulation resistance tests on all illumination and power conductors as required in Item 620 "Electrical Conductors" and ED(3). To prevent electronics damage, do not conduct insulation resistance tests on traffic signal cables after termination.
9. Lock all enclosures and bolt down all ground box covers before applying power to the signal installation.
10. Terminate conduits entering the top of enclosures with a conduit-sealing hub or threaded boss such as meter hub. Install a grounding bushing on all metal conduits not connected to conduit-sealing hub or threaded boss. Bond the grounding bushing to the ground bus with a bonding jumper. Seal all conduits entering enclosures with duct seal or expanding foam. Do not use silicone to seal conduit ends.
11. For all conduits, ensure the burial depth is a minimum of 18". Ensure the minimum burial depth for conduit placed under a roadway is 24".



SIGNAL POLE WITH SERVICE

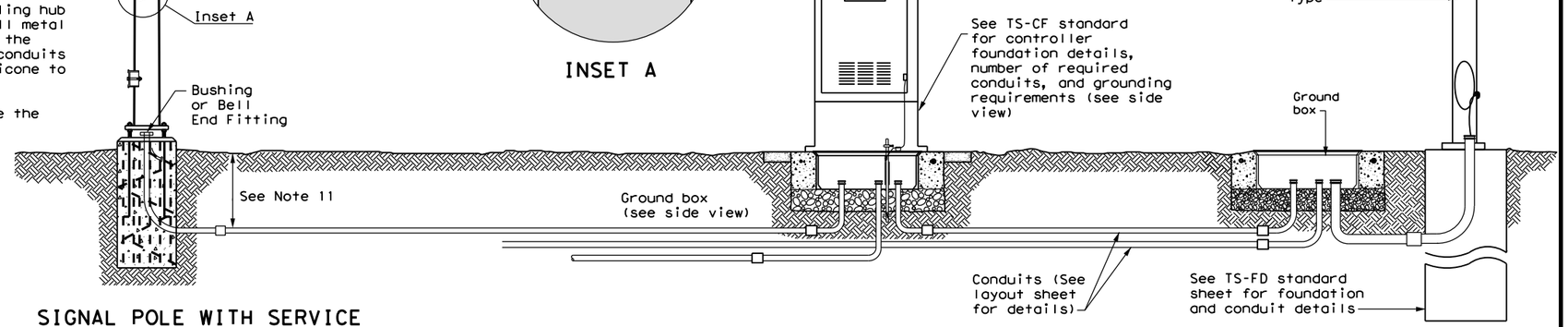
Type T electrical service mounted on signal pole shown as an example. See electrical details, layout sheets, and electrical service data chart for additional details.

INSET A



SIGNAL CONTROLLER SIDE VIEW

See TS-CF standard for conduit and grounding requirements. See layout sheets for ground box locations and any additional conduits that are required.



SIGNAL CONTROLLER FRONT VIEW

SIGNAL POLE

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS TYPICAL TRAFFIC SIGNAL SYSTEM DETAILS

ED(8)-14

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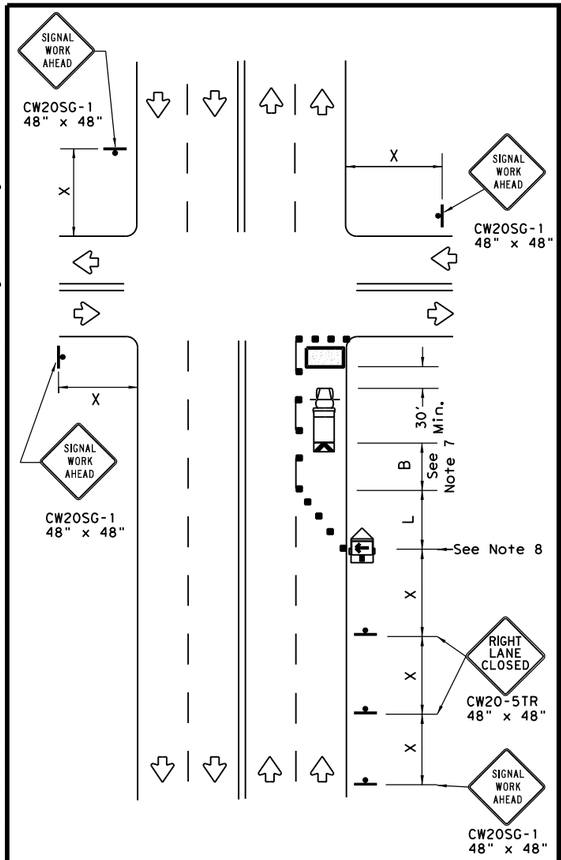
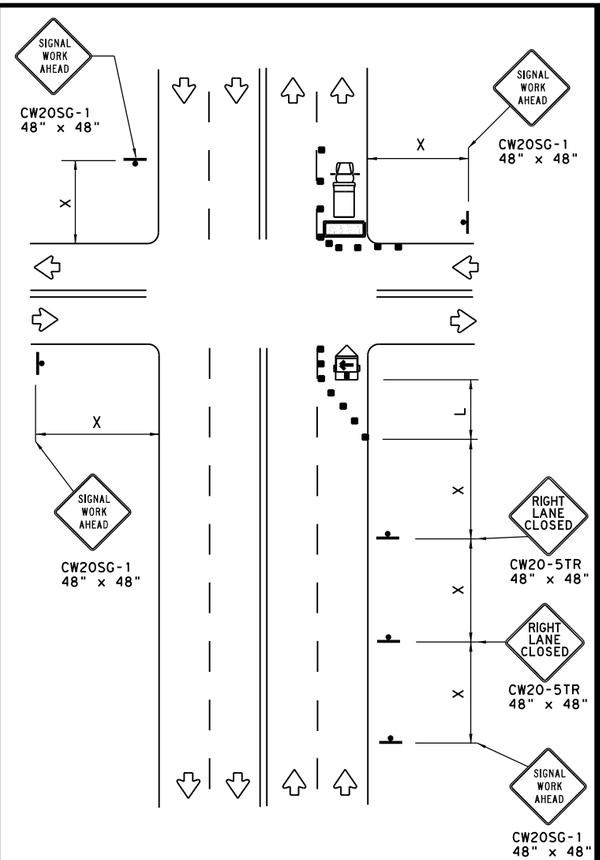


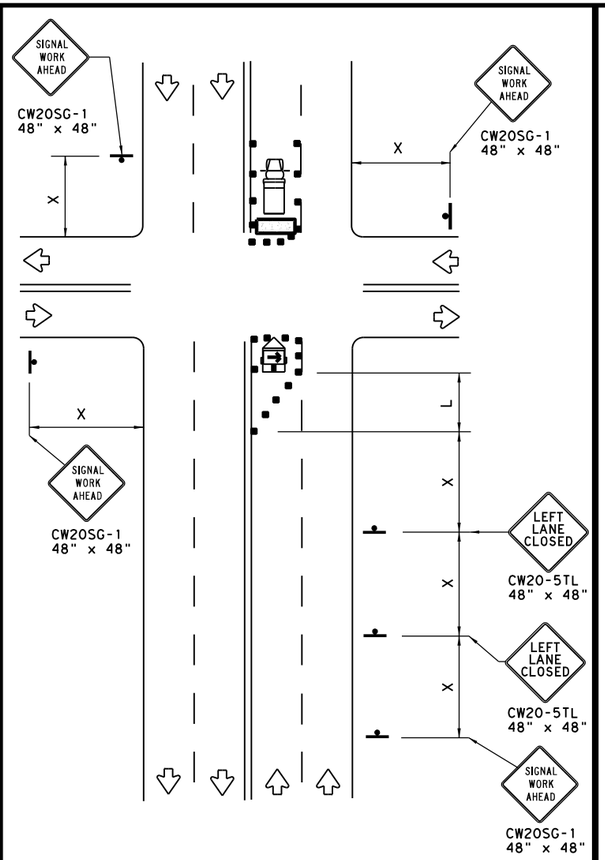
NEAR SIDE LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE RIGHT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY



FAR SIDE LEFT LANE CLOSURE

SHORT DURATION OR SHORT TERM STATIONARY

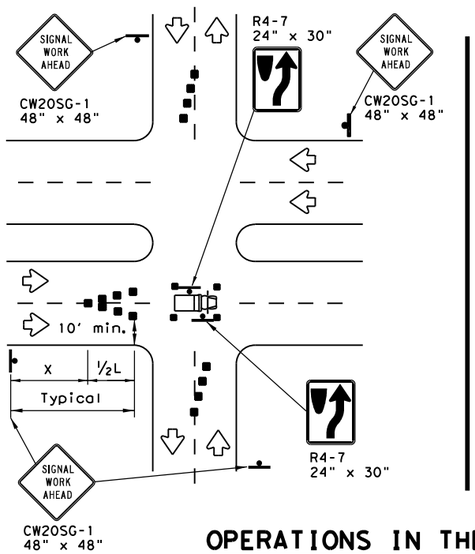
LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board	M	Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

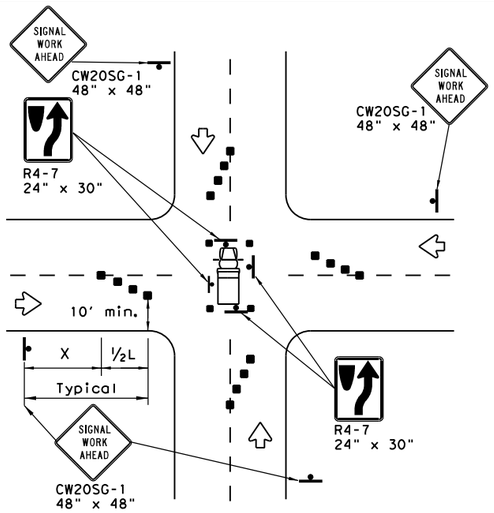
Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices On a Taper	On a Tangent	Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'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

* Conventional Roads Only

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

WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.





OPERATIONS IN THE INTERSECTION

SHORT DURATION

GENERAL NOTES

1. The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
2. Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
3. Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
4. Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
5. High level warning devices (flag trees) may be used at corners of the vehicle.
6. When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
7. For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
8. The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
9. Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.

SHEET 1 OF 2

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK TYPICAL DETAILS

WZ(BTS-1)-13

FILE: wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
2-98 10-99 7-13 4-98 3-03	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		

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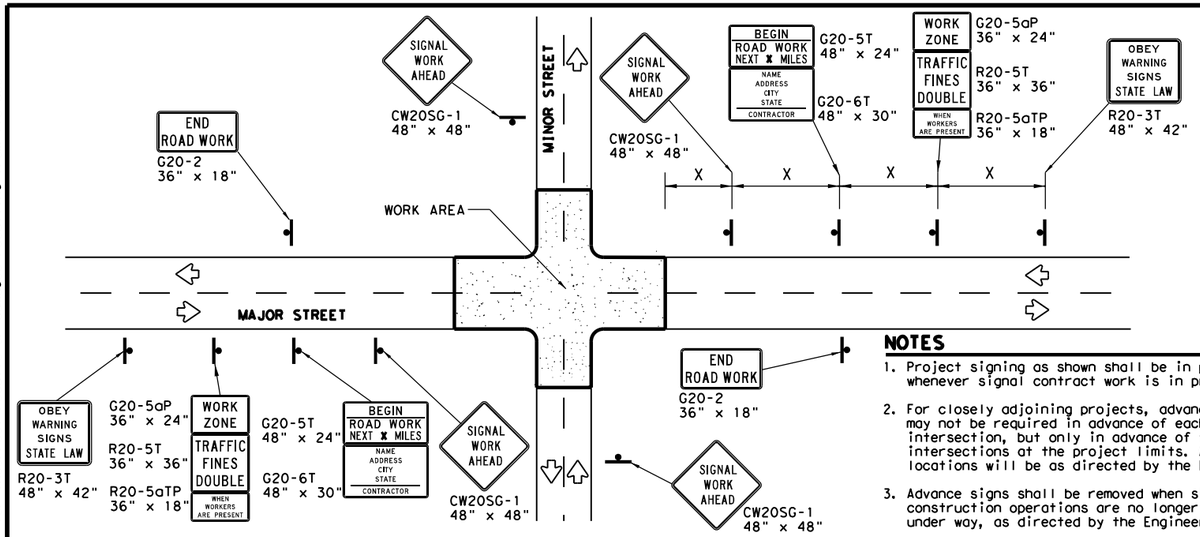


TYPICAL ADVANCE SIGNAL PROJECT SIGNING

FOR LONG TERM and INTERMEDIATE-TERM STATIONARY WORK OPERATIONS

NOTES

1. Project signing as shown shall be in place whenever signal contract work is in progress.
2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
4. Warning sign spacing shown is typical for both directions.
5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

GENERAL NOTES FOR WORK ZONE SIGNS

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. 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".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

DURATION OF WORK

1. Work zone durations are defined in Part 6, Section 6G.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

SIGN MOUNTING HEIGHT

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

REMOVING OR COVERING

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. 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, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

REFLECTIVE SHEETING

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

SIGN SUPPORT WEIGHTS

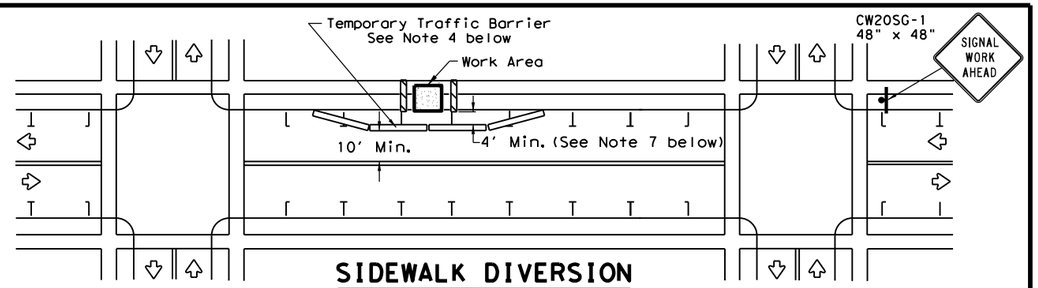
1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support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

LEGEND	
	Sign
	Channelizing Devices
	Type 3 Barricade

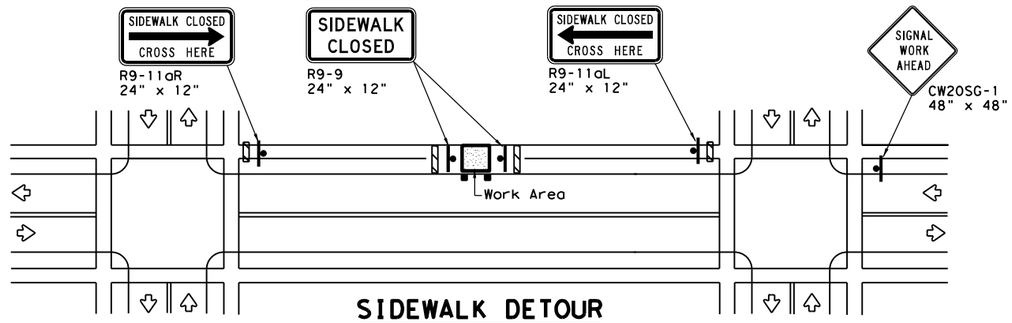
DEPARTMENTAL MATERIAL SPECIFICATIONS	
SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

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

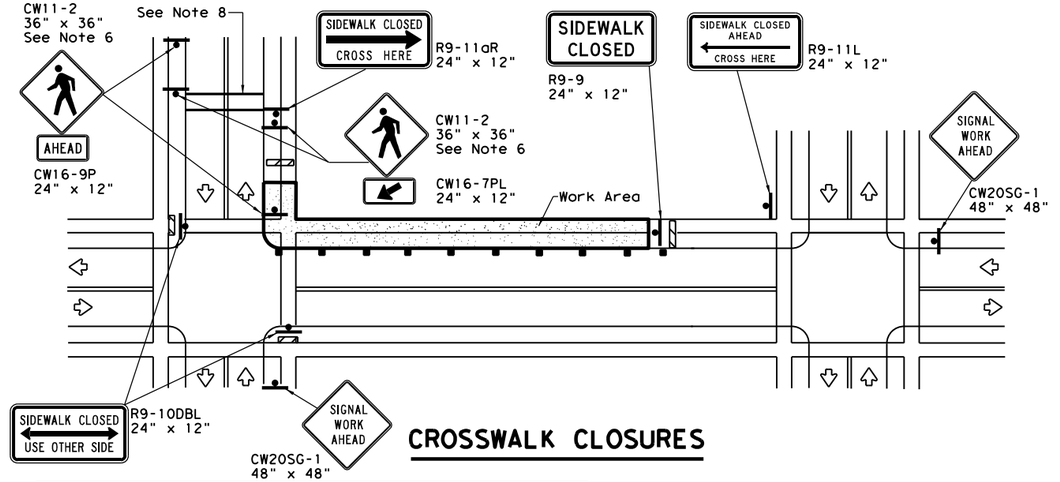
Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:
http://www.txdot.gov/txdot_library/publications/construction.htm



SIDEWALK DIVERSION



SIDEWALK DETOUR



CROSSWALK CLOSURES

PEDESTRIAN CONTROL

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC SIGNAL WORK BARRICADES AND SIGNS

WZ(BTS-2)-13

FILE:	wzbts-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2-98 10-99 7-13		DIST	COUNTY		SHEET NO.
4-98 3-03		HOU	HARRIS		

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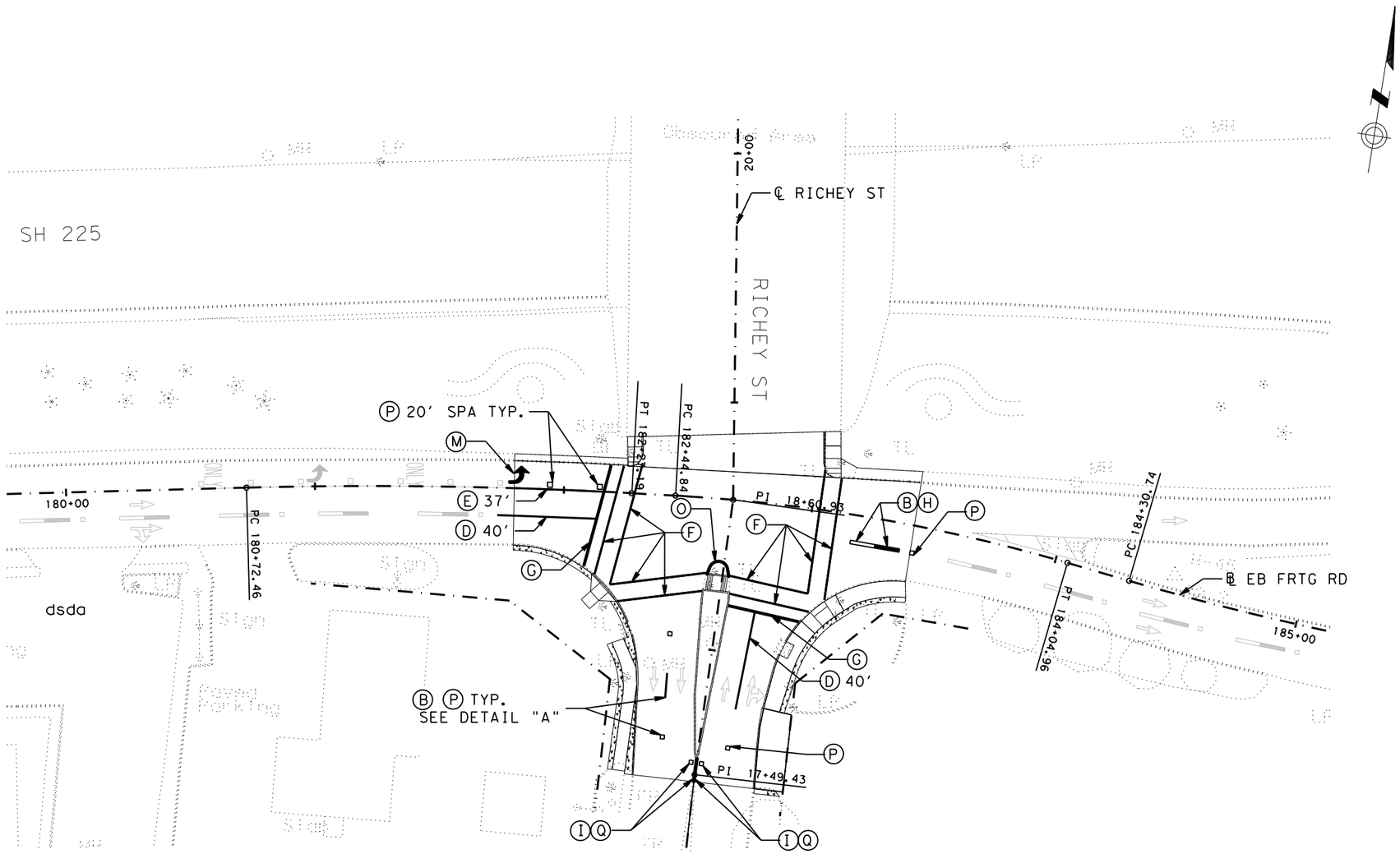
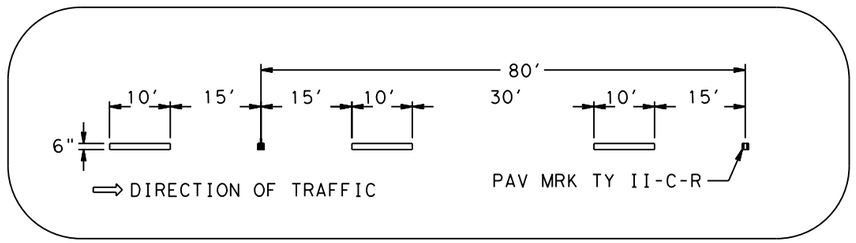


LEGEND

- Ⓑ MULTIPOLYMER PAV MRK (W)(6")(BRK)
- Ⓒ MULTIPOLYMER PAV MRK (W)(6")(DOT)
- Ⓓ MULTIPOLYMER PAV MRK (W)(6")(SLD)
- Ⓔ MULTIPOLYMER PAV MRK (W)(8")(SLD)
- Ⓕ MULTIPOLYMER PAV MRK (W)(12")(SLD)
- Ⓖ MULTIPOLYMER PAV MRK (W)(24")(SLD)
- Ⓗ MULTIPOLYMER PAV MRK (BLK)(6")(BRK)
- Ⓘ MULTIPOLYMER PAV MRK (Y)(4")(SLD)
- Ⓙ MULTIPOLYMER PAV MRK (Y)(6")(SLD)
- Ⓚ MULTIPOLYMER PAV MRK (Y)(24")(SLD)
- Ⓛ PREFAB PAV MRK TY C (W)(WORD)
- Ⓜ PREFAB PAV MRK TY C (W)(ARROW)
- Ⓝ PREFAB PAV MRK TY C (W)(DBL ARROW)
- Ⓞ REFL PAV MRK TY II (Y) (12") (SLD)
- Ⓟ REFL PAV MRKR TY II-C-R
- Ⓠ REFL PAV MRKR TY II-A-A



DETAIL "A"

STATE OF TEXAS
STEVE VAN
137551
LICENSED PROFESSIONAL ENGINEER

Steve Van, P.E.

03/24/2021

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

EASTBOUND FRONTAGE ROAD & RICHEY ST

PAVEMENT MARKING LAYOUT

SHEET NO. 1 OF 1 **SCALE: 1" = 50'**

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
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STATE	DIST.	COUNTY	
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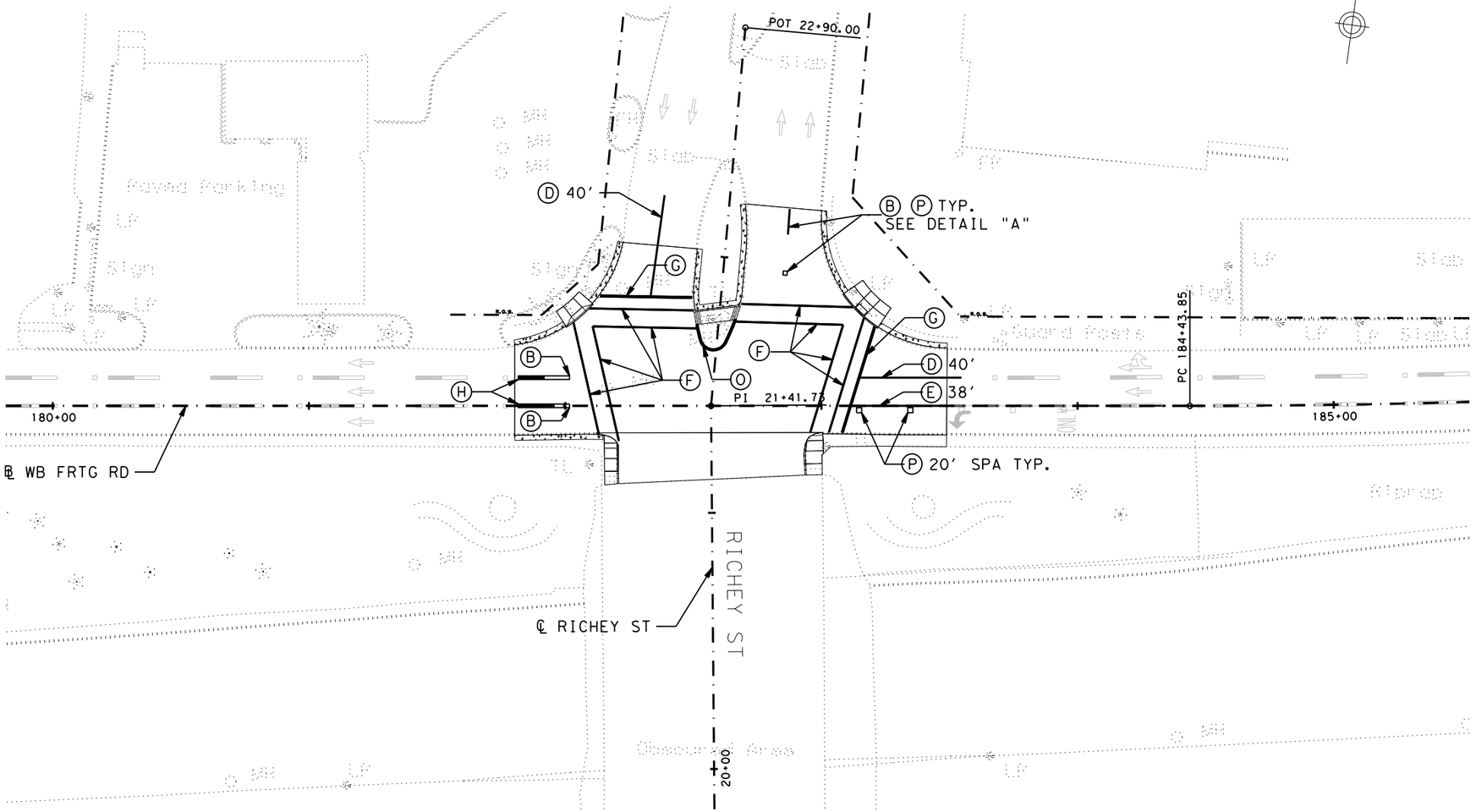
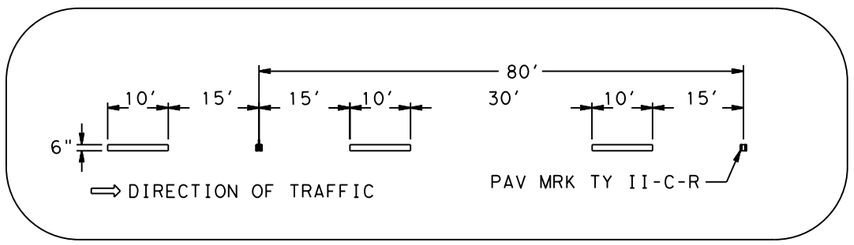
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225





DETAIL "A"

LEGEND

- (B) MULTIPOLYMER PAV MRK (W)(6")(BRK)
- (C) MULTIPOLYMER PAV MRK (W)(6")(DOT)
- (D) MULTIPOLYMER PAV MRK (W)(6")(SLD)
- (E) MULTIPOLYMER PAV MRK (W)(8")(SLD)
- (F) MULTIPOLYMER PAV MRK (W)(12")(SLD)
- (G) MULTIPOLYMER PAV MRK (W)(24")(SLD)
- (H) MULTIPOLYMER PAV MRK (BLK)(6")(BRK)
- (I) MULTIPOLYMER PAV MRK (Y)(4")(SLD)
- (J) MULTIPOLYMER PAV MRK (Y)(6")(SLD)
- (K) MULTIPOLYMER PAV MRK (Y)(24")(SLD)
- (L) PREFAB PAV MRK TY C (W)(WORD)
- (M) PREFAB PAV MRK TY C (W)(ARROW)
- (N) PREFAB PAV MRK TY C (W)(DBL ARROW)
- (O) REFL PAV MRK TY II (Y) (12") (SLD)
- (P) REFL PAV MRKR TY II-C-R
- (Q) REFL PAV MRKR TY II-A-A

STATE OF TEXAS
STEVE VAN
137551
LICENSED PROFESSIONAL ENGINEER

S Van ,P.E.

03/24/2021

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

WESTBOUND FRONTAGE ROAD & RICHEY ST

PAVEMENT MARKING LAYOUT

SHEET NO. 1 OF 1 SCALE: 1" = 50'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
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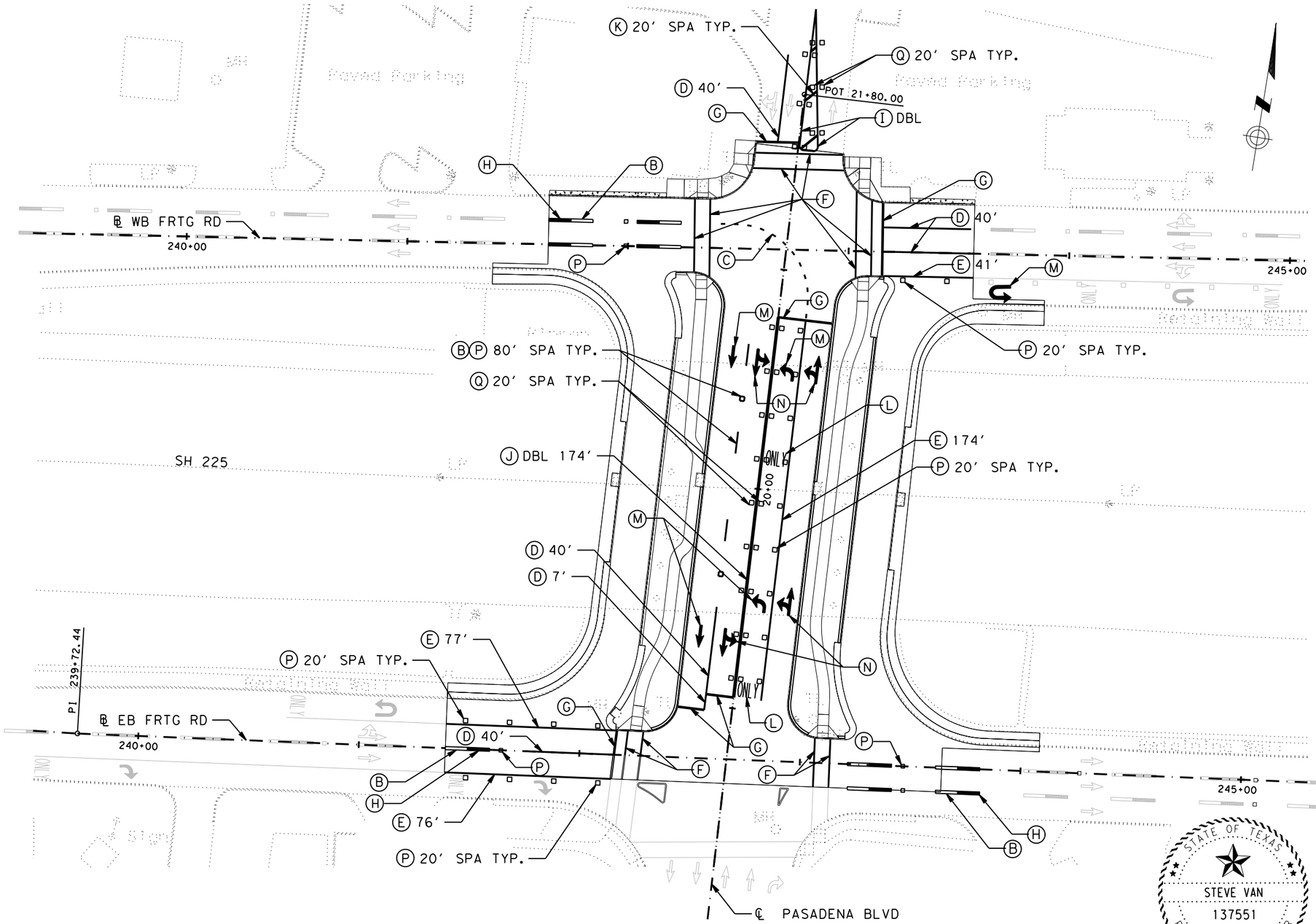
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

- (B) MULTIPOLYMER PAV MRK (W)(6")(BRK)
- (C) MULTIPOLYMER PAV MRK (W)(6")(DOT)
- (D) MULTIPOLYMER PAV MRK (W)(6")(SLD)
- (E) MULTIPOLYMER PAV MRK (W)(8")(SLD)
- (F) MULTIPOLYMER PAV MRK (W)(12")(SLD)
- (G) MULTIPOLYMER PAV MRK (W)(24")(SLD)
- (H) MULTIPOLYMER PAV MRK (BLK)(6")(BRK)
- (I) MULTIPOLYMER PAV MRK (Y)(4")(SLD)
- (J) MULTIPOLYMER PAV MRK (Y)(6")(SLD)
- (K) MULTIPOLYMER PAV MRK (Y)(24")(SLD)
- (L) PREFAB PAV MRK TY C (W)(WORD)
- (M) PREFAB PAV MRK TY C (W)(ARROW)
- (N) PREFAB PAV MRK TY C (W)(DBL ARROW)
- (O) REFL PAV MRK TY II (Y) (12") (SLD)
- (P) REFL PAV MRKR TY II-C-R
- (Q) REFL PAV MRKR TY II-A-A

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

FRONTAGE ROAD & PASADENA BLVD

PAVEMENT MARKING LAYOUT

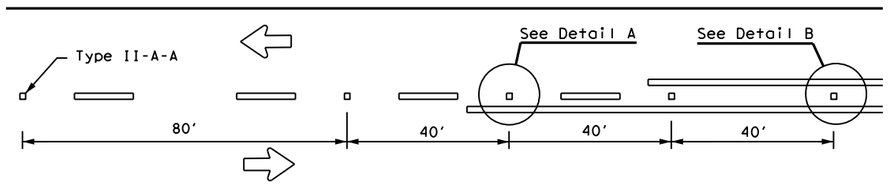
STATE OF TEXAS
STEVE VAN
137551
LICENSED PROFESSIONAL ENGINEER

S.Van ,P.E.
03/24/2021

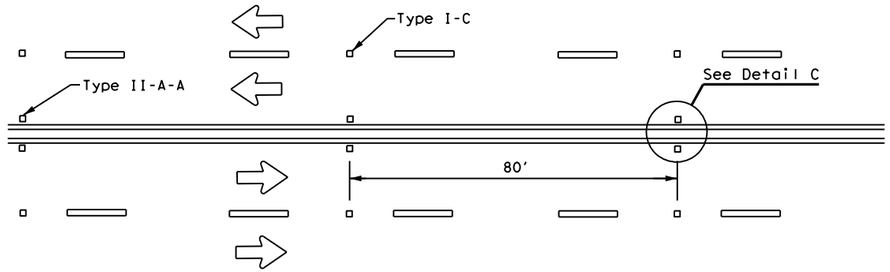
SHEET NO. 1 OF 1 **SCALE: 1" = 50'**

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			141
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

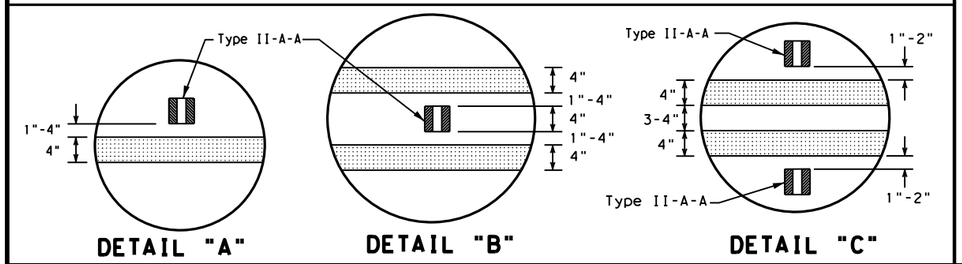
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



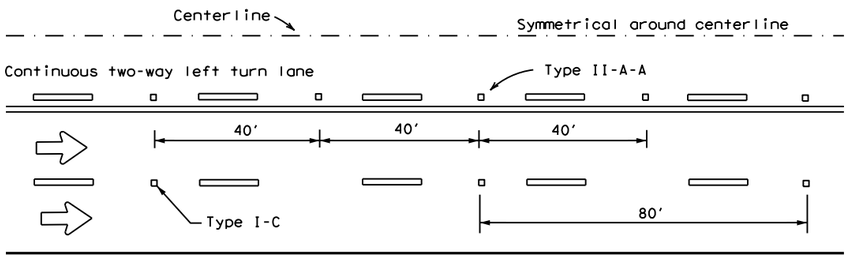
CENTERLINE FOR ALL TWO LANE ROADWAYS



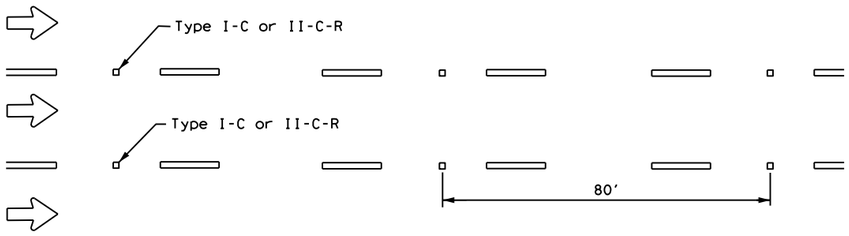
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY HIGHWAYS



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

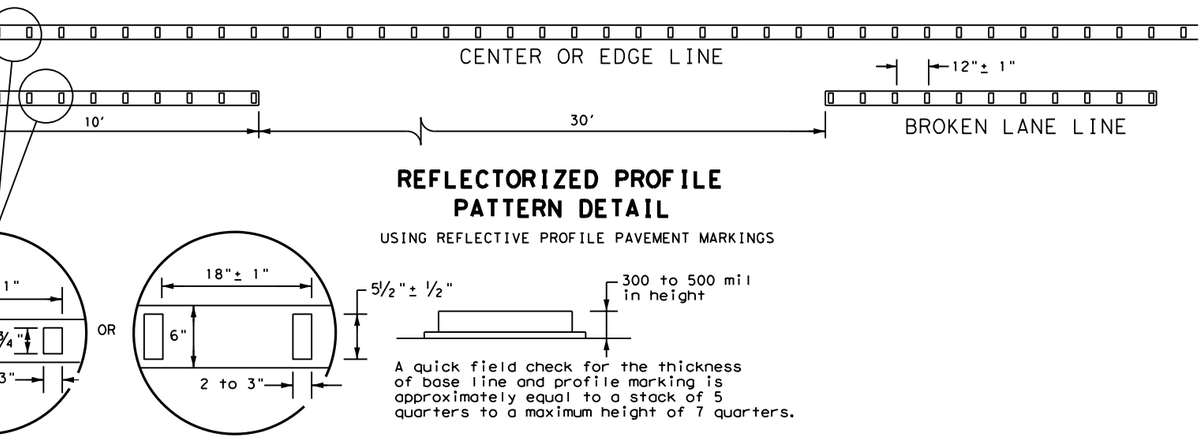


CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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

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



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

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

4" EDGE LINE, CENTER LINE OR LANE LINE

OPTIONAL 6" EDGE LINE, CENTER LINE OR LANE LINE

NOTE

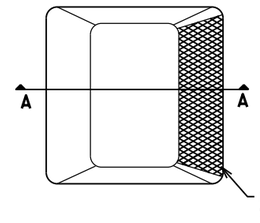
Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

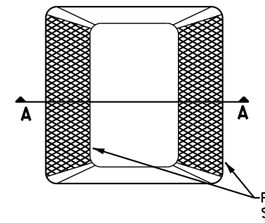
1. All raised pavement markers placed in broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.

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

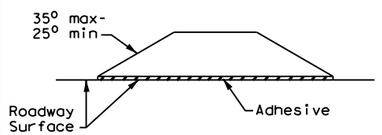
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

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

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©TxDOT April 1977	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-92 2-10 5-00 2-12 8-00 6-20	0502	01	222	SH 225
	DIST	COUNTY		SHEET NO.
	HOU	HARRIS		142

22B

DATE:
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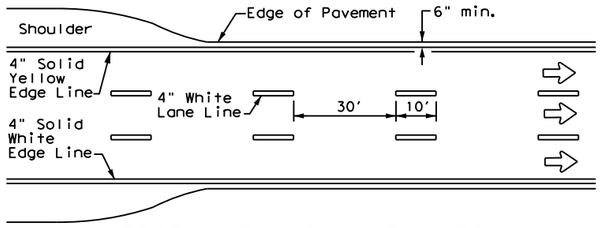
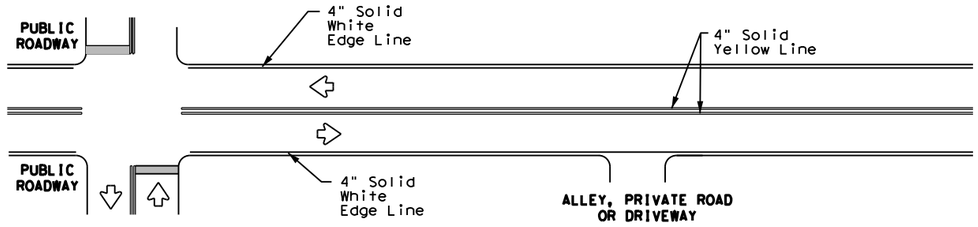
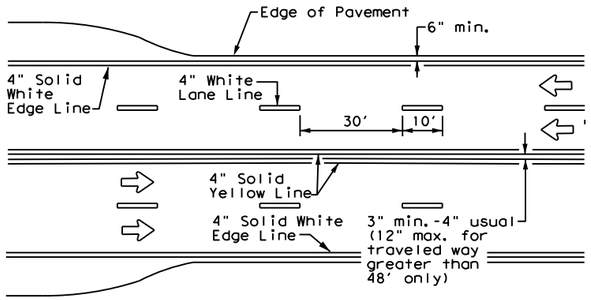


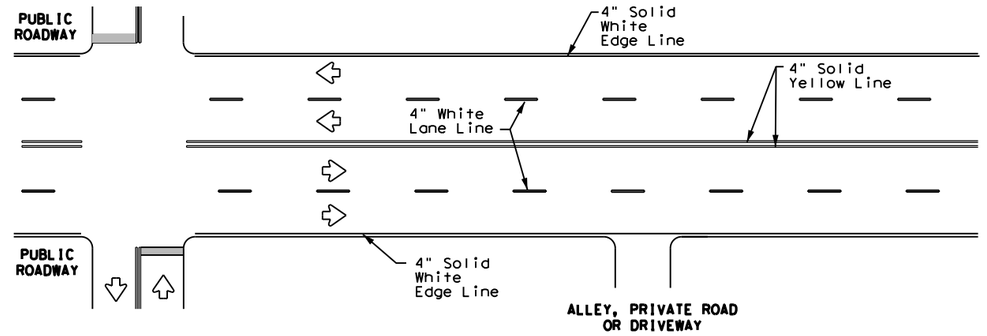
EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



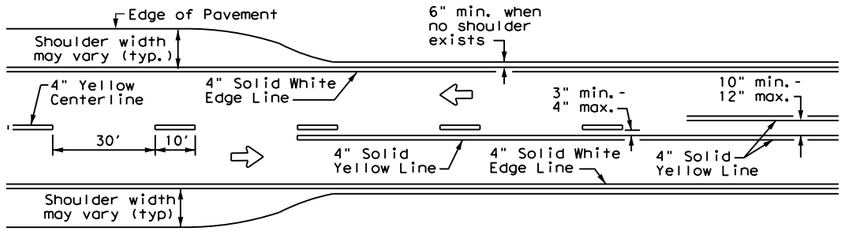
TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



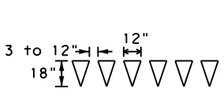
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



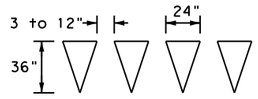
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

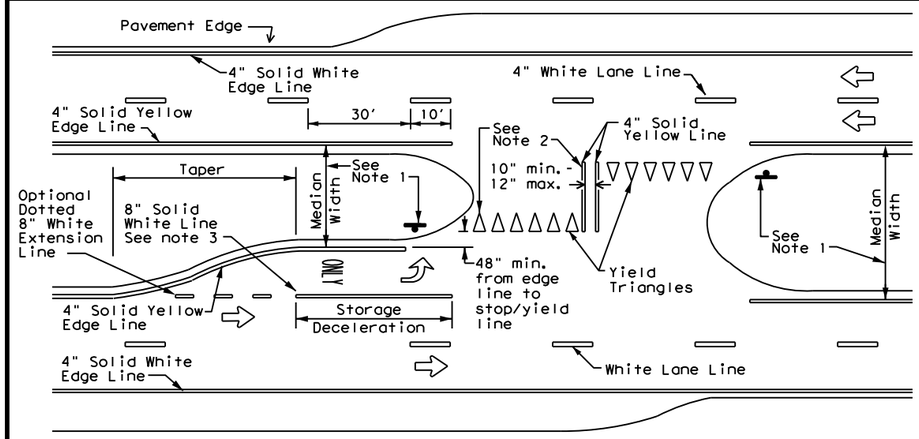


For posted speed on road being marked equal to or less than 40 MPH.



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

YIELD LINES



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTE:

1. Irrespective of shoulder, use 6in 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

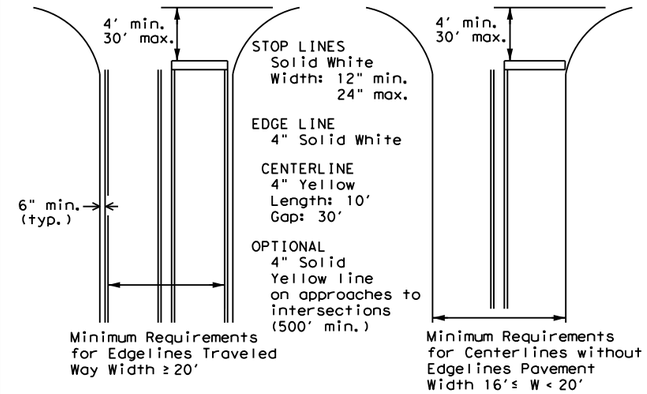
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling 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 traingles shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

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

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

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



GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Highways

Texas Department of Transportation
HOUSTON DISTRICT STANDARD

TYPICAL STANDARD PAVEMENT MARKINGS

PM-20

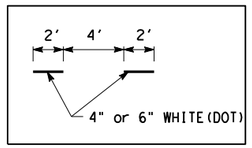
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
8-95 2-12
5-00 8-16
8-00 7-20
3-03

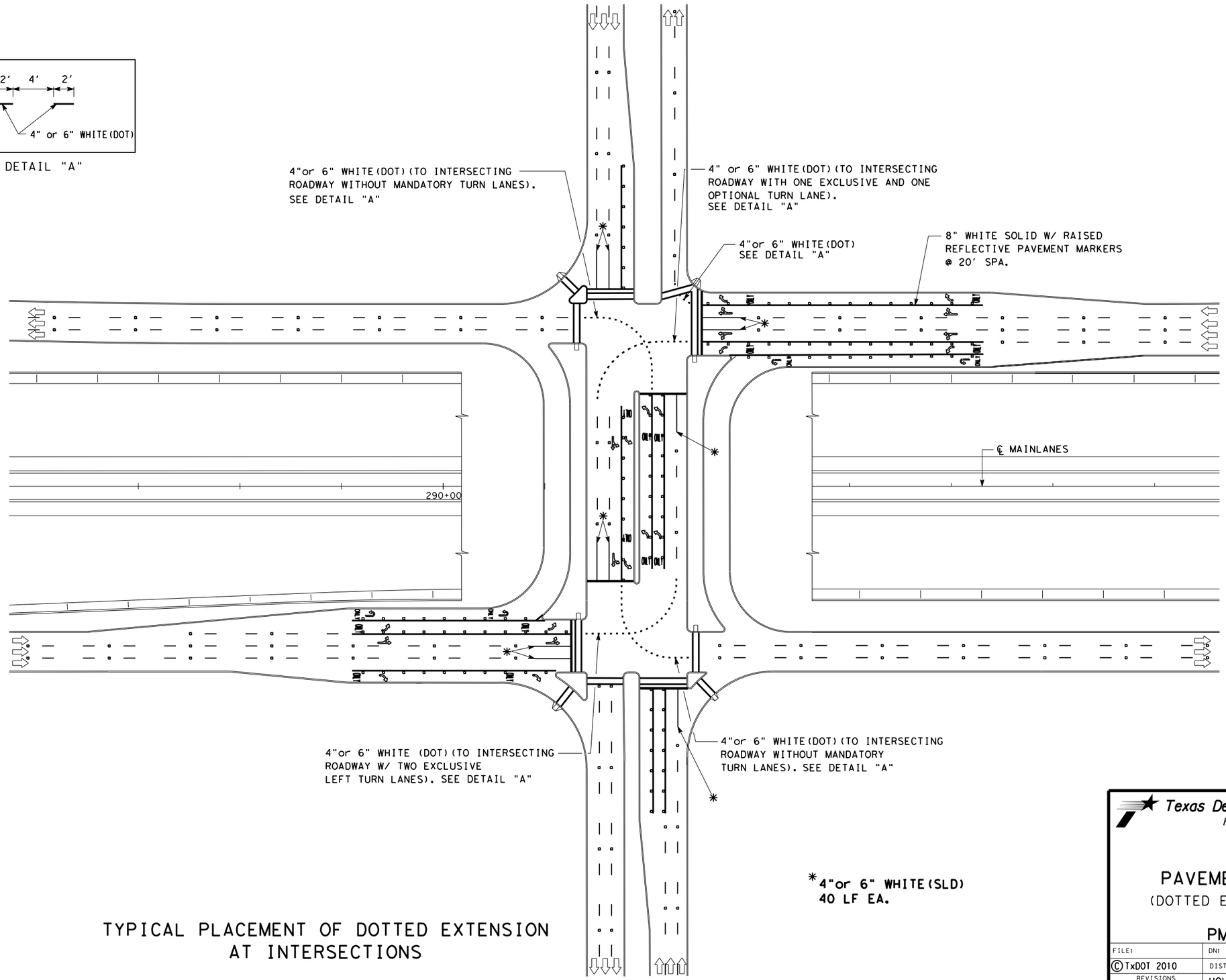
CONT	SECT	JOB	HIGHWAY
0502	01	222	SH 225
DIST	COUNTY		SHEET NO.
HOU	HARRIS		143

DATE:
FILE:

STD N-5a



DETAIL "A"



*4"or 6" WHITE(SLD) 40 LF EA.

TYPICAL PLACEMENT OF DOTTED EXTENSION AT INTERSECTIONS

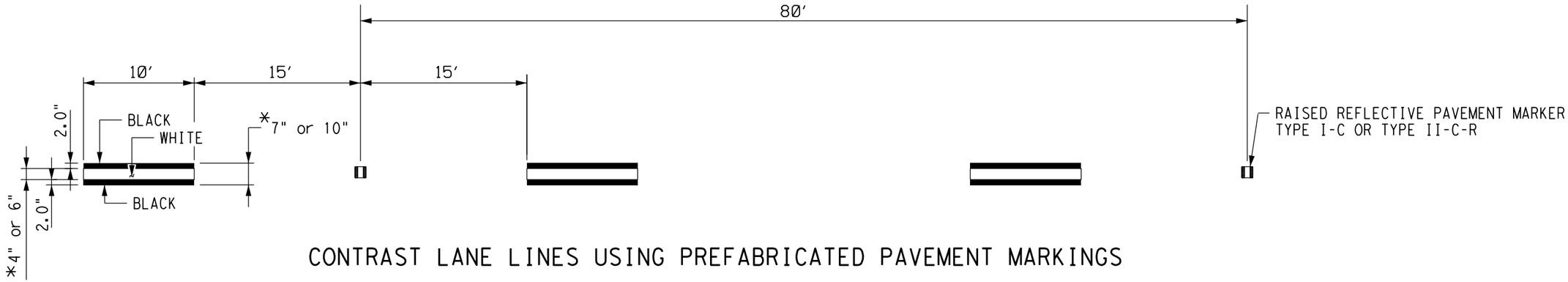
Texas Department of Transportation
Houston District

PAVEMENT MARKINGS
(DOTTED EXTENSION DETAILS)

PM(DOT)-11

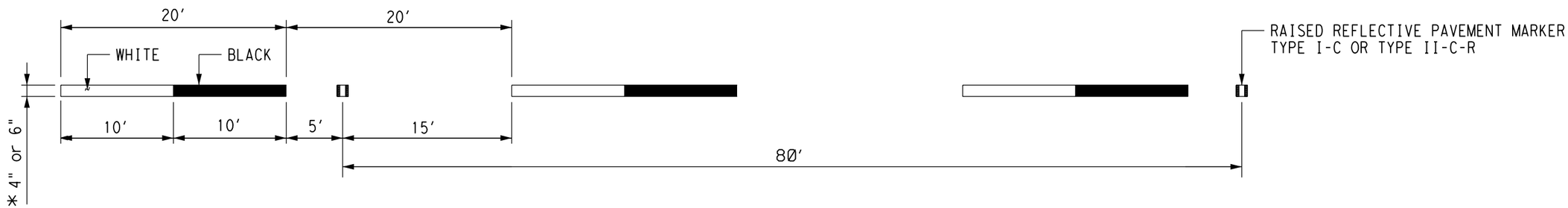
FILE:	DN:	CK:	DW:	CK:
© TxDOT 2010	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 4/2010 4/2011	HOU	6		144
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	HARRIS	0502	01	222	SH 225

STD N-28



CONTRAST LANE LINES USING PREFABRICATED PAVEMENT MARKINGS

DIRECTION OF TRAFFIC



CONTRAST LANE LINES USING LIQUID APPLICATIONS
(MULTIPOLYMER, THERMOPLASTIC, ETC.)

* AS SHOWN ON THE PLANS.

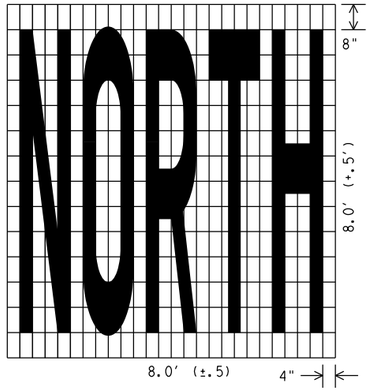
Texas Department of Transportation
Houston District

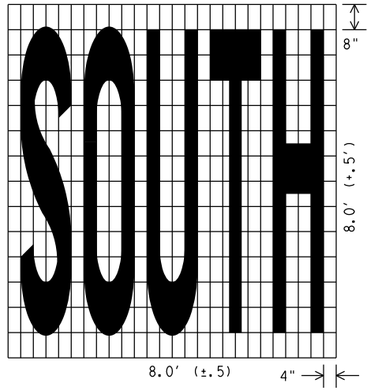
PAVEMENT MARKINGS
(CONTRAST LANE LINES)

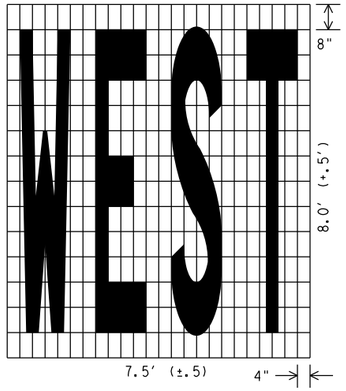
PM(CLL)-14

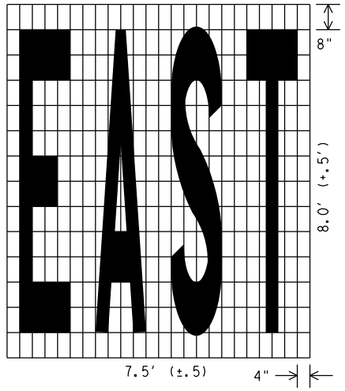
FILE:	DN:	CK:	DW:	CK:
© TxDOT 2003	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 01-10-06 02-12-08 10-2019 9" to 10"	HOU	6		145
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	HARRIS	0502	01 222	SH 225

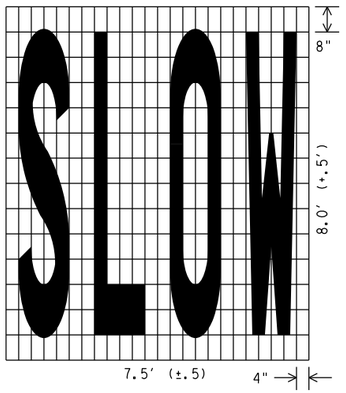
STD N-30

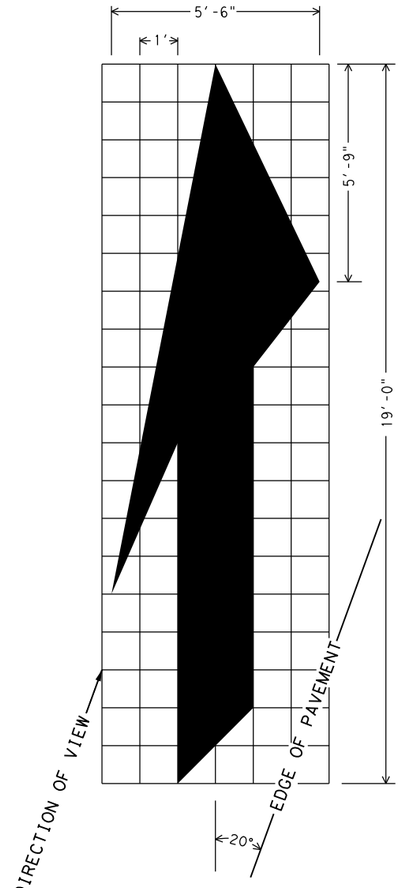






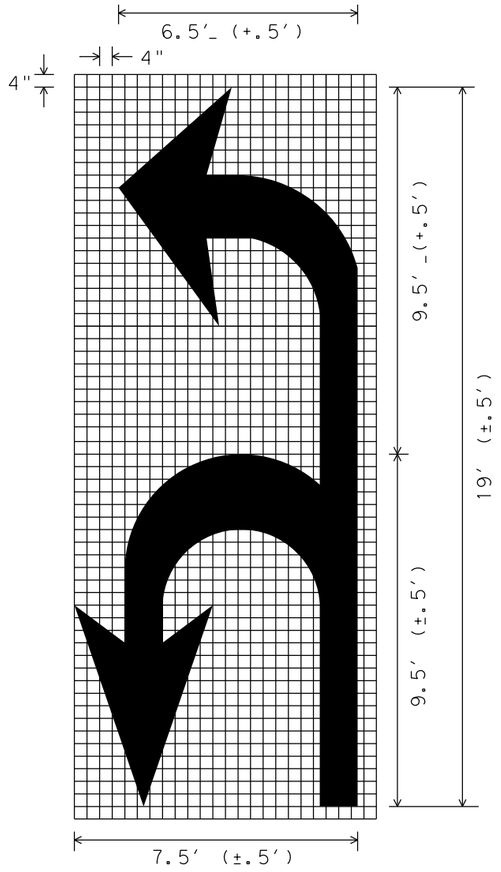




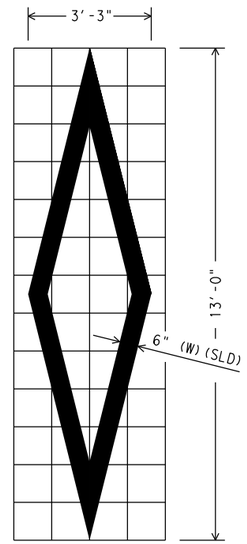


ISOMETRIC ARROW

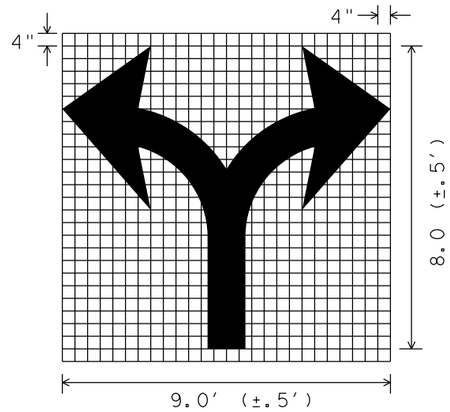
12 INCH GRID
AREA = 42 SQ. FT.
RIGHT LANE DROP ARROW
(FOR LEFT LANE, USE MIRROR IMAGE)



U-L ARROW



DIAMOND SYMBOL



SCALE 1/4" = 1′

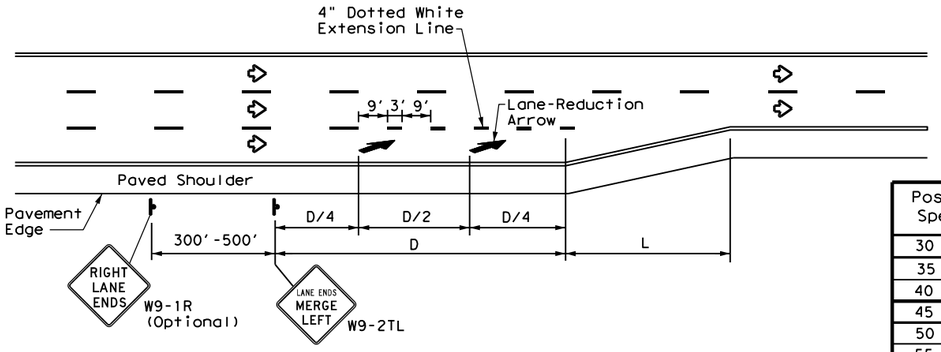
Texas Department of Transportation
Houston District

PAVEMENT MARKINGS (WORDS, ARROWS & SYMBOLS)

PM(WAS)-07

FILE:	DN:	CK:	DW:	CK:
© TxDOT 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS 03-19-07	HOU	6		146
	COUNTY	CONTROL	SECT JOB	HIGHWAY
	HARRIS	0502	01 222	SH 225

STD-N31

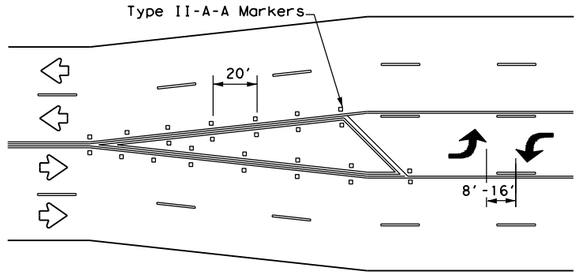


LANE REDUCTION

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

NOTES

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



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

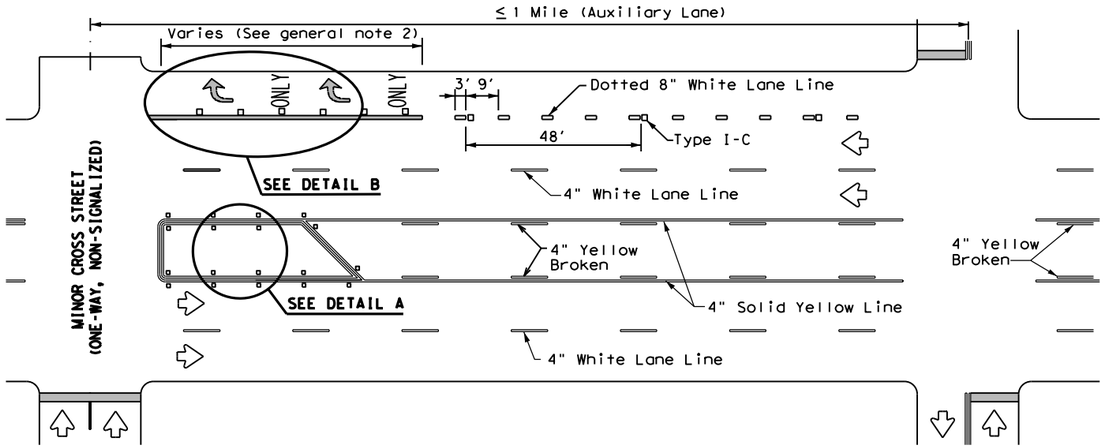
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

GENERAL NOTES

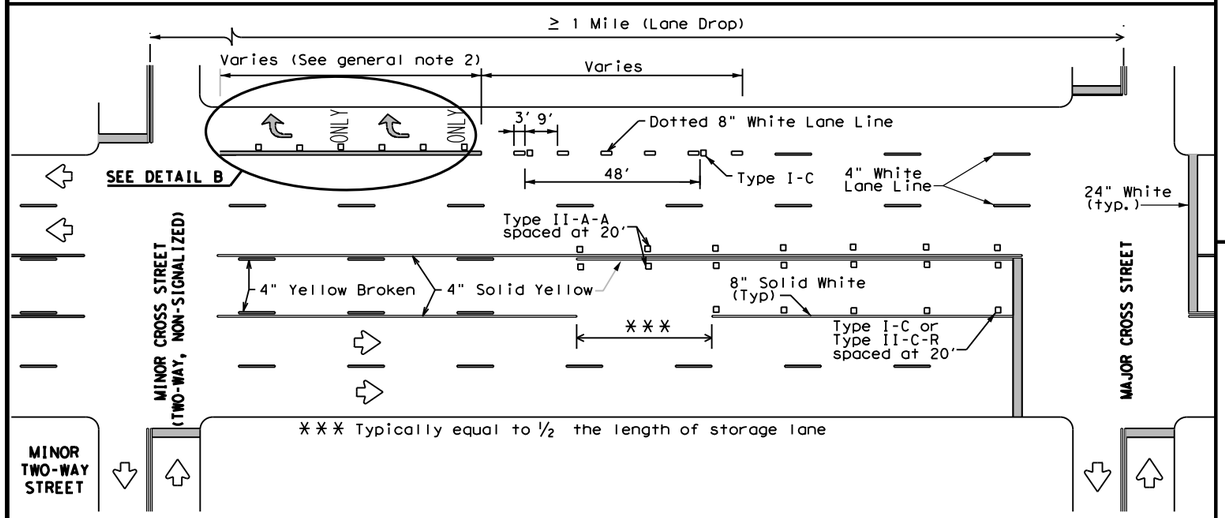
1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn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

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

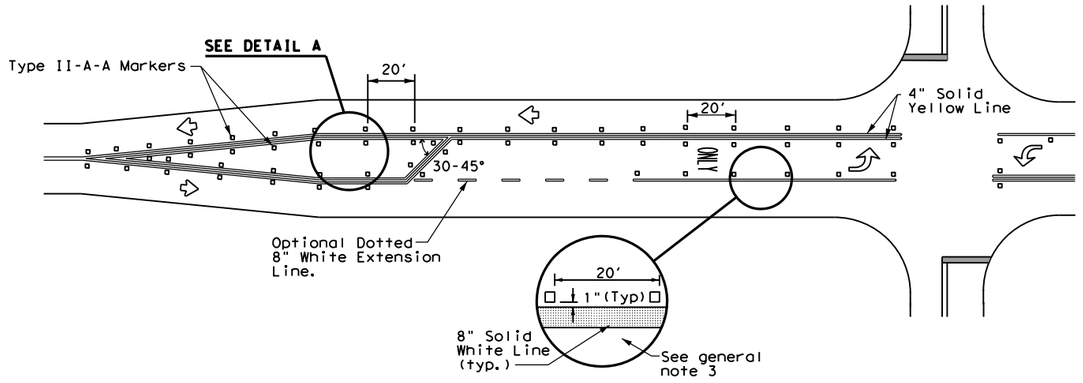
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



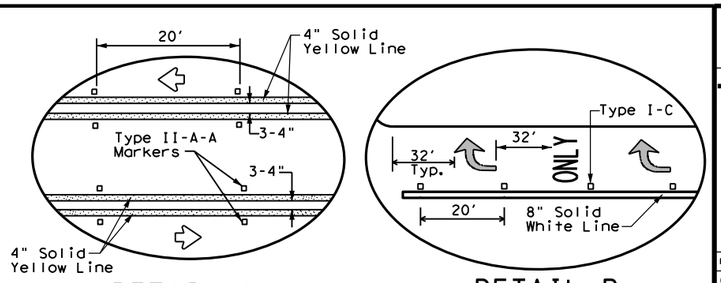
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



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



TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS



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	0502	01	222	SH 225
5-00 2-10	DIST	COUNTY		SHEET NO.
8-00 2-12	HOU	HARRIS		147
3-03 6-20				

22C

DATE:
FILE:

SITE DESCRIPTION

PROJECT LIMITS: FROM SH 225. RICHEY ST TO WEST OF RED BLUFF RD

PROJECT DESCRIPTION: RECONSTRUCTION OF INTERSECTION PAVEMENT AT S. RICHEY ST AND PASADENA BLVD, FULL-DEPTH REPAIRS OF FRONTAGE ROADS, AND SLOPE STABILIZATION

MAJOR SOIL DISTURBING ACTIVITIES: REMOVAL OF PAVEMENT OF CONC & ASPH PAV., STAB. BASE, EARTHWORKS, SODDING, PLANING, DRILL SHAFTS, EXCAVATION OF VEGETATION SOIL BEHIND CURB, EXCAVATION OF VEGETATION SOIL FOR SLOPE STABLIZATION.

TOTAL PROJECT AREA: 11.252 AC

TOTAL AREA TO BE DISTURBED: 2.187 AC

WEIGHTED RUNOFF COEFFICIENT: (AFTER CONSTRUCTION): 0.85

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: 94% LAKE CHARLES-URBAN LAND COMPLEX SOIL, 6% DYLAN CLAY; 35% GRASS COVER

NAME OF RECEIVING WATERS: LITTLE VINCE BAYOU: SEGMENT ID 1007A TO BUFFALO BAYOU: SEGMENT ID 1007 LITTLE VINCE BAYOU: SEGMENT ID 1007A TO BUFFALO BAYOU: SEGMENT ID 1007

EROSION AND SEDIMENT CONTROLS

SOIL STABILIZATION PRACTICES:

____ TEMPORARY SEEDING
_X_ PERMANENT PLANTING, SODDING, OR SEEDING
____ MULCHING
____ SOIL RETENTION BLANKET
____ BUFFER ZONES
____ PRESERVATION OF NATURAL RESOURCES

OTHER: N/A

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
_X_ EROSION CONTROL LOGS

OTHER:

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

AFTER THE SIGNS AND BARRICADES HAVE BEEN INSTALLED:

1. INSTALL THE BIODEGRADABLE EROSION CONTROL LOGS AS DIRECTED BY THE ENGINEER.
2. MAINTAIN THE BIODEGRADABLE EROSION CONTROL LOGS DURING THE PROJECT.
3. REMOVE THE BIODEGRADABLE EROSION CONTROL LOGS ON COMPLETION OF WORK AT EACH LOCATION.

STORM WATER MANAGEMENT:

ANY DEVICES REQUIRED TO MINIMIZE SEDIMENT RUNOFF IN THE EVENT OF A STORM WILL BE PLACED IN POSITION BEFORE CONSTRUCTION BEGINS. THE STORM WATER DRAINAGE WILL BE PROVIDED BY THE EXISTING SYSTEMS ALREADY IN PLACE. WATER WITHIN THE RIGHT OF WAY WILL BE CARRIED BY DITCHES TO LOWS IN THE ROAD PROFILE WHERE IT WILL OUTFALL INTO THE RECEIVING WATERS.

POST CONSTRUCTION STORM WATER MANAGEMENT

THERE WILL BE NO DEVICES INSTALLED DURING THE CONSTRUCTION PROCESS TO CONTROL STORM WATER DISCHARGES THAT WILL REMAIN AFTER CONSTRUCTION OPERATIONS HAVE BEEN COMPLETED.

This may be amended if the devices to be used are known i.e. silt fence, biodegrad, control logs, etc.

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: ALL SANITARY WASTE WILL BE COLLECTED FROM THE PORTABLE UNITS ALL NECESSARY OR AS REQUIRED BY LOCAL REGULATIONS BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.

OFFSITE VEHICLE TRACKING:

_X_ HAUL ROADS DAMPENED FOR DUST CONTROL
_X_ LOADED HAUL TRUCKS TO BE COVERED WITH TARPAULIN
_X_ EXCESS DIRT ON ROAD REMOVED DAILY
_X_ STABILIZED CONSTRUCTION ENTRANCE

OTHER: N/A

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.

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

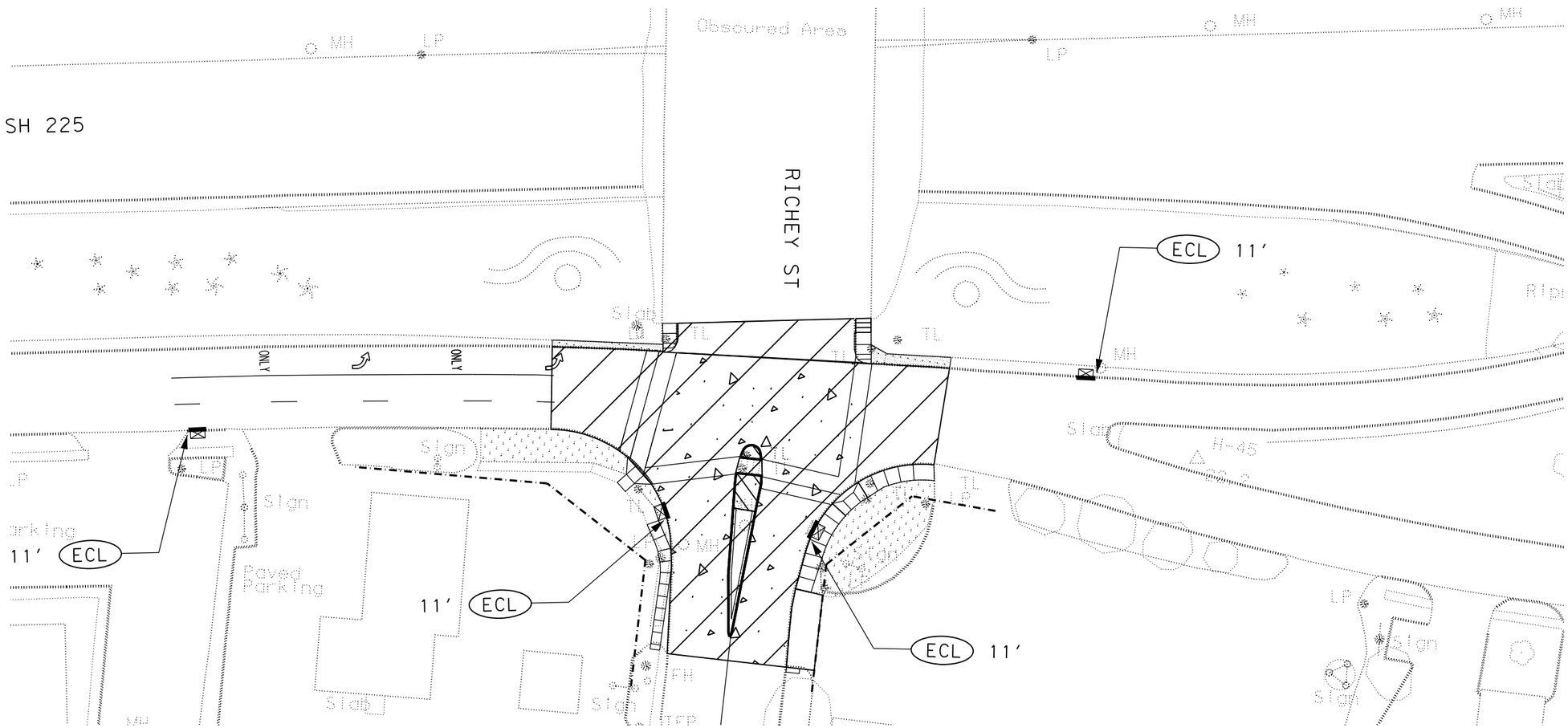
Texas Department of Transportation
Houston District

TxDOT STORM WATER POLLUTION PREVENTION PLAN

SWP3

FILE: STDG1.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot
©TxDOT JANUARY 2007	DIST	FED REG	PROJECT NO.	SHEET
REVISIONS REV. 9/2010 INSPECTION NOTE REV. 9/2013 INSPECTION NOTE REV. 11/2013 SW3P TO SWP3	HOUSTON	6		148
	COUNTY		CONTROL SECT JOB	HIGHWAY
	HARRIS		0502 01 222	SH 225

STD G-1



LEGEND

▨	LIMITS OF PROPOSED WORK
ECL	EROSION CONTROL LOG

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by
DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

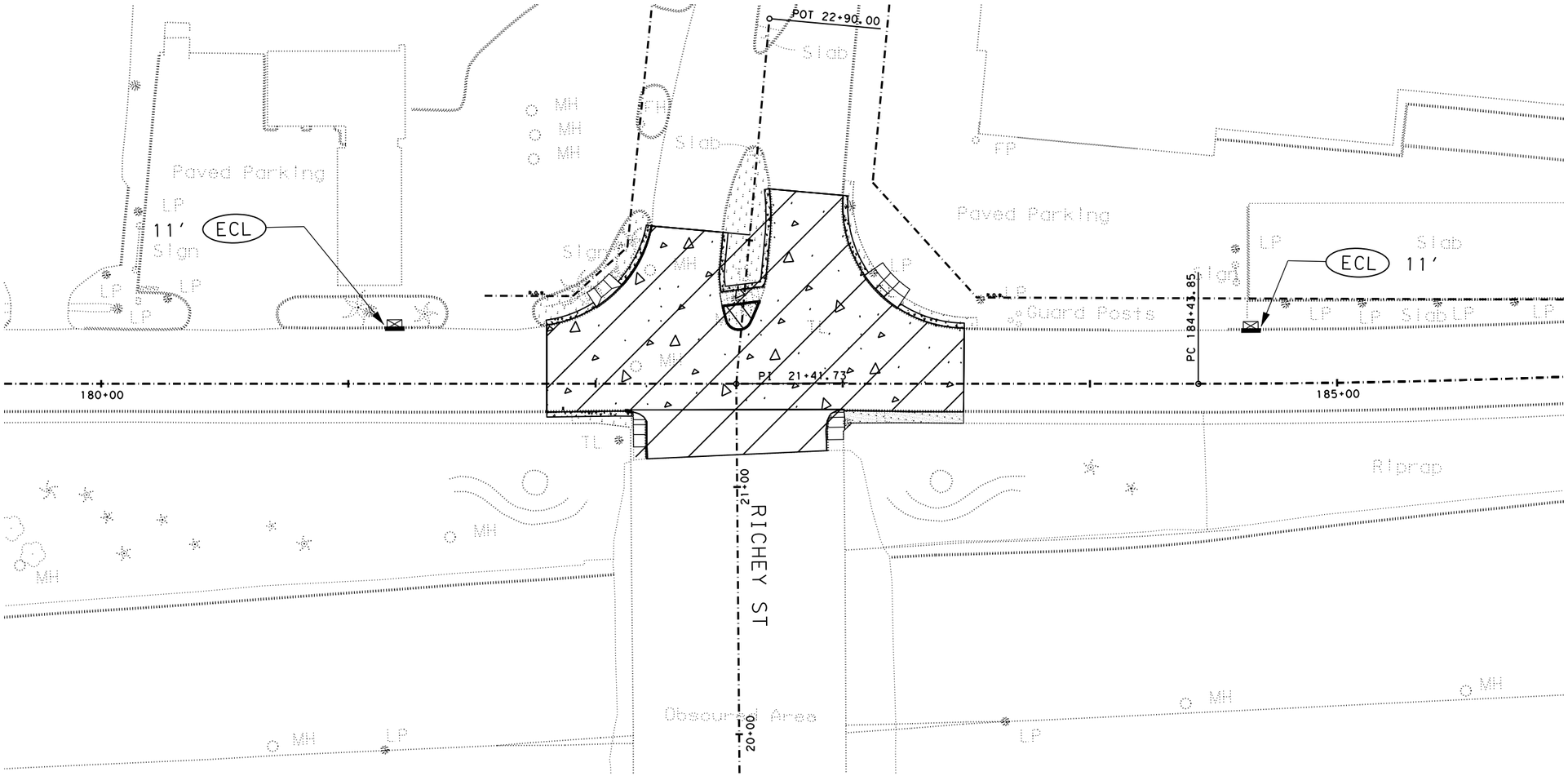
SH 225

EASTBOUND FRONTAGE ROAD & RICHEY ST

SWP3 LAYOUT

SHEET NO. 1 OF 4 SCALE: 1" = 50'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			149
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

▨	LIMITS OF PROPOSED WORK
ECL	EROSION CONTROL LOG

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

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3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

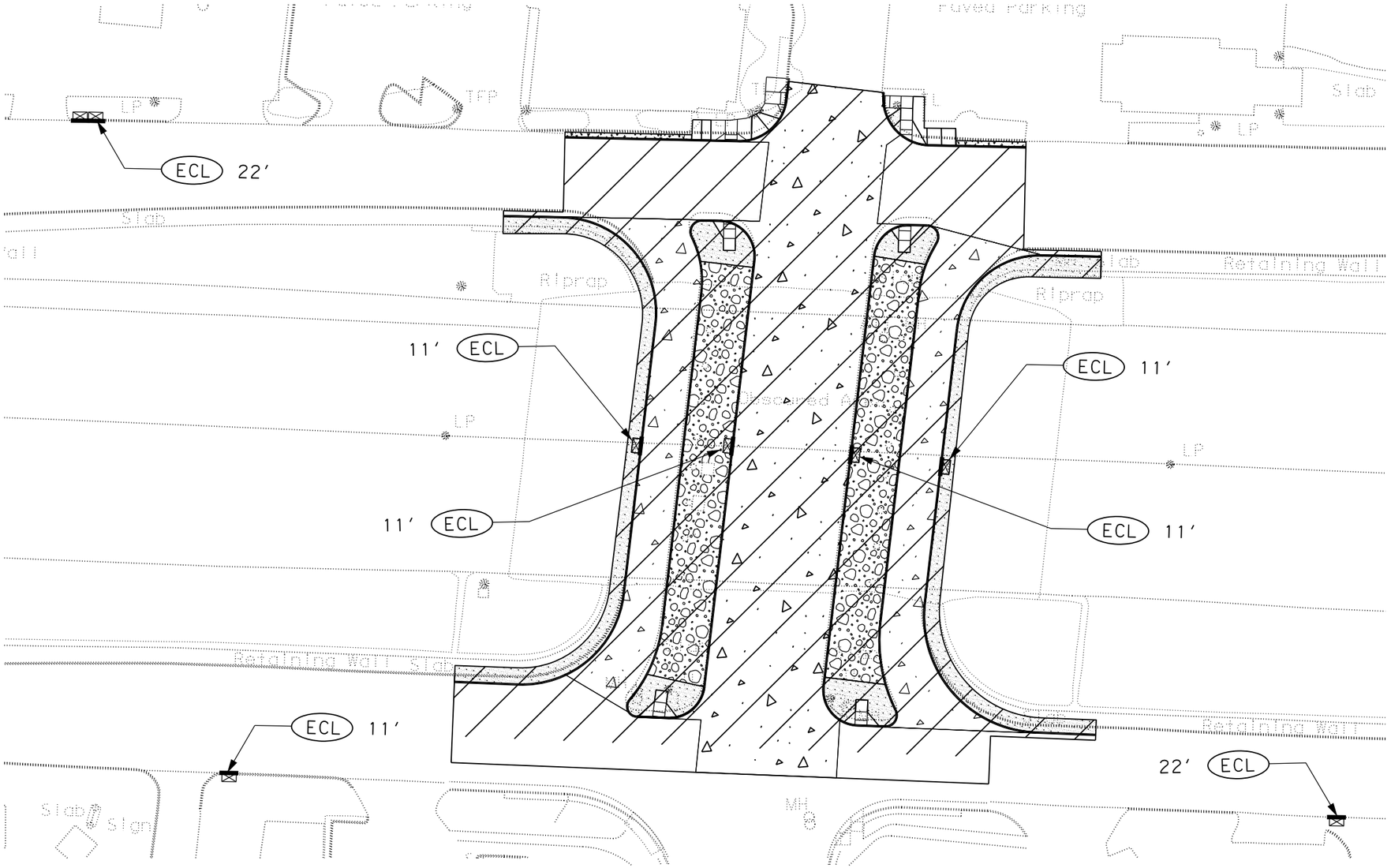
SH 225

WESTBOUND FRONTAGE ROAD & RICHEY ST

SWP3 LAYOUT

SHEET NO. 2 OF 4 SCALE: 1" = 50'

FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
6			150
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

▨	LIMITS OF PROPOSED WORK
ECL	EROSION CONTROL LOG

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED
PROFESSIONAL ENGINEER

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3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

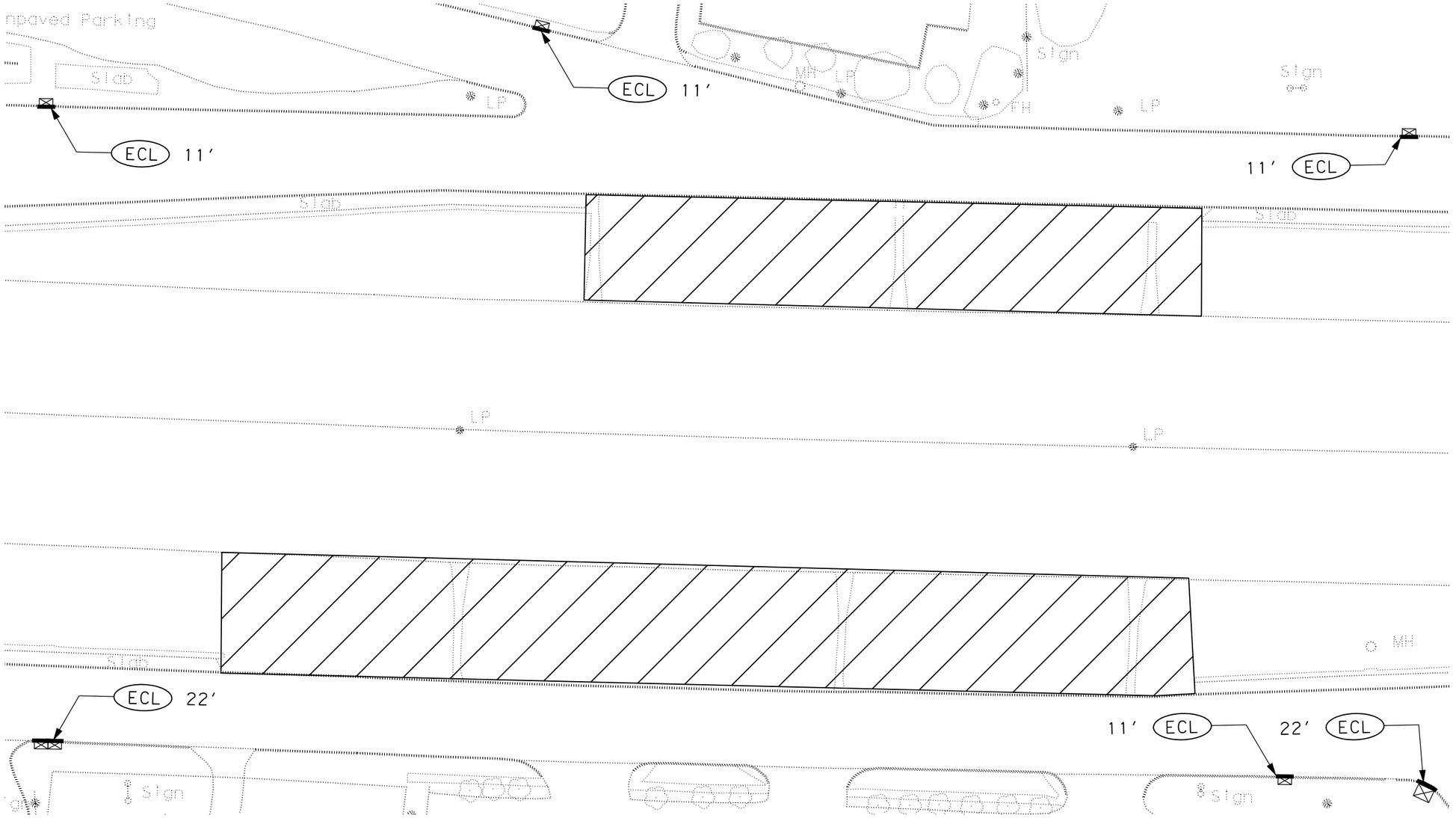
SH 225

FRONTAGE ROAD & PASADENA BLVD

SWP3 LAYOUT

SHEET NO. 3 OF 4 SCALE: 1" = 50'

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			151
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225



LEGEND

LIMITS OF PROPOSED WORK

ECL — EROSION CONTROL LOG

STATE OF TEXAS
DEDRICK D. KNIGHTEN
103612
LICENSED PROFESSIONAL ENGINEER

The seal appearing on this document was authorized by DEDRICK D. KNIGHTEN, P.E. 103612

3/25/2021

Dedrick D. Knighten, P.E.

TEXAS DEPARTMENT OF TRANSPORTATION

SH 225

FRONTAGE ROAD SLOPE PAVING

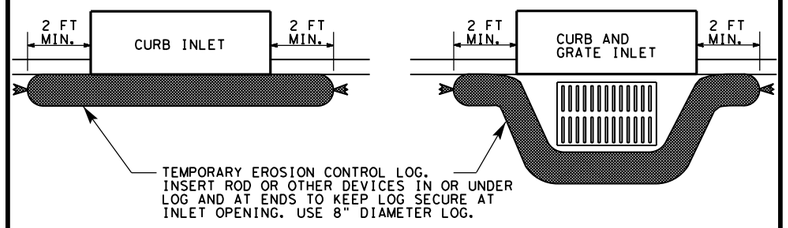
SWP3 LAYOUT

SHEET NO. 4 OF 4 SCALE: 1" = 50'

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6			152
STATE	DIST.	COUNTY	
TEXAS	12	HARRIS	
CONT.	SECT.	JOB	HIGHWAY NO.
0502	01	222	SH 225

CURB INLETS
8" DIAMETER LOGS

ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8")



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

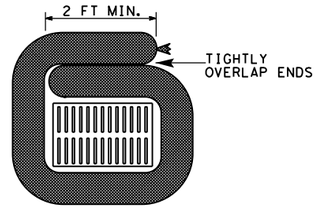
The trap should be cleaned when the capacity has been reduced by 1/2 or the sediment has accumulated to a depth of 1', whichever is less.

REQUIRED ITEMS:

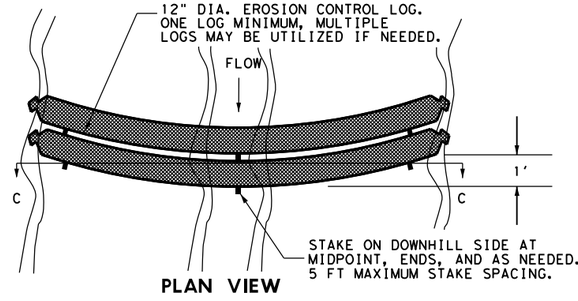
- ITEM 506-6040 BIODEG EROSN CONT LOGS (INSTL) (8") LF
- ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF
- ITEM 506-6043 BIODEG EROSN CONT LOGS (REMOVE) LF

DROP INLETS AND OTHER LOCATIONS
12" DIAMETER LOGS

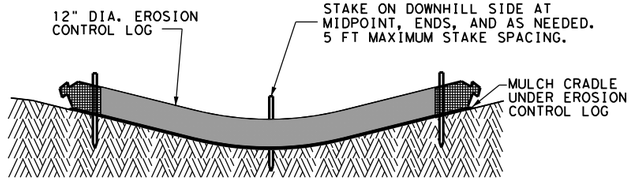
ITEM 506-6041 BIODEG EROSN CONT LOGS (INSTL)(12")



DROP INLETS

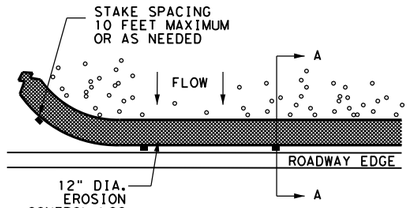


PLAN VIEW

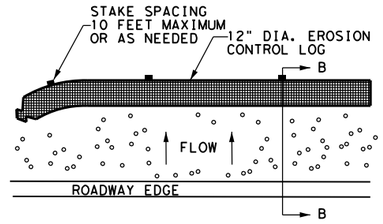


SECTION C-C

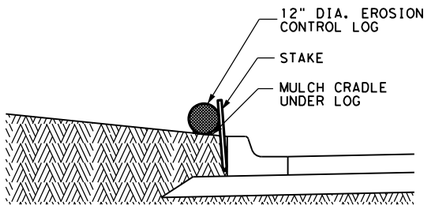
DRAINAGE SWALE OR DITCH



PLAN VIEW

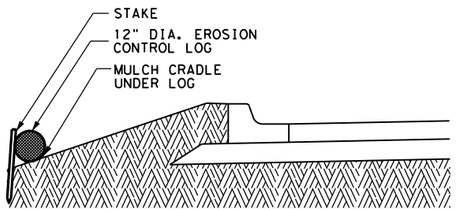


PLAN VIEW



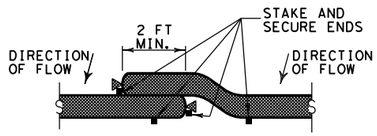
SECTION A-A

SLOPE TO ROADWAY EDGE

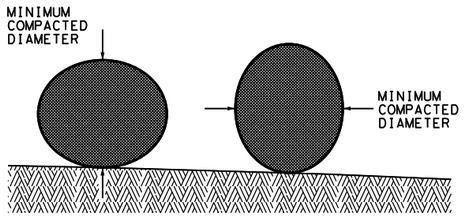


SECTION B-B

SLOPE AWAY FROM ROADWAY EDGE



END OF LOG OVERLAP



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation
Houston District

EROSION CONTROL LOG

ECL-12

FILE: STDG4a.DGN	DN: TxDot	CK: TxDot	DW: TxDot	CK: TxDot			
©TxDOT 2014	DISTRICT	FED REG	PROJECT NUMBER				SHEET
REVISIONS 3/15 MINOR CORRECTIONS	HOU	6					153
	COUNTY			CONTROL	SECT	JOB	HIGHWAY
	HARRIS			0502	01	222	SH 225

STD G-4A

I. STORMWATER POLLUTION PREVENTION

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.

No Additional Comments

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS

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.

☒ No United States Army Corps (USACE) Permit Required

☐ 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."

☐ 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."

☐ 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.

☐ 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.

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.

☒ No United States Coast Guard (USCG) Coordination Required

☐ United States Coast Guard (USCG) Permit

☐ United States Coast Guard (USCG) Exemption

No Additional Comments

III. CULTURAL RESOURCES

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

No Additional Comments

IV. VEGETATION RESOURCES

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.

No Additional Comments

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

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.

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)

No Additional Comments

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.

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

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.

No Additional Comments

VII. OTHER ENVIRONMENTAL ISSUES

Comments:

DATE: Jan 04, 2021
FILE:

Version 2.1

Texas Department of Transportation

TxDOT Houston District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: EPIC Sheet.dgn	DN:	CK:	DW:	CK:
© TxDOT: March 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	0502	01	222	SH 225
UPDATED section V. text and added definition (10/17) ADDED USCG and USACE notes in Section VII (04/18)	DIST	COUNTY		SHEET NO.
	12	Harris		154

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.		
	✓		**161-6017 COMPOST MANUF TOPSOIL (BIP)(4") SY**	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.
✓			**162-6002 BLOCK SODDING SY**	GRASS SPECIES Item 162.2. Materials. Common Bermuda (Cynodon Dactylon)	Item 162.2.1. Block Sod. Use block palletized or roll type sod. **REMOVE PLASTIC BACKING FROM ROLL TYPE SOD.** 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.
	✓		**164-6066 DRILL SEEDING(PERM)(WARM OR COOL) SY** 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 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	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. 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. Use broadcast seeding method where site conditions prevent drill seeding method. 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.
	✓		**164-6052 BROADCAST SEED(PERM)(SPECIAL MIX) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
		✓	**164-6051 DRILL SEED(TEMP)(WARM OR COOL) SY** 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 November, December, January, February, Oats (Avena sativa - 72.0 lbs PLS/acre	
		✓	**164-6009 BROADCAST SEED(TEMP)(WARM) SY** Item 164.1. Description Provide and install seeding as shown on District Standard		
	✓	✓	**162-6003 STRAW OR HAY MULCH SY**	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
✓	✓	✓	**166-6001 FERTILIZER AC** 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 **NON-CHEMICAL** 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
✓	✓	✓	**168-6001 VEGETATIVE WATERING MG**	APPLICATION RATE Item 168.3 Construction. 6000 gallons/acre per working day x 20 consecutive working days = 120,000 gallons total/acre	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

Texas Department of Transportation

HOUSTON DISTRICT

FERTILIZER, SEED, SOD, STRAW, COMPOST, AND WATER

SHEET 1 OF 1

REVISIONS	FILE:	FED DIV	STATE	PROJECT NUMBER			SHEET
10/2014 UPDATED TO 2014 SPECS 3/2015 MINOR CORRECTIONS	OCT 2014	6	TEXAS				155
	ORIGINAL:	DIST	COUNTY	CONTROL	SECT	JOB	HIGHWAY
		12	HARRIS	0502	01	222	SH 225

STD K-1